



# Memory Stick Information for Developers

Memory Stick ►► Electrical Specifications

## 4. Electrical Specifications

### 4.1. Overview

Electrical specifications of Memory Stick

Number of connector pins	: 10
Connector shape	: Planar electrode one-row
Write speed	: 1,800 KB ~ 330 KB/s *1
Read speed	: 2.45 MB/s *1
Capacity	: 4 MB ~ 128 MB
Write unit	: 512 B
Erase block size	: 8KB or 16KB
Power source voltage	: 2.7 ~ 3.6 V
Serial clock	: 20 MHz(MAX)

\*1:Burst data transfer rate with overhead taken into account.

#### 4.1.1. Block Diagram

Fig. 4.1.1 shows an example of Memory Stick block diagram in which NAND-type flash memory and its controller are built.

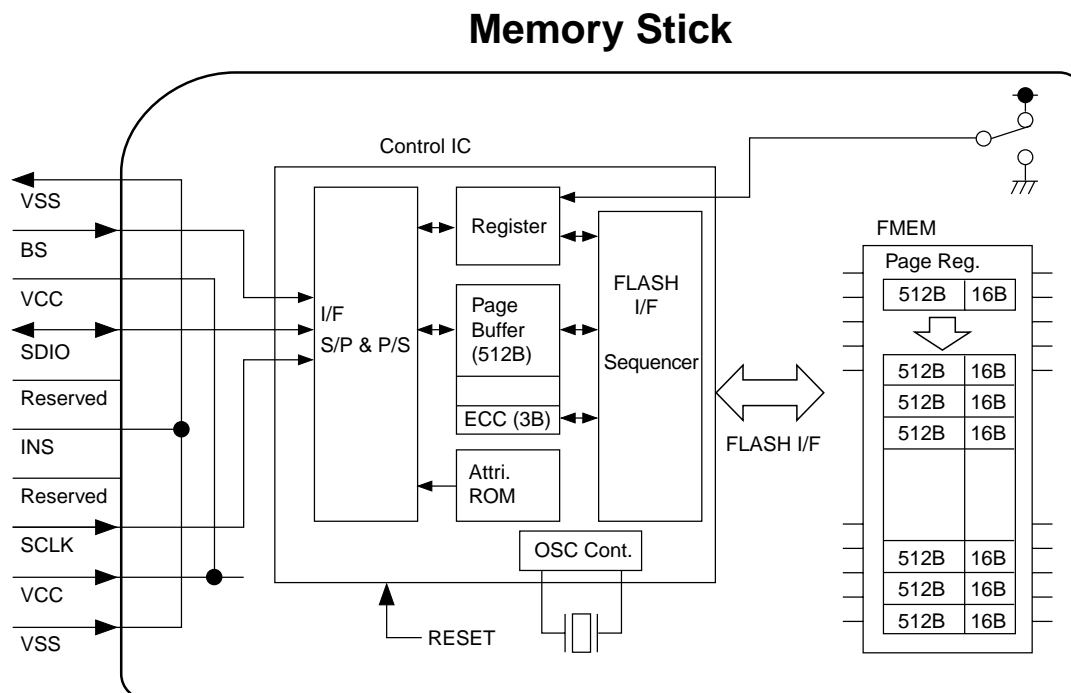


Fig. 4.1.1 Block Diagram(example)

#### 4.1.2. Interface

Memory Stick is read or written by half-duplex serial protocol of three-wire system as shown in Fig. 4.1.2 (See Section 5.3 for details.)

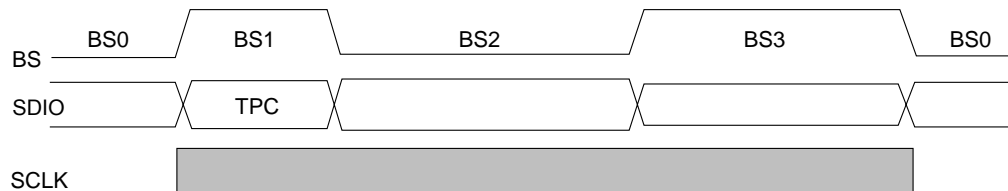


Fig. 4.1.2 Interface

4.2. Pin Assignment

Fig. 4.2.1 shows the pin assignment of Memory Stick.

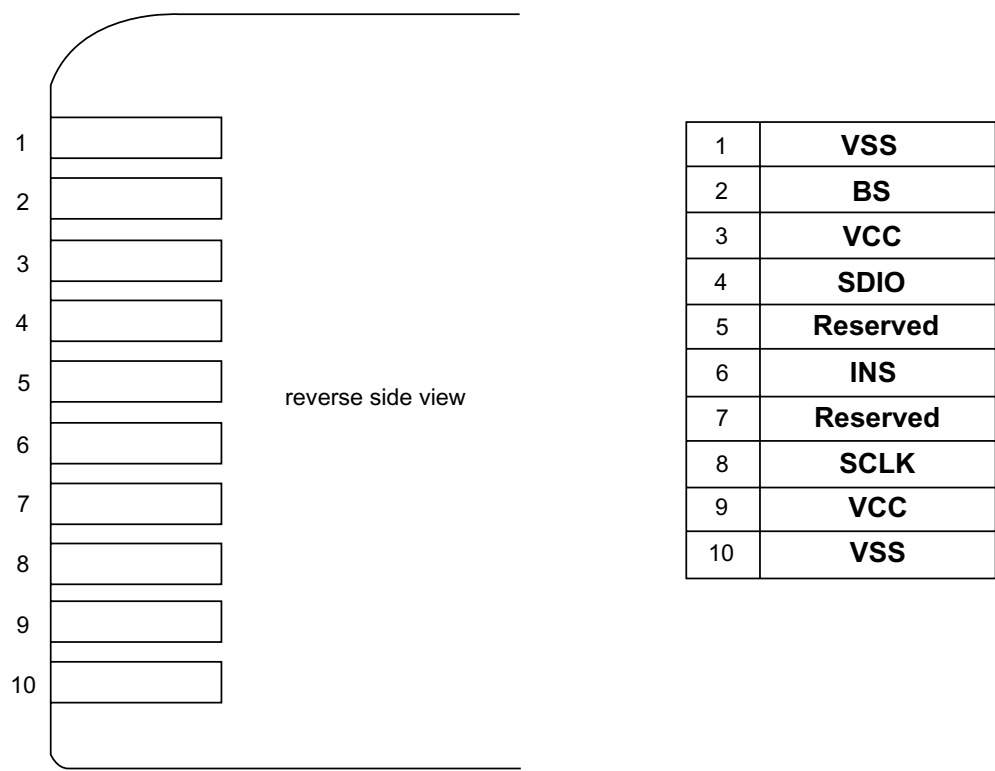


Fig. 4.2.1 Pin Assignment

### 4.3. Signal Description

**Table 4.3.1 Signal Description**

No.	Pin name	I/O	Pin function
1	VSS		Vss
2	BS	I	Serial protocol bus state signal
3	VCC	I	Vcc
4	SDIO	I/O	Serial protocol data signal
5	Reserved		Reserved
6	INS	O	Stick insertion/extraction detect-terminal
7	Reserved		Reserved
8	SCLK	I	Serial protocol clock signal
9	VCC	I	Vcc
10	VSS		Vss

## 4.4. Electrical Characteristics

### 4.4.1. Absolute Maximum Ratings

Stress over absolute maximum ratings may cause permanent damage to Memory Stick. Normal logical operation under these conditions is not guaranteed.

**Table 4.4.1 Absolute Maximum Ratings**

Parameter	Symbol	Standards	Unit
Power source voltage	V <sub>cc</sub>	−0.5~+4.5	V
Input voltage	V <sub>i</sub>	−0.3~V <sub>cc</sub> +0.3	V
Output voltage	V <sub>o</sub>	−0.3~V <sub>cc</sub> +0.3	V
Operation ambient temperature	T <sub>op</sub>	−5~+65	°C
Storage ambient temperature *1	T <sub>st</sub>	−20~+80	°C
Output current *2	I <sub>o</sub>	I <sub>ol</sub> =3.2mA + 40(V <sub>o</sub> =V <sub>cc</sub> ) −40(V <sub>o</sub> =0V)	mA
Overshoot	—	Within V <sub>cc</sub> +1.0 *3	V
Undershoot	—	Within −1.0 *3	V

\*1 : When data is retained

\*2 : One second for one terminal

\*3 : Within 50ns

### 4.4.2. Recommended Operating Conditions

Memory Stick shall be used under the recommended operating conditions to ensure normal logical operation.

DC and AC characteristics described in pages to follow are guaranteed as long as Memory Stick is used under the recommended operating conditions.

**Table 4.4.2 Recommended Operating Conditions**

Parameter	Symbol	Standards			Unit
		Min.	Typ.	Max.	
Power source voltage	V <sub>cc</sub>	2.7	—	3.6	V
H-level input voltage	V <sub>IH</sub>	V <sub>cc</sub> × 0.7	—	V <sub>cc</sub>	V
L-level input voltage	V <sub>IL</sub>	0	—	V <sub>cc</sub> × 0.3	V
Operation ambient temperature	T <sub>op</sub>	−5	—	+65	°C

Note) Above voltage values are measured at Memory Stick terminal without causing voltage drop by contact resistance etc.

#### 4.4.3. DC and Operating Characteristics

DC characteristics are to guarantee the values of static characteristics of input-output buffer under the recommended operating conditions.

**Table 4.4.3 DC and Operating Characteristics**

(Measurement conditions : V<sub>cc</sub> = 2.7 ~ 3.6 V, T<sub>a</sub> = 0 ~ 60°C)

Parameter	Symbol	Standards			Unit
		Min.	Typ.	Max.	
H-level input voltage	V <sub>IH</sub>	V <sub>cc</sub> × 0.7	—	V <sub>cc</sub>	V
L-level input voltage	V <sub>IL</sub>	0	—	V <sub>cc</sub> × 0.3	V
H-level output voltage	V <sub>OH</sub>	V <sub>cc</sub> − 0.3	—	V <sub>cc</sub>	V
L-level output voltage	V <sub>OL</sub>	0	—	0.4	V
Pull-down resistance	R <sub>PD</sub>	25	—	200	k Ω
Operating current (for access)	I <sub>CCO1</sub>	—	35	45	mA
Average operating current (for program)	I <sub>CCO2</sub>	—	45	65	mA
Average operating current (for erase)	I <sub>CCO3</sub>	—	35	45	mA
Stand-by current	I <sub>CCS</sub>	—	—	130	μA

**4.4.4. AC Characteristics****Table 4.4.4 AC Characteristics****(Measurement conditions : Vcc = 2.7 ~ 3.6V, Ta = 0 ~ 60 °C)**

Signal	Parameter	Symbol	Standards		Unit
			Min.	Max.	
SCLK	Cycle	tSCLKc	50	—	nsec
	H pulse length	tSCLKwh	15	—	nsec
	L pulse length	tSCLKwl	15	—	nsec
	Rise time	tSCLKr	—	10	nsec
	Fall time	tSCLKf	—	10	nsec
BS	Set-up time	tBSsu	5	—	nsec
	Hold time	tBSsh	5	—	nsec
DATA	Set-up time	tDsu	5	—	nsec
	Hold time	tDh	5	—	nsec
	Output delay time	tDd	—	15	nsec

※ The values are provisional and will not guarantee the specification values of final products.

※ Set up time shall be reserved to read out data on the host side, in consideration of the output delay time of Memory Stick.



[SCLK Timing]

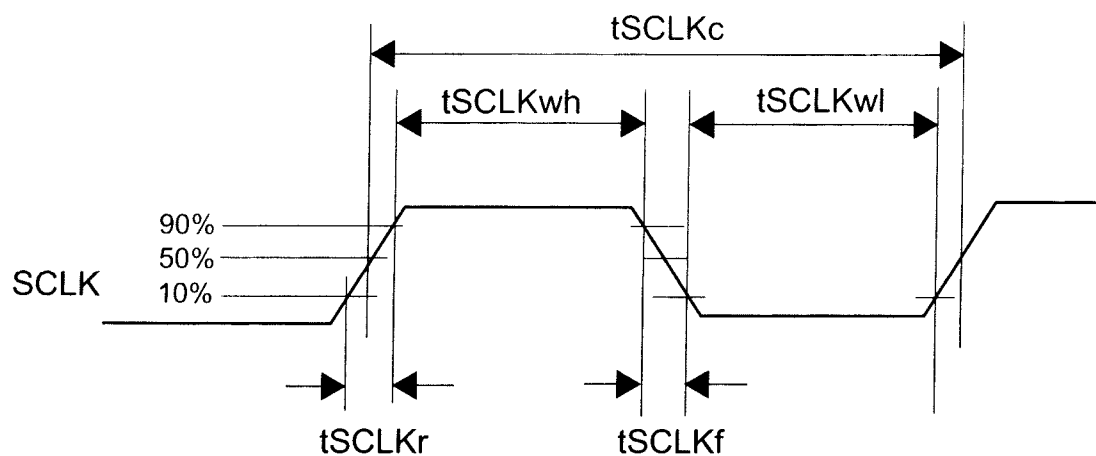


Fig. 4.4.1 Serial Clock

[Serial Transfer Operation Timing]

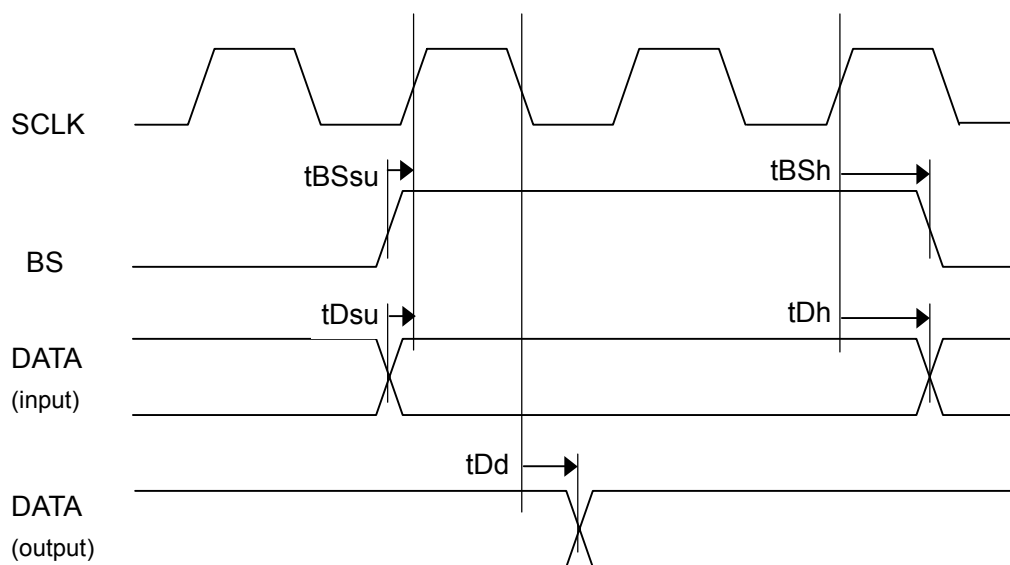


Fig. 4.4.2 Serial Interface

#### 4.4.5. Capacitance

**Table 4.4.5 Capacitance (Measurement conditions : Ta = 25°C、Vcc = Vi = 0V、f = 1MHz)**

Parameter	Symbol	Standards			Unit
		Min.	Typ.	Max.	
Input terminal	CIN	—	—	26	pF
Input/output terminal	CI/O	—	—	26	pF

Connector terminal capacitance shall also be taken into account in designing Appliances .

#### 4.5. Insertion Detect

Insertion/extraction of Memory Stick is detected through signal of no.6 pin.

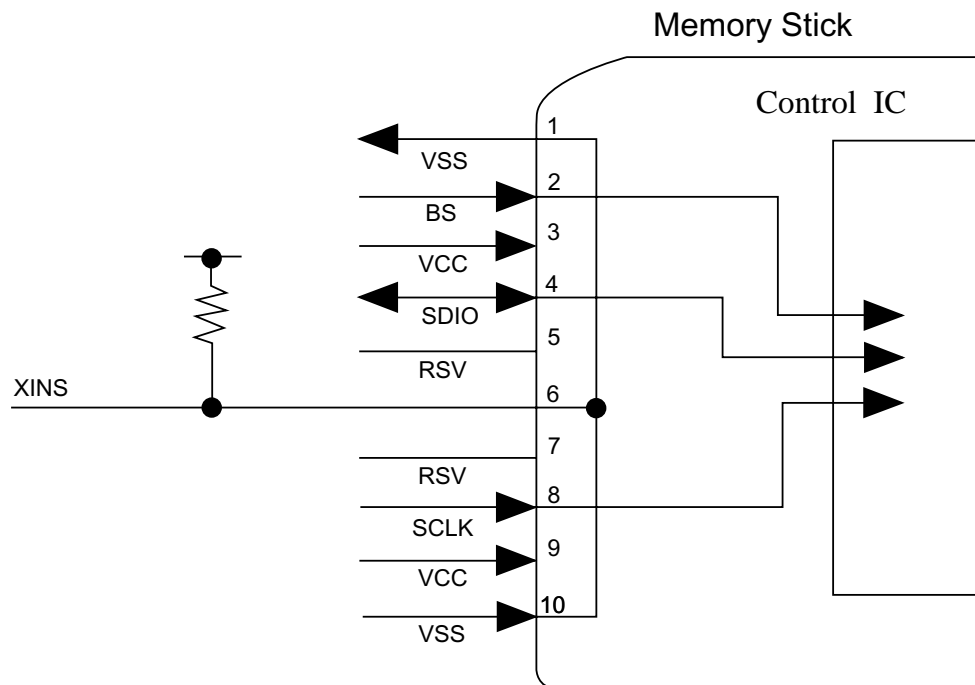


Fig. 4.5.1 Insertion Detect

#### **4.6. Termination**

Three serial signal lines are pulled down in the control IC of Memory Stick (see DC characteristics for the value), however, it is recommended to put optimal termination in each system.

**4.7. Power Supply ON/OFF Procedure**

The power supply of Appliances shall be turned on after insertion and detection of Memory Stick, and shall be turned off before it is pulled out.

As appliances are turned on, Memory Stick takes 1 msec for internal initialization after power supply voltage exceeds 2.6 V, during that time, it is unable to access to Memory Stick.

#### 4.8. Attribute Information

Memory Stick holds physical information necessary to Appliance inside the boot block. The system shall decide whether it can correspond to the Memory Stick or not, by reading out the boot block immediately after the power supply is turned on.

(See “Section 7 Physical Format” for details.)

#### 4.9. Write-protect Switch

Memory Stick has built-in a write protect switch against accidental erasure of data.

The status of this switch is detected by reading Status Register0 as follows:

StatusRegister0 bit0: WP (Write-protect bit)

WP=1: Write-protect ON (Locked)

WP=0: Write-protect OFF (Unlocked)

When WP=1, creation of new files and erasure of existing files in the user area shall be prohibited.