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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HM621400HC Series

4M High Speed SRAM (4-Mword × 1-bit)

ADE-203-1199C (Z)

Rev. 2.0
Feb. 3, 2003

Description

The HM621400HC is a 4-Mbit high speed static RAM organized 4-Mword × 1-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 HM621400HC is packaged in 400-mil 32-pin SOJ for high density surface mounting.

Features

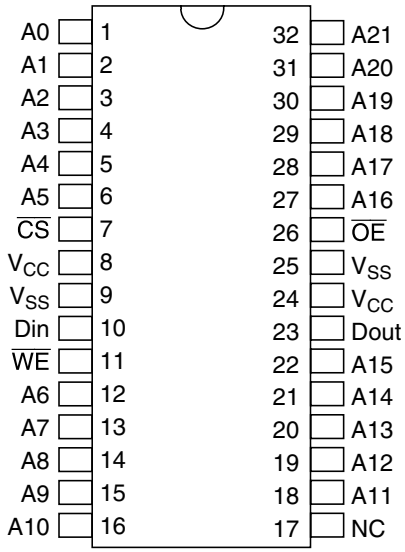
- Single 5.0 V supply: 5.0 V ± 10%
- Access time: 10/12 ns (max)
- Completely static memory
  - — No clock or timing strobe required
- Equal access and cycle times
- Directly TTL compatible
  - — All inputs and outputs
- Operating current: 140/130 mA (max)
- TTL standby current: 40 mA (max)
- CMOS standby current: 5 mA (max)
  : 1.2 mA (max) (L-version)
- Data retention current: 0.8 mA (max) (L-version)
- Data retention voltage: 2 V (min) (L-version)
- Center V_{CC} and V_{SS} type pin out

Ordering Information

Type No.	Access time	Device marking	Package
HM621400HCJP-10	10 ns	HM621400CJP10	400-mil 32-pin plastic SOJ (CP-32DB)
HM621400HCJP-12	12 ns	HM621400CJP12	
HM621400HCLJP-10	10 ns	HM621400CLJP10	
HM621400HCLJP-12	12 ns	HM621400CLJP12	

Pin Arrangement

32-pin SOJ

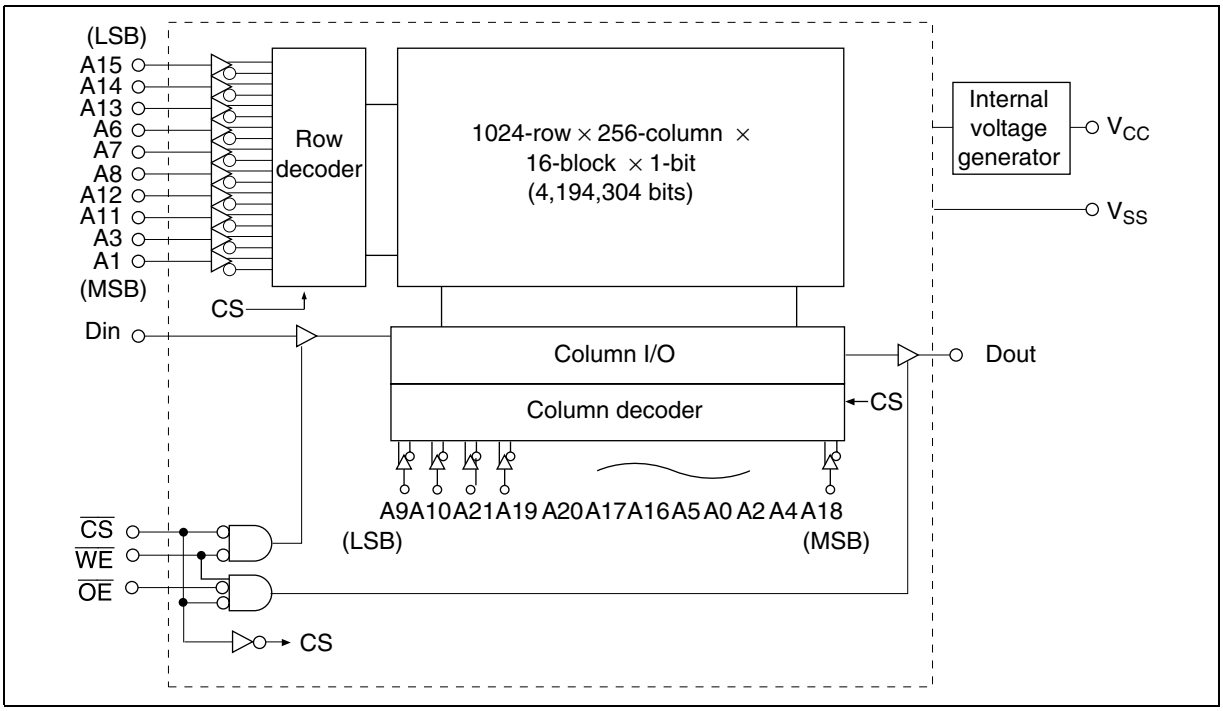


(Top view)

Pin Description

Pin name	Function
A0 to A21	Address input
Din	Data input
Dout	Data 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	Dout	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}	High-Z	Write cycle (1)
L	L	L	Write	I_{CC}	High-Z	Write cycle (2)

Note: H: V_{IH}, L: V_{IL}, ×: V_{IH} or V_{IL}

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*[1] to V_{CC}+0.5*[2]	V
Power dissipation	P_T	1.0	W
Operating temperature	Topr	0 to +70	°C
Storage temperature	Tstg	–55 to +125	°C
Storage temperature under bias	Tbias	–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}*[3]	4.5	5.0	5.5	V
	V_{SS}*[4]	0	0	0	V
Input voltage	V_{IH}	2.2	—	V_{CC} + 0.5*[2]	V
	V_{IL}	–0.5*[1]	—	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.

DC Characteristics

(Ta = 0 to +70°C, V_{CC} = 5.0 V ± 10%, V_{SS} = 0 V)

Parameter		Symbol	Min	Typ*[1]	Max	Unit	Test conditions
Input leakage current		$\|I_{LI}\|$	—	—	2	µA	Vin = V_{SS} to V_{CC}
Output leakage current		$\|I_{LO}\|$	—	—	2	µA	Vin = V_{SS} to V_{CC}
Operation power supply current	10 ns cycle	I_{CC}	—	—	140	mA	Min cycle $\overline{CS}$ = V_{IL}, Iout = 0 mA Other inputs = V_{IH}/V_{IL}
	12 ns cycle	I_{CC}	—	—	130	mA	
Standby power supply current		I_{SB}	—	—	40	mA	Min cycle, $\overline{CS}$ = V_{IH}, Other inputs = V_{IH}/V_{IL}
		I_{SB1}	—	2.5	5	mA	f = 0 MHz $V_{CC} \geq \overline{CS} \geq V_{CC}$ - 0.2 V, (1) 0 V ≤ Vin ≤ 0.2 V or (2) $V_{CC} \geq$ Vin ≥ V_{CC} - 0.2 V
			—*[2]	0.6*[2]	1.2*[2]		
Output voltage		V_{OL}	—	—	0.4	V	I_{OL} = 8 mA
		V_{OH}	2.4	—	—	V	I_{OH} = –4 mA

Notes: 1. Typical values are at V_{CC} = 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*[1]	Cin	—	—	6	pF	Vin = 0 V
	C_{DIN}	—	—	6	pF	V_{DIN} = 0 V
Input/output capacitance*[1]	C_{DOUT}	—	—	8	pF	V_{DOUT} = 0 V

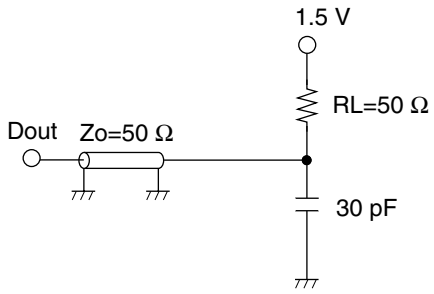
Note: 1. This parameter is sampled and not 100% tested.

AC Characteristics

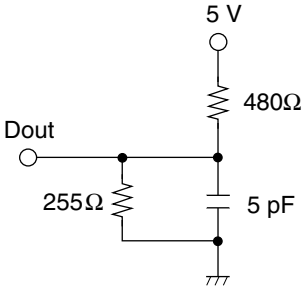
(Ta = 0 to +70°C, V_{CC} = 5.0 V ± 10%, unless otherwise noted.)

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)



Output load (A)



Output load (B)
(for t_{CLZ}, t_{OLZ}, t_{CHZ}, t_{OHZ}, t_{WHZ}, and t_{OW})

Read Cycle

		HM621400HC					
		-10		-12			
Parameter	Symbol	Min	Max	Min	Max	Unit	Notes
Read cycle time	t_{RC}	10	—	12	—	ns	
Address access time	t_{AA}	—	10	—	12	ns	
Chip select access time	t_{ACS}	—	10	—	12	ns	
Output enable to output valid	t_{OE}	—	5	—	6	ns	
Output hold from address change	t_{OH}	3	—	3	—	ns	
Chip select to output in low-Z	t_{CLZ}	3	—	3	—	ns	1
Output enable to output in low-Z	t_{OLZ}	0	—	0	—	ns	1
Chip deselect to output in high-Z	t_{CHZ}	—	5	—	6	ns	1
Output disable to output in high-Z	t_{OHZ}	—	5	—	6	ns	1

Write Cycle

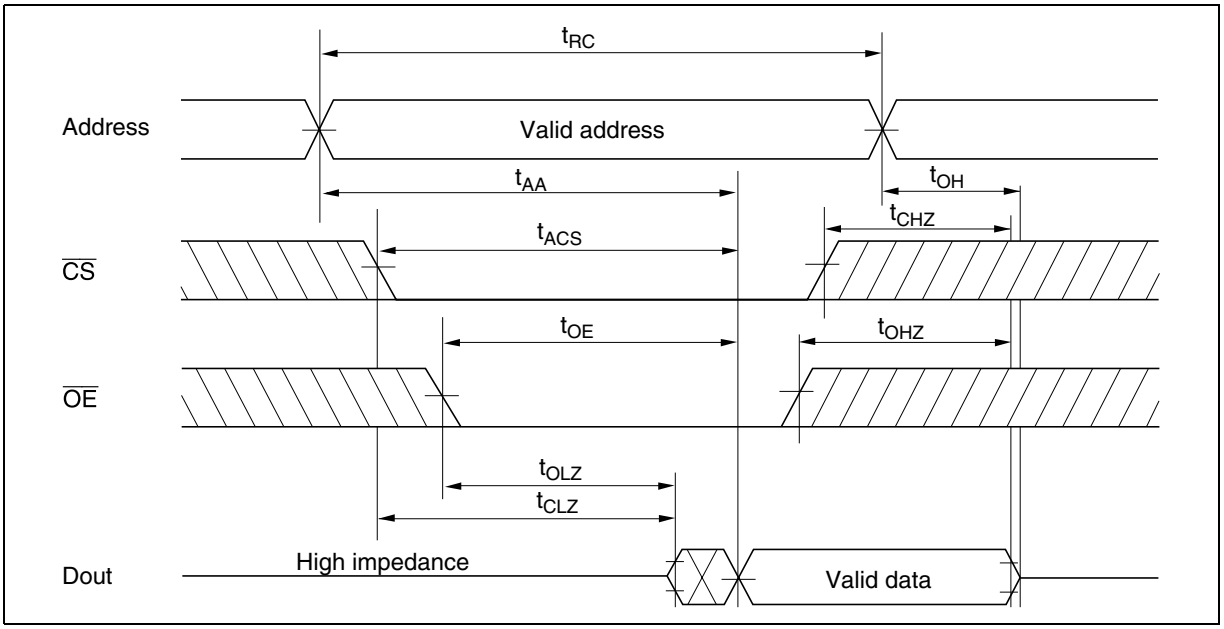
		HM621400HC					
		-10		-12			
Parameter	Symbol	Min	Max	Min	Max	Unit	Notes
Write cycle time	t_{WC}	10	—	12	—	ns	
Address valid to end of write	t_{AW}	7	—	8	—	ns	
Chip select to end of write	t_{CW}	7	—	8	—	ns	9
Write pulse width	t_{WP}	7	—	8	—	ns	8
Address setup time	t_{AS}	0	—	0	—	ns	6
Write recovery time	t_{WR}	0	—	0	—	ns	7
Data to write time overlap	t_{DW}	5	—	6	—	ns	
Data hold from write time	t_{DH}	0	—	0	—	ns	
Write disable to output in low-Z	t_{OW}	3	—	3	—	ns	1
Output disable to output in high-Z	t_{OHZ}	—	5	—	6	ns	1
Write enable to output in high-Z	t_{WHZ}	—	5	—	6	ns	1

Notes: 1. Transition is measured ±200 mV from steady voltage with output load (B). This parameter is sampled and not 100% tested.

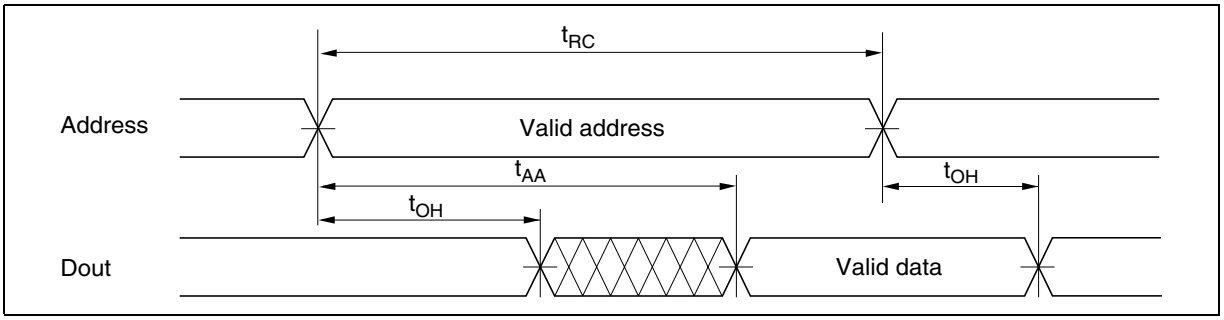
2. Address should be valid prior to or coincident with $\overline{CS}$ transition low.
3. $\overline{WE}$ and/or $\overline{CS}$ must be high during address transition time.
4. If $\overline{CS}$ and $\overline{OE}$ are low during this period, Dout pins are in the output state. Then, the data input signals 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 end of write.

Timing Waveforms

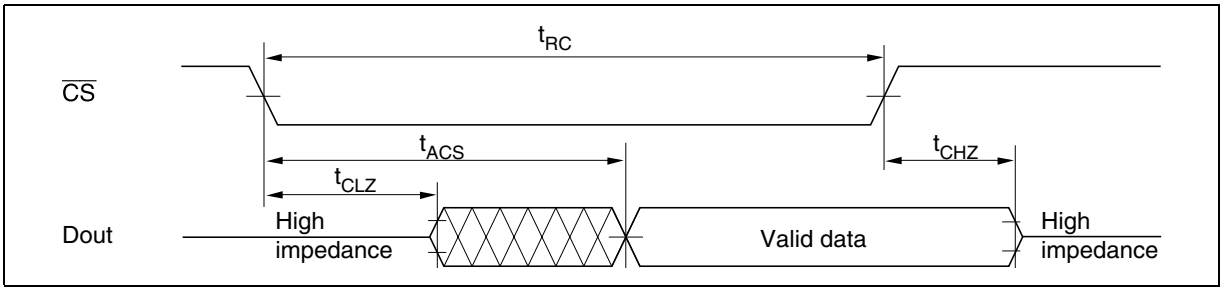
Read Timing Waveform (1) ($\overline{WE}$ = V_{IH})



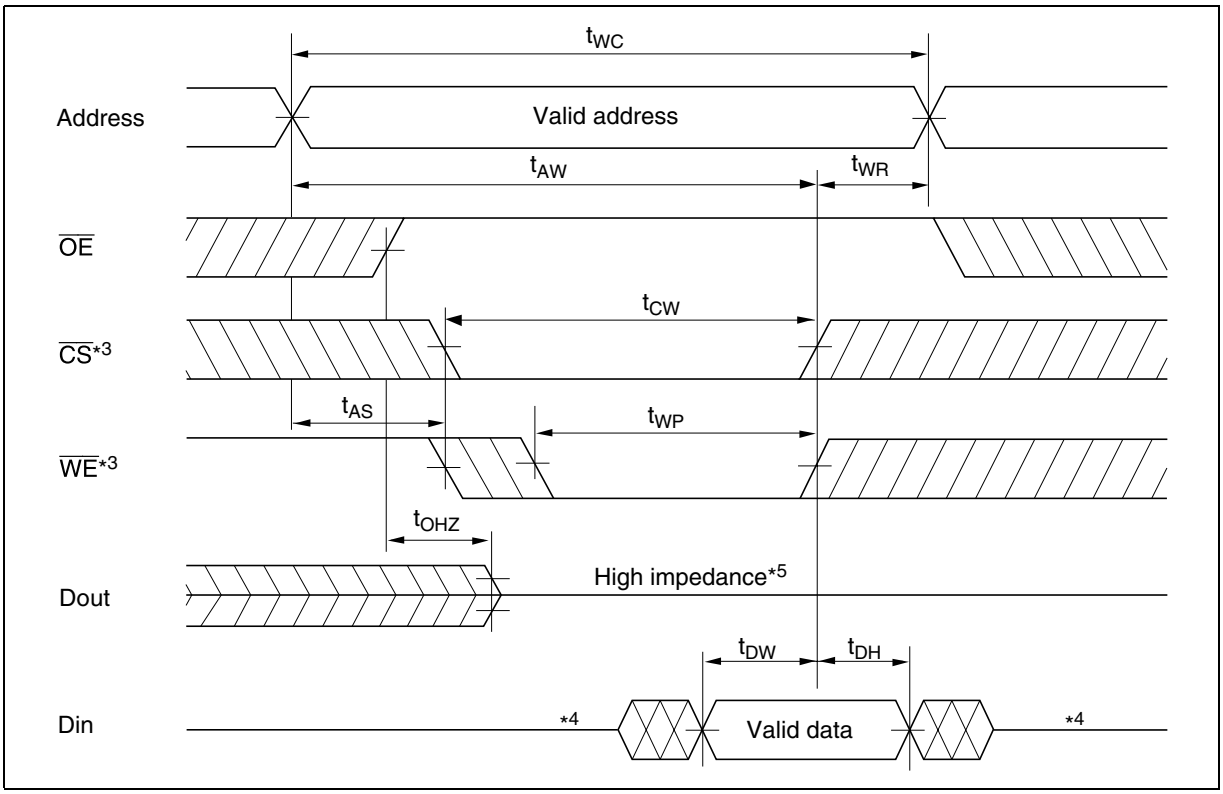
Read Timing Waveform (2) ($\overline{WE}$ = V_{IH}, $\overline{CS}$ = V_{IL}, $\overline{OE}$ = V_{IL})



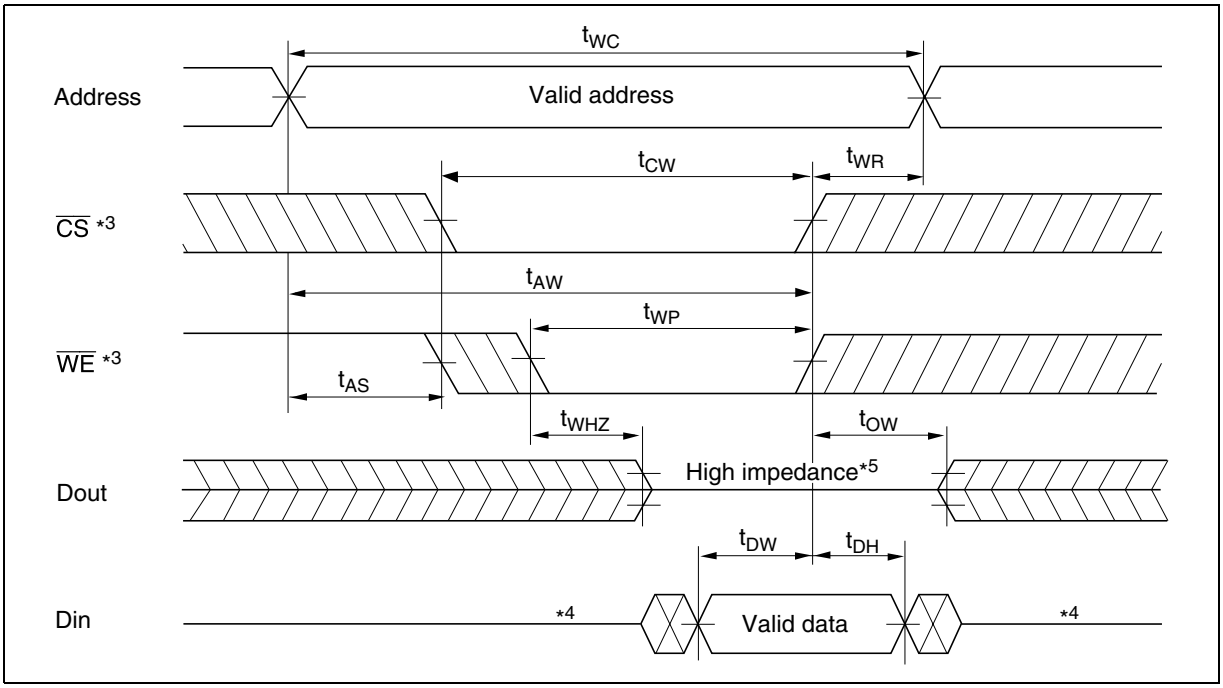
Read Timing Waveform (3) ($\overline{WE}$ = V_{IH}, $\overline{CS}$ = V_{IL}, $\overline{OE}$ = V_{IL})*2



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



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



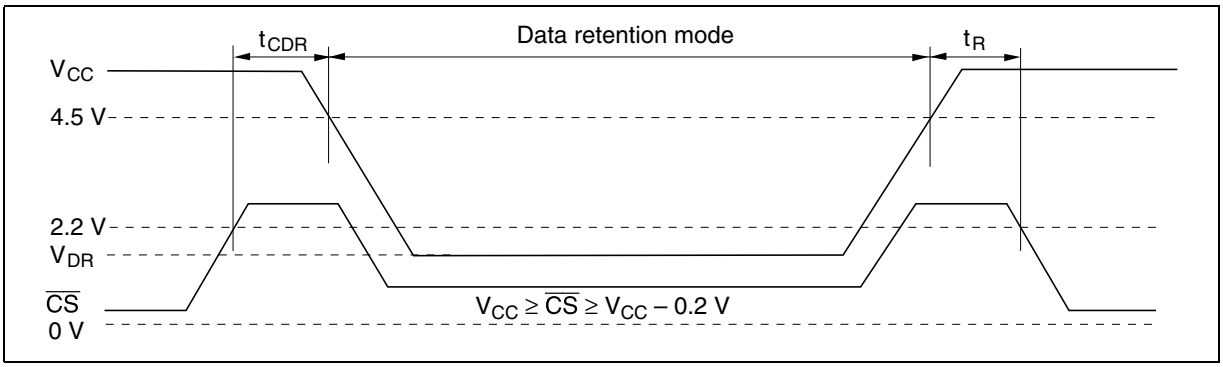
Low V_{CC} Data Retention Characteristics

(Ta = 0 to +70°C)

This characteristics is guaranteed only for L-version.

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

Low V_{CC} Data Retention Timing Waveform

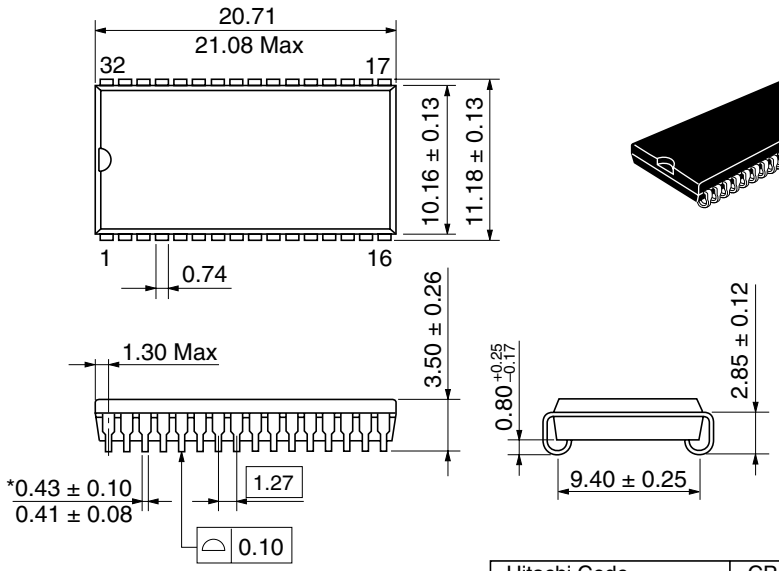


Package Dimensions

HM621400HCJP/HCLJP Series (CP-32DB)

As of July, 2002

Unit: mm



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

*Dimension including the plating thickness
Base material dimension

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HITACHI

Hitachi, Ltd.
Semiconductor & Integrated Circuits
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: (03) 3270-2111 Fax: (03) 3270-5109

URL http://www.hitachisemiconductor.com/

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 Ltd.
Electronic Components Group
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 778322

Hitachi Europe GmbH
Electronic Components Group
Dornacher Str 3
D-85622 Feldkirchen
Postfach 201, D-85619 Feldkirchen
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Asia Ltd.
Hitachi Tower
16 Collyer Quay #20-00
Singapore 049318
Tel : <65>-6538-6533/6538-8577
Fax : <65>-6538-6933/6538-3877
URL : http://semiconductor.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://semiconductor.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>-2735-9218
Fax : <852>-2730-0281
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