



**512K x 8 SRAM**

**MSM8512 - 70/85/10**

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**Description**

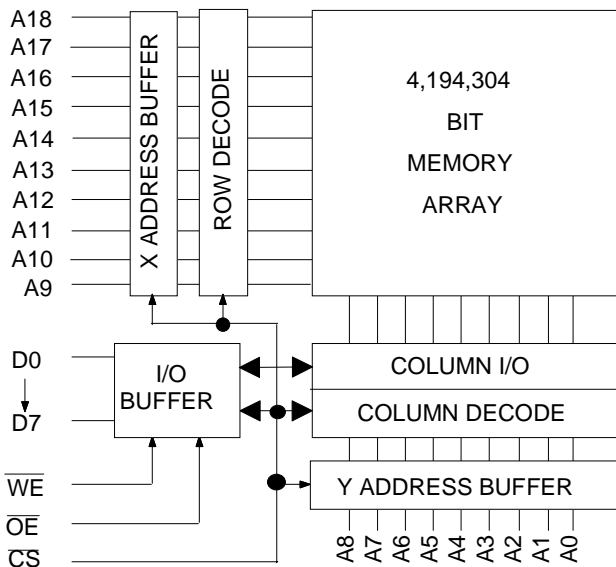
The MSM8512 is a 4Mbit monolithic SRAM organised as 512K x 8 with access times from 70ns to 100ns available. The device has a low power standby version which supports data retention mode and is directly TTL compatible. All versions can be screened in accordance with MIL-STD-883C.

524,288 x 8 CMOS Static RAM

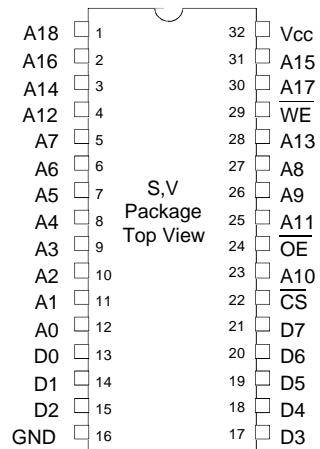
**Features**

- Fast Access Times of 70/85/100 ns
- JEDEC standard package.
- Average Operating Power 385 mW (max)
- Standby Power 550  $\mu$ W (max) -L version
- Low voltage data retention.
- Completely Static Operation
- Directly TTL compatible
- May be processed in accordance with MIL-STD-883C

**Block Diagram**



**Pin Definition**



**Package Details**

Pin Count	Description	Package Type
32	0.6" Dual-in-Line (DIP)	S

**Pin Functions**

- A0-A18** Address Inputs
- D0-7** Data Input/Output
- CS** Chip Select
- OE** Output Enable
- WE** Write Enable
- V<sub>CC</sub>** Power (+5V)
- GND** Ground

**DC OPERATING CONDITIONS****Absolute Maximum Ratings** <sup>(1)</sup>

Voltage on any pin relative to $V_{SS}$ <sup>(2)</sup>	$V_T$	-0.5	to	+7.0	V
Power Dissipation	$P_T$			1	W
Storage Temperature	$T_{STG}$	-55	to	+150	°C

Notes : (1) Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**Recommended Operating Conditions**

Parameter	Symbol	min	typ	max	unit
Supply Voltage	$V_{CC}$	4.5	5.0	5.5	V
Input High Voltage	$V_{IH}$	2.2	-	6.0	V
Input Low Voltage	$V_{IL}$	-0.3	-	0.8	V
Operating Temperature	$T_A$	0	-	70	°C
	$T_{AI}$	-40	-	85	°C (I suffix)
	$T_{AM}$	-55	-	125	°C (M, MB suffix)

**DC Electrical Characteristics** ( $V_{CC} = 5.0V \pm 10\%$ ,  $T_A = -55^\circ C$  to  $+125^\circ C$ )

Parameter	Symbol	Test Condition	min	typ	max	Unit
Input Leakage Current	$I_{LI}$	$V_{IN} = 0V$ to $V_{CC}$	-1	-	1	$\mu A$
Output Leakage Current	$I_{LO}$	$\overline{CS} = V_{IH}$ , $V_{IO} = 0V$ to $V_{CC}$ , $\overline{OE} = V_{IH}$ or $\overline{WE} = V_{IL}$	-1	-	1	$\mu A$
Average Supply Current	$I_{CC1}$	$\overline{CS} = V_{IL}$ , $I_{IO} = 0mA$ , min cycle, duty=100%	-	-	70	mA
Standby Supply Current	$I_{SB}$	$\overline{CS} = V_{IH}$ , $V_{IN} = V_{IH}$ or $V_{IL}$	-	-	3	mA
	$I_{SB1}$	$\overline{CS} \geq V_{CC} - 0.2V$ , $V_{IN} \geq V_{CC} - 0.2V$ or $0.2V \geq V_{IN}$	-	-	100	$\mu A$
Output Voltage	$V_{OL}$	$I_{OL} = 2.1mA$	-	-	0.4	V
	$V_{OH}$	$I_{OH} = -1.0mA$	2.4	-	-	V

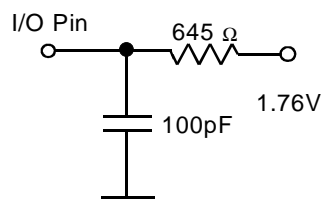
**Capacitance** ( $V_{CC} = 5V \pm 10\%$ ,  $T_A = 25^\circ C$ )

Parameter	Symbol	Test Condition	typ	max	Unit
Input Capacitance:	$C_{IN}$	$V_{IN} = 0V$	-	8	pF
I/O Capacitance:	$C_{IO}$	$V_{IO} = 0V$	-	10	pF

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

**AC Test Conditions****Output Load**

- \* Input pulse levels: 0.8V to 2.2V
- \* Input rise and fall times: 5ns
- \* Input and Output timing reference levels: 1.5V
- \* Output load: See Load Diagram
- \*  $V_{CC} = 5V \pm 10\%$



**Low  $V_{CC}$  Data Retention Characteristics - L Version Only ( $T_A = -55^\circ\text{C}$  to  $+125^\circ\text{C}$ )**

Parameter	Symbol	Test Condition	min	typ	max	Unit
$V_{CC}$ for Data Retention	$V_{DR}$	$\overline{CS} \geq V_{CC} - 0.2\text{V}$	2.0	-	5.5	V
Data Retention Current	$I_{CCDR}$	$V_{CC} = 3.0\text{V}, \overline{CS} \geq V_{CC} - 0.2\text{V}$ ,	-	-	250	$\mu\text{A}$
Chip Deselect to Data Retention	$t_{CDR}$	See Retention Waveform	0	-	-	ns
Operation Recovery Time	$t_R$	See Retention Waveform	5	-	-	ms

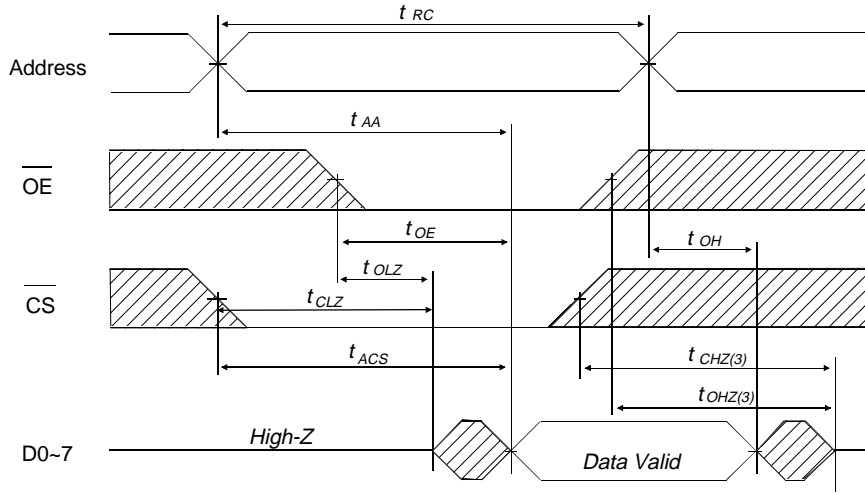
**AC OPERATING CONDITIONS****Read Cycle**

Parameter	Symbol	70		85		10		Units
		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
Output Hold from Address Change	$t_{OH}$	10	-	10	-	10	-	ns
Chip Selection to Output in Low Z	$t_{CLZ}$	10	-	10	-	10	-	ns
Output Enable to Output in Low Z	$t_{OLZ}$	5	-	5	-	5	-	ns
Chip Deselection to Output in High Z <sup>(3)</sup>	$t_{CHZ}$	0	25	0	30	0	30	ns
Output Disable to Output in High Z <sup>(3)</sup>	$t_{OHZ}$	0	25	0	30	0	30	ns

**Write Cycle**

Parameter	Symbol	70		85		10		Unit
		min	max	min	max	min	max	
Write Cycle Time	$t_{WC}$	70	-	85	-	100	-	ns
Chip Selection to End of Write	$t_{CW}$	60	-	75	-	80	-	ns
Address Valid to End of Write	$t_{AW}$	60	-	75	-	80	-	ns
Address Setup Time	$t_{AS}$	0	-	0	-	0	-	ns
Write Pulse Width	$t_{WP}$	50	-	55	-	60	-	ns
Write Recovery Time	$t_{WR}$	0	-	5	-	5	-	ns
Write to Output in High Z	$t_{WHZ}$	0	30	0	30	0	30	ns
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
Output Disable to Output in High Z	$t_{OHZ}$	0	25	0	30	0	30	ns

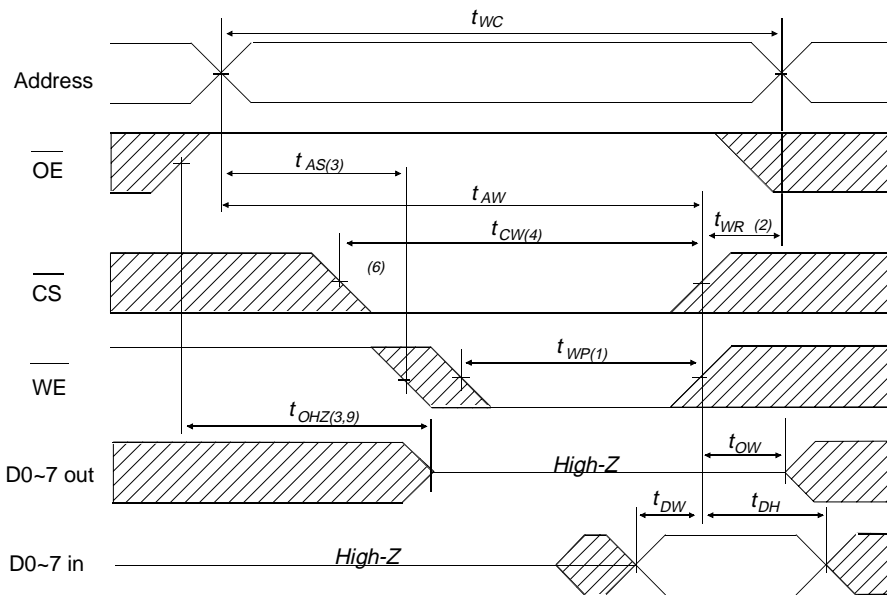
**Read Cycle Timing Waveform <sup>(1,2)</sup>**



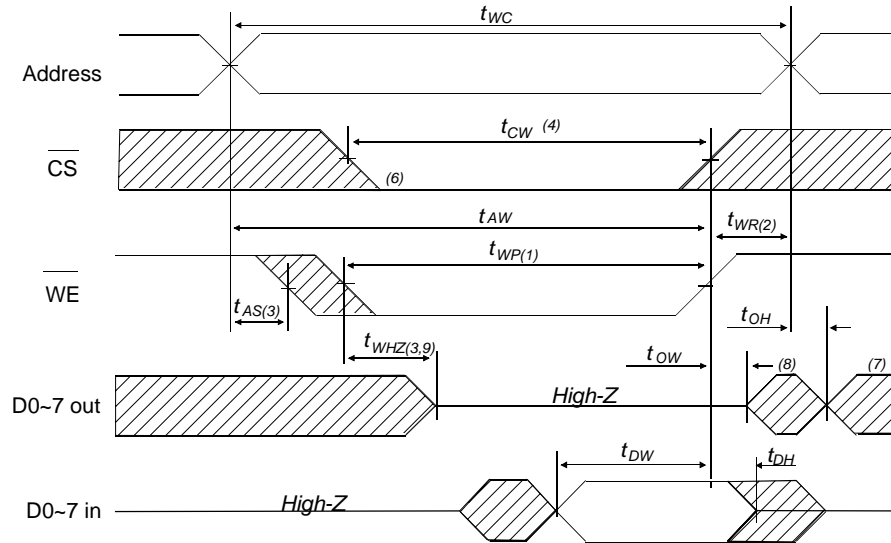
Notes:

- (1) During the Read Cycle,  $\overline{WE}$  is high.
- (2) Address valid prior to or coincident with  $\overline{CS}$  transition Low.
- (3)  $t_{CHZ}$  and  $t_{OHZ}$  are defined as the time at which the outputs achieve the open circuit conditions and are not referenced to output voltage levels. These parameters are sampled and not 100% tested.

**Write Cycle No.1 Timing Waveform**



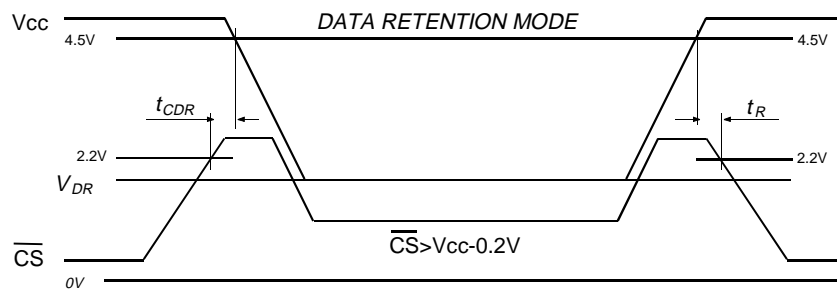
### Write Cycle No.2 Timing Waveform <sup>(5)</sup>



### AC Characteristics Notes

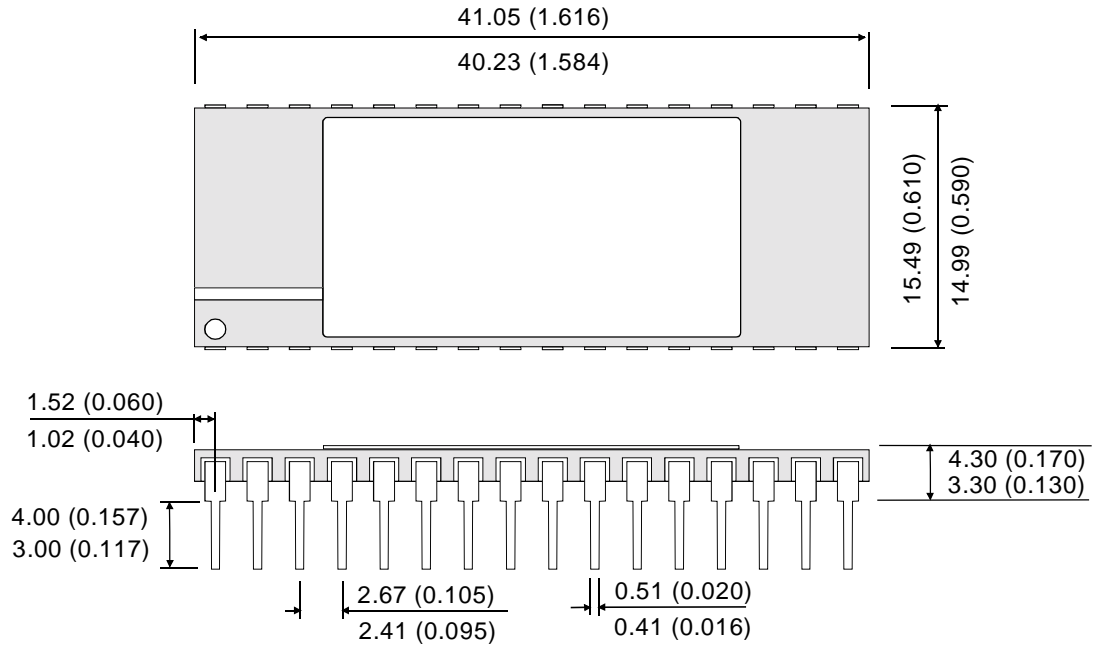
- (1) A write occurs during the overlap ( $t_{WP}$ ) of a low  $\overline{CS}$  and a low  $\overline{WE}$ .
- (2)  $t_{WR}$  is measured from the earlier of  $\overline{CS}$  or  $\overline{WE}$  going high to the end of write cycle.
- (3) During this period, I/O pins are in the output state. Input signals out of phase must not be applied.
- (4) If the  $\overline{CS}$  low transition occurs simultaneously with the  $\overline{WE}$  low transition or after the  $\overline{WE}$  low transition, outputs remain in a high impedance state.
- (5)  $\overline{OE}$  is continuously low. ( $\overline{OE}=V_{IL}$ )
- (6)  $D_{OUT}$  is in the same phase as written data of this write cycle.
- (7)  $D_{OUT}$  is the read data of next address.
- (8) If  $\overline{CS}$  is low during this period, I/O pins are in the output state. Input signals out of phase must not be applied.
- (9)  $t_{WHZ}$  and  $t_{OHZ}$  are defined as the time at which the outputs achieve the open circuit conditions and are not referenced to output voltage levels. These parameters are sampled and not 100% tested.

### Low $V_{CC}$ Data Retention Timing Waveform



**Package Details**

**32 pin 0.6" Dual-in-Line (DIP) - 'S' Package**



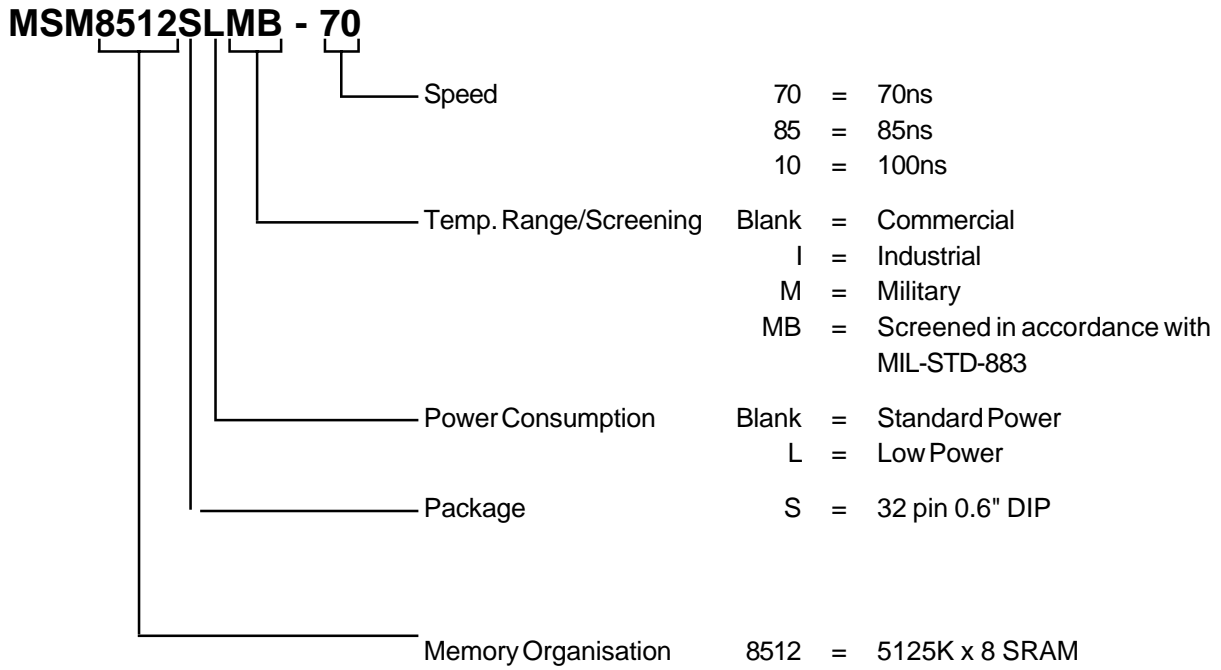
All dimensions in mm (inches).

<b>Military Screening Procedure</b>
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Screening Flow for high reliability product in accordance with MIL-STD-883 method 5004 is shown below.

<b>MB COMPONENT SCREENING FLOW</b>		
<i>SCREEN</i>	<i>TEST METHOD</i>	<i>LEVEL</i>
<b>Visual and Mechanical</b>		
Internal visual	2010 Condition B or manufacturers equivalent	100%
Temperature cycle	1010 Condition C (10 Cycles, -65°C to +150°C)	100%
Constant acceleration	2001 Condition E (Y, only) (30,000g)	100%
Pre-Burn-in electrical	Per applicable device specifications at $T_A=+25^\circ\text{C}$	100%
Burn-in	Method 1015, Condition D, $T_A=+125^\circ\text{C}$ , 160hrs min	100%
<b>Final Electrical Tests</b>	Per applicable Device Specification	
Static (dc)	a) @ $T_A=+25^\circ\text{C}$ and power supply extremes	100%
	b) @ temperature and power supply extremes	100%
Functional	a) @ $T_A=+25^\circ\text{C}$ and power supply extremes	100%
	b) @ temperature and power supply extremes	100%
Switching (ac)	a) @ $T_A=+25^\circ\text{C}$ and power supply extremes	100%
	b) @ temperature and power supply extremes	100%
<b>Percent Defective allowable (PDA)</b>	Calculated at post-burn-in at $T_A=+25^\circ\text{C}$	5%
<b>Hermeticity</b>	1014	
Fine	Condition A	100%
Gross	Condition C	100%
<b>External Visual</b>	2009 Per vendor or customer specification	100%

**Ordering Information**



Although this data is believed to be accurate, the information contained herein, is not intended to and does not create any warranty of merchantability or fitness for a particular purpose. Our products are subject to a constant process of development. Data may be changed at any time without notice. Products are not authorised for use as critical components in life support devices without the express written approval of a company director.