HM62256BI Series

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

HITACHI

Rev. 2.0
Jul. 20, 1995

The Hitachi HM62256BI is a CMOS static RAM organized 32-kword × 8-bit. It realizes higher performance and low power consumption by employing 0.8 µm Hi-CMOS process technology. The device, packaged in thickness of 1.2 mm with 450 mil SOP (foot print pitch width), 600 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.

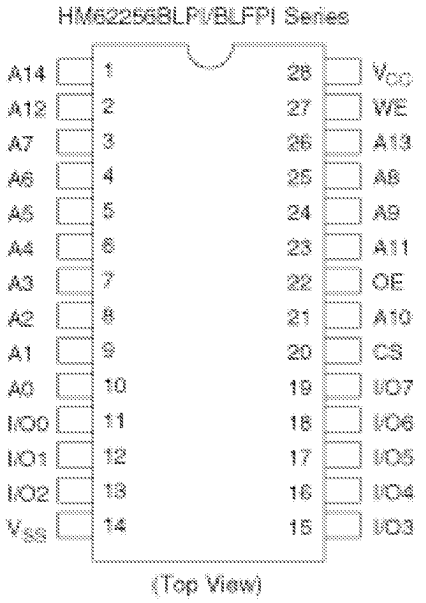
Features

- High speed
  Fast access time: 70/85/100 ns (max)
- Low power
  Standby: 1.0 µW (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
- Operating temperature range
  – 40 °C to + 85°C

Ordering Information

Type No.	Access time	Package
HM62256BLPI-10	100 ns	600-mil 28-pin plastic DIP (DP-28)
HM62256BLPI-7SL	70 ns	
HM62256BLFPI-8T	85 ns	450-mil 28-pin plastic SOP (FP-28DA)
HM62256BLFPI-7SLT	70 ns	

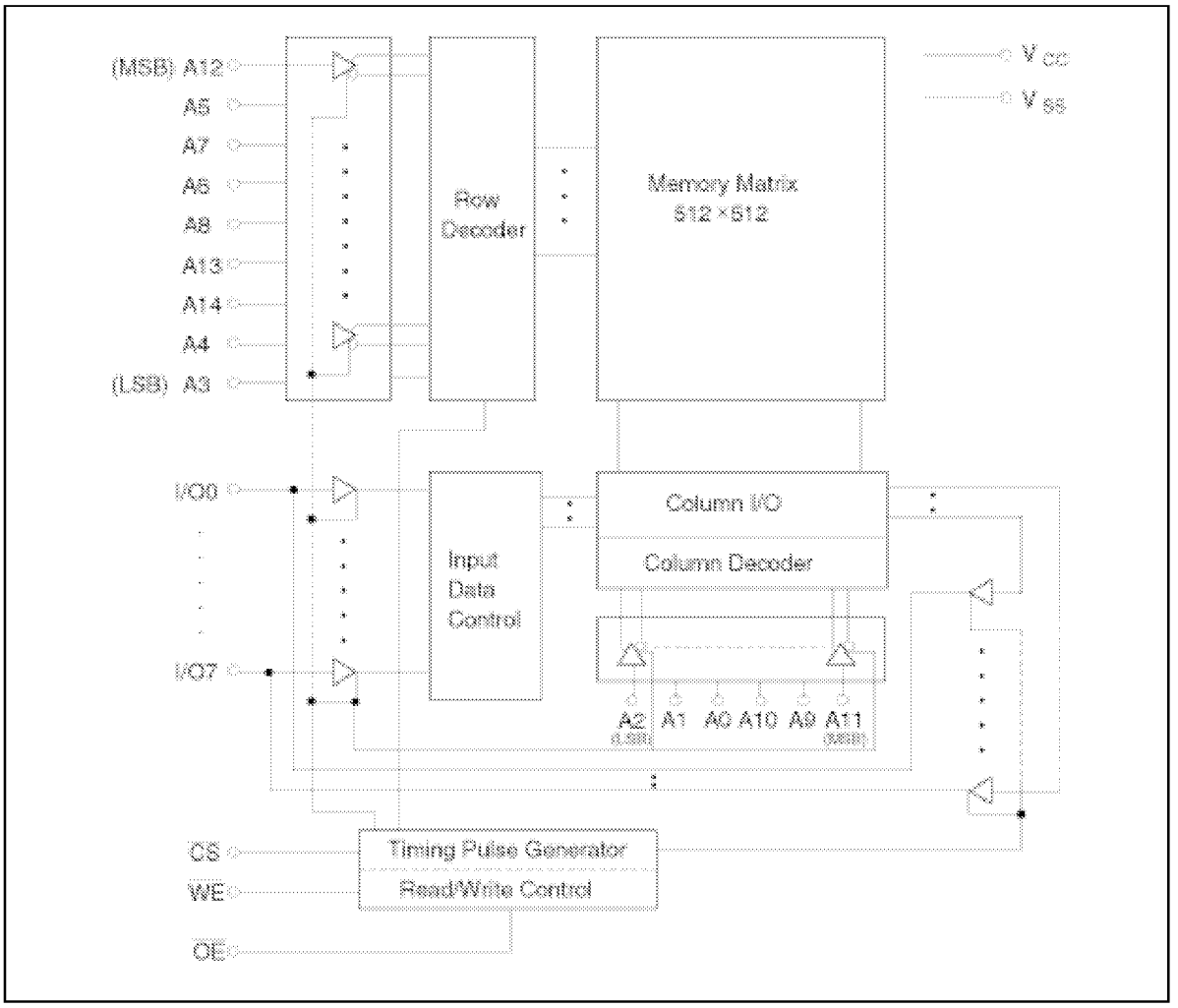
Pin Arrangement



Pin Description

Symbol	Function
A0 to A14	Address input
I/O0 to I/O7	Data input/output
$\overline{CS}$	Chip select
$\overline{WE}$	Write enable
$\overline{OE}$	Output enable
V_{cc}	Power supply
V_{ss}	Ground

Block Diagram



Function Table

WE	CS	OE	Mode	V_{CC} current	I/O pin	Ref. cycle
×	H	×	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: ×: 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	Topr	– 40 to + 85	°C
Storage temperature	Tstg	– 55 to + 125	°C
Storage temperature under bias	Tbias	– 40 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 (Ta = – 40 to + 85°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}	2.4	—	V_{CC} + 0.3	V
Input low (logic 0) voltage	V_{IL}	–0.5*1	—	0.6	V

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

DC Characteristics (Ta = – 40 to + 85°C, V_{CC} = 5 V ±10%, V_{SS} = 0 V)

Parameter		Symbol	Min	Typ*1	Max	Unit	Test conditions
Input leakage current		$\|I_{LI}\|$	—	—	1	µA	$V_{SS} \geq Vin \geq V_{CC}$
Output leakage current		$\|I_{LO}\|$	—	—	1	µA	$\overline{CS}$ = V_{IH} or $\overline{OE}$ = V_{IH} or $\overline{WE}$ = VIL, $V_{SS} \geq V_{I/O} \geq V_{CC}$
Operating power supply current		I_{CC}	—	6	20	mA	$\overline{CS}$ = V_{IL}, Others = V_{IH}/V_{IL} $I_{I/O}$ = 0 mA
Average operating power supply current	HM62256BI-7	I_{CC1}	—	33	70	mA	Min cycle, duty = 100 %, $I_{I/O}$ = 0 mA
	HM62256BI-8	I_{CC1}	—	29	60		$\overline{CS}$ = V_{IL}, Others = V_{IH}/V_{IL}
	HM62256BI-10	I_{CC1}	—	26	60		
		I_{CC2}	—	5	20	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	3	mA	$\overline{CS}$ = V_{IH}
		I_{SB1}	—	0.2	100	µA	Vin ≥ 0 V,
			—	0.2*2	50*2		$\overline{CS}$ ≥ V_{CC} – 0.2 V,
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.

Capacitance (Ta = 25°C, f = 1.0 MHz)

Parameter	Symbol	Min	Typ	Max	Unit	Test conditions
Input capacitance*1	Cin	—	—	8	pF	Vin = 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 = – 40 to + 85°C, V_{CC} = 5 V ± 10%, unless otherwise noted.)

Test Conditions

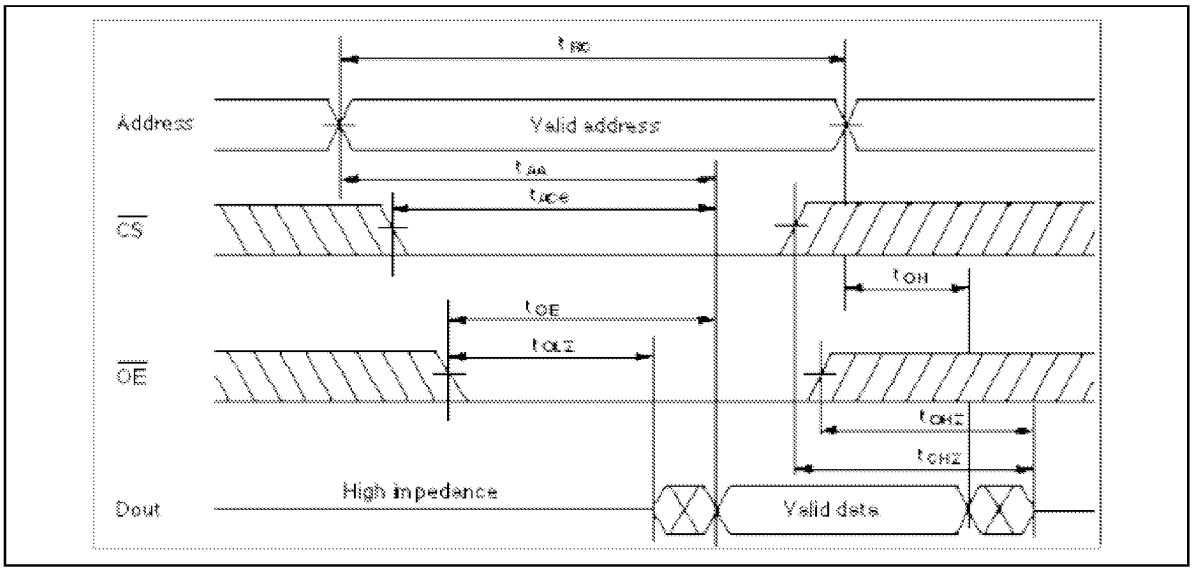
- Input pulse levels: 0.6 V to 2.4 V
- Input and output timing reference level: 1.5 V
- Input rise and fall times: 5 ns
- Output load: 1 TTL Gate + C_L (100 pF) (Including scope & jig)

Read Cycle

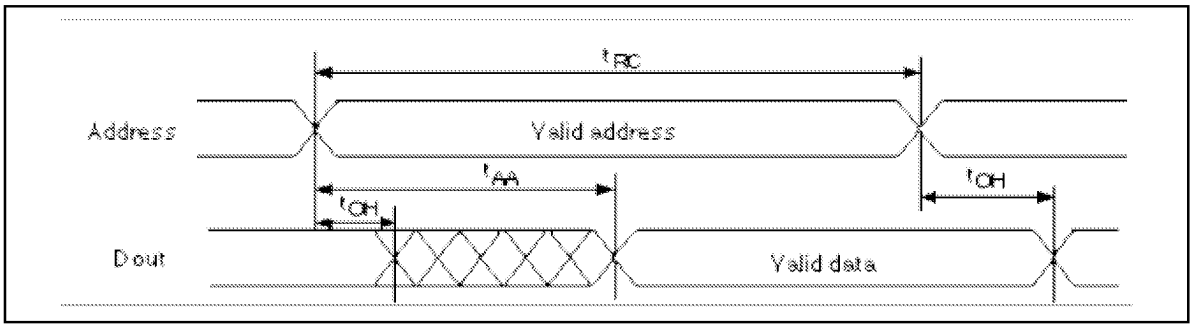
		HM62256BI							
		-7		-8		-10			
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Unit	Notes
Read cycle time	t_{RC}	70	—	85	—	100	—	ns	
Address access time	t_{AA}	—	70	—	85	—	100	ns	
Chip select access time	t_{ACS}	—	70	—	85	—	100	ns	
Output enable to output valid	t_{OE}	—	40	—	45	—	50	ns	
Chip selection to output in low-Z	t_{CLZ}	10	—	10	—	10	—	ns	2
Output enable to output in low-Z	t_{OLZ}	5	—	5	—	5	—	ns	2
Chip deselection in to output in high-Z	t_{CHZ}	0	25	0	30	0	35	ns	1, 2
Output disable to output in high-Z	t_{OHZ}	0	25	0	30	0	35	ns	1, 2
Output hold from address change	t_{OH}	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.

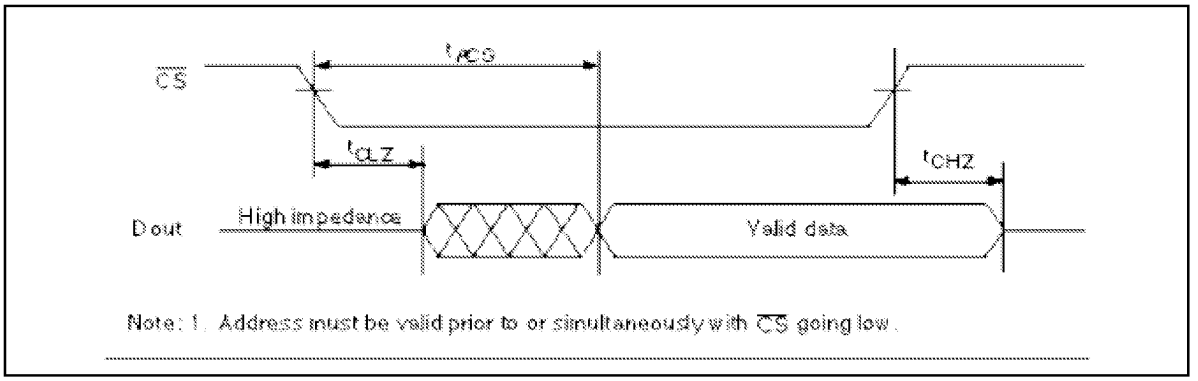
Read Timing Waveform (1) ($\overline{WE}$ = V_{IH})



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

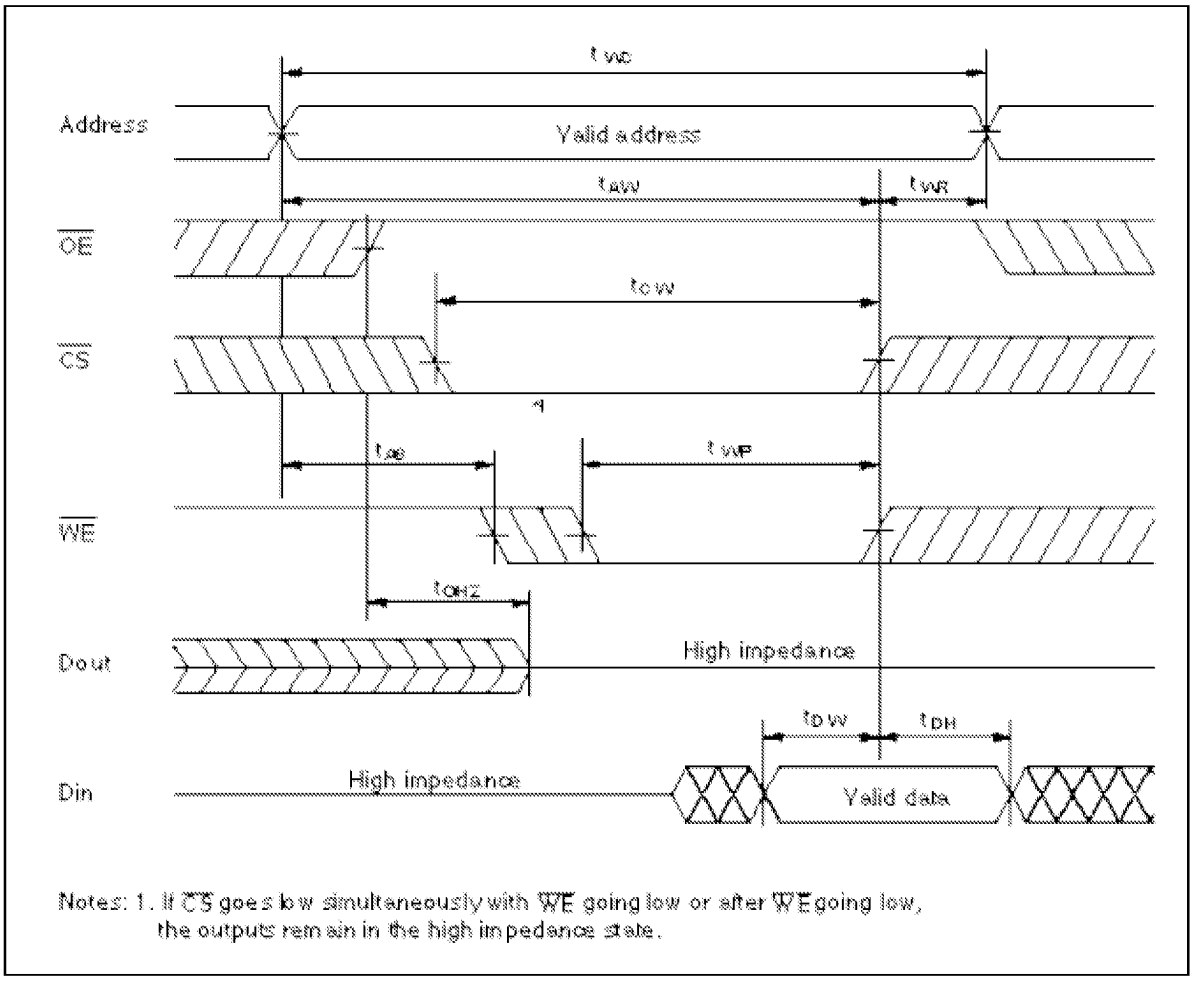


Write Cycle

		HM62256BI							
		-7		-8		-10			
Parameter	Symbol	Min	Max	Min	Max	Min	Max	Unit	Notes
Write cycle time	t_{WC}	70	—	85	—	100	—	ns	
Chip selection to end of write	t_{CW}	60	—	75	—	80	—	ns	4
Address setup time	t_{AS}	0	—	0	—	0	—	ns	5
Address valid to end of write	t_{AW}	60	—	75	—	80	—	ns	
Write pulse width	t_{WP}	50	—	55	—	60	—	ns	3, 8
Write recovery time	t_{WR}	0	—	0	—	0	—	ns	6
$\overline{WE}$ to output in high-Z	t_{WHZ}	0	25	0	30	0	35	ns	1, 2, 7
Data to write time overlap	t_{DW}	30	—	35	—	40	—	ns	
Data hold from write time	t_{DH}	0	—	0	—	0	—	ns	
Output active from end of write	t_{OW}	5	—	5	—	5	—	ns	2
Output disable to output in high-Z	T_{oHZ}	0	25	0	30	0	35	ns	1, 2, 7

Notes:
1. 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.
2. This parameter is sampled and not 100% tested.
3. 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.
4. t_{CW} is measured from $\overline{CS}$ going low to the end of write.
5. t_{AS} is measured from the address valid to the beginning of write.
6. t_{WR} is measured from the earlier of $\overline{WE}$ or $\overline{CS}$ going high to the end of write cycle.
7. 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.
8. In the write cycle with $\overline{OE}$ low fixed, t_{WP} must satisfy the following equation to avoid a problem of data bus contention, $t_{WP} \geq t_{WHZ}$ max + t_{DW} min.

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

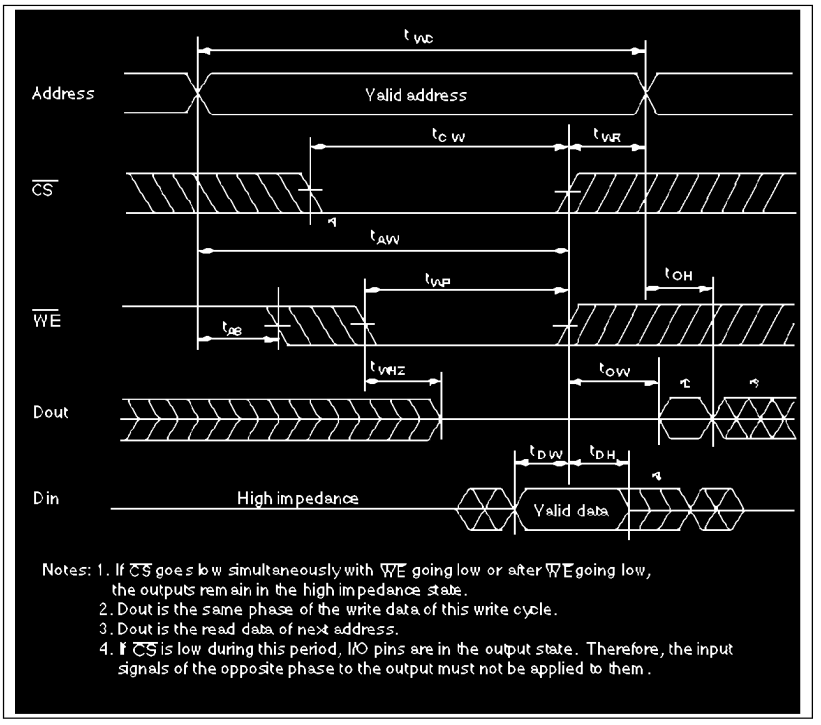


Notes: 1. If $\overline{CS}$ goes low simultaneously with $\overline{WE}$ going low or after $\overline{WE}$ going low, the outputs remain in the high impedance state.

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

HM62256BI Series

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

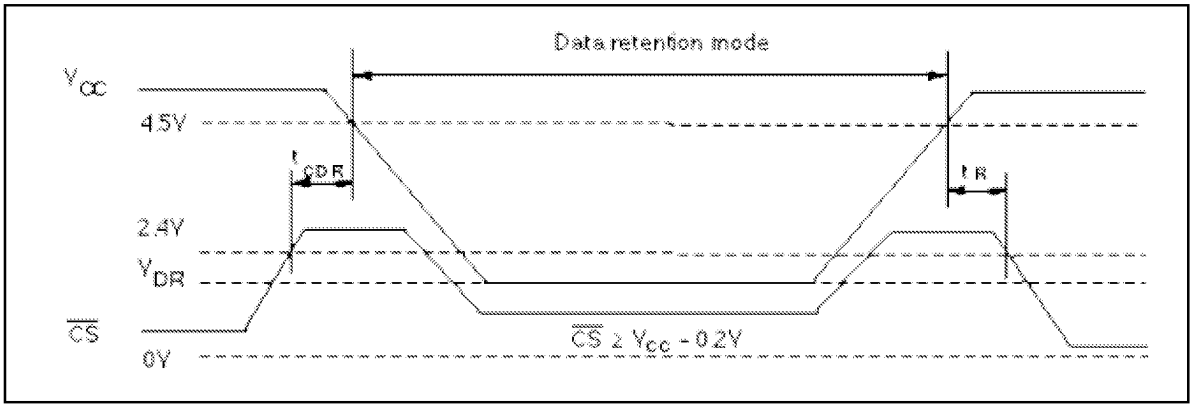


Low V_{CC} Data Retention Characteristics (Ta = – 40 to + 85°C)

Parameter	Symbol	Min	Typ *1	Max	Unit	Test conditions *4
V_{CC} for data retention	V_{DR}	2.0	—	5.5	V	$\overline{CS} \geq V_{CC}$ –0.2 V, Vin ≥ 0 V
Data retention current	I_{CCDR}	—	0.05	50	µA	V_{CC} = 3.0 V, Vin ≥ 0 V $\overline{CS} \geq V_{CC}$ –0.2 V,
		—	0.05	15 *2		
Chip deselect to data retention time	t_{CDR}	0	—	—	ns	See retention waveform
Operation recovery time	t_R	t_{RC} *3	—	—	ns	

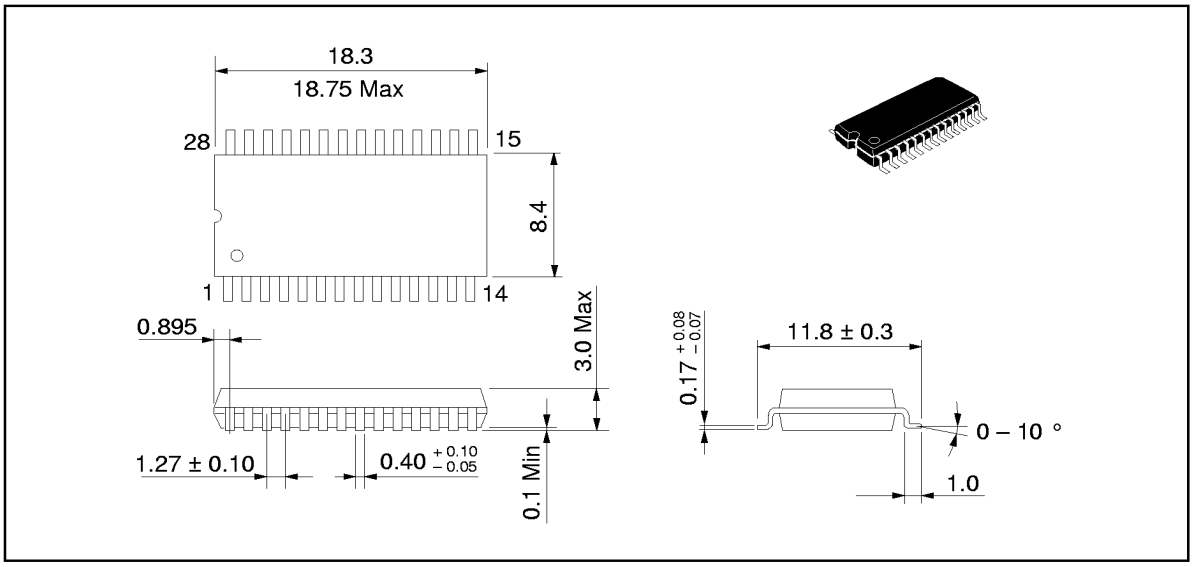
Notes: 1. Typical values are at V_{CC} = 3.0 V, Ta = 25°C and not guaranteed.
2. This characteristics guaranteed for only L-SL version.
3. t_{RC} = read cycle time. (The transient time from V_{DR} to operating voltage must be more than 50 ms. When this transient time is less than 50 ms, t_R must be 50 ms or more.)
4. $\overline{CS}$ 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 ($\overline{CS}$ Controlled)



Package Dimensions

HM62256BLPI Series (DP-28) **Unit: mm**



HM62256BLFPI Series (FP-28DA) **Unit: mm**