Marconi
Electronic Devices

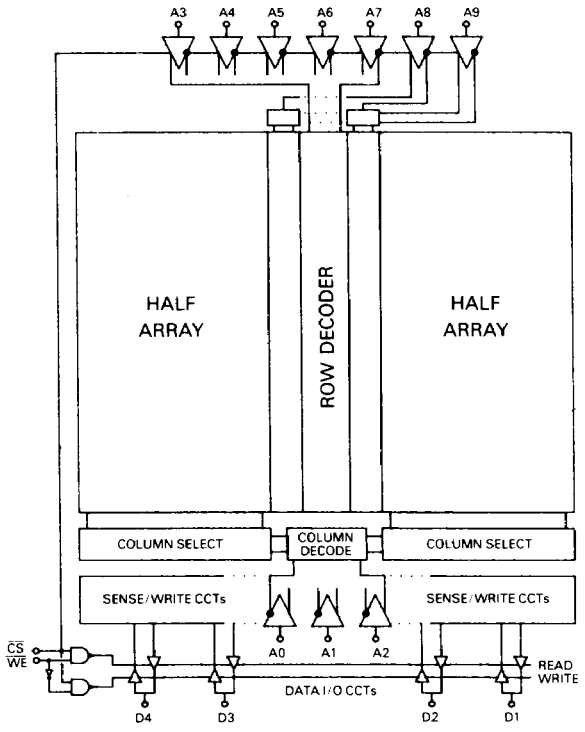
MA5114

Radiation Hard 1024 × 4 Bit Static RAM

FEATURES

- Radiation hard 3μm CMOS-SOS technology
- Fast access time 90ns typical
- Total dose 10^5 rad(Si)
- Transient upset 5×10^{10} rad(Si)/sec
- SEU 3.1×10^{-10} errors/bit day
- No latch-up possible
- Single 5V supply
- TTL and CMOS compatible inputs
- Fully static operation
- Three state output
- Low standby current 50μA typical
- —55°C to +125°C operation
- Data retention at 2 volts supply

BLOCK DIAGRAM



GENERAL DESCRIPTON

The MA5114 4K Static RAM is configured as 1024 × 4 bits and manufactured using MEDL's CMOS-SOS high performance, radiation hard, 3μm technology.

The design uses a 6 transistor cell and has full static operation with no clock or timing strobe required. Address input buffers are deselected when Chip Select is in the High state.

TRUTH TABLE

$\overline{CS}$	$\overline{WE}$	I/O Pin	Mode
H	H	High Z	Not selected
H	L	High Z	Not selected
L	H	Data out	Selected
L	L	Data in	Selected

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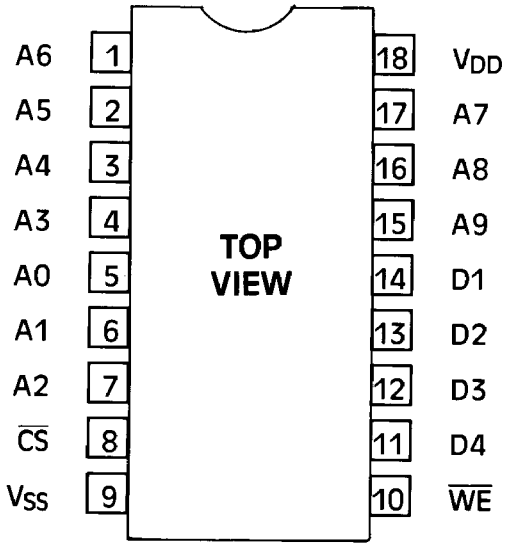
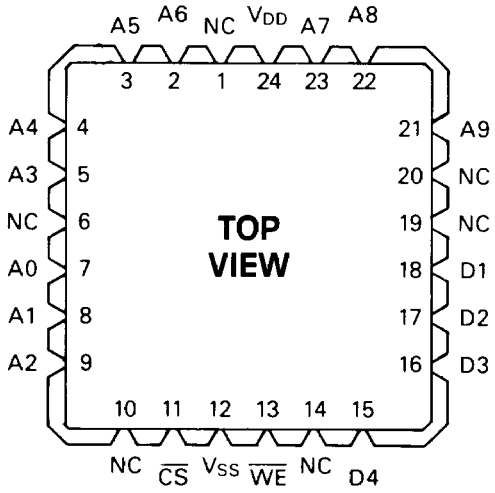
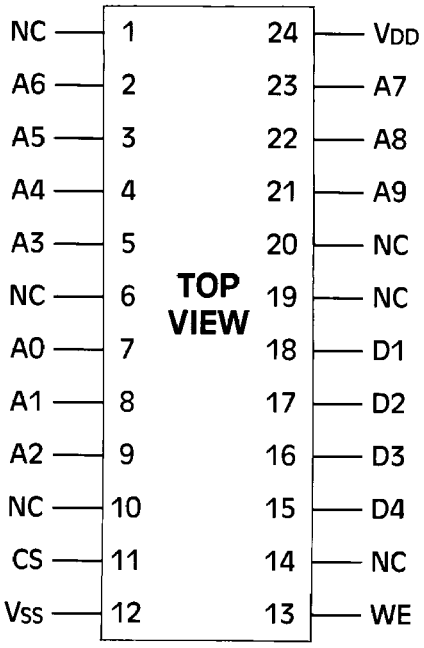
PIN ASSIGNMENT



PACKAGE A —
18 LEAD CERAMIC DIL



PACKAGE I —
24 CONTACT CERAMIC LCC



PACKAGE H —
24 LEAD CERAMIC FLATPACK

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Min	Max
V_{DD}	Supply Voltage	—0.5V	8V
V_I	Input Voltage	—0.3V	V_{DD} + 0.3V
T_A	Operating Temperature	—55°C	125°C
T_S	Storage Temperature	—65°C	150°C

Stresses above those listed may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

The following D.C. and A.C. electrical characteristics apply pre-radiation at T_A = —55°C to +125°C, V_{DD} = 5V ±10% and to post 100kRad(Si) total dose radiation at T_A = 25°C, V_{DD} = 5V ±10%

OPERATING D.C. ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Min	Typ	Max	Units	Conditions
V_{DD}	Supply Voltage	4.5	5	5.5	V	
V_{IH}	Logical '1' Input Voltage	$\frac{V_{DD}}{2}$		V_{DD}	V	
V_{IL}	Logical '0' Input Voltage	V_{SS}		0.8	V	
V_{OH}	Logical '1' Output Voltage	2.4			V	I_{OH} = —1mA
V_{OL}	Logical '0' Output Voltage			0.4	V	I_{OL} = 2mA
I_{LI}	Input Leakage Current			±10	μA	All inputs except $\overline{CS}$
I_{ZOH}	Output Leakage Current			+10	μA	Output disabled, V_{OUT} = V_{DD}
I_{ZOL}	Output Leakage Current			—20	μA	Output disabled, V_{OUT} = V_{SS}
I_{PUI}	Input Pull-Up Current			—100	μA	V_{IN} = V_{SS} $\overline{CS}$ input only
I_{PDI}	Input Leakage Current			5	μA	V_{IN} = V_{DD} $\overline{CS}$ input only
I_{DDL}	Power Supply Current, Standby		50	1000	μA	Chip disabled
I_{DD}	Power Supply Current		12	16	mA	f_{RC} = 1MHz, $\overline{CS}$ = 50% mark:space

DATA RETENTION CHARACTERISTICS

Symbol	Parameter	Min	Typ	Max	Units	Conditions
V_{DR}	V_{CC} for Data Retention	2.0			V	$\overline{CS}$ = V_{DR}
I_{DDR}	Data Retention Current		30	500	μA	$\overline{CS}$ = V_{DR}, V_{DR} = 2.0V

A.C. ELECTRICAL CHARACTERISTICS

READ CYCLE

Symbol	Parameter	Min	Max	Units
t_{RC}	Read Cycle Time	135		ns
t_A	Access Time		135	ns
t_{CA}	Chip Select to Output Valid		135	ns
t_{CX} (Note 4)	Chip Select to Output Active	10		ns
t_{COT} (Note 4)	Chip Select to Output THREE STATE	10	50	ns
t_{OHA}	Output Hold from Address Change	10		ns

WRITE CYCLE

Symbol	Parameter	Min	Max	Units
t_{WC}	Write Cycle Time	135		ns
t_{AW}	Address to Write Set-Up Time	10		ns
t_{WP}	Write Pulse Width	50		ns
t_{WR}	Write Recovery Time	5		ns
t_{DS}	Data Set-Up Time	35		ns
t_{DH}	Data Hold Time	5		ns
t_{WOT} (Note 4)	Write Enable to Output THREE-STATE	10	50	ns
t_{CW}	Chip Selection to Write Low	25		ns

A.C. CONDITIONS OF TEST

NOTE: 1 — Input Pulse V_{SS} to 3.0Volts
2 — Times Measurement Reference Level 1.5Volts
3 — Full Output Current Loading and C_L = 100pF
4 — Transition is measured ±500mV from steady state. This parameter is sampled and not 100% tested.
5 — Input Rise and Fall Times ⩽ 5ns

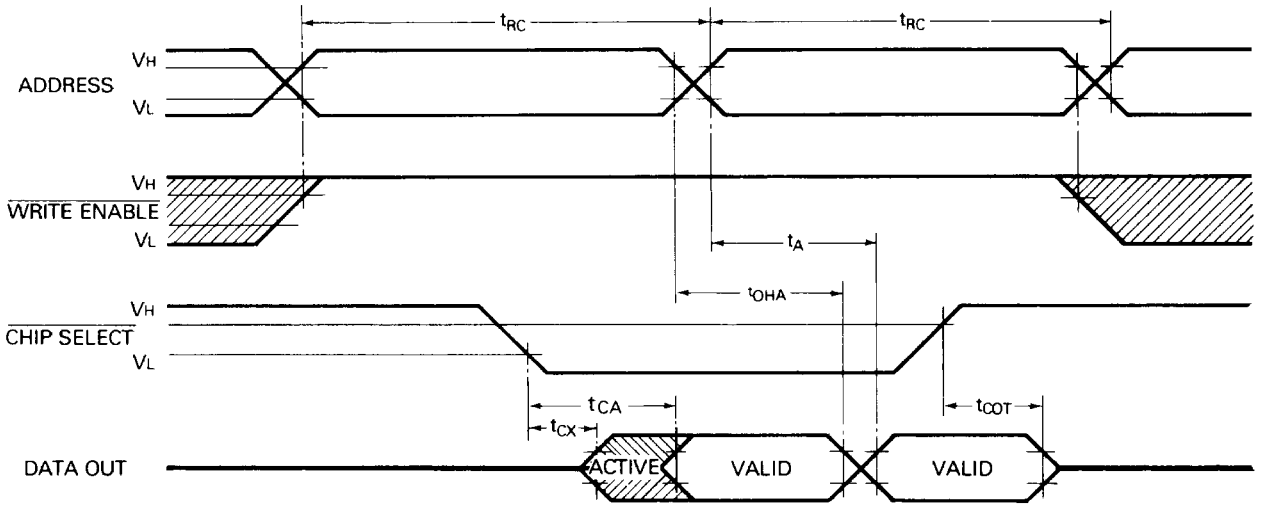
CAPACITANCE

$T_A = 25°C$, f = 1MHz

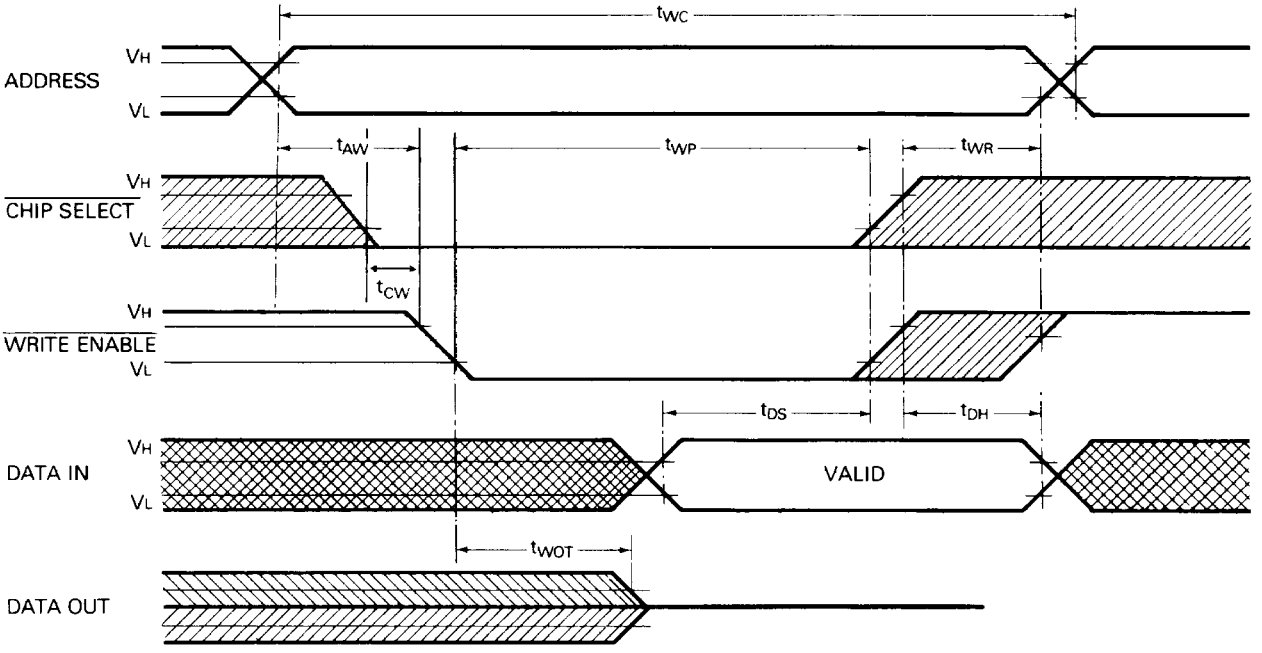
Symbol	Parameter	Min	Typ	Max	Unit	Test Condition
C_{IN}	Input Capacitance		6	10	pF	$V_I = 0V$
C_{OUT}	Output Capacitance		8	12	pF	$V_O = 0V$

SWITCHING TIME WAVEFORMS

READ CYCLE



WRITE CYCLE



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MAxxxx

Radiation Hard Static RAM Family

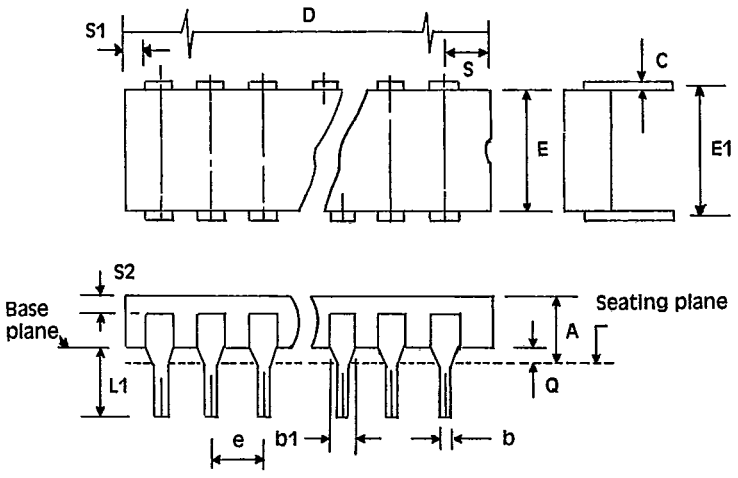
PACKAGING INFORMATION

Device Number	Sidebrazed Ceramic DIL	Ceramic Flatpack	Ceramic LCC
MA5101	Package D		
MA5104	Package A	Package H	
MA5114	Package A	Package H	Package I
MA6116	Package E	Package H	
MA6216	Package E	Package H	
MA9167	Package B	Package H	
MA9167	Package E		
MA9187	Package E	Package H	Package K

NOTE: Other Packages available on request.

PACKAGING INFORMATION

Packages A to E — CERAMIC DIL



DIMENSIONS IN INCHES

	Package A		Package B		Package C		Package D		Package E	
	18 LEAD 0.3 pitch		20 LEAD 0.3 pitch		22 LEAD 0.3 pitch		22 LEAD 0.4 pitch		24 LEAD 0.6 pitch	
Dim.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
A		.220		.220		.220		.220		.220
b	.013	.023	.014	.023	.014	.023	.014	.023	.014	.023
b1		.060		.060		.060		.060		.060
C	.008	.014	.008	.014	.008	.014	.008	.014	.008	.014
D		.910		1.010	1.089	1.111		1.100		1.212
E	.30 Nom.		.30 Nom.		.30 Nom.		.40 Nom.		.60 Nom.	
E1		.320		.320		.320		.420		.620
e	.10 Nom.		.10 Nom.		.10 Nom.		.10 Nom.		.10 Nom.	
L1	.175	.212	.185	.212	.175	.212	.185	.212	.185	.212
Q	.015	.060	.015	.060	.037	.039	.015	.060	.015	.060
S		.050		.050		.050		.050		.050
S1	.005		.005	0	.005		.005		.005	
S2	.005		.005		.005		.005		.005	

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Radiation Hard Static RAM Family

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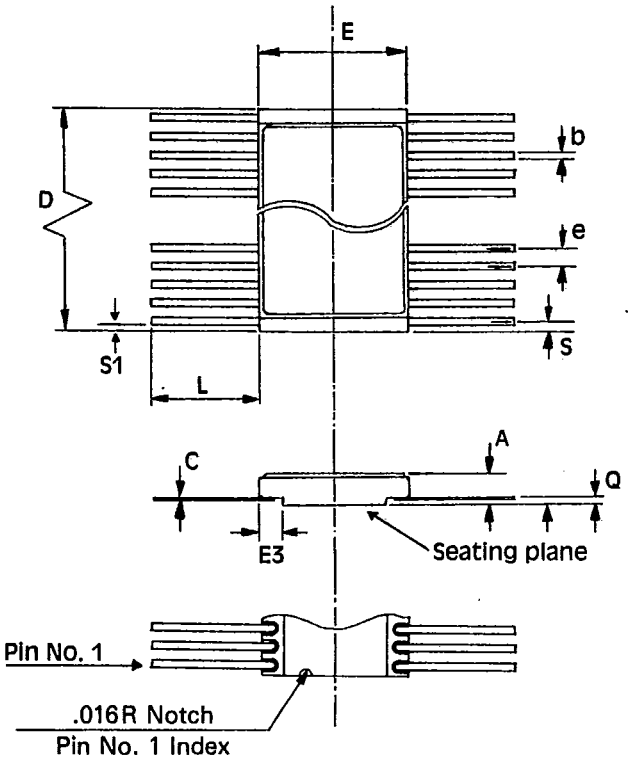
PACKAGING INFORMATION

Packages H and J — CERAMIC FLATPACK



DIMENSIONS IN INCHES

	Package H		Package J	
	24 LEAD		28 LEAD	
Dim.	Min.	Max.	Min.	Max.
A		.105		.130
b	.015	.019	.015	.019
C	.004	.007	.003	.006
D	.585	.615		.740
E	.390	.410	.380	.420
E3	.030		.030	
e	.050 Nom.		.050 Nom.	
L	.265	.305	.250	.370
Q	.011	.018	.026	.045
S		.045		.045
S1	.005		.000	

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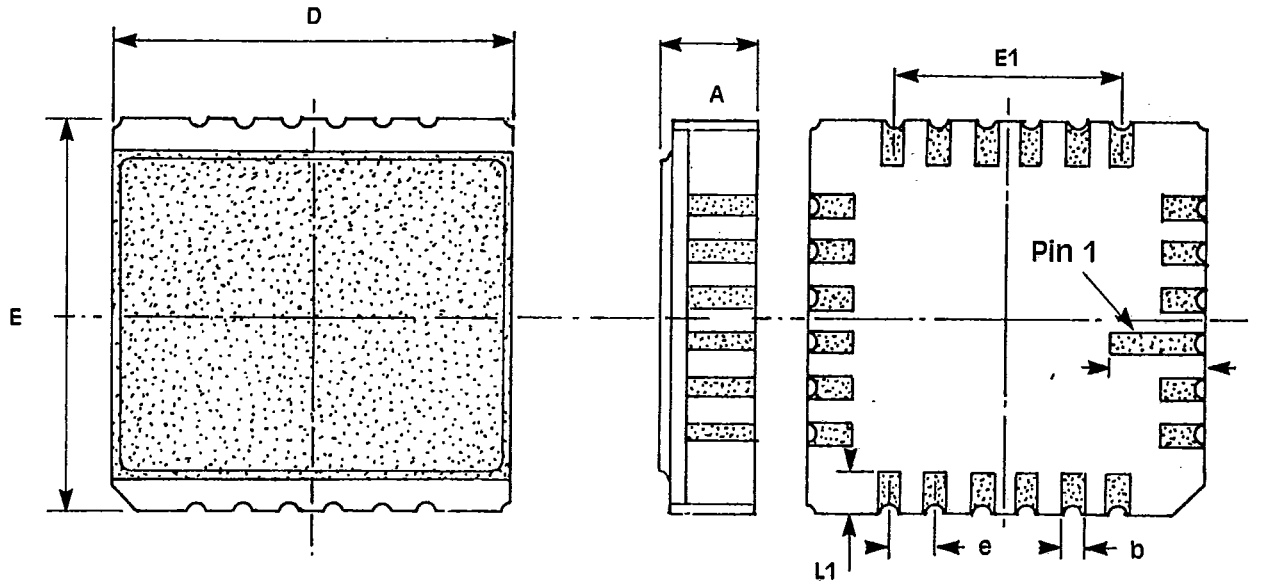
Radiation Hard Static RAM Family

PACKAGING INFORMATION

PACKAGES I and K — LEADLESS CHIP CARRIER



DIMENSIONS IN INCHES

	Package I		Package K	
	24 LEAD		44 LEAD	
Dim.	Min.	Max.	Min.	Max.
A	—	0.096	0.101	0.119
b	0.018	0.022	0.025 Typ.	
D	0.345	0.360	0.643	0.662
E	0.345	0.360	0.643	0.662
E1	0.198	0.202	0.500 Typ.	
e	0.037	0.043	0.050 Typ.	
L1	0.040 Typ.		0.045	0.050

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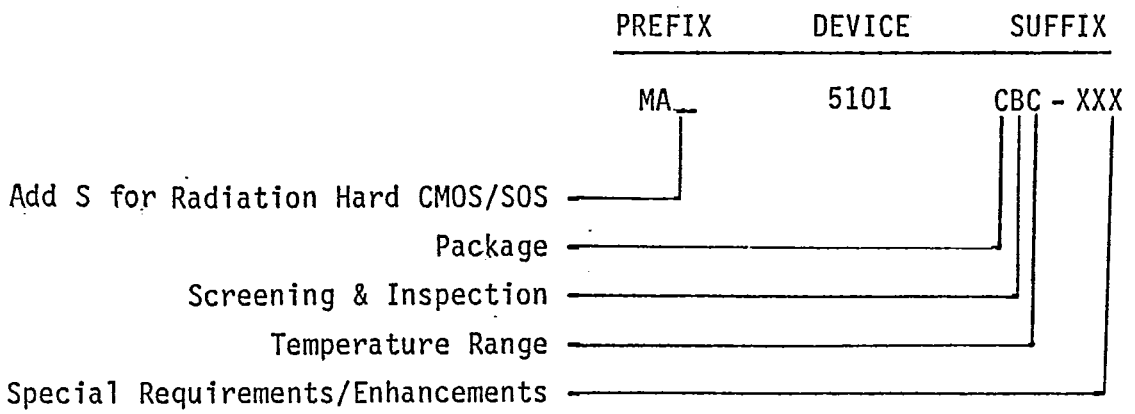

PACKAGE

A. Pin Grid Array
C. Ceramic DIL
E. Epic
F. Flat Pack
G. Cerdip
L. Leadless Chip Carrier
M. Module
N. Naked Die
P. Plastic DIL
Q. Quad Plastic J-Lead
R. Qual Cerpack J-Lead
S. SO Plastic
X. Special

TEMPERATURE RANGE

A. Special
B. 0 to 70°C
C. -55 to +125°C
D. -25 to +70°C
E. -25 to +85°C
F. -40 to +85°C
G. -55 to +85°C
H. -40 to +125°C
J. -10 to +80°C
K. 0 to +200°C

SCREENING & INSPECTION

B. Mil Std-883C Class B
G. Commercial Hermetic
L. Commercial Plastic
S. Mil Std-883C Class S
T. ESA9000
X. Special

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