



**CMOS SSI**

**QUAD EXCLUSIVE "OR" AND "NOR" GATES**

The MC14070B quad exclusive OR gate and the MC14077B quad exclusive NOR gate are constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. These complementary MOS logic gates find primary use where low power dissipation and/or high noise immunity is desired.

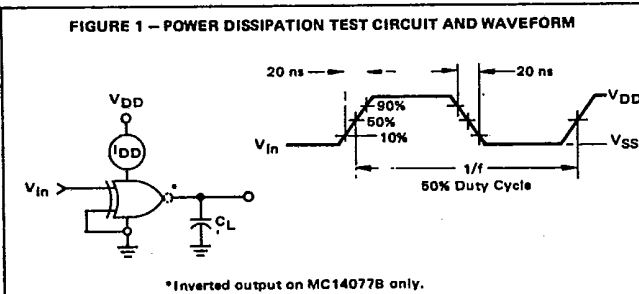
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- All Outputs Buffered
- Capable of Driving Two Low-Power TTL Loads or One Low-Power Schottky TTL Load Over the Rated Temperature Range
- Double Diode Protection on All Inputs
- MC14070B — Replacement for CD4030B and CD4070B Types
- MC14077B — Replacement for CD4077B Type

**MAXIMUM RATINGS\*** (Voltages Referenced to V<sub>SS</sub>)

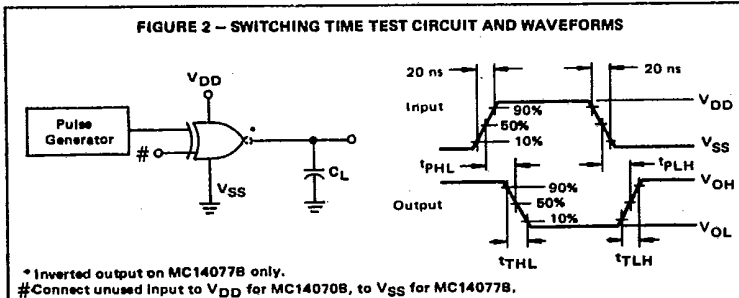
Symbol	Parameter	Value	Unit
V <sub>DD</sub>	DC Supply Voltage	-0.5 to +18.0	V
V <sub>In</sub> , V <sub>Out</sub>	Input or Output Voltage (DC or Transient)	-0.5 to V <sub>DD</sub> + 0.5	V
I <sub>In</sub> , I <sub>Out</sub>	Input or Output Current (DC or Transient), per Pin	± 10	mA
P <sub>D</sub>	Power Dissipation, per Package†	500	mW
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (8-Second Soldering)	260	°C

\*Maximum Ratings are those values beyond which damage to the device may occur.  
 †Temperature Derating: Plastic "P" Package: -12mW/°C from 65°C to 85°C  
 Ceramic "L" Package: -12mW/°C from 100°C to 125°C

**FIGURE 1 — POWER DISSIPATION TEST CIRCUIT AND WAVEFORM**



**FIGURE 2 — SWITCHING TIME TEST CIRCUIT AND WAVEFORMS**

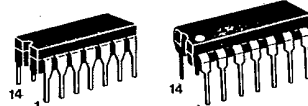


**MC14070B**

QUAD EXCLUSIVE "OR" GATE

**MC14077B**

QUAD EXCLUSIVE "NOR" GATE

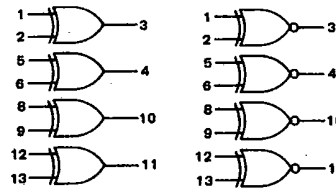


CASE 632 L SUFFIX CERAMIC PACKAGE  
 CASE 646 P SUFFIX PLASTIC PACKAGE

**ORDERING INFORMATION**

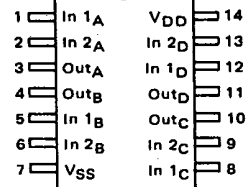
A Series: -55°C to +125°C  
 MC14XXXBAL (Ceramic Package Only)  
 C Series: -40°C to +85°C  
 MC14XXXBCP (Plastic Package)  
 MC14XXXBCL (Ceramic Package)

**MC14070B** Quad Exclusive OR Gate  
**MC14077B** Quad Exclusive NOR Gate



V<sub>DD</sub> = Pin 14  
 V<sub>SS</sub> = Pin 7  
 (Both Devices)

**PIN ASSIGNMENT**



MC14070B•MC14077B

T-43-21

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V<sub>SS</sub>)

Characteristic	Symbol	V <sub>DD</sub> Vdc	T <sub>low</sub> *		25°C			T <sub>high</sub> *		Unit	
			Min	Max	Min	Typ #	Max	Min	Max		
Output Voltage V <sub>in</sub> = V <sub>DD</sub> or 0	"0" Level V <sub>OL</sub>	5.0	—	0.05	—	0	0.05	—	0.05	Vdc	
		10	—	0.05	—	0	0.05	—	0.05		
		15	—	0.05	—	0	0.05	—	0.05		
	"1" Level V <sub>in</sub> = 0 or V <sub>DD</sub>	V <sub>OH</sub>	5.0	4.95	—	4.95	5.0	—	4.95	—	Vdc
			10	9.95	—	9.95	10	—	9.95	—	
			15	14.95	—	14.95	15	—	14.95	—	
Input Voltage (V <sub>O</sub> = 4.5 or 0.5 Vdc) (V <sub>O</sub> = 9.0 or 1.0 Vdc) (V <sub>O</sub> = 13.5 or 1.5 Vdc)	"0" Level V <sub>IL</sub>	5.0	—	1.5	—	2.25	1.5	—	1.5	Vdc	
		10	—	3.0	—	4.50	3.0	—	3.0		
		15	—	4.0	—	6.75	4.0	—	4.0		
	"1" Level (V <sub>O</sub> = 0.5 or 4.5 Vdc) (V <sub>O</sub> = 1.0 or 9.0 Vdc) (V <sub>O</sub> = 1.5 or 13.5 Vdc)	V <sub>IH</sub>	5.0	3.5	—	3.5	2.75	—	3.5	—	Vdc
			10	7.0	—	7.0	5.50	—	7.0	—	
			15	11.0	—	11.0	8.25	—	11.0	—	
Output Drive Current (AL Device)	Source I <sub>OH</sub>	5.0	-3.0	—	-2.4	-4.2	—	-1.7	—	mA <sub>dc</sub>	
		5.0	-0.64	—	-0.51	-0.88	—	-0.36	—		
		10	-1.6	—	-1.3	-2.25	—	-0.9	—		
	Sink I <sub>OL</sub>	5.0	0.64	—	0.51	0.88	—	0.36	—	mA <sub>dc</sub>	
		10	1.6	—	1.3	2.25	—	0.9	—		
		15	4.2	—	3.4	8.8	—	2.4	—		
Output Drive Current (CL/CP Device)	Source I <sub>OH</sub>	5.0	-2.5	—	-2.1	-4.2	—	-1.7	—	mA <sub>dc</sub>	
		5.0	-0.52	—	-0.44	-0.88	—	-0.36	—		
		10	-1.3	—	-1.1	-2.25	—	-0.9	—		
	Sink I <sub>OL</sub>	5.0	0.52	—	0.44	0.88	—	0.36	—	mA <sub>dc</sub>	
		10	1.3	—	1.1	2.25	—	0.9	—		
		15	3.6	—	3.0	8.8	—	2.4	—		
Input Current (AL Device)	I <sub>in</sub>	15	—	±0.1	—	±0.00001	±0.1	—	±1.0	μA <sub>dc</sub>	
Input Current (CL/CP Device)	I <sub>in</sub>	15	—	±0.3	—	±0.00001	±0.3	—	±1.0	μA <sub>dc</sub>	
Input Capacitance (V <sub>in</sub> = 0)	C <sub>in</sub>	—	—	—	—	5.0	7.5	—	—	pF	
Quiescent Current (AL Device) (Per Package)	I <sub>DD</sub>	5.0	—	0.25	—	0.0005	0.25	—	7.5	μA <sub>dc</sub>	
		10	—	0.60	—	0.0010	0.60	—	15		
		15	—	1.00	—	0.0015	1.00	—	30		
Quiescent Current (CL/CP Device) (Per Package)	I <sub>DD</sub>	5.0	—	1.0	—	0.0005	1.0	—	7.5	μA <sub>dc</sub>	
		10	—	2.0	—	0.0010	2.0	—	15		
		15	—	4.0	—	0.0015	4.0	—	30		
Total Supply Current**† (Dynamic plus Quiescent, Per Package) (C <sub>L</sub> = 50 pF on all outputs, all buffers switching)	I <sub>T</sub>	5.0	I <sub>T</sub> = (0.3 μA/kHz) f + I <sub>DD</sub>							μA <sub>dc</sub>	
10	I <sub>T</sub> = (0.6 μA/kHz) f + I <sub>DD</sub>										
15	I <sub>T</sub> = (0.9 μA/kHz) f + I <sub>DD</sub>										
Output Rise and Fall Times** (C <sub>L</sub> = 50 pF) †TLH, †THL = (1.35 ns/pF) C <sub>L</sub> + 33 ns ‡TLH, ‡THL = (0.60 ns/pF) C <sub>L</sub> + 20 ns §TLH, §THL = (0.40 ns/pF) C <sub>L</sub> + 20 ns	†TLH, ‡THL	5.0	—	—	—	100	200	—	—	ns	
		10	—	—	—	50	100	—	—		
		10	—	—	—	40	80	—	—		
		15	—	—	—	—	—	—	—		
Propagation Delay Times** (C <sub>L</sub> = 50 pF) †PLH, †PHL = (0.90 ns/pF) C <sub>L</sub> + 130 ns ‡PLH, ‡PHL = (0.38 ns/pF) C <sub>L</sub> + 57 ns §PLH, §PHL = (0.26 ns/pF) C <sub>L</sub> + 37 ns	†PLH, ‡PHL	5.0	—	—	—	175	350	—	—	ns	
		10	—	—	—	75	150	—	—		
		10	—	—	—	55	110	—	—		
		15	—	—	—	—	—	—	—		

\*T<sub>low</sub> = -55°C for AL Device, -40°C for CL/CP Device.  
T<sub>high</sub> = +125°C for AL Device, +85°C for CL/CP Device.

†To calculate total supply current at loads other than 50 pF:

$$I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) V/fk$$

#Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

where: I<sub>T</sub> is in μA (per package), C<sub>L</sub> in pF, V = (V<sub>DD</sub> - V<sub>SS</sub>) in volts, f in kHz is input frequency, and k = 0.002.

\*\*The formulas given are for the typical characteristics only at 25°C.

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V<sub>in</sub> and V<sub>out</sub> should be constrained to the range V<sub>SS</sub> ≤ (V<sub>in</sub> or V<sub>out</sub>) ≤ V<sub>DD</sub>. Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V<sub>SS</sub> or V<sub>DD</sub>). Unused outputs must be left open.



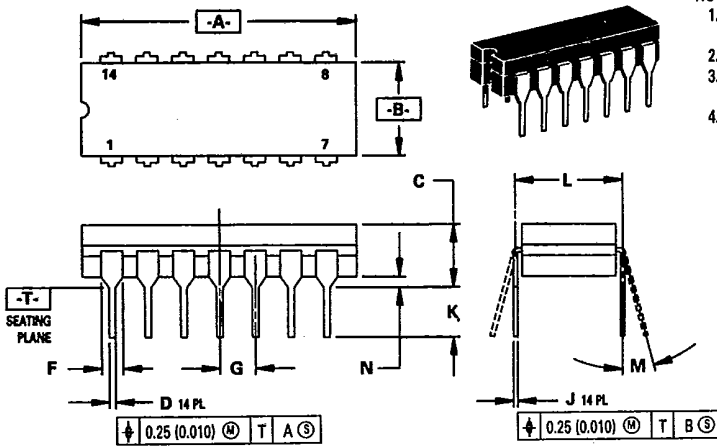
**PACKAGE DIMENSIONS**

T-90-20

The standard package availability for each device is indicated on the front page of the individual data sheets. Dimensions for the packages are given in this chapter. Surface mount packages may be special ordered by specifying the following suffixes: "D" (narrow SOIC), "DW" (wide SOIC), or "FN" (PLCC). For example, to order a quad NOR gate, use MC14001BD.

**14-PIN PACKAGE**

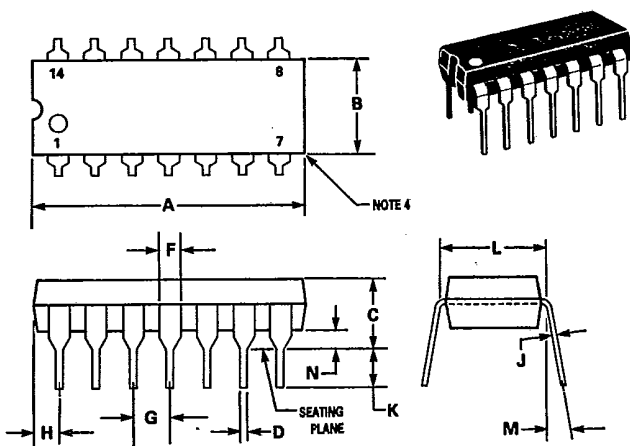
**CERAMIC PACKAGE  
CASE 632-08**



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

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

**PLASTIC PACKAGE  
CASE 646-06**



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

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
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	1.32	2.41	0.052	0.095
J	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	0.39	1.01	0.015	0.039

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PACKAGE DIMENSIONS (Continued)

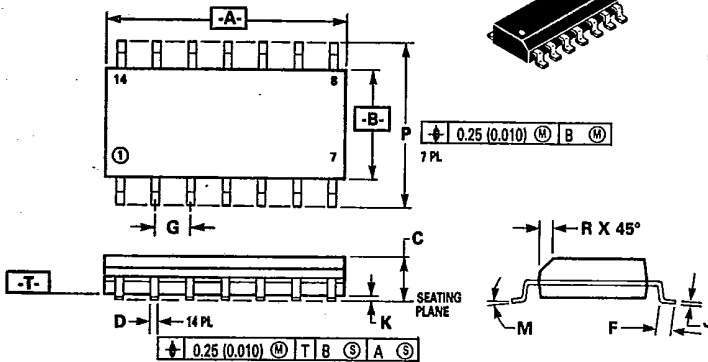
14-PIN PACKAGE

SOIC PACKAGE  
CASE 751A-02  
D SUFFIX

NOTES:

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

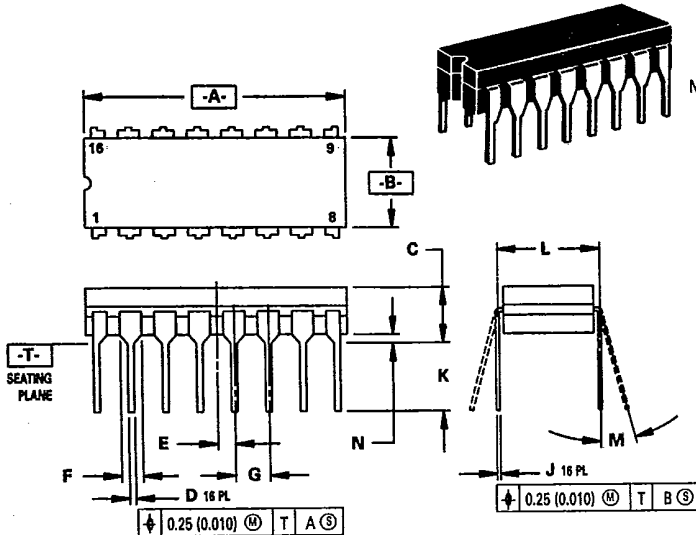
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.088
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019



PACKAGE DIMENSIONS (Continued)

16-PIN PACKAGE

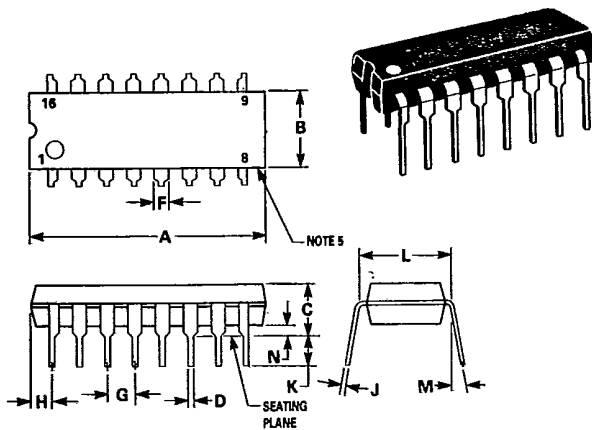
CERAMIC PACKAGE  
CASE 620-09



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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	19.05	19.55	0.750	0.770
B	6.10	7.36	0.240	0.290
C	—	4.19	—	0.165
D	0.39	0.53	0.015	0.021
E	1.27 BSC		0.050 BSC	
F	1.40	1.77	0.055	0.070
G	2.54 BSC		0.100 BSC	
J	0.23	0.27	0.009	0.011
K	—	5.08	—	0.200
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.39	0.88	0.015	0.035

PLASTIC PACKAGE  
CASE 648-06



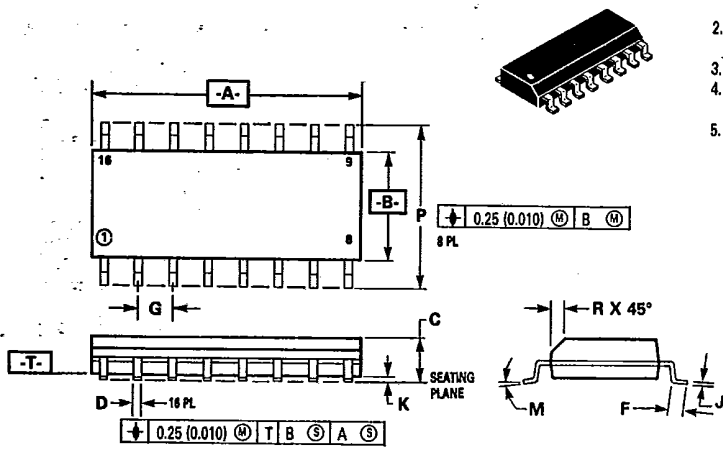
- NOTES:
1. LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
  2. DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
  3. DIMENSION "B" DOES NOT INCLUDE MOLD FLASH.
  4. "F" DIMENSION IS FOR FULL LEADS.
  5. ROUNDED CORNERS OPTIONAL.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	18.80	21.34	0.740	0.840
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
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.38	2.41	0.015	0.095
J	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	0.39	1.01	0.015	0.040

PACKAGE DIMENSIONS (Continued)

16-PIN PACKAGE

SOIC PACKAGE  
CASE 751B-03  
D SUFFIX

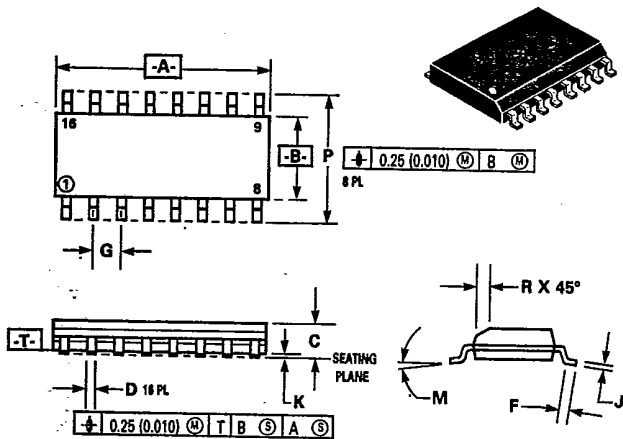


NOTES:

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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.088
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

SOIC PACKAGE  
CASE 751G-01  
DW SUFFIX



NOTES:

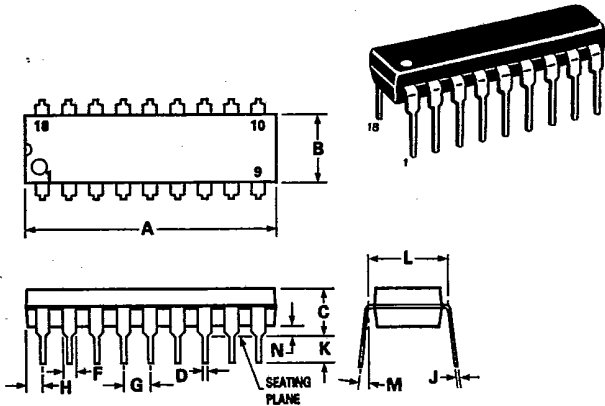
1. DIMENSIONS A AND B ARE DATUMS AND T IS A DATUM SURFACE.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
3. CONTROLLING DIMENSION: MILLIMETER.
4. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
5. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.15	10.45	0.400	0.411
B	7.40	7.60	0.292	0.299
C	2.35	2.65	0.093	0.104
D	0.35	0.49	0.014	0.019
F	0.50	0.90	0.020	0.035
G	1.27 BSC		0.050 BSC	
J	0.25	0.32	0.010	0.012
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

PACKAGE DIMENSIONS (Continued)

18-PIN PACKAGE

PLASTIC PACKAGE  
CASE 707-02

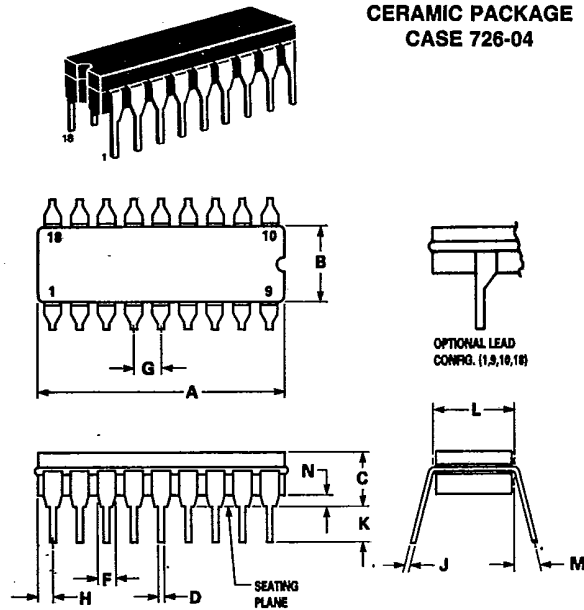


NOTES:

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

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
F	1.27	1.78	0.050	0.070
G	2.54 BSC		0.100 BSC	
H	1.02	1.52	0.040	0.060
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.51	1.02	0.020	0.040

CERAMIC PACKAGE  
CASE 726-04



NOTES:

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

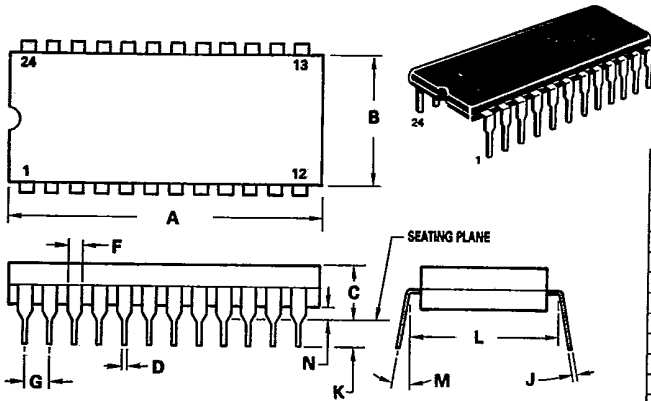
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	22.35	23.11	0.880	0.910
B	6.10	7.49	0.240	0.295
C	—	5.08	—	0.200
D	0.38	0.53	0.015	0.021
F	1.40	1.78	0.055	0.070
G	2.54 BSC		0.100 BSC	
H	0.51	1.14	0.020	0.045
J	0.20	0.30	0.008	0.012
K	3.18	4.32	0.125	0.170
L	7.62 BSC		0.300 BSC	
M	0°	15°	0°	15°
N	0.51	1.02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

9

PACKAGE DIMENSIONS (Continued)

24-PIN PACKAGE

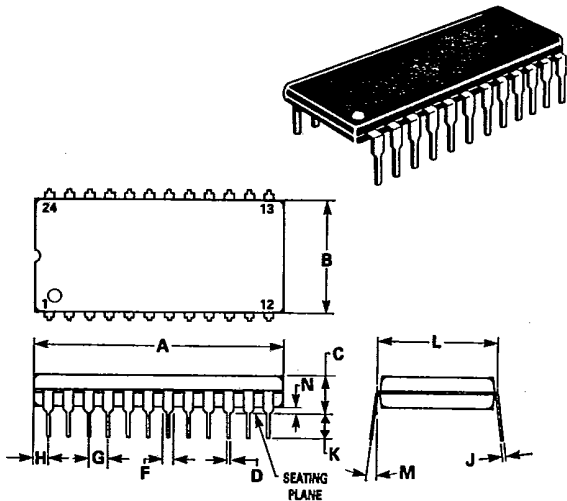
CERAMIC PACKAGE  
CASE 623-05



- 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).

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

PLASTIC PACKAGE  
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- NOTES:
- POSITIONAL TOLERANCE OF LEADS (D), SHALL BE WITHIN 0.25 mm (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.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	31.37	32.13	1.235	1.265
B	13.72	14.22	0.540	0.560
C	3.94	5.08	0.155	0.200
D	0.36	0.56	0.014	0.022
F	1.02	1.52	0.040	0.060
G	2.54 BSC		0.100 BSC	
H	1.65	2.03	0.065	0.080
J	0.20	0.38	0.008	0.015
K	2.92	3.43	0.115	0.135
L	15.24 BSC		0.600 BSC	
M	0°	15°	0°	15°
N	0.51	1.02	0.020	0.040