To all our customers

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

Cautions

HM62V16256CI Series

Wide Temperature Range Version
4 M SRAM (256-kword × 16-bit)

ADE-203-1230C (Z)
Rev. 3.0
Jul. 23, 2001

Description

The Hitachi HM62V16256CI Series is 4-Mbit static RAM organized 262,144-word × 16-bit. HM62V16256CI Series has realized higher density, higher performance and low power consumption by employing CMOS process technology (6-transistor memory cell). It offers low power standby power dissipation; therefore, it is suitable for battery backup systems. It is packaged in standard 44-pin plastic TSOPII.

Features

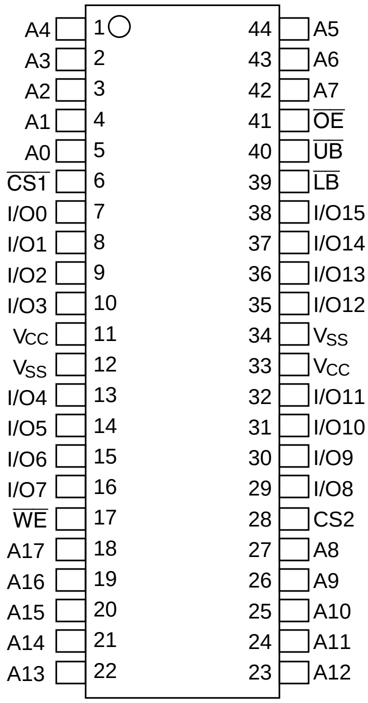
- Single 2.5 V and 3.0 V supply: 2.2 V to 3.6 V
- Fast access time: 70 ns (max)
- Power dissipation:
  - Active: 5.0 mW/MHz (typ)(V_{CC} = 2.5 V)
    : 6.0 mW/MHz (typ) (V_{CC} = 3.0 V)
  - Standby: 2 µW (typ) (V_{CC} = 2.5 V)
    : 2.4 µW (typ) (V_{CC} = 3.0 V)
- Completely static memory.
  - No clock or timing strobe required
- Equal access and cycle times
- Common data input and output.
  - Three state output
- Battery backup operation.
  - 2 chip selection for battery backup
- Temperature range: –40 to +85°C

Ordering Information

Type No.	Access time	Package
HM62V16256CLTTI-7	70 ns	400-mil 44-pin plastic TSOPII (normal-bend type) (TTP-44DB)

Pin Arrangement

44-pin TSOP

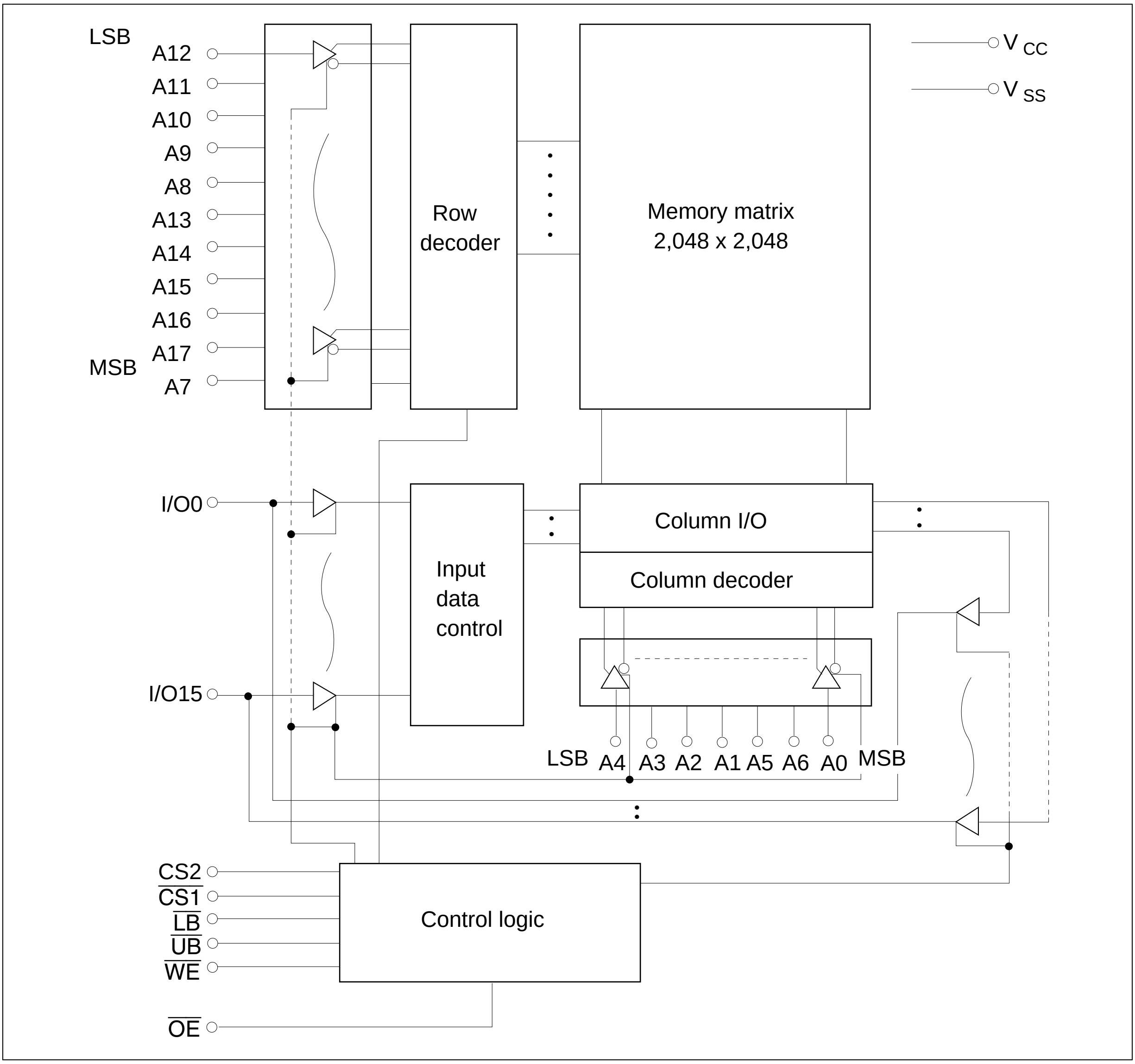


(Top view)

Pin Description

Pin name	Function
A0 to A17	Address input
I/O0 to I/O15	Data input/output
$\overline{CS1}$	Chip select 1
CS2	Chip select 2
$\overline{WE}$	Write enable
$\overline{OE}$	Output enable
$\overline{LB}$	Lower byte select
$\overline{UB}$	Upper byte select
V_{CC}	Power supply
V_{SS}	Ground

Block Diagram



Operation Table

$\overline{CS1}$	CS2	$\overline{WE}$	$\overline{OE}$	$\overline{UB}$	$\overline{LB}$	I/O0 to I/O7	I/O8 to I/O15	Operation
H	×	×	×	×	×	High-Z	High-Z	Standby
×	L	×	×	×	×	High-Z	High-Z	Standby
×	×	×	×	H	H	High-Z	High-Z	Standby
L	H	H	L	L	L	Dout	Dout	Read
L	H	H	L	H	L	Dout	High-Z	Lower byte read
L	H	H	L	L	H	High-Z	Dout	Upper byte read
L	H	L	×	L	L	Din	Din	Write
L	H	L	×	H	L	Din	High-Z	Lower byte write
L	H	L	×	L	H	High-Z	Din	Upper byte write
L	H	H	H	×	×	High-Z	High-Z	Output disable

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

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power supply voltage relative to V_{SS}	V_{CC}	–0.5 to + 4.6	V
Terminal voltage on any pin relative to V_{SS}	V_T	–0.5*1 to V_{CC} + 0.3*2	V
Power dissipation	P_T	1.0	W
Storage temperature range	Tstg	–55 to +125	°C
Storage temperature range under bias	Tbias	–40 to +85	°C

Notes: 1. V_T min: –3.0 V for pulse half-width ≤ 30 ns.
2. Maximum voltage is +4.6 V.

DC Operating Conditions

Parameter		Symbol	Min	Typ	Max	Unit	Note
Supply voltage		V_{CC}	2.2	2.5/3.0	3.6	V	
		V_{SS}	0	0	0	V	
Input high voltage	V_{CC} = 2.2 V to 2.7 V	V_{IH}	2.0	—	V_{CC} + 0.3	V	
	V_{CC} = 2.7 V to 3.6 V	V_{IH}	2.2	—	V_{CC} + 0.3	V	
Input low voltage	V_{CC} = 2.2 V to 2.7 V	V_{IL}	–0.2	—	0.4	V	1
	V_{CC} = 2.7 V to 3.6 V	V_{IL}	–0.3	—	0.6	V	1
Ambient temperature range		Ta	–40	—	85	°C	

Note: 1. V_{IL} min: –3.0 V for pulse half-width ≤ 30 ns.

DC Characteristics

Parameter		Symbol	Min	Typ*1	Max	Unit	Test conditions
Input leakage current		$\|I_{LI}\|$	—	—	1	µA	Vin = V_{SS} to V_{CC}
Output leakage current		$\|I_{LO}\|$	—	—	1	µA	$\overline{CS1}$ = V_{IH} or CS2 = V_{IL} or $\overline{OE}$ = V_{IH} or $\overline{WE}$ = V_{IL} or $\overline{LB}$ = $\overline{UB}$ = V_{IH}, $V_{I/O}$ = V_{SS} to V_{CC}
Operating current		I_{CC}	—	5	20	mA	$\overline{CS1}$ = V_{IL}, CS2 = V_{IH}, Others = V_{IH}/V_{IL}, $I_{I/O}$ = 0 mA
Average operating current		I_{CC1}	—	7	25	mA	Min. cycle, duty = 100%, $I_{I/O}$ = 0 mA, $\overline{CS1}$ = V_{IL}, CS2 = V_{IH}, Others = V_{IH}/V_{IL}
		I_{CC2}	—	2	5	mA	Cycle time = 1 µs, duty = 100%, $I_{I/O}$ = 0 mA, $\overline{CS1}$ ≤ 0.2 V, CS2 ≥ V_{CC} – 0.2 V, V_{IH} ≥ V_{CC} – 0.2 V, V_{IL} ≤ 0.2 V
Standby current		I_{SB}	—	0.1	0.3	mA	CS2 = V_{IL}
Standby current		I_{SB1}*2	—	0.8	20	µA	0 V ≤ Vin (1) 0 V ≤ CS2 ≤ 0.2 V or (2) $\overline{CS1}$ ≥ V_{CC} – 0.2 V, CS2 ≥ V_{CC} – 0.2 V or (3) $\overline{LB}$ = $\overline{UB}$ ≥ V_{CC} – 0.2 V CS2 ≥ V_{CC} – 0.2 V $\overline{CS1}$ ≤ 0.2 V
Output high voltage	V_{CC} =2.2 V to 2.7 V	V_{OH}	2.0	—	—	V	I_{OH} = –0.5 mA
	V_{CC} =2.7 V to 3.6 V	V_{OH}	2.4	—	—	V	I_{OH} = –1 mA
	V_{CC} =2.2 V to 3.6 V	V_{OH}	V_{CC} – 0.2	—	—	V	I_{OH} = –100 µA
Output low voltage	V_{CC} =2.2 V to 2.7 V	V_{OL}	—	—	0.4	V	I_{OL} = 0.5 mA
	V_{CC} =2.7 V to 3.6 V	V_{OL}	—	—	0.4	V	I_{OL} = 2 mA
	V_{CC} =2.2 V to 3.6 V	V_{OL}	—	—	0.2	V	I_{OL} = 100 µA

Notes: 1. Typical values are at V_{CC} = 2.5 V/3.0 V, Ta = +25°C and not guaranteed.
2. This characteristic is guaranteed only for L-version.

Capacitance (Ta = +25°C, f = 1.0 MHz)

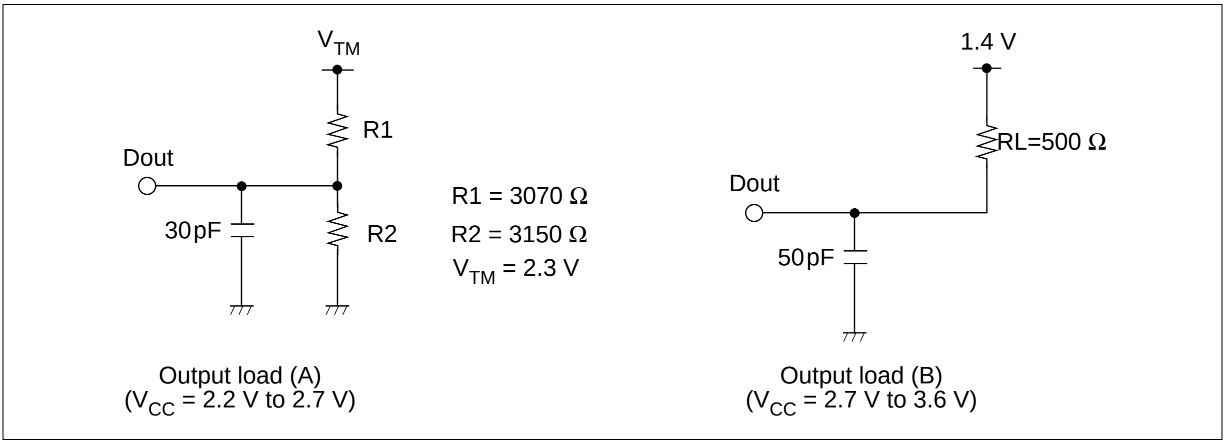
Parameter	Symbol	Min	Typ	Max	Unit	Test conditions	Note
Input capacitance	Cin	—	—	8	pF	Vin = 0 V	1
Input/output capacitance	$C_{I/O}$	—	—	10	pF	$V_{I/O}$ = 0 V	1

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

AC Characteristics (Ta = –40 to +85°C, V_{CC} = 2.2 V to 3.6 V, unless otherwise noted.)

Test Conditions

- Input pulse levels: V_{IL} = 0.4 V, V_{IH} = 2.2 V (V_{CC} = 2.2 V to 2.7 V)
  : V_{IL} = 0.4 V, V_{IH} = 2.4 V (V_{CC} = 2.7 V to 3.6 V)
- Input rise and fall time: 5 ns
- Input/output timing reference levels: 1.1 V (V_{CC} = 2.2 V to 2.7 V)
  : 1.4 V (V_{CC} = 2.7 V to 3.6 V)
- Output load: See figures (Including scope and jig)



Read Cycle

Parameter	Symbol	HM62V16256CI -7 Min	Max	Unit	Notes
Read cycle time	t_{RC}	70	—	ns	
Address access time	t_{AA}	—	70	ns	
Chip select access time	t_{ACS1}	—	70	ns	
	t_{ACS2}	—	70	ns	
Output enable to output valid	t_{OE}	—	40	ns	
Output hold from address change	t_{OH}	10	—	ns	
$\overline{LB}$, $\overline{UB}$ access time	t_{BA}	—	70	ns	
Chip select to output in low-Z	t_{CLZ1}	10	—	ns	2, 3
	t_{CLZ2}	10	—	ns	2, 3
$\overline{LB}$, $\overline{UB}$ enable to low-z	t_{BLZ}	5	—	ns	2, 3
Output enable to output in low-Z	t_{OLZ}	5	—	ns	2, 3
Chip deselect to output in high-Z	t_{CHZ1}	0	25	ns	1, 2, 3
	t_{CHZ2}	0	25	ns	1, 2, 3
$\overline{LB}$, $\overline{UB}$ disable to high-Z	t_{BHZ}	0	25	ns	1, 2, 3
Output disable to output in high-Z	t_{OHZ}	0	25	ns	1, 2, 3

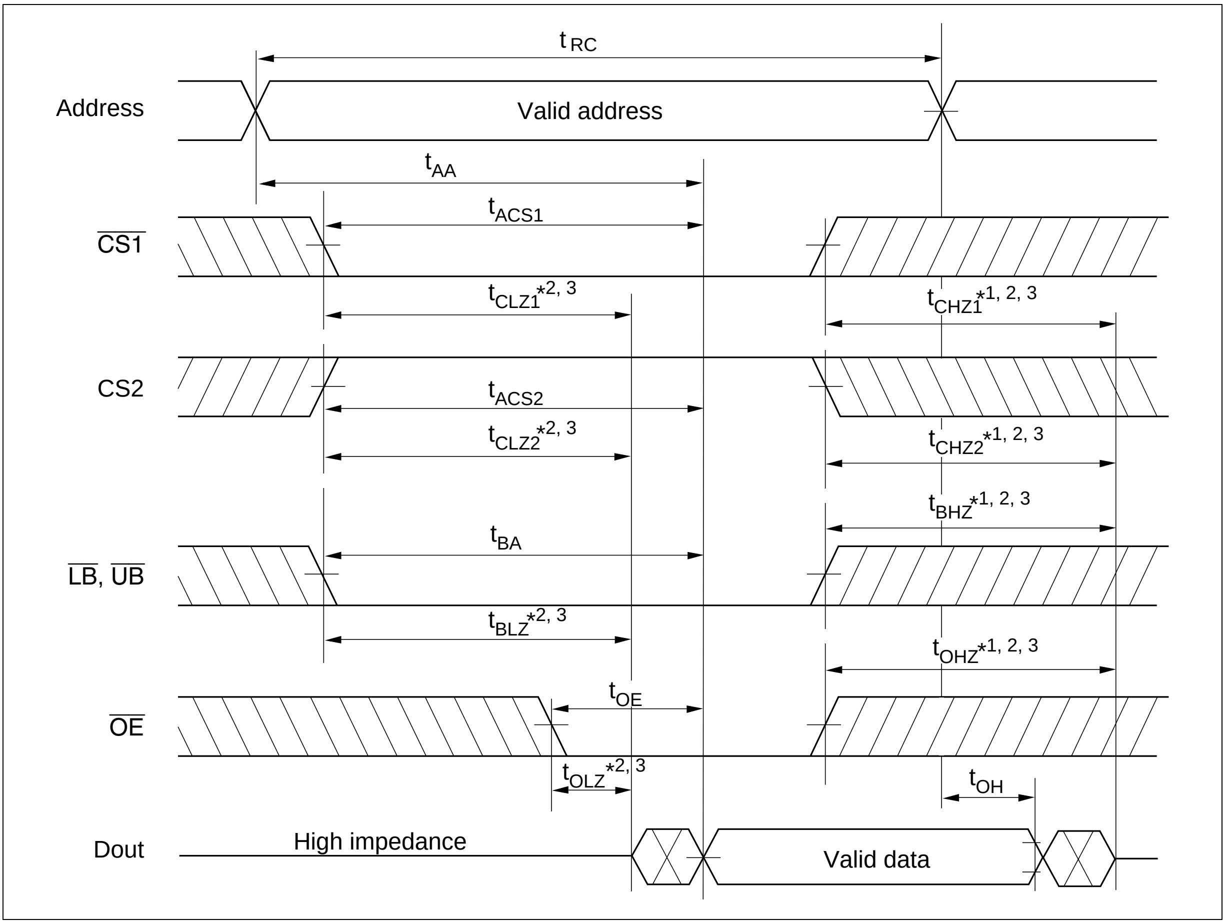
Write Cycle

		HM62V16256CI			
		-7			
Parameter	Symbol	Min	Max	Unit	Notes
Write cycle time	t_{WC}	70	—	ns	
Address valid to end of write	t_{AW}	60	—	ns	
Chip selection to end of write	t_{CW}	60	—	ns	5
Write pulse width	t_{WP}	50	—	ns	4
$\overline{LB}$, $\overline{UB}$ valid to end of write	t_{BW}	55	—	ns	
Address setup time	t_{AS}	0	—	ns	6
Write recovery time	t_{WR}	0	—	ns	7
Data to write time overlap	t_{DW}	30	—	ns	
Data hold from write time	t_{DH}	0	—	ns	
Output active from end of write	t_{OW}	5	—	ns	2
Output disable to output in High-Z	t_{OHZ}	0	25	ns	1, 2
Write to output in high-Z	t_{WHZ}	0	25	ns	1, 2

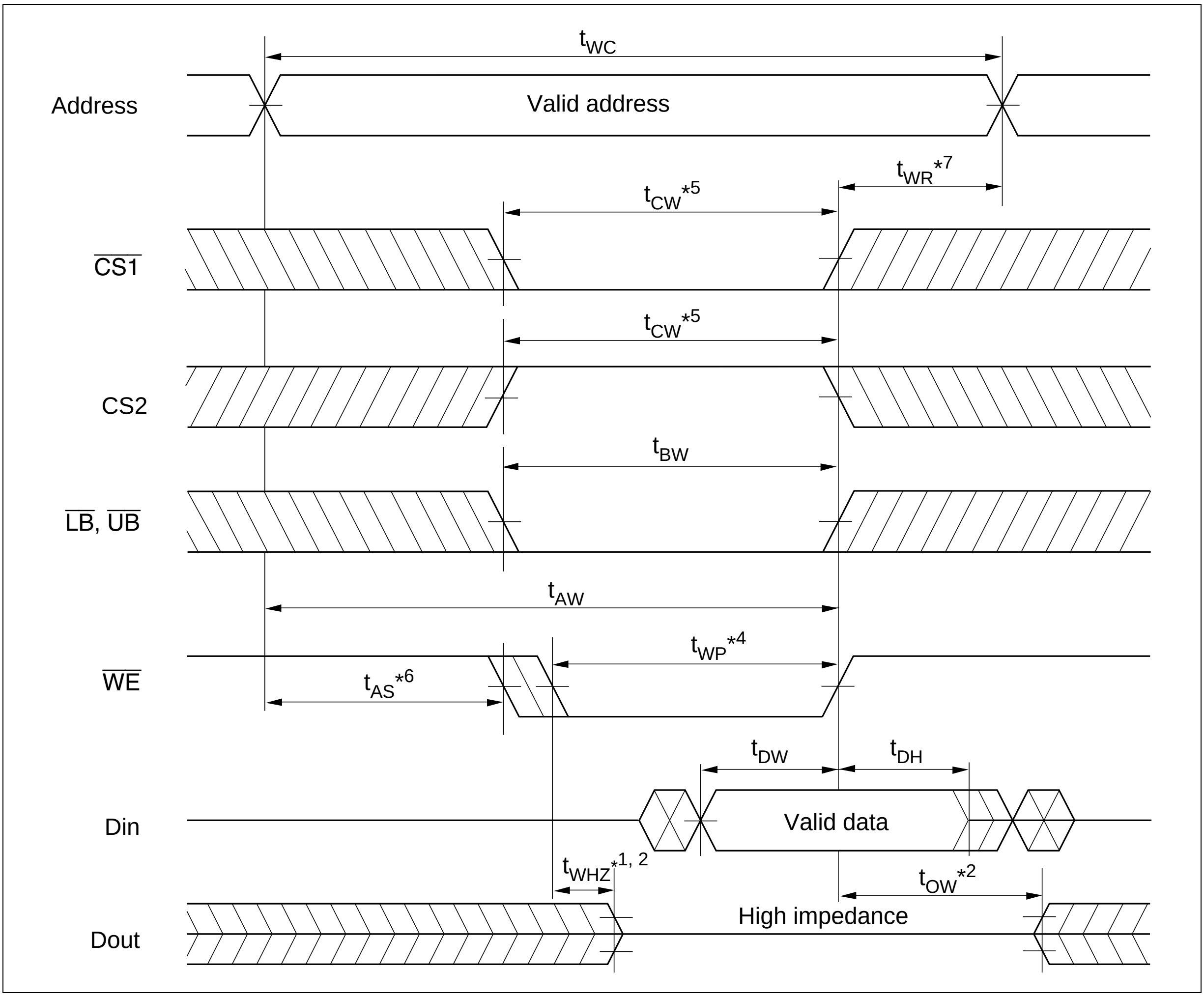
Notes:
1. t_{CHZ}, t_{OHZ}, t_{WHZ} and t_{BHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.
2. This parameter is sampled and not 100% tested.
3. At any given temperature and voltage condition, t_{HZ} max is less than t_{LZ} min both for a given device and from device to device.
4. A write occures during the overlap of a low $\overline{CS1}$, a high CS2, a low $\overline{WE}$ and a low $\overline{LB}$ or a low $\overline{UB}$. A write begins at the latest transition among $\overline{CS1}$ going low, CS2 going high, $\overline{WE}$ going low and $\overline{LB}$ going low or $\overline{UB}$ going low. A write ends at the earliest transition among $\overline{CS1}$ going high, CS2 going low, $\overline{WE}$ going high and $\overline{LB}$ going high or $\overline{UB}$ going high. t_{WP} is measured from the beginning of write to the end of write.
5. t_{CW} is measured from the later of $\overline{CS1}$ going low or CS2 going high to the end of write.
6. t_{AS} is measured from the address valid to the beginning of write.
7. t_{WR} is measured from the earliest of $\overline{CS1}$ or $\overline{WE}$ going high or CS2 going low to the end of write cycle.

Timing Waveform

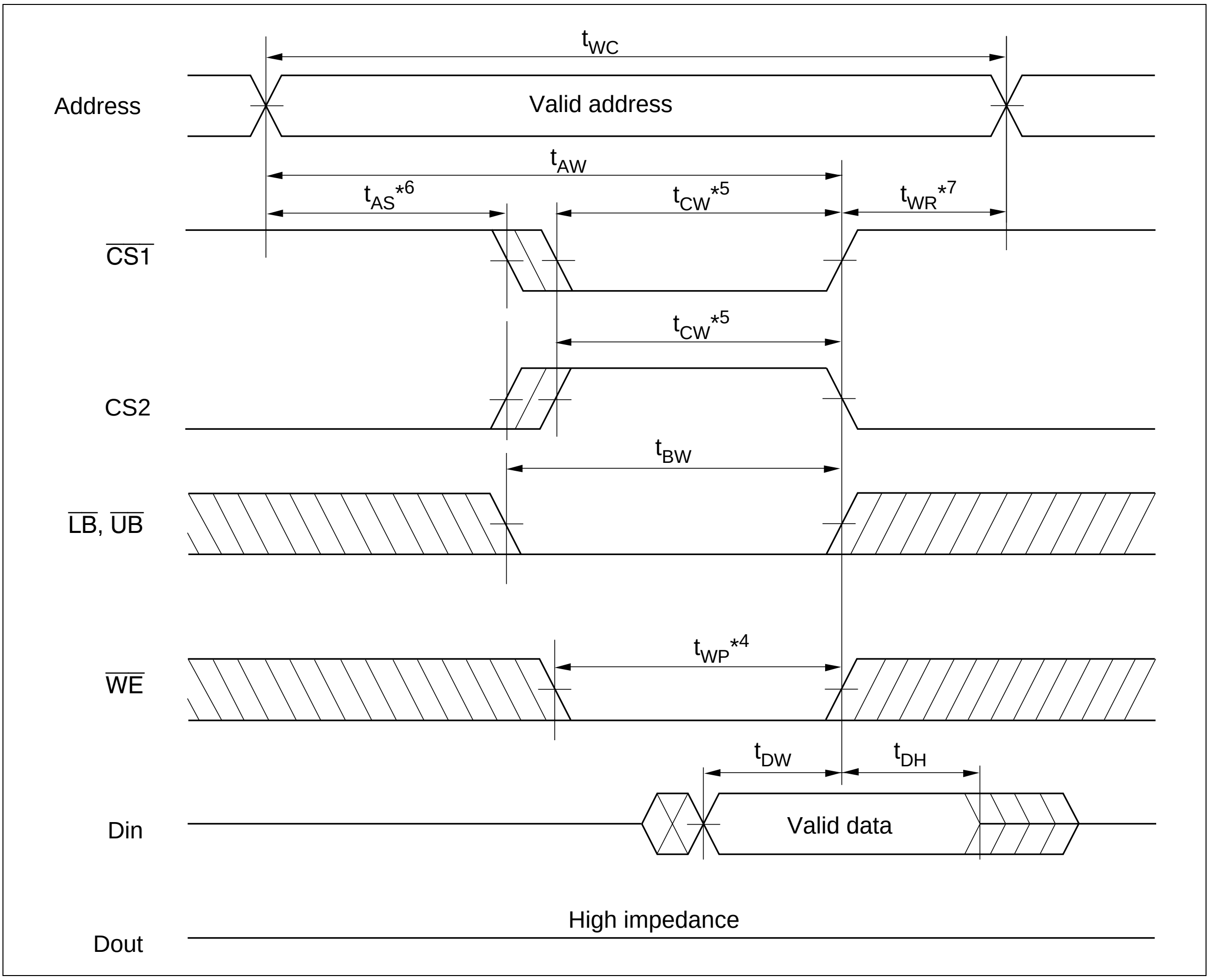
Read Cycle



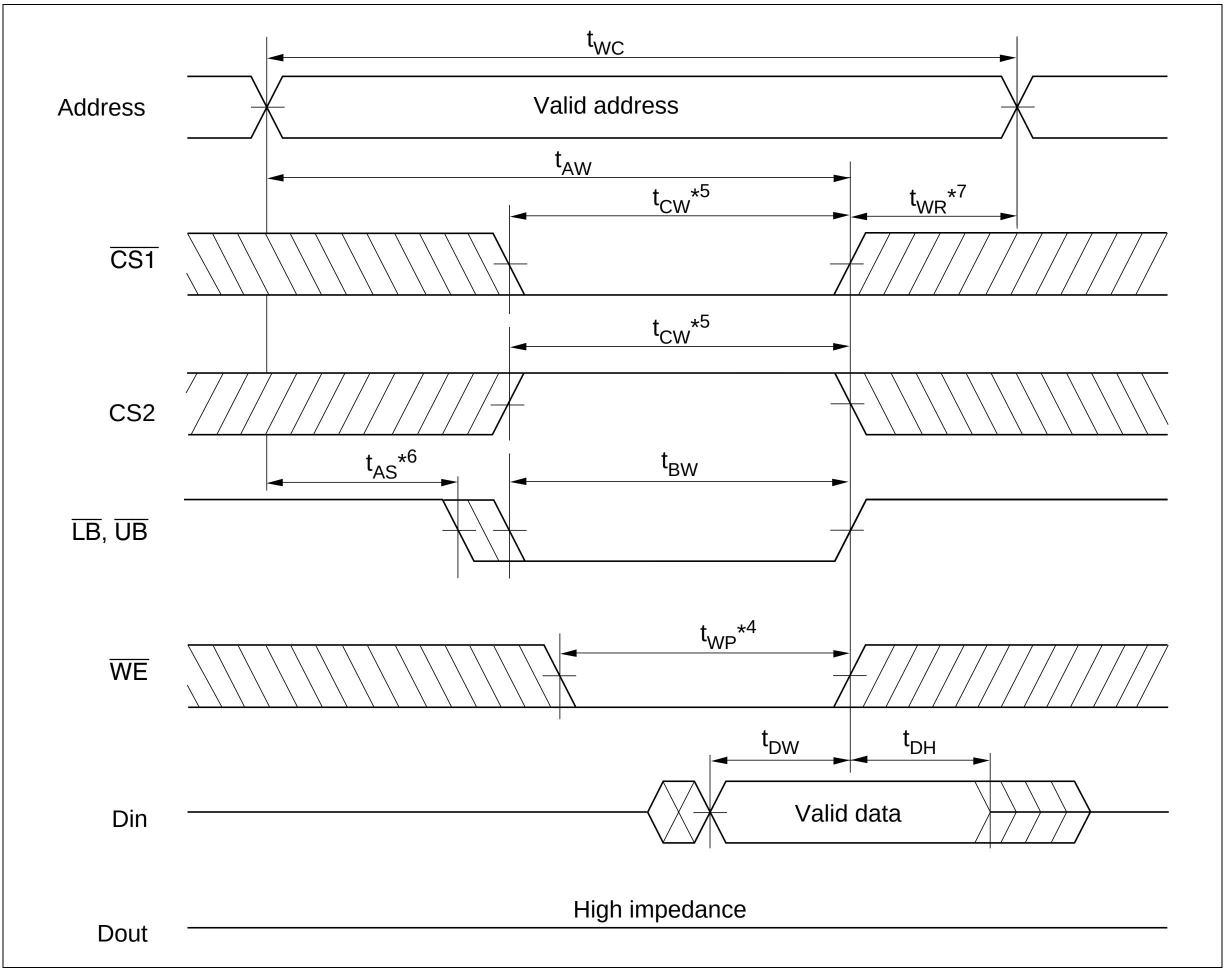
Write Cycle (1) ($\overline{WE}$ Clock)



Write Cycle (2) ($\overline{CS}$ Clock, $\overline{OE}$ = V_{IH})



Write Cycle (3) ($\overline{LB}$, $\overline{UB}$ Clock, $\overline{OE}$ = V_{IH})



RENESAS

Low V_{CC} Data Retention Characteristics (Ta = –40 to +85°C)

Parameter	Symbol	Min	Typ*[3]	Max	Unit	Test conditions*[2]
V_{CC} for data retention	V_{DR}	2.0	—	3.6	V	Vin ≥ 0V (1) 0 V ≤ CS2 ≤ 0.2 V or (2) CS2 ≥ V_{CC} – 0.2 V, $\overline{\text{CS1}}$ ≥ V_{CC} – 0.2 V or (3) $\overline{\text{LB}}$ = $\overline{\text{UB}}$ ≥ V_{CC} – 0.2 V, CS2 ≥ V_{CC} – 0.2 V, $\overline{\text{CS1}}$ ≤ 0.2 V
Data retention current	I_{CCDR}*[1]	—	0.8	20	µA	V_{CC} = 3.0 V, Vin ≥ 0V (1) 0 V ≤ CS2 ≤ 0.2 V or (2) CS2 ≥ V_{CC} – 0.2 V, $\overline{\text{CS1}}$ ≥ V_{CC} – 0.2 V or (3) $\overline{\text{LB}}$ = $\overline{\text{UB}}$ ≥ V_{CC} – 0.2 V, CS2 ≥ V_{CC} – 0.2 V, $\overline{\text{CS1}}$ ≤ 0.2 V
Chip deselect to data retention time	t_{CDR}	0	—	—	ns	See retention waveform
Operation recovery time	t_R	t_{RC}*[4]	—	—	ns	

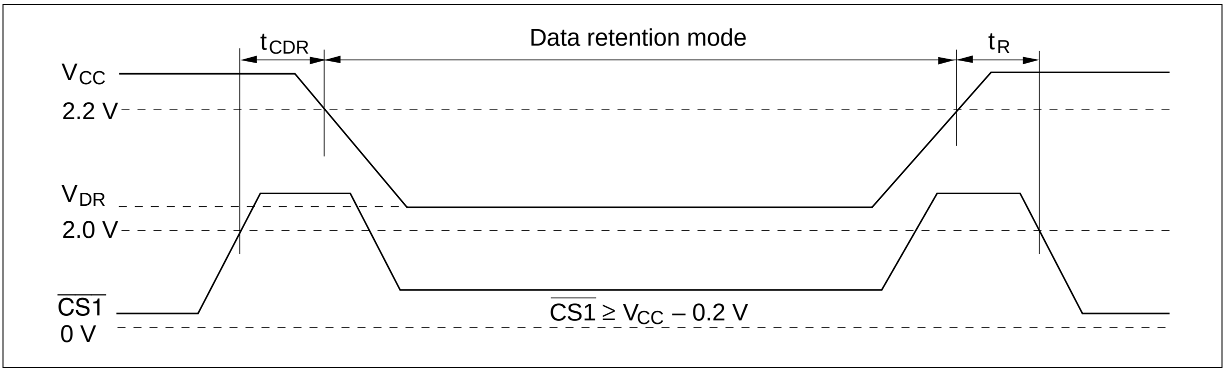
Notes: 1. This characteristic is guaranteed only for L-version, 10 µA max. at Ta = –40 to +40°C.

2. CS2 controls address buffer, $\overline{\text{WE}}$ buffer, $\overline{\text{CS1}}$ buffer, $\overline{\text{OE}}$ buffer, $\overline{\text{LB}}$, $\overline{\text{UB}}$ buffer and Din buffer. If CS2 controls data retention mode, Vin levels (address, $\overline{\text{WE}}$, $\overline{\text{OE}}$, $\overline{\text{CS1}}$, $\overline{\text{LB}}$, $\overline{\text{UB}}$, I/O) can be in the high impedance state. If $\overline{\text{CS1}}$ controls data retention mode, CS2 must be CS2 ≥ V_{CC} – 0.2 V or 0 V ≤ CS2 ≤ 0.2 V. The other input levels (address, $\overline{\text{WE}}$, $\overline{\text{OE}}$, $\overline{\text{LB}}$, $\overline{\text{UB}}$, I/O) can be in the high impedance state.

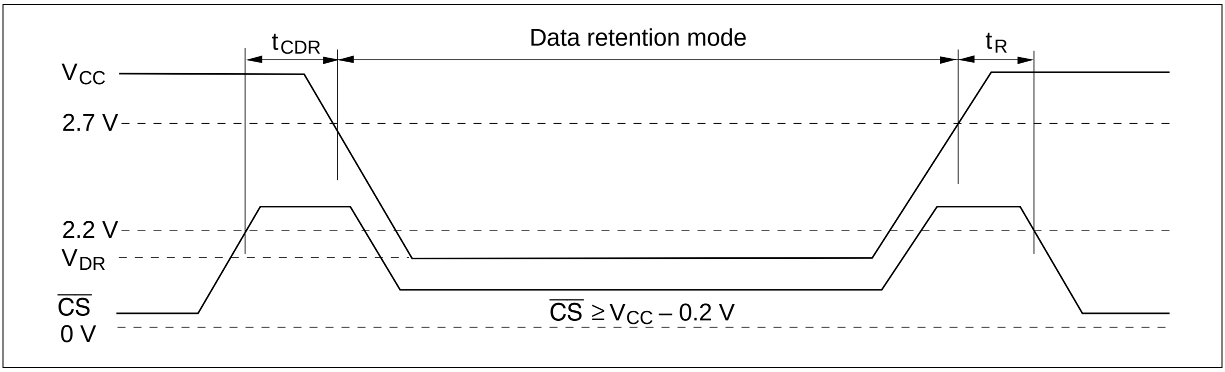
3. Typical values are at V_{CC} = 3.0 V, Ta = +25°C and not guaranteed.

4. t_{RC} = read cycle time.

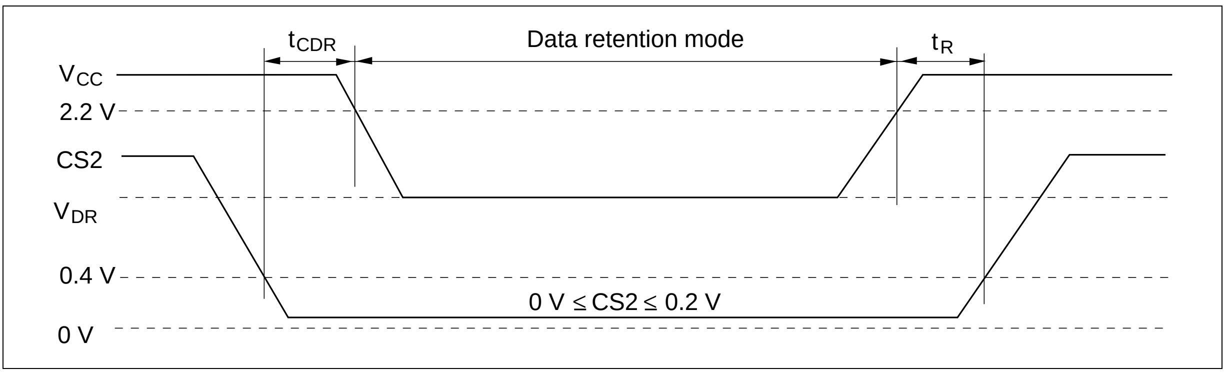
Low V_{CC} Data Retention Timing Waveform (1) ($\overline{CS1}$ Controlled) **(**V_{CC} = 2.2 V to 2.7 V)



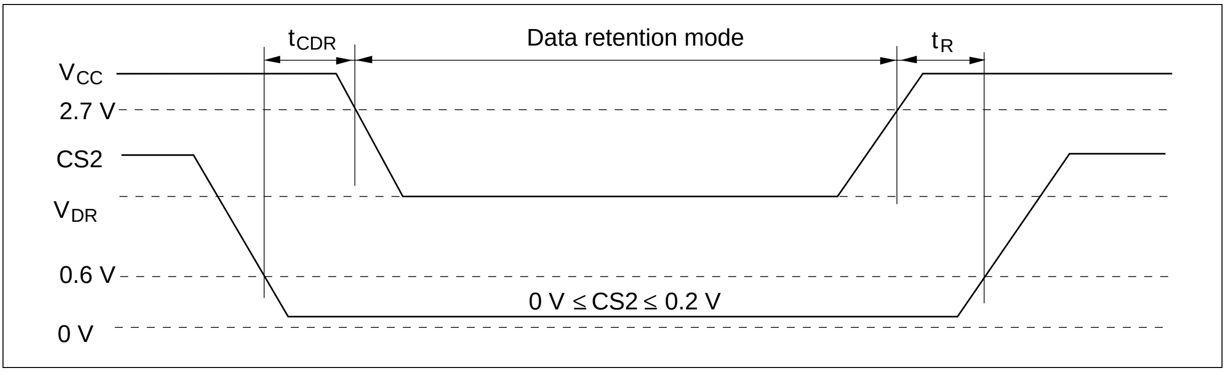
Low V_{CC} Data Retention Timing Waveform (2) ($\overline{CS1}$ Controlled) **(**V_{CC} = 2.7 V to 3.6 V)



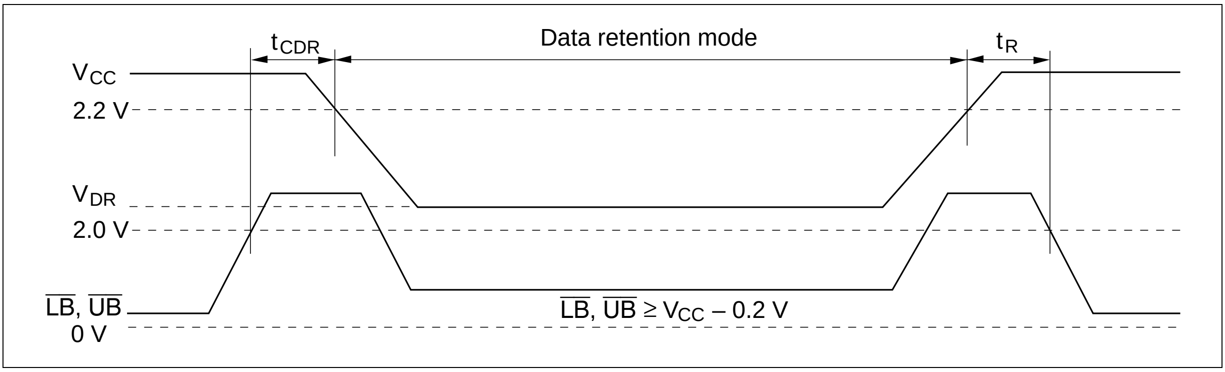
Low V_{CC} Data Retention Timing Waveform (3) (CS2 Controlled) **(**V_{CC} = 2.2 V to 2.7 V)



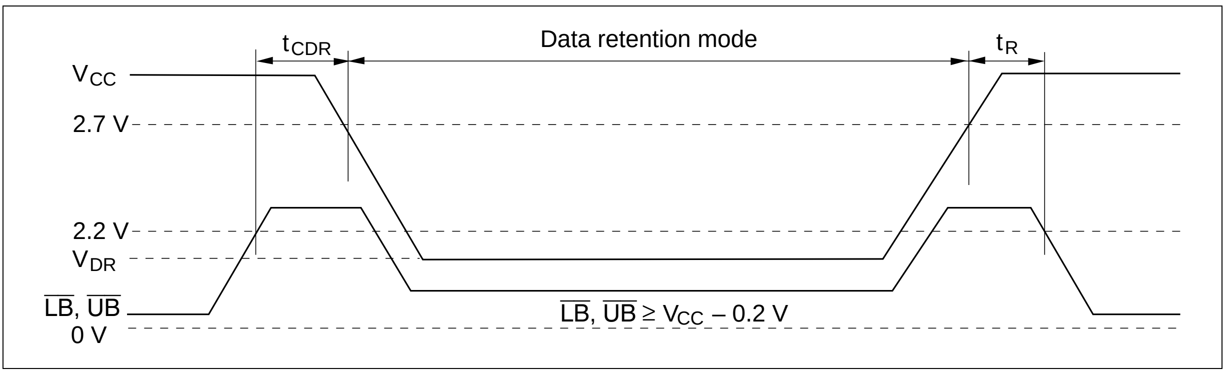
Low V_{CC} Data Retention Timing Waveform (4) (CS2 Controlled) **(**V_{CC} = 2.7 V to 3.6 V)



Low V_{CC} Data Retention Timing Waveform (5) ($\overline{LB}$, $\overline{UB}$ Controlled) **(**V_{CC} = 2.2 V to 2.7 V)



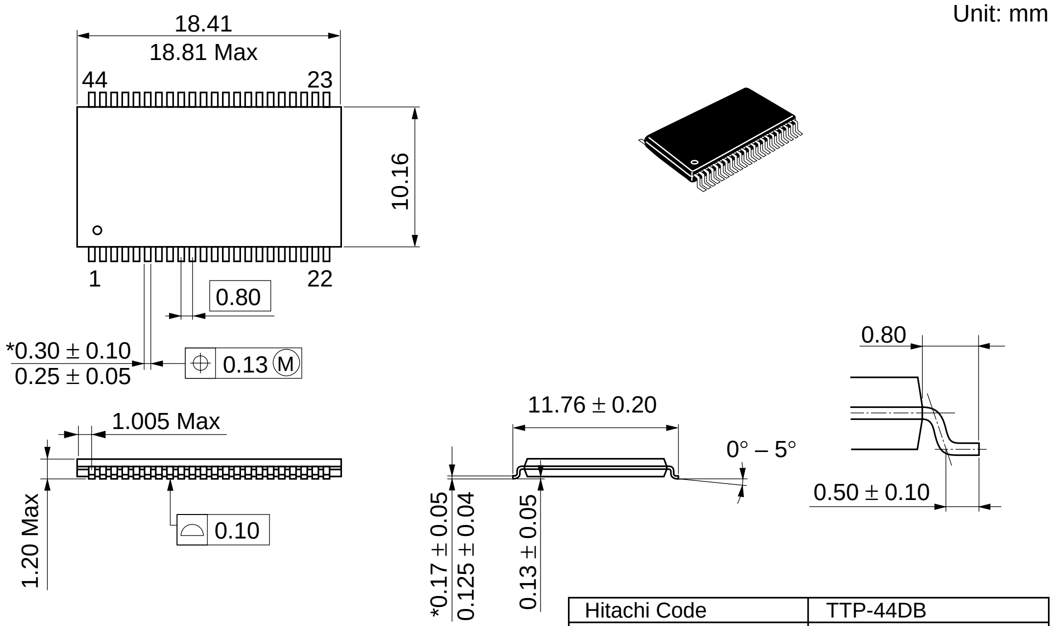
Low V_{CC} Data Retention Timing Waveform (6) ($\overline{LB}$, $\overline{UB}$ Controlled) **(**V_{CC} = 2.7 V to 3.6 V)



Package Dimensions

HM62V16256CLTTI Series (TTP-44DB)

As of January, 2001
Unit: mm



Hitachi Code	TTP-44DB
JEDEC	—
EIAJ	—
Mass (reference value)	0.43 g

*Dimension including the plating thickness
Base material dimension

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