

# **JEDEC STANDARD**

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## **Embedded MultiMediaCard (*e*•MMC) Mechanical Standard, with Optional Reset Signal**

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**JESD84-C44**

**JULY 2009**

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**JEDEC SOLID STATE TECHNOLOGY ASSOCIATION**



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## **Embedded MultiMediaCard (*e*•MMC) Mechanical Standard, with Optional Reset Signal**

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### **Foreword**

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The Embedded MultiMediaCard (*e*•MMC) Mechanical Standard has been prepared by JEDEC. The MultiMediaCard Association, hereafter referred to as MMCA, exists to promote adoption of a global standard for a compact, robust, affordable storage and retrieval device, the MultiMediaCard. Consumers worldwide will benefit from this standard, allowing them to carry with them, information and entertainment that fits their needs, wherever they are, whenever they wish.

JEDEC has taken the basic MMCA specification and adopted it for embedded applications, calling it “*e*•MMC.” In addition to the packaging differences, *e*MMC devices use a reduced voltage interface. These specifications are detailed in the JEDEC Standard for Embedded MultiMediaCard (*e*•MMC) *e*•MMC/Card Product Standard, JESD84-Axx.

The purpose of the standard is the mechanical definition of the *e*•MMC.

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### **Introduction**

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MultiMediaCards are universal data storage and communication media. It is designed to cover a wide area of applications such as smart phones, cameras, organizers, PDAs, digital recorders, MP3 players, pagers, electronic toys, etc. Targeted features are high mobility and high performance at a low cost price. These features include low power consumption and high data throughput at the memory card interface.

MultiMediaCard communication is based on an advanced 11-signal bus. The communication protocol is defined as a part of this standard and referred to as the MultiMediaCard mode.



## **Embedded MultiMediaCard (*e*•MMC) Mechanical Standard, with Optional Reset Signal**

(From JEDEC Board Ballot JCB-09-26, formulated under the cognizance of the JC-64 Committee on Flash memory modules.)

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### **1 Scope**

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This standard describes the mechanical features of the *e*•MMC.

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### **2 Normative reference**

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There are no normative references for this document at this time.

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### **3 Terms and definitions**

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For the purposes of this publication, the following terms and definitions apply:

MMC: MultiMediaCard

*e*•MMC: Embedded MultiMediaCard

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## 4 eMMC General description

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The JEDEC eMMC Mechanical Standard describes the mechanical and physical attributes of the Embedded MultiMediaCard.

There are four physical configurations, AA, AB, AC and BA, that are each discussed in this document.

**NOTE** As used in this document, “shall” or “will” denotes a mandatory provision of the standard. “Should” denotes a provision that is recommended but not mandatory. “May” denotes a feature whose presence does not preclude compliance, that may or may not be present at the option of the implementor.

### 4.1 Device signals

JEDEC eMMC devices transfer data via a configurable number of data-bus signals. The communication signals are shown in [Table 1](#).

**Table 1 — Communication signals**

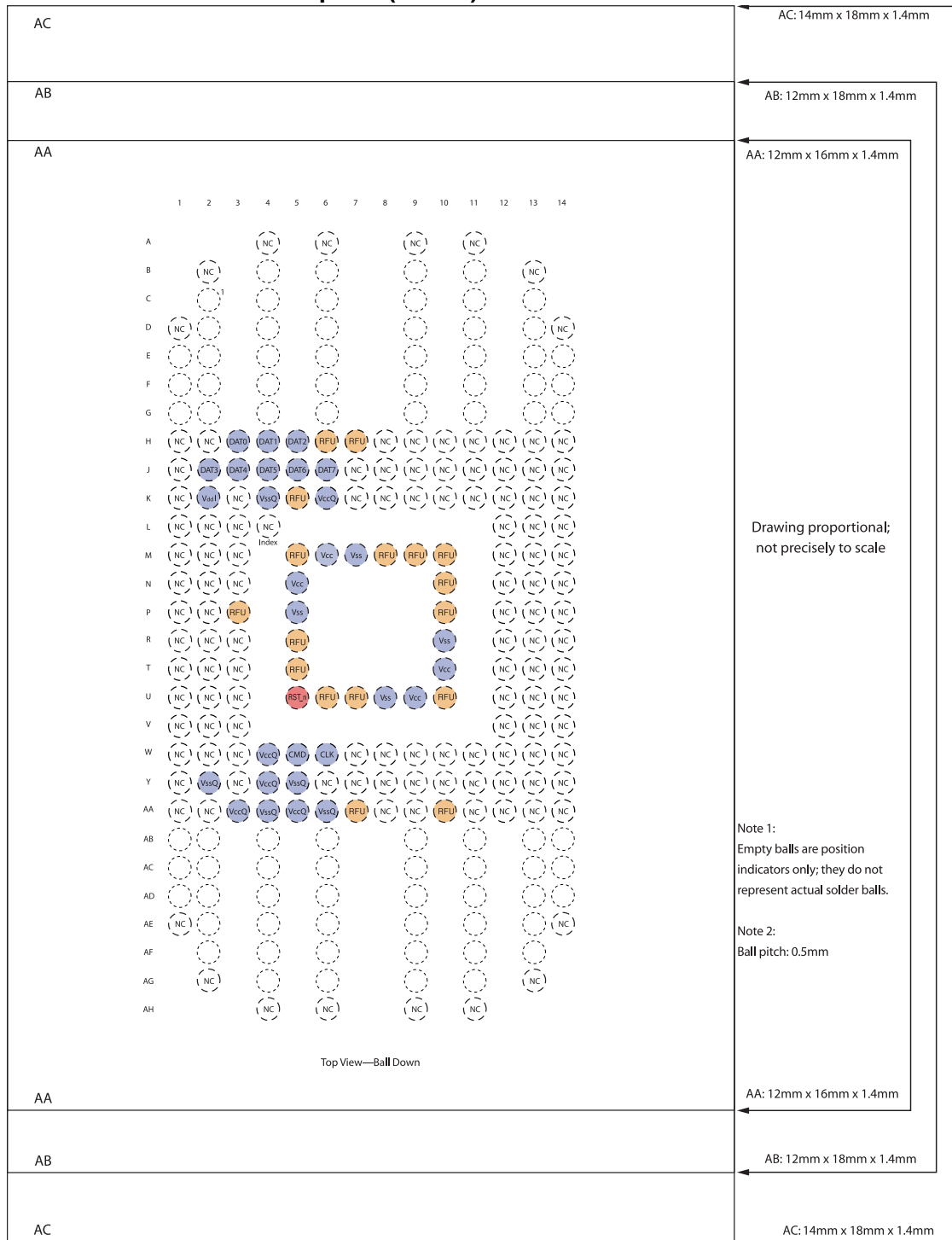
Signal	Symbol	Description
Clock	CLK	Each cycle of the clock directs a transfer on the command line and on the data line(s). The frequency can vary between the minimum and the maximum clock frequency.
Command	CMD	This signal is a bidirectional command channel used for device initialization and command transfers. The CMD signal has two operating modes: open-drain for initialization, and push-pull for command transfer. Commands are sent from the MultiMediaCard bus master to the device, and responses are sent from the device to the host.
DATA	DAT[7:0]	These are bidirectional data signals. The DAT signals operate in push-pull mode. By default, after power-up or RESET, only DAT0 is used for data transfer. The memory controller can configure a wider data bus for data transfer using either DAT[3:0] (4-bit mode) or DAT[7:0] (8-bit mode). JEDEC eMMC includes internal pull-up resistors for data lines DAT[7:1]. Immediately after entering the 4-bit mode, the device disconnects the internal pull-up resistors on the DAT1, DAT2, and DAT3. Correspondingly, immediately after entering the 8-bit mode, the device disconnects the internal pull-ups on the DAT1–DAT7.
Reset	RST_n	Reset signal is used for host resetting device, moving the device to pre-idle state. By default, the RST_n signal is temporary disabled in device. Host need to set bit[0:1] in the extended CSD register [162] to 0x1 to enable this functionality before the host uses.

Device initialization uses only the CMD channel and is, therefore, compatible with all devices.

### 4.2 eMMC Components

Ball assignments for AA, AB and AC devices are depicted in [Figure 1 on page 3](#). Ball assignments for BA devices are shown in [Figure 2 on page 4](#).

#### 4 eMMC General description (cont'd)



**Figure 1 — Ball assignment: AA, AB and AC devices (see MO-276 for details)**

**NOTE** Some previous versions of the specification, either product specification or mechanical specification, had defined reserved ball as NC balls. The NC balls could have been connected to ground in system board. But some of the NC balls could be assigned for new signals in the future. These balls are assigned as RFU in v4.4 mechanical specification. Any new implementations should use the new ball assignments and leave the RFU balls floating on system board.



4 eMMC General description (cont'd)

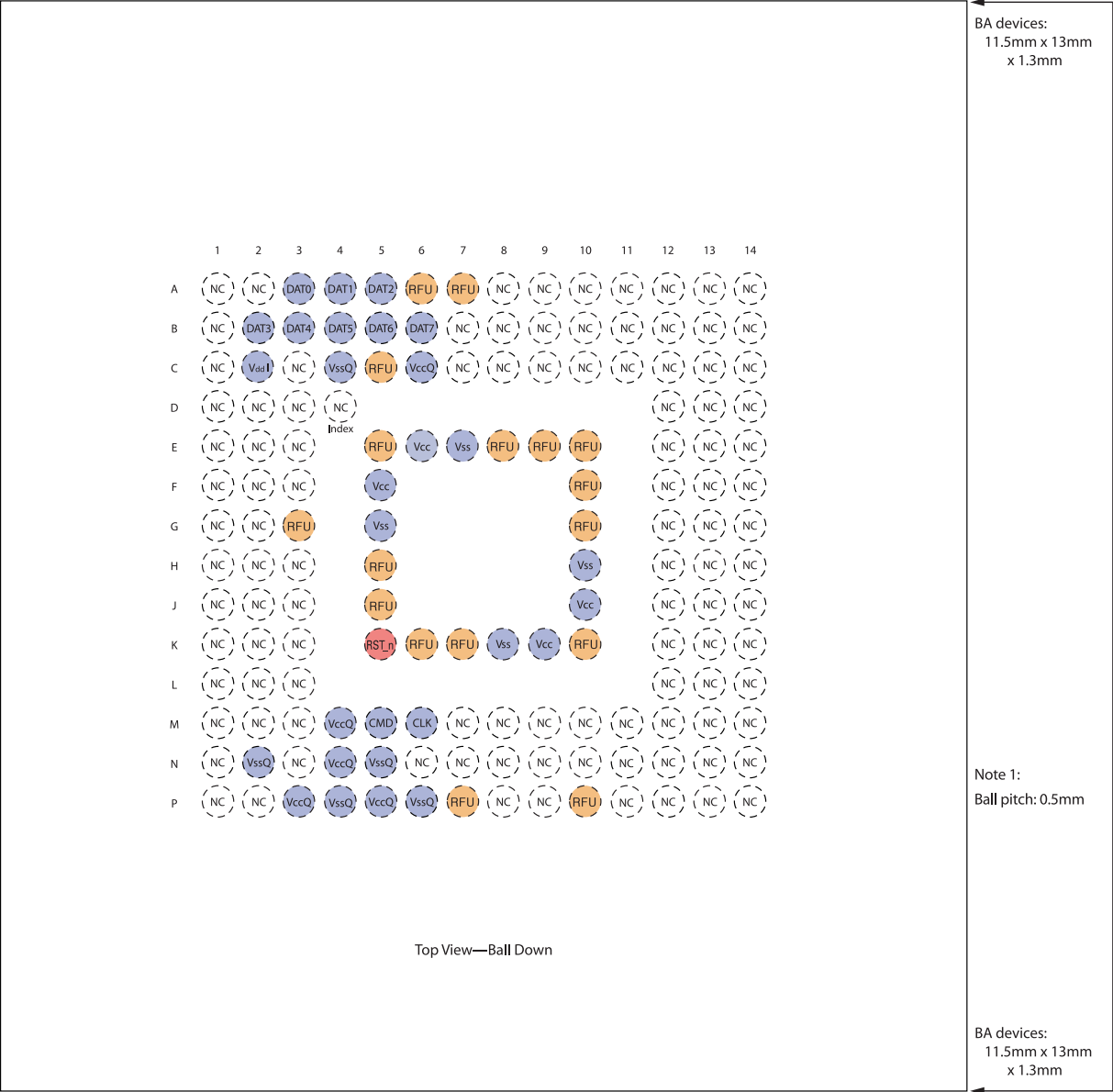


Figure 2 — Ball assignments: BA devices (see MO-276 for details)

NOTE Some previous versions of the specification, either product specification or mechanical specification, had defined reserved ball as NC balls. The NC balls could have been connected to ground in system board. But some of the NC balls could be assigned for new signals in the future. These balls are assigned as RFU in v4.4 mechanical specification. Any new implementations should use the new ball assignments and leave the RFU balls floating on system board.

4.3 eMMC Physical description

JEDEC eMMC has 11 signals. The host is connected to the device using a dedicated 11-ball connector. Ball assignments are shown in Table 2 on page 5. Note that Table 2 continues on the following page.

## 4 eMMC General description (cont'd)

Table 2 — Ball assignments

169-Ball Devices	153-Ball Devices	Symbol	Type	Ball Function
AA, AB and AC Devices	BA Device			
W6	M6	CLK	Input	Clock: Each cycle directs a 1-bit transfer on the command and DAT lines.
W5	M5	CMD	Input	Command: A bidirectional channel used for device initialization and command transfers. Command has two operating modes: 1) Open-drain for initialization. 2) Push-pull for fast command transfer.
H3	A3	DAT0	I/O	Data I/O0: Bidirectional channel used for data transfer.
H4	A4	DAT1	I/O	Data I/O1: Bidirectional channel used for data transfer.
H5	A5	DAT2	I/O	Data I/O2: Bidirectional channel used for data transfer.
J2	B2	DAT3	I/O	Data I/O3: Bidirectional channel used for data transfer.
J3	B3	DAT4	I/O	Data I/O4: Bidirectional channel used for data transfer.
J4	B4	DAT5	I/O	Data I/O5: Bidirectional channel used for data transfer.
J5	B5	DAT6	I/O	Data I/O6: Bidirectional channel used for data transfer.
J6	B6	DAT7	I/O	Data I/O7: Bidirectional channel used for data transfer.
U5	K5	RST_n	Input	Reset signal pin
M6, N5, T10, U9	E6, F5, J10, K9	V <sub>CC</sub>	Supply	V <sub>CC</sub> : Flash memory I/F and Flash memory power supply.
K6, W4, Y4, AA3, AA5	C6, M4, N4, P3, P5	V <sub>CCQ</sub>	Supply	V <sub>CCQ</sub> : Memory controller core and MMC interface I/O power supply.
M7, P5, R10, U8	E7, G5, H10, K8	V <sub>SS</sub>	Supply	V <sub>SS</sub> : Flash memory I/F and Flash memory ground connection.
K4, Y2, Y5, AA4, AA6	C4, N2, N5, P4, P6	V <sub>SSQ</sub>	Supply	V <sub>SSQ</sub> : Memory controller core and MMC I/F ground connection.
K2	C2	V <sub>DDi</sub>		V <sub>DDi</sub> : Connect 0.1μF capacitor from V <sub>DDi</sub> to ground.

**Table 2 — Ball assignments (continued)**

169-Ball Devices	153-Ball Devices	Symbol	Type	Ball Function
AA, AB and AC Devices	BA Device			
Miscellaneous				
L4	D4	NC Index	—	Index: Can be connected to ground or left floating.
A4, A6, A9, A11, B2, B13, D1, D14, H1, H2, H8, H9, H10, H11, H12, H13, H14, J1, J7, J8, J9, J10, J11, J12, J13, J14, K1, K3, K7, K8, K9, K10, K11, K12, K13, K14, L1, L2, L3, L12, L13, L14, M1, M2, M3, M12, M13, M14, N1, N2, N3, N12, N13, N14, P1, P2, P12, P13, P14, R1, R2, R3, R12, R13, R14, T1, T2, T3, T12, T13, T14, U1, U2, U3, U12, U13, U14, V1, V2, V3, V12, V13, V14, W1, W2, W3, W7, W8, W9, W10, W11, W12, W13, W14, Y1, Y3, Y6, Y7, Y8, Y9, Y10, Y11, Y12, Y13, Y14, AA1, AA2, AA8, AA9, AA11, AA12, AA13, AA14, AE1, AE14, AG2, AG13, AH4, AH6, AH9, AH11	A1, A2, A8, A9, A10, A11, A12, A13, A14, B1, B7, B8, B9, B10, B11, B12, B13, B14, C1, C3, C7, C8, C9, C10, C11, C12, C13, C14, D1, D2, D3, D12, D13, D14, E1, E2, E3, E12, E13, E14, F1, F2, F3, F12, F13, F14, G1, G2, G12, G13, G14, H1, H2, H3, H12, H13, H14, J1, J2, J3, J12, J13, J14, K1, K2, K3, K12, K13, K14, L1, L2, L3, L12, L13, L14, M1, M2, M3, M7, M8, M9, M10, M11, M12, M13, M14, N1, N3, N6, N7, N8, N9, N10, N11, N12, N13, N14, P1, P2, P8, P9, P11, P12, P13, P14	NC	—	No connect: Can be connected to ground or left floating.
H6, H7, K5, M5, M8, M9, M10, N10, P3, P10, R5, T5, U6, U7, U10, AA7, AA10	A6, A7, C5, E5, E8, E9, E10, F10, G3, G10, H5, J5, K6, K7, K10, P7, P10	RFU	—	Reserved for future use. Left it floating for future use.





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JEDEC: JESD84-C44

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1. I recommend changes to the following:

☐ Requirement, paragraph number: \_\_\_\_\_

☐ Test method number: \_\_\_\_\_ Paragraph number: \_\_\_\_\_

The referenced paragraph number has proven to be:

☐ Unclear ☐ Too rigid ☐ In error

☐ Other: \_\_\_\_\_

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\_\_\_\_\_

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2. Recommendations for correction:

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3. Other suggestions for document improvement:

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