MC14508B

Dual 4-Bit Latch

The MC14508B dual 4–bit latch is constructed with MOS P–channel and N–channel enhancement mode devices in a single monolithic structure. The part consists of two identical, independent 4–bit latches with separate Strobe (ST) and Master Reset (MR) controls. Separate Disable inputs force the outputs to a high impedance state and allow the devices to be used in time sharing bus line applications.

These complementary MOS latches find primary use in buffer storage, holding register, or general digital logic functions where low power dissipation and/or high noise immunity is desired.

- 3–State Output
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable–of Driving Two Low–power TTL Loads or One Low–power Schottky TTL Load over the Rated Temperature Range

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

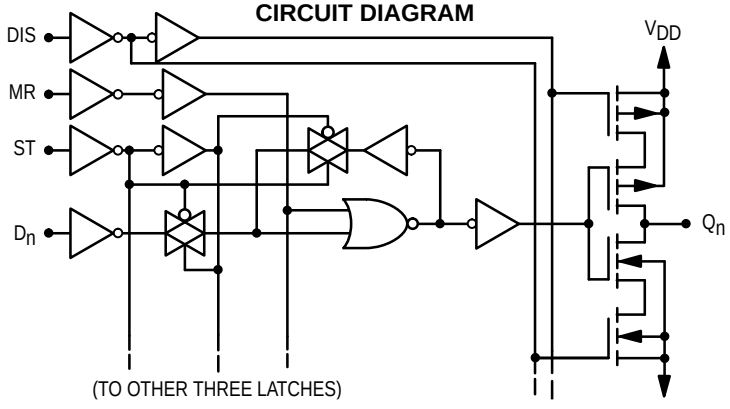
* Maximum Ratings are those values beyond which damage to the device may occur.
†Temperature Derating:
Plastic “P and D/DW” Packages: – 7.0 mW/°C From 65°C To 125°C
Ceramic “L” Packages: – 12 mW/°C From 100°C To 125°C

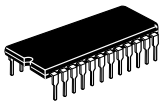
TRUTH TABLE

MR	ST	Disable	D3	D2	D1	D0	Q3	Q2	Q1	Q0
0	1	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	1	0	0	0	1
0	1	0	0	0	1	0	0	0	1	0
0	1	0	0	1	0	0	0	1	0	0
0	1	0	1	0	0	0	1	0	0	0
0	0	0	X	X	X	X	Latched			
1	X	0	X	X	X	X	0	0	0	0
X	X	1	X	X	X	X	High Impedance			

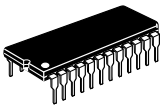
X = Don’t Care

CIRCUIT DIAGRAM





L SUFFIX
CERAMIC
CASE 623



P SUFFIX
PLASTIC
CASE 709

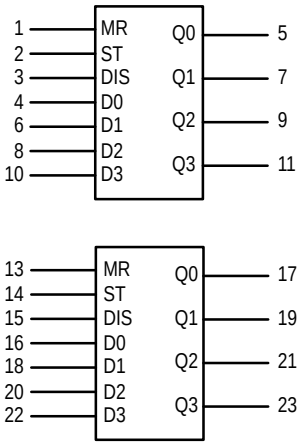
DW SUFFIX
SOIC
CASE 751E

ORDERING INFORMATION

MC14XXXBCP	Plastic
MC14XXXBCL	Ceramic
MC14XXXBDW	SOIC

T_A = – 55° to 125°C for all packages.

BLOCK DIAGRAM



V_{DD} = PIN 24
V_{SS} = PIN 12

REV 3
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ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	– 55°C Min	– 55°C Max	25°C Min	25°C Typ #	25°C Max	125°C Min	125°C Max	Unit
Output Voltage "0" Level V_{in} = V_{DD} or 0	V_{OL}	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
"1" Level V_{in} = 0 or V_{DD}	V_{OH}	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 (V_O = 4.5 or 0.5 Vdc) (V_O = 9.0 or 1.0 Vdc) (V_O = 13.5 or 1.5 Vdc)	V_{IL}	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
"1" Level (V_O = 0.5 or 4.5 Vdc) (V_O = 1.0 or 9.0 Vdc) (V_O = 1.5 or 13.5 Vdc)	V_{IH}	5.0 10 15	3.5 7.0 11	— — —	3.5 7.0 11	2.75 5.50 8.25	— — —	3.5 7.0 11	— — —	Vdc
Output Drive Current (V_{OH} = 2.5 Vdc) Source (V_{OH} = 4.6 Vdc) (V_{OH} = 9.5 Vdc) (V_{OH} = 13.5 Vdc)	I_{OH}	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
(V_{OL} = 0.4 Vdc) Sink (V_{OL} = 0.5 Vdc) (V_{OL} = 1.5 Vdc)	I_{OL}	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
Input Current	I_{in}	15	—	± 0.1	—	±0.00001	± 0.1	—	± 1.0	µAdc
Input Capacitance (V_{in} = 0)	C_{in}	—	—	—	—	5.0	7.5	—	—	pF
Quiescent Current (Per Package)	I_{DD}	5.0 10 15	— — —	5.0 10 20	— — —	0.005 0.010 0.015	5.0 10 20	— — —	150 300 600	µAdc
Total Supply Current**† (Dynamic plus Quiescent, Per Package) (C_L = 50 pF on all outputs, all buffers switching)	I_T	5.0 10 15	I_T = (1.46 µA/kHz) f + I_{DD} I_T = (2.91 µA/kHz) f + I_{DD} I_T = (4.37 µA/kHz) f + I_{DD}							µAdc
Three–State Leakage Current	I_{TL}	15	—	± 0.1	—	± 0.0001	± 0.1	—	± 3.0	µAdc

#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:

$$I_T(C_L) = I_T(50\ pF) + (C_L - 50)\ Vfk$$

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 = 0.008.

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 $V_{SS} \le (V_{in}$ or $V_{out}) \le V_{DD}$.

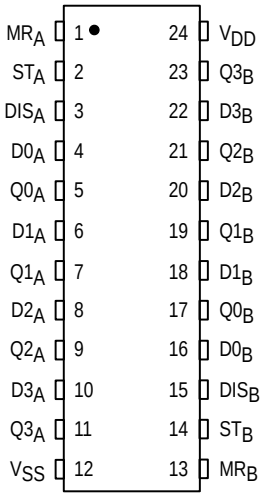
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.

SWITCHING CHARACTERISTICS* (C_L = 50 pF, T_A = 25°C)

Characteristic	Symbol	V_{DD}	All Types			Unit
			Min	Typ #	Max	
Output Rise and Fall Time	t_{TLH}, t_{THL}					ns
t_{TLH}, t_{THL} = (1.5 ns/pF) C_L + 25 ns		5.0	—	100	200	
t_{TLH}, t_{THL} = (0.75 ns/pF) C_L + 12.5 ns		10	—	50	100	
t_{TLH}, t_{THL} = (0.55 ns/pF) C_L + 9.5 ns		15	—	40	80	
Propagation Delay Time, Dn or MR to Q	t_{PLH}, t_{PHL}					ns
t_{PLH}, t_{PHL} = (1.7 ns/pF) C_L + 135 ns		5.0	—	220	440	
t_{PLH}, t_{PHL} = (0.66 ns/pF) C_L + 57 ns		10	—	90	180	
t_{PLH}, t_{PHL} = (0.5 ns/pF) C_L + 35 ns		15	—	60	120	
Master Reset Pulse Width	$t_{WH(R)}$	5.0	200	100	—	ns
		10	100	50	—	
		15	70	35	—	
Master Reset Removal Time	t_{rem}	5.0	30	– 15	—	ns
		10	25	0	—	
		15	20	0	—	
Strobe Pulse Width	$t_{WH(S)}$	5.0	140	70	—	ns
		10	70	35	—	
		15	40	20	—	
Setup Time	t_{su}	5.0	50	25	—	ns
Data to Strobe		10	20	10	—	
		15	10	5.0	—	
Hold Time	t_h	5.0	50	20	—	ns
Strobe to Data		10	35	10	—	
		15	35	10	—	
3–State Propagation Delay Time	t_{PHZ}					ns
Output “1” to High Impedance		5.0	—	55	170	
		10	—	35	100	
		15	—	30	70	
Output “0” to High Impedance	t_{PLZ}	5.0	—	75	170	
		10	—	40	100	
		15	—	35	70	
High Impedance to “1” Level	t_{PZH}	5.0	—	80	170	
		10	—	35	100	
		15	—	30	70	
High Impedance to “0” Level	t_{PZL}	5.0	—	105	210	
		10	—	50	100	
		15	—	35	70	

* 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.

PIN ASSIGNMENT



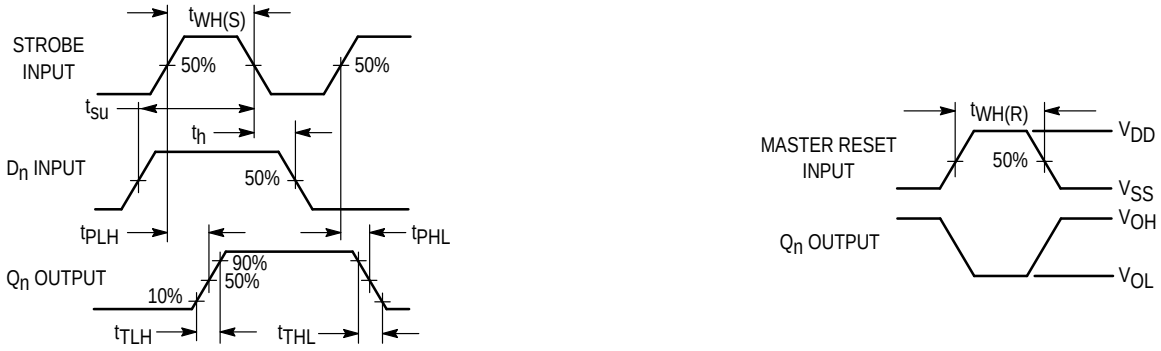
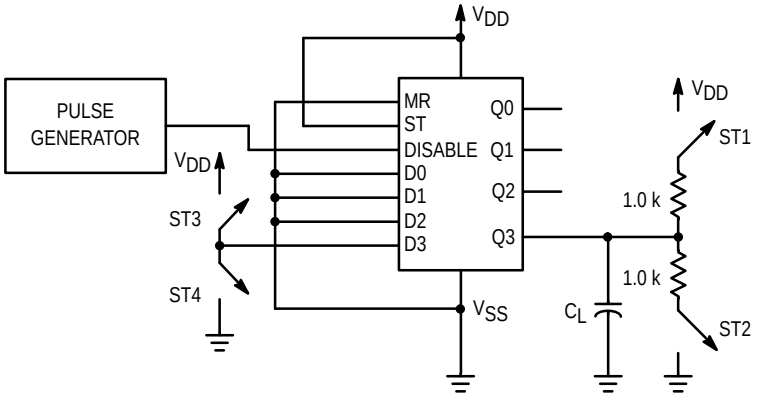


Figure 1. AC Waveforms



Test	ST1	ST2	ST3	ST4
t_{PHZ}	Open	Close	Close	Open
t_{PLZ}	Close	Open	Open	Close
t_{PZL}	Close	Open	Open	Close
t_{PZH}	Open	Close	Close	Open

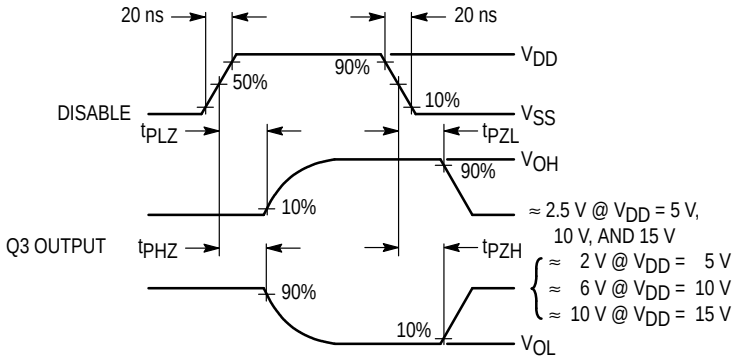


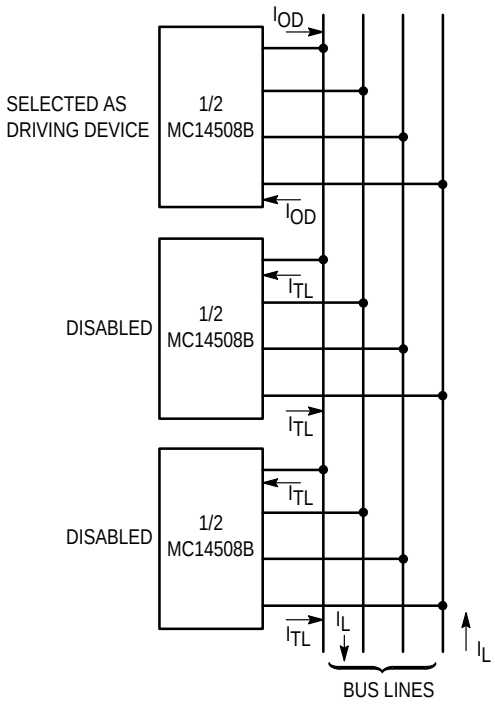
Figure 2. 3–State AC Test Circuit and Waveforms

3–STATE MODE OF OPERATION

The MC14508B can be used in bussed systems as shown. The output terminals of N 4–bit latches can be directly wired to a bus line, and to one of the 4–bit latches selected. The selected latch controls the logic state of the bus line and the remaining (N–1) 4–bit latches are disabled into a high impedance "off" state. The number of latches, N, which may be connected to a bus line is determined from the output drive current, I_{OD}, the 3–state or disabled output leakage current, I_{TL}, and the load current, I_L, required to drive the bus line (including fanout to other device inputs) and can be calculated by the following:

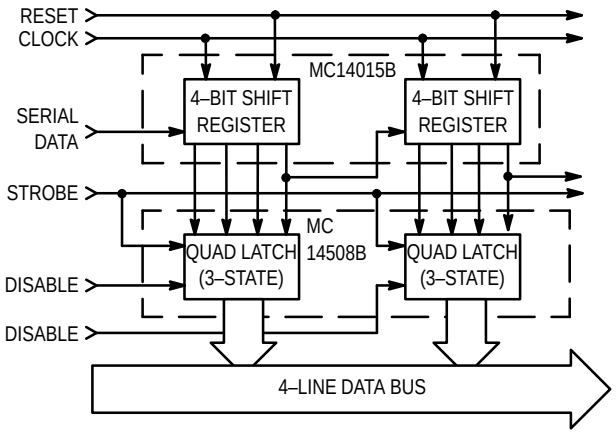
$$N = \frac{I_{OD} - I_L}{I_{TL}} + 1$$

N must be calculated for both high and low logic states of the bus line.

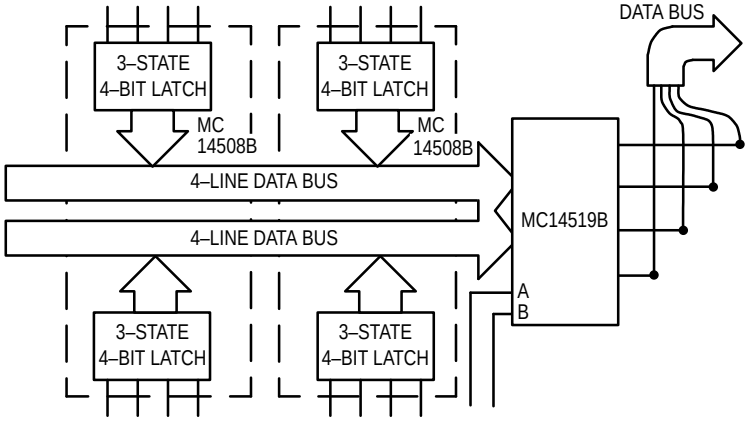


TYPICAL 3–STATE APPLICATIONS

EXAMPLE 1

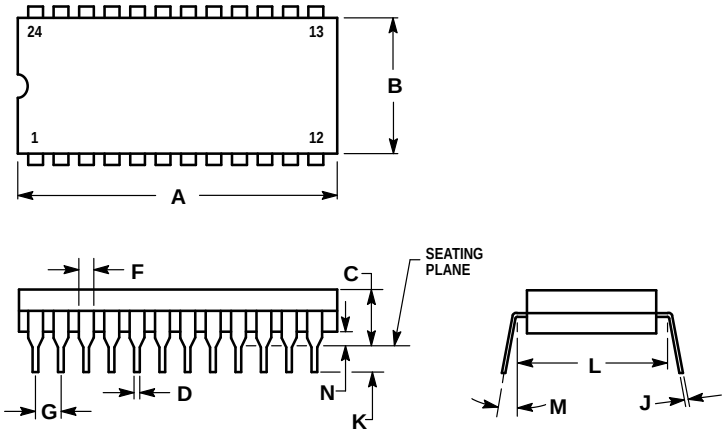


EXAMPLE 2



OUTLINE DIMENSIONS

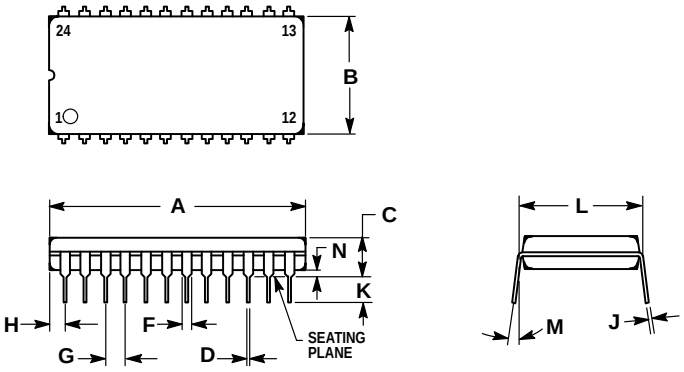
L SUFFIX
CERAMIC DIP PACKAGE
CASE 623–05
ISSUE M



NOTES:
1. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
2. LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION (WHEN FORMED PARALLEL).

	MILLIMETERS		INCHES	
DIM	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

P SUFFIX
PLASTIC DIP PACKAGE
CASE 709–02
ISSUE C

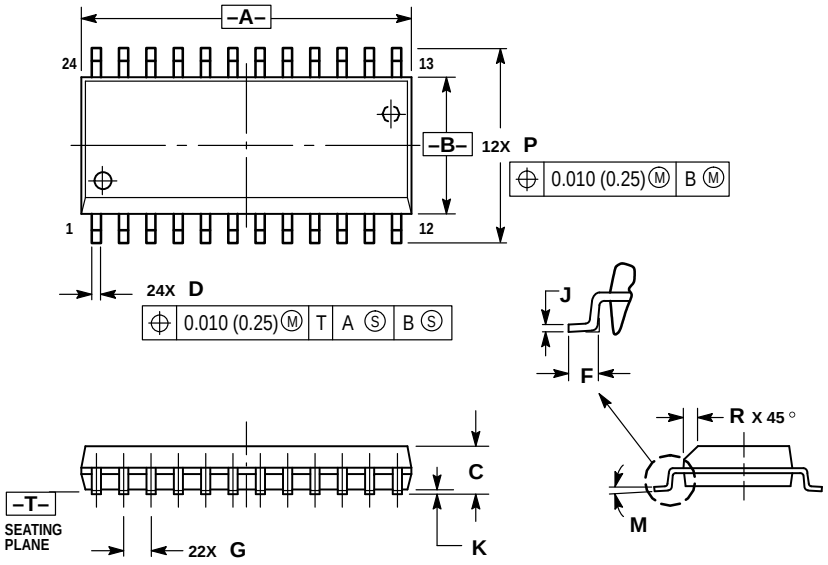


NOTES:
1. POSITIONAL TOLERANCE OF LEADS (D), SHALL BE WITHIN 0.25 (0.010) AT MAXIMUM MATERIAL CONDITION, IN RELATION TO SEATING PLANE AND EACH OTHER.
2. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. DIMENSION B DOES NOT INCLUDE MOLD FLASH.

	MILLIMETERS		INCHES	
DIM	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

OUTLINE DIMENSIONS

DW SUFFIX
PLASTIC SOIC PACKAGE
CASE 751E–04
ISSUE E



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.13 (0.005) TOTAL IN EXCESS OF D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	15.25	15.54	0.601	0.612
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	0.41	0.90	0.016	0.035
G	1.27 BSC		0.050 BSC	
J	0.23	0.32	0.009	0.013
K	0.13	0.29	0.005	0.011
M	0 °	8 °	0 °	8 °
P	10.05	10.55	0.395	0.415
R	0.25	0.75	0.010	0.029

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