

6367252 MOTOROLA SC (LOGIC)

98D 79540 D

**MOTOROLA****MC14043B**

QUAD "NOR" R-S LATCH

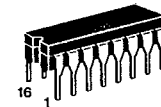
MC14044B

QUAD "NAND" R-S LATCH

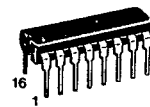
CMOS MSI QUAD R-S LATCHES

The MC14043B and MC14044B quad R-S latches are constructed with MOS P-channel and N-channel enhancement mode devices in a single monolithic structure. Each latch has an independent Q output and set and reset inputs. The Q outputs are gated through three-state buffers having a common enable input. The outputs are enabled with a logical "1" or high on the enable input; a logical "0" or low disconnects the latch from the Q outputs, resulting in an open circuit at the Q outputs.

- Double Diode Input Protection
- Three-State Outputs with Common Enable
- Outputs Capable of Driving Two Low-power TTL Loads or One Low-Power Schottky TTL Load Over the Rated Temperature Range
- Supply Voltage Range = 3.0 Vdc to 18 Vdc



L SUFFIX
CERAMIC PACKAGE
CASE 620



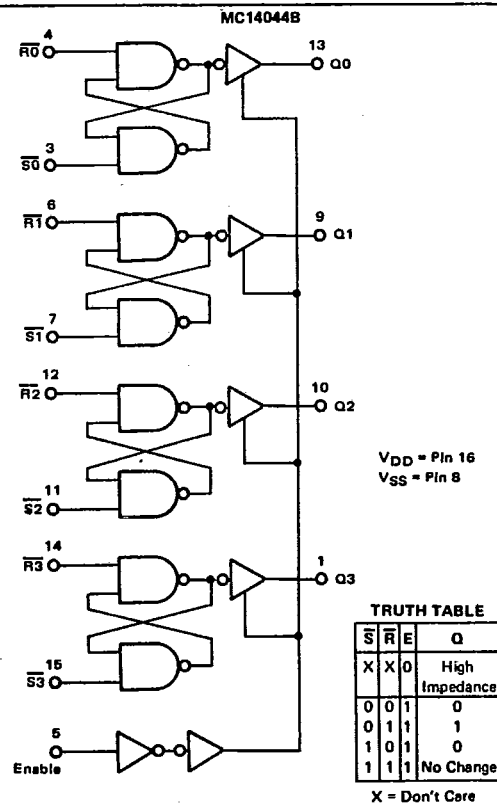
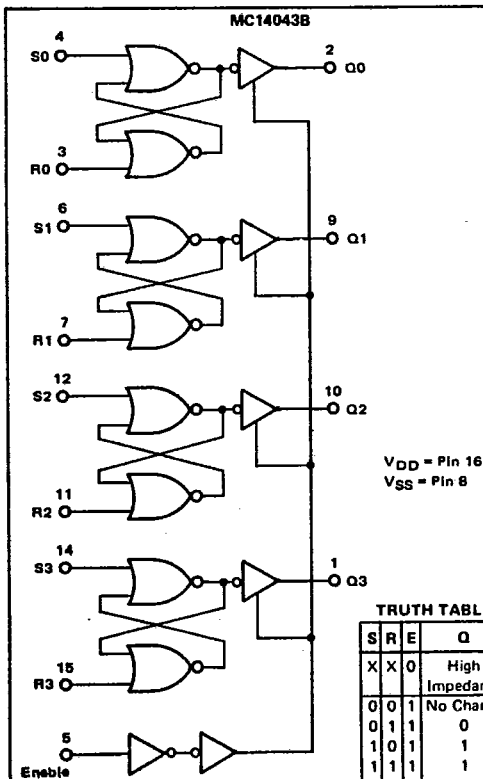
P SUFFIX
PLASTIC PACKAGE
CASE 648

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)

6



6367252 MOTOROLA SC (LOGIC)

98D 79541 D

MC14043B•MC14044B

T-46-07-15

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	VDD Vdc	Tlow*		25°C			Thigh*		Unit
			Min	Max	Min	Typ #	Max	Min	Max	
Output Voltage "0" Level VIN = VDD or 0	VOL	5.0 10 15	— — —	0.05 0.05 0.05	— — —	0 0 0	0.05 0.05 0.05	— — —	0.05 0.05 0.05	Vdc
VIN = 0 or VDD "1" Level	VOH	5.0 10 15	4.95 9.95 14.95	— — —	4.95 9.95 14.95	5.0 10 15	— — —	4.95 9.95 14.95	— — —	Vdc
Input Voltage "0" Level (VO = 4.5 or 0.5 Vdc) (VO = 9.0 or 1.0 Vdc) (VO = 13.5 or 1.5 Vdc)	VIL	5.0 10 15	— — —	1.5 3.0 4.0	— — —	2.25 4.50 6.75	1.5 3.0 4.0	— — —	1.5 3.0 4.0	Vdc
VIN = 0.5 or 4.5 Vdc (VO = 1.0 or 9.0 Vdc) (VO = 1.5 or 13.5 Vdc) "1" Level	VIH	5.0 10 15	3.5 7.0 11.0	— — —	3.5 7.0 11.0	2.75 5.50 8.25	— — —	3.5 7.0 11.0	— — —	Vdc
Output Drive Current (AL Device) (VOH = 2.5 Vdc) Source	IOH	5.0 5.0 10 15	-3.0 -0.64 -1.6 -4.2	— — — —	-2.4 -0.51 -1.3 -3.4	-4.2 -0.88 -2.25 -8.8	— — — —	-1.7 -0.36 -0.9 -2.4	— — — —	mAdc
(VOL = 0.4 Vdc) Sink	IOL	5.0 10 15	0.64 1.6 4.2	— — —	0.51 1.3 3.4	0.88 2.25 8.8	— — —	0.36 0.9 2.4	— — —	mAdc
Output Drive Current (CL/CP Device) (VOH = 2.5 Vdc) Source	IOH	5.0 5.0 10 15	-2.5 -0.52 -1.3 -3.6	— — — —	-2.1 -0.44 -1.1 -3.0	-4.2 -0.88 -2.25 -8.8	— — — —	-1.7 -0.36 -0.9 -2.4	— — — —	mAdc
(VOL = 0.4 Vdc) Sink	IOL	5.0 10 15	0.52 1.3 3.6	— — —	0.44 1.1 3.0	0.88 2.25 8.8	— — —	0.36 0.9 2.4	— — —	mAdc
Input Current (AL Device)	Iin	15	—	±0.1	—	±0.00001	±0.1	—	±1.0	μAdc
Input Current (CL/CP Device)	Iin	15	—	±0.3	—	±0.00001	±0.3	—	±1.0	μAdc
Input Capacitance (VIN = 0)	Cin	—	—	—	—	5.0	7.5	—	—	pF
Quiescent Current (AL Device) (Per Package)	IDD	5.0 10 15	— — —	1.0 2.0 4.0	— — —	0.002 0.004 0.006	1.0 2.0 4.0	— — —	30 60 120	μAdc
Quiescent Current (CL/CP Device) (Per Package)	IDD	5.0 10 15	— — —	4.0 8.0 16	— — —	0.002 0.004 0.006	4.0 8.0 16	— — —	30 60 120	μAdc
Total Supply Current**† (Dynamic plus Quiescent, Per Package) (CL = 50 pF on all outputs, all outputs switching)	IT	5.0 10 15	IT = (0.58 μA/kHz) f + IDD IT = (1.15 μA/kHz) f + IDD IT = (1.73 μA/kHz) f + IDD							μAdc
Three-State Output Leakage Current (AL Device)	ITL	15	—	±0.1	—	±0.0001	±0.1	—	±3.0	μAdc
Three-State Output Leakage Current (CL/CP Device)	ITL	15	—	±1.0	—	±0.0001	±1.0	—	±7.5	μAdc

*T_{low} = -55°C for AL Device, -40°C for CL/CP Device.
 T_{high} = +125°C for AL Device, +85°C for CL/CP Device.

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

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

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

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

where: I_T is in μA (per package), C_L in pF, V = (V_{DD} - V_{SS}) in volts,
 f in kHz is input frequency, and k = 0.004.

6367252 MOTOROLA SC (LOGIC)

98D 79542 D

MC14043B•MC14044B

T-46-07-15

MAXIMUM RATINGS* (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	-0.5 to +18.0	V
V_{in}, V_{out}	Input or Output Voltage (DC or Transient)	-0.5 to $V_{DD} + 0.5$	V
I_{in}, I_{out}	Input or Output Current (DC or Transient), per Pin	± 10	mA
P_D	Power Dissipation, per Package†	500	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	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

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_{in} and V_{out} should be constrained to the range $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$.

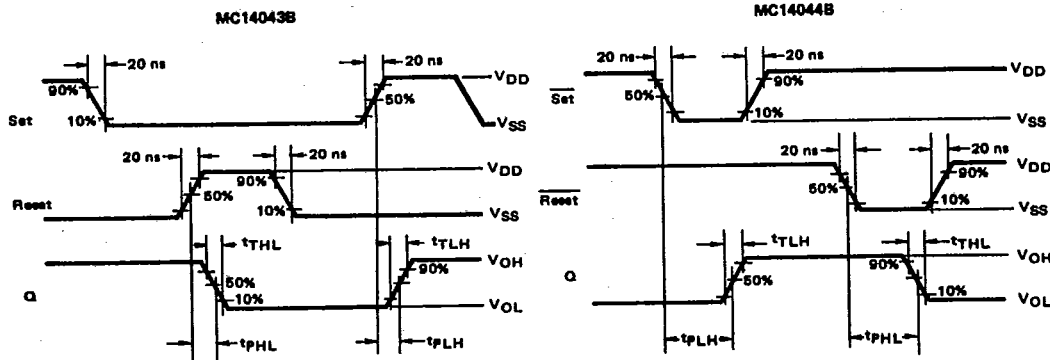
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.

SWITCHING CHARACTERISTICS* ($C_L = 50$ pF, $T_A = 25^\circ\text{C}$)

Characteristic	Symbol	V_{DD} V_{dc}	Min	Typ #	Max	Unit
Output Rise Time $t_{TLH} = (1.35 \text{ ns/pF}) C_L + 32.5 \text{ ns}$ $t_{TLH} = (0.60 \text{ ns/pF}) C_L + 20 \text{ ns}$ $t_{TLH} = (0.40 \text{ ns/pF}) C_L + 20 \text{ ns}$	t_{TLH}	5.0 10 15	— — —	100 50 40	200 100 80	ns
Output Fall Time $t_{THL} = (1.35 \text{ ns/pF}) C_L + 32.5 \text{ ns}$ $t_{THL} = (0.60 \text{ ns/pF}) C_L + 20 \text{ ns}$ $t_{THL} = (0.40 \text{ ns/pF}) C_L + 20 \text{ ns}$	t_{THL}	5.0 10 15	— — —	100 50 40	200 100 80	ns
Propagation Delay Time $t_{PLH} = (0.90 \text{ ns/pF}) C_L + 130 \text{ ns}$ $t_{PLH} = (0.36 \text{ ns/pF}) C_L + 57 \text{ ns}$ $t_{PLH} = (0.26 \text{ ns/pF}) C_L + 47 \text{ ns}$ $t_{PHL} = (0.90 \text{ ns/pF}) C_L + 130 \text{ ns}$ $t_{PHL} = (0.90 \text{ ns/pF}) C_L + 57 \text{ ns}$ $t_{PHL} = (0.26 \text{ ns/pF}) C_L + 47 \text{ ns}$	t_{PLH} t_{PHL}	5.0 10 15	— — —	175 75 60	350 175 120	ns
Set, Set Pulse Width	t_W	5.0 10 15	200 100 70	80 40 30	— — —	ns
Reset, Reset Pulse Width	t_W	5.0 10 15	200 100 70	80 40 30	— — —	ns
Three-State Enable/Disable Delay	t_{PLZ} t_{PHZ} t_{PZL} t_{PZH}	5.0 10 15	— — —	150 80 55	300 160 110	ns

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

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

AC WAVEFORMS

6367252 MOTOROLA SC (LOGIC)

98D 79543 D

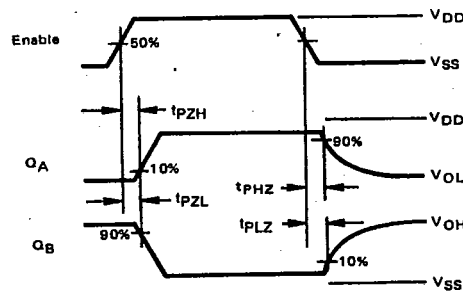
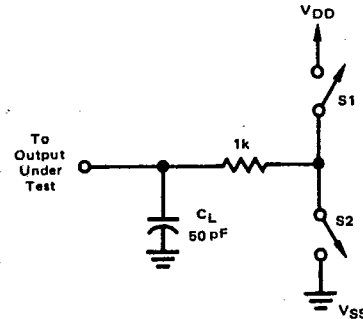
MC14043B•MC14044B

T-46-07-15

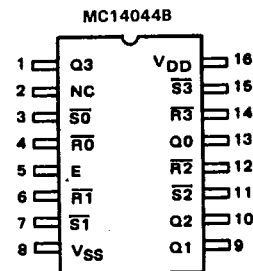
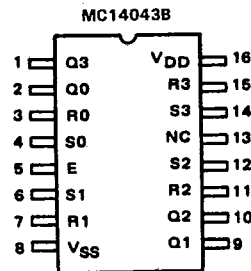
THREE-STATE ENABLE/DISABLE DELAYS

Set, Reset, Enable, and Switch Conditions for 3-State Tests.

TEST	ENABLE	S1	S2	Q1	MC14043B, MC14044B			
					S	R	S	R
t _{PZH}		Open	Closed	A	V _{DD}	V _{SS}	V _{SS}	V _{DD}
t _{PZL}		Closed	Open	B	V _{SS}	V _{DD}	V _{DD}	V _{SS}
t _{PHZ}		Open	Closed	A	V _{DD}	V _{SS}	V _{SS}	V _{DD}
t _{PLZ}		Closed	Open	B	V _{SS}	V _{DD}	V _{DD}	V _{SS}



PIN ASSIGNMENT



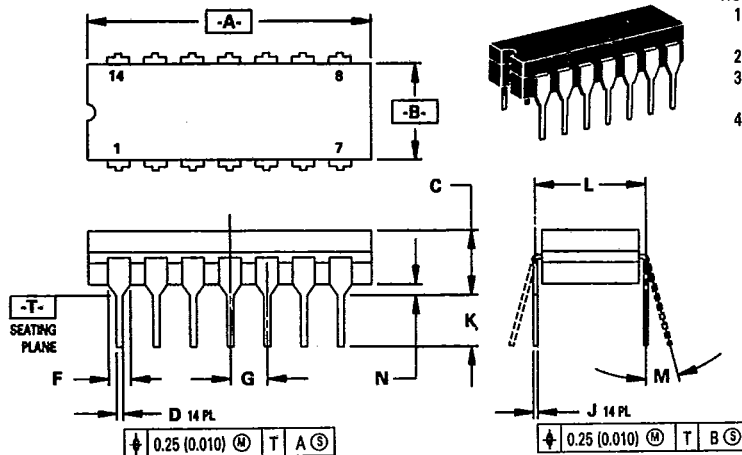
NC = No Connection

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.

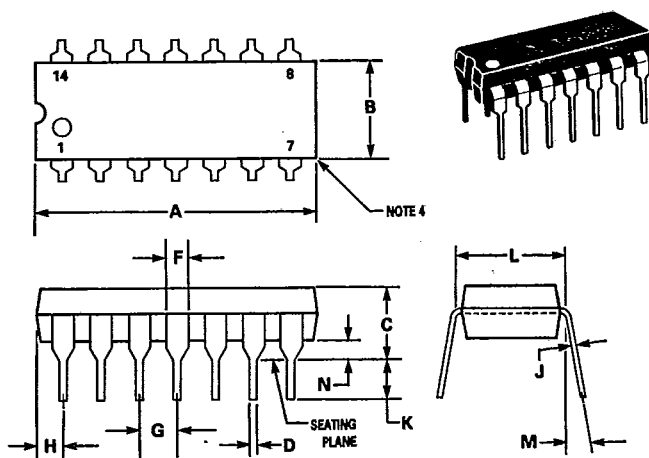
14-PIN PACKAGE

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

T-90-20

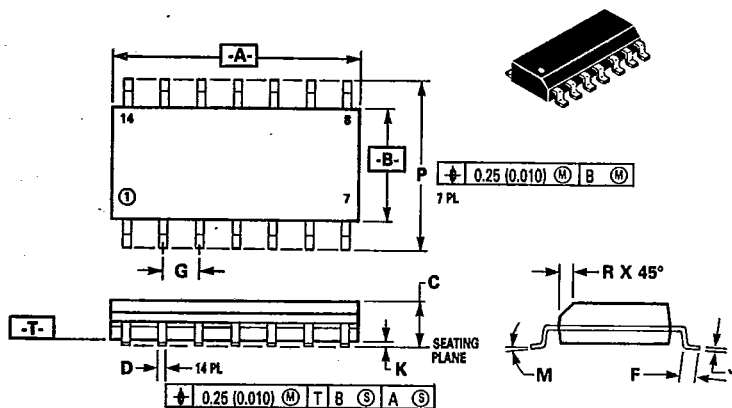
PACKAGE DIMENSIONS (Continued)

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.

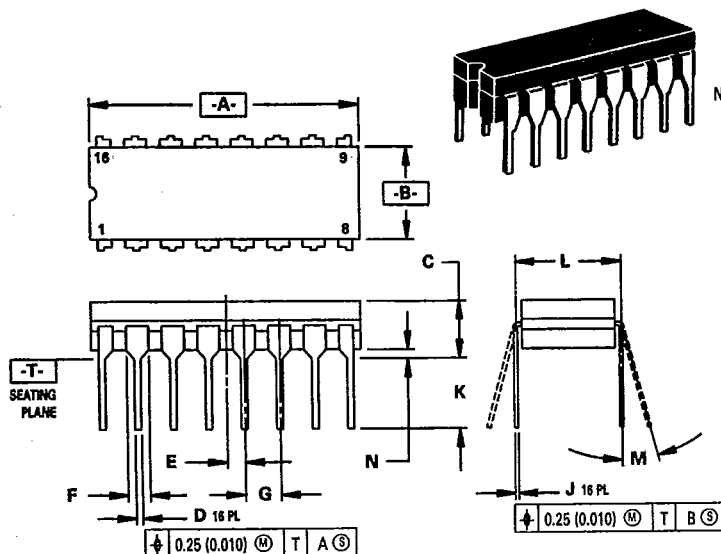


DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

T-90-20

PACKAGE DIMENSIONS (Continued)

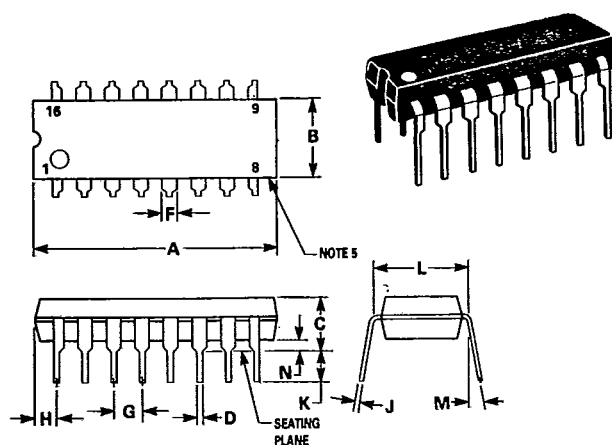
16-PIN PACKAGE

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

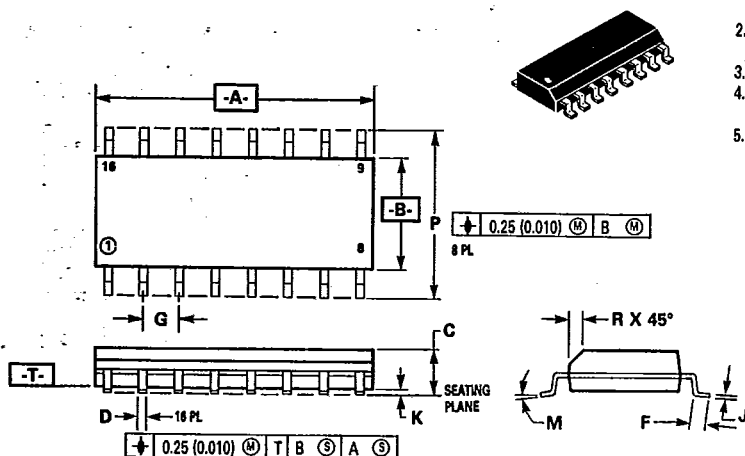
NOTES:

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)

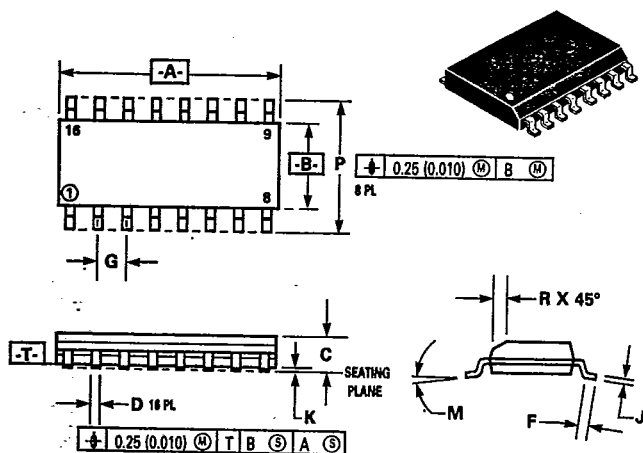
16-PIN PACKAGE

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	0.068
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

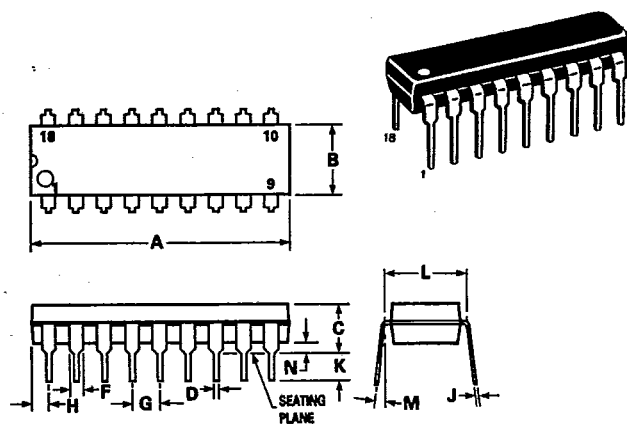
NOTES:

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)

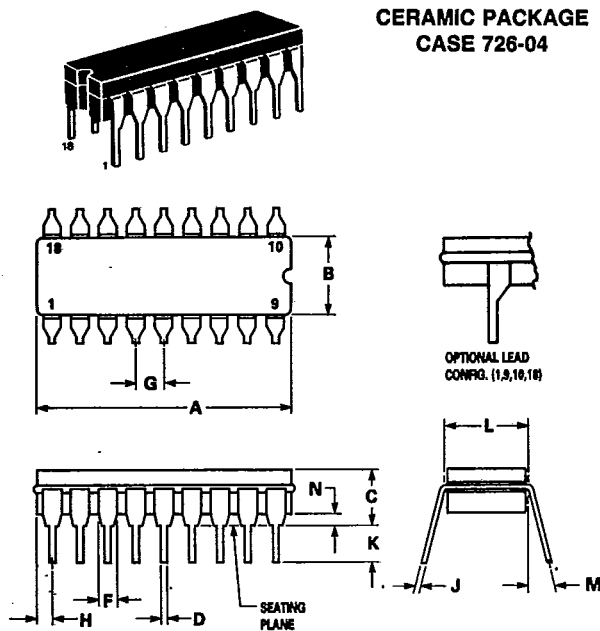
18-PIN PACKAGE

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:

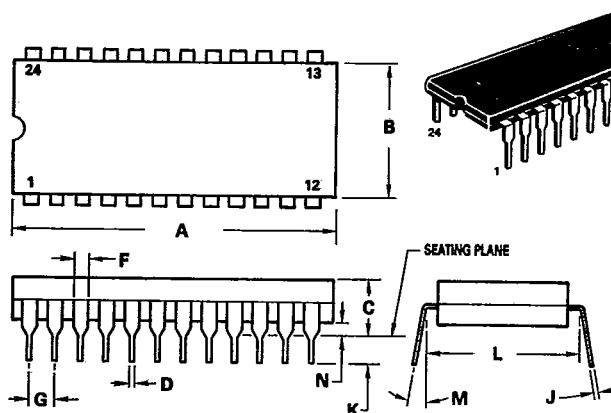
1. LEADS, TRUE POSITIONED WITHIN 0.25 mm (0.010) DIA. AT SEATING PLANE, AT MAXIMUM MATERIAL CONDITION.
2. DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. DIM "A" & "B" INCLUDES MENISCUS.
4. "E" DIMENSION IS FOR FULL LEADS. "HALF" LEADS ARE OPTIONAL AT LEAD POSITIONS 1, 9, 10, AND 18.

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

T-90-20

PACKAGE DIMENSIONS (Continued)

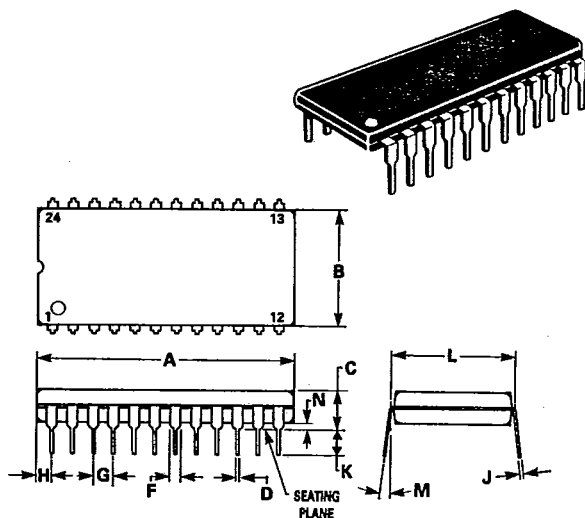
24-PIN PACKAGE

CERAMIC PACKAGE
CASE 623-05

NOTES:

1. DIM "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
2. 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
CASE 709-02

NOTES:

1. 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.
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	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