CYPRESS SEMICONDUCTOR

CYM1460

512K x 8 Static RAM Module

Features

- **High-density 4-megabit SRAM module**
- **High-speed CMOS SRAMs**
  - **Access time of 35 ns**
- **Low active power**
  - **3.4W (max.)**
- **Double-sided SMD technology**
- **TTL-compatible inputs and outputs**
- **Low profile version (PF)**
  - **Max. height of .345 in.**
- **Small footprint SIP version (PS)**
  - **PCB layout area of 1.2 sq. in.**

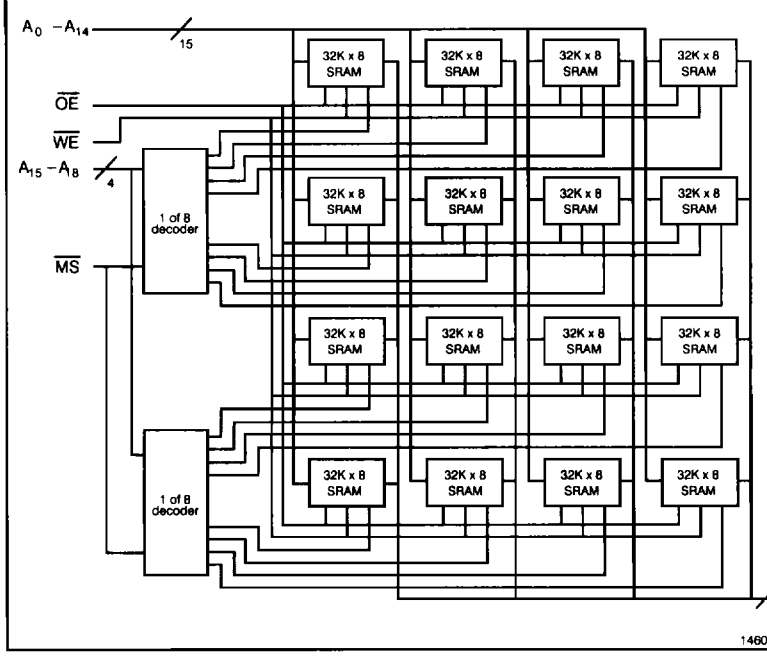
Functional Description

The CYM1460 is a high-performance 4-megabit static RAM module organized as 512K words by 8 bits. This module is constructed from sixteen 32K x 8 SRAMs in plastic surface mount packages on an epoxy laminate board with pins. Two choices of pins are available for vertical (PS) or horizontal (PF) through-hole mounting. On-board decoding selects one of the sixteen SRAMs from the high-order address lines, keeping the remaining fifteen devices in standby mode for minimum power consumption.

An active LOW write enable signal ($\overline{WE}$) controls the writing/reading operation of the memory. When $\overline{MS}$ and $\overline{WE}$ inputs are both LOW, data on the eight data input/output pins is written into the memory location specified on the address pins. Reading the device is accomplished by selecting the device and enabling the outputs, $\overline{MS}$ and $\overline{OE}$, active LOW, while $\overline{WE}$ remains inactive or HIGH. Under these conditions, the content of the location addressed by the information on the address pins is present on the eight data input/output pins.

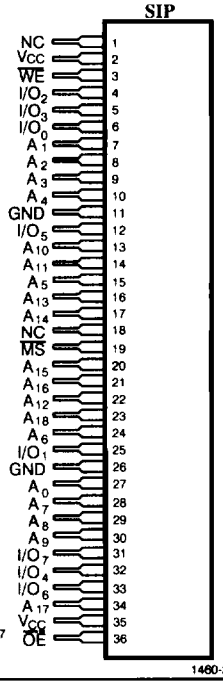
The input/output pins remain in a high-impedance state unless the module is selected, outputs are enabled, and write enable ($\overline{WE}$) is HIGH.

Logic Block Diagram



Pin Configuration

SIP



Selection Guide

	1460–35	1460–45	1460–55	1460–70
Maximum Access Time (ns)	35	45	55	70
Maximum Operating Current (mA)	625	625	625	625
Maximum Standby Current (mA)	560	560	560	560

Maximum Ratings

(Above which the useful life may be impaired)

Storage Temperature ..... −65°C to +150°C

Ambient Temperature with Power Applied ..... 0°C to +70°C

Supply Voltage to Ground Potential ..... −0.5V to +7.0V

DC Voltage Applied to Outputs in High Z State ..... −0.5V to +7.0V

DC Input Voltage ..... −0.5V to +7.0V

Operating Range

Range	Ambient Temperature	V_{CC}
Commercial	0°C to +70°C	5V ± 10%

Electrical Characteristics Over the Operating Range

Parameters	Description	Test Conditions	CYM1460		Units
			Min.	Max.	
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = −4.0 mA	2.4		V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 8.0 mA	0.4	V	
V_{IH}	Input HIGH Voltage		2.2	V_{CC}	V
V_{IL}	Input LOW Voltage		−0.5	0.8	V
I_{IX}	Input Load Current	GND ≤ V_I ≤ V_{CC}	−20	+20	µA
I_{OZ}	Output Leakage Current	GND ≤ V_I ≤ V_{CC} Output Disabled	−20	+20	µA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max., MS < V_{IL} I_{OUT} = 0 mA		625	mA
I_{SB1}	Automatic $\overline{MS}$ Power-Down Current	Max. V_{CC}, $\overline{MS}$ ≥ V_{IH} Min. Duty Cycle = 100%		560	mA
I_{SB2}	Automatic $\overline{MS}$ Power-Down Current	Max. V_{CC} $\overline{MS}$ ≥ V_{CC} − 0.2V, V_{IN} ≥ V_{CC} − 0.2V or V_{IN} ≤ 0.2V		320	mA

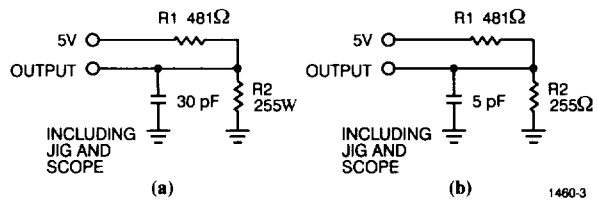
Capacitance[1]

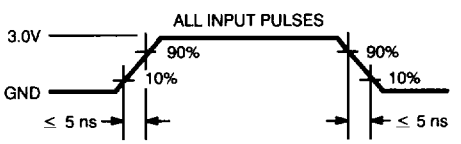
Parameters	Description	Test Conditions	Max.	Unit
C_{IN}	Input Capacitance	T_A = 25°C, f = 1 MHz V_{CC} = 5.0V	120	pF
C_{OUT}	Output Capacitance		180	pF

Notes:

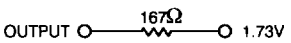
1. Tested on a sample basis.

AC Test Loads and Waveforms





Equivalent to: THÉVENIN EQUIVALENT



9 MODULES

Switching Characteristics Over the Operating Range [2]

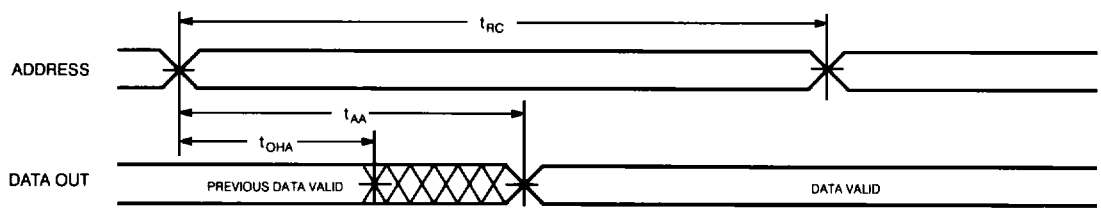
Parameters	Description	1460-35		1460-45		1460-55		1460-70		Units
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE										
t_{RC}	Read Cycle Time	35		45		55		70		ns
t_{AA}	Address to Data Valid		35		45		55		70	ns
t_{OHA}	Data Hold from Address Change	3		3		3		3		ns
t_{AMS}	$\overline{MS}$ LOW to Data Valid		35		45		55		70	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		15		20		25		30	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z	0		0		0		0		ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z [3]		15		25		25		30	ns
t_{LZMS}	$\overline{MS}$ LOW to Low Z [4]	5		5		5		5		ns
t_{HZMS}	$\overline{MS}$ HIGH to High Z [3, 4]		15		20		25		35	ns
WRITE CYCLE [5]										
t_{WC}	Write Cycle Time	35		45		55		70		ns
t_{SMS}	$\overline{MS}$ LOW to Write End	30		40		50		60		ns
t_{AW}	Address Set-Up to Write End	30		40		50		60		ns
t_{HA}	Address Hold from Write End	5		5		5		5		ns
t_{SA}	Address Set-Up to Write Start	5		5		5		5		ns
t_{PWE}	$\overline{WE}$ Pulse Width	25		30		40		55		ns
t_{SD}	Data Set-Up to Write End	15		20		25		30		ns
t_{HD}	Data Hold from Write End	5		5		5		5		ns
t_{HZWE}	$\overline{WE}$ LOW to High Z [3]		15		20		25		25	ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z	3		3		3		3		ns

Notes:

2. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 1.5V, input levels of 0 to 3.0V and output loading of the specified I_{OL}/I_{OH} and 30-pF load capacitance.
3. t_{HZOE}, t_{HZMS} and t_{HZWE} are specified with $C_L = 5$ pF as in part (b) of AC Test Loads. Transition is measured ±500 mV from steady state voltage.
4. At any given temperature and voltage condition, t_{HZMS} is less than t_{LZMS} for any given device. These parameters are guaranteed and not 100% tested.
5. The internal write time of the memory is defined by the overlap of $\overline{MS}$ LOW and $\overline{WE}$ LOW. Both signals must be LOW to initiate a write and either signal can terminate a write by going HIGH. The data input set-up and hold timing should be referenced to the rising edge of the signal that terminates the write.
6. $\overline{WE}$ is HIGH for read cycle.
7. Device is continuously selected. $\overline{OE}$, $\overline{MS}$ = V_{IL}.
8. Address valid prior to or coincident with $\overline{MS}$ transition LOW.
9. Data I/O is HIGH impedance if $\overline{OE}$ = V_{IH}.
10. If $\overline{MS}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.

Switching Waveforms

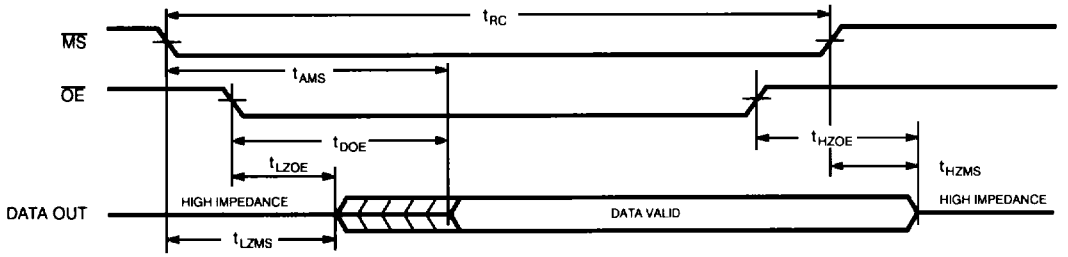
Read Cycle No. 1 [6, 7]



1460-5

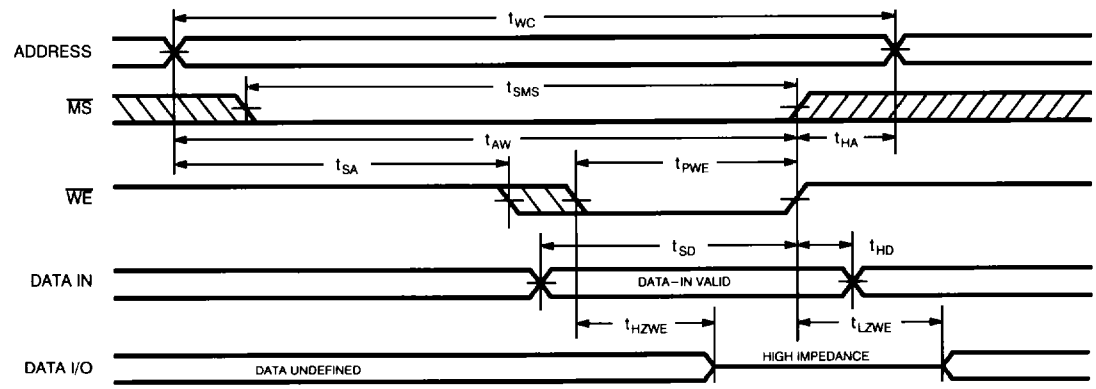
Switching Waveforms (continued)

Read Cycle No. 2 [6, 8]



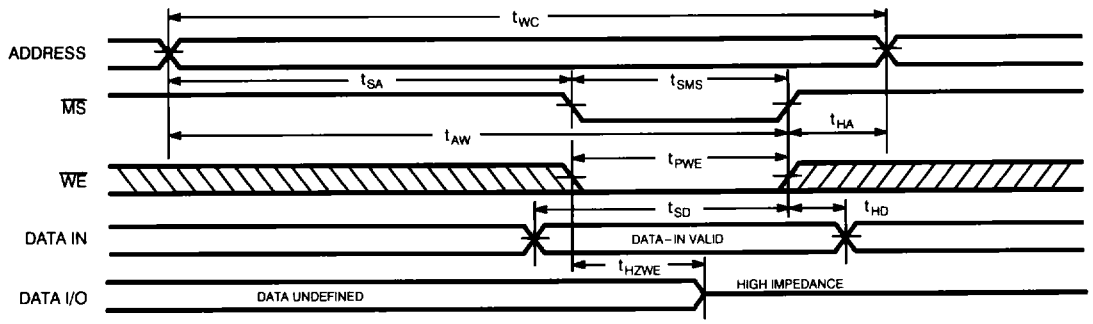
1460-6

Write Cycle No. 1 ($\overline{WE}$ Controlled) [5, 9]



1460-7

Write Cycle No. 2 ($\overline{MS}$ Controlled) [5, 9, 10]



1460-8

Truth Table

$\overline{MS}$	$\overline{WE}$	$\overline{OE}$	Input/Outputs	Mode
H	X	X	High Z	Deselect/Power-Down
L	H	L	Data Out	Read
L	L	X	Data In	Write
L	H	H	High Z	Deselect

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Ordering Information

Speed	Ordering Code	Package Type	Operating Range
35	CYM1460PS-35C	PS05	Commercial
	CYM1460PF-35C	PF03	
45	CYM1460PS-45C	PS05	Commercial
	CYM1460PF-45C	PF03	
55	CYM1460PS-55C	PS05	Commercial
	CYM1460PF-55C	PF03	
70	CYM1460PS-70C	PS05	Commercial
	CYM1460PF-70C	PF03	