

# OKI semiconductor

## MSM51257AL

32,768-Word x 8-Bit CMOS STATIC RAM

### GENERAL DESCRIPTION

The MSM51257AL is a 32768-word by 8-bit CMOS RAM static RAM featuring a 5V power supply operation and direct TTL input/output compatibility. Since the circuitry is completely static, external clock and refreshing operations are unnecessary, making this device very easy to use. The MSM51257AL is also a CMOS silicon gate device that requires very low power during standby (standby current of 100  $\mu$ A) when there is no chip selection.

The pins  $\overline{CS}$  and  $\overline{OE}$  are provided as control signals that permit the outputs to be tri-stated, allowing easy memory expansion on a system bus.

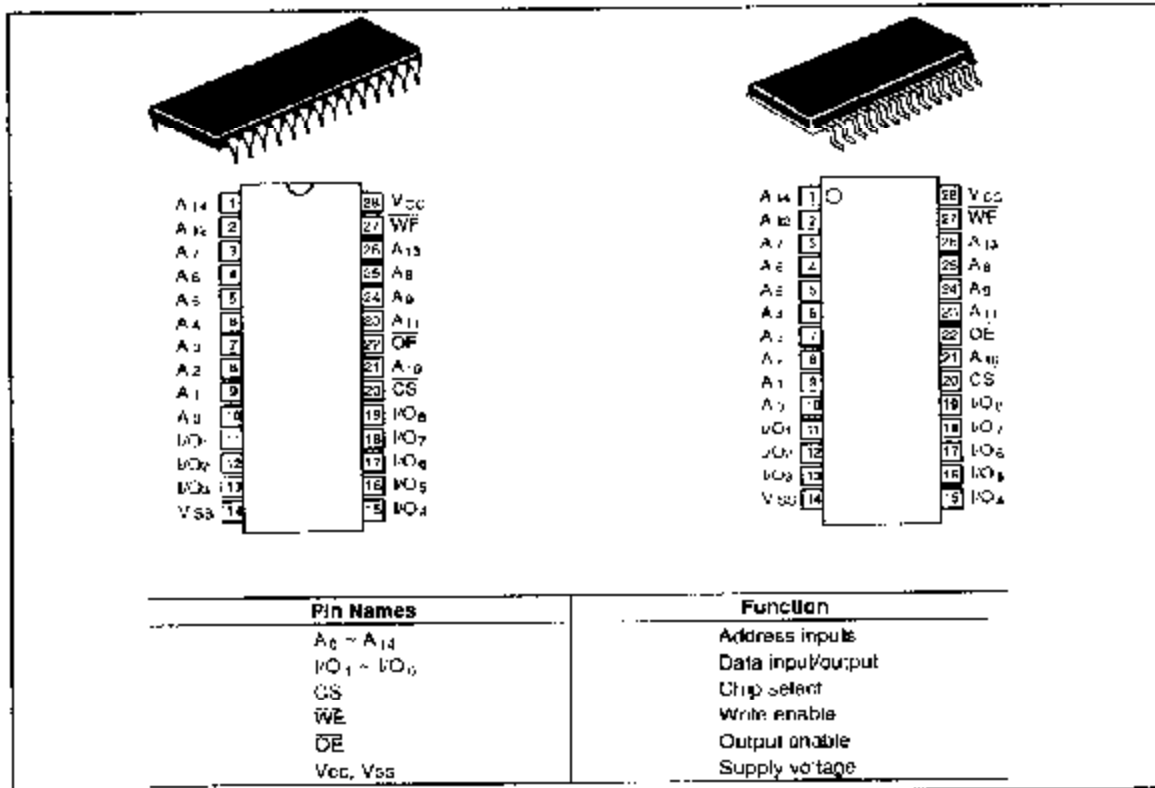
### FEATURES

- Single 5V Supply
- 0°C ~ 70°C
- Low Power Dissipation
  - Standby: 0.55 mW MAX
  - Operation: 385 mW MAX (-10, -12)
  - 440 mW MAX (-70, -85)
- High Speed (Equal Access and Cycle Time)
  - 70-120 ns MAX
- Direct TTL Compatible (Input and Output)
- 3-State Output
- 28-pin DIP PKG
- 28 pin FLAT PKG

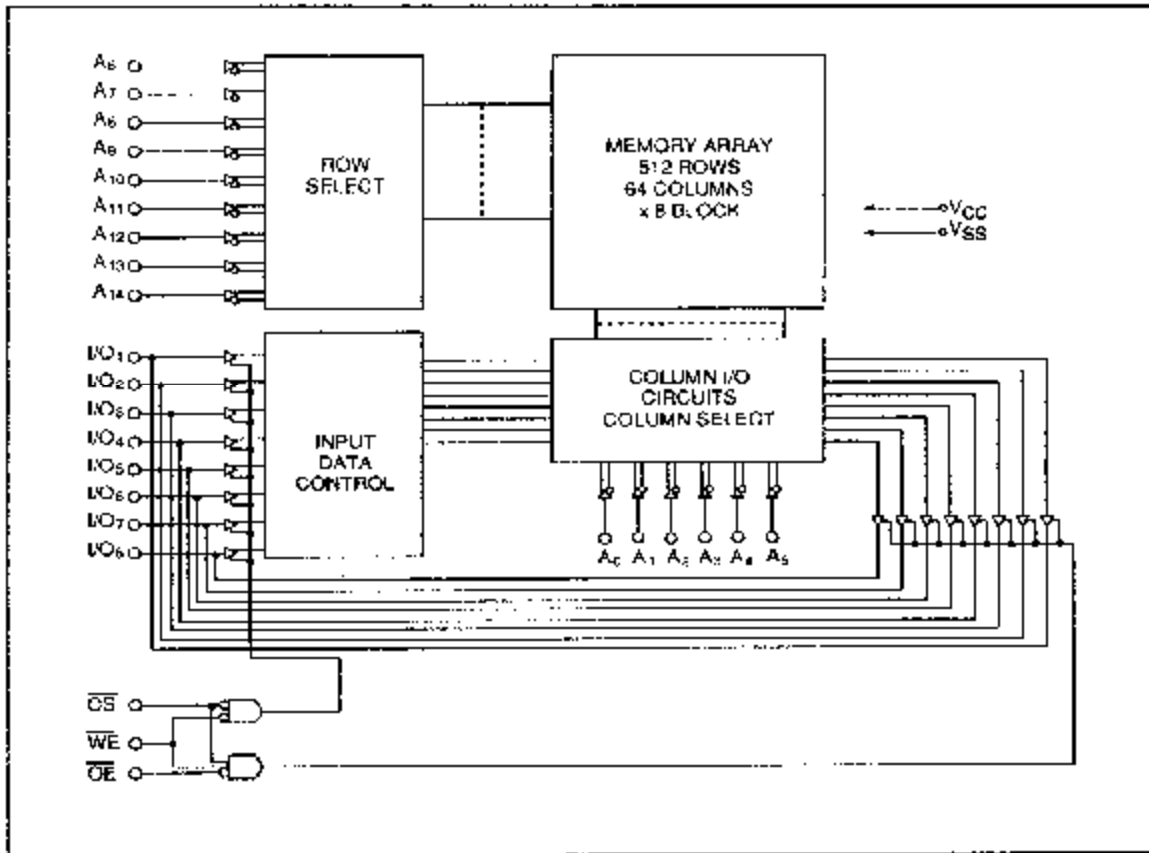
### PIN CONFIGURATION (TOP VIEW)

MSM51257ALRS

MSM51257ALGS



**FUNCTIONAL BLOCK DIAGRAM**



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**TRUTH TABLE**

Mode	Pins	CS	WE	OE	Output
Standby		H	X	X	High Z
Read		L	H	H	High Z
		L	H	L	DOUT
Write		L	L	X	DIN

X: H or L

**ELECTRICAL CHARACTERISTICS  
ABSOLUTE MAXIMUM RATINGS**

Rating	Symbol	Conditions	Value	Unit
Supply Voltage	$V_{CC}$	Referenced to GND	-0.3~7.0	V
Input Voltage	$V_{IN}$		-0.3~ $V_{CC}+0.3$	V
Operating Temperature	$T_{op}$	—	0~70	°C
Storage Temperature	$T_{stg}$	—	-55~150	°C
Power Dissipation	$P_D$	$T_a = 25^{\circ}C$	1.0	W

\* Pulse width < 30 ns: -3.0V MIN

## ■ MSM51257AL ■

Note: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to the conditions as detailed in the operational sections of this data sheet. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Conditions	Value			Unit
			Min.	Typ.	Max.	
Supply Voltage	$V_{CC}$	$5V \pm 10\%$	4.5	5	5.5	V
	$V_{SS}$	—	—	0	—	V
Data Retention Voltage	$V_{CCD}$	—	2	5	5.5	V
Input Voltage	$V_{IH}$	$5V \pm 10\%$	2.2	—	$V_{CC}+0.3$	V
	$V_{IL}$		-0.3*	—	0.8	V
Output Voltage	$C_L$	—	—	—	100	pF
	TTL		—	—	1	—

\* Pulse width < 30 ns; -3.0V MIN

### DC CHARACTERISTICS

( $V_{CC} = 5V \pm 10\%$ ,  $T_a = 0 \sim 70^\circ\text{C}$ )

Parameter	Symbol	Conditions	MSM51257AL			Unit	Notes
			Min.	Typ.	Max.		
Input Leakage Current	$I_{LI}$	$V_{IH} = 0 \sim V_{CC}$	-1	—	1	$\mu\text{A}$	
Output Leakage Current	$I_{LO}$	$\overline{CS} = V_{IH}$ or $OE = V_{IH}$ $V_{OH} = 0 \sim V_{CC}$	-1	—	1	$\mu\text{A}$	
Output Voltage	$V_{OH}$	$I_{OH} = -1\text{mA}$	2.4	—	—	V	
	$V_{OL}$	$I_{OL} = 2.1\text{mA}$	—	—	0.4	V	
Standby Supply Current	$I_{CCS}$	$\overline{CS} \geq V_{CC} - 0.2\text{V}$ $V_{IH} = 0 \sim V_{CC}$	—	2	100*	$\mu\text{A}$	
	$I_{CCD}$	$\overline{CS} = V_{IH}$	—	—	3	mA	
Operating Supply Current	$I_{CCA}$	Min cycle, $I_{OH} = 0\text{mA}$	—	—	①	mA	

\*  $T_a = 0$  to  $40^\circ\text{C}$ : 30  $\mu\text{A}$  MAX

① 51257AL-70/85 80 mA 51257AL-10/12 70 mA

**AC CHARACTERISTICS**

Test Condition

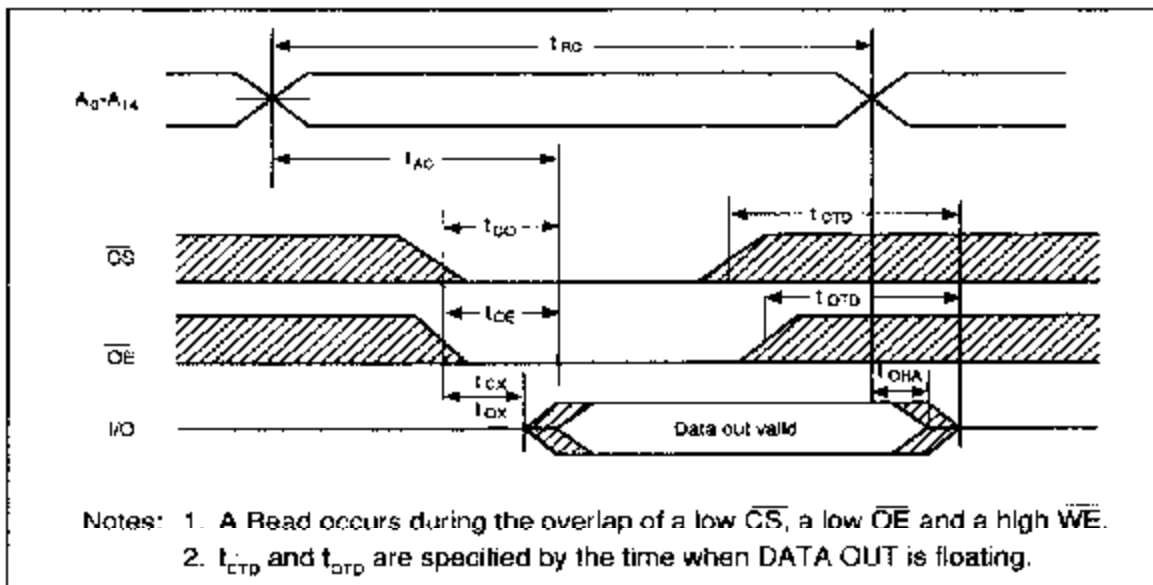
Parameter	Conditions
Input Pulse Level	$V_{IH} = 2.4V, V_{IL} = 0.6V$
Input Rise and Fall Times	5 ns
Input and Output	1.5V
Output Load	$C_L = 100pF, 1TTL\ Gate$

**READ CYCLE**

( $V_{CC} = 5V \pm 10\%, T_A = 0 \sim +70^\circ C$ )

Parameter	Symbol	MSM51257AL-70		MSM51257AL-85		MSM51257AL-10		MSM51257AL-12		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle Time	$t_{RC}$	70	—	85	—	100	—	120	—	ns
Address Access Time	$t_{AA}$	—	70	—	85	—	100	—	120	ns
Chip Enable Access Time	$t_{CE}$	—	70	—	85	—	100	—	120	ns
Output Enable to Output Valid	$t_{OE}$	—	40	—	45	—	50	—	60	ns
Chip Selection to Output Active	$t_{CS}$	10	—	10	—	10	—	10	—	ns
Output Hold Time from Address Change	$t_{OH}$	5	—	5	—	10	—	10	—	ns
Output 3-State from Output Disable	$t_{ODT}$	—	30	—	30	—	35	—	35	ns
Output 3-State from Chip Deselection	$t_{OR}$	—	30	—	30	—	35	—	35	ns
Output Enable to Output Active	$t_{UX}$	5	—	5	—	5	—	5	—	ns

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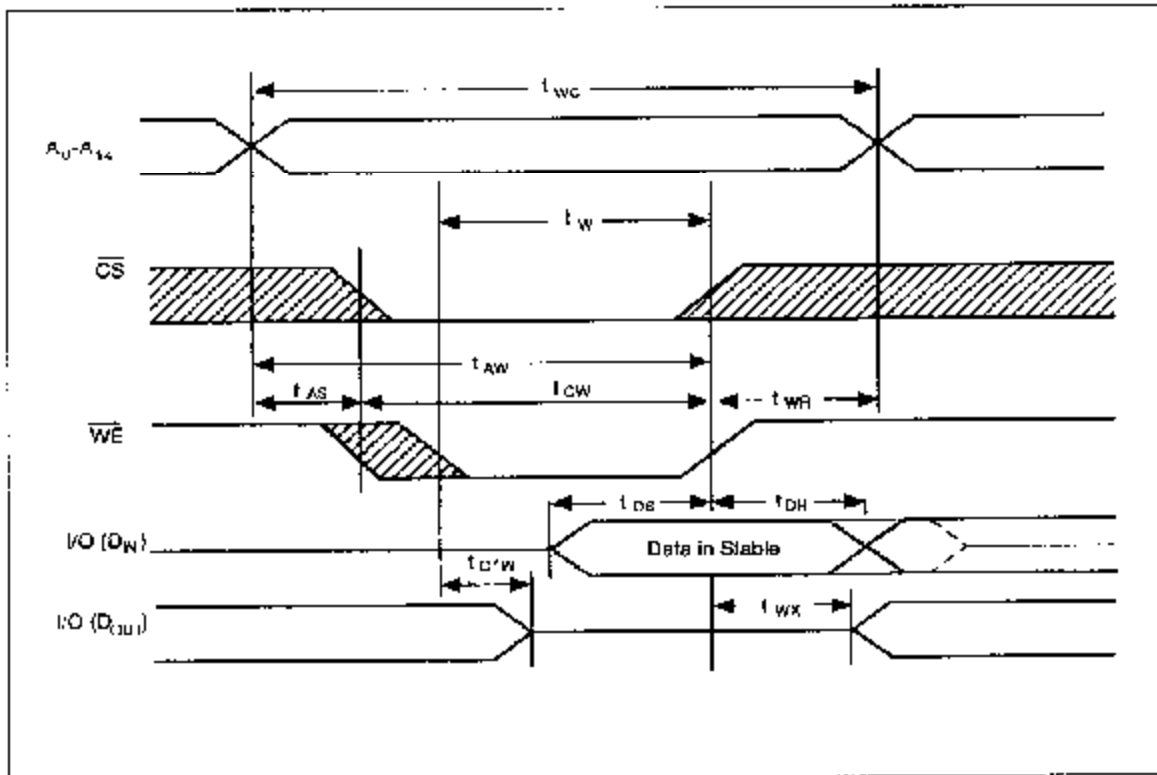


WRITE CYCLE

(V<sub>CC</sub> = 5 V ±10%, T<sub>a</sub> = 0 ~ +70°C)

Parameter	Symbol	MSM51257AL-70		MSM51257AL-85		MSM51257AL-10		MSM51257AL-12		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Write Cycle Time	t <sub>wc</sub>	70	—	85	—	100	—	120	—	ns
Address to Write Setup Time	t <sub>AS</sub>	0	—	0	—	0	—	0	—	ns
Write Time	t <sub>w</sub>	65	—	70	—	75	—	90	—	ns
Write Recovery Time	t <sub>wr</sub>	5	—	5	—	5	—	5	—	ns
Data Setup Time	t <sub>DS</sub>	35	—	40	—	40	—	50	—	ns
Data Hold from Write Time	t <sub>DH</sub>	0	—	0	—	0	—	0	—	ns
Output 3-State from Write	t <sub>OTW</sub>	0	30	0	30	0	35	0	35	ns
Chip Selection to End of Write	t <sub>CW</sub>	65	—	75	—	90	—	100	—	ns
Address Valid to End of Write	t <sub>AW</sub>	65	—	75	—	90	—	100	—	ns
Output Active from End of Write	t <sub>WX</sub>	5	—	5	—	5	—	5	—	ns

- Notes
1. A Write Cycle occurs during the overlap of a low  $\overline{CS}$ , and a low  $\overline{WE}$ .
  2.  $\overline{OE}$  can be both high and low in a Write Cycle.
  3. t<sub>AS</sub> is specified from  $\overline{CS}$  or  $\overline{WE}$ , whichever occurs last.
  4. t<sub>w</sub> is an overlap time of a low  $\overline{CS}$ , and a low  $\overline{WE}$ .
  5. t<sub>wr</sub>, t<sub>DS</sub>, and t<sub>DH</sub> are specified from  $\overline{CS}$  or  $\overline{WE}$ , whichever occurs first.
  6. t<sub>OTW</sub> is specified by the time when DATA OUT is floating, not defined by output level.
  7. When I/O pins are Data output mode, don't force inverse signals to those pins.



**LOW V<sub>CC</sub> DATA RETENTION CHARACTERISTICS**

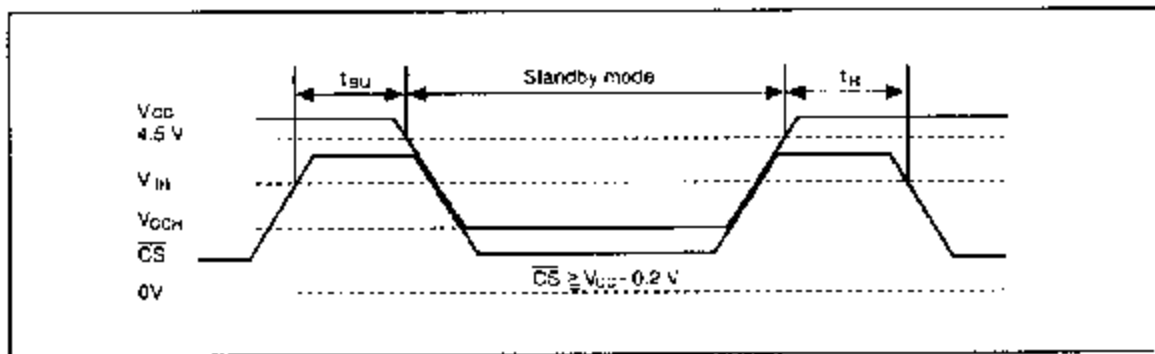
(T<sub>a</sub> = 0 ~ +70°C, unless otherwise noted)

Parameter	Symbol	Conditions	Specified Value			Unit
			Min.	Typ.	Max.	
V <sub>CC</sub> for Data Retention	V <sub>CC1</sub>	$\overline{CS} \geq V_{CC} - 0.2 \text{ V}$	2.0	—	5.5	V
Data Retention Current	I <sub>CC1</sub>	V <sub>CC</sub> = 3 V, $\overline{CS} \geq V_{CC} - 0.2 \text{ V}$	—	1	50*	μA
CS to Data Retention Time	t <sub>SD</sub>	—	0	—	—	ns
Operation Recovery Time	t <sub>R</sub>	—	**t <sub>RC</sub>	—	—	ns

\* T<sub>a</sub> = 0 to 40°C ; 15 μA Max.

\*\* t<sub>RC</sub> = Read Cycle Time

**$\overline{CS}$  CONTROL**



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**CAPACITANCE**

(T<sub>a</sub> = 25°C, f = 1MHz)

Parameter	Symbol	Conditions	Value		Unit
			Min.	Max.	
I/O Capacitance	C <sub>I/O</sub>	—	—	10	pF
Input Capacitance	C <sub>I</sub>	—	—	10	pF

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