JEDEC STANDARD

Embedded MultiMediaCard (eMMC) Mechanical Standard

JESD84-C43

June 2007

JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

NOTICE

JEDEC standards and publications contain material that has been prepared, reviewed, and approved through the JEDEC Board of Directors level and subsequently reviewed and approved by the JEDEC legal counsel.

JEDEC standards and publications are designed to serve the public interest through eliminating misunderstandings between manufacturers and purchasers, facilitating interchangeability and improvement of products, and assisting the purchaser in selecting and obtaining with minimum delay the proper product for use by those other than JEDEC members, whether the standard is to be used either domestically or internationally.

JEDEC standards and publications are adopted without regard to whether or not their adoption may involve patents or articles, materials, or processes. By such action JEDEC does not assume any liability to any patent owner, nor does it assume any obligation whatever to parties adopting the JEDEC standards or publications.

The information included in JEDEC standards and publications represents a sound approach to product specification and application, principally from the solid state device manufacturer viewpoint. Within the JEDEC organization there are procedures whereby a JEDEC standard or publication may be further processed and ultimately become an ANSI standard.

No claims to be in conformance with this standard may be made unless all requirements stated in the standard are met.

Inquiries, comments, and suggestions relative to the content of this JEDEC standard or publication should be addressed to JEDEC at the address below, or call (703) 907-7559 or www.jedec.org

Published by

©JEDEC Solid State Technology Association 2007

2500 Wilson Boulevard

Arlington, VA 22201-3834

PRICE: Please refer to the current

Catalog of JEDEC Engineering Standards and Publications online at

http://www.jedec.org/Catalog/catalog.cfm

Printed in the U.S.A.

Foreword

The Embedded MultiMediaCard (eMMC) Mechanical Standard has been prepared by JEDEC. The Multi-MediaCard 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 “eMMC.” In addition to the packaging differences, eMMC devices use a reduced voltage interface. These specifications are detailed in the JEDEC JC-64 “JEDEC MMC Electrical Interface Specification.”

The purpose of the standard is the mechanical definition of the eMMC.

Introduction

The MultiMediaCard is an universal low-cost 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 10-signal bus. The communication protocol is defined as a part of this standard and referred to as the MultiMediaCard mode.

Embedded MultiMediaCard (eMMC) Mechanical Standard

1 Scope

This standard describes the mechanical features of the eMMC.

2 Normative reference

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

3 Terms and definitions

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

MMC: MultiMediaCard

eMMC Embedded MultiMediaCard

4 eMMC General description

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

There are three physical configurations, AA, AB, 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.

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

4.2 eMMC Components

Ball assignments for AA and AB devices are depicted in Figure 1 on page 3. Ball assignments for BA devices are shown in Figure 2 on page 4.

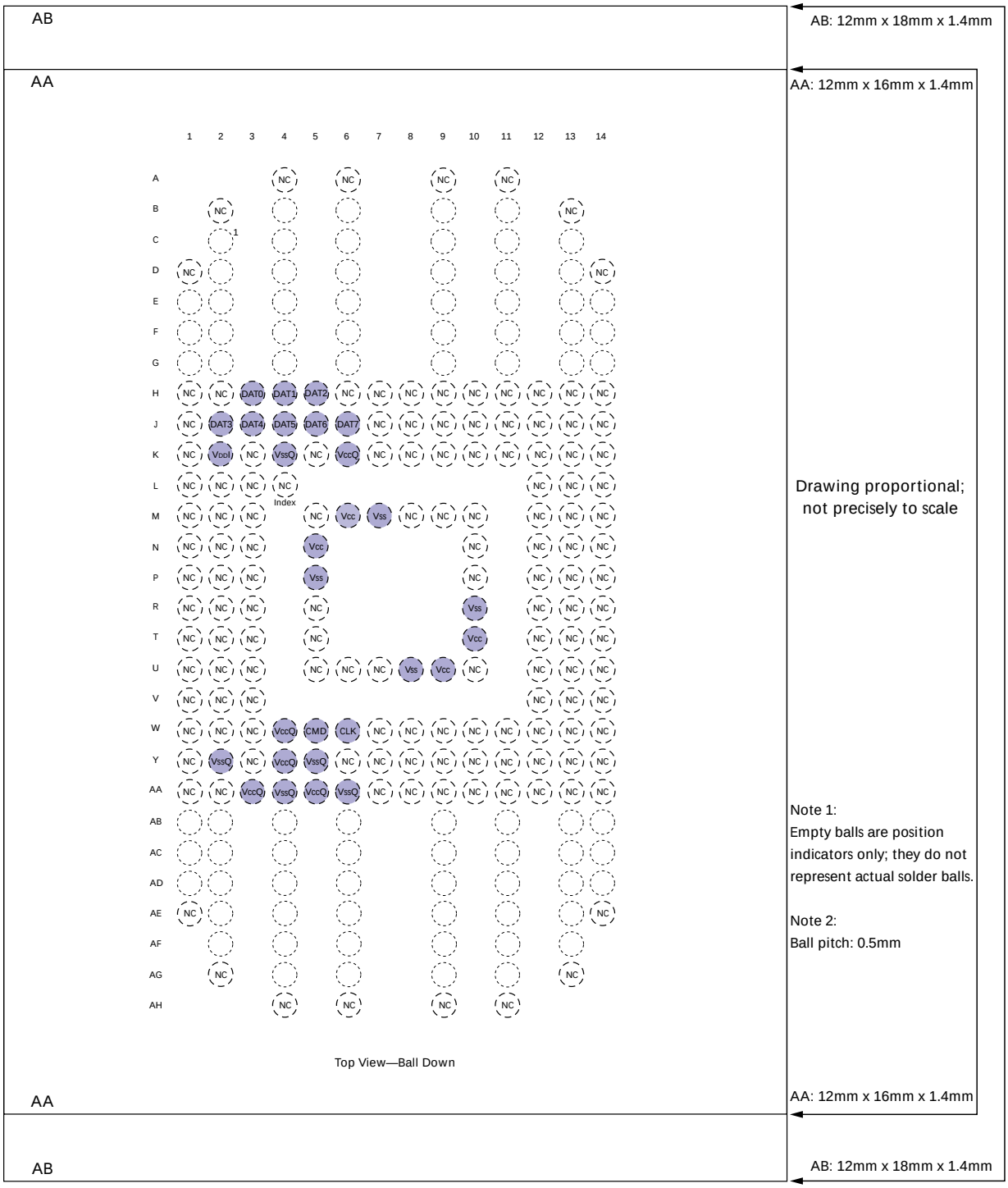

Figure 1 — Ball assignment: AA and BA devices (see MO-276 drawings for details)

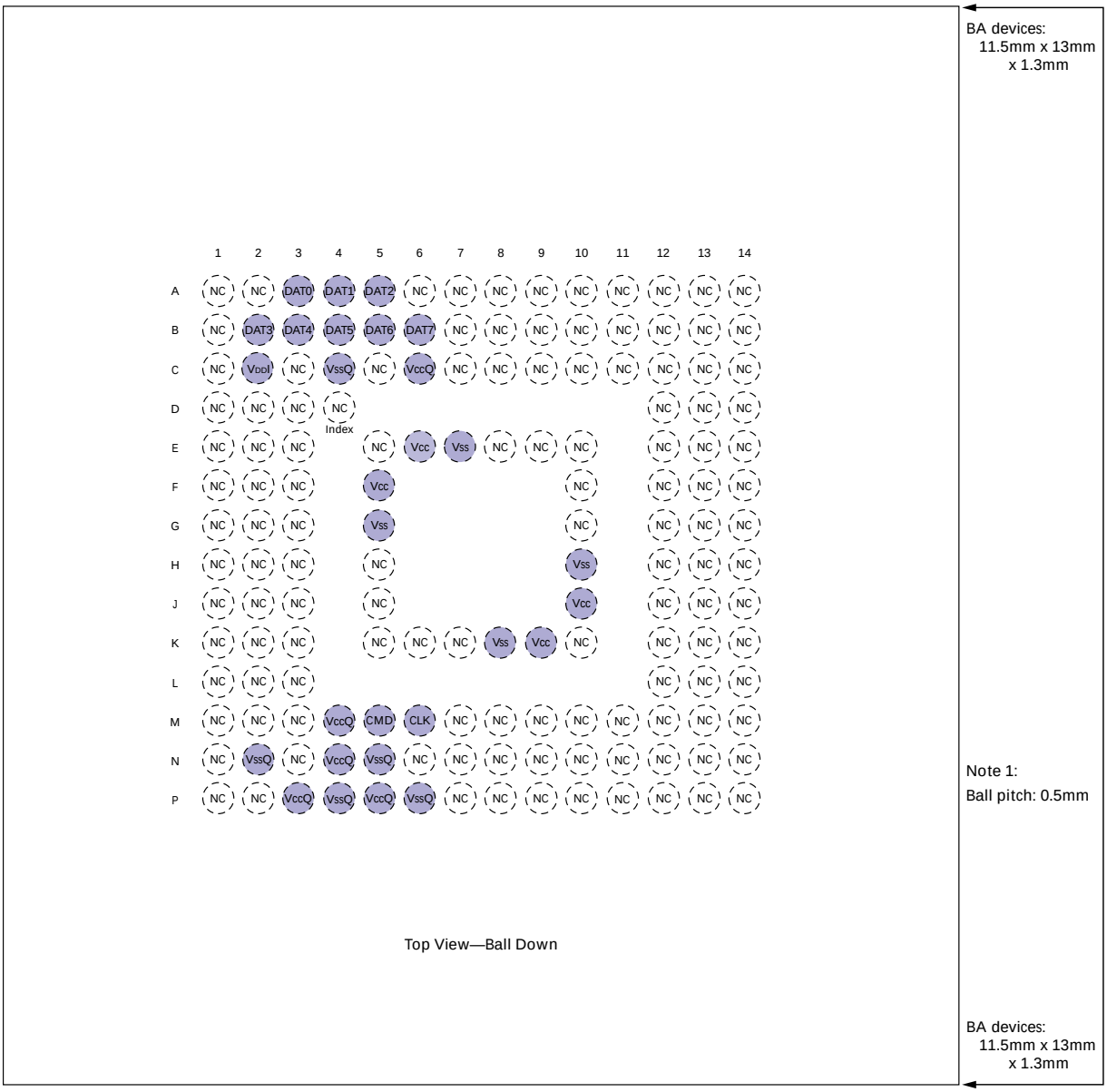

Figure 2 — Ball assignments: BA devices (see MO-276 drawings for details)

4.3 eMMC Physical description

JEDEC eMMC has 10 signals. The host is connected to the device using a dedicated 10-ball connector. Ball assignments are shown in Table 2 on page 5. Note that Table 2 continues on the following page.

Table 2 — Ball assignments

169-Ball Devices	153-Ball Devices	Symbol	Type	Ball Function
AA and AB 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.
M6, N5, T10, U9	E6, F5, J10, K9	V_{CC}	Supply	V_{CC}: Flash memory I/F and Flash memory power supply.
K6, W4, Y4, AA3, AA5	C6, M4, N4, P3, P5	$V_{CC}Q$	Supply	$V_{CC}Q$: Memory controller core and MMC interface I/O power supply.
M7, P5, R10, U8	E7, G5, H10, K8	V_{SS}	Supply	V_{SS}: Flash memory I/F and Flash memory ground connection.
K4, Y2, Y5, AA4, AA6	C4, N2, N5, P4, P6	$V_{SS}Q$	Supply	$V_{SS}Q$: Memory controller core and MMC I/F ground connection.
K2	C2	$V_{DD}i$		$V_{DD}i$: Connect 0.1µF capacitor from $V_{DD}i$ to ground.

Table 2 — Ball assignments (continued)

169-Ball Devices	153-Ball Devices	Symbol	Type	Ball Function
AA and AB 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, H6, H7, H8, H9, H10, H11, H12, H13, H14, J1, J7, J8, J9, J10, J11, J12, J13, J14, K1, K3, K5, K7, K8, K9, K10, K11, K12, K13, K14, L1, L2, L3, L12, L13, L14, M1, M2, M3, M5, M8, M9, M10, M12, M13, M14, N1, N2, N3, N10, N12, N13, N14, P1, P2, P3, P10, P12, P13, P14, R1, R2, R3, R5, R12, R13, R14, T1, T2, T3, T5, T12, T13, T14, U1, U2, U3, U5, U6, U7, U10, 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, AA7, AA8, AA9, AA10, AA11, AA12, AA13, AA14, AE1, AE14, AG2, AG13, AH4, AH6, AH9, AH11	A1, A2, A6, A7, A8, A9, A10, A11, A12, A13, A14, B1, B7, B8, B9, B10, B11, B12, B13, B14, C1, C3, C5, C7, C8, C9, C10, C11, C12, C13, C14, D1, D2, D3, D12, D13, D14, E1, E2, E3, E5, E8, E9, E10, E12, E13, E14, F1, F2, F3, F10, F12, F13, F14, G1, G2, G3, G10, G12, G13, G14, H1, H2, H3, H5, H12, H13, H14, J1, J2, J3, J5, J12, J13, J14, K1, K2, K3, K5, K6, K7, K10, 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, P7, P8, P9, P10, P11, P12, P13, P14	NC	—	No connect: Can be connected to ground or left floating.

Standard Improvement Form JEDEC: JESD84-C43

The purpose of this form is to provide the Technical Committees of JEDEC with input from the industry regarding usage of the subject standard. Individuals or companies are invited to submit comments to JEDEC. All comments will be collected and dispersed to the appropriate committee(s).

If you can provide input, please complete this form and return to:

JEDEC
Attn: Publications Department
2500 Wilson Blvd. Suite 220
Arlington, VA 22201-3834
Fax: 703.907.7583

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: _____

2. Recommendations for correction:

3. Other suggestions for document improvement:

Submitted by:

Name: _____ Phone: _____

Company: _____ Email: _____

Address _____

City/State/Zip _____ Date: _____


JEDEC


MULTIMEDIACARD
ASSOCIATION