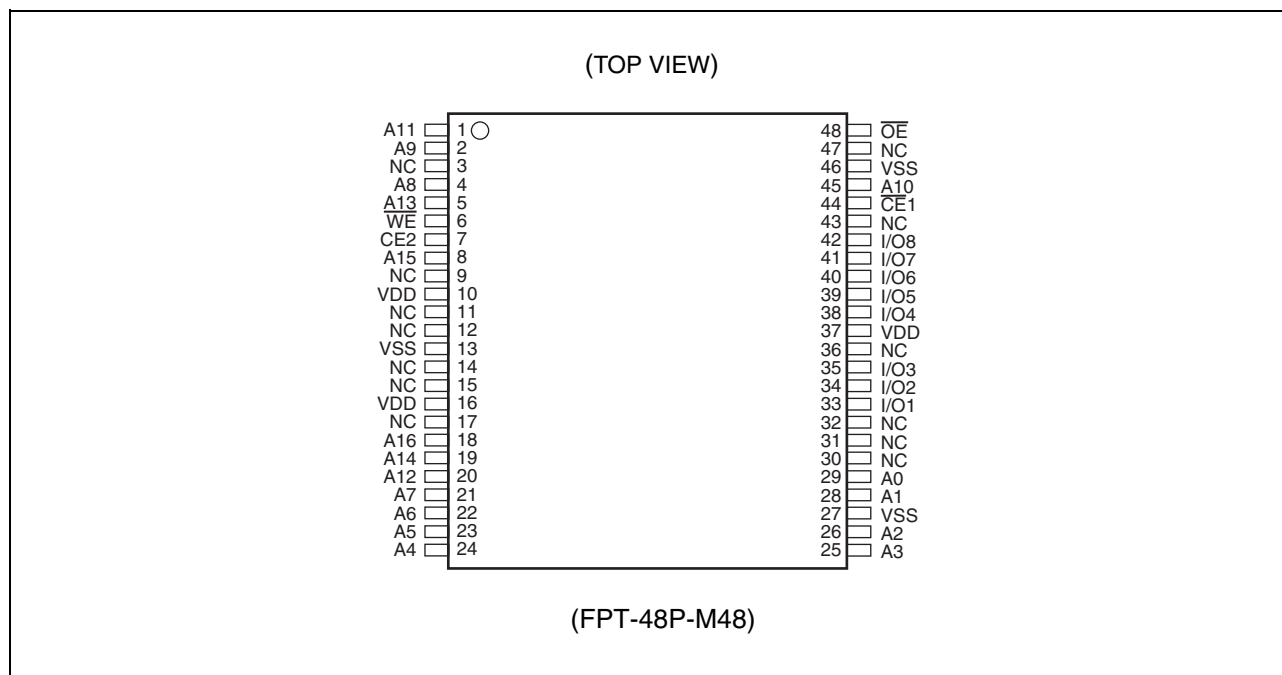


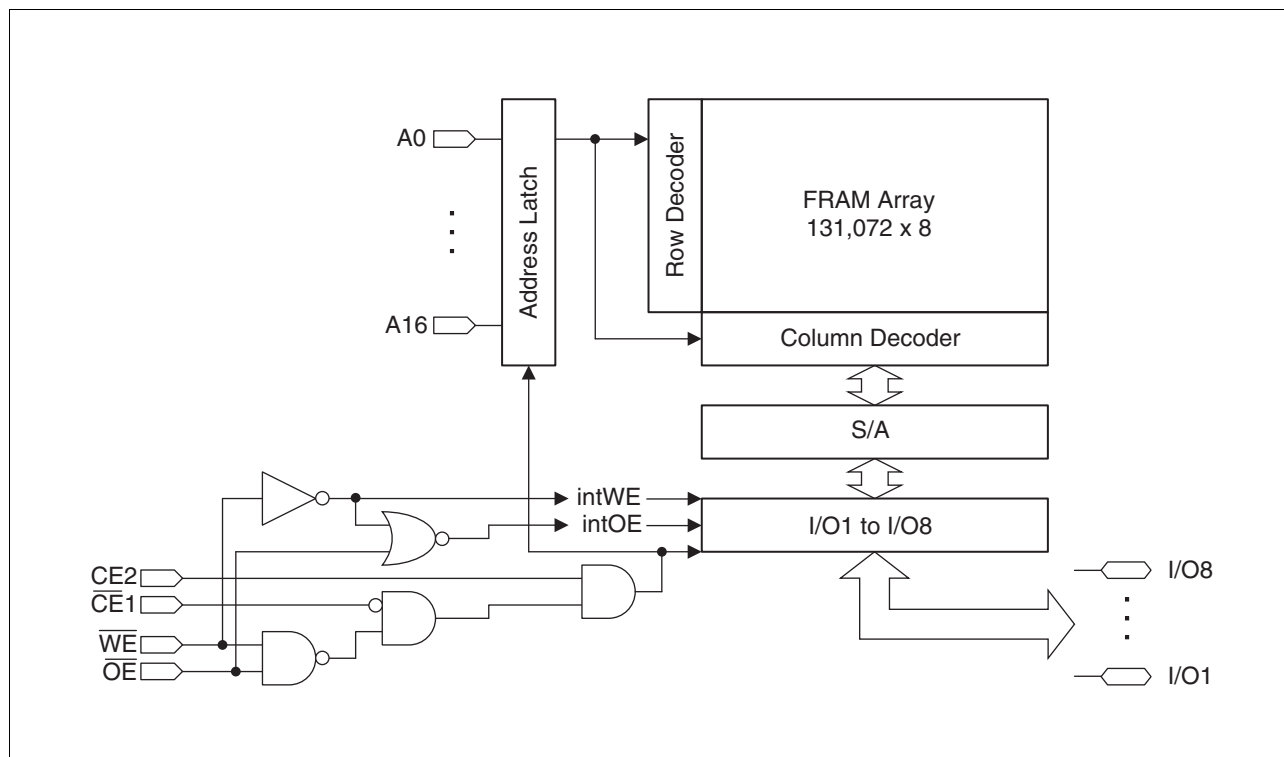
PIN ASSIGNMENTS



PIN DESCRIPTIONS

Pin Number	Pin Name	Functional Description
1, 2, 4, 5, 8, 18 to 26, 28, 29, 45	A0 to A16	Address Input pins
33 to 35, 38 to 42	I/O1 to I/O8	Data Input/Output pins
44	$\overline{CE}1$	Chip Enable 1 Input pin
7	CE2	Chip Enable 2 Input pin
6	\overline{WE}	Write Enable Input pin
48	\overline{OE}	Output Enable Input pin
10, 16, 37	VDD	Supply Voltage pins Connect all three pins to the power supply.
13, 27, 46	VSS	Ground pins Connect all three pins to ground.
3, 9, 11, 12, 14, 15, 17, 30 to 32, 36, 43, 47	NC	No Connect pins Leave these pins open, or connect to VDD or VSS.

■ BLOCK DIAGRAM



■ FUNCTIONAL TRUTH TABLE

Operation Mode	$\overline{CE1}$	CE2	\overline{WE}	\overline{OE}	I/O1 to I/O8	Supply Current
Standby Precharge	H	X	X	X	Hi-Z	Standby (I _{SB})
	X	L	X	X		
	X	X	H	H		
Read	$\overline{\downarrow}$	H	H	L	Data Output	Operation (I _{DD})
	L	\uparrow				
Read (Pseudo-SRAM, \overline{OE} control*1)	L	H	H	$\overline{\downarrow}$	Data Input	
Write	$\overline{\downarrow}$	H	L	H		
	L	\uparrow				
Write (Pseudo-SRAM, \overline{WE} control*2)	L	H	$\overline{\downarrow}$	H		

Note: L = V_{IL} , H = V_{IH} , X can be either H, L, \downarrow or \uparrow , Hi-Z = High Impedance

\downarrow : Latch address and latch data at falling edge, \uparrow : Latch address and latch data at rising edge

*1: \overline{OE} control of the Pseudo-SRAM means the valid address at the falling edge of \overline{OE} to read.

*2: \overline{WE} control of the Pseudo-SRAM means the valid address and data at the falling edge of \overline{WE} to write.

■ ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Rating		Unit
		Min	Max	
Power Supply Voltage*	V_{DD}	− 0.5	+ 4.0	V
Input Pin Voltage*	V_{IN}	− 0.5	$V_{DD} + 0.5$ (≤ 4.0)	V
Output Pin Voltage*	V_{OUT}	− 0.5	$V_{DD} + 0.5$ (≤ 4.0)	V
Operation ambient temperature	T_A	− 40	+ 85	°C
Storage Temperature	T_{STG}	− 55	+ 125	°C

* : All voltages are referenced to $V_{SS} = 0$ V.

WARNING: Semiconductor devices can be permanently damaged by application of stress (voltage, current, temperature, etc.) in excess of absolute maximum ratings. Do not exceed these ratings.

■ RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Value			Unit
		Min	Typ	Max	
Power Supply Voltage* ¹	V_{DD}	3.0	3.3	3.6	V
Operation ambient temperature* ²	T_A	− 40	—	+ 85	°C

*1 : All voltages are referenced to $V_{SS} = 0$ V.

*2 : Ambient temperature when only this device is working. Please consider it to be the almost same as the package surface temperature.

WARNING: The recommended operating conditions are required in order to ensure the normal operation of the semiconductor device. All of the device's electrical characteristics are warranted when the device is operated within these ranges.

Always use semiconductor devices within their recommended operating condition ranges. Operation outside these ranges may adversely affect reliability and could result in device failure. No warranty is made with respect to uses, operating conditions, or combinations not represented on the data sheet. Users considering application outside the listed conditions are advised to contact their representatives beforehand.

■ ELECTRICAL CHARACTERISTICS

1. DC Characteristics

(within recommended operating conditions)

Parameter	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Input Leakage Current	I_{LIL}	$V_{IN} = 0 \text{ V to } V_{DD}$	—	—	10	μA
Output Leakage Current	I_{LOL}	$V_{OUT} = 0 \text{ V to } V_{DD}$, $\overline{CE1} = V_{IH}$ or $\overline{OE} = V_{IH}$	—	—	10	μA
Operating Power Supply Current*1	I_{DD}	$\overline{CE1} = 0.2 \text{ V}$, $CE2 = V_{DD} - 0.2 \text{ V}$, $I_{out} = 0 \text{ mA}$	—	10	15	mA
Standby Current*2	I_{SB}	$\overline{CE1} \geq V_{DD} - 0.2 \text{ V}$	—	10	50	μA
		$CE2 \leq 0.2 \text{ V}$				
		$\overline{OE} \geq V_{DD} - 0.2 \text{ V}$, $\overline{WE} \geq V_{DD} - 0.2 \text{ V}$				
High Level Input Voltage	V_{IH}	$V_{DD} = 3.0 \text{ V to } 3.6 \text{ V}$	$V_{DD} \times 0.8$	—	$V_{DD} + 0.5$ (≤ 4.0)	V
Low Level Input Voltage	V_{IL}	$V_{DD} = 3.0 \text{ V to } 3.6 \text{ V}$	-0.5	—	$+0.6$	V
High Level Output Voltage	V_{OH}	$I_{OH} = -1.0 \text{ mA}$	$V_{DD} \times 0.8$	—	—	V
Low Level Output Voltage	V_{OL}	$I_{OL} = 2.0 \text{ mA}$	—	—	0.4	V

*1 : During the measurement of I_{DD} , the Address and Data In were taken to only change once per active cycle.
 I_{out} : output current

*2 : All pins other than setting pins shall be input at the CMOS level voltages such as $H \geq V_{DD} - 0.2 \text{ V}$, $L \leq 0.2 \text{ V}$.

2. AC Characteristics

• AC Test Conditions

Power Supply Voltage : 3.0 V to 3.6 V
 Operation Ambient Temperature : -40 °C to +85 °C
 Input Voltage Amplitude : 0.3 V to 2.7 V
 Input Rising Time : 5 ns
 Input Falling Time : 5 ns
 Input Evaluation Level : 2.0 V / 0.8 V
 Output Evaluation Level : 2.0 V / 0.8 V
 Output Load Capacitance : 50 pF

(1) Read Cycle

Parameter	Symbol	Value		Unit
		Min	Max	
Read Cycle Time	t_{RC}	150	—	ns
$\overline{CE1}$ Active Time	t_{CA1}	120	—	ns
$\overline{CE2}$ Active Time	t_{CA2}	120	—	ns
\overline{OE} Active Time	t_{RP}	120	—	ns
Precharge Time	t_{PC}	20	—	ns
Address Setup Time	t_{AS}	0	—	ns
Address Hold Time	t_{AH}	50	—	ns
\overline{OE} Setup Time	t_{ES}	0	—	ns
Output Hold Time	t_{OH}	0	—	ns
Output Set Time	t_{LZ}	30	—	ns
$\overline{CE1}$ Access Time	t_{CE1}	—	100	ns
$\overline{CE2}$ Access Time	t_{CE2}	—	100	ns
\overline{OE} Access Time	t_{OE}	—	100	ns
Output Floating Time	t_{OHZ}	—	20	ns

(2) Write Cycle

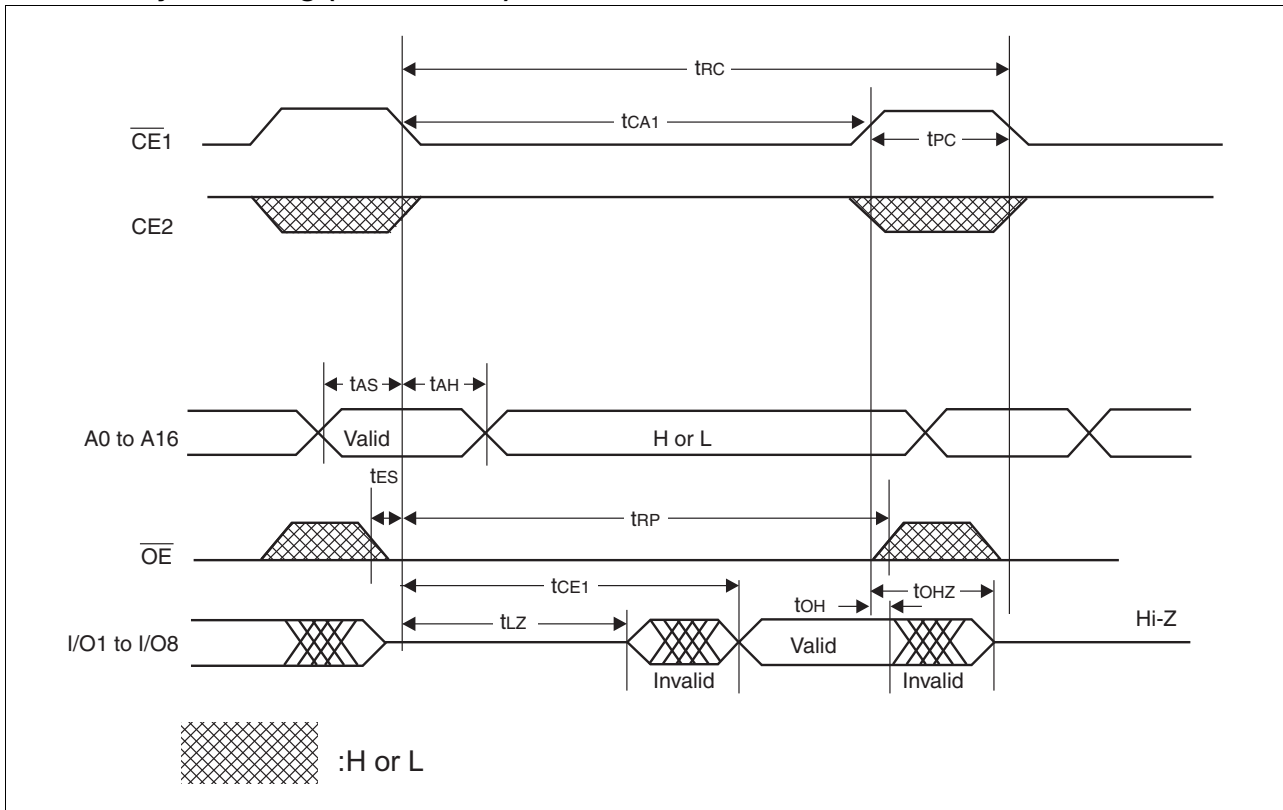
Parameter	Symbol	Value		Unit
		Min	Max	
Write Cycle Time	t_{WC}	150	—	ns
$\overline{CE1}$ Active Time	t_{CA1}	120	—	ns
$\overline{CE2}$ Active Time	t_{CA2}	120	—	ns
Precharge Time	t_{PC}	20	—	ns
Address Setup Time	t_{AS}	0	—	ns
Address Hold Time	t_{AH}	50	—	ns
Write Pulse Width	t_{WP}	120	—	ns
Data Setup Time	t_{DS}	0	—	ns
Data Hold Time	t_{DH}	50	—	ns
Write Setup Time	t_{WS}	0	—	ns

3. Pin Capacitance

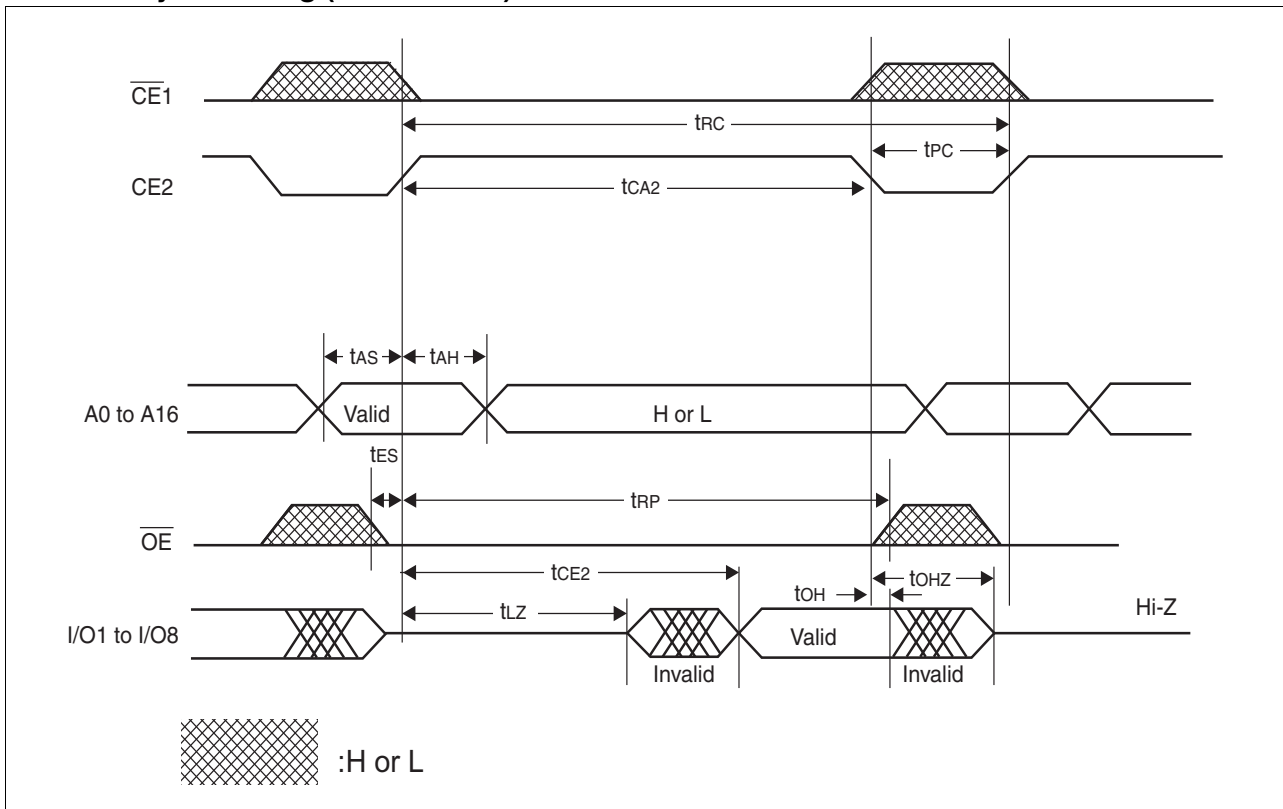
Parameter	Symbol	Condition	Value			Unit
			Min	Typ	Max	
Input Capacitance	C_{IN}	$V_{DD} = V_{IN} = V_{OUT} = 0\text{ V}$, $f = 1\text{ MHz}$, $T_A = +25\text{ °C}$	—	—	10	pF
Output Capacitance	C_{OUT}		—	—	10	pF

■ TIMING DIAGRAMS

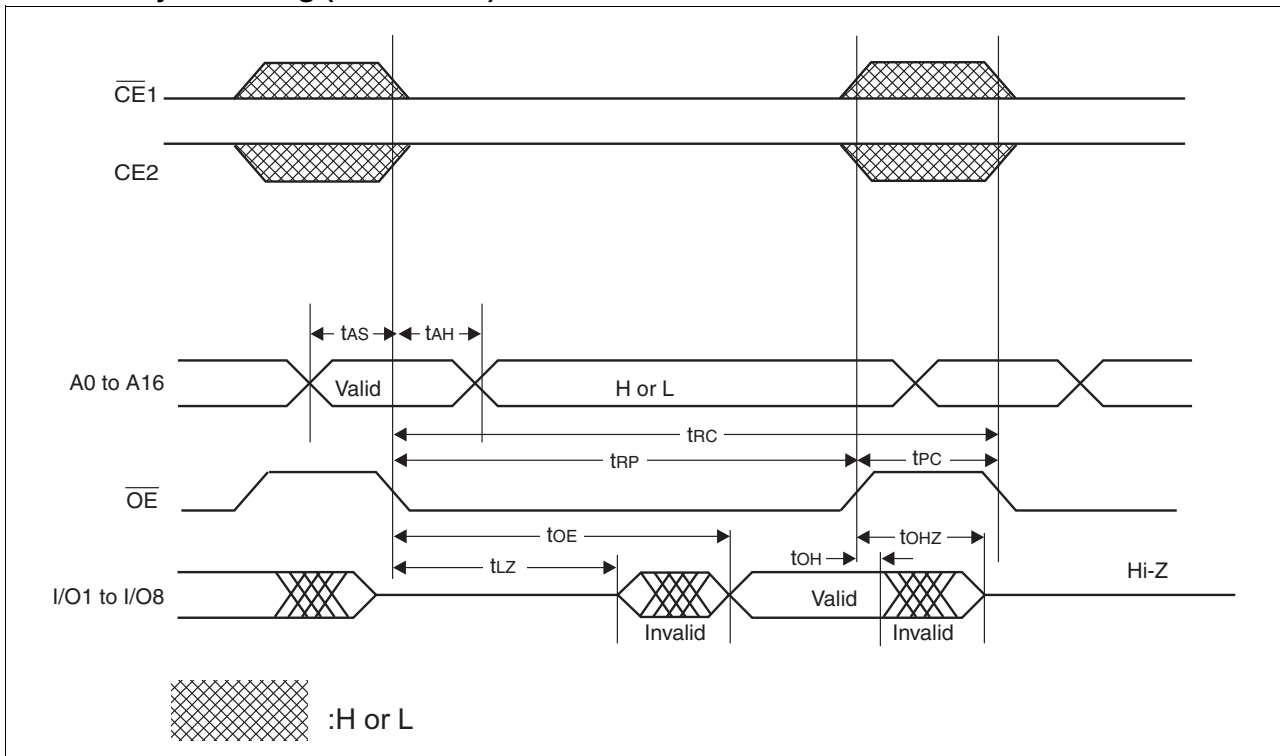
1. Read Cycle Timing ($\overline{\text{CE1}}$ Control)



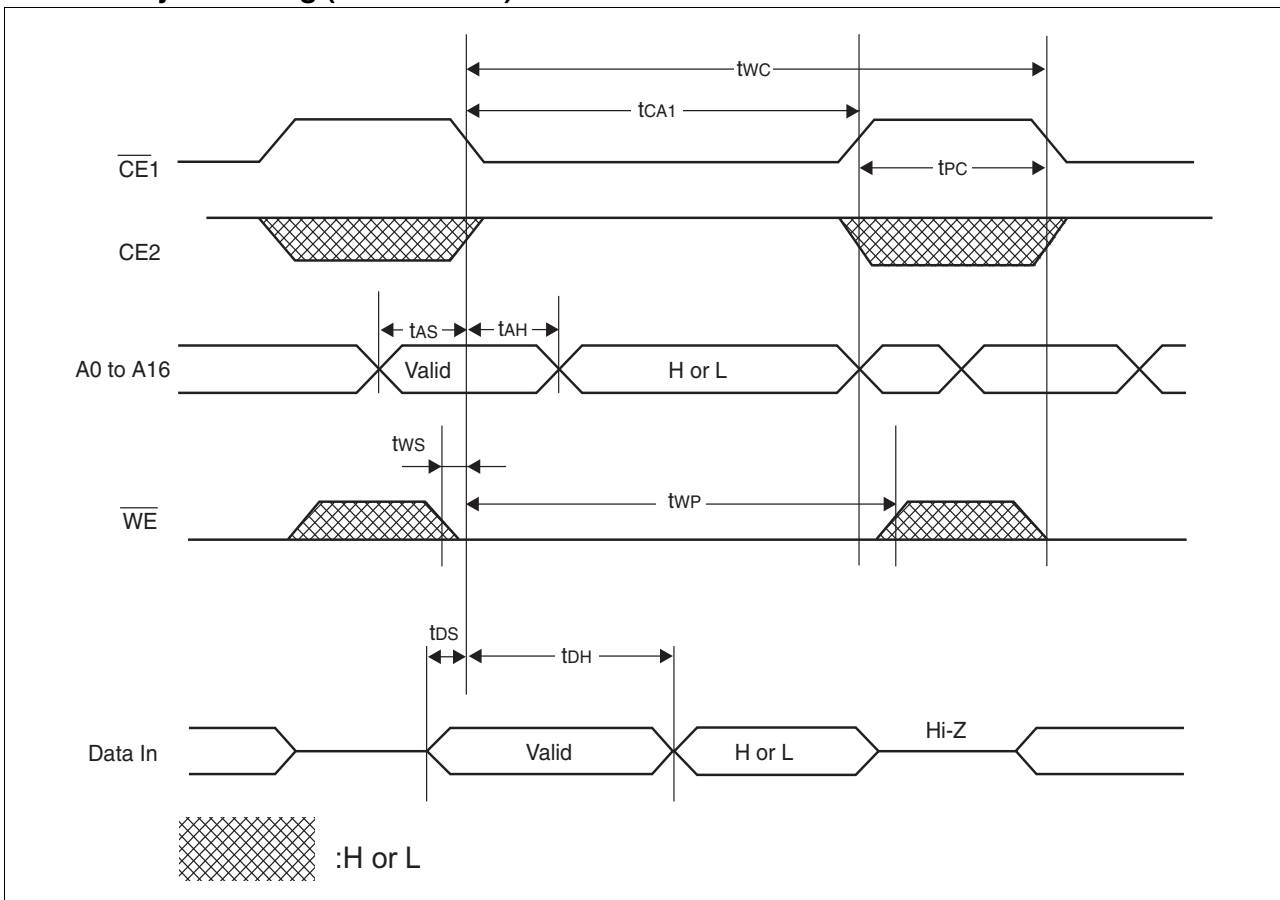
2. Read Cycle Timing (CE2 Control)



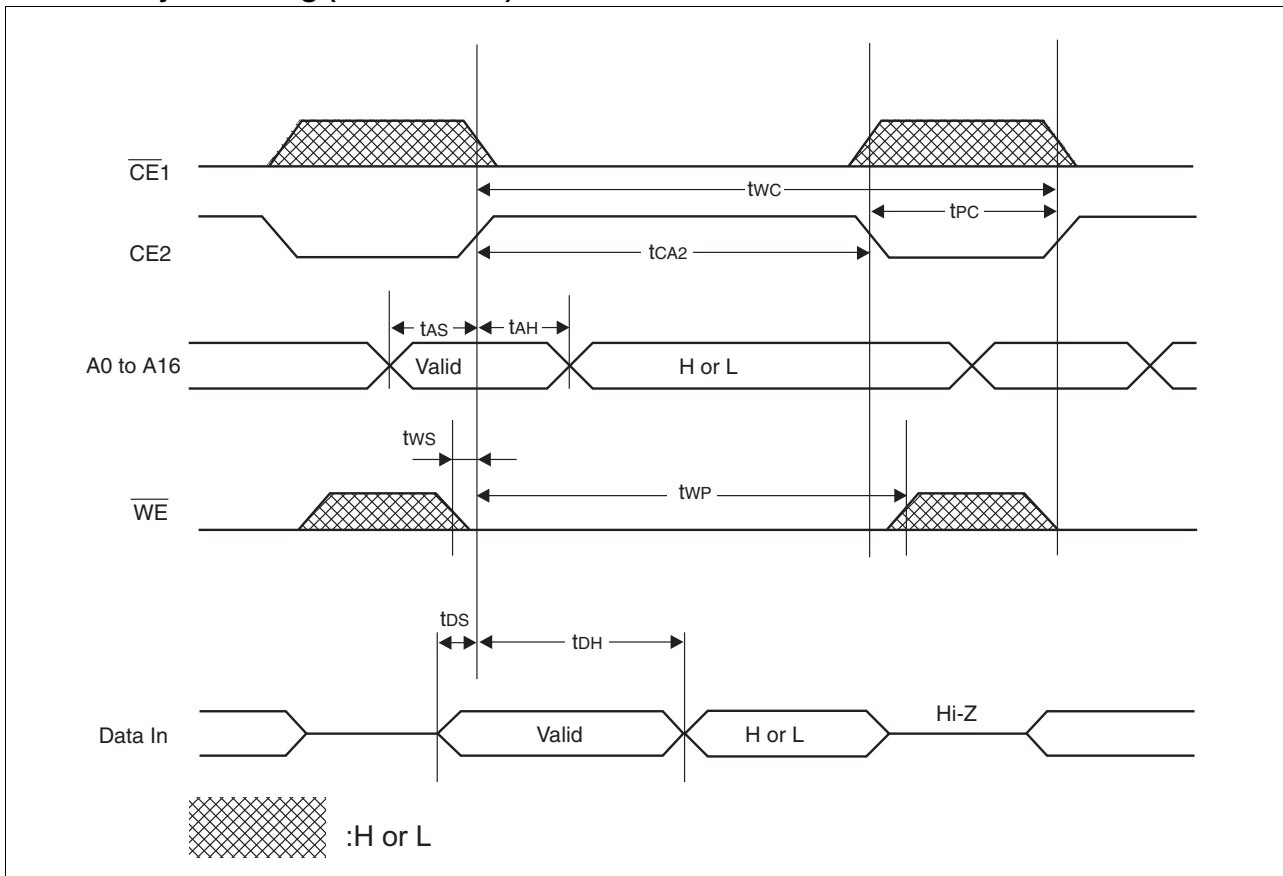
3. Read Cycle Timing ($\overline{\text{OE}}$ Control)



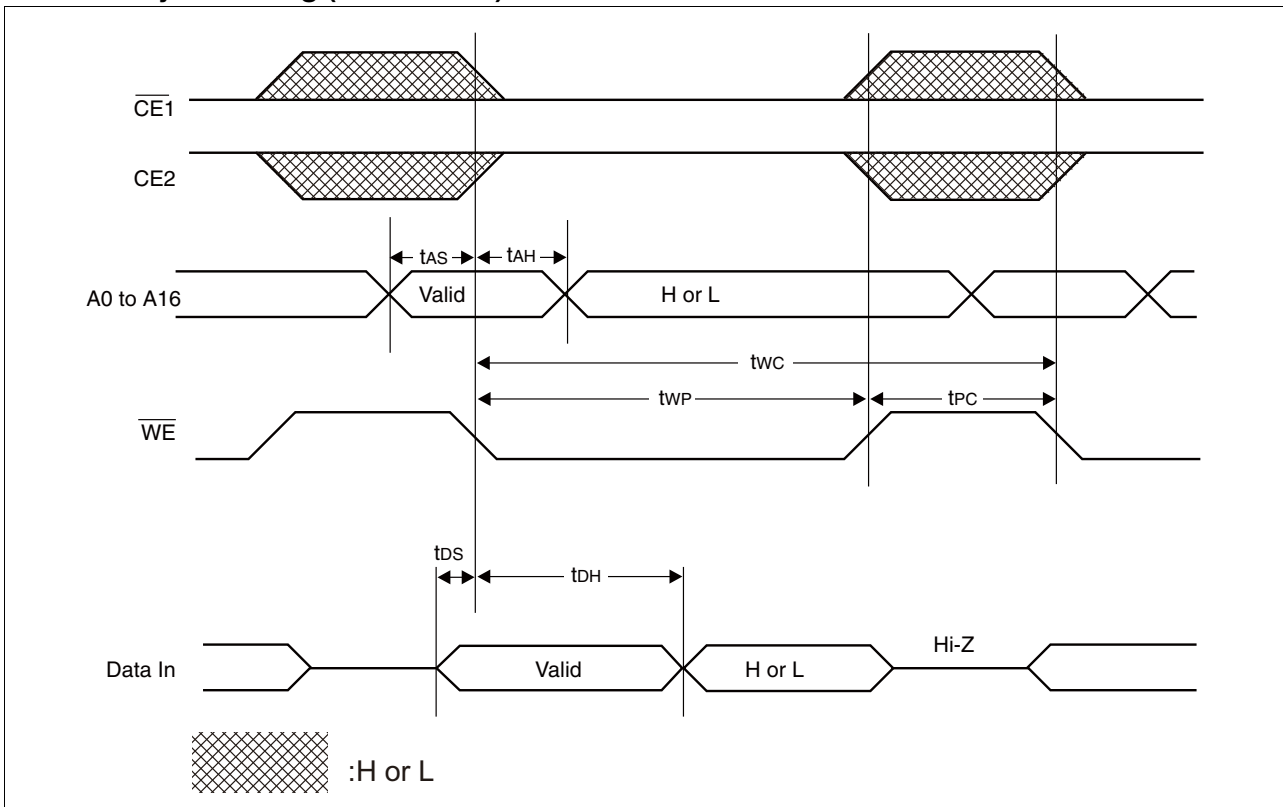
4. Write Cycle Timing ($\overline{\text{CE1}}$ Control)



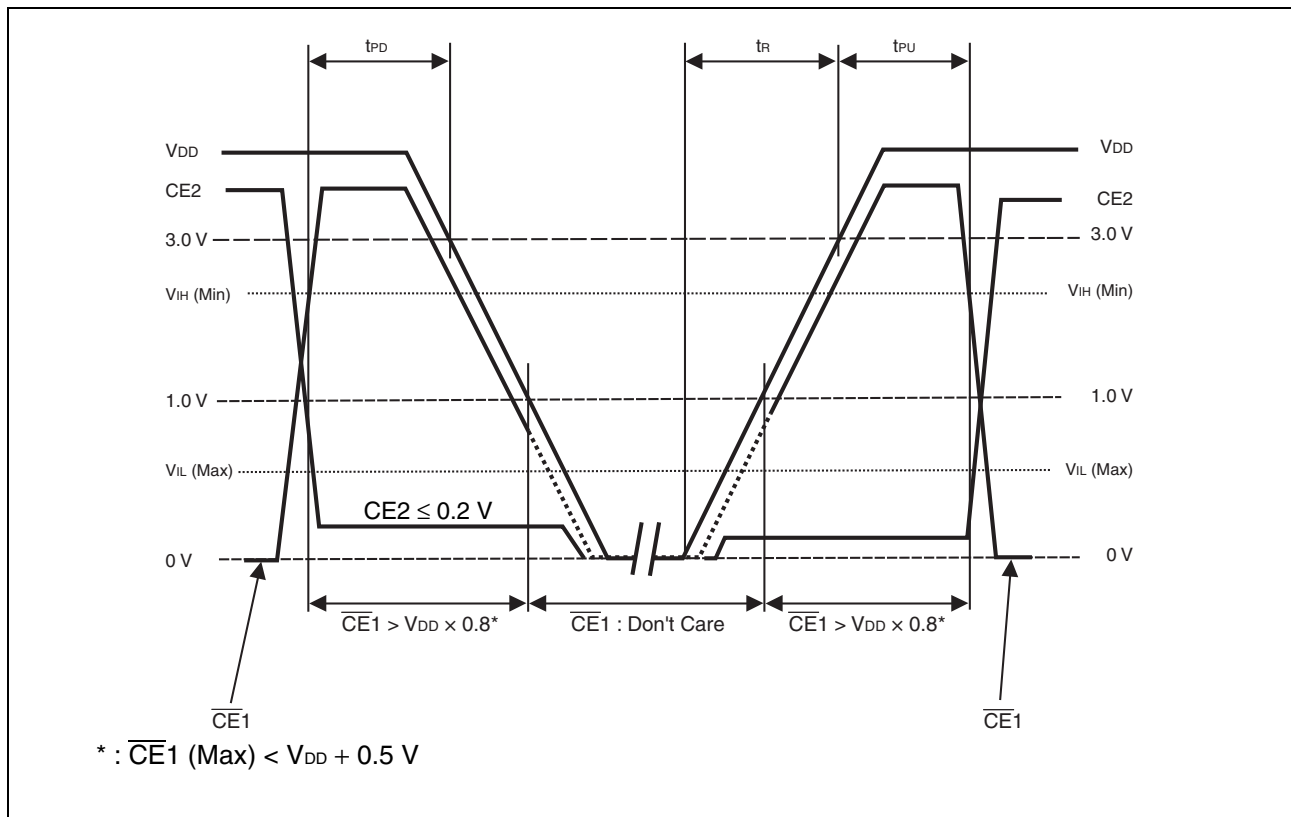
5. Write Cycle Timing (CE2 Control)



6. Write Cycle Timing (WE Control)



■ POWER ON/OFF SEQUENCE



Parameter	Symbol	Value			Unit
		Min	Typ	Max	
$\overline{CE1}$ level hold time for Power OFF	t_{PD}	85	—	—	ns
$\overline{CE1}$ level hold time for Power ON	t_{PU}	85	—	—	ns
Power supply rising time	t_R	0.05	—	200	ms

If the device does not operate within the specified conditions of read cycle, write cycle or power on/off sequence, memory data can not be guaranteed.

In case the power is turned on or off, use the power supply reset IC and fix the CE2 to low level, to prevent unexpected writing. Use either of $\overline{CE1}$ or CE2, or both to disable control of the device.

■ FRAM CHARACTERISTICS

Item	Min	Max	Unit	Parameter
Read/Write Endurance*1	10^{10}	—	Times/byte	Operation Ambient Temperature $T_A = +85\text{ }^{\circ}\text{C}$
Data Retention*2	10	—	Years	Operation Ambient Temperature $T_A = +55\text{ }^{\circ}\text{C}$
	55	—		Operation Ambient Temperature $T_A = +35\text{ }^{\circ}\text{C}$

*1 : Total number of reading and writing defines the minimum value of endurance, as an FRAM memory operates with destructive readout mechanism.

*2 : Minimum values define retention time of the first reading/writing data right after shipment, and these values are calculated by qualification results.

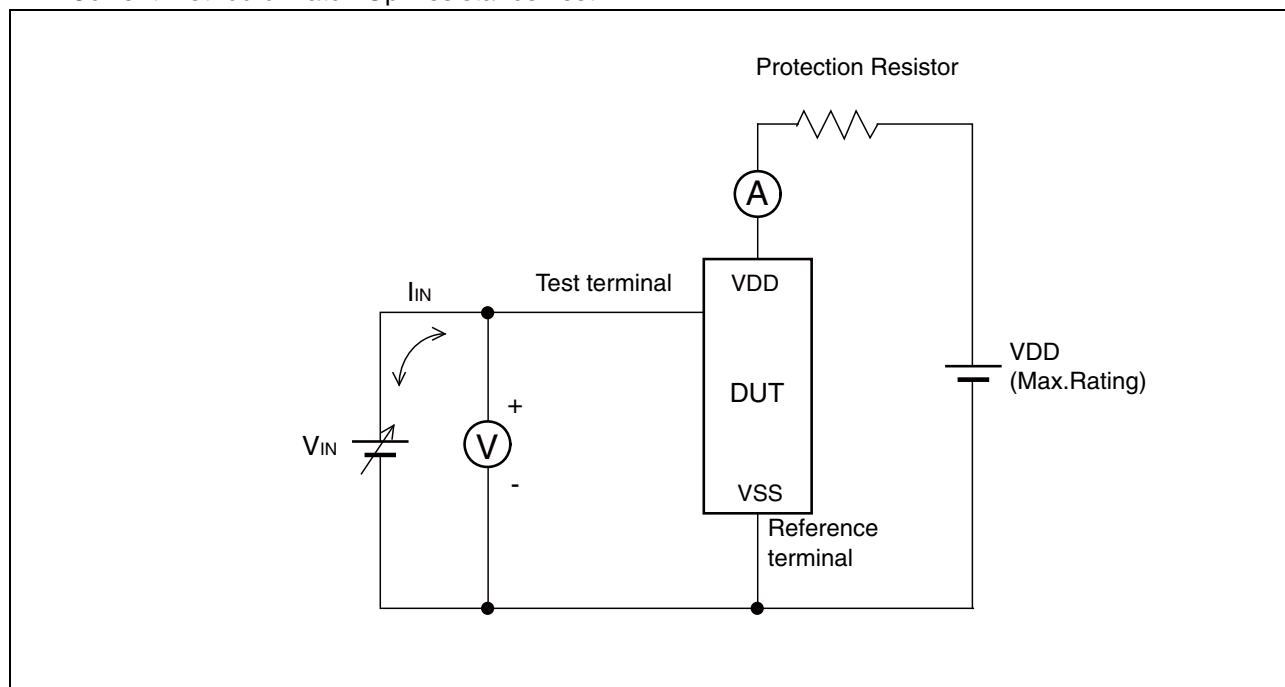
■ NOTES ON USE

We recommend programming of the device after reflow. Data written before reflow cannot be guaranteed.

■ ESD AND LATCH-UP

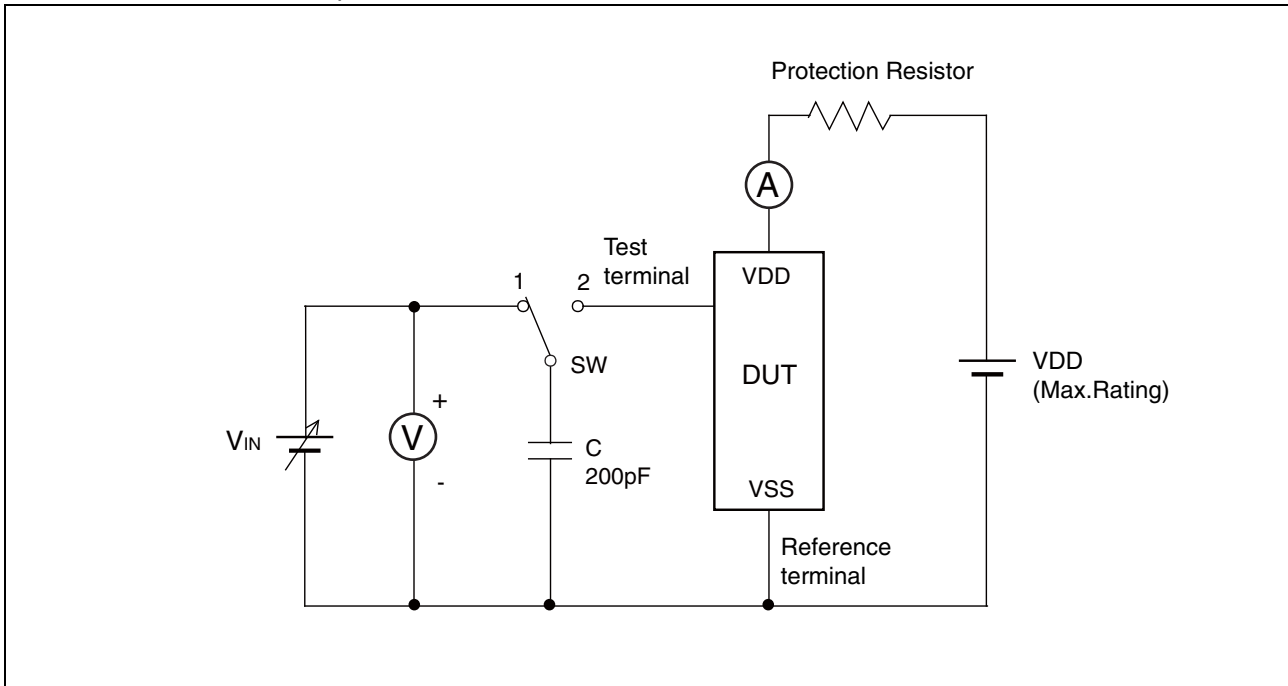
Test	DUT	Value
ESD HBM (Human Body Model) JESD22-A114 compliant	MB85R1001ANC-GE1	$\geq 2000 \text{ V} $
ESD MM (Machine Model) JESD22-A115 compliant		$\geq 200 \text{ V} $
ESD CDM (Charged Device Model) JESD22-C101 compliant		$\geq 1000 \text{ V} $
Latch-Up (I-test) JESD78 compliant		—
Latch-Up (V_{supply} overvoltage test) JESD78 compliant		—
Latch-Up (Current Method) Proprietary method		$\geq 300 \text{ mA} $
Latch-Up (C-V Method) Proprietary method		—

• Current method of Latch-Up Resistance Test



Note : The voltage V_{IN} is increased gradually and the current I_{IN} of 300 mA at maximum shall flow.
 Confirm the latch up does not occur under $I_{IN} = \pm 300 \text{ mA}$.
 In case the specific requirement is specified for I/O and I_{IN} cannot be 300 mA, the voltage shall be increased to the level that meets the specific requirement.

- C-V method of Latch-Up Resistance Test



Note : Charge voltage alternately switching 1 and 2 approximately 2 sec interval. This switching process is considered as one cycle.
Repeat this process 5 times. However, if the latch-up condition occurs before completing 5 times, this test must be stopped immediately.

■ REFLOW CONDITIONS AND FLOOR LIFE

[JEDEC MSL] : Moisture Sensitivity Level 3 (ISP/JEDEC J-STD-020D)

■ CURRENT STATUS ON CONTAINED RESTRICTED SUBSTANCES

This product complies with the regulations of REACH Regulations, EU RoHS Directive and China RoHS.

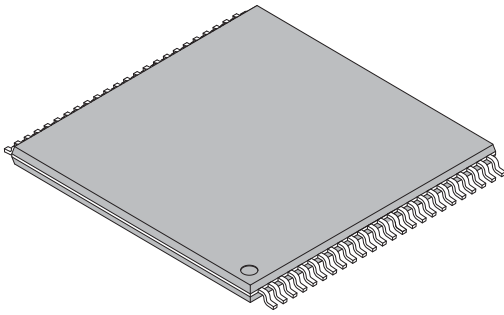
MB85R1001A

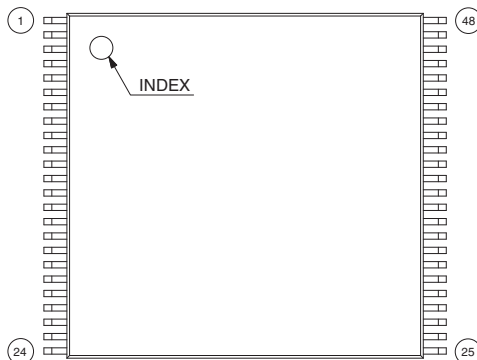
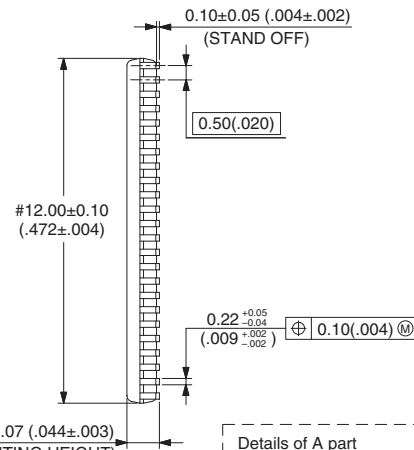
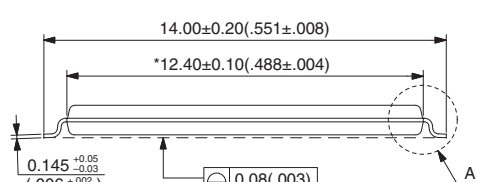
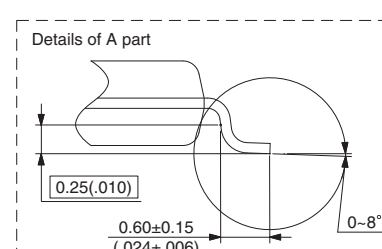
■ ORDERING INFORMATION

Part Number	Package	Shipping form	Minimum shipping quantity
MB85R1001ANC-GE1	48-pin plastic TSOP (FPT-48P-M48)	Tray	—*

*: Please contact our sales office about minimum shipping quantity.

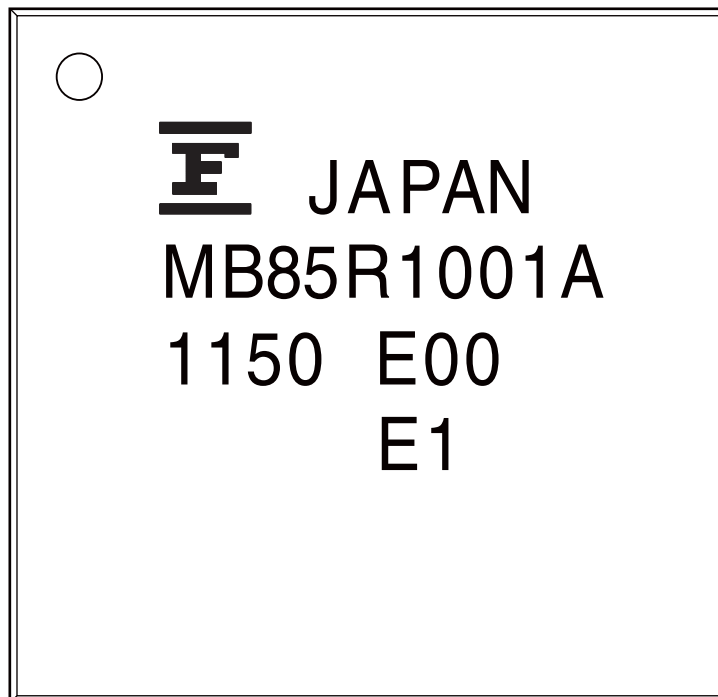
■ PACKAGE DIMENSIONS

<div style="text-align: center;"> <p>48-pin plastic TSOP</p>  <p>(FPT-48P-M48)</p> </div>	Lead pitch	0.50 mm
	Package width × package length	12.00 mm × 12.40 mm
	Lead shape	Gullwing
	Sealing method	Plastic mold
	Mounting height	1.20 mm MAX
	Weight	0.36 g

<p>48-pin plastic TSOP (FPT-48P-M48)</p>		<p>Note 1) # : Resin protrusion. (Each side : +0.15 (.006) Max).</p> <p>Note 2) * : These dimensions do not include resin protrusion.</p> <p>Note 3) Pins width and pins thickness include plating thickness.</p> <p>Note 4) Pins width do not include tie bar cutting remainder.</p>
		
		<p>Details of A part</p> 
<p>© 2010 FUJITSU SEMICONDUCTOR LIMITED F48048Sc-1-1</p>		<p>Dimensions in mm (inches).</p> <p>Note: The values in parentheses are reference values.</p>

■ MARKING

[MB85R1001ANC-GE1]

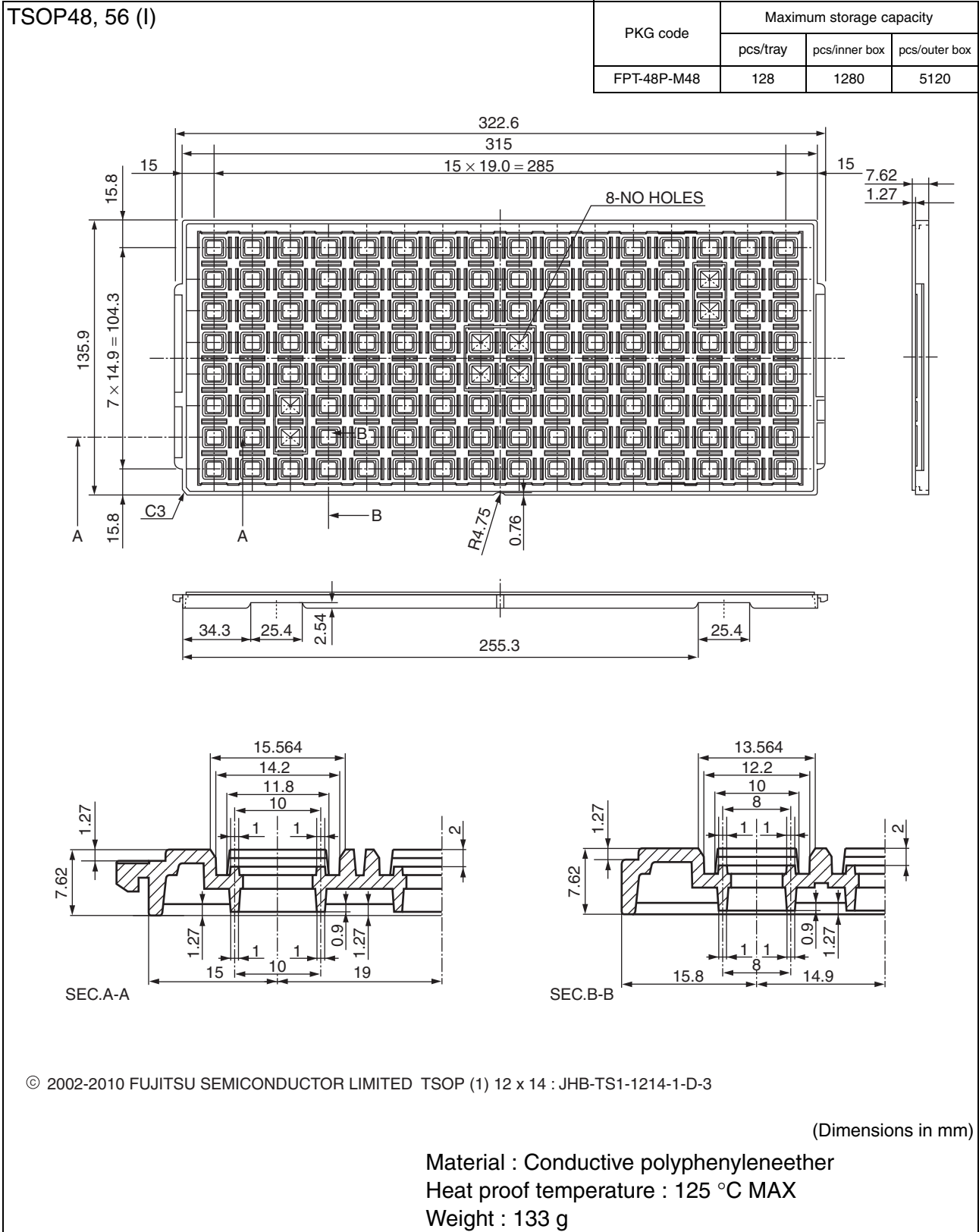


[FPT-48P-M48]

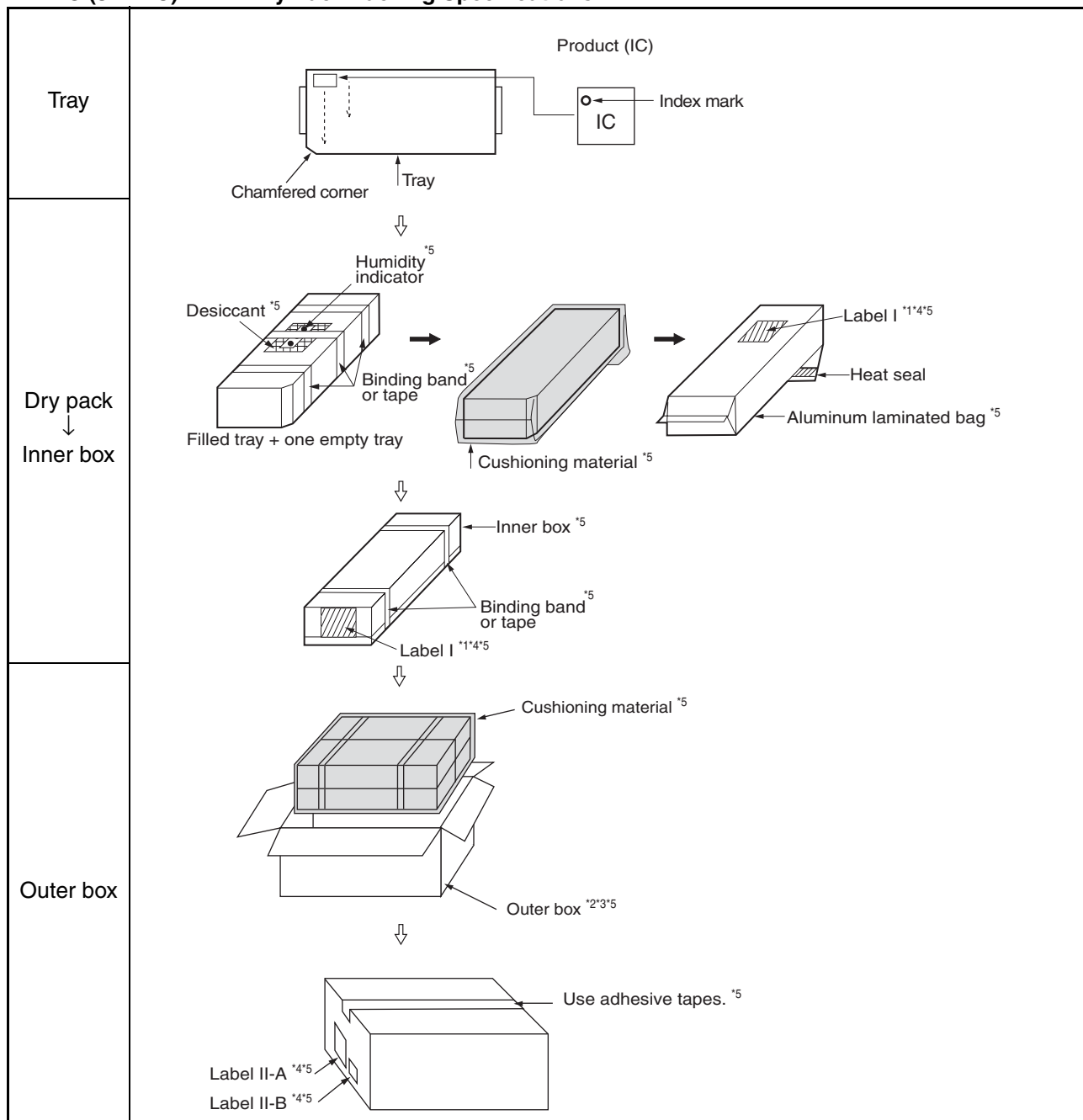
■ SHIPPING FORM

1. Tray

1.1 Tray Dimensions



1.2 IEC (JEDEC) TRAY Dry Pack Packing Specifications



*1: For a product of which part number is suffixed with "E1", a "G" and "P" marks is display to the moisture barrier bag and the inner boxes.

*2: The size of the outer box may be changed depending on the quantity of inner boxes.

*3: The space in the outer box will be filled with empty inner boxes, or cushions, etc.

*4: Please refer to an attached sheet about the indication label.

*5: The packing materials except tray may differ slightly from the color and dimensions depend on country of manufacture.

Note: The packing specifications may not be applied when the product is delivered via a distributor.

1.3 Product label indicators

Label I: Label on Inner box/Moisture Barrier Bag/ (It sticks it on the reel for the emboss tapping) [C-3 Label (50mm x 100mm) Supplemental Label (20mm x 100mm)]

XXXXXXXXXXXXXXXX (Customer part number or FJ part number)		← C-3 Label
<div style="display: flex; justify-content: space-between;"> (3N)1 XXXXXXXXXXXXXXXX XXX (LEAD FREE mark) </div> <div style="display: flex; justify-content: space-between;"> XXXXXXXXXXXXXXXXXXXX (Part number and quantity) </div> <div style="display: flex; justify-content: space-between;"> XXXXXXXXXXXXXXXXXXXX QC PASS </div>		
<div style="display: flex; justify-content: space-between;"> (3N)2 XXXXXXXXXXXXXXXX XXXXXXXX (FJ control number) </div> <div style="display: flex; justify-content: space-between;"> XXX pcs (Quantity) </div> <div style="display: flex; justify-content: space-between;"> XXXXXXXXXXXXXXXXXXXX (Customer part number or FJ part number) </div> <div style="display: flex; justify-content: space-between;"> XXXXXXXXXXXXXXXXXXXX (Customer part number or FJ part number bar code) </div> <div style="display: flex; justify-content: space-between;"> XXXX/XX/XX (Packed years/month/day) ASSEMBLED IN xxxx </div>		← Perforated line
<div style="display: flex; justify-content: space-between;"> XXXXXXXXXXXXXXXXXXXX (Customer part number or FJ part number) (FJ control number bar code) </div> <div style="display: flex; justify-content: space-between;"> XX/XX XXXX-XXX XXX </div> <div style="display: flex; justify-content: space-between;"> (Package count) XXXX-XXX XXX </div> <div style="display: flex; justify-content: space-between;"> XXXXXXXXXXXX (FJ control number) (Lot Number and quantity) </div> <div style="display: flex; justify-content: space-between;"> XXXXXXXXXXXXXXXXXXXX (Comment) </div>		

Label II-A: Label on Outer box [D Label] (100mm x 100mm)

<div style="display: flex; justify-content: space-between;"> <div> 発注者 XXXXXXXXXXXXXXXX (Customer Name) (CUST.) 受渡場所名 XXXXXXXXXXXXXXXX (Delivery Address) (DELIVERY POINT) 納品キー番号 XXXXXXXXXXXXXXXX (TRANS.NO.) (FJ control number) 品名コード XXXXXXXXXXXXXXXX (PART NO.) (Customer part number or FJ part number) </div> <div> 受注者 (VENDOR) 富士通 セミコンダクター株式会社 XXX (FJ control number) XXX (FJ control number) XXX (FJ control number) XXXXXXXXXXXXXXXX (Part number) </div> </div>		← D Label
<div style="display: flex; justify-content: space-between;"> <div> 品名 (PART NAME) XXXXXXXXXXXXXXXX (Part number) 人数／納入数量 XXX/XXX (Q'TY/TOTAL Q'TY) </div> <div> 単位 XX (UNIT) </div> </div> <div style="display: flex; justify-content: space-between;"> <div> 発注者用備考 (CUSTOMER'S REMARKS) XXXXXXXXXXXXXXXXXXXXXXXX </div> <div> 梱包個数 (PACKAGE COUNT) XXX/XXX </div> </div> <div style="display: flex; justify-content: space-between;"> <div> (3N)3 XXXXXXXXXXXXXXXX XXX XXXXXXXXXXXXXXXX (FJ control number + Product quantity) (FJ control number + Product quantity bar code) </div> <div> (3N)4 XXXXXXXXXXXXXXXX XXX XXXXXXXXXXXXXXXX (Part number + Product quantity) (Part number + Product quantity bar code) </div> </div> <div style="display: flex; justify-content: space-between;"> <div> (3N)5 XXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXX (FJ control number) (FJ control number bar code) </div> </div>		

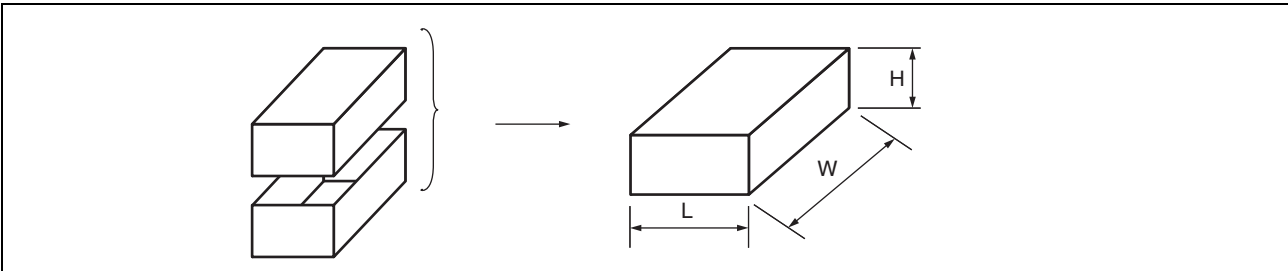
Label II-B: Outer boxes product indicate

XXXXXXXXXXXXXXXX (Part number)		
(Lot Number)	(Count)	(Quantity)
XXXX-XXX	X 箱	XXX 個
XXXX-XXX	X 箱	XXX 個
	計	XXX 個

Note: Depending on shipment state, "Label II-A" and "Label II-B" on the external boxes might not be printed.

1.4 Dimensions for Containers

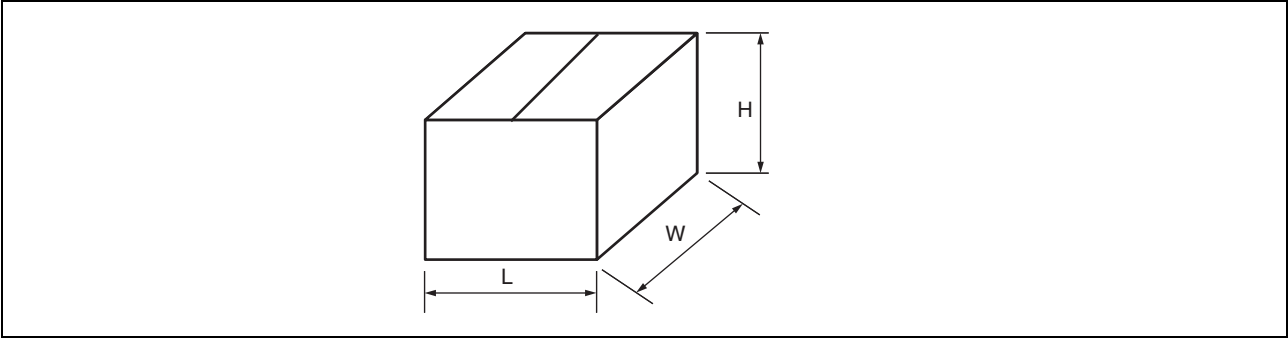
(1) Dimensions for inner box



L	W	H
165	360	75

(Dimensions in mm)

(2) Dimensions for outer box



L	W	H
355	385	195

(Dimensions in mm)

■ MAJOR CHANGES IN THIS EDITION

A change on a page is indicated by a vertical line drawn on the left side of that page.

Page	Section	Change Results
1	■ DESCRIPTIONS	Deleted the “that is compatible with conventional asynchronous SRAM”.
4	■ RECOMMENDED OPERATING CONDITIONS	Added note on the Operation Ambient Temperature. Moved the “High Level Input Voltage” and “Low Level Input Voltage” to DC Characteristics.
5	1. DC Characteristics	Moved the “High Level Input Voltage” and “Low Level Input Voltage” from RECOMMENDED OPERATING CONDITIONS.
13	■ CURRENT STATUS ON CONTAINED RESTRICTED SUBSTANCES	Deleted the URL info.
15	■ PACKAGE DIMENSION	Deleted the URL info.

MEMO

MEMO

FUJITSU SEMICONDUCTOR LIMITED

Shin-Yokohama Chuo Building, 2-100-45 Shin-Yokohama,
Kohoku-ku, Yokohama, Kanagawa 222-0033, Japan
<http://jp.fujitsu.com/fsl/en/>

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Edited: System Memory Business Division