CYM1821

16K x 32 Static RAM Module

Features

- **High-density 512-Kbit SRAM module**
- **32-bit standard footprint supports densities from 16K x 32 through 1M x 32**
- **High-speed CMOS SRAMs**
  - **Access time of 12 ns**
- **Low active power**
  - **4W (max.)**
- **SMD technology**
- **TTL-compatible inputs and outputs**
- **Low profile**
  - **Max. height of .50 in.**
- **Small PCB footprint**
  - **1.0 sq. in.**
- **JEDEC-compatible pinout**

Functional Description

The CYM1821 is a high-performance 512-Kbit static RAM module organized as 16K words by 32 bits. This module is constructed from eight 16K x 4 SRAM SOJ packages mounted on an epoxy laminate board with pins. Four chip selects ($\overline{CS}_1$, $\overline{CS}_2$, $\overline{CS}_3$, and $\overline{CS}_4$) are used to independently enable the four bytes. Reading or writing can be executed on individual bytes or any combination of multiple bytes through proper use of selects.

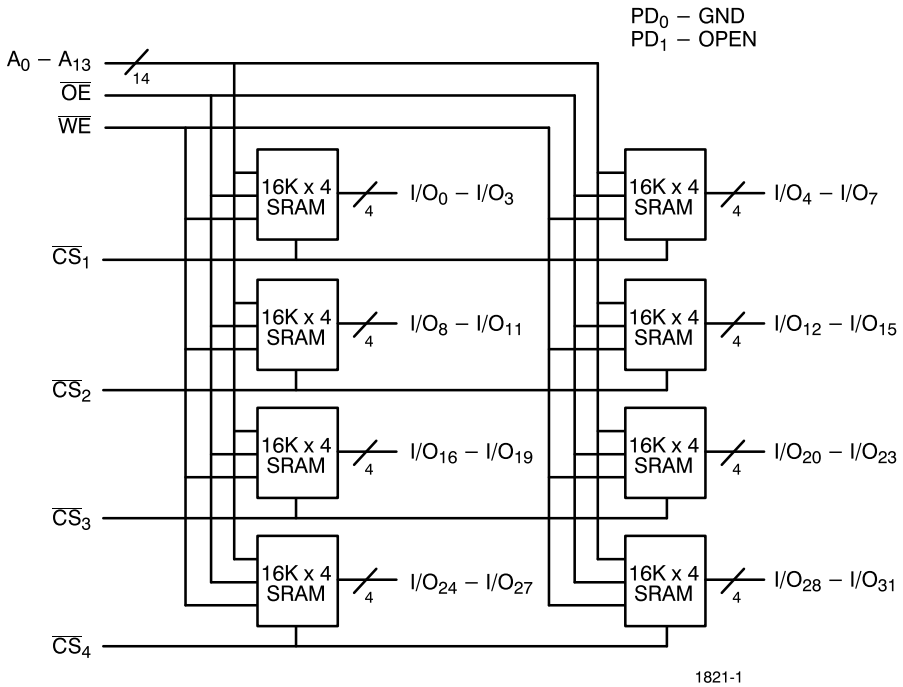
Writing to each byte is accomplished when the appropriate chip selects ($\overline{CS}_N$) and write enable ($\overline{WE}$) inputs are both LOW. Data on the input/output pins (I/O_X) is written into the memory location specified on the address pins (A_0 through A_{13}).

Reading the device is accomplished by taking the chip selects ($\overline{CS}_N$) LOW, while write enable ($\overline{WE}$) remains HIGH. Under these conditions the contents of the memory location specified on the address pins will appear on the data input/output pins (I/O_X).

The data input/output pins stay in the high-impedance state when write enable ($\overline{WE}$) is LOW, or the appropriate chip selects are HIGH.

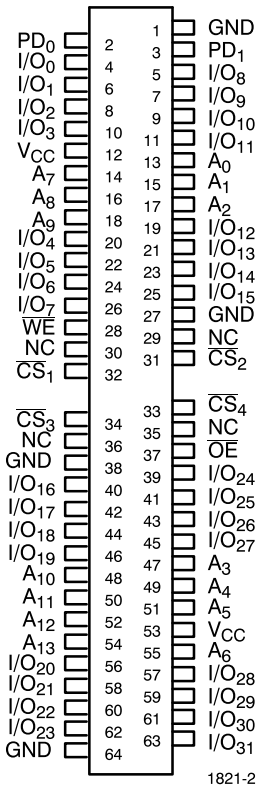
Two pins (PD_0 and PD_1) are used to identify module memory density in applications where alternate versions of the JEDEC standard modules can be interchanged.

Logic Block Diagram



Pin Configuration

ZIP
Top View



Selection Guide

	1821–12	1821–15	1821–20	1821–25	1821–35	1821–45
Maximum Access Time (ns)	12	15	20	25	35	45
Maximum Operating Current (mA)	960	960	720	720	720	720
Maximum Standby Current (mA)	450	450	160	160	160	160

Maximum Ratings

(Above which the useful life may be impaired.)

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

Ambient Temperature with Power Applied ..... −10°C to +85°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

Output Current into Outputs (LOW) ..... 20 mA

Operating Range

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

Electrical Characteristics Over the Operating Range

Parameter	Description	Test Conditions	1821−12 1821−15		1821−20 1821−25 1821−35 1821−45		Unit
			Min.	Max.	Min.	Max.	
V_{OH}	Output HIGH Voltage	V_{CC} = Min., I_{OH} = − 4.0 mA	2.4		2.4		V
V_{OL}	Output LOW Voltage	V_{CC} = Min., I_{OL} = 8.0 mA		0.4		0.4	V
V_{IH}	Input HIGH Voltage		2.2	V_{CC}	2.2	V_{CC}	V
V_{IL}	Input LOW Voltage		−0.5	0.8	−0.5	0.8	V
I_{IX}	Input Load Current	GND ≤ V_I ≤ V_{CC}	−20	+20	−20	+20	µA
I_{OZ}	Output Leakage Current	GND ≤ V_O ≤ V_{CC}, Output Disabled	−20	+20	−20	+20	µA
I_{OS}	Output Short Circuit Current[1]	V_{CC} = Max., V_{OUT} = GND		−350		−350	mA
I_{CC}	V_{CC} Operating Supply Current	V_{CC} = Max., I_{OUT} = 0 mA, $\overline{CS}$ ≤ V_{IL}		960		720	mA
I_{SB1}	Automatic $\overline{CS}$ Power-Down Current[2]	Max. V_{CC}, $\overline{CS}$ ≥ V_{IH}, Min. Duty Cycle = 100%		450		160	mA
I_{SB2}	Automatic $\overline{CS}$ Power-Down Current[2]	Max. V_{CC}, $\overline{CS}_N$ ≥ V_{CC} − 0.3V, V_{IN} ≥ V_{CC} − 0.3V or V_{IN} ≤ 0.3V		160		160	mA

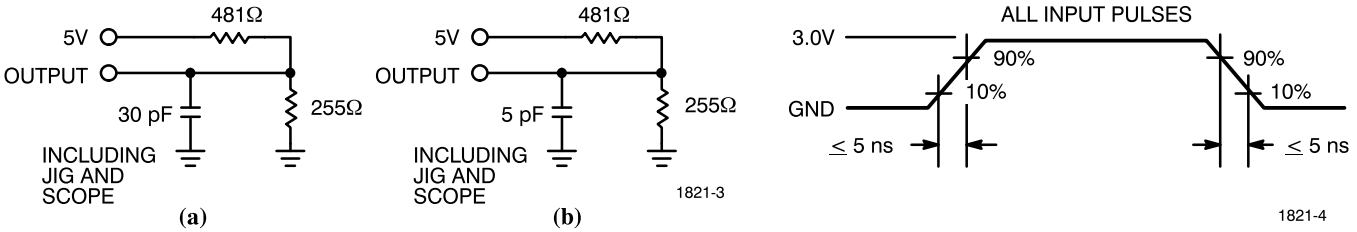
Capacitance[3]

Parameter	Description	Test Conditions	Max.	Unit
C_{INA}	Input Capacitance (ADDR, $\overline{OE}$, $\overline{WE}$)	T_A = 25°C, f = 1 MHz, V_{CC} = 5.0V	70	pF
C_{INB}	Input Capacitance ($\overline{CS}$)		35	pF
C_{OUT}	Output Capacitance		20	pF

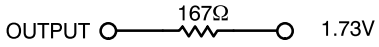
Notes:

1. Not more than 1 output should be shorted at one time. Duration of the short circuit should not exceed 30 seconds.
2. A pull-up resistor to V_{CC} on the $\overline{CS}$ input is required to keep the device deselected during V_{CC} power-up, otherwise I_{SB} will exceed values given.
3. Tested on a sample basis.

AC Test Loads and Waveforms



Equivalent to: THÉVENIN EQUIVALENT



Switching Characteristics Over the Operating Range[4]

Parameter	Description	1821−12		1821−15		1821−20		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE								
t_{RC}	Read Cycle Time	12		15		20		ns
t_{AA}	Address to Data Valid		12		15		20	ns
t_{OHA}	Data Hold from Address Change	2		2		2		ns
t_{ACS}	$\overline{CS}$ LOW to Data Valid		12		15		20	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		10		10		10	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z	2		2		3		ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z		8		8		8	ns
t_{LZCS}	$\overline{CS}$ LOW to Low Z[5]	3		3		5		ns
t_{HZCS}	$\overline{CS}$ HIGH to High Z[5, 6]		8		8		8	ns
t_{PU}	$\overline{CS}$ LOW to Power-Up	0		0		0		ns
t_{PD}	$\overline{CS}$ HIGH to Power-Down		12		15		20	ns
WRITE CYCLE[7]								
t_{WC}	Write Cycle Time	12		15		20		ns
t_{SCS}	$\overline{CS}$ LOW to Write End	10		12		15		ns
t_{AW}	Address Set-Up to Write End	10		12		15		ns
t_{HA}	Address Hold from Write End	2		2		2		ns
t_{SA}	Address Set-Up to Write Start	0		0		2		ns
t_{PWE}	$\overline{WE}$ Pulse Width	10		12		15		ns
t_{SD}	Data Set-Up to Write End	10		10		10		ns
t_{HD}	Data Hold from Write End	2		2		2		ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z	3		3		3		ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[6]	0	7	0	7	0	7	ns

Notes:

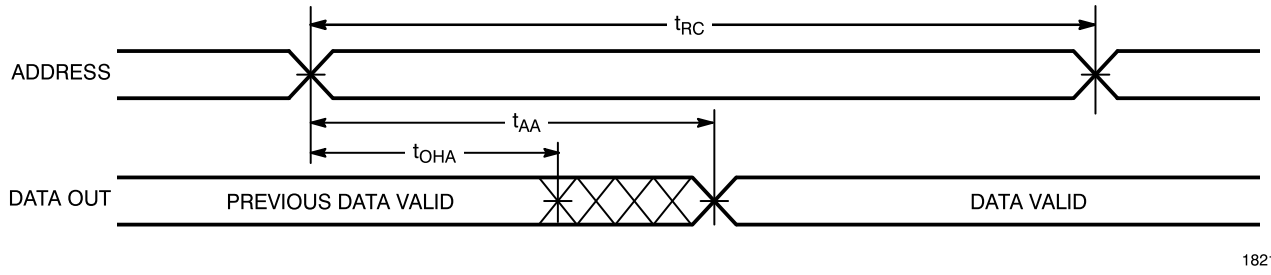
4. Test conditions assume signal transition times of 5 ns or less, timing reference levels of 1.5V, input pulse levels of 0 to 3.0V, and output loading of the specified I_{OL}/I_{OH} and 30-pF load capacitance.
5. At any given temperature and voltage condition, t_{HZCS} is less than t_{LZCS} for any given device. These parameters are guaranteed by design and not 100% tested.
6. t_{HZCS} and t_{HZWE} are specified with $C_L = 5$ pF as in part (b) of AC Test Loads and Waveforms. Transition is measured ±500 mV from steady-state voltage.
7. The internal write time of the memory is defined by the overlap of $\overline{CS}$ 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.

Switching Characteristics Over the Operating Range (continued)[4]

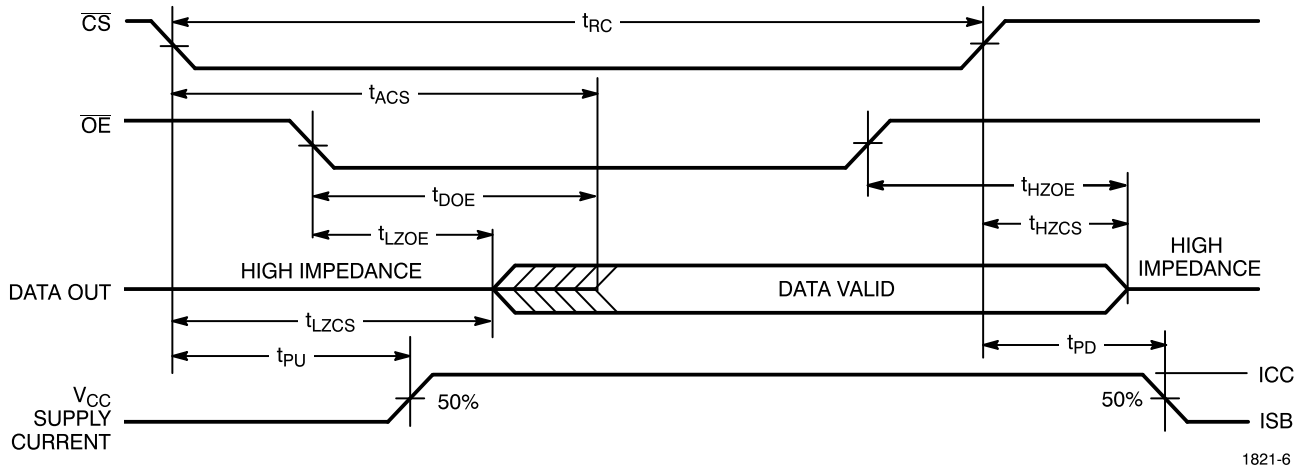
Parameter	Description	1821−25		1821−35		1821−45		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
READ CYCLE								
t_{RC}	Read Cycle Time	25		35		45		ns
t_{AA}	Address to Data Valid		25		35		45	ns
t_{OHA}	Data Hold from Address Change	3		3		3		ns
t_{ACS}	$\overline{CS}$ LOW to Data Valid		25		35		45	ns
t_{DOE}	$\overline{OE}$ LOW to Data Valid		15		25		30	ns
t_{LZOE}	$\overline{OE}$ LOW to Low Z	3		3		3		ns
t_{HZOE}	$\overline{OE}$ HIGH to High Z		15		20		20	ns
t_{LZCS}	$\overline{CS}$ LOW to Low Z[5]	5		10		10		ns
t_{HZCS}	$\overline{CS}$ HIGH to High Z[5, 6]		10		15		20	ns
t_{PU}	$\overline{CS}$ LOW to Power-Up	0		0		0		ns
t_{PD}	$\overline{CS}$ HIGH to Power-Down		25		35		45	ns
WRITE CYCLE[7]								
t_{WC}	Write Cycle Time	25		35		45		ns
t_{SCS}	$\overline{CS}$ LOW to Write End	20		25		35		ns
t_{AW}	Address Set-Up to Write End	20		25		35		ns
t_{HA}	Address Hold from Write End	2		2		2		ns
t_{SA}	Address Set-Up to Write Start	2		2		2		ns
t_{PWE}	$\overline{WE}$ Pulse Width	20		25		30		ns
t_{SD}	Data Set-Up to Write End	13		15		20		ns
t_{HD}	Data Hold from Write End	2		2		2		ns
t_{LZWE}	$\overline{WE}$ HIGH to Low Z	3		5		5		ns
t_{HZWE}	$\overline{WE}$ LOW to High Z[6]	0	7	0	10	0	15	ns

Switching Waveforms

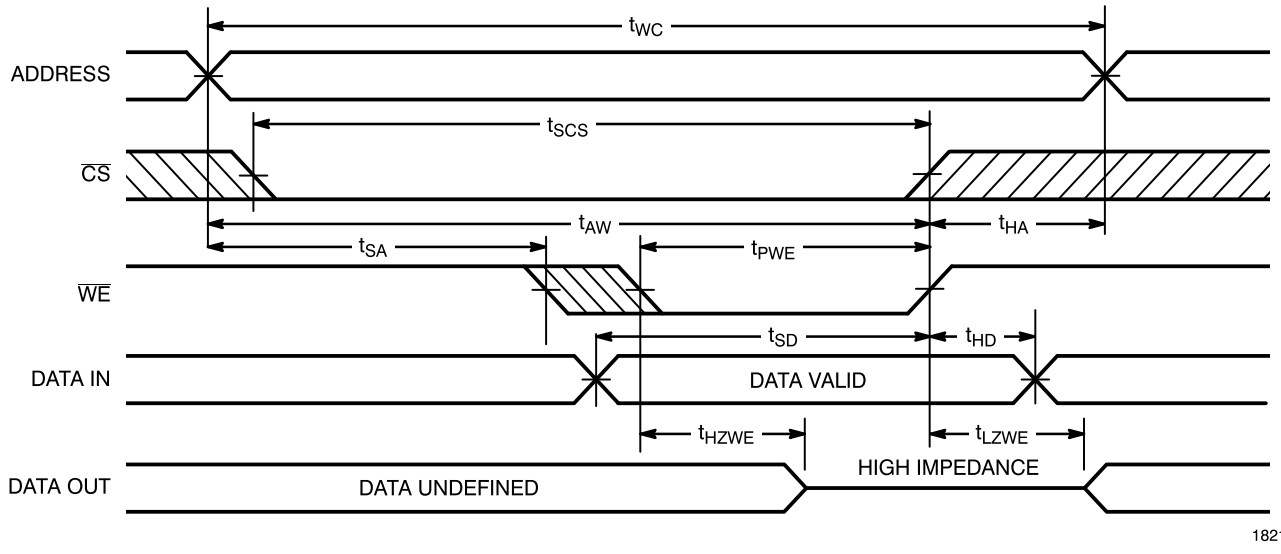
Read Cycle No. 1[8, 9]



Read Cycle No. 2 ($\overline{WE}$ Controlled)[8, 10]



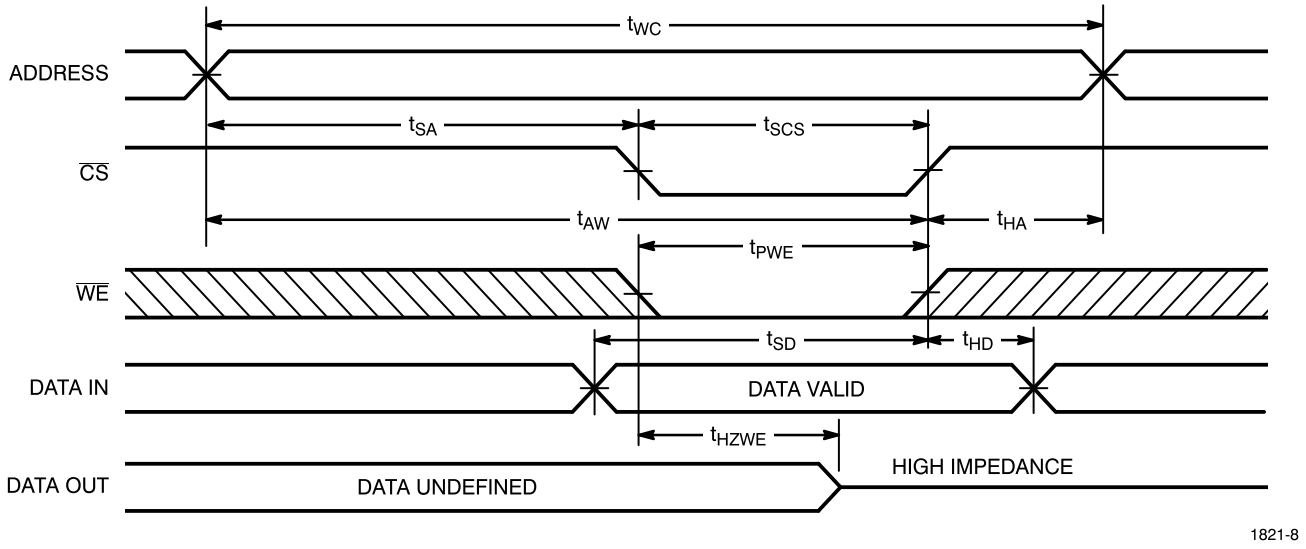
Write Cycle No. 1 ($\overline{WE}$ Controlled)[7]



Notes:
8. $\overline{WE}$ is HIGH for read cycle.
9. Device is continuously selected, $\overline{CS}$ = V_{IL} and $\overline{OE}$= V_{IL}.
10. Address valid prior to or coincident with $\overline{CS}$ transition LOW.

Switching Waveforms (continued)

Write Cycle No. 2 ($\overline{CS}$ Controlled)[7, 11]



Note:
11. If $\overline{CS}$ goes HIGH simultaneously with $\overline{WE}$ HIGH, the output remains in a high-impedance state.

Truth Table

$\overline{CS}_N$	$\overline{WE}$	$\overline{OE}$	Inputs/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

Ordering Information

Speed	Ordering Code	Package Name	Package Type	Operating Range
12	CYM1821PM−12C	PM01	64-Pin Plastic SIMM Module	Commercial
	CYM1821PZ−12C	PZ01	64-Pin Plastic ZIP Module	
15	CYM1821PM−15C	PM01	64-Pin Plastic SIMM Module	Commercial
	CYM1821PZ−15C	PZ01	64-Pin Plastic ZIP Module	
20	CYM1821PM−20C	PM01	64-Pin Plastic SIMM Module	Commercial
	CYM1821PZ−20C	PZ01	64-Pin Plastic ZIP Module	
25	CYM1821PM−25C	PM01	64-Pin Plastic SIMM Module	Commercial
	CYM1821PZ−25C	PZ01	64-Pin Plastic ZIP Module	
35	CYM1821PM−35C	PM01	64-Pin Plastic SIMM Module	Commercial
	CYM1821PZ−35C	PZ01	64-Pin Plastic ZIP Module	
45	CYM1821PM−45C	PM01	64-Pin Plastic SIMM Module	Commercial
	CYM1821PZ−45C	PZ01	64-Pin Plastic ZIP Module	

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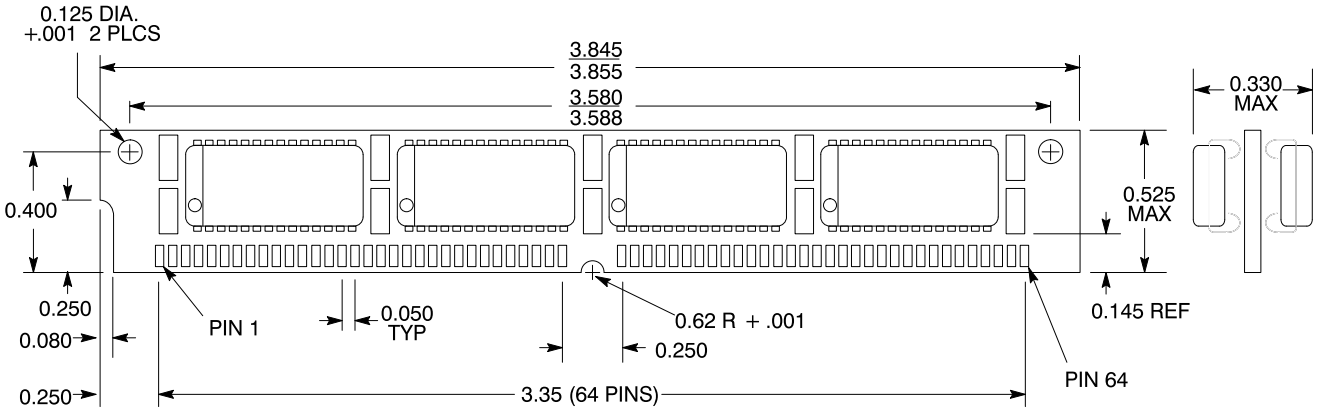
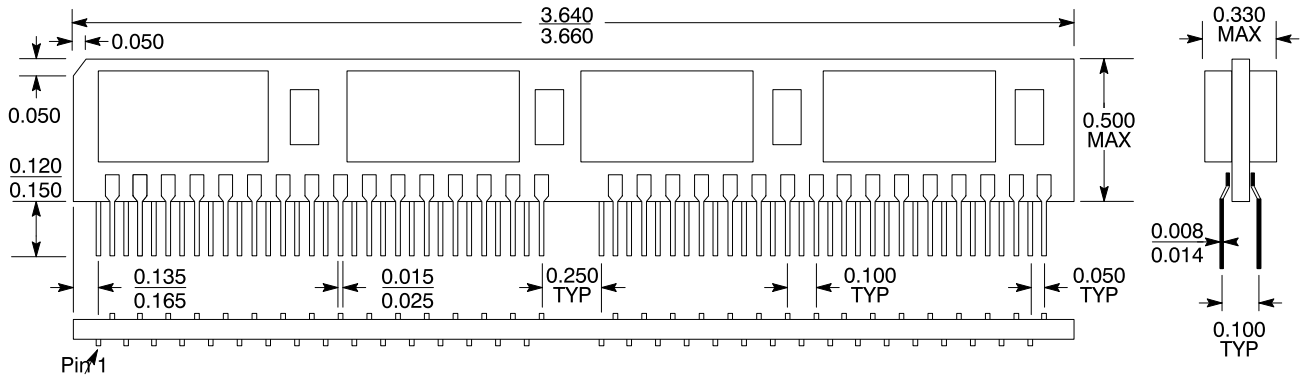
Package Diagrams

64-Pin Plastic SIMM Module PM01



64-Pin Plastic ZIP Module PZ01

Bottom View



DIMENSIONS IN INCHES

MIN.
MAX.