
HM628512BFP Series

4 M SRAM (512-kword $\times$ 8-bit)

HITACHI

ADE-203-1078B (Z)

Rev. 2.0

Nov. 23, 1999

Description

The Hitachi HM628512BFP is a 4-Mbit static RAM organized 512-kword $\times$ 8-bit. It realizes higher density, higher performance and low power consumption by employing Hi-CMOS process technology. It is packaged in standard 32-pin SOP.

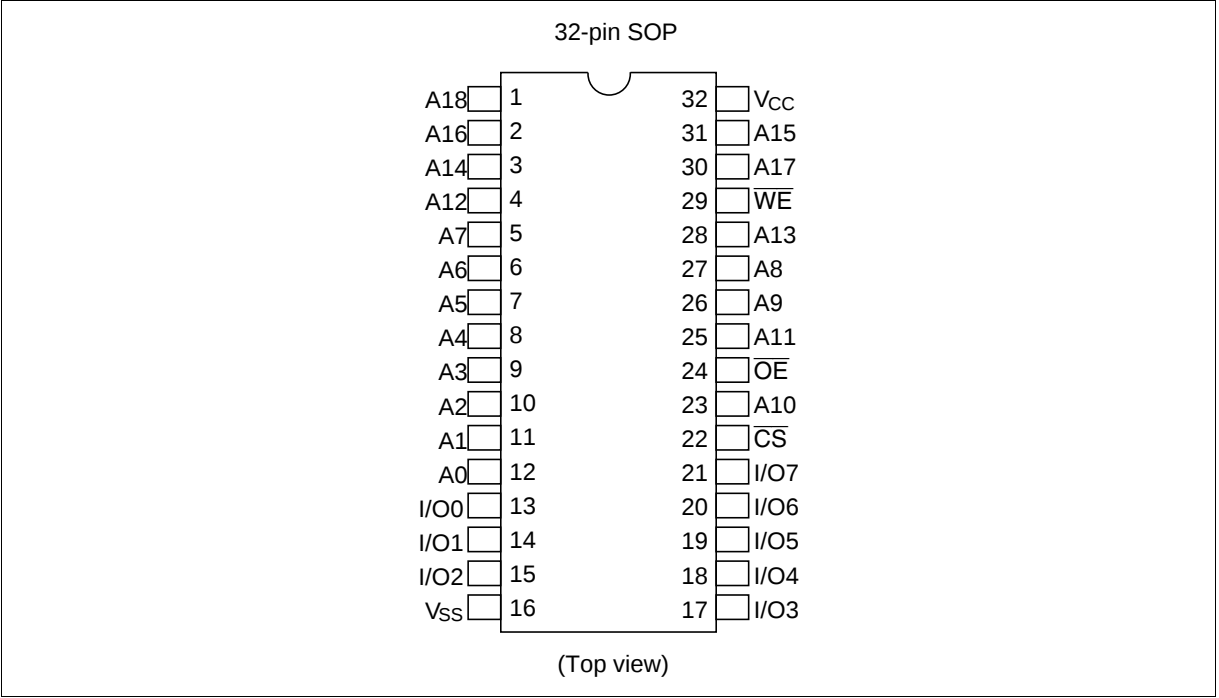
Features

- Single 5 V supply
- Access time: 55/70 ns (max)
- Power dissipation
 - Active: 50 mW/MHz (typ)
 - Standby: 2 mW (max)
- Completely static memory. No clock or timing strobe required
- Equal access and cycle times
- Common data input and output: Three state output
- Directly TTL compatible: All inputs and outputs

Ordering Information

Type No.	Access time	Package
HM628512BFP-5	55 ns	525-mil 32-pin plastic SOP (FP-32D)
HM628512BFP-7	70 ns	

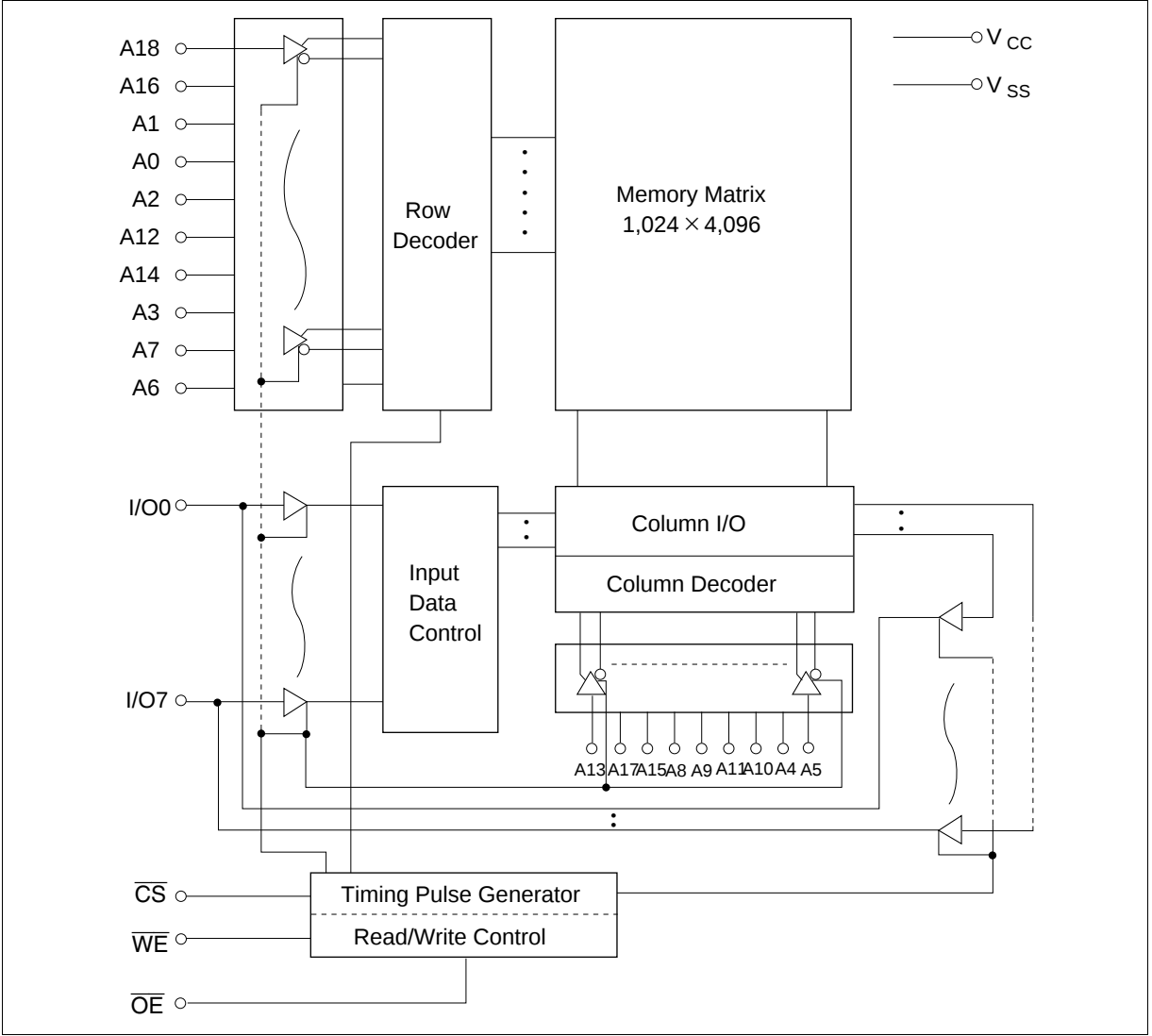
Pin Arrangement



Pin Description

Pin name	Function
A0 to A18	Address input
I/O0 to I/O7	Data input/output
CS	Chip select
OE	Output enable
WE	Write enable
Vcc	Power supply
Vss	Ground

Block Diagram



Function Table

$\overline{\text{WE}}$	$\overline{\text{CS}}$	$\overline{\text{OE}}$	Mode	V_{CC} current	Dout pin	Ref. cycle
×	H	×	Not selected	$I_{\text{SB}}, I_{\text{SB1}}$	High-Z	—
H	L	H	Output disable	I_{CC}	High-Z	—
H	L	L	Read	I_{CC}	Dout	Read cycle
L	L	H	Write	I_{CC}	Din	Write cycle (1)
L	L	L	Write	I_{CC}	Din	Write cycle (2)

Note: ×: H or L

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power supply voltage	V_{CC}	−0.5 to +7.0	V
Voltage on any pin relative to V_{SS}	V_{T}	−0.5*1 to $V_{\text{CC}} + 0.3$ *2	V
Power dissipation	P_{T}	1.0	W
Operating temperature	T_{opr}	−20 to +70	°C
Storage temperature	T_{stg}	−55 to +125	°C
Storage temperature under bias	T_{bias}	−20 to +85	°C

Notes: 1. −3.0 V for pulse half-width ≤ 30 ns
2. Maximum voltage is 7.0 V

Recommended DC Operating Conditions ($T_{\text{a}} = -20$ to +70°C)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.5	5.0	5.5	V
	V_{SS}	0	0	0	V
Input high voltage	V_{IH}	2.2	—	$V_{\text{CC}} + 0.3$	V
Input low voltage	V_{IL}	−0.3*1	—	0.8	V

Note: 1. −3.0 V for pulse half-width ≤ 30 ns

DC Characteristics ($T_a = -20$ to $+70^\circ\text{C}$, $V_{CC} = 5\text{ V} \pm 10\%$, $V_{SS} = 0\text{ V}$)

Parameter	Symbol	Min	Typ* ¹	Max	Unit	Test conditions
Input leakage current	$ I_{LI} $	—	—	1	μA	$V_{in} = V_{SS}$ to V_{CC}
Output leakage current	$ I_{LO} $	—	—	1	μA	$\overline{CS} = V_{IH}$ or $\overline{OE} = V_{IH}$ or $\overline{WE} = V_{IL}$, $V_{IO} = V_{SS}$ to V_{CC}
Operating power supply current: DC	I_{CC}	—	8	15	mA	$\overline{CS} = V_{IL}$, others = V_{IH}/V_{IL} , $I_{IO} = 0\text{ mA}$
Operating power supply current	I_{CC1}	—	40	60	mA	Min cycle, duty = 100% $\overline{CS} = V_{IL}$, others = V_{IH}/V_{IL} $I_{IO} = 0\text{ mA}$
Operating power supply current	I_{CC2}	—	10	20	mA	Cycle time = $1\text{ }\mu\text{s}$, duty = 100% $I_{IO} = 0\text{ mA}$, $\overline{CS} \leq 0.2\text{ V}$ $V_{IH} \geq V_{CC} - 0.2\text{ V}$, $V_{IL} \leq 0.2\text{ V}$
Standby power supply current: DC	I_{SB}	—	1	3	mA	$\overline{CS} = V_{IH}$
Standby power supply current (1): DC	I_{SB1}	—	300	400	μA	$V_{in} \geq 0\text{ V}$, $\overline{CS} \geq V_{CC} - 0.2\text{ V}$
Output low voltage	V_{OL}	—	—	0.4	V	$I_{OL} = 2.1\text{ mA}$
Output high voltage	V_{OH}	2.4	—	—	V	$I_{OH} = -1.0\text{ mA}$

Note: 1. Typical values are at $V_{CC} = 5.0\text{ V}$, $T_a = +25^\circ\text{C}$ and specified loading, and not guaranteed.

Capacitance ($T_a = +25^\circ\text{C}$, $f = 1\text{ MHz}$)

Parameter	Symbol	Typ	Max	Unit	Test conditions
Input capacitance* ¹	C_{in}	—	8	pF	$V_{in} = 0\text{ V}$
Input/output capacitance* ¹	C_{IO}	—	10	pF	$V_{IO} = 0\text{ V}$

Note: 1. This parameter is sampled and not 100% tested.

AC Characteristics (Ta = -20 to +70°C, V_{CC} = 5 V ± 10%, unless otherwise noted.)

Test Conditions

- Input pulse levels: 0.8 V to 2.4 V
- Input rise and fall time: 5 ns
- Input and output timing reference levels: 1.5 V
- Output load: 1 TTL Gate + C_L (50 pF) (HM628512BFP-5) (Including scope & jig)
1 TTL Gate + C_L (100 pF) (HM628512BFP-7) (Including scope & jig)

Read Cycle

		HM628512BFP					
		-5		-7			
Parameter	Symbol	Min	Max	Min	Max	Unit	Notes
Read cycle time	t _{RC}	55	—	70	—	ns	
Address access time	t _{AA}	—	55	—	70	ns	
Chip select access time	t _{CO}	—	55	—	70	ns	
Output enable to output valid	t _{OE}	—	25	—	35	ns	
Chip selection to output in low-Z	t _{LZ}	10	—	10	—	ns	2
Output enable to output in low-Z	t _{OLZ}	5	—	5	—	ns	2
Chip deselection to output in high-Z	t _{HZ}	0	20	0	25	ns	1, 2
Output disable to output in high-Z	t _{OHZ}	0	20	0	25	ns	1, 2
Output hold from address change	t _{OH}	10	—	10	—	ns	

Write Cycle

		HM628512BFP					
		-5		-7			
Parameter	Symbol	Min	Max	Min	Max	Unit	Notes
Write cycle time	t _{WC}	55	—	70	—	ns	
Chip selection to end of write	t _{CW}	50	—	60	—	ns	4
Address setup time	t _{AS}	0	—	0	—	ns	5
Address valid to end of write	t _{AW}	50	—	60	—	ns	
Write pulse width	t _{WP}	40	—	50	—	ns	3, 12
Write recovery time	t _{WR}	0	—	0	—	ns	6
$\overline{WE}$ to output in high-Z	t _{WHZ}	0	20	0	25	ns	1, 2, 7
Data to write time overlap	t _{DW}	25	—	30	—	ns	
Data hold from write time	t _{DH}	0	—	0	—	ns	
Output active from output in high-Z	t _{OW}	5	—	5	—	ns	2
Output disable to output in high-Z	t _{OHZ}	0	20	0	25	ns	1, 2, 7

Notes: 1. t_{HZ} , t_{OHZ} and t_{WHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.

2. This parameter is sampled and not 100% tested.

3. A write occurs during the overlap (t_{WP}) of a low $\overline{CS}$ and a low $\overline{WE}$. A write begins at the later transition of $\overline{CS}$ going low or $\overline{WE}$ going low. A write ends at the earlier transition of $\overline{CS}$ going high or $\overline{WE}$ going high. t_{WP} is measured from the beginning of write to the end of write.

4. t_{CW} is measured from $\overline{CS}$ going low to the end of write.

5. t_{AS} is measured from the address valid to the beginning of write.

6. t_{WR} is measured from the earlier of $\overline{WE}$ or $\overline{CS}$ going high to the end of write cycle.

7. During this period, I/O pins are in the output state so that the input signals of the opposite phase to the outputs must not be applied.

8. If the $\overline{CS}$ low transition occurs simultaneously with the $\overline{WE}$ low transition or after the $\overline{WE}$ transition, the output remain in a high impedance state.

9. Dout is the same phase of the write data of this write cycle.

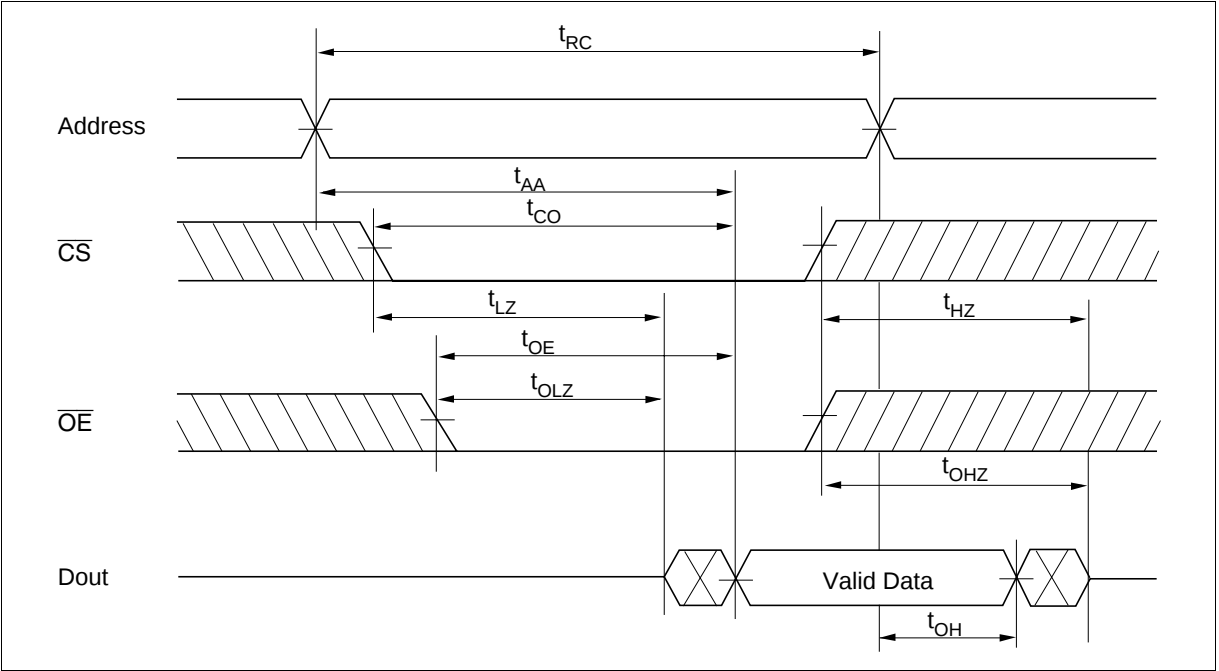
10. Dout is the read data of next address.

11. If $\overline{CS}$ is low during this period, I/O pins are in the output state. Therefore, the input signals of the opposite phase to the outputs must not be applied to them.

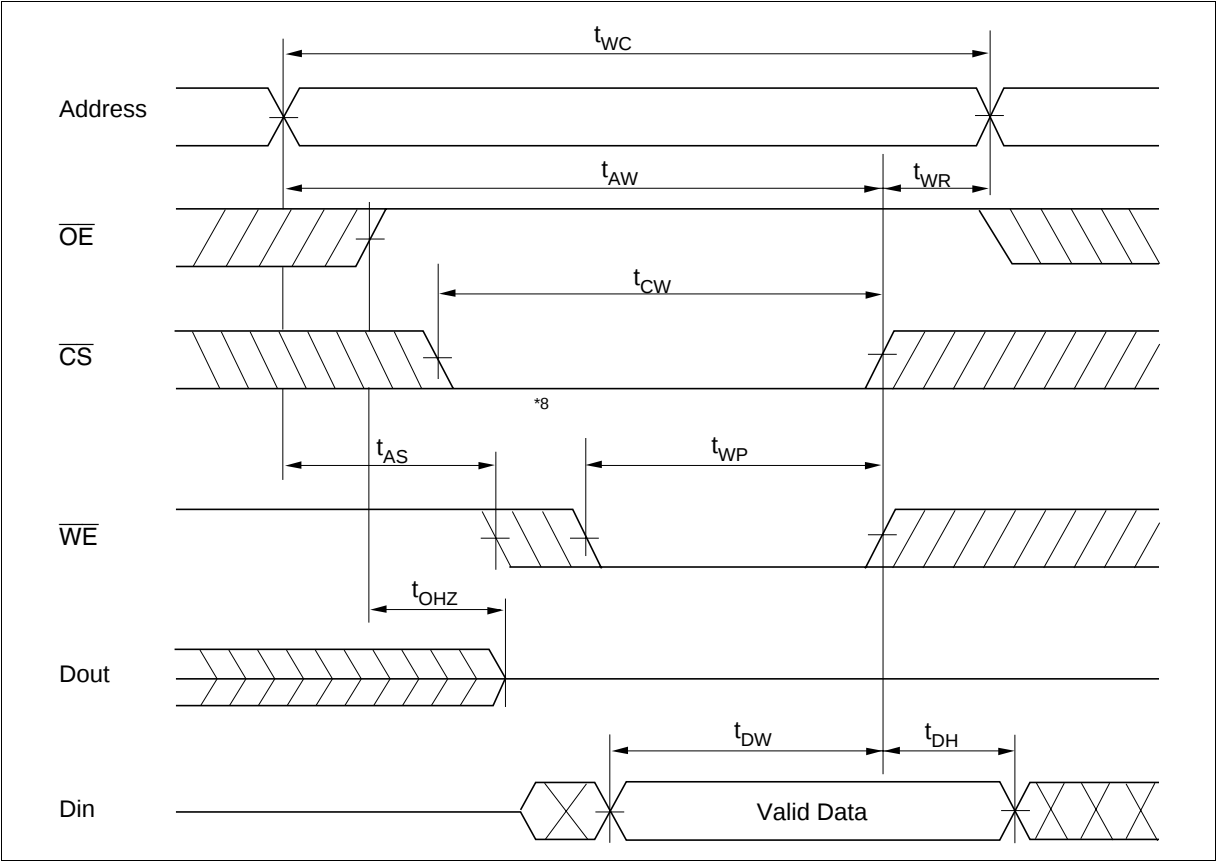
12. In the write cycle with $\overline{OE}$ low fixed, t_{WP} must satisfy the following equation to avoid a problem of data bus contention. $t_{WP} \geq t_{DW} \text{ min} + t_{WHZ} \text{ max}$

Timing Waveforms

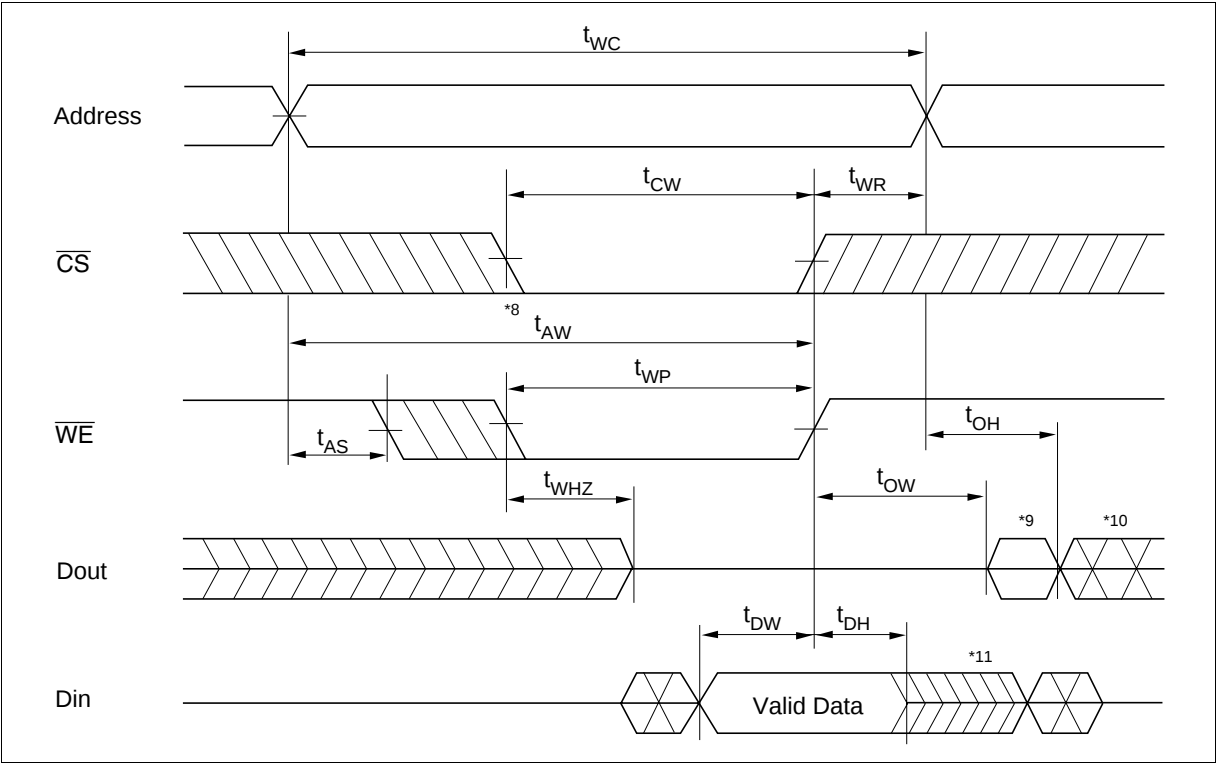
Read Timing Waveform ($\overline{WE} = V_{IH}$)



Write Timing Waveform (1) ($\overline{\text{OE}}$ Clock)



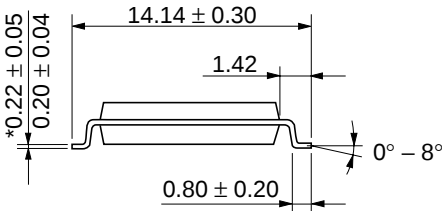
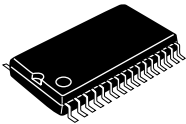
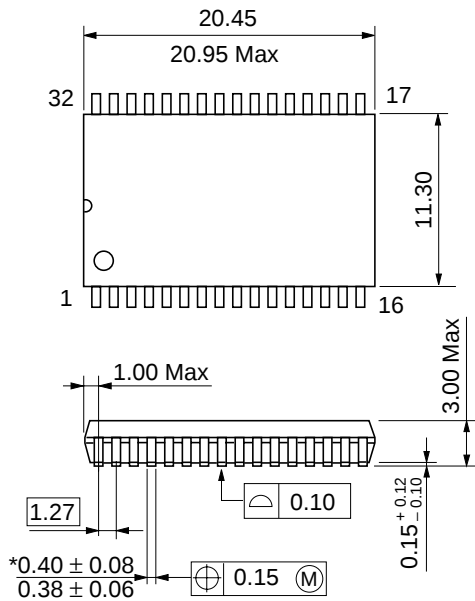
Write Timing Waveform (2) ($\overline{\text{OE}}$ Low Fixed)



Package Dimensions

HM628512BFP Series (FP-32D)

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-32D
JEDEC	Conforms
EIAJ	—
Weight (reference value)	1.3 g

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Revision Record

Rev.	Date	Contents of Modification	Drawn by	Approved by
1.0	Jun. 29, 1999	Initial issue	S. Kunito	K. Imato
2.0	Nov. 23, 1999	Addition of HM628512BFP-5 Series		