
HM671400H Series

4,194,304-words $\times$ 1-bit High Speed Static Random Access
Memory

HITACHI

ADE-203-086G(Z)

Rev. 8

Aug. 28, 1996

Features

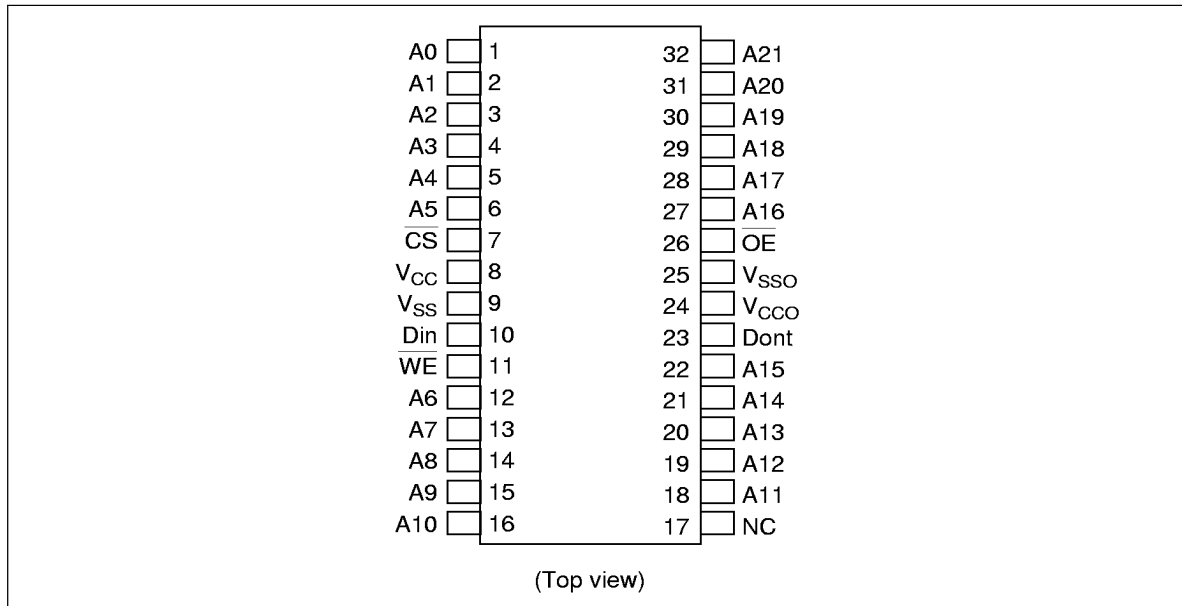
- 4194304-words $\times$ 1 bit organization
- Directly TTL compatible input and output
- +5.0 V Single Supply
- Completely static memory
- No clock or timing strobe required
- Super fast access time: 15/20 ns (Max)
- Revolutionary Pin Arrangement

Ordering Information

Type No.	Organization	Access time	Package
HM671400HJP-15		15 ns	400 mil 32 pin
HM671400HJP-20	4M $\times$ 1	20 ns	Plastic SOJ (CP-32DB)

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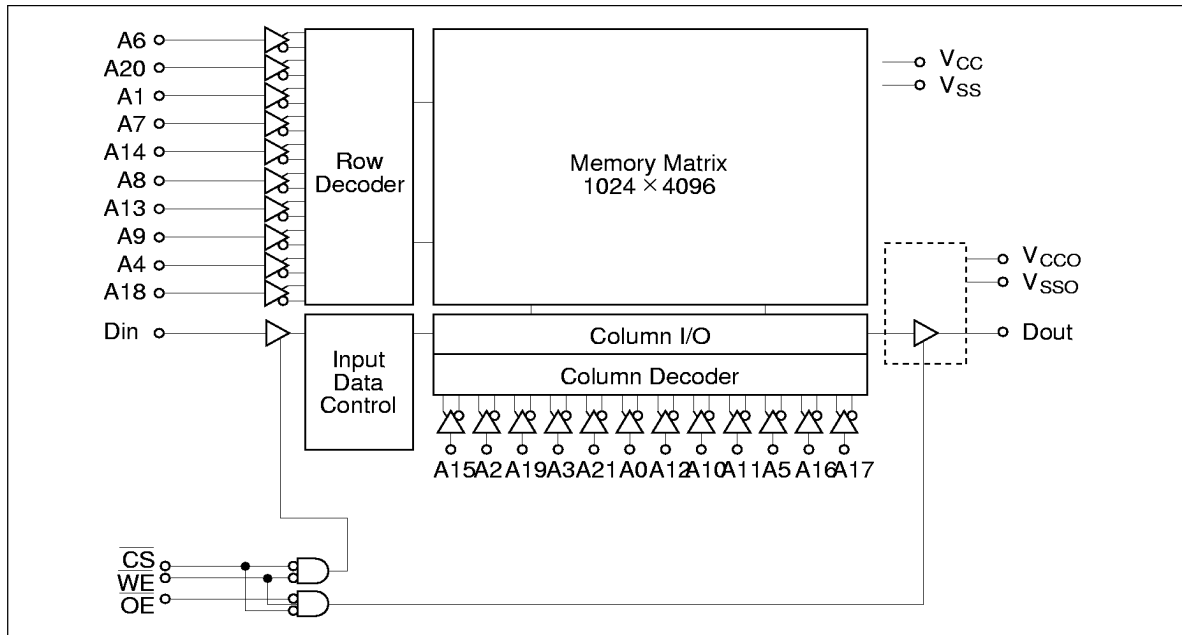
Pin Arrangement



Pin Description

Pin Name	Function
A0 to A21	Address Input
Din	Data Input
Dout	Data Output
$\overline{WE}$	Write Enable
$\overline{CS}$	Chip Select
$\overline{OE}$	Output Enable
V_{CC}	+5 V Power Supply
V_{CCO}	Output Buffer Power Supply
V_{SSO}	Output Buffer Ground
V_{SS}	Ground
NC	Not Connect

Block Diagram



Function Table

$\overline{CS}$	$\overline{WE}$	$\overline{OE}$	Mode	Output	V_{CC} Current
H	X	X	Not Selected	High Z	I_{SB} , I_{SB1}
L	H	H	Output Disable	High Z	I_{CC} , I_{CC1}
L	H	L	Read	Data Out	I_{CC} , I_{CC1}
L	L	H	Write	High Z	I_{CC} , I_{CC1}
L	L	L	Write	High Z	I_{CC} , I_{CC1}

Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply Voltage *1	V_{CC}	-0.5 to + 7.0	V
Voltage on any pin relative to V_{SS} *1	V_T	-0.5 to $V_{CC} + 0.5$	V
Power dissipation	P_T	1.0/1.5 *2	W
Operating Temperature Range	Topr	0 to +70	°C
Storage Temperature Range (with bias)	Tstg (Bias)	-10 to + 85	°C
Storage Temperature Range	Tstg	-55 to + 125	°C

Notes: 1. With respect to $V_{SS} = V_{SSO}$

2. $P_T = 1.5$ W is guaranteed under the minimum air flow exceeding 500 linear feet per minute.

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Under the dc and ac specifications shown in the Tables, this device is tested under the minimum transverse air flow exceeding 500 linear feet per minute.

Recommended DC Operating Conditions ($0^{\circ}\text{C} \leq T_a \leq 70^{\circ}\text{C}$)

Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}, V_{CCO}	4.5	5.0	5.5	V
	V_{SS}, V_{SSO}	0.0	0.0	0.0	V
Input High Voltage	V_{IH}	2.2	—	$V_{CC} + 0.5$	V
Input Low Voltage	V_{IL}	-0.5	—	0.8	V

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DC and Operating Characteristics ($V_{CC} = V_{CCO} = 5.0 \text{ V} \pm 10\%$, $V_{SS} = V_{SSO} = 0 \text{ V}$, $T_a = 0 \text{ to } +70^\circ\text{C}$)

Item	Symbol	Test Conditions	15		20		Unit
			Min	Max	Min	Max	
Input Leakage Current	I_{L1}	$V_{CC} = 5.5 \text{ V}$, $V_{IN} = 0 \text{ V to } V_{CC}$	—	2	—	2	μA
Output Leakage Current	I_{LO1}	$\overline{CS} = V_{IH}$ or $\overline{OE} = V_{IH}$, $\overline{WE} = V_{IL}$, $V_{OUT} = 0 \text{ V to } V_{CC}$	—	10	—	10	μA
Operating Power Supply Current	I_{CC}	$\overline{CS} = V_{IL}$, $I_{OUT} = 0 \text{ mA}$	—	120	—	120	mA
Average Operating Current	I_{CC1}	Min. cycle, $I_{OUT} = 0 \text{ mA}$	—	170	—	150	mA
Standby Power Supply Current	I_{SBAC}	$\overline{CS} = V_{IH}$ Min. cycle	—	100	—	80	mA
	I_{SBDC}	$\overline{CS} = V_{IH}$ All input fixed and $V_{IN} = V_{IH}$ or V_{IL}	—	20	—	20	mA
	I_{SB1}	$\overline{CS} \geq V_{CC} - 0.2 \text{ V}$ $V_{IN} \leq 0.2 \text{ V}$ or $V_{IN} \geq V_{CC} - 0.2 \text{ V}$	—	10	—	10	mA
Output Low Voltage	V_{OL}	$I_{OL} = 8 \text{ mA}$	—	0.4	—	0.4	V
Output High Voltage	V_{OH}	$I_{OH} = -4 \text{ mA}$	2.4	—	2.4	—	V

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AC Characteristics ($V_{CC} = V_{CCO} = 5.0 \text{ V} \pm 10\%$, $V_{SS} = V_{SSO} = 0 \text{ V}$, $T_a = 0^\circ\text{C}$ to 70°C , unless otherwise noted.)

Read Cycle

Item	Symbol	15		20		Unit
		Min	Max	Min	Max	
Read Cycle Time	t_{RC}	15	—	20	—	ns
Address Access Time	t_{AA}	—	15	—	20	ns
Chip Select Access Time	t_{ACS}	—	15	—	20	ns
Chip Selection to Output in Low Z	$t_{LZ}^{*1, *2}$	5	—	5	—	ns
Output Enable to Output Valid	t_{OE}	—	8	—	10	ns
Output Enable to Output in Low Z	$t_{OLZ}^{*1, *2}$	2	—	2	—	ns
Chip Deselection to Output in High Z	$t_{HZ}^{*1, *2}$	0	7	0	8	ns
Output Hold from Address Change	t_{OH}	5	—	5	—	ns

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

2. Transition is measured $\pm 200 \text{ mV}$ from steady state voltage with specified loading in Load(B).

Write Cycle

Item	Symbol	15		20		Unit
		Min	Max	Min	Max	
Write Cycle Time	t_{WC}^{*1}	15	—	20	—	ns
Chip Selection to End of Write	t_{CW}	12	—	15	—	ns
Address Valid to End of Write	t_{AW}	12	—	15	—	ns
Address Setup Time	t_{AS}	0	—	0	—	ns
Write Pulse Width	t_{WP}	12	—	15	—	ns
Write Recovery Time	t_{WR}	3	—	3	—	ns
Data Valid to End of Write	t_{DW}	8	—	10	—	ns
Data Hold Time	t_{DH}	0	—	0	—	ns
Write Enable to Output in High Z	$t_{WZ}^{*2, *3}$	0	7	0	8	ns
Output Disable to Output in High Z	$t_{OHZ}^{*2, *3}$	0	7	0	8	ns
Output Active from End of Write	$t_{OW}^{*2, *3}$	2	—	2	—	ns

Notes: 1. All Write Cycle timings are referenced from the last valid address to the first transitioning address.

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

3. Transition is measured $\pm 200 \text{ mV}$ from steady state voltage with specified with loading Load(B).

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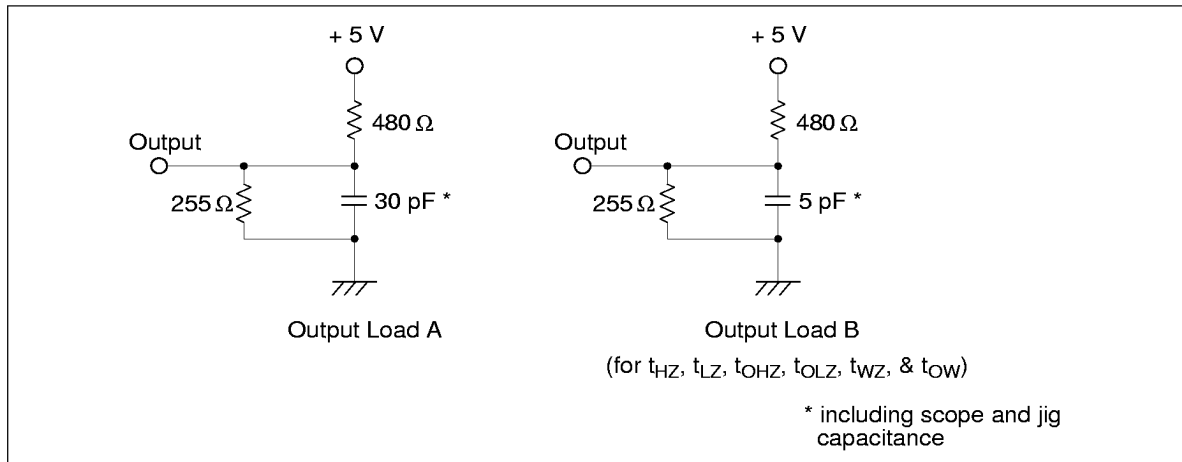
Capacitance ($T_a = 25^\circ\text{C}$, $f = 1\text{ MHz}$)

Item	Symbol	Max	Unit	Test Condition
Input Capacitance	C_{IN}^*	6	pF	$V_{IN} = 0\text{ V}$
Output Capacitance	C_{OUT}^*	8	pF	$V_{OUT} = 0\text{ V}$

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

AC Test Conditions

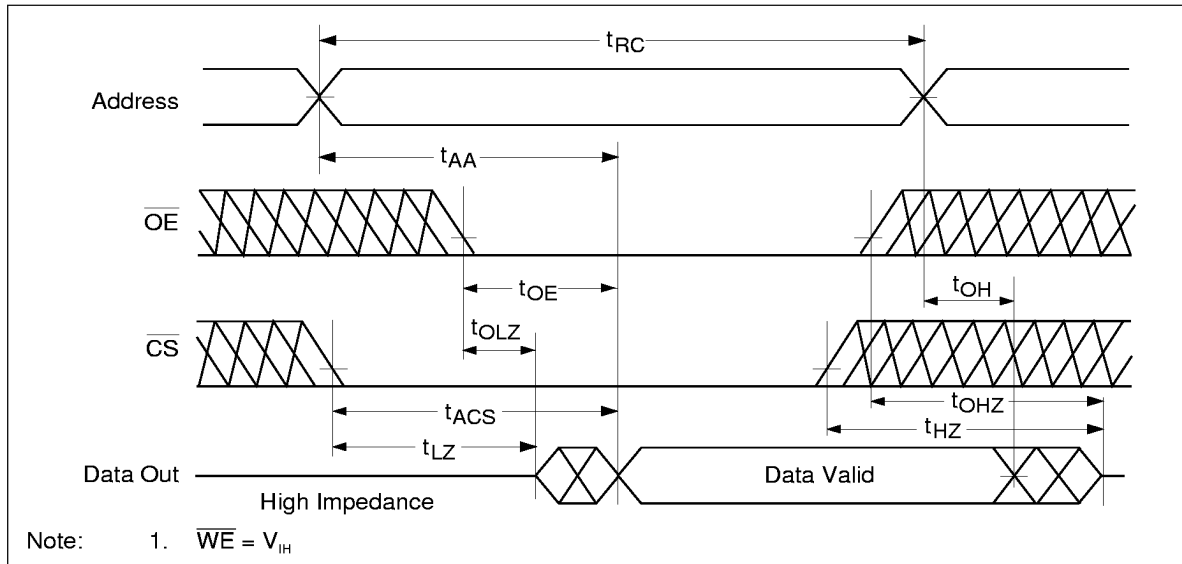
- Input pulse levels: V_{SS} to 3.0 V
- Input timing reference levels: 1.5 V
- Output Load: See figure
- Input rise and fall times: 4 ns
- Output reference levels: 1.5 V



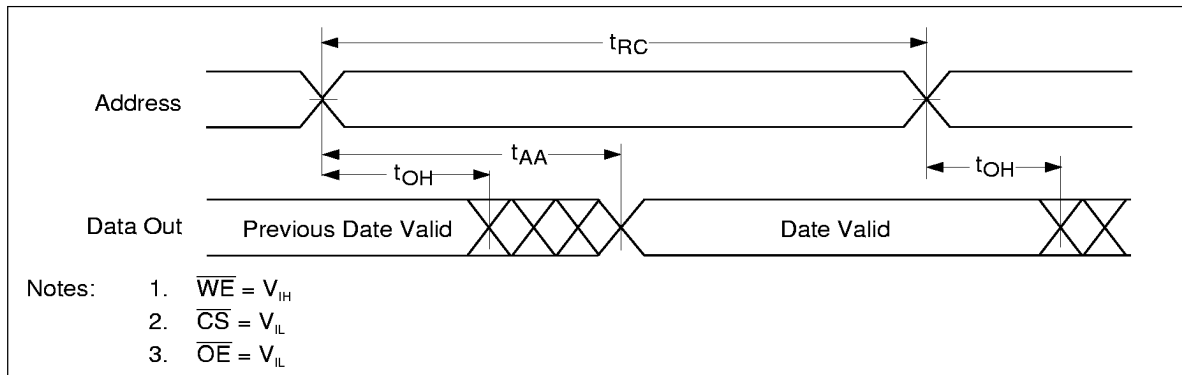
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Timing Waveforms

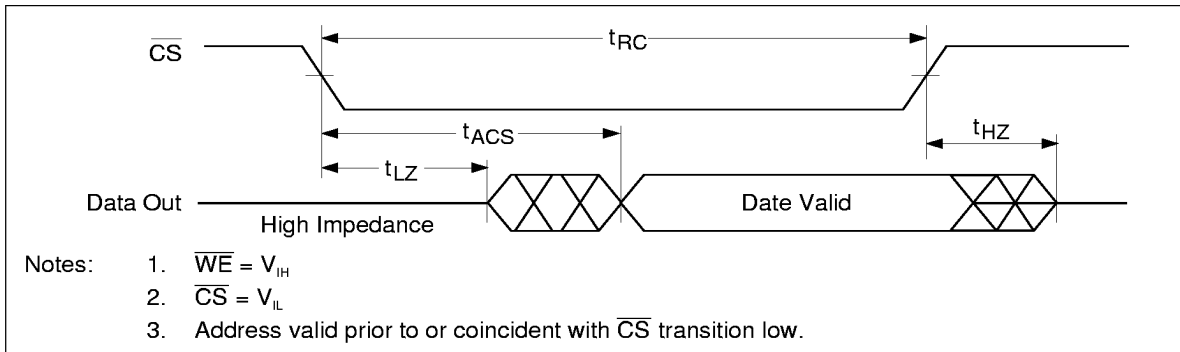
Read Cycle-1 *1



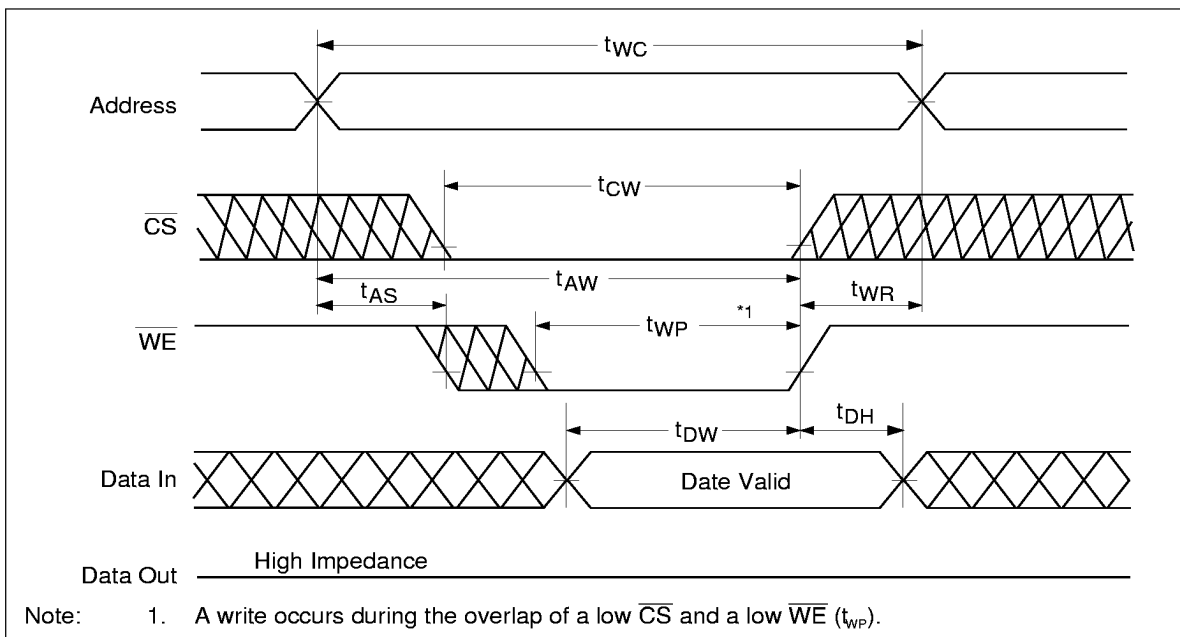
Read Cycle-2 *1, *2, *3



Read Cycle-3 *1, *2, *3

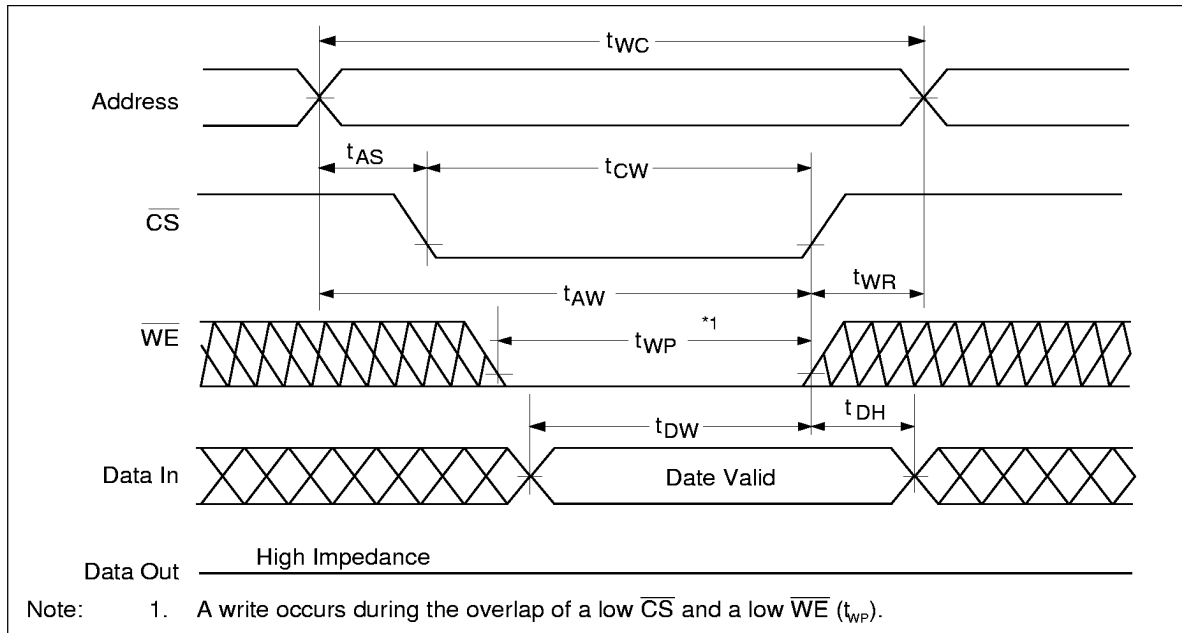


Write Cycle-1 *1 ($\overline{OE} = H$, $\overline{WE}$ Controlled)

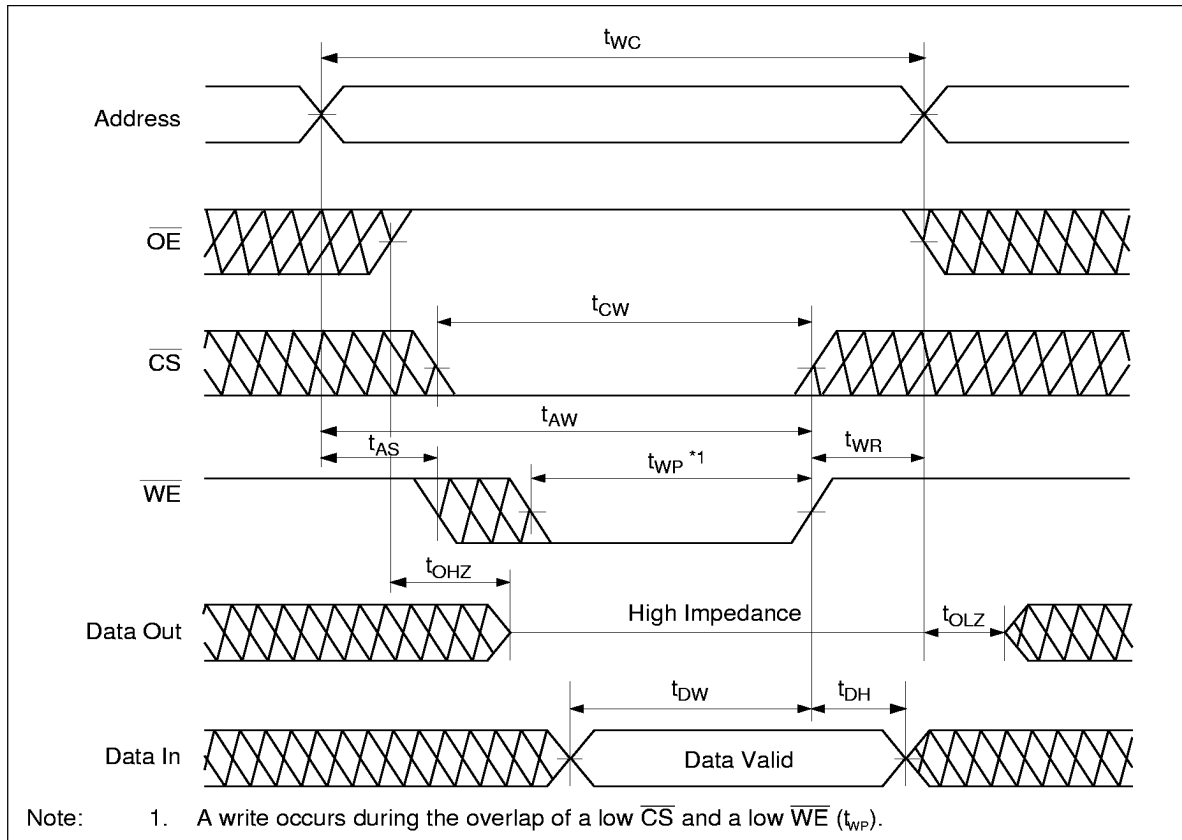


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Write Cycle-2 *1 ($\overline{OE} = H$, $\overline{CS}$ Controlled)

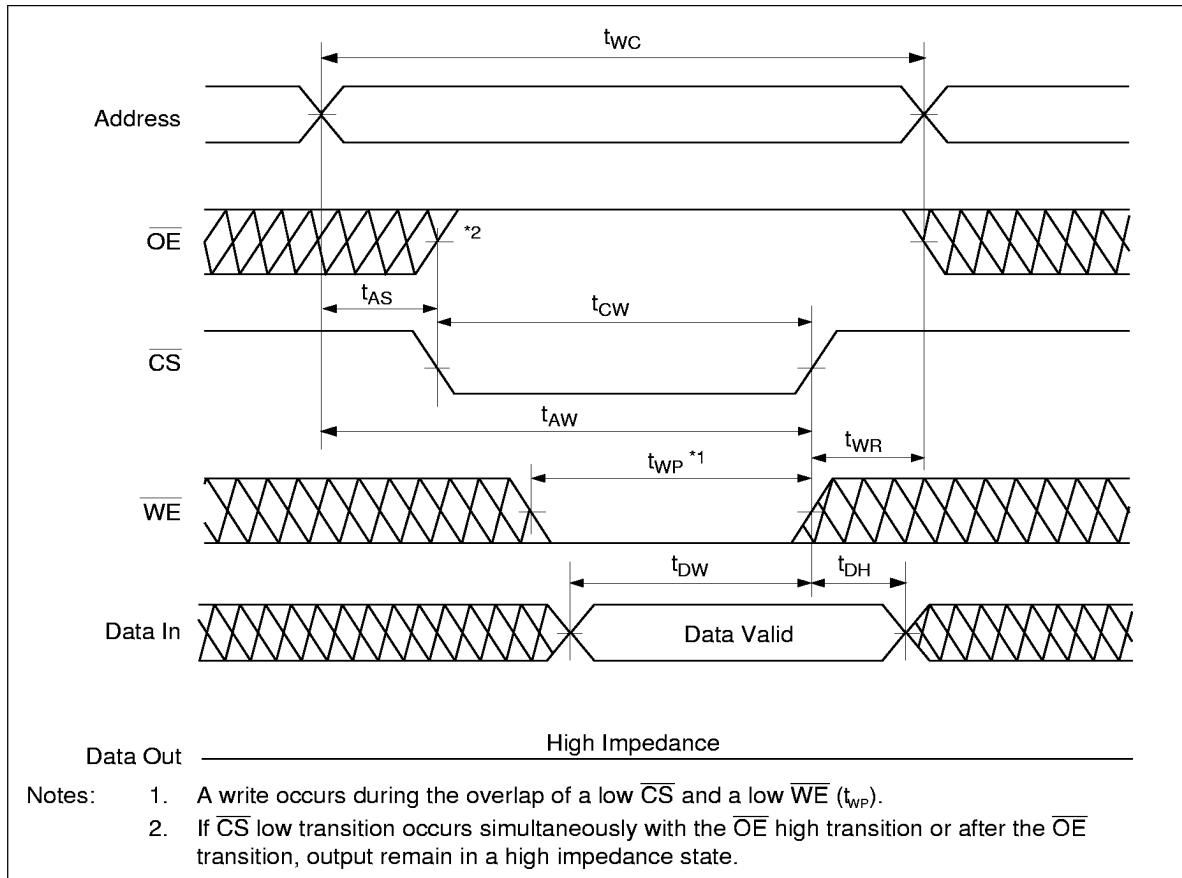


Write Cycle-3 *1 ($\overline{\text{OE}}$ = Clocked, $\overline{\text{WE}}$ Controlled)

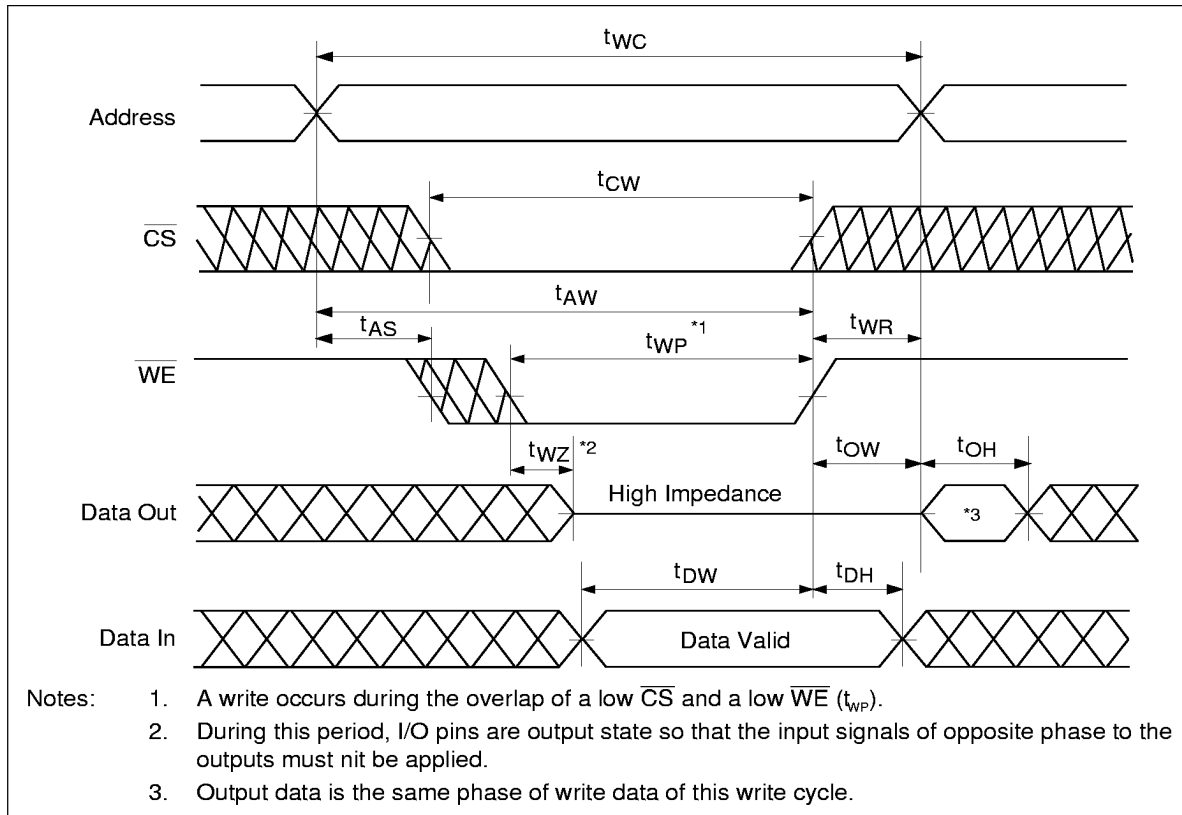


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Write Cycle-4 *¹, *² ($\overline{\text{OE}}$ = Clocked, $\overline{\text{CS}}$ Controlled)

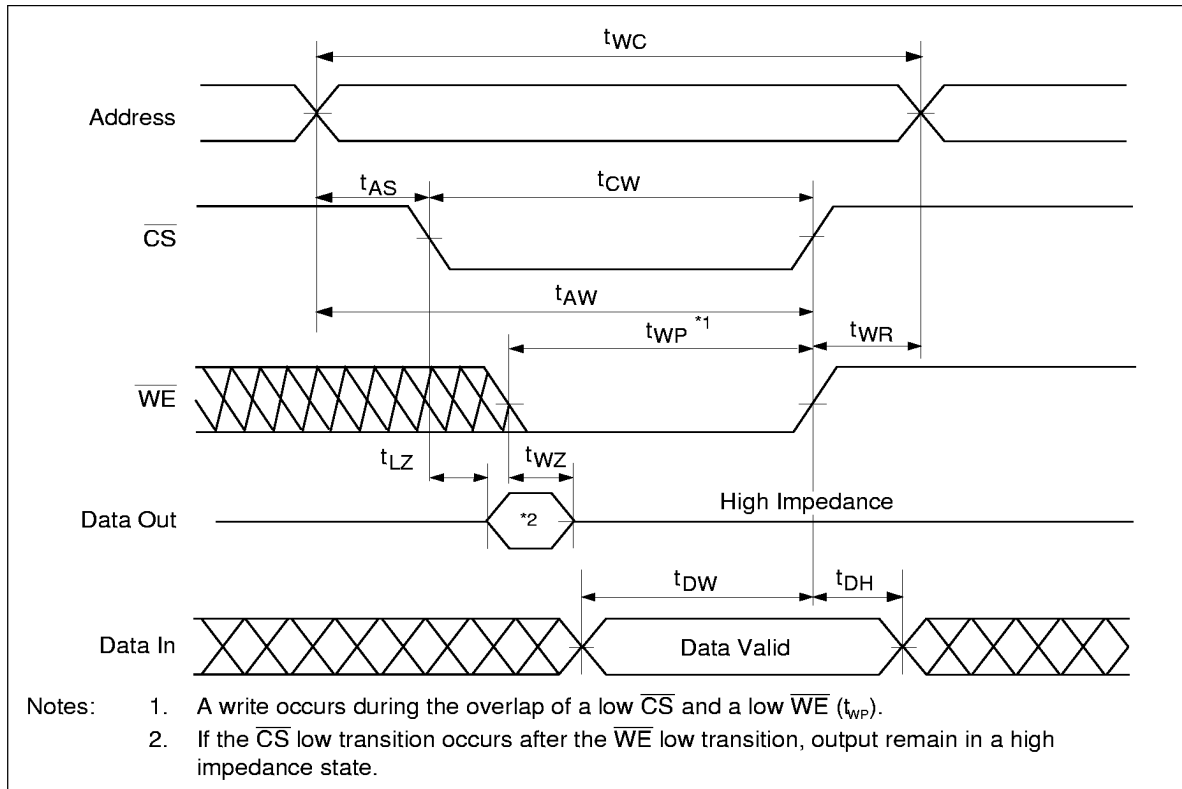


Write Cycle-5 *1, *2, *3 ($\overline{OE} = L$, $\overline{WE}$ Controlled)



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Write Cycle-6 *¹, *² ($\overline{OE} = L$, $\overline{CS}$ Controlled)



Package Dimension**HM761400HJP Series (CP-32DB)****Unit : mm**