Datasheet

MaxNova 新宏电子

MicroSD Card

MaxNova, Inc. 新宏电子

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1. General Description

1.1 Scope

This chapter describes the mechanical and electromechanical feature of the Micro-Sized SD memory card. The Micro-Sized SD is functionally compatible with the SD Memory card but is smaller in dimensions. The Micro-Sized SD can be inserted into a passive SD or miniSD Memory card adapter and operate as an SD Memory card. All technical draft follow DIN ISO standard.

1.2 System Features

The MicroSD Card provides the following features:

- •SD Card protocol compatible.
- •Supports SPI Mode.
- •Targeted for portable and stationary applications for secured (copyright protected) and non-secured data storage.
- •Voltage range:
  - – Basic communication (CMD0, CMD15, CMD55, ACMD41): 2.0 to 3.6 V
  - – Other commands and memory access: 2.7 to 3.6 V
- •Functional clock rate 0-25 MHz.
- •Transparent correction of memory field errors.
- •Application specific commands.
- •Comfortable erase mechanism.

The performance of the communication channel is described in Table 1.

Table 1 SD Bus/SPI Bus Comparison

SD Card Using SD Bus	SD Card Using SPI Bus
Six-wire communication channel (clock, command, 4 data lines)	Three-wire serial data bus (Clock, DataIn, DataOut) + card specific CS signal (hardwired card selection)
Error-protected data transfer	Optional non-protected data transfer mode available
Single or multiple block oriented data transfer	Single or multiple block oriented data transfer

Note: The capacity is the un-formatted size. Actual user capacity may be smaller after the cad format.

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1.3 Primary Reference Document

This Specification is base on and refers extensively to:

SD Memory Card Specifications Part 1
PHYSICAL LAYER SPECIFICATION
Version 1.10
October 2004

1.4 Concept

The functions of the Micro-Sized SD package are:
- Protecting the chip
- Easy handling for the end user
- Reliable electrical interconnection
- Bearing textual information and image
- Customer appeal

The functions of the Micro-Sized SD Connector are:
- Attaching and fixing the card
- Electrical interconnecting the card to the system board
- Protection against card inverse insertion

The functions of the Micro-Sized SD Adapter are:
- Providing the ability to use the Micro-Sized SD in an SD Memory Cards socket
- Providing the ability to use the Micro-Sized SD in a miniSD Memory Card socket

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2. Electrical Specifications

2.1 Pin Assignment

Figure 1: Contact Area

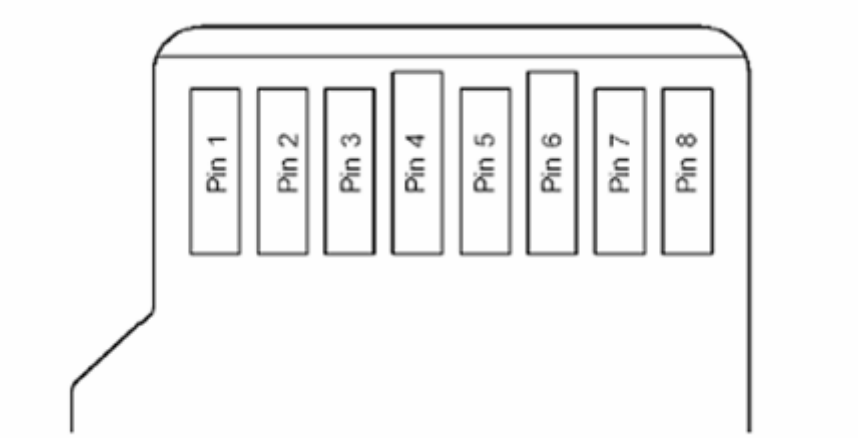

Table 2: Micro-Sized SD Contact Pad assignment

Pin	SD Mode			SPI Mode		
	Name	Type[1]	Description	Name	Type	Description
1	DAT2	I/O/PP	Data Line [Bit2]	RSV		
2	CD/DAT3[2]	I/O/PP[3]	Card Detect / Data Line [Bit3]	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	Vss	S	Supply voltage ground
7	DAT0	I/O/PP	Data Line [Bit0]	DO	O/PP	Data out
8	DAT1	I/O/PP	Data Line [Bit1]	RSV		

1) S: power supply; I: input; O: output using push-pull drivers; PP: I/O using push-pull drivers
2) The extended DAT line (DAT1-DAT3) is 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 MultiMediaCards.
3) After power up this line is input with 50KOhm pull-up (can be used for card detection or SPI mode selection). The pull-up should be disconnected by the user, during regular data transfer, with SET_CLR_CARD_DETECT (ACMD42) command

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2.2 Bus Topology

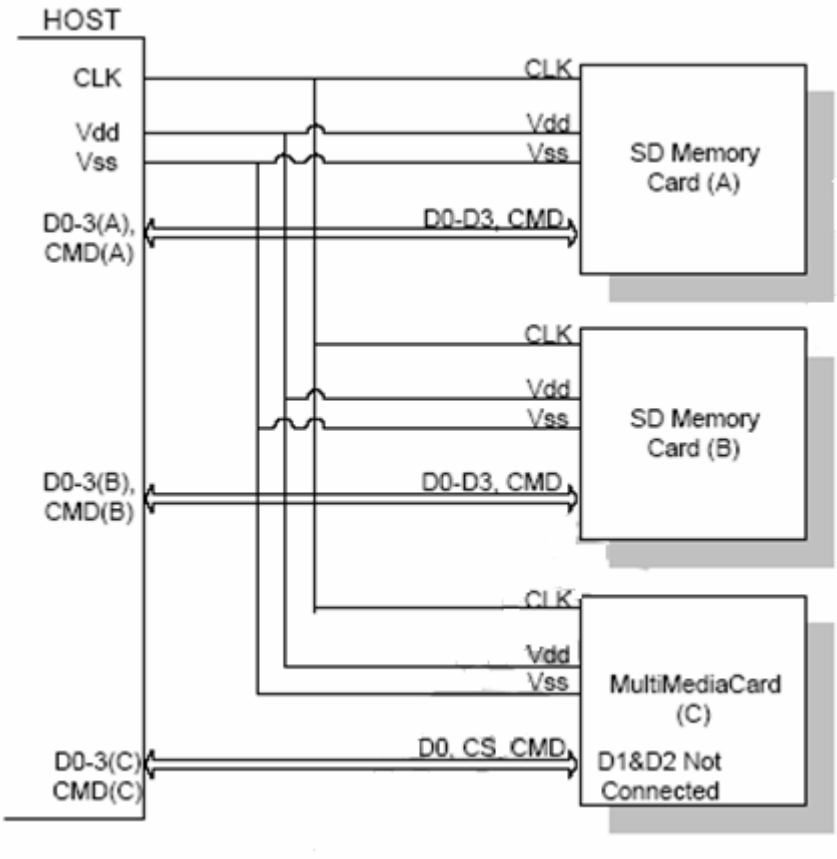
2.2.1 SD Bus Connection

The SD Memory Card system defines two alternative communication protocols: SD and SPI. Applications can choose either one of modes. Mode selection is transparent to the host. The card automatically detects the mode of the reset command and will expect all further communication to be in the same communication mode. Therefore, applications that use only one communication mode do not have to be aware of the other. In High-Speed mode, only one card can be connected to the bus.

The SD bus includes the following signals:

CLK: Host to card clock signal
CMD: Bidirectional Command/Response signal
DAT0 - DAT3: 4 Bidirectional data signals
V_{DD}, V_{SS}: Power and ground signals

Figure 2 SD Bus Connections



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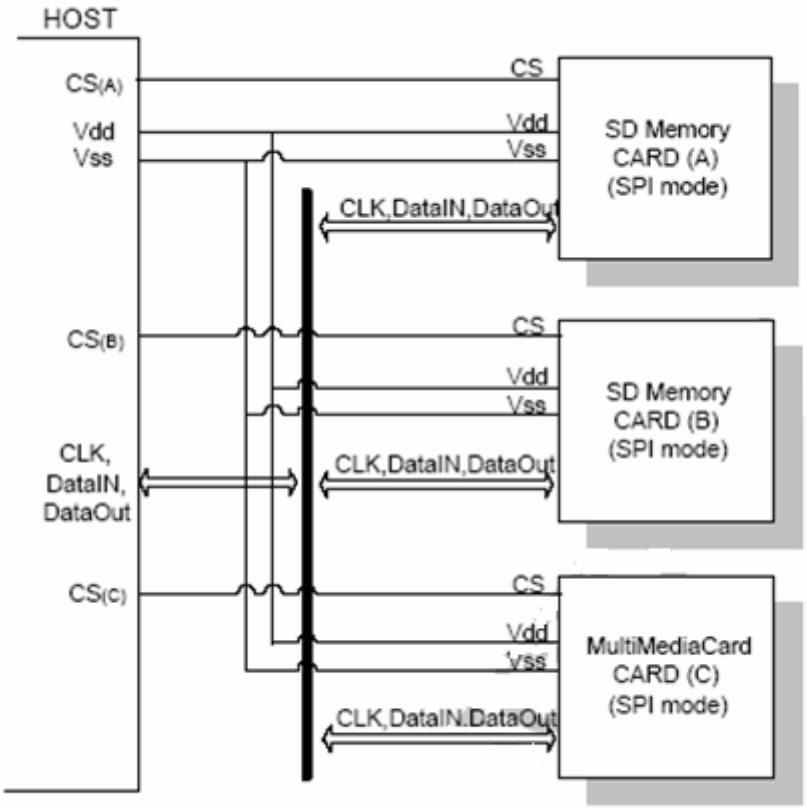
2.2.2 SPI Bus Connection

The SPI compatible communication mode of the SD Memory Card is designed to communicate with a SPI channel, commonly found in various microcontrollers in the market. The interface is selected during the first reset command after power up and cannot be changed as long as the part is powered on.
The SPI standard defines the physical link only, and not the complete data transfer protocol. The SD Memory Card SPI implementation uses the same command set of the SD mode. From the application point of view, the advantage of the SPI mode is the capability of using an off-the-shelf host, hence reducing the design-in effort to minimum. The disadvantage is the loss of performance, relatively to the SD mode which enables the wide bus option.
The SD Memory Card SPI interface is compatible with SPI hosts available on the market. As any other SPI device the SD Memory Card SPI channel consists of the following four signals:

CS: Host to card Chip Select signal
CLK: Host to card clock signal
DataIn: Host to card data signal
DataOut: Card to host data signal

Figure 3 SPI Bus Connections



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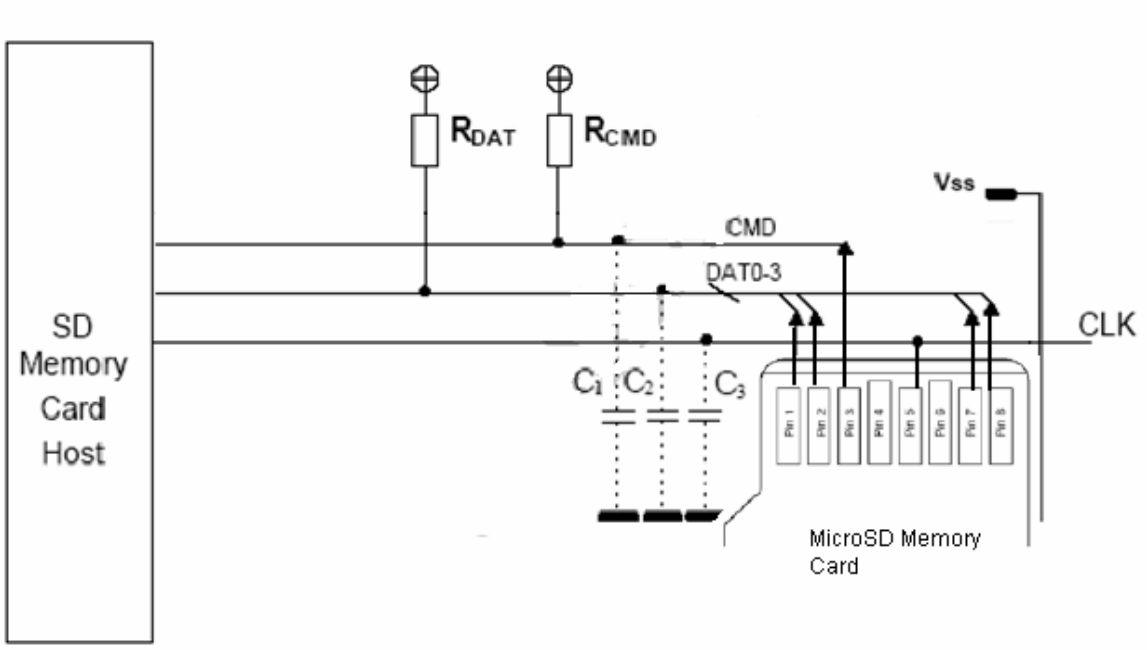
2.2.3 SD Memory Card Hardware Interface

Figure 4 SD Bus Host interface application



The SD Memory Card has six communication lines and three supply lines:

• **CMD**: Command is a bidirectional signal. The host and card drivers are operating in push pull mode.

• **DAT0-3**: Data lines are bidirectional signals. Host and card drivers are operating in push pull mode.

• **CLK:** Clock is a host to card signal. CLK operates in push pull mode.

• **V_{DD}**: V_{DD} is the power supply line for all cards.

• **V_{SS}** is ground line for all cards.

When DAT3 is used for card detection, RDAT for DAT3 should be unconnected and a resistor should be connected to the ground.

RDAT and RCMD are pull-up resistors protecting the CMD and the DAT lines against bus floating when no card is inserted or when all card drivers are in a high-impedance mode. The host shall pull-up all DAT0-3 lines by RDAT, even if the host uses SD Memory Card as 1 bit mode-only in SD mode. Also, the host shall pull-up all "RSV" lines in SPI mode, even though they are not used.

Refer to SD Memory Card Specifications Part1, Physical Layer Specification Version 1.10

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3. Mechanical Specifications

3.1 Card Package

Every card package shall have the characteristics described in the following sections.

3.1.1 Design and Format

Table 3: Micro-Sized SD – Dimensions Summary

Dimensions, Micro-Sized SD package	11 mm x 15 mm; (min. 10.9mm x 14.9mm; max.11.1mm x 15.1 mm) Testing according to MIL STD 883, Method 2016
Thickness	Inter Connect Area: 0.7mm+/-0.05mm Card Thickness: 0.95mm Max Pull Area: 1.0mm +/-0.1mm
Surface	Plain (except contact area)
Edges	Smooth edges
Inverse insertion	Protection on right corner (top view)
Position of ESC contacts	Along middle of shorter edge

3.1.2 Reliability and Durability

Table 4: Reliability and Durability

Temperature	Operation: -25°C / 85°C Storage: -40°C (168h) / 85°C (500h)
Moisture and corrosion	Operation: 25°C / 95% rel. humidity Storage: 40°C / 93% rel. hum./500h Salt water spray: 3% NaCl/35C; 24h acc. MIL STD Method 1009
Durability	10000 mating cycles.
Bending 1	10N
Torque 1	0.10N*m, ± 2.5° max
Drop test	1.5m free fall
UV light exposure	UV: 254nm, 15Ws/cm2 according to ISO 7816-1
Visual inspection shape and form 1	No mold skin; complete form; No cavities surface smoothness <= -0.1 mm/cm2 within contour; No cracks; no pollution (fat, oil dust, etc.)

Note: SDA's recommended test methods for torque, bending and warpage are defined separately.

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3.1.3 Electrical Static Discharge (ESD) Requirement

ESD testing should be conducted according to IEC 61000-4-2
Required ESD parameters are:
(1) Human body model +- 4 KV 100 pf / 1.5 K ohm
(2) Machine model +- 0.25 KV 200 pf / 0 ohm
Contact Pads:
+/- 4kV, Human body model according to IEC 61000-4-2
Non Contact Pads area:
+/-8kV (coupling plane discharge)
+/-15kV (air discharge)
Human body model according to IEC61000-4-2
The SDA's recommended test methods for the non-contact/air discharge tests are given in a separate Application Note document.

3.1.4 External Signal Contacts (ESC)

Table 5: Micro-Sized SD Package - External Signal Contacts

Number of ESC	8 minimum
Distance from front edge	1.1 mm
ESC grid	1.1 mm
Contact dimensions	0.8 mm * 2.9 mm
Electrical resistance	30m-ohm (worst case: 100m-ohm)

Contact discontinuity /micro-interrupt in accordance with application notes of SD Memory Card Specification Part 1, Physical Layer Specification Version 1.10

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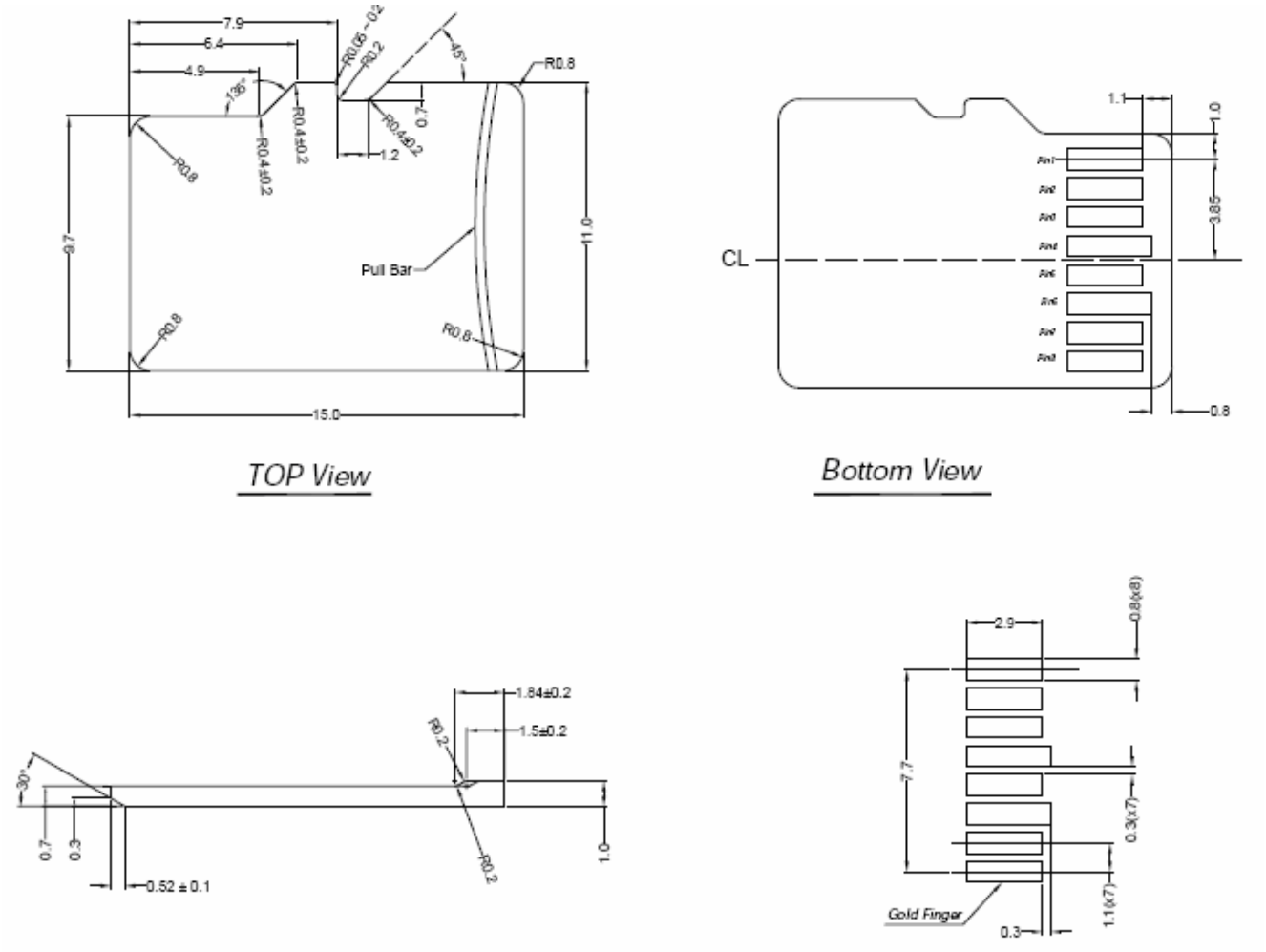
3.2 Mechanical Form Factor

Figure 5: Mechanical Description: Form Factor View



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4. Operating Conditions

4.1 General

Table 6 General Parameters

Parameter	Symbol	Min	Max.	Unit	Remark
Peak voltage on all lines		-0.3	V_{DD}+0.3	V	
All Inputs					
Input leakage current		-10	10	μA	
All Outputs					
Output leakage current		-10	10	μA	

4.2 Power Supply Voltage

Table 7 Power Supply Range

Parameter	Symbol	Min	Max.	Unit	Remark
Supply voltage	V_{DD}	2.0	3.6	V	CMD0, 15, 55, ACMD41 commands
Power up time			250	mS	From 0v to $V_{DD,min}$

4.3 Bus Signal Line Loading

The total capacitance CL the CLK line of the SD Memory Card bus is the sum of the bus master capacitance CHOST, the bus capacitance CBUS itself and the capacitance CCARD of each card connected to this line:
CL = CHOST + CBUS + N*CCARD

Table 8 Bus Line Loading

Parameter	Symbol	Min	Max.	Unit	Remark
Pull-up resistance	RCMD RDAT	10	100	kΩ	to prevent bus floating
Bus signal line capacitance	CL		100	pF	fPP ≤20 MHz, 7 cards
Single card capacitance	CCARD		10	pF	
Maximum signal line inductance			16	nH	fPP ≤20 MHz
Pull-up resistance inside card (pin1)	RDAT3	10	90	kΩ	May be used for card detection

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4.4 Bus Signal Levels

As the bus can be supplied with a variable supply voltage, all signal levels are related to the supply voltage.

Figure 6 Voltage Level

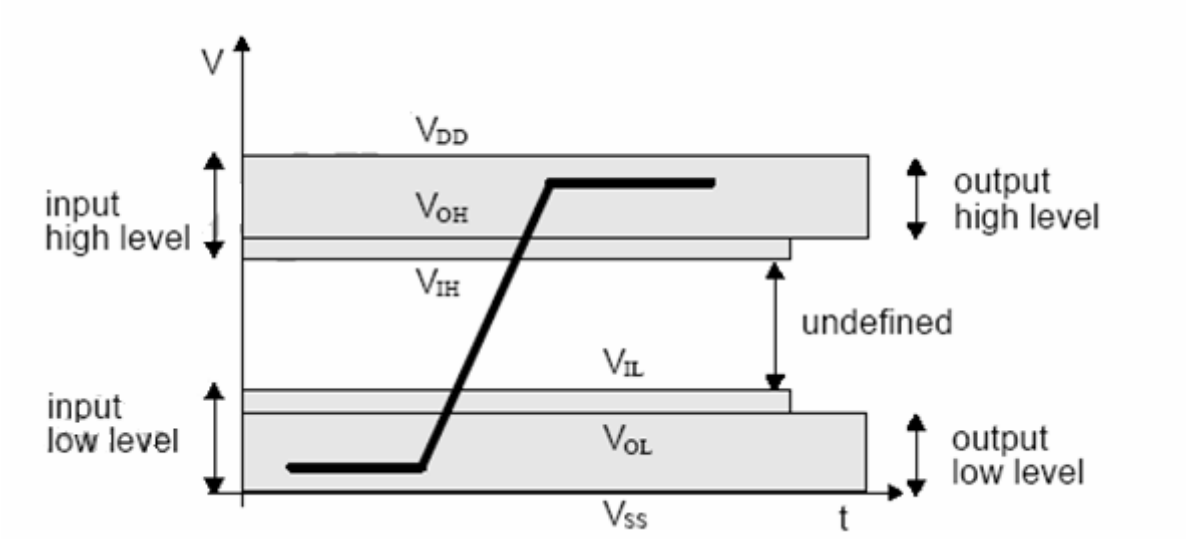

Table 9 Voltage Level

Parameter	Symbol	Min	Max.	Unit	Conditions
Output HIGH voltage	VOH	0.75 V_{DD}		V	IOH=-100 µA @$V_{DD,min}$
Output LOW voltage	VOL		0.125 V_{DD}	V	IOL=100 µA @$V_{DD,min}$
Input HIGH voltage	VIH	0.625 V_{DD}	V_{DD} + 0.3	V	
Input LOW voltage	VIL	V_{SS}-0.3	0.25 V_{DD}	V	

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4.5 Bus Timing

Figure 7 SD Bus Timing

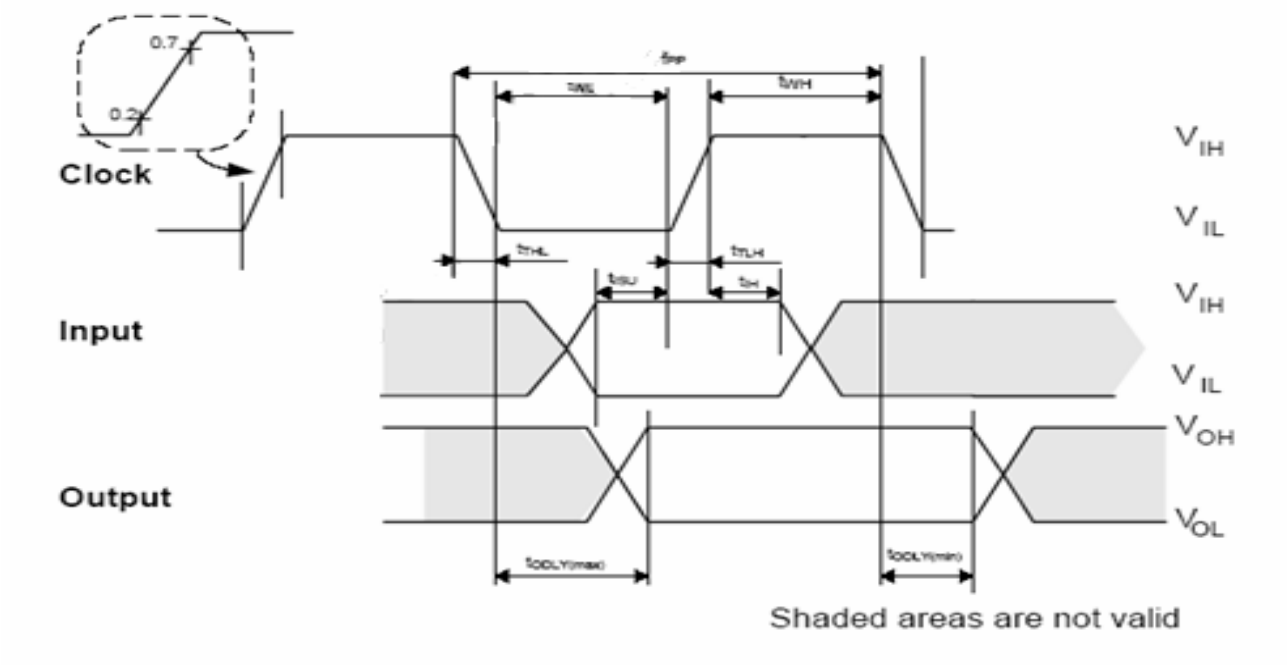

Table 10 SD Bus Timing

Parameter	Symbol	Min	Max.	Unit	Remark
Clock CLK (All values are referred to min (VIH) and max (VIL)					
Clock frequency Data Transfer Mode	f_{PP}	0	25	MHz	CL ≤100 pF
Clock frequency Identification Mode (the low freq. is required for MultiMediaCards compatibility).	f_{OD}	0(1)/100K Hz	400	KHz	CL ≤250 pF
Clock low time	t_{WL}	10		ns	CL ≤100 pF
Clock high time	t_{WH}	10		ns	CL ≤100 pF
Clock rise time	t_{TLH}		10	ns	CL ≤100 pF
Clock fall time	t_{THL}		10	ns	CL ≤100 pF
Inputs CMD, DAT (referenced to CLK)					
Input set-up time	t_{ISU}	5		ns	CL ≤25 pF
Input hold time	t_{IH}	5		ns	CL ≤25 pF
Outputs CMD, DAT(referenced to CLK)					
Output Delay time during Data Transfer Mode	t_{ODLY}	0	14	ns	CL ≤25 pF
Output Delay time during Identification Mode	t_{ODLY}	0	50	ns	CL ≤25 pF

(1) Zero Hz stops the clock. The given minimum frequency range is for cases where a continuous clock is required.

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5. Ordering Information

This chapter describes the coding system for MaxNova MicroSD Cards products.
To place orders for MaxNova products, contact sales@maxnova.com

MicroSD Flash Cards

- MV128F-SDU – 128 MB
  MV256F-SDU – 256 MB
  MV512F-SDU – 512 MB
  MV01GF-SDU – 1 GB

Table 11 MicroSD Card Part Number Coding System

Density \ Digits	1	2	3	4	5	6	7	8	9	10
512MB	**M**	**V**	**5**	**1**	**2**	**F**	**-**	**S**	**D**	**U**

Table 12 Coding Definitions

	Definition	Digits	Example	Description
1-2	Manufacturing Company	2	MV	MaxNova
3-5	Density	3	128	128 MByte
			256	256 MByte
			512	512 MByte
			01G	01 GByte
6-7	Technology -	2	F -	Technology, F: Flash
8-10	Card type	3	SDU	Micro-Sized Secure Digital Card

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