c100 microSDHC and microSDXC Card

MTSD032AHC6MS-1WTCS, MTSD064AHC6MS-1WTCS, MTSD128AHC6MS-1WTCS, MTSD256AHC6MS-1WTCS, MTSD512AJC6MS-1WTCS

Features

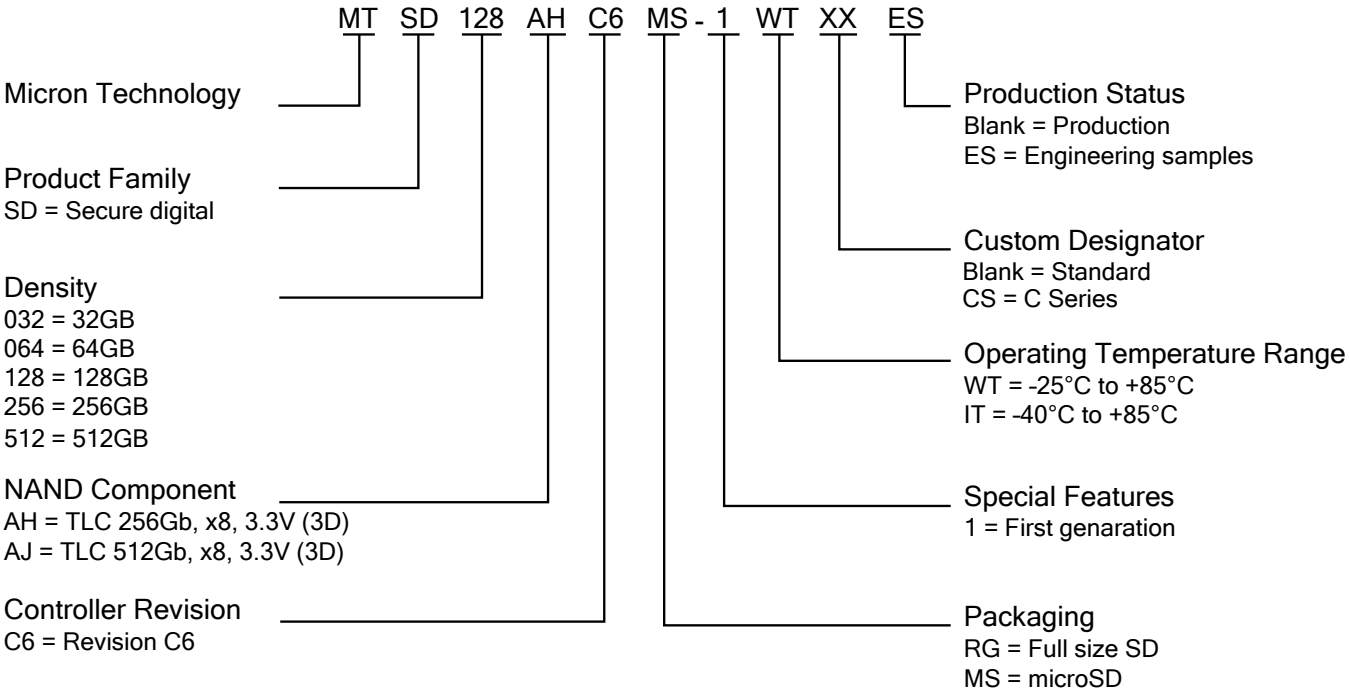
- Micron® 3D TLC NAND Flash
- Form factor: 8-pad microSD memory card (11mm × 15mm)
- Density[1]: 32GB, 64GB, 128GB, 256GB, 512GB
- SD Physical Layer Specification version 6.10 compliant[2]
  - microSD Card Specification version 4.20[3]
  - SD memory card file system specification
  - Password protection of cards
  - Supports secure digital interface (SD) and serial peripheral interface (SPI)
- Performance
  - Refer to Performance and Capacity (page 6) for read and write speed
- Bus speed mode (theoretical transfer rate @x4 bits)
  - Default: 3.3V signaling up to 12.5 MB/s @25 MHz
  - High-speed: 3.3V signaling up to 25 MB/s @50 MHz
  - SDR12: UHS-I 1.8V signaling up to 12.5 MB/s @25 MHz
  - SDR25: UHS-I 1.8V signaling up to 25 MB/s @50 MHz
  - SDR50: UHS-I 1.8V signaling up to 50 MB/s @100 MHz
  - SDR104: UHS-I 1.8V signaling up to 104 MB/s @208 MHz
  - DDR50: UHS-I 1.8V signaling up to 50 MB/s @50 MHz (sampled on both clock edges)
- Integrated power-on reset, oscillator, voltage regulation, and voltage detection circuits
- Built-in features for defect and error management
  - Strong error correction code implemented
  - Global wear leveling
  - Bad block management
  - Refresh mechanism for UECC prevention
  - Sudden power-off (SPO) protection
- Operating voltage: 2.7–3.6V
- Temperature
  - Operating: –25°C to +85°C
  - Storage: –40°C to +85°C
- Standards compliance
  - RoHS
  - FCC
  - CE
  - BSMI
  - KC RRA
  - W.E.E.E.
  - VCCI
  - IC
- Halogen-free

Notes:
1. Actual usable capacity may vary. 1GB equals 1 billion bytes.
2. SD Specifications, Part 1, Physical Layer Specification, version 6.10.
3. SD Specifications, Part 1, microSD Card Specification, version 4.20.

Part Number Ordering Information

Micron microSD memory cards are available in different configurations and densities. Verify valid part numbers by using Micron's part catalog search at www.micron.com. To compare features and specifications by device type, visit www.micron.com/products. Contact the factory for cards not found.

Figure 1: Marketing Part Number Chart



Note: 1. Not all combinations are necessarily available. For a list of available devices or for further information on any aspect of these products, please contact your nearest Micron sales office.

Table 1: Ordering Information

Part Number	Capacity
MTSD032AHC6MS-1WTCS	32GB
MTSD064AHC6MS-1WTCS	64GB
MTSD128AHC6MS-1WTCS	128GB
MTSD256AHC6MS-1WTCS	256GB
MTSD512AJC6MS-1WTCS	512GB

Important Notes and Warnings

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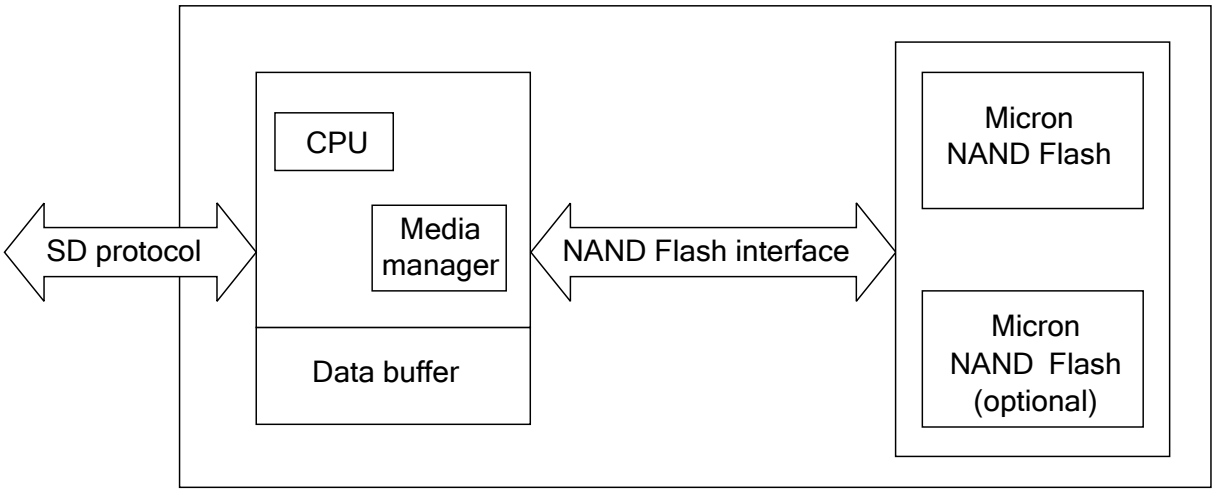
Limited Warranty. In no event shall Micron be liable for any indirect, incidental, punitive, special or consequential damages (including without limitation lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort, warranty, breach of contract or other legal theory, unless explicitly stated in a written agreement executed by Micron's duly authorized representative.

General Description

The microSD card is an advanced Micron® 3D NAND Flash memory technology based removable storage device specifically designed to meet the performance, capacity, and quality required for mass market devices or systems. In addition to mass storage-specific Flash memory, the microSD card includes an on-board intelligent controller which manages interface protocols, security algorithms for content protection, data storage and retrieval, as well as error correction code (ECC) algorithms, defect handling, sudden power-off safeguard and wear leveling.

The microSD card includes one or more NAND Flash memory components and a microSD card controller. The density of a card depends on the number of die within the package and the density of each die.

Figure 2: Functional Block Diagram



Note: 1. Not drawn to scale.

Pad Assignment and Descriptions

Figure 3: microSD Card Pad Assignment (Bottom View)

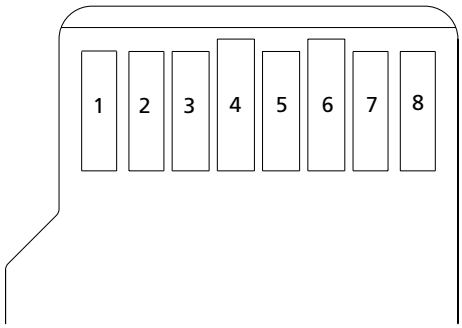


Table 2: MicroSD Contact Pad Description

Pad #	SD Mode			SPI Mode		
	Symbol	Type[1]	Description	Symbol	Type[1]	Description
1	DAT2[2]	I/O/PP	Data line [Bit 2]	RSV	–	Reserved
2	CD/DAT3[2]	I/O/PP[3]	Card detect/data line [Bit 3]	CS	I[3]	Chip select (active low)
3	CMD	PP	Command/response	DI	I	Data in
4	V_{DD}	S	Supply voltage	V_{DD}	S	Supply voltage
5	CLK	I	Clock	SCLK	I	Clock
6	V_{SS}	S	Supply voltage ground	V_{SS}	S	Supply voltage ground
7	DAT0	I/O/PP	Data line [Bit 0]	DO	O/PP	Data out
8	DAT1[2]	I/O/PP	Data line [Bit 1]	RSV	–	Reserved

Notes:
1. S: power supply; I: input; O: output using push-pull drivers; PP: I/O using push-pull drivers.
2. The extended DAT lines (DAT1-DAT3) are input on power-up. They start to operate as DAT lines after SET_BUS_WIDTH (ACMD6) command. The host shall keep its own DAT1-DAT3 lines in input mode, as well, while they are not used.
3. After power-up, pad 2 is configured as an input with an internal 50kΩ pull-up (for card detection and SPI mode selection). The pull-up should be disconnected prior to regular data transfer by issuing the SET_CLR_CARD_DETECT (ACMD42) command.

Performance and Capacity

Performance

Using a striping method across multiple NAND Flash devices the card read and write performance is optimized.

The microSD cards also use performance features of the underlying NAND Flash to increase speed in streaming applications. By sending larger packets of sequential data, the microSD card can better utilize NAND Flash features to enhance performance.

Table 3: Measured Performance (25°C, V_{DD} = 3.3V)

Density[1]	Sequential Read[2]	Sequential Write[2]
32GB	95 MB/s	25 MB/s
64GB	95 MB/s	45 MB/s
128GB	95 MB/s	45 MB/s
256GB	95 MB/s	45 MB/s
512GB	95 MB/s	90 MB/s

Notes:
1. 1GB = 1 billion bytes.
2. Measurements are based on a 256MB file size in UHS-I mode and depend on the host configuration used to run the test.

Capacity

When quoting device capacity, Micron uses the formatted capacity, not the raw number of bytes available.

Table 4: Bytes Available After Factory Formatting (FAT32 for SDHC card and exFAT for SDXC card)

Density[1]	Usable Bytes[2]	Speed Class[3]	Application Performance Class[3, 4]
32GB	31,243,370,496	Class10, U1, V10	Class1 (A1)
64GB	62,478,352,384	Class10, U3, V30	Class1 (A1)
128GB	124,688,269,312	Class10, U3, V30	Class1 (A1)
256GB	249,376,538,624	Class10, U3, V30	Class1 (A1)
512GB	512,577,503,232	Class10, U3, V30	Class1 (A1)

Notes:
1. 1GB = 1 billion bytes.
2. Actual user usable capacity. When cloning disk partitions, the master disk should always be formatted to no more than the minimum guaranteed usable bytes available for that card capacity.
3. Class is determined by Testmetrix VTE4100 Compliance Test.
4. Enable users to run their smartphone apps from the installed memory card.

Electrical Specifications

Absolute Ratings and Operating Conditions

Stresses greater than those listed in may cause permanent damage to the device. This is a stress rating only, and functional operation of the device at these or any other conditions outside those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may adversely affect reliability.

Table 5: Absolute Maximum Ratings

Parameter/Condition	Min	Max	Unit
V_{DD} supply voltage	2.7	3.6	V
Storage temperature	–40	+85	°C

Table 6: Recommended Operating Conditions

Parameter/Condition	Symbol	Min	Typ	Max	Unit
Operating temperature	T_A	–25	–	+85	°C
Supply voltage	V_{DD}	2.7	3.3	3.6	V
Regulator supply voltage for 1.8V signaling	V_{DDIO}	1.7	1.8	1.95	V
Ground supply voltage	V_{SS}	0	0	0	V

DC Characteristics

Table 7: DC Voltage Characteristics for 3.3V signaling

Parameter	Symbol	Min	Max	Unit	Comments
Input low voltage	V_{IL}	V_{ss} - 0.30	0.25 × V_{DD}	V	
Input high voltage	V_{IH}	0.625 × V_{DD}	V_{DD} + 0.30	V	
Output low voltage	V_{OL}	–	0.125 × V_{DD}	V	I_{OL} = 2mA @ V_{DD} (MIN)
Output high voltage	V_{OH}	0.75 × V_{DD}	–	V	I_{OH} = –2mA @ V_{DD} (MIN)

Table 8: DC Voltage Characteristics for 1.8V signaling

Parameter	Symbol	Min[1]	Max[1]	Unit	Comments
Input low voltage	V_{IL}	V_{ss} - 0.30	0.58	V	
Input high voltage	V_{IH}	1.27	2.00	V	
Output low voltage	V_{OL}	–	0.45	V	I_{OL} = 2mA
Output high voltage	V_{OH}	1.40	–	V	I_{OH} = –2mA

Note: 1. As signaling level is generated by regulator in host and card, some of the values are defined by fixed value rather than based on V_{DD}.

AC Characteristics

Timing specifications including clock timing, input and output timings for all bus modes are defined in SD Specifications. Refer to Section 6.6 and 6.7 of Part 1, Physical Layer Specification, version 5.10 for detail information.

Electrostatic Discharge (ESD)

Contacts pads:

- Human body model of ±4kV according to IEC61000-4-2.

Non contacts pad area:

- Coupling plane discharge of ±8kV.
- Air discharge of ±15kV.
- Human body model according to IEC61000-4-2.

Command Set

The SD specification categorizes commands into classes. Table 9 shows commands supported by the microSD card.

Table 9: Supported Commands

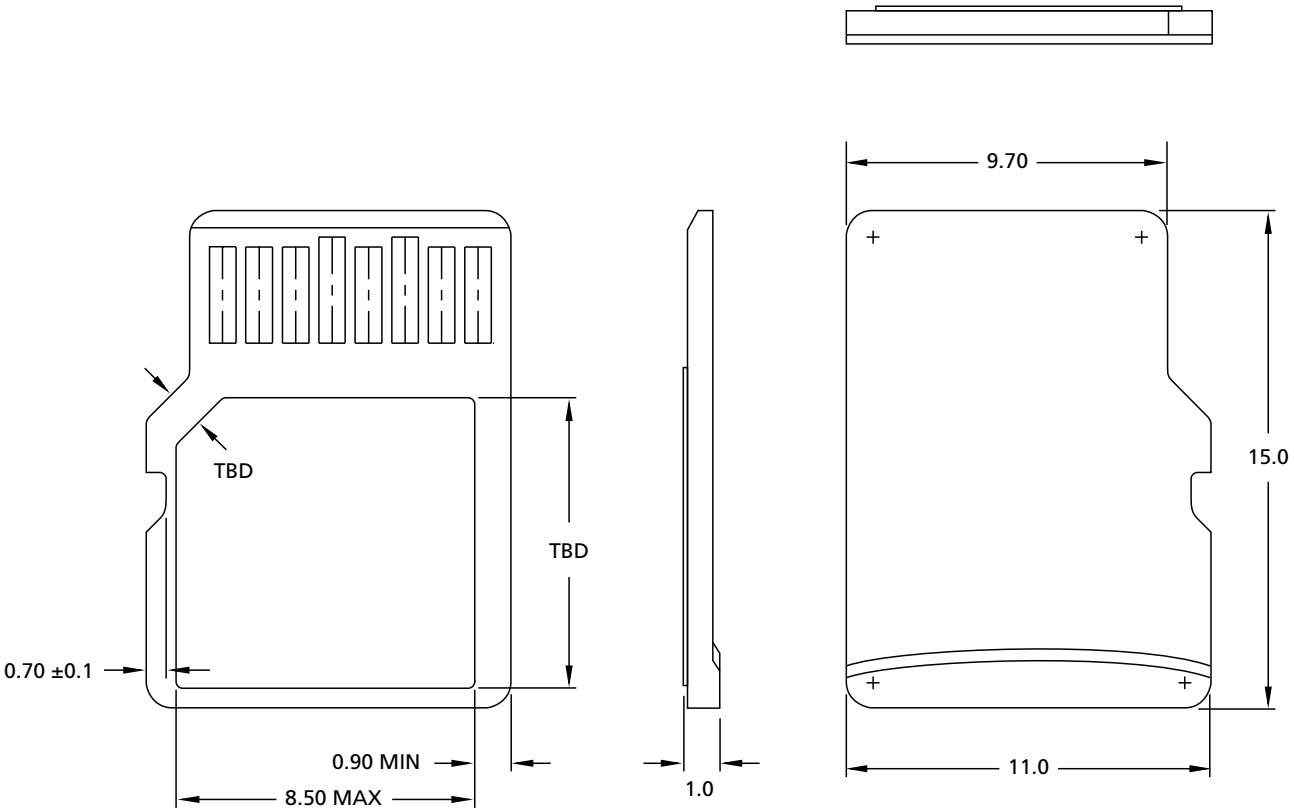
Command Type	Card Command Class (CCC)	Supported Commands
Basic commands	Class 0	CMD0, CMD2, CMD3, CMD7, CMD8, CMD9, CMD10, CMD11, CMD12, CMD13, CMD15
Block-oriented read commands	Class 2	CMD16, CMD17, CMD18, CMD19, CMD20, CMD23
Block-oriented write commands	Class 4	CMD16, CMD20, CMD23, CMD24, CMD25, CMD27
Erase commands	Class 5	CMD32, CMD33, CMD38
Lock card	Class 7	CMD16, CMD42
Application-specific commands[1]	Class 8	CMD55, CMD56, ACMD6, ACMD13, ACMD22, ACMD23, ACMD41, ACMD42, ACMD51
Switch commands	Class 10	CMD6

Note: 1. Each application-specific (ACMD) command is a 2-sequence command. First, a CMD55 is sent, followed by a CMDx, where x is the ACMDx value.

Package Dimensions

Figure 4 provides the physical dimensions of Micron microSD card. For detail dimensions and tolerances, refer to SDA microSD Card Addendum, Section 3.0 Mechanical Specification for microSD Memory Card.

Figure 4: microSD Card – 11mm × 15mm



Note: 1. Dimensions are in millimeters.

Table 10: Package Specifications

Parameter	Descriptions
Surface	Plain (except contact area)
Edges	Smooth edges
Weight	0.25gm

Compliance

Micron microSD card comply with the following:

- Micron Green Standard
- CE (Europe): EN 55032 Class B, RoHS
- FCC: CFR Title 47, Part 15 Class B
- BSMI (Taiwan): approval to CNS 13438 Class B and CNS 15663

D33F63
RoHS

- KC RRA (Korea): approval to KN32 Class B, KN 35 Class B

B 급 기기	이 기기는 가정용으로 전자파적합등록을한 기기로서 주거
(가정용 정보통신기기)	지역에서는 물론 모든지역에서 사용할 수 있습니다.

R-REM-MU2-MTSDXXXAJC6MS or R-R-MU2-MTSDXXXAHC6MS

- W.E.E.E.: compliance with EU WEEE directive 2012/19/EC. Additional obligations may apply to customers who place these products in the markets where WEEE is enforced.
- VCCI (Japan): 2015-04 Class B

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取扱説明書に従って正しい取り扱いをして下さい。
VCCIーB

- IC (Canada): ICES-003 Class B
  - This Class B digital apparatus complies with Canadian ICES-003.
  - Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.
  - CAN ICES-3 (B)/NMB-3(B).

FCC Rules

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Revision History

Rev. B – 12/18

- Update Korean ID in Compliance section.

Rev. A – 10/18

- Initial version

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www.micron.com/products/support Sales inquiries: 800-932-4992

This data sheet contains minimum and maximum limits specified over the power supply and temperature range set forth herein.
Although considered final, these specifications are subject to change, as further product development and data characterization sometimes occur.