FMJ ES SD Card

Overview

The FMJ SD (Secure Digital) Card is a small, low cost, high performance, removable solid-state memory storage subsystem. It is an appropriate replacement for hard disk drives and host systems that require low power and small scalable storage solutions. FMJ technology is designed for customer's that prefer reliable operation in harsh environments and a long product lifecycle. Enhanced Security Features for robust Power Protection, Lifecycle Monitoring, Logical Block Erase (LBE), Physical Block Erase (PBE), Password Protection and other security options are available. Amongst the endless number of applications are networking products, military systems, interactive kiosks, record and playback systems, medical equipment, industrial control systems, avionics, and voting machines. Every FMJ SD Card is integrated with technology that prevents data corruption and loss from power anomalies.

Features

- Capacity range: 512MB to 16GB
- Industry standard SD form factor
- Integrated wear-leveling and ECC technology
- Voltage Range 2.7V-3.6V
- MTBF: 4,000,000 hours
- RoHS 6 of 6 compliant
- Industrial temperature version available
- Supports CPRM
- Compatible with SDA Physical Layer, Specifications version 2.0
- Supports SD command class 0,2,4,5,6,7,8,10
- Support SPI and CPRM
- Enhanced error correction, < 1 error in 10^{15} bits read
- 100,000 cycle SLC NAND Flash utilized

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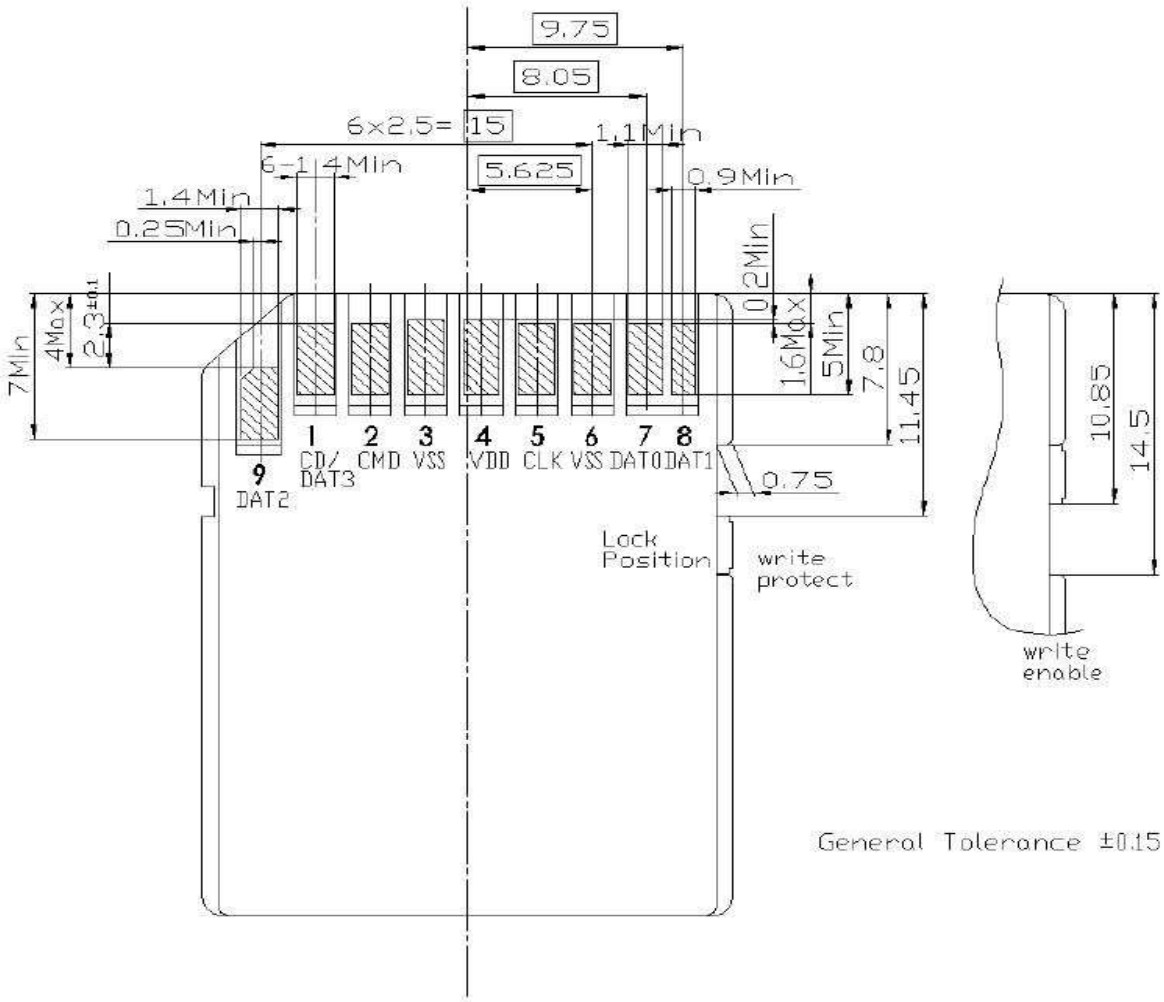
1.0 Physical Specifications

The FMJ Storage SD Card has a form factor of 24mm x 32mm x 2.1mm, See figure 1.1 for mechanical specifications.

1.1 Physical Dimensions

The following figure describes the physical dimensions for the FMJ SD Card.



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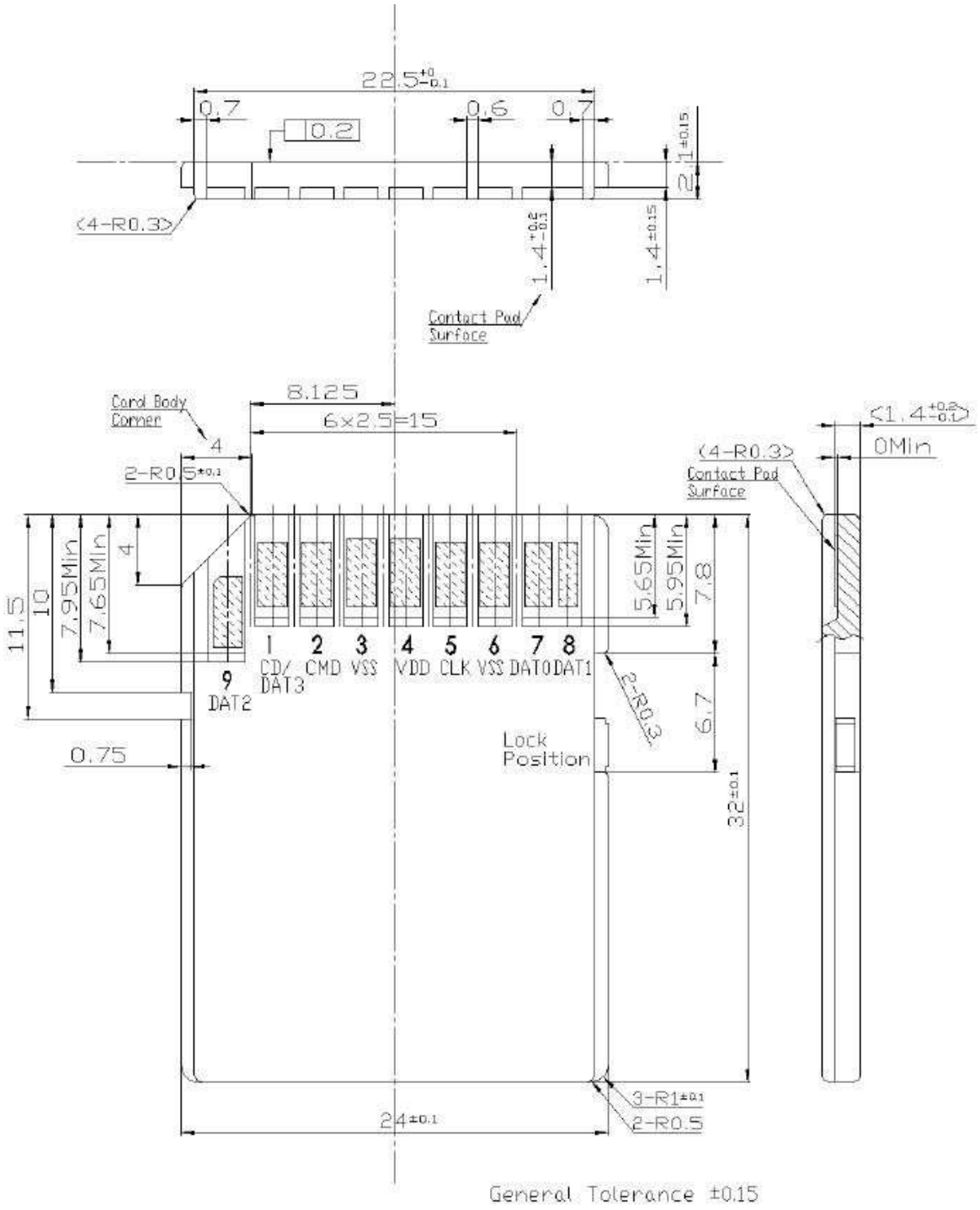

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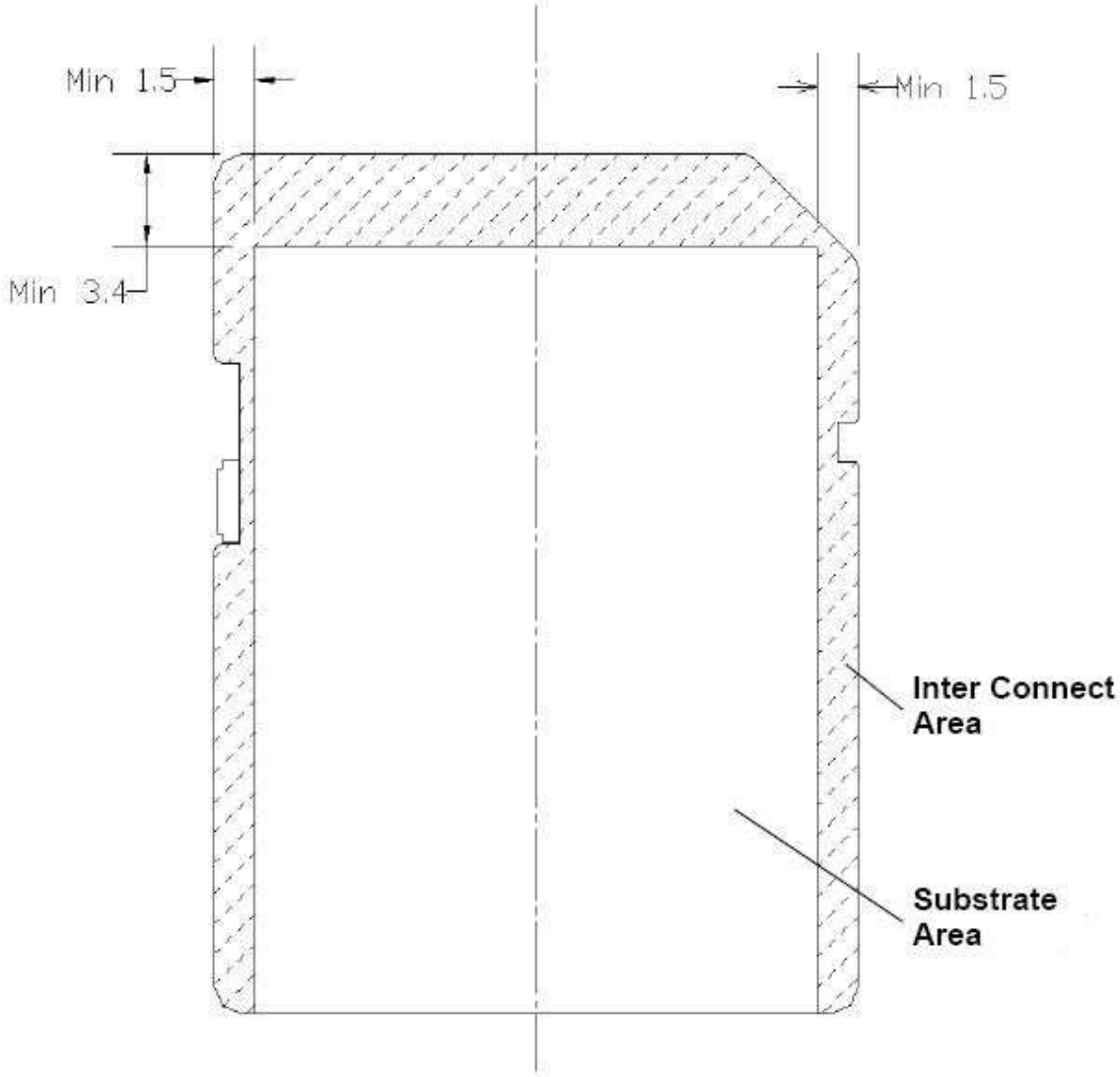

Figure 1.1 SD Card Mechanical Specifications

2.0 Product Specifications

Note: All FMJ SD Card values quoted are typical at 25°C and nominal supply voltage.

2.1 System Performance

Table 1 shows the System Performance characteristics of the FMJ SD Card.

Table 1: System Performance

Parameter	Value
Read Transfer Rate	Up to 22MB/s
Write Transfer Rate	Up to 16MB/s

2.2 Reliability

Table 2 shows the Reliability information on the FMJ SD Card.

Table 2: Reliability Information

Parameter	Value
MTBF (@ 25°C)	4,000,000 hours
Bit Error Rate	<1 non-recoverable error in 10^{15} bits read
Data Retention	10 Years

2.3 Capacity

Table 3 shows the Product Capacities of the FMJ SD Card.

Table 3: Product Capacity

Product Capacity	Formatted Capacity (Bytes)	Number of Sectors
128MB	127,139,840	248,320
256MB	255,852,544	499,712
512MB	513,277,952	1002496
1GB	1.023.830.400	1,999,872
2GB	2,057,830,400	4,019,200
4GB	4,125,622,272	8,057,860
8GB	8,269,594,624	16,151,552
16GB	16,384,601,344	31,692,112

2.4 Environmental

Table 4: Environmental Specifications

Temperature (Operating)	0°C to 70°C (Commercial) -40°C to 85°C (Industrial)
Humidity	8% to 95% non-condensing
Vibration	16.3gRMS, MIL-STD-810F, Method 514.5, Procedure I, Category 24
Shock	1000G, Half-sine, 0.5ms Duration 50G Pk, MIL-STD-810F, Method 516.5, Procedure
Altitude	80,000ft, MIL-STD-810F, Method 500.4, Procedure II

3.0 Electrical Specifications

3.1 Absolute Maximum Ratings

Table 5: Absolute Maximum Ratings

Parameter	Symbol	Minimum	Maximum	Units
Storage Temperature	T_S	-55	125	°C
Operating Temperature*	T_A	-40	85	°C
Supply Voltage Relative to Ground	V_{CC}	-0.3	6.0	V

* = Industrial temperature version.

3.2 DC Specifications

Table 6: DC Specifications

Parameter	Symbol	3.3V		Units
		Min	Max	
Supply Voltage	Vcc	2.7	3.6	V
Input Leakage Current	I_{LI}	-	10	µA
Output Leakage Current	I_{LO}	-	10	µA
Icc Read Current	I_{CCR}	-	80	mA
Icc Write Current	I_{CCW}	-	80	mA
Icc Sleep Current	I_{CCS}	-	200	µA
Input Voltage Low	V_{IL}	Vss-0.3	.25*Vdd	V
Input Voltage High	Vih	0.625*Vdd	Vdd + 0.3	V
Output Voltage Vol	Vol		.125*Vdd	V
Output Voltage Voh	Voh	.25*Vdd		V
Input/output Capacitance	Ci/Co		10	pF

3.2 Pin Assignments/Signals

Figure 2 and Table 7 describes the FMJ SD Card connector assignments and signals. Refer to the SD specification for more information on the signals.

	SD Mode			SPI Mode		
Pin #	**Signal Name**	**Pin Type [1]**	**Description**	**Signal Name**	**Pin Type**	**Description**
1	CD/DAT3 [2]	I/O/PP [3]	Card Detect/ Data Line bit 3	CSN	I	Chip Select (active low)
2	CMD	PP	Command/Response	SDI	I	Serial Data In
3	VSS1	S	Supply Ground	VSS	S	Supply Ground
4	VDD	S	Supply Power	VDD	S	Supply Power
5	CLK	I	Clock	SCLK	I	Serial Clock
6	VSS2	S	Supply Ground	VSS2	S	Supply Ground
7	DAT2	I/O/PP	Data Line bit 2	SDO	O	Serial Data Out
8	DAT1	I/O/PP	Data Line bit 1	RSV		Reserved
9	DAT0	I/O/PP	Data Line bit 0	RSV		Reserved

1. S: Power; I: Input; O: output; PP: Bidirectional
2. DAT[1:3] is inputs on power up.
3. After power up, this pin is input with 50K ohm pull-up. The host can disconnect the pull-up by issuing a SET_CLR_CARD_DETECT command.

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3.3 Signal Timing

Please refer to Sections 6.7 and 6.8 of the SDA Physical Layer Specifications, Version 1.1 for bus timing specifications for default mode and high speed mode.

3.4 Signal Description

Table 3-7 describes the I/O signals. Signals where source is the host are designated as inputs while signals that the SD Card sources are outputs. The SD Card logic levels conform to those specified in the *SDA Physical Layer Specification, version 1.01, 1.1 and 2.0.*

Signal Name	Di r.	Description
CD/DAT3/SDD3 (SD mode) CSN (SPI mode)	I/O /PP I	This pin is an input with 50Kohm pull-up at power up time and can be used for Card detection or SPI mode selection. For regular data transfer, the host should disconnect the pull-up by issuing a SET_CLR_CARD_DETECT command to the Card. In SPI mode, this is an input for chip select.
CMD/SDCMD SDI	PP I	This pin is used by the host to send a command to the Card and is used by the Card to send response back to the host. In SPI mode, this is serial data input to the Card.
CLK/SDCLK	I	This is clock input to the Card.
DAT0/SDD0	I/O /PP O	This pin is input on power up. It will function as a data line once the host has issued a SET_BUS_WIDTH command. In SPI mode, this pin is serial data out from the Card.
DAT1/SDD1, DAT2/SDD2	I/O /PP	These pins are inputs on power up. They will function as data lines once the host has issued a SET_BUS_WIDTH command.

3.4 Bus Protocol

The FMJ SD products bus protocol is compliant to *SDA Physical Layer Specifications, Version 1.01, 1.1 and 2.0*. Please refer to those documents for details about bus protocol and timing.

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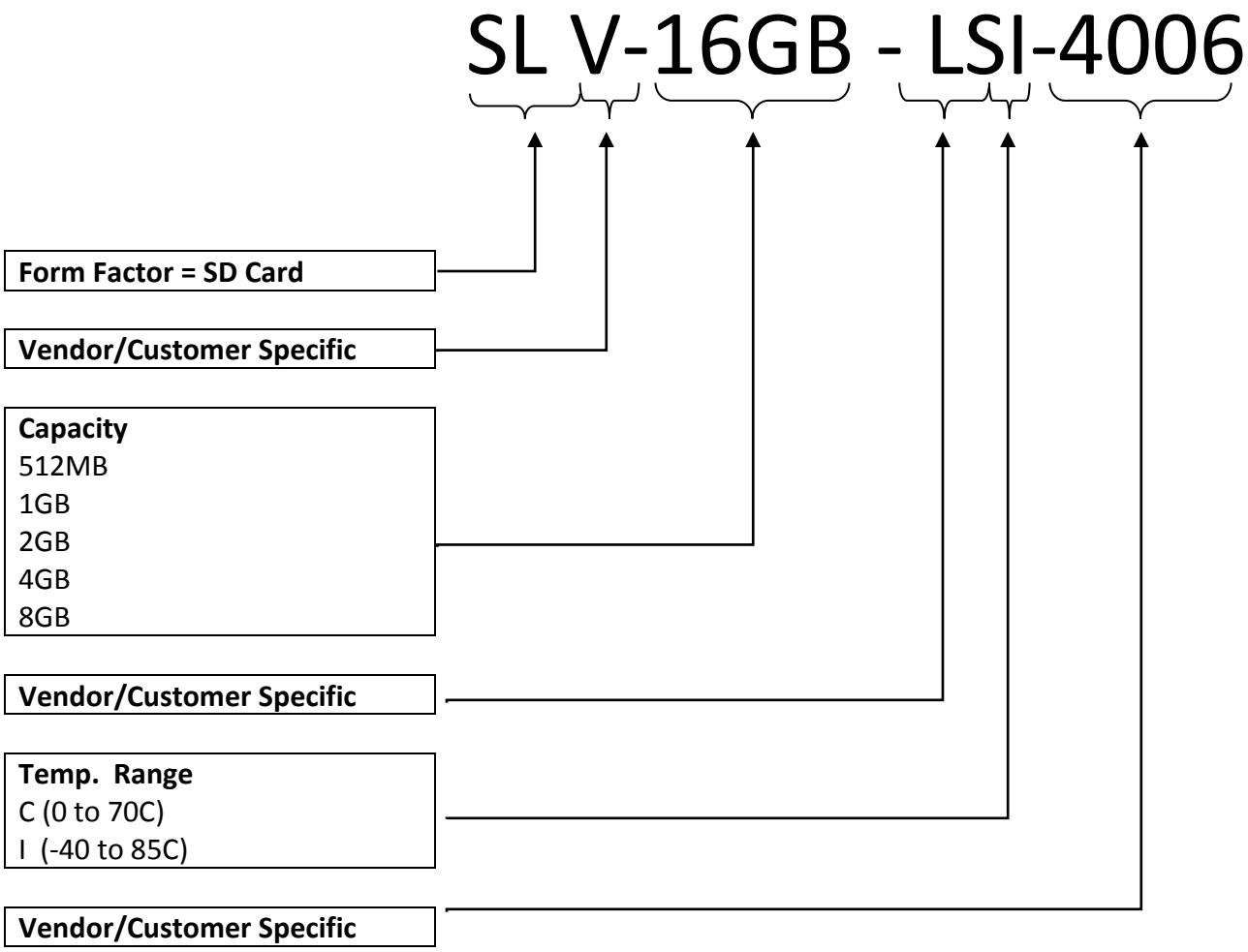
4.0 Ordering Information

The following describes the part number ordering nomenclature from FMJ Storage.



FMJ Storage' performance tests, ratings, and product specifications are measured using specific computer systems and/or components and reflect the approximate performance of FMJ Storage' products as measured by those tests.
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1 Megabyte (MB) equals 1 Million Bytes; 1 Gigabyte (GB) equals 1 Billion Bytes. Accessible capacity may vary depending on the operating environment.