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# HM6208H Series

65,536-word × 4-bit High Speed CMOS Static RAM

# HITACHI

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## Features

- Single 5 V supply and high density 24-pin package
- High speed: Access time 25/35/45 ns (max)
- Low power
  - Operation: 300 mW (typ)
  - Standby: 100  $\mu$ W (typ)  
30  $\mu$ W (typ) (L-version)
- Completely static memory required
  - No clock or timing strobe required
- Equal access and cycle time
- Directly TTL compatible: All inputs and outputs
- Battery backup operation capability (L-version)

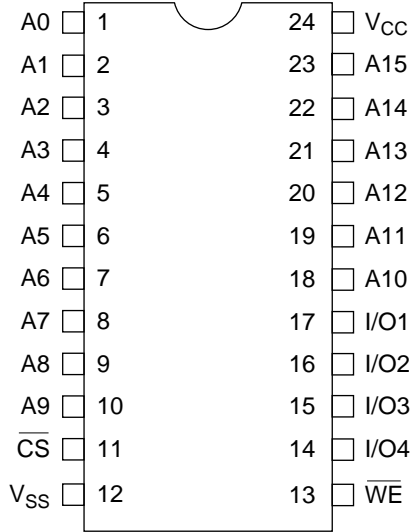
## Ordering Information

Type No.	Access Time	Package
HM6208HP-25	25 ns	300-mil, 24-pin plastic DIP (DP-24NC)
HM6208HP-35	35 ns	
HM6208HP-45	45 ns	
HM6208HLP-25	25 ns	300-mil, 24-pin SOJ (CP-24D)
HM6208HLP-35	35 ns	
HM6208HLP-45	45 ns	
HM6208HJP-25	25 ns	300-mil, 24-pin SOJ (CP-24D)
HM6208HJP-35	35 ns	
HM6208HJP-45	45 ns	
HM6208HLJP-25	25 ns	300-mil, 24-pin SOJ (CP-24D)
HM6208HLJP-35	35 ns	
HM6208HLJP-45	45 ns	

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# HM6208H Series

## Pin Arrangement

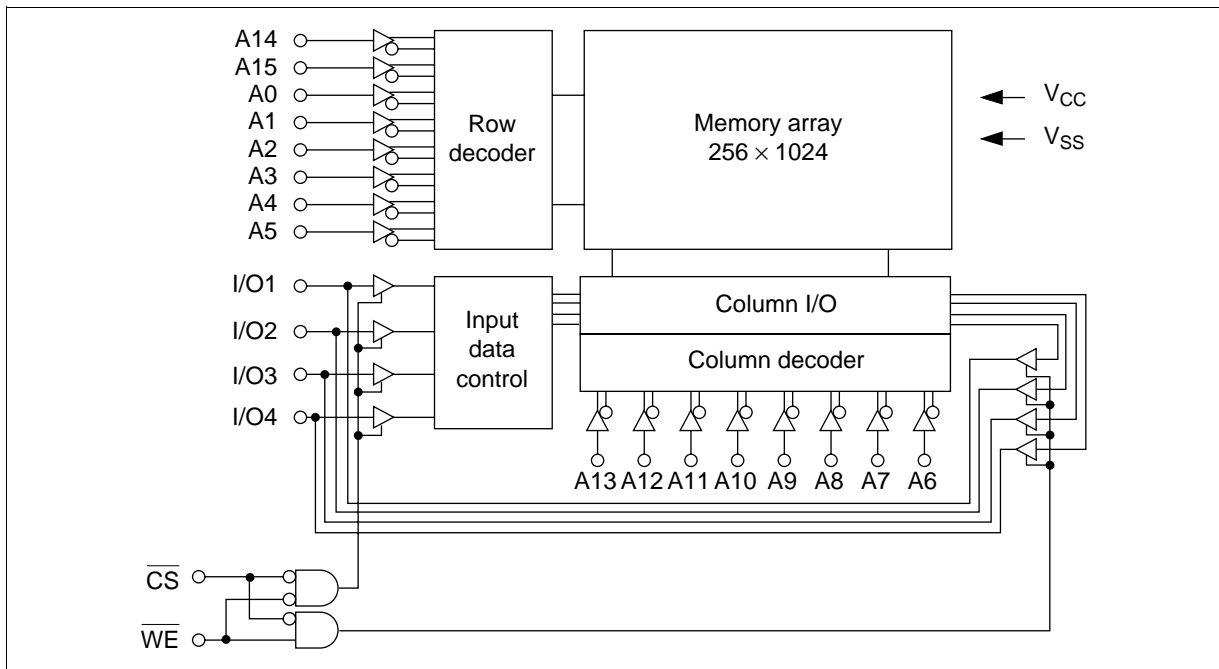


(Top view)

## Pin Description

Pin Name	Function
A0–A15	Address
I/O1–I/O4	Input/output
$\overline{\text{CS}}$	Chip select
$\overline{\text{WE}}$	Write enable
$V_{\text{CC}}$	Power supply
$V_{\text{SS}}$	Ground

Block Diagram



Truth Table

$\overline{CS}$	$\overline{WE}$	Mode	$V_{CC}$ Current	I/O Pin	Ref. Cycle
H	×	Not selected	$I_{SB}, I_{SB1}$	High-Z	—
L	H	Read	$I_{CC}$	Dout	Read cycle
L	L	Write	$I_{CC}$	Din	Write cycle

Note: ×: Don't care.

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Voltage on any pin relative to $V_{SS}$	$V_{in}$	$-0.5^{*1}$ to +7.0	V
Power dissipation	$P_T$	1.0	W
Operating temperature range	$T_{opr}$	0 to +70	°C
Storage temperature range	$T_{stg}$	-55 to +125	°C
Storage temperature range under bias	$T_{bias}$	-10 to +85	°C

Note: 1.  $V_{in}$  min = -2.5 V for pulse widths  $\leq 10$  ns.

# HM6208H Series

## Recommended DC Operating Conditions (Ta = 0 to +70°C)

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V <sub>CC</sub>	4.5	5.0	5.5	V
	V <sub>SS</sub>	0	0	0	V
Input high (logic 1) voltage	V <sub>IH</sub>	2.2	—	6.0	V
Input low (logic 0) voltage	V <sub>IL</sub>	-0.5 <sup>*1</sup>	—	0.8	V

Note: 1. V<sub>IL</sub> min = -2.0 V for pulse width ≤ 10 ns.

## DC Characteristics (Ta = 0 to +70°C, V<sub>CC</sub> = 5 V ± 10%, V<sub>SS</sub> = 0 V)

Parameter	Symbol	HM6208H-25			HM6208H-35/45			Unit	Test Conditions
		Min	Typ <sup>*2</sup>	Max	Min	Typ <sup>*2</sup>	Max		
Input leakage current	I <sub>LI</sub>	—	—	2.0	—	—	2.0	μA	V <sub>CC</sub> = Max Vin = V <sub>SS</sub> to V <sub>CC</sub>
Output leakage current	I <sub>LO</sub>	—	—	10.0	—	—	10.0	μA	$\overline{CS} = V_{IH}$ , V <sub>IO</sub> = V <sub>SS</sub> to V <sub>CC</sub>
Operating power supply current	I <sub>CC</sub>	—	60	120	—	50	100	mA	$\overline{CS} = V_{IL}$ , I <sub>IO</sub> = 0 mA, min cycle, duty = 100%
	I <sub>CC1</sub>	—	40	80	—	40	80	mA	$\overline{CS} = V_{IL}$ , I <sub>IO</sub> = 0 mA, t cycle = 50 ns, duty = 100%
Standby power supply current	ISB	—	20	40	—	15	30	mA	$\overline{CS} = V_{IH}$ , min cycle
Standby power supply current (1)	ISB1	—	0.02	2.0	—	0.02	2.0		$\overline{CS} \geq V_{CC} - 0.2$ V, 0 V ≤ Vin < 0.2 V, or Vin ≥ V <sub>CC</sub> - 0.2 V
	ISB1 <sup>*1</sup>	—	0.006	0.1 <sup>*1</sup>	—	0.006	0.1 <sup>*1</sup>		
Output low voltage	V <sub>OL</sub>	—	—	0.4	—	—	0.4	V	I <sub>OL</sub> = 8 mA
Output high voltage	V <sub>OH</sub>	2.4	—	—	2.4	—	—	V	I <sub>OH</sub> = -4.0 mA

Notes: 1. L-version

2. Typical values are at V<sub>CC</sub> = 5.0 V, Ta = +25°C and not guaranteed.

## Capacitance (Ta = 25°C, f = 1 MHz)<sup>\*1</sup>

Parameter	Symbol	Min	Max	Unit	Test Conditions
Input capacitance	C <sub>in</sub>	—	6	pF	Vin = 0 V
Input/output capacitance	C <sub>IO</sub>	—	11	pF	V <sub>IO</sub> = 0 V

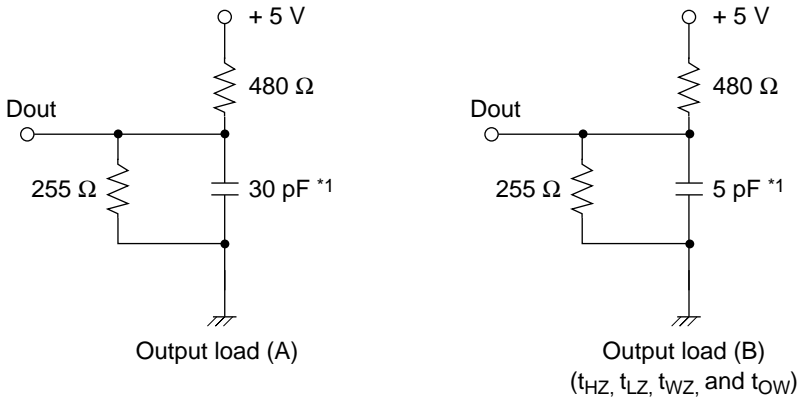
Note: 1. These parameters are sampled and not 100% tested.

**AC Characteristics** ( $T_a = 0$  to  $+70^\circ\text{C}$ ,  $V_{CC} = 5\text{ V} \pm 10\%$ , unless otherwise noted)

**Test Conditions**

- Input pulse levels:  $V_{SS}$  to 3.0 V
- Input rise and fall time: 5 ns
- Input and output timing reference levels: 1.5 V
- Output load: See figure

**Output Load**



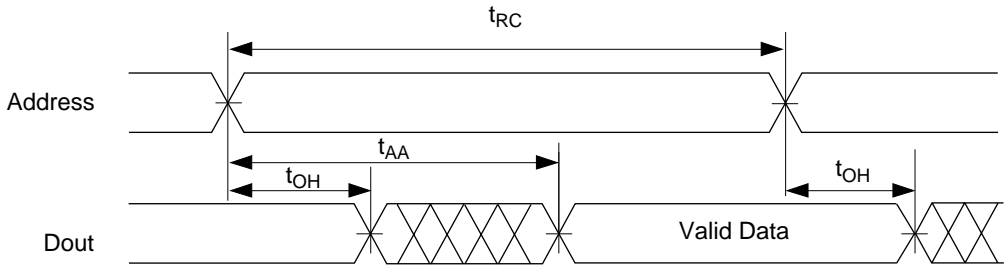
Note: 1. Including scope and jig

**Read Cycle**

Parameter	Symbol	HM6208H-25		HM6208H-35		HM6208H-45		Unit
		Min	Max	Min	Max	Min	Max	
Read cycle time	$t_{RC}$	25	—	35	—	45	—	ns
Address access time	$t_{AA}$	—	25	—	35	—	45	ns
Chip select access time	$t_{ACS}$	—	25	—	35	—	45	ns
Output hold from address change	$t_{OH}$	5	—	5	—	5	—	ns
Chip selection to output in low-Z	$t_{LZ}^{*1}$	5	—	5	—	5	—	ns
Chip deselection to output in high-Z	$t_{HZ}^{*1}$	0	15	0	20	0	20	ns
Chip deselection to power up time	$t_{PU}$	0	—	0	—	0	—	ns
Chip deselection to power down time	$t_{PD}$	—	15	—	25	—	30	ns

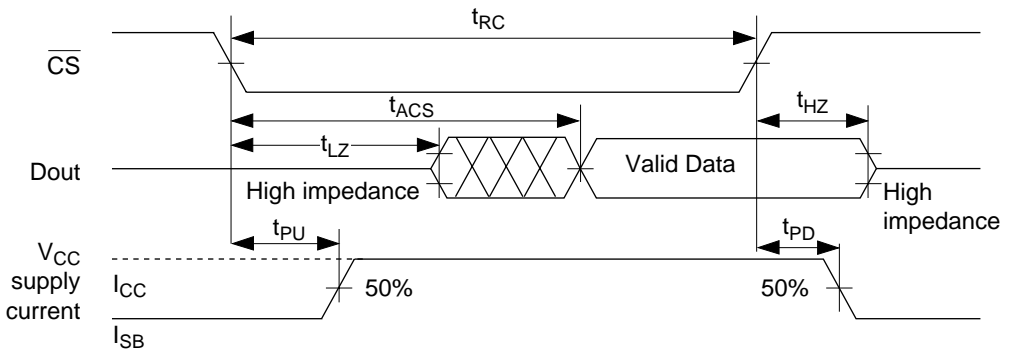
Note: 1. Transition is measured  $\pm 200$  mV from steady state voltage with load (B). These parameters are sampled and not 100% tested.

## Read Timing Waveform (1)



- Notes: 1.  $\overline{WE}$  is high for read cycle.  
 2. Device is continuously selected.

## Read Timing Waveform (2)



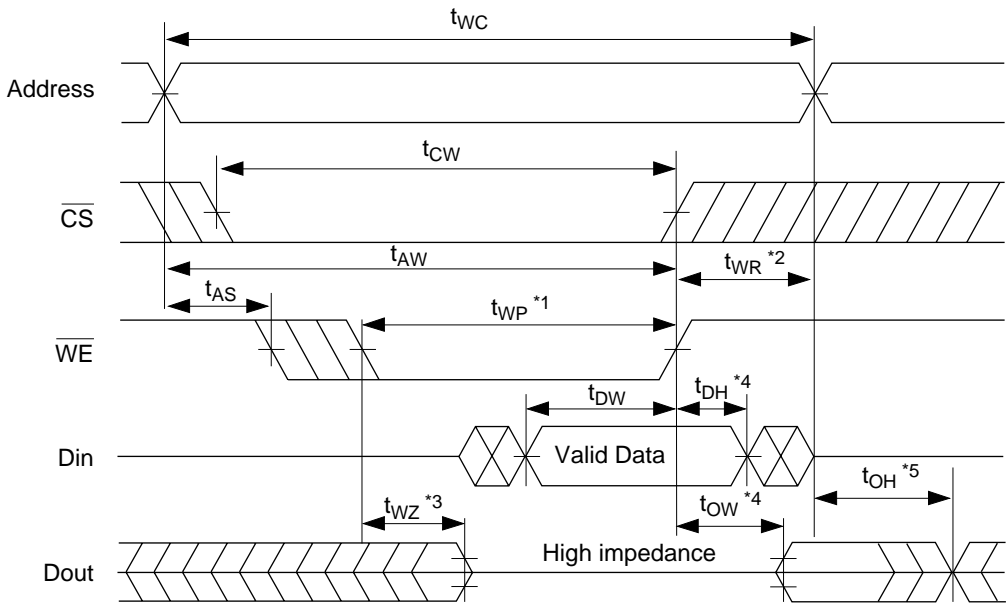
- Notes: 1.  $\overline{WE}$  is high for read cycle.  
 2. Address valid prior to or coincident with the  $\overline{CS}$  transition to low.

Write Cycle

Parameter	Symbol	HM6208H-25		HM6208H-35		HM6208H-45		Unit
		Min	Max	Min	Max	Min	Max	
Write cycle time	$t_{WC}$	25	—	35	—	45	—	ns
Chip selection to end of write	$t_{CW}$	20	—	30	—	40	—	ns
Address valid to end of write	$t_{AW}$	20	—	30	—	40	—	ns
Address setup time	$t_{AS}$	0	—	0	—	0	—	ns
Write pulse width	$t_{WP}$	20	—	25	—	30	—	ns
Write recovery time	$t_{WR}$	3	—	3	—	3	—	ns
Data valid to end of write	$t_{DW}$	15	—	20	—	20	—	ns
Data hold time	$t_{DH}$	0	—	0	—	0	—	ns
Write enabled to output in high-Z	$t_{WZ}^{*1}$	0	8	0	10	0	15	ns
Output active from end of write	$t_{OW}^{*1}$	0	—	0	—	0	—	ns

Note: 1. Transition is measured  $\pm 200$  mV from high impedance voltage with load (B).  
 These parameters are sampled and not 100% tested.

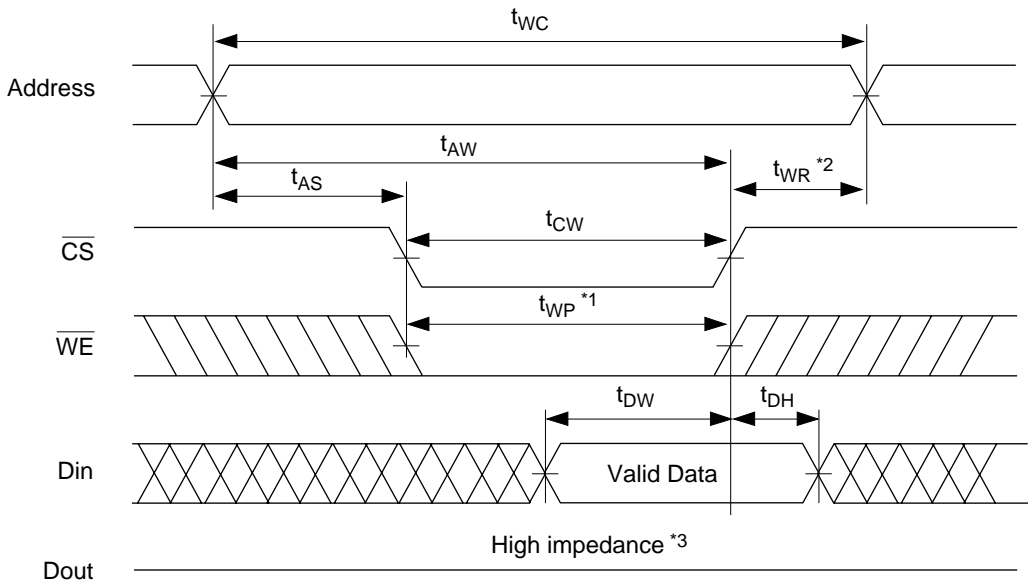
## Write Timing Waveform (1) ( $\overline{WE}$ Controlled)



- Notes:
1. A write occurs during the overlap of a low  $\overline{CS}$  and a low  $\overline{WE}$  ( $t_{WP}$ ).
  2.  $t_{WR}$  is measured from the earlier of  $\overline{CS}$  or  $\overline{WE}$  going high to the end of the write cycle.
  3. During this period, I/O pins are in the output state. The input signals of the opposite phase to the outputs must not be applied.
  4. If  $\overline{CS}$  is low during this period, I/O pins are in the output state. The data input signals of opposite phase to the outputs must not be applied to them.
  5. Dout is the same phase of write data of this write cycle.



Write Timing Waveform (2) ( $\overline{CS}$  Controlled)



- Notes:
1. A write occurs during the overlap of a low  $\overline{CS}$  and a low  $\overline{WE}$  ( $t_{WP}$ ).
  2.  $t_{WR}$  is measured from the earlier of  $\overline{CS}$  or  $\overline{WE}$  going high to the end of the write cycle.
  3. If the  $\overline{CS}$  low transition occurs simultaneously with the  $\overline{WE}$  low transition or after the  $\overline{WE}$  transition, the output buffers remain in a high-impedance state.

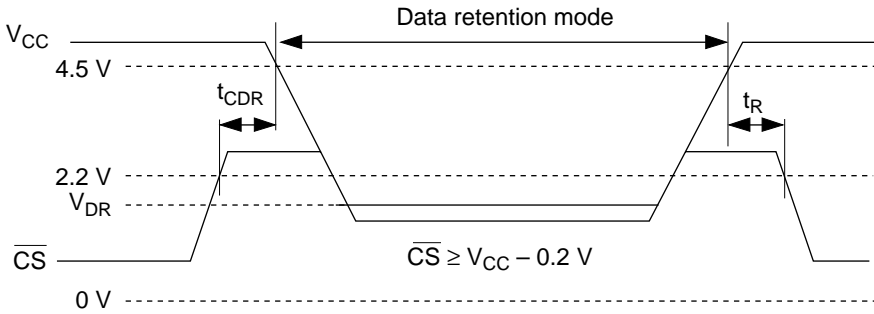
## Low $V_{CC}$ Data Retention Characteristics ( $T_a = 0$ to $+70^\circ\text{C}$ )

These characteristics are guaranteed for the L-version only.

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
$V_{CC}$ for data retention	$V_{DR}$	2.0	—	—	V	$\overline{CS} \geq V_{CC} - 0.2 \text{ V}$ , $V_{in} \geq V_{CC} - 0.2 \text{ V}$ , or $0 \text{ V} \leq V_{in} < 0.2 \text{ V}$ , or
Data retention current	$I_{CCDR}$	—	2	$50^{*1}$	$\mu\text{A}$	
Chip deselect to data retention time	$t_{CDR}$	0	—	—	ns	
Operation recovery time	$t_R$	5	—	—	ms	

Note: 1.  $V_{CC} = 3.0 \text{ V}$

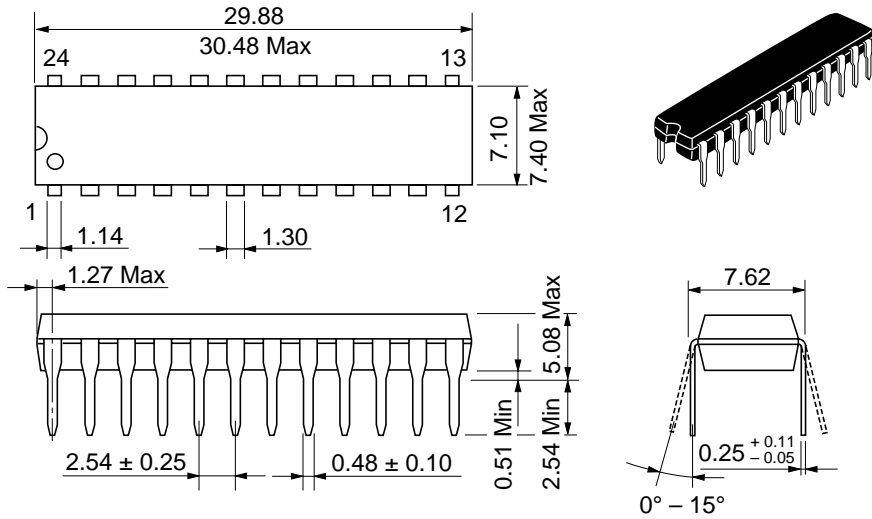
### Low $V_{CC}$ Data Retention Timing Waveform



Package Dimensions

HM6208HP/HLP Series (DP-24NC)

Unit: mm



HM6208HJP/HLJP Series (CP-24D)

Unit: mm

