



**THE DATASHEET OF  
NTJS3157NT1G**



# NTJS3157N

## MOSFET – Power, Single, N-Channel, Trench, SC-88

20 V, 4.0 A

### Features

- Leading Trench Technology for Low  $R_{DS(ON)}$  Extending Battery Life
- Fast Switching for Increased Circuit Efficiency
- SC-88 Small Outline (2 x 2 mm) for Maximum Circuit Board Utilization, Same as SC-70-6
- These are Pb-Free Devices

### Applications

- DC-DC Conversion
- Low Side Load Switch
- Cell Phones, Computing, Digital Cameras, MP3s and PDAs

### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter   | Symbol         | Value                    | Unit     |     |                  |                          |
|---|----------------|--------------------------|----------|-----|------------------|--------------------------|
| Drain-to-Source Voltage   | $V_{DSS}$      | 20                       | V        |     |                  |                          |
| Gate-to-Source Voltage  | $V_{GS}$       | $\pm 8.0$                | V        |     |                  |                          |
| Continuous Drain Current (Note 1)                                 | Steady State   | $T_A = 25^\circ\text{C}$ | $I_D$    | 3.2 | A                |                          |
|   |                | $T_A = 85^\circ\text{C}$ |          |     |                  | 2.3                      |
|   |                | $t \leq 5\text{ s}$      |          |     |                  | $T_A = 25^\circ\text{C}$ |
| Power Dissipation (Note 1)  | Steady State   | $T_A = 25^\circ\text{C}$ | $P_D$    | 1.0 | W                |                          |
| Pulsed Drain Current  |                | $t_p = 10\ \mu\text{s}$  | $I_{DM}$ | 10  | A                |                          |
| Operating Junction and Storage Temperature                        | $T_J, T_{STG}$ | -55 to 150               |          |     | $^\circ\text{C}$ |                          |
| Source Current (Body Diode)                                       | $I_S$          | 1.6                      |          |     | A                |                          |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | $T_L$          | 260                      |          |     | $^\circ\text{C}$ |                          |

### THERMAL RESISTANCE RATINGS (Note 1)

| Parameter                                 | Symbol          | Max | Unit                      |
|---|-----------------|-----|---------------------------|
| Junction-to-Ambient – Steady State        | $R_{\theta JA}$ | 125 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – $t \leq 5\text{ s}$ | $R_{\theta JA}$ | 80  |                           |
| Junction-to-Lead – Steady State           | $R_{\theta JL}$ | 45  |                           |

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. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

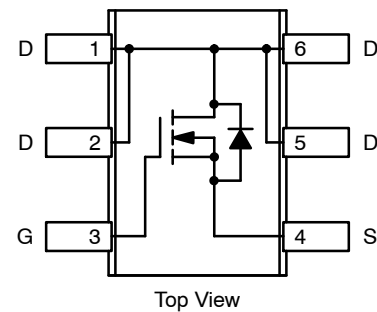


ON Semiconductor®

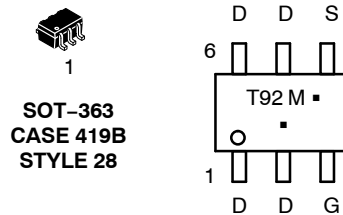
<http://onsemi.com>

| $V_{(BR)DSS}$ | $R_{DS(on)}$ Typ      | $I_D$ Max |
|---------------|-----------------------|-----------|
| 20 V          | 45 m $\Omega$ @ 4.5 V | 4.0 A     |
|               | 55 m $\Omega$ @ 2.5 V |           |
|               | 70 m $\Omega$ @ 1.8 V |           |

### SC-88 (SOT-363)



### MARKING DIAGRAM & PIN ASSIGNMENT



T92 = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

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

# NTJS3157N

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-----------|--------|----------------|-----|-----|-----|------|
|-----------|--------|----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|   |                   |  |                          |    |           |               |
|---|-------------------|--|--------------------------|----|-----------|---------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$    | 20                       |    |           | V             |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$    |                          | 12 |           | mV/°C         |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = 16\text{ V}$      | $T_J = 25^\circ\text{C}$ |    | 1.0       | $\mu\text{A}$ |
|   |                   |  | $T_J = 85^\circ\text{C}$ |    | 5.0       |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 8.0\text{ V}$ |                          |    | $\pm 100$ | nA            |

### ON CHARACTERISTICS (Note 2)

|  |                  |   |   |     |     |            |    |
|--|------------------|---|---|-----|-----|------------|----|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$   | 0.40  |     | 1.0 | V          |    |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |   | -4.0  |     |     | mV/°C      |    |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 4.5\text{ V}, I_D = 4.0\text{ A}$ |   | 45  | 60  | m $\Omega$ |    |
|  |                  |   | $V_{GS} = 2.5\text{ V}, I_D = 3.6\text{ A}$ |     | 55  |            | 70 |
|  |                  |   | $V_{GS} = 1.8\text{ V}, I_D = 2.0\text{ A}$ |     | 70  |            | 85 |
| Forward Transconductance                   | $g_{FS}$         | $V_{GS} = 10\text{ V}, I_D = 3.2\text{ A}$  |   | 9.0 |     | S          |    |

### CHARGES AND CAPACITANCES

|                              |              |   |  |     |    |    |
|------------------------------|--------------|---|--|-----|----|----|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 10\text{ V}$   |  | 500 |    | pF |
| Output Capacitance           | $C_{OSS}$    |   |  | 75  |    |    |
| Reverse Transfer Capacitance | $C_{RSS}$    |   |  | 60  |    |    |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3.2\text{ A}$ |  | 6.9 | 15 | nC |
| Gate-to-Source Charge        | $Q_{GS}$     |   |  | 1.0 |    |    |
| Gate-to-Drain Charge         | $Q_{GD}$     |   |  | 1.8 |    |    |

### SWITCHING CHARACTERISTICS (Note 3)

|                     |              |  |  |     |    |    |
|---------------------|--------------|--|--|-----|----|----|
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{GS} = 4.5\text{ V}, V_{DD} = 10\text{ V}, I_D = 0.5\text{ A}, R_G = 6.0\ \Omega$ |  | 6.0 | 15 | ns |
| Rise Time           | $t_r$        |  |  | 12  | 25 |    |
| Turn-Off Delay Time | $t_{d(off)}$ |  |  | 21  | 45 |    |
| Fall Time           | $t_f$        |  |  | 11  | 25 |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

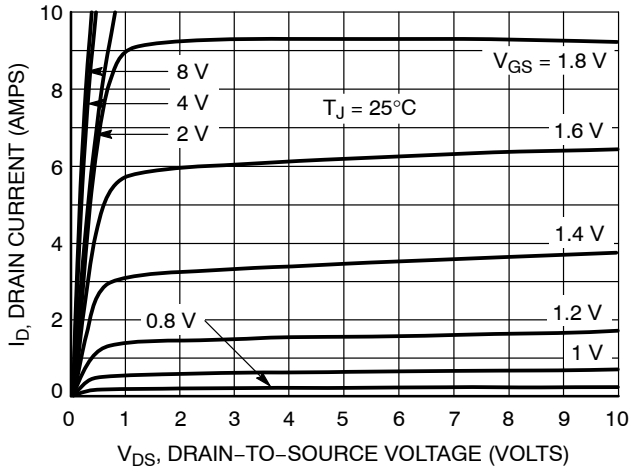
|                         |          |   |                          |  |     |     |    |
|-------------------------|----------|---|--------------------------|--|-----|-----|----|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = 1.6\text{ A}$                                     | $T_J = 25^\circ\text{C}$ |  | 0.7 | 1.0 | V  |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 1.6\text{ A}$ |                          |  | 15  |     | ns |
| Charge Time             | $T_a$    |   |                          |  | 12  |     |    |
| Discharge Time          | $T_b$    |   |                          |  | 3.0 |     |    |
| Reverse Recovery Charge | $Q_{RR}$ |   |                          |  | 5.0 |     | nC |

2. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

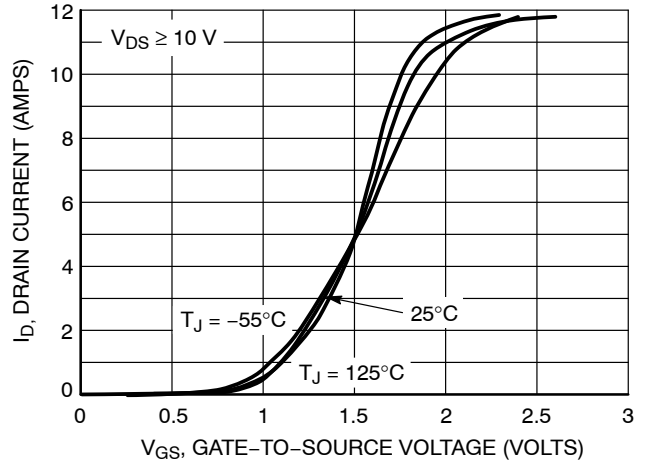
3. Switching characteristics are independent of operating junction temperatures.

# NTJS3157N

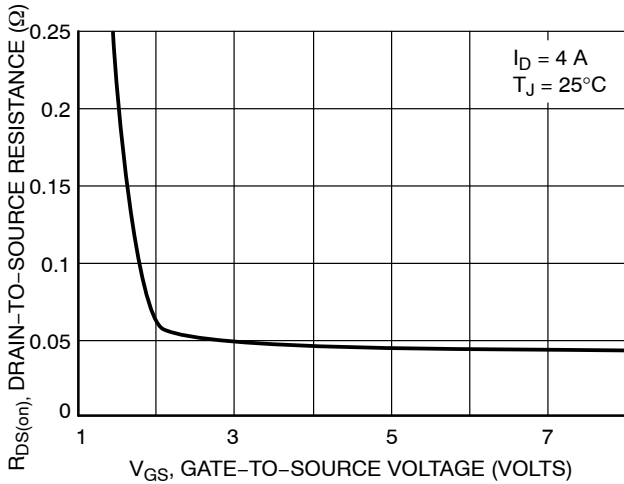
## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



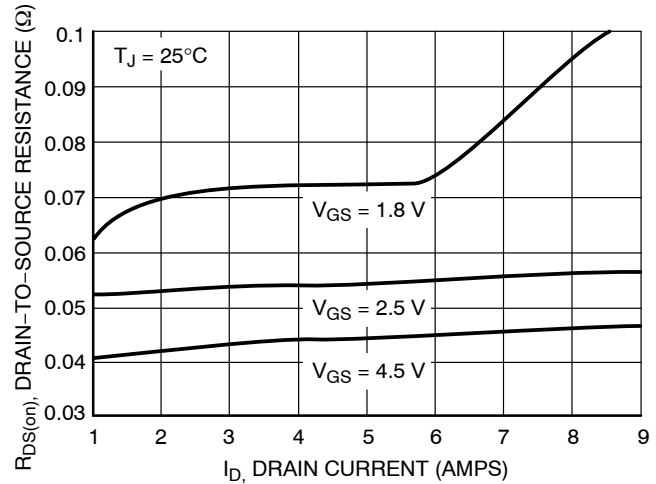
**Figure 1. On-Region Characteristics**



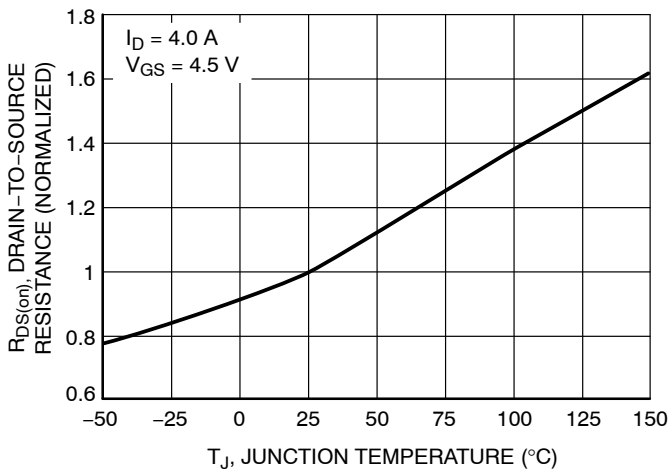
**Figure 2. Transfer Characteristics**



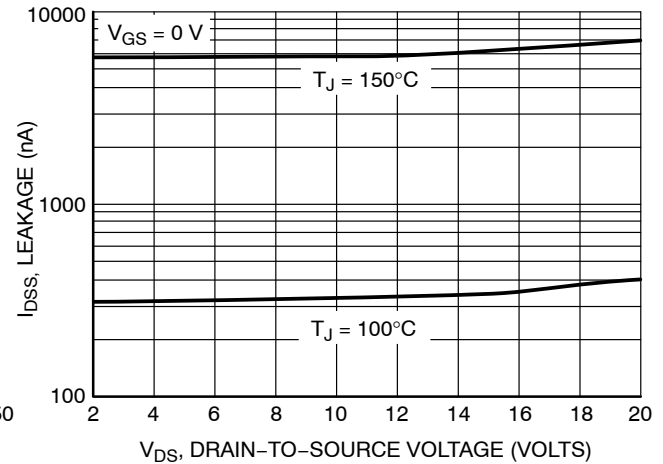
**Figure 3. On-Resistance vs. Gate-to-Source Voltage**



**Figure 4. On-Resistance vs. Drain Current and Gate Voltage**



**Figure 5. On-Resistance Variation with Temperature**



**Figure 6. Drain-to-Source Leakage Current vs. Voltage**

TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

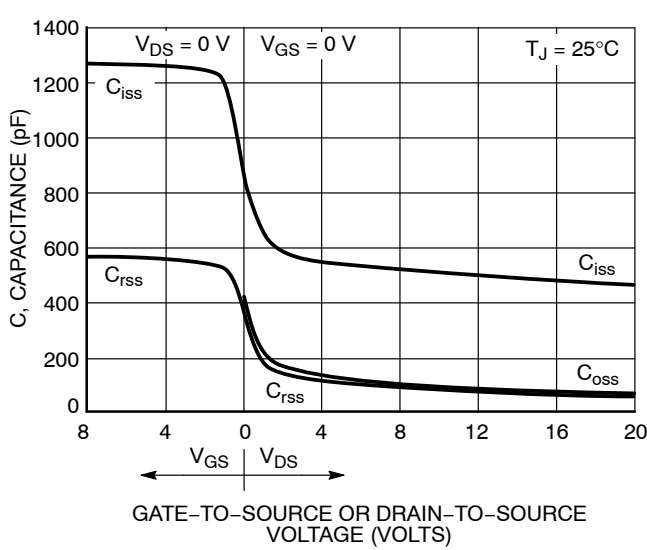


Figure 7. Capacitance Variation

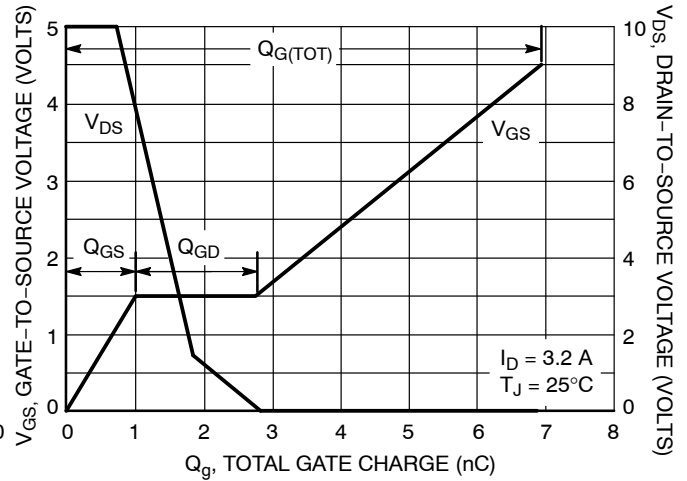


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

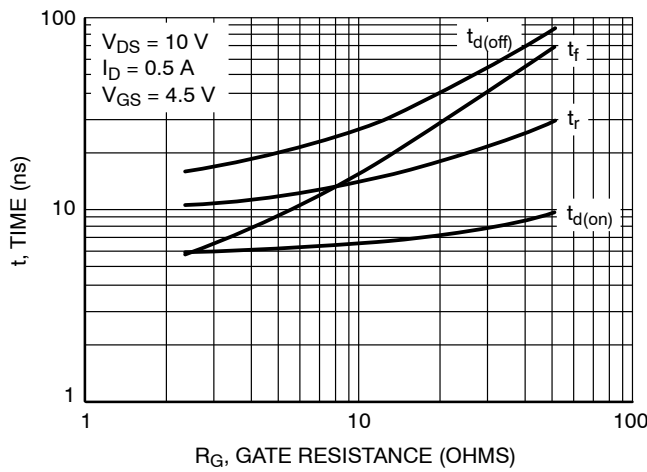


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

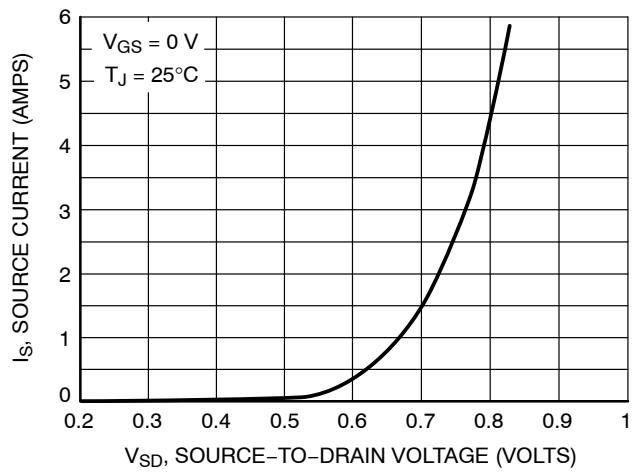


Figure 10. Diode Forward Voltage vs. Current

# NTJS3157N

## ORDERING INFORMATION

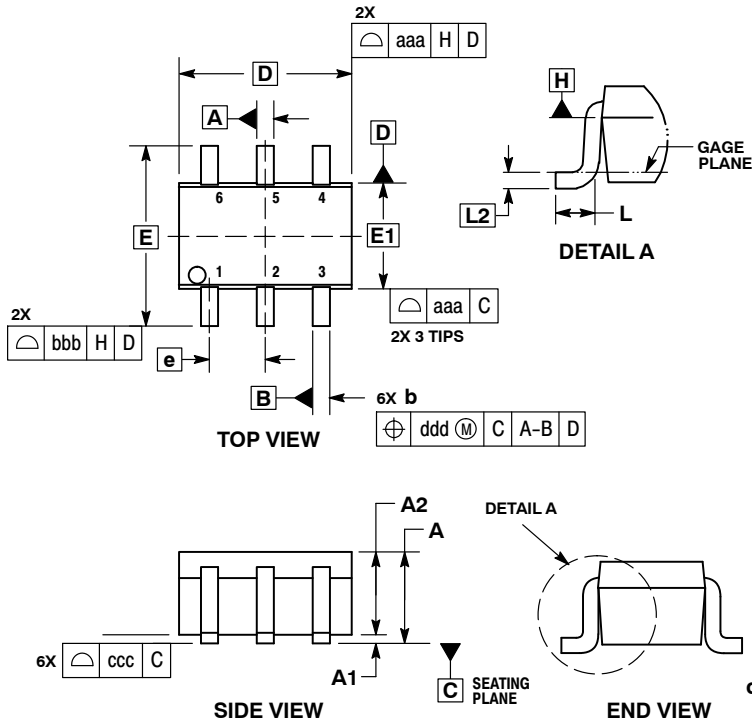
| Device       | Package            | Shipping†          |
|--------------|--------------------|--------------------|
| NTJS3157NT1G | SC-88<br>(Pb-Free) | 3000 / Tape & Reel |
| NTJS3157NT2G | SC-88<br>(Pb-Free) | 3000 / Tape & Reel |

†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.

# NTJS3157N

## PACKAGE DIMENSIONS

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

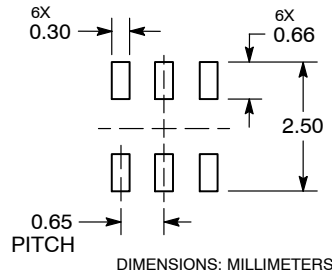


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | ---         | ---  | 1.10 | ---       | ---   | 0.043 |
| A1  | 0.00        | ---  | 0.10 | 0.000     | ---   | 0.004 |
| A2  | 0.70        | 0.90 | 1.00 | 0.027     | 0.035 | 0.039 |
| b   | 0.15        | 0.20 | 0.25 | 0.006     | 0.008 | 0.010 |
| C   | 0.08        | 0.15 | 0.22 | 0.003     | 0.006 | 0.009 |
| D   | 1.80        | 2.00 | 2.20 | 0.070     | 0.078 | 0.086 |
| E   | 2.00        | 2.10 | 2.20 | 0.078     | 0.082 | 0.086 |
| E1  | 1.15        | 1.25 | 1.35 | 0.045     | 0.049 | 0.053 |
| e   | 0.65 BSC    |      |      | 0.026 BSC |       |       |
| L   | 0.26        | 0.36 | 0.46 | 0.010     | 0.014 | 0.018 |
| L2  | 0.15 BSC    |      |      | 0.006 BSC |       |       |
| aaa | 0.15        |      |      | 0.006     |       |       |
| bbb | 0.30        |      |      | 0.012     |       |       |
| ccc | 0.10        |      |      | 0.004     |       |       |
| ddd | 0.10        |      |      | 0.004     |       |       |

**RECOMMENDED SOLDERING FOOTPRINT\***



**STYLE 28:**

- PIN 1. DRAIN
- DRAIN
- GATE
- SOURCE
- DRAIN
- DRAIN

\*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 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-Marketing.pdf](http://www.onsemi.com/site/pdf/Patent-Marketing.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

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View NTJS3157NT1G on WIN SOURCE](#)

 [ON Semiconductor](#) Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management