
HM62W4100H Series

4M High Speed SRAM (1-Mword × 4-bit)

HITACHI

ADE-203-774D (Z)

Rev. 1.0

Sept. 15, 1998

Description

The HM62W4100H is a 4-Mbit high speed static RAM organized 1-Mword × 4-bit. It has realized high speed access time by employing CMOS process (4-transistor + 2-poly resistor 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 HM62W4100H is packaged in 400-mil 32-pin SOJ for high density surface mounting.

Features

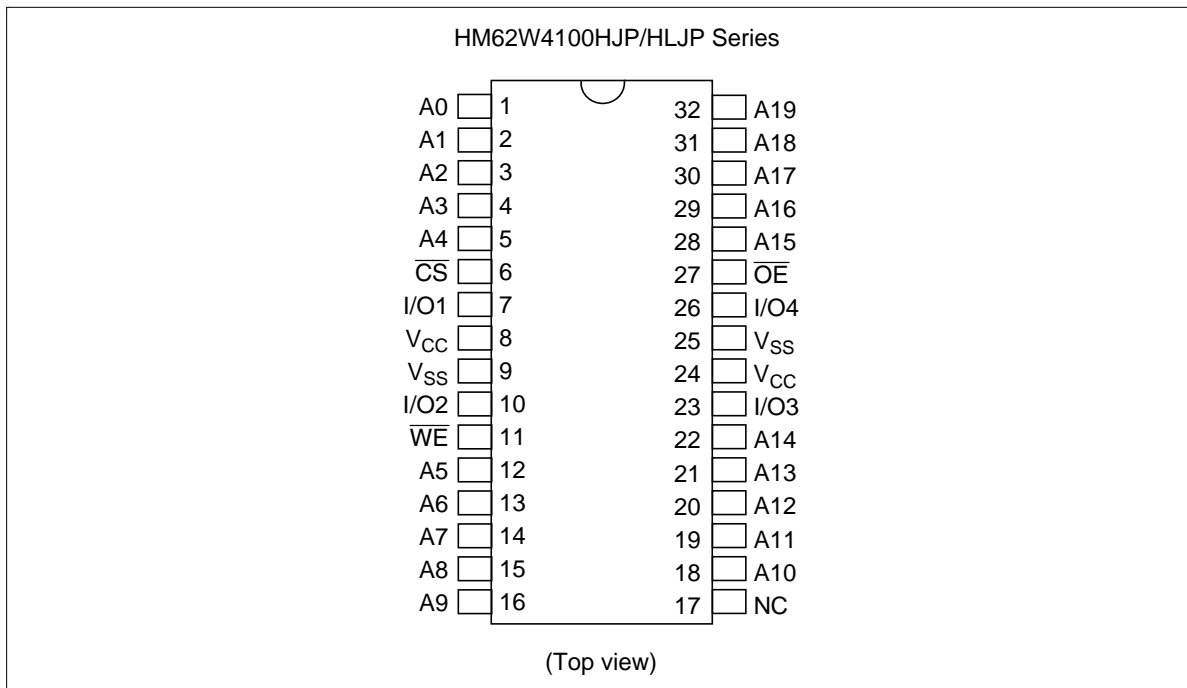
- Single supply : 3.3 V ± 0.3 V
- Access time 12/15 ns (max)
- Completely static memory
 - No clock or timing strobe required
- Equal access and cycle times
- Directly TTL compatible
 - All inputs and outputs
- Operating current : 180/160 mA (max)
- TTL standby current : 60/50 mA (max)
- CMOS standby current : 5 mA (max)
 - : 1 mA (max) (L-version)
- Data retention current : 0.6 mA (max) (L-version)
- Data retention voltage: 2 V (min) (L-version)
- Center V_{CC} and V_{SS} type pinout

HM62W4100H Series

Ordering Information

| Type No. | Access time | Package |
|------------------|-------------|--------------------------------------|
| HM62W4100HJP-12 | 12 ns | 400-mil 32-pin plastic SOJ (CP-32DB) |
| HM62W4100HJP-15 | 15 ns | |
| HM62W4100HLJP-12 | 12 ns | |
| HM62W4100HLJP-15 | 15 ns | |

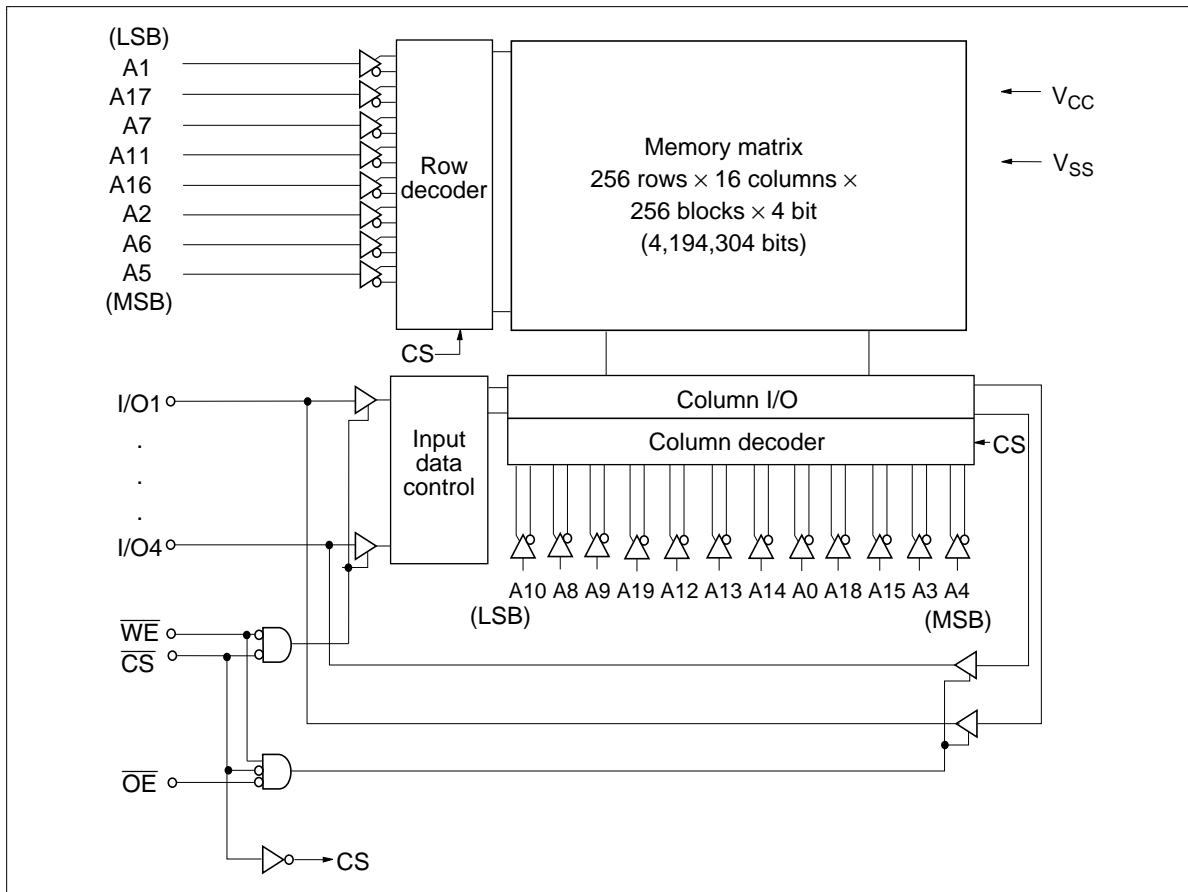
Pin Arrangement



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



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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 +4.6 | 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 | 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) ≤ 8 ns
 2. V_T (max) = $V_{CC} + 2.0$ V for pulse width (over shoot) ≤ 8 ns

Recommended DC Operating Conditions ($T_a = 0$ to +70°C)

| Parameter | Symbol | Min | Typ | Max | Unit |
|----------------|------------------------|--------------------|-----|------------------------------|------|
| Supply voltage | V_{CC} ^{*3} | 3.0 | 3.3 | 3.6 | 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) ≤ 8 ns
 2. V_{IH} (max) = $V_{CC} + 2.0$ V for pulse width (over shoot) ≤ 8 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.

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DC Characteristics (Ta = 0 to +70°C, V_{CC} = 3.3 V ± 0.3 V, V_{SS} = 0V)

| Parameter | Symbol | Min | Typ* ¹ | Max | Unit | Test conditions |
|--------------------------------|-----------------------------|-----------------|-------------------|-----|------|---|
| Input leakage current | I _{LI} | — | — | 2 | μA | V _{in} = V _{SS} to V _{CC} |
| Output leakage current | I _{LO} | — | — | 2 | μA | V _{in} = V _{SS} to V _{CC} |
| Operation power supply current | 12 ns cycle I _{CC} | — | — | 180 | mA | Min cycle CS = V _{IL} , I _{out} = 0 mA Other inputs = V _{IH} /V _{IL} |
| | 15 ns cycle I _{CC} | — | — | 160 | | |
| Standby power supply current | 12 ns cycle I _{SB} | — | — | 60 | mA | Min cycle, CS = V _{IH} , Other inputs = V _{IH} /V _{IL} |
| | 15 ns cycle I _{SB} | — | — | 50 | | |
| | I _{SB1} | — | 0.05 | 5 | mA | f = 0 MHz V _{CC} ≥ 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 |
| —* ² | 0.05* ² | 1* 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} = 3.3 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 | C _{in} | — | — | 6 | pF | V _{in} = 0 V |
| Input/output capacitance* ¹ | C _{I/O} | — | — | 8 | pF | V _{I/O} = 0 V |

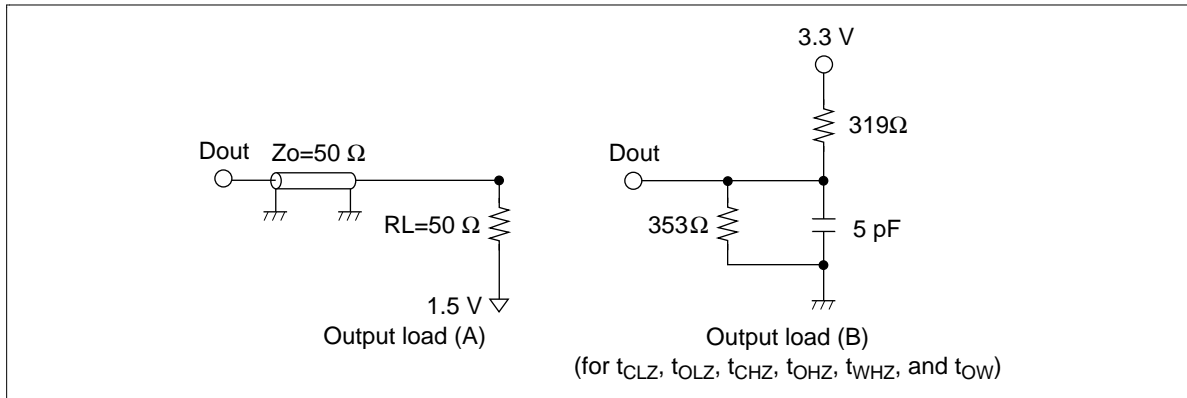
Note: 1. This parameter is sampled and not 100% tested.

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AC Characteristics ($T_a = 0$ to $+70^\circ\text{C}$, $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$, 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 | HM62W4100H | | | | Unit | Notes |
|------------------------------------|-----------|------------|-----|-----|-----|------|-------|
| | | -12 | | -15 | | | |
| | | Min | Max | Min | Max | | |
| Read cycle time | t_{RC} | 12 | — | 15 | — | ns | |
| Address access time | t_{AA} | — | 12 | — | 15 | ns | |
| Chip select access time | t_{ACS} | — | 12 | — | 15 | ns | |
| Output enable to output valid | t_{OE} | — | 6 | — | 7 | 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} | — | 6 | — | 7 | ns | 1 |
| Output disable to output in high-Z | t_{OHZ} | — | 6 | — | 7 | ns | 1 |

Write Cycle

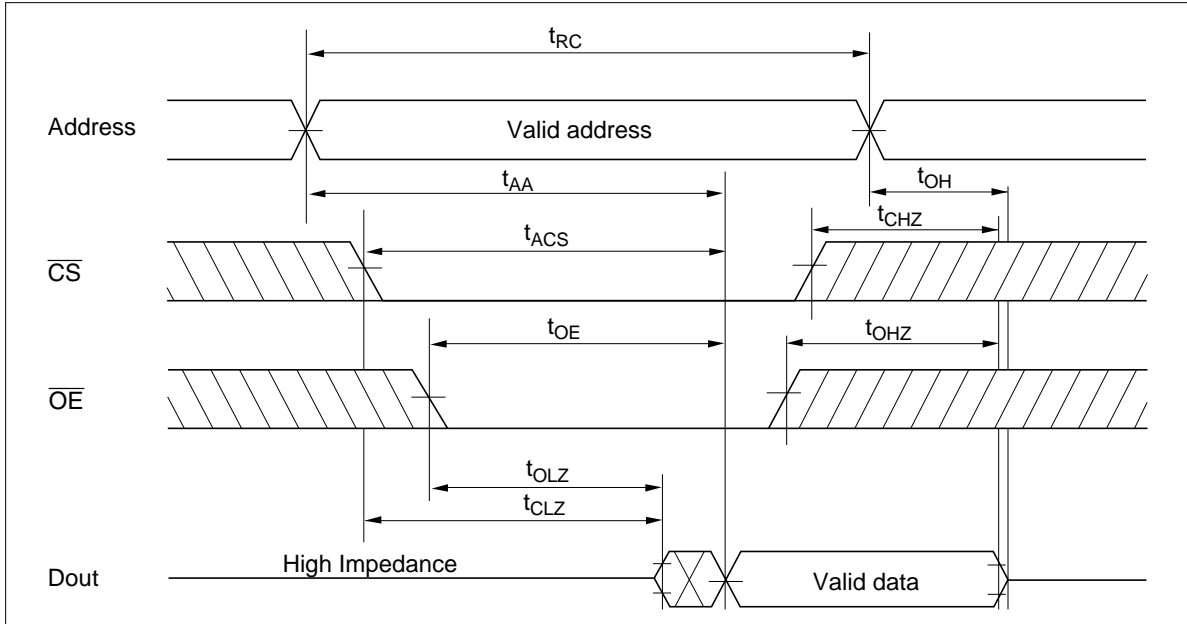
| Parameter | Symbol | HM62W4100H | | | | Unit | Notes |
|------------------------------------|-----------|------------|-----|-----|-----|------|-------|
| | | -12 | | -15 | | | |
| | | Min | Max | Min | Max | | |
| Write cycle time | t_{WC} | 12 | — | 15 | — | ns | |
| Address valid to end of write | t_{AW} | 8 | — | 10 | — | ns | |
| Chip select to end of write | t_{CW} | 8 | — | 10 | — | ns | 9 |
| Write pulse width | t_{WP} | 8 | — | 10 | — | 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} | 6 | — | 7 | — | 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} | — | 6 | — | 7 | ns | 1 |
| Write enable to output in high-Z | t_{WHZ} | — | 6 | — | 7 | ns | 1 |

- Note:
1. Transition is measured ± 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 end of write.

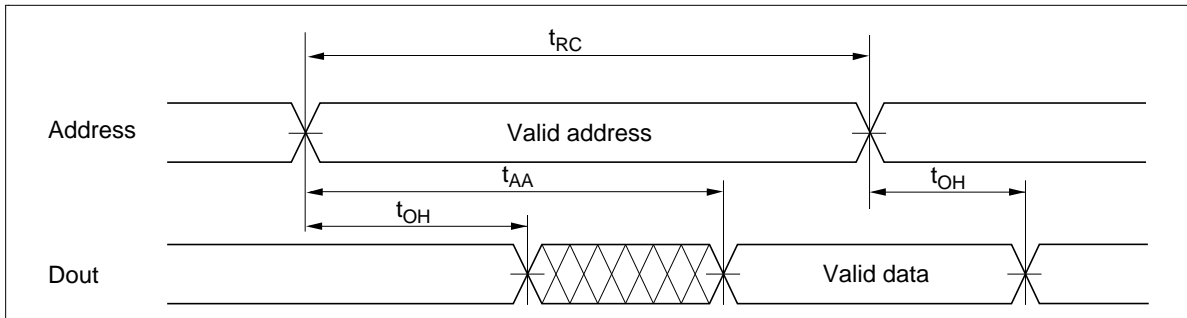
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Timing Waveforms

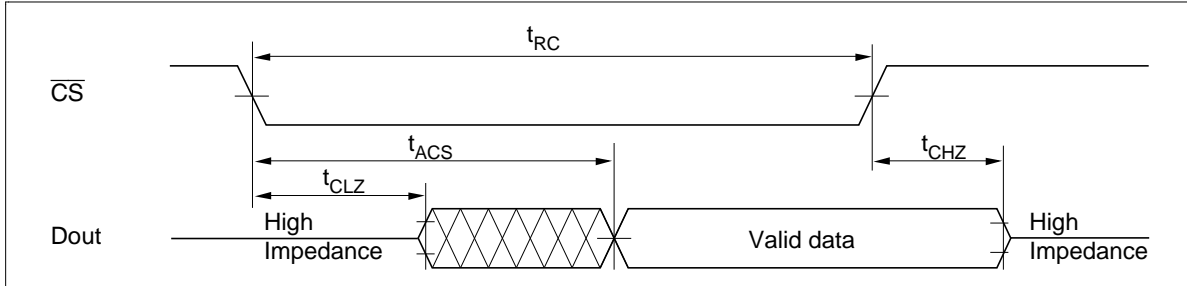
Read Timing Waveform (1) ($\overline{WE} = V_{IH}$)



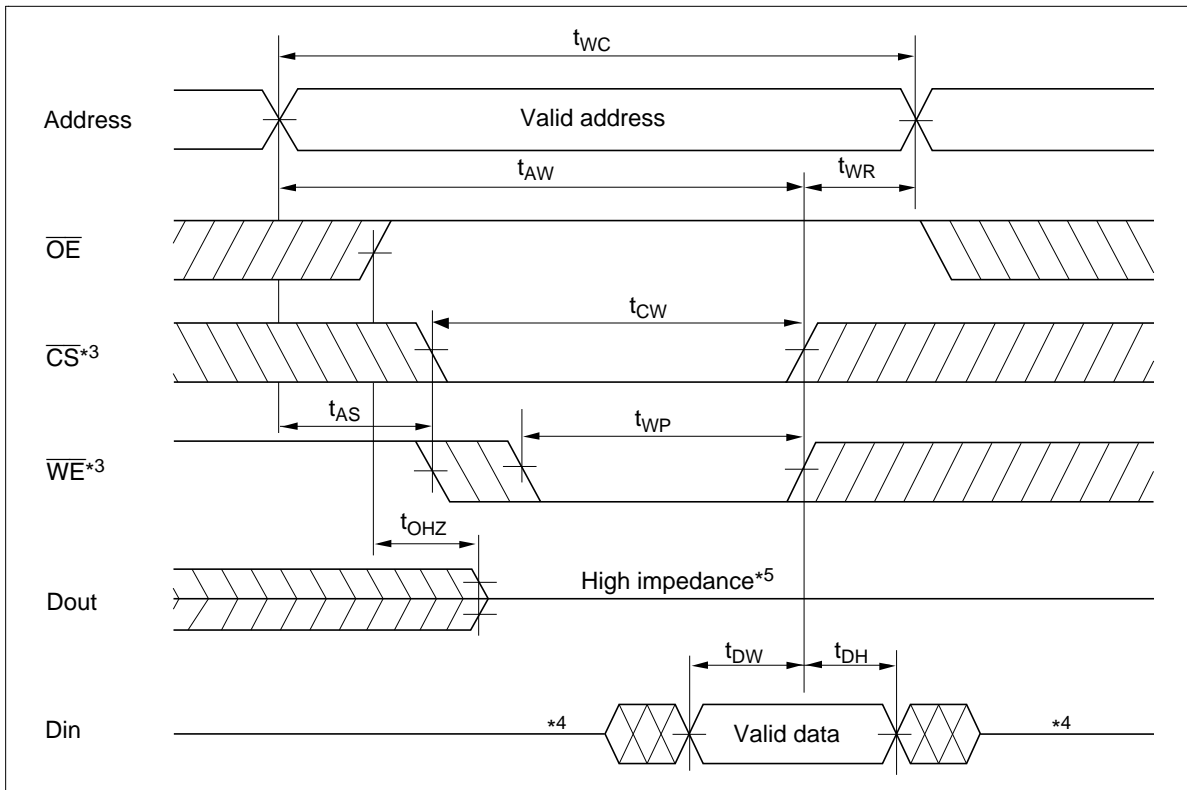
Read Timing Waveform (2) ($\overline{WE} = V_{IH}, \overline{CS} = V_{IL}, \overline{OE} = V_{IL}$)



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

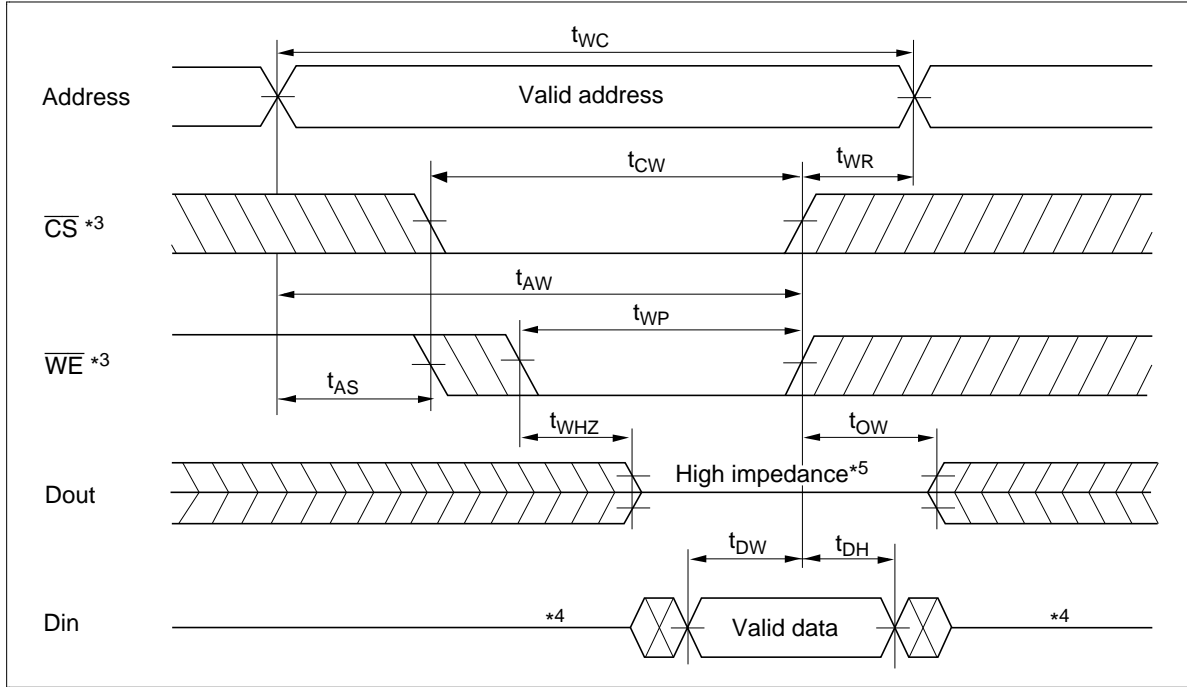


Write Timing Waveform (1) (\overline{WE} Controlled)



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



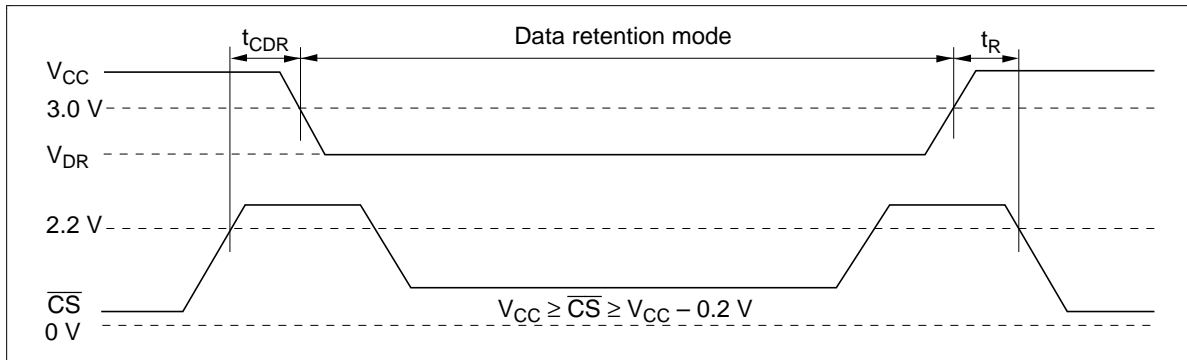
Low V_{CC} Data Retention Characteristics ($T_a = 0$ to $+70^\circ\text{C}$)

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 | $V_{CC} \geq \overline{CS} \geq V_{CC} - 0.2$ V (1) $0 \text{ V} \leq V_{in} \leq 0.2 \text{ V}$ or (2) $V_{CC} \geq V_{in} \geq V_{CC} - 0.2 \text{ V}$ |
| Data retention current | I_{CCDR} | — | 40 | 600 | μA | $V_{CC} = 3 \text{ V}$, $V_{CC} \geq \overline{CS} \geq V_{CC} - 0.2 \text{ V}$ (1) $0 \text{ V} \leq V_{in} \leq 0.2 \text{ V}$ or (2) $V_{CC} \geq V_{in} \geq V_{CC} - 0.2 \text{ V}$ |
| 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 $V_{CC} = 3.0 \text{ V}$, $T_a = +25^\circ\text{C}$, and not guaranteed.

Low V_{CC} Data Retention Timing Waveform

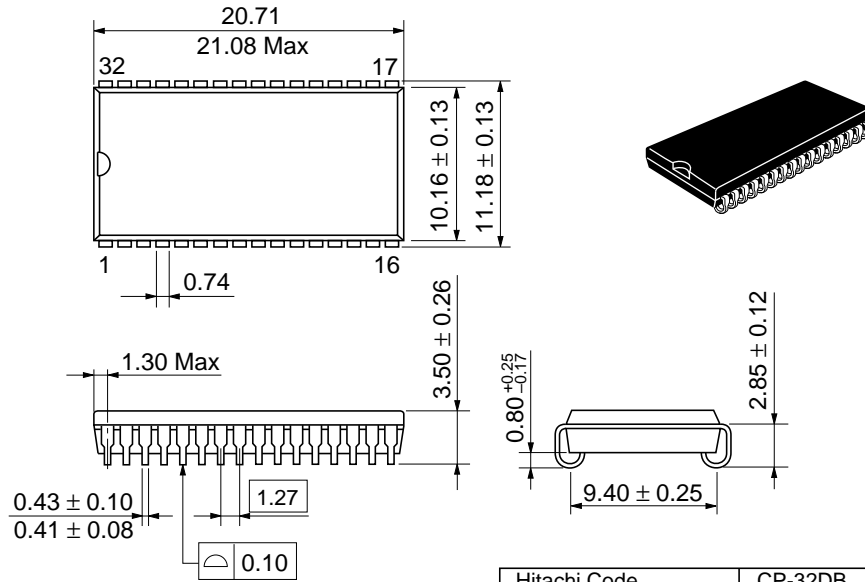


HM62W4100H Series

Package Dimensions

HM62W4100HJP/HLJP Series (CP-32DB)

Unit: mm



Dimension including the plating thickness
Base material dimension

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

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HM62W4100H Series

Revision Record

| Rev. | Date | Contents of Modification | Drawn by | Approved by |
|------|---------------|---|-------------|-------------|
| 0.0 | Apr. 28, 1997 | Initial issue | A. Ide | A. Ide |
| 0.1 | Nov. 20, 1997 | Change of subtitle | K. Makuta | K. Makuta |
| 0.2 | Dec. 5, 1997 | Features Addition of Operating current Addition of TTL standby current Addition of CMOS standby current Addition of Data retention current Addition of Data retention voltage Change of Block Diagram Absolute Maximum Ratings V_{IH} (max): $V_{CC} + 0.3$ V to $V_{CC} + 0.5$ V V_{IL} (min): -0.3 V to -0.5 V Change of notes Recommended DC Operating Conditions Change of notes DC Characteristics I_{CC} (max): 240/200/190 mA to 160/140/120 mA I_{SB} (max): 100/100/100 mA to 70/60/50 mA I_{SB1} (max): 10/0.5 mA to 5/1 mA Test conditions I_{CC} and I_{SB} : Addition of Min cycle Test conditions I_{SB1} : Addition of $f = 0$ MHz AC Characteristics Change of Output load (A) t_{OE} , t_{CHZ} and t_{OHZ} (max): 5/6/8 ns to 5/6/7 ns t_{AW} , t_{CW} and t_{WP} (min): 6/8/10 ns to 7/8/10 ns t_{DW} (min): 5/6/8 ns to 5/6/7 ns t_{OHZ} and t_{WHZ} (max): 5/6/8 ns to 5/6/7 ns Low V_{CC} Data Retention Characteristics I_{CCDR} : $-2/300$ μ A to $-1/300$ μ A | T. Fukazawa | K. Makuta |
| 0.3 | May. 15, 1998 | Features Change of Operating current Change of Block Diagram DC Characteristics I_{CC} (max): 160/140/120 mA to 200/180/160 mA | T. Fukazawa | K. Makuta |
| 1.0 | Sep. 15, 1998 | Delete of HM62W4100H-10 Series Features Change of Data retention current DC Characteristics I_{SB1} (typ): $-1/300$ mA to 0.05/0.05 mA Low V_{CC} Data Retention Characteristics I_{CCDR} : $-1/300$ μ A to $-40/600$ μ A | | |