



Double Top Technology Limited  
创想科技有限公司

**Confidential**

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# **Product Specification**

## **MMC Plus**



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**MMC plus card specification**

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## A. General Description

The MMC Plus is fully compliant to the MMC Memory Card Specification version 4.0. It provides the highest level of performance for MMC-supported consumer electronic devices.

MMC Plus card supports 16~512MB of NAND flash memory and is capable for storing up to 2GB of data. The MMC Plus card is based on an advanced 13-pin interface, designed to operate at a maximum operating frequency of 52MHz. The MMC Plus card support voltage range from 2.7V to 3.6V. MMC Plus card can alternate communication protocol between MMC mode or SPI mode. It performs data error detection and correction with very low power consumption.

MMC Plus card is one of the most popular cards today based on its high performance, good reliability and wide compatibility.

## B. Features

Support MMC system specification version 4.0      Backward compatible with previous MultiMediaCard system (1bit data bus, multi-card system).      Support Capacity : 16MB / 32MB / 64MB / 128MB / 256MB / 512MB / 1GB / 2GB      Designed for read-only, read/write storage cards.      Support MMC SPI mode      Erase, Write protection and Lock card supported.      Support variable clock frequencies 0 - 20MHz, 0 - 26MHz, 0 - 52 MHz.      Card support for three different data bus width mode: 1bit, 4bit and 8bit.      High performance [refer to the speed test].      System Voltage(VDD) Range :

	High Voltage MultiMedia Card
Communication	2.7V~3.6V
Memory Access	2.7V~3.6V

► ECC circuits to protect data communication. ► Low power consumption for portable device. ► +4KV/-4KV ESD protection in contact pads. ► MMC Plus Dimension : 32mm(L) x 24mm(W) x 1.4mm(H)

## C. Speed Test

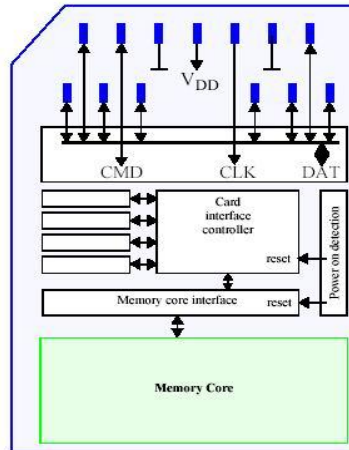
**Platform:** *Windows XP*  
**Test hardware:** *TestMetrix VTE2100*  
**Software version:** *VTE2000 2.7W*  
**Test Script:** *HS-MMC\_Card\_Performance-Speed 52MHz [rev2.7J].vte*  
**Test Sample:** *10MB (52MHz, 8-bit transfer)*

Card Type	Data Bus	Flash Mode	Sequential Read(MB/s)	Sequential Write(MB/s)	Random Read(MB/s)	Random Write(MB/s)
MMC Plus	8-bit @3.3V	1x8	12.66	13.17	11.74	10.40
		2x8	25.36	22.44	22.30	14.75
	4-bit @3.3V	1x8	12.66	12.74	11.74	10.33
		2x8	23.01	18.73	20.74	13.30
	1-bit @3.3V	1x8	6.44	5.67	6.44	5.08
		2x8	6.44	5.96	6.44	5.14

**Note :** 1x8 for single channel data transfer. 2x8 for dual channel(parallel mode) data transfer.

## D. Block Diagram

### D.1 MMC Moblie architecture



MultiMediaCard Architecture

### D.2 MMC Plus pad assignment

Pin No.	MultiMediaCard Mode			SPI Mode		
	Name	Type1	Description	Name	Type	Description
1	DAT3	I/O/PP	Data	CS	I	Chip Select (neg true)
2	CMD	I/O/PP/OD	Command/Response	DI	I/PP	Data In
3	VSS1	S	Supply voltage ground	VSS	S	Supply voltage ground
4	VDD	S	Supply voltage	VDD	S	Supply voltage
5	CLK	I	Clock	SCLK	I	Clock
6	VSS2	S	Supply voltage ground	VSS2	S	Supply voltage ground
7	DAT0	I/O/PP	Data	DO	O/PP	Data Out
8	DAT1	I/O/PP	Data	Not used		
9	DAT2	I/O/PP	Data	Not used		
10	DAT4	I/O/PP	Data	Not used		
11	DAT5	I/O/PP	Data	Not used		
12	DAT6	I/O/PP	Data	Not used		
13	DAT7	I/O/PP	Data	Not used		

(1) **S**: power supply, **I**:input; **O**:output; **PP**:push-pull; **OD**:open-drain; **NC**:Not connected (or logical high)

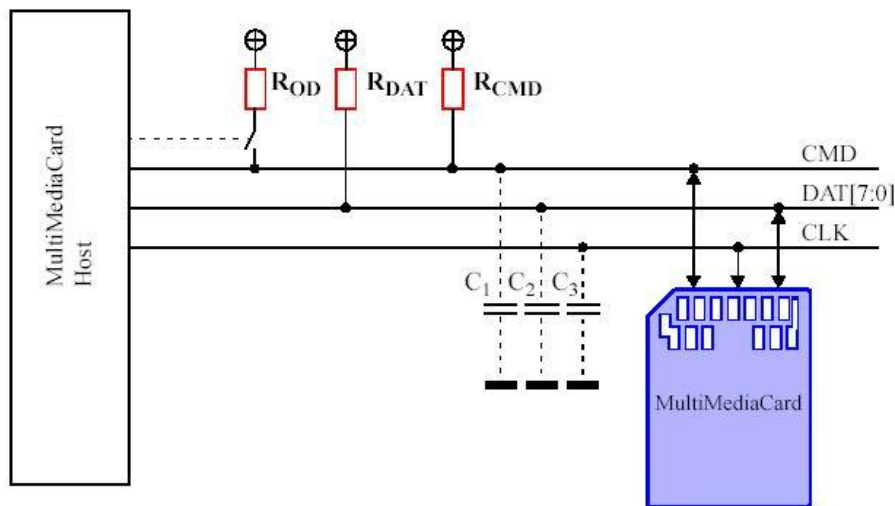
(2) The DAT0-DAT7 lines for read-only cards are output only.

Name	Width	Description
CID	128bit	Card identification number; card individual number for identification.
RCA	16bit	Relative card address, is the card system address, dynamically assigned by the host during initialization.
DSR	16bit	Driver Stage Register; to configure the card's output drivers.
CSD	128bit	Card Specific Data; information about the card operation conditions.
OCR	32bit	Operation condition register.
EXT_CSD	512bytes	Extended Card Specific Data. More information about the card capabilities and selected modes.

## E. HardWare Interface

The MultiMediaCard bus has 10 communication lines and three supply lines:

- u CMD: Command is a bidirectional signal. The host and card drivers are operating in two modes, open drain and push pull.
- u DAT0~7: Data lines are bidirectional signal. Host and card drivers are operating in push pull mode.
- u CLK: Clock is a host to card signal. CLK operates in push pull mode.
- u VDD: VDD is the power supply line for all cards.
- u VSS1, VSS2 are two ground lines.



Bus circuitry diagram



## F. System Power Consumption

Table list as below is the power consumption of MMC card.

### MMC-1bit @ 52MHz

Max Power up Current (uA)	Max Stand by Current (uA)	Max Read Current (mA)	Max Write Current (mA)
150	150	40 @ 3.6V	40 @ 3.6V

### MMC-4bit @ 52MHz

Max Power up Current (uA)	Max Stand by Current (uA)	Max Read Current (mA)	Max Write Current (mA)
150	150	60 @ 3.6V	60 @ 3.6V

### MMC-8bit @ 52MHz

Max Power up Current (uA)	Max Stand by Current (uA)	Max Read Current (mA)	Max Write Current (mA)
150	150	60 @ 3.6V	60 @ 3.6V

## G. DC Characters

### G1. Bus Operating Conditions

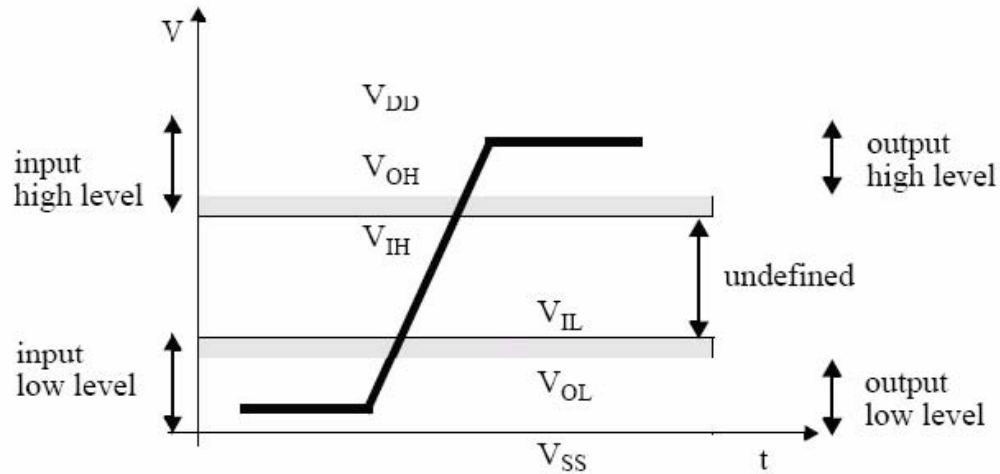
#### General

#### Power Supply Voltage - Dual voltage MultiMedia Card (MMC Plus)

Parameter	Symbol	Min	Max	Unit	Remark
Peak voltage on all lines		-0.5	3.6	V	
<b>All Inputs</b>					
Input Leakage Current		-10	10	μA	
<b>All Outputs</b>					
Output Leakage Current		-10	10	μA	

Parameter	Symbol	Min	Max	Unit	Remark
Supply voltage (high voltage range)	VDDH	2.7	3.6	V	
Supply voltage differentials (VSS1, VSS2)		-0.5	0.5	V	

## G2. Bus Signal Levels



### G2.1 Open-Drain Mode Bus Signal Level

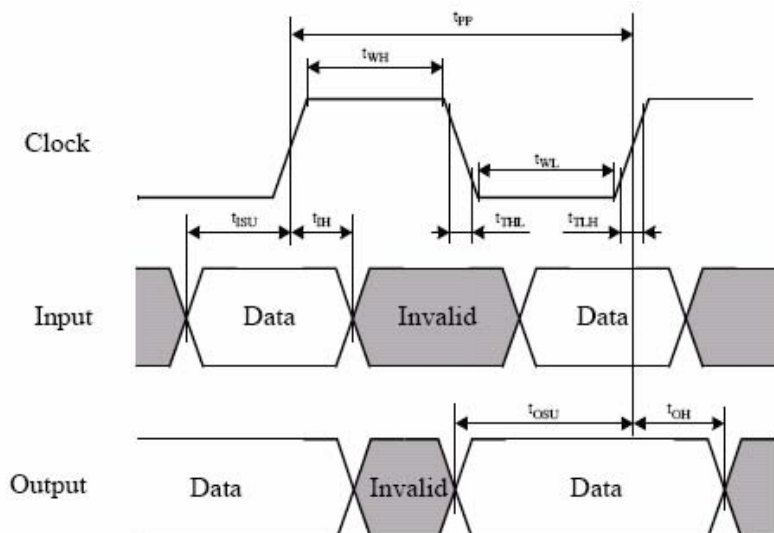
Parameter	Symbol	Min	Max.	Unit	Conditions
Output HIGH voltage	VOH	VDD-0.2		V	IOH = -100 $\mu$ A
Output LOW voltage	VOL		0.3	V	IOL = 2 mA

### G2.2 Push-Pull Mode Bus Signal Level - Dual voltage MultiMediaCard

Parameter	Symbol	Min	Max.	Unit	Conditions
Output HIGH voltage	VOH	VDD-0.2V		V	IOH=-100 $\mu$ A @VDDmin
Output LOW voltage	VOL		0.2V	V	IOL=100 $\mu$ A @VDDmin
Input HIGH voltage	VIH	0.7 * VDD	VDD + 0.3	V	
Input LOW voltage	VIL	VSS-0.3	0.3 * VDD	V	

## H. AC Characters

### H1. MMC Interface timing



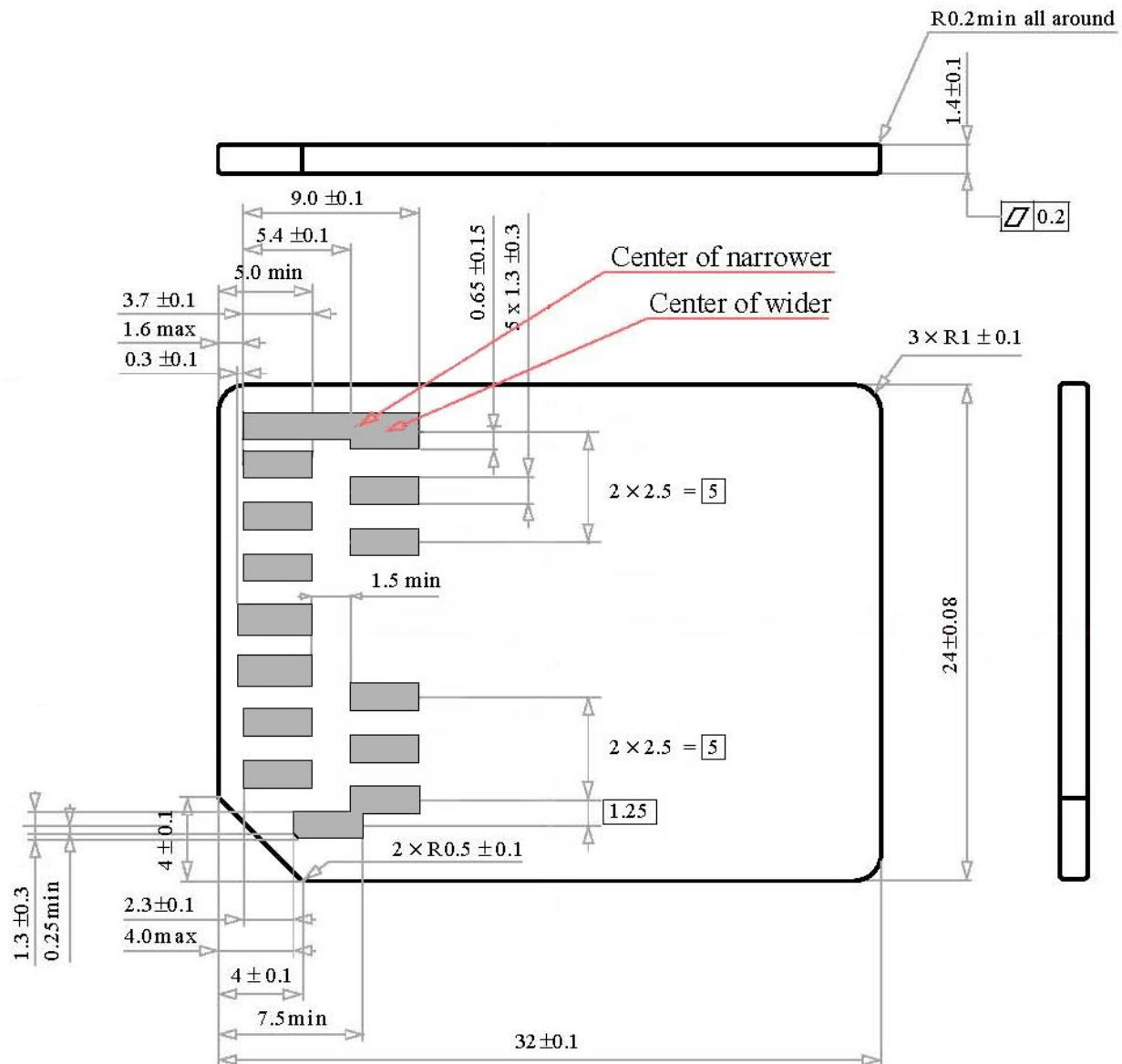
### H2. High Speed Card Interface Timing

Parameter	Symbol	Min	Max	Unit	Remark
<b>Clock CLK1</b>					
Clock frequency Data Transfer Mode (PP) <sub>2</sub>	fPP	0	26/52	MHz	CL ≤ 30 pF Tolerance: +100KHz
Clock frequency Identification Mode (OD)	fOD	0	400	kHz	Tolerance: +20KHz
Clock low time	tWL	6.5		ns	CL ≤ 30 pF
Clock rise time <sub>3</sub>	tTLH		3	ns	CL ≤ 30 pF
Clock fall time	tTHL		3	ns	CL ≤ 30 pF
<b>Inputs CMD, DAT (referenced to CLK)</b>					
Input set-up time	tISU	3		ns	CL ≤ 30 pF
Input hold time	tIH	3		ns	CL ≤ 30 pF
<b>Outputs CMD, DAT (referenced to CLK)</b>					
Output set-up time	tOSU	5		ns	CL ≤ 30 pF
Output hold time	tOH	5		ns	CL ≤ 30 pF
Signal rise time <sub>4</sub>	trise		3	ns	CL ≤ 30 pF
Signal fall time	tfall		3	ns	CL ≤ 30 pF

### H3. Backwards Compatible Card Interface Timing

Parameter	Symbol	Min	Max	Unit	Remark
<b>Clock CLK<sub>1</sub></b>					
Clock frequency Data Transfer Mode (PP)	fPP	0	20	MHz	CL ≤ 30 pF
Clock frequency Identification Mode (OD)	fOD	0	400	kHz	
Clock low time	tWL	10		ns	CL ≤ 30 pF
Clock rise time <sub>2</sub>	tTLH		10	ns	CL ≤ 30 pF
Clock fall time	tTHL		10	ns	CL ≤ 30 pF
<b>Inputs CMD, DAT (referenced to CLK)</b>					
Input set-up time	tISU	3		ns	CL ≤ 30 pF
Input hold time	tIH	3		ns	CL ≤ 30 pF
<b>Outputs CMD, DAT (referenced to CLK)</b>					
Output set-up time	tOSU	13.1		ns	CL ≤ 30 pF
Output hold time	tOH	9.7		ns	CL ≤ 30 pF

## I. Physical Outline Dimension



### Dimensions of A Normal Size MMC (Bottom View, DIN) - **MMC Plus**