

**MOTOROLA**

Universal Decade Counter

**ELECTRICALLY TESTED PER:
MPG 10537**

The 10537 is a high speed synchronous counter that can count up, count down, preset, or stop count at frequencies exceeding 100 MHz. The flexibility of this device allows the designer to use one basic counter for most applications. The synchronous count feature makes the 10537 suitable for either computers or instrumentation.

Three control lines (S1, S2, and $\overline{\text{Carry In}}$) determine the operation mode of the counter. Lines S1 and S2 determine one of four operations; preset (program), increment (count up), decrement (count down), or hold (stop count). Note that in the preset mode a clock pulse is necessary to load the counter, and the information present on the data inputs (D0, D1, D2, and D3) will be entered into the counter.

$\overline{\text{Carry out}}$ goes low on the terminal count. The $\overline{\text{Carry Out}}$ on the 10537 is partially decoded from Q1 and Q2 directly, so in the preset mode the condition of the $\overline{\text{Carry Out}}$ after Clock's positive excursion will depend on the condition of Q1 and/or Q2. The counter changes state only on the positive going edge of the clock. Any other input may change at any time except during the positive transition of the clock. The sequence for counting out of improper states is as shown in the State Diagrams.

- 860 mW Typ/Pkg (No Load)
- $f_{\text{COUNT}} = 150 \text{ MHz typ}$
- $t_{\text{pd}} = 3.3 \text{ ns typ (C - Q)}$
 $= 7.0 \text{ ns typ (C - } \overline{\text{COUT}})$
 $= 5.0 \text{ ns typ (} \overline{\text{CIN}} - \overline{\text{COUT}})$

PIN ASSIGNMENTS

FUNCTION	DIL	FLATS	LCC	BURN-IN (CONDITION C)
VCC1	1	5	2	GND
Q2	2	6	3	51 Ω TO V_{TT}
Q3	3	7	4	51 Ω TO V_{TT}
$\overline{\text{COUT}}$	4	8	5	51 Ω TO V_{TT}
D3	5	9	7	GND
D2	6	10	8	GND
S2	7	11	9	OPEN
VEE	8	12	10	VEE
S1	9	13	12	OPEN
$\overline{\text{CIN}}$	10	14	13	OPEN
D1	11	15	14	GND
D0	12	16	15	GND
CLK	13	1	17	CP1
Q0	14	2	18	51 Ω TO V_{TT}
Q1	15	3	19	51 Ω TO V_{TT}
VCC2	16	4	20	GND

BURN - IN CONDITIONS: **$V_{\text{TT}} = -2.0 \text{ V MAX} / -2.2 \text{ V MIN}$** **$V_{\text{EE}} = -5.7 \text{ V MAX} / -5.2 \text{ V MIN}$**

Military 10537

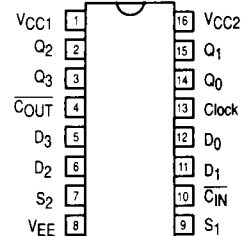


AVAILABLE AS

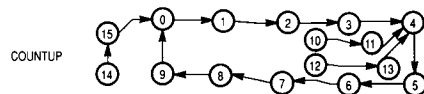
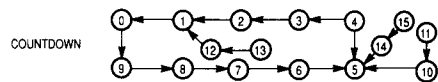
- 1) JAN: N/A
 - 2) SMD: N/A
 - 3) 883: 10537/BXAJC
- X = CASE OUTLINE AS FOLLOWS:**

PACKAGE: CERDIP: E
CERFLAT: F
LCC: 2

**The letter "M" appears before
the slash on LCC.**



STATE DIAGRAMS

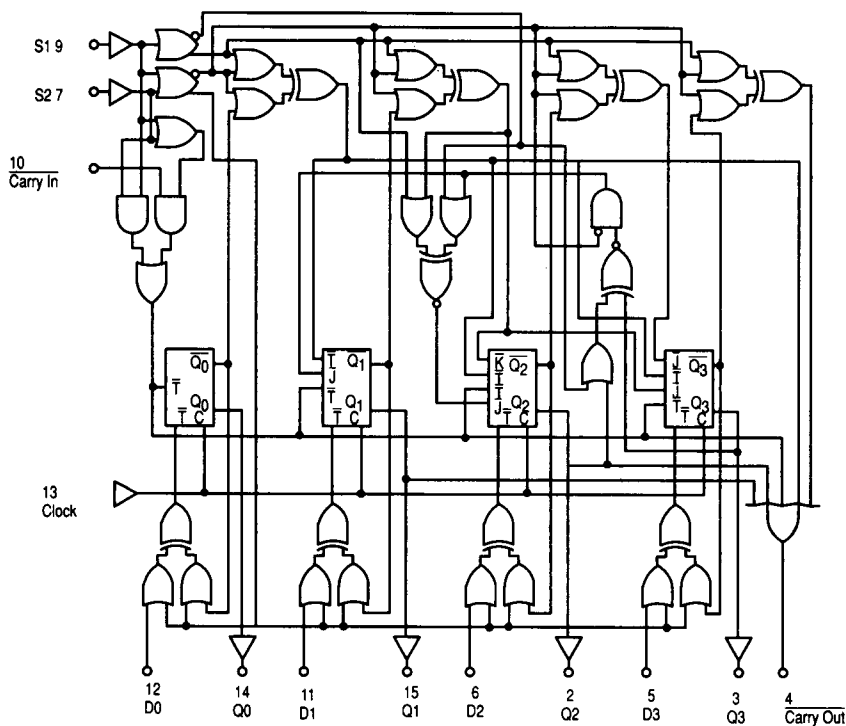


3

S ₁	S ₂	D ₀	D ₁	D ₂	D ₃	Carry IN	Clock ••	Q ₀	Q ₁	Q ₂	Q ₃	Carry OUT
L	L	H	H	H	L	Ø	H	H	H	H	L	H
L	H	Ø	Ø	Ø	Ø	L	H	L	L	L	H	H
L	H	Ø	Ø	Ø	Ø	L	H	H	L	L	H	L
L	H	Ø	Ø	Ø	Ø	L	H	L	L	L	L	H
L	H	Ø	Ø	Ø	Ø	L	H	H	L	L	L	H
L	H	Ø	Ø	Ø	Ø	H	L	H	L	L	L	H
L	H	Ø	Ø	Ø	Ø	H	H	H	L	L	L	H
L	H	Ø	Ø	Ø	Ø	Ø	H	H	L	L	L	H
L	L	H	H	L	L	Ø	H	H	H	L	L	H
H	L	Ø	Ø	Ø	Ø	L	H	L	H	L	L	H
H	L	Ø	Ø	Ø	Ø	L	H	H	L	L	L	H
H	L	Ø	Ø	Ø	Ø	L	H	L	L	L	L	L

- Truth table shows logic states assuming inputs vary in sequence shown from top to bottom.

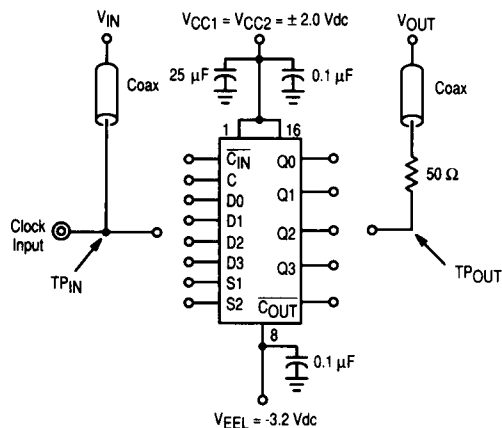
- A clock H is defined as a clock input transition from a low to a high logic level.



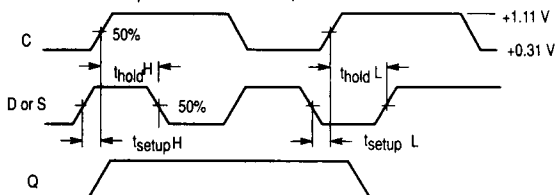
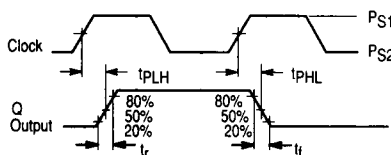
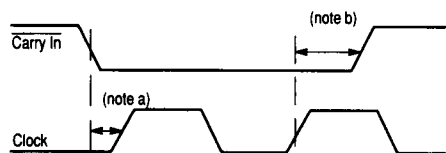
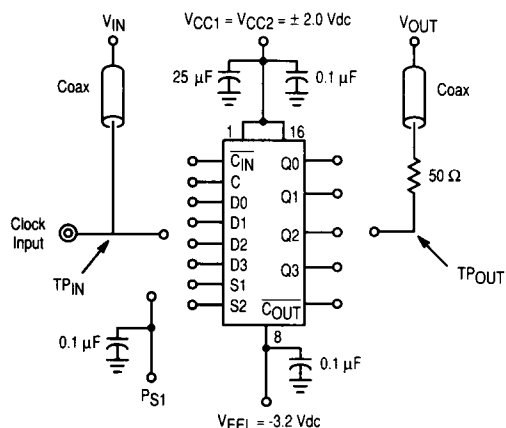
NOTE
FLIP FLOPS WILL TOGGLE WHEN
ALL $\overline{T}$ INPUTS ARE LOW.

Figure 1. Logic Diagram

Switching Time Test Circuit



Counter Frequency Test Circuit



NOTES

1. All input and output cables to the scope are equal lengths of 50 Ω coaxial cable. Wire length should be 1/4 inch from TP_{IN} to input pin and TP_{OUT} to output pin.
2. Unused outputs are connected to a 100 Ω resistor to ground.
3. 50 Ω termination located in each scope channel input.
4. $PW \geq 20$ ns.
5. $PRR = 1.0$ MHz.
6. $t_r = t_f = 2.0$ ns ± 0.2 ns (20% to 80%).

a) is the minimum time to wait after the counter has been enabled to clock it.

b) is the minimum time before the counter has been disabled that it may be clocked.

c) is the minimum time before the counter is enabled that a clock pulse may be applied with no effect on the state of the counter.

d) is the minimum time to wait after the counter is disabled that a clock pulse may be applied with no effect in the state of the counter.

(b) and (c) may be negative numbers.

t_{setup} is the minimum time before the positive transition of the clock pulse (C) that information must be present at the input D or S.

t_{hold} is the minimum time after the positive transition of the clock pulse (C) that information must remain unchanged at the input D or S.

Figure 2. Test Circuits and Waveforms

3

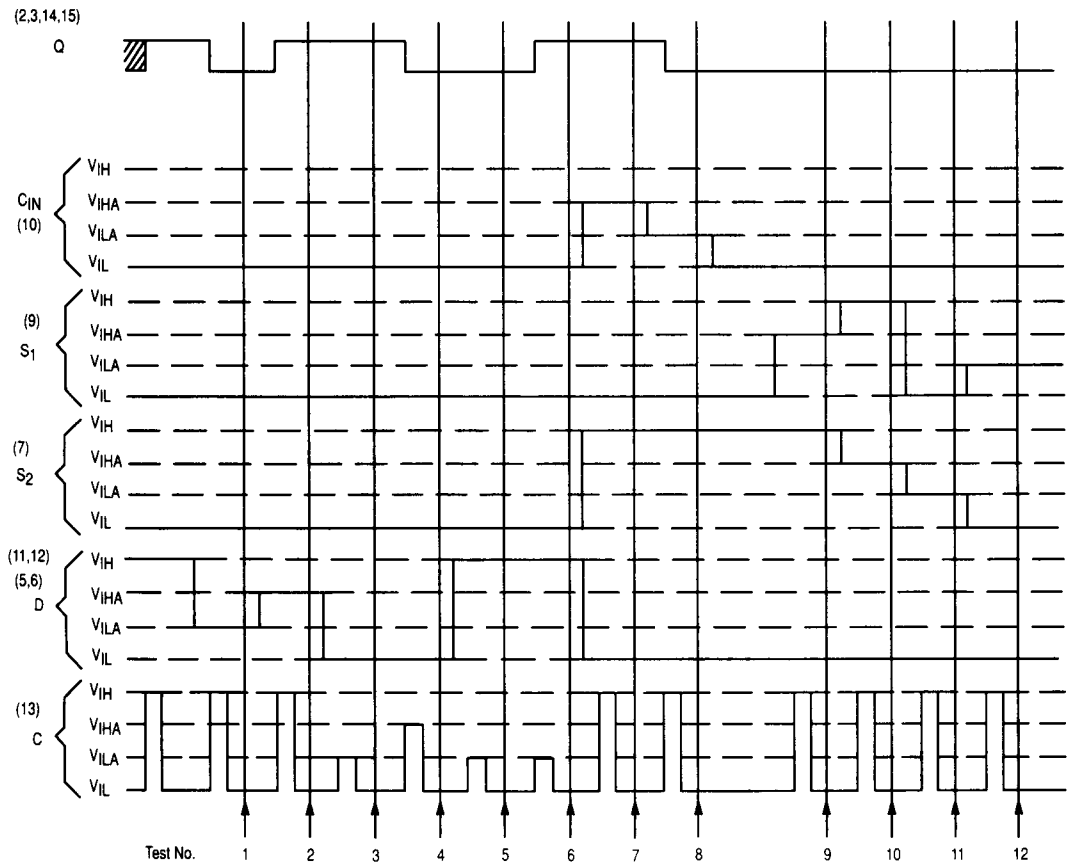


Figure 3. Threshold Sequence for VOLA, VOHA Tests

10537 QUIESCENT LIMIT TABLE *

* ELECTRICAL CHARACTERISTICS

Each MECL 10K series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear fpm is maintained. Outputs are terminated through a 100 Ω resistor to - 2.0 volts.

Test Temperature	Test Voltage Values (Volts)						
	V _{IH1}	V _{IL1}	V _{IH2}	V _{IL2}	P _{S1}	P _{S2}	VEE
T _A = 25 °C	- 0.780	- 1.850	- 1.105	- 1.475	+ 1.11	+ 0.31	- 5.2
T _A = 125 °C	- 0.630	- 1.820	- 1.000	- 1.400	+ 1.24	+ 0.36	- 5.2
T _A = - 55 °C	- 0.880	- 1.920	- 1.255	- 1.510	+ 1.01	+ 0.28	- 5.2

Symbol	Parameter	Limits						Units	TEST VOLTAGE APPLIED TO PINS BELOW				
		+ 25 °C		+ 125 °C		- 55 °C			Pinouts referenced are for DIL package, check Pin Assignments V _{CC} = 0 V, Output Load = 100 Ω to - 2.0 V				
		Subgroup 1		Subgroup 2		Subgroup 3							
		Min	Max	Min	Max	Min	Max		V _{IH1}	V _{IL1}	V _{EE}	V _{CC}	P. U. T.
V _{OH}	High Output Voltage	- 0.93	- 0.78	- 0.825	- 0.63	- 1.08	- 0.88	V	5 - 7, 9, 11 - 13	13	8	1, 16	2, 3, 4, 14, 15
V _{OL}	Low Output Voltage	- 1.85	- 1.62	- 1.82	- 1.545	- 1.92	- 1.655	V	13	13	8	1, 16	2, 3, 4, 14, 15
V _{OH1}	High Output Voltage**	- 0.95		- 0.845		- 1.10		V			8	1, 16	2, 3, 4, 14, 15
V _{OL1}	Low Output Voltage**		- 1.60		- 1.525		- 1.635	V			8	1, 16	2, 3, 4, 14, 15
I _{EE}	Power Supply Current	- 150		- 165		- 165		mA			8	1, 16	8
I _{IH}	Input Current High		220		375		375	μA	5, 6, 11, 12		8	1, 16	5, 6, 11, 12
I _{IH1}	Input Current High		245		415		415	μA	9, 10		8	1, 16	9, 10
I _{IH2}	Input Current High		265		450		450	μA	7		8	1, 16	7
I _{IH3}	Input Current High		290		495		495	μA	13		8	1, 16	13
I _{IL}	Input Current Low	0.5		0.3		0.5		μA		5 - 7, 10 - 14	8	1, 16	5 - 7, 10 - 14

** See Figure 3

10537 QUIESCENT LIMIT TABLE *

* ELECTRICAL CHARACTERISTICS

Each MECL 10K series circuit has been designed to meet the dc specifications shown in the test table, after thermal equilibrium has been established. The circuit is in a test socket or mounted on a printed circuit board and transverse air flow greater than 500 linear fpm is maintained. Outputs are terminated through a 100 Ω resistor to - 2.0 volts.

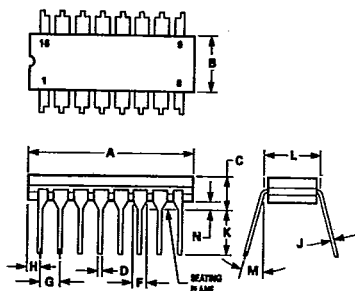
Test Temperature	Test Voltage Values (Volts)							
	V _{IH1}	V _{IL1}	V _{IH2}	V _{IL2}	PS1	PS2	VEE	VEEL
T _A = 25 °C	- 0.780	- 1.850	- 1.105	- 1.475	+ 1.11	+ 0.31	- 5.2	- 3.2
T _A = 125 °C	- 0.630	- 1.820	- 1.000	- 1.400	+ 1.24	+ 0.36	- 5.2	- 3.2
T _A = - 55 °C	- 0.980	- 1.920	- 1.255	- 1.510	+ 1.01	+ 0.28	- 5.2	- 3.2

Symbol	Parameter	Limits						Units	TEST VOLTAGE APPLIED TO PINS BELOW									
		+ 25 °C		+ 125 °C		- 55 °C			Pinouts referenced are for DIL package, check Pin Assignments VCC = 2.0 V, Output Load = 100 Ω to GND									
		Subgroup 9	Subgroup 10	Subgroup 11	CLK	V _{IN}	V _{OUT}		V _{CC}	VEEL	PS1	PS2	P. U. T.					
t _{TLH}	Rise Time	1.1	3.3	1.2	3.7	0.9	3.3	ns	7, 10, 12, 13	4, 14	1, 16	8, 11, 12	5-7, 13	9, 10	4, 14			
t _{THL}	Fall Time	1.1	3.3	1.2	3.7	0.9	3.3	ns	7, 10, 12, 13	4, 14	1, 16	8, 11, 12	5-7, 13	9, 10	4, 14			
t _{pd}	Propagation Delay CLK to Q CLK to Carry Out Carry In to Carry Out	1.0 2.5 1.6	4.5 10.5 6.9	1.4 2.4 1.9	5.2 12.6 7.6	0.8 2.0 1.6	4.6 11.0 7.1	ns ns ns	7, 10, 12, 13 7, 10, 12, 13 7, 10, 12, 13	4, 14 4, 14 4, 14	1, 16 1, 16 1, 16	8, 11, 12 8, 11, 12 8, 11, 12	5-7, 13 5-7, 13 5-7, 13	9, 10 9, 10 9, 10	4, 14 4, 14 4, 14			
t _{set}	Setup Time Data Inputs Select Inputs Carry In Input	3.5 7.5 7.5 3.7 -1.0		3.5 7.5 7.5 4.5 -1.0		3.5 7.5 7.5 4.5 -1.0		ns ns ns ns ns	7, 10, 12, 13 7, 10, 12, 13 7, 10, 12, 13 7, 10, 12, 13 7, 10, 12, 13	14 14 14 14 14	1, 16 1, 16 1, 16 1, 16 1, 16	8 8 8 8 8	7 7 7 7 7	7, 10 7, 10 7, 10 7, 10 7, 10	14 14 14 14 14			
t _{hold}	Hold Time Data Inputs Select Inputs Carry In Inputs	0.0 -2.5 -1.6 3.1		0.0 -2.5 -1.6 4.0		0.0 -2.5 -1.6 4.0		ns ns ps ns	7, 10, 12, 13 7, 10, 12, 13 7, 10, 12, 13 7, 10, 12, 13	14 14 14 14	1, 16 1, 16 1, 16 1, 16	8 8 8 8	7 7 7 7	7, 10 7, 10 7, 10 7, 10	14 14 14 14			
t _{count}	Counting Frequency	125		115		115		MHz	13	14	1, 16	8	7, 9		14			

PACKAGE OUTLINE DIMENSIONS

A letter suffix to the MECL logic function part number is used to specify the package style (see drawings below). See appropriate selector guide for specific packaging available for a given device type.

**L SUFFIX
CERAMIC PACKAGE
CASE 620-09**



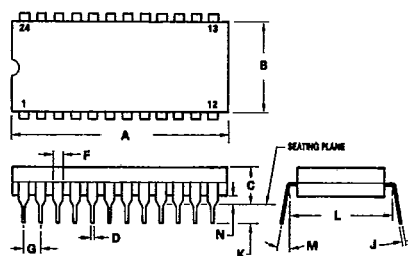
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	19.05	19.81	0.750	0.780
B	6.32	6.59	0.245	0.275
C	4.06	5.08	0.160	0.200
D	0.38	0.51	0.015	0.020
F	1.40	1.65	0.055	0.065
G	2.54 BSC		0.100 BSC	
H	0.51	1.14	0.020	0.045
J	0.20	0.30	0.008	0.012
K	3.18	4.06	0.125	0.160
L	2.27	2.87	0.090	0.110
M	10°		10°	
N	0.51	1.02	0.020	0.040

NOTES:

- LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- PACKAGE INDEX: NOTCH IN LEAD NOTCH IN CERAMIC OR INK DOT.
- DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.

**L SUFFIX
CERAMIC PACKAGE
CASE 623-05**

(LW SUFFIX
FOR
MC10H181
ONLY)

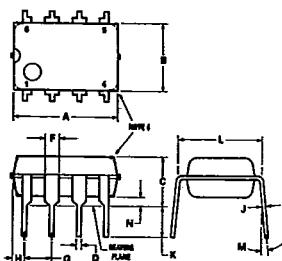


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	31.24	32.77	1.230	1.290
B	12.70	15.49	0.500	0.610
C	4.06	5.59	0.160	0.220
D	0.41	0.51	0.016	0.020
F	1.27	1.52	0.050	0.060
G	2.54 BSC		0.100 BSC	
J	0.20	0.30	0.008	0.012
K	3.18	4.06	0.125	0.160
L	15.24 BSC		0.600 BSC	
M	0° 15°		0° 15°	
N	0.51	1.27	0.020	0.050

NOTES:

- DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
- LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION (WHEN FORMED PARALLEL).

**P SUFFIX
PLASTIC PACKAGE
CASE 626-04**

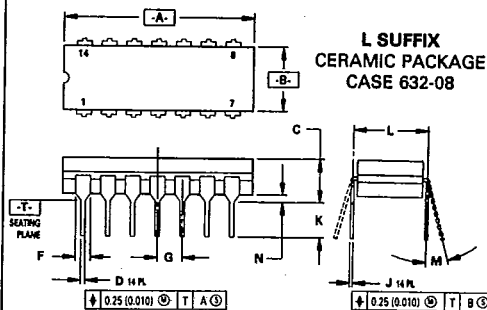


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.54	4.45	0.135	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.87	3.43	0.115	0.135
L	2.87 BSC		0.300 BSC	
M	10°		10°	
N	0.51	0.76	0.020	0.030

NOTES:

- LEAD POSITIONAL TOLERANCE:
 $\phi 0.13 (0.005) \text{ T A } \phi \text{ B } \phi$
- DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
- PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
- DIMENSIONS A AND B ARE DATUMS.
- DIMENSIONS AND TOLERANCING PER ANSI Y14.5M, 1982.

**L SUFFIX
CERAMIC PACKAGE
CASE 632-08**



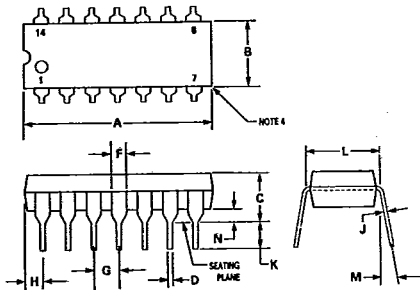
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	19.05	19.94	0.750	0.785
B	6.23	7.11	0.245	0.280
C	3.94	5.08	0.155	0.200
D	0.39	0.50	0.015	0.020
F	1.40	1.65	0.055	0.065
G	2.54 BSC		0.100 BSC	
J	0.21	0.38	0.008	0.015
K	3.18	4.31	0.125	0.170
L	7.62 BSC		0.300 BSC	
M	0° 15°		0° 15°	
N	0.51	1.01	0.020	0.040

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
- DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY.

PACKAGE OUTLINE DIMENSIONS (continued)

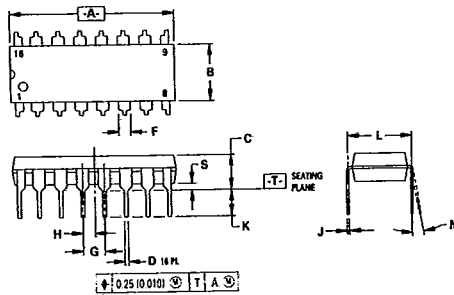
T-90-20

P SUFFIX
PLASTIC PACKAGE
CASE 646-06

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	18.16	19.56	0.715	0.770
B	6.10	6.60	0.240	0.260
C	3.69	4.69	0.145	0.185
D	0.38	0.53	0.015	0.021
E	1.02	1.78	0.040	0.070
F	2.54 BSC		0.100 BSC	
G	1.32	2.41	0.052	0.095
H	0.20	0.38	0.008	0.015
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	0°	10°	0°	10°
N	0.29	1.01	0.015	0.039

NOTES:

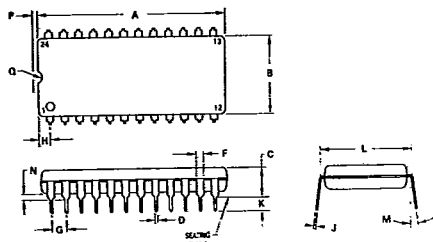
- LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
- DIMENSION "B" DOES NOT INCLUDE MOLD FLASH.
- ROUNDED CORNERS OPTIONAL.

P SUFFIX
PLASTIC PACKAGE
CASE 648-08

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	18.80	19.55	0.740	0.770
B	6.35	6.85	0.250	0.270
C	3.69	4.44	0.145	0.175
D	0.39	0.53	0.015	0.021
E	1.02	1.77	0.040	0.070
F	2.54 BSC		0.100 BSC	
G	1.27 BSC		0.050 BSC	
H	0.21	0.38	0.008	0.015
K	2.80	3.30	0.110	0.130
L	7.50	7.74	0.295	0.305
M	0°	10°	0°	10°
N	0.51	1.01	0.020	0.040

NOTES:

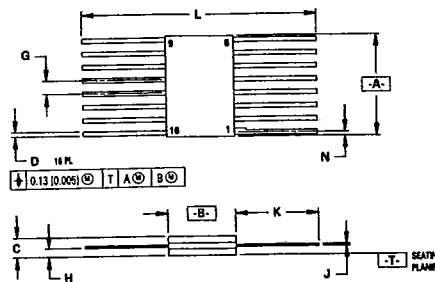
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
- DIMENSION "B" DOES NOT INCLUDE MOLD FLASH.
- ROUNDED CORNERS OPTIONAL.

P SUFFIX
PLASTIC PACKAGE
CASE 649-03(PW SUFFIX
FOR MC10H181
ONLY)

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	31.50	32.13	1.240	1.265
B	13.21	13.72	0.520	0.540
C	4.70	5.21	0.185	0.205
D	0.38	0.51	0.015	0.020
E	1.02	1.52	0.040	0.060
F	2.54 BSC		0.100 BSC	
G	1.65	2.16	0.065	0.085
H	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	14.99	15.49	0.590	0.610
M	—	10°	—	10°
N	0.51	1.02	0.020	0.040
P	0.13	0.38	0.005	0.015
Q	0.51	0.76	0.020	0.030

NOTES:

- LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.

F SUFFIX
CERAMIC PACKAGE
CASE 650-05

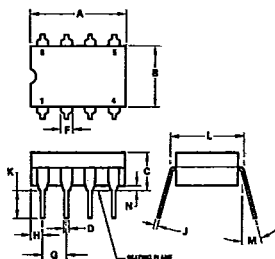
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.40	9.90	0.370	0.390
B	6.23	6.60	0.245	0.260
C	1.53	2.15	0.060	0.085
D	0.38	0.48	0.014	0.019
E	1.27 BSC		0.050 BSC	
F	0.64	0.01	0.025	0.040
G	0.11	0.17	0.004	0.007
K	6.35	9.39	0.250	0.370
L	18.93	—	0.745	—
N	—	0.50	—	0.020

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- DIMENSION "A" AND "B" ALLOW FOR LID MISMATCH, AND GLASS MENISCUS.
- DIMENSION "H" SHALL BE MEASURED AT THE POINT OF EXIT OF THE LEAD FROM THE BODY.
- LEAD NUMBER 1 IDENTIFIED BY TAB ON LEAD OR DOT ON COVER.
- DIMENSION "J" INCLUDES SOLDER LEAD FINISH.
- LEAD NUMBERS SHOWN FOR REFERENCE ONLY.

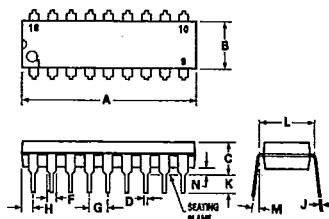
PACKAGE OUTLINE DIMENSIONS (continued)

T-90-20

L SUFFIX
CERAMIC PACKAGE
CASE 693-02


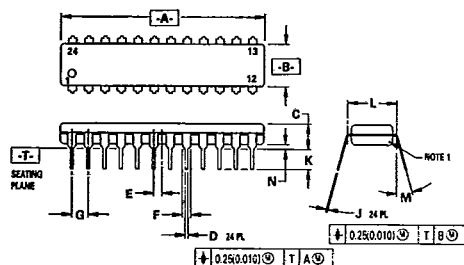
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.91	10.92	0.390	0.430
B	6.22	6.99	0.245	0.275
C	4.32	5.08	0.170	0.200
D	0.41	0.51	0.016	0.020
E	1.40	1.65	0.055	0.065
F	2.54 BSC		0.100 BSC	
G	1.14	1.65	0.045	0.065
H	0.20	0.30	0.008	0.012
I	3.18	4.08	0.125	0.160
J	2.37	2.87	0.090	0.110
K	—	15°	—	15°
L	0.51	1.02	0.020	0.040

- NOTES:
- LEADS WITHIN 0.13 mm (0.005) RAD OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
 - DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.

P SUFFIX
PLASTIC PACKAGE
CASE 707-02


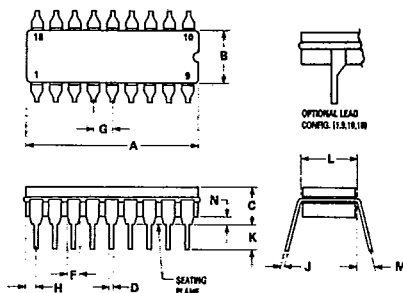
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	22.22	23.24	0.875	0.915
B	6.10	6.60	0.240	0.260
C	3.56	4.57	0.140	0.180
D	0.36	0.56	0.014	0.022
E	1.27	1.78	0.050	0.070
F	2.54 BSC		0.100 BSC	
G	1.02	1.52	0.040	0.060
H	0.20	0.30	0.008	0.012
I	2.92	3.43	0.115	0.135
J	7.62 BSC		0.300 BSC	
K	0°	15°	0°	15°
L	0.51	1.02	0.020	0.040

- NOTES:
- POSITIONAL TOLERANCE OF LEADS (D), SHALL BE WITHIN 0.25mm(0.010) AT MAXIMUM MATERIAL CONDITION, IN RELATION TO SEATING PLANE AND EACH OTHER.
 - DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIMENSION B DOES NOT INCLUDE MOLD FLASH.

P SUFFIX
PLASTIC PACKAGE
CASE 724-03


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	31.25	32.13	1.230	1.265
B	6.35	6.85	0.250	0.270
C	3.68	4.44	0.145	0.175
D	0.38	0.51	0.015	0.020
E	1.27 BSC		0.050 BSC	
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	0.18	0.30	0.007	0.012
I	2.80	3.55	0.110	0.140
J	7.62 BSC		0.300 BSC	
K	0°	15°	0°	15°
L	0.51	1.01	0.020	0.040

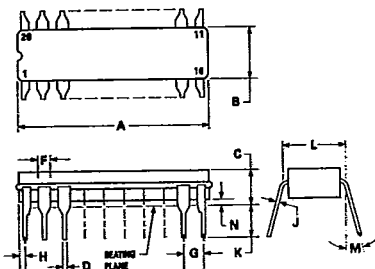
- NOTES:
- CHAMFERED CONTOUR OPTIONAL.
 - DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: INCH.

L SUFFIX
CERAMIC PACKAGE
CASE 726-04


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	22.35	23.11	0.880	0.910
B	6.10	7.49	0.240	0.295
C	—	5.08	—	0.200
D	0.38	0.53	0.015	0.021
E	1.40	1.78	0.055	0.070
F	2.54 BSC		0.100 BSC	
G	0.51	1.14	0.020	0.045
H	0.20	0.30	0.008	0.012
I	3.18	4.32	0.125	0.170
J	7.62 BSC		0.300 BSC	
K	0°	15°	0°	15°
L	0.51	1.02	0.020	0.040

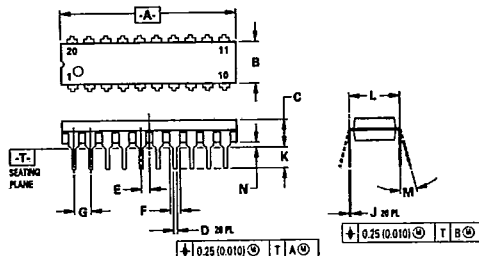
- NOTES:
- LEADS, TRUE POSITIONED WITHIN 0.25 mm (0.010) DIA. AT SEATING PLANE, AT MAXIMUM MATERIAL CONDITION.
 - DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIM "A" & "B" INCLUDES MENISCUS.
 - "F" DIMENSION IS FOR FULL LEADS. "HALF" LEADS ARE OPTIONAL AT LEAD POSITIONS 1, 9, 10, AND 18.

PACKAGE OUTLINE DIMENSIONS (continued)

L SUFFIX
CERAMIC PACKAGE
CASE 732-03

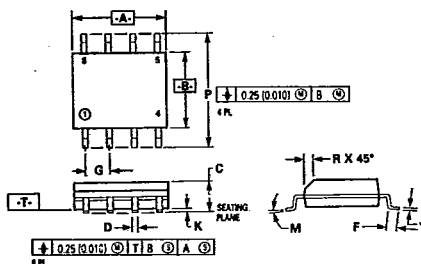
DIM	MILLIMETERS	INCHES
	MIN	MAX
A	23.88	25.15
B	6.80	7.43
C	3.81	5.08
D	0.38	0.56
E	1.40	1.65
F	2.54 BSC	0.100 BSC
G	0.51	1.27
H	0.20	0.30
I	3.18	4.06
J	7.62 BSC	0.300 BSC
K	0°	15°
L	0.25	1.02

- NOTES:
- LEADS WITHIN 0.25 mm (0.010) DIA., TRUE POSITION AT SEATING PLANE, AT MAXIMUM MATERIAL CONDITION.
 - DIM L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIM A AND B INCLUDES MENISCUS.

P SUFFIX
PLASTIC PACKAGE
CASE 738-03

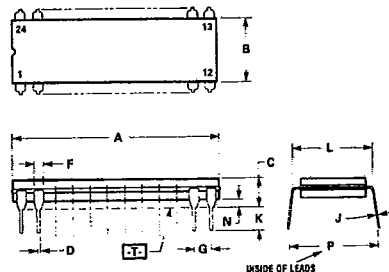
DIM	MILLIMETERS	INCHES
	MIN	MAX
A	25.55	27.17
B	6.10	6.60
C	3.81	4.57
D	0.38	0.56
E	1.27 BSC	0.050 BSC
F	1.27	1.77
G	2.54 BSC	0.100 BSC
H	0.21	0.38
I	2.80	3.55
J	7.62 BSC	0.300 BSC
K	0°	15°
L	0.51	1.01

- NOTES:
- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIMENSION: INCH.
 - DIMENSION 'L' TO CENTER OF LEAD WHEN FORMED PARALLEL.
 - DIMENSION 'B' DOES NOT INCLUDE MOLD FLASH.

D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751-03

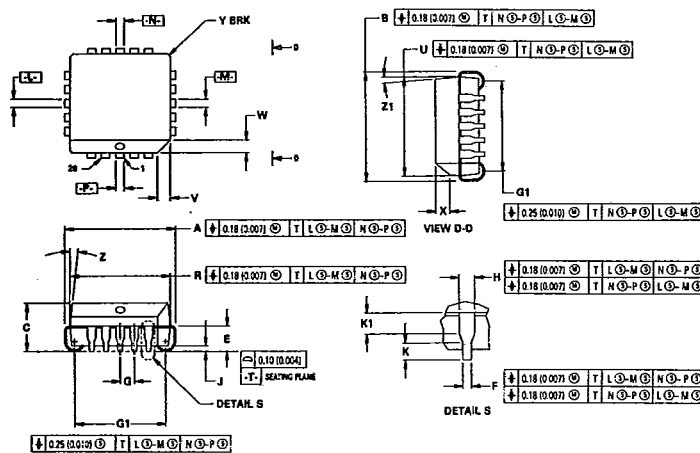
DIM	MILLIMETERS	INCHES
	MIN	MAX
A	4.80	5.00
B	3.80	4.00
C	1.35	1.75
D	0.35	0.49
E	0.40	1.25
F	1.27 BSC	0.050 BSC
G	0.18	0.25
H	0.10	0.25
I	0°	7°
J	5.80	6.20
K	0.25	0.50

- NOTES:
- DIMENSIONS "A" AND "B" ARE DATUMS AND "T" IS A DATUM SURFACE.
 - DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 - CONTROLLING DIM: MILLIMETER.
 - DIMENSION "A" AND "B" DO NOT INCLUDE MOLD PROTRUSION.
 - MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.

L SUFFIX
CERAMIC PACKAGE
CASE 758-01

DIM	MILLIMETERS	INCHES
	MIN	MAX
A	31.50	32.64
B	7.24	7.75
C	3.68	4.44
D	0.38	0.53
E	1.14	1.57
F	2.54 BSC	0.100 BSC
G	0.20	0.33
H	2.54	4.19
I	7.62	7.87
J	0.51	1.27
K	9.14	10.16

- NOTES:
- DIMENSION A IS DATUM.
 - POSITIONAL TOLERANCE FOR LEADS: 24 PLACES $\pm 0.25 (0.010) \text{ TIA } \text{B}$
 - "T" IS SEATING PLANE.
 - DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 - DIMENSIONING AND TOLERANCING PER ANSI Y14.5, 1973.

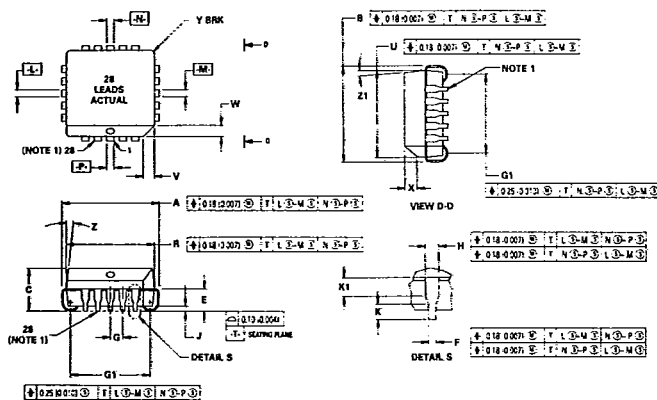


FN SUFFIX
PLASTIC PACKAGE
CASE 775-02

NOTES:

1. DATUMS -L-, -M-, -N-, AND -P- DETERMINED WHERE TOP OF LEAD SHOULDER EXIT PLASTIC BODY AT MOLD PARTING LINE.
2. DIM G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
3. DIM R AND U DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.25 (0.010) PER SIDE.
4. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
5. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.78	10.03	0.385	0.395
B	9.78	10.03	0.385	0.395
C	4.20	4.57	0.165	0.180
E	2.29	2.79	0.090	0.110
F	0.33	0.48	0.013	0.019
G	1.27 BSC		0.050 BSC	
H	0.66	0.81	0.026	0.032
J	0.51	—	0.020	—
K	0.64	—	0.025	—
R	8.83	9.04	0.350	0.356
U	8.83	9.04	0.350	0.356
V	1.07	1.21	0.042	0.048
W	1.07	1.21	0.042	0.048
X	1.07	1.42	0.042	0.056
Y	—	0.50	—	0.020
Z	2°	10°	2°	10°
G1	7.88	8.38	0.310	0.330
K1	1.02	—	0.040	—
Z1	2°	10°	2°	10°



FN SUFFIX
PLASTIC PACKAGE
CASE 776-02

NOTES:

1. DUE TO SPACE LIMITATION, CASE 776-02 SHALL BE REPRESENTED BY A GENERAL (SMALLER) CASE OUTLINE DRAWING RATHER THAN SHOWING ALL 28 LEADS.
2. DATUMS -L-, -M-, -N-, AND -P- DETERMINED WHERE TOP OF LEAD SHOULDER EXIT PLASTIC BODY AT MOLD PARTING LINE.
3. DIM G1, TRUE POSITION TO BE MEASURED AT DATUM -T-, SEATING PLANE.
4. DIM R AND U DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE MOLD PROTRUSION IS 0.25 (0.010) PER SIDE.
5. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
6. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	12.32	12.57	0.485	0.495
B	12.32	12.57	0.485	0.495
C	4.20	4.57	0.165	0.180
E	2.29	2.79	0.090	0.110
F	0.33	0.48	0.013	0.019
G	1.27 BSC		0.050 BSC	
H	0.66	0.81	0.026	0.032
J	0.51	—	0.020	—
K	0.64	—	0.025	—
R	11.43	11.58	0.450	0.456
U	11.43	11.58	0.450	0.456
V	1.07	1.21	0.042	0.048
W	1.07	1.21	0.042	0.048
X	1.07	1.42	0.042	0.056
Y	—	0.50	—	0.020
Z	2°	10°	2°	10°
G1	10.42	10.92	0.410	0.430
K1	1.02	—	0.040	—
Z1	2°	10°	2°	10°

MECL Logic Surface Mount

WHY SURFACE MOUNT?

Surface Mount Technology is now being utilized to offer answers to many problems that have been created in the use of insertion technology.

Limitations have been reached with insertion packages and PC board technology. Surface Mount Technology offers the opportunity to continue to advance the State-of-the-Art designs that cannot be accomplished with Insertion Technology.

Surface Mount Packages allow more optimum device performance with the smaller Surface Mount configuration. Internal lead lengths, parasitic capacitance and inductance that placed limitations on chip performance have been reduced.

The lower profile of Surface Mount Packages allows more boards to be utilized in a given amount of space. They are stacked closer together and utilize less total volume than insertion populated PC boards.

Printed circuit costs are lowered with the reduction of the number of board layers required. The elimination or reduction of the number of plated through holes in the board, contribute significantly to lower PC board prices.

Surface Mount assembly does not require the preparation of components that are common on insertion technology lines. Surface Mount components are sent directly to the assembly line, eliminating an intermediate step.

Automatic placement equipment is available that can place Surface Mount components at the rate of a few thousand per hour to hundreds of thousands of components per hour.

Surface Mount Technology is cost effective, allowing the manufacturer the opportunity to produce smaller units and offer increased functions with the same size product.

MECL AVAILABILITY IN SURFACE MOUNT

Motorola is now offering MECL 10K and MECL 10KH in the PLCC (Plastic Leaded Chip Carrier) packages.

MECL in PLCC may be ordered in conventional plastic rails or on Tape and Reel. Refer to the Tape and Reel section for ordering details.

TAPE AND REEL

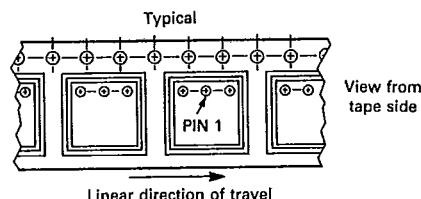
Motorola has now added the convenience of Tape and Reel packaging for our growing family of standard Integrated Circuit products. The packaging fully conforms to

the latest EIA RS-481A specification. The antistatic embossed tape provides a secure cavity sealed with a peel-back cover tape.

GENERAL INFORMATION

- Reel Size 13 inch (330 mm) Suffix: R2
- Tape Width 16 mm
- Units/Reel 1000

MECHANICAL POLARIZATION



ORDERING INFORMATION

- Minimum Lot Size/Device Type = 3000 Pieces.
- No Partial Reel Counts Available.
- To order devices which are to be delivered in Tape and Reel, add the appropriate suffix to the device number being ordered.

EXAMPLE:

ORDERING CODE

MC10100FN
MC10100FNR2
MC10H100FN
MC10H100FNR2
MC12015D
MC12015DR2

SHIPMENT METHOD

Magazines (Rails)
13 inch Tape and Reel
Magazines (Rails)
13 inch Tape and Reel
Magazines (Rails)
13 inch Tape and Reel

DUAL-IN-LINE PACKAGE TO PLCC PIN CONVERSION DATA

The following tables give the equivalent I/O pinouts of Dual-In-Line (DIL) packages and Plastic Leaded Chip Carrier (PLCC) packages.

Conversion Tables

16 PIN DIL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
20 PIN PLCC	2	3	4	5	7	8	9	10	12	13	14	15	17	18	19	20

20 PIN DIL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
20 PIN PLCC	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

24 PIN DIL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
28 PIN PLCC	2	3	4	5	6	7	9	10	11	12	13	14	16	17	18	19	20	21	23	24	25	26	27	28