
HM62V256 Series

256 k SRAM (32-kword × 8-bit)

HITACHI

ADE-203-136F (Z)

Rev. 6.0

Nov. 1997

Features

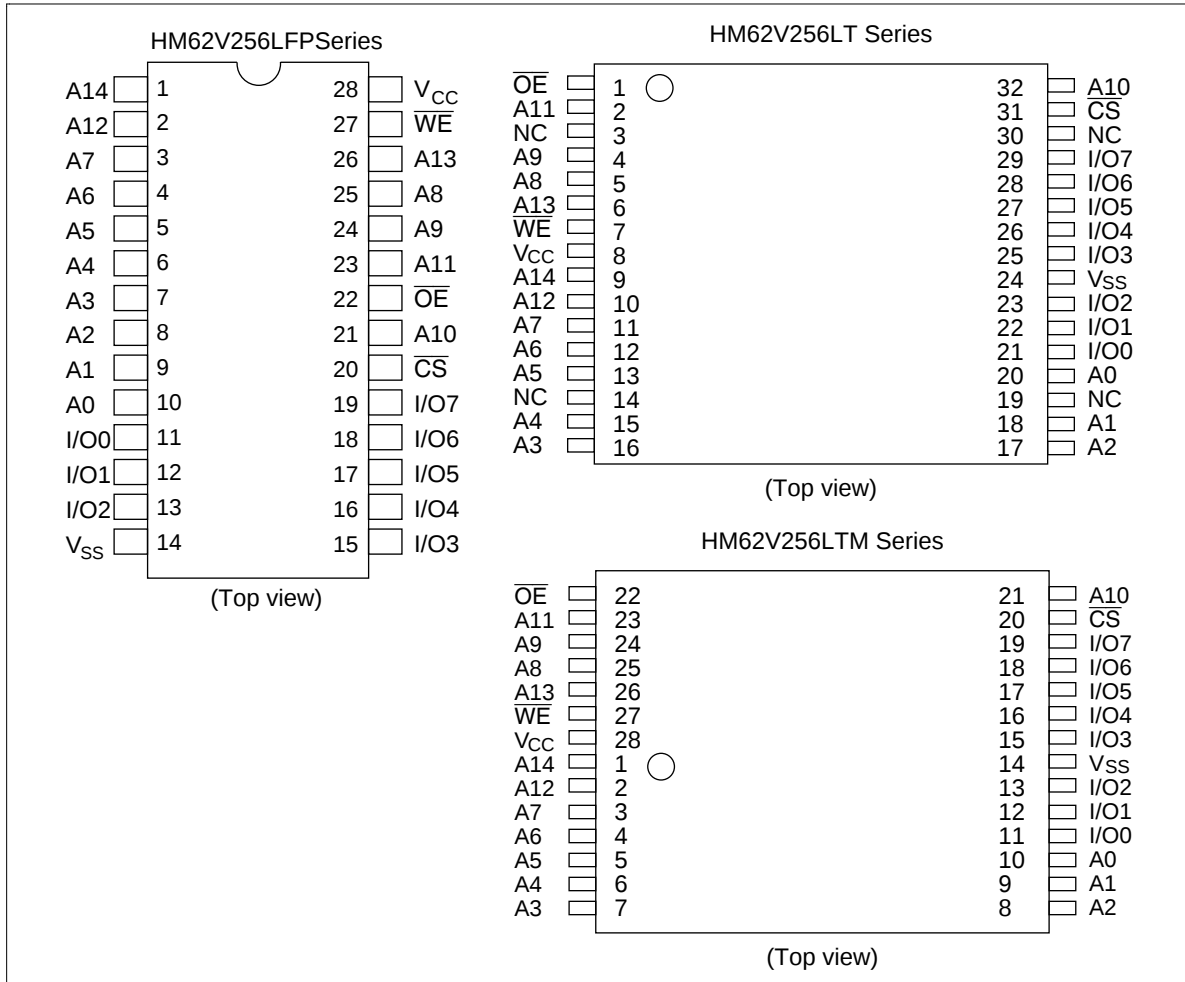
- Low voltage operation SRAM
Operating Supply Voltage: 2.7 V to 3.6 V
- 0.8 μm Hi-CMOS process
- High speed
Access time: 70/85/100 ns (max)
- Low power
Standby: 0.15 μW (typ)
- Completely static memory
No clock or timing strobe required
- Directly LVTTTL compatible: All inputs and outputs

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 × 14 mm 32 pin TSOP (normal type) (TFP-32DA)
HM62V256LT-8SL	85 ns	
HM62V256LTM-10	100 ns	8 mm × 13.4 mm 28-pin TSOP (normal type) (TFP-28DA)
HM62V256LTM-7SL	70 ns	
HM62V256LTM-10SL	100 ns	
HM62V256LTM-8UL	85 ns	

HM62V256 Series

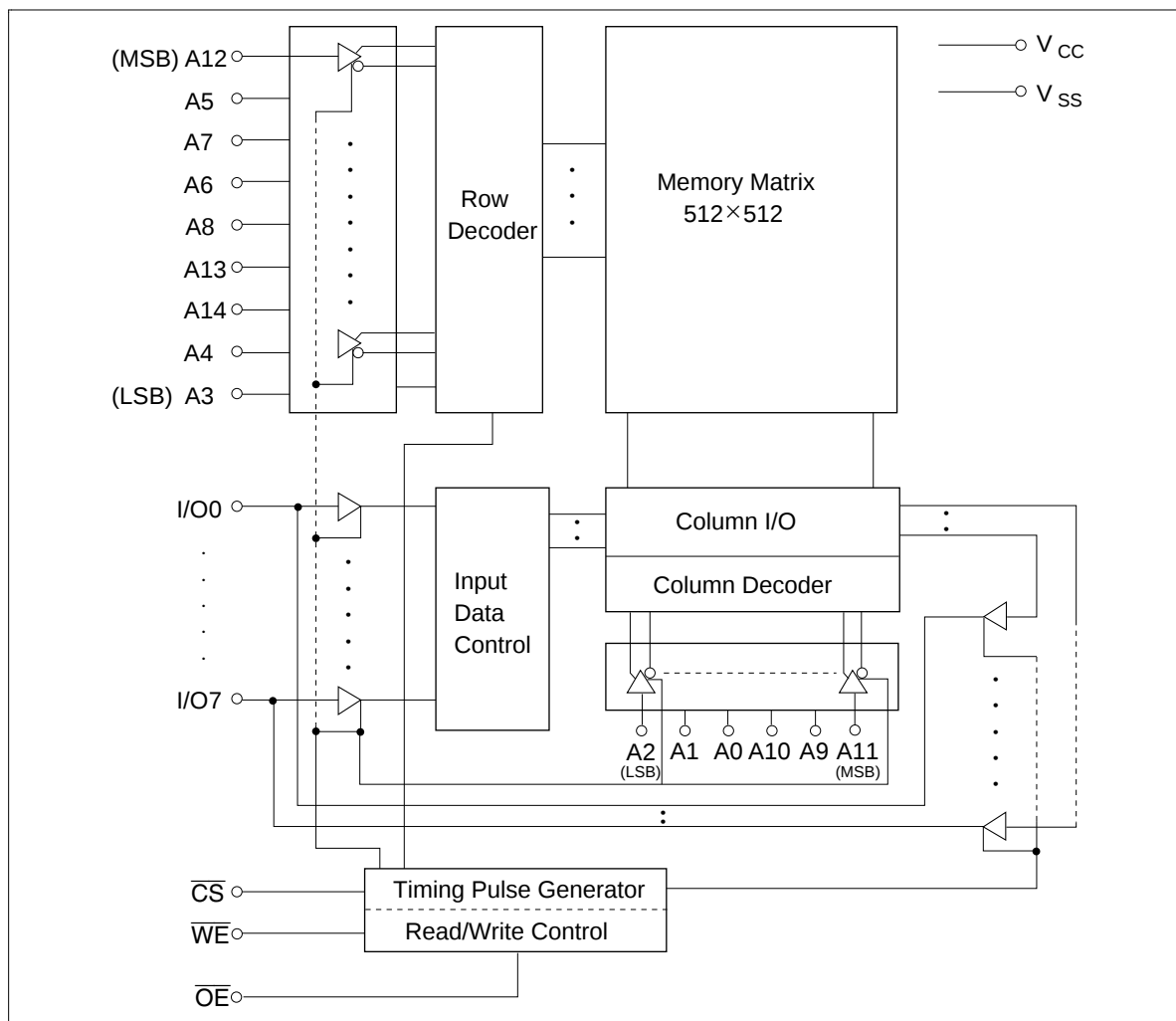
Pin Arrangement



Pin Description

Pin name	Function
A0 to A14	Address inputs
I/O0 to I/O7	Data input/output
$\overline{CS}$	Chip select
$\overline{WE}$	Write enable
$\overline{OE}$	Output enable
NC	No connection
V _{CC}	Power supply
V _{SS}	Ground

Block Diagram



HM62V256 Series

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}	0.7 V_{CC}	—	$V_{CC}+0.3$	V
Input low(logic 0) voltage	V_{IL}	−0.3 ^{*1}	—	0.2 V_{CC}	V

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

HM62V256 Series

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

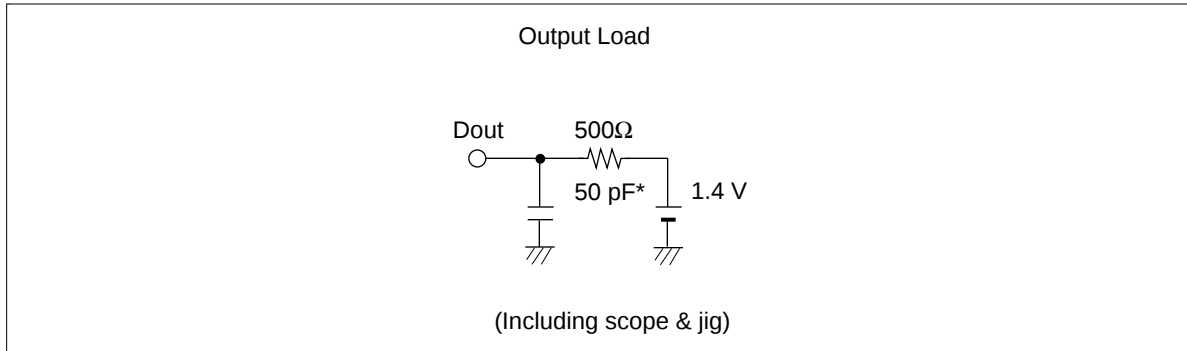
Note: 1. This parameter is sampled and not 100% tested.

HM62V256 Series

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							
		-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}	—	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	

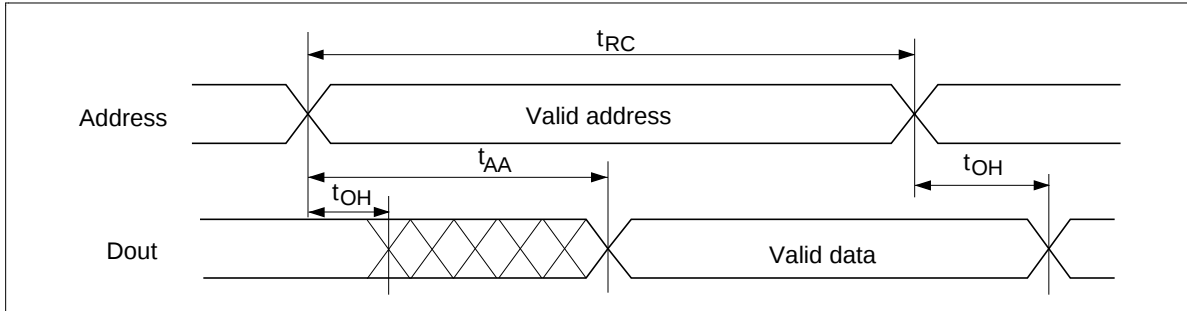
Notes: 1. t_{CHZ} and t_{OHZ} are defined as the time at which the outputs achieve the open circuit conditions and are not referred to output voltage levels.

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

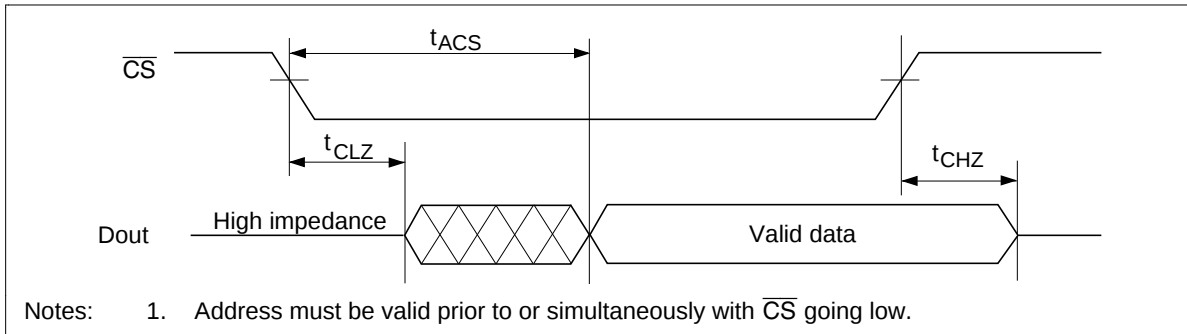
Read Timing Waveform (1) ($\overline{WE} = V_{IH}$)

Error! Unknown switch argument.

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							
		-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}	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.

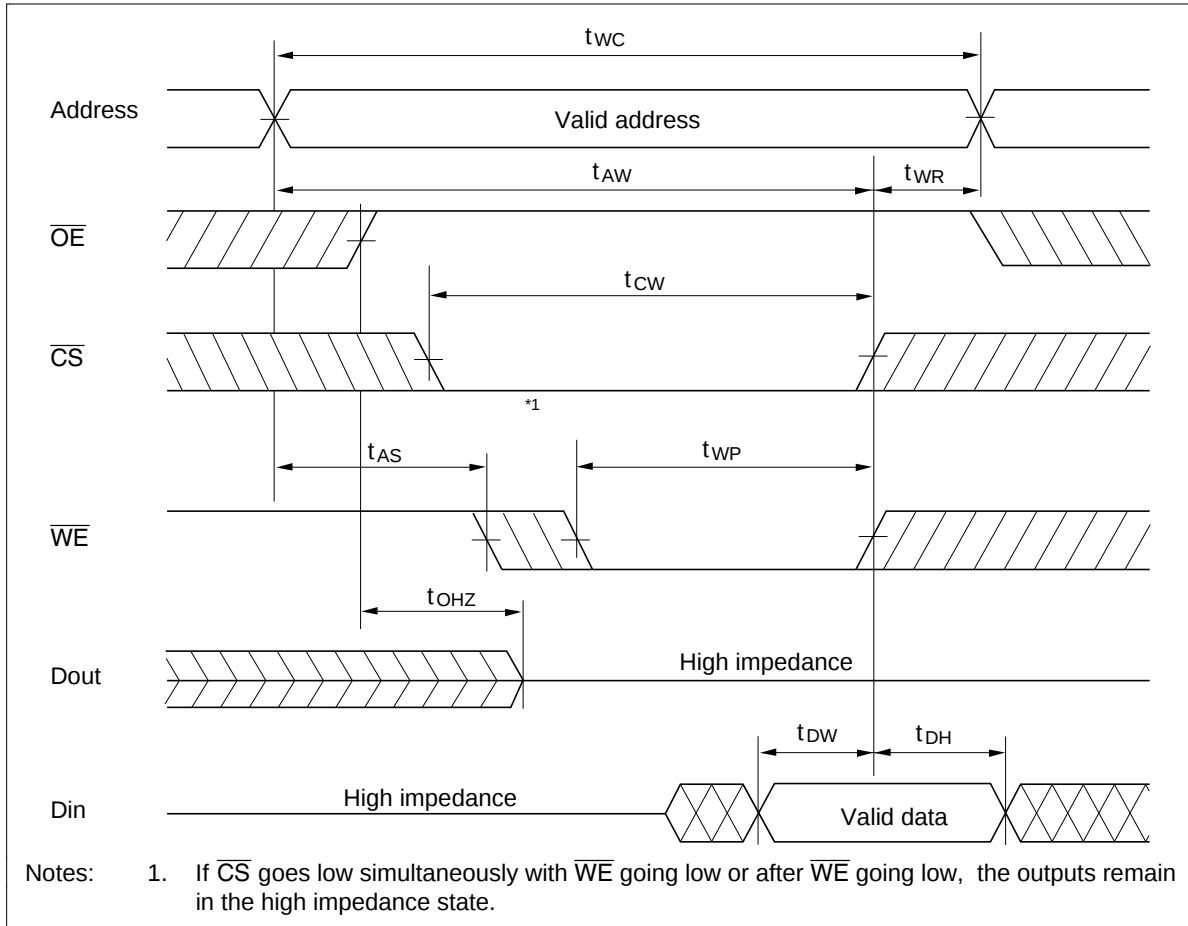
5. t_{AS} is measured from the address valid to the beginning of write.

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.

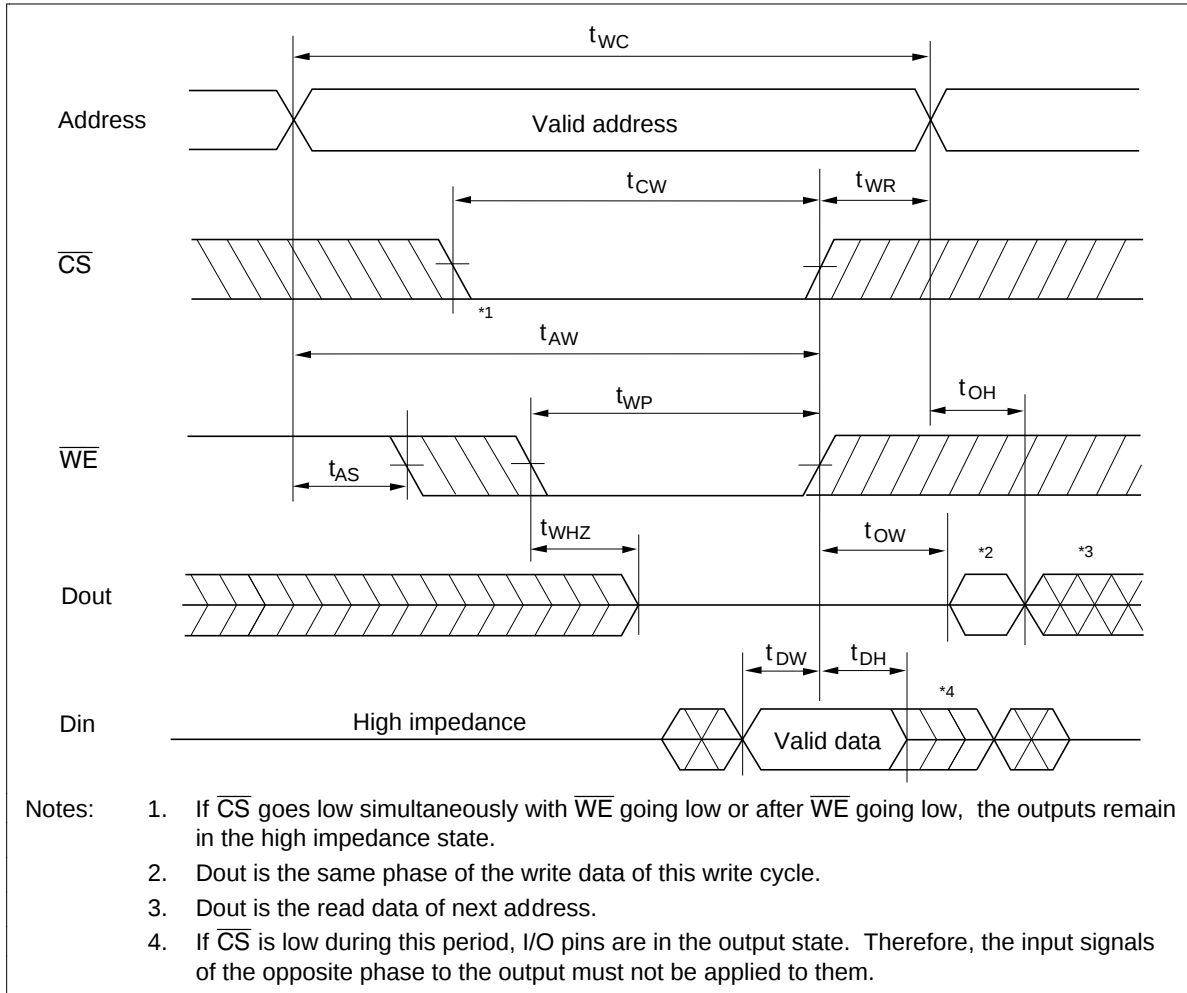
8. In the write cycle with $\overline{OE}$ low fixed, t_{WP} must satisfy the following equation to avoid a problem of data bus contention, $t_{WP} \geq t_{WHZ} \text{ max} + t_{DW} \text{ min}$.

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



HM62V256 Series

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

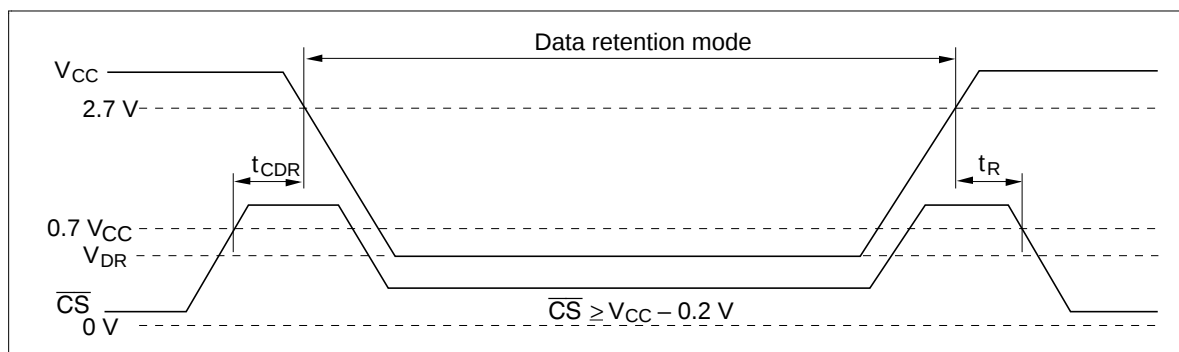


Low V_{CC} Data Retention Characteristics ($T_a = 0$ to $+70^\circ\text{C}$)

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 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

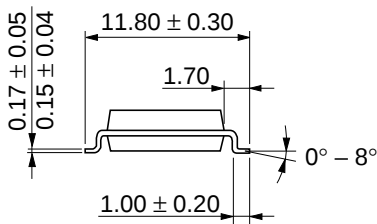
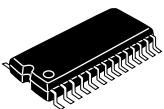
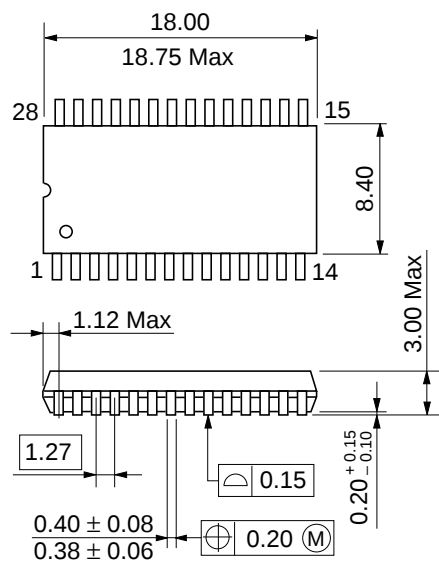


HM62V256 Series

Package Dimensions

HM62V256LFP Series (FP-28DA)

Unit: mm

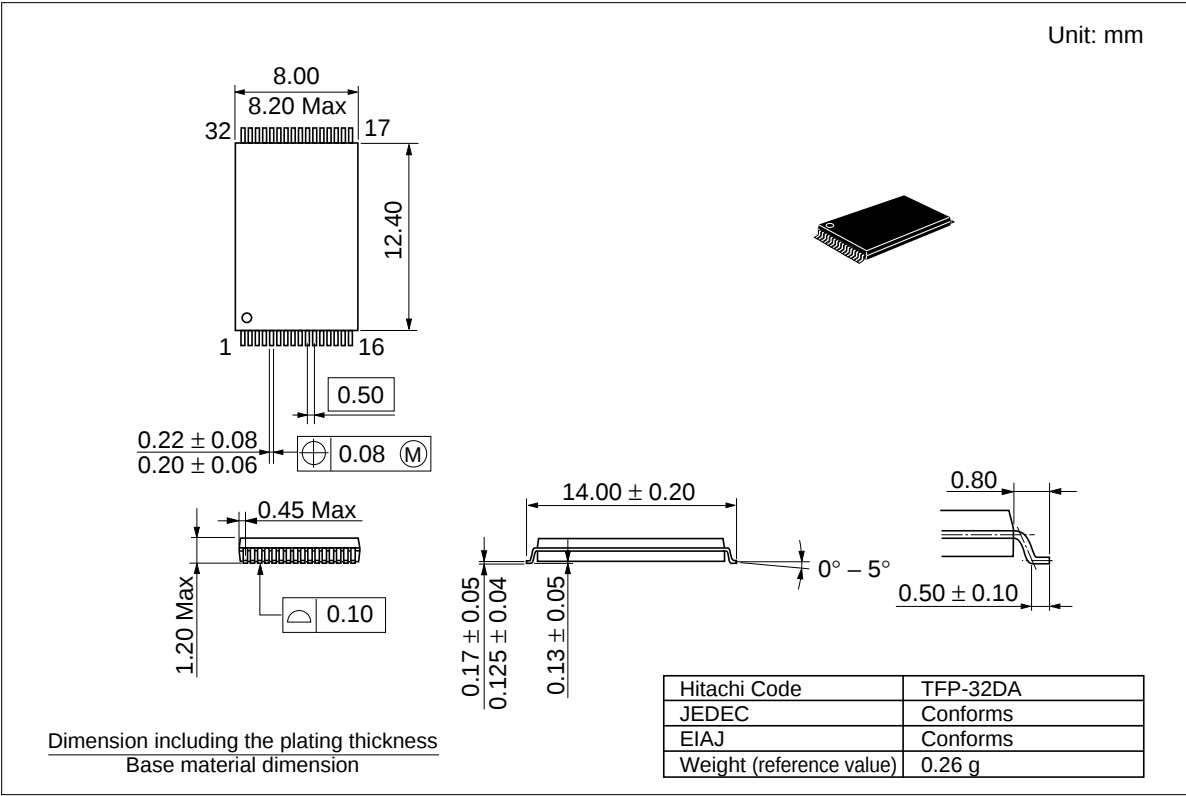


Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-28DA
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.82 g

Package Dimensions (cont.)

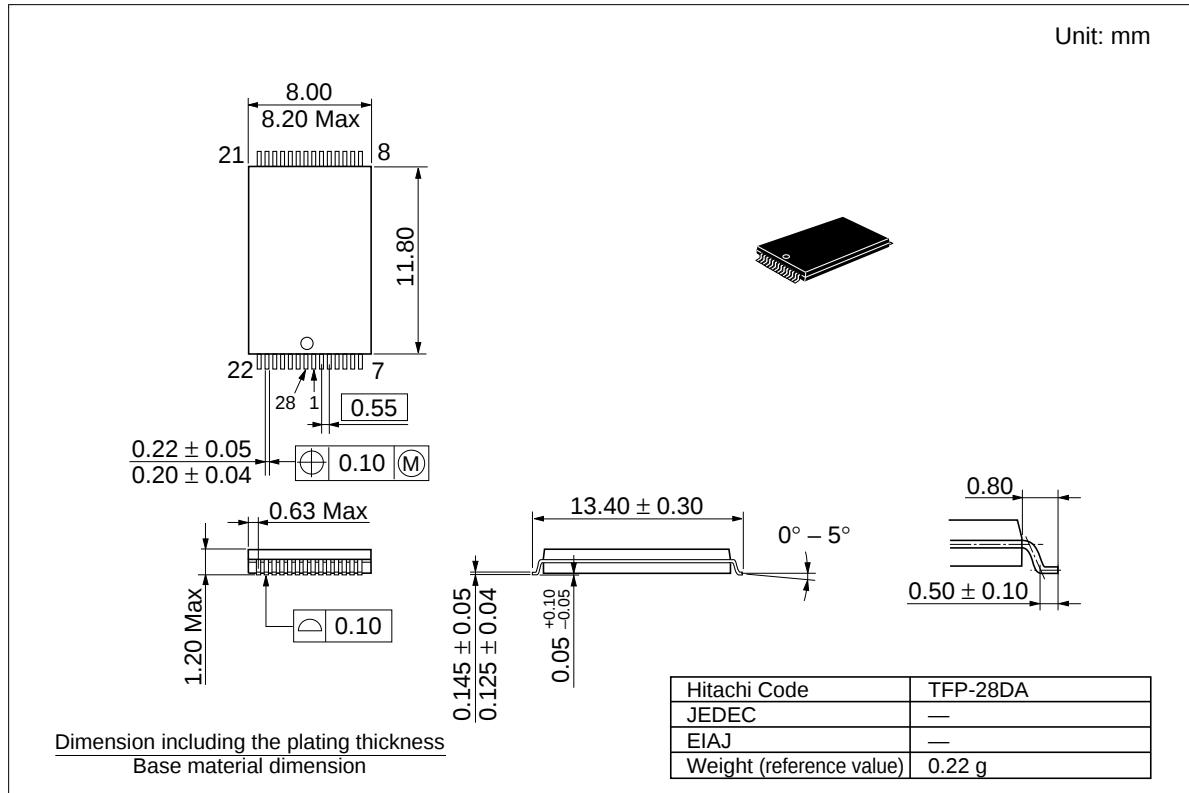
HM62V256LT Series (TFP-32DA)



HM62V256 Series

Package Dimensions (cont.)

HM62V256LTM Series (TFP-28DA)



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HITACHI

Hitachi, Ltd.

Semiconductor & IC Div.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100, Japan
Tel: Tokyo (03) 3270-2111
Fax: (03) 3270-5109

For further information write to:

Hitachi Semiconductor
(America) Inc.
2000 Sierra Point Parkway
Brisbane, CA. 94005-1897
U S A
Tel: 800-285-1601
Fax: 303-297-0447

Hitachi Europe GmbH
Continental Europe
Dornacher Straße 3
D-85622 Feldkirchen
München
Tel: 089-9 91 80-0
Fax: 089-9 29 30-00

Hitachi Europe Ltd.
Electronic Components Div.
Northern Europe Headquarters
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA
United Kingdom
Tel: 01628-585000
Fax: 01628-585160

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia (Hong Kong) Ltd.
Unit 706, North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon
Hong Kong
Tel: 27359218
Fax: 27306071

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HM62V256 Series

Revision Record

Rev.	Date	Contents of Modification	Drawn by	Approved by
1.0	Dec. 25, 1992	Initial issue	Y. Saito	Y. Kawashima
2.0	Sep. 10, 1993	Addition of full specification	Y. Saito	K. Yoshizaki
3.0	Mar. 17, 1994	DC Characteristics I_{CCDR2} (max): 10 mA to 15 mA	Y. Saito	T. Matumoto
4.0	Nov. 17 1994	Addition of HM62V256LTM Series (TFP-28DA) Addition of Block Diagram Absolute maximum ratings Addition of note 3 AC Characteristics Addition of note 12	Y. Saito	K. Yoshizaki
5.0	Jun. 19, 1995	Change of format Features Access time: 85/100 ns to 70/85/100 ns Low power standby: 0.60 μW to 0.15 μW Deletion of HM62V256LFP-8/8SL Deletion of HM62V256LT-8/10SL Deletion of HM62V256LTM-8/8SL Addition of HM62V256LFP-7SLT/8ULT Addition of HM62V256LTM-7SL/8UL Change of Block Diagram Absolute Maximum Ratings Terminal voltage V_T : -0.5 to $V_{\text{CC}} + 0.3$ to Terminal voltage V_T : -0.5 to $V_{\text{CC}} + 0.5$ DC Characteristics Addition of note 3 t_{CCAC1} (min): 27/24 mA to 30/ 27/ 24 mA I_{SB1} (typ): 0.2/0.2 μA to 0.05/0.05/0.05 μA I_{SB1} (max): 50/10 μA to 50/10/4 μA Capacitance Input Capacitance C_{in} (max): 8 pF to 5 pF Input/output Capacitance $C_{\text{I/O}}$ (max): 10 pF to 8 pF AC Characteristics Change order of notes t_{RC} (min): 85/100 ns to 70/85/100 ns t_{AA} (max): 85/100 ns to 70/85/100 ns t_{ASC} (max): 85/100 ns to 70/85/100 ns t_{OE} (max): 45/50 ns to 35/45/50 ns t_{CLZ} (min): 10/10 ns to 10/10/10 ns t_{OLZ} (min): 5/5 ns to 5/5/5 ns t_{CHZ} (max): 30/35 ns to 25/30/35 ns t_{OHZ} (max): 30/35 ns to 25/30/35 ns t_{OH} (min): 10/10 ns to 10/10/10 ns t_{WC} (min): 85/100 ns to 70/85/100 ns t_{CW} (min): 75/80 ns to 50/75/80 ns t_{AW} (min): 75/80 ns to 50/75/80 ns	M. Higuchi	K. Yoshizaki

Revision Record (cont)

Rev.	Date	Contents of Modification	Drawn by	Approved by
5.0	Jun. 19, 1995	AC Characteristics t _{WP} (min): 55/60 ns to 45/55/60 ns t _{WHZ} (max): 30/35 ns to 25/30/35 ns t _{DW} (min): 35/40 ns to 30/35/40 ns t _{OW} (min): 10/10 ns to 10/10/10 ns t _{OHZ} (max): 30 35 ns to 25/30/35 ns Low V _{CC} Data Retention Characteristics Addition of note 4 t _{CCDR} (typ): 0.2/0.2 μA to 0.05/0.05/0.05 μA t _{CCDR} (max): 27/7 μA to 27/7/2 μA	M. Higuchi	K. Yoshizaki
6.0	Nov. 1997	Change of format Change of Subtitle		