MC14503B

Hex Non-Inverting 3-State Buffer

The MC14503B is a hex non−inverting buffer with 3−state outputs, and a high current source and sink capability. The 3−state outputs make it useful in common bussing applications. Two disable controls are provided. A high level on the Disable A input causes the outputs of buffers 1 through 4 to go into a high impedance state and a high level on the Disable B input causes the outputs of buffers 5 and 6 to go into a high impedance state.

Features

- 3−State Outputs
- TTL Compatible — Will Drive One TTL Load Over Full Temperature Range
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Two Disable Controls for Added Versatility
- Pin for Pin Replacement for MM80C97 and 340097
- These Devices are Pb−Free and are RoHS Compliant
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable

MAXIMUM RATINGS (Voltages Referenced to V_{SS}) (Note 1)

Parameter	Symbol	Value	Unit
DC Supply Voltage Range	V_{DD}	−0.5 to +18.0	V
Input or Output Voltage Range (DC or Transient)	V_{in}, V_{out}	−0.5 to V_{DD} + 0.5	V
Input Current (DC or Transient) per Pin	I_{in}	±10	mA
Output Current (DC or Transient) per Pin	I_{out}	±25	mA
Power Dissipation, per Package (Note 2)	P_D	500	mW
Ambient Temperature Range	T_A	−55 to +125	°C
Storage Temperature Range		−65 to +150	°C
Lead Temperature (8−Second Soldering)		260	°C

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Maximum Ratings are those values beyond which damage to the device may occur.
2. 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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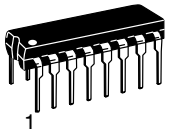
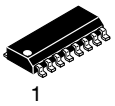
MARKING DIAGRAMS



PDIP−16
P SUFFIX
CASE 648



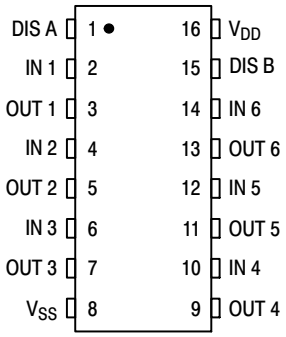
SOIC−16
D SUFFIX
CASE 751B

A	= Assembly Location
WL, L	= Wafer Lot
YY, Y	= Year
WW, W	= Work Week
G	= Pb−Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

PIN ASSIGNMENT

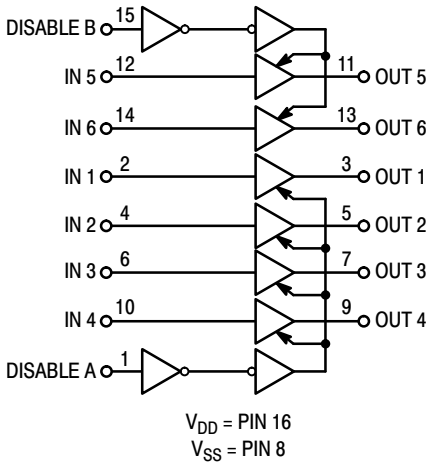


TRUTH TABLE

In_n	Appropriate Disable Input	Out_n
0	0	0
1	0	1
X	1	High Impedance

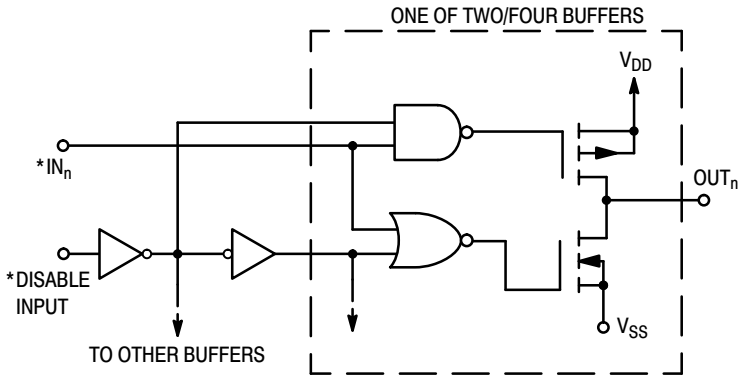
X = Don't Care

LOGIC DIAGRAM



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

CIRCUIT DIAGRAM



*Diode protection on all inputs (not shown)

ORDERING INFORMATION

Device	Package	Shipping†
MC14503BCPG	PDIP−16 (Pb−Free)	500 / Rail
MC14503BDG	SOIC−16 (Pb−Free)	48 / Rail
MC14503BDR2G	SOIC−16 (Pb−Free)	2500 / Tape & Reel
NLV14503BDR2G*		

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q100 Qualified and PPAP Capable.

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	– 55°C Min	– 55°C Max	25°C Min	25°C Typ (Note 3)	25°C Max	125°C Min	125°C Max	Unit
Output Voltage "0" Level V_{in} = 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} = 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 = 3.6 or 1.4 Vdc)		5.0	–	1.5	–	2.25	1.5	–	1.5	
(V_O = 7.2 or 2.8 Vdc)		10	–	3.0	–	4.50	3.0	–	3.0	
(V_O = 11.5 or 3.5 Vdc)		15	–	4.0	–	6.75	4.0	–	4.0	
"1" Level	V_{IH}									Vdc
(V_O = 1.4 or 3.6 Vdc)		5.0	3.5	–	3.5	2.75	–	3.5	–	
(V_O = 2.8 or 7.2 Vdc)		10	7.0	–	7.0	5.50	–	7.0	–	
(V_O = 3.5 or 11.5 Vdc)		15	11	–	11	8.25	–	11	–	
Output Drive Current	I_{OH}									mAdc
(V_{OH} = 2.5 Vdc) Source		4.5	– 4.3	–	– 3.6	– 5.0	–	– 2.5	–	
(V_{OH} = 2.5 Vdc)		5.0	– 5.8	–	– 4.8	– 6.1	–	– 3.0	–	
(V_{OH} = 4.6 Vdc)		5.0	– 1.2	–	– 1.02	– 1.4	–	– 0.7	–	
(V_{OH} = 9.5 Vdc)		10	– 3.1	–	– 2.6	– 3.7	–	– 1.8	–	
(V_{OH} = 13.5 Vdc)		15	– 8.2	–	– 6.8	– 14.1	–	– 4.8	–	
(V_{OL} = 0.4 Vdc) Sink	I_{OL}	4.5	2.2	–	1.8	2.1	–	1.2	–	mAdc
		5.0	2.6	–	2.1	2.3	–	1.3	–	
(V_{OL} = 0.4 Vdc)		10	6.5	–	5.5	6.2	–	3.8	–	
(V_{OL} = 0.5 Vdc)		15	19.2	–	16.1	25	–	11.2	–	
(V_{OL} = 1.5 Vdc)										
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_Q	5.0	–	1.0	–	0.002	1.0	–	30	μAdc
		10	–	2.0	–	0.004	2.0	–	60	
		15	–	4.0	–	0.006	4.0	–	120	
Total Supply Current (Note 4, 5) (Dynamic plus Quiescent, Per Package) (C_L = 50 pF on all outputs) (All outputs switching, 50% Duty Cycle)	I_T	5.0	I_T = (2.5 μA/kHz) f + I_{DD}							μAdc
		10	I_T = (6.0 μA/kHz) f + I_{DD}							
		15	I_T = (10 μA/kHz) f + I_{DD}							
3–State Output Leakage Current	I_{TL}	15	–	± 0.1	–	± 0.0001	± 0.1	–	± 3.0	μAdc

3. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.
4. The formulas given are for the typical characteristics only at 25°C.
5. 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 = 0.006.

SWITCHING CHARACTERISTICS (Note 6) (C_L = 50 pF, T_A = 25°C)

Characteristic	Symbol	V_{DD} V_{CC}	All Types		Unit
			Typ (Note 7)	Max	
Output Rise Time	t_{TLH}				ns
t_{TLH} = (0.5 ns/pF) C_L + 20 ns		5.0	45	90	
t_{TLH} = (0.3 ns/pF) C_L + 8.0 ns		10	23	45	
t_{TLH} = (0.2 ns/pF) C_L + 8.0 ns		15	18	35	
Output Fall Time	t_{THL}				ns
t_{THL} = (0.5 ns/pF) C_L + 20 ns		5.0	45	90	
t_{THL} = (0.3 ns/pF) C_L + 8.0 ns		10	23	45	
t_{THL} = (0.2 ns/pF) C_L + 8.0 ns		15	18	35	
Turn−Off Delay Time, all Outputs	t_{PLH}				ns
t_{PLH} = (0.3 ns/pF) C_L + 60 ns		5.0	75	150	
t_{PLH} = (0.15 ns/pF) C_L + 27 ns		10	35	70	
t_{PLH} = (0.1 ns/pF) C_L + 20 ns		15	25	50	
Turn−On Delay Time, all Outputs	t_{PHL}				ns
t_{PHL} = (0.3 ns/pF) C_L + 60 ns		5.0	75	150	
t_{PHL} = (0.15 ns/pF) C_L + 27 ns		10	35	70	
t_{PHL} = (0.1 ns/pF) C_L + 20 ns		15	25	50	
3−State Propagation Delay Time	t_{PHZ}	5.0	75	150	ns
Output “1” to High Impedance		10	40	80	
		15	35	70	
Output “0” to High Impedance	t_{PLZ}	5.0	80	160	ns
		10	40	80	
		15	35	70	
High Impedance to “1” Level	t_{PZH}	5.0	65	130	ns
		10	25	50	
		15	20	40	
High Impedance to “0” Level	t_{PZL}	5.0	100	200	ns
		10	35	70	
		15	25	50	

6. The formulas given are for the typical characteristics only at 25°C.
7. Data labelled “Typ” is not to be used for design purposes but is intended as an indication of the IC’s potential performance.

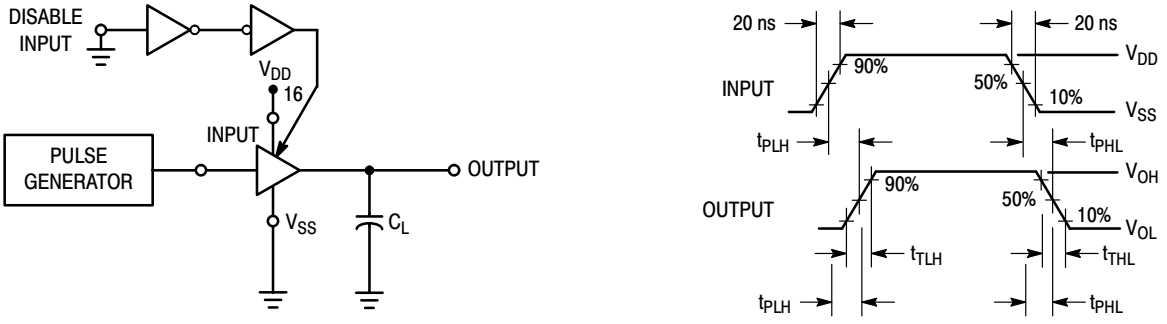


Figure 1. Switching Time Test Circuit and Waveforms (t_{TLH}, t_{THL}, t_{PHL}, and t_{PLH})

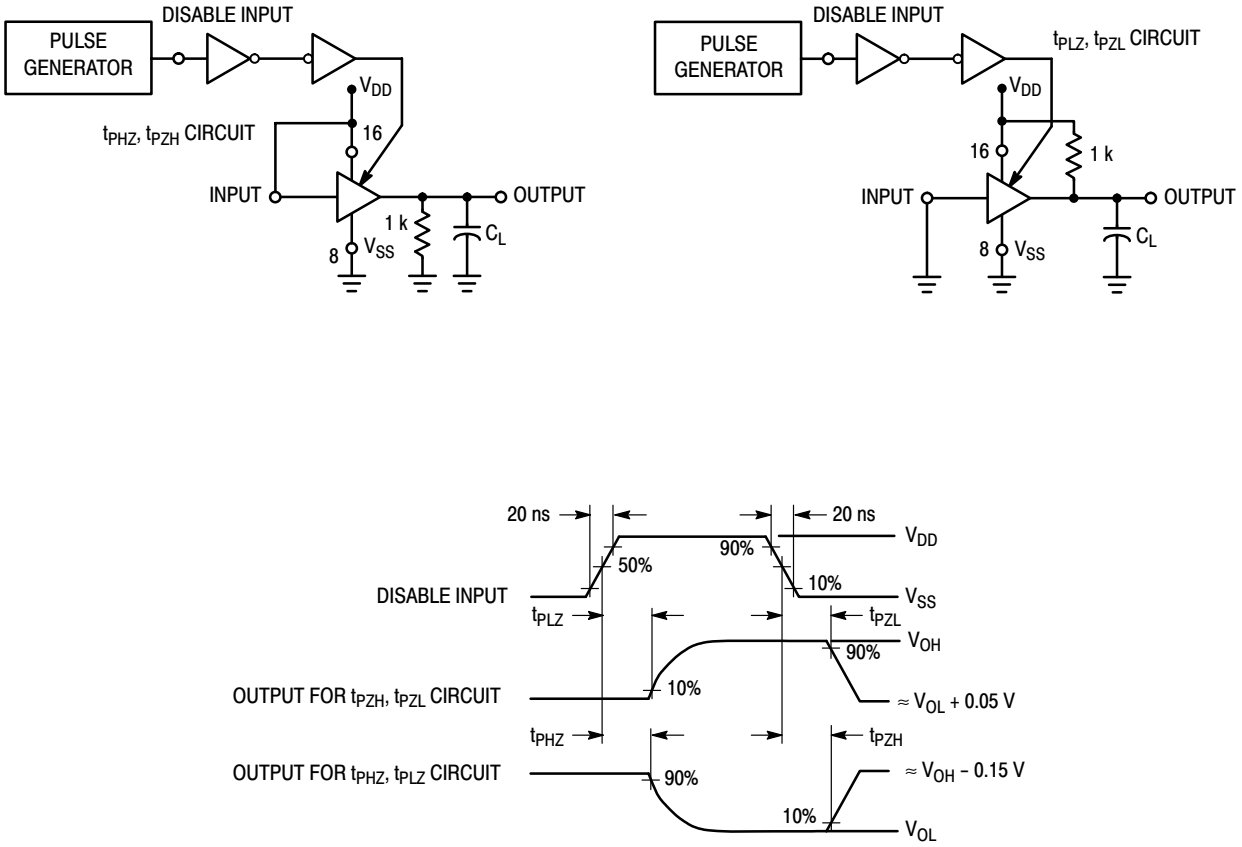
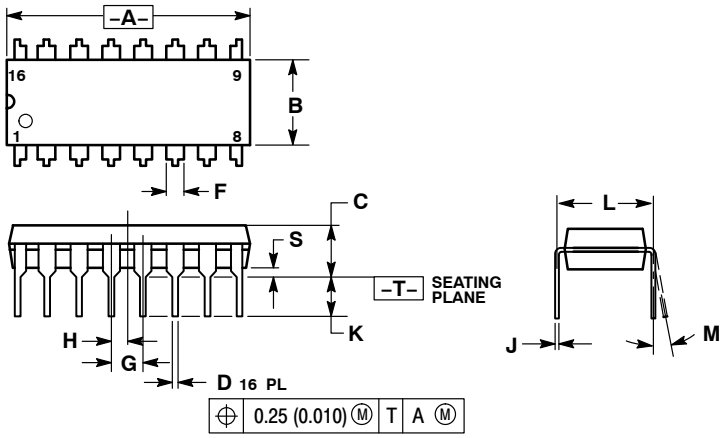


Figure 2. 3−State AC Test Circuit and Waveforms (t_{PLZ}, t_{PHZ}, t_{PZH}, t_{PZL})

PACKAGE DIMENSIONS

PDIP−16
CASE 648−08
ISSUE T

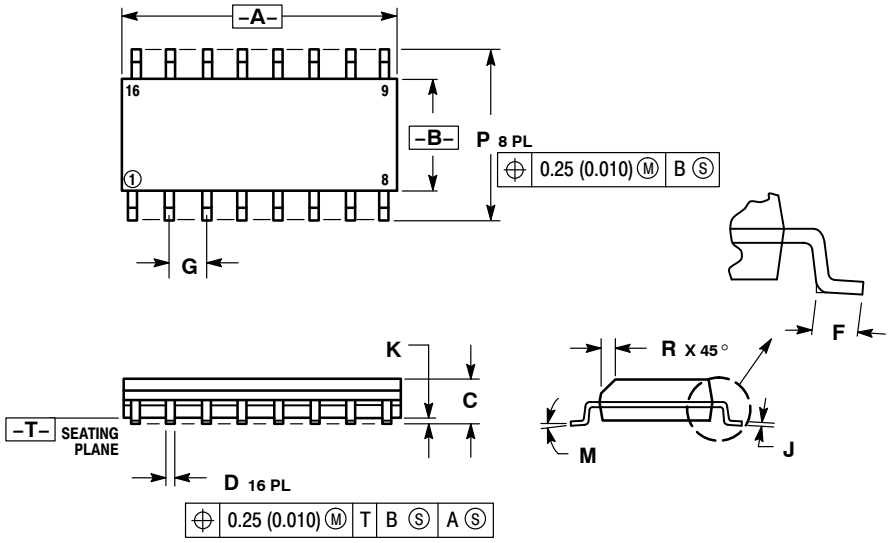


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	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

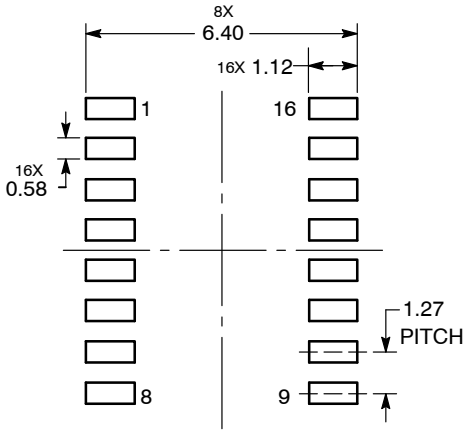
SOIC−16
CASE 751B−05
ISSUE K



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

SOLDERING FOOTPRINT



DIMENSIONS: MILLIMETERS

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