

Recommendation for Register-Related SPD Settings on DDR3 RDIMM

Christian Schmoeller

ABSTRACT

DDR3 memory modules can be populated with EEPROMs that use the Serial Presence Detect memory technology. The SPD EEPROM contains information for the memory controller about the memory module. On Registered DIMM (RDIMM), the SPD bytes 65-76 are reserved for register specific content.

This application report gives DIMM manufacturers who are using TI registers on their modules, a recommendation for the correct SPD settings of bytes 65-76. Only the JEDEC standard board layouts (Raw Cards or R/C) are covered by this report, namely R/C A-H, J-N, and V.

Contents

1	Description of SPD Bytes 65–76	2
2	Recommendation for Standard RDIMM	3
3	Recommendation for Very Low Profile (VLP) RDIMM	4
4	References	4

List of Figures

List of Tables

1	Description of SPD Bytes 65-76	2
2	TI DDR3 Register Revision ID Overview	2
3	Recommended DDR3 RDIMM SPD Programming for Bytes 65–76	3
4	Recommended DDR3 VLP RDIMM SPD Programming for Bytes 65-76.....	4

1 Description of SPD Bytes 65–76

The DDR3 register is a complex buffer that which allows various kinds of configuration. The memory controller performs the configuration by writing Register Control commands to the register.

As different DIMM designs have different requirements, it is necessary to write the correct settings in the SPD EEPROM on the memory module. The memory controller can read this information at system start and program the register accordingly. [Table 1](#) gives a short description for the register-related bytes in the SPD.

Table 1. Description of SPD Bytes 65-76

SPD Byte	Short Description	Description
65	Vendor ID1	Bytes 65 and 66 are reserved for the register vendor ID. TI's ID is 0x8097
66	Vendor ID2	
67	Revision ID	Information about the revision of the register. See Table 2 for version overview.
68	Register Type	Reserved
69	RC0+RC1	Global feature and clock driver enable control word
70	RC2+RC3	Timing and CA signal driver characteristics control word
71	RC4+RC5	Control signal driver characteristics control word
72	RC6+RC7	Reserved
73	RC8+RC9	Input bus termination and static system settings control word
74	RC10+RC11	Maximum DIMM speed and voltage range control word
75	RC12+RC13	Reserved
76	RC14+RC15	Reserved

Table 2. TI DDR3 Register Revision ID Overview

Part Number	Top Marking	Architecture	Revision ID (SPD Byte 67)
SN74SSQE32882	TE32882E	V3.1	0x1D
SN74SSQEA32882	EA32882B	V4.2	0x28
SN74SSQEB32882	EB32882A	V5.0	0x33
SN74SSQEC32882	EC32882S	V5.1	0X3D

2 Recommendation for Standard RDIMM

Table 3 shows TI's recommendation for the register-related SPD bytes on DDR3 standard height RDIMM. Different DRAM vendors have different input loads. Therefore, bytes 70 and 71 might be different for individual DIMM/DRAM vendors, as those bytes define the driver strength of the register. It is up to the DIMM vendors to verify this with simulations and measurements on their own DIMM design.

Table 3. Recommended DDR3 RDIMM SPD Programming for Bytes 65–76

SPD Byte	Description	R/C A 1Rx8 Planar	R/C B 2Rx8 Planar	R/C C 1Rx4 Planar	R/C D 2Rx4 Stacked	R/C E 2Rx4 Planar	R/C F 4Rx4 Stacked	R/C G 4Rx8 Stacked	R/C H 4Rx8 Planar	R/C J 2Rx4 Planar	R/C W 4Rx4 Stacked	R/C Y 4Rx8 Planar	R/C AB 4Rx4 Stacked
65	TI Vendor ID	0x80	0x80	0x80	0x80	0x80	0x80	0x80	0x80	0x80	0x80	0x80	0x80
66	TI Vendor ID	0x97	0x97	0x97	0x97	0x97	0x97	0x97	0x97	0x97	0x97	0x97	0x97
67	Rev. ID	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2
68	Register Type	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
69	RC1 + RC0	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
70	RC 3 + RC2	0x00	0x50	0x50	0xA0	0x50	0x50	0x50	0x50	0x50	0x50	0x50	0x50
71	RC 5 + RC4	0x00	0x00	0x55	0xA5	0x55	0x50	0x55	0x55	0x55	0x50	0x55	0x50
72	RC7+RC6	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
73	RC9+RC8	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
74	RC11+RC10	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
75	RC13+RC12	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00
76	RC15+RC14	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00	0x00

3 Recommendation for Very Low Profile (VLP) RDIMM

Table 4 shows TI's recommendation for the register related SPD bytes on DDR3 VLP-RDIMM. Different DRAM vendors have different input loads. Therefore, bytes 70 and 71 might be different for individual DIMM/DRAM vendors, as those bytes define the driver strength of the register. It is up to the DIMM vendors to verify this with simulations and measurements on their own DIMM design.

Table 4. Recommended DDR3 VLP RDIMM SPD Programming for Bytes 65-76

SPD Byte	Description	R/C K	R/C L	R/C M	R/C N	R/C U	R/C V
		1Rx8 planar	2Rx8 planar	1Rx4 planar	2Rx4 stacked	4Rx4 stacked	4Rx8 stacked
65	TI Vendor ID	0x80	0x80	0x80	0x80	0x80	0x80
66	TI Vendor ID	0x97	0x97	0x97	0x97	0x97	0x97
67	Rev. ID	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2	See Table 2
68	Register Type	0x00	0x00	0x00	0x00	0x00	0x00
69	RC1 + RC0	0x00	0x00	0x00	0x00	0x00	0x00
70	RC 3 + RC2	0x00	0x50	0x50	0xA0	0xA0	0xA0
71	RC 5 + RC4	0x00	0x00	0x55	0x55	0x55	0xAA
72	RC7+RC6	0x00	0x00	0x00	0x00	0x00	0x00
73	RC9+RC8	0x00	0x00	0x00	0x00	0x00	0x00
74	RC11+RC10	0x00	0x00	0x00	0x00	0x00	0x00
75	RC13+RC12	0x00	0x00	0x00	0x00	0x00	0x00
76	RC15+RC14	0x00	0x00	0x00	0x00	0x00	0x00

4 References

1. SN74SSQEC32882, 28-Bit to 56-Bit Registered Buffer with Address Parity Test One Pair to Four Pair Differential Clock PLL Driver data sheet [SCAS920](#)
2. JEDEC Solid State Technology Association, Registered DIMM Design Specification (JESD21)

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as "components") are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have **not** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products

Audio	www.ti.com/audio
Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
OMAP Applications Processors	www.ti.com/omap
Wireless Connectivity	www.ti.com/wirelessconnectivity

Applications

Automotive and Transportation	www.ti.com/automotive
Communications and Telecom	www.ti.com/communications
Computers and Peripherals	www.ti.com/computers
Consumer Electronics	www.ti.com/consumer-apps
Energy and Lighting	www.ti.com/energy
Industrial	www.ti.com/industrial
Medical	www.ti.com/medical
Security	www.ti.com/security
Space, Avionics and Defense	www.ti.com/space-avionics-defense
Video and Imaging	www.ti.com/video

TI E2E Community

e2e.ti.com