

MC14557B

1-to-64 Bit Variable Length Shift Register

The MC14557B is a static clocked serial shift register whose length may be programmed to be any number of bits between 1 and 64. The number of bits selected is equal to the sum of the subscripts of the enabled Length Control inputs (L1, L2, L4, L8, L16, and L32) plus one. Serial data may be selected from the A or B data inputs with the A/B select input. This feature is useful for recirculation purposes. A Clock Enable (CE) input is provided to allow gating of the clock or negative edge clocking capability.

The device can be effectively used for variable digital delay lines or simply to implement odd length shift registers.

- 1–64 Bit Programmable Length
- Q and \bar{Q} Serial Buffered Outputs
- Asynchronous Master Reset
- All Inputs Buffered
- No Limit On Clock Rise and Fall Times
- 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:

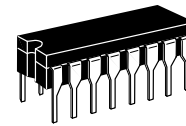
Plastic "P and D/DW" Packages: – 7.0 mW/°C From 65°C To 125°C

Ceramic "L" Packages: – 12 mW/°C From 100°C To 125°C

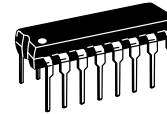
LENGTH SELECT TRUTH TABLE

L32	L16	L8	L4	L2	L1	Register Length
0	0	0	0	0	0	1 Bit
0	0	0	0	0	1	2 Bits
0	0	0	0	1	0	3 Bits
0	0	0	0	1	1	4 Bits
0	0	0	1	0	0	5 Bits
0	0	0	1	0	1	6 Bits
⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	0	0	0	0	0	33 Bits
1	0	0	0	0	1	34 Bits
⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮
⋮	⋮	⋮	⋮	⋮	⋮	⋮
1	1	1	1	0	0	61 Bits
1	1	1	1	1	1	62 Bits
1	1	1	1	1	0	63 Bits
1	1	1	1	0	1	64 Bits

NOTE: Length equals the sum of the binary length control subscripts plus one.



L SUFFIX
CERAMIC
CASE 620



P SUFFIX
PLASTIC
CASE 648



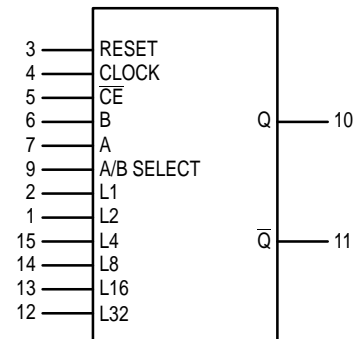
DW SUFFIX
SOIC
CASE 751G

ORDERING INFORMATION

MC14XXXBCP	Plastic
MC14XXXBCL	Ceramic
MC14XXXBDW	SOIC

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

BLOCK DIAGRAM



V_{DD} = PIN 16
V_{SS} = PIN 8

TRUTH TABLE

Inputs				Output
Rst	A/B	Clock	CE	Q
0	0	↗	0	B
0	1	↗	0	A
0	0	1	↘	B
0	1	1	↘	A
1	X	X	X	0

Q is the output of the first selected shift register stage.

X = Don't Care

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	- 55°C		25°C			125°C		Unit
			Min	Max	Min	Typ #	Max	Min	Max	
Output Voltage $V_{in} = V_{DD}$ or 0 $V_{in} = 0$ or V_{DD}	"0" Level V_{OL}	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_{OH}	5.0	4.95	—	4.95	5.0	—	4.95	—	
		10	9.95	—	9.95	10	—	9.95	—	
		15	14.95	—	14.95	15	—	14.95	—	
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) "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_{IL}	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	
	V_{IH}	5.0	3.5	—	3.5	2.75	—	3.5	—	
		10	7.0	—	7.0	5.50	—	7.0	—	
		15	11	—	11	8.25	—	11	—	
Output Drive Current Source ($V_{OH} = 2.5$ Vdc) ($V_{OH} = 4.6$ Vdc) ($V_{OH} = 9.5$ Vdc) ($V_{OH} = 13.5$ Vdc) Sink ($V_{OL} = 0.4$ Vdc) ($V_{OL} = 0.5$ Vdc) ($V_{OL} = 1.5$ Vdc)	I_{OH}	5.0	- 3.0	—	- 2.4	- 4.2	—	- 1.7	—	mAdc
		5.0	- 0.64	—	- 0.51	- 0.88	—	- 0.36	—	
		10	- 1.6	—	- 1.3	- 2.25	—	- 0.9	—	
		15	- 4.2	—	- 3.4	- 8.8	—	- 2.4	—	
	I_{OL}	5.0	0.64	—	0.51	0.88	—	0.36	—	
		10	1.6	—	1.3	2.25	—	0.9	—	
15		4.2	—	3.4	8.8	—	2.4	—		
Input Current	I_{in}	15	—	± 0.1	—	± 0.00001	± 0.1	—	± 1.0	μ Adc
Input Capacitance ($V_{in} = 0$)	C_{in}	—	—	—	—	5.0	7.5	—	—	pF
Quiescent Current (Per Package)	I_{DD}	5.0	—	5.0	—	0.010	5.0	—	150	μ Adc
		10	—	10	—	0.020	10	—	300	
		15	—	20	—	0.030	20	—	600	
Total Supply Current**† (Dynamic plus Quiescent, Per Package) ($C_L = 50$ pF on all outputs, all buffers switching)	I_T	5.0 10 15	$I_T = (1.75 \mu A/kHz) f + I_{DD}$ $I_T = (3.50 \mu A/kHz) f + I_{DD}$ $I_T = (5.25 \mu A/kHz) f + I_{DD}$							μ Adc

#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:

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

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 $k = 0.001$.

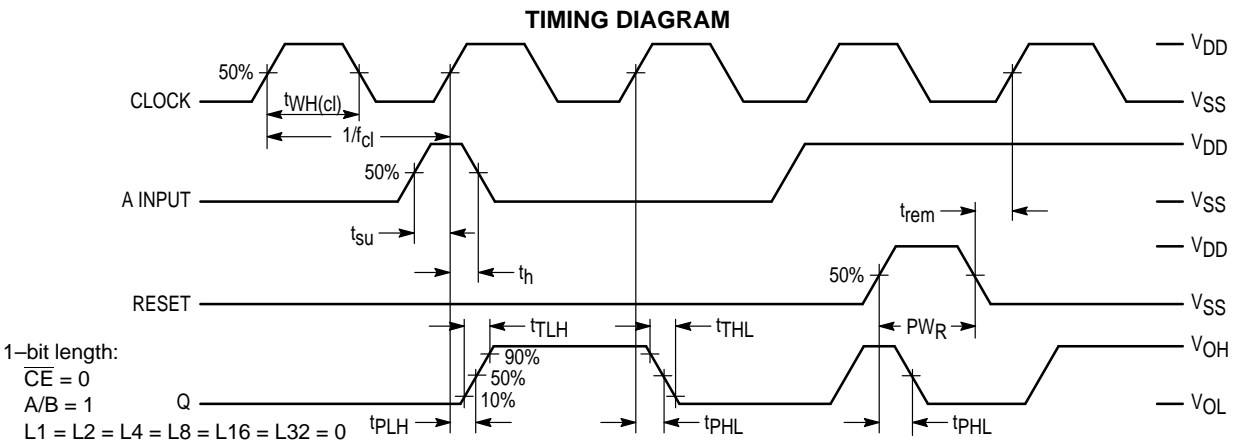
This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should 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* ($C_L = 50 \text{ pF}$, $T_A = 25^\circ\text{C}$)

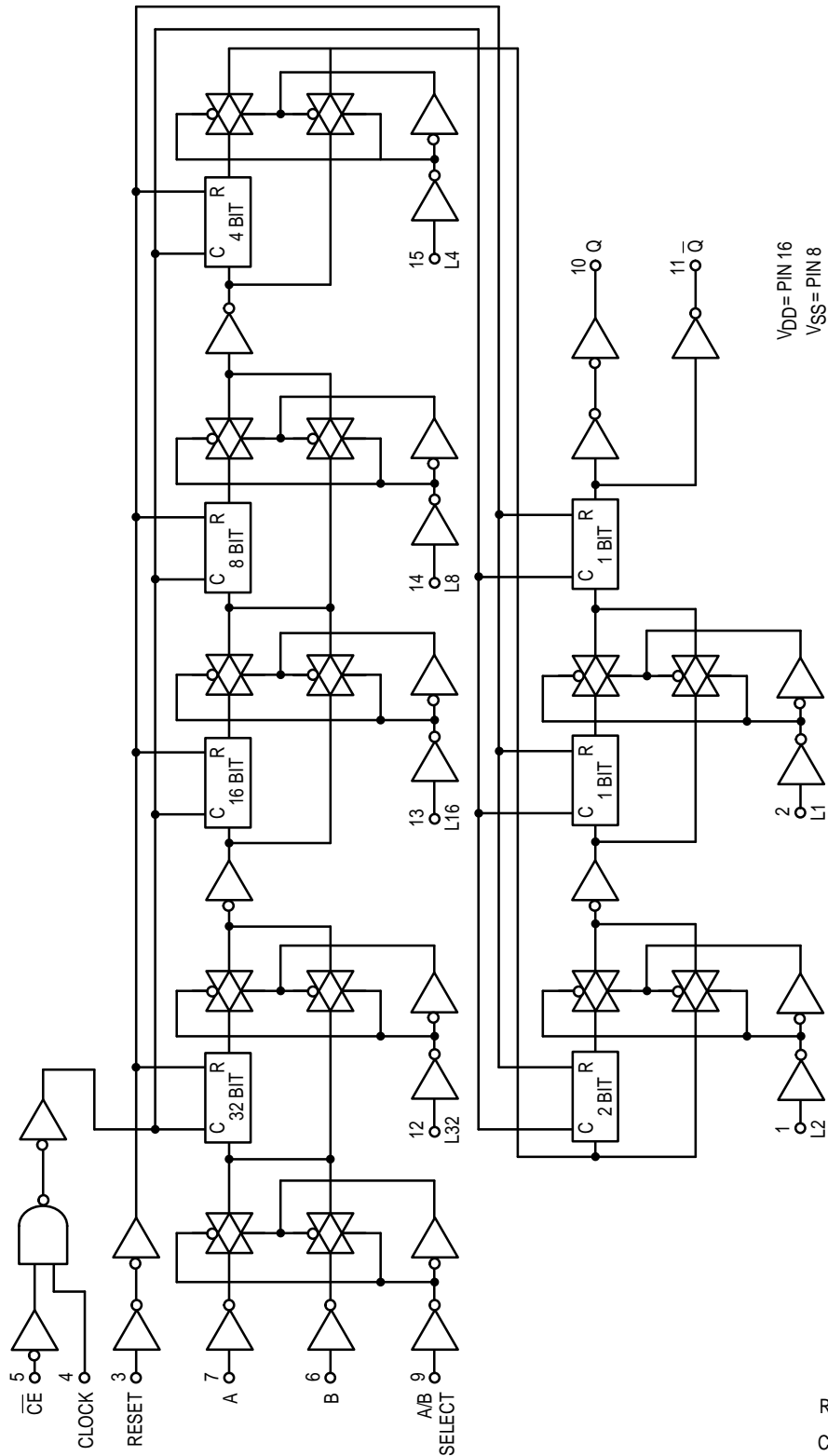
Characteristic	Symbol	V _{DD}	Min	Typ #	Max	Unit
Rise and Fall Time, Q or \bar{Q} Output $t_{TLH}, t_{THL} = (1.5 \text{ ns/pF}) C_L + 25 \text{ ns}$ $t_{TLH}, t_{THL} = (0.75 \text{ ns/pF}) C_L + 12.5 \text{ ns}$ $t_{TLH}, t_{THL} = (0.55 \text{ ns/pF}) C_L + 9.5 \text{ ns}$	t_{TLH}, t_{THL}	5 10 15	— — —	100 50 40	200 100 80	ns
Propagation Delay, Clock or \bar{CE} to Q or \bar{Q} $t_{PLH}, t_{PHL} = (1.7 \text{ ns/pF}) C_L + 215 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.66 \text{ ns/pF}) C_L + 97 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 65 \text{ ns}$	t_{PLH}, t_{PHL}	5 10 15	— — —	300 130 90	600 260 180	ns
Propagation Delay, Reset to Q or \bar{Q} $t_{PLH}, t_{PHL} = (1.7 \text{ ns/pF}) C_L + 215 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.66 \text{ ns/pF}) C_L + 97 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.5 \text{ ns/pF}) C_L + 70 \text{ ns}$	t_{PLH}, t_{PHL}	5 10 15	— — —	300 130 95	600 260 190	ns
Pulse Width, Clock	$t_{WH(cl)}$	5 10 15	200 100 75	95 45 35	— — —	ns
Pulse Width, Reset	$t_{WH(rst)}$	5 10 15	300 140 100	150 70 50	— — —	ns
Clock Frequency (50% Duty Cycle)	f_{cl}	5 10 15	— — —	3.0 7.5 13.0	1.7 5.0 6.7	MHz
Setup Time, A or B to Clock or \bar{CE} Worst case condition: L1 = L2 = L4 = L8 = L16 = L32 = V _{SS} (Register Length = 1) Best case condition: L32 = V _{DD} , L1 through L16 = Don't Care (Any register length from 33 to 64)	t_{su}	5 10 15 5 10 15	700 290 145 400 165 60	350 130 85 45 5 0	— — — — — —	ns
Hold Time, Clock or \bar{CE} to A or B Best case condition: L1 = L2 = L4 = L8 = L16 = L32 = V _{SS} (Register Length = 1) Worst case condition: L32 = V _{DD} , L1 through L16 = Don't Care (Any register length from 33 to 64)	t_h	5 10 15 5 10 15	200 100 10 400 185 85	-150 -60 -50 50 25 22	— — — — — —	ns
Rise and Fall Time, Clock	t_r, t_f	5 10 15	No Limit			—
Rise and Fall Time, Reset or \bar{CE}	t_r, t_f	5 10 15	— — —	— — —	15 5 4	μs
Removal Time, Reset to Clock or \bar{CE}	t_{rem}	5 10 15	160 80 70	80 40 35	— — —	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.



LOGIC DIAGRAM



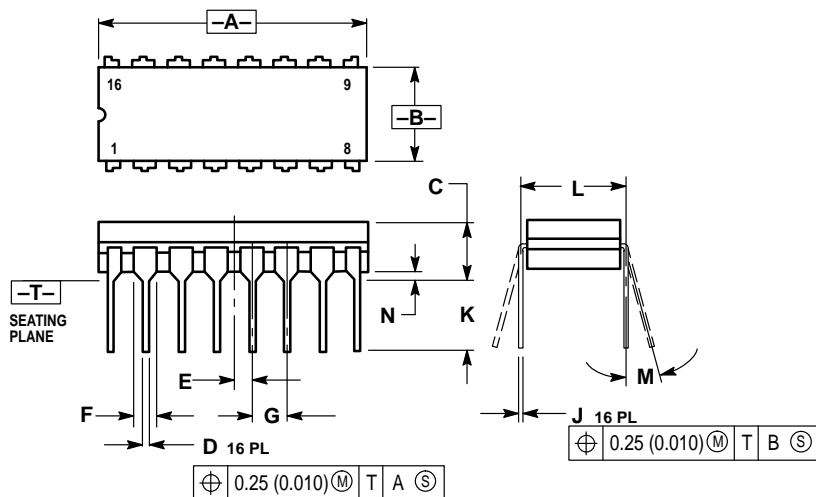
V_{DD} = PIN 16
V_{SS} = PIN 8

PIN ASSIGNMENT

L2	1	16	V _{DD}
L1	2	15	L4
RESET	3	14	L8
CLOCK	4	13	L16
\overline{CE}	5	12	L32
B	6	11	\overline{Q}
A	7	10	Q
V _{SS}	8	9	A/B SEL

OUTLINE DIMENSIONS

L SUFFIX CERAMIC DIP PACKAGE CASE 620-10 ISSUE V

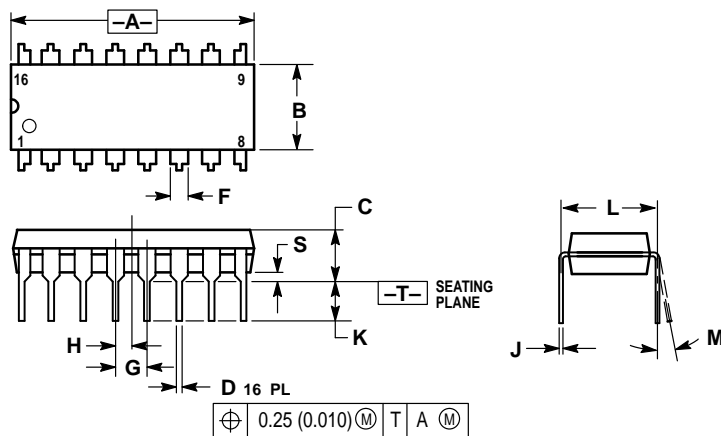


NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.750	0.785	19.05	19.93
B	0.240	0.295	6.10	7.49
C	—	0.200	—	5.08
D	0.015	0.020	0.39	0.50
E	0.050 BSC		1.27 BSC	
F	0.055	0.065	1.40	1.65
G	0.100 BSC		2.54 BSC	
H	0.008	0.015	0.21	0.38
K	0.125	0.170	3.18	4.31
L	0.300 BSC		7.62 BSC	
M	0°	15°	0°	15°
N	0.020	0.040	0.51	1.01

P SUFFIX PLASTIC DIP PACKAGE CASE 648-08 ISSUE R



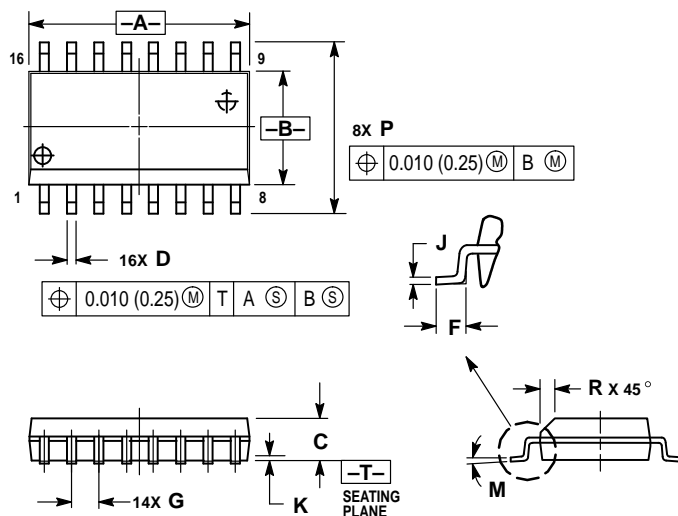
NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

OUTLINE DIMENSIONS

DW SUFFIX PLASTIC SOIC PACKAGE CASE 751G-02 ISSUE A



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.

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

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MC14557B/D

