DENSE-PAC
MICROSYSTEMS

16 Megabit High Speed CMOS SRAM

DPS1MX16MKn3

DESCRIPTION:

The DPS1MX16MKn3 High Speed SRAM ''STACK'' modules are a revolutionary new memory subsystem using Dense-Pac Microsystems' ceramic Stackable Leadless Chip Carriers (SLCC). Available in straight leaded, ''J'' leaded or gullwing leaded packages. The module packs 16-Megabits of low-power CMOS static RAM in an area as small as 0.549 in^2, while maintaining a total height as low as 0.269 inches.

The DPS1MX16MKn3 STACK modules contain four individual 512K x 8 SRAMs, each packaged in a hermetically sealed SLCC, making the modules suitable for commercial, industrial and military applications.

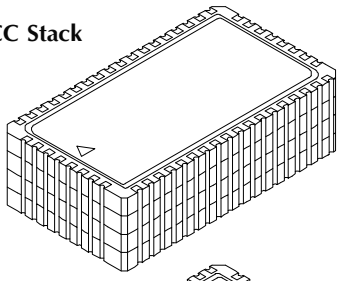
By using SLCCs, the ''Stack'' family of modules offer a higher board density of memory than available with conventional through-hole, surface mount or hybrid techniques.

FEATURES:

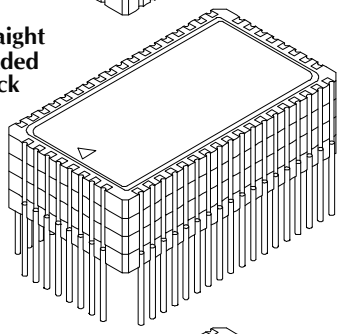
- Organizations Available:
  1Meg x 16 or 2 Meg x 8
- Access Times: 20*, 25, 30, 35, 45ns
- Fully Static Operation
  - No clock or refresh required
- Single +5V Power Supply, ±10% Tolerance
- TTL Compatible
- Common Data Inputs and Outputs
- Low Data Retention Voltage: 2.0V min.
- Packages Available:
  SLCC Stack
  Straight Leaded Stack
  ''J'' Leaded Stack
  Gullwing Leaded Stack

* Commercial and Industrial Grade only.

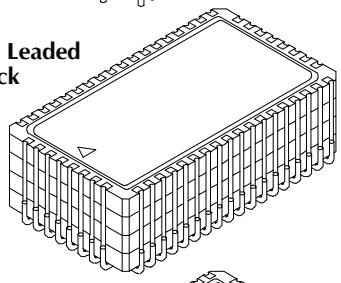
SLCC Stack



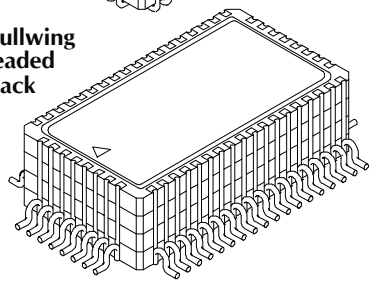
Straight Leaded Stack



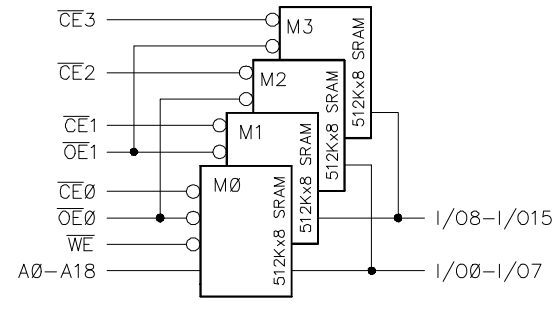
"J" Leaded Stack



Gullwing Leaded Stack

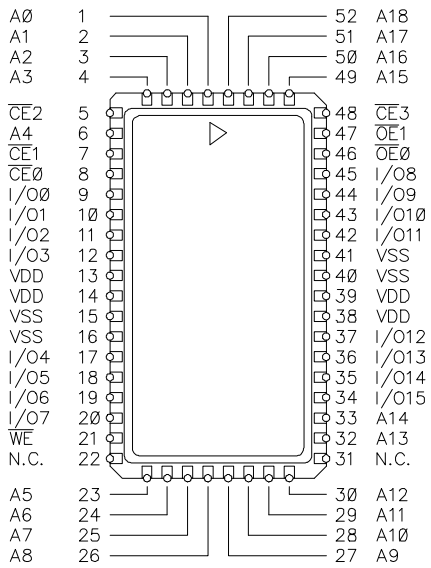


FUNCTIONAL BLOCK DIAGRAM



PIN NAMES	
A0 - A18	Address Inputs
I/O0 - I/O15	Data Input/Output
$\overline{CE}$0 - $\overline{CE}$3	Low Chip Enables
$\overline{WE}$	Write Enable
$\overline{OE}$0, $\overline{OE}$1	Output Enables
V_{DD}	Power (+5V)
V_{SS}	Ground
N.C.	No Connect

PIN-OUT DIAGRAM



TRUTH TABLE

Mode	$\overline{CE}$	$\overline{WE}$	$\overline{OE}$	I/O Pin	Supply Current
Not Selected	H	X	X	High-Z	Standby
D_{OUT} Disable	L	H	H	High-Z	Active
Read	L	H	L	D_{OUT}	Active
Write	L	L	X	D_{IN}	Active

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

ABSOLUTE MAXIMUM RATINGS [3]

Symbol	Parameter	Value	Unit
T_{STC}	Storage Temperature	-65 to +150	°C
T_{BIAS}	Temperature Under Bias	-55 to +125	°C
V_{DD}	Supply Voltage [1]	-0.5 to +7.0	°C
$V_{I/O}$	Input/Output Voltage [1]	-0.5 to V_{DD} +0.5	V

RECOMMENDED OPERATING RANGE [3]

Symbol	Characteristic		Min.	Typ.	Max.	Unit
V_{DD}	Supply Voltage		4.5	5.0	5.5	V
V_{IH}	Input HIGH Voltage		2.2		V_{DD} +0.3	V
V_{IL}	Input LOW Voltage		-0.5[2]		0.8	V
T_A	Operating Temperature	M/B	-55	+25	+125	°C
		I	-40	+25	+85	
		C	0	+25	+70	

CAPACITANCE [4]: T_A = 25°C, F = 1.0MHz

Symbol	Parameter	Max.	Unit	Condition
C_{ADR}	Address Input	40	pF	V_{IN}[2] = 0V
C_{CE}	Chip Enable	16		
C_{WE}	Write Enable	40		
C_{OE}	Output Enable	25		
$C_{I/O}$	Data Input/Output	25		

DC OUTPUT CHARACTERISTICS

Symbol	Parameter	Conditions	Min.	Max.	Unit
V_{OH}	HIGH Voltage	I_{OH} = -4.0mA	2.4		V
V_{OL}	LOW Voltage	I_{OL} = 8.0mA		0.4	V

DC OPERATING CHARACTERISTICS: Over operating ranges

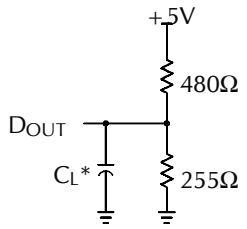
Symbol	Characteristics	Test Conditions		Typ. (†)	C		I		M/B		Unit
					Min.	Max.	Min.	Max.	Min.	Max.	
I_{IN}	Input Leakage Current	V_{IN} = 0V to V_{DD}		-	-20	+20	-20	+20	-20	+20	µA
I_{OUT}	Output Leakage Current	$V_{I/O}$ = 0V to V_{DD}, $\overline{CE}$ or $\overline{OE}$ = V_{IH}, or $\overline{WE}$ = V_{IL}		-	-20	+20	-20	+20	-20	+20	µA
I_{CC}	Operating Supply Current	Cycle = min., Duty = 100% I_{OUT} = 0mA	X8	185		350		360		36 0	mA
			X16	290		460		480		480	
I_{SB1}	Full Standby Supply Current	$V_{IN} \geq V_{DD}$ -0.2V or $V_{IN} \leq V_{SS}$ +0.2V		4		40		40		60	mA
I_{SB2}	Standby Current (TTL)	$\overline{CE}$ = V_{IH}		80		240		240		240	mA
I_{DR3}	Data Retention Supply Current (3.0V)	V_{DR} = 3.0V, $\overline{CE} \geq V_{DR}$ -0.2V		0.6		2.0		4.0		8.0	mA
I_{DR2}	Data Retention Supply Current (2.0V)	V_{DR} = 2.0V, $\overline{CE} \geq V_{DR}$ -0.2V		0.4		1.2		3.2		7.2	mA
V_{OL}	Output Low Voltage	I_{OUT} = 8.0mA		-		0.4		0.4		0.4	V
V_{OH}	Output High Voltage	I_{OUT} = -4.0mA		-	2.4		2.4		2.4		V

† Typical measurements made at +25°C, Cycle = min., V_{DD} = 5.0V.

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

OUTPUT LOAD		
Load	**C_L**	**Parameters Measured**
1	100pF	except t_{LZ}, t_{HZ}, t_{OHZ}, t_{OLZ}, and t_{WHZ}
2	5pF	t_{LZ}, t_{HZ}, t_{OHZ}, t_{OLZ}, and t_{WHZ}

Figure 1. Output Load



Data Retention AC Characteristics [8]						
Symbol	**Parameter**	**Test Conditions**	**Min.**	**Typ.**	**Max.**	**Unit**
V_{DR}	V_{DD} for Data Retention	$\overline{CE} \geq V_{DR}$ -0.2V	2.0	-	-	V
V_{CDR}	Chip Disable to Data Retention Time	See Data Retention Waveform	0	-	-	ns
t_R	Operation Recovery Time	See Data Retention Waveform	5	-	-	ms

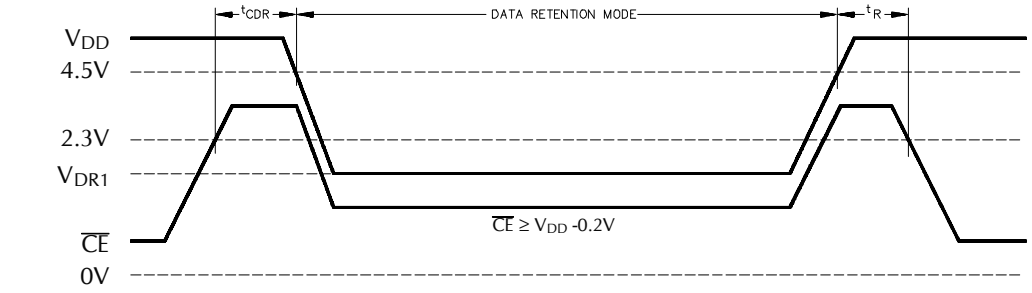
AC OPERATING CONDITIONS AND CHARACTERISTICS - READ CYCLE: Over operating ranges													
No.	**Symbol**	**Parameter**	**20ns***		**25ns**		**30ns**		**35ns**		**45ns**		**Unit**
			Min.	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	
1	t_{RC}	Read Cycle Time	20		25		30		35		45		ns
2	t_{AA}	Address Access Time		20		25		30		35		45	ns
3	t_{CO}	$\overline{CE}$ to Output Valid		20		25		30		35		45	ns
4	t_{OE}	Output Enable to Output Valid		10		12		15		20		25	ns
5	t_{LZ}	$\overline{CE}$ to Output in LOW-Z [4, 5]	3		3		3		3		3		ns
6	t_{OLZ}	Output Enable to Output in LOW-Z [4, 5]	0		0		0		0		0		ns
7	t_{HZ}	$\overline{CE}$ to Output in HIGH-Z [4, 5]		8		10		15		20		25	ns
8	t_{OHZ}	Output Enable to Output in HIGH-Z [4, 5]	0	8	0	10	0	15	0	20	0	25	ns
9	t_{OH}	Output Hold from Address Change	4		5		5		5		5		ns

AC OPERATING CONDITIONS AND CHARACTERISTICS - WRITE CYCLE [6, 7]: Over operating ranges													
No.	**Symbol**	**Parameter**	**20ns***		**25ns**		**30ns**		**35ns**		**45ns**		**Unit**
			Min.	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	**Min.**	**Max.**	
10	t_{WC}	Write Cycle Time	20		25		30		35		45		ns
11	t_{AW}	Address Valid to End of Write	13		15		20		25		35		ns
12	t_{CW}	Chip Enable to End of Write	13		15		20		25		35		ns
13	t_{AS}	Address Set-Up Time **	0		0		0		0		0		ns
14	t_{WP}	Write Pulse Width	13		15		20		25		35		ns
15	t_{WR}	Write Recovery Time	0		0		0		0		0		ns
16	t_{WHZ}	Write Enable to Output in HIGH-Z [4, 5]	0	8	0	10	0	12	0	15	0	20	ns
17	t_{DW}	Data to Write Time Overlap	9		10		12		15		20		ns
18	t_{DH}	Data Hold from Write Time	0		0		0		0		0		ns
19	t_{OW}	Output Active from End of Write	3		3		3		3		3		ns

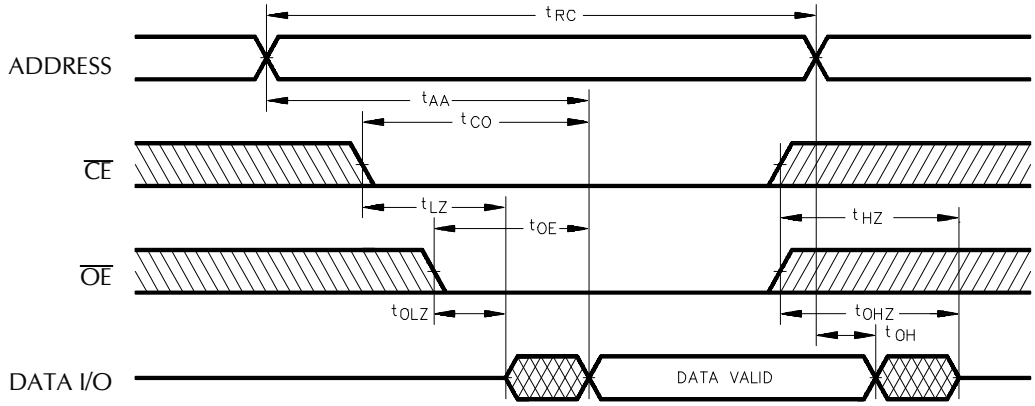
* Available in Commercial and Industrial Grade Only.

** Valid for both Read and Write Cycles.

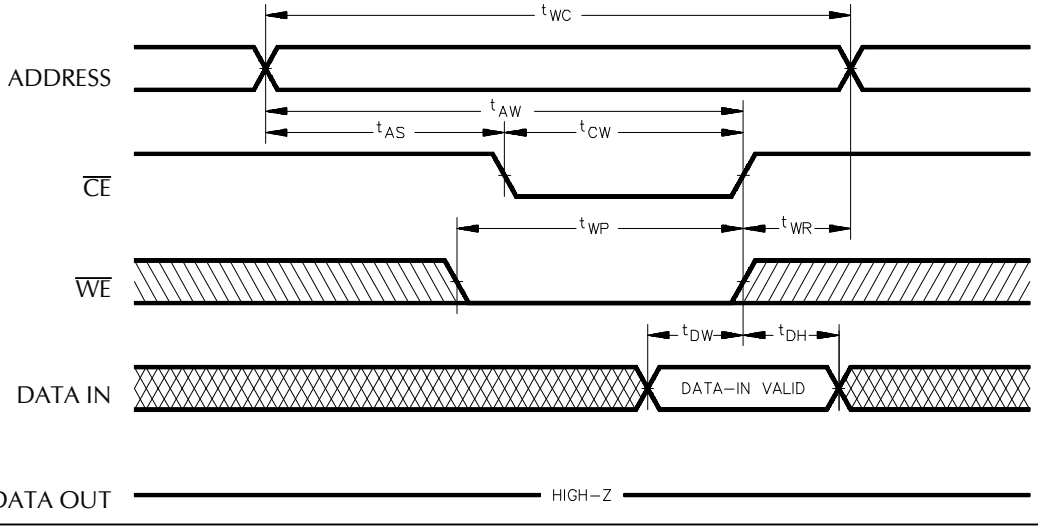
DATA RETENTION WAVEFORM: $\overline{CE}$ Controlled.



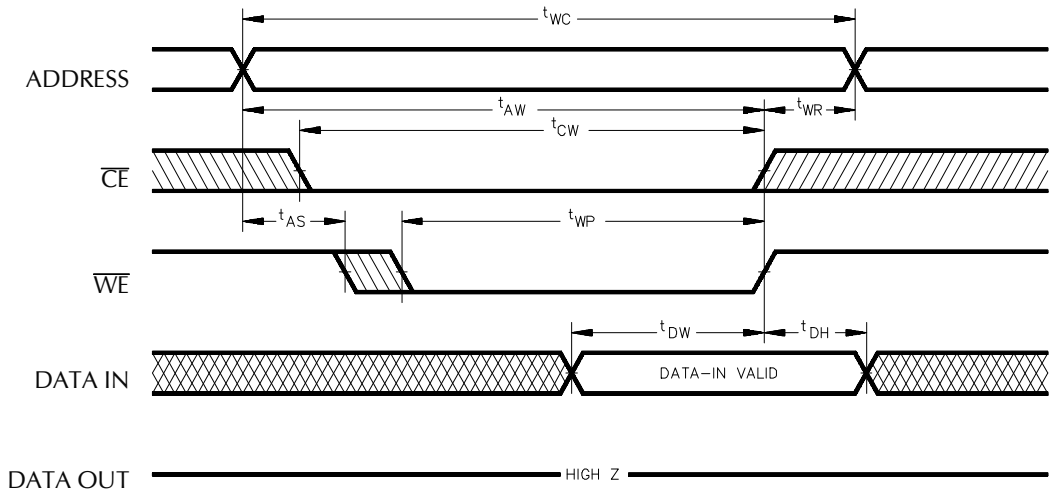
READ CYCLE



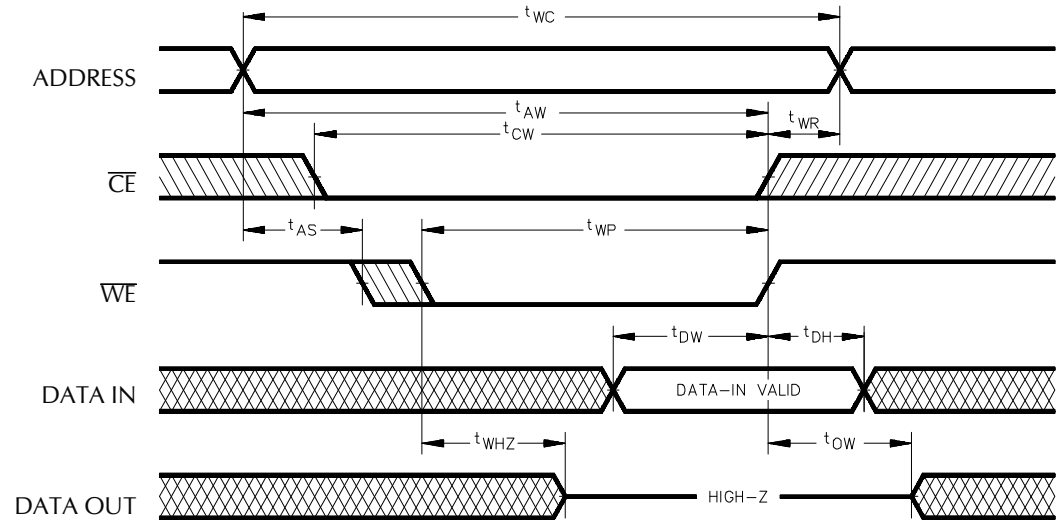
WRITE CYCLE 1: $\overline{CE}$ Controlled.



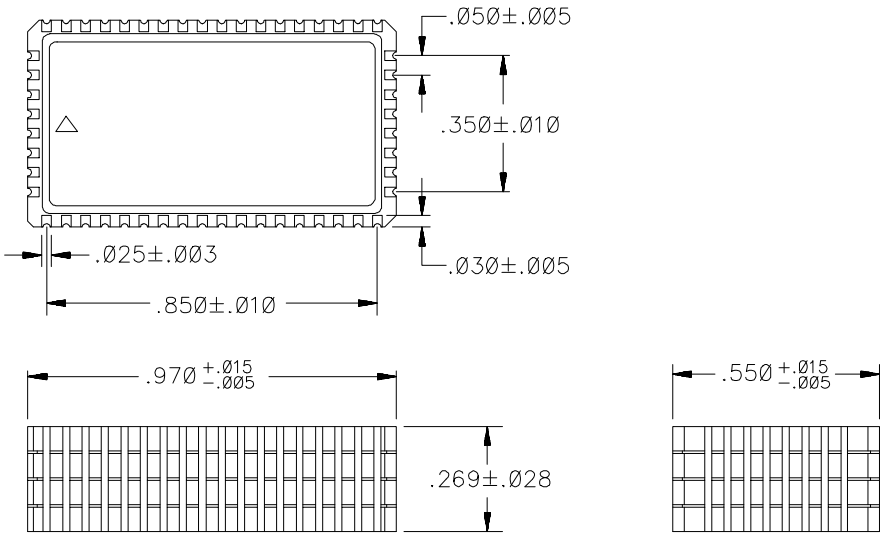
WRITE CYCLE 2: $\overline{WE}$ Controlled. $\overline{OE}$ is HIGH. [8]



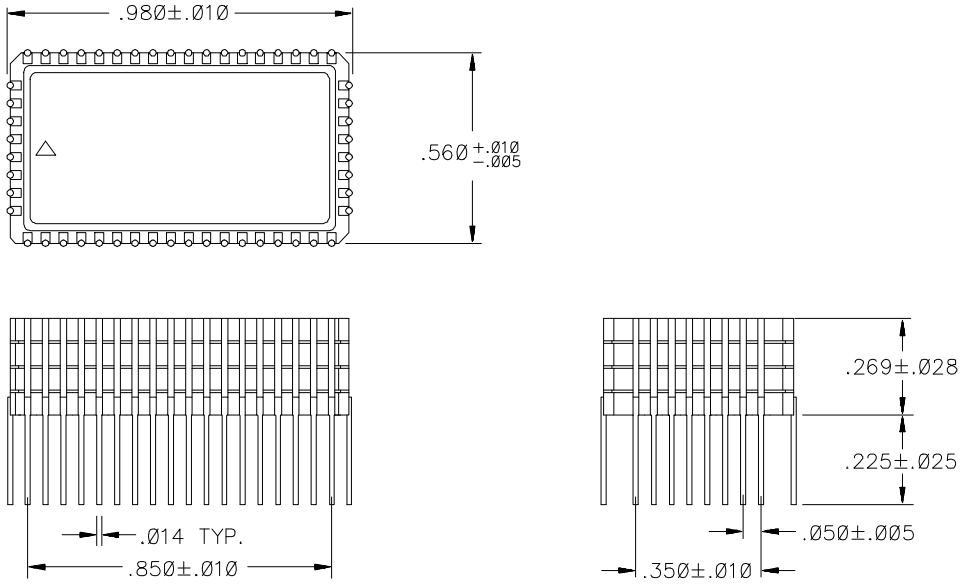
WRITE CYCLE 3: $\overline{WE}$ Controlled. $\overline{OE}$ is LOW. [8]



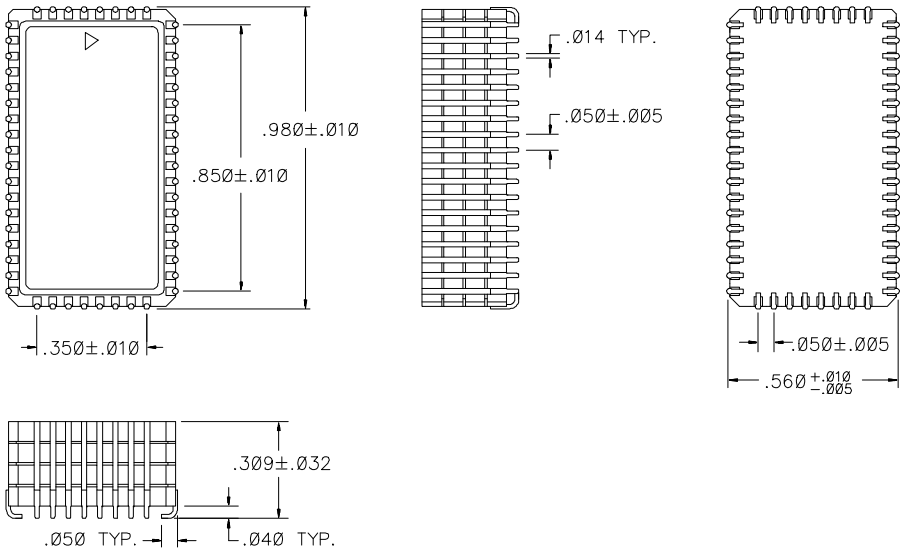
(52 - PIN LEADLESS STACK) MECHANICAL DRAWING



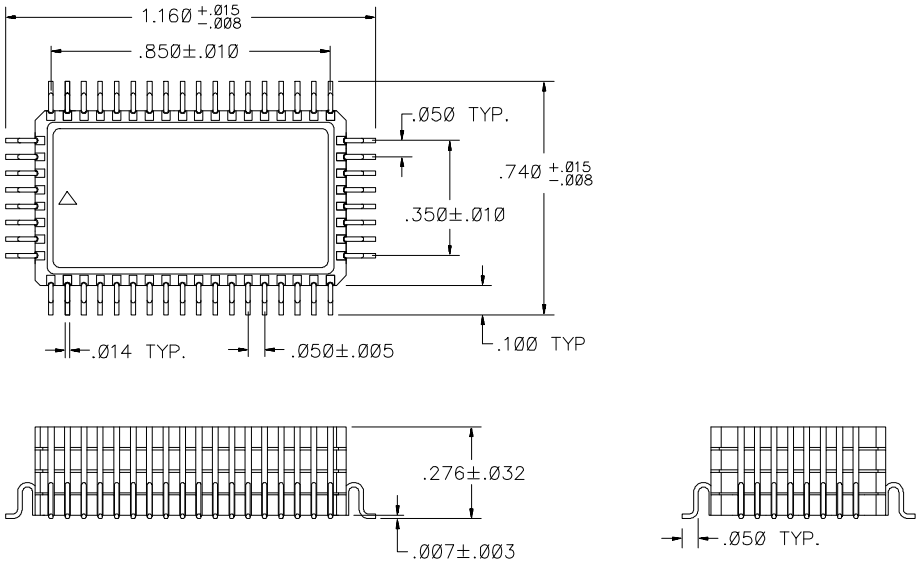
(52 - PIN STRAIGHT LEADED STACK) MECHANICAL DRAWING



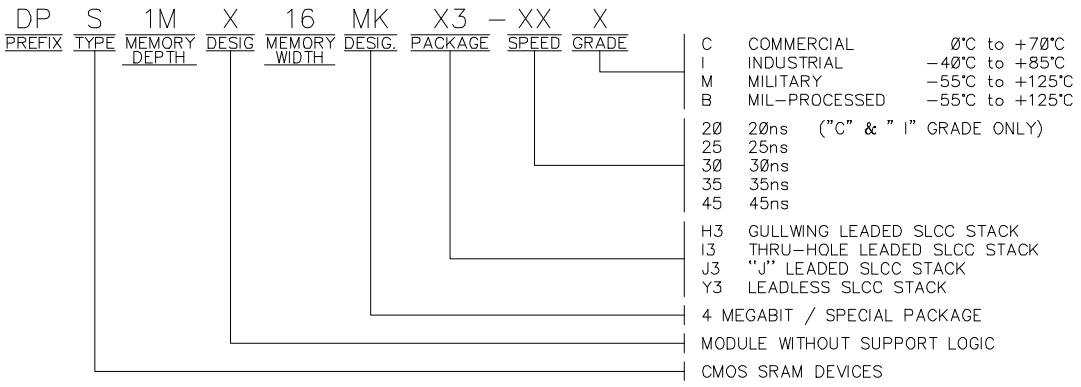
(52 - PIN "J" LEADED STACK) MECHANICAL DRAWING



(52 - PIN GULLWING LEADED STACK) MECHANICAL DRAWING



ORDERING INFORMATION



NOTES:

1. All voltages are with respect to V_{SS}.
2. -2.0V min. for pulse width less than 20ns (V_{IL} min. = -0.5V at DC level).
3. 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.
4. This parameter is guaranteed and not 100% tested.
5. Transition is measured at the point of ±500mV from steady state voltage.
6. When $\overline{OE}$ and $\overline{CE}$ are LOW and $\overline{WE}$ is HIGH, I/O pins are in the output state,and input signals of opposite phase to the outputs must not be applied.
7. The outputs are in a high impedance state when $\overline{WE}$ is LOW.
8. $\overline{CE}$ and $\overline{WE}$ can initiate and terminate WRITE Cycle.

WAVEFORM KEY

Data Valid	Transition from HIGH to LOW	Transition from LOW to HIGH	Data Undefined or Don't Care

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