

# 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	$I_{in}$	$\pm 10$	mA
Output Current (DC or Transient) per Pin	$I_{out}$	$\pm 25$	mA
Power Dissipation, per Package (Note 2)	$P_D$	500	mW
Ambient Temperature Range	$T_A$	-55 to +125	$^{\circ}C$
Storage Temperature Range		-65 to +150	$^{\circ}C$
Lead Temperature (8-Second Soldering)		260	$^{\circ}C$

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/ $^{\circ}C$  From 65 $^{\circ}C$  To 125 $^{\circ}C$

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

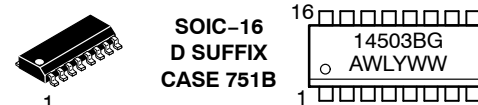
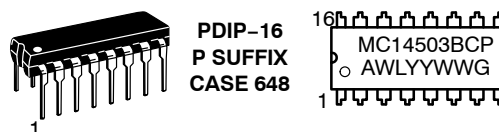
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either  $V_{SS}$  or  $V_{DD}$ ). Unused outputs must be left open.



ON Semiconductor®

<http://onsemi.com>

### MARKING DIAGRAMS



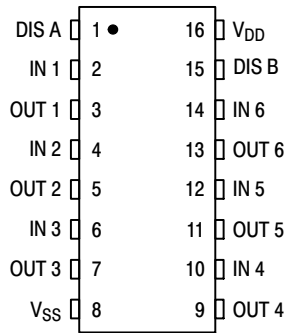
A = Assembly Location  
 WL, L = Wafer Lot  
 YY, Y = Year  
 WW, W = Work Week  
 G = Pb-Free Package

### ORDERING INFORMATION

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

# MC14503B

## PIN ASSIGNMENT

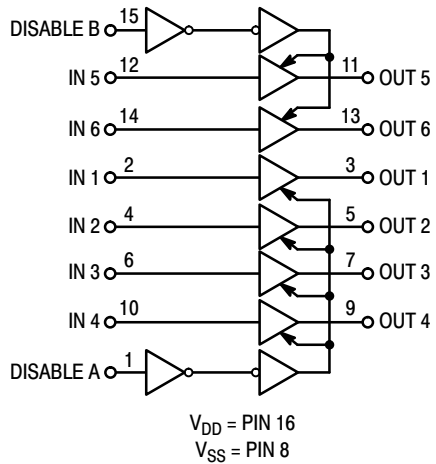


## TRUTH TABLE

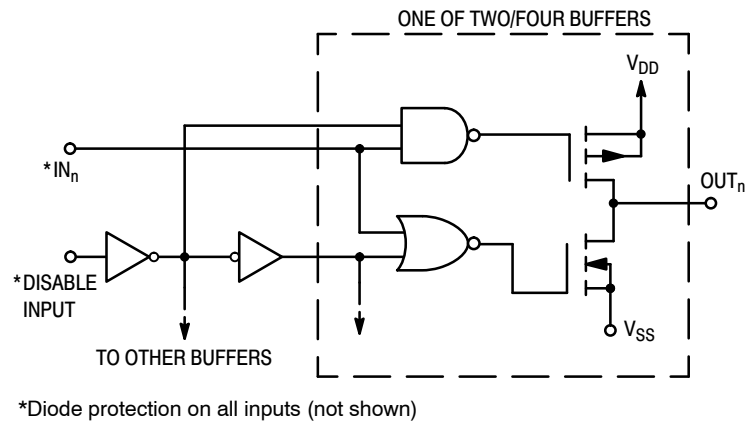
$In_n$	Appropriate Disable Input	$Out_n$
0	0	0
1	0	1
X	1	High Impedance

X = Don't Care

## LOGIC DIAGRAM



## CIRCUIT DIAGRAM



## 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.

# MC14503B

## ELECTRICAL CHARACTERISTICS (Voltages Referenced to $V_{SS}$ )

Characteristic	Symbol	$V_{DD}$ Vdc	- 55°C		25°C			125°C		Unit
			Min	Max	Min	Typ (Note 3)	Max	Min	Max	
Output Voltage $V_{in} = 0$  $V_{in} = V_{DD}$	"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	-	Vdc
		10	9.95	-	9.95	10	-	9.95	-	
		15	14.95	-	14.95	15	-	14.95	-	
Input Voltage $(V_O = 3.6 \text{ or } 1.4 \text{ Vdc})$ $(V_O = 7.2 \text{ or } 2.8 \text{ Vdc})$ $(V_O = 11.5 \text{ or } 3.5 \text{ Vdc})$  $(V_O = 1.4 \text{ or } 3.6 \text{ Vdc})$ $(V_O = 2.8 \text{ or } 7.2 \text{ Vdc})$ $(V_O = 3.5 \text{ or } 11.5 \text{ Vdc})$	"0" Level  $V_{IL}$	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	
	"1" Level  $V_{IH}$	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 $(V_{OH} = 2.5 \text{ Vdc})$ $(V_{OH} = 2.5 \text{ Vdc})$ $(V_{OH} = 4.6 \text{ Vdc})$ $(V_{OH} = 9.5 \text{ Vdc})$ $(V_{OH} = 13.5 \text{ Vdc})$ $(V_{OL} = 0.4 \text{ Vdc})$  $(V_{OL} = 0.4 \text{ Vdc})$ $(V_{OL} = 0.5 \text{ Vdc})$ $(V_{OL} = 1.5 \text{ Vdc})$	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	-	
		Input Current	$I_{in}$	15	-	$\pm 0.1$	-	$\pm 0.00001$	$\pm 0.1$	
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	$\mu\text{Adc}$
		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) $(C_L = 50 \text{ pF}$ on all outputs) (All outputs switching, 50% Duty Cycle)	$I_T$	5.0	$I_T = (2.5 \mu\text{A/kHz}) f + I_{DD}$							$\mu\text{Adc}$
		10	$I_T = (6.0 \mu\text{A/kHz}) f + I_{DD}$							
		15	$I_T = (10 \mu\text{A/kHz}) f + I_{DD}$							
3-State Output Leakage Current	$I_{TL}$	15	-	$\pm 0.1$	-	$\pm 0.0001$	$\pm 0.1$	-	$\pm 3.0$	$\mu\text{Adc}$

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:  $I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) V f k$  where:  $I_T$  is in  $\mu\text{A}$  (per package),  $C_L$  in pF,  $V = (V_{DD} - V_{SS})$  in volts,  $f$  in kHz is input frequency, and  $k = 0.006$ .

# MC14503B

## SWITCHING CHARACTERISTICS (Note 6) ( $C_L = 50 \text{ pF}$ , $T_A = 25^\circ\text{C}$ )

Characteristic	Symbol	$V_{DD}$ $V_{CC}$	All Types		Unit
			Typ (Note 7)	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

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.

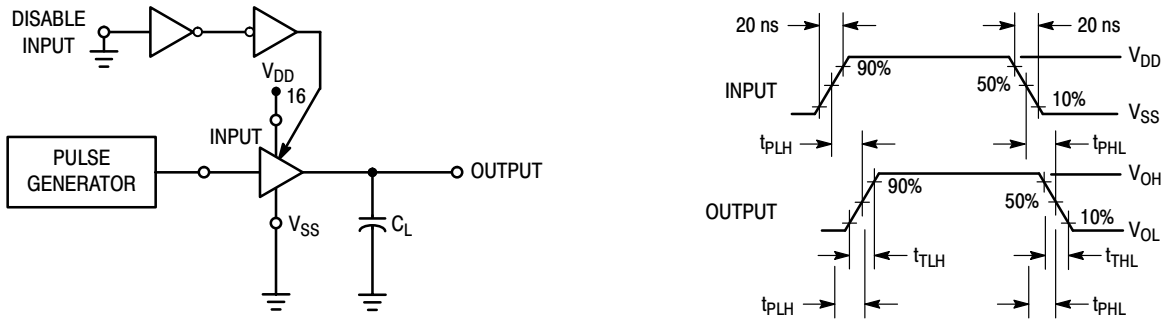
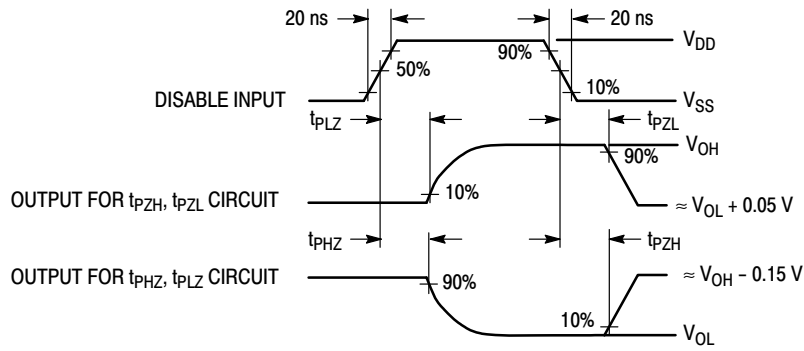
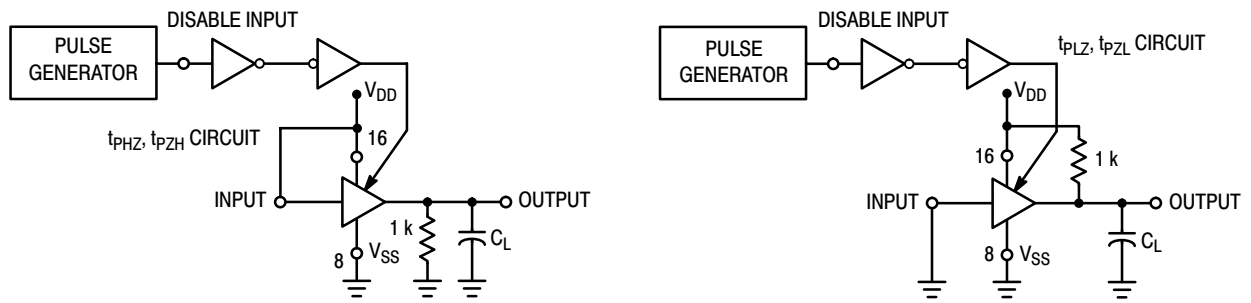


Figure 1. Switching Time Test Circuit and Waveforms  
( $t_{TLH}$ ,  $t_{THL}$ ,  $t_{PHL}$ , and  $t_{PLH}$ )

# MC14503B

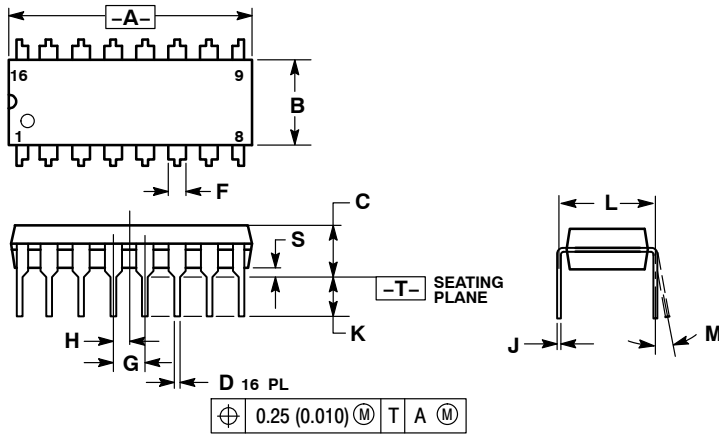


**Figure 2. 3-State AC Test Circuit and Waveforms**  
**( $t_{PLZ}$ ,  $t_{PHZ}$ ,  $t_{PZH}$ ,  $t_{PZL}$ )**

# MC14503B

## PACKAGE DIMENSIONS

PDIP-16  
CASE 648-08  
ISSUE T



NOTES:

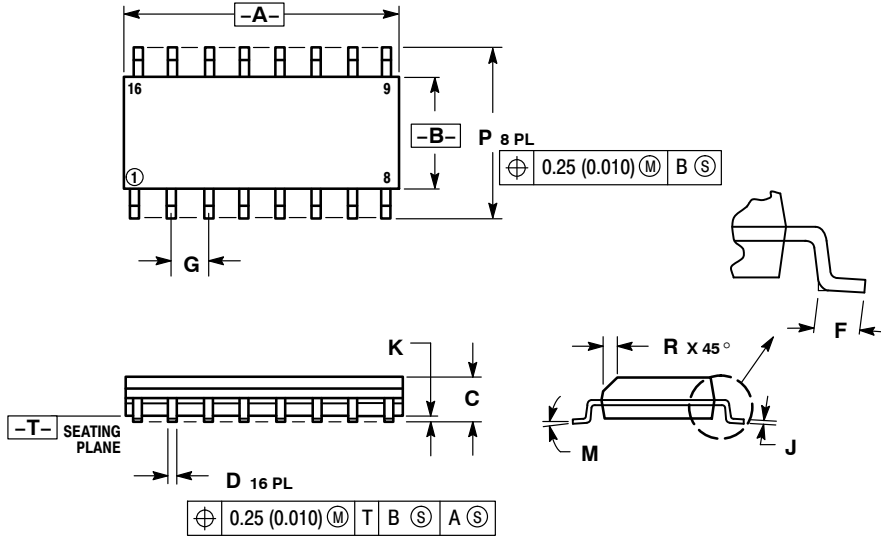
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

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 <sup>°</sup>	10 <sup>°</sup>	0 <sup>°</sup>	10 <sup>°</sup>
S	0.020	0.040	0.51	1.01

# MC14503B

## PACKAGE DIMENSIONS

SOIC-16  
CASE 751B-05  
ISSUE K

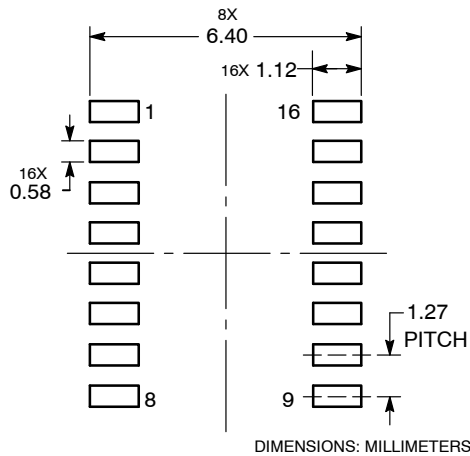


### NOTES:

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.

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

### SOLDERING FOOTPRINT



ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

#### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5817-1050

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative