

ATP Industrial Grade SD Card Specification

Revision 1.5



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Revision History

Date	Version	Changes compared to previous issue
Apr. 5 th , 2005	1.0	- Base version
May. 24 th , 2005	1.1	- Odd Size card (384MB, 768MB, 1.28GB and 1.54GB) P/N and images added
Jul. 22 nd , 2005	1.2	- “X” rating speed changed from 60X to 80X - Operating temperature changed from -25~85C to -40C~85C
Feb. 3 rd , 2006	1.3	- Add in the basic communication Voltage - Typo on VOH, VOL, VIH and VIL values
Sep. 11 th , 2006	1.4	- Document format change and typo correction - Update bus timing data - Remove the basic communication Voltage - Combine “Speed in “X” rating” and “data transfer rate”
Apr. 27 th , 2007	1.5	-Remove odd size card -Modify the performance of the card -Update Number of insertions data

Card Images



Capacities:

ATP P/N	CAPACITY
AF128SDI	128MB
AF256SDI	256MB
AF512SDI	512MB
AF1GSDI	1GB
AF2GSDI	2GB

SD Card Pad Assignment:

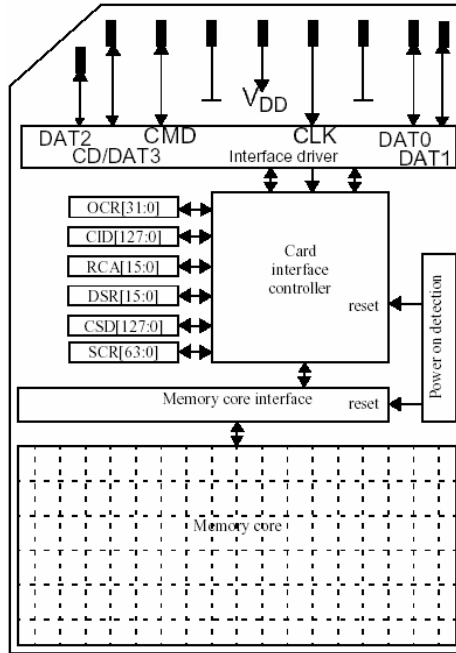
Pin #	SD Mode			SPI Mode		
	Name	Type ¹	Description	Name	Type ¹	Description
1	CD/DAT3 ²	I/O/PP ³	Card Detect /Data Line (Bit 3)	CS	I ³	Chip Select (Active Low)
2	CMD	PP	Command/ Response	DI	I/PP	Data In
3	V _{SS1}	S	Supply Voltage Ground	V _{SS1}	S	Supply Voltage Ground
4	V _{DD}	S	Supply Voltage	V _{DD}	S	Supply Voltage
5	CLK	I	Clock	SCLK	I	Clock
6	V _{SS2}	S	Supply Voltage Ground	V _{SS2}	S	Supply Voltage Ground
7	DAT0	I/O/PP	Data Line (Bit 0)	DO	O/PP	Data Out
8	DAT1	I/O/PP	Data Line (Bit 1)	RSV		
9	DAT2	I/O/PP	Data Line (Bit 2)	RSV		

- 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 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 user, during regular data transfer, with SET_CLR_CARD_DETECT (ACMD42) command.

Your Ultimate Memory Solution!

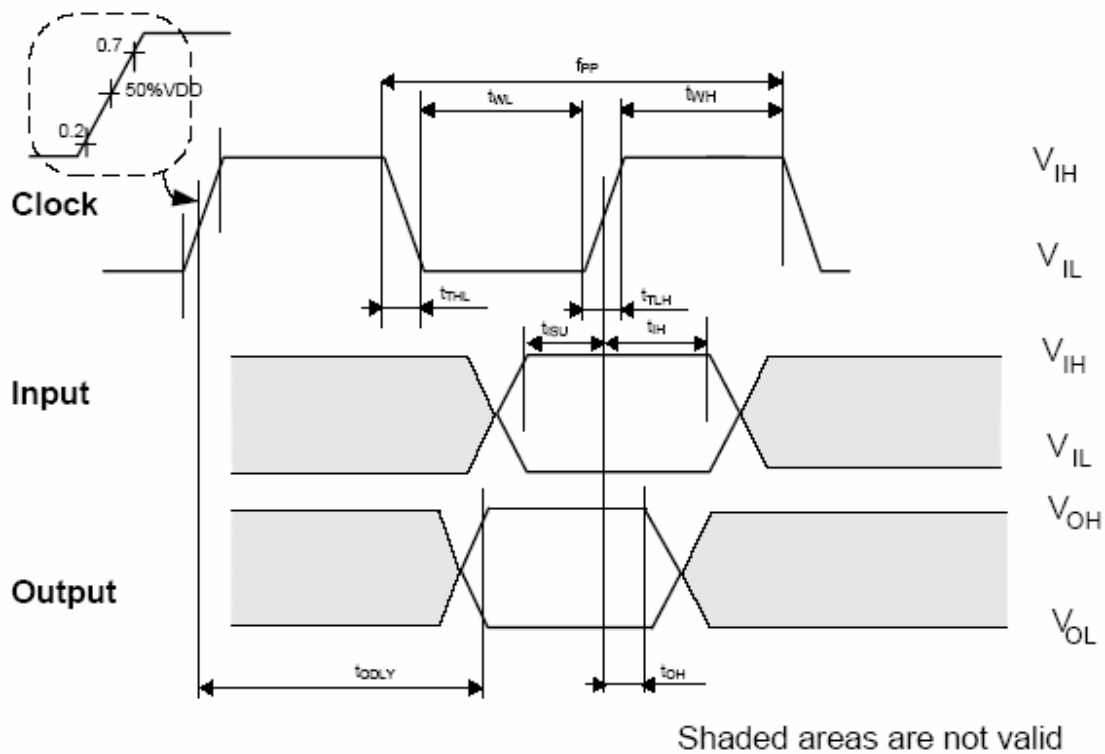


Functional Block Diagram:



Bus Operating Conditions:

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Supply voltage	V_{DD}	2.7	3.3	3.6	V	
Operating Current	I_{CC}	-	30	50	mA	
Standby Current	I_{SB}	-	-	200	μA	
Input Leakage Current	I_{LI}	-10	-	10	μA	
Output Leakage Current	I_{LO}	-10	-	10	μA	
Input High Voltage	V_{IH}	$0.625 \times V_{DD}$	-	$V_{DD} + 0.3$	V	
Input Low Voltage	V_{IL}	$V_{SS} - 0.3$	-	$0.25 \times V_{DD}$	V	
Output High Voltage	V_{OH}	$0.75 \times V_{DD}$	-	-	V	
Output Low Voltage	V_{OL}	-	-	$0.125 \times V_{DD}$	V	



High Speed Mode Bus Timing:

Parameter	Symbol	Min	Max	Unit	Remark
Clock CLK (All values are referred to min (V_{IH}) and max (V_{IL}))					
Clock frequency Data Transfer Mode	f_{PP}	25	50	MHZ	$C_L \leq 30$ pF(1 card)
Clock low time	t_{WL}	6.5	-	ns	$C_L \leq 30$ pF(1 card)
Clock high time	t_{WH}	6.5	-	ns	$C_L \leq 30$ pF(1 card)
Clock rise time	t_{TLH}	-	3	ns	$C_L \leq 30$ pF(1 card)
Clock fall time	t_{THL}	-	3	ns	$C_L \leq 30$ pF(1 card)
Inputs CMD, DAT (referenced to CLK)					
Input set-up time	t_{ISU}	3	-	ns	$C_L \leq 30$ pF(1 card)
Input hold time	t_{IH}	3	-	ns	$C_L \leq 30$ pF(1 card)
Outputs CMD, DAT (referenced to CLK)					
Output Delay time during Data Transfer Mode	t_{ODLY}	3	7	ns	$C_L \leq 30$ pF(1 card)

Default Bus Timing:

Parameter	Symbol	Min	Max	Unit	Remark
Clock CLK (All values are referred to min (V_{IH}) and max (V_{IL}))					
Clock frequency Data Transfer Mode	f_{PP}	0	25	MHz	$C_L \leq 30$ pF(1 card)
Clock frequency Identification Mode	f_{OD}	0	400	KHz	$C_L \leq 30$ pF(1 card)
Clock low time	t_{WL}	10	-	ns	$C_L \leq 30$ pF(1 card)
Clock high time	t_{WH}	10	-	ns	$C_L \leq 30$ pF(1 card)
Clock rise time	t_{TLH}	-	10	ns	$C_L \leq 30$ pF(1 card)
Clock fall time	t_{THL}	-	10	ns	$C_L \leq 30$ pF(1 card)
Inputs CMD, DAT (referenced to CLK)					
Input set-up time	t_{ISU}	3	-	ns	$C_L \leq 30$ pF(1 card)
Input hold time	t_{IH}	3	-	ns	$C_L \leq 30$ pF(1 card)
Outputs CMD, DAT (referenced to CLK)					
Output Delay time during Data Transfer Mode	t_{ODLY}	3	7	ns	$C_L \leq 30$ pF(1 card)

Environment Specifications:

Type		Standard
Temperature	Operating	-40°C to 85°C
	Non-Operating	-40°C to 85°C
Humidity	Operating	8% to 95%, noncondensing
	Non-Operating	8% to 95%, noncondensing
Vibration	Operating	15G peak-to-peak Max.
	Non-Operating	15G peak-to-peak Max.
Shock	Operating	1,000G Max.
	Non-Operating	1,000G Max.
Altitude	Operating	80,000 feet Max.
	Non-Operating	80,000 feet Max.

Reliability:

Type	Measurement
Number of insertions	10,000 minimum
Data Retention	10 years
Endurance	>2,000,000 cycles (program/erase, in normal applications)
MTBF (@ 25°C)	>2,000,000 hours

Electrical Characteristics:

Type	Measurement
Card supported Voltage	2.7~3.6V
Card supported Frequency	0~50 MHz
Data Bus Width Supported	1 or 4 bits

Performance:

Type	Measurement
Data Transfer Rate	≤1GB up to 12MB/s (80X)
	2GB up to 22.5MB/s (150X)

Extra Features:

Type	Measurement
Water Proof	Yes
Dust Proof	Yes
ESD Proof	Yes

Physical Dimension Specifications (Units in MM):

Type	Measurement
Length	32mm +/- 0.10mm
Width	24mm +/- 0.10mm
Thickness	2.1mm +/- 0.15mm
Weight	2.0g Max.

