

RoHS Compliant

Industrial Micro SDHC Card

Industrial Micro SDHC 4GB Specifications

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Version 1.0



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FEATURES:

- **Fully compliant with SD Card Specifications 2.0**
- **Capacity range**
 - 4 GB
- **Performance***
 - Sustained Read: Up to 20 MB/sec
 - Sustained Write: Up to 16 MB/sec
- **SD-protocol compatible**
- **SDHC compatible**
- **Standard interface**
 - 8-pins SD interface
- **NAND Flash Type: SLC**
- **Operating voltage: 2.7V ~ 3.6V**
- **Physical dimension** : 15.0 mm(L) x 11.0 mm(W) x 1.0 mm(H)
- **Intelligent endurance design**
 - Built-in advanced ECC algorithm: 24bits/1KB
 - Wear-leveling algorithm
- **Temperature ranges**
 - Operating temperature: -40°C ~ +85°C
 - Storage temperature: -40°C ~ +85°C
- **Power consumption***
 - Operating mode: 50 mA
 - Standby mode: 100 uA
- **Supports S.M.A.R.T.**
- **RoHS Compliant**

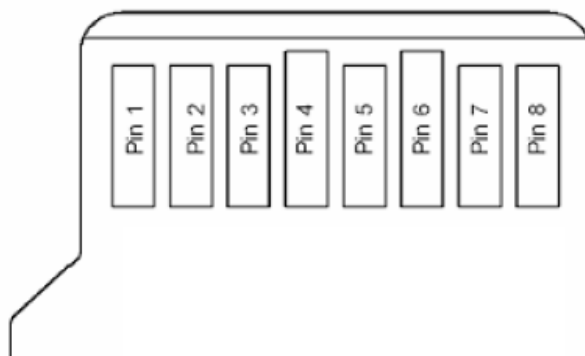
*Performance and power consumption values presented here are typical and may vary depending on settings and platforms.

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2. Product Characteristics

2.1 Card Architecture



2.2 Pin Assignment

Pin	SD Mode		SPI Mode	
	Name	Description	Name	Description
1	DAT2	Data line[bit 2]	RSV	Reserved
2	CD/DAT3 ²	Card Detect/Data line [bit 3]	CS	Chip select
3	CMD	Command/Response	DI	Data in
4	VDD	Supply voltage	VDD	Supply voltage
5	CLK	Clock	SCLK	Clock
6	VSS	Supply voltage ground	VSS	Supply voltage ground
7	DAT0	Data line[bit 0]	DO	Data out
8	DAT1	Data line[bit 1]	RSV	Reserved

2.3 Capacity Specification

Capacity	User Data Bytes	Usable Storage Space
4 GB	4,043,309,056	3.76 GB

Note: results may vary depending on settings and platforms. Please be noted that products are shipped with unformatted capacity. The number of user data bytes and usable storage space may vary from different host operating systems.

2.4 Performance

Performances of the SD card are shown in the table below.

Modes \ Capacity	4 GB
Sequential Read (MB/s)	20
Sequential Write (MB/s)	16

Note: results may vary depending on settings and platforms.

2.5 Operating Voltage

Symbol	Parameter	Min.	Max.	Unit
V _{DD}	Supply Voltage	2.7	3.6	V
T _A	Ambient operating temperature	-40	85	°C
T _{storage}	Storage Temperature	-40	85	°C

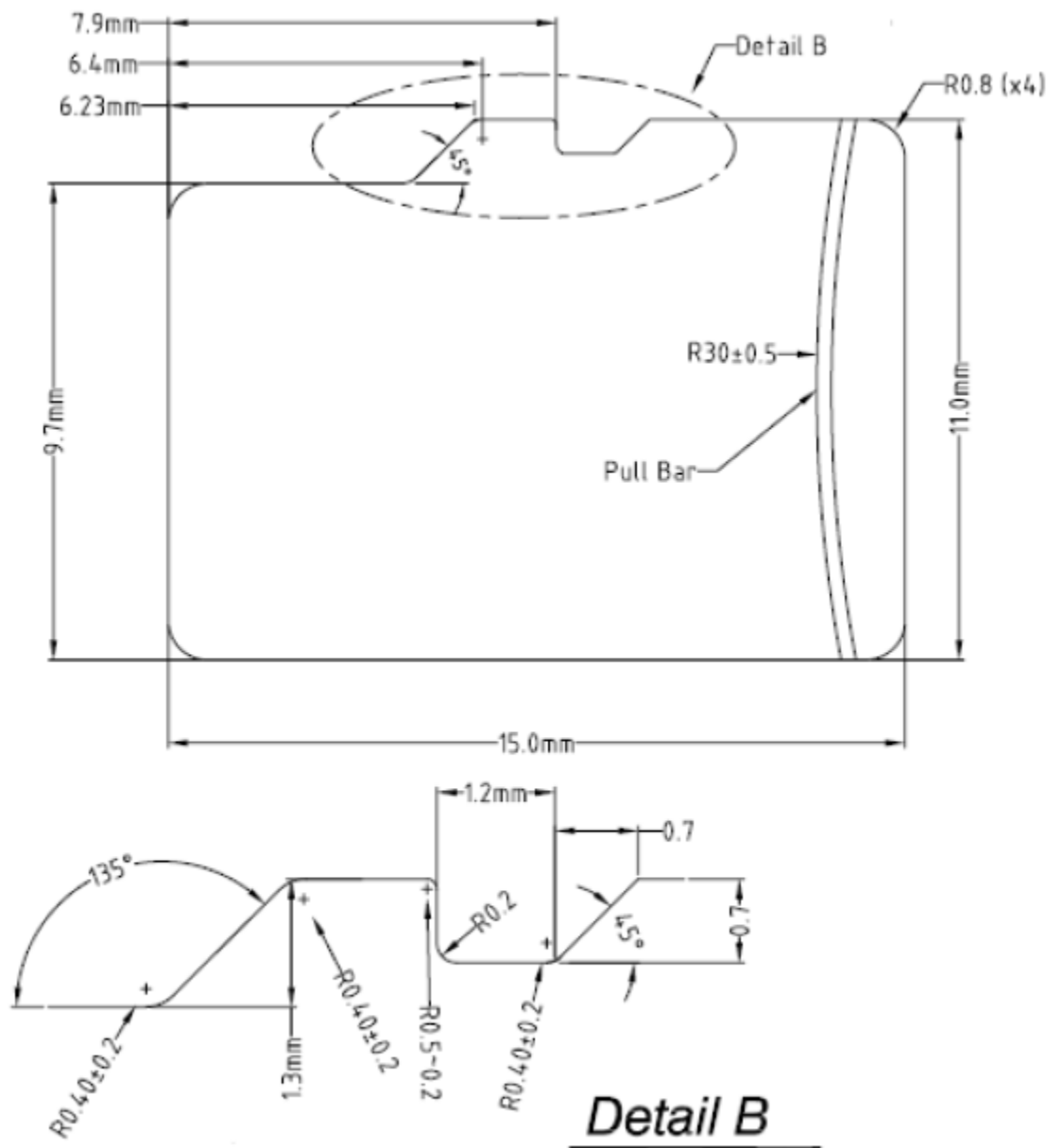
2.6 Power consumption (typical)

Modes \ Capacity	4 GB
Operating (mA)	50
Idle (uA)	100

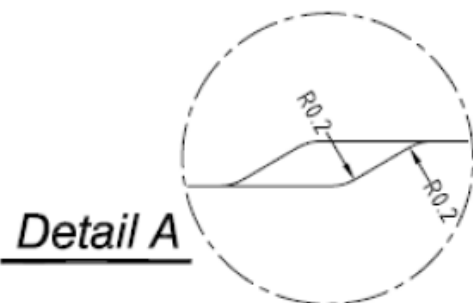
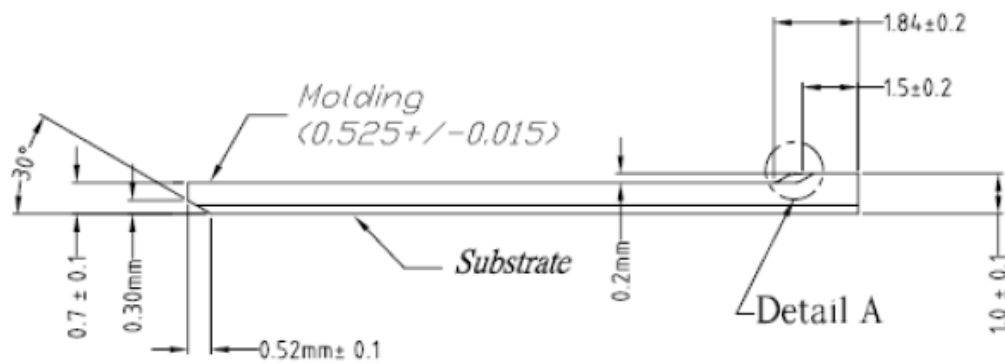
Note: results may vary depending on settings and platforms.

3. Physical Characteristics

Top View

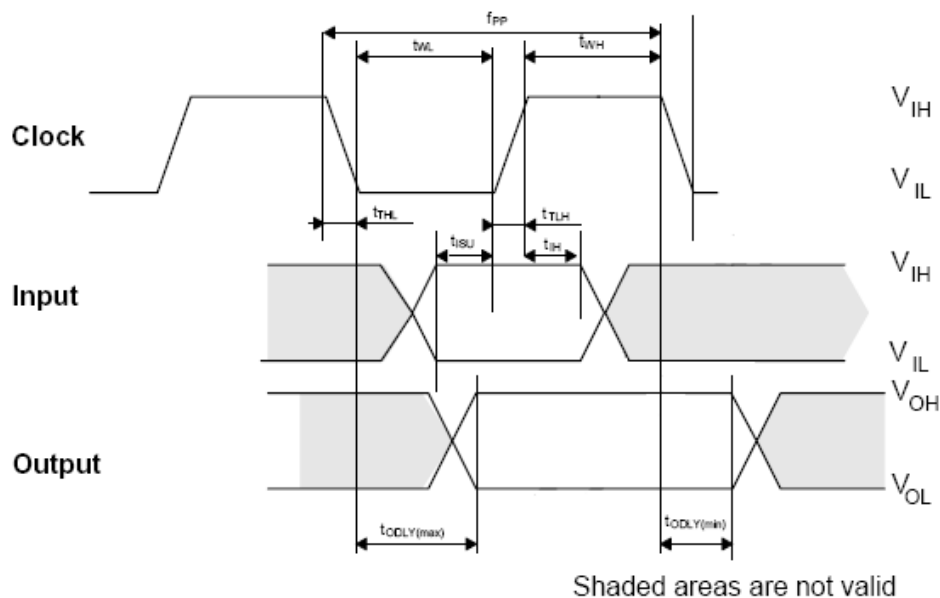


Technical drawing of the PCB layout showing dimensions and pin locations. The drawing includes a side view of the PCB with dimensions: 0.6mm, 1.0mm, 1.1mm, and 0.80mm. The pin locations are labeled Pin1 through Pin8. The bottom view shows the layout of the pins with dimensions: 2.9mm, 7.70mm, 0.30mm(x7), 0.80mm(x8), 1.10mm(x7), 0.3mm, and Gold Finger.



4. Electrical Characteristics

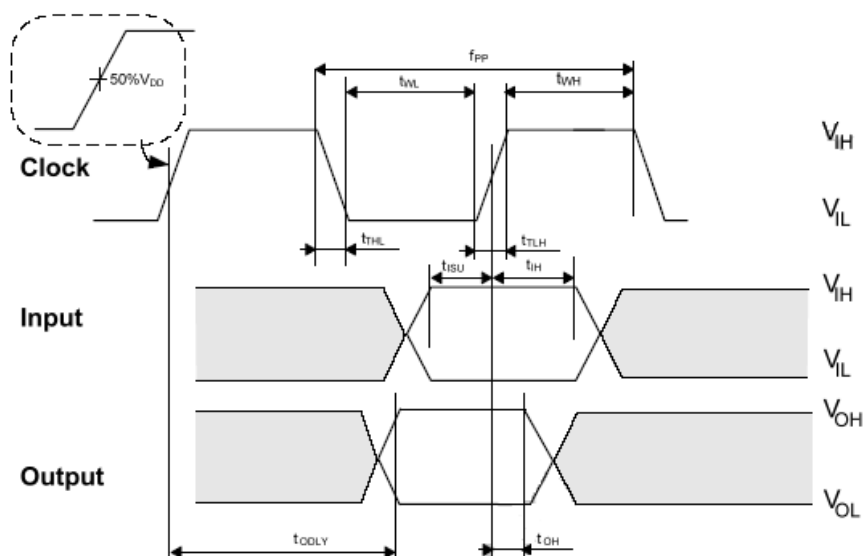
4.1 Bus Interface Timing (Standard)



SYMBOL	PARAMETER	MIN	MAX	UNIT	Note
Clock CLK (All values are referred to min(V_{IH}) and max(V_{IL}))					
f _{PP}	Clock frequency Data Transfer Mode	0	25	MHz	C _{card} ≤ 10 pF (1 card)
f _{OD}	Clock frequency Identification Mode	0 ₍₁₎ /100	400	kHz	C _{card} ≤ 10 pF (1 card)
t _{WL}	Clock low time	10	-	ns	C _{card} ≤ 10 pF (1 card)
t _{WH}	Clock high time	10	-	ns	C _{card} ≤ 10 pF (1 card)
t _{TLH}	Clock rise time	-	10	ns	C _{card} ≤ 10 pF (1 card)
t _{THL}	Clock fall time	-	10	ns	C _{card} ≤ 10 pF (1 card)
t _{ISU}	Input setup time	5	-	ns	C _{card} ≤ 10 pF (1 card)
t _{IH}	Input hold time	5	-	ns	C _{card} ≤ 10 pF (1 card)
t _{ODLY}	Output delay time	0	14	ns	C _L ≤ 40 pF (1 card)
t _{ODLY}	Output Delay time during Identification Mode	0	50	ns	C _L ≤ 40 pF (1 card)

(1)0Hz means to stop the clock. The given minimum frequency range is for cases that requires the clock to be continued.

4.2 Bus Interface Timing (High-speed)



Shaded areas are not valid

SYMBOL	PARAMETER	MIN	MAX	UNIT	Note
f_{PP}	Clock frequency data transfer mode	0	50	MHz	$C_{card} \leq 10 \text{ pF}$ (1 card)
t_{WL}	Clock low time	7	-	ns	$C_{card} \leq 10 \text{ pF}$ (1 card)
t_{WH}	Clock high time	7	-	ns	$C_{card} \leq 10 \text{ pF}$ (1 card)
t_{TLH}	Clock rise time	-	3	ns	$C_{card} \leq 10 \text{ pF}$ (1 card)
t_{THL}	Clock fall time	-	3	ns	$C_{card} \leq 10 \text{ pF}$ (1 card)
t_{ISU}	Input setup time	6	-	ns	$C_{card} \leq 10 \text{ pF}$ (1 card)
t_{IH}	Input hold time	2	-	ns	$C_{card} \leq 10 \text{ pF}$ (1 card)
t_{ODLY}	Output delay time		14	ns	$CL \leq 40 \text{ pF}$ (1 card)
T_{OH}	Output hold time	2.5	50	ns	$CL \leq 15 \text{ pF}$ (1 card)
C_L	System capacitance of each line*		40	pF	$CL \leq 15 \text{ pF}$ (1 card)

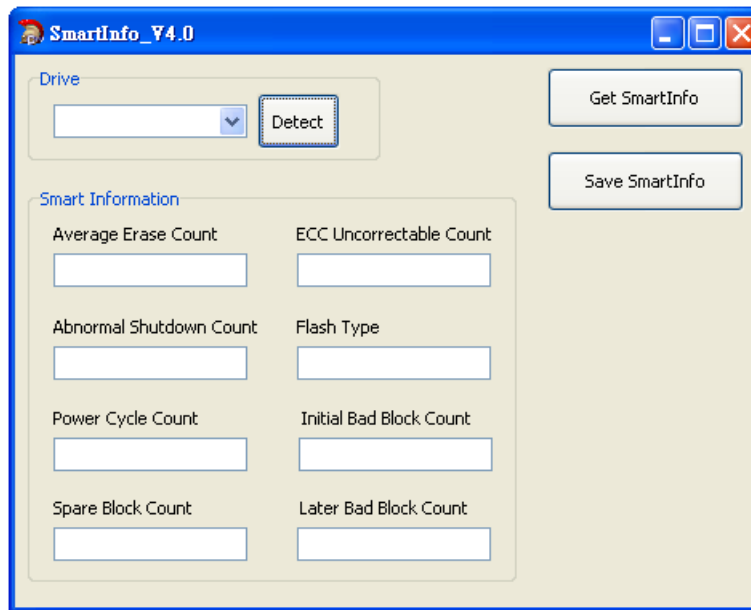
*In order to satisfy severe timing, host shall run on only one card

5. S.M.A.R.T.

S.M.A.R.T. is the abbreviation for Self-Monitoring, Analysis and Reporting Technology, an open standard allowing disk drives to automatically monitor their own health and report potential problems. It provides users critical drive status information and attributes parameters for anticipation purposes. Ideally, this should prevent unexpected drive failure and data loss.

Depending on product ordering requests, we provide customizable user interfaces for our S.M.A.R.T utility. The utility program comes in two types of interfaces versions: complete and simple.

Complete User Interface Version:



Detailed Description for SMART Information

1. Average Erase Count

Value: To record average erase ratio.

This value is calculated by “total erase counts”, “Flash P/E cycles”, “Flash total blocks”.

Initial value = 00.00%

Maximum value = 100.00%

2. Abnormal Shutdown Count

Value: To record abnormal shutdown condition.

Increasing this value by 1 when detected error in the power on stage.

Initial value = 0.

Maximum value = 4294967295.

3. Power Cycle Count

Value: To record power cycle condition.

Increasing this value by 1 when a power Cycle (both normal and abnormal) occurred.

Initial value = 0.

Maximum value = 4294967295.

4. Spare Block Count

Value: To record spare block counts.

Decreasing this variable when detected run-time bad blocks.

(Note:run-time bad blocks may be “erase error”, “program error”, “read error”.)

Initial value = depend on Flash.

Maximum value = 255.

Minimum value = 0.

5. ECC Uncorrectable Count

Value: To record ECC uncorrectable block counts.

Increase this value by 1 when fatal error occurred in Flash read operation.

Initial value = 0.

Maximum value = 255.

6. Flash Type

Value: To determinate mounted Flash type, and always keep in original value.

0: SLC, 1:MLC.

Initial value = depend on Flash.

7. Initial Bad Block Count

Value: To record initial bad blocks when MP process, and always keep in original value.

Initial value = depend on Flash.

Maximum value = 65535.

8. Later Bad Block Count

Value: To record run time bad blocks.

Increasing this variable when detected run-time bad blocks.

Initial value = 0.

Maximum value = 65535.

Simple User Interface Version:



Average Erase Count

Value: To record average erase ratio.

This value is calculated by “total erase counts”, “Flash P/E cycles”, “Flash total blocks”.

Initial value = 00.00%

Maximum value = 100.00%

Detect

Detect the available drive for S.M.A.R.T. monitoring.

Get SmartInfo

Click it to display the health status of the monitored drive, which appears as a dashboard presence.

6. Product Ordering Information

<i>Capacity</i>	<i>AP/N</i>
4GB	AP-MSD04GIHI-T

Note:

- Valid combinations list out the available models for mass production.
- Products are normally shipped in unformatted capacities unless required otherwise.
- For customization request, please consult with Apacer sales representatives.

Revision History

Revision	Description	Date
1.0	Official release	10/03/2013

Global Presence

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