



# Memory Stick Information for Developers

Basic Technology on Memory Stick ▶▶ Physical/Electrical Specifications

## ▶ Basic Technology on Memory Stick

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### ■ Physical Specifications

Out look

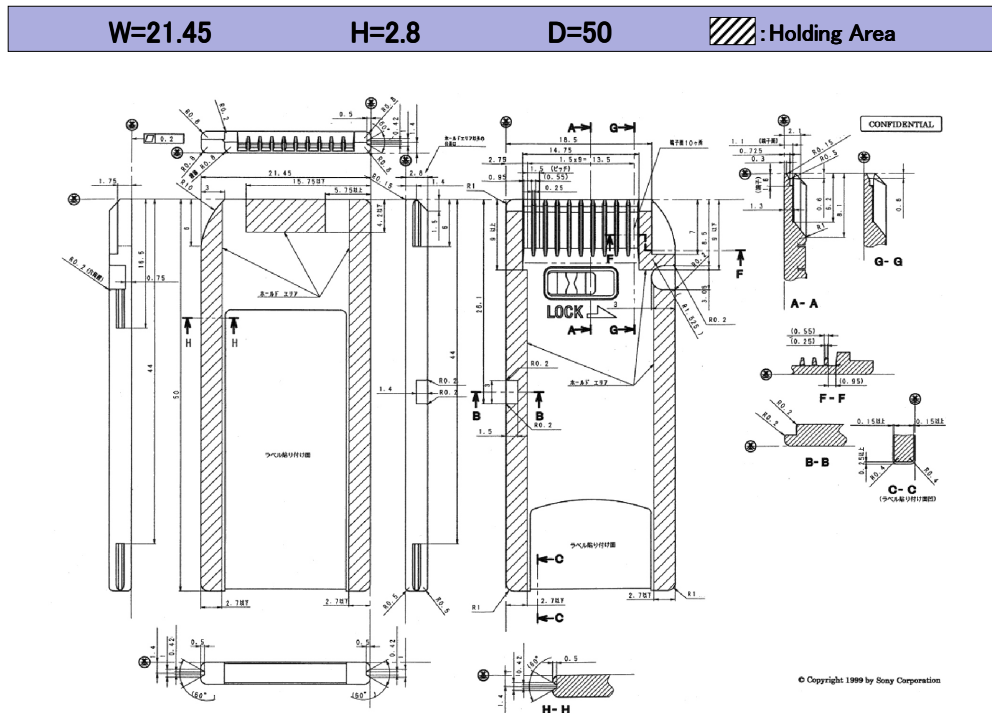


This is Standard Memory Stick.

## Basic Technology on Memory Stick

### Physical Specifications

Dimension



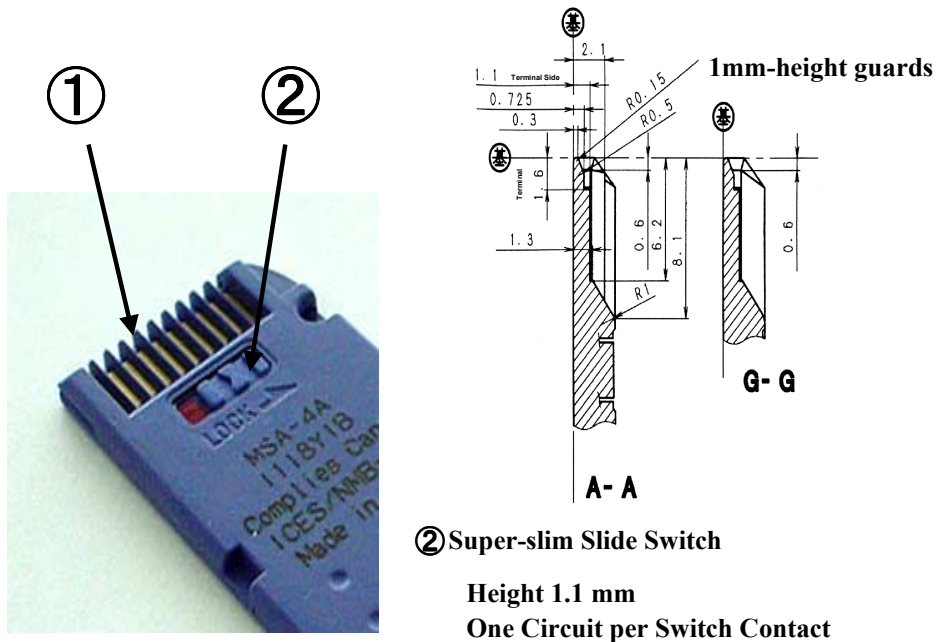
This is the drawing of Memory Stick.  
Dimension is 21.45mm(W) x 2.8mm(H) x 50mm(D).

## Basic Technology on Memory Stick

### Physical Specifications

Function 1

#### ① Direct Contact Prevention Structure



#### ② Super-slim Slide Switch

Height 1.1 mm  
One Circuit per Switch Contact

Memory Stick physical specifications.

The contact part has 1mm-height guard to prevent direct touch by finger and scratch by a hard object.

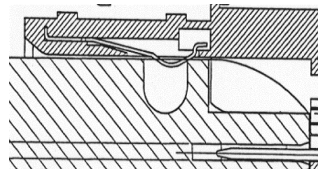
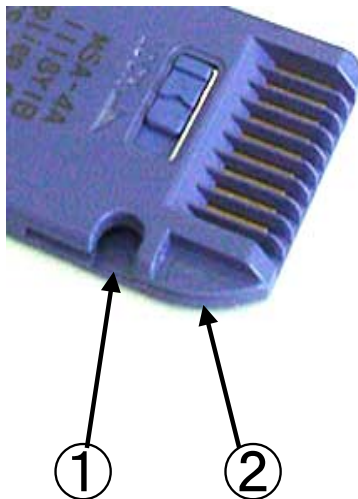
The switch is super-slim slide switch. Its height is 1.1 mm and each circuit is connected with each contact part. This switch is for accidental erasure prevention.

## Basic Technology on Memory Stick

### Physical Specifications

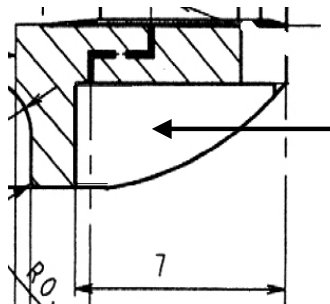
#### Function 2

##### ① Holding, Insertion Confirmation Structure



Spring on Connector Side

##### ② Prevent inverted insertion



Stopper  
on Connector Side

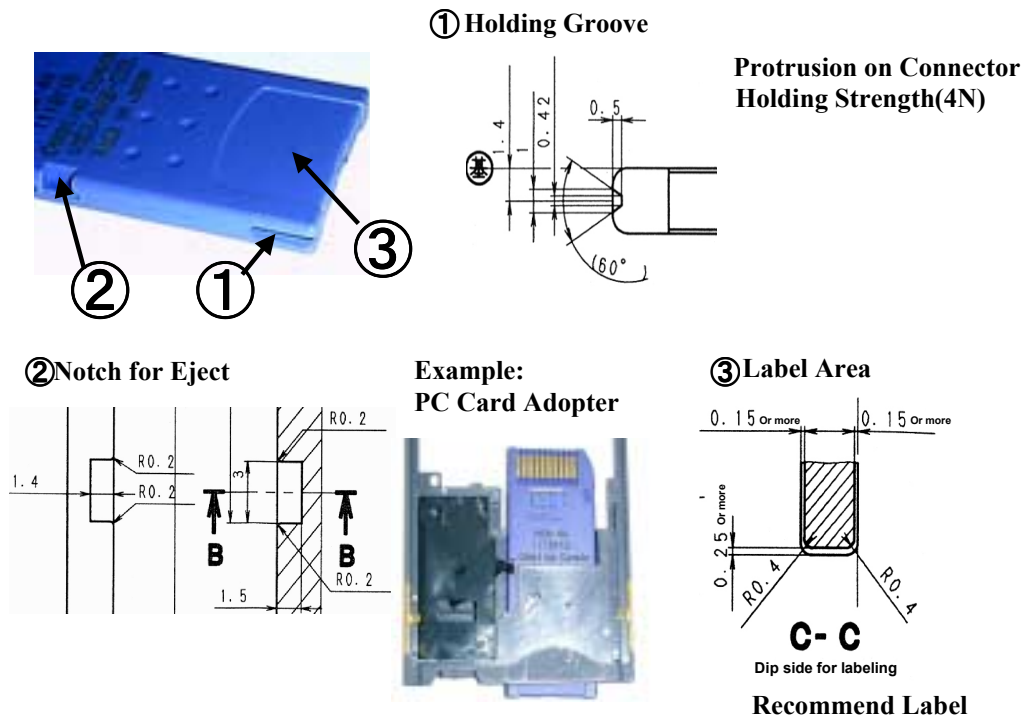
The notch ① is for holding and ensuring insertion feeling with the spring on the connector side.

The notch ② is for wrong insertion prevention with the stopper on connector.

## Basic Technology on Memory Stick

### Physical Specifications

#### Function 3



The groove on notch is to maintain holding strength on connector side.

The notch is for eject.

is label area.

## Basic Technology on Memory Stick

### Physical Specifications

#### Connector

#### Requirements for Connector

**Contact Reliability** : Before Test less than  $40\text{m}\Omega$ , After Test less than  $500\text{m}\Omega$

**Contact Location** : Upon Insertion, Prevent contact with case

**Contact Pressure** :  $0.5\text{N}$  (Contact Bending  $0.2\text{mm}$ )

#### Connectors



**For Injector**  
(Mass Production Unit)

**Mass Production Unit**



**With Injector**  
(Mass Production Unit)

Here are requirements for Memory Stick connector.

Connector contact location prevents friction with exterior case.

Contact pressure is  $0.5\text{N}$  when contact displacement is  $0.2\text{mm}$ .

## ▶ Basic Technology on Memory Stick

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### ■ Reliability Testing Standards Condition Specification

Condition, Specification

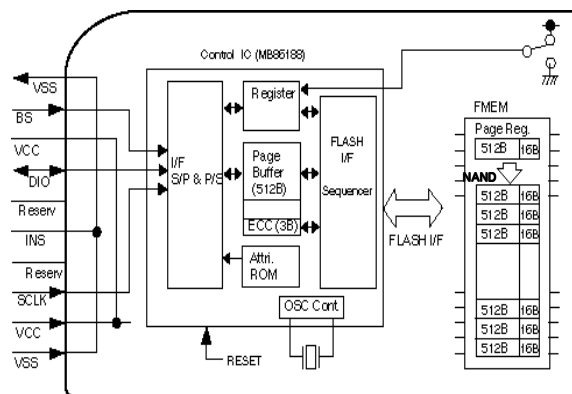
( Not on public )



## Basic Technology on Memory Stick

### Electrical Specifications

General, Block diagram



#### Specifications

<b>Connector Pin</b>
10 Pins
<b>Connector Shape</b>
Planar electrode one-row
<b>Write Speed</b>
1,800 KB ~ 330 KB/s
<b>Read Speed</b>
2.45 MB/s *1
<b>Capacity</b>
4 MB ~
<b>Write Unit</b>
512 B
<b>Erase Block Size</b>
8 KB or 16 KB
<b>Power Source Voltage</b>
2.7 ~ 3.6 V
<b>Serial Clock</b>
20 MHz(MAX)

This is block diagram of Memory Stick.

Memory Stick consists of a controller IC and NAND flash memory.

Controller consists of serial-pararell/pararell-serial interface block, register to set various data, page buffer of 512 byte, ECC generator block, interface block for flash memory, etc.

Flash memory can be either NAND or AND as the controller adjust the difference. Current controller is for NAND. In case the capacity increases and flash memory's spec is changed, this adjustment is possible by the controller.

Ten pin assignment is as shown in the table. Signals necessary for serial transfer is SCLK(serial clock), BS(bus state), SDIO(serial data I/O).

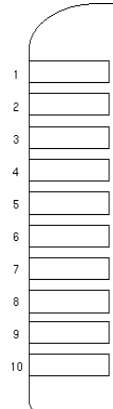
1. Number of the connectors is 10.
2. Connector form is planer electrode one-row.
3. Write speed is 1,800MB - 330KB/s. Depends on flash memory cell.
4. Read speed is 2.45MB/s.
5. Minimum capacity is 4MB.
6. Write unit is 512B.
7. Erase block size is 8KB or 16 KB.
8. Power source voltage is 2.7 - 3.6V.
9. Serial clock is 20MHz (MAX).

## Basic Technology on Memory Stick

### Electrical Specifications

Pin Assignment, Interface

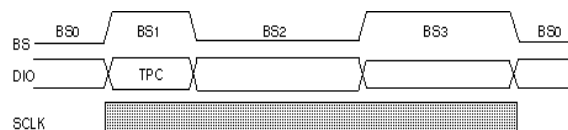
#### Pin Assignment



No.	Pin Name	I/O	Pin Function
1	VSS		VSS
2	BS	I	Serial Protocol bus state signal
3	VCC	I	VCC
4	DIO	I/O	Serial Protocol data signal
5	Reserve		Reserved
6	INS	O	Stick insertion/extraction detect-terminal
7	Reserve		Reserved
8	SCLK	I	Serial Protocol clock signal
9	VCC	I	VCC
10	VSS		VSS

#### Interface

Memory Stick is read or written by half-duplex serial protocol of three-wire system (Ref, Protocol Section)



The chart shows connector pin interface.

Memory Stick is read or written by half-duplex serial protocol of three-wire system.

More details will be explained later.

## Basic Technology on Memory Stick

### Electrical Specifications

#### Electrical Characteristics 1

##### Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Power Source Voltage	Vcc	-0.5~+4.5	V
Input Voltage	Vi	-0.3~Vcc+0.3	V
Output Voltage	Vo	-0.3~Vcc+0.3	V
Operation Ambient Temp	Top	-5~+65	°C
Storage Ambient Temp *1	Tst	-20~+80	°C
Output Current *2	Io	Iol=3.2mA + 40(Vo=Vcc) -40(Vo=0V)	mA
Overshoot		Vcc+1.0 or less *3	V
Undershoot		-1.0 or less *3	V

\*1: When data is retained

\*2: One sec. Per terminal

\*3: within 50ns

##### Recommended Operating Conditions

Parameter	Symbol	Rating			Units
		Min	typ	MAX	
Power Source Voltage	Vcc	2.7	—	3.6	V
H-level input voltage	VIH	Vcc × 0.7	—	Vcc	V
L-level input voltage	VIL	0	—	Vcc × 0.3	V
Operation Ambient Temp	Top	-5	—	+65	°C

Note: Voltage values are  
Memory Stick terminal  
without voltage drop

Electrical characteristics.

Absolute maximum ratings and recommended operating conditions are shown in the table.

## Basic Technology on Memory Stick

### Electrical Specifications

#### Electrical Characteristics 2

#### DC Characteristics

(Measurement Conditions :  $V_{cc} = 2.7-3.6 \text{ V}$ ,  $T_a = 0-60^\circ\text{C}$ )

Parameter	Symbol	Rating			Unit
		Min	typ	MAX	
H-level input voltage	$V_{IH}$	$V_{cc} \times 0.7$	–	$V_{cc}$	V
L-level input voltage	$V_{IL}$	0	–	$V_{cc} \times 0.3$	V
H-level output voltage	$V_{OH}$	$V_{cc}-0.3$	–	$V_{cc}$	V
L-level output voltage	$V_{OL}$	0	–	0.4	V
Pull-down resistance	RPD	40	100	200	k $\Omega$
Operating current(for access)	ICC01	–	35	45	mA
Average operating current(for program)	ICC02	–	45	65	mA
Average operating current(for erase)	ICC03	–	35	45	mA
Stand-by current	ICCS	–	–	130	$\mu\text{A}$

DC characteristics are shown in the table.

## Basic Technology on Memory Stick

### Electrical Specifications

Electrical Characteristics 3

#### AC Characteristics

(Measurement Conditions : Vcc = 2.7-3.6 V, Ta = 0-60°C)

Signal	Parameter	Symbol	Rating		Units
			Min	MAX	
SCLK	Cycle	tSCLKc	50	–	nsec
	H Pulse Length	tSCLKwh	15	–	nsec
	L Pulse Length	tSCLKwl	15	–	nsec
	Rise Time	tSCLKr	–	5	nsec
	Fall Time	tSCLKf	–	5	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

AC characteristics are shown in the table.

## ▶ Basic Technology on Memory Stick

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### ■ Electrical Specifications

Others

#### **Insertion / Extraction Detect**

Detected through signal of pin #6. (connected to Vss).

#### **Termination**

Three serial signal lines are pulled down in the control IC of Memory Stick, but it is recommended to put optimum termination in each system.

#### **Power Supply ON/OFF Procedure**

For 1 msec after power supply voltage exceeds 2.6V, internal initialization takes place and data is not accessible.

#### **Attribute Information**

Memory Stick has necessary physical information inside the boot block. The system is required to decide whether the system can correspond to the Memory Stick or not, by reading out the boot block just after the power supply is turned on. (Ref. Section 7 “Physical Format”)

Other electrical specifications. Pin 6 is used for eject detection.

Optimum termination in each system is recommended for serial signal.

Memory Stick has been designed so that the power supply shall be on after insertion is detected on the appliance and shall be off before the Memory Stick is pulled out.

For 1 msec after power supply voltage exceeds 2.6V, internal initialization takes place and data is not accessible.

Memory Stick has attribute information in BOOT block.