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MC14528B

Dual Monostable Multivibrator

The MC14528B is a dual, retriggerable, resettable monostable multivibrator. It may be triggered from either edge of an input pulse, and produces an output pulse over a wide range of widths, the duration of which is determined by the external timing components, C_X and R_X.

- Separate Reset Available
- Diode Protection on All Inputs
- Triggerable from Leading or Trailing Edge Pulse
- 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
- This part should only be used in new designs where the pulse width is < 10 μs.
  Note: For designs requiring a pulse width > 10 μs, please see the MC14538, which is pin–for–pin compatible.

MAXIMUM RATINGS (Voltages Referenced to V_{SS}) (Note 2.)

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage Range	–0.5 to +18.0	V
V_{in}, V_{out}	Input or Output Voltage Range (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 (Note 3.)	500	mW
T_A	Ambient Temperature Range	–55 to +125	°C
T_{stg}	Storage Temperature Range	–65 to +150	°C
T_L	Lead Temperature (8–Second Soldering)	260	°C

2. Maximum Ratings are those values beyond which damage to the device may occur.
3. Temperature Derating:
   Plastic “P and D/DW” Packages: – 7.0 mW/°C From 65°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 $V_{SS} \le (V_{in}$ 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.

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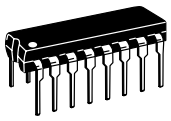
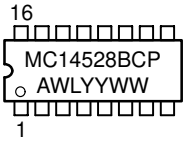
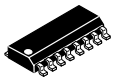
MARKING DIAGRAMS

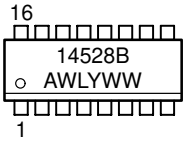


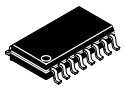
PDIP–16
P SUFFIX
CASE 648



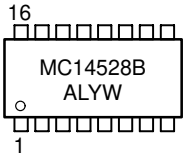


SOIC–16
D SUFFIX
CASE 751B





SOEIAJ–16
F SUFFIX
CASE 966



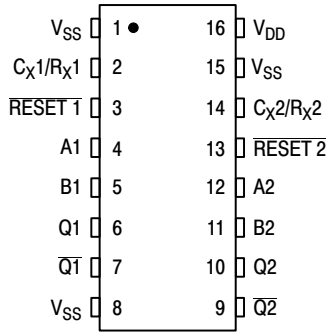
A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week

ORDERING INFORMATION

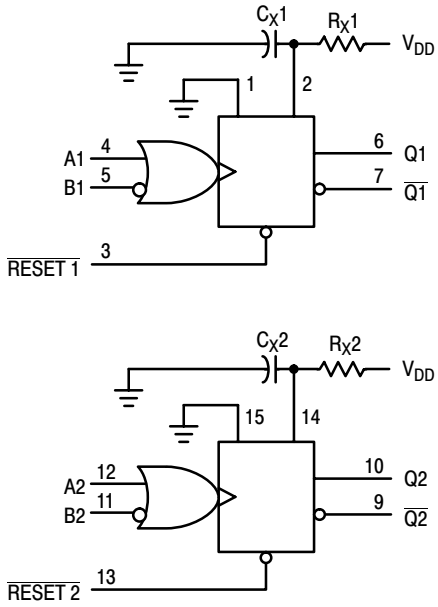
Device	Package	Shipping
MC14528BCP	PDIP–16	2000/Box
MC14528BD	SOIC–16	48/Rail
MC14528BDR2	SOIC–16	2500/Tape & Reel
MC14528BF	SOEIAJ–16	See Note 1.
MC14528BFEL	SOEIAJ–16	See Note 1.

1. For ordering information on the EIAJ version of the SOIC packages, please contact your local ON Semiconductor representative.

PIN ASSIGNMENT

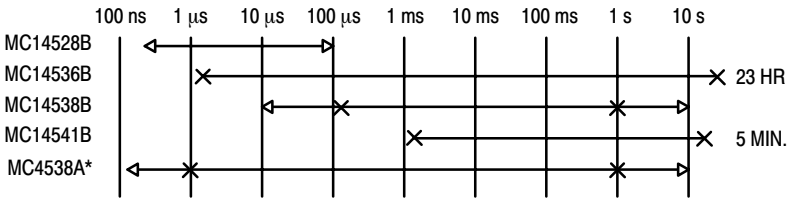


BLOCK DIAGRAM



V_{DD} = PIN 16
V_{SS} = PIN 1, PIN 8, PIN 15
R_X AND C_X ARE EXTERNAL COMPONENTS

ONE–SHOT SELECTION GUIDE



*LIMITED OPERATING VOLTAGE (2–6 V)

TOTAL OUTPUT PULSE WIDTH RANGE
RECOMMENDED PULSE WIDTH RANGE

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	– 55°C Min	– 55°C Max	25°C Min	25°C Typ (4.)	25°C Max	125°C Min	125°C Max	Unit
Output Voltage "0" Level V_{in} = V_{DD} or 0	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_{in} = 0 or V_{DD}	V_{OH}	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 "0" Level	V_{IL}									Vdc
(V_O = 4.5 or 0.5 Vdc)		5.0	—	1.5	—	2.25	1.5	—	1.5	
(V_O = 9.0 or 1.0 Vdc)		10	—	3.0	—	4.50	3.0	—	3.0	
(V_O = 13.5 or 1.5 Vdc)		15	—	4.0	—	6.75	4.0	—	4.0	
"1" Level	V_{IH}									Vdc
(V_O = 0.5 or 4.5 Vdc)		5.0	3.5	—	3.5	2.75	—	3.5	—	
(V_O = 1.0 or 9.0 Vdc)		10	7.0	—	7.0	5.50	—	7.0	—	
(V_O = 1.5 or 13.5 Vdc)		15	11	—	11	8.25	—	11	—	
Output Drive Current										mAdc
(V_{OH} = 2.5 Vdc) Source	I_{OH}	5.0	– 1.2	—	– 1.0	– 1.7	—	– 0.7	—	
(V_{OH} = 4.6 Vdc)		5.0	– 0.64	—	– 0.51	– 0.88	—	– 0.36	—	
(V_{OH} = 9.5 Vdc)		10	– 1.6	—	– 1.3	– 2.25	—	– 0.9	—	
(V_{OH} = 13.5 Vdc)		15	– 4.2	—	– 3.4	– 8.8	—	– 2.4	—	
(V_{OL} = 0.4 Vdc) Sink	I_{OL}	5.0	0.64	—	0.51	0.88	—	0.36	—	mAdc
(V_{OL} = 0.5 Vdc)		10	1.6	—	1.3	2.25	—	0.9	—	
(V_{OL} = 1.5 Vdc)		15	4.2	—	3.4	8.8	—	2.4	—	
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	—	5.0	—	0.005	5.0	—	150	µAdc
		10	—	10	—	0.010	10	—	300	
		15	—	20	—	0.015	20	—	600	
Total Supply Current at an external load Capacitance (C_L) and at external timing capacitance (C_X), use the formula — (5.)	I_T	—	$I_T(C_L, C_X) = [(C_L + 0.36C_X)V_{DD}f + 2x10^{-8} R_XC_X(V_{DD}^{-2})^2f] \times 10^{-3}$ where: I_T in µA (per circuit), C_L and C_X in pF, R_X in megohms, V_{DD} in Vdc, f in kHz is input frequency.							µAdc

4. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.
5. The formulas given are for the typical characteristics only at 25°C.

SWITCHING CHARACTERISTICS [8.] (C_L = 50 pF, T_A = 25°C)

Characteristic	Symbol	C_X pF	R_X kΩ	V_{DD} Vdc	Min	Typ [9.]	Max	Unit
Output Rise and Fall Time	t_{TLH},	—	—					ns
t_{TLH}, t_{THL} = (1.5 ns/pF) C_L + 25 ns	t_{THL}			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	
Turn–Off, Turn–On Delay Time — A or B to Q or $\overline{Q}$	t_{PLH},	15	5.0					ns
t_{PLH}, t_{PHL} = (1.7 ns/pF) C_L + 240 ns	t_{PHL}			5.0	—	325	650	
t_{PLH}, t_{PHL} = (0.66 ns/pF) C_L + 87 ns				10	—	120	240	
t_{PLH}, t_{PHL} = (0.5 ns/pF) C_L + 65 ns				15	—	90	180	
Turn–Off, Turn–On Delay Time — A or B to Q or $\overline{Q}$	t_{PLH},	1000	10					ns
t_{PLH}, t_{PHL} = (1.7 ns/pF) C_L + 620 ns	t_{PHL}			5.0	—	705	—	
t_{PLH}, t_{PHL} = (0.66 ns/pF) C_L + 257 ns				10	—	290	—	
t_{PLH}, t_{PHL} = (0.5 ns/pF) C_L + 185 ns				15	—	210	—	
Input Pulse Width — A or B	t_{WH}	15	5.0	5.0	150	70	—	ns
				10	75	30	—	
				15	55	30	—	
	t_{WL}	1000	10	5.0	—	70	—	ns
				10	—	30	—	
				15	—	30	—	
Output Pulse Width — Q or $\overline{Q}$	t_W	15	5.0	5.0	—	550	—	ns
(For C_X < 0.01 μF use graph for				10	—	350	—	
appropriate V_{DD} level.)				15	—	300	—	
Output Pulse Width — Q or $\overline{Q}$	t_W	10,000	10	5.0	15	30	45	μs
(For C_X > 0.01 μF use formula:				10	10	50	90	
t_W = 0.2 R_X C_X Ln [V_{DD} – V_{SS}]) [6.]				15	15	55	95	
Pulse Width Match between Circuits in the same	t1 – t2	10,000	10	5.0	—	6.0	25	%
package				10	—	8.0	35	
				15	—	8.0	35	
Reset Propagation Delay — $\overline{Reset}$ to Q or $\overline{Q}$	t_{PLH},	15	5.0	5.0	—	325	600	ns
	t_{PHL}			10	—	90	225	
				15	—	60	170	
		1000	10	5.0	—	1000	—	ns
				10	—	300	—	
				15	—	250	—	
Retrigger Time	t_{rr}	15	5.0	5.0	0	—	—	ns
				10	0	—	—	
				15	0	—	—	
		1000	10	5.0	0	—	—	ns
				10	0	—	—	
				15	0	—	—	
External Timing Resistance	R_X	—	—	—	5.0	—	1000	kΩ
External Timing Capacitance	C_X	—	—	—	No Limits [7.]			μF

6. R_X is in Ohms, C_X is in farads, V_{DD} and V_{SS} in volts, PW_{out} in seconds.
7. If C_X > 15 μF, Use Discharge Protection Diode D_X, per Fig. 9.
8. The formulas given are for the typical characteristics only at 25°C.
9. Data labelled “Typ” is not to be used for design purposes but is intended as an indication of the IC’s potential performance.

FUNCTION TABLE

Inputs			Outputs	
$\overline{\text{Reset}}$	A	B	Q	$\overline{Q}$
H	↗	H	⊓	⊔
H	L	↘	⊓	⊔
H	↗↘	L	Not Triggered	
H	H	↗↘	Not Triggered	
H	L, H, ↘	H	Not Triggered	
H	L	L, H, ↗	Not Triggered	
L	X	X	L	H
↘↗	X	X	Not Triggered	

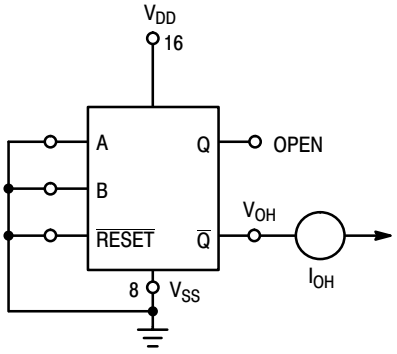


Figure 1. Output Source Current Test Circuit

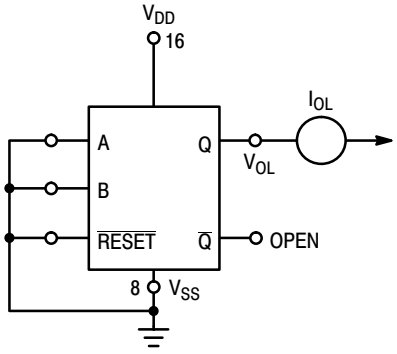
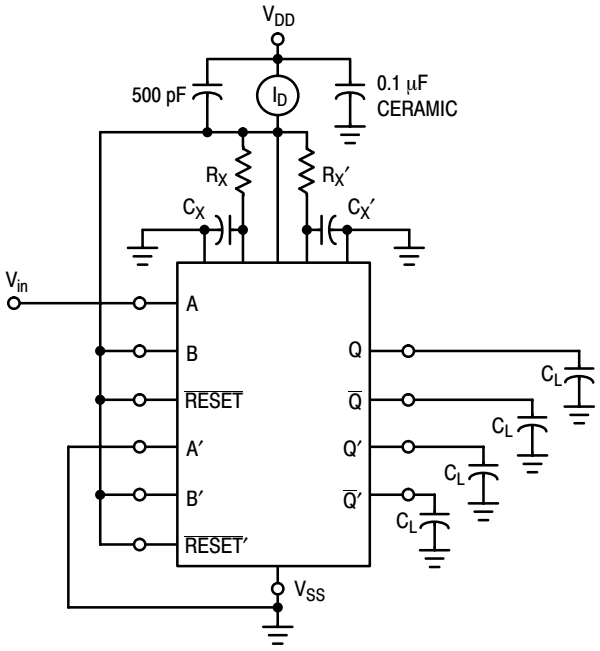


Figure 2. Output Sink Current Test Circuit



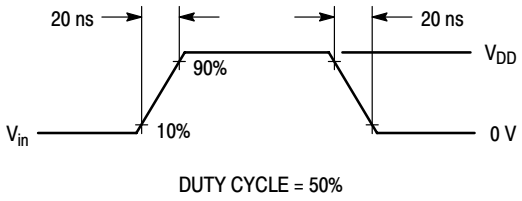
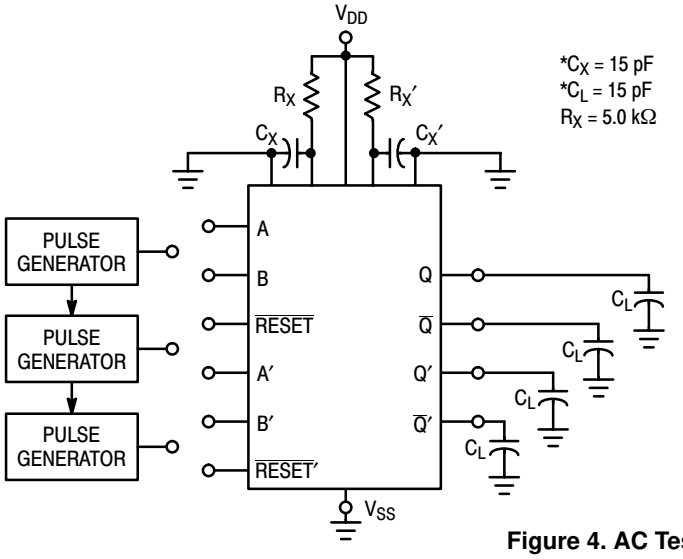


Figure 3. Power Dissipation Test Circuit and Waveforms



INPUT CONNECTIONS

Characteristics	$\overline{\text{Reset}}$	A	B
t_{PLH}, t_{PHL}, t_{TLH}, t_{THL} t_W	V_{DD}	PG1	V_{DD}
t_{PLH}, t_{PHL}, t_{TLH}, t_{THL} t_W	V_{DD}	V_{SS}	PG2
$t_{PLH(R)}$, $t_{PHL(R)}$, t_W	PG3	PG1	PG2

*Includes capacitance of probes, wiring, and fixture parasitic.

NOTE: AC test waveforms for PG1, PG2, and PG3 on next page.

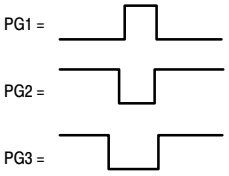


Figure 4. AC Test Circuit

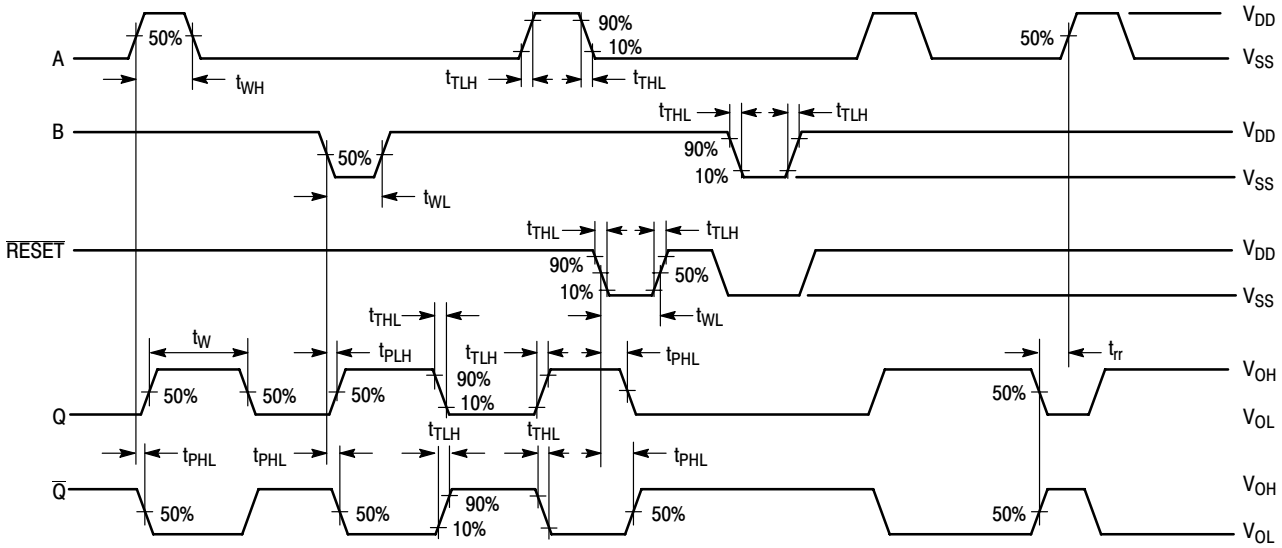


Figure 5. AC Test Waveforms

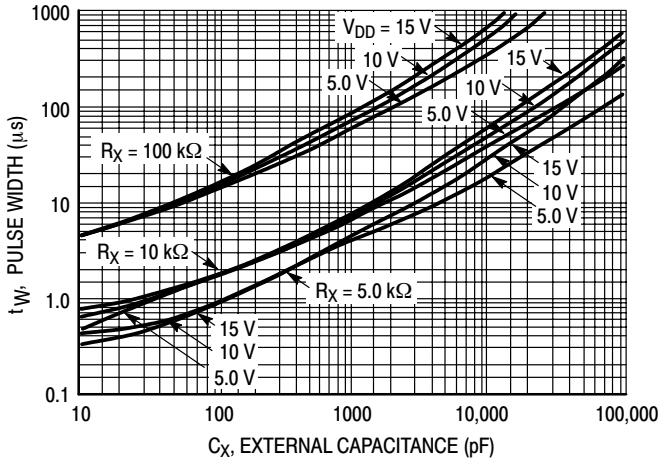


Figure 6. Pulse Width versus C_X

TYPICAL APPLICATIONS

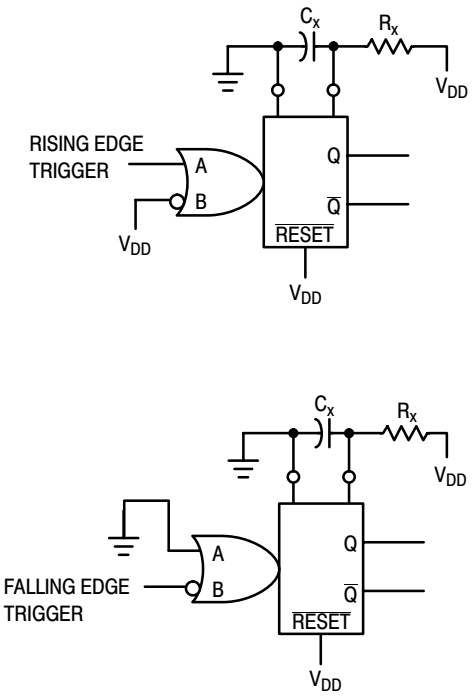


Figure 7. Retriggerable Monostables Circuitry

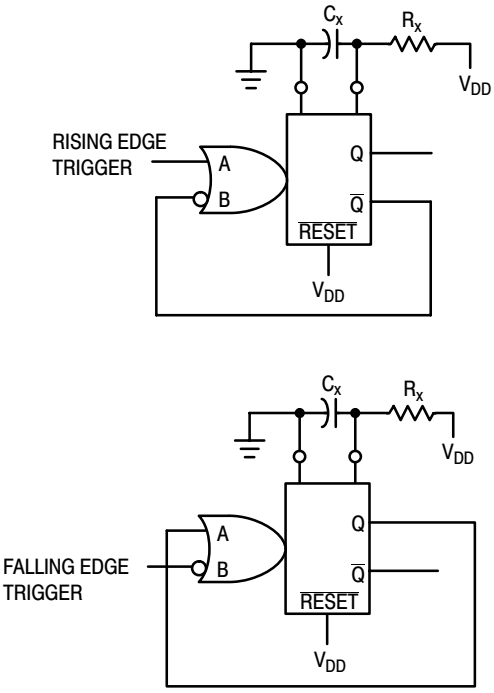


Figure 8. Non–Retriggerable Monostables Circuitry

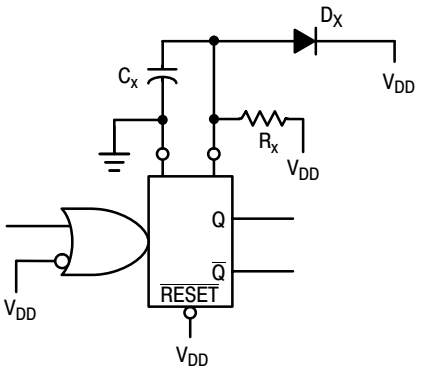


Figure 9. Use of a Diode to Limit Power Down Current Surge

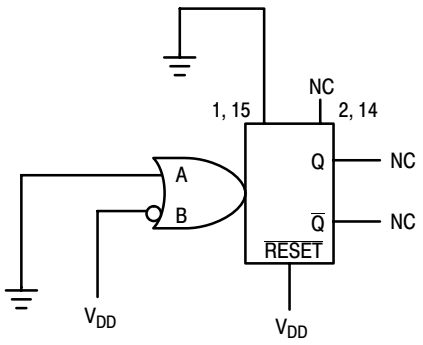
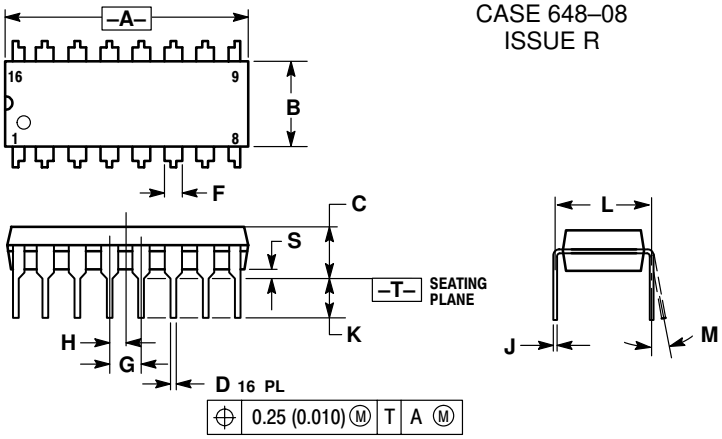


Figure 10. Connection of Unused Sections

PACKAGE DIMENSIONS

PDIP–16
P SUFFIX
PLASTIC DIP PACKAGE
CASE 648–08
ISSUE R

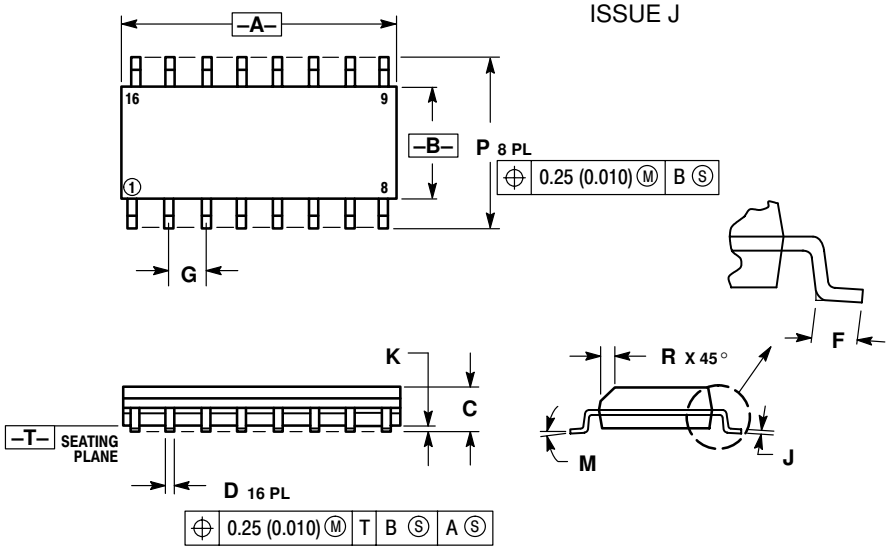


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	INCHES		MILLIMETERS	
DIM	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

PACKAGE DIMENSIONS

SOIC–16
D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751B–05
ISSUE J

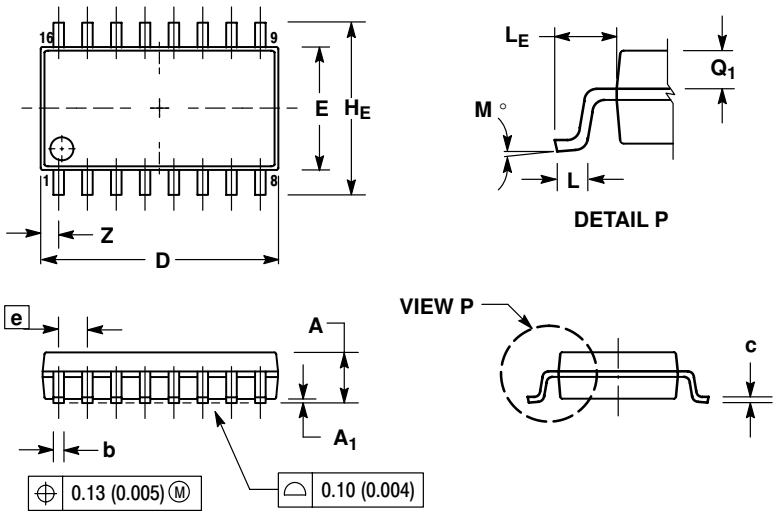


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	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

PACKAGE DIMENSIONS

SOEIAJ–16
F SUFFIX
PLASTIC EIAJ SOIC PACKAGE
CASE 966–01
ISSUE O



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A_1	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H_E	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L_E	1.10	1.50	0.043	0.059
M	0 °	10 °	0 °	10 °
Q_1	0.70	0.90	0.028	0.035
Z	---	0.78	---	0.031

Notes

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