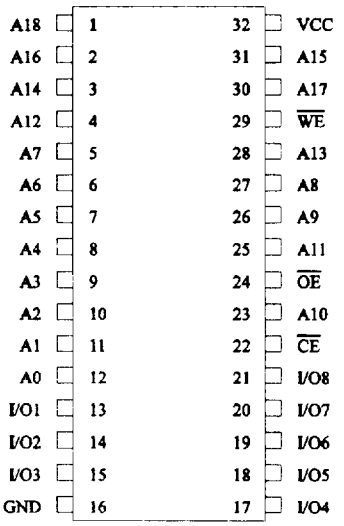
4Mb CMOS STATIC SRAM

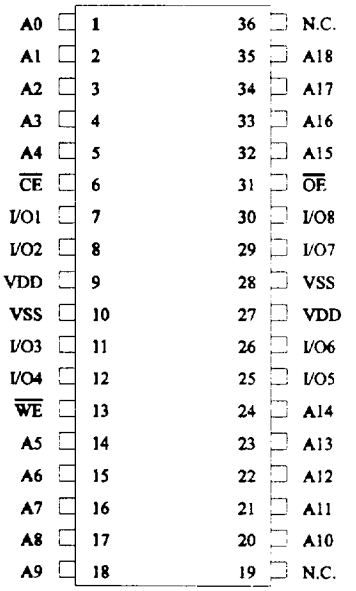
FEATURES

- **High density SRAM module**
- **Organized as 524,288 x 8**
- **Access time 20 - 35ns**
- **Low power consumption**
  Standby: 50mW(typ.)
  Operating: 700mW(typ.)
- **Power supply voltage 5V±10%**
- **TTL compatible inputs and outputs**
- **Fully static operation**
- **JEDEC standard pinout**
- **Available Packages:**
  32 Pin 400 mil SOJ
  36 Pin 400 mil SOJ
  32 Pin 600 mil DIP

32 Pin Configuration



36 Pin Configuration



Pin Descriptions

A0-A18	Address Inputs
I/O1-I/O8	Data Inputs/Outputs
$\overline{CE}$	Chip Enable
$\overline{OE}$	Output Enable
$\overline{WE}$	Write Enable
VCC	Power Supply
GND	Ground

GENERAL DESCRIPTION

The ELPAQ EMS512K8E is a high performance 4Mb CMOS SRAM module organized as 524,288 bytes of 8 bits each, using four 1Mb SRAMs and a decoder. The EMS512K8E is packaged in a new small 32 or 36 lead 400 mil wide plastic SOJ, featuring ELPAQs proprietary die stacking technology. The module is also available in a standard 600 mil plastic DIP package.

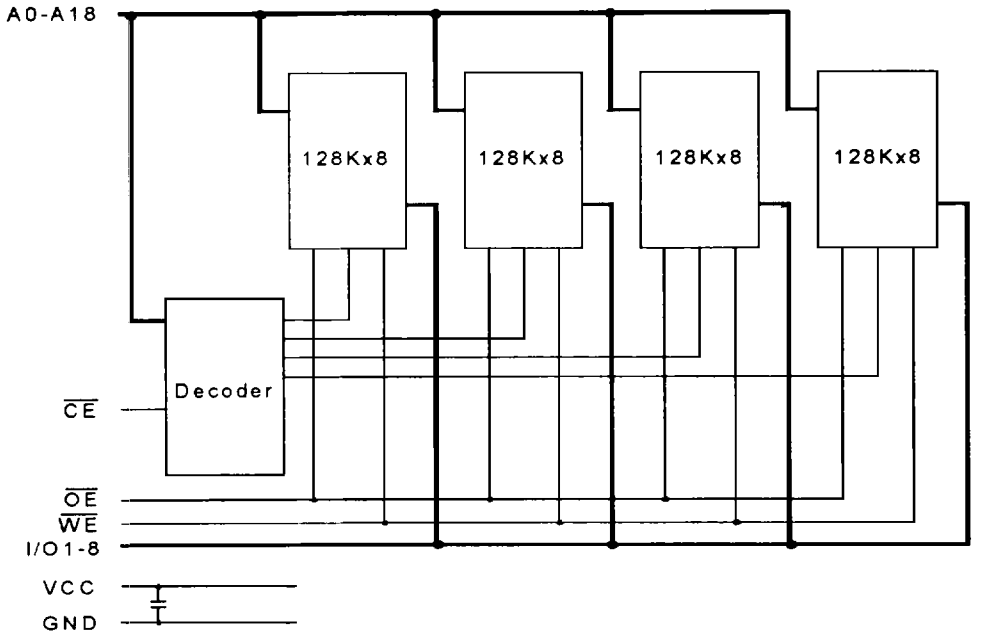
The EMS512K8E is functionally equivalent and plug-in compatible to the 4Mb monolithic SRAM, and can therefore be used in new designs where the 4Mb monolithic will eventually be used.

All inputs and outputs are TTL compatible and the module operates from a single 5V power supply. The EMS512K8E is a fully asynchronous SRAM and requires no clocks for operation. The module is also available in Low Power and Low Power with Data Retention versions for applications where low current and low stand-by voltages are required.

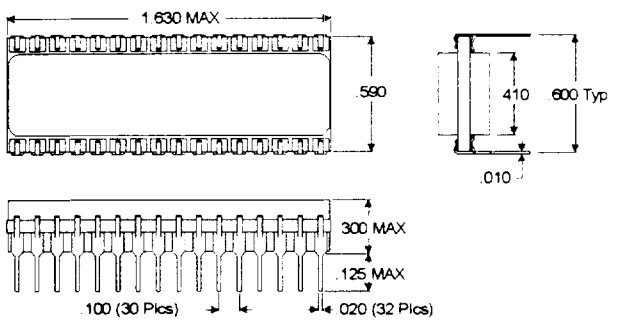
Writing data to the module is accomplished by bringing the chip enable ($\overline{CE}$) and write enable ($\overline{WE}$) inputs LOW. Data present on the eight I/O pins (I/O_1 - I/O_8) of the device is then written into the memory location specified by the address inputs (A_0 - A_{18}). Reading data from the device is accomplished by bringing chip enable ($\overline{CE}$) and ($\overline{OE}$) LOW while write enable remains inactive or HIGH. The data in the location specified by the address inputs will then appear on the I/O pins.

7590 North Glenoaks Blvd, Burbank, CA 91504-1052
Tel. (818)768-7500 Fax. (818)767-3195

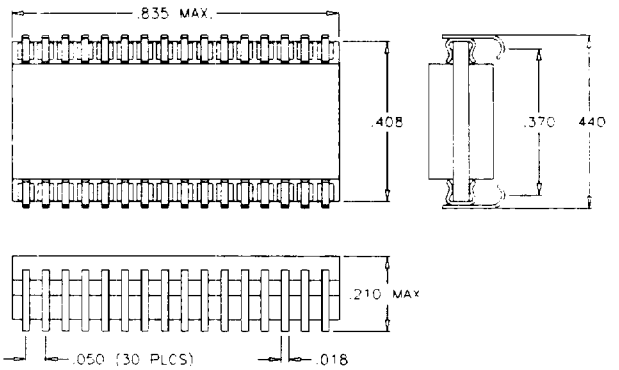
BLOCK DIAGRAM



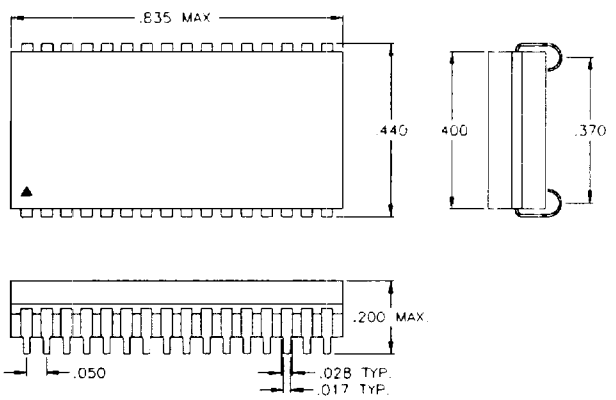
PACKAGE OUTLINES



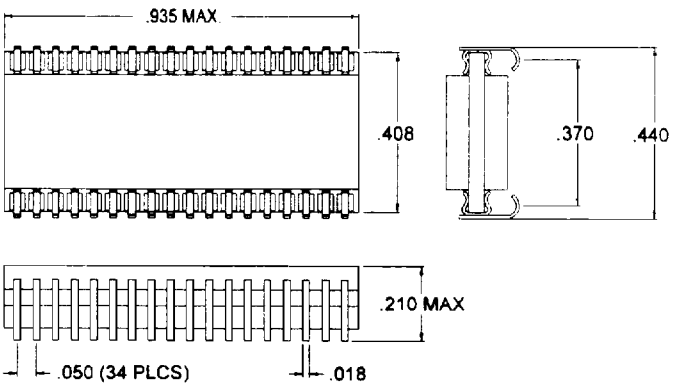
Package Type MO6, 32 Lead .600" Plastic DIP



Package Type MO8, 32 Lead .400" SOJ



Package Type MO7, 32 Lead .400" SOJ



Package Type MO9, 36 Lead .400" SOJ

7590 North Glenoaks Blvd, Burbank, CA 91504-1052
Tel. (818)768-7500 Fax. (818)767-3195

ABSOLUTE MAXIMUM RATINGS

Storage Temperature	
Plastic Packages	-55°C to +125°C
Voltage and Current	
Supply Voltage	-0.5 to +7.0V
Input Voltage	-0.5 to Vcc+0.5V
Input/Output Voltage	-0.5 to Vcc+0.5V
Allowable Power Dissipation	1W
Soldering Temperature*Time	230°C * 10s

OPERATING RANGES

Operating Temperature	
Commercial	0°C to +70°C
Industrial	-40°C to +85°C
Voltage and Current	
Supply Voltage	4.5 to 5.5V
Input High Voltage	2.2 to Vcc+0.3V
Input Low Voltage	-0.3 to 0.8V

FUNCTIONAL TRUTH TABLE

$\overline{CE}$	$\overline{OE}$	$\overline{WE}$	Mode	I/O1 - 8	Vcc Current
H	X	X	Not Selected	High Z	ISB1, ISB2
L	H	H	Output Disable	High Z	ICC
L	L	H	Read	Data Out	ICC
L	X	L	Write	Data In	ICC

CAPACITANCE (Ta=25°C, f=1MHz)

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C_{IN}	VIN = 0V		30	50	pF
Input/Output Capacitance	$C_{I/O}$	VI/O = 0V		40	50	pF

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

7590 North Glenoaks Blvd, Burbank, CA 91504-1052
Tel. (818)768-7500 Fax. (818)767-3195

DC CHARACTERISTICS (Vcc=5V±10%, Ta=Topr)

Item	Symbol	Test Condition	Speed	Min.	Typ.	Max.	Unit
Input Leakage Current	IIL	VIN=GND or VCC	All	-20		20	µA
Output Leakage Current	IOL	VI/O=GND or VCC, $\overline{CE}$=VIH $\overline{OE}$=VIH or $\overline{WE}$=VIL	All	-20		20	µA
Average Operating Current	ICC	Min. Cycle, Iout=0mA VIH=VCC-0.2V, VIL=0.2V	20 25 35		180 150 120	300 250 170	mA mA mA
Standby Current	ISB1	$\overline{CE}$≥VCC-0.2V, VIN≥VCC-0.2V	All		8	20	mA
	ISB2	$\overline{CE}$=VIH, VIN=VIL or VIH	All			80	mA
Output High Voltage	VOH	IOH=-4.0mA	All	2.4			V
Output Low Voltage	VOL	IOL=8.0mA	All			0.4	V

AC CHARACTERISTICS (Vcc=5V±10%, Ta=Topr)

AC Test Conditions

Item	Condition
Input Pulse High Level	VIH=3V
Input Pulse Low Level	VIL=0V
Input Pulse Rise Time	tr=5ns
Input Pulse Fall Time	tf=5ns
Input and Output Timing Level	1.5V
Output Load	Fig. 1

Output Load

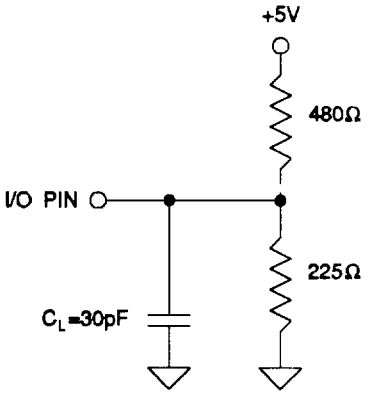


Fig. 1

NOTE: C_L= 5pF for TEHQZ, TELQX, TGHQZ, TGLQX, TWLQZ, TWHQX

Read Cycle

Item	Symbol	-20		-25		-35		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle Time	TAVAV	20		25		35		ns
Address Access Time	TAVQV		20		25		35	ns
Chip Enable Access Time	TELQV		20		25		35	ns
Output Enable to Output Valid	TGLQV		8		8		20	ns
Chip Enable to Output in High Z (1)	TEHQZ		12		12		15	ns
Chip Enable to Output in Low Z (1)	TELQX	5		5		5		ns
Output Disable to Output in High Z (1)	TGHQZ		8		8		12	ns
Output Enable to Output in Low Z (1)	TGLQX	0		0		0		ns
Output Hold from Address Change	TAVQX	5		5		5		ns

Write Cycle

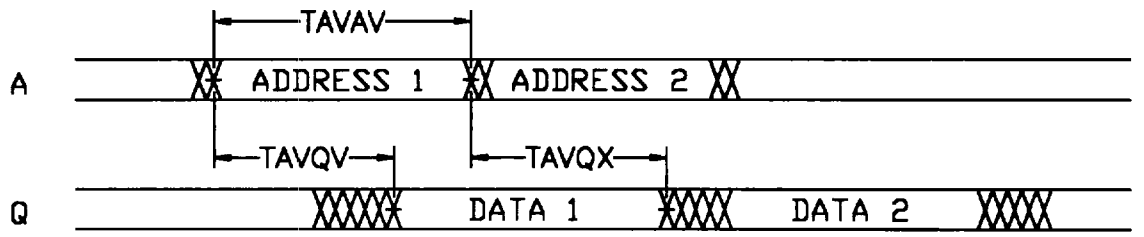
Item	Symbol	-20		-25		-35		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Write Cycle Time	TAVAV	20		25		35		ns
Address Valid to End of Write	TAVWH	15		20		30		ns
Chip Enable to End of Write	TELWH	17		17		25		ns
	TWLEH	17		17		25		ns
Data to Write Time Overlap	TDVWH	10		12		15		ns
	TDVEH	10		12		15		ns
Data Hold Time from Write	TWHDX	0		0		0		ns
	TEHDX	0		0		0		ns
Write Pulse Width	TWLWH	15		15		20		ns
	TELEH	15		15		20		ns
Address Set-up Time	TAVWL	0		0		0		ns
	TAVEL	0		0		0		ns
Write Recovery Time	TWHAX	0		0		0		ns
	TEHAX	0		0		0		ns
Write to Output in High Z (1)	TWLQZ		8		10		15	ns
Output Active from End of Write (1)	TWHQX	0		0		0		ns

NOTE 1: This parameter is guaranteed by design and sample tested only.

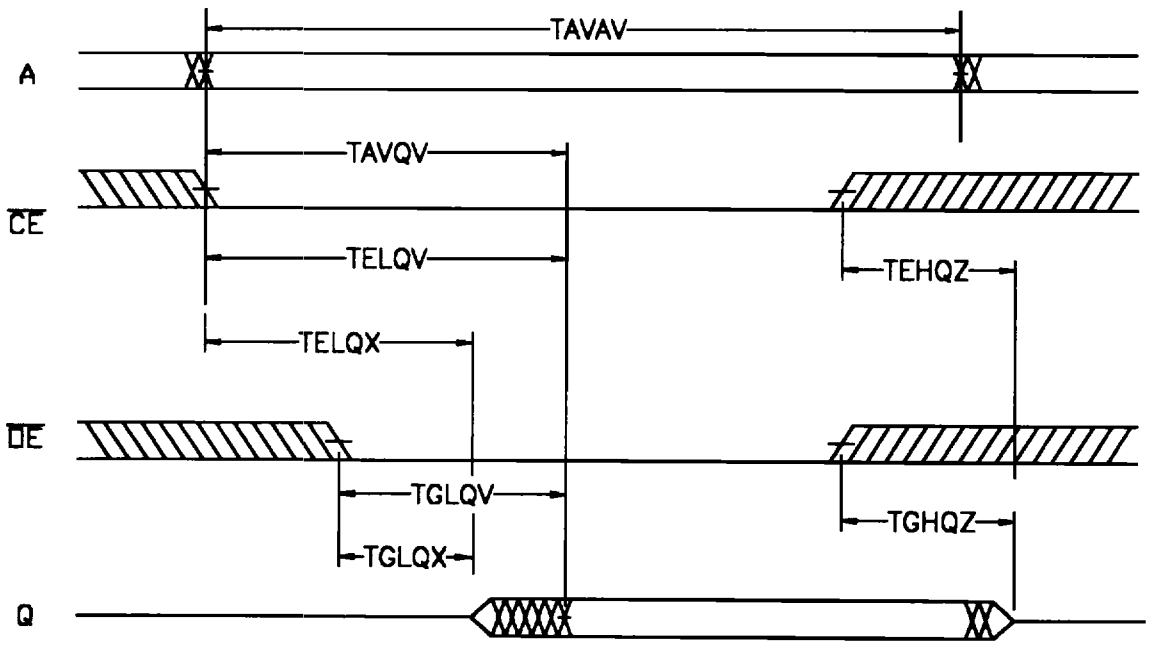
Timing Diagrams

Read Cycle Timing

Read Cycle 1: $\overline{CE}$=$\overline{OE}$=VIL, $\overline{WE}$=VIH

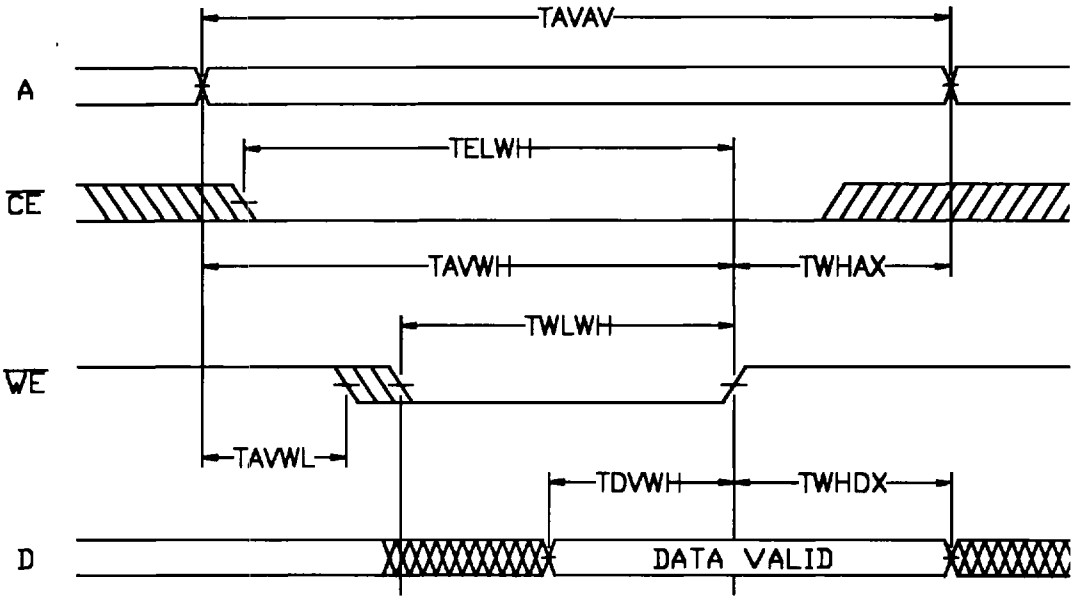


Read Cycle 2: $\overline{WE}$=VIH

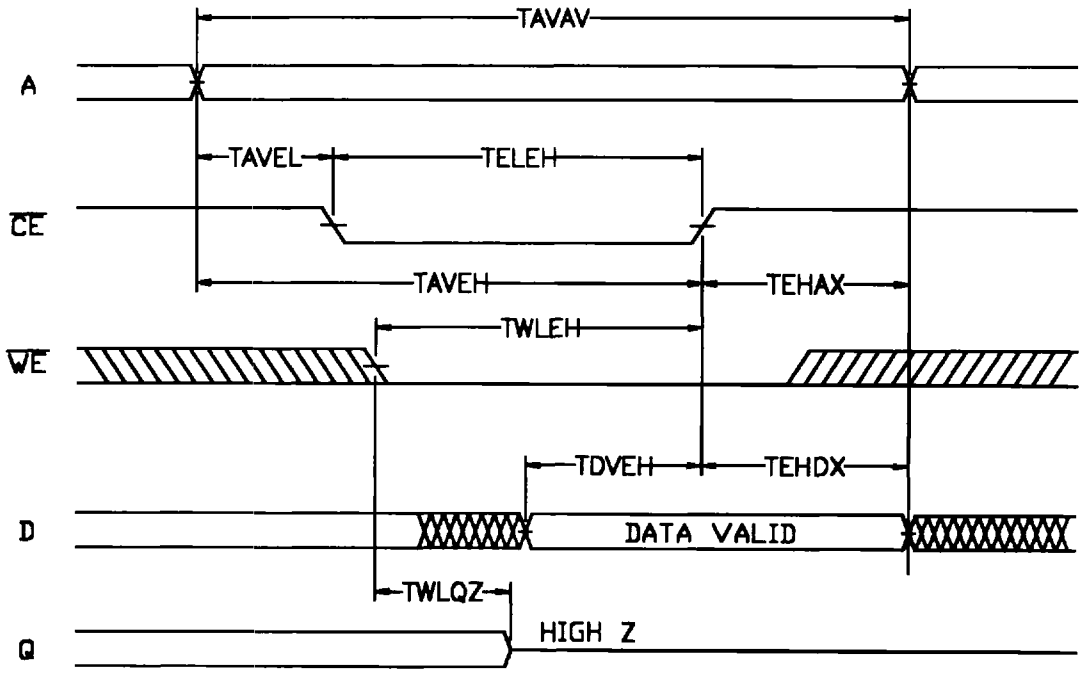


Write Cycle Timing

Write Cycle 1: $\overline{WE}$ Control



Write Cycle 2: $\overline{CE}$ Control



NOTES:

ORDERING INFORMATION

EMS512K8E ***MO7*** ***-20*** ***C***

Temperature Range

C = Commercial (0 - 70°C)
I = Industrial (-40 - +85°C)

Speed

-20 = 20ns Access Time
-25 = 25ns Access Time
-35 = 35ns Access Time

Package

MO6 = .600" 32 Lead Plastic DIP
MO7 = .400" 32 Lead Plastic SOJ, Type I *
MO8 = .400" 32 Lead Plastic SOJ, Type C *
MO9 = .400" 36 Lead Plastic SOJ, Type C *

* Also available in reverse leaded configuration for over-under applications. MO7R, MO8R, MO9R.

7590 North Glenoaks Blvd, Burbank, CA 91504-1052
Tel. (818)768-7500 Fax. (818)767-3195