

## 32K x 8 CMOS STATIC RAM

### PRELIMINARY DATA

- BYTEWYDE™ 32K X 8 CMOS SRAM
- EQUAL CYCLE/ACCESS TIMES, 100, 120NS MAX.
- LOW V<sub>CC</sub> DATA RETENTION, 2 VOLTS
- THREE-STATE OUTPUT

### DESCRIPTION

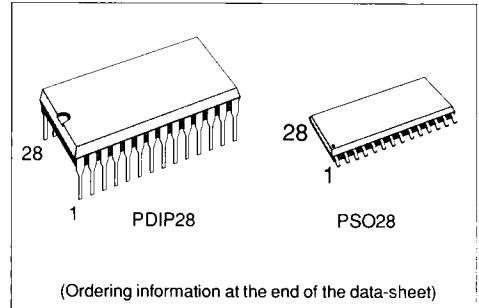
The MK48256 is a 256K (262,144-bit) CMOS SRAM, organized as 32,768 words x 8 bits. It is fabricated using SGS-THOMSON's low power, high performance, CMOS technology. The device features fully static operation requiring no external clocks or timing strobes, with equal address access and cycle times. It requires a single +5V ± 10% supply, and all inputs and outputs are TTL compatible.

### OPERATIONAL MODES

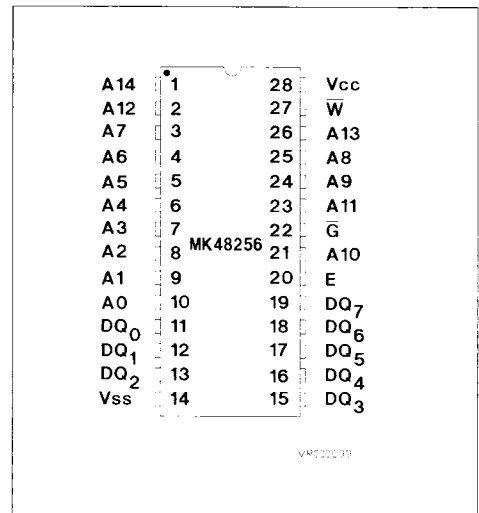
The MK48256 has a Chip Enable power down feature which sustains an automatic standby mode whenever Chip Enable ( $\bar{E}$ ) goes inactive high. An Output Enable ( $\bar{G}$ ) pin provides a high speed tristate control, allowing fast read/write cycles to be achieved with the common-I/O data bus. Operational modes are determined by device control inputs  $\bar{W}$ ,  $\bar{G}$  and  $\bar{E}$ , as summarized in the truth table.

### PIN NAMES

A0-A14	Address Inputs
DQ0-DQ7	Data I/O <sub>0,7</sub>
$\bar{E}$	Chip Enable
$\bar{G}$	(OE) Output Enable
$\bar{W}$	Write/Read Enable
V <sub>CC</sub>	+ 5V
V <sub>SS</sub>	GROUND



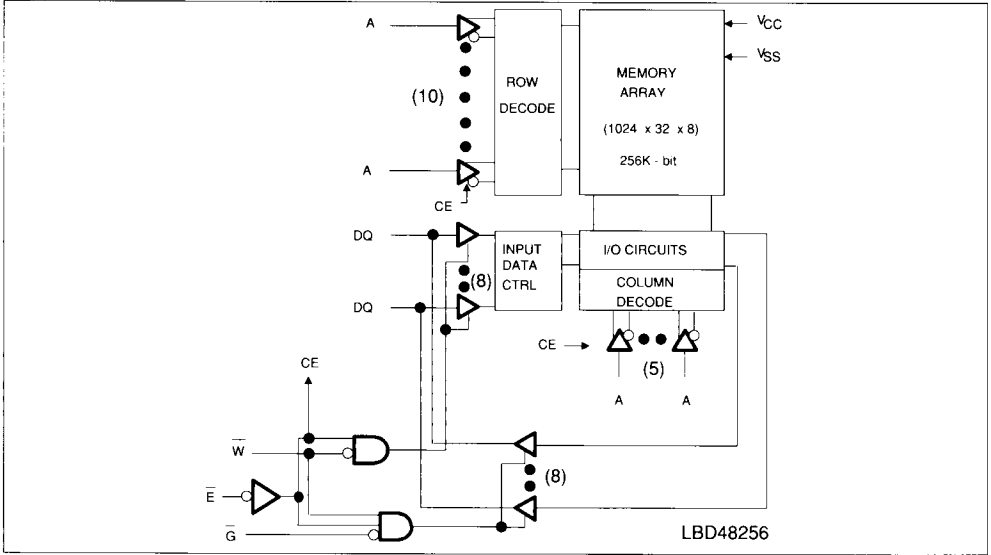
### Pin Connection



### MK48256 TRUTH TABLE

$\bar{E}$	$\bar{W}$	$\bar{G}$	MODE	DQ	POWER
H	X	X	Deselect	Hi-Z	Standby
L	H	H	Read	Hi-Z	Active
L	H	L	Read	D <sub>OUT</sub>	Active
L	L	X	write	D <sub>IN</sub>	Active

Figure 1 : MK48256 Block Diagram



**READ MODE**

The MK48256 is in the Read mode whenever Write Enable ( $\overline{W}$ ) is high with Output Enable ( $\overline{G}$ ) low, and Chip Enable ( $\overline{E}$ ) is active low. This provides access to data from eight of 262,144 locations in the static memory array, specified by the 15 address inputs. Valid data will be available at the eight Output pins

within  $t_{AVQV}$  after the last stable address, providing  $\overline{G}$  is low, and  $\overline{E}$  is low. If Chip Enable or Output Enable access times are not met, data access will be measured from the limiting parameter ( $t_{ELQV}$ , or  $t_{GLQV}$ ) rather than the address. Data out may be indeterminate at  $t_{ELQX}$ , and  $t_{GLQX}$ , but data lines will always be valid at  $t_{AVQV}$ .

**AC ELECTRICAL CHARACTERISTICS (READ CYCLE)**

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

SYMBOL	PARAMETER	MK48256-100		MK48256-120		UNIT	NOTE
		MIN	MAX	MIN	MAX		
t <sub>AVAV</sub>	Read Cycle Time	100		120		ns	
t <sub>AVQV</sub>	Address Access Time		100		120		4
t <sub>ELQV</sub>	Chip Enable Access Time		100		120		4
t <sub>GLQV</sub>	Output Enable Access Time		50		60		4
t <sub>ELQX</sub>	Chip Enable to Q Low-Z	10		10			5
t <sub>GLQX</sub>	Output Enable to Q Low-Z	5		5			5
t <sub>EHQZ</sub>	Chip Disable ( $\overline{E}$ ) High to Q High-Z	0	35	0	35		5
t <sub>GHQX</sub>	Output Disable ( $\overline{G}$ ) High to Q High-Z	0	35	0	35		5
t <sub>AXQX</sub>	Output Hold from Address Change	10		10			4

NOTES : 4. Measured with load as shown in Figure 8A.

5. Measured with load as shown in Figure 8B.

Figure 2 : Read Timing N°1 ( Address Access)

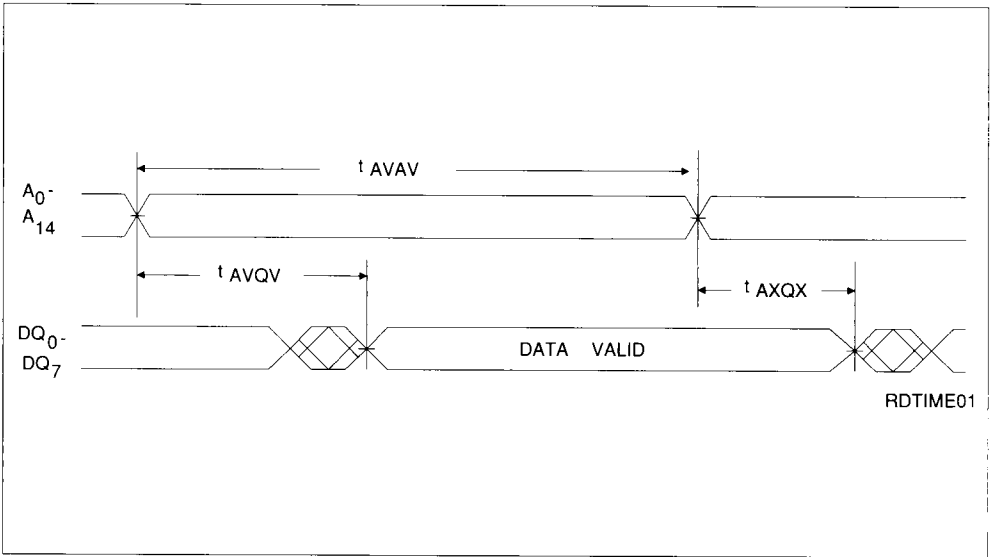
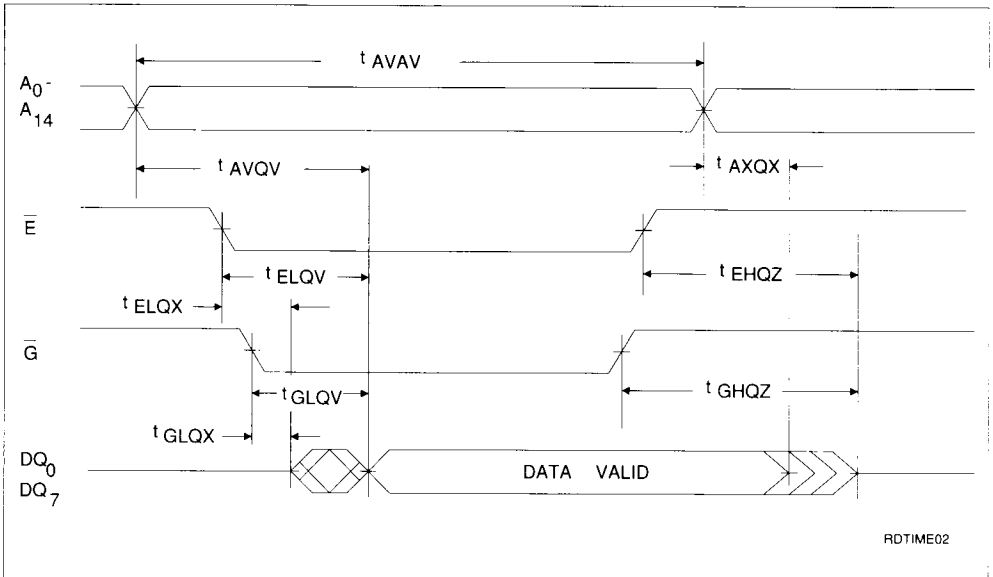
NOTE :  $\bar{E} = \bar{G} = \text{Low}, W = \text{High}$ 

Figure 3 : Read Timing N°2

NOTE :  $W = \text{High}$

**WRITE MODE**

The MK48256 is in the Write mode whenever the  $\overline{W}$  and  $\overline{E}$  pins are low. Either Chip Enable or  $\overline{W}$  must be inactive during Address transitions. The Write begins with the concurrence of Chip Enable being low with  $\overline{W}$  low. Therefore, address setup times are referenced to Write Enable and Chip Enable as  $t_{AVWL}$ , and  $t_{AVEL}$  respectively, and is determined by whichever edge occurs latter. The Write cycle can be terminated by the earliest rising edge of  $\overline{W}$  or Chip Enable ( $\overline{E}$ ).

If the Output is enabled ( $\overline{E} = \text{low}$ ,  $\overline{G} = \text{low}$ ), then  $\overline{W}$  will return the outputs to high impedance within  $t_{WLQZ}$  of its falling edge. Care must be taken to avoid bus contention in this type of operation. Data-in must be valid for  $t_{DVWH}$  to the rising edge of Write Enable, or to the rising edge of  $\overline{E}$ , whichever occurs first, and remain valid  $t_{WHDX}$ .

**AC ELECTRICAL CHARACTERISTICS (WRITE CYCLE)**

( $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$ ,  $V_{CC} = 5.0 \pm 10\%$ )

SYMBOL	PARAMETER	MK48256-100		MM48256-120		UNIT	NOTE
		MIN	MAX	MIN	MAX		
$t_{AVAV}$	Write Cycle Time	100		120		ns	
$t_{AVWL}$	Address Set-up Time to $\overline{W}$ Low	0		0			
$t_{AVEL}$	Address Set-up Time to $\overline{E}$ Low	0		0			
$t_{AVWH}$	address valid to $\overline{W}$ High	80		85			
$t_{WLWH}$	Write Pulse Width	60		65			
$t_{WHAX}$	Address Hold After End Of Write	5		5			
$t_{ELEH}$	Chip Enable Active To End Of Write	80		85			
$t_{EHAX}$	Address Hold Time From Chip Enable	5		5			
$t_{DVWH}$	Data Valid To End Of Write	40		45			
$t_{WHDX}$	Data Hold Time	0		0			
$t_{WHQX}$	$\overline{W}$ High to Q Active	5		5			5
$t_{WLQZ}$	$\overline{W}$ Low to Q High-Z	0	35	0	40		5

NOTE : 5. Measured with load as shown in Figure 8B.

Figure 4 : Write Control Cycle Timing

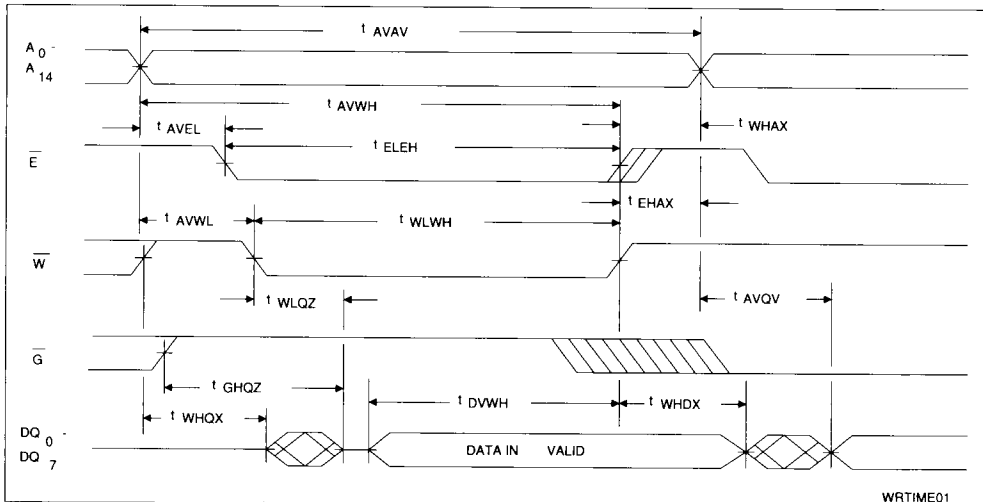
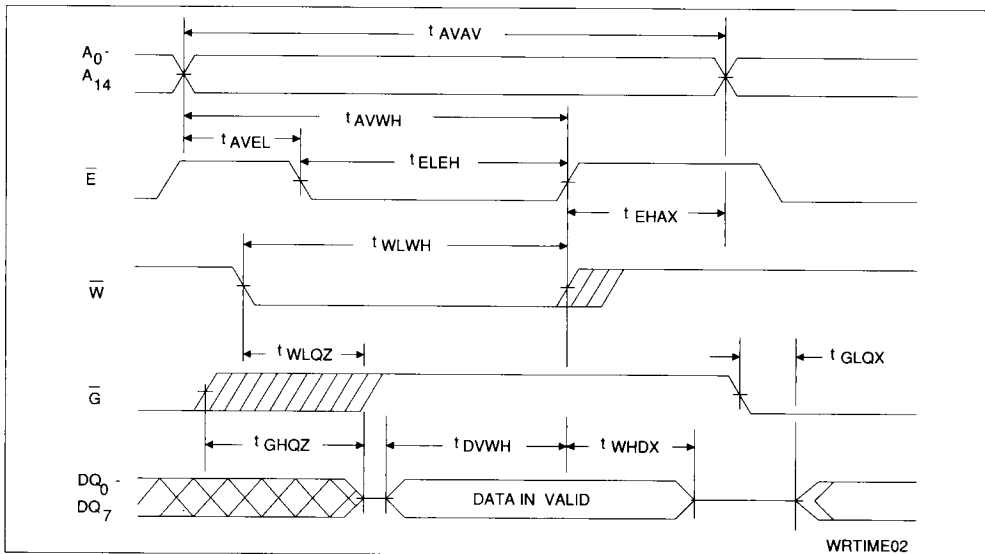


Figure 5 : Chip Enable Control Write Cycle Timing



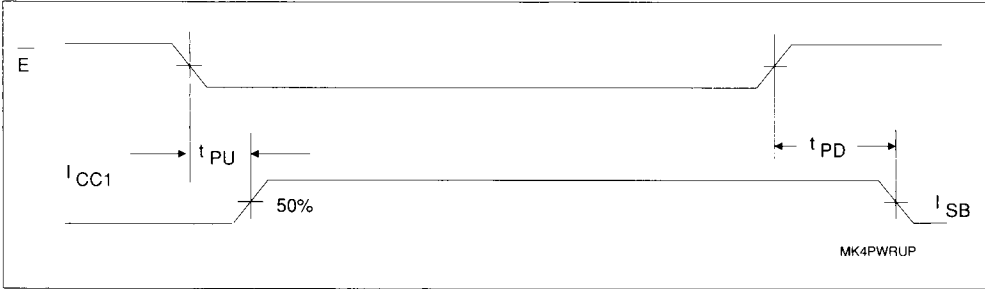
**STANDBY MODE CHARACTERISTICS**

(0°C ≤ T<sub>A</sub> ≤ +70°C, V<sub>CC</sub> = 5.0V ± 10%)

SYMBOL	PARAMETER	MK48256-100		MK48256-120		UNIT
		MAX	MIN	MAX	MIN	
t <sub>PU</sub> †	Chip Enable to Power-Up	0		0		ns
t <sub>PD</sub> †	Chip Enable to Power-Down		100		120	ns

† Parameters are guaranteed but not tested.

**Figure 6 : Standby Mode Timing**



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

(0°C ≤ T<sub>A</sub> ≤ +70°C, V<sub>CC</sub> = 5.0 ± 10%)

SYMBOL	PARAMETER	MAX	MAX	UNIT	NOTE
V <sub>DR</sub>	V <sub>CC</sub> Data Retention Mode	2.0		V	9
I <sub>CCDR</sub> <sup>(1)</sup>	Data Retention Pwr. supply Current Test Condition : V <sub>CC</sub> = 3.0	MK48256	500	μA	9
		MK48256L	50	μA	9
t <sub>CDR</sub> †	Chip Deselect to Data Retention Mode	0		nS	9
t <sub>R</sub> †	Operation Recovery Time	t <sub>AVAV</sub> <sup>(2)</sup>		nS	9

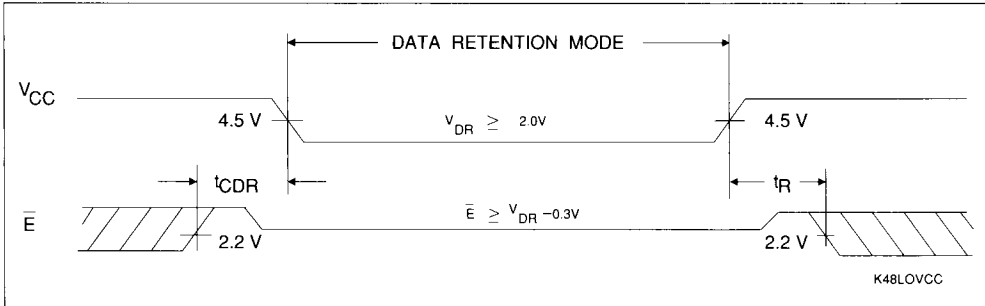
NOTE : 9. E-bar ≥ V<sub>CC</sub> - 0.3v, all other inputs = don't care ; f = 0

† Parameters are guaranteed but not tested.

<sup>(1)</sup> For I<sub>CCDR</sub> between V<sub>CC</sub> (MIN.) and V<sub>CC</sub> (MAX.) refer to ISB1.

<sup>(2)</sup> t<sub>AVAV</sub> = Read Cycle Time.

**Figure 7 : Low V<sub>CC</sub> Data Retention**



**ABSOLUTE MAXIMUM RATINGS \***

SYMBOL	PARAMETER	VALUE	UNIT
V <sub>I</sub>	Voltage On Any Pin Relative to Ground	-0.5 to +7.0	V
T <sub>A</sub>	Ambient Operating Temperature	0 to 70	°C
T <sub>STG</sub>	Storage Temperature	-65 to 150	°C
P <sub>D</sub>	Power Dissipation	1	W
I <sub>O</sub>	Output Current †	50	mA

\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

† Output current absolute maximum rating is specified for one output at a time, not to exceed a duration of 1 second.

**RECOMMENDED DC OPERATING CONDITIONS**

(0°C ≤ T<sub>A</sub> ≤ +70°C)

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT	NOTE
V <sub>CC</sub>	Supply Voltage	4.5	5.0	5.5	V	1
V <sub>SS</sub>	Ground	0	0	0	V	1
V <sub>IH</sub>	Logic "1" Voltage All Inputs	2.2		V <sub>CC</sub> + 0.3V	V	1
V <sub>IL</sub>	Logic "0" Voltage All Inputs	-0.3		0.8	V	1

**DC ELECTRICAL CHARACTERISTICS**

(0°C ≤ T<sub>A</sub> ≤ +70°C)

SYMBOL	PARAMETER	MIN	MAX	UNIT	NOTE
I <sub>CC1</sub>	Average V <sub>CC</sub> Power Supply Current		70	mA	6
I <sub>SB</sub>	TTL Standby Current ( $\bar{E} = V_{IH}$ )		3	mA	7
I <sub>SB1</sub>	CMOS Standby Current ( $\bar{E} = V_{CC} - 0.2V$ )	MK48256	1	mA	8
		MK48256L	100	μA	8
I <sub>LI</sub>	Input Leakage Current (Any Input)	-1	+1	μA	2
I <sub>LO</sub>	Output Leakage Current	-2	+2	μA	2
V <sub>OH</sub>	Output Logic "1" Voltage (I <sub>OUT</sub> = -4.0 mA)	2.4		V	1
V <sub>OL</sub>	Output Logic "0" Voltage (I <sub>OUT</sub> = +8.0 mA)		0.4	V	1

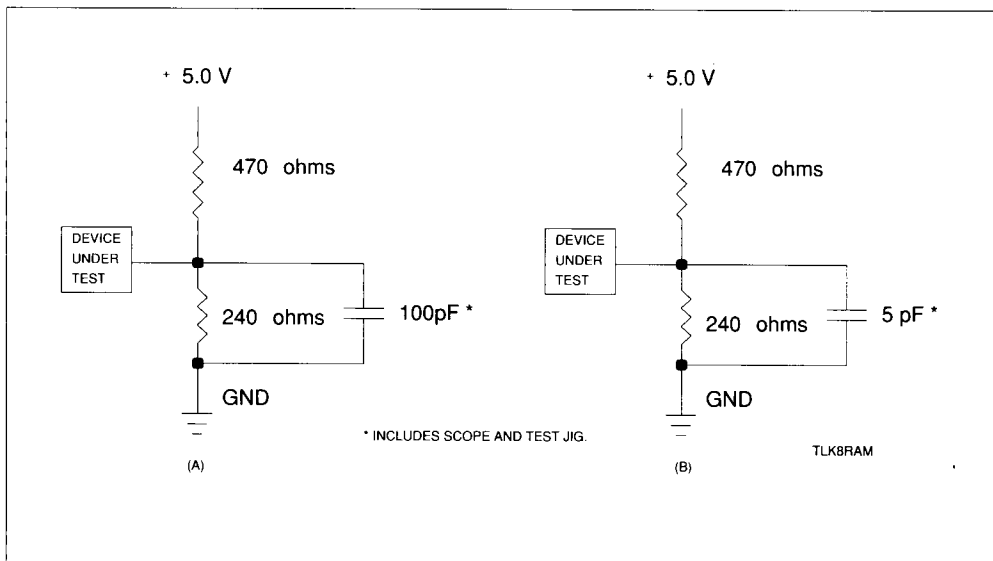
- NOTES :
1. All voltages references to Ground.
  2. Measured with V<sub>SS</sub> ≤ V ≤ V<sub>CC</sub> and outputs deselected.
  6. I<sub>CC1</sub> measured with outputs open, V<sub>CC</sub> max ; f = min.duty cycle 100%.
  7.  $\bar{E} = V_{IH}$ , all other inputs = don't care ; f = 0
  8. V<sub>CC</sub> (max) ≥  $\bar{E} \geq V_{CC} - 0.3V$ , all other inputs = don't care ; f = 0.

**AC TEST CONDITIONS**

Input Levels	GND to 3.0 V
Transition Time	1.5 ns
Input and Output Signal Timing Reference Level	1.5 Volts
Ambient Temperature	0°C to 70°C
V <sub>CC</sub>	5.0V ± 10%

Note : ± 5% V-bump test is employed for t<sub>AVQV</sub> only.

**Figure 8 : Output Load Diagram**



**CAPACITANCE (TA = 25°C, f = 1.0 MHz)**

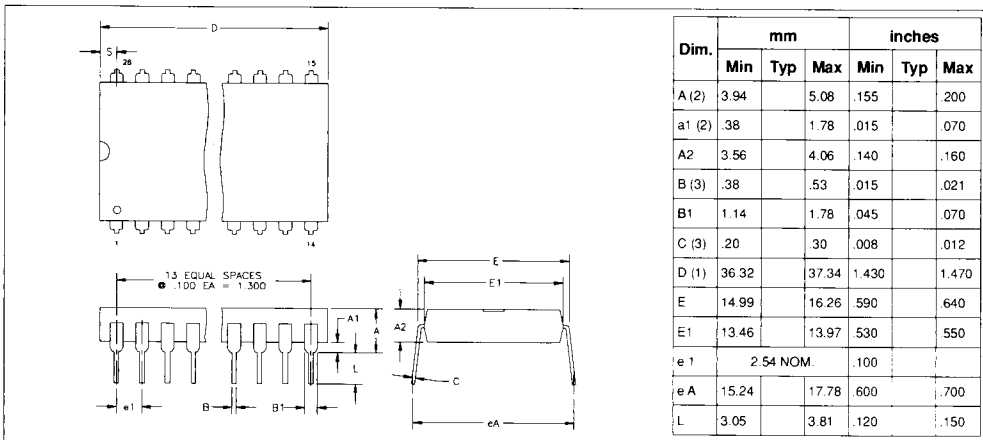
Symbol	Parameter	Max	Unit	Note
C <sub>I</sub>	Capacitance on all pins (except DQ)	8.0	pF	10
C <sub>DQ</sub>	Capacitance on DQ pins	10.0	pF	3,10

- NOTES : 3. Output buffer is deselected.  
 10. Capacitances are sampled and not 100 % tested.



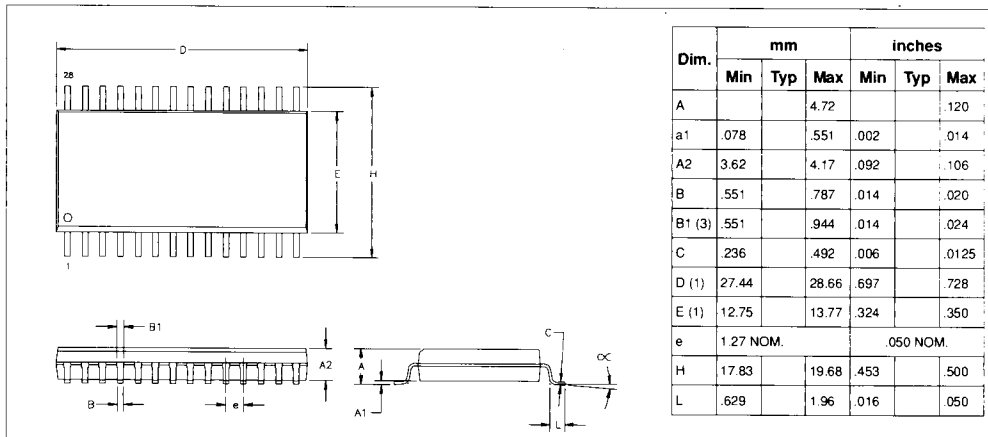
## MECHANICAL INFORMATION

Figure 9 : Plastic PDIP28



- NOTES : 1. Overall length includes .010 IN. Flash on either end of the package.  
 2. Package stand off to be measured per jedec requirements.  
 3. The maximum limit shall be increased by .003 IN. When solder lead finish is specified.

Figure 10 : Plastic PSO28



- NOTES : 1. Overall length and width dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed .006 per side.  
 2. Formed leads shall be planar with respect to one another within .004 at seating plane.  
 3. B1 is to allow for positive dambar protrusion.

**ORDERING INFORMATION**

<b>PART NUMBER</b>	<b>ACCESS TIME</b>	<b>PACKAGE TYPE</b>	<b>TEMPERATURE RANGE</b>
MK48256N-100	100ns	28 PIN 600 Mil. Plastic DIP	0°C to 70°C
MK48256N-120	120ns	28 PIN 600 Mil. Plastic DIP	0°C to 70°C
MK48256LN-100	100ns	28 PIN 600 Mil. Plastic DIP	0°C to 70°C
MK48256LN-120	120ns	28 PIN 600 Mil. Plastic DIP	0°C to 70°C
MK48256S-100	100ns	28 PIN 330 mil. PSO	0°C to 70°C
MK48256S-120	120ns	28 PIN 330 mil. PSO	0°C to 70°C
MK48256LS-100	100ns	28 PIN 330 mil. PSO	0°C to 70°C
MK48256LS-100	120 ns	28 PIN 330 mil. PSO	0°C to 70°C

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