

# NTJD4152P

## Trench Small Signal MOSFET

20 V, 0.88 A, Dual P-Channel, ESD Protected SC-88

### Features

- Leading Trench Technology for Low  $R_{DS(ON)}$  Performance
- Small Footprint Package (SC70-6 Equivalent)
- ESD Protected Gate
- Pb-Free Package is Available

### Applications

- Load/Power Management
- Charging Circuits
- Load Switching
- 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  |              | $V_{GS}$       | $\pm 12$                 | V                |   |
| Continuous Drain Current (Note 1)                                 | Steady State | $I_D$          | $T_A = 25^\circ\text{C}$ | -0.88            | A |
|   |              |                | $T_A = 85^\circ\text{C}$ | -0.63            |   |
| Power Dissipation (Note 1)  | Steady State | $P_D$          | $T_A = 25^\circ\text{C}$ | 0.272            | W |
|   |              |                | $T_A = 85^\circ\text{C}$ | 0.141            |   |
| Continuous Drain Current (Note 2)                                 | $t \leq 5$ s | $I_D$          | $T_A = 25^\circ\text{C}$ | -1.0             | A |
|   |              |                | $T_A = 85^\circ\text{C}$ | -0.72            |   |
| Power Dissipation (Note 2)  | $t \leq 5$ s | $P_D$          | $T_A = 25^\circ\text{C}$ | 0.35             | W |
|   |              |                | $T_A = 85^\circ\text{C}$ | 0.181            |   |
| Pulsed Drain Current  |              | $I_{DM}$       | $\pm 3.0$                | A                |   |
| Operating Junction and Storage Temperature                        |              | $T_J, T_{STG}$ | -55 to 150               | $^\circ\text{C}$ |   |
| Continuous Source Current (Body Diode)                            |              | $I_S$          | -0.48                    | 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 | $R_{\theta JA}$ | 460 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – $t \leq 5$ s | $R_{\theta JA}$ | 357 |                           |
| Junction-to-Lead – Steady State    | $R_{\theta JL}$ | 226 |                           |

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.

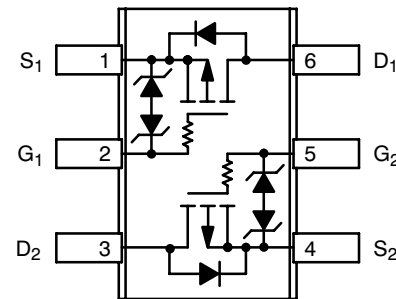
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces), steady state.
2. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces),  $t \leq 5$  s.



ON Semiconductor®

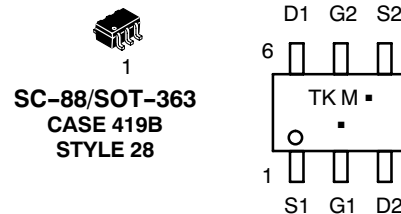
<http://onsemi.com>

| $V_{(BR)DSS}$ | $R_{DS(on)}$ Typ        | $I_D$ Max |
|---------------|-------------------------|-----------|
| -20 V         | 215 m $\Omega$ @ -4.5 V | -0.88 A   |
|               | 345 m $\Omega$ @ -2.5 V |           |
|               | 600 m $\Omega$ @ -1.8 V |           |



Top View

### MARKING DIAGRAM & PIN ASSIGNMENT



SC-88/SOT-363  
CASE 419B  
STYLE 28

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

(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device       | Package           | Shipping        |
|--------------|-------------------|-----------------|
| NTJD4152PT1  | SOT-363           | 3000 Units/Reel |
| NTJD4152PT1G | SOT-363 (Pb-Free) | 3000 Units/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.

# NTJD4152P

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub>=25°C unless otherwise stated)

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

### OFF CHARACTERISTICS

|                                   |                      |   |                        |  |      |    |
|-----------------------------------|----------------------|---|------------------------|--|------|----|
| Drain-to-Source Breakdown Voltage | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA | -20                    |  |      | V  |
| Zero Gate Voltage Drain Current   | I <sub>DSS</sub>     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -16 V  | T <sub>J</sub> = 25°C  |  | 1.0  | μA |
|                                   |                      |   | T <sub>J</sub> = 125°C |  | 1.0  |    |
| Gate-to-Source Leakage Current    | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±4.5 V |                        |  | 0.03 | μA |
|                                   |                      | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±12 V  |                        |  | 6.0  |    |

### ON CHARACTERISTICS (Note 3)

|                               |                     |  |       |     |      |    |
|-------------------------------|---------------------|--|-------|-----|------|----|
| Gate Threshold Voltage        | V <sub>GS(TH)</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA | -0.45 |     |      | V  |
| Drain-to-Source On Resistance | R <sub>DS(on)</sub> | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.88 A           |       | 215 | 260  | mΩ |
|                               |                     | V <sub>GS</sub> = -2.5 V, I <sub>D</sub> = -0.71 A           |       | 345 | 500  |    |
|                               |                     | V <sub>GS</sub> = -1.8 V, I <sub>D</sub> = -0.20 A           |       | 600 | 1000 |    |
| Forward Transconductance      | g <sub>FS</sub>     | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.88 A            |       | 3.0 |      | S  |

### CHARGES AND CAPACITANCES

|                              |                     |  |  |      |  |    |
|------------------------------|---------------------|--|--|------|--|----|
| Input Capacitance            | C <sub>ISS</sub>    | V <sub>GS</sub> = 0 V, f = 1.0 MHz,<br>V <sub>DS</sub> = -20 V                 |  | 155  |  | pF |
| Output Capacitance           | C <sub>OSS</sub>    |  |  | 25   |  |    |
| Reverse Transfer Capacitance | C <sub>RSS</sub>    |  |  | 18   |  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V,<br>I <sub>D</sub> = -0.88 A |  | 2.2  |  | nC |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |  |  | 0.5  |  |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |  |  | 0.65 |  |    |

### SWITCHING CHARACTERISTICS (Note 4)

|                     |                     |  |  |      |  |    |
|---------------------|---------------------|--|--|------|--|----|
| Turn-On Delay Time  | t <sub>d(ON)</sub>  | V <sub>GS</sub> = -4.5 V, V <sub>DD</sub> = -10 V,<br>I <sub>D</sub> = -0.5 A, R <sub>G</sub> = 20 Ω |  | 5.8  |  | ns |
| Rise Time           | t <sub>r</sub>      |  |  | 6.5  |  |    |
| Turn-Off Delay Time | t <sub>d(OFF)</sub> |  |  | 13.5 |  |    |
| Fall Time           | t <sub>f</sub>      |  |  | 3.5  |  |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                       |                 |  |                        |       |      |   |
|-----------------------|-----------------|--|------------------------|-------|------|---|
| Forward Diode Voltage | V <sub>SD</sub> | V <sub>GS</sub> = 0 V,<br>I <sub>S</sub> = -0.48 A | T <sub>J</sub> = 25°C  | -0.8  | -1.2 | V |
|                       |                 |  | T <sub>J</sub> = 125°C | -0.66 |      |   |

3. Pulse Test: pulse width ≤ 300μs, duty cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

# NTJD4152P

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

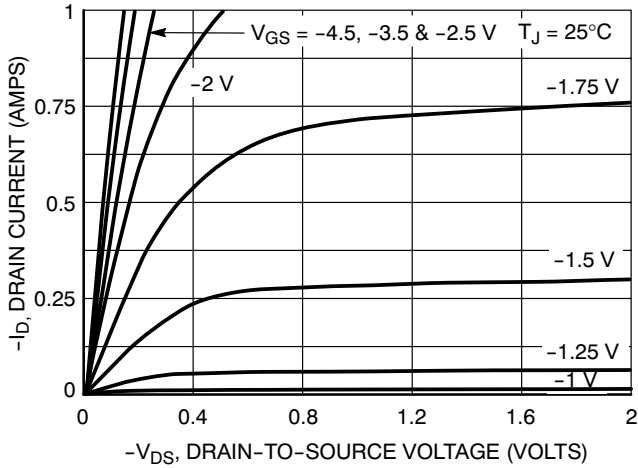


Figure 1. On-Region Characteristics

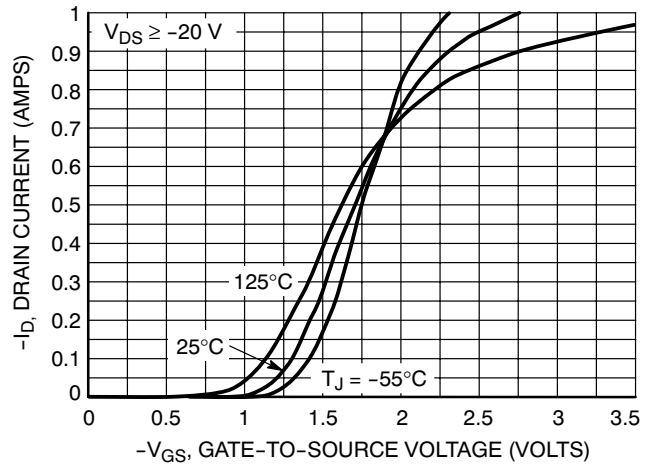


Figure 2. Transfer Characteristics

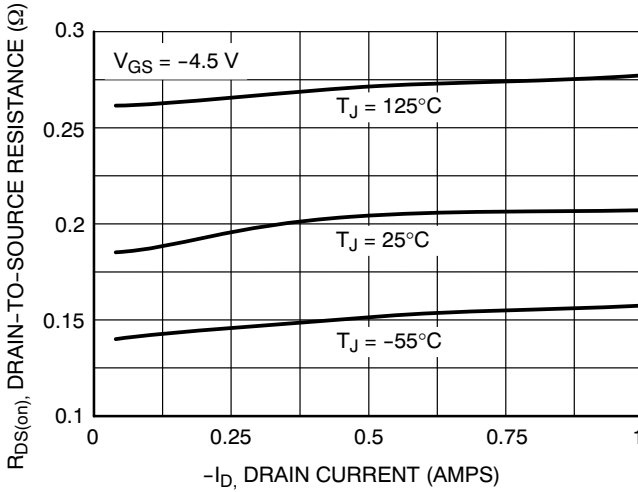


Figure 3. On-Resistance vs. Drain Current and Temperature

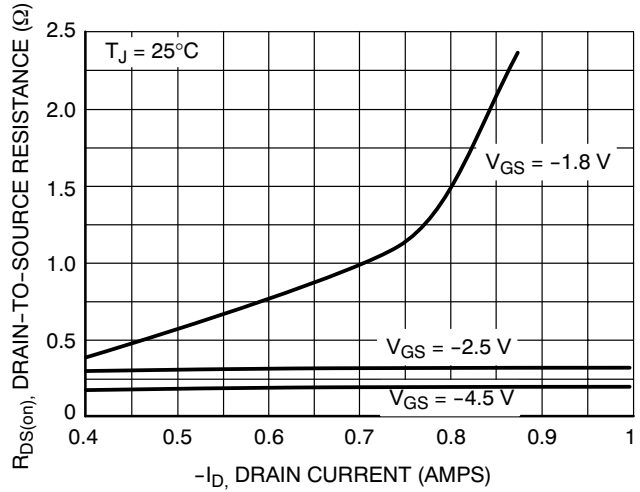


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

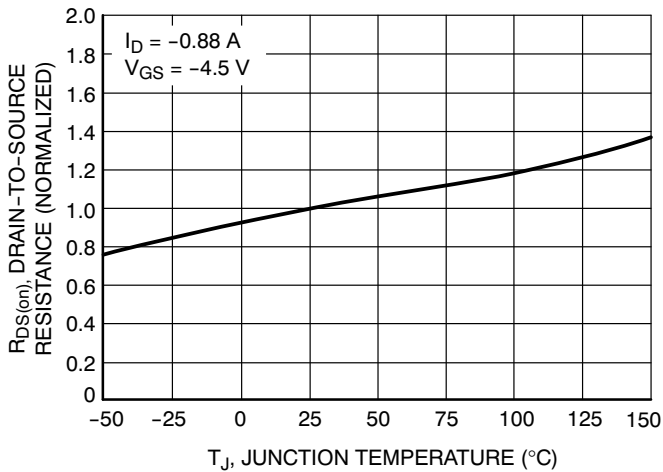


Figure 5. On-Resistance Variation with Temperature

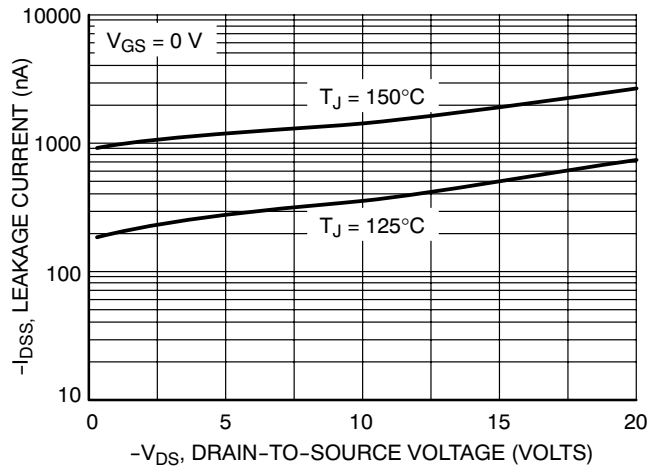


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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

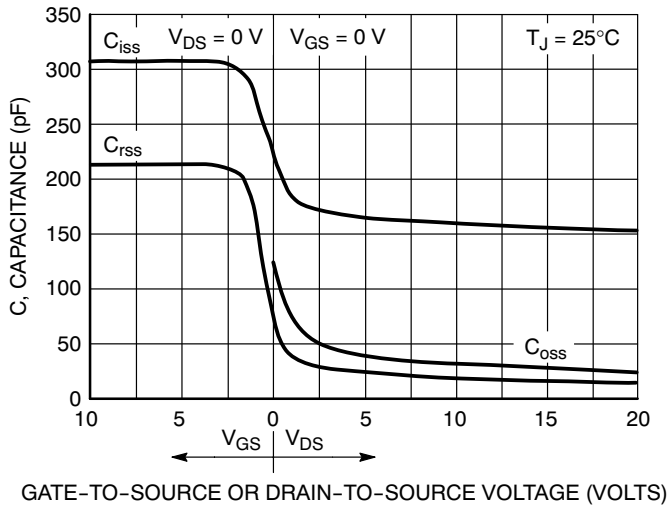


Figure 7. Capacitance Variation

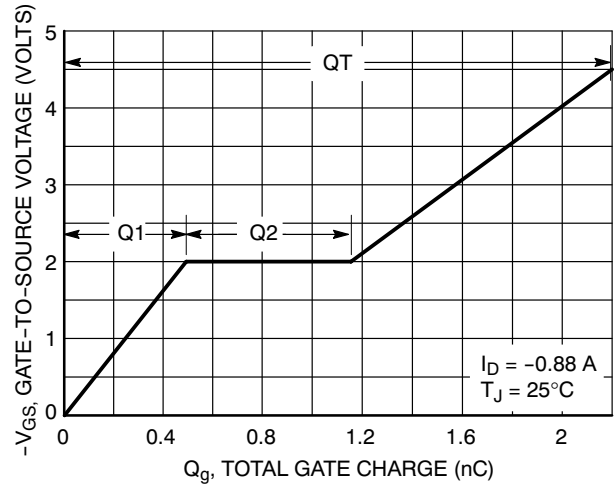


Figure 8. Gate-to-Source Voltage vs. Total Gate Charge

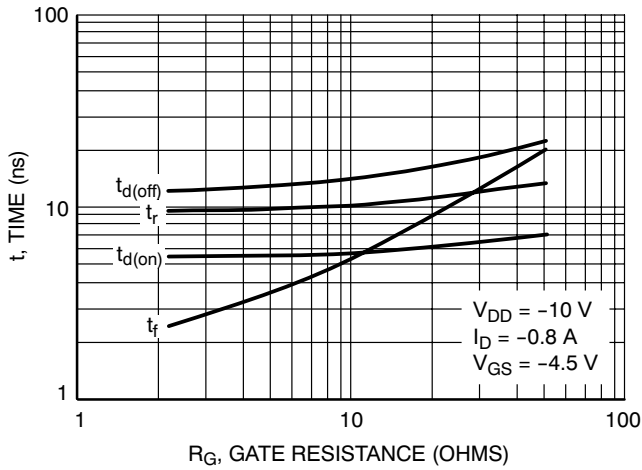


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

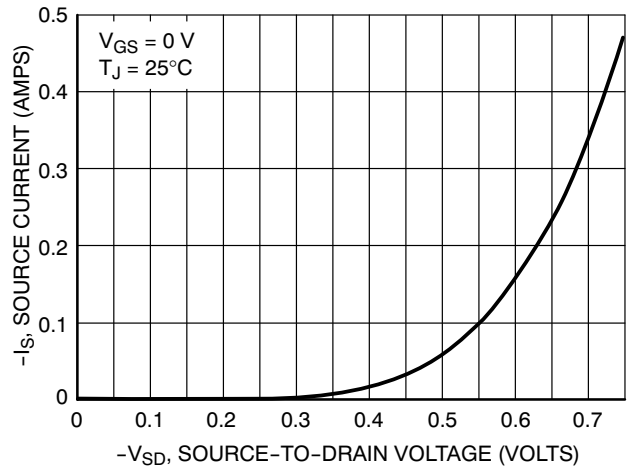
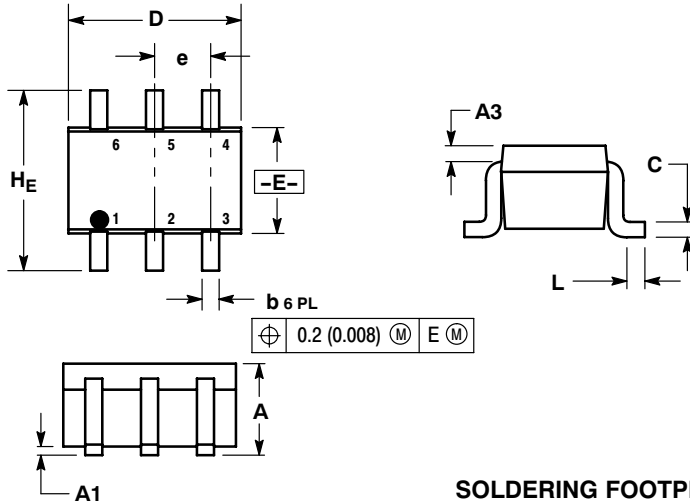


Figure 10. Diode Forward Voltage vs. Current

# NTJD4152P

## PACKAGE DIMENSIONS

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



**NOTES:**

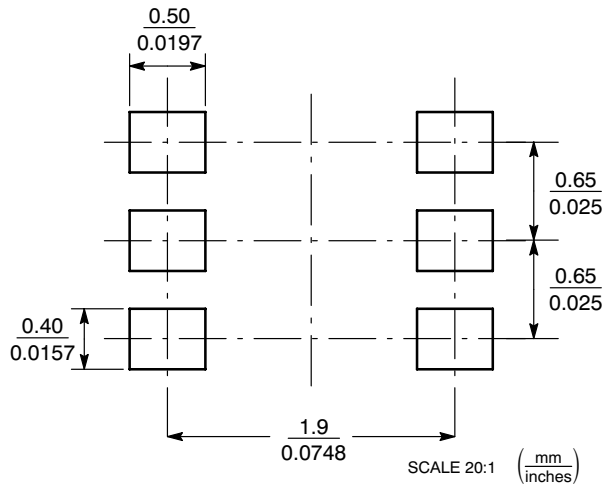
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

| 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 |

**STYLE 26:**

- PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

### 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](http://www.onsemi.com)

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

For additional information, please contact your local Sales Representative