

NC7SZ02

TinyLogic UHS Two-Input NOR Gate

Description

The NC7SZ02 is a single two-input NOR gate from ON Semiconductor's Ultra-High Speed (UHS) series of TinyLogic. The device is fabricated with advanced CMOS technology to achieve ultra-high speed with high output drive while maintaining low static power dissipation over a broad V_{CC} operating range. The device is specified to operate over the 1.65 V to 5.5 V V_{CC} operating range. The inputs and output are high-impedance when V_{CC} is 0 V. Inputs tolerate voltages up to 5.5 V, independent of V_{CC} operating range.

Features

- Ultra-High Speed: t_{PD} 2.4 ns (Typical) into 50 pF at 5 V V_{CC}
- High Output Drive: ± 24 mA at 3 V V_{CC}
- Broad V_{CC} Operating Range: 1.65 V to 5.5 V
- Matches Performance of LCX Operated at 3.3 V V_{CC}
- Power Down High-Impedance Inputs / Outputs
- Over-Voltage Tolerance Inputs Facilitate 5 V to 3 V Translation
- Proprietary Noise / EMI Reduction Circuitry
- Ultra-Small MicroPak™ Packages
- Space-Saving SC-74A and SC-88A Packages
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

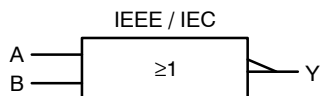


Figure 1. Logic Symbol



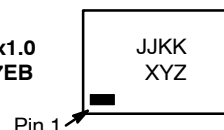
ON Semiconductor®

www.onsemi.com

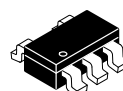
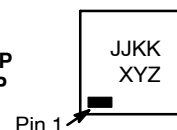
MARKING DIAGRAMS



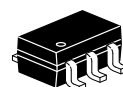
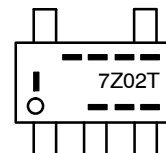
SIP6 1.45x1.0
CASE 127EB



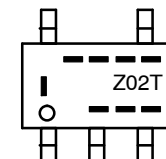
UDFN6
1.0X1.0, 0.35P
CASE 517DP



SC-74A
CASE 318BQ



SC-88A
1.25x2
CASE 419AC-01



JJ, 7Z02, Z02 = Specific Device Code
KK = 2-Digit Lot Run Traceability Code
XY = 2-Digit Date Code Format
Z = Assembly Plant Code
M = Data Code
T = Die Run Code
--- = Year Coding Scheme
I- = Plant Code Identifier
--- = Eight-Week Datacoding Scheme

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

NC7SZ02

Pin Configurations

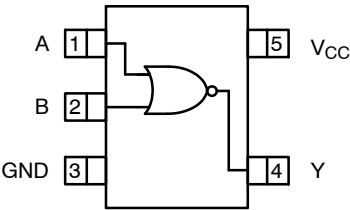


Figure 2. SC-88A and SC-74A (Top View)

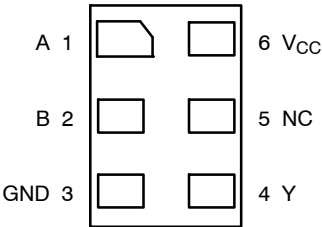


Figure 3. MicroPak (Top Through View)

PIN DEFINITIONS

Pin # SC-88A / SC74A	Pin # MicroPak	Name	Description
1	1	A	Input
2	2	B	Input
3	3	GND	Ground
4	4	Y	Output
5	6	V _{CC}	Supply Voltage
	5	NC	No Connect

FUNCTION TABLE (Y = /A + /B)

Inputs		Output
A	B	Y
L	L	H
L	H	L
H	L	L
H	H	L

H = HIGH Logic Level
L = LOW Logic Level

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter		Min	Max	Unit
V _{CC}	Supply Voltage		−0.5	6.0	V
V _{IN}	DC Input Voltage		−0.5	6.0	V
V _{OUT}	DC Output Voltage		−0.5	6.0	V
I _{IK}	DC Input Diode Current	V _{IN} < −0.5 V	−	−50	mA
		V _{IN} > 6.0 V	−	+20	
I _{OK}	DC Output Diode Current	V _{OUT} < −0.5 V	−	−50	mA
		V _{OUT} > 6 V, V _{CC} = GND	−	+20	
I _{OUT}	DC Output Current		−	±50	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current		−	±50	mA
T _{STG}	Storage Temperature Range		−65	+150	°C
T _J	Junction Temperature Under Bias		−	+150	°C
T _L	Junction Lead Temperature (Soldering, 10 Seconds)		−	+260	°C
P _D	Power Dissipation in Still Air	SC−74A	−	225	mW
		SC−88A−5	−	190	
		MicroPak−6	−	327	
		MicroPak2™−6	−	327	
ESD	Human Body Model, JEDEC: JESD22−A114		−	4000	V
	Charge Device Model, JEDEC: JESD22−C101		−	2000	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	Supply Voltage Operating		1.65	5.50	V
	Supply Voltage Data Retention		1.5	5.5	
V _{IN}	Input Voltage		0	5.5	V
V _{OUT}	Output Voltage		0	V _{CC}	V
T _A	Operating Temperature		−40	+85	°C
t _r , t _f	Input Rise and Fall Times	V _{CC} at 1.8 V, 2.5 V ±0.2 V	0	20	ns/V
		V _{CC} at 3.3 V ±0.3 V	0	10	
		V _{CC} at 5.0 V ±0.5 V	0	5	
θ _{JA}	Thermal Resistance	SC−74A	−	555	°C/W
		SC−88A−5	−	659	
		MicroPak−6	−	382	
		MicroPak2−6	−	382	

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

1. Unused inputs must be held HIGH or LOW. They may not float.

NC7SZ02

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C			T _A = -40 to +85°C		Unit
				Min	Typ	Max	Min	Max	
V _{IH}	HIGH Level Input Voltage	1.65 to 1.95		0.65 V _{CC}	–	–	0.65 V _{CC}	–	V
		2.30 to 5.50		0.70 V _{CC}	–	–	0.70 V _{CC}	–	
V _{IL}	LOW Level Input Voltage	1.65 to 1.95		–	–	0.35 V _{CC}	–	0.35 V _{CC}	V
		2.30 to 5.50		–	–	0.30 V _{CC}	–	0.30 V _{CC}	
V _{OH}	HIGH Level Output Voltage	1.65	V _{IN} = V _{IL} , I _{OH} = –100 µA	1.55	1.65	–	1.55	–	V
		1.80		1.70	1.80	–	1.70	–	
		2.30		2.20	2.30	–	2.20	–	
		3.00		2.90	3.00	–	2.90	–	
		4.50		4.40	4.50	–	4.40	–	
		1.65	I _{OH} = –4 mA	1.29	1.52	–	1.29	–	
		2.30	I _{OH} = –8 mA	1.90	2.15	–	1.90	–	
		3.00	I _{OH} = –16 mA	2.40	2.80	–	2.40	–	
		3.00	I _{OH} = –24 mA	2.30	2.68	–	2.30	–	
		4.50	I _{OH} = –32 mA	3.80	4.20	–	3.80	–	
V _{OL}	LOW Level Output Voltage	1.65	V _{IN} = V _{IH} , I _{OL} = 100 µA	–	0.00	0.10	–	0.10	V
		1.80		–	0.00	0.10	–	0.10	
		2.30		–	0.00	0.10	–	0.10	
		3.00		–	0.00	0.10	–	0.10	
		4.50		–	0.00	0.10	–	0.10	
		1.65	I _{OL} = 4 mA	–	0.08	0.24	–	0.24	
		2.30	I _{OL} = 8 mA	–	0.10	0.30	–	0.30	
		3.00	I _{OL} = 16 mA	–	0.15	0.40	–	0.40	
		3.00	I _{OL} = 24 mA	–	0.22	0.55	–	0.55	
		4.50	I _{OL} = 32 mA	–	0.22	0.55	–	0.55	
I _{IN}	Input Leakage Current	1.65 to 5.50	V _{IN} = 5.5 V, GND	–	–	±1	–	±10	µA
I _{OFF}	Power Off Leakage Current	0	V _{IN} or V _{OUT} = 5.5 V	–	–	1	–	10	µA
I _{CC}	Quiescent Supply Current	1.65 to 5.50	V _{IN} = 5.5 V, GND	–	–	2.0	–	20	µA

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	V _{CC} (V)	Conditions	T _A = +25°C			T _A = -40 to +85°C		Unit
				Min	Typ	Max	Min	Max	
t _{PLH} , t _{PHL}	Propagation Delay (Figure 4, 5)	1.65	C _L = 15 pF, R _L = 1 MΩ	–	5.3	11.5	–	12.0	ns
		1.80		–	4.4	9.5	–	10.0	
		2.50 ±0.20		–	2.9	6.5	–	7.0	
		3.30 ±0.30	C _L = 50 pF, R _L = 500 Ω	–	2.3	4.5	–	4.7	
		5.00 ±0.50		–	1.9	3.9	–	4.1	
		3.30 ±0.30		–	2.9	5.0	–	5.2	
		5.00 ±0.50		–	2.4	4.3	–	4.5	
C _{IN}	Input Capacitance	0		–	4	–	–	–	pF
C _{PD}	Power Dissipation Capacitance (Note 2) (Figure 6)	3.30		–	23	–	–	–	pF
		5.00		–	30	–	–	–	

2. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle. C_{PD} is related to I_{CCD} dynamic operating current by the expression:
 $I_{CCD} = (C_{PD}) (V_{CC}) (f_{IN}) + (I_{CCstatic})$.

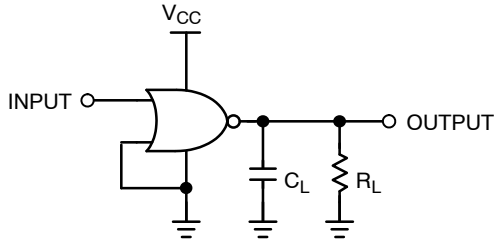


Figure 4. AC Test Circuit

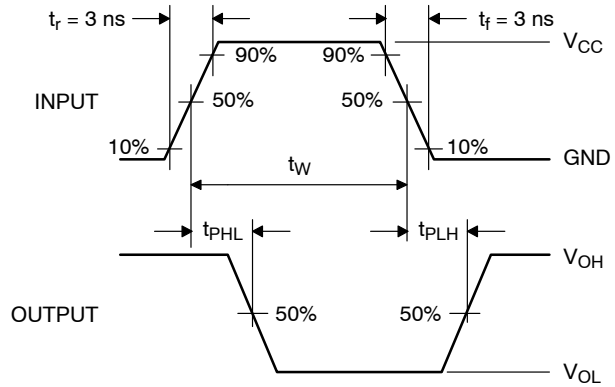
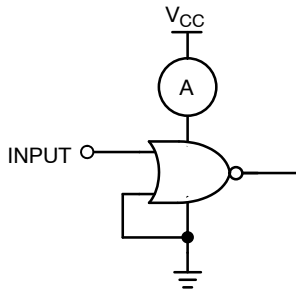


Figure 5. AC Waveforms



NOTE:

3. Input = AC Waveform; t_r = t_f = 1.8 ns;
 PRR = 10 MHz; Duty Cycle = 50%.

Figure 6. I_{CCD} Test Circuit

NC7SZ02

ORDERING INFORMATION

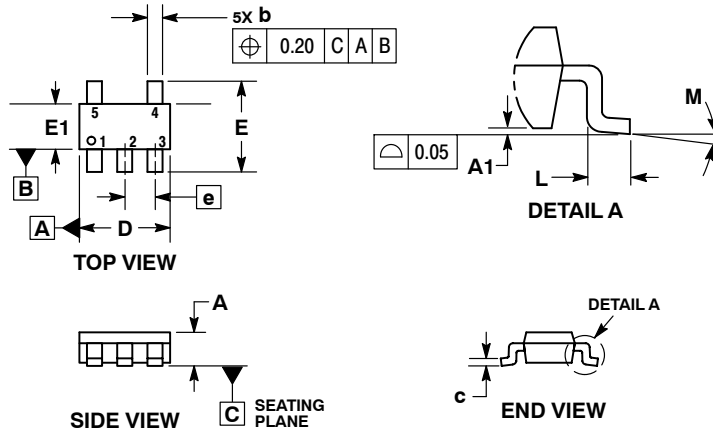
Part Number	Top Mark	Packages	Shipping [†]
NC7SZ02M5X	7Z02	5-Lead SC-74A	3000 / Tape & Reel
NC7SZ02P5X	Z02	5-Lead SC-88A	3000 / Tape & Reel
NC7SZ02L6X	JJ	6-Lead MicroPak	5000 / Tape & Reel
NC7SZ02FHX	JJ	6-Lead, MicroPak2	5000 / Tape & Reel

[†]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.

NC7SZ02

PACKAGE DIMENSIONS

SC-74A CASE 318BQ ISSUE B

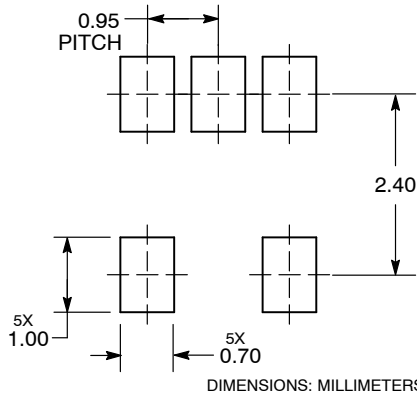


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE.

DIM	MILLIMETERS	
	MIN	MAX
A	0.90	1.10
A1	0.01	0.10
b	0.25	0.50
c	0.10	0.26
D	2.85	3.15
E	2.50	3.00
E1	1.35	1.65
e	0.95 BSC	
L	0.20	0.60
M	0°	10°

RECOMMENDED SOLDERING FOOTPRINT*



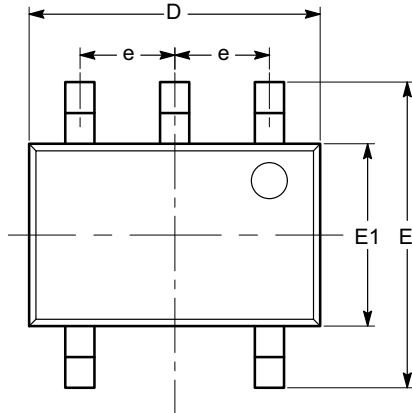
DIMENSIONS: MILLIMETERS

*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NC7SZ02

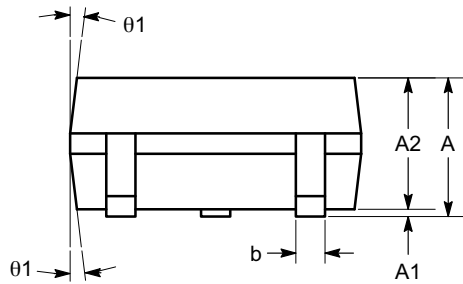
PACKAGE DIMENSIONS

SC-88A (SC-70 5 Lead), 1.25x2
CASE 419AC-01
ISSUE A

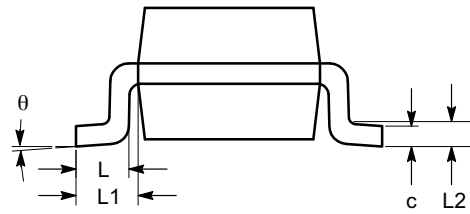


TOP VIEW

SYMBOL	MIN	NOM	MAX
A	0.80		1.10
A1	0.00		0.10
A2	0.80		1.00
b	0.15		0.30
c	0.10		0.18
D	1.80	2.00	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.26	0.36	0.46
L1	0.42 REF		
L2	0.15 BSC		
θ	0°		8°
$\theta 1$	4°		10°



SIDE VIEW



END VIEW

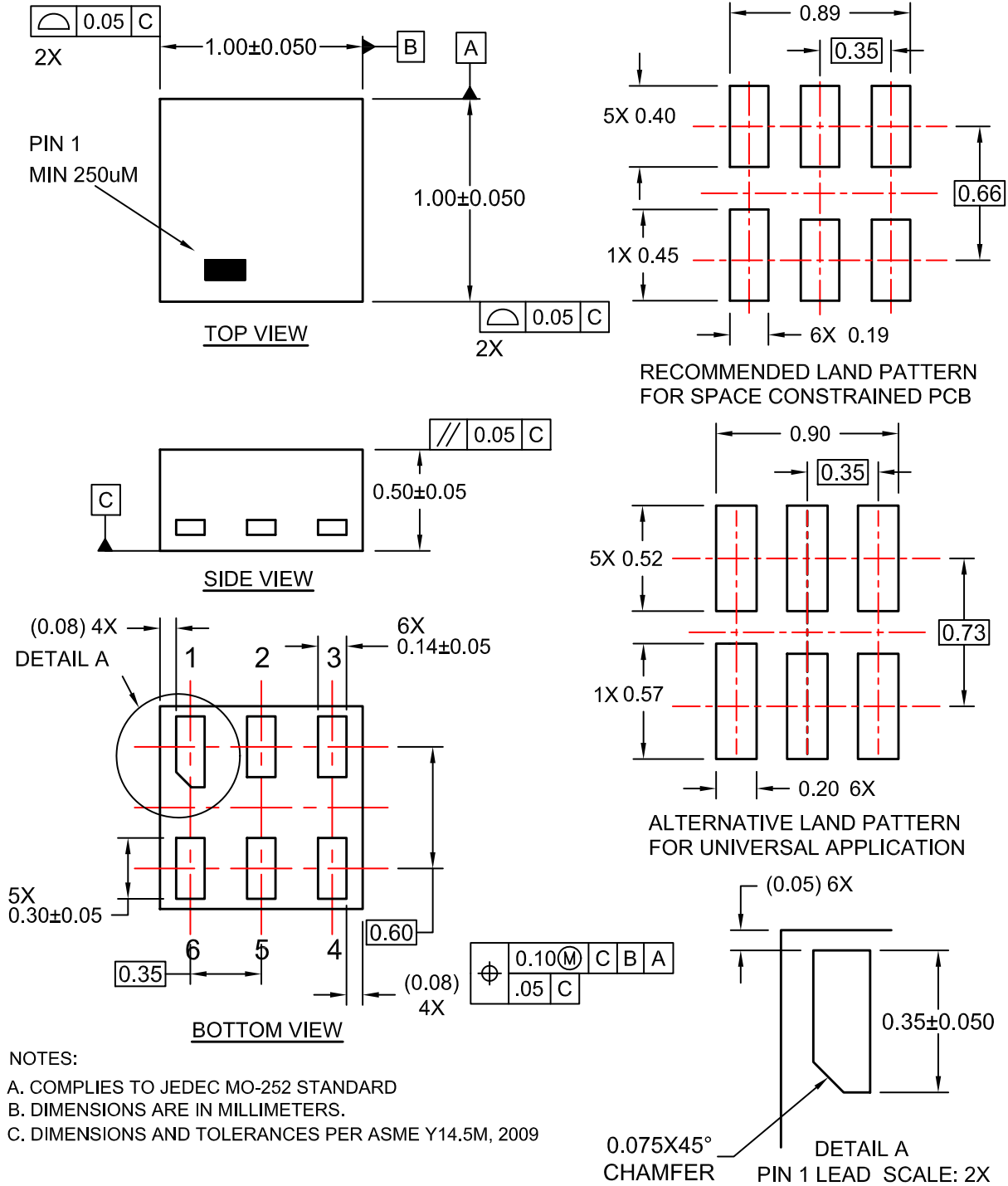
Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-203.

NC7SZ02

PACKAGE DIMENSIONS

UDFN6 1.0X1.0, 0.35P
CASE 517DP
ISSUE O



MicroPak and MicroPak2 are trademarks of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor 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
19521 E. 32nd Pkwy, Aurora, Colorado 80011 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

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910

ON Semiconductor Website: www.onsemi.com

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

For additional information, please contact your local Sales Representative