NL27WZU04

Dual Unbuffered Inverter

The NL27WZU04 is a high performance dual unbuffered inverter operating from a 1.65 to 5.5 V supply. These devices are well suited for use as oscillators, pulse shapers, and in many other applications requiring a high–input impedance amplifier. For digital applications, the NL27WZ04 is recommended.

- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Unbuffered for Crystal Oscillator and Analog Applications
- LVCMOS Compatible
- Source/Sink ±16 mA @ 4.5 V V_{CC}
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 72; Equivalent Gate = 18

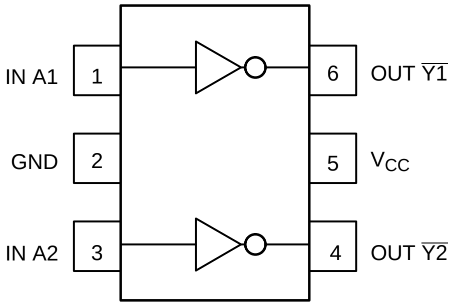


Figure 1. Pinout (Top View)

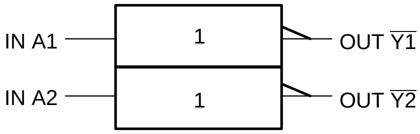


Figure 2. Logic Symbol

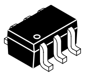
FUNCTION TABLE

A Input	$\overline{Y}$ Output
L	H
H	L

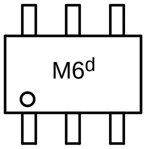
ON Semiconductor®

http://onsemi.com

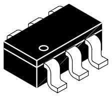
MARKING DIAGRAMS



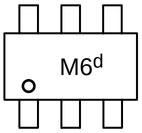
SC–88 / SOT–363/SC–70
DF SUFFIX
CASE 419B



Pin 1
d = Date Code



TSOP–6/SOT–23/SC–59
DT SUFFIX
CASE 318G



Pin 1
d = Date Code

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

PIN ASSIGNMENT

1	IN A1
2	GND
3	IN A2
4	OUT $\overline{Y2}$
5	V_{CC}
6	OUT $\overline{Y1}$

August, 2002 – Rev. 2

MAXIMUM RATINGS (Note 1)

Symbol	Characteristics		Value	Unit
V_{CC}	DC Supply Voltage		−0.5 to +7.0	V
V_I	DC Input Voltage		$-0.5 \leq V_I \leq V_{CC}$	V
V_O	DC Output Voltage		−0.5 to 7.0	V
I_{IK}	DC Input Diode Current	V_I < GND	−50	mA
I_{OK}	DC Output Diode Current	V_O < GND $V_O > V_{CC}$	−50 +50	mA
I_O	DC Output Sink Current		±50	mA
I_{CC}	DC Supply Current per Supply Pin		±100	mA
I_{GND}	DC Ground Current per Ground Pin		±100	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
P_D	Power Dissipation in Still Air	SC–88, TSOP–6	200	mW
θ_{JA}	Thermal Resistance	SC–88, TSOP–6	333	°C/W
T_L	Lead Temperature, 1 mm from case for 10 s		260	°C
T_J	Junction Temperature under Bias		+150	°C
V_{ESD}	ESD Withstand Voltage	Human Body Model (Note 2) Machine Model (Note 3) Charged Device Model (Note 4)	> 2000 > 200 N/A	V
$I_{Latch–Up}$	Latch–Up Performance	Above V_{CC} and Below GND at 85°C (Note 5)	±500	mA

1. Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute–maximum–rated conditions is not implied.
2. Tested to EIA/JESD22–A114–A
3. Tested to EIA/JESD22–A115–A
4. Tested to JESD22–C101–A
5. Tested to EIA/JESD78

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Max	Unit
V_{CC}	Supply Voltage	Operating Data Retention Only	1.65 1.5	5.5 5.5	V
V_I	Input Voltage		0	5.5	V
V_O	Output Voltage	(High or LOW State)	0	V_{CC}	V
T_A	Operating Free–Air Temperature		−40	+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate	V_{CC} = 2.5 V ±0.2 V V_{CC} =3.0 V ±0.3 V V_{CC} =5.0 V ±0.5 V	0 0 0	20 10 5	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			− 40°C ≤ T_A ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
V_{IH}	High–Level Input Voltage		1.65 to 1.85	0.85 V_{CC}			0.85 V_{CC}		V
			2.3 to 5.5	0.8 V_{CC}			0.8 V_{CC}		
V_{IL}	Low–Level Input Voltage		1.65 to 1.85			0.15 V_{CC}		0.15 V_{CC}	V
			2.3 to 5.5			0.2 V_{CC}		0.2 V_{CC}	
V_{OH}	High–Level Output Voltage V_{IN} = V_{IL}	I_{OH} = –100 μA	1.65 to 5.5	V_{CC}–0.1			V_{CC}–0.1		V
	V_{IN} = GND	I_{OH} = –3 mA	1.65	1.29	1.52		1.29		
		I_{OH} = –4 mA	2.3	1.9	2.1		1.9		
		I_{OH} = –6 mA	2.7	2.2	2.3		2.2		
		I_{OH} = –8 mA	3.0	2.4	2.6		2.4		
		I_{OH} = –12 mA	3.0	2.3	2.5		2.3		
		I_{OH} = –16 mA	4.5	3.8	4.2		3.8		
V_{OL}	Low–Level Output Voltage V_{IN} = V_{IH}	I_{OL} = 100 μA	1.65 to 5.5			0.1		0.1	V
	V_{IN} = V_{CC}	IOL = 3 mA	1.65		0.08	0.24		0.24	
		I_{OL} = 4 mA	2.3		0.12	0.3		0.3	
		I_{OL} = 6 mA	2.7		0.20	0.4		0.4	
		I_{OL} = 8 mA	3.0		0.24	0.4		0.4	
		I_{OL} = 12 mA	3.0		0.26	0.55		0.55	
		I_{OL} = 16 mA	4.5		0.31	0.55		0.55	
I_{IN}	Input Leakage Current	V_{IN} = V_{CC} or GND	5.5			± 0.1		± 1.0	μA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND	1.65 to 5.5			1.0		10	μA

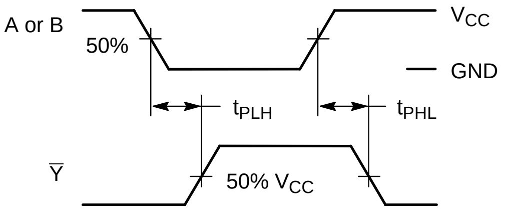
AC ELECTRICAL CHARACTERISTICS $t_R = t_F$ = 2.5 ns; C_L = 50 pF; R_L = 500 Ω

Symbol	Parameter	Condition	V_{CC} (V)	T_A = 25°C			− 40°C ≤ T_A ≤ 85°C		Unit
				Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay Input A to Y (Figure 3 and 4)	R_L = 1 MΩ, C_L = 50 pF	1.8 ± 0.15	1.5	5.5	1.8	1.5	11.0	ns
		R_L = 1 MΩ, C_L = 15 pF	2.5 ± 0.2	1.2	3.3	5.7	1.2	6.3	
		R_L = 1 MΩ, C_L = 15 pF	3.3 ± 0.3	0.8	2.7	4.1	0.8	4.5	
		R_L = 500 Ω, C_L = 50 pF		1.2	4.0	6.4	1.2	7.0	
		R_L = 1 MΩ, C_L = 15 pF	5.0 ± 0.5	0.5	2.2	3.3	0.5	3.6	
		R_L = 500 Ω, C_L = 50 pF		0.8	3.4	5.6	0.8	6.2	

CAPACITIVE CHARACTERISTICS

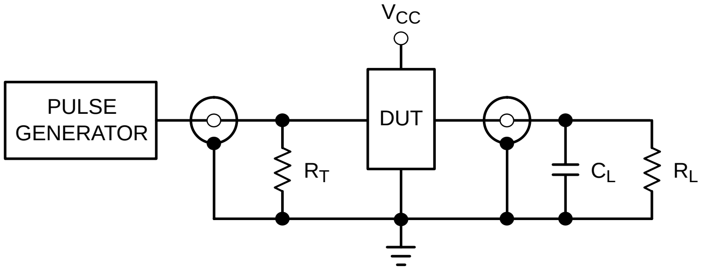
Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	7	pF
C_{OUT}	Output Capacitance	V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance (Note 6)	10 MHz, V_{CC} = 5.5 V, V_I = 0 V or V_{CC}	25	pF

6. C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: $I_{CC(OPR)} = C_{PD} \bullet V_{CC} \bullet f_{in} + I_{CC}$. C_{PD} is used to determine the no–load dynamic power consumption; $P_D = C_{PD} \bullet V_{CC}^2 \bullet f_{in} + I_{CC} \bullet V_{CC}$.



PROPAGATION DELAYS
$t_R = t_F = 2.5$ ns, 10% to 90%; f = 1 MHz; $t_W = 500$ ns

Figure 3. Switching Waveforms



C_L =50 pF or equivalent (includes jig and probe capacitance)
$R_L = R_1 = 500\ \Omega$ or equivalent
$R_T = Z_{OUT}$ of pulse generator (typically 50 Ω)

Figure 4. Test Circuit

DEVICE ORDERING INFORMATION

Device Order Number	Device Nomenclature							Package Type (Name/SOT# / Common Name)	Tape and Reel Size
	Logic Circuit Indicator	No. of Gates per Package	Temp Range Identifier	Technology	Device Function	Package Suffix	Tape & Reel Suffix		
NL27WZU04DFT2	NL	2	7	WZ	U04	DF	T2	SC–88 / SOT–363 / SC–70	178 mm (7”) 3000 Unit
NL27WZU04DTT1	NL	2	7	WZ	U04	DT	T1	TSOP–6 / SOT–23 / SC–59	178 mm (7”) 3000 Unit

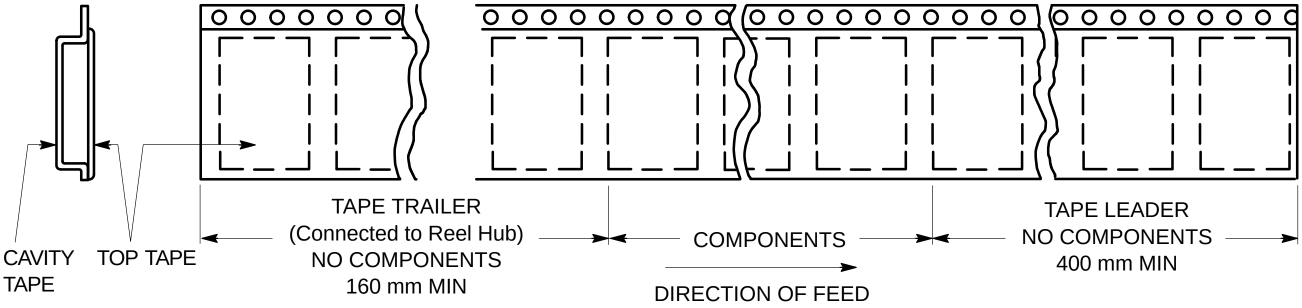


Figure 5. Tape Ends for Finished Goods

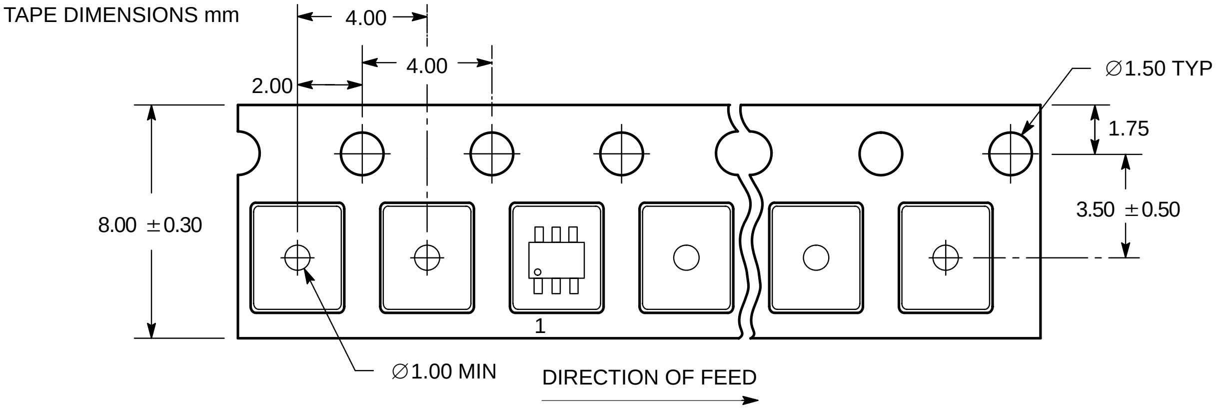


Figure 6. SC70–6/SC–88/SOT–363 DFT2 and SOT23–6/TSOP–6/SC59–6 DTT1 Reel Configuration/Orientation

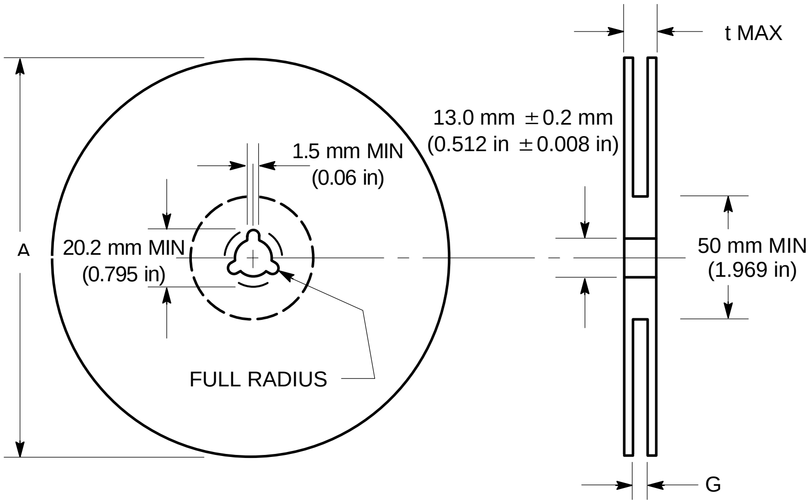


Figure 7. Reel Dimensions

REEL DIMENSIONS

Tape Size	T and R Suffix	A Max	G	t Max
8 mm	T1, T2	178 mm (7 in)	8.4 mm, + 1.5 mm, –0.0 (0.33 in + 0.059 in, –0.00)	14.4 mm (0.56 in)

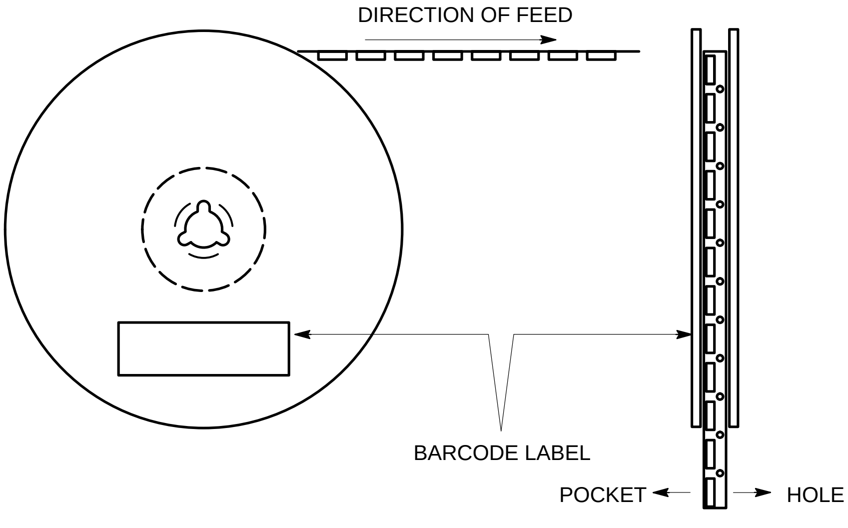
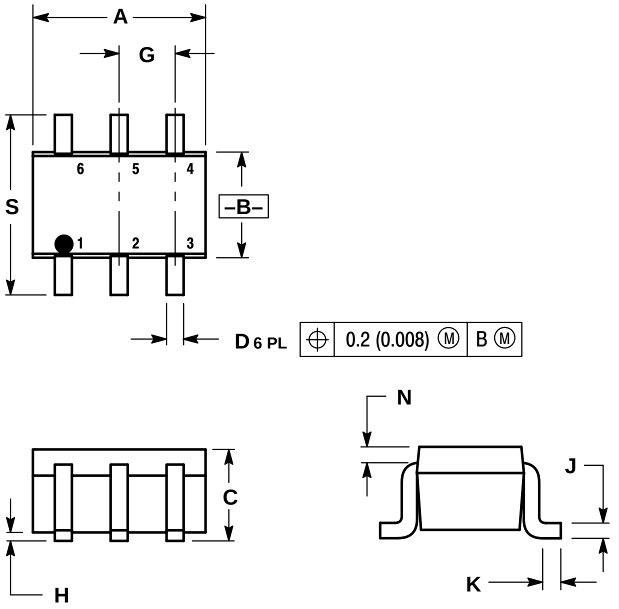


Figure 8. Reel Winding Direction

PACKAGE DIMENSIONS

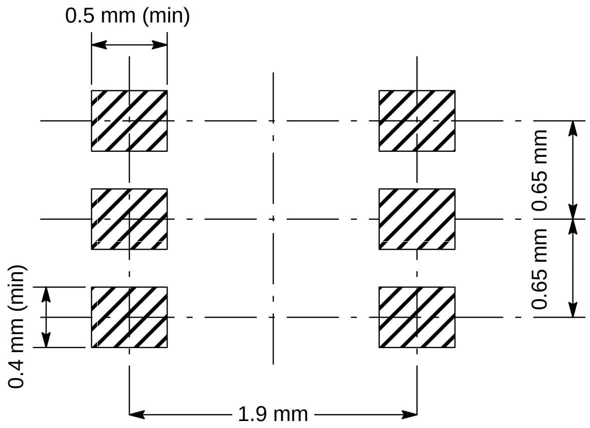
SC70–6/SC–88/SOT–363
DF SUFFIX

CASE 419B–02
ISSUE K



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B–01 OBSOLETE, NEW STANDARD 419B–02.

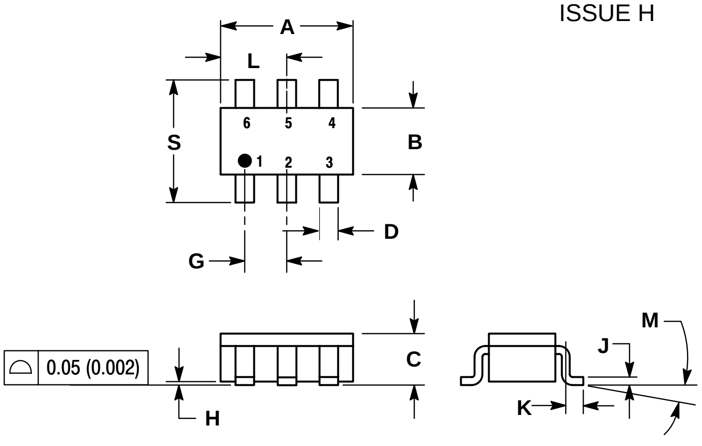
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20



PACKAGE DIMENSIONS

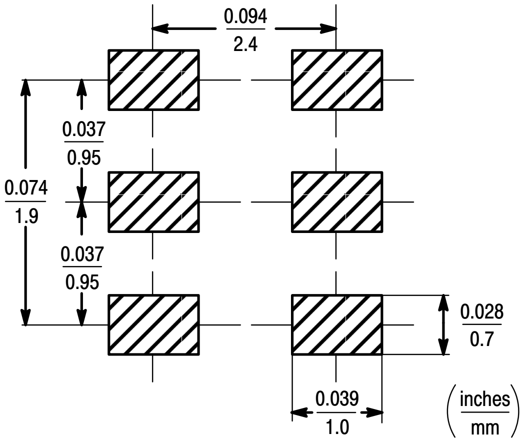
SOT23–6/TSOP–6/SC59–6
DT SUFFIX

CASE 318G–02
ISSUE H



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	2.90	3.10	0.1142	0.1220
B	1.30	1.70	0.0512	0.0669
C	0.90	1.10	0.0354	0.0433
D	0.25	0.50	0.0098	0.0197
G	0.85	1.05	0.0335	0.0413
H	0.013	0.100	0.0005	0.0040
J	0.10	0.26	0.0040	0.0102
K	0.20	0.60	0.0079	0.0236
L	1.25	1.55	0.0493	0.0610
M	0°	10°	0°	10°
S	2.50	3.00	0.0985	0.1181



ON Semiconductor and ON are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). 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.

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: ONlit@hibbertco.com

N. American Technical Support: 800–282–9855 Toll Free USA/Canada

JAPAN: ON Semiconductor, Japan Customer Focus Center
2–9–1 Kamimeguro, Meguro–ku, Tokyo, Japan 153–0051
Phone: 81–3–5773–3850
Email: r14525@onsemi.com

ON Semiconductor Website: http://onsemi.com

For additional information, please contact your local
Sales Representative.