

# NTJD4001N, NVTJD4001N

## MOSFET – Dual, N-Channel, Small Signal, SC-88

**30 V, 250 mA**

### Features

- Low Gate Charge for Fast Switching
- Small Footprint – 30% Smaller than TSOP-6
- ESD Protected Gate
- AEC Q101 Qualified – NVTJD4001N
- These Devices are Pb-Free and are RoHS Compliant

### Applications

- Low Side Load Switch
- Li-Ion Battery Supplied Devices – Cell Phones, PDAs, DSC
- Buck Converters
- Level Shifts

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

| Parameter   |              | Symbol                            | Value                  | Units |    |
|---|--------------|-----------------------------------|------------------------|-------|----|
| Drain-to-Source Voltage   |              | V <sub>DSS</sub>                  | 30                     | V     |    |
| Gate-to-Source Voltage  |              | V <sub>GS</sub>                   | ±20                    | V     |    |
| Continuous Drain Current (Note 1)                                 | Steady State | I <sub>D</sub>                    | T <sub>A</sub> = 25 °C | 250   | mA |
|   |              |                                   | T <sub>A</sub> = 85 °C | 180   |    |
| Power Dissipation (Note 1)  | Steady State | T <sub>A</sub> = 25 °C            | P <sub>D</sub>         | 272   | mW |
| Pulsed Drain Current  |              | t = 10 μs                         | I <sub>DM</sub>        | 600   | mA |
| Operating Junction and Storage Temperature                        |              | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150             | °C    |    |
| Source Current (Body Diode)                                       |              | I <sub>S</sub>                    | 250                    | mA    |    |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) |              | T <sub>L</sub>                    | 260                    | °C    |    |

### THERMAL RESISTANCE RATINGS (Note 1)

| Parameter                          | Symbol           | Value | Unit |
|------------------------------------|------------------|-------|------|
| Junction-to-Ambient – Steady State | R <sub>θJA</sub> | 458   | °C/W |
| Junction-to-Lead – Steady State    | R <sub>θJL</sub> | 252   |      |

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.

1. Surface mounted on FR4 board using min pad size (Cu area = 0.155 in sq [1 oz] including traces).

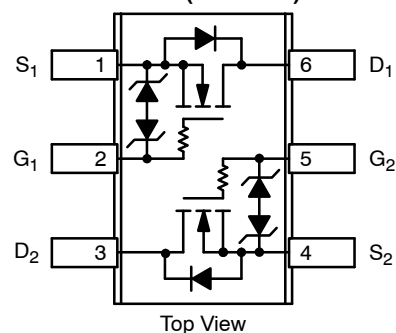


**ON Semiconductor®**

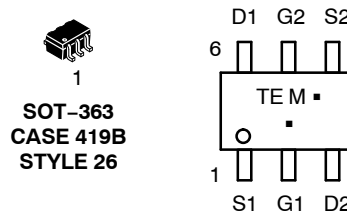
[www.onsemi.com](http://www.onsemi.com)

| V <sub>(BR)DSS</sub> | R <sub>DS(on)</sub> TYP | I <sub>D</sub> Max |
|----------------------|-------------------------|--------------------|
| 30 V                 | 1.0 Ω @ 4.0 V           | 250 mA             |
|                      | 1.5 Ω @ 2.5 V           |                    |

**SOT-363  
SC-88 (6 LEADS)**



### MARKING DIAGRAM & PIN ASSIGNMENT



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

(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device        | Package           | Shipping†          |
|---------------|-------------------|--------------------|
| NTJD4001NT1G  | SOT-363 (Pb-Free) | 3000 / Tape & Reel |
| NVTJD4001NT1G | SOT-363 (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 Specification Brochure, BRD8011/D.

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## 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> = 100 μA | 30 |    |      | V     |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V <sub>(BR)DSS</sub> /T <sub>J</sub> |  |    | 56 |      | mV/°C |
| Zero Gate Voltage Drain Current                           | I <sub>DSS</sub>                     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 30 V  |    |    | 1.0  | μA    |
| Gate-to-Source Leakage Current                            | I <sub>GSS</sub>                     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±10 V |    |    | ±1.0 | μA    |

### ON CHARACTERISTICS (Note 2)

|  |                                     |   |     |      |     |       |
|--|-------------------------------------|---|-----|------|-----|-------|
| Gate Threshold Voltage                 | V <sub>GS(TH)</sub>                 | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 100 μA | 0.8 | 1.2  | 1.5 | V     |
| Gate Threshold Temperature Coefficient | V <sub>GS(TH)</sub> /T <sub>J</sub> |   |     | -3.2 |     | mV/°C |
| Drain-to-Source On Resistance          | R <sub>DS(on)</sub>                 | V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 10 mA             |     | 1.0  | 1.5 | Ω     |
|  |                                     | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 10 mA             |     | 1.5  | 2.5 |       |
| Forward Transconductance               | g <sub>FS</sub>                     | V <sub>DS</sub> = 3.0 V, I <sub>D</sub> = 10 mA             |     | 80   |     | mS    |

### CHARGES AND CAPACITANCES

|                              |                     |  |  |      |     |    |
|------------------------------|---------------------|--|--|------|-----|----|
| Input Capacitance            | C <sub>ISS</sub>    | V <sub>GS</sub> = 0 V, f = 1.0 MHz,<br>V <sub>DS</sub> = 5.0 V             |  | 20   | 33  | pF |
| Output Capacitance           | C <sub>OSS</sub>    |  |  | 19   | 32  |    |
| Reverse Transfer Capacitance | C <sub>RSS</sub>    |  |  | 7.25 | 12  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = 5.0 V, V <sub>DS</sub> = 24 V,<br>I <sub>D</sub> = 0.1 A |  | 0.9  | 1.3 | nC |
| Threshold Gate Charge        | Q <sub>G(TH)</sub>  |  |  | 0.2  |     |    |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |  |  | 0.3  |     |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |  |  | 0.2  |     |    |

### SWITCHING CHARACTERISTICS (Note 3)

|                     |                     |  |  |    |  |    |
|---------------------|---------------------|--|--|----|--|----|
| Turn-On Delay Time  | t <sub>d(ON)</sub>  | V <sub>GS</sub> = 4.5 V, V <sub>DD</sub> = 5.0 V,<br>I <sub>D</sub> = 10 mA, R <sub>G</sub> = 50 Ω |  | 17 |  | ns |
| Rise Time           | t <sub>r</sub>      |  |  | 23 |  |    |
| Turn-Off Delay Time | t <sub>d(OFF)</sub> |  |  | 94 |  |    |
| Fall Time           | t <sub>f</sub>      |  |  | 82 |  |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                       |                 |  |                        |      |     |    |
|-----------------------|-----------------|--|------------------------|------|-----|----|
| Forward Diode Voltage | V <sub>SD</sub> | V <sub>GS</sub> = 0 V,<br>I <sub>S</sub> = 10 mA                                 | T <sub>J</sub> = 25°C  | 0.65 | 0.7 | V  |
|                       |                 |  | T <sub>J</sub> = 125°C | 0.45 |     |    |
| Reverse Recovery Time | t <sub>RR</sub> | V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 8.0 A/μs,<br>I <sub>S</sub> = 10 mA |                        | 12.4 |     | ns |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

# NTJD4001N, NVTJD4001N

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

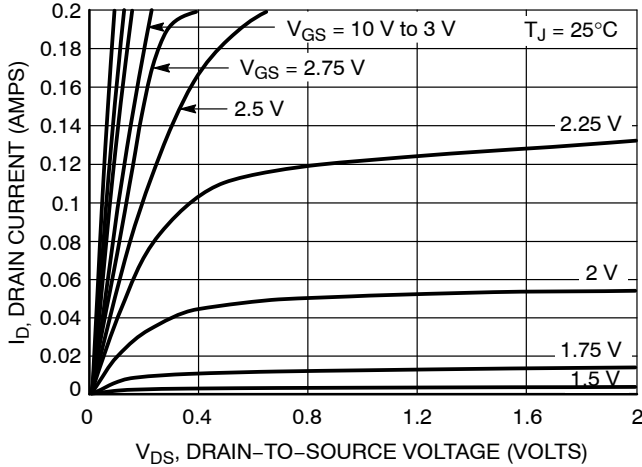


Figure 1. On-Region Characteristics

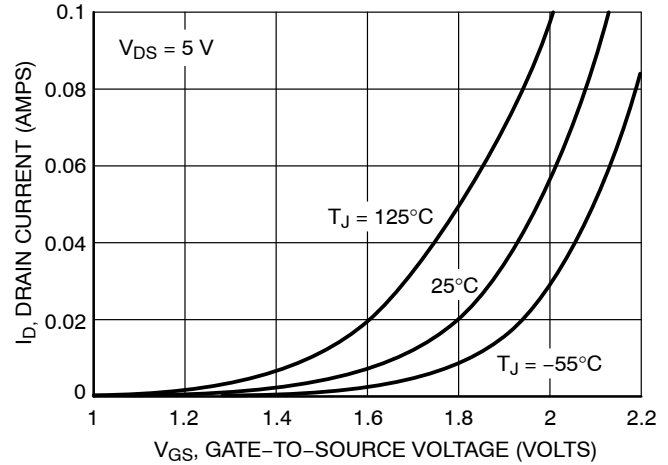


Figure 2. Transfer Characteristics

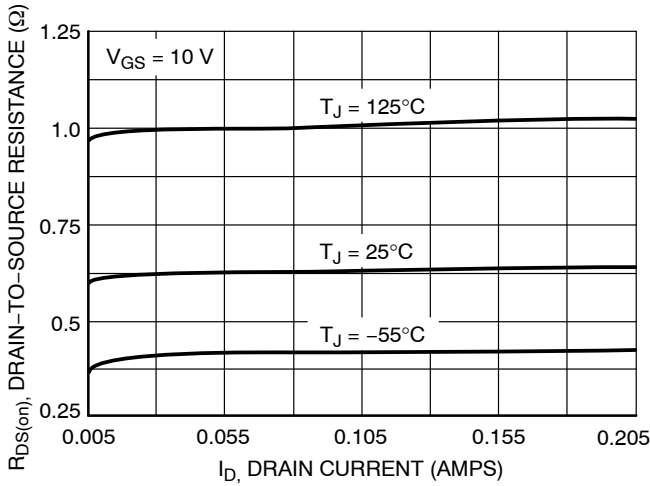


Figure 3. On-Resistance vs. Drain Current and Temperature

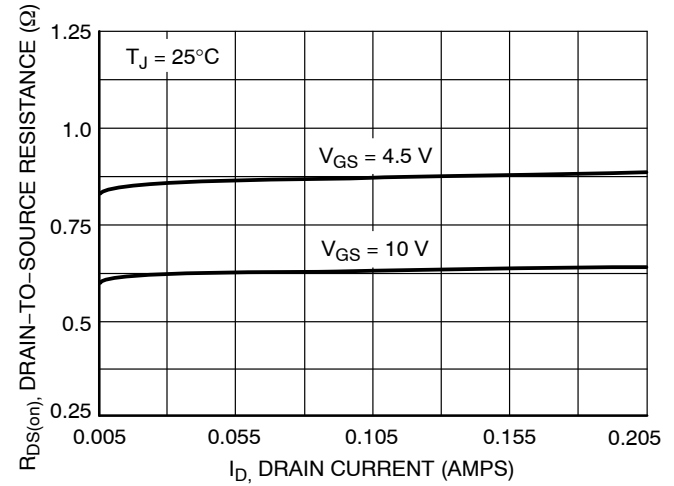


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

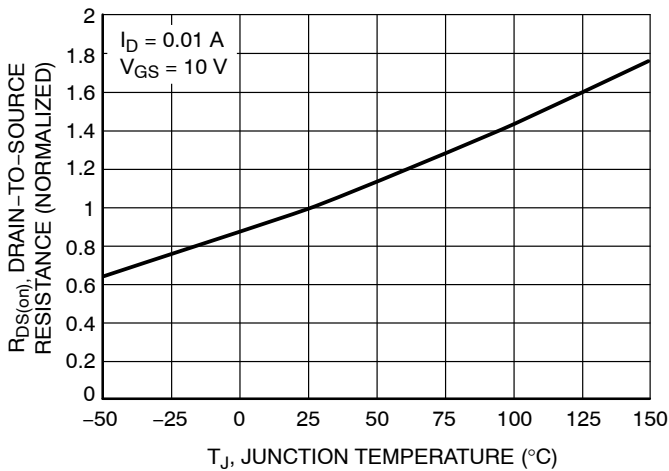


Figure 5. On-Resistance Variation with Temperature

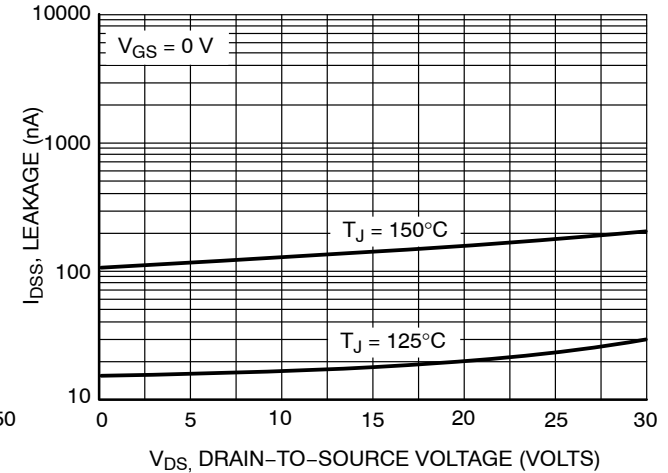
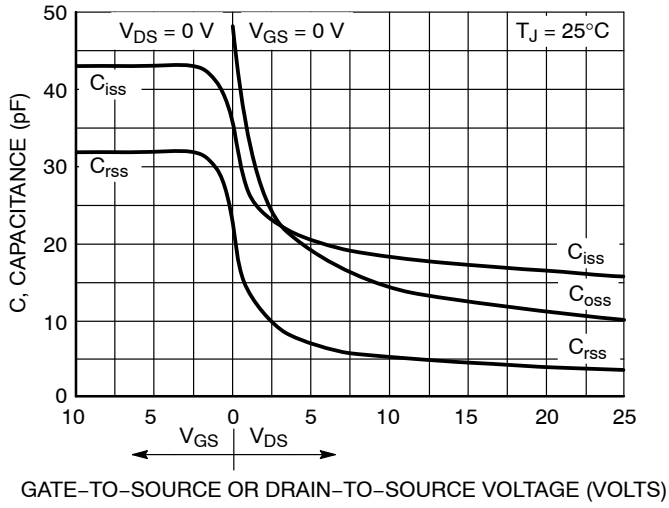


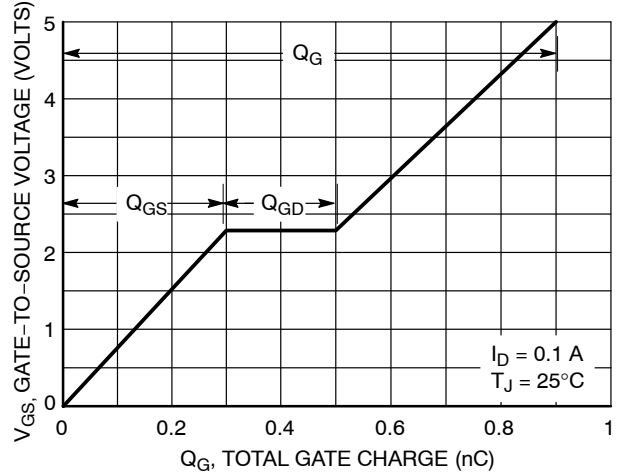
Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTJD4001N, NVTJD4001N

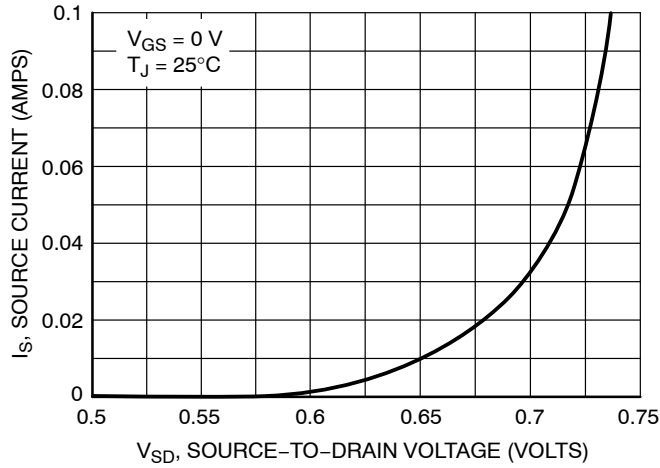
## TYPICAL PERFORMANCE CURVES ( $T_J = 25^\circ\text{C}$ unless otherwise noted)



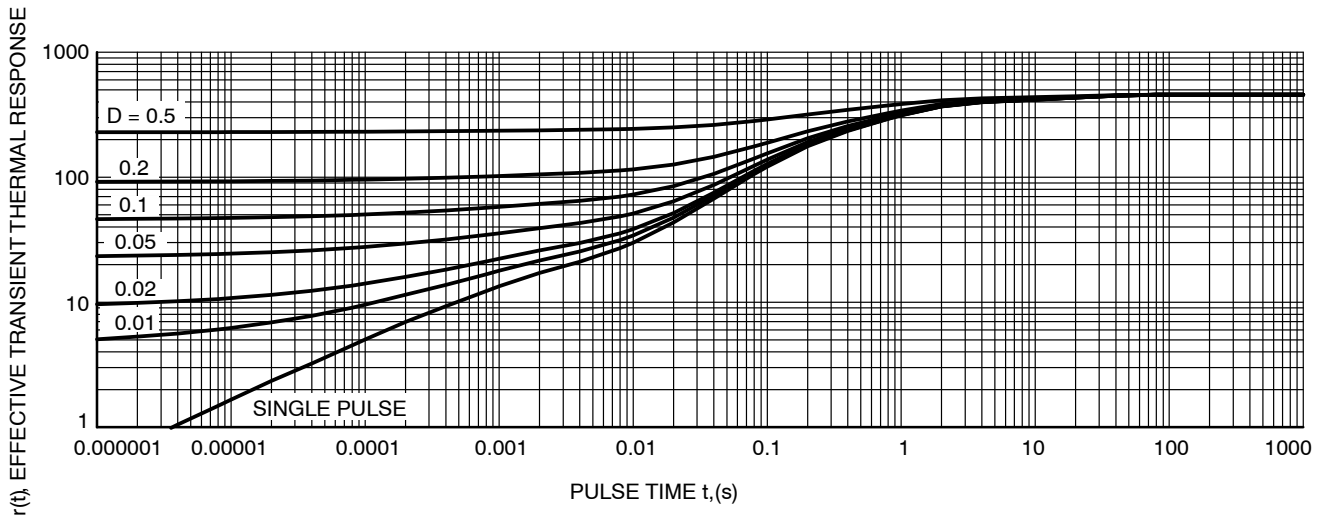
**Figure 7. Capacitance Variation**



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



**Figure 9. Diode Forward Voltage vs. Current**

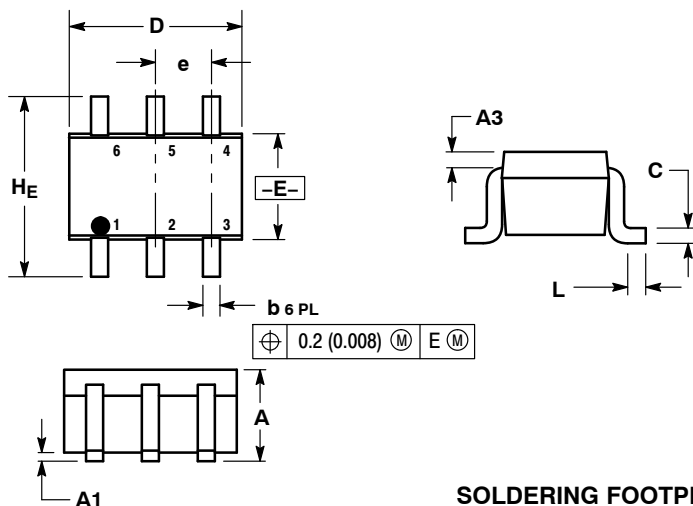


**Figure 10. Thermal Response**

# NTJD4001N, NVTJD4001N

## PACKAGE DIMENSIONS

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



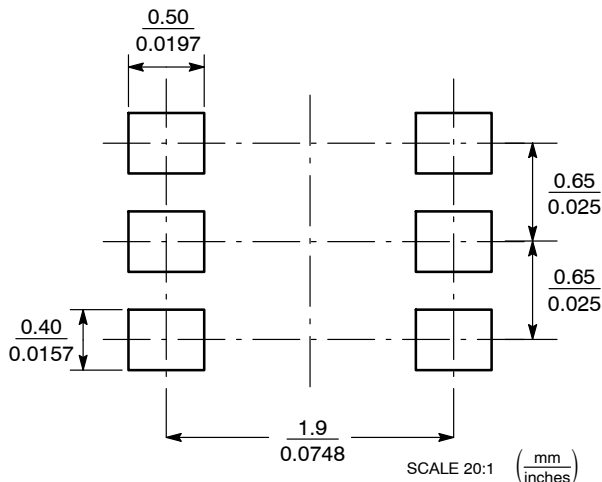
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

| 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.

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