

---

# HM624100HC Series

4M High Speed SRAM (1-Mword × 4-bit)

# HITACHI

ADE-203-1198 (Z)  
Preliminary  
Rev. 0.0  
Nov. 30, 2000

---

## Description

The HM624100HC is a 4-Mbit high speed static RAM organized 1-Mword × 4-bit. It has realized high speed access time by employing CMOS process (6-transistor memory cell) and high speed circuit designing technology. It is most appropriate for the application which requires high speed and high density memory, such as cache and buffer memory in system. The HM624100HC is packaged in 400-mil 32-pin SOJ for high density surface mounting.

## Features

- Single 5.0 V supply : 5.0 V ± 10 %
- Access time 10 ns (max)
- Completely static memory
  - No clock or timing strobe required
- Equal access and cycle times
- Directly TTL compatible
  - All inputs and outputs
- Operating current : 140 mA (max)
- TTL standby current : 40 mA (max)
- CMOS standby current : 5 mA (max)
  - : 1.2 mA (max) (L-version)
- Data retention current : 0.8 mA (max) (L-version)
- Data retention voltage : 2.0 V (min) (L-version)
- Center  $V_{CC}$  and  $V_{SS}$  type pinout

Preliminary: The specification of this device are subject to change without notice. Please contact your nearest Hitachi's Sales Dept. regarding specification.

---

## HM624100HC Series

---

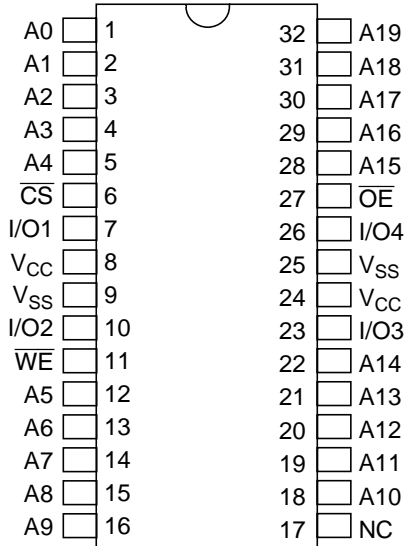
### Ordering Information

Type No.	Access time	Package
HM624100HCJP-10	10 ns	400-mil 32-pin plastic SOJ (CP-32DB)
HM624100HCLJP-10	10 ns	

---

Pin Arrangement

32-pin SOJ

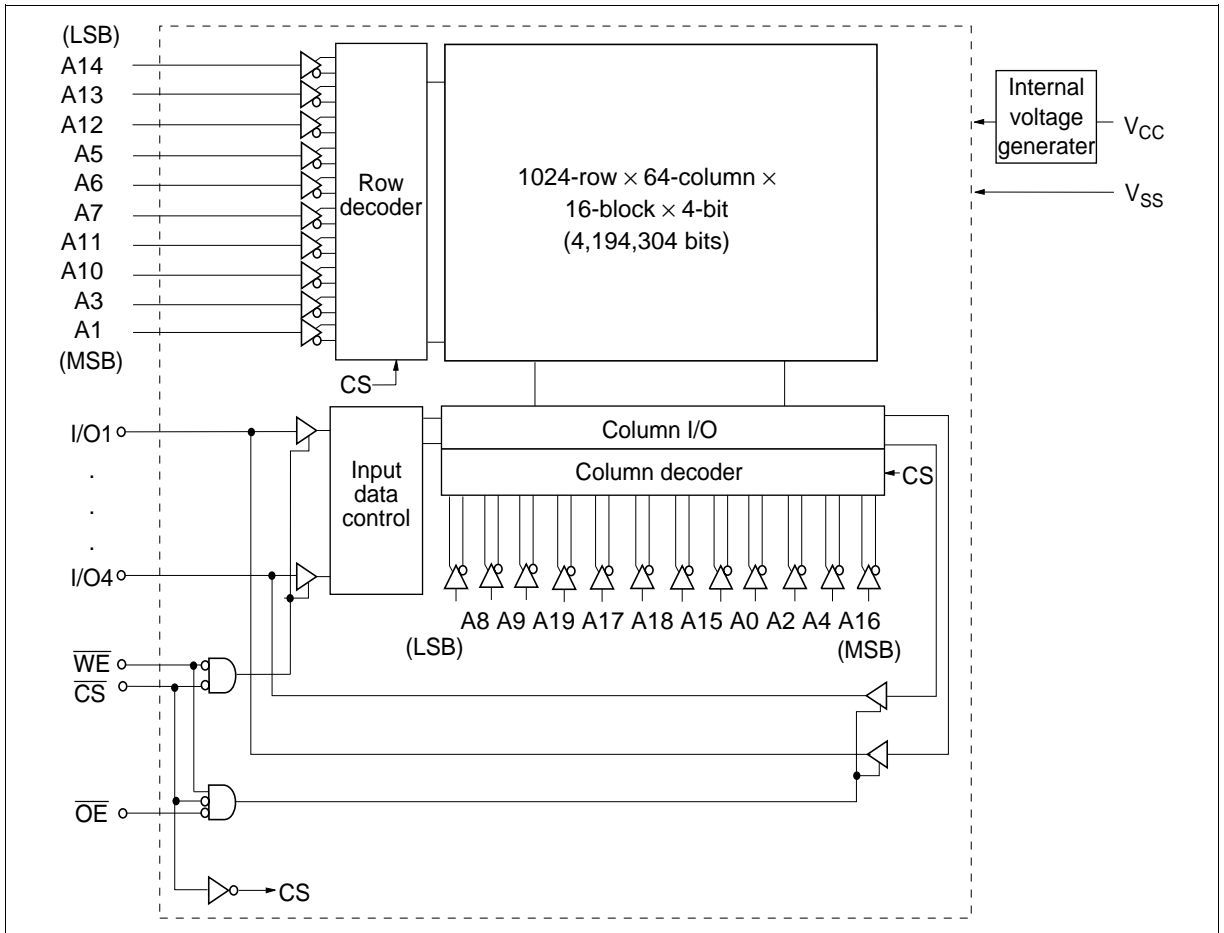


(Top view)

Pin Description

Pin name	Function
A0 to A19	Address input
I/O1 to I/O4	Data input/output
$\overline{CS}$	Chip select
$\overline{OE}$	Output enable
$\overline{WE}$	Write enable
$V_{CC}$	Power supply
$V_{SS}$	Ground
NC	No connection

## Block Diagram



**Operation Table**

$\overline{CS}$	$\overline{OE}$	$\overline{WE}$	Mode	$V_{CC}$ current	I/O	Ref. cycle
H	×	×	Standby	$I_{SB}, I_{SB1}$	High-Z	—
L	H	H	Output disable	$I_{CC}$	High-Z	—
L	L	H	Read	$I_{CC}$	Dout	Read cycle (1) to (3)
L	H	L	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
Supply voltage relative to $V_{SS}$	$V_{CC}$	-0.5 to +7.0	V
Voltage on any pin relative to $V_{SS}$	$V_T$	-0.5* <sup>1</sup> to $V_{CC}+0.5$ * <sup>2</sup>	V
Power dissipation	$P_T$	1.0	W
Operating temperature	$T_{opr}$	0 to +70	°C
Storage temperature	$T_{stg}$	-55 to +125	°C
Storage temperature under bias	$T_{bias}$	-10 to +85	°C

Notes: 1.  $V_T$  (min) = -2.0 V for pulse width (under shoot) 6 ns.  
 2.  $V_T$  (max) =  $V_{CC} + 2.0$  V for pulse width (over shoot) 6 ns.

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

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	$V_{CC}$ * <sup>3</sup>	4.5	5.0	5.5	V
	$V_{SS}$ * <sup>4</sup>	0	0	0	V
Input voltage	$V_{IH}$	2.2	—	$V_{CC} + 0.5$ * <sup>2</sup>	V
	$V_{IL}$	-0.5* <sup>1</sup>	—	0.8	V

Notes: 1.  $V_{IL}$  (min) = -2.0 V for pulse width (under shoot) 6 ns.  
 2.  $V_{IH}$  (max) =  $V_{CC} + 2.0$  V for pulse width (over shoot) 6 ns.  
 3. The supply voltage with all  $V_{CC}$  pins must be on the same level.  
 4. The supply voltage with all  $V_{SS}$  pins must be on the same level.

# HM624100HC Series

## DC Characteristics (Ta = 0 to +70°C, V<sub>CC</sub> = 5.0 V ± 10 %, V<sub>SS</sub> = 0V)

Parameter	Symbol	Min	Typ* <sup>1</sup>	Max	Unit	Test conditions
Input leakage current	I <sub>LI</sub>	—	—	2	μA	V <sub>in</sub> = V <sub>SS</sub> to V <sub>CC</sub>
Output leakage current	I <sub>LO</sub>	—	—	2	μA	V <sub>in</sub> = V <sub>SS</sub> to V <sub>CC</sub>
Operation power supply current	I <sub>CC</sub>	—	—	140	mA	Min cycle CS = V <sub>IL</sub> , I <sub>out</sub> = 0 mA Other inputs = V <sub>IH</sub> /V <sub>IL</sub>
Standby power supply current	I <sub>SB</sub>	—	—	40	mA	Min cycle, CS = V <sub>IH</sub> , Other inputs = V <sub>IH</sub> /V <sub>IL</sub>
	I <sub>SB1</sub>	—	TBD	5	mA	f = 0 MHz V <sub>CC</sub> CS V <sub>CC</sub> - 0.2 V, (1) 0 V V <sub>in</sub> 0.2 V or (2) V <sub>CC</sub> V <sub>in</sub> V <sub>CC</sub> - 0.2 V
Output voltage	V <sub>OL</sub>	—	—	0.4	V	I <sub>OL</sub> = 8 mA
	V <sub>OH</sub>	2.4	—	—	V	I <sub>OH</sub> = -4 mA
		—* <sup>2</sup>	TBD* <sup>2</sup>	1.2* <sup>2</sup>		

Notes: 1. Typical values are at V<sub>CC</sub> = 5.0 V, Ta = +25°C and not guaranteed.

2. This characteristics is guaranteed only for L-version.

## Capacitance (Ta = +25°C, f = 1.0 MHz)

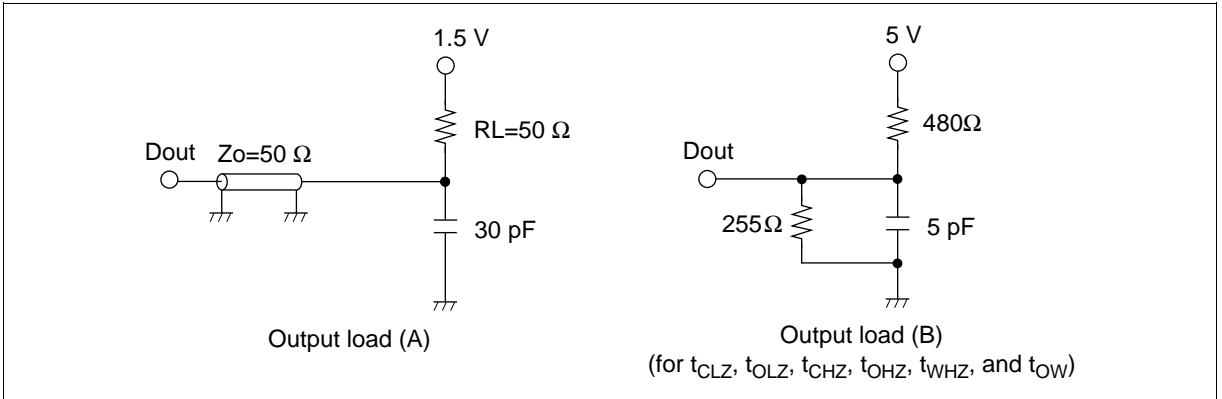
Parameter	Symbol	Min	Typ	Max	Unit	Test conditions
Input capacitance* <sup>1</sup>	C <sub>in</sub>	—	—	6	pF	V <sub>in</sub> = 0 V
Input/output capacitance* <sup>1</sup>	C <sub>I/O</sub>	—	—	8	pF	V <sub>I/O</sub> = 0 V

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

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

**Test Conditions**

- Input pulse levels: 3.0 V/0.0 V
- Input rise and fall time: 3 ns
- Input and output timing reference levels: 1.5 V
- Output load: See figures (Including scope and jig)



**Read Cycle**

Parameter	Symbol	HM624100HC		Unit	Notes
		-10			
		Min	Max		
Read cycle time	$t_{RC}$	10	—	ns	
Address access time	$t_{AA}$	—	10	ns	
Chip select access time	$t_{ACS}$	—	10	ns	
Output enable to output valid	$t_{OE}$	—	5	ns	
Output hold from address change	$t_{OH}$	3	—	ns	
Chip select to output in low-Z	$t_{CLZ}$	3	—	ns	1
Output enable to output in low-Z	$t_{OLZ}$	0	—	ns	1
Chip deselect to output in high-Z	$t_{CHZ}$	—	5	ns	1
Output disable to output in high-Z	$t_{OHZ}$	—	5	ns	1

## Write Cycle

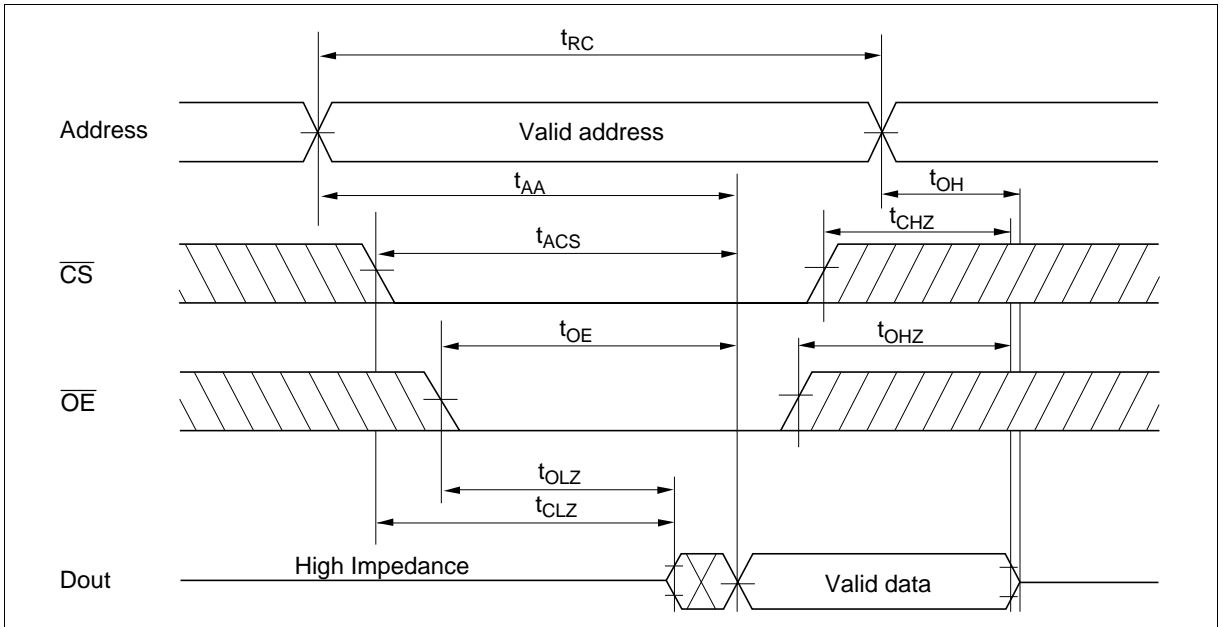
Parameter	Symbol	HM624100HC		Unit	Notes
		-10			
		Min	Max		
Write cycle time	$t_{WC}$	10	—	ns	
Address valid to end of write	$t_{AW}$	7	—	ns	
Chip select to end of write	$t_{CW}$	7	—	ns	9
Write pulse width	$t_{WP}$	7	—	ns	8
Address setup time	$t_{AS}$	0	—	ns	6
Write recovery time	$t_{WR}$	0	—	ns	7
Data to write time overlap	$t_{DW}$	5	—	ns	
Data hold from write time	$t_{DH}$	0	—	ns	
Write disable to output in low-Z	$t_{OW}$	3	—	ns	1
Output disable to output in high-Z	$t_{OHZ}$	—	5	ns	1
Write enable to output in high-Z	$t_{WHZ}$	—	5	ns	1

- Note:
1. Transition is measured  $\pm 200$  mV from steady voltage with Load (B). This parameter is sampled and not 100% tested.
  2. Address should be valid prior to or coincident with  $\overline{CS}$  transition low.
  3.  $\overline{WE}$  and/or  $\overline{CS}$  must be high during address transition time.
  4. if  $\overline{CS}$  and  $\overline{OE}$  are low during this period, I/O pins are in the output state. Then, the data input signals of opposite phase to the outputs must not be applied to them.
  5. If the  $\overline{CS}$  low transition occurs simultaneously with the  $\overline{WE}$  low transition or after the  $\overline{WE}$  transition, output remains a high impedance state.
  6.  $t_{AS}$  is measured from the latest address transition to the later of  $\overline{CS}$  or  $\overline{WE}$  going low.
  7.  $t_{WR}$  is measured from the earlier of  $\overline{CS}$  or  $\overline{WE}$  going high to the first address transition.
  8. A write occurs during the overlap of a low  $\overline{CS}$  and a low  $\overline{WE}$ . A write begins at the latest transition among  $\overline{CS}$  going low and  $\overline{WE}$  going low. A write ends at the earliest transition among  $\overline{CS}$  going high and  $\overline{WE}$  going high.  $t_{WP}$  is measured from the beginning of write to the end of write.
  9.  $t_{CW}$  is measured from the later of  $\overline{CS}$  going low to the the end of write.

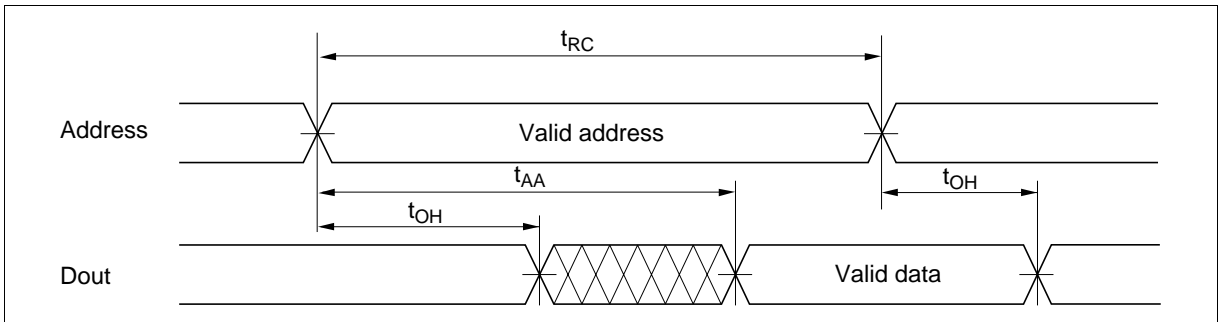


Timing Waveforms

Read Timing Waveform (1) ( $\overline{WE} = V_{IH}$ )

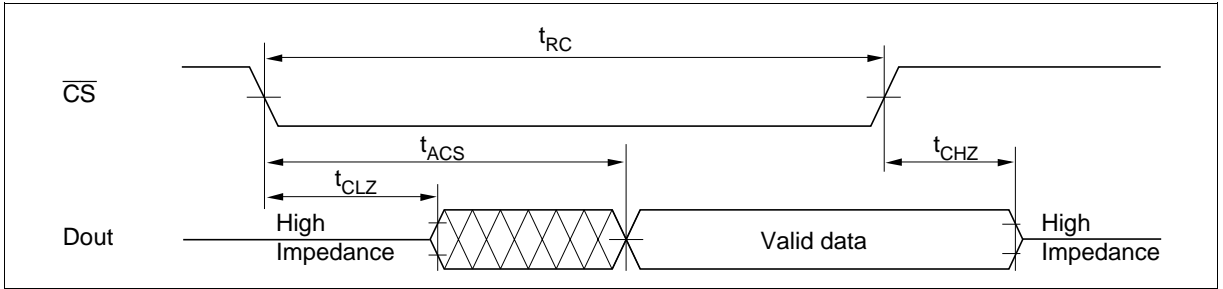


Read Timing Waveform (2) ( $\overline{WE} = V_{IH}$ ,  $\overline{CS} = V_{IL}$ ,  $\overline{OE} = V_{IL}$ )

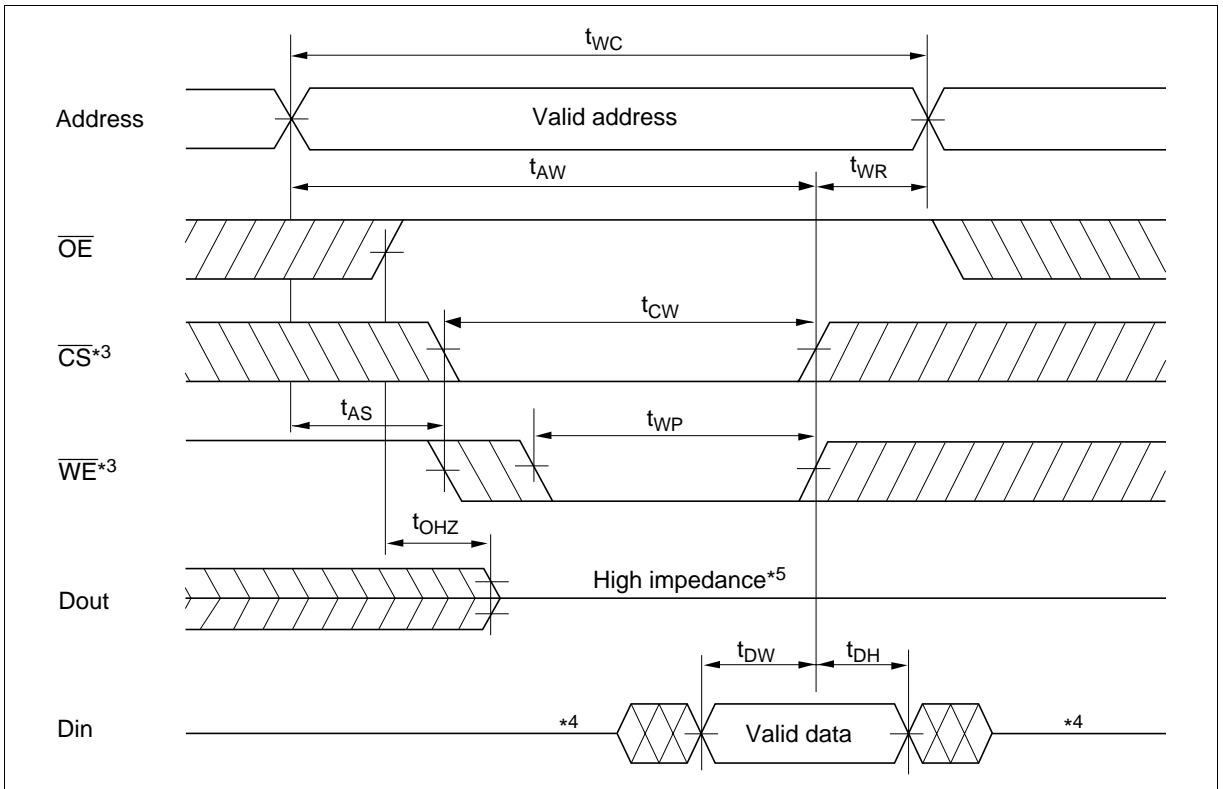


# HM624100HC Series

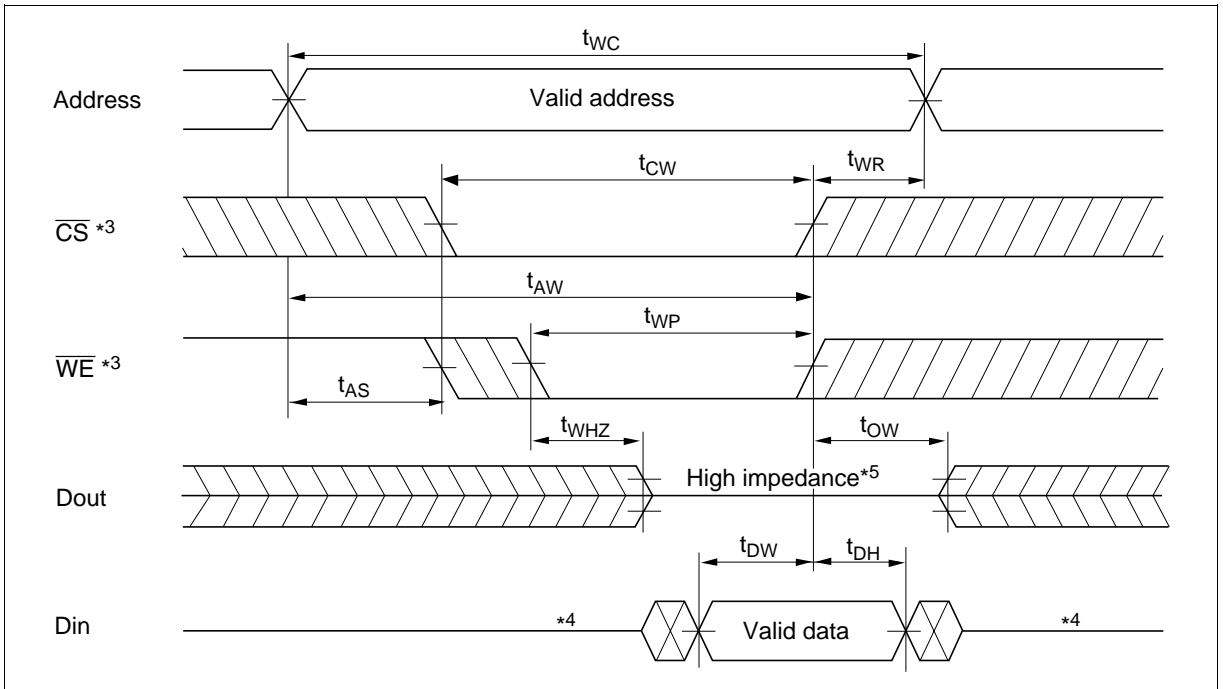
## Read Timing Waveform (3) ( $\overline{WE} = V_{IH}, \overline{CS} = V_{IL}, \overline{OE} = V_{IL}$ )\*2



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



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



# HM624100HC Series

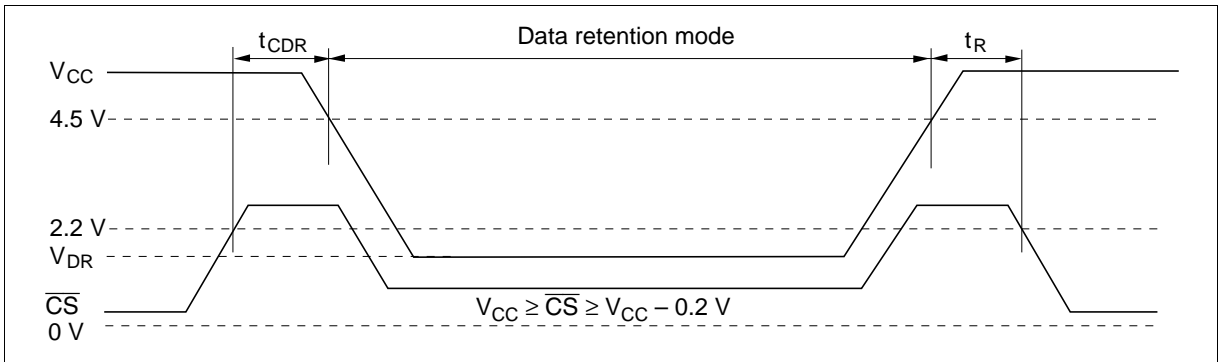
## Low $V_{CC}$ Data Retention Characteristics ( $T_a = 0$ to $+70^\circ\text{C}$ )

This characteristics is guaranteed only for L-version.

Parameter	Symbol	Min	Typ*1	Max	Unit	Test conditions
$V_{CC}$ for data retention	$V_{DR}$	2.0	—	—	V	$V_{CC}$ $\overline{CS}$ $V_{CC} - 0.2$ V (1) 0 V $V_{in}$ 0.2 V or (2) $V_{CC}$ $V_{in}$ $V_{CC} - 0.2$ V
Data retention current	$I_{CCDR}$	—	TBD	800	$\mu\text{A}$	$V_{CC} = 3$ V, $V_{CC}$ $\overline{CS}$ $V_{CC} - 0.2$ V (1) 0 V $V_{in}$ 0.2 V or (2) $V_{CC}$ $V_{in}$ $V_{CC} - 0.2$ V
Chip deselect to data retention time	$t_{CDR}$	0	—	—	ns	See retention waveform
Operation recovery time	$t_R$	5	—	—	ms	

Note: 1. Typical values are at  $V_{CC} = 3.0$  V,  $T_a = +25^\circ\text{C}$ , and not guaranteed.

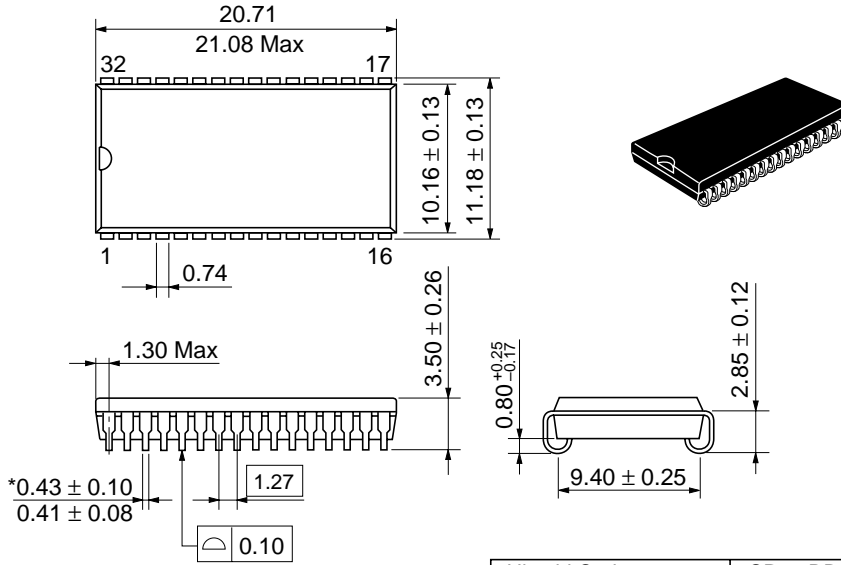
## Low $V_{CC}$ Data Retention Timing Waveform



Package Dimensions

HM624100HCJP/HCLJP Series (CP-32DB)

Unit: mm



\*Dimension including the plating thickness  
Base material dimension

Hitachi Code	CP-32DB
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.2 g

## Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

# HITACHI

## Hitachi, Ltd.

Semiconductor & Integrated Circuits.

Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL      NorthAmerica      : <http://semiconductor.hitachi.com/>  
          Europe                : <http://www.hitachi-eu.com/hel/ecg>  
          Asia                    : <http://sicapac.hitachi-asia.com>  
          Japan                    : <http://www.hitachi.co.jp/Sicd/indx.htm>

## For further information write to:

Hitachi Semiconductor  
(America) Inc.  
179 East Tasman Drive,  
San Jose, CA 95134  
Tel: <1> (408) 433-1990  
Fax: <1>(408) 433-0223

Hitachi Europe GmbH  
Electronic Components Group  
Dornacher Straße 3  
D-85622 Feldkirchen, Munich  
Germany  
Tel: <49> (89) 9 9180-0  
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.  
Electronic Components Group.  
Whitebrook Park  
Lower Cookham Road  
Maidenhead  
Berkshire SL6 8YA, United Kingdom  
Tel: <44> (1628) 585000  
Fax: <44> (1628) 585160

Hitachi Asia Ltd.  
Hitachi Tower  
16 Collyer Quay #20-00,  
Singapore 049318  
Tel : <65>-538-6533/538-8577  
Fax : <65>-538-6933/538-3877  
URL : <http://www.hitachi.com.sg>

Hitachi Asia Ltd.  
(Taipei Branch Office)  
4/F, No. 167, Tun Hwa North Road,  
Hung-Kuo Building,  
Taipei (105), Taiwan  
Tel : <886>-(2)-2718-3666  
Fax : <886>-(2)-2718-8180  
Telex : 23222 HAS-TP  
URL : <http://www.hitachi.com.tw>

Hitachi Asia (Hong Kong) Ltd.  
Group III (Electronic Components)  
7/F., North Tower,  
World Finance Centre,  
Harbour City, Canton Road  
Tsim Sha Tsui, Kowloon,  
Hong Kong  
Tel : <852>-(2)-735-9218  
Fax : <852>-(2)-730-0281  
URL : <http://www.hitachi.com.hk>

Copyright © Hitachi, Ltd., 2000. All rights reserved. Printed in Japan.  
Colophon 2.0