

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.

- 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

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}	Input Current (DC or Transient), per Pin	± 10	mA
I_{out}	Output Current (DC or Transient), per Pin	± 25	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

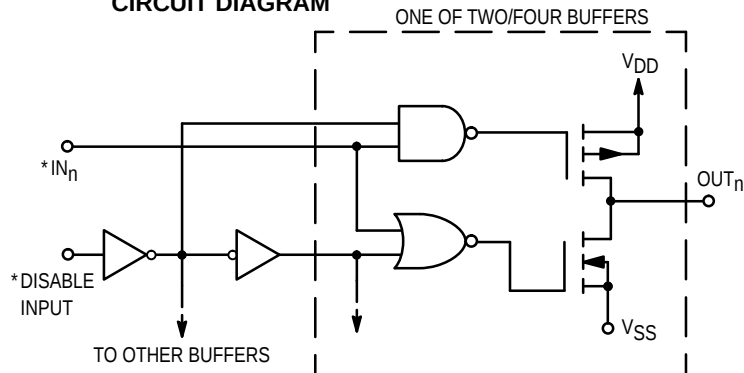
* Maximum Ratings are those values beyond which damage to the device may occur.

† 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

CIRCUIT DIAGRAM

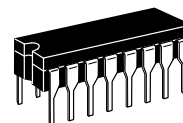


* Diode protection on all inputs (not shown)

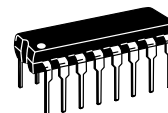
This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should 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.

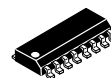
MC14503B



L SUFFIX
CERAMIC
CASE 620



P SUFFIX
PLASTIC
CASE 648



D SUFFIX
SOIC
CASE 751B

ORDERING INFORMATION

MC14XXXBCP Plastic
MC14XXXBCL Ceramic
MC14XXXBD SOIC

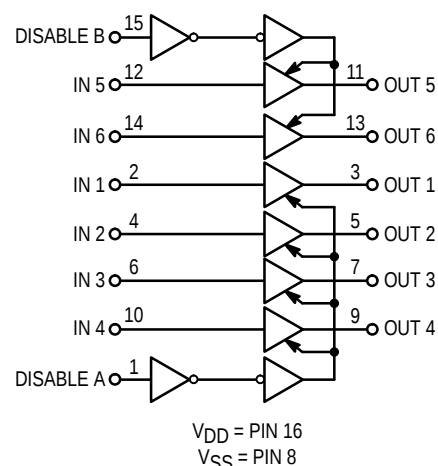
$T_A = -55^\circ$ to 125°C for all packages.

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



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} = 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	
	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 (V _O = 3.6 or 1.4 Vdc) (V _O = 7.2 or 2.8 Vdc) (V _O = 11.5 or 3.5 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	—	Vdc
		10	7.0	—	7.0	5.50	—	7.0	—	
		15	11	—	11	8.25	—	11	—	
Output Drive Current (V _{OH} = 2.5 Vdc) (V _{OH} = 2.5 Vdc) (V _{OH} = 4.6 Vdc) (V _{OH} = 9.5 Vdc) (V _{OH} = 13.5 Vdc) (V _{OL} = 0.4 Vdc) (V _{OL} = 0.4 Vdc) (V _{OL} = 0.5 Vdc) (V _{OL} = 1.5 Vdc)	Source I _{OH}	4.5	– 4.3	—	– 3.6	– 5.0	—	– 2.5	—	mAdc
		5.0	– 5.8	—	– 4.8	– 6.1	—	– 3.0	—	
		5.0	– 1.2	—	– 1.02	– 1.4	—	– 0.7	—	
		10	– 3.1	—	– 2.6	– 3.7	—	– 1.8	—	
		15	– 8.2	—	– 6.8	– 14.1	—	– 4.8	—	
	Sink I _{OL}	4.5	2.2	—	1.8	2.1	—	1.2	—	mAdc
		5.0	2.6	—	2.1	2.3	—	1.3	—	
		10	6.5	—	5.5	6.2	—	3.8	—	
		15	19.2	—	16.1	25	—	11.2	—	
		15	—	± 0.1	—	± 0.00001	± 0.1	—	± 1.0	
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***† (Dynamic plus Quiescent, Per Package) (C _L = 50 pF on all outputs) (All outputs switching, 50% Duty Cycle)	I _T	5.0 10 15	I _T = (2.5 μA/kHz) f + I _{DD} I _T = (6.0 μA/kHz) f + I _{DD} I _T = (10 μA/kHz) f + I _{DD}							μAdc
Three-State Output 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:

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

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 = 0.006.

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

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

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

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PIN ASSIGNMENT

DIS A	1	16	V_{DD}
IN 1	2	15	DIS B
OUT 1	3	14	IN 6
IN 2	4	13	OUT 6
OUT 2	5	12	IN 5
IN 3	6	11	OUT 5
OUT 3	7	10	IN 4
V_{SS}	8	9	OUT 4

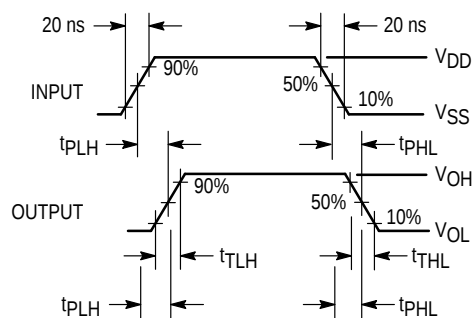
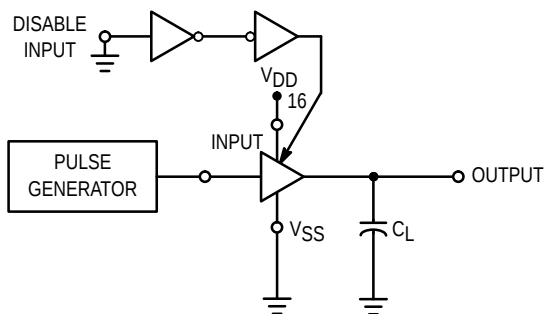


Figure 1. Switching Time Test Circuit and Waveforms (t_{TLH} , t_{THL} , t_{PHL} , and t_{PLH})

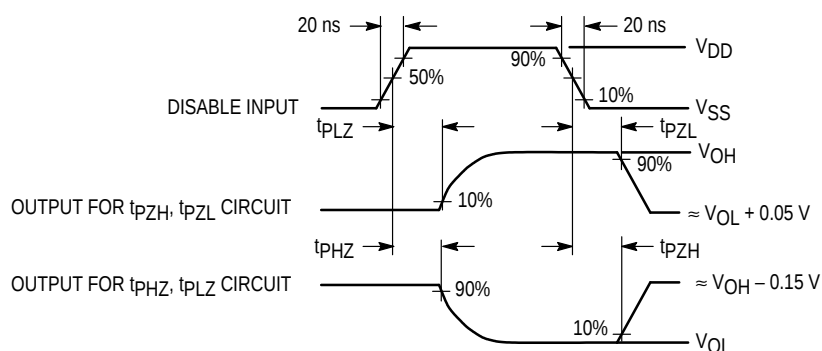
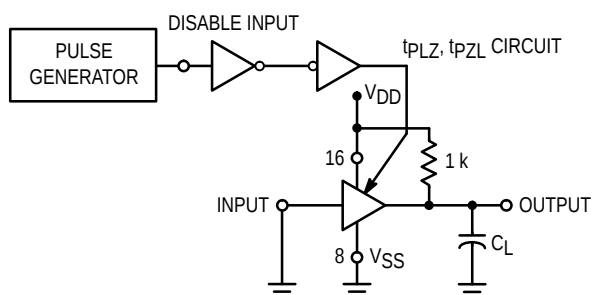
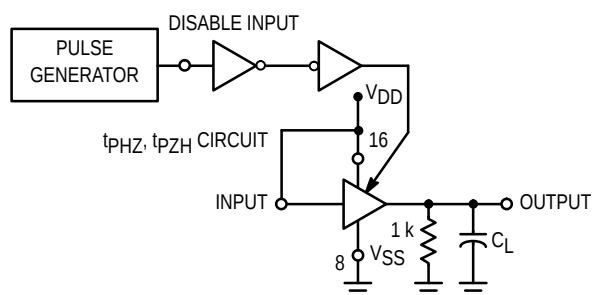
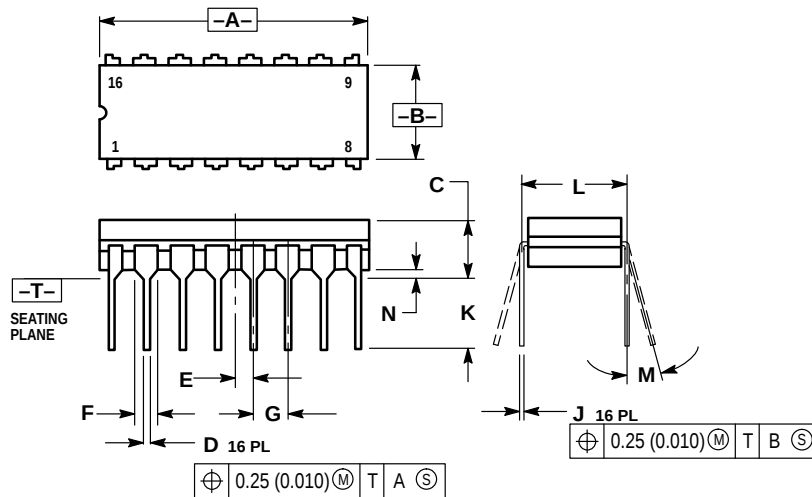


Figure 2. 3-State AC Test Circuit and Waveforms (t_{PLZ} , t_{PHZ} , t_{PZH} , t_{PZL})

OUTLINE DIMENSIONS

L SUFFIX CERAMIC DIP PACKAGE CASE 620-10 ISSUE V

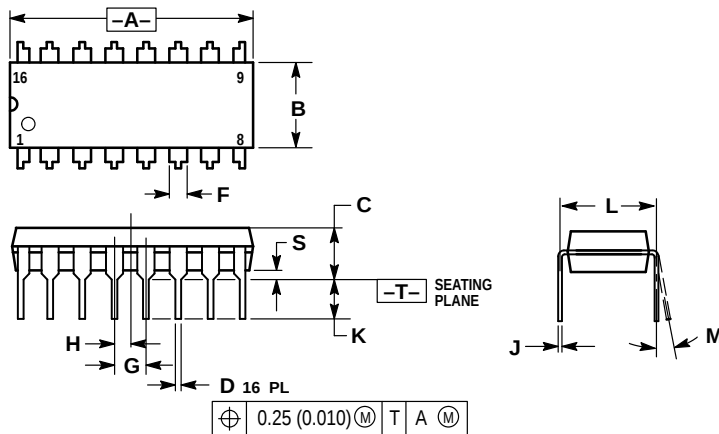


NOTES:

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



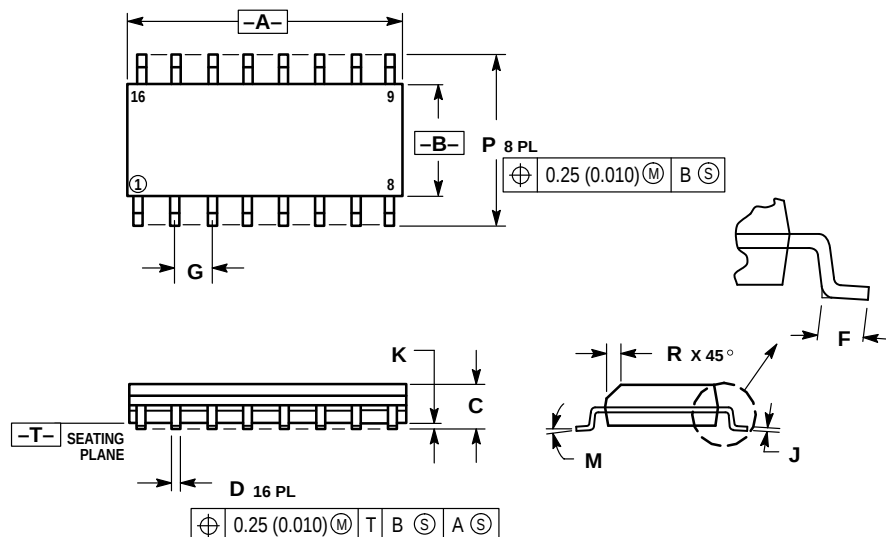
NOTES:

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

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.

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

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MOTOROLA



MC14503B/D

