
HM62V256 Series

32,768-word $\times$ 8-bit Low Voltage Operation CMOS Static RAM

HITACHI

ADE-203-136E (Z)

Rev. 5.0

Jun. 19, 1995

Features

- Low voltage operation SRAM
Operating Supply Voltage: 2.7 V to 3.6 V
- 0.8 μm Hi-CMOS process
- High speed
Access time: 70/85/100 ns (max)
- Low power
Standby: 0.15 μW (typ)
- Completely static memory
No clock or timing strobe required
- Directly LVTTTL compatible: All inputs and outputs

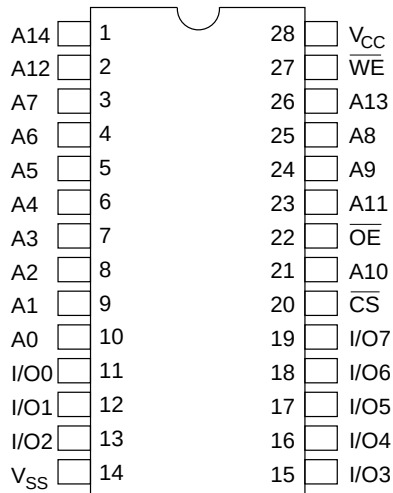
Ordering Information

Type No.	Access Time	Package
HM62V256LFP-10T	100 ns	450 mil 280 pin plastic SOP (FP-28DA)
HM62V256LFP-7SLT	70 ns	
HM62V256LFP-10SLT	100 ns	
HM62V256LFP-8ULT	85 ns	
HM62V256LT-10	100 ns	8 mm $\times$ 14 mm 32 pin TSOP (normal type) (TFP-32DA)
HM62V256LT-8SL	85 ns	
HM62V256LTM-10	100 ns	8 mm $\times$ 13.4 mm 28-pin TSOP (normal type) (TFP-28DA)
HM62V256LTM-7SL	70 ns	
HM62V256LTM-10SL	100 ns	
HM62V256LTM-8UL	85 ns	

HM62V256 Series

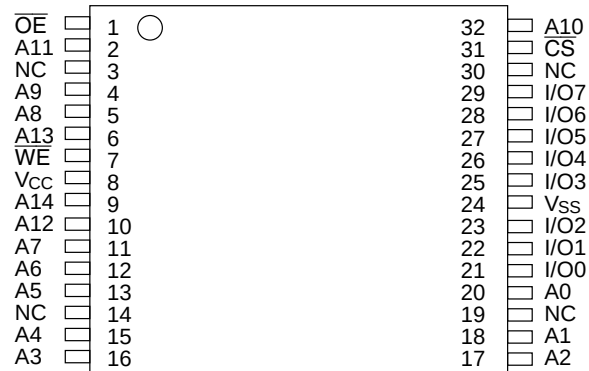
Pin Arrangement

HM62W256LFP Series



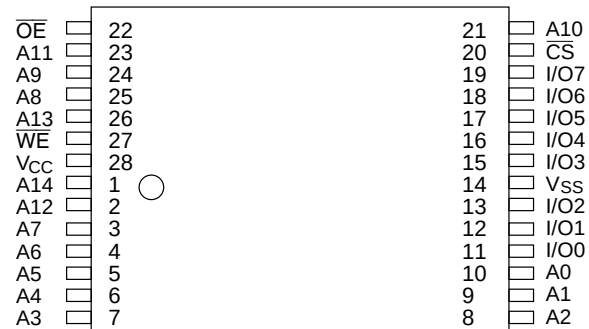
(Top View)

HM62W256LT Series



(Top View)

HM62W256LTM Series



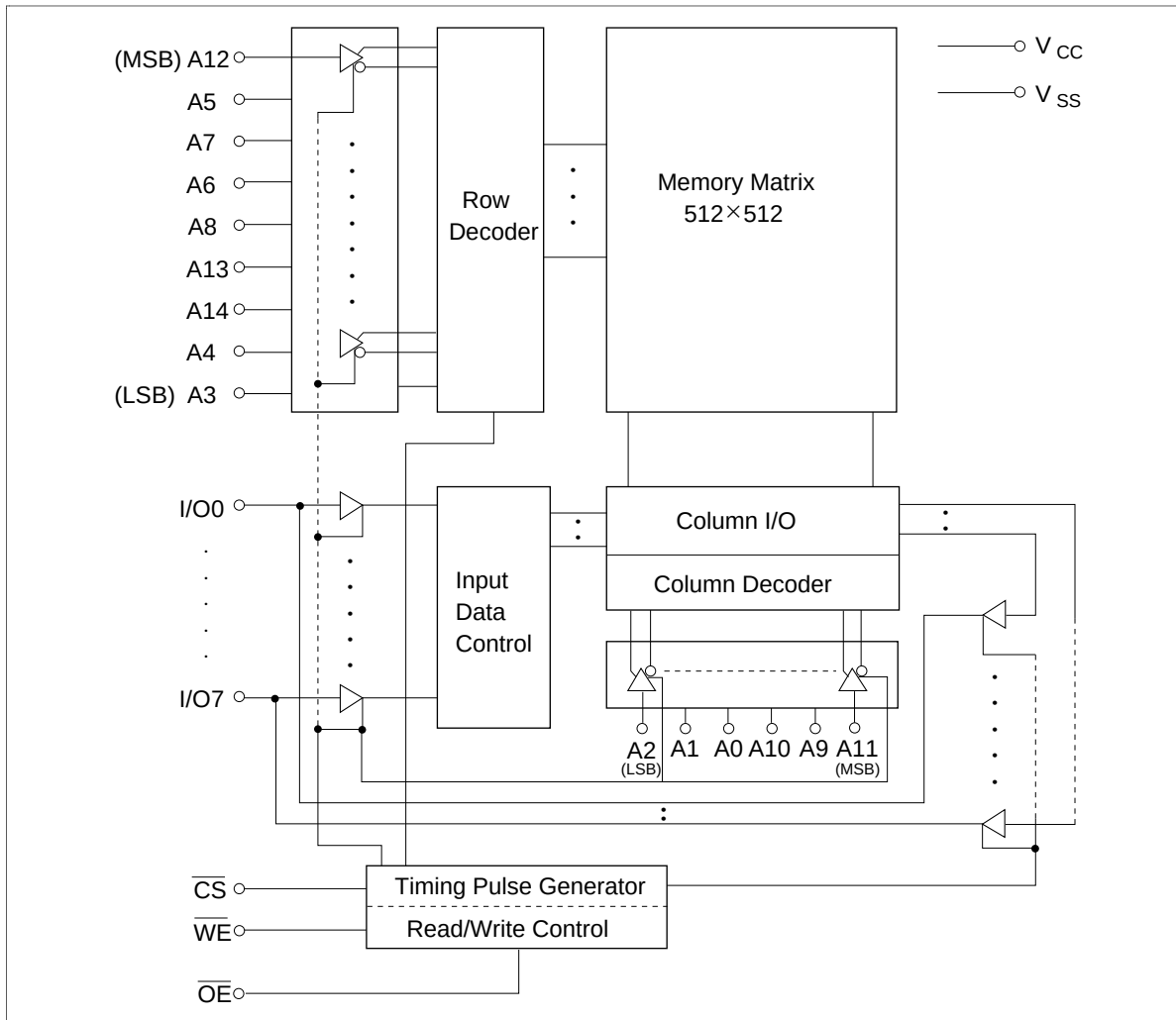
(Top View)

Pin Description

Pin name	Function
A0 to A14	Address inputs
I/O0 to I/O7	Data 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

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Block Diagram



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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 4.6	V
Terminal voltage ¹	V_T	–0.5 ^{*2} to $V_{CC}+0.5$ ^{*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 4.6V

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

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage	V_{CC}	2.7	3.0	3.6	V
	V_{SS}	0	0	0	V
Input high(logic 1) voltage	V_{IH}	$0.7V_{CC}$	—	$V_{CC}+0.3$	V
Input low(logic 0) voltage	V_{IL}	–0.3 ^{*1}	—	$0.2V_{CC}$	V

Note: 1. V_T min: –3.0 V for pulse half-width ≤ 50 ns

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DC Characteristics (Ta = 0 to +70°C, V_{CC} = 2.7 V to 3.6V, V_{SS} = 0 V)

Parameter	Symbol	Min	Typ ¹	Max	Unit	Test conditions
Input leakage current	I _{LI}	—	—	1	μA	V _{SS} ≤ Vin ≤ 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 (DC)	I _{CCDC1}	—	—	15	mA	$\overline{CS} = V_{IL}$, others = V _{IH} /V _{IL} , I _{I/O} = 0 mA
	I _{CCDC2}	—	—	10	mA	$\overline{CS} \leq 0.2$ V, V _{IH} ≥ V _{CC} − 0.2 V, V _{IL} ≤ 0.2 V, I _{I/O} = 0 mA
Average operating power supply current	HM62V256-7 I _{CCAC1}	—	—	30	mA	min cycle, duty = 100 %, I _{I/O} = 0 mA $\overline{CS} = V_{IL}$, others = V _{IH} /V _{IL}
	HM62V256-8 I _{CCAC1}	—	—	27		
	HM62V256-10 I _{CCAC1}	—	—	24		
	I _{CCAC2}	—	—	15	mA	Cycle time ≥ 1 μs, duty = 100% I _{I/O} = 0 mA, $\overline{CS} \leq 0.2$ V, V _{IH} ≥ V _{CC} − 0.2 V, V _{IL} ≤ 0.2 V
Standby power supply current	I _{SB}	—	0.1	1	mA	$\overline{CS} = V_{IH}$
	I _{SB1}	—	0.05	50	μA	Vin ≥ 0 V, $\overline{CS} \geq V_{CC} - 0.2$ V,
		—	0.05	10 ⁺²		
		—	0.05	4 ⁺³		
Output low voltage	V _{OL}	—	—	0.2	V	I _{OL} = 20 μA
Output high voltage	V _{OH}	V _{CC} − 0.2	—	—	V	I _{OH} = −20 μA

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

Capacitance (Ta = 25°C, f = 1.0 MHz)

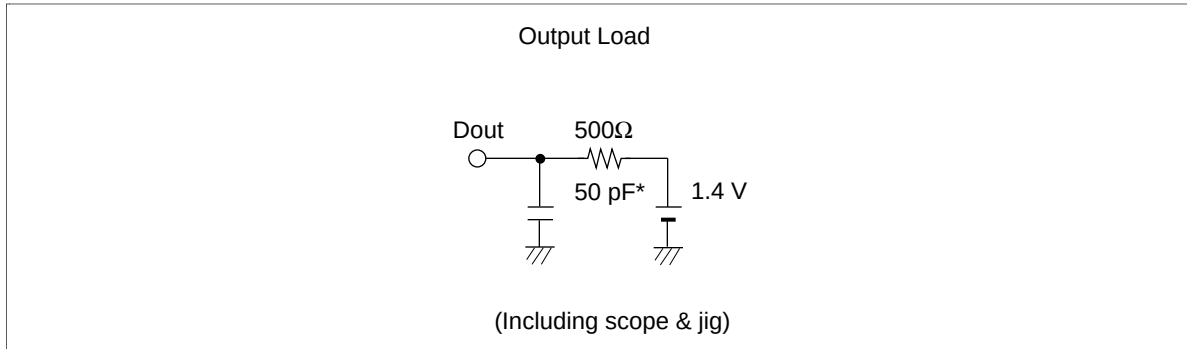
Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Input capacitance ^{*1}	C _{in}	—	—	5	pF	Vin = 0 V
Input/output capacitance ^{*1}	C _{I/O}	—	—	8	pF	V _{I/O} = 0 V

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

AC Characteristics ($T_a = 0$ to $+70^\circ\text{C}$, $V_{CC} = 2.7$ V to 3.6 V, unless otherwise noted.)

Test Conditions

- Input pulse levels: 0.4 V to 2.4 V
- Input rise and fall time: 5 ns
- Input and output timing reference level: 1.4 V



Read Cycle

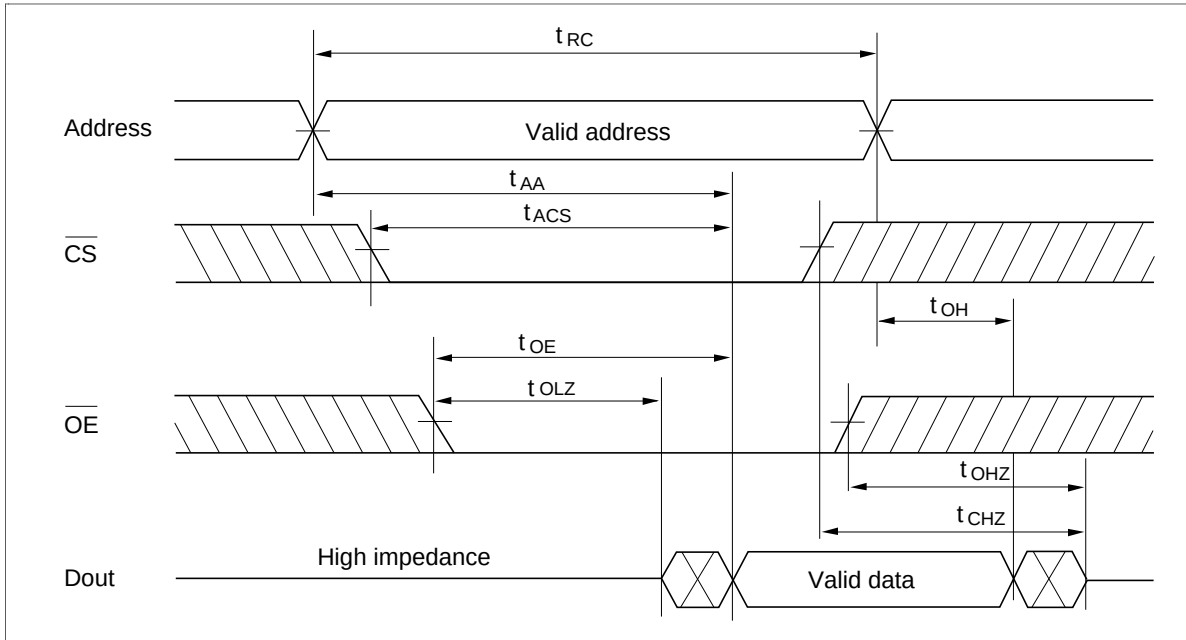
HM62V256									
Parameter	Symbol	-7		-8		-10		Unit	Notes
		Min	Max	Min	Max	Min	Max		
Read cycle time	t_{RC}	70	—	85	—	100	—	ns	
Address access time	t_{AA}	—	70	—	85	—	100	ns	
Chip select access time	t_{ACS}	—	70	—	85	—	100	ns	
Output enable to output valid	t_{OE}	—	35	—	45	—	50	ns	
Chip selection to 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 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}	10	—	10	—	10	—	ns	

Notes: 1. t_{CHZ} and t_{OHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.

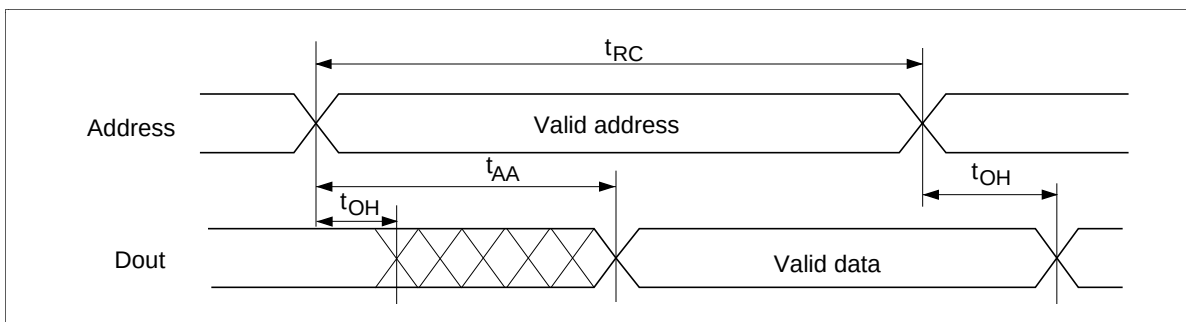
2. This parameter is sampled and not 100% tested.

HM62V256 Series

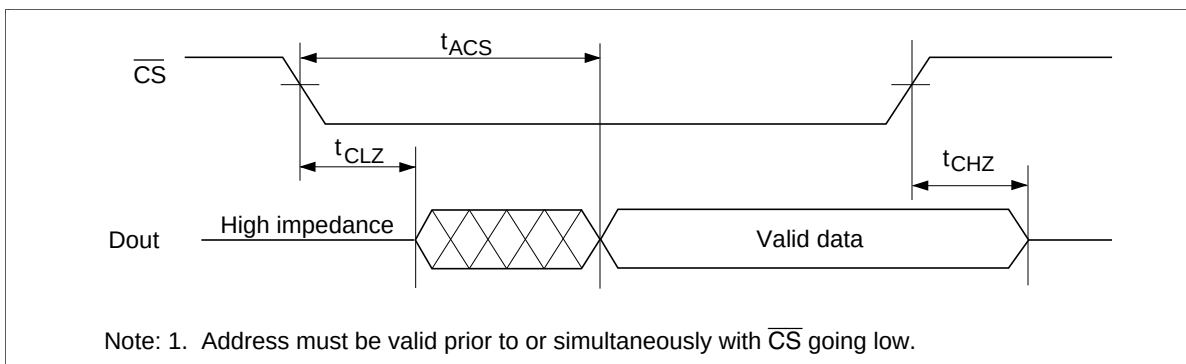
Read Timing Waveform (1) ($\overline{WE} = V_{IH}$)



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



HM62V256 Series

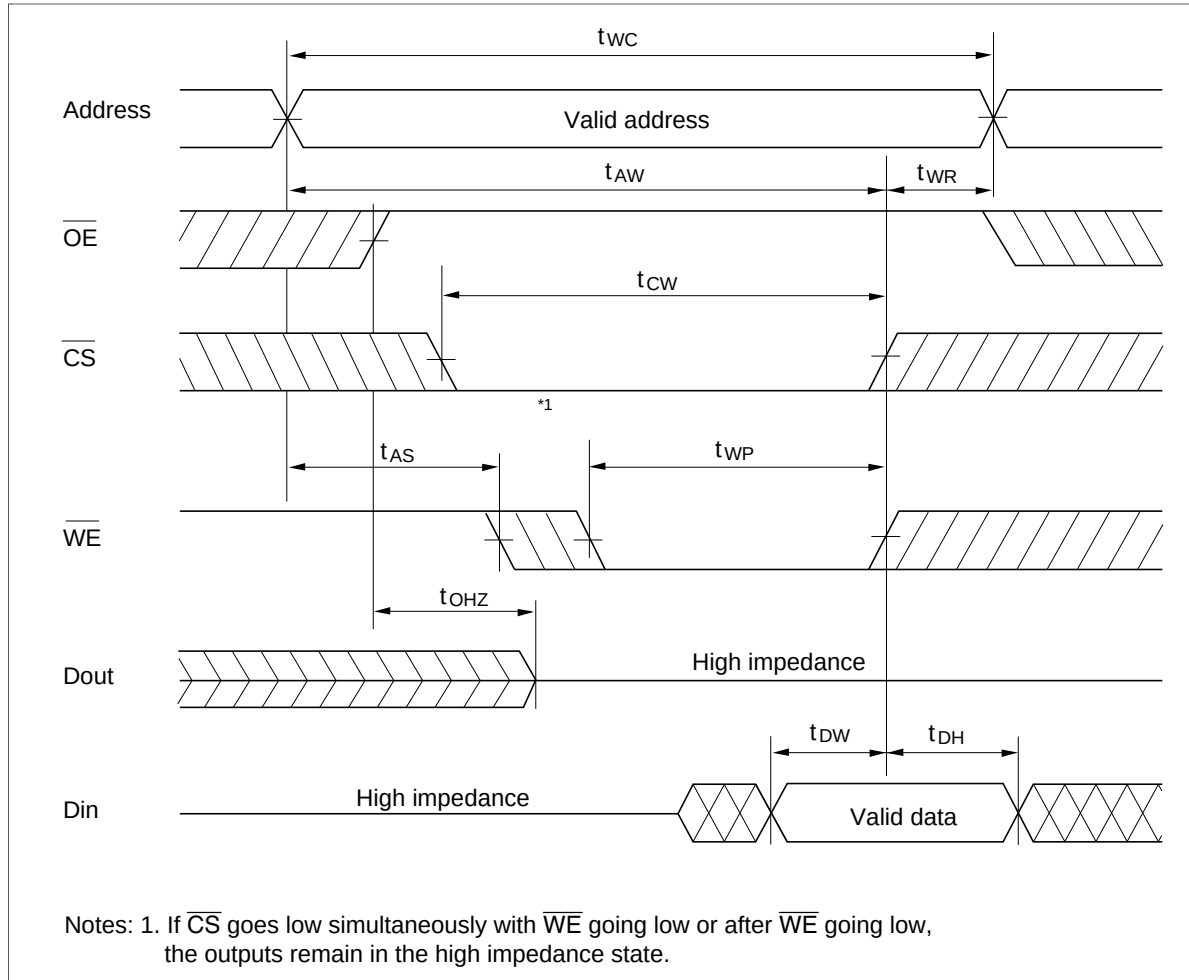
Write Cycle

HM62V256									
Parameter	Symbol	-7		-8		-10		Unit	Notes
		Min	Max	Min	Max	Min	Max		
Write cycle time	t _{WC}	70	—	85	—	100	—	ns	
Chip selection to end of write	t _{CW}	50	—	75	—	80	—	ns	4
Address setup time	t _{AS}	0	—	0	—	0	—	ns	5
Address valid to end of write	t _{AW}	50	—	75	—	80	—	ns	
Write pulse width	t _{WP}	45	—	55	—	60	—	ns	3, 8
Write recovery time	t _{WR}	0	—	0	—	0	—	ns	6
Write 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}	10	—	10	—	10	—	ns	2
Output disable to output in high-Z	t _{OHZ}	0	25	0	30	0	35	ns	1, 2, 7

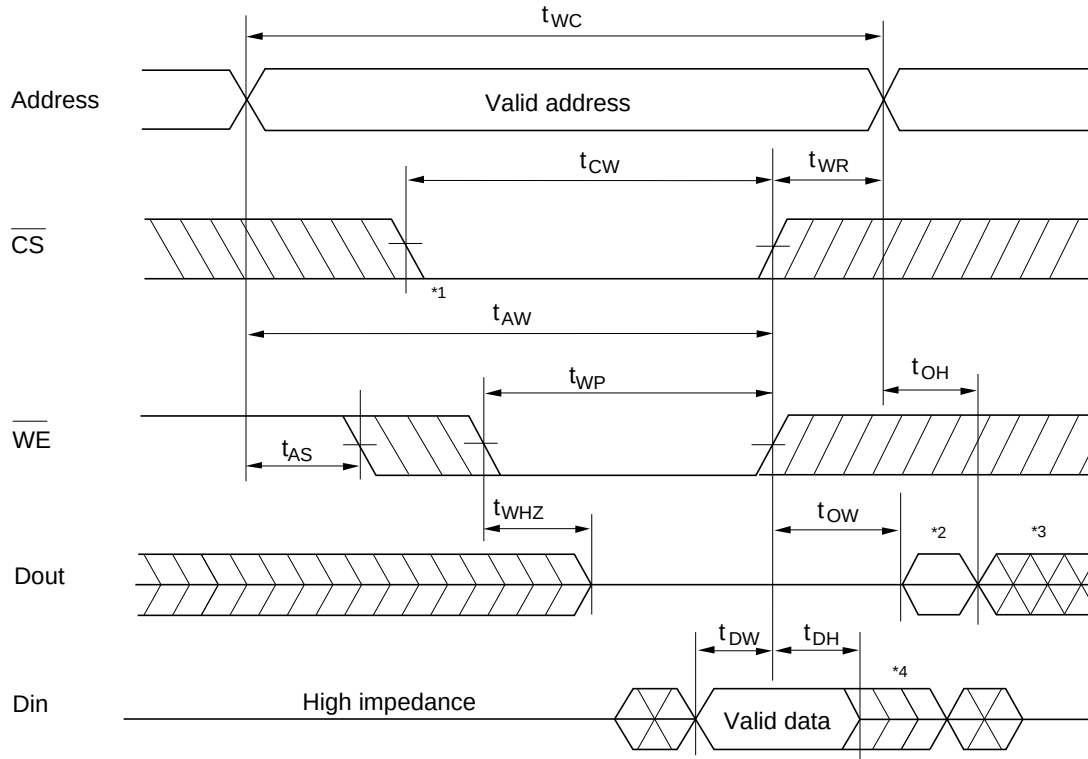
- Notes: 1. t_{OHZ} and t_{WHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.
2. This parameter is sampled and not 100% tested.
3. A write occurs during the overlap (t_{WP}) of a low $\overline{CS}$ and a low $\overline{WE}$. 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, $t_{WP} \geq t_{WHZ} \text{ max} + t_{DW} \text{ min}$.

HM62V256 Series

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



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



- Notes:
1. If $\overline{\text{CS}}$ goes low simultaneously with $\overline{\text{WE}}$ going low or after $\overline{\text{WE}}$ going low, the outputs remain in the high impedance state.
 2. Dout is the same phase of the write data of this write cycle.
 3. Dout is the read data of next address.
 4. If $\overline{\text{CS}}$ is low during this period, I/O pins are in the output state. Therefore, the input signals of the opposite phase to the output must not be applied to them.

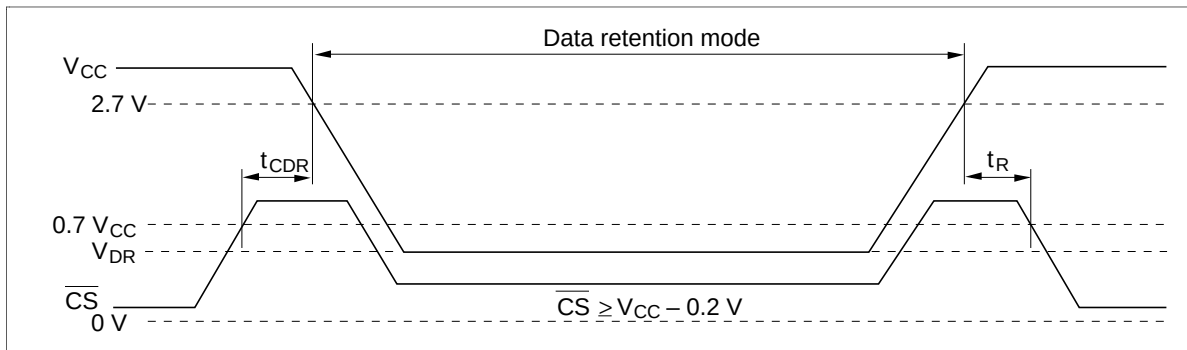
HM62V256 Series

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

Parameter	Symbol	Min	Typ* ¹	Max	Unit	Test conditions* ⁶
V_{CC} for data retention	V_{DR}	2.0	—	3.6	V	$\overline{CS} \geq V_{CC} - 0.2 \text{ V}$, $V_{in} \geq 0 \text{ V}$
Data retention current	I_{CCDR}	—	0.05	27^{*2}	μA	$V_{CC} = 2.7 \text{ V}$, $V_{in} \geq 0 \text{ V}$ $\overline{CS} \geq V_{CC} - 0.2 \text{ V}$
		—	0.05	7^{*3}		
		—	0.05	2^{*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 $V_{CC} = 2.7 \text{ V}$, $T_a = 25^\circ\text{C}$ and not guaranteed.
2. $9 \mu\text{A}$ max at $T_a = 0$ to 40°C .
3. This characteristics guaranteed for only L-SL version. $2.0 \mu\text{A}$ max at $T_a = 0$ to 40°C .
4. This characteristics guaranteed for only L-UL version. $0.4 \mu\text{A}$ max at $T_a = 0$ to 40°C .
5. t_{RC} = read cycle time.
6. $\overline{CS}$ controls address buffer, $\overline{WE}$ buffer, $\overline{OE}$ buffer, and D_{in} 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.

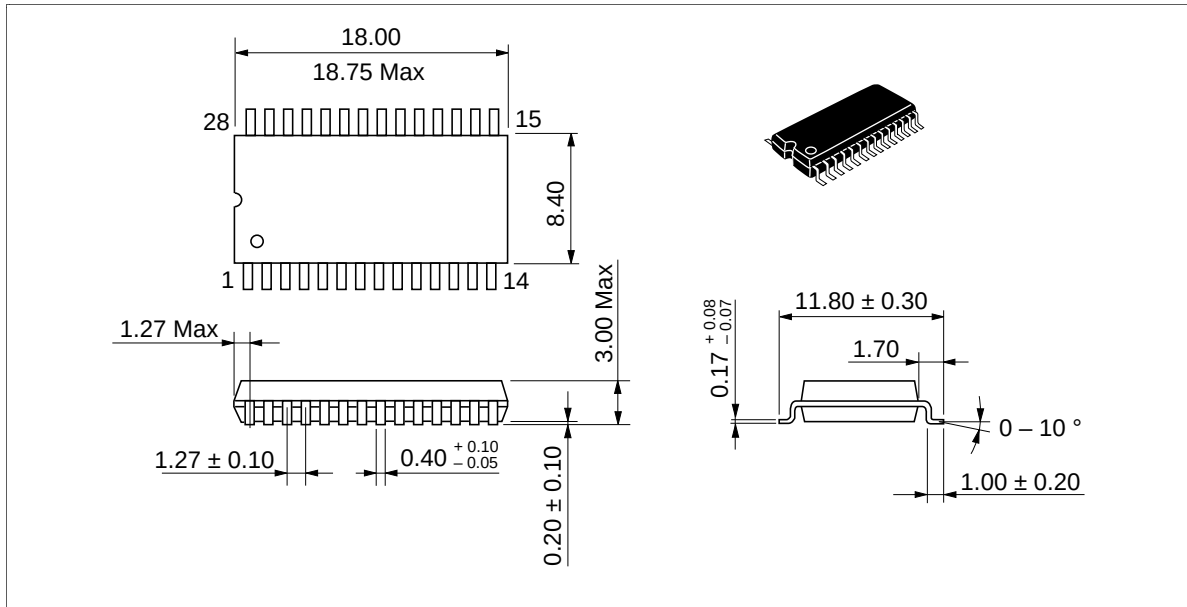
Low V_{CC} Data Retention Timing Waveform



Package Dimensions

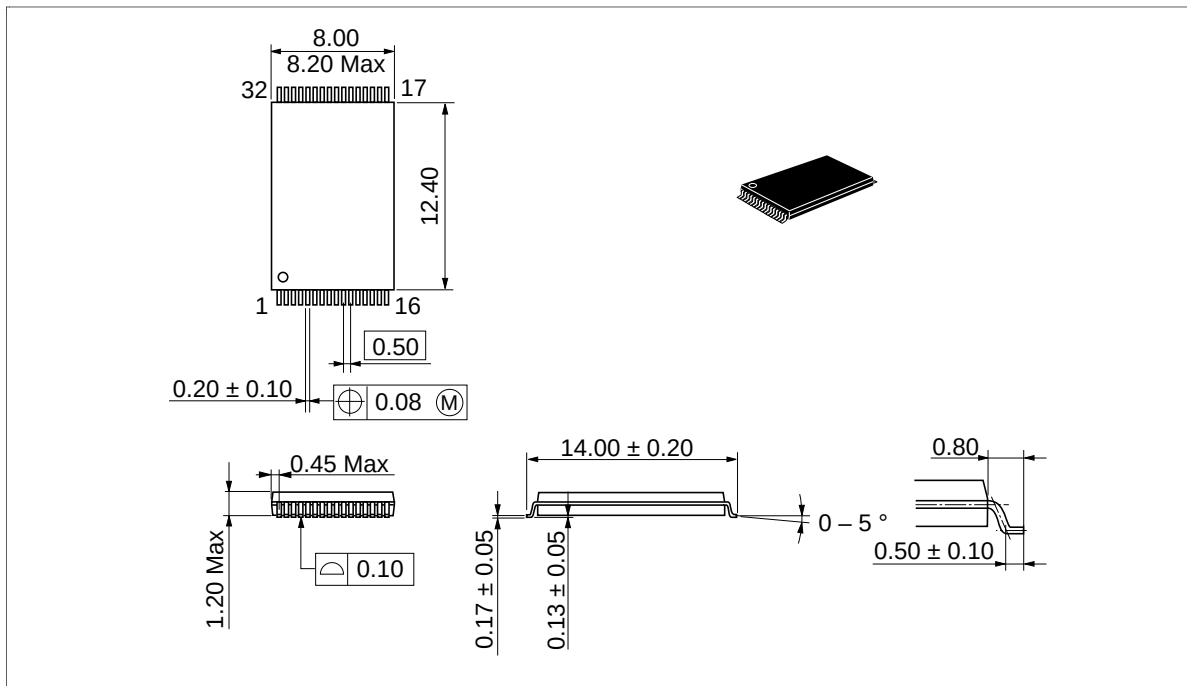
HM62V256LFP Series (FP-28DA)

Unit: mm



HM62V256LT Series (TFP-32DA)

Unit: mm



HM62V256 Series

HM62V256LTM Series (TFP-28DA)

Unit: mm

