
HM62256B Series

32,768-word \times 8-bit High Speed CMOS Static RAM

HITACHI

ADE-203-135D (Z)

Rev. 4.0

Nov. 29, 1995

Description

The Hitachi HM62256B is a CMOS static RAM organized 32-kword \times 8-bit. It realizes higher performance and low power consumption by employing 0.8 μ m Hi-CMOS process technology. The device, packaged in 8 \times 14 mm TSOP, 8 \times 13.4 mm TSOP with thickness of 1.2 mm, 450-mil SOP (foot print pitch width), 600-mil plastic DIP, or 300-mil plastic DIP, is available for high density mounting. It offers low power standby power dissipation; therefore, it is suitable for battery back-up systems.

Features

- High speed
Fast access time: 45/55/70/85 ns (max)
- Low power
Standby: 1.0 μ W (typ)
Operation: 25 mW (typ) ($f = 1$ MHz)
- Single 5 V supply
- Completely static memory
No clock or timing strobe required
- Equal access and cycle times
- Common data input and output
Three state output
- Directly TTL compatible
All inputs and outputs
- Capability of battery back up operation

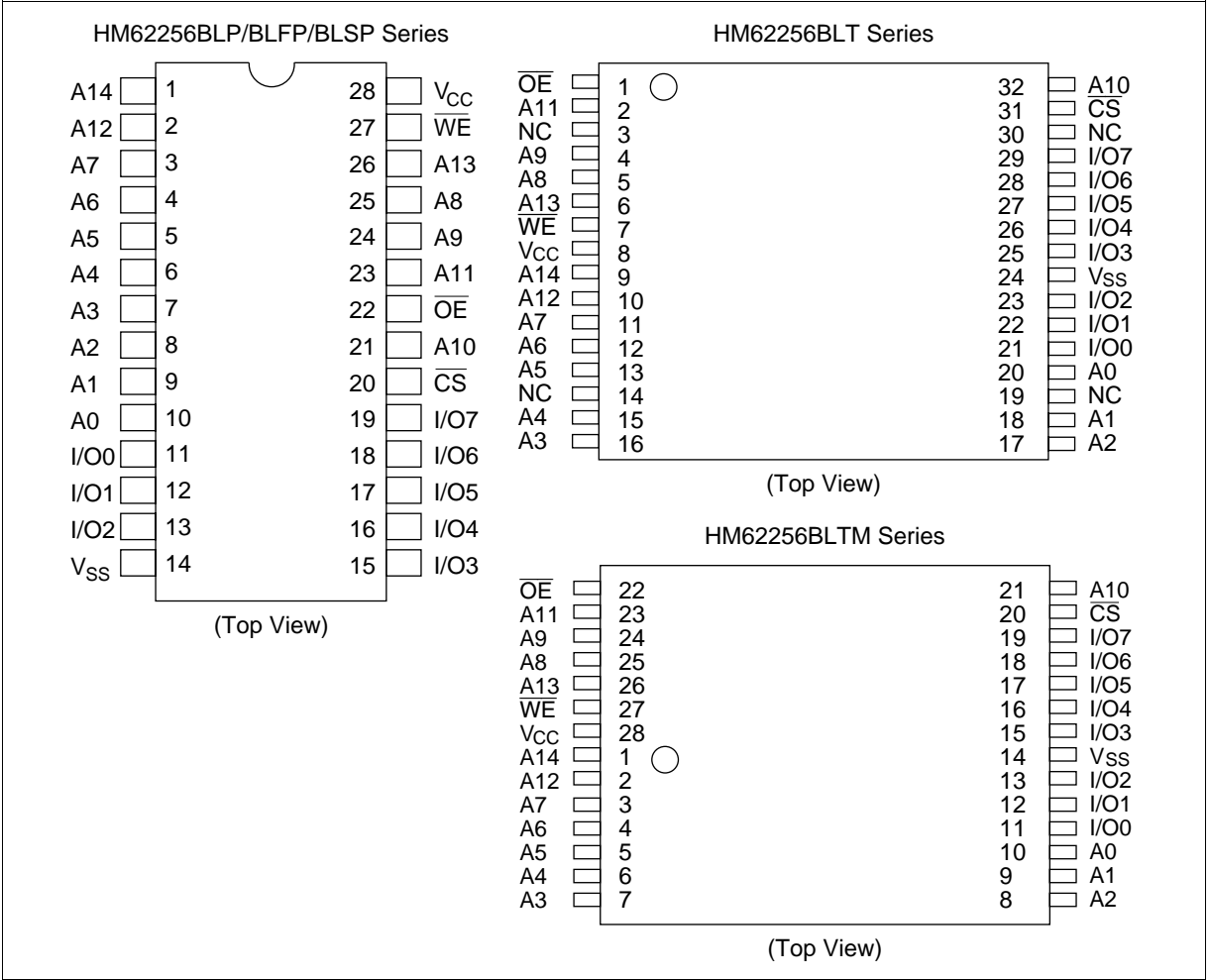
HM62256B Series

Ordering Information

Type No.	Access Time	Package
HM62256BLP-7	70 ns	600-mil 28-pin plastic DIP (DP-28)
HM62256BLP-7SL	70 ns	
HM62256BLSP-7	70 ns	300-mil 28-pin plastic DIP (DP-28NA)
HM62256BLSP-7SL	70 ns	
HM62256BLFP-7T	70 ns	450-mil 28-pin plastic SOP (FP-28DA)
HM62256BLFP-4SLT ^{*1}	45 ns	
HM62256BLFP-5SLT	55 ns	
HM62256BLFP-7SLT	70 ns	
HM62256BLFP-7ULT	70 ns	8 mm × 14 mm 32-pin TSOP (TFP-32DA)
HM62256BLT-8	85 ns	
HM62256BLT-7SL	70 ns	
HM62256BLTM-8	85 ns	8 mm × 13.4 mm 28-pin TSOP (TFP-28DA)
HM62256BLTM-4SL ^{*1}	45 ns	
HM62256BLTM-5SL	55 ns	
HM62256BLTM-7SL	70 ns	
HM62256BLTM-7UL	70 ns	

Note: 1. Under development

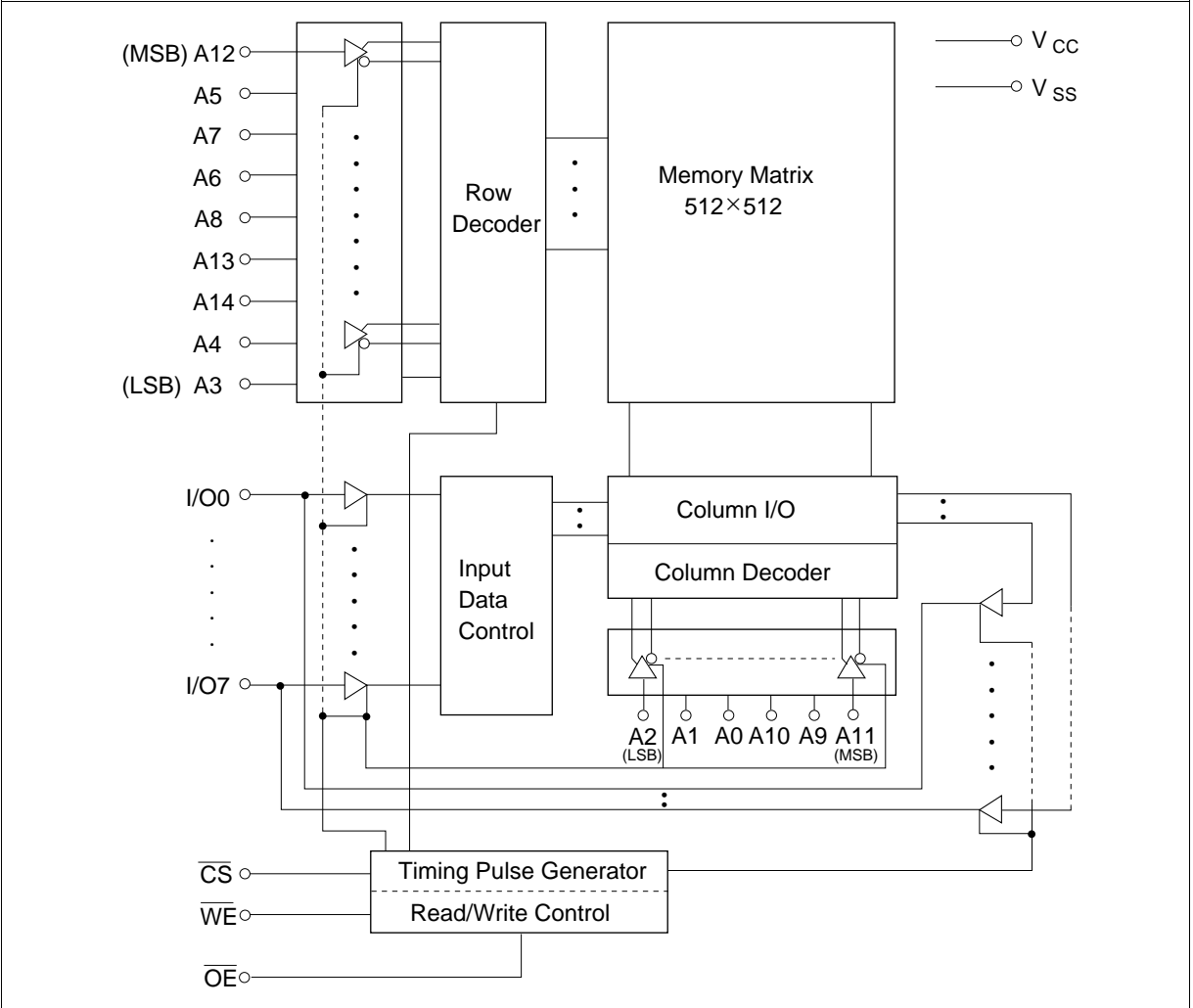
Pin Arrangement



Pin Description

Symbol	Function
A0 – A14	Address
I/O0 – I/O7	Input/output
$\overline{\text{CS}}$	Chip select
$\overline{\text{WE}}$	Write enable
$\overline{\text{OE}}$	Output enable
NC	No connection
V_{CC}	Power supply
V_{SS}	Ground

Block Diagram



Function Table

\overline{WE}	\overline{CS}	\overline{OE}	Mode	V_{CC} Current	I/O Pin	Ref. Cycle
X	H	X	Not selected	I_{SB}, I_{SB1}	High-Z	—
H	L	H	Output disable	I_{CC}	High-Z	—
H	L	L	Read	I_{CC}	Dout	Read cycle (1)–(3)
L	L	H	Write	I_{CC}	Din	Write cycle (1)
L	L	L	Write	I_{CC}	Din	Write cycle (2)

Note: X: H or L

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power supply voltage ^{*1}	V_{CC}	-0.5 to +7.0	V
Terminal voltage ^{*1}	V_T	-0.5 ^{*2} to $V_{CC} + 0.3$ ^{*3}	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. Relative to V_{SS}

2. V_T min: -3.0 V for pulse half-width ≤ 50 ns

3. Maximum voltage is 7.0 V

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

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	4.5	5.0	5.5	V
	V_{SS}	0	0	0	V
Input high (logic 1) voltage	V_{IH}	2.2	—	$V_{CC} + 0.3$	V
Input low (logic 0) voltage	V_{IL}	-0.5 ^{*1}	—	0.8	V

Note: 1. V_{IL} min: -3.0 V for pulse half-width ≤ 50 ns

DC Characteristics (Ta = 0 to +70°C, V_{CC} = 5 V ±10%, V_{SS} = 0 V)

Parameter		Symbol	Min	Typ*1	Max	Unit	Test Conditions
Input leakage current		I _{IL}	—	—	1	μA	V _{in} = V _{SS} to V _{CC}
Output leakage current		I _{LO}	—	—	1	μA	$\overline{CS} = V_{IH}$ or $\overline{OE} = V_{IH}$ or $\overline{WE} = V_{IL}$, V _{SS} ≤ V _{I/O} ≤ V _{CC}
Operating power supply current		I _{CC}	—	6	15	mA	$\overline{CS} = V_{IL}$, others = V _{IH} /V _{IL} , I _{I/O} = 0 mA
Average operating power supply current	HM62256B-4	I _{CC1}	—	—	70	mA	min cycle, duty = 100 %, I _{I/O} = 0 mA $\overline{CS} = V_{IL}$, others = V _{IH} /V _{IL}
	HM62256B-5	I _{CC1}	—	—	60		
	HM62256B-7	I _{CC1}	—	33	60		
	HM62256B-8	I _{CC1}	—	29	50		
		I _{CC2}	—	5	15	mA	Cycle time = 1 μs, I _{I/O} = 0 mA $\overline{CS} = V_{IL}$, V _{IH} = V _{CC} , V _{IL} = 0
Standby power supply current		I _{SB}	—	0.3	2	mA	$\overline{CS} = V_{IH}$
		I _{SB1}	—	0.2	100	μA	V _{in} ≥ 0 V, $\overline{CS} \geq V_{CC} - 0.2$ V,
			—	0.2 ^{*2}	50 ^{*2}		
			—	0.2 ^{*3}	10 ^{*3}		
Output low voltage		V _{OL}	—	—	0.4	V	I _{OL} = 2.1 mA
Output high voltage		V _{OH}	2.4	—	—	V	I _{OH} = -1.0 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-SL version.
3. This characteristics is guaranteed only for L-UL version.

Capacitance (Ta = 25°C, f = 1.0 MHz)^{*1}

Parameter		Symbol	Min	Typ	Max	Unit	Test Conditions
Input capacitance ^{*1}		C _{in}	—	—	8	pF	V _{in} = 0 V
Input/output capacitance ^{*1}		C _{I/O}	—	—	10	pF	V _{I/O} = 0 V

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

AC Characteristics (Ta = 0 to +70°C, V_{CC} = 5 V ± 10%, unless otherwise noted.)

Test Conditions

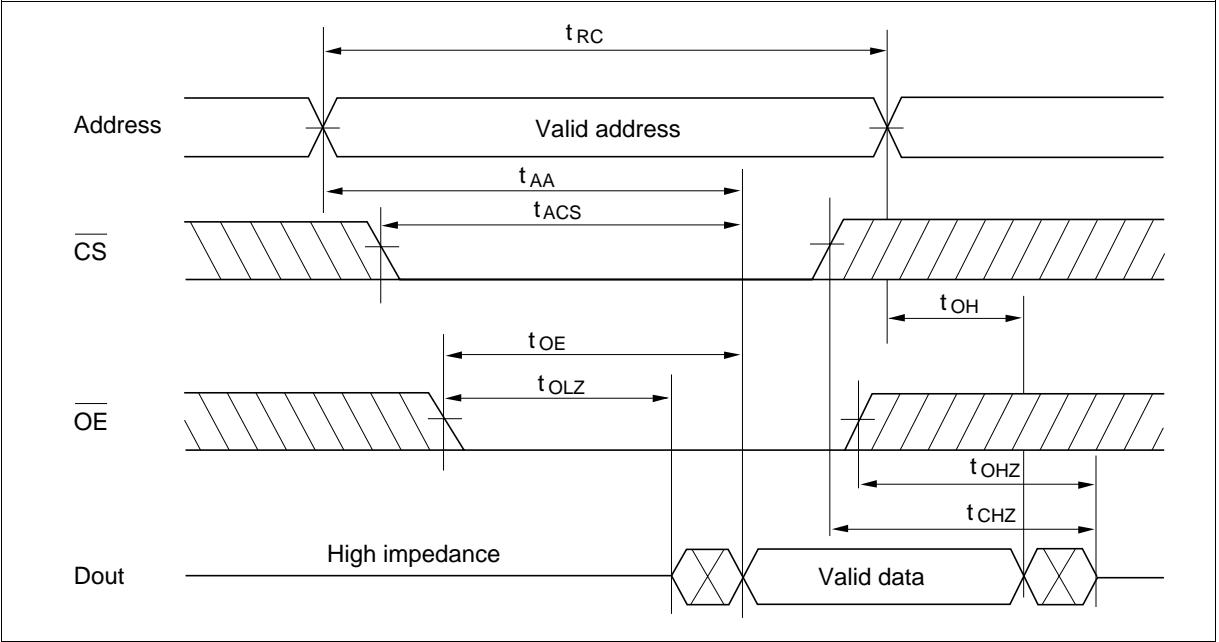
- Input pulse levels: 0.8 V to 2.4 V
- Input rise and fall times: 5 ns
- Input and output timing reference level: 1.5 V
- Output load: HM62256B-4: 1 TTL Gate + C_L (30 pF)(Including scope & jig)
HM62256B-5: 1 TTL Gate + C_L (50 pF)(Including scope & jig)
HM62256B-7/8: 1 TTL Gate + C_L (100 pF)(Including scope & jig)

Read Cycle

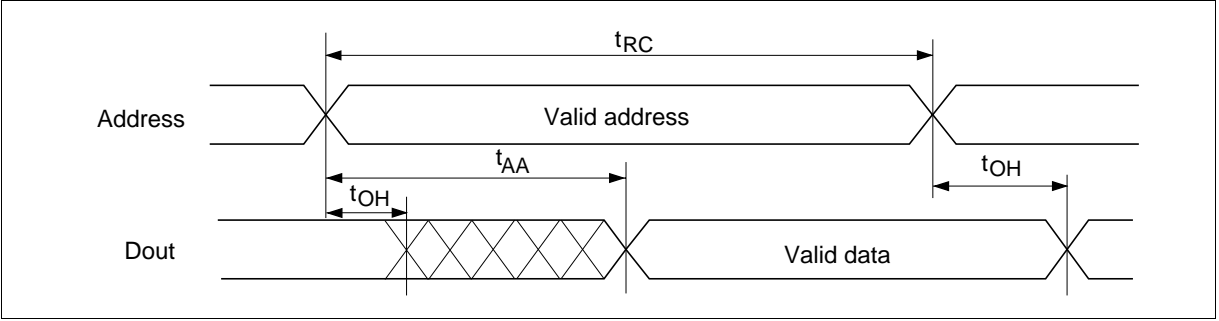
		HM62256B									
		-4		-5		-7		-8			
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Min	Max	Unit	Notes
Read cycle time	t _{RC}	45	—	55	—	70	—	85	—	ns	
Address access time	t _{AA}	—	45	—	55	—	70	—	85	ns	
Chip select access time	t _{ACS}	—	45	—	55	—	70	—	85	ns	
Output enable to output valid	t _{OE}		30	—	35	—	40	—	45	ns	
Chip selection to output in low-Z	t _{CLZ}	5	—	5	—	10	—	10	—	ns	2
Output enable to output in low-Z	t _{OLZ}	5	—	5	—	5	—	5	—	ns	2
Chip deselection in to output in high-Z	t _{CHZ}	0	20	0	20	0	25	0	30	ns	1, 2
Output disable to output in high-Z	t _{OHZ}	0	20	0	20	0	25	0	30	ns	1, 2
Output hold from address change	t _{OH}	5	—	5	—	5	—	10	—	ns	

- Notes: 1. t_{CHZ} and t_{OHZ} 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.

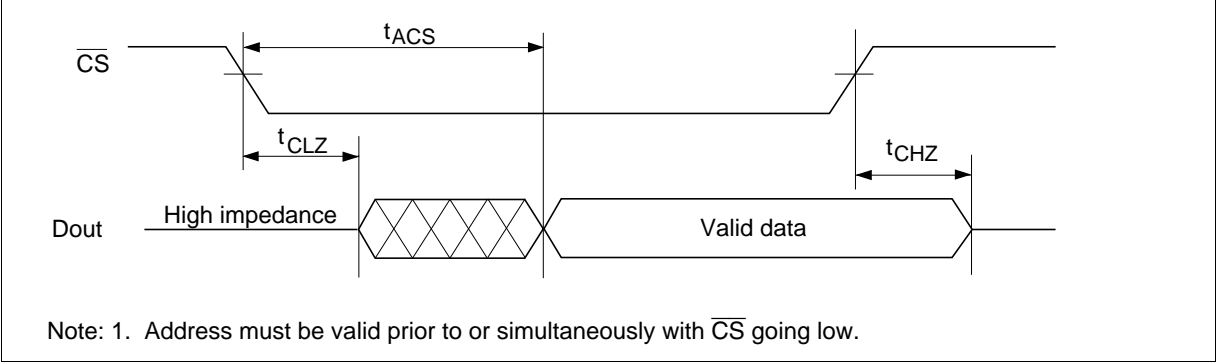
Read Timing Waveform (1) ($\overline{WE}=V_{IH}$)



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



Read Timing Waveform (3) ($\overline{WE}=V_{IH}, \overline{OE}=V_{IL}$)*1

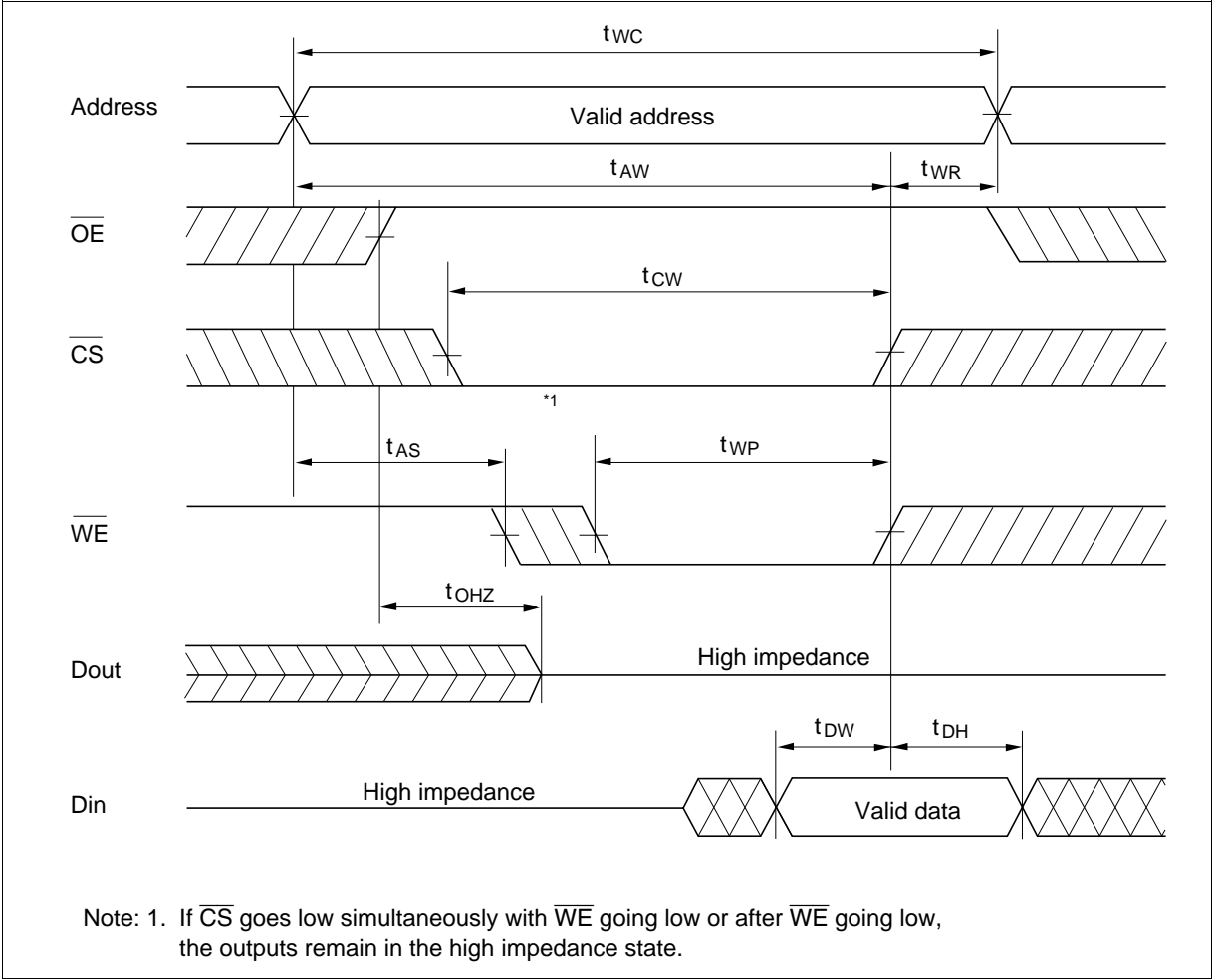


Write Cycle

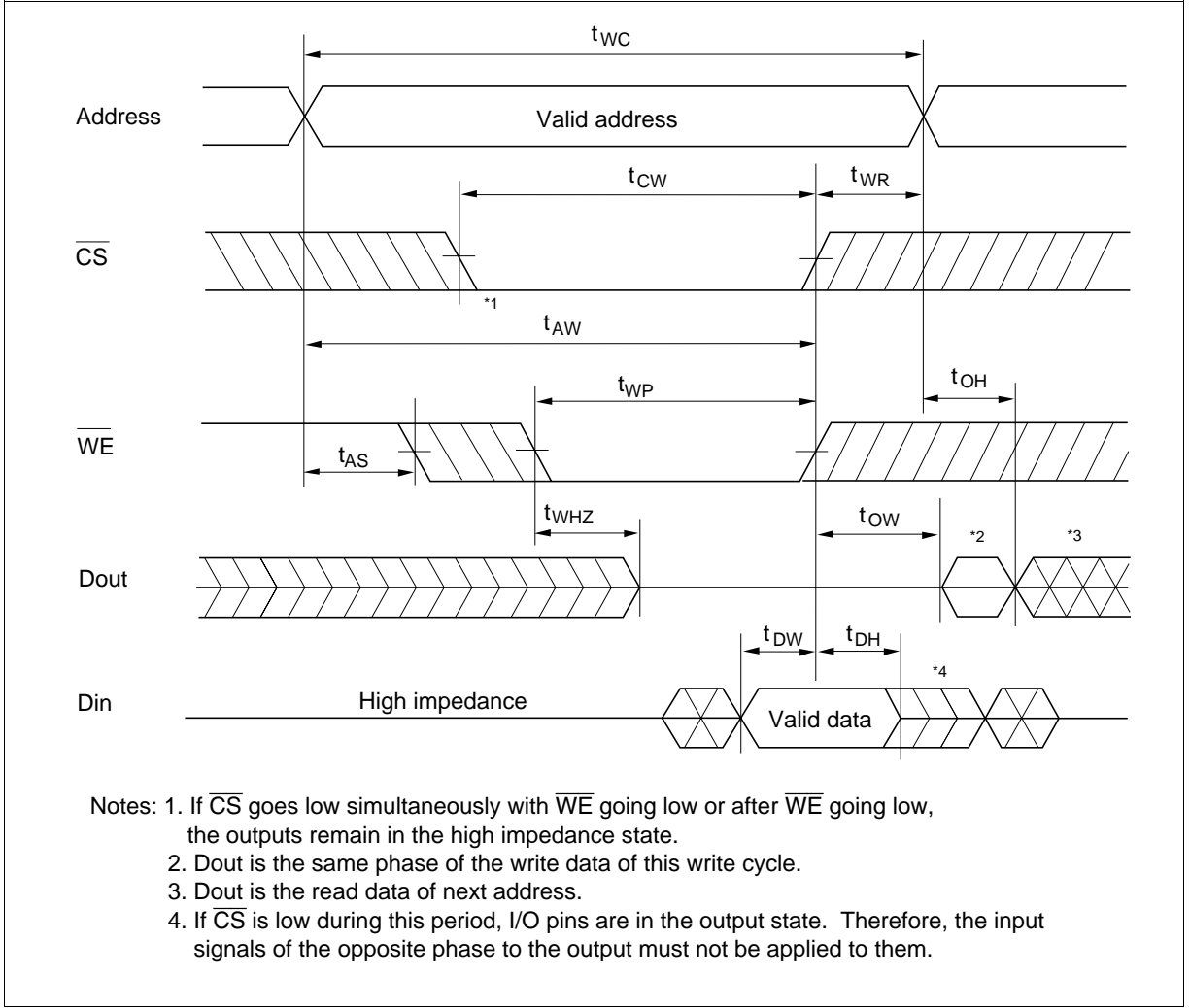
		HM62256B									
		-4		-5		-7		-8			
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Min	Max	Unit	Notes
Write cycle time	t _{WC}	45	—	55	—	70	—	85	—	ns	
Chip selection to end of write	t _{CW}	35	—	40	—	60	—	75	—	ns	4
Address setup time	t _{AS}	0	—	0	—	0	—	0	—	ns	5
Address valid to end of write	t _{AW}	35	—	40	—	60	—	75	—	ns	
Write pulse width	t _{WP}	30	—	35	—	50	—	55	—	ns	3, 8
Write recovery time	t _{WR}	0	—	0	—	0	—	0	—	ns	6
\overline{WE} to output in high-Z	t _{WHZ}	0	20	0	20	0	25	0	40	ns	1, 2, 7
Data to write time overlap	t _{DW}	20	—	25	—	30	—	35	—	ns	
Data hold from write time	t _{DH}	0	—	0	—	0	—	0	—	ns	
Output active from end of write	t _{OW}	5	—	5	—	5	—	5	—	ns	2
Output disable to output in high-Z	t _{OHZ}	0	20	0	20	0	25	0	40	ns	1, 2, 7

- Notes:
- t_{OHZ} and t_{WHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.
 - This parameter is sampled and not 100% tested.
 - A write occurs during the overlap (t_{WP}) of a low \overline{CS} and a low \overline{WE} . A write begins at the later transition of \overline{CS} going low or \overline{WE} going low. A write ends at the earlier transition of \overline{CS} going high or \overline{WE} going high. t_{WP} is measured from the beginning of write to the end of write.
 - t_{CW} is measured from \overline{CS} going low to the end of write.
 - t_{AS} is measured from the address valid to the beginning of write.
 - t_{WR} is measured from the earlier of \overline{WE} or \overline{CS} going high to the end of write cycle.
 - During this period, I/O pins are in the output state so that the input signals of the opposite phase to the outputs must not be applied.
 - In the write cycle with \overline{OE} low fixed, t_{WP} must satisfy the following equation to avoid a problem of data bus contention, t_{WP} ≥ t_{WHZ} max + t_{DW} min.

Write Timing Waveform (1) ($\overline{\text{OE}}$ Clock)



Write Timing Waveform (2) (\overline{OE} Low Fixed) ($\overline{OE} = V_{IL}$)

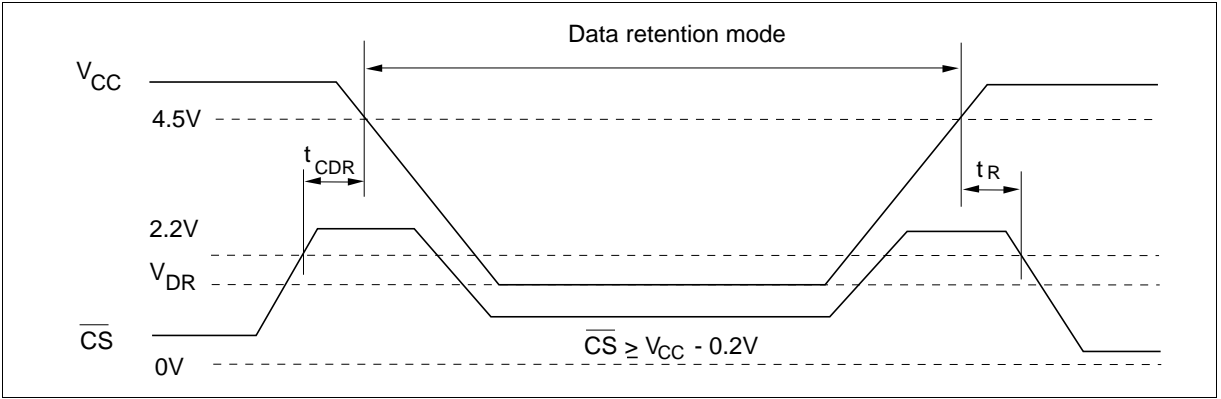


Low V_{CC} Data Retention Characteristics (Ta = 0 to +70°C)

Parameter	Symbol	Min	Typ* ¹	Max	Unit	Test Conditions* ⁶
V _{CC} for data retention	V _{DR}	2.0	—	5.5	V	$\overline{CS} \geq V_{CC} - 0.2\text{ V}$, Vin ≥ 0 V
Data retention current	I _{CCDR}	—	0.05	30 ²	μA	V _{CC} = 3.0 V, Vin ≥ 0 V
		—	0.05	10 ³		$\overline{CS} \geq V_{CC} - 0.2\text{ V}$,
		—	0.05	3 ⁴		
Chip deselect to data retention time	t _{CDR}	0	—	—	ns	See retention waveform
Operation recovery time	t _R	t _{RC} ⁵	—	—	ns	

- Notes: 1. Typical values are at V_{CC} = 3.0 V, Ta = 25°C and not guaranteed.
2. 10 μA max at Ta = 0 to + 40°C.
3. This characteristics guaranteed for only L-SL version. 3 μA max at Ta = 0 to +40°C.
4. This characteristics guaranteed for only L-UL version. 0.6 μA max at Ta = 0 to +40°C.
5. t_{RC} = read cycle time.
6. \overline{CS} controls address buffer, \overline{WE} buffer, \overline{OE} buffer, and Din buffer. If \overline{CS} controls data retention mode, other input levels (address, \overline{WE} , \overline{OE} , I/O) can be in the high impedance state.

Low V_{CC} Data Retention Timing Waveform

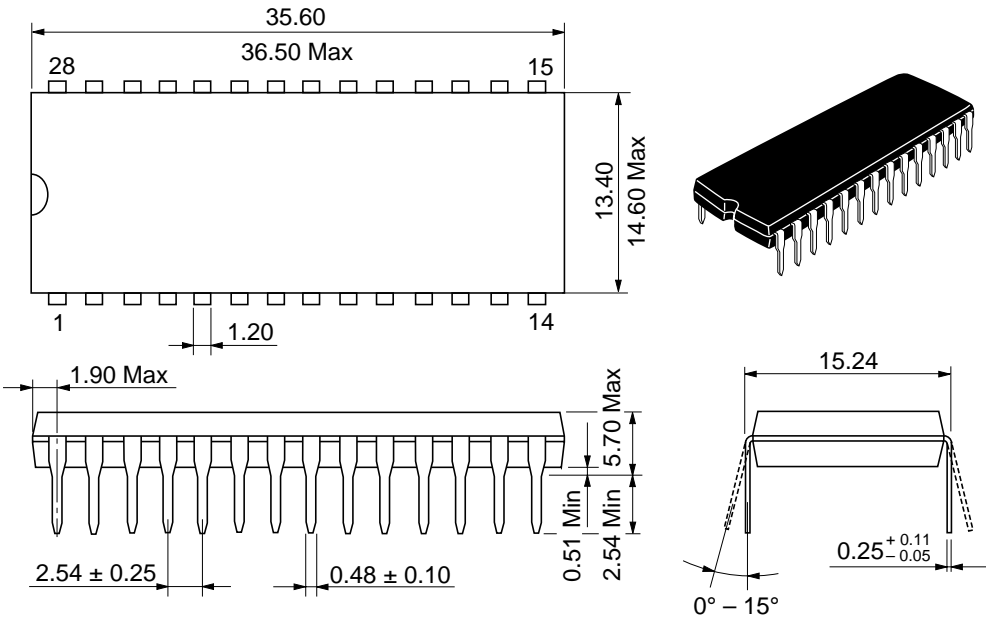


HM62256B Series

Package Dimensions

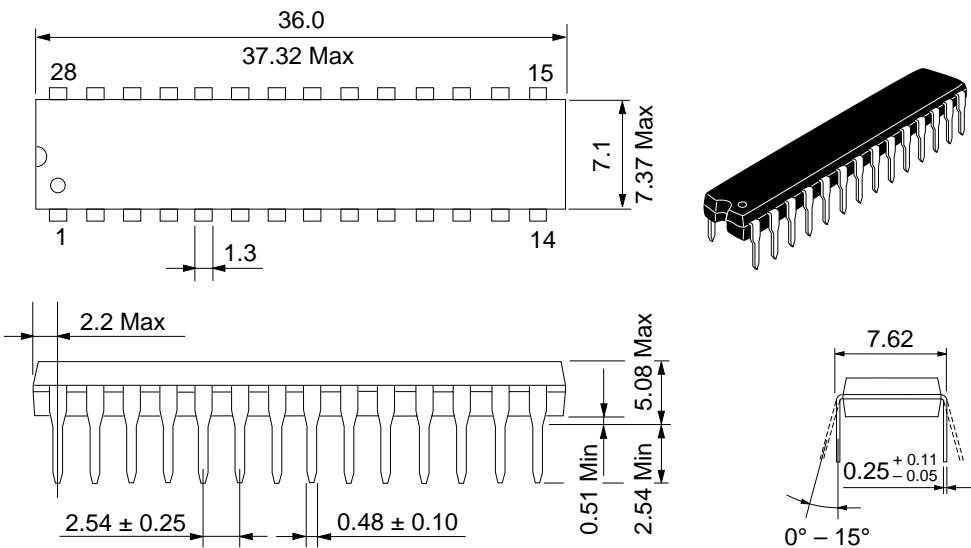
HM62256BLP Series (DP-28)

Unit: mm



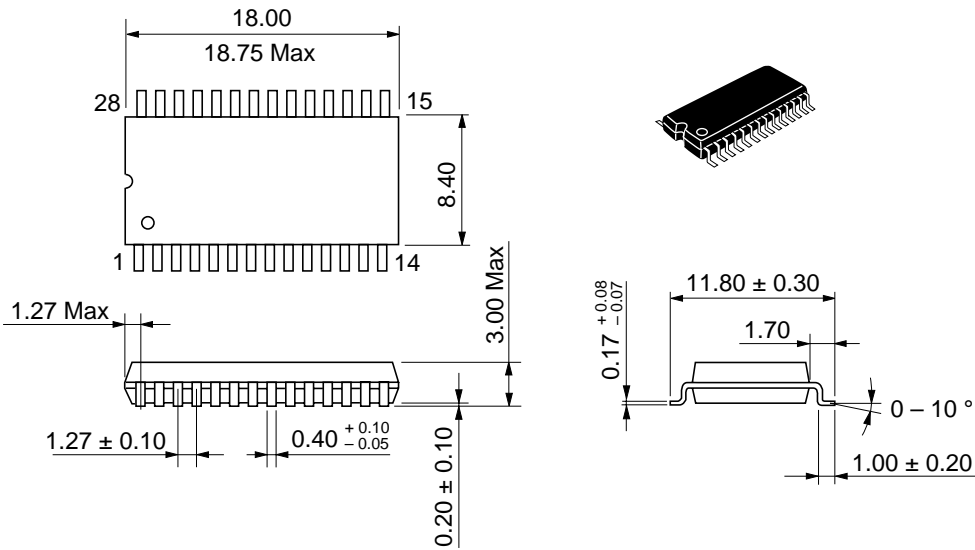
HM62256BLSP Series (DP-28NA)

Unit: mm



HM62256BLFP Series (FP-28DA)

Unit: mm



HM62256BLT Series (TFP-32DA)

Unit: mm

