株式会社アドテック

microSDカード 512MB-2GB

(ET1268+KIOXIA[Toshiba] 24/32nm SLC)

データシート

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REVISION HISTORY

Revision	Description	Date
V1.1	First released	August 2015
V1.2	Updated Humidity information	April 2017
V1.3	Added Product Feature information	May 2017
V1.4	Added 512MB Capacity and Support CPRM	June 2017
V1.5	Changed the microSD SLC 512MB Flash from TC58NVG3S0FTAI0 to TC58NVG2S0HTAI0	August 2017
V1.6	Added ESD ability and water proof information	April 2018
V1.7	Added 1.2 Product Features, 1.3 TBW and 3.8 Dust proof	July 2020
V1.8	Added 4.3 Bus Timing (Append Default Speed Mode)	September 2021

1. Product Introduction

1.1. Overview

 The Industrial microSD Card is designed for demanding industrial applications especially for portable devices.　The microSD Card is compatible with SD 2.0 and provides excellent performance．The built-in auto ECC function can also detect and correct errors during data transfer. Moreover, Industrial microSD Card provides high write/read speed and high IOPS, it was designed to meet the security, high performance, and environmental requirements.

1.2. Product Features

- Interface: 8 pins microSD standard interface
- Compliant SD Card Specification 2.0
- Capacity: 512MB, 1GB, 2GB
- Variable Clock Rate
    - Default Mode: 0-25 MHz, up to 12.5MB/s Interface Speed
    - High-Speed Mode: 0-50 MHz, up to 25MB/s Interface Speed

- Operating at -40°C to 85°C

- Flash: SLC NAND Flash (512MB: TC58NVG2S0HTAI0 ,1GB/2GB: TC58NVG3S0FTAI0)
- Controller: ET1268
- Program/Erase Cycle: 60,000 Cycles
- Built-in ECC corrects up to 30 bits/1 KB
- Read disturbance management (Auto-Refresh)
- Adaptive wear leveling
- Management of sudden power-fails
- SMART Function support (Dedicated software support)
- Support CPRM (Content Protection for Recordable Media) of SD Card
- Support Water & Dust proof IEC 60529 IP58

1.3. TBW (Tera Bytes Written)

Capacity	512MB	1GB	2GB
SLC	25.2TB	50.4TB	98.2TB

*The endurance of disk could be varying based on user behavior, NAND endurance cycles, and write amplification factor. It is not guaranteed by flash vendor.
*Client workload by JESD-219A

2．microSD Card Interface Description

2.1 microSD Pin Assignment

Table 1: SD Bus Mode Pin Definition

Pin #	Name	Type	SD Description
1	DAT2	I/O	Data Line [Bit2]
2	CD/DAT3	I/O	Card Detect / Data Line [Bit3]
3	CMD	PP	Command / Response
4	VDD	S	Supply Voltage
5	CLK	I	Clock
6	VSS	S	Supply Voltage Ground
7	DAT0	I/O	Data Line [Bit 0]
8	DAT1	I/O	Data Line [Bit 1]

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 command. The Host shall keep its own DAT1-DAT3 lines in input mode, as well, while they are not used. It is defined so, in order to keep compatibility to Multi-media Cards.

3) After power up this line (Pin2) is input with 50Kohm pull-up (can be used for card detection or SPI mode selection). The pull-up should be disconnected by user, during regular data transfer, with SET_CLR_CARD_DETECT (ACMD42) command.

Table 2: SPI Bus Mode Pin Definition

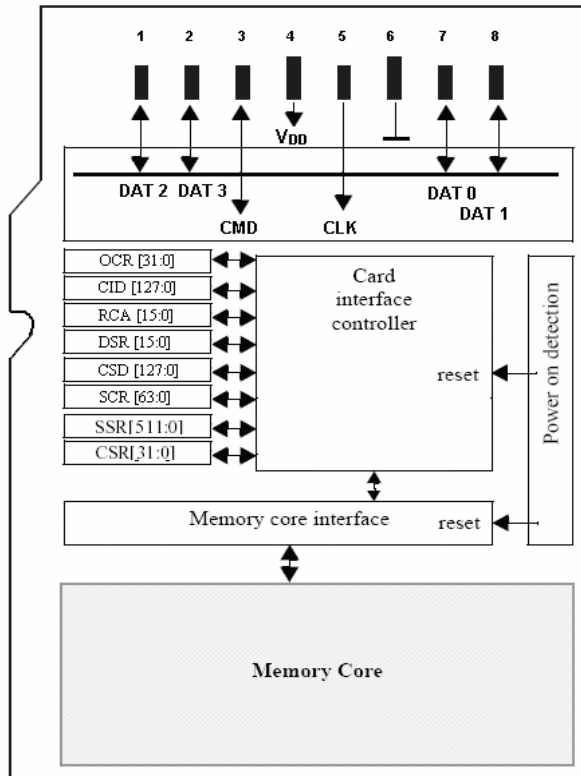| Pin #	Name	Type	SD Description
1	RSV		Reserved
2	CS	I	Chip Select (neg true)
3	DI	I	Data In
4	VDD	S	Supply Voltage
5	SCLK	I	Clock
6	VSS	S	Supply Voltage Ground
7	DO	O	Data Out
8	RSV		Reserved

Figure 1: Functional Diagram

3．Specifications

3.1. Performance

Max. Data Transfer Rate

■ Read: 23MB/s; Write: 16MB/s

3.2. NAND Flash Memory

Industrial SD Card uses Single Level Cell (SLC) NAND Flash memory, which is non-volatility, high reliability, and high-speed memory storage. There are only two statuses 0 or 1 of one cell.

3.3. Power Requirement

3.3.1. DC Input Voltage

■ 2.7V to 3.6V

3.4. Temperature Range

■ -40°C to +85°C

3.5. Humidity

Relative Humidity: 5-95%, non-condensing

3.6. Water proof

Water proof level: IEC 60529 IPX8.

Test Condition	Referred standard
Depth of water 1.5m for 30 mins.	IEC 60529 IPX8

3.7. ESD Ability

Test Condition	Referred standard
□ Contact discharge: ± 2KV, ± 4KV	SD Spec. Appendix D.1
□ Air discharge: ± 4KV, ± 8KV, ± 15KV	SD Spec. Appendix D.2

3.8. Dust Proof

Dust proof level: IEC 60529 IP5X.

Test Condition	Referred standard
Depression of 2 KPa, Talcum powder 2kg/m³, 8 hrs.	IEC 60529 IP5X

4．Electrical Specifications

4.1. General DC Characteristic

Table 3: Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Unit	Note
$T_{storage}$	Storage Temperature	-50	95	°C	-
Ta	Ambient Operating Temperature	-40	85	°C	-
V_I	3.3V External Input Voltage	-0.3	3.6	V	-

Table 4: Power Consumption

Symbol	Parameter	Min.	Typ.	Max.	Unit
I_{Read}	Read Current at 3.3V	-	62	200	mA
I_{Write}	Write Current at 3.3V	-	73	200	mA
I_{STBY}	Standby Current	-	0.14	15	mA

4.2. Bus Signal Line Loading

Table 5: Bus Signal Line Loading

Symbol	Parameter	Min	Max	Unit	Remark
R_{CMD}	Pull-up resistance for SD_CMD Line	25	100	KΩ	To prevent bus floating
R_{DAT}	Pull-up resistance for SD_DATA Line	25	100	KΩ	To prevent bus floating
C_{CARD}	Card capacitance for each signal pin	-	10	pF	For single card
L_L	Signal Line Inductance	-	16	nH	

Table 6: DC Characteristics of I/O Interface

Symbol	Parameter	Min.	Max.	Unit
V_{IH}	Input High Voltage	$0.625 \times V_I$	$V_I + 0.3$	V
V_{IL}	Input Low Voltage	-0.3	$0.25 \times V_I$	V
V_{OH}	Output High Voltage	$0.75 \times V_I$	-	V
V_{OL}	Output Low Voltage	-	$0.125 \times V_I$	V
I_{OH}	Output High Current	-16	-	mA
I_{OL}	Output Low Current	-	16	mA
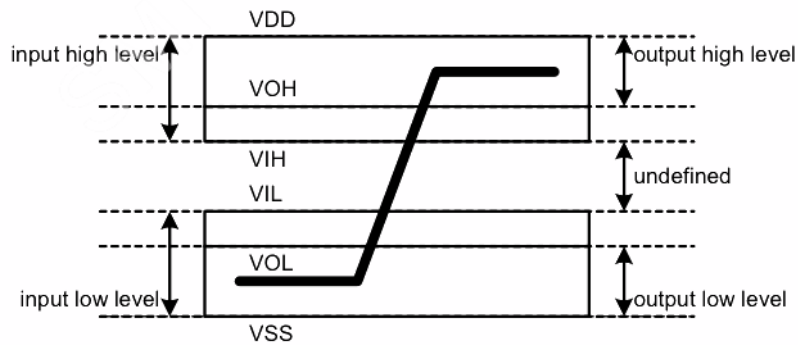
Figure 2: Bus Signal Level

4.3. Bus Timing

4.3.1 Bus Timing (Default Speed Mode)
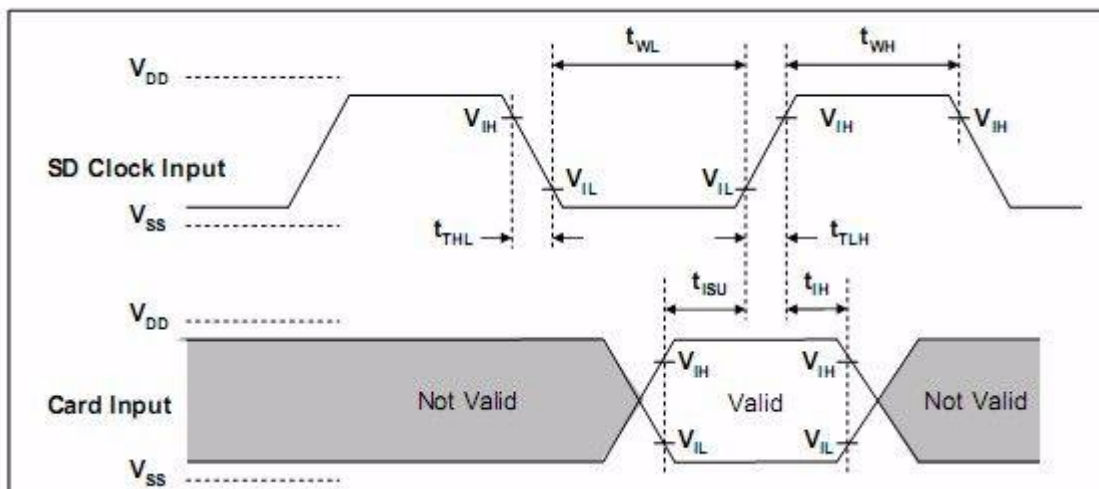
Figure 3: Card input Timing (Default Speed Card)

Sep. 2021 Rev1.8
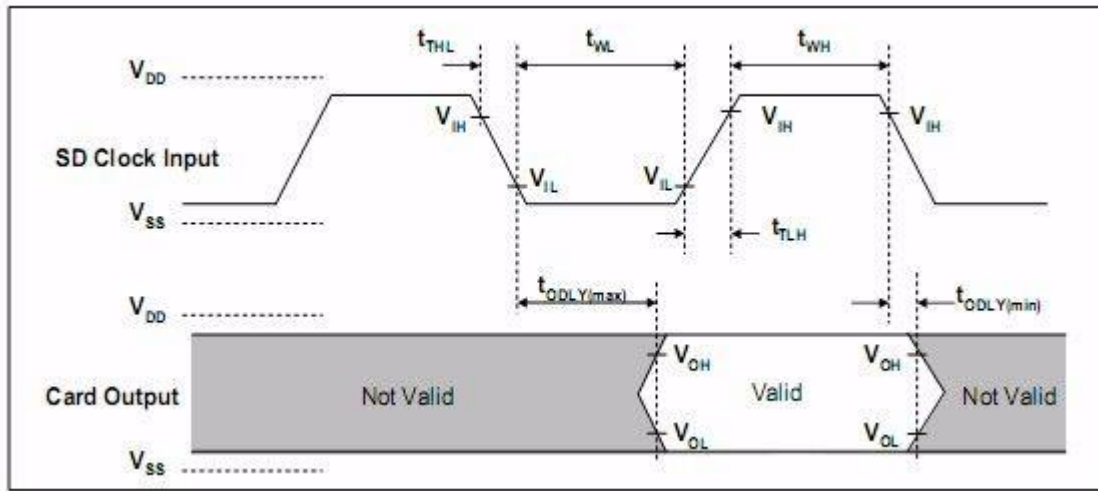
Figure 4: Card Output Timing (Default Speed Mode)

Table 7: Bus Timing-Parameters Values (Default Speed)

Parameter	Symbol	Min.	Max	Unit	Remark
Clock CLK (All values are referred to min (V_{IH}) and max (V_{IL})					
Clock frequency data transfer	f_{PP}	0	25	MHz	$C_{CARD} \leq 10pF$ (1 card)
Clock frequency Identification	f_{OD}	$0_{(1)}/100$	400	KHz	$C_{CARD} \leq 10pF$ (1 card)
Clock low time	t_{WL}	10		ns	$C_{CARD} \leq 10pF$ (1 card)
Clock high time	t_{WH}	10		ns	$C_{CARD} \leq 10pF$ (1 card)
Clock rise time	t_{TLH}		10	ns	$C_{CARD} \leq 10pF$ (1 card)
Clock fall time	t_{THL}		10	ns	$C_{CARD} \leq 10pF$ (1 card)
Inputs CMD, DAT (referenced to CLK)					
Input set-up time	t_{ISU}	5		ns	$C_{CARD} \leq 10pF$ (1 card)
Input hold time	t_{TH}	5		ns	$C_{CARD} \leq 10pF$ (1 card)
Outputs CMD, DAT (referenced to CLK)					
Output Delay time during Data					
Transfer Mode	t_{ODLY}	0	14	ns	$C_L \leq 40pF$ (1 card)
Output Hold time	t_{OH}	0	50	ns	$C_L \leq 40pF$ (1 card)

(1) 0 Hz means to stop the clock. The given minimum frequency range is for cases were continues clock is required.
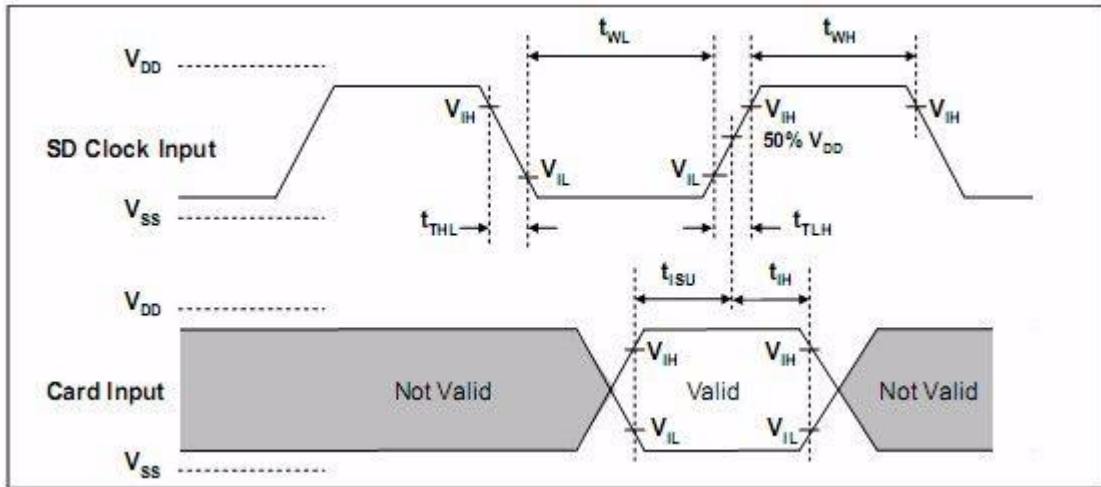
4.3.2 Bus Timing (High-Speed Mode)
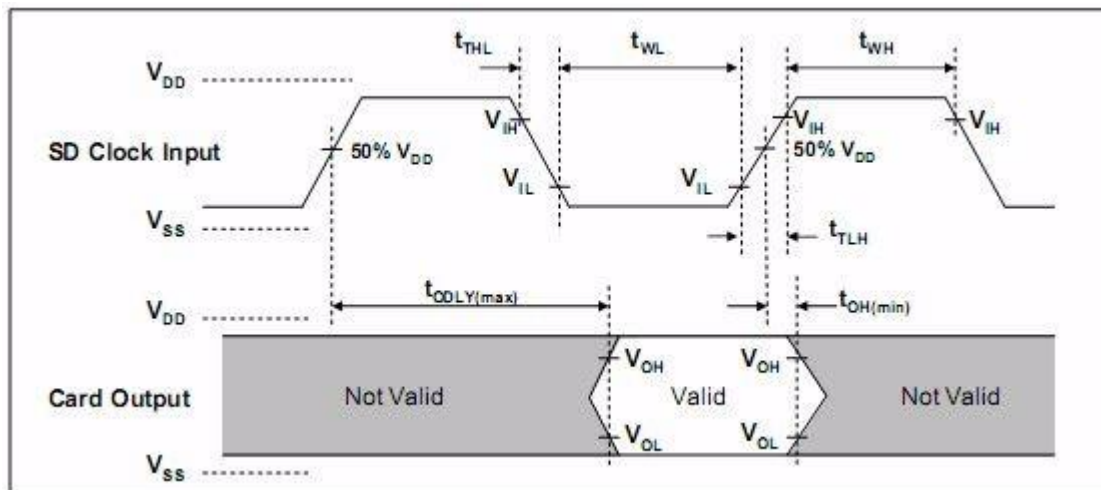

Figure 5: Card Input Timing (High Speed Card)

Figure 6: Card Output Timing (High Speed Mode)

Table 8 : Bus Timing – Parameters Values(High Speed)

Parameter	Symbol	Min.	Max	Unit	Remark
Clock CLK (All values are referred to min (V_{IH}) and max (V_{IL})					
Clock frequency data transfer	f_{PP}	0	50	MHz	$C_{CARD} \leq$ 10pF (1 card)
Clock low time	t_{WL}	7		ns	$C_{CARD} \leq$ 10pF (1 card)
Clock high time	t_{WH}	7		ns	$C_{CARD} \leq$ 10pF (1 card)
Clock rise time	t_{TLH}		3	ns	$C_{CARD} \leq$ 10pF (1 card)
Clock fall time	t_{THL}		3	ns	$C_{CARD} \leq$ 10pF (1 card)
Inputs CMD, DAT (referenced to CLK)					
Input set-up time	t_{ISU}	6		ns	$C_{CARD} \leq$ 10pF (1 card)
Input hold time	t_{TH}	2		ns	$C_{CARD} \leq$ 10pF (1 card)
Outputs CMD, DAT (referenced to CLK)					
Output Delay time during Data Transfer Mode	t_{ODLY}		14	ns	$C_L \leq$ 40pF (1 card)
Output Hold time	t_{OH}	2.5		ns	$C_L \geq$ 15pF (1 card)
Total System capacitance for each line[1]	C_L		40	pF	1 card

1) In order to satisfy sever timing, host shall drive only one card.

5. Mechanical Dimensions

The mechanical dimensions of industrial microSD card were basically followed the mechanical form factor definitions on microSD card specifications which constructed by SD card association.
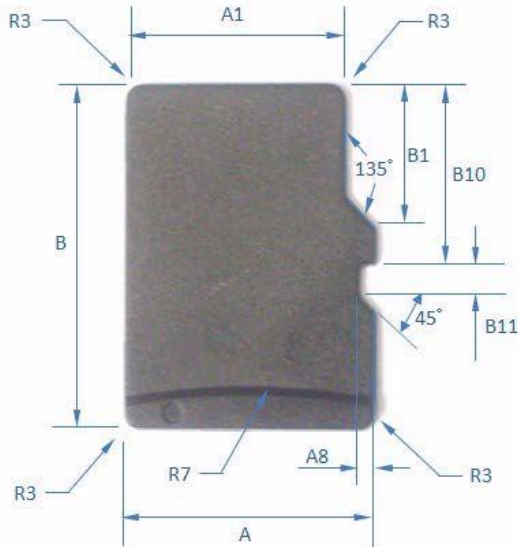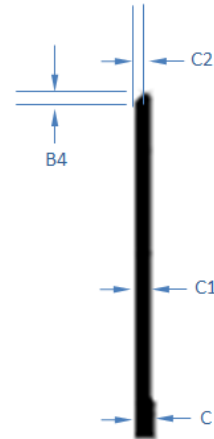

Figure 7: Top View
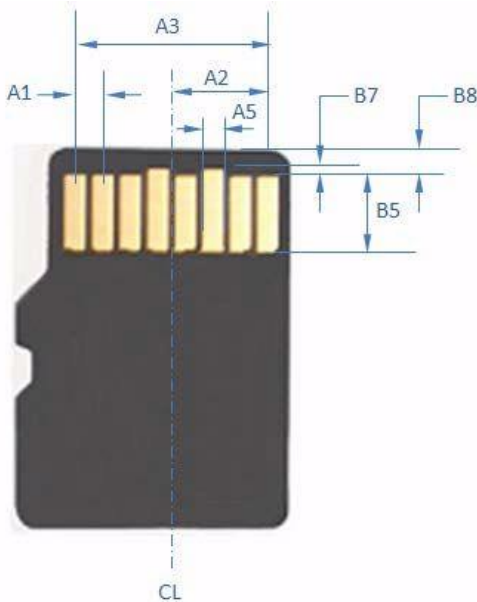

Figure 8: Side View

Figure 9: Bottom View

Criteria of microSD				Unit: mm
Dimensions	Min	TYP	Max	Note
A	10.90	11.00	11.10	
A1	9.60	9.70	9.80	
A2		3.85		BASIC
A3	7.60	7.70	7.80	
A4		1.10		BASIC
A5	0.75	0.80	0.85	
A8	0.60	0.70	0.80	
B	14.90	15.00	15.10	
B1	6.13	6.23	6.33	
B4	0.42	0.52	0.62	
B5	2.80	2.90	3.00	
B7	0.20	0.30	0.40	
B8	1.00	1.10	1.20	
B10	7.80	7.90	8.00	
B11	1.10	1.20	1.30	
R3	0.70	0.80	0.90	
R7	29.50	30.00	30.50	
C	0.90	1.00	1.10	
C1	0.60	0.70	0.80	
C2	0.20	0.30	0.40	

Jul. 2020 Rev1.7

6. Ordering Information

Part Number	Capacity
EMR512SITCCEBF	512MB
EMR01GSITDBEBB	1GB
EMR02GSITDBEBB	2GB

Sep. 2021 Rev1.8