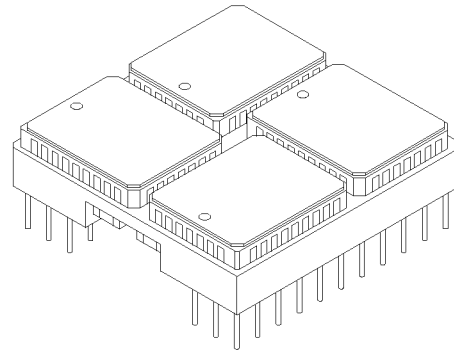


**DESCRIPTION:**

The DPE128C32V is a high-performance Electrically Erasable and Programmable Read Only Memory (EEPROM) module and may be organized as 128K X 32, 256K X 16 or 512K X 8.

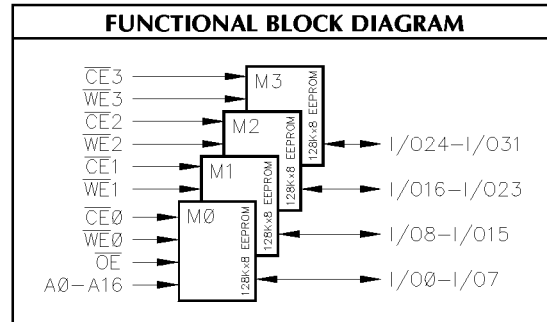
The module is built with four low-power CMOS 128K X 8 EEPROMs. The four chip enables are used for individual BWDW\* selection. The DPE128C32V is ideally suited for those computer systems having 16-bit or 32-bit architectures.

The DPE128C32V contains a 128-BWDW page register to allow writing of up to 128 BWDWs simultaneously. During a write cycle, the address and 1 to 128 BWDWs of data are internally latched, freeing the address and data bus for other operations. Following the initiation of a write cycle, the module will automatically write the latched data using an internal control timer. The end of a write cycle can be detected by DATA Polling of the most significant data bit in each byte. Once the end of a write cycle has been detected, a new access for a read or write can begin.



**FEATURES:**

- Fast Access Times: 120, 150, 200, 250ns
- Organizations Available:  
128K X 32, 256K X 16 or 512K X 8
- Automatic Page Write Operation  
Internal Address and Data Latches  
Internal Control Timer
- Fast Write Cycle Times  
Page Write Cycle Time: 10ms maximum  
1 to 128 BWDW\* Page Write Operation
- DATA Polling for END of Write Detection
- High Reliability CMOS Technology  
Endurance: 10<sup>4</sup> Cycles  
Data Retention: 10 years
- Single + 5V Power Supply, ±10% Tolerance
- CMOS and TTL Compatible Inputs and Outputs
- Available with All Semiconductor Components used to Construct the Module Compliant to MIL-STD-883; Class B
- 66-Pin PGA (Grid Array) Package
- Same Package as other Versapac Versions (SRAMs, EPROMs, and Mixed)



PIN NAMES	
A0 - A16	Address Inputs
I/O0 - I/O31	Data In/Out
CE0 - CE3	Chip Enables
WE0 - WE3	Write Enables
OE	Output Enable
VDD	Power (+ 5V)
VSS	Ground
N.C.	No Connect

\* Byte, Word or Double Word (BWDW).

**PIN-OUT DIAGRAM**

1 I/O8	12 WE1	23 I/O15	Ⓜ Ⓝ Ⓟ	Ⓢ Ⓣ Ⓤ	34 I/O24	45 VDD	56 I/O31
2 I/O9	13 CE1	24 I/O14	○ ○ ○	○ ○ ○	35 I/O25	46 CE3	57 I/O30
3 I/O10	14 VSS	25 I/O13	○ ○ ○	○ ○ ○	36 I/O26	47 WE3	58 I/O29
4 A14	15 I/O11	26 I/O12	○ ○ ○	○ ○ ○	37 A7	48 I/O27	59 I/O28
5 A16	16 A10	27 OE	○ ○ ○	○ ○ ○	38 A12	49 A4	60 A1
6 A11	17 A9	28 N.C.	○ ○ ○	○ ○ ○	39 N.C.	50 A5	61 A2
7 A0	18 A15	29 WE0	○ ○ ○	○ ○ ○	40 A13	51 A6	62 A3
8 N.C.	19 VDD	30 I/O7	○ ○ ○	○ ○ ○	41 A8	52 WE2	63 I/O23
9 I/O0	20 CE0	31 I/O6	○ ○ ○	○ ○ ○	42 I/O16	53 CE2	64 I/O22
10 I/O1	21 N.C.	32 I/O5	○ ○ ○	○ ○ ○	43 I/O17	54 VSS	65 I/O21
11 I/O2	22 I/O3	33 I/O4	Ⓠ Ⓡ Ⓢ	Ⓣ Ⓤ Ⓥ	44 I/O18	55 I/O19	66 I/O20

(TOP VIEW)

RECOMMENDED OPERATING RANGE <sup>1</sup>						
Symbol	Characteristic	Min.	Typ.	Max.	Unit	
V <sub>DD</sub>	Supply Voltage	4.5	5.0	5.5	V	
V <sub>IH</sub>	Input HIGH Voltage	2.0			V	
V <sub>IL</sub>	Input LOW Voltage			0.8	V	
T <sub>A</sub>	Operating Temperature	C	0	+ 25	+ 70	°C
		I	-40	+ 25	+ 85	
		M/B	-55	+ 25	+ 125	

TRUTH TABLE				
Mode	CE	OE	WE	I/I Pin
Standby	H	X	X	HIGH-Z
Read	L	L	H	D <sub>OUT</sub>
Write	L	H	L	D <sub>IN</sub>
Write Inhibit	X	L	X	HIGH-Z
Write Inhibit	X	X	H	HIGH-Z

L = LOW                      H = HIGH                      X = Don't Care

ABSOLUTE MAXIMUM RATINGS <sup>1</sup>			
Symbol	Parameter	Value	Unit
T <sub>STG</sub>	Storage Temperature	-65 to + 150	°C
T <sub>BIAS</sub>	Temperature Under Bias	-65 to + 135	°C
V <sub>DD</sub>	Supply Voltage <sup>2</sup>	-0.6 to + 6.25	°C
V <sub>I/O</sub>	Input/Output Voltage <sup>2</sup>	-0.6 to + 6.25	V

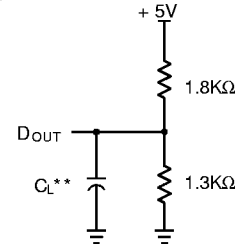
CAPACITANCE <sup>3</sup> : T <sub>A</sub> = 25°C, F = 1.0MHz				
Symbol	Parameter	Max.	Unit	Condition
C <sub>CE</sub>	Chip Enable	30	pF	V <sub>IN</sub> = 0V
C <sub>ADR</sub>	Address Input	70		
C <sub>WE</sub>	Write Enable	70		
C <sub>OE</sub>	Output Enable	70		
C <sub>I/O</sub>	Data Input/Output	30		

AC TEST CONDITIONS	
Input Pulse Levels	0V to 3.0V
Input Pulse Rise and Fall Times	5ns*
Input and Output Timing Reference Levels	1.5V

\* Transition between 0.8V and 2.2V.

Figure 1. Output Load

\*\* Including Probe and Jg Capacitance.



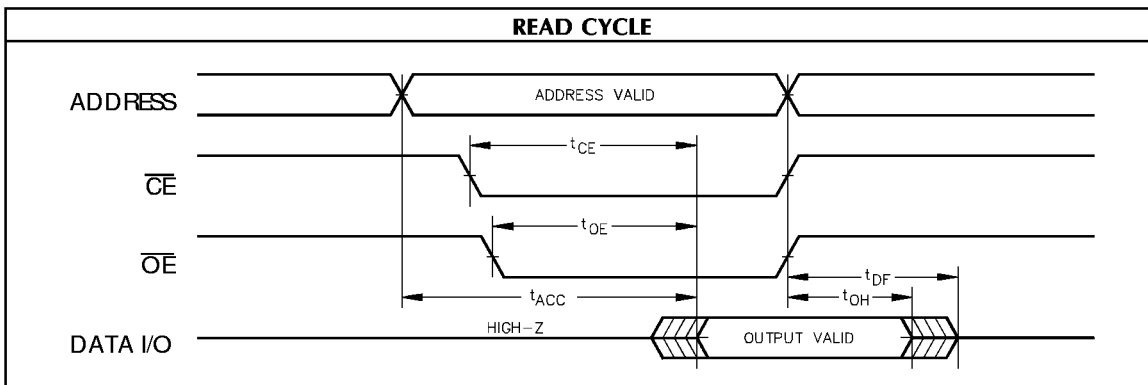
OUTPUT LOAD		
Load	C <sub>L</sub>	Parameters Measured
1	100pF	except t <sub>DF</sub>
2	5pF	t <sub>DF</sub>

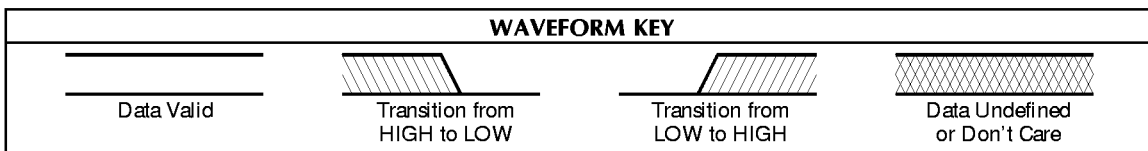
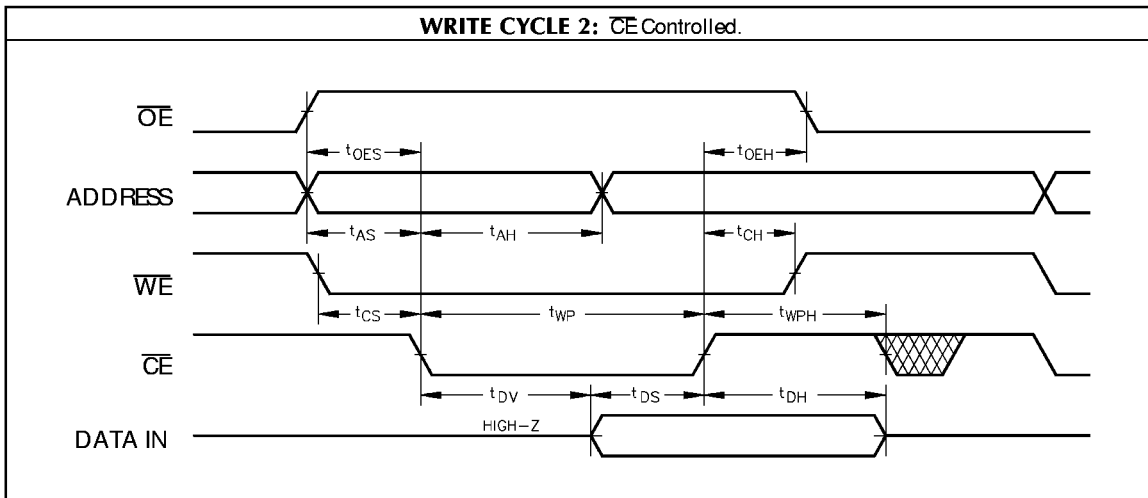
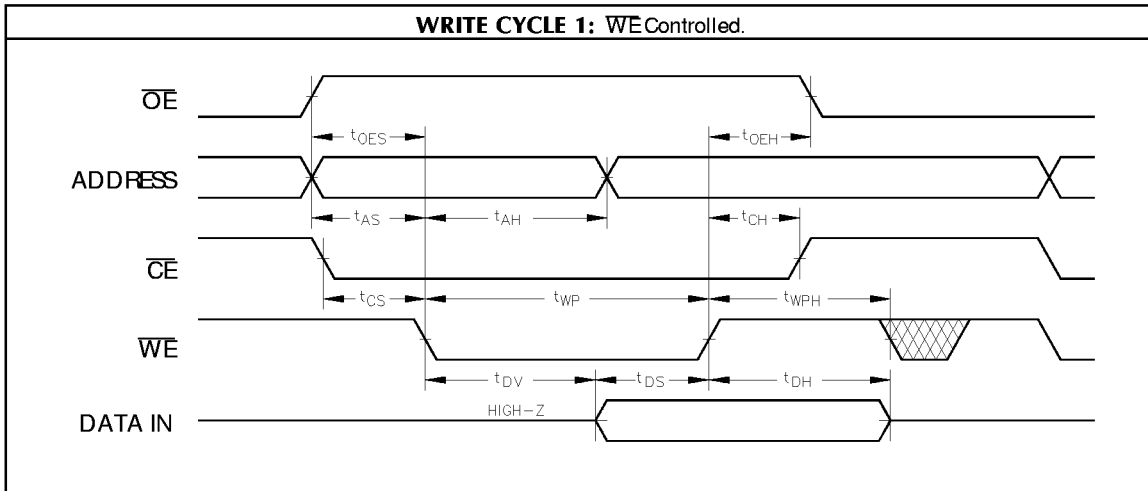
DC OPERATING CHARACTERISTICS: Over operating ranges									
Symbol	Characteristics	Test Conditions	X32		X16		X8		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	
I <sub>IN</sub>	Input Leakage Current	V <sub>IN</sub> = V <sub>DD</sub> Max.	-40	+ 40	-40	+ 40	-40	+ 40	μA
I <sub>OUT</sub>	Output Leakage Current	V <sub>OUT</sub> = V <sub>DD</sub> Max.	-10	+ 10	-20	+ 20	-40	+ 40	μA
I <sub>CC</sub>	Operating Supply Current	$\overline{CE} = \overline{OE} = V_{IL}$ , all I/O = 0mA, f = 5MHz		320		170		90	mA
I <sub>SB1</sub>	V <sub>DD</sub> Standby Current (TTL)	$\overline{CE} = V_{IH}$		12		12		12	mA
I <sub>SB2</sub>	V <sub>DD</sub> Standby Current (CMOS)	$\overline{CE} = V_{DD} - 0.3V_{dc}$		1.2		1.2		1.2	mA
V <sub>IL</sub>	Input Voltage Low			0.8		0.8		0.8	V
V <sub>IH</sub>	Input Voltage High		2.0		2.0		2.0		V
V <sub>OL</sub>	Output Voltage Low	I <sub>OUT</sub> = 2.1mA		0.45		0.45		0.45	V
V <sub>OH</sub>	Output Voltage High	I <sub>OUT</sub> = -400μA	2.4		2.4		2.4		V

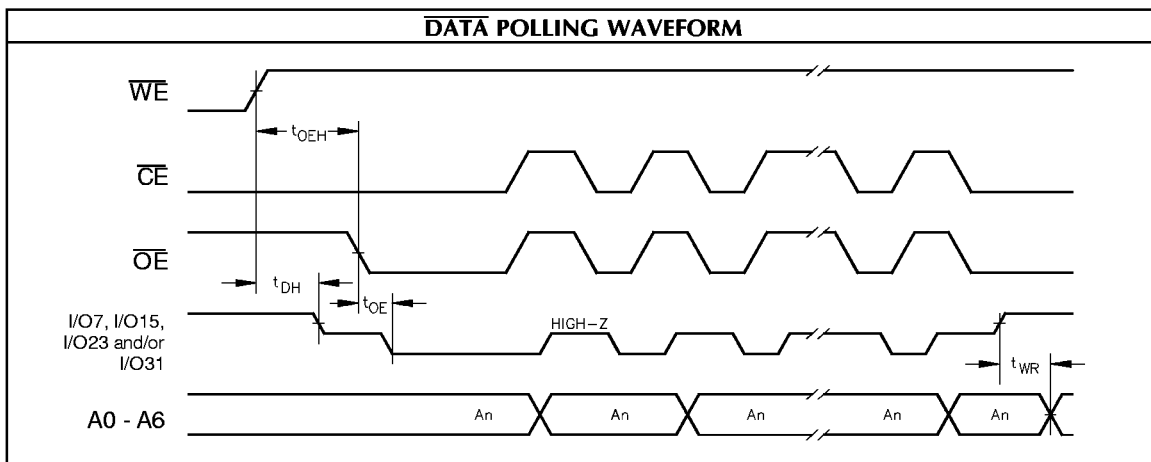
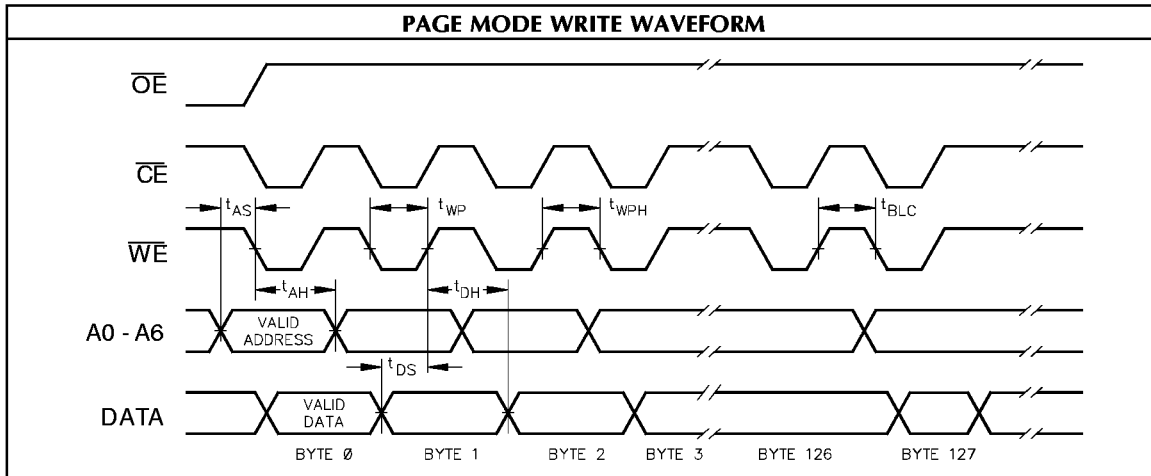
AC OPERATING CONDITIONS AND CHARACTERISTICS - READ CYCLE: Over operating ranges											
No.	Symbol	Parameter	120ns		150ns		200ns		250ns		Unit
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
1	$t_{RC}$	Read Cycle Time	120		150		200		250		ns
2	$t_{CE}$	Chip Enable to Output Valid		120		150		200		250	ns
3	$t_{ACC}$	Address Access Time		120		150		200		250	ns
4	$t_{OE}$	Output Enable Access Time		50		55		55		55	ns
5	$t_{DF}$	Chip Enable or Output Enable to Output Float <sup>3</sup>		50		55		55		55	ns
6	$t_{OH}$	Output Hold from Chip Enable, Output Enable, or Address, Whichever Occurs First	0		0		0		0		ns

AC OPERATING CONDITIONS AND CHARACTERISTICS - WRITE CYCLE: Over operating ranges <sup>5, 6</sup>					
No.	Symbol	Parameter	Min.	Max.	Unit
7	$t_{WC}$	Write Cycle Time		10	ms
8	$t_{AS}$	Address Set-up Time *	0		ns
9	$t_{AH}$	Address Hold Time	50		ns
10	$t_{CS}$	Chip Select Set-up Time	0		ns
11	$t_{CH}$	Chip Select Hold Time	0		ns
12	$t_{WP}$	Write Pulse Width ( $\overline{WE}$ or $\overline{CE}$ )	100		ns
13	$t_{DS}$	Data Set-up Time	50		ns
14	$t_{DH}$	Data Hold Time	0		ns
15	$t_{OES}$	Output Enable Set-up Time	0		ns
16	$t_{OEH}$	Output Enable Hold Time	0		ns
17	$t_{WPH}$	Write Pulse Width High	50		ns
18	$t_{BLC}$	Byte Load Cycle Time		150	$\mu$ s
19	$t_{WR}$	Write Recovery Time	0		ns

\* Valid for both Read and Write Cycles.







## DEVICE OPERATION

**READ:** The DPE128C32V is accessed like a Static RAM. When  $\overline{CE}$  and  $\overline{OE}$  are low and  $\overline{WE}$  is high, the data stored at the memory location determined by the address pins is asserted on the outputs. The outputs are put in the high impedance state whenever  $\overline{CE}$  or  $\overline{OE}$  is high. This dual line control gives designers flexibility in preventing bus contention.

**WRITE:** A low pulse on the  $\overline{WE}$  or  $\overline{CE}$  input with  $\overline{CE}$  or  $\overline{WE}$  low (respectively) and  $\overline{OE}$  high initiates a write cycle. The address is latched on the falling edge of  $\overline{CE}$  or  $\overline{WE}$ . Once a \*\* BWDW Write has been started it will automatically time itself to completion.

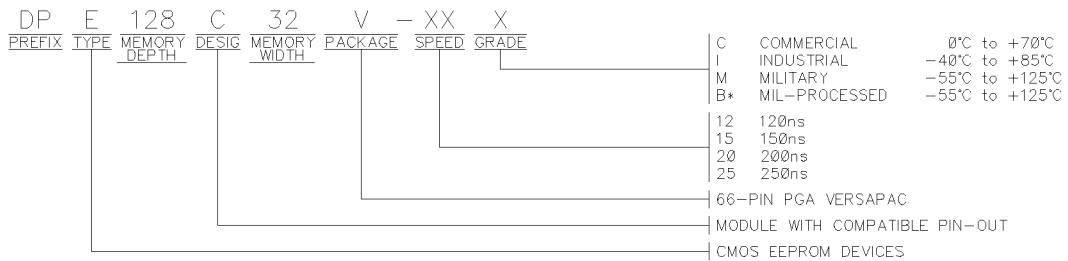
**PAGEWRITE:** The page write operation of the DPE128C32V allows 1 to 128 BWDWs of data to be loaded into the device and then simultaneously written during the internal programming period. After the first data BWDW has been loaded into the device, successive BWDWs may be loaded in the same manner. Each new BWDW to be written must have its high to low transition on  $\overline{WE}$  (or  $\overline{CE}$ ) within 150  $\mu$ s of the low to high transition of  $\overline{WE}$  (or  $\overline{CE}$ ) of the preceding BWDW. If a high to low transition is not detected within 150  $\mu$ s of the last low to high transition, the load period will end and the internal

programming period will start. A7 to A16 specify the page address. The page address must be valid during each high to low transition of  $\overline{WE}$  (or  $\overline{CE}$ ). A0 to A6 are used to specify which BWDW within the page are to be written. The BWDWs may be loaded in any order and may be changed within the same load period. Only BWDWs which are specified for writing will be written; unnecessary cycling of other BWDWs within the page does not occur.

**DATA POLLING:** Write cycles typically are completed in less time than the maximum write cycle time of 10ms. To determine when the write is completed, a method called DATA Polling is utilized. If a read is performed on the address of the last BWDW written to the DPE128C32V while a write cycle is in progress, the one's complement of data most significant bit (I/O7, I/O15, I/O23 and I/O31) will appear on the output. When the write is completed, a read from the last address written will return valid data. A DATA Polling may begin at any time during the Write Cycle.

\*\* Byte, Word, or Double Word.

**ORDERING INFORMATION**

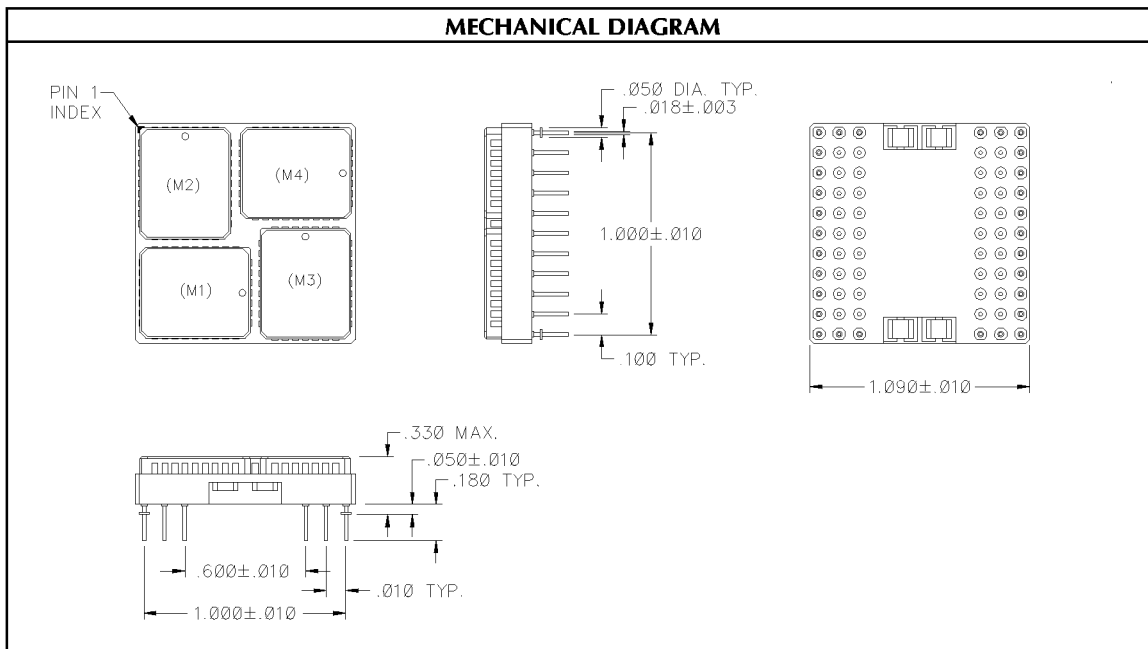


\* B grade modules are constructed with 883 devices.

**NOTES:**

1. All voltages are with respect to V<sub>SS</sub>
2. Stresses greater than those under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
3. This parameter is guaranteed and not 100% tested.
4. Address hold time is with respect to the falling edge of the control signal  $\overline{WE}$  or  $\overline{CE}$
5.  $\overline{WE}$  and  $\overline{CE}$  are noise protected. Less than a 15ns write pulse will not activate a write cycle.

**MECHANICAL DIAGRAM**



**Dense-Pac Microsystems, Inc.**

7321 Lincoln Way ♦ Garden Grove, California 92841-1431  
(714) 898-0007 (800) 642-4477 (Outside CA) ♦ FAX: (714) 897-1772 ♦ <http://www.dense-pac.com>