

Wireless Terminals Solutions Guide



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Broad Wireless Technology Portfolio

In the 2.5G and 3G era of wireless communications, mobile users want access to a range of services in a handset. Texas Instruments (TI) wireless technology portfolio offers handset manufacturers the flexibility to create handsets from voice-only to capability-rich. TI's focus is on real-time communications, and its proven wireless technology is delivering the high performance and low-power consumption needed for a range of applications such as multimedia, DVD-quality video, MP3 audio, high-end imaging, speech recognition, security, location-based services and e-commerce.

TI's experience in providing semiconductor solutions to the wireless market spans over 15 years. As the established leader for 2.5G and 3G, TI provides the technology of choice to leading wireless handset and handheld manufacturers including Nokia, NEC, Fujitsu, Palm, Sendo, Legend and many more. The company supports all wireless standards including GSM, GPRS, EDGE, WCDMA, CDMA, UMTS, TDMA and PDC. Operating system vendors such as Symbian™, Microsoft®, Palm, Sun Microsystems and SavaJe have also ported their software platforms on TI's processors, and a broad range of software developers are creating innovative applications to run on OMAP™ processors mobile devices.

Making **Wireless**



Through its TCS family of chipsets, TI provides complete “antenna-to-applications” solutions that include digital baseband modems, integrated analog and power management, RF processing and powerful applications processors. To enhance system flexibility, TI also offers a complete range of peripherals such as USB, Bluetooth®, removable flash cards, camera controllers, stereo codecs and drivers. In addition, complete hardware and software wireless reference designs give manufacturers the tools they need to develop and deliver products to market fast.

Software reuse and programmability are key features of TI's wireless technology, giving manufacturers the ability to leverage engineering from previous generations for developing multiple product lines. TI's wireless chipset solutions and OMAP processors are backward and forward compatible, providing customers with platform investment protection as standards and capabilities evolve.

For differentiated voice and multimedia applications, TI offers the widely adopted OMAP platform that combines high-performance, power-efficient processors with comprehensive, easy-to-use software and unprecedented technical support. OMAP processors support all standards and high-level operating systems. TI's OMAP Developer Network includes the compelling, easy-to-implement applications for 2.5G and 3G wireless smartphones, PDAs and other Internet access devices.

TI has the architecture, systems expertise, partnerships and manufacturing strength to continue to offer customers with differentiated technology solutions into the next generation of wireless communications. Please read on to find out more about TI's solutions for a full range of mobile devices and applications.

NEW!

TEXAS INSTRUMENTS

OMAP²

TEXAS INSTRUMENTS TECHNOLOGY

OMAP²

TEXAS INSTRUMENTS TECHNOLOGY

All-in-One Entertainment Architecture

Features shown around the central phone:

- DIGITAL AUDIO
- DIGITAL TV
- VGA DISPLAY
- DVD VIDEO
- DIGITAL CAMERA
- 3-D GAMING
- HI-FI MUSIC

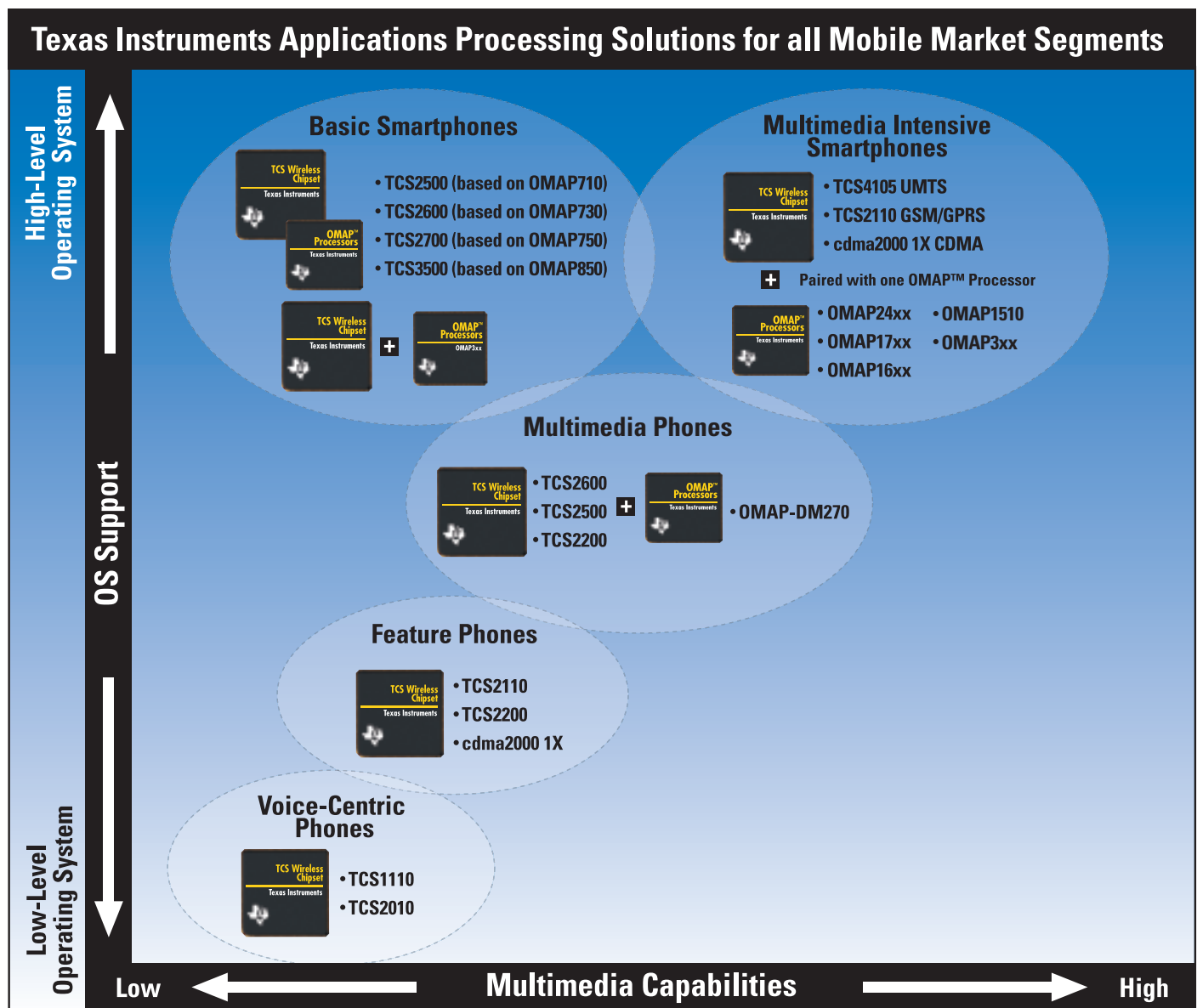
Overview

To Know More

For detailed information about TCS Chipset solutions featured in this issue:

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TI's family of TCS Chipsets give mobile device manufacturers complete, scalable platforms that meet the requirements of all market segments and standards, including GSM, GPRS, CDMA, WCDMA, UMTS and EDGE. TI's solutions provide the necessary elements to bring differentiated mobile devices to market fast, including a broad range of hardware, software, reference designs, development tools and support. Digital and analog baseband processors, applications processors capable of real-time multimedia processing, power management ICs, RF transceivers and more are also part of TI's broad range of TCS Chipset offerings.





Together these highly integrated components give manufacturers:

- Real-time multimedia processing
- High-performance processing
- Low-power consumption
- Small form factors

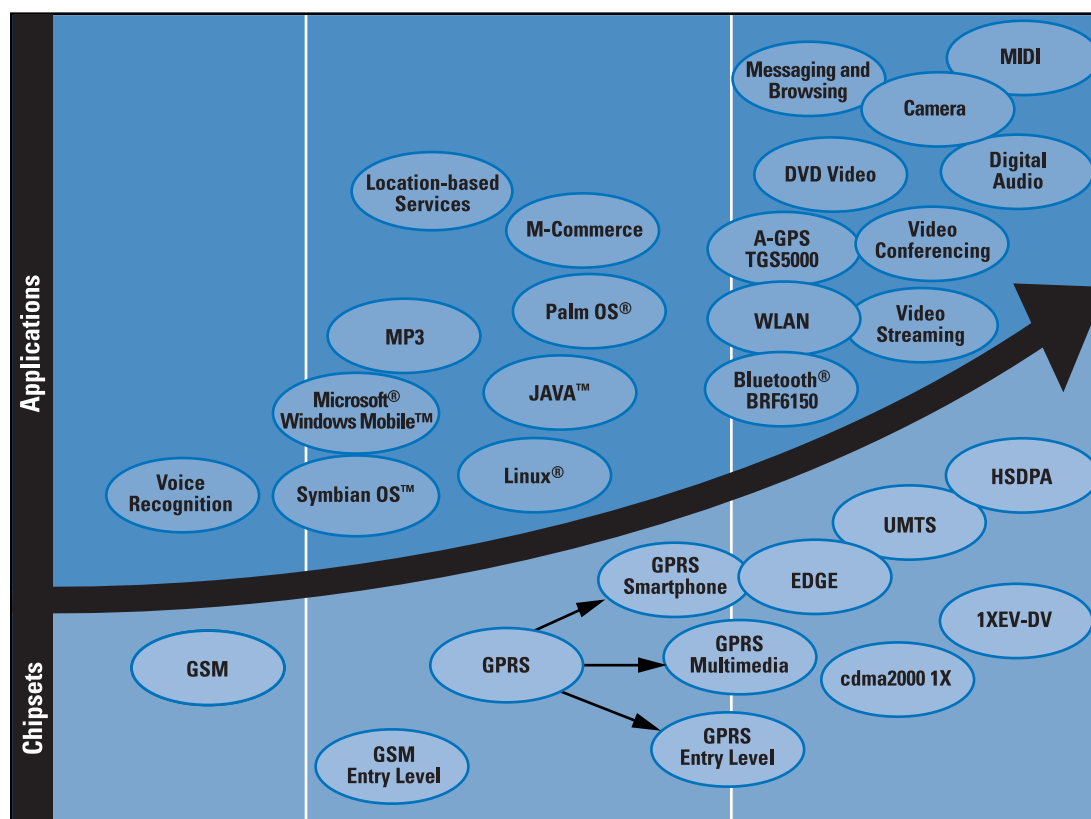
From traditional, cost-sensitive voice-centric handsets to high-end multimedia-rich PDAs, smartphones and Internet access devices, TCS Chipsets support all leading mobile operating systems. Standards-compliant protocol stacks, high-level programming languages, easy-to-use APIs and development tools are part of their fully validated and tested reference designs. Incorporating OMAP™ applications processors within many TCS Chipset solutions allows TI to deliver the most integrated modems, baseband and dedicated smartphone solutions available.

TI's TCS Chipsets offer advanced real-time and general purpose processing for the most advanced applications, including streaming media, graphics, high-end stereo, polyphonic audio, interactive 3D

gaming and entertainment, speech processing, location-based services and more. The advanced integration of TI's TCS Chipsets reduces part count and size, delivering a low bill of materials (BOM) and continuing TI's industry-leading track record of the lowest power consumption and longest battery life.

More recent generations of the TCS Chipsets address the growing importance of security, providing the most secure mode for wireless transactions through a comprehensive set of hardware-based security features, software libraries and services that allow manufacturers to add enhanced protection.

An array of value-added software and services are available as part of the TCS Chipsets and reference designs, including the TCS Wireless Software Suite of fully validated embedded software. The TCS Wireless Software Suite includes an easy-to-use PC-based software development environment, optimized JAVA Sun KVM, MIDI, MP3, WAP2.0 stack and browser, EMS and MMS KVM messaging clients, Bluetooth® profiles and more. TI's OMAP Developer Network and the Independent OMAP Technology Centers (OTC) serve as additional resources for quickly deploying compelling 2.5G and 3G devices.



TI's Roadmap for Complete TCS Chipset Solutions



Key Benefits

- Complete chipset solution and reference design for reduced time-to-market
- Leverages four generations of system-level understanding and leading performance
- Full GSM implementation
- Dual-core digital baseband with proven GSM modem architecture
- Reduced BOM count and cost
- Audio software modules
- Bluetooth® connectivity

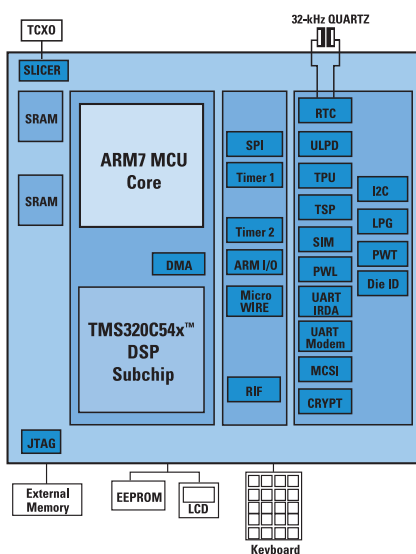
TCS1110 GSM Chipset

TI's proven TCS1110 chipset and complete reference design for GSM handsets combines the hardware and software required for GSM handset development. This fourth generation solution offers enhanced performance and capabilities, and features a complete L1/L2/L3 GSM protocol stack. It is implemented today in a broad array of mobile devices across the wireless market, and comes with a full suite of development tools and software.

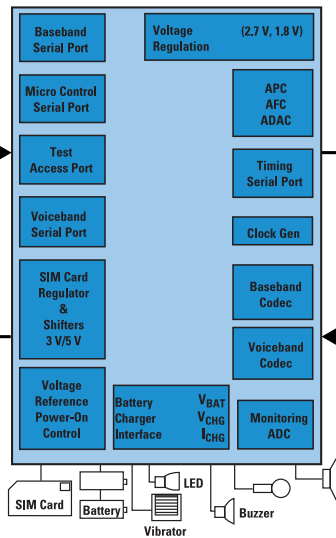
TCS1110 components include:

- TBB1100 dual-core, high-performance digital baseband processor
- TWL3012 analog baseband with full power management
- TRF6150 tri-band direct-conversion RF transceiver

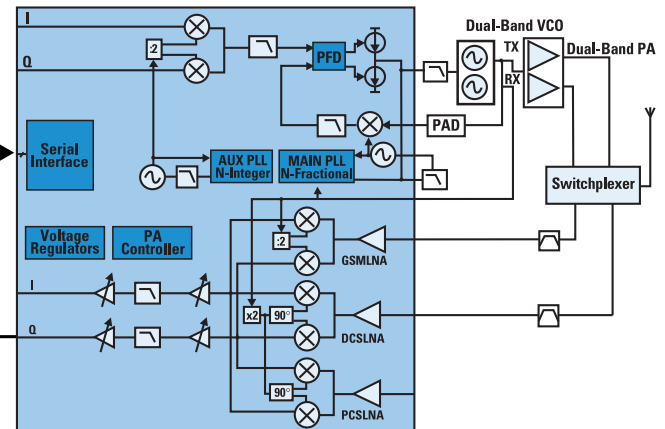
TBB1100 Digital Baseband



TWL3012 Analog Baseband



TRF6150 RF Transceiver





TBB1100 Digital Baseband

The TBB1100 features high performance and low power through TI's dual core architecture. This highly integrated device is built on TI's industry-leading TMS320C54x™ DSP core, specifically optimized for wireless.

Key Features

- Dual core architecture combining C54x™ DSP with ARM7TDMI® for high performance and low power
- 180 nm full static CMOS technology
- 3.3-V I/Os, 1.8-V cores
- Memory protection
- DMA controller
- Real Time Clock (RTC)
- GSM Ultra Low-Power Device (ULPD)
- Die-ID cell
- Two UARTS, one supporting IRDA control
- 3.3-V and 1.8-V compliant SIM interface
- 12 mm x 12 mm MicroStar BGA™ package
- FR/EFR/HR triple vocoder
- Data one slot for fax, RLIP, RA, V42bis
- Acoustic echo and noise suppression
- Voice memo and voice recognition with name dialing
- Melody generator

TWL3012 Analog Baseband

TI's TWL3012 is highly integrated, leveraging TI's industry-leading mixed-signal and analog baseband technology. Combined in a single chip are voiceband codecs, baseband codecs, single and multi-slot IQ RF interface and RF converters.

Key Features

- Voiceband and baseband codecs
- Single and multi-slot IQ LRF interfaces
- Auxiliary RF converters
- 3-V or 5-V SIM card interface
- Low-dropout voltage regulators
- Li-Ion or NiMH charging control
- Voltage detectors with power-off delay
- 10 mm x 10 mm MicroStar BGA™ package

TRF6150 RF Transceiver

The TRF6150 is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device integrates several external components to reduce complexity, part-count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating previous external filtering devices, the DC architecture of the TRF6150 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Direct conversion architecture
- Receiver with front-end filters only
- Single-chip, dual-band/tri-band transceiver
- Low BOM cost
- GPRS class 12 compliant
- Single external VCO solution
- N-fractional synthesizer
- PA control loop
- On-chip voltage regulators
- Frequency plan compatible with Bluetooth® and GPS
- RF BiCMOS 2 process
- 64-TQFP package



GSM

Key Benefits

- Complete GSM/GPRS handset reference design
- Dual-core digital baseband with TI proven GSM/GPRS modem architecture
- Reduced BOM costs for high-volume low-cost handsets
- Low-power consumption with twice the standby time of previous generation
- Pin compatibility with TBB2100 GSM/GPRS modem
- Integrated quad-band, direct conversion, single-chip RF transceiver
- Software compatible with TCS2200 and TCS2100 GSM/GPRS chipsets
- Class 12 GPRS ready
- Adaptive MultiRate Narrow Band (AMR-NB) vocoders
- Integrated EOTD location determination
- Optimized interface to OMAP™ applications processors
- Full range of software applications through TCS Wireless Software Suite

TCS2010 GSM/GPRS Chipset

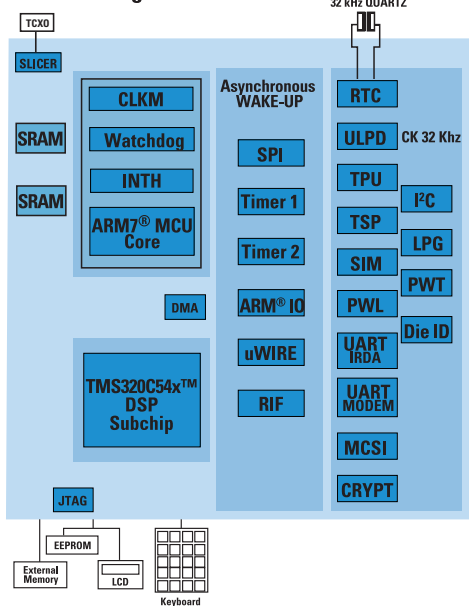
Designed for low power, TI's TCS2010 chipset offers a full Class 12 GSM/GPRS platform with applications processing abilities. The solution combines a dual-core digital baseband processor based on TI's low power TMS320C54x™ DSP and ARM® general-purpose processing cores, along with an analog baseband that uses power-down sleep modes to reduce power consumption and increase standby time of mobile devices.

TBB2010 components include:

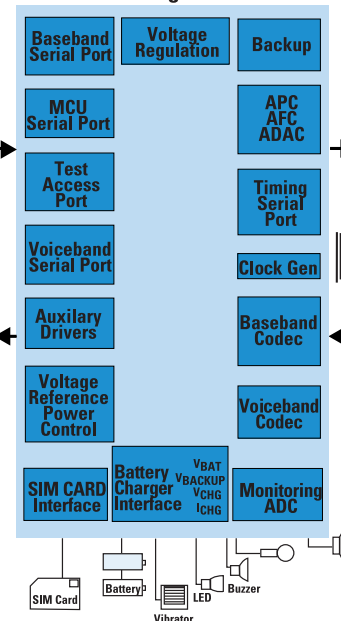
- TBB2010 dual core digital baseband processor
- TWL3014 analog baseband with sleep modes for reduced power consumption
- TRF6151 direct conversion, quad-band RF transceiver

When additional application processing is required, the TCS2010 is optimized to interface with TI OMAP™ applications processors. The combination of the TCS2010 and an OMAP processor delivers the processing performance needed for advanced multimedia applications.

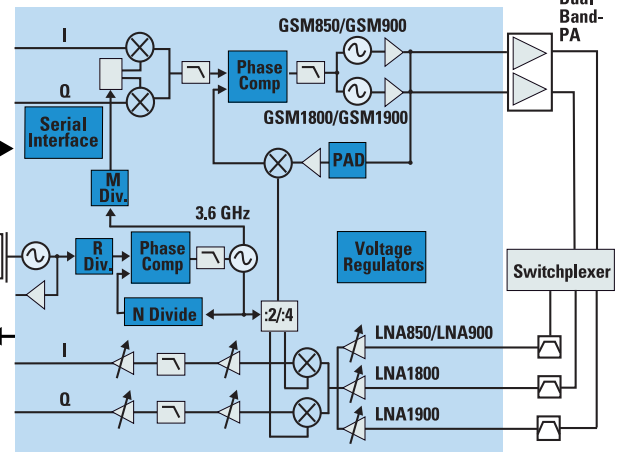
TBB2010 Digital Baseband



TWL3014 Analog Baseband



TRF6151 RF Transceiver (GSM/GPRS)





TBB2010 Digital Baseband

Based on TI's leading TMS320C54x™ DSP for wireless-centric applications, the TBB2010 is extremely efficient. The baseband's on-chip memory and fast, four-channel DMA controller allows for quick data transfers. Page mode with external memory access also facilitates data movement.

Key Features

- Dual-core architecture combining TI's C54x™ DSP and an ART7TDMI® core
- On-chip memory
- Four-channel DMA controller
- Page mode for external memory access

TWL3014 Analog Baseband

The TWL3014 analog baseband integrates all the power management and analog functions on a single chip, reducing board space requirements, chip count and development costs. The device includes voice-band and baseband codecs and features programmable low-dropout voltage regulators.

Key Features

- Single-chip solution integrates power management functions
- Voice band codecs
- Single/multislot baseband codecs
- I/Q RF interface and GMSK modulator in UL path
- LDO voltage regulators with programmable voltage
- Battery charger interface; control of either 1-cell Li-ion or 3-series Ni-MH/Ni-Cd cell batteries
- 1.8-V or 3-V automatic frequency control/power Control SIM interface
- 1.8-V or 3.3-V external memory
- Headset audio interface, LED drivers
- 10 mm x 10 mm MicroStar BGA™ package

TRF6151 RF Transceiver

The TRF6151 is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device integrates several external components to reduce complexity, part count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm QFP package



GPRS

Key Benefits

- Complete hardware and software solution for GPRS handset
- Class 12 GPRS with headroom for additional applications and features
- Reduced BOM cost through high integration levels
- Software compatible with TCS2200 and TCS2010 GSM/GPRS chipsets
- Integrated EOTD location determination
- Optimized interface to OMAP™ applications processors for multimedia applications
- Easy-to-use software development environment for embedded applications

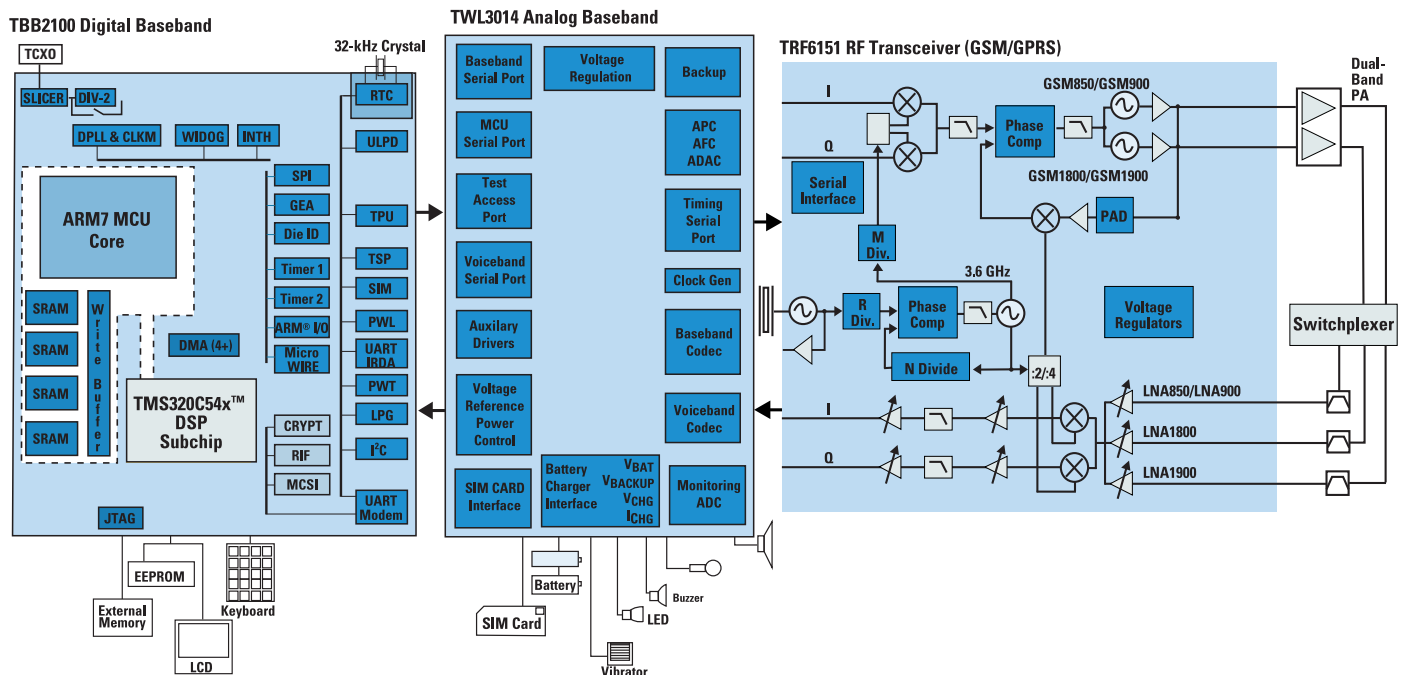
TCS2110 GSM/GPRS Chipset

The TCS2110 chipset and complete reference design support Class 12 GPRS and offer software compatibility with TI's TCS2010 and TCS2200 GSM/GPRS chipset solutions. It provides the MIPS processing headroom for manufacturers to add features and applications, and also incorporates a power-split technique for delivering low-power consumption.

TCS2110 components include:

- TBB2110 digital baseband combines TMS320C54x™ DSP with ARM7TDMI® processor
- TWL3014 analog baseband with power-split technique for low-power consumption
- TRF6151 single-chip, quad-band RF transceiver with dual-conversion architecture

A complete set of communication software is provided as part of the TCS2110 solution, along with a comprehensive TCS Wireless Software Suite that provides a range of embedded applications including WAP2.0 stack and browser, EMS and MMS messaging clients, Bluetooth® PS and profiles.





TBB2110 Digital Baseband

The TBB2110 is a dual-core, high-performance digital baseband that includes a powerful shared-memory architecture. It combines TI's low-power TMS320C54x™ DSP with an ARM7TDMI® RISC processor to support multi-slot GPRS Class 12 with the corresponding data throughput and extra processing headroom for manufacturers to deliver their own value through added applications and features.

Key Features

- TMS320C54x DSP with Data/Program memory on-chip
- ARM7TDMI running internal SRAM
- 130 nm CMOS technology
- 3.3-V I/Os, 1.8-V cores
- Memory protection unit
- DMA controller
- Real Time Clock (RTC)
- GSM ultra-low-power device (ULPD)
- HW accelerator for GPRS encryption
- Die-ID cell
- Two UARTS, one supporting IRDA control
- SIM interface (3.3-V and 1.8-V compliant)
- 12 mm x 12 mm MicroStar BGA™ package

TWL3014 Analog Baseband

The TWL3014 analog baseband integrates all the power management and analog functions on a single chip, reducing board space requirements, chip count and development costs. The device includes voice-band and baseband codecs and features programmable low-dropout voltage regulators.

Key Features

- Single-chip solution integrates power management functions
- Voice band codecs
- Single/multislot baseband codecs
- I/Q RF interface and GMSK modulator in UL path
- LDO voltage regulators with programmable voltage
- Battery charger interface; control of either single-cell Li-Ion or 3-series Ni-MH/Ni-CD cell batteries
- 1.8-V or 3-V automatic frequency control/power Control SIM interface
- 1.8-V or 3.3-V external memory
- Headset audio interface, LED drivers
- 10 mm x 10 mm MicroStar BGA™ package

TRF6151 RF Transceiver

The TRF6151 delivers GSM/GPRS reception as part of the TCS2110 chipset. It is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device brings together several external components to reduce complexity, part count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm QFP package



Key Benefits

- Integrated applications processor and digital baseband leverages proven dual-core modem architecture
- Enhanced application processing with color display, music and security
- Low-system power consumption through split power-down techniques
- Security protection through hardware features and third party security library
- Fast data movement and extended memory resourced with DMA
- Page-mode interface for external memory
- Location determination through integrated EOTD
- Full peripheral set including USB, MMC, Memory Stick®, Bluetooth® connectivity and others

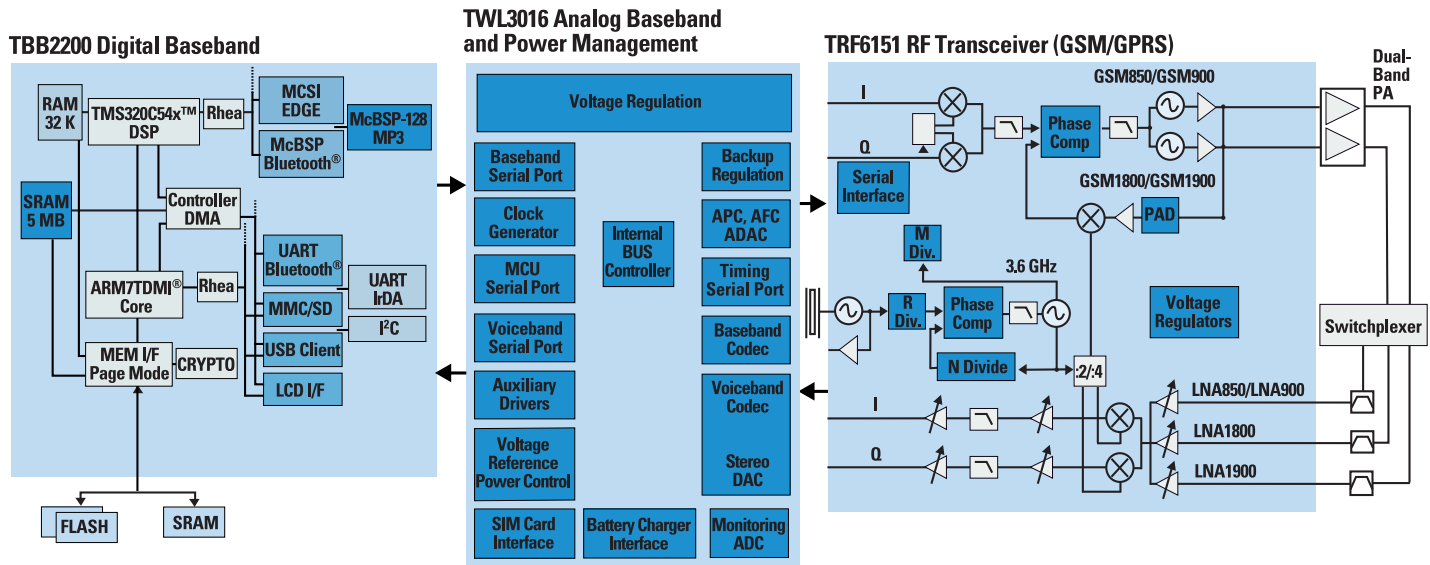
TCS2200 GSM/GPRS Chipset

Targeted at multimedia Java handsets, TI's TCS2200 chipset solution and reference design delivers the enhanced performance and low-power consumption required for processing-intensive multimedia applications.

TCS2200 components include:

- TBB2200 digital baseband with integrated TI DSP and ARM cores
- TWL3016 analog baseband with integrated power management
- TRF6151 quad-band RF transceiver

Storage and fast data movement facilities are gained through the TCS2200's extended memory resources and fast direct memory access (DMA) controller. The solution is software compatible with the TCS2110 and TCS2010, includes a L1/L2/L3 GSM/GPRS protocol stack and a full peripheral set with USB, MMC, Memory Stick, Bluetooth connectivity and others. The fully type-approved TCS2200 reference design includes a full BOM, detailed board design with schematics and layout. A complete set of development tools allows manufactures to easily differentiate capabilities.





TBB2200 Digital Baseband

The TBB2200 provides the connectivity and capabilities required for the latest multimedia applications. It features TI's proven digital baseband architecture, integrating TI's leading, low power TMS320C54x™ DSP and the ARM7TDMI® core. The TBB2200 runs a complete Class 12 modem and includes a TCS Wireless Software Suite.

Key Features

- Dual core architecture including C54x™ DSP and ARM7TDMI core
- ARM® processor with DMA and page-mode access
- Complete Class 12 modem
- Full suite of Java and embedded multimedia applications
- USB client port
- Parallel port for color LCDs
- Interfaces for Smart Card, Bluetooth®
- External NAND flash
- 12 mm x 12 mm MicroStar BGA™ package
- 130-nm CMOS technology

TWL3016 Analog Baseband

The TWL3016 analog baseband integrates all analog and power management functionality on a single chip. Through power-down sleep modes, the TWL3016 extends system standby time significantly, contributing to the overall battery savings the TCS2200 provides. The device also includes a D/A converter for applications like MP3 music, and an 8-Ω amplifier for hands-free speaker phone operation.

Key Features

- Integrated high-fidelity audio DAC
- Integrated hands-free and headphone amplifiers
- Overall clock input reduction of 50 percent
- 10 mm x 10 mm MicroStar BGA™ package

TRF6151 RF Transceiver

Specifically designed for GSM/GPRS reception as part of the TCS2200 chipset, the TRF6151 transceiver is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device integrates several external components to reduce complexity, part count and cost of the RF subsystem. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm QFP package



GPRS

Key Benefits

- Low system cost and small size due to high levels of integration
- Complete smartphone reference design
- Supports all high level OS support, including Symbian, Microsoft® Windows Mobile™, Palm OS®, Linux®, SavaJe and more
- Software compatible with OMAP™ processors and applications family
- Includes support from OMAP™ Developer Network and Independent OMAP Technology Centers
- Tri-band, direct conversion RF solution
- Support for MPEG-4, MP3, JPEG and speech recognition
- Removable storage of multimedia data

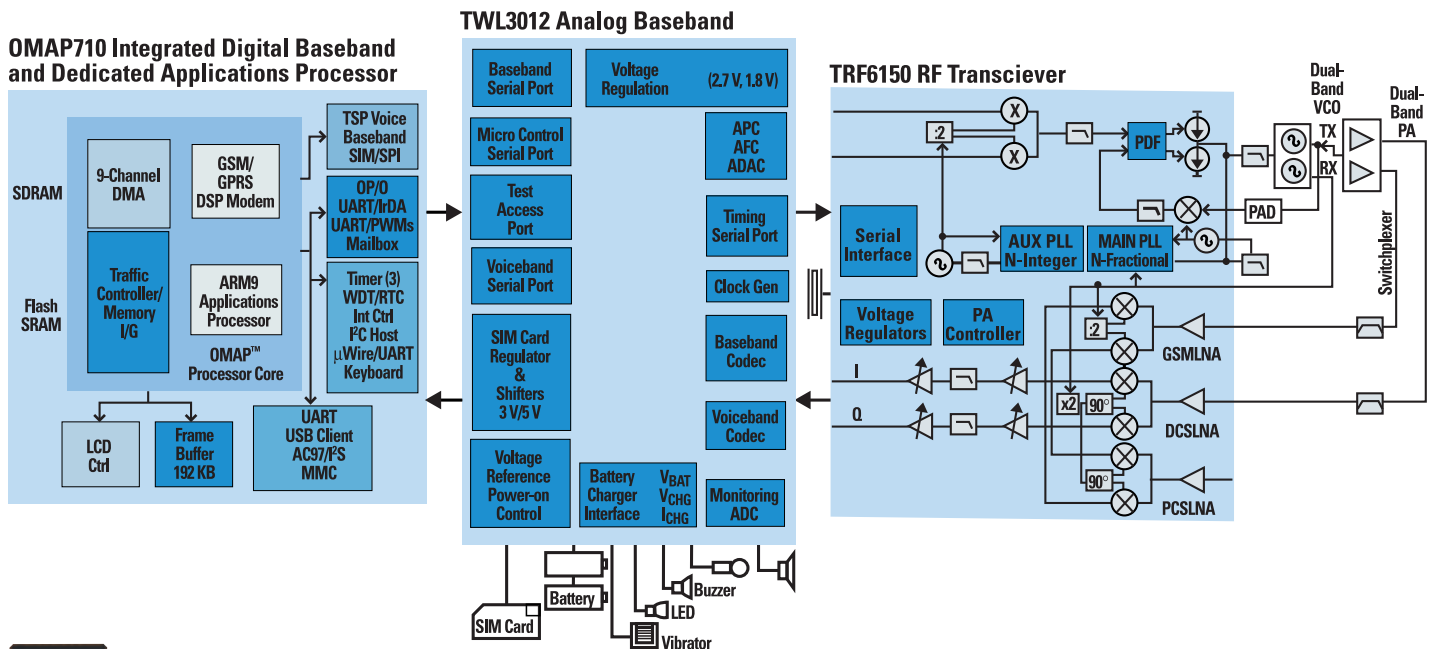
TCS2500 GSM/GPRS Chipset

TI's highly integrated TCS2500 leverages the most integrated smart-phone processor, the OMAP710, for implementing real-time voice, Internet access and basic multimedia. These capabilities, along with support of all mobile OS and a L1/L2/L3 GSM/GPRS protocol stack, are combined into a single baseband processor, reducing smartphone manufacturers' BOM cost and chip count significantly. The TCS2500 is the first chipset to optimize the combination of GSM/GPRS communication with powerful OS-based application processing in a highly integrated solution, enabling significant system cost savings and sleek form factors.

TCS2500 components include:

- OMAP710 digital baseband and dedicated applications processor
- TWL3012 integrated analog baseband with full power management
- TRF6150 RF transceiver based on direct conversion architecture

A fully type-approved TCS2500 reference design is also included that reduces development time by more than 6 months. The reference design comes with a complete BOM, board design and layout, and worldwide customer support. A full application software suite is included.



See OMAP™ Processor information on page 48



OMAP710 Digital Baseband and Dedicated Applications Processor

An ideal solution for smartphones and PDAs, the OMAP710 combines on a single baseband processor a dedicated TI-enhanced ARM925 applications processor and a GSM/GPRS baseband based on TI's leading, low power TMS320C54x™ DSP.

Key Features

- Complete GSM/GPRS digital baseband, including complete class 8 GPRS protocol stack
- TI-enhanced ARM925 processor up to 132 MHz (maximum frequency)
- 0.8-μm SIA/0.15-μm SIA full static CMOS technology
- 1.8-V nominal
- Memory management unit including:
 - 16-Kbytes instruction cache
 - 8-Kbytes data cache
 - 17-word write buffer
 - 192-Kbytes internal SRAM
- Integrated frame buffer and LCD controller
- USB 1.1 support with tier 4 compliance
- Multimedia card (MMC) interface
- Compact flash
- 12 mm x 12 mm, 289-ball MicroStar BGA™ package, 0.5-mm pitch

TWL3012 Analog Baseband

The TWL3012 is a highly integrated analog baseband with full power management. The device combines voiceband and baseband codecs with single and multi-slot IQ RF interface, and auxiliary RF converters.

Key Features

- Voiceband and baseband codecs
- Single and multi-slot IQ RF interface
- Auxiliary RF converters
- 3-V, 5-V SIM card interface
- Low-dropout voltage regulators
- Li-Ion or NiMH charging control
- Voltage detectors with power off delay
- 10 mm x 10 mm, 100-ball MicroStar BGA™ package, 0.8-mm pitch

TRF6150 RF Transceiver

Based on TI's unique direct conversion (DC) architecture, the TRF6150 is a single-chip, tri-band transceiver. Its high level of integration contribute to the overall cost savings of the TCS2500 chipset solution, reducing the overall BOM by about 30 percent over super heterodyne architectures.

Key Features

- Single-chip tri-band transceiver
- Direct conversion receiver with front-end filters only
- Low BOM cost
- GPRS class 12 compliant
- Single external VCO solution
- N-fractional synthesizer
- PA control loop
- On-chip voltage regulators
- Frequency plan compatible with Bluetooth® and GPS
- RF BiCMOS 2 process
- 64-TQFP package



GPRS

Key Benefits

- Proven GSM/GPRS modem technology and EDGE upgradeable
- Complete reference design includes Nokia Series 60 Platform and Microsoft® Windows Mobile™
- Twice the performance over previous generation, including 70% audio performance improvement and 8X Java processing increase
- High-level mobile OS support
- Software compatible with OMAP™ processors and applications
- OMAP Developer Network and Independent OMAP Technology Centers support and applications
- Highly integrated with reduced smartphone BOM and chip count
- Memory protection on FLASH and SDRAM interface
- Hardware acceleration for Java
- Complete peripherals set: USB On-the-Go, SD/MMC/SDIO, Bluetooth®, dedicated 802.11 a/b/g high-speed link, Fast IrDA and more

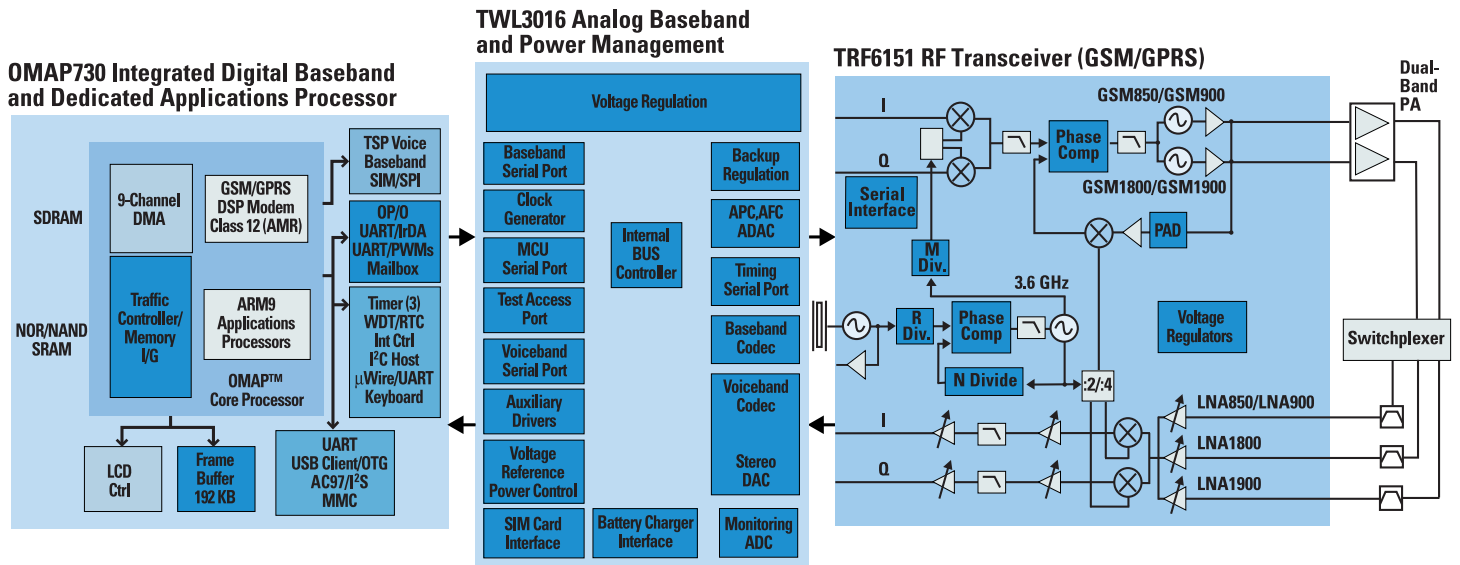
TCS2600 GSM/GPRS Chipset

The TCS2600 is a complete hardware/software reference design for high-performance multimedia smartphones, delivering twice the performance of the previous generation while extending battery life. Its reduced part count and integrated set of peripherals on-chip lower BOM costs and free up space for additional functionality.

TCS2600 components include:

- OMAP730 with integrated Class 12 GSM/GPRS digital baseband and dedicated ARM926 applications processor
- TWL3016 analog baseband with complete power management
- TRF6151 quad-band RF transceiver

Designed for security, the TCS2600 includes 48-kB secure ROM and 16-kB secure RAM with dedicated NOR/NAND flash memory and write production. A true random number generator (TRNG) aids in encryption and authentication standards. The numerous software modules and hardware features of the TCS2600 chipset insure a secure mode of operation where information stored on the device is safeguarded and ownership rights of content and programs are protected.



See OMAP™ Processor information on page 47



OMAP730 Integrated Digital Baseband and Dedicated Applications Processor

TI's OMAP730 combines an ARM926EJ-S™ applications processing core with TI's GSM/GPRS digital baseband modem, delivering twice the application performance of its predecessor, and doubling standby time for handsets, smartphones and PDAs.

Over 40 on-chip integrated peripherals reduce board space by half as compared with the previous generation, saving cost and providing space for added functionality. An SRAM frame buffer delivers faster streaming media and application performance. The OMAP730 includes a standard interface to 54-Mbps WLAN technology, along with accelerated Java processing, web browsing, personal information management (PIM) applications, location-based services and more. A comprehensive hardware-based security system features bootloaders, secure RAM and ROM, a secure mode of operation, and hardware accelerators to address security standards.

Key Features

- Low-voltage 130 nm technology
- 1.1-V to 1.5-V core, 1.8-V to 2.75 V IO
- Extremely low-power consumption: less than 10 μ A in standby mode
- Split power supplies for application processing, digital baseband and real-time clock enable precise control over power consumption
- Optimized clocking and power management: only two clocks required at 13 MHz and 32 kHz

TWL3016 Analog Baseband

The TWL3016 analog baseband integrates all analog and power management functionality on a single chip. Through power-down sleep modes, the TWL3016 is able to extend system standby time significantly, contributing to the overall battery savings the TCS2600 provides. The device also includes a D/A converter for applications like MP3 music and an 8- Ω amplifier for hands-free speakerphone operation.

Key Features

- Integrated high-fidelity audio DAC
- Integrated hands-free and headphone amplifiers
- Overall TCS2600 clock input reduction of 50 percent

TRF6151 RF Transceiver

Specifically designed for GSM/GPRS reception as part of the TCS2600 chipset, the TRF6151 transceiver is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device integrates several external components to reduce complexity, part-count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previous several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm, 48-pin QFP package



GPRS

Key Benefits

- Twice the application processing performance over previous generations
- 70 percent improvement in audio performance; 8X improvement in Java processing
- Complete hardware/software smartphone reference design including Nokia Series 60 Platform and Microsoft® Windows Mobile™
- Support for high-level mobile OS
- Software compatible with OMAP™ processors and applications from OMAP Developer Network
- OMAP Developer Network and Independent OMAP Technology Centers support and applications
- Leverages proven GSM/GPRS modem technology
- EDGE upgradeable
- Memory protection unit on FLASH and SDRAM interface
- Hardware acceleration for Java with ARM Jazelle® technology
- Integrated peripherals including USB On-the-Go, SD/MMC/SDIO, Bluetooth®, dedicated 802.11 a/b/g/high-speed link, Fast IrDA and others

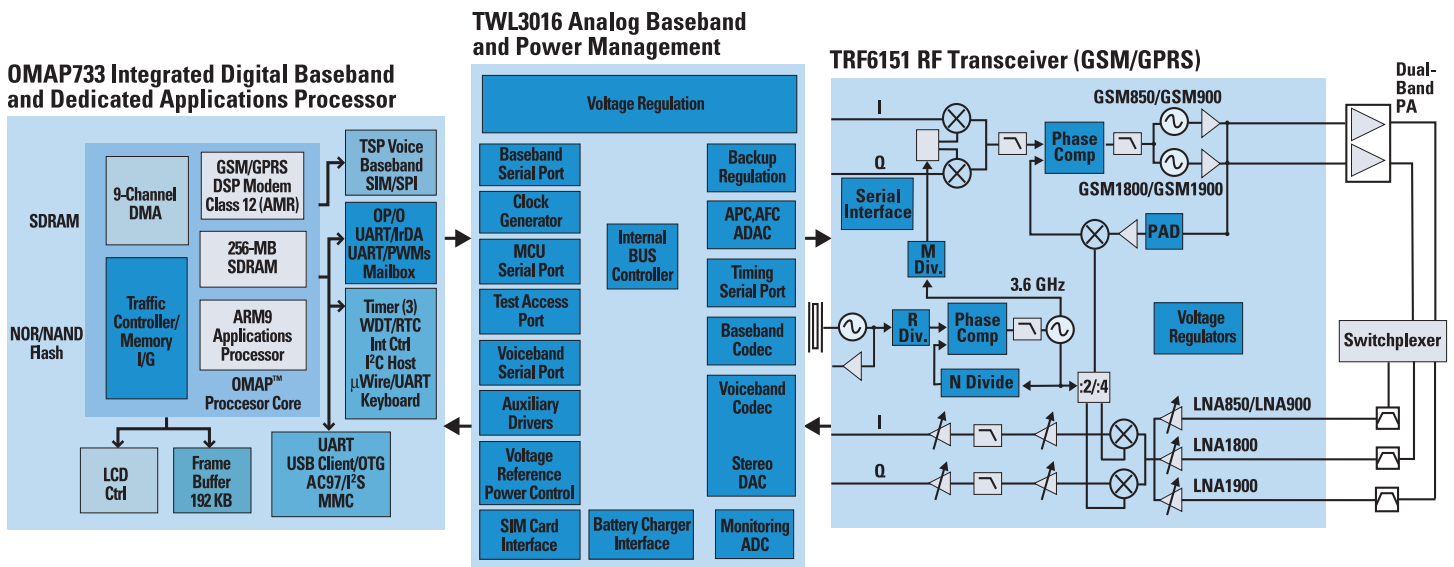
TCS2630 GSM/GPRS Chipset

The TCS2630 is specifically designed for space-constrained systems or for smaller, lighter mobile device designs. It features the OMAP733 processor that includes all the features of the OMAP730, but adds support for 256-Mb stacked SDRAM. These memory enhancements enable the TCS2630 to consume less power than traditional external memory configurations, and its performance makes the TCS2630 ideal for high-performance multimedia smartphones.

TCS2630 components include:

- OMAP733 applications processor with Class 12 digital baseband and ARM926 processor
- TWL3016 single-chip analog baseband with power management
- TRF6151 RF transceiver with direct conversion architecture

Hardware-based security features are another element of the TCS2630, including a secure bootloader with 48-kB secure ROM and 16-kB secure RAM with dedicated NOR/NAND flash memory with write protection. Hardware accelerators are included that aid in encryption and authentication standards and a secure mode of operation is enabled where personal information is safeguarded. Additional software modules are available through the OMAP™ Developer Network.



See OMAP™ Processor information on page 46



OMAP733 Integrated Communication and Dedicated Applications Processor

The OMAP733 is a single chip integrating an ARM926EJ-S™ microprocessor core with TI's GSM/GPRS digital baseband modem. This combination delivers twice the application performance over the previous generation while doubling standby time for handsets, smartphones and PDAs.

The OMAP733 includes the same features of the OMAP730 and adds support for 256-Mb stacked SDRAM. The result is less power consumption versus traditional external memory configurations making the OMAP733 an ideal engine for space-constrained systems or small, light mobile devices.

Key Features

- Low-voltage 130 nm technology
- 1.1-V to 1.5-V cores, 1.8-V to 2.75-V IO
- Consumes less than 10 μ A of power in standby mode
- Optimized clocking and power management
- ARM926EJ-S V5 architecture up to 200 MHz (maximum frequency)
- 16-kB I-cache; 8-kB D-cache
- Java acceleration in hardware
- Multimedia instruction set architecture (ISA) extension
- Class 12 GPRS ROM-based DBB
- E-GPRS interface for EDGE co-processor
- 200-Kbytes internal SRAM
- E-OTD and TTY support
- Quad vocoder with EFR, FR, HR, AMR
- GSM ultra-low-power device (ULPD)
- SIM interface

TWL3016 Analog Baseband

The TWL3016 analog baseband integrates all analog and power management functionality on a single chip. Through power-down sleep modes, the TWL3016 is able to extend system standby time significantly, contributing to the overall battery savings the TCS2600 provides. The device also includes a D/A converter for applications like MP3 music and an 8- Ω amplifier for hands-free speakerphone operation.

Key Features

- Integrated high-fidelity audio DAC
- Integrated hands-free and headphone amplifiers
- Overall TCS2600 clock input reduction of 50 percent

TRF6151 RF Transceiver

The TRF6151 delivers GSM/GPRS reception as part of the TCS2630 chipset. It is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device brings together several external components to reduce complexity, part-count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm, 48-pin QFP package



Key Benefits

- Ideal for Class 12 GSM/GPRS wireless handsets, smartphones, PDAs and Internet access devices
- Leverages OMAP750 processor for enhanced performance of streaming video and high-end imaging applications
- D/A converter in analog baseband provides MP3 music and hands-free speaker phone operation
- Extended standby time and battery savings through integrated analog and power management with power-down sleep modes
- Compatibility across all OMAP™ applications processors
- OMAP Developer Network and Independent OMAP Technology Centers support and applications
- Complete reference design and set of peripherals
- GPS, WLAN and Bluetooth® capable
- Mobile OS support

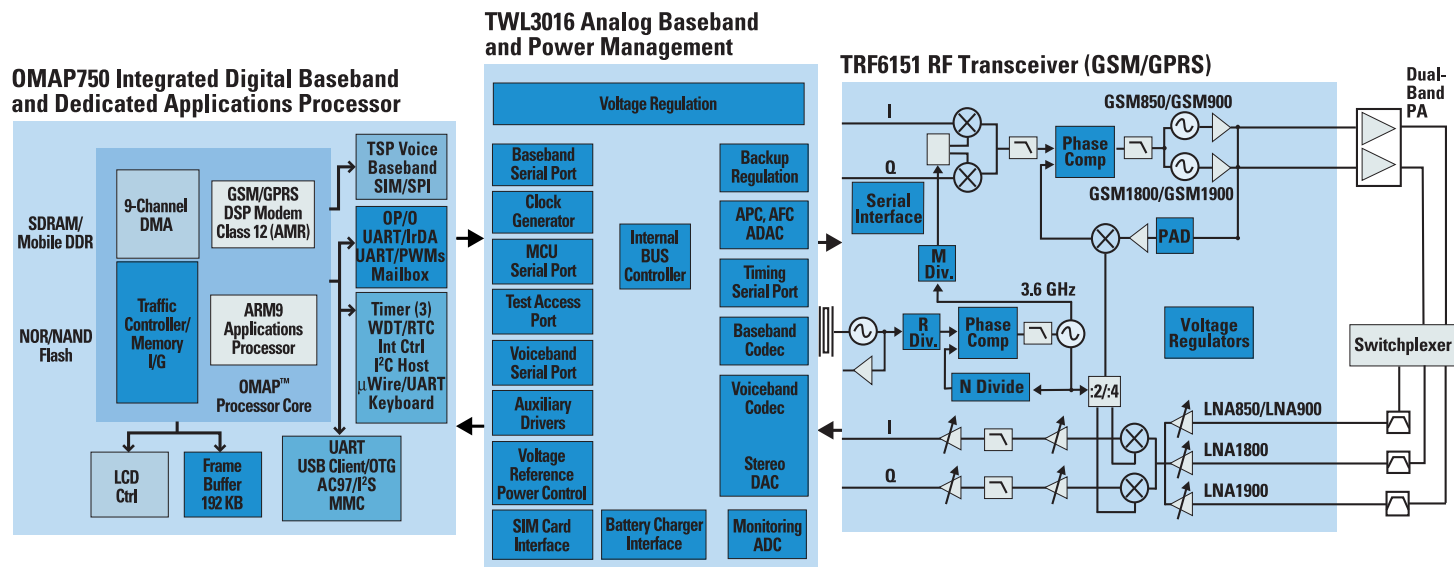
TCS2700 GSM/GPRS Chipset

The TCS2700 chipset solution and reference design includes a range of features that deliver improved multimedia applications performance to wireless handsets, smartphones, PDAs and other Internet access devices. Based on the OMAP750 applications processor, the TCS2700 chipset's improved throughput and faster memory options enhance the processing speed of applications including streaming video and high-end imaging.

The TCS2700 is designed for Class 12 GSM/GPRS and integrates three components as part of the chipset, providing battery savings, reduced board space and lower cost.

TCS2700 components include:

- OMAP750 includes a GPRS modem baseband and ARM926 core for applications processing
- TWL3016 analog baseband with integrated power management
- TRF6151 RF transceiver based on direct conversion (DC) architecture



See OMAP™ Processor information on page 45



OMAP750 Integrated Communication and Dedicated Applications Processor

The OMAP750 extends capabilities of the OMAP73x devices while including a range of features that improve multimedia application performance. The single-chip OMAP750 integrates an ARM926 core dedicated to applications processing with a complete Class12 GSM/GPRS modem baseband subsystem that consists of an ARM7 core with TI's low power TMS320C54x™ DSP core.

The OMAP750 incorporates faster memory options, including support of double data rate (DDR) memory that increases processing speed over the OMAP730, which only supported SDRAM. Improved throughput from an internal frame buffer also enhances processing of multimedia applications, including streaming video and high-end imaging functions.

Key Features

- Improved multimedia and application performance
- Class 12 GSM/GPRS modem baseband and ARM926 core for applications processing
- Increased processing speeds through DDR memory option and internal frame buffer
- Security protection through hardware-based security platform
- Extended list of peripherals, including parallel OCP camera interface for high-resolution imaging
- GPS, WLAN and Bluetooth® capable
- 2.0-megapixel camera
- Pin-to-pin compatible with OMAP730

TWL3016 Analog Baseband

The TWL3016 analog baseband integrates all analog and power management functionality on a single chip. Through power-down sleep modes, the TWL3016 is able to extend system standby time significantly, contributing to the overall battery savings the TCS2700 provides. The device also includes a D/A converter for applications like MP3 music and an 8-Ω amplifier for hands-free speakerphone operation.

Key Features

- Integrated high-fidelity audio DAC
- Integrated hands-free and headphone amplifiers
- Overall TCS2600 clock input reduction of 50 percent

TRF6151 RF Transceiver

The TRF6151 delivers GSM/GPRS reception as part of the TCS2700 chipset. It is a single-chip transceiver with quad-band support based on a direct conversion (DC) architecture. This device brings together several external components to reduce complexity, part-count and cost of the RF subsystem, including vocoders and vocoder tanks. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm, 48-pin QFP package



Key Benefits

- Complete pre-FTA certified, smartphone EDGE Class 12 reference design
- Data rates of 3X the throughput of GSM/GPRS devices
- Applications including MPEG-4 video and Windows Media™ video, MP3, 2.0 megapixel camera, etc.
- Software compatible with TCS2600 GSM/GPRS chipset
- Modules available for camera, A-GPS through TI's TGS5000 chipset and high-speed WLAN through TI's TNETW1230
- TI's highly integrated BRF6150 Bluetooth® chipset based on TI's patented DRP architecture
- High-level mobile OS support, including Symbian OS™ and Nokia Series 60, Microsoft® Windows Mobile™, Palm OS®, SavaJe OS and Linux®
- OMAP™ Developer Network and Independent OMAP Technology Centers support and applications

TCS3500 EDGE Chipset

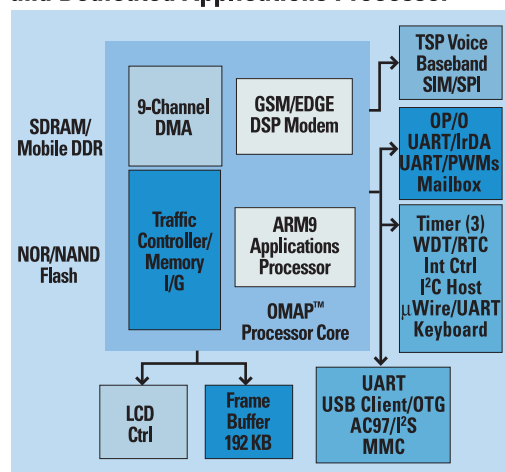
The TCS3500 is TI's first EDGE chipset and complete reference design targeted at wireless smart phones and PDAs. It serves as the ideal migration path to EDGE for manufacturers using the TCS2600 GSM/GPRS chipset.

TCS3500 components include:

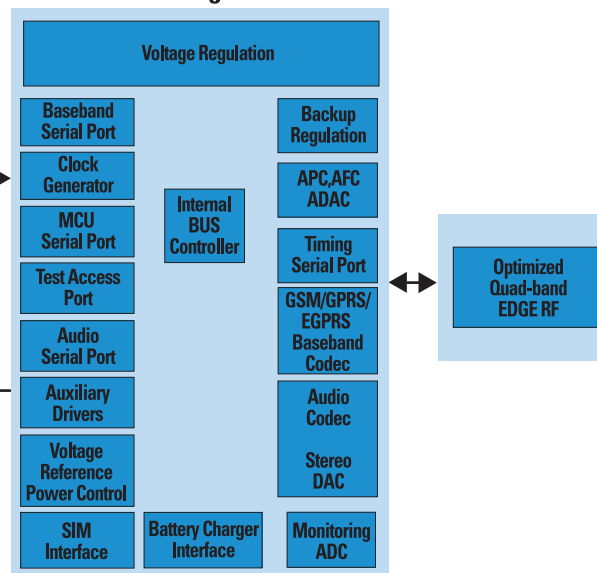
- OMAP850 applications processor with quad-band EDGE modem
- TWL3027 integrated analog baseband with full power management and audio codec
- BRF6150 featuring TI's patented digital radio processing (DRP) technology
- Fully optimized third-party RF

The TCS3500 is a flexible, scalable solution with the performance and low power required for systems addressing EDGE applications, including multimedia, gaming and camera functionality. In addition to the solution's components, modules are also available for incorporating camera, A-GPS and WLAN capabilities to bring added, optional capabilities.

OMAP850 Integrated Digital Baseband and Dedicated Applications Processor



TWL3027 Analog Baseband and Power Management



See OMAP™ Processor information on page 44



OMAP850 Integrated Digital Baseband and Dedicated Applications Processor

The OMAP850 high-performance applications processor is integrated with a digital baseband and EDGE co-processor. It is based on the OMAP750 applications processor for GSM/GPRS with added EDGE capabilities. It enables applications including MPEG-4 video and Microsoft® Windows Media™ video, MP3, 2.0 megapixel camera and more.

Key Features

- Based on previous generation OMAP750 applications processor
- EDGE Class 12
- Quad vocoders for AMR, EFR, RF and HR
- Camera sensors and support for up to 2.0 megapixels
- Enhanced frame-buffer interface data rate
- DDR support addition
- Secure boot, secure mode and hardware encryption accelerators
- Complete peripheral set
- Complete reference design, hardware and software

TWL3027 Analog Baseband

The TWL3027 is an analog baseband device which, together with a digital baseband device is part of a TI DSP solution intended for digital cellular telephone applications including GSM 900, DCS 1800 and PCS 1900 standards (dual-band capability).

The TWL3027 includes a complete set of baseband functions to perform the interface and processing of voice signals, interface and processing of baseband in-phase (I) and quadrature (Q) signals which support single-slot and multi-slot mode for both GMSK and 8-PSK modulations. The TWL3027 also includes associated auxiliary RF control features, supply voltage regulation, battery charging controls, and switch ON/OFF system analysis.

Key Features

- Applications include EGPRS, GSM900 and PCS1900
- DCS1800 Cellular Telephones
- Baseband codec single and multi-slot
- GMSK/8PSK with I/Q RF interface
- Auxiliary RF converters
- SIM card interface
- Five Channel Analog to Digital Converter
- Audio DAC based on I²S format
- Voice codec
- Six low-dropout low-noise linear voltage regulators
- Dedicated low quiescent current mode on regulators
- High voltage (20 V), Li-Ion or NiMH battery charging control
- Voltage detectors (with power-off delay)
- Dedicated very low quiescent current supply domain
- 143-ball MicroStar Junior BGA™ package

BRF6150 Bluetooth® Solution

TI's BRF6150 is a highly integrated Bluetooth v1.2 single-chip solution that integrates TI's Bluetooth baseband, RF, ARM7TDMI® and power management into a single device for enhanced performance, reduced cost and reduced board space. The BRF6150 is ideally suited optimized for mobile terminals where performance and space are critical. The device leverages TI's advanced 130 nm digital CMOS process while incorporating advantages of DRP in a form factor of 50 mm².

Key Features

- Full Bluetooth specification v1.2, including eSCO, AFH and faster connection
- Based on previous generation Bluetooth chip BRF6100 with improved performance and features
- Direct connection to battery at 2.7 V to 5.5 V; 1.65 V to 3.6 V via LDO
- RF TX: 25 µA; RF RX: 27 µA; Deep-sleep 30 µA
- Improved RF performance with sensitivity of -85 dBm, TX Power + 7 dBm and Class 1 ready
- Blocking -0 dBm at GSM bands
- Direct connection to battery with 11 external passives and a PCB layout area of 50 mm²
- Collaborative interface with WLAN and Bluetooth v1.2 AFH
- Complete reference designs with TI's TCS Chipsets and OMAP™ platform
- Manufactured in TI's 130 nm CMOS process
- Packaging: 4.5 x 4.5 x 0.8 ROM; or 4.5 x 4.5 stacked flash prototypes

Third-Party-RF Transceiver

A third-party RF transceiver has been fully optimized to work with the other above components in the TCS3500 solution.



UMTS/WCDMA

Key Benefits

- Dual-mode GSM/GPRS and WCDMA
- Fast time-to-market with complete hardware and software chipset and reference design
- Extends battery standby time over existing 3G handsets
- Multimedia-rich 2.5G and 3G applications through interface to OMAP™ processors
- 30 percent parts count reduction
- Applications including MMS, digital camera, hardware-accelerated Java applications, MP3 and other music formats, streaming video, etc.

TCS4105 UMTS/WCDMA Chipset

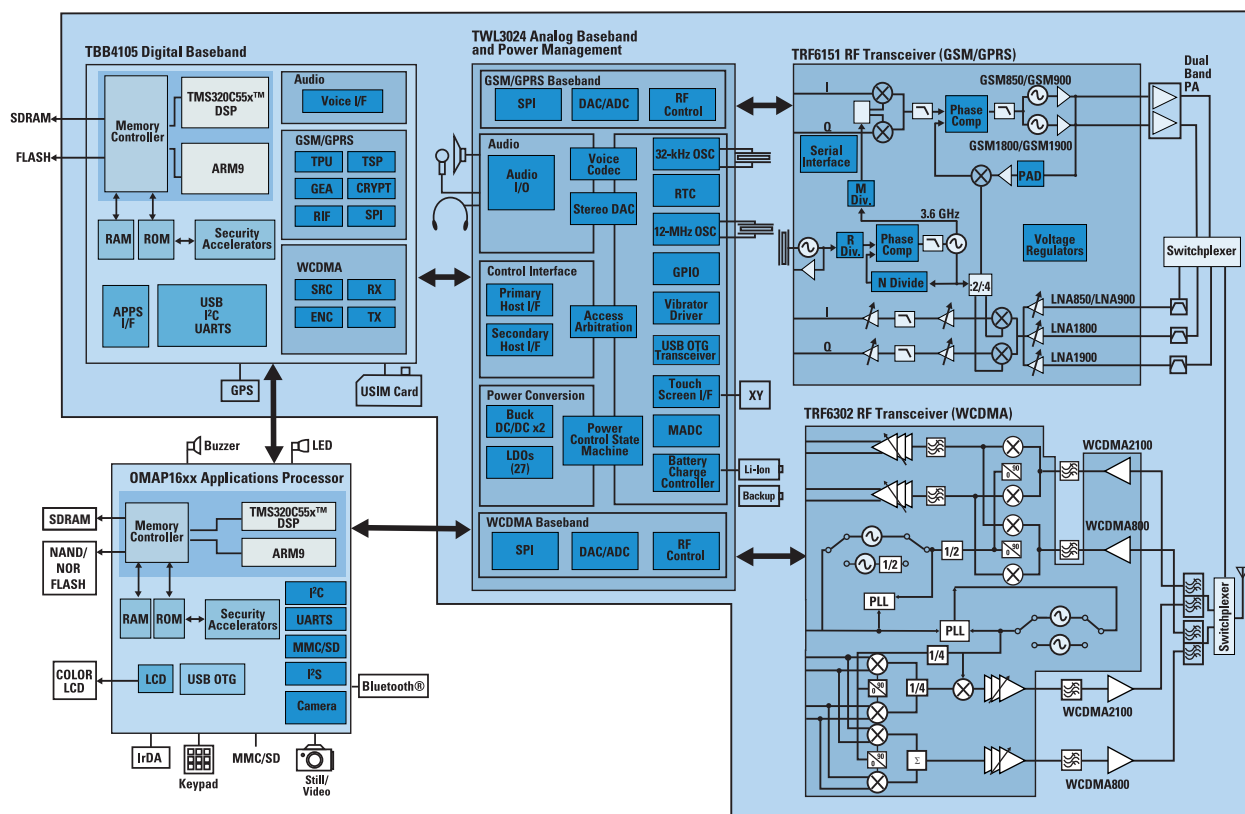
Designed for the UMTS market, TI's highly integrated TCS4105 chipset and reference design includes hardware, software with protocol stack, operating systems, development tools and worldwide support. It is geared toward a wide variety of platforms including handsets, smartphones, wireless PDAs, PC cards and other mobile devices. The TCS4105 offers extended battery standby time over existing 3G handsets without sacrificing high-performance application processing. High levels of integration reduce parts count by approximately 30 percent over today's 3G designs.

The TCS4105 is a four-chip, dual-mode chipset for both the WCDMA and GSM/GPRS communications protocols. It supports Class 12 GSM/GPRS and 384-kbps WCDMA services.

TCS4105 components include:

- TBB4105 UMTS/GPRS digital baseband
- TWL3024 analog baseband with integrated power management
- TRF6151 quad-band RF transceiver for GSM/GPRS
- TRF6302 dual-band RF transceiver for WCDMA

Processing capabilities of the TCS4105 are scalable due to its ability to interface to OMAP™ processors, giving manufacturers a high level of software and engineering reuse among mobile device product lines. The TCS4105 is ideal for 3G multimedia applications like vivid imaging, video conferencing, interactive 3D gaming and entertainment, location-based services, high-end stereo music and others.





TBB4105 Digital Baseband

The TBB4105 is a dual-mode GSM/GPRS and WCDMA digital baseband processor that supports Class 12 GSM/GPRS data communications and WCDMA service up to 384 kbps. The TBB4105 includes a DSP core based on TI's TMS320C55x™ family, and a TI-enhanced ARM926 general purpose processor. The TBB4105 is compatible with the current requirements of the 3rd Generation Partnership Project (3GPP) Release 99 specification for UMTS. Due to system partitioning and flexibility, a TCS4105-based design can be quickly adapted to changes in the evolving 3GPP specification.

Key Features

- Dual-mode WCDMA and GSM/GPRS digital baseband
- WCDMA service up to 384 kbps
- Class 12 GSM/GPRS data communications
- C55x™ DSP core and TI-enhanced ARM926 GPP
- 130-nm CMOS process
- 1.5-V core operation with 3.3-V I/Os
- 293-ball, 12 mm x 12 mm, MicroStar BGA™ package
- 3GPP compatible and adaptable

TWL3024 Analog Baseband

The TWL3024 analog baseband integrates power management functionality, reducing the overall parts count of the system by minimizing external power components. Low-dropout voltage regulators, and voiceband and baseband codecs needed for GSM/GPRS and WCDMA are integrated in the TWL3024. System partitioning into low-power sleep or shut down modes doubles standby time for existing designs without sacrificing applications processing capabilities.

Key Features

- Low-overall BOM and cost
- Includes 27 programmable low-dropout voltage regulators on-chip
- Integrates voiceband and baseband codecs for GSM/GPRS and WCDMA
- Battery charger interfaces
- 3.3 V and 1.8 V memory
- Audio headset
- System partitioning extends standby time over existing designs

TRF6151 RF Transceiver

The RF subsystem of the TCS4105 chipset is made up of two highly integrated direct conversion (DC) RF transceivers. For GSM/GPRS, the TRF6151 delivers reception as part of the TCS4105 chipset. This single-chip transceiver with quad-band support is based on a DC architecture, bringing together external components to reduce complexity, part-count and cost of the RF subsystem. By integrating what was previously several external filtering devices, the DC architecture of the TRF6151 reduces a manufacturer's RF BOM by approximately 30 percent from RF devices with the super heterodyne architecture.

Key Features

- Single-chip transceiver with quad-band support
- Direct conversion architecture
- GPRS Class12/CS4 compliant
- Full integration of VCO and VCO tanks
- Integrated voltage regulators, PA control loop, PLL loop filters and VCXO
- N-fractional synthesizer
- 7 mm x 7 mm, 48-pin QFP package

TRF6302 RF Transceiver

The TRF6302 transceiver provides WCDMA reception as part of the overall TCS4105 chipset. It is the world's first dual-band WCDMA transceiver device supporting both 800-MHz and 2100-MHz frequencies. It leverages TI's integration capabilities by integrating several external components such as LNAs, VCOs and PLLs, significantly reducing the complexity and parts count of the RF subsystem.

Key Features

- Single-chip transceiver
- Direct conversion architecture
- Full synthesizer integration (no external components)
- Integrated LNA, VCOs, PLLs and loop filters



Key Benefits

- Complete hardware and software system solution addresses mid-range and voice-centric markets
- Low development and manufacturing costs through high integration
- Direct conversion (DC) architecture saves power, circuitry and space
- Flexibility and scalability allow product differentiation
- Rapid time-to-production through mature protocol stack
- Customization through TCS Application Suite
- Interface to TI's OMAP™ applications processors, A-GPS, WLAN, Bluetooth®, camera modules and Flash memories
- In depth support through reference design, EVM, development and testing tools

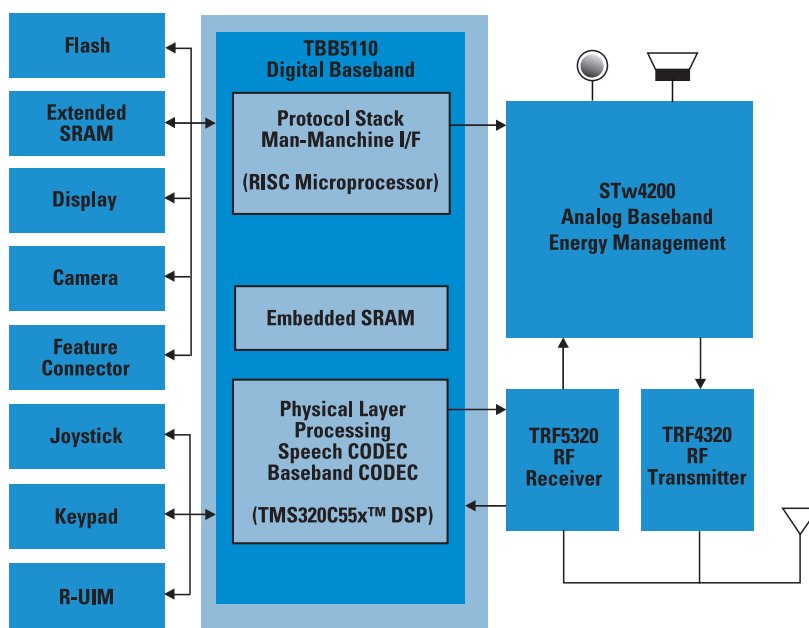
cdma2000 1X Chipset Solution

The cdma2000 1X offering from TI and STMicroelectronics integrates four devices in a complete hardware/software solution and reference design for handsets supporting the cdma2000 1X standard. This complete system solution is based on an open architecture and provides a flexible, seamless design that reduces power consumption during active and standby operation.

cdma2000 1X components include:

- TBB5110 digital baseband combining TI DSP and ARM core
- STw4200 analog baseband and energy management device available from STMicroelectronics
- TRF4320 RF transmitter
- TRF5320 RF receiver

Programmable interfaces are also included to support complementary technologies including A-GPS, WLAN, Bluetooth® and camera modules.





TBB5110 Digital Baseband

A narrow-band cdma2000 1X engine, the TBB5110 digital baseband includes a TI low power TMS320C55x™ DSP core for performing baseband signal processing, an ARM® MCU core for executing system software and custom logic to perform CDMA and FM functions. The digital baseband connects to the analog baseband and RF devices, along with memory and user interface features.

Key Features

- Software supports IS-2000 release 0, with data rates up to 153.6 kbps
- Software upgradeable to IS-2000, rev. A, with support for 307.2 kbps
- 16-bit C55x™ DSP with 4-KB cache
- MCU and DSP program RAM
- General purpose UART and I/Os, Flash programming, PLLs
- ABB control, keyboard, LDC, test interfaces
- Programmable RF or PLL interface
- 144-lead BGA package

STw4200 Analog Baseband

The STw4200 analog baseband/energy management device available from STMicroelectronics integrates the cdma2000 converters plus all functions required for power management, battery and charger. The analog baseband also includes required housekeeping functions and all required interfaces.

Key Features

- RF Sigma-Delta Converters
- Voice codec converters
- Microphone amplifier, earpiece and headset drivers
- Startup oscillator, 32-kHz crystal, RTC logic, R-UIM and serial control interfaces
- Buzzer, vibrator, keyboard, display, backlight, LED drivers
- Bandgap and voltage references
- Charger detection, control and monitoring
- Baseband LDO regulators for analog, logic, Flash, LEDs, DBB core and R-UIM
- 244-lead TFBGA package

TRF4320 RF Transmitter

The TRF4320 RF transmitter performs the quadrature modulation and up-conversion to dual-band (800 and 1900 MHz) RF. It is based on a direct conversion (DC) architecture that saves power, circuitry and space.

Key Features

- Supports voice and voice + data modulation schemes
- Direct transmit modulation from I/Q baseband to cellular and PCS RF bands with variable gain and differential driver amps
- UHF synthesizer with VCO for both bands
- Instrumentation summing amp and reference voltage for RF power detector
- Programmable SIO bus interface
- 40-lead VQFN package

TRF5320 RF Receiver

The TRF5320 RF receiver performs the quadrature demodulation and down-conversion from dual band (800 and 1900 MHz) RF to baseband. A DC architecture saves power, circuitry and space.

Key Features

- Supports voice and voice + data modulation schemes
- Direct receive demodulation from cellular and PCS RF bands to baseband; imbalance and intermodulation product calibration
- Low-noise, high-dynamic range baseband buffer amps
- Baseband low-pass filters, variable gain amps
- Programmable SIO bus interface
- Standby, varied power-down and operation modes
- 84-lead TFBGA package



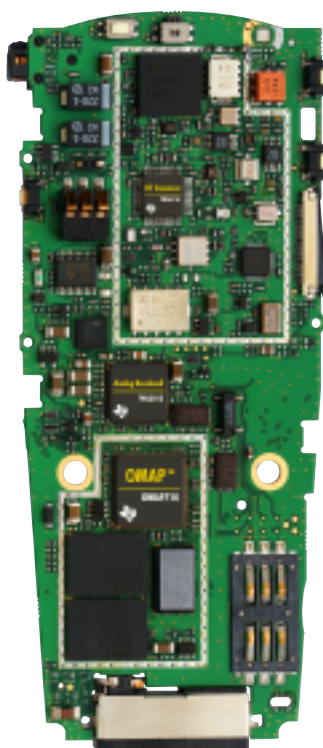
TCS Chipset Reference Designs

Key Benefits

- Manufacturing quality, with competitive BOM costs and full component list
- Designs tailored to all market segments
- Low-power consumption
- Board design and layout
- Complete and fully-validated Wireless Software Suite includes communication protocol stacks and leading OS support
- Customizable-ready user interface
- Multimedia and PIM applications
- Worldwide support structure

TI Chipset Reference Designs:

- TCS4105 UMTS
- TCS2600 GSM/GPRS
- TCS2500 GSM
- TCS2200 GSM/GPRS
- TCS2110 GSM
- TCS2010 GSM/GPRS
- TCS1110 GSM



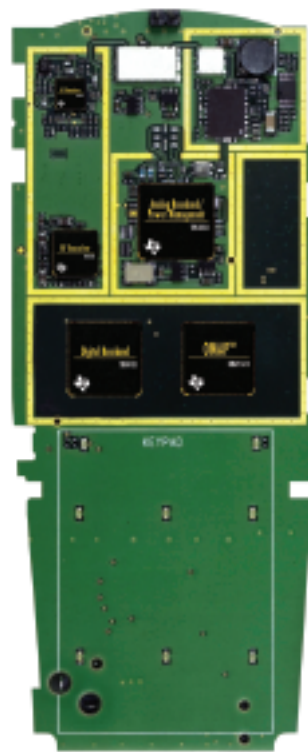
**TCS2500 GSM Chipset
Reference Design**



**TCS2600 GSM/GPRS Chipset
Reference Design**



**BRF6100 Bluetooth®
Solution**



**TCS4105 UMTS
Chipset Reference Design**

TCS Chipset Reference Designs

The TCS Chipset family and supporting reference designs speed a manufacturer's new product development and time-to-market, and address market segments ranging from voice-centric phones to application-rich smartphones and high-end wireless PDAs. In some cases, manufacturers can leverage a reference design to deliver a new product to market in less than six months.

Because they are fully tested and type-approved, TI's wireless reference designs allow manufacturers to focus on product differentiation and product development. They come with a complete BOM and component list, along with board design and layout. A complete and fully validated Wireless Software Suite includes communication protocol stacks for 2G, 2.5G and 3G, along with support for the major mobile OSs, and the TCS Wireless Application Suite for the TCS Wireless Chipsets.

TI's best-in-class customer support guides manufacturers from design start through full-scale production. Worldwide locations are based in Europe, USA, China, Taiwan and Japan.

Overview



To Know More

For detailed information about TI's OMAP™ Processors featured in this issue:

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Integrated Modem Applications Processors	44-48



For designers looking to deliver the most compelling, multimedia-rich applications that will attract users to next-generation devices and services, TI's OMAP™ platform is the answer. Its comprehensive mix of processors, software and support deliver the real-time processing and low-power consumption necessary for 2.5G and 3G applications, including streaming media, security, interactive gaming, mobile commerce, location-based services and more.

The OMAP family includes applications processors and integrated baseband and applications processors suited toward a wide range of mobile devices from general-purpose handsets to high-end power-efficient multimedia smartphones, PDAs and other Internet access devices. TI has maximized software reuse and incorporates a high level of compatibility, making the OMAP platform an effective choice for implementing a complete multi-line product family for all market segments.

Optimized software, including the operating system port, is an essential element of the OMAP platform. TI delivers optimized OMAP Reference Software for all leading operating systems with key driver support and DSP-accelerated applications. An extensive selection of integrated peripherals and manufacturing-ready reference designs reduces a system's bill-of-materials (BOM) cost, reduces board space and accelerates time-to market.

A comprehensive, open software infrastructure makes the OMAP platform an ideal complement to the TCS Wireless Chipset solutions. TI provides support for the most prevalent OSs, high-level programming languages, third-party applications, multimedia components, basic building block algorithms and a host of software development tools. In addition, TI's OMAP Developer Network of third party application developers includes an extensive selection of innovative applications and media components that manufacturers can easily integrate into products for differentiation.

TI also offers unmatched support with its full complement of reference designs. Wireless design centers in the Americas, Europe and Asia provide quick access to TI expertise. Additionally, the worldwide Independent OMAP Technology Centers are staffed by development experts who provide system integration, development and other critical support for OMAP-based product processor development. Finally, TI offers training, technical documentation, an online knowledge base and interactive discussion groups—all designed to speed the development process and work with manufacturers to quickly get to market.

**OMAP Software****Operating Systems**

Through close collaboration with OS providers and key third parties, TI provides robust development packages for the OMAP platform that support all wireless communications standards and the most widely used high-level programming languages. Complete reference designs, board support packages (BSP) and reference software packages provide everything needed to get started with OMAP™, including integrated development environments, driver support, accelerated DSP software, JTAG emulators, and much more depending on the selected OS. These tools, in addition to applications and support available through the OMAP Developer Network and Independent OMAP Technology Centers (OTCs), enable developers to create and optimize real-time execution of applications that leverage the processing power and low-power consumption of the OMAP platform.

Symbian OS™

Developing with the Symbian OS and the OMAP platform gives developers an open, easy-to-develop software environment with access to DSP-based hardware acceleration through a high-level API.

TI is a Symbian Platinum Partner and offers full support for Symbian OS v7.0, v7.0s and v8.x ports. TI is also qualified to support Nokia Series 60 Software Platform and has access to Series 60 APIs. This gives TI's hardware platform a higher level of integration with Nokia's Series 60 Software Platform. Software libraries from TI, and the OMAP Developer Network provide manufacturers with innovative software applications to further differentiate devices. Also supported is UIQ, a user interface platform for Symbian OS, especially designed for media rich mobile phones. These user interface platforms are designed to offer easy access to the wide variety of data services in 2.5G and 3G networks.

Microsoft® Windows Mobile™

Collaboration with Microsoft has enabled TI to design optimized solutions that get manufacturers to market fast. Windows Mobile software is certified for OMAP processors, and TI will continue to support further OS versions. TI offers DSP hardware accelerated Windows Media in certain OMAP platforms. Platform reference designs with software packages and board support packages (BSPs) for Microsoft Windows Mobile-based devices on Pocket PC, Pocket PC Phone Edition 2003, and Microsoft Smartphone are included. The OMAP73x reference design comes with advanced power management, on-chip drivers and board peripherals. The OMAP161x BSP contains base port peripheral drivers plus DSP-BIOS Bridge software and OMAP hardware accelerated Windows Media. A full range of easy-to-use software development tools is also available through the OMAP Developer Network and Microsoft's mobile2market programs.

Palm®

TI works closely with Palmsource to enable OMAP developers with the Palm OS capabilities they need to quickly develop compelling multimedia-rich applications for handheld mobile devices like smart phones, PDA's and wireless PDA's.

Java™

TI, Sun Microsystems and other Java™ leaders have created a complete Java solution and development environment for TI's wireless chipsets and the OMAP platform. Through Java virtual machines (VMs) companies like Aplix, Esmertec, Tao Group and SavaJe combine enhanced Java applications and services with TI's TCS wireless chipsets and the OMAP processors. Enhanced Java features include MIDP and CDLC, which provide a complete J2ME™ (Java 2 Micro Edition) application runtime environment. TI's OMAP platform supports Mobile Media APIs (JSR-135), MPEG-4, MP3, MIDI and other MIME-types.

Linux®

A full board support package for Linux helps software developers get started quickly with the performance and power efficiency of the OMAP platform. The open source BSP includes the basics plus a set of advanced and fully tested tools to accelerate development. This includes GNU Linux OS, source-level debugging tools, Linux trace tools, language tools including C, C++ and Java. Also available is the MontaVista Linux embedded cross-development platform that includes the MontaVista Linux kernel, software updates, utilities, development tools and one year of technical support, along with expanded technology add-on products.



SavaJe

Based on Sun Microsystems' Java™ technology, SavaJe OS offers OEMs, ODMs and operators a standardized platform with a high level of security. TI's OMAP platform enables the SavaJe OS to provide HTML Web browsing, SMS and MMS messaging, games, PIM, full-motion video, MP3 support and Over-the-Air (OTA) application provisioning and device management, including OS patching and upgrades. At the foundation of the SavaJe OS lies an advanced multi-threaded, multi-tasking operating system supporting the industry standards essential to the wireless market—Sun-certified Java.

IXI-Connect OS™

IXI Mobile (IXI) has worked with TI on a reference design for feature phones incorporating OMAP processors and IXI-Connect OS operating system. It features Personal Mobile Gateway (PMG) technology that enables always-on wireless data connectivity for companion devices of the phone. IXI-Connect is a complete OS and SW solution for mobile phones designed for extensive data usage providing distributed data terminals support over a Personal Area Network (e.g. Bluetooth).

Wireless Applications Center

With locations worldwide, TI opened its first Wireless Application Center for customers and members of the OMAP™ Developer Network in Dallas in 2002. Current locations include Dallas, Bangalore, Taipei and Nice. The applications center provides a venue for handset makers to see all of TI's wireless technologies in action, including the OMAP platform as well as solutions for cellular, Wireless LAN and Bluetooth®. Manufacturers use the applications center to gain first-hand experience with new wireless software programs and services on the market and under development from TI's OMAP Developer Network.





OMAP Developer Network

TI's OMAP Developer Network provides innovative applications, services and multimedia modules for OMAP processors. Consisting of an extensive range of third party software developers, the ready-to-implement OMAP software and algorithms deliver the most compelling applications of a user's 2.5G or 3G experience.

OMAP Developer Network members are continuously building new multimedia-rich applications and capabilities for the OMAP platform to enable product differentiation, quick time-to-market and fast return on investment. Just a few of the applications available through the OMAP Developer Network include streaming media, voice recognition, 3D gaming, high-end audio, speech recognition, text-to-speech, video conferencing, location-based services and security. TI works with the industry's most innovative developers, including Action Engine, BitFlash, Certicom, Comverse, Ideaworks3D, HI Corporation, McAfee, Microsoft Media, PacketVideo, RealNetworks, SafeNet Speechworks and more.

Training

Various online and live workshop training opportunities are available for software development, DSP algorithm development, development tools and other subjects.

Developer Catalog

TI's online OMAP Developer Network Catalog serves as an important place to assist TI customers in identifying solutions offered by developer network members. Application descriptions and services are provided for additional information to aid in selecting an application mix or to seek engineering assistance in a particular application area.

Invitation to join network

If you are developing software applications for 2.5G and 3G handsets and PDAs, apply for membership to the OMAP Developer Network.

[**www.ti.com/omapmembership**](http://www.ti.com/omapmembership)

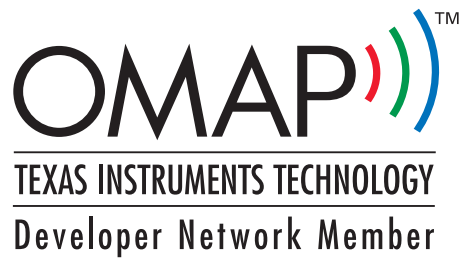
Member Benefits/Product Exposure:

Prospective customers will be exposed to develop product information through a variety of marketing opportunities including:

- OMAP Developer Network online catalog
- TI collateral
- Wireless Access e-newsletter
- Website promotions
- Online demos

Network members may have their application demos selected for use in one or more of TI's regional Wireless Applications Centers for direct exposure to TI customers.

Members may also be invited to participate at select tradeshows using TI booth properties and exhibit space. See the TI Wireless Communications show schedule for some of our target shows.



[**www.ti.com/omapdevelopers**](http://www.ti.com/omapdevelopers)

Independent OMAP Technology Centers



To further streamline the development process, TI offers support and service through its worldwide Independent OMAP Technology Centers (OTCs). Manufacturers use OTCs to leverage extensive expertise in hardware design, embedded software development and system integration. It's possible to assemble a team of world class experts for your project using OTCs.

Wireless manufacturers are seeking expert support for emerging technologies and specialized techniques that are continually evolving. While TI is the world leader in wireless expertise, the skills and time-to-market requirements of manufacturers in the wireless industry today are tremendously divergent. Manufacturers still must think long and hard about communications protocols, baseband processors and other wireless design technologies, but now they also must contend with new issues like security, high-level operating systems, multimedia coders/decoders (codecs), consumer applications and services, interactive gaming, location-based services, WLAN (802.11), and Bluetooth®.

TI's network of OTCs provides the diverse expertise that wireless manufacturers need:

- Systems integration
- Wireless systems architecture
- Embedded software development
 - Device drivers
 - OS optimization
 - Middleware
 - Applications
- Hardware design
- RF and antenna design
- Communication protocols and telephony
- GSM/GPRS, CDMA, UMTS, WCDMA, WLAN, Bluetooth
- Multimedia codec development
- ARM® and DSP algorithm development

OTCs are valued members of TI's wireless team with proven track records. As wireless designs become more integrated and complex, TI and its OTCs are working to ensure that manufacturers receive the support and solutions they need to capitalize on the rapidly changing wireless market. When you plan your next product development, consider the benefits of partnering with TI and an OTC for support.

www.ti.com/otc

Linux®

Intrinsyc
Master IA
Sasken
Teleca
Wipro

Nucleus™

Sasken
Teleca
Wipro

Palm OS®

HandEra
Productivity Systems, Inc. (PSI)
Teleca
Wipro

Symbian OS™

Digia
Elektrobit
Fujitsu Broad Solution & Consulting
Hampex
Sasken
TapRoot Systems
Teleca
Wipro

Microsoft® Windows Mobile™

Accelent Systems
BSQUARE
Fujitsu Broad Solution & Consulting
Intrinsyc
Productivity Systems, Inc. (PSI)
Sasken
Teleca
Wipro



→ High-Performance Multimedia-Rich Applications Processors

Key Benefits

- Leverages same features of OMAP2410 including dedicated 2D/3D graphics accelerator at 2 million polygons per second
- Added imaging and video accelerator enables high-resolution still image capture, larger screen sizes and higher video frame rates
- Supports high-end features including 4+ megapixel cameras, VGA-quality video, high-end interactive gaming functionality and analog/digital TV video output
- 5-Mb internal SRAM boosts streaming media performance
- Software compatibility with previous OMAP™ processors
- Parallel processing ensures no interruptions or degradation of service with simultaneously running applications
- Optimized power management companion chip (TWL92230)
- 12 mm x 12 mm, 325-ball MicroStar BGA™, 0.5-mm pitch

OMAP2420 Processor

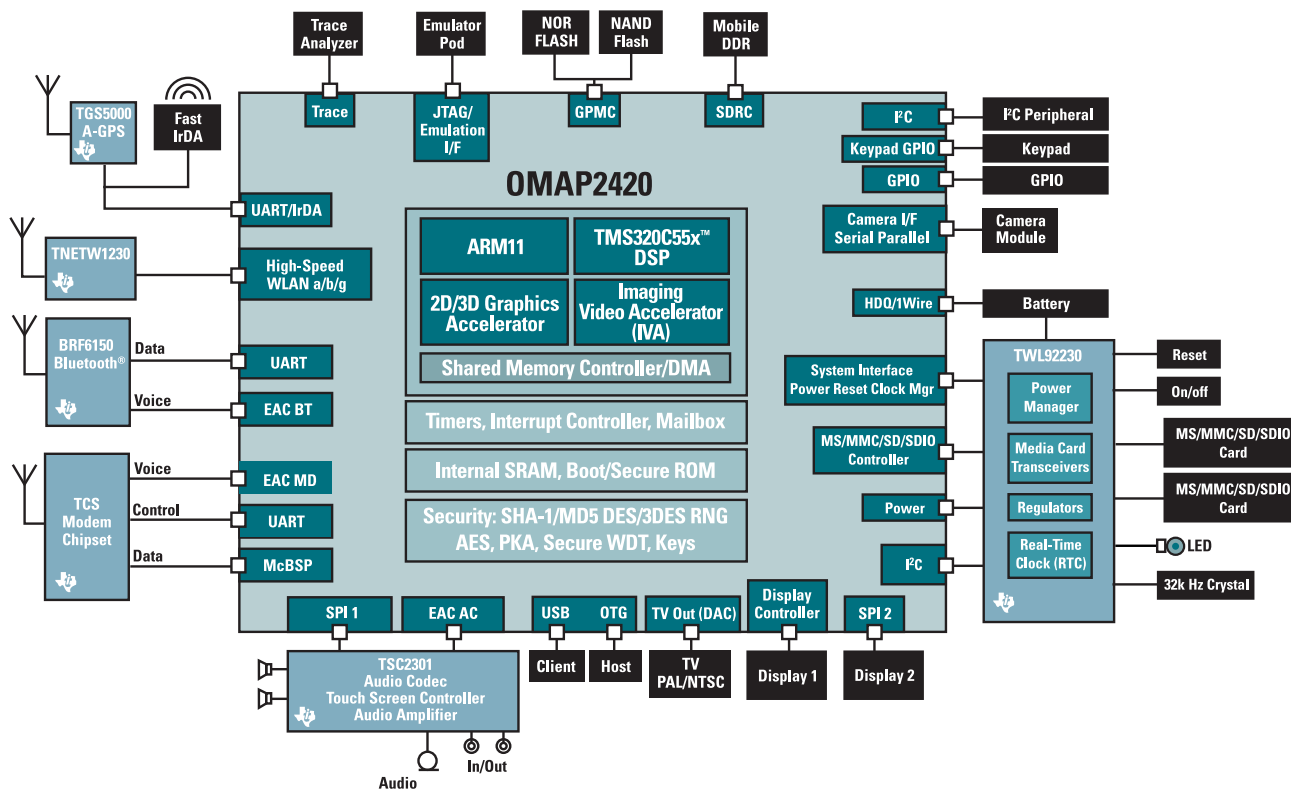
The OMAP2420 is a superset of the OMAP2410 with added capabilities for further enhancing the “All-in-One Entertainment” capabilities that the OMAP™ 2 architecture brings to smartphones and other portable devices.

The OMAP2420 includes the benefits of the OMAP 2 architecture’s parallel processing, giving users the ability to instantly run applications and operate multiple functions simultaneously without quality of service compromises. The OMAP2420 includes an integrated ARM1136 processor (330 MHz), a TI TMS320C55x™ DSP (220 MHz), 2D/3D graphics accelerator, imaging and video accelerator, high-performance system interconnects and industry-standard peripherals.

Multimedia enhancements made in the OMAP2420 include an added imaging and video accelerator for higher-resolution still capture applications, multi-megapixel cameras and full-motion video encode and decode with VGA resolution of 30 frames per second. An added TV video output supports connections to television displays for displaying images and video captured from the handset. 5-Mb internal SRAM also boost streaming media performance.

Access to the OMAP Developer Network also provides an extensive range of programs and media components that manufacturers can use for differentiating and delivering products to market fast.

Based on TI's new OMAP™ 2 Architecture



High-Performance Multimedia-Rich Applications Processors



Key Benefits

- TI DSP-based video, imaging audio and industry-leading graphics accelerators
- Software compatibility with previous OMAP processors
- Simultaneous multimedia without QoS compromises due to parallel processing, multi-engine approach
- ARM1136 processor operating at 330 MHz and TMS320C55x™ DSP operating at 220 MHz
- Supports all mobile OSs, including Symbian OS™, Microsoft® Windows Mobile™, and Linux®
- Optimized power management companion chip (TWL92230)
- Comprehensive security platform assures strong and fast protection
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

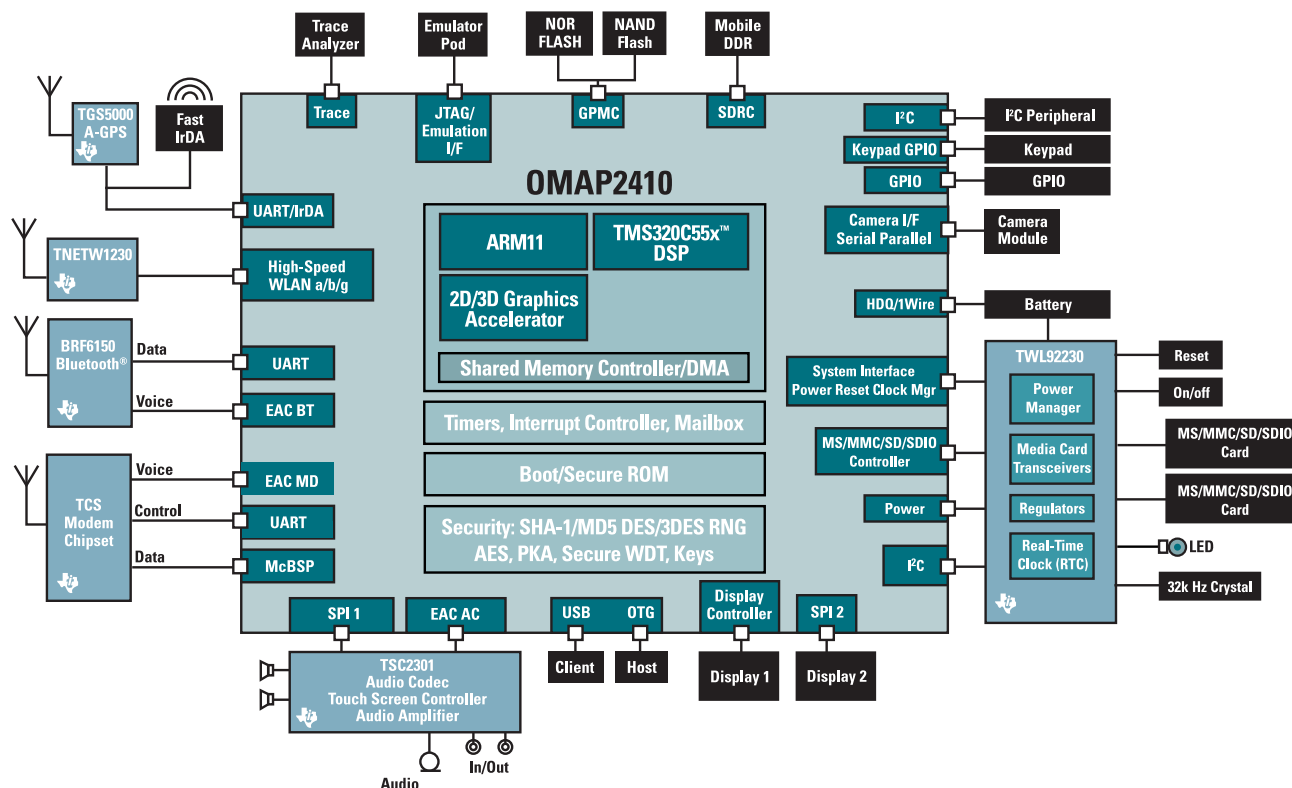
OMAP2410 Processor

TI's OMAP2410 Processor is based on OMAP™ 2 "All-in-One Entertainment" architecture for bringing the most compelling consumer electronics into smartphones and portable media devices. It supports high-end features such as multi-megapixel cameras, interactive gaming functionality, hi-fi music with 3D sound effects, high-speed wireless connectivity and more.

The architecture's multi-engine approach allows the OMAP2410 to perform parallel processing that gives mobile users the flexibility to operate multimedia without compromising quality of service or experience. When separate applications are launched or run simultaneously, the unique OMAP 2 architecture ensures there is no interruption or degradation to the multimedia.

The industry's first processor based on the ARM11 architecture the OMAP2410 leverages TI's 90 nm process technology. It's multiple engines include an ARM1136 processor, TI's programmable TMS320C55x™ DSP designed for low power, 2D/3D graphics accelerator that offers up to 2 million polygons per second, sophisticated DMA controller and more. A power management companion chip, the TWL92230, is optimized for the OMAP2410 and further reduces system cost and board area.

Based on TI's new OMAP™ 2 Architecture



→ High-Performance Multimedia-Rich Applications Processors

Key Benefits

- First OMAP™ processor manufactured on TI's advanced 90 nm CMOS process technology
- 40 percent performance improvement in a variety of mobile applications
- TMS320C55x™ DSP and ARM926 at 220 KMHz
- Software reuse due to compatibility and flexibility across other OMAP™ devices
- Multiple engines enable concurrent features and service without quality degradation
- High-performance camera interface supports up to 2.0 megapixels
- 802.11 capable up to 54 Mbps of data throughput with integrated VLYNQ™ interface
- Integrated hardware and software security
- Improved multimedia and graphics
- Optimized for TI's TCS wireless chipsets for GSM/GPRS/EDGE, cdma2000 1X, UMTS and operating standards
- Advanced mobile OS support
- Broad range of applications through OMAP Developer Network
- Development support and access to open programming interfaces and development tools
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

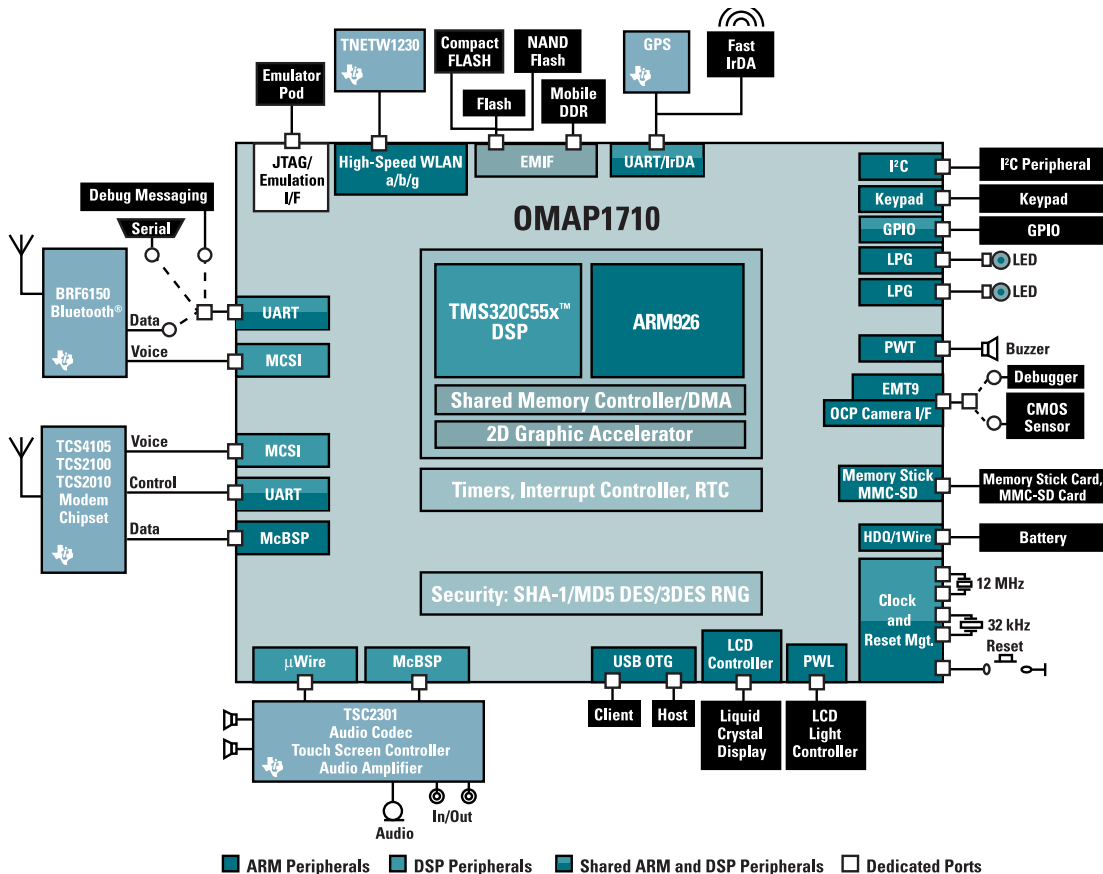
OMAP1710 Processor

The dual-core OMAP1710 applications processor combines an ARM926 processor with a DSP core operating at 220 MHz. The first OMAP™ applications processor manufactured on TI's advanced 90 nm CMOS process technology, the OMAP1710 provides up to 40 percent more performance for a variety of applications, while consuming half the power of current TI applications processors in active mode.

A range of software and hardware accelerators are included as part of the OMAP1710, including video encode and decode, still picture compression, Java and security. TI's advanced security hardware provides a secure execution environment and an ideal platform to address a range of security threats. Features including a secure bootloader, secure mode of operation, secure RAM and ROM and various accelerators are all aspects of TI's security-based capabilities.

The OMAP1710 is designed to handle a variety of applications in parallel for concurrent features and service. This unique approach ensures that applications are not interrupted or degraded when additional operations are launched or run simultaneously.

For manufacturers looking to increase performance and multimedia capabilities of their product line, the OMAP1710 offers an easy migration path due to software compatibility with previous generations of OMAP applications processors.



Wireless Terminals Solutions Guide

→ High-Performance Multimedia-Rich Applications Processors

Key Benefits

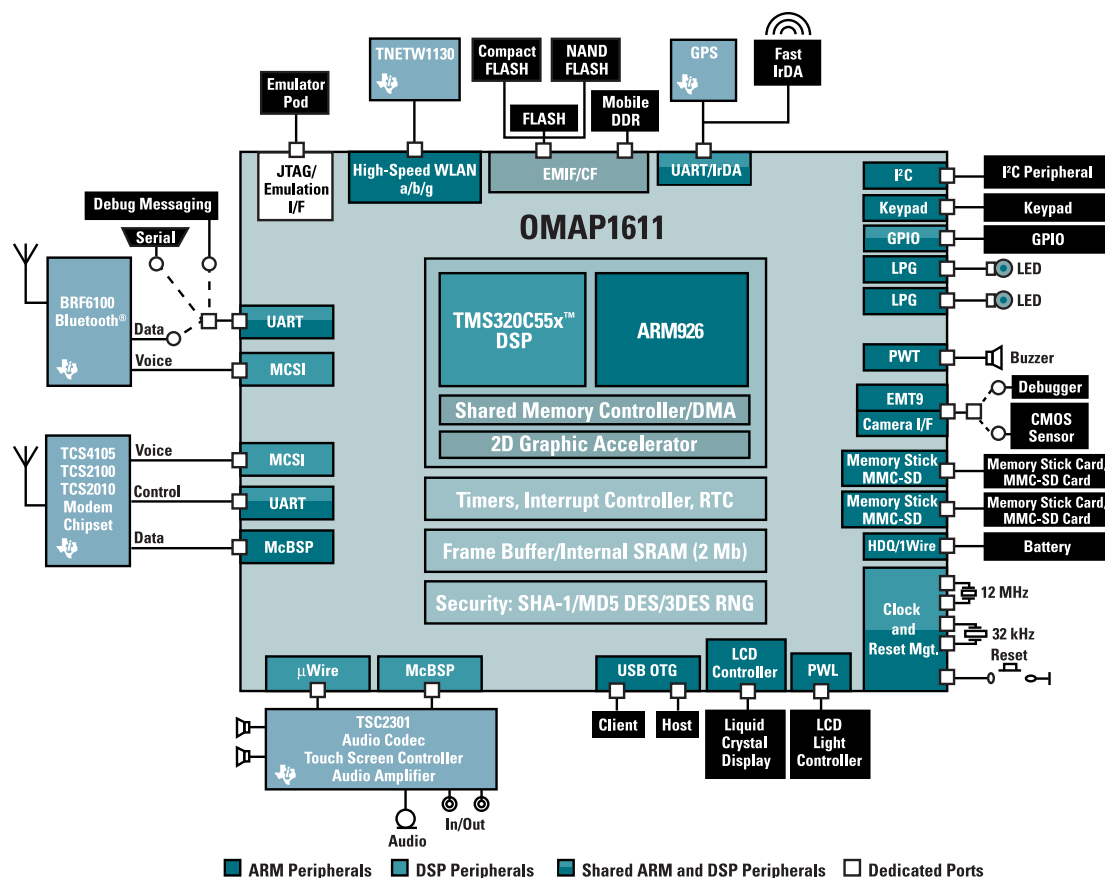
- The OMAP1611 processors enjoys all the same features, functionality and benefits of the OMAP1610 and more
- OMAP1611 adds improved graphics and streaming media performance through added internal SRAM that serves as a frame buffer
- Support of all cellular standards
- WLAN capable to speeds up to 54 Mbps
- Scalable solution provides path to high-end market segments
- Reduced power consumption through inclusion of hardware-based accelerators
- Secure mode-of-operation through wireless security hardware
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

OMAP1611 Processor

The OMAP1611 single-chip applications processor includes all the features of the OMAP1610. It is based on the same dual-core architecture that consists of TI's TMS320C55x™ DSP and TI-enhanced ARM926 microprocessor cores. However, the OMAP1611 adds 2 Mb of internal SRAM optimized to act as a frame buffer. This results in improved graphics and streaming media performance while reducing power consumption. The OMAP1611 also includes a dedicated, high-performance interface to WLAN, including 802.11a/b/g, for high-speed access of up to 54 Mbps.

The OMAP1611 engines come with several hardware-based application accelerators, such as a dedicated on-chip 2D graphics engine that eliminates the need for discrete graphic chips and multimedia acceleration. Java program accelerators are also included, and a hardware-based security system provides protection of creative content or software, guards confidential information and secures information transmission.

In addition to performance improvements, the OMAP1611 and other OMAP161x applications processors maintain standby power consumption levels of less than 10 μ A and are among the lowest in the industry. The processors support all cellular standards and complement any modem, chipset and air interface.



High-Performance Multimedia-Rich Applications Processors



OMAP1610 Processor

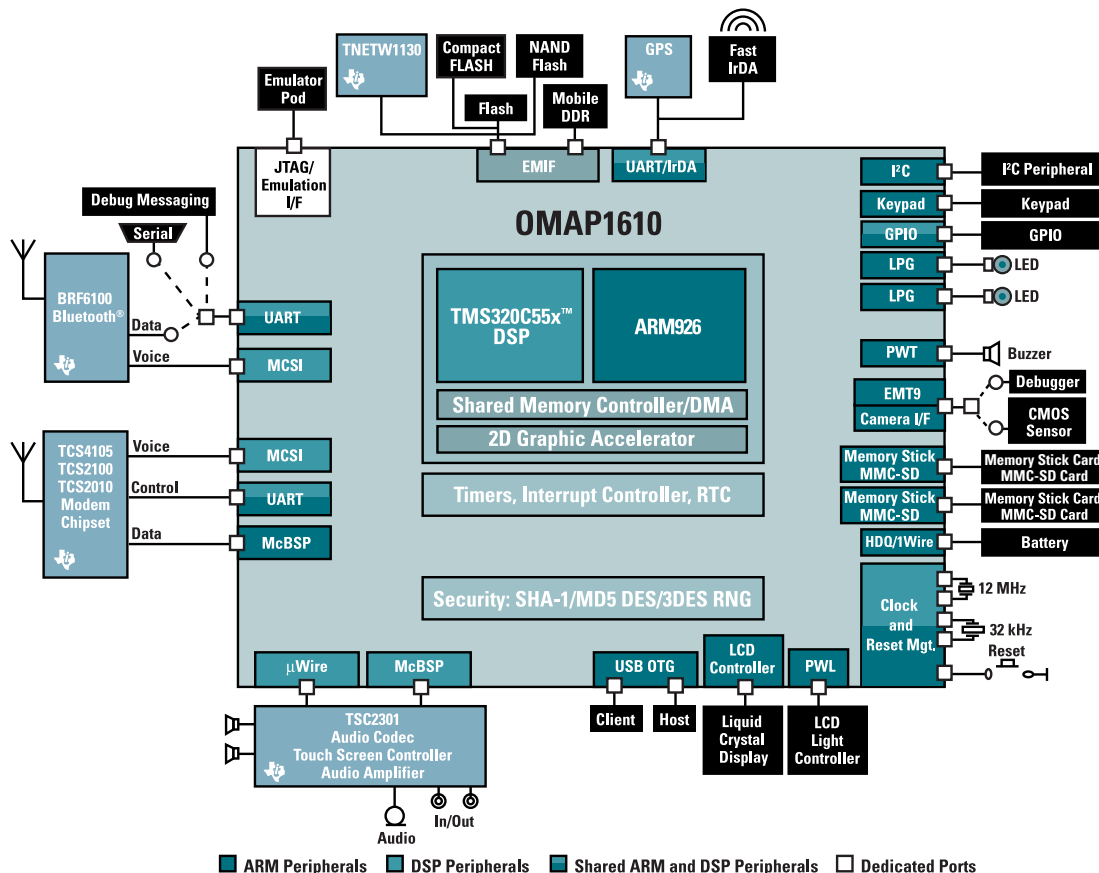
Key Benefits

- Multimedia applications including video conferencing, interactive gaming, speech processing, m-commerce, location-based services and others
- Supports all cellular standards
- Migration path to high-end market segments through scalability
- Reduced power consumption through inclusion of hardware-based accelerators
- Secure mode-of-operation with wireless security hardware
- Dedicated on-chip 2D graphics engine
- TI-enhanced ARM926
- Leverages TI TMS320C55x™ DSP and TI-enhanced to 200-MHz processing capabilities
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

The OMAP1610 and OMAP161x devices are single-chip applications processors that feature the same dual-core architecture of the OMAP1510 based on TI's TMS320C55x™ DSP and TI-enhanced ARM926 cores. Each core has processing capabilities of up to 200 MHz, resulting in enhanced performance for processing 2.5G and 3G multimedia applications such as video conferencing, interactive gaming, speech processing, location-based services, video streaming and others. Because the OMAP1610 shares the same architecture of the OMAP1510, manufacturers benefit with scalability across the OMAP™ processor family and gain a path to higher-end market segments.

The high-speed DSP and ARM® engines include hardware-based application accelerators such as a dedicated on-chip 2D graphics engine that eliminates the need for discrete graphic chips and multimedia acceleration. Java program accelerators are also incorporated into the OMAP1610, and a hardware-based security system provides protection of creative content or software, guarding confidential information and securing information transmission.

In addition to performance improvements, the OMAP1610 applications processor maintains standby power consumption levels of less than 10 μ A and is among the lowest in the industry. It supports all cellular standards, and complements any modem, chipset and air interface.



→ High-Performance Multimedia-Rich Applications Processors

Key Benefits

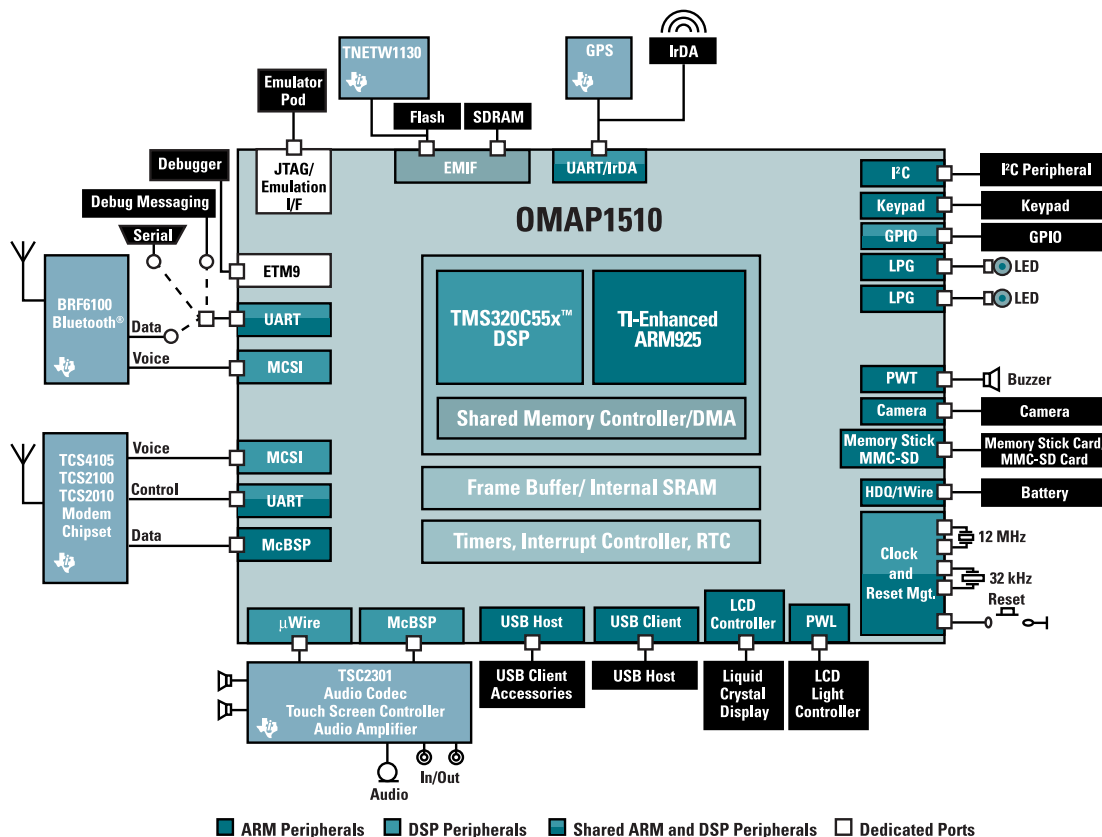
- Real-time processing for high-end multimedia rich devices
- Reduced power consumption through partitioning to TI DSP and ARM® cores
- Software compatible with all OMAP™ devices
- Scalable across multiple market segments through pin compatibility with OMAP310
- Ultra-small footprint
- Applications including streaming video, audio, still image capture location-based services and others
- The OMAP1510 supports all the major operating systems
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

OMAP1510 Processors

The OMAP1510 applications processor offers the processing performance required for high-end multimedia PDAs, smartphones, Internet appliances, Web tablets and other mobile devices. TI's low power TMS320C55x™ DSP core and TI-enhanced ARM925 core processor are integrated in the OMAP1510 to provide a highly efficient processor that maintains low-power consumption. Real-time, processing-intensive tasks are partitioned to the DSP, while functions such as operating system and user interface routines are assigned to the ARM core, making OMAP1510 a very flexible and efficient multimedia processor.

In addition to the DSP and ARM cores, the OMAP1510 applications processor includes 192-KB shared internal SRAM, memory traffic and DMA controllers, and a digital phase locked loop (DPLL) for clocking control. The OMAP1510 also has a comprehensive power-saving mode leveraged by the DSP and ARM cores and traffic controller.

Pin compatibility with the OMAP310 offers scalability for mobile devices that range from voice-centric devices through next-generation multimedia appliances. Because the OMAP1510 maintains a small footprint of 0.5-mm ball pitch, the OMAP1510 is very compact and allows for more functionality in a smaller space.



Basic Multimedia Applications Processors

OMAP331 Processor

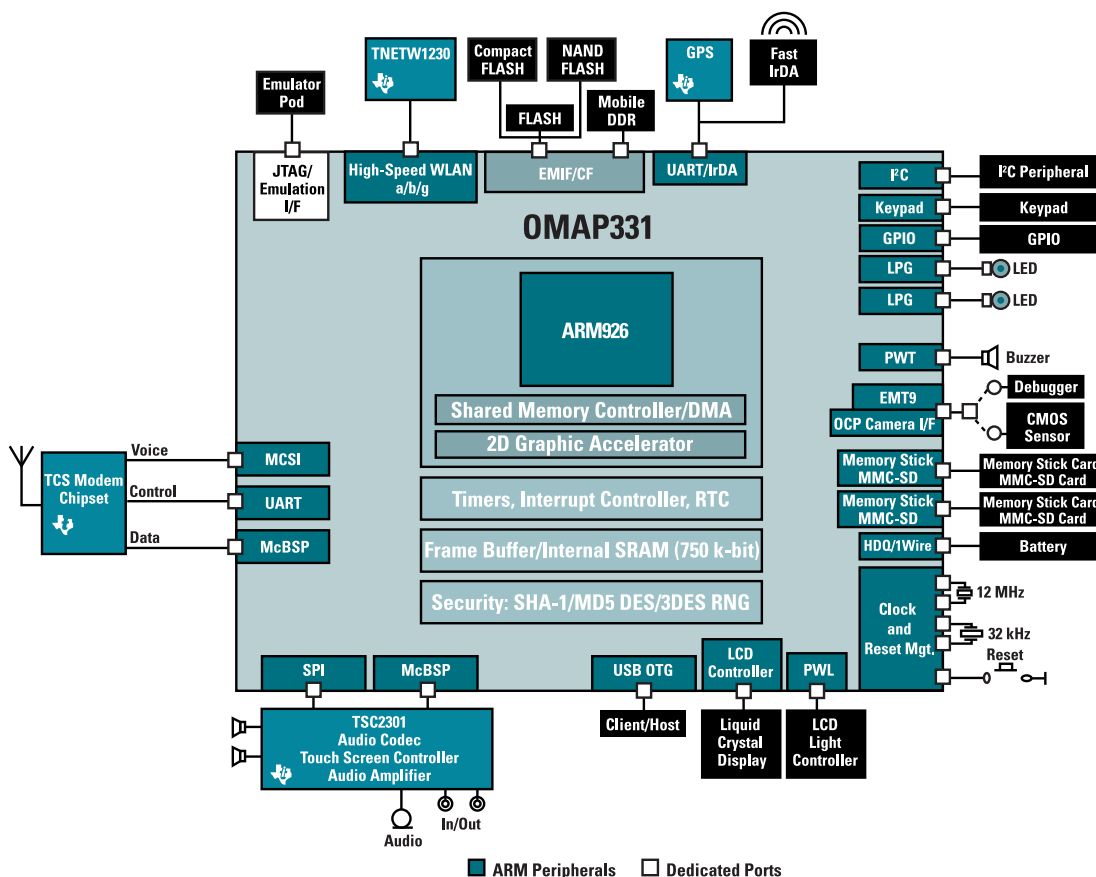
Key Benefits

- 17 percent faster performance and enhanced features over the OMAP310
- Low-power consumption
- Software reuse and compatibility with other OMAP™ devices
- On-chip frame buffer and 2D graphics accelerator speeds multimedia performance
- High-resolution imaging through OCP camera port
- Hardware-based security platform
- 802.11 capable up to 54 Mbps
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

The OMAP331 applications processor provides a feature-rich platform for price-sensitive 2.5G and 3G handsets, PDAs and other mobile devices. Based on an ARM926 processing core, the OMAP331 includes the features of the OMAP310 with extended capabilities for 17 percent faster performance over the OMAP310, and lower power consumption. Software reuse and compatibility with higher end OMAP™ devices provide manufacturers a migration path to higher performing smart-phones, Internet appliances and multimedia devices.

Added features found in the OMAP331 include increased multimedia performance, faster processing speeds, a 2D graphics accelerator engine, improved frame buffer performance, a high-throughput direct memory access interface and several other enhancements. An on-chip frame buffer improves performance of multimedia applications like streaming video and graphics. Enhanced, high-resolution imaging is possible through a new parallel OCP camera port.

The OMAP331 includes a hardware-based security engine and random number generator for transparent security algorithm processing. Hardware accelerators are also included to address industry security standards such as MD5/SHA1 and DES/3DES.





Basic Multimedia Applications Processors

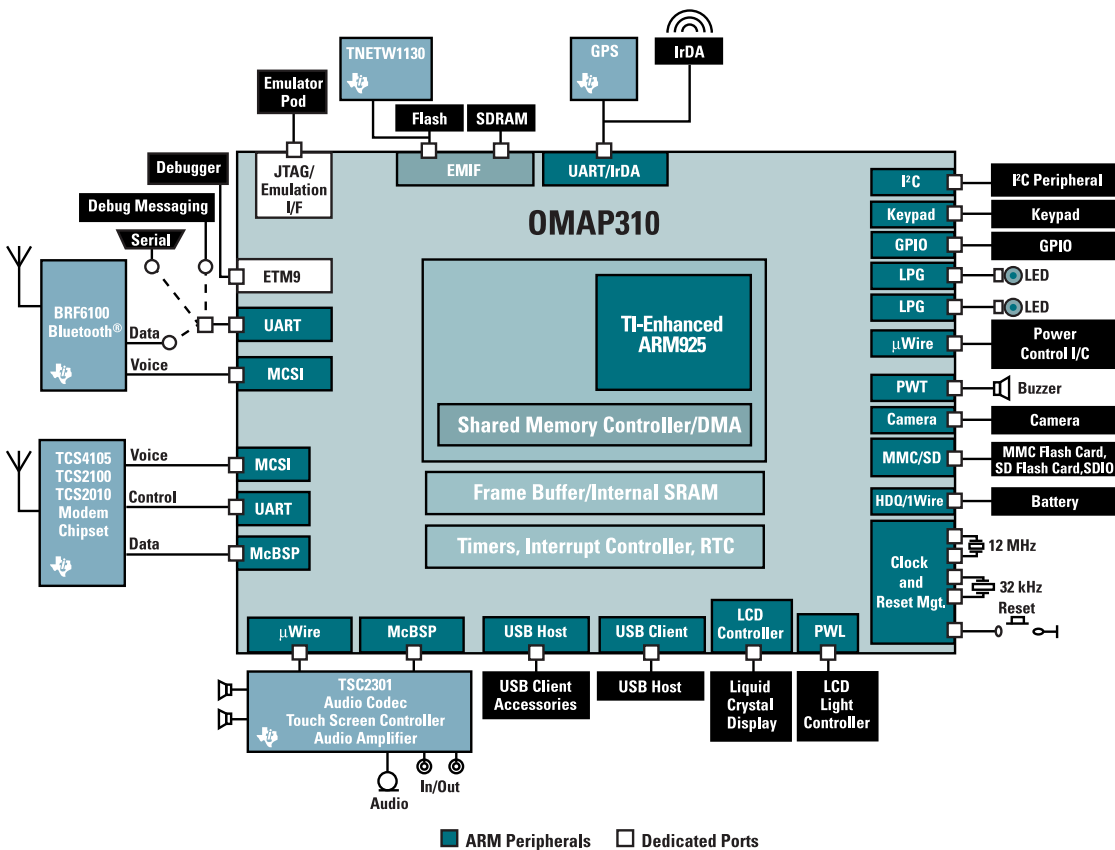
Key Benefits

- Delivers cost-efficient multimedia functionality
- Software compatible across OMAP™ processors future-proofs investment
- Pin-compatible with OMAP1510 for increased processing performance needs
- Low voltage through 130 nm CMOS technology
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

OMAP310 Processor

For cost-sensitive 2.5G and 3G handsets and PDAs, the OMAP310 delivers basic multimedia functionality while maintaining power efficiency. The OMAP310 includes a TI-enhanced ARM925 applications processor that performs up to 175 MHz; 192-KB shared internal SRAM that serves as a frame buffer, memory traffic and DMA controllers, digital phase-locked loop (DPLL) for clocking control and a full applications subsystem.

Manufacturers leveraging the OMAP310 can benefit from the device's software compatibility across the full line of OMAP processors, and software reuse for addressing higher-end market segments. Software developed for the OMAP310 is upwardly compatible with all OMAP processors. The OMAP310 is also pin compatible with the OMAP1510 dual-core applications processor that targets high-end mobile devices that require additional processing performance.



Basic Multimedia Applications Processors



Key Benefits

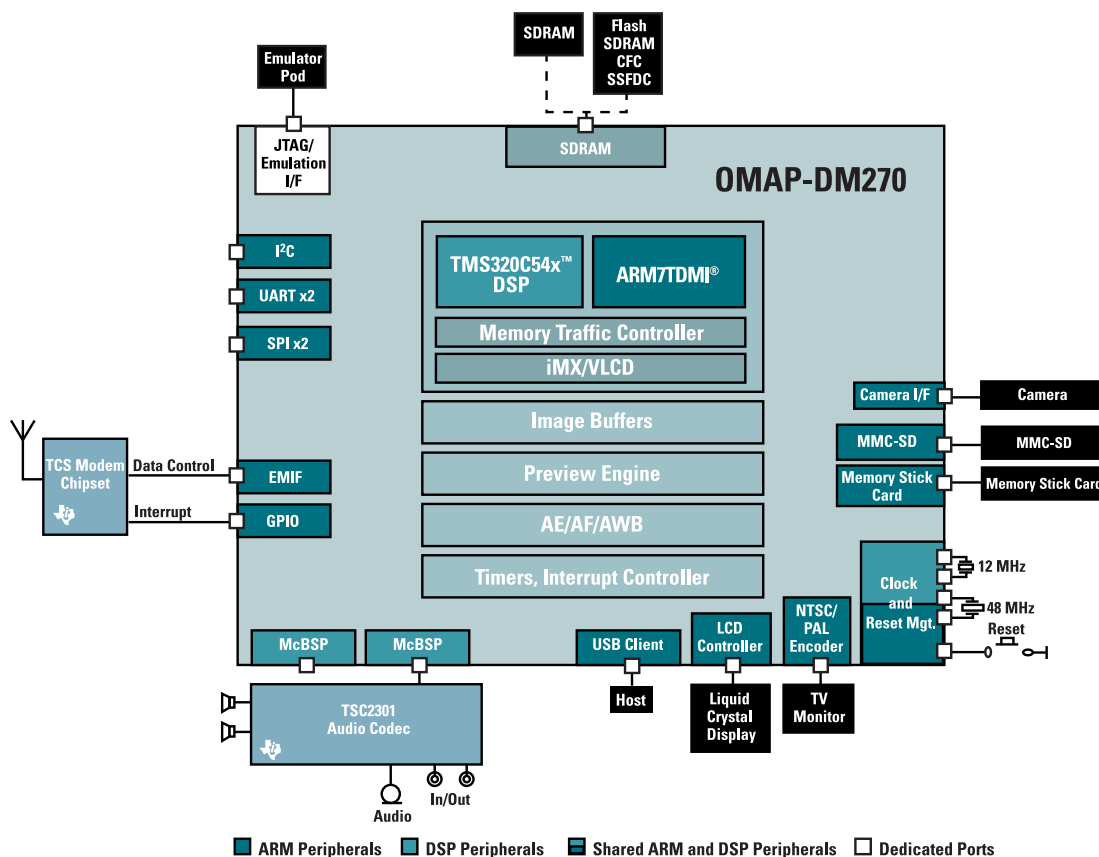
- Integrated programmable platform lets manufacturers add image-processing algorithms
- Performance delivers high image quality and rich features in cost effective solution
- Broad range of encoding support, including support of all major audio, video, imaging and voice standards
- MPEG-4 video support of up to 30 fps (VGA)
- Live view and digital zoom through preview engine
- Real-time auto-focus, auto-white balance and auto-balance statistics
- Highly integrated peripheral set
- Leverages 130 nm process technology for low power and increased performance

OMAP-DM270 Processor

The OMAP-DM270 combines image-processing capabilities with a highly integrated imaging peripheral set in an integrated, programmable platform. Consisting of ARM7TDMI® and TMS320C54x™ DSP cores with on-chip program and data memory, the OMAP-DM270 offers enhanced performance and flexibility for camera-enabled mobile handsets and PDAs and fulfills customer demands for image quality, feature richness and low cost.

Platform programmability is achieved through a DSP-based imaging coprocessor that gives manufacturers the ability to implement proprietary image processing algorithms in software and differentiate their products. In addition, the OMAP-DM270 architecture supports various types of CCD and CMOS sensors, signal conditioning circuits, power management, SDRAM, shutter, iris and auto-focus motor controls.

The DM270 supports all the popular audio, video, imaging and voice standards, including MPEG-4 video up to 30 fps (VGA). A full set of peripherals includes on-screen display and an interface for color LCD. Seamless interface to CompactFlash™, SmartMedia™, Secure Digital™ and Memory Stick™ cards are also provided as part of the OMAP-DM270 multimedia processor.





Integrated Modem Applications Processors

Key Benefits

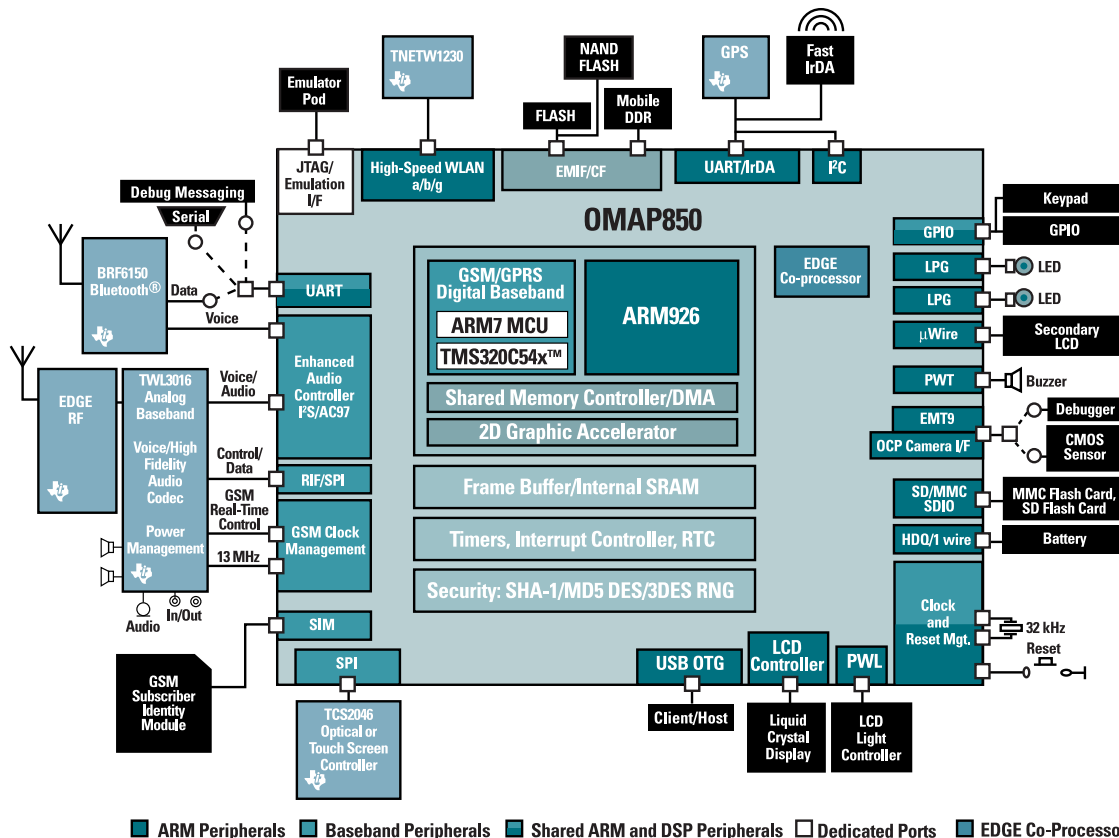
- Enables multimedia, gaming and camera functions in high-performance smartphones and PDAs
- Based on previous generation OMAP730 applications processor
- GSM/GPRS/EDGE capable
- Software compatible with family of OMAP™ applications processors
- Support for various software standards including MPEG-4 video, Microsoft® Windows Media™ video, MP3, 2.0 megapixel camera and others
- High-level mobile OS support
- Broad range of applications through OMAP Developer Network
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

OMAP850 Processor

Designed to work as part of the TCS3500 chipset, the OMAP850 applications processor offers the high performance and low power required for GSM/GPRS and EDGE applications including multimedia, gaming and camera functionality. Because it is software compatible with other OMAP™ applications processors, it serves as an ideal choice for upgrading wireless smart phones and PDAs to meet the EDGE standard requirements.

The OMAP850 high-performance applications processor is integrated with a digital baseband and EDGE co-processor. It is based on the OMAP750 and supports MPEG-4 video, Windows Media™ video, MP3, 2.0 megapixel camera and more.

TI includes a security hardware platform as part of the OMAP850 that includes secure boot, secure mode and hardware encryption accelerators. It supports all high-level mobile OSs, including Symbian OS™, Microsoft Windows Media, Nokia Series 60, Palm OS® and Linux®.



Integrated Modem Applications Processors

OMAP750 Processor

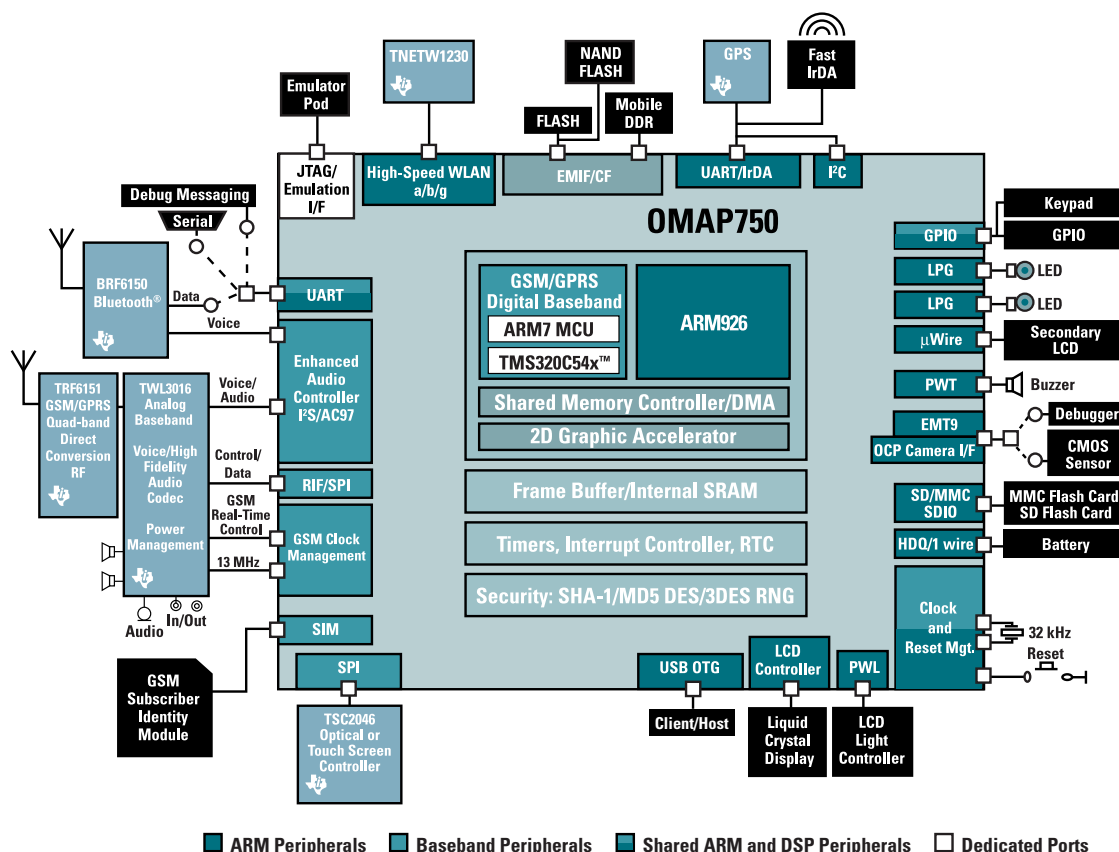
Key Benefits

- Improved multimedia and application performance
- Class 12 GSM/GPRS modem baseband and ARM926 core for applications processing
- Increased processing speeds through DDR memory option and internal frame buffer
- Security protection through hardware-based security platform
- Extended list of peripherals, including parallel OCP camera interface for high resolution imaging
- GPS, WLAN and Bluetooth® capable
- 2.0 megapixel camera
- Pin-to pin compatible with OMAP730
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

Targeted at wireless handsets, smartphones, PDAs and Internet access devices, the OMAP750 extends capabilities of the OMAP73x device while including a range of features that improve multimedia application performance. The single-chip OMAP750 integrates an ARM926 core dedicated to applications processing with a complete Class12 GSM/GPRS modem baseband subsystem that consists of an ARM7 core with TI's low power TMS320C54x™ core.

The OMAP750 incorporates faster memory options, including support of double data rate (DDR) memory that increases processing speed over the OMAP730, which only supported SDRAM. Improved throughput from an internal frame buffer also enhances processing of multimedia applications, including streaming video and high-end imaging functions.

The OMAP750 provides strong security safeguards, as its hardware-based measures offer a higher degree of protection over software-only features. A secure bootloader, secure memory (ROM and RAM), and random number generators are included. Security hardware accelerators also address popular security standards like MD5/SHA1 and DES/3DES.





Integrated Modem Applications Processors

Key Benefits

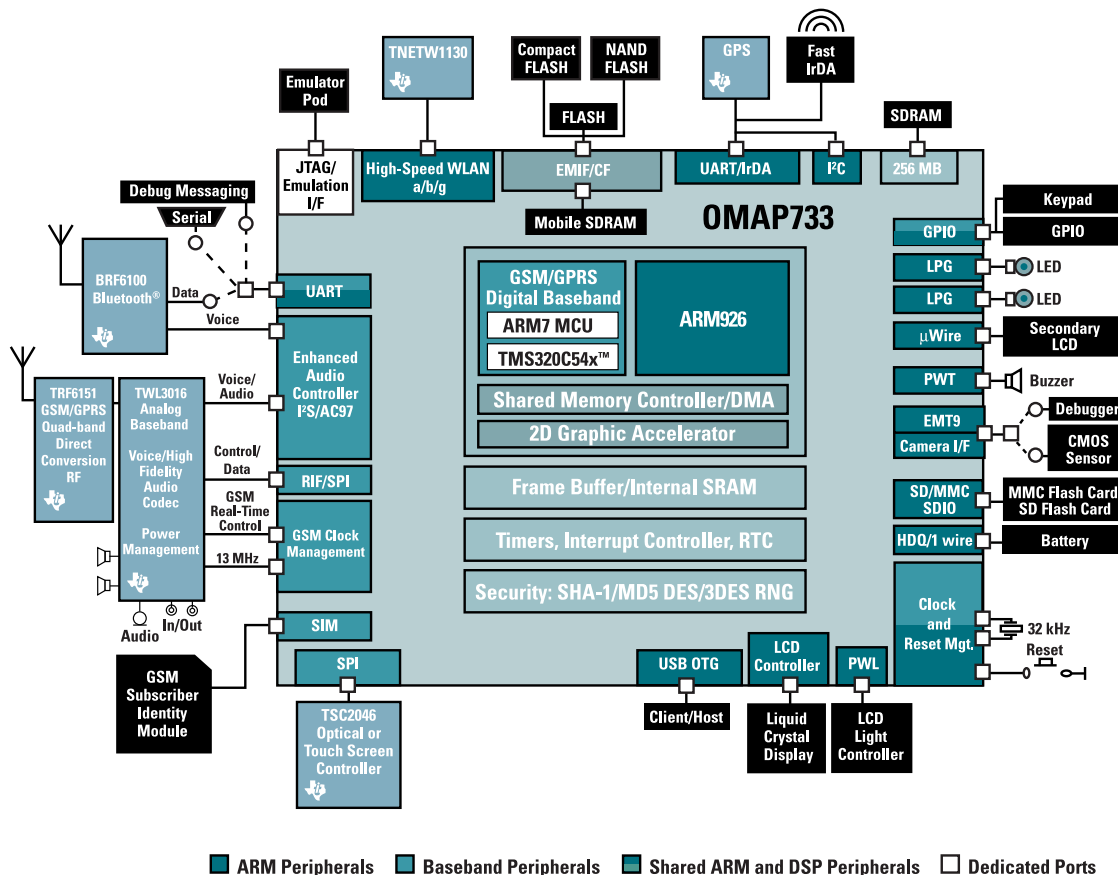
- Twice the application performance over the previous generation
- Double the standby time for handsets, smartphones and PDAs,
- Reduced size and lower power consumption due to stacked SDRAM configuration
- Half the board space over the previous generation and reduced system cost
- Enables applications including accelerated Java processing, web browsing, personal information management, location-based services and more
- Increased space for adding functionality including WLAN, Bluetooth® or GPS
- Security protection through hardware security subsystem
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

OMAP733 Processor

Designed for space-constrained systems or to enable smaller and lighter mobile device designs, the OMAP733 is similar to the OMAP730 but supports memory stacking 256-Mb stacked mobile SDRAM. This further reduces the size of high-end next generation smartphones and wireless PDAs and offers reduced power consumption over traditional external memory configurations.

The single-chip OMAP733 integrates an ARM926EJ-S™ core for applications processing and TI's Class 12 GSM/GPRS digital baseband modem to offer twice the application performance over the previous generation and double the standby time. It includes a complete application subsystem with support of all major operating systems and capabilities to implement WLAN, GPS and Bluetooth®. And like the OMAP730, the OMAP733 also includes comprehensive hardware-based security subsystem that includes a secure bootloader, secure execution environment with secure RAM and ROM, and accelerators for encryption and authentication standards.

The OMAP733 is part of TI's TCS2630 GPRS chipset solution and reference design.



Integrated Modem Applications Processors



Key Benefits

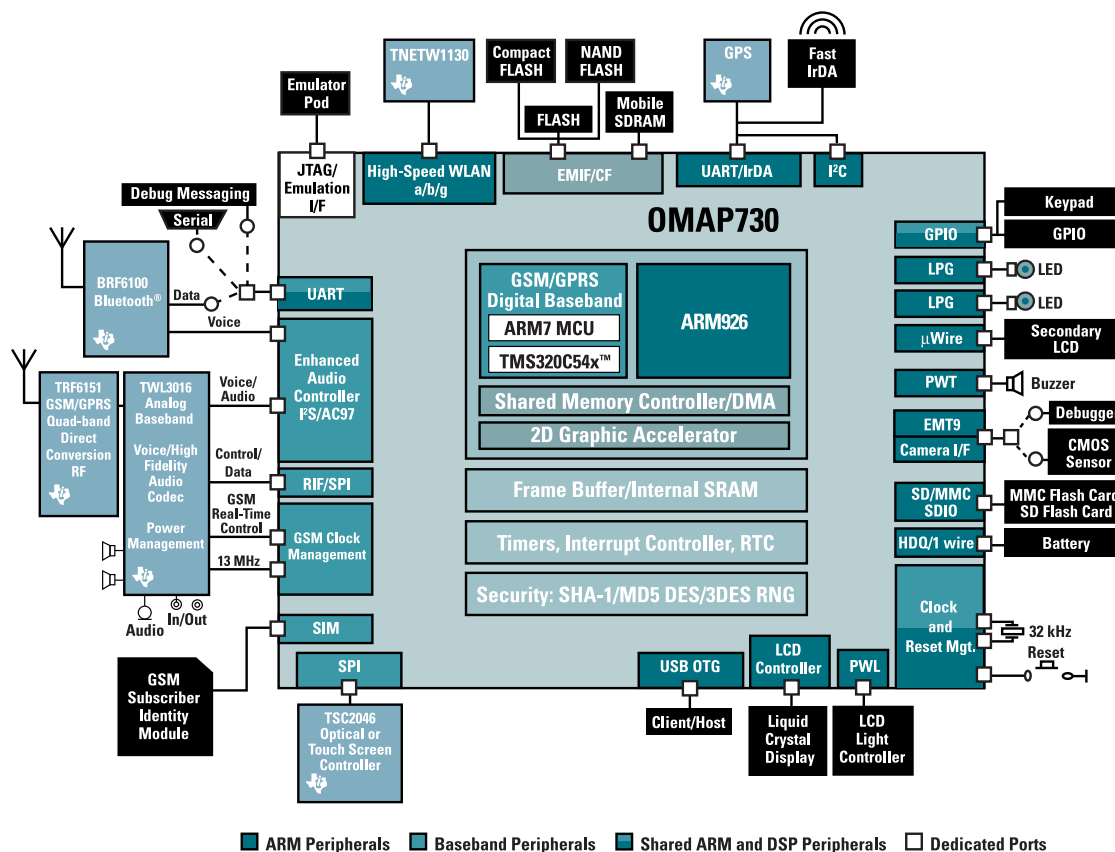
- Twice the application performance over the previous generation
- Double the standby time for handsets, smartphones and PDAs,
- Half the board space over the previous generation and reduced system cost
- Enables applications including accelerated Java processing, web browsing, personal information management, location-based services and more
- Increased space for adding functionality including WLAN, Bluetooth® or GPS
- Security protection through hardware security subsystem
- Integrated peripherals including USB On-the-Go and VLYNQ™
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

OMAP730 Processor

The single chip OMAP730 builds on the proven foundation of the OMAP710 processor, and offers twice the application performance and double the standby time for handsets, smartphones and PDAs. It includes a dedicated TI-enhanced ARM926 processor for applications processing, and TI's Class 12 GSM/GPRS digital baseband that incorporates an ARM7TDMI® and TMS320C54x™ DSP core. The ARM926 applications processor enables applications like high-quality streaming audio, hardware-based security, accelerated Java processing, web browsing, personal information management (PIM) applications, location-based services and more. The OMAP730's integrated SRAM frame buffer boosts streaming media performance and lowers IDLE-mode power.

Forty integrated on-chip peripherals included as part of the OMAP730 reduce board space by half over the previous generation and overall system cost by one-third. This provides additional space for functionality such as WLAN, GPS or Bluetooth®. A comprehensive hardware security subsystem is also included and consists of a secure bootloader, secure execution environment with secure RAM and ROM, and hardware accelerators for encryption and authentication.

The OMAP730 processor is available as part of the TCS2600 Chipset and reference design.





Integrated Modem Applications Processors

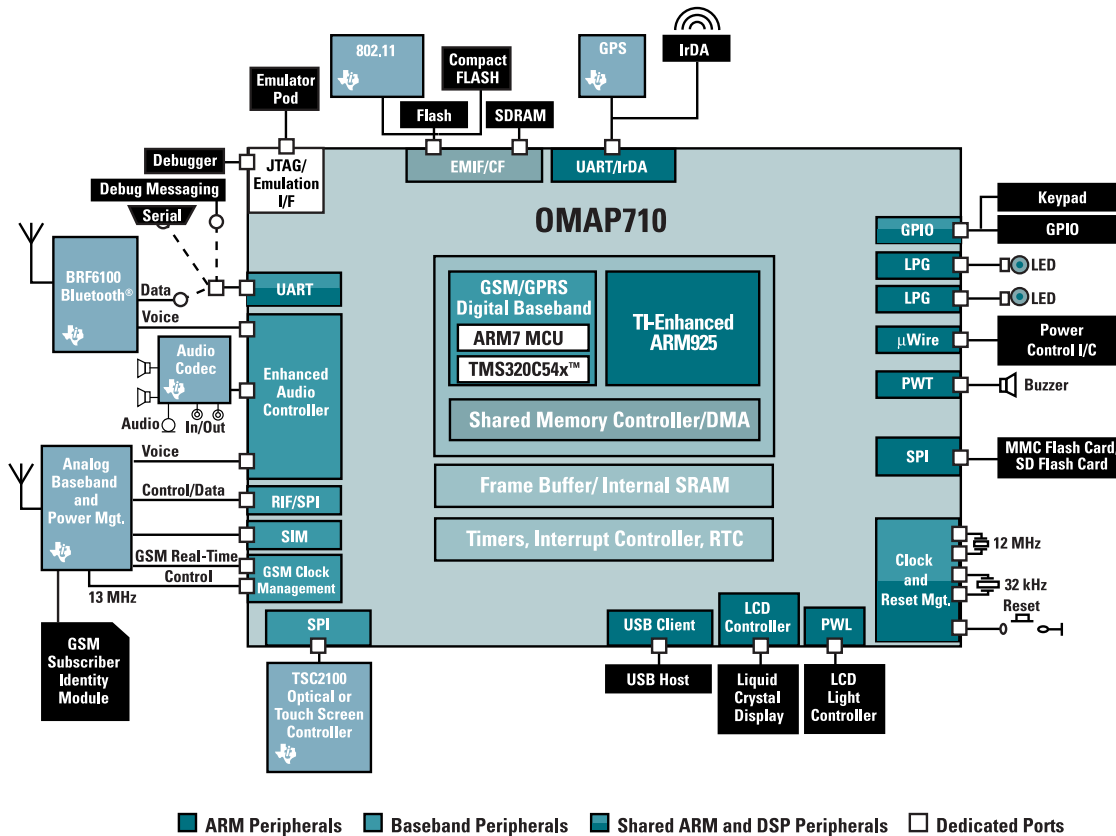
Key Benefits

- Ideal for mid-level smartphones, PDAs and Internet access devices
- Enables real-time voice and multimedia applications
- Software compatible with low and high-end OMAP™ processors
- High performance and low power through TI CMOS technology
- Reduced BOM and parts count through high integration levels
- Support of all major operating systems
- 12 mm x 12 mm, 289-ball MicroStar BGA™, 0.5-mm pitch

OMAP710 Processor

The OMAP710 digital baseband processor is a platform targeted at mid-level smartphones, PDAs and Internet access devices. The single-chip device combines TI's DSP-based GSM/GPRS modem baseband subsystem with a TI enhanced ARM925 microprocessor. The OMAP710 serves as part of TI's TCS2500 chipset solution and reference design.

The OMAP710 is software compatible with the OMAP310 and OMAP1510 processors that target higher and lower-end markets. Its integrated communication and applications processor is complemented by TI's full line of analog, RF and power management solutions. RF technology based on a direct conversion (DC) architecture reduces OMAP710 based devices' BOM and overall cost. The OMAP710 offers a full set of peripherals and a complete GSM/GPRS communications protocol stack.





➔ To Know More

For detailed information about TI's Complementary Technologies featured in this issue:

A-GPS Solutions	50
Bluetooth® Solutions	51-52
WLAN Solutions	53-54

By continuously adding and expanding capabilities to give manufacturers a competitive edge, TI is uniquely positioned to supply all the technologies for multi-mode mobile devices. Technologies like Bluetooth®, 802.11 and global positioning services (GPS) are all available as part of TI's tightly integrated and proven wireless solutions so that manufacturers can get products to market efficiently and fast.

Bluetooth®

Bluetooth allows the wholesale replacement of many short-connecting cables in use today. The easy-to-use, ad-hoc networks that Bluetooth enables creates a host of new applications, and enhances user convenience and utility. TI's Bluetooth focus is on requirements of mobile devices and peripherals. By leveraging its innovative digital radio processor (DRP) architecture and advanced fabrication process, TI's single-chip Bluetooth solutions integrate an RF processor and Bluetooth processor that is optimized to mix with the various 2.5G and 3G communication standards. These high-levels of integration enable cost-effective Bluetooth solutions that use very little power and board space, making them ideal for mobile devices.

802.11/WLAN

A leader in wireless LAN (WLAN) technology, TI has played a significant role in developing the open IEEE 802.11 specification. TI WLAN technology delivers innovative performance levels, low-power consumption and interoperability. Solutions for embedded and battery-powered applications include a new level of functionality and extended battery life for 802.11-enabled PDAs and smartphones. For example, TI's TNETW1100B MAC/baseband processor features enhanced low power (ELP) technology and enables chip-level standby power consumption of less than 2 mW, which is 10X less than comparable chips. TI also provides a TNETW1130 processor that supports 802.11g and speeds up to 54 Mbps in the 2.4 GHz and 5.2 GHz bands. TI Auto-Band™ technology allows users to roam and remain connected to 802.11b, 802.11g or 802.11a networks without manually adjusting network settings.

GPS

TI addresses assisted GPS (A-GPS) with a highly integrated chipset optimized for current and developing mobile standards. TI's TGS5000 operates in the standalone, MS-assisted or MS-based modes and intelligently transfers between modes as needed. It interfaces with TI's wireless chipsets and delivers precision location capabilities to markets ranging from voice-centric handsets to high-end multimedia smart phones and PDAs. TI's A-GPS solution is programmable and will support future A-GPS enhancements as geolocation algorithms, standards and applications evolve.

Ultra Wideband

Ultra Wideband (UWB) is a wireless technology for transmitting digital data at very high rates over a wide spectrum of frequency bands using very low power, targeted for wireless personal area networks (PANs). UWB is ideally suited for wireless communications, particularly short-range and high-speed data transmissions for local area network applications.

TI is actively involved with the companies and industry groups working toward finalizing the specification for Ultra Wideband (UWB) technology, as well as developing standards-compliant products that will enable the first generation of UWB end equipments expected in 2005. TI's multi-band OFDM approach to UWB technology is now supported by more than 50 companies, including leaders in the consumer electronics, computing, cellular and semiconductor industries.



A-GPS Solutions

Key Benefits

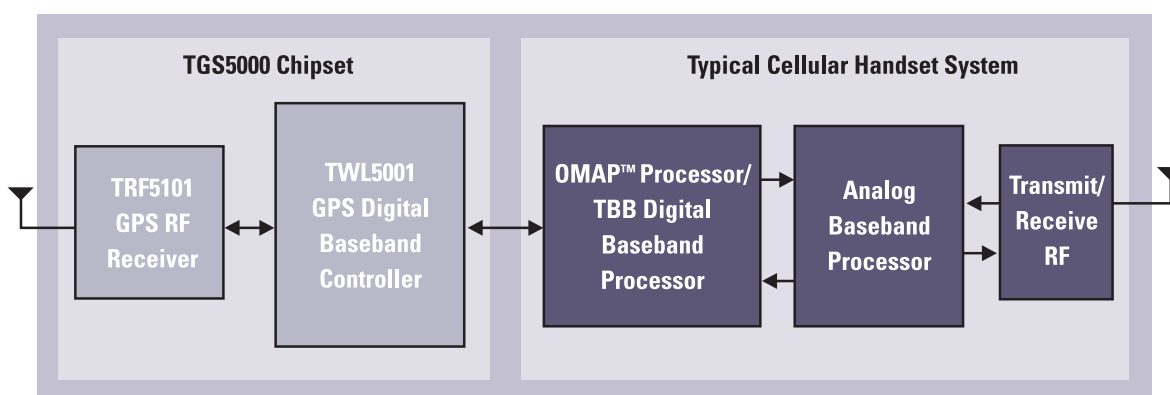
- A-GPS solution supports standalone, MS-assisted and MS-based modes of operation
- Cellular modem interface designed for support of current and future standards
- Programmability supports evolving GPS algorithms through software upgrades
- Reduced board space and low-power consumption through 130-nm CMOS process
- Greater accuracy and reliability with flexible design
- Simultaneous operation with cellular phone system
- Interface to TI's TCS Chipsets and OMAP™ platform

TGS5000 A-GPS Solution

The TGS5000 is a complete programmable solution for Assisted GPS (A-GPS). It is highly integrated and power-efficient, delivering faster, more accurate location-based services across a wider area. The TGS5000 interfaces with TI's OMAP™ platform and TCS Chipsets, bringing reliable and precise location capabilities to market segments that range from voice-centric handsets to high-end multimedia smart phones and PDAs.

Designed for wireless handsets, the TGS5000 is a two-chip solution that consists of a proven A-GPS baseband processor and an RF receiver; both highly integrated and in ultra-small chip-scale packages to extend board space savings. The TGS5000 also includes the logic, memory, analog and software necessary for A-GPS implementation and testing. Manufactured on TI's 130-nm CMOS process, the TGS5000 saves on board space, reducing overall cost and allowing for greater flexibility for wireless handset manufacturers.

The TGS5000 is optimized for current and developing standards, including GSM, GPRS, EDGE, CDMA, UMTS and WCDMA. The TGS5000 operates in standalone, MS-assisted or MS-based modes and can maneuver between modes as required to further ensure seamless worldwide operation.





Key Benefits

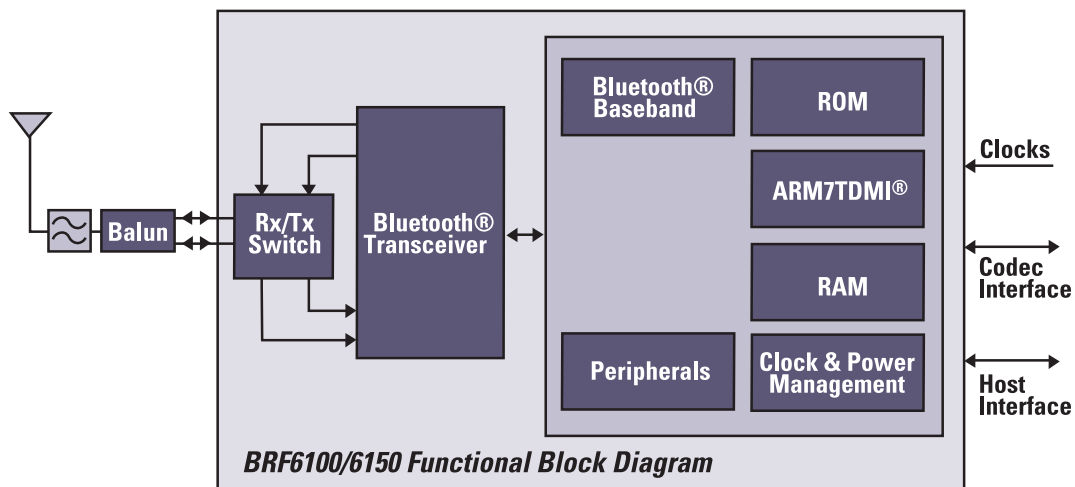
- Single-chip Bluetooth® solution increases performance, reduces cost and minimizes board space
- Increased scalability, low-power consumption, reduced size due to RF technology advances
- Long talk and standby times from best-in-class power consumption
- Bluetooth Specification V1.1 certified (Class 2 and 3)
- Integration and complete reference designs available with OMAP™ platform, TI GSM/GPRS and WLAN chipsets for fast time-to-market

BRF6100 Single-Chip Bluetooth®

Based on TI's 130-nm digital CMOS process, the BRF6100 is TI's first generation single-chip solution designed for Bluetooth® Specification V1.1. The device integrates a Bluetooth baseband, RF, memory (RAM and ROM) and power management to enhance performance, reduce cost and minimize board space, making it well suited for low-cost, high-volume applications like mobile handheld devices.

The BRF6100 incorporates TI's first generation of a digital radio processor (DRP), a revolution in RF technology that offers major advantages over existing analog RF-based solutions. These benefits include increased scalability, lower power consumption, reduced size and lower cost. High levels of integration allow the BRF6100's form factor to drop below 90 mm². This is achieved by integrating power management, PLL, loop filter, antenna switch filters and other analog functions that were previously external.

Optimized and tailored to suit all requirements of cellular applications, the BRF6100 provides seamless integration with TI's OMAP™ platform, and TI's GSM/GPRS and WLAN chipsets.





Bluetooth® Solutions

Key Benefits

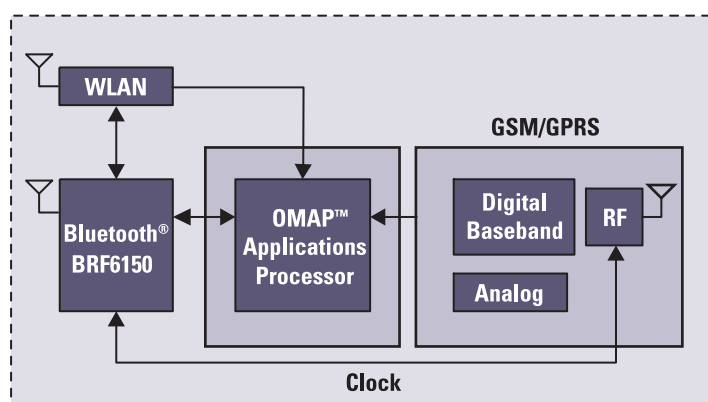
- Industry's longest talk, standby and shut-down times
- Direct connection to battery provides improved power management (2.7 V to 5.5 V)
- Full Bluetooth® Specification v1.2, including eSCO, AFH and faster connection
- Low cost and part count due to high integration and improved interfaces
- Reduced development time through availability of pin-to-pin compatible stacked-flash prototypes (4.5 mm x 4.5 mm)
- Complete reference designs with TI's OMAP™ Platform and GSM/GPRS chipsets provide fast time-to-market
- WLAN collaborative coexistence solution
- Manufactured in 130-nm process to meet mass-production needs

BRF6150 Single-Chip Bluetooth®

Optimized for mobile terminals, TI's BRF6150 is a highly integrated Bluetooth® Specification v1.2 solution that combines TI's Bluetooth baseband, RF, ARM7TDMI® and power management into a single chip. Its extreme levels of integration enhance performance and lower power consumption while reducing cost and minimizing board space.

The BRF6150 is based on TI's BRF6100 device. Improved RF performance and power management capabilities deliver higher integration and reduced package size, resulting in a 50mm² Bluetooth solution for cellular phones. The BRF6150 is tailored to suit cellular applications requirements, including RF performance, power consumption, solution size, ease of integration and cost. It connects directly to the battery, saving cost and space of external regulators and simplifying the interface with the host by separating power management entities.

The BRF6150, which utilizes AFH and eSCO, offers an upgrade to the current coexistence solution. When manufacturers combine the v1.2 compliant BRF6150 with TI's Bluetooth/Wi-Fi coexistence software package for either the TNETW1100B chipset for 802.11b or TNETW1230 solution for 802.11a/b/g, improved coexistence performance is achieved. This results in better utilization of the 2.4 GHz frequency band and solves the most demanding coexistence scenarios for simultaneous Bluetooth voice/data and high speed Wi-Fi data. It also enhances WLAN data throughput to maximum performance when co-located into small mobile products such as smartphones and wireless PDAs. The BRF6150 includes complete reference designs with TI's GSM/GPRS chipsets and OMAP™ platform.



Smartphone application: BRF6150 interconnects with the OMAP™ applications processor, GSM/GPRS chipset and WLAN.

**Key Benefits**

- Interoperable with both the 2.4-GHz and 5.x-GHz 802.11 bands and World Band
- Lower cost opens new market opportunities for triple mode APs
- Easy migration path to new real-time applications through future-proofed architecture
- Intelligently applies bandwidth where needed through adaptive time domain switching
- Single design functions as three AP products: 802.11a only, 802.11g only and triple mode 802.11a/b/g AP
- Simplified manufacturing process and fast time-to-market
- Rapid development through Access Point Development Kit and TI HDK support
- Configuration application with complete customizable software kit
- Software library and sample program for all supported form factors
- In-house test using FCC, Wi-Fi® and WHQL test suites and TI-designed performance test suites
- WHQL-approved TI AP reference designs
- Access to Designed for Microsoft® Windows® XP logo

wONE™ Universal Router

TI's wONE Universal Router makes affordable multimedia home networking possible, allowing for video, audio, imaging (802.11a) and data (802.11b/g) with minimal interference or performance degradation. Its architecture is interoperable with all 802.11 standards including 802.11b and b+, 802.11g and g+ and 802.11a, as well as World Band implementations, and provides simultaneous 802.11 a, b and g dual band operation (2.4 GHz and 5.x GHz).

Integrated in a single chip, the wONE Router combines a single CPU, media access controller, RF front end (RFFE) and baseband processor reducing component costs for equipment designers and manufacturers. This opens new markets for triple mode access points by giving consumers a range of benefits, including across-the-board interoperability, a future-proofed solution, seamless compatibility and others for incremental cost over single-band AP platforms.

Installed wONE-based APs can easily and efficiently accommodate mixed-mode and multimedia networks in the future due to built-in expansion capabilities that future-proof wONE wireless networks. Consumers will have the ability to easily implement real-time multimedia applications such as streaming video or high-fidelity audio over 802.11a without added cost or installation hassles. Equipment suppliers also will be able to easily upgrade performance capabilities needed for future, higher-end applications well before they are available to consumers.

wONE technology runs on TI's 802.11 chipsets. It is included as a standard feature in TI's 802.11 AP Design Kit and is supported by all TI's 802.11 AP reference designs. wONE is Wi-Fi® certifiable and conforms to all applicable 802.11 standards.

**WLAN Solutions****Key Benefits**

- Simultaneous 802.11a/g operation through wOne™ universal router software technology
- Affordable price due to ability to offer dual-band routers
- Industry's smallest package; 12 mm x 12 mm
- Integration delivers compact solution designed specifically for mobile, battery powered devices
- Delivers complete wireless design when combined with TI OMAP™ processors or TCS Chipsets.
- Easily connects to OMAP1610, OMAP1611 and OMAP730 processors and BRF6100 Bluetooth® device
- Developers kit and sample reference designs speed development and time-to-market

TNETW1230 Media ACCESS Controller

Built in the industry's smallest package, the TNETW1230 single-chip media access controller (MAC) and baseband processor is ideal for mobile, battery-operated devices such as cell phones and PDAs. It is an 802.11a/b/g solution, and can be combined with OMAP™ processors and wireless chipsets for developing complete wireless designs.

A high-throughput connection shortens transmit and receive times, and improves battery life, meeting the mobile market's need for 802.11g. The device also meets demands for dual-band 802.11a/g networking for voice-over-WLAN (VoWLAN) mobile applications.

The TNETW1230 includes VLYNQ™, TI's low-power, low-pin-count serial interface. These interfaces enable the TNETW1230 to easily connect with the OMAP1610, OMAP1611 and OMAP730 processors and cellular chipsets for Wi-Fi cellular phones and PDAs. The TNETW1230 also can connect to the BRF6100 single-chip Bluetooth® solution as part of TI's Bluetooth 802.11 coexistence package.

A modular embedded station developer's kit (eSTADK) for mobile 802.11g and 802.11a/g development is included. It provides programming and hardware design tools and sample reference designs to streamline the development process and accelerate a customized design.



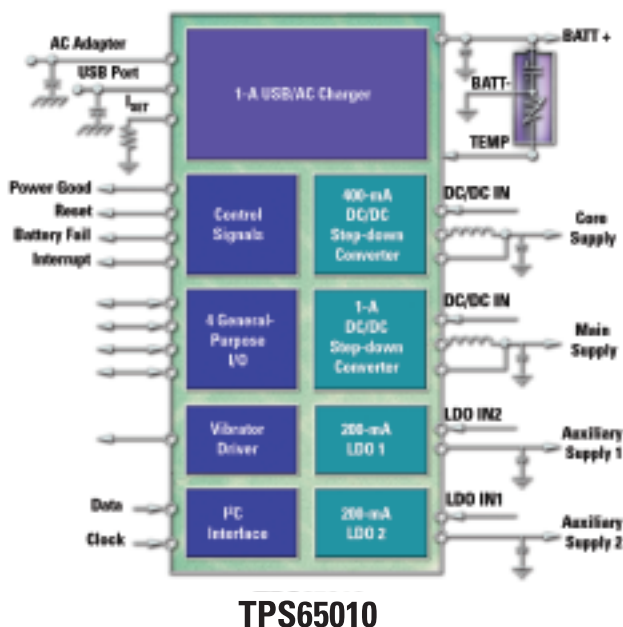
High-Performance Analog Products for Mobile Handsets

- Multifunctional and specialized DC/DC converters
- DC/DC controllers
- Low-dropout regulators (LDOs)
- Battery charge management ICs
- Battery fuel gauges
- Battery protection ICs
- Supply voltage supervisors
- Power MUX controllers
- Backlight/color display drivers (for White LED, LCD, OLED displays)
- Touchscreen controllers
- Class-D audio power amplifiers
- Audio codecs

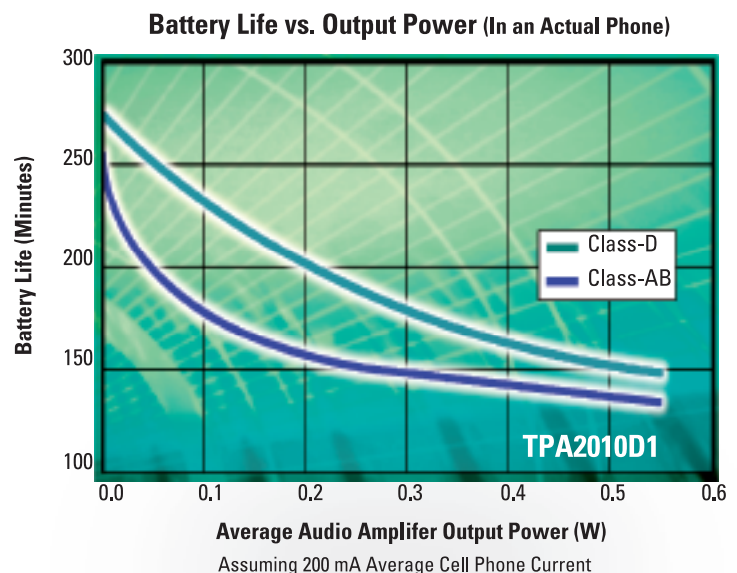
Mobile handset designers face a myriad of challenges and pressures to deliver new products to market with a broad range of functionality and applications. Today's 2.5G and 3G devices require faster processing power and higher quality color displays, without compromising battery life, performance or system run-times. Additionally, designers must understand a pivotal piece of next-generation, voice-centric wireless communications—*analog*. The handset's power subsystem and analog circuitry must achieve optimal power efficiency and noise/ripple performance. This requirement cannot be met through increased battery size or the addition of silicon, as board space is a premium.

Texas Instruments (TI) leverages its wireless system-level expertise and manufacturing capabilities to provide high-performance, discrete and integrated analog products to fit any mobile handset design. TI delivers a wide array of custom and "off-the-shelf" analog solutions for mobile handsets, including power management, battery management, noise-reduction, signal conversion and signal conditioning products to help designers deliver differentiated handsets and grow market opportunities. By understanding the complete wireless system and design requirements, TI combines the right analog techniques and innovation with digital components to produce greater levels of integration, efficiency, performance and functionality.

Fully Integrated Power and Battery Management IC for Single-Cell Li-Ion



Class-D Audio Power Amplifier Greater Talk Time in a Smaller Size



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