

NL27WZ06

Dual Inverter with Open Drain Outputs

The NL27WZ06 is a high performance dual inverter with open drain outputs operating from a 1.65 V to 5.5 V supply.

The internal circuit is composed of multiple stages, including an open drain output which provides the capability to set output switching level. This allows the NL27WZ06 to be used to interface 5 V circuits to circuits of any voltage between V_{CC} and 7 V using an external resistor and power supply.

Features

- Extremely High Speed: t_{PD} 2.4 ns (typical) at $V_{CC} = 5$ V
- Designed for 1.65 V to 5.5 V V_{CC} Operation
- Over Voltage Tolerant Inputs
- LVTTTL Compatible – Interface Capability With 5 V TTL Logic with $V_{CC} = 3$ V
- LVC MOS Compatible
- 24 mA Output Sink Capability
- Near Zero Static Supply Current Substantially Reduces System Power Requirements
- Chip Complexity: FET = 72; Equivalent Gate = 18
- Pb-Free Packages are Available

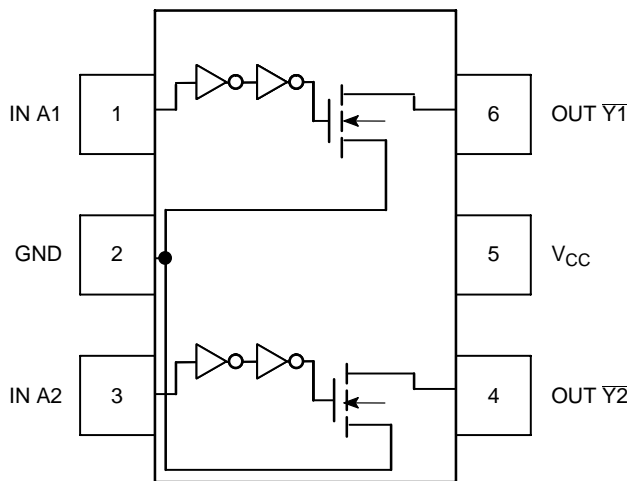


Figure 1. Pinout (Top View)

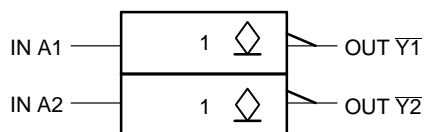


Figure 2. Logic Symbol



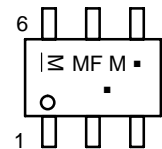
ON Semiconductor®

<http://onsemi.com>

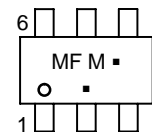
MARKING DIAGRAMS



SC-88
DF SUFFIX
CASE 419B



TSOP-6
DT SUFFIX
CASE 318G



MF = Device Code
M = Date Code*
▪ = Pb-Free Package

(Note: Microdot may be in either location)
*Date Code orientation and/or position may vary depending upon manufacturing location.

PIN ASSIGNMENT

| | |
|---|----------|
| 1 | IN A1 |
| 2 | GND |
| 3 | IN A2 |
| 4 | OUT Y2 |
| 5 | V_{CC} |
| 6 | OUT Y1 |

FUNCTION TABLE

| A Input | \bar{Y} Output |
|---------|------------------|
| L | Z |
| H | L |

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

NL27WZ06

MAXIMUM RATINGS

| Symbol | Characteristics | Value | Unit |
|----------------------|---|------------------------------|------|
| V _{CC} | DC Supply Voltage | -0.5 to +7.0 | V |
| V _I | DC Input Voltage | -0.5 ≤ V _I ≤ +7.0 | V |
| V _O | DC Output Voltage Output in Z or LOW State (Note 1) | -0.5 ≤ V _O ≤ 7.0 | V |
| I _{IK} | DC Input Diode Current V _I < GND | -50 | mA |
| I _{OK} | DC Output Diode Current V _O < GND | -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 _{Latchup} | Latchup Performance Above V _{CC} and Below GND at 85°C (Note 5) | ±500 | mA |

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. I_O absolute maximum rating must be observed.
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 (Z or LOW State) | 0 | 5.5 | V |
| T _A | Operating Free-Air Temperature | -55 | +125 | °C |
| Δt/ΔV | 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 |

NL27WZ06

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 2.3 to 5.5 | 0.75 V _{CC} 0.70 V _{CC} | | | 0.75 V _{CC} 0.70 V _{CC} | | V |
| V _{IL} | Low-Level Input Voltage | | 1.65 2.3 to 5.5 | | | 0.25 V _{CC} 0.30 V _{CC} | | 0.25 V _{CC} 0.30 V _{CC} | V |
| I _{LKG} | Z-State Output Leakage Current | V _{IN} = V _{IL} V _{OUT} = V _{CC} or GND | 1.65 to 5.5 | | | ±5.0 | | ±10.0 | μA |
| V _{OL} | Low-Level Output Voltage V _{IN} = V _{IH} | I _{OL} = 100 μA | 1.65 to 5.5 | | 0.0 | 0.1 | | 0.1 | V |
| | | I _{OL} = 3 mA | 1.65 | | 0.08 | 0.24 | | | |
| | | I _{OL} = 8 mA | 2.3 | | 0.22 | 0.3 | | 0.3 | |
| | | I _{OL} = 12 mA | 2.7 | | 0.22 | 0.4 | | 0.4 | |
| | | I _{OL} = 16 mA | 3.0 | | 0.28 | 0.4 | | 0.4 | |
| | | I _{OL} = 24 mA | 3.0 | | 0.38 | 0.55 | | 0.55 | |
| | | I _{OL} = 32 mA | 4.5 | | 0.42 | 0.55 | | 0.55 | |
| I _{IN} | Input Leakage Current | V _{IN} or V _{OUT} = V _{CC} or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA |
| I _{OFF} | Power Off-Output Leakage Current | V _{OUT} = 5.5 V | 0 | | | 1 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 1 | | 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 _{PZL} | Propagation Delay (Figure 3 and 4) | R _L = R ₁ = 5000 Ω, C _L = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 2.5 ± 0.20 | 0.8 | 3.0 | 3.6 | 0.8 | 4.1 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 3.3 ± 0.30 | 0.8 | 2.4 | 3.2 | 0.8 | 3.7 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 5.0 ± 0.50 | 0.5 | 2.4 | 3.0 | 0.5 | 3.5 | |
| t _{PLZ} | Propagation Delay (Figure 3 and 4) | R _L = R ₁ = 5000 Ω, C _L = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 2.5 ± 0.20 | 0.8 | 3.0 | 3.6 | 0.8 | 4.1 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 3.3 ± 0.30 | 0.8 | 2.1 | 3.2 | 0.8 | 3.7 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 5.0 ± 0.50 | 0.5 | 1.2 | 3.0 | 0.5 | 3.5 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|------------------|--|--|---------|------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 2.5 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 4 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 6) | 10 MHz, V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 4 | 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} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

NL27WZ06

DC ELECTRICAL CHARACTERISTICS

| Symbol | Parameter | Condition | V _{CC} (V) | T _A = 25°C | | | -55°C ≤ T _A ≤ 125°C | | Unit |
|------------------|---|--|---------------------|--|------|--|--|--|------|
| | | | | Min | Typ | Max | Min | Max | |
| V _{IH} | High-Level Input Voltage | | 1.65 2.3 to 5.5 | 0.75 V _{CC} 0.70 V _{CC} | | | 0.75 V _{CC} 0.70 V _{CC} | | V |
| V _{IL} | Low-Level Input Voltage | | 1.65 2.3 to 5.5 | | | 0.25 V _{CC} 0.30 V _{CC} | | 0.25 V _{CC} 0.30 V _{CC} | V |
| I _{LKG} | Z-State Output Leakage Current | V _{IN} = V _{IL} V _{OUT} = V _{CC} or GND | 1.65 to 5.5 | | | ±5.0 | | ±10.0 | μA |
| V _{OL} | Low-Level Output Voltage V _{IN} = V _{IH} | I _{OL} = 100 μA | 1.65 to 5.5 | | 0.0 | 0.1 | | 0.1 | V |
| | | I _{OL} = 3 mA | 1.65 | | 0.08 | 0.24 | | | |
| | | I _{OL} = 8 mA | 2.3 | | 0.22 | 0.3 | | 0.35 | |
| | | I _{OL} = 12 mA | 2.7 | | 0.22 | 0.4 | | 0.45 | |
| | | I _{OL} = 16 mA | 3.0 | | 0.28 | 0.4 | | 0.5 | |
| | | I _{OL} = 24 mA | 3.0 | | 0.38 | 0.55 | | 0.65 | |
| | | I _{OL} = 32 mA | 4.5 | | 0.42 | 0.55 | | 0.65 | |
| I _{IN} | Input Leakage Current | V _{IN} or V _{OUT} = V _{CC} or GND | 0 to 5.5 | | | ±0.1 | | ±1.0 | μA |
| I _{OFF} | Power Off-Output Leakage Current | V _{OUT} = 5.5 V | 0 | | | 1 | | 10 | μA |
| I _{CC} | Quiescent Supply Current | V _{IN} = V _{CC} or GND | 5.5 | | | 1 | | 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 | | | -55°C ≤ T _A ≤ 125°C | | Unit |
|------------------|---------------------------------------|--|---------------------|-----------------------|-----|------|--------------------------------|------|------|
| | | | | Min | Typ | Max | Min | Max | |
| t _{PZL} | Propagation Delay (Figure 3 and 4) | R _L = R ₁ = 5000 Ω, C _L = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 2.5 ± 0.20 | 0.8 | 3.0 | 3.6 | 0.8 | 4.1 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 3.3 ± 0.30 | 0.8 | 2.4 | 3.2 | 0.8 | 3.7 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 5.0 ± 0.50 | 0.5 | 2.4 | 3.0 | 0.5 | 3.5 | |
| t _{PLZ} | Propagation Delay (Figure 3 and 4) | R _L = R ₁ = 5000 Ω, C _L = 15 pF | 1.8 ± 0.15 | 2.0 | 5.7 | 10.5 | 2.0 | 11.0 | ns |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 2.5 ± 0.20 | 0.8 | 3.8 | 4.5 | 0.8 | 5.0 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 3.3 ± 0.30 | 0.8 | 2.9 | 3.2 | 0.8 | 3.7 | |
| | | R _L = R ₁ = 500 Ω, C _L = 50 pF | 5.0 ± 0.50 | 0.5 | 1.2 | 3.0 | 0.5 | 3.5 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|------------------|--|--|---------|------|
| C _{IN} | Input Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 2.5 | pF |
| C _{OUT} | Output Capacitance | V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 4 | pF |
| C _{PD} | Power Dissipation Capacitance (Note 6) | 10 MHz, V _{CC} = 5.5 V, V _I = 0 V or V _{CC} | 4 | pF |

7. 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} • V_{CC} • f_{in} + I_{CC}. C_{PD} is used to determine the no-load dynamic power consumption; P_D = C_{PD} • V_{CC}² • f_{in} + I_{CC} • V_{CC}.

NL27WZ06

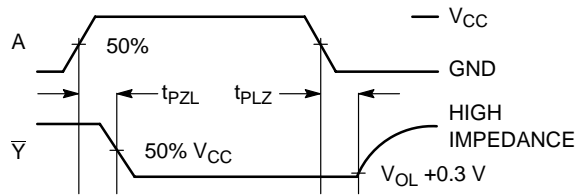


Figure 3. Switching Waveforms

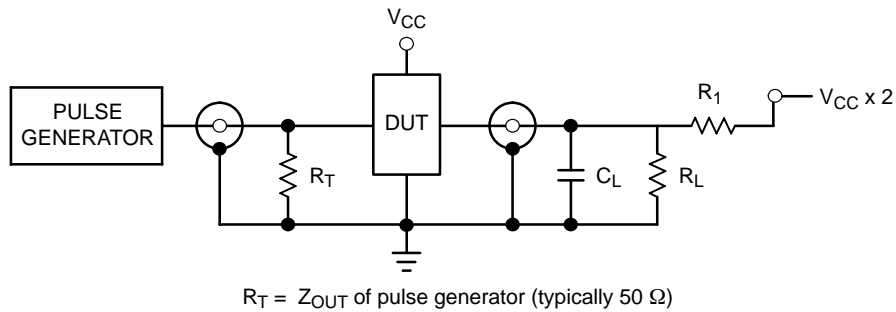


Figure 4. Test Circuit

ORDERING INFORMATION

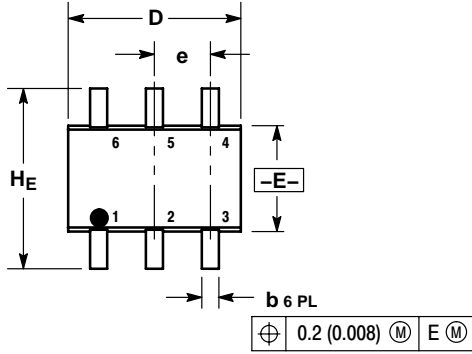
| Device | Package | Shipping† |
|---------------|---------------------|--------------------|
| NL27WZ06DFT2 | SC-88 | 3000 / Tape & Reel |
| NL27WZ06DFT2G | SC-88 (Pb-Free) | |
| NL27WZ06DTT1 | TSOP-6 | |
| NL27WZ06DTT1G | TSOP-6 (Pb-Free) | |

†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.

NL27WZ06

PACKAGE DIMENSIONS

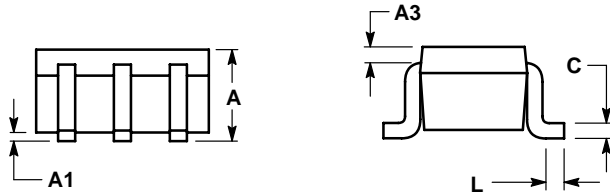
SC-88/SC70-6/SOT-363
CASE 419B-02
ISSUE W



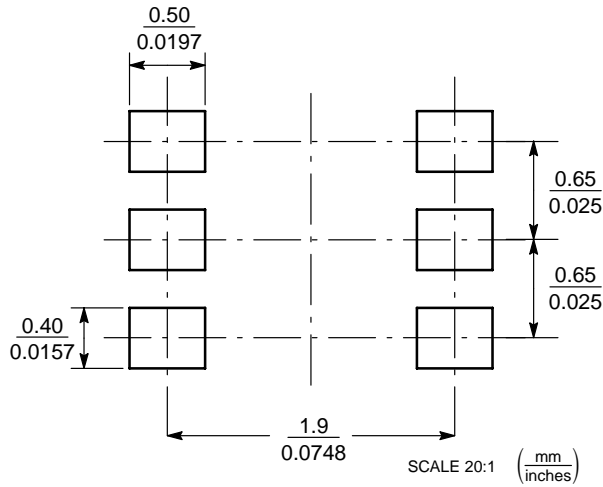
NOTES:

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

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.80 | 0.95 | 1.10 | 0.031 | 0.037 | 0.043 |
| A1 | 0.00 | 0.05 | 0.10 | 0.000 | 0.002 | 0.004 |
| A3 | 0.20 REF | | | 0.008 REF | | |
| b | 0.10 | 0.21 | 0.30 | 0.004 | 0.008 | 0.012 |
| C | 0.10 | 0.14 | 0.25 | 0.004 | 0.005 | 0.010 |
| D | 1.80 | 2.00 | 2.20 | 0.070 | 0.078 | 0.086 |
| E | 1.15 | 1.25 | 1.35 | 0.045 | 0.049 | 0.053 |
| e | 0.65 BSC | | | 0.026 BSC | | |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| HE | 2.00 | 2.10 | 2.20 | 0.078 | 0.082 | 0.086 |



SOLDERING FOOTPRINT*

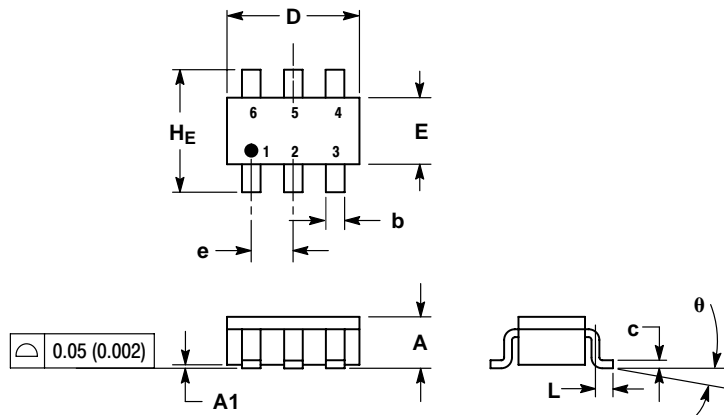


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

NL27WZ06

PACKAGE DIMENSIONS

TSOP-6 CASE 318G-02 ISSUE S

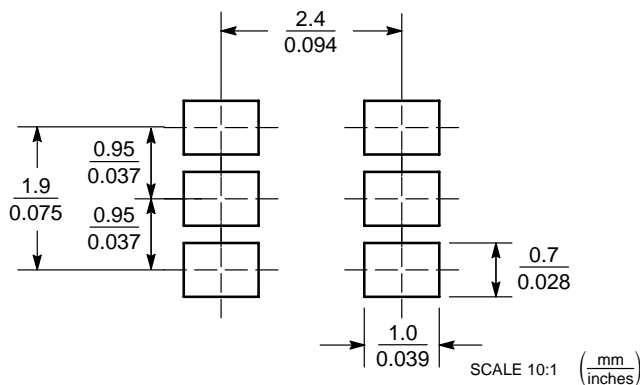


NOTES:

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.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-------|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 | 0.035 | 0.039 | 0.043 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.25 | 0.38 | 0.50 | 0.010 | 0.014 | 0.020 |
| c | 0.10 | 0.18 | 0.26 | 0.004 | 0.007 | 0.010 |
| D | 2.90 | 3.00 | 3.10 | 0.114 | 0.118 | 0.122 |
| E | 1.30 | 1.50 | 1.70 | 0.051 | 0.059 | 0.067 |
| e | 0.85 | 0.95 | 1.05 | 0.034 | 0.037 | 0.041 |
| L | 0.20 | 0.40 | 0.60 | 0.008 | 0.016 | 0.024 |
| HE | 2.50 | 2.75 | 3.00 | 0.099 | 0.108 | 0.118 |
| theta | 0° | - | 10° | 0° | - | 10° |

SOLDERING FOOTPRINT*



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

ON Semiconductor and 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. 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

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: 81-3-5773-3850

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

For additional information, please contact your local Sales Representative