

# High Density MMC Application Note

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# MMC Specification

MMC System Specification	Form Factor			Capacity		Min. Performance	Dual Voltage
	MMC plus	MMC mobile	MMC micro	2GB, FAT12/16	> 2GB, FAT 32		
4.0	Any Form Factor			Mandatory	N/A	N/A	MMCmobile / MMCmicro (Mandatory)
4.1	Any Form Factor			Mandatory	N/A	2.4 MB/S	MMCmobile / MMCmicro (Mandatory)
4.2*	Any Form Factor			Mandatory	N/A	2.4 MB/S	MMCmobile / MMCmicro (Mandatory)
				N/A	Mandatory		

\* Please refer to Official MMCA website;  
[http://www.mmca.org/members/Current\\_Specs](http://www.mmca.org/members/Current_Specs)

# Overview of High Density MMC

- ❑ Target Density: Over 2GB
- ❑ Target Market: Video, Images, Audio... etc

SDTV (10 Mbps) video data, 50min → 4GB

HDTV (24 Mbps) video data, 90min → 16GB

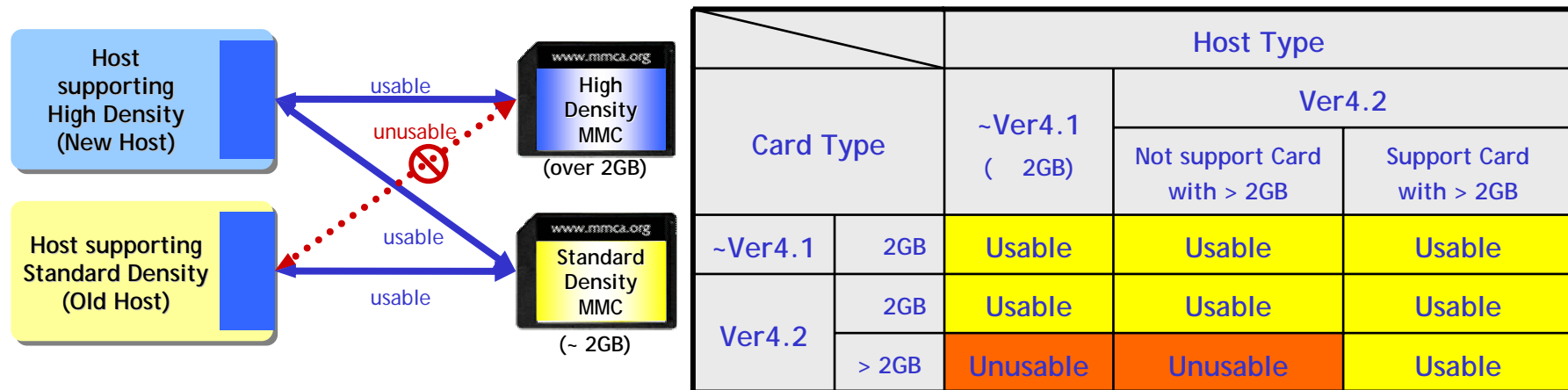
- ❑ Features:

- Form Factor: MMCplus, MMCmobile, MMCmicro
- New Physical Specification: Initialization Sequence, Addressing Mode, Registers and more
- New File System for Over 2GB: FAT32



# Policy for more than 2GBytes MMC

- ❑ High Density MMC can be supported in only the host supporting high density MMC and Standard Density MMC should be supported in any MMC host
  - Standard density MultiMedia Cards supports capacity up to and including 2 G Bytes (231 bytes)
  - High density MultiMedia Cards supports capacity more than 2 G Bytes (231 bytes) and limits capacity up to and including 32 GB in this notes



# High Density Support for MMC (1/6)

## ❑ New Initialization Sequence

- CMD1 and OCR register are including two bits for the indication of the supported access mode (byte and block mode) of the memory
- High Density Card will go to inactive state when the host does not support High Density Card

## ❑ New Addressing Mode

- For over 2GB Card, Sector address (512B sectors) is used instead of byte address

## ❑ New Register Field Definitions

- OCR register, [30:29] bit are assigned for Access Mode.  
00b for byte mode and 10b for block mode
- The Density of Card (over 2GB) is read from the EXT\_CSD register instead of CSD register

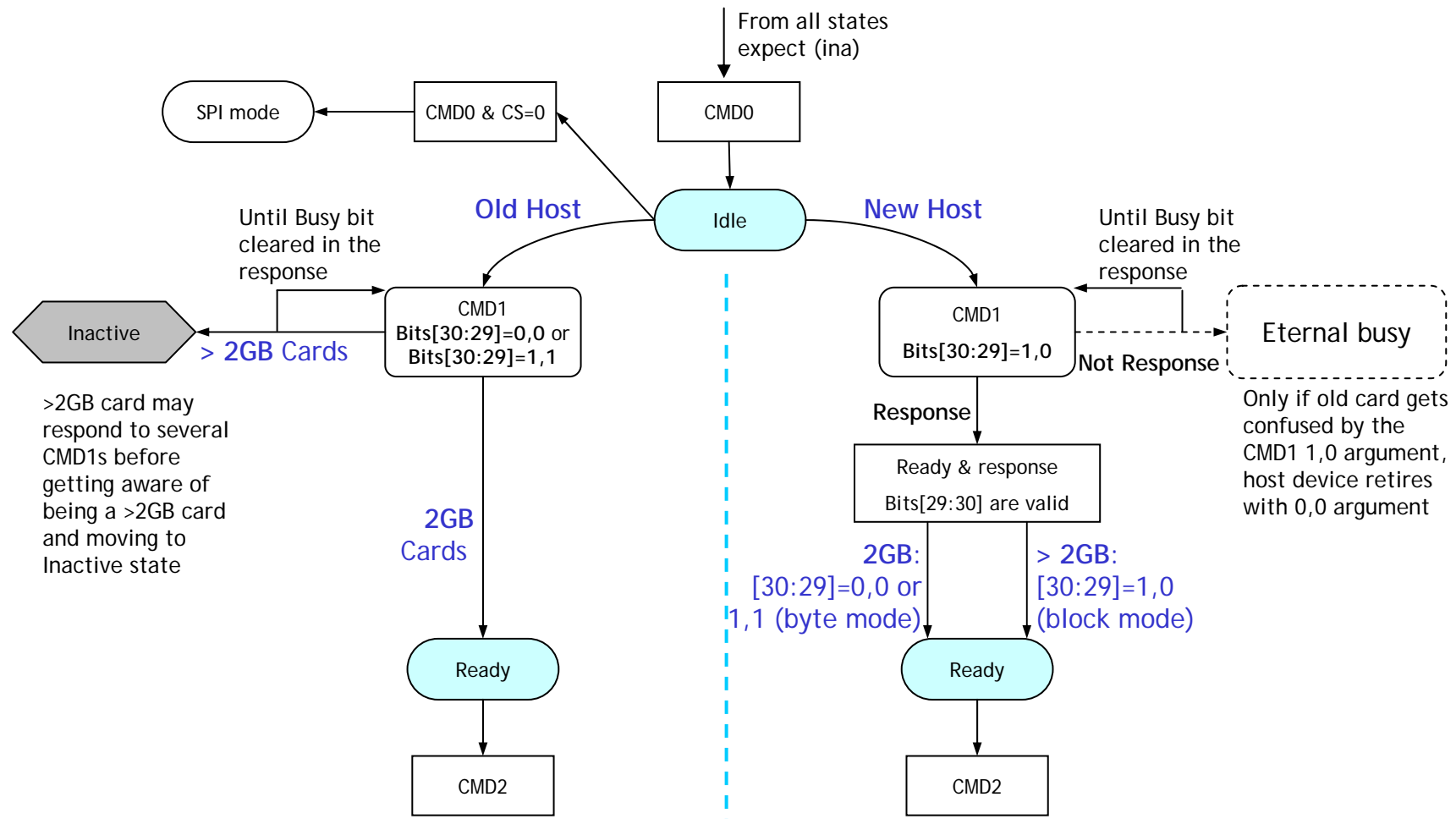
# High Density Support for MMC (2/6)

## Comparison between MMC and SD for HD\* supports

Comparison	MMC 4.2		SD 2.0			
Host CMD	CMD1	Voltage Verification	CMD8	Voltage Verification		
		[30:29]=1,0	High Density Support indication (>2GB)	ACMD41	HCS[30]=1	High Density Support indication (>2GB)
		[30:29]=0:0	Standard Density only indication ( 2GB)	HCS[30]=0	Standard Density only indication ( 2GB)	
Register	OCR Register	[30:29]=1,0	High Density (>2GB)	OCR Register	CCS[30]=1	High Density (>2GB)
		[30:29]=0:0	Standard Density ( 2GB)		CCS[30]=0	Standard Density ( 2GB)
Addressing Mode	Block mode	High Density (>2GB)	Block mode	High Density (>2GB)		
	Byte mode	Standard Density ( 2GB)	Byte mode	Standard Density ( 2GB)		
File System	FAT32	High Density (>2GB)	FAT32	High Density (>2GB)		
	FAT12/16	Standard Density ( 2GB)	FAT12/16	Standard Density ( 2GB)		
Comment	Utilized existed CMD and register. Add new argument for CMD1 and Register (OCR)		Add new CMD and utilized existed CMD and register  *HD: High Density (>2GB)			

# High Density Support for MMC (3/6)

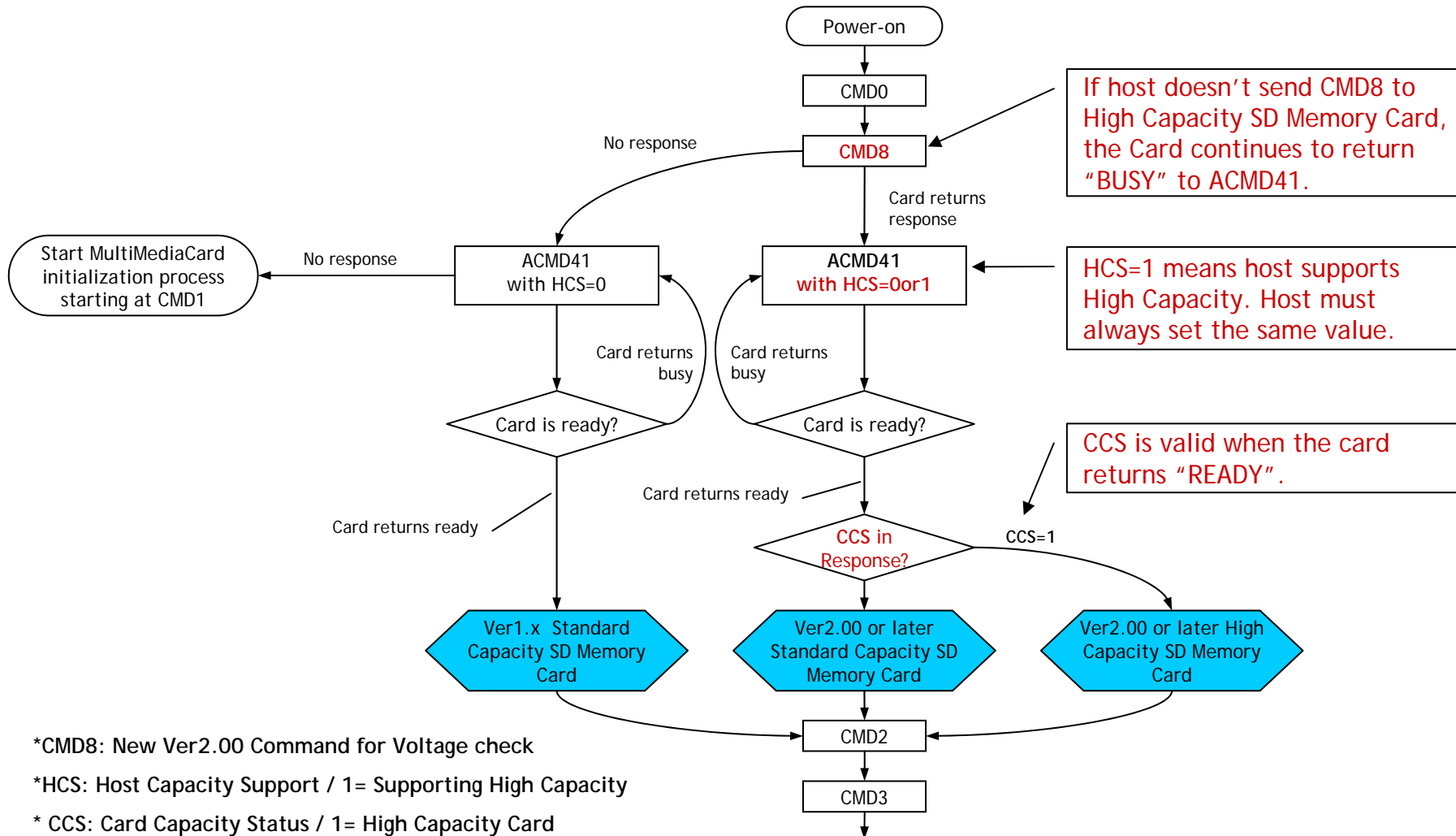
## □ MMC mode initialization



\*\* Host and CARD should handshake

# High Density Support for MMC (4/6)

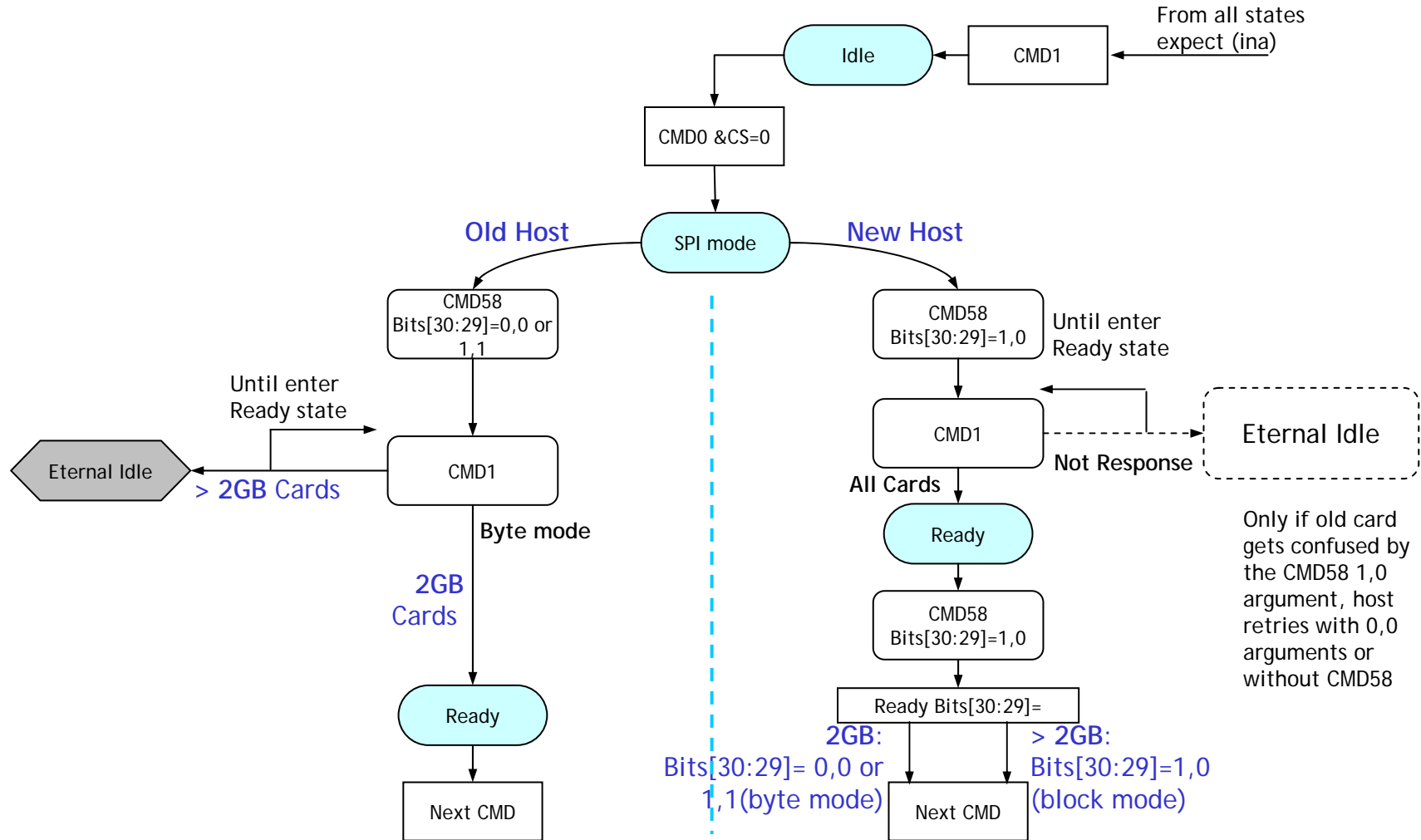
## SD mode Initialization Procedure (reference)





# High Density Support for MMC (5/6)

## ❑ SPI mode initialization (MultiMedia Card)



# High Density Support for MMC (6/6)

## □ Differences between Ver4.2 and previous version

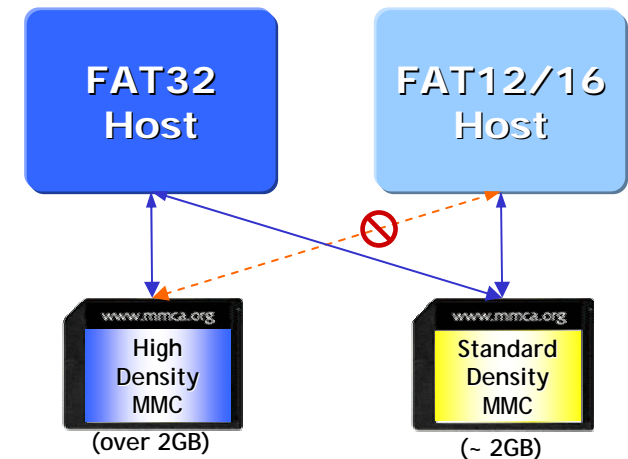
Function	Standard density ( ≤ 2GB)		High Density (> 2GB)
	~ Ver4.1	Ver4.2	
CMD1* [30:29]	0:0 or 1:1	0:0	1:0
OCR [30:29]	Reserved (0:0 or 1:1)	0:0	1:0
Addressing Mode	Byte Address	Byte Address	Block Address
File System	FAT12/16	FAT12/16	FAT32
Density Read	CSD register	CSD register	EXD_CSD register

\* Host (supporting High Density, >2GB) must define [30:29]=1:0 in CMD1 argument

# File System for High Density MMC

- ❑ FAT32 Files System is required to support for High Density(>2GB)
  - FAT32 file system can support more than 2GB
  
- ❑ Standard Density ( ≤ 2GB) Card shall use FAT12/16 only
  - FAT32 shall not be used for Standard Density

	FAT12/16	FAT32
Supported Density	2GB	> 2GB
Size of Each FAT Entry	12/16 bits	32 bits
Maximum Num. of Clusters	4,086 / 65,526	~268,435,456
Cluster Size Used	8KB, 16KB, 32KB Depends on Card Density	32KB
Maximum Volume Size	16,736,256 / 2,147,123,200	About 2 <sup>41</sup>



\* FAT32 host can read/write FAT12/16 card  
 , but FAT12/16 host cannot access FAT32 card

# Appendix

# Card Density Calculation Methods

## ❑ MMC Card Density Calculation

- Max C\_SIZE\_MULT register setting value, 3 bit 0x7

$$\text{MULT} = 2^{(\text{C\_SIZE\_MULT} + 2)} = 2^9 = 512$$

- Max C\_SIZE register setting value 12 bi

$$\text{Max C\_SIZE} = 2^{12} = 4096-1$$

- Card Memory Density = BLOCKNR \* BLOCK\_LEN

$$= ((\text{C\_SIZE} + 1) * \text{MULT}) * \text{BLOCK\_LEN}$$

$$= ((4095 + 1) * 512) * \text{BLOCK\_LEN}$$

$$= 4095 * 512 * \text{BLOCK\_LEN}$$

## ❑ Block length = 512byte

$$\text{Card Density} = 4096 * 512 * 512 = 1\text{Gbyte}$$

## ❑ Block length = 2048byte

$$\text{Card Density} = 4096 * 512 * 2048 = 4\text{Gbyte}$$