

# NTA4153N, NTE4153N, NVA4153N, NVE4153N

## MOSFET – Single, N-Channel with ESD Protection, Small Signal, SC-75 and SC-89 20 V, 915 mA

### Features

- Low  $R_{DS(on)}$  Improving System Efficiency
- Low Threshold Voltage, 1.5 V Rated
- ESD Protected Gate
- NV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Pb-Free Packages are Available

### Applications

- Load/Power Switches
- Power Supply Converter Circuits
- Battery Management
- Portables like Cell Phones, PDAs, Digital Cameras, Pagers, etc.

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

| Parameter                                                         |                        | Symbol         | Value                           | Units            |
|-------------------------------------------------------------------|------------------------|----------------|---------------------------------|------------------|
| Drain-to-Source Voltage                                           |                        | $V_{DS}$       | 20                              | V                |
| Gate-to-Source Voltage                                            |                        | $V_{GS}$       | $\pm 6.0$                       | V                |
| Continuous Drain Current (Note 1)                                 | Steady State           | $I_D$          | $T_A = 25^\circ\text{C}$<br>915 | mA               |
|                                                                   |                        |                | $T_A = 85^\circ\text{C}$<br>660 |                  |
| Power Dissipation (Note 1)                                        | Steady State           | $P_D$          | 300                             | mW               |
| Pulsed Drain Current                                              | $t_p = 10 \mu\text{s}$ | $I_{DM}$       | 1.3                             | A                |
| Operating Junction and Storage Temperature                        |                        | $T_J, T_{STG}$ | -55 to 150                      | $^\circ\text{C}$ |
| Continuous Source Current (Body Diode)                            |                        | $I_S$          | 280                             | mA               |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) |                        | $T_L$          | 260                             | $^\circ\text{C}$ |

### THERMAL RESISTANCE RATINGS

| Parameter                                                               | Symbol          | Value      | Units              |
|-------------------------------------------------------------------------|-----------------|------------|--------------------|
| Junction-to-Ambient – Steady State (Note 1)<br>SC-75 / SOT-416<br>SC-89 | $R_{\theta JA}$ | 416<br>400 | $^\circ\text{C/W}$ |

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.

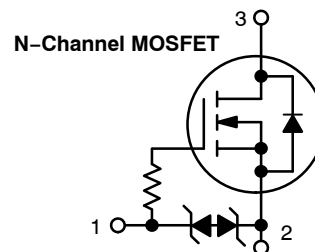
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).



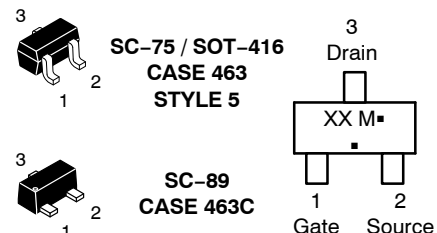
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| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP       | $I_D$ MAX |
|---------------|------------------------|-----------|
| 20 V          | 0.127 $\Omega$ @ 4.5 V | 915 mA    |
|               | 0.170 $\Omega$ @ 2.5 V |           |
|               | 0.242 $\Omega$ @ 1.8 V |           |
|               | 0.500 $\Omega$ @ 1.5 V |           |



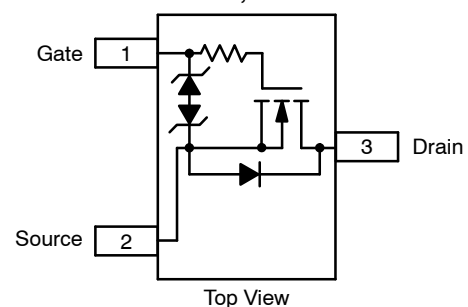
### MARKING DIAGRAM & PIN ASSIGNMENT



XX = Device Code  
M = Date Code\*  
■ = Pb-Free Package  
(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

### SC-75, SC-89



### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

# NTA4153N, NTE4153N, NVA4153N, NVE4153N

## 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 | 26   |      | V     |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V <sub>(BR)DSS</sub> /T <sub>J</sub> |                                                 |    | 18.4 |      | mV/°C |
| Zero Gate Voltage Drain Current                           | I <sub>DSS</sub>                     | V <sub>GS</sub> = 0 V, V <sub>DS</sub> = 16 V   |    |      | 100  | nA    |
| Gate-to-Source Leakage Current                            | I <sub>GSS</sub>                     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±4.5 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> = 250 μA | 0.45 | 0.76  | 1.1 | V     |
| Negative Threshold Temperature Coefficient | V <sub>GS(TH)</sub> /T <sub>J</sub> |                                                             |      | -2.15 |     | mV/°C |
| Drain-to-Source On Resistance              | R <sub>DS(on)</sub>                 | V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 600 mA            |      | 127   | 230 | mΩ    |
|                                            |                                     | V <sub>GS</sub> = 2.5 V, I <sub>D</sub> = 500 mA            |      | 170   | 275 |       |
|                                            |                                     | V <sub>GS</sub> = 1.8 V, I <sub>D</sub> = 350 mA            |      | 242   | 700 |       |
|                                            |                                     | V <sub>GS</sub> = 1.5 V, I <sub>D</sub> = 40 mA             |      | 500   | 950 |       |
| Forward Transconductance                   | g <sub>FS</sub>                     | V <sub>DS</sub> = 10 V, I <sub>D</sub> = 400 mA             |      | 1.4   |     | 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> = 16 V              |  | 110  |  | pF |
| Output Capacitance           | C <sub>OSS</sub>    |                                                                            |  | 16   |  |    |
| Reverse Transfer Capacitance | C <sub>RSS</sub>    |                                                                            |  | 12   |  |    |
| 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> = 0.2 A |  | 1.82 |  | 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>     |                                                                            |  | 0.42 |  |    |

### SWITCHING CHARACTERISTICS (Note 3)

|                     |                     |                                                                                                   |  |     |  |    |
|---------------------|---------------------|---------------------------------------------------------------------------------------------------|--|-----|--|----|
| 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> = 0.2 A, R <sub>G</sub> = 10 Ω |  | 3.7 |  | ns |
| Rise Time           | t <sub>r</sub>      |                                                                                                   |  | 4.4 |  |    |
| Turn-Off Delay Time | t <sub>d(OFF)</sub> |                                                                                                   |  | 25  |  |    |
| Fall Time           | t <sub>f</sub>      |                                                                                                   |  | 7.6 |  |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                       |                 |                                                   |                        |  |      |     |   |
|-----------------------|-----------------|---------------------------------------------------|------------------------|--|------|-----|---|
| Forward Diode Voltage | V <sub>SD</sub> | V <sub>GS</sub> = 0 V,<br>I <sub>S</sub> = 200 mA | T <sub>J</sub> = 25°C  |  | 0.67 | 1.1 | V |
|                       |                 |                                                   | T <sub>J</sub> = 125°C |  | 0.54 |     |   |

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.

TYPICAL ELECTRICAL CHARACTERISTICS

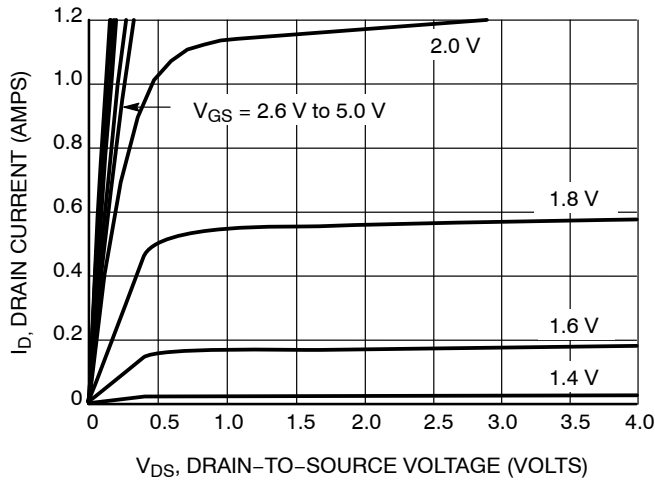


Figure 1. On-Region Characteristics

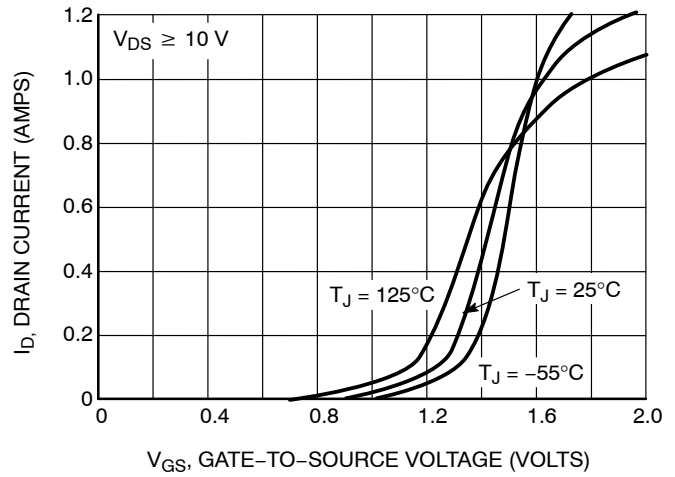


Figure 2. Transfer Characteristics

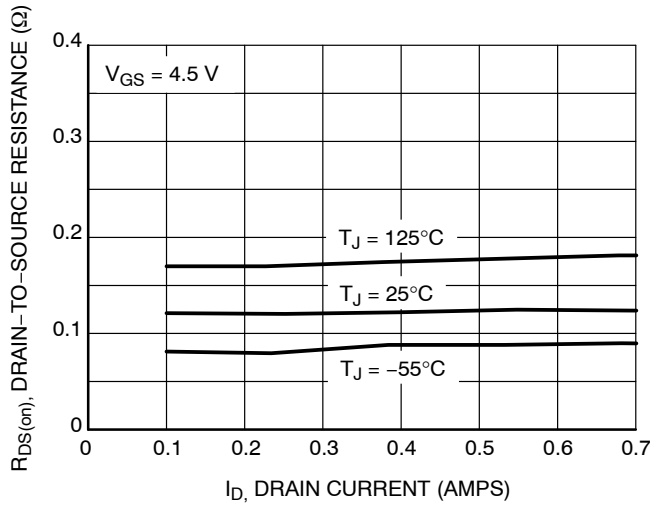


Figure 3. On-Resistance vs. Drain Current and Temperature

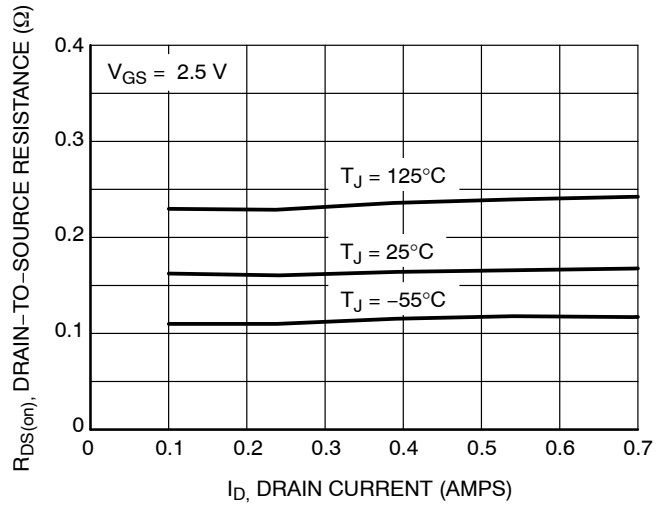


Figure 4. On-Resistance vs. Drain Current and Temperature

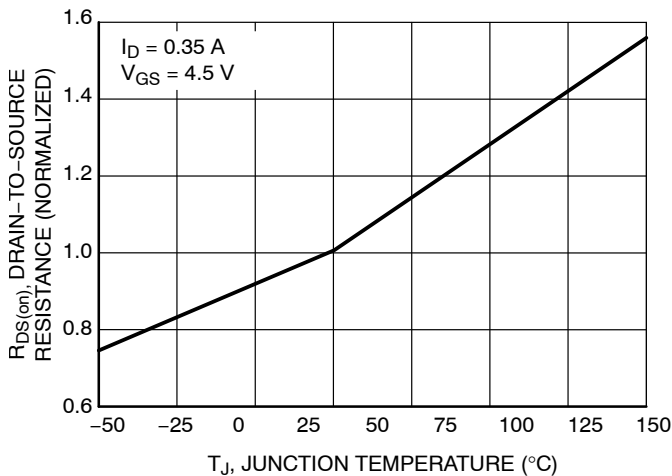


Figure 5. On-Resistance Variation with Temperature

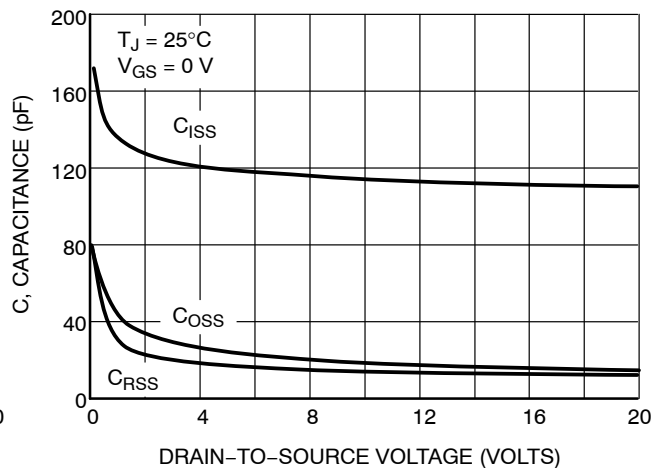


Figure 6. Capacitance Variation

TYPICAL ELECTRICAL CHARACTERISTICS

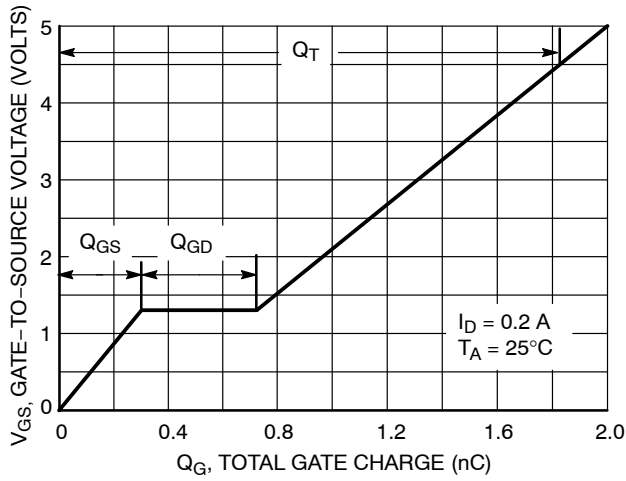


Figure 7. Gate-to-Source Voltage vs. Total Gate Charge

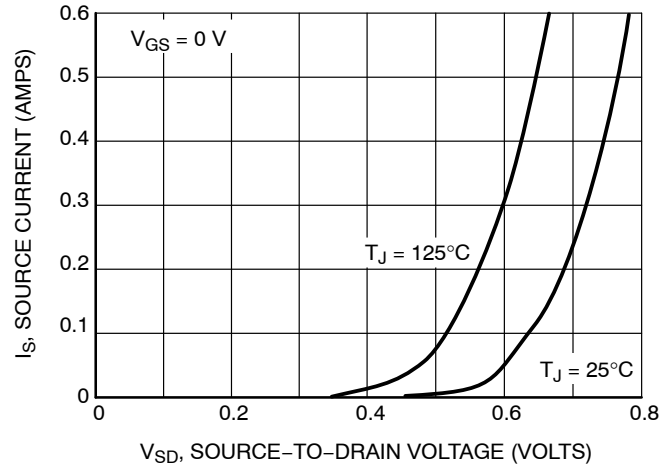


Figure 8. Diode Forward Voltage vs. Current

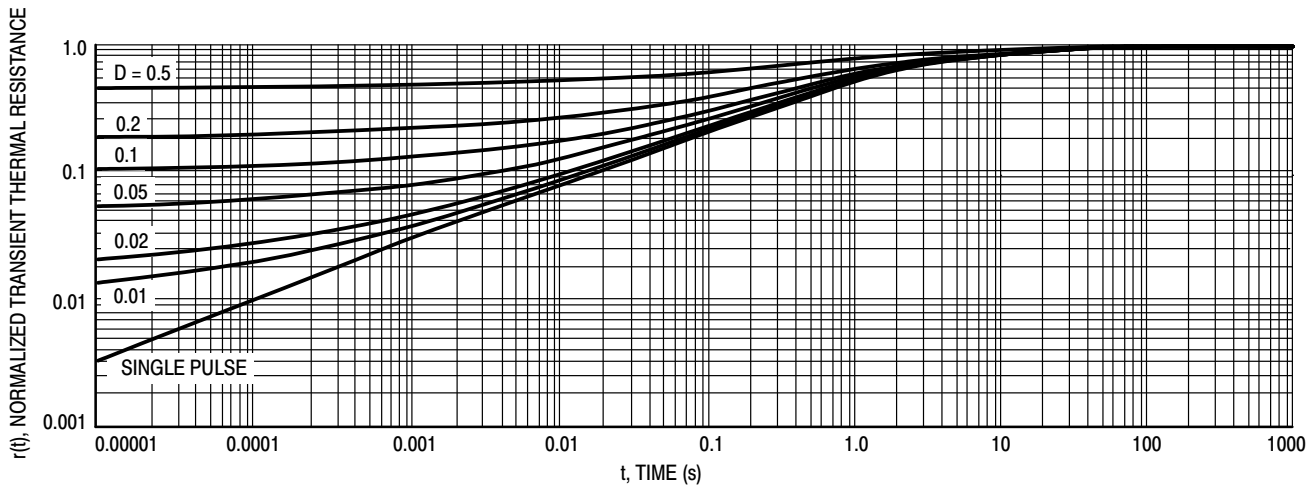


Figure 9. Normalized Thermal Response

ORDERING INFORMATION

| Device      | Marking | Package                      | Shipping <sup>†</sup> |
|-------------|---------|------------------------------|-----------------------|
| NTA4153NT1  | TR      | SC-75 / SOT-416              | 3000 / Tape & Reel    |
| NTA4153NT1G | TR      | SC-75 / SOT-416<br>(Pb-Free) | 3000 / Tape & Reel    |
| NTE4153NT1G | TP      | SC-89<br>(Pb-Free)           | 3000 / Tape & Reel    |
| NVA4153NT1G | VR      | SC-75 / SOT-416<br>(Pb-Free) | 3000 / Tape & Reel    |
| NVE4153NT1G | VP      | SC-89<br>(Pb-Free)           | 3000 / Tape & Reel    |

<sup>†</sup>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.



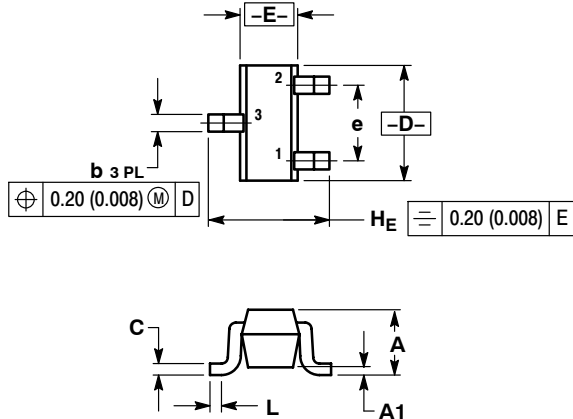
SCALE 4:1

### SC-75/SOT-416

#### CASE 463-01

#### ISSUE G

DATE 07 AUG 2015

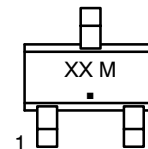


#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM            | MILLIMETERS |      |      | INCHES   |       |       |
|----------------|-------------|------|------|----------|-------|-------|
|                | MIN         | NOM  | MAX  | MIN      | NOM   | MAX   |
| A              | 0.70        | 0.80 | 0.90 | 0.027    | 0.031 | 0.035 |
| A1             | 0.00        | 0.05 | 0.10 | 0.000    | 0.002 | 0.004 |
| b              | 0.15        | 0.20 | 0.30 | 0.006    | 0.008 | 0.012 |
| C              | 0.10        | 0.15 | 0.25 | 0.004    | 0.006 | 0.010 |
| D              | 1.55        | 1.60 | 1.65 | 0.061    | 0.063 | 0.065 |
| E              | 0.70        | 0.80 | 0.90 | 0.027    | 0.031 | 0.035 |
| e              | 1.00 BSC    |      |      | 0.04 BSC |       |       |
| L              | 0.10        | 0.15 | 0.20 | 0.004    | 0.006 | 0.008 |
| H <sub>E</sub> | 1.50        | 1.60 | 1.70 | 0.060    | 0.063 | 0.067 |

#### GENERIC MARKING DIAGRAM\*



XX = Specific Device Code  
M = Date Code  
■ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present.

STYLE 1:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

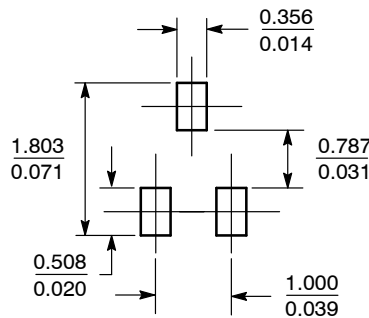
STYLE 2:  
PIN 1. ANODE  
2. N/C  
3. CATHODE

STYLE 3:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 4:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 5:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

#### SOLDERING FOOTPRINT\*



SCALE 10:1 (mm/inches)

\*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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| DESCRIPTION:     | SC-75/SOT-416 | PAGE 1 OF 1                                                                                                                                                                      |

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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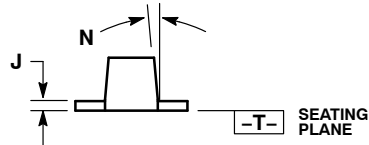
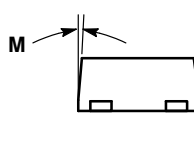
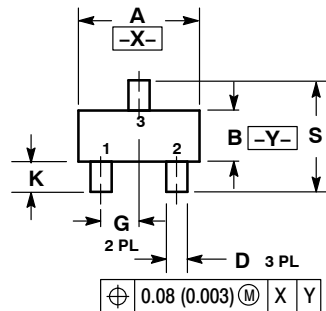


### SC-89, 3 LEAD CASE 463C-03 ISSUE C

DATE 31 JUL 2003



SCALE 4:1

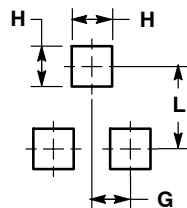


STYLE 1:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 2:  
PIN 1. ANODE  
2. N/C  
3. CATHODE

STYLE 3:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 4:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE



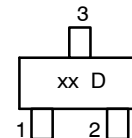
RECOMMENDED PATTERN  
OF SOLDER PADS

#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

| DIM | MILLIMETERS |      |      | INCHES    |       |       |
|-----|-------------|------|------|-----------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN       | NOM   | MAX   |
| A   | 1.50        | 1.60 | 1.70 | 0.059     | 0.063 | 0.067 |
| B   | 0.75        | 0.85 | 0.95 | 0.030     | 0.034 | 0.040 |
| C   | 0.60        | 0.70 | 0.80 | 0.024     | 0.028 | 0.031 |
| D   | 0.23        | 0.28 | 0.33 | 0.009     | 0.011 | 0.013 |
| G   | 0.50 BSC    |      |      | 0.020 BSC |       |       |
| H   | 0.53 REF    |      |      | 0.021 REF |       |       |
| J   | 0.10        | 0.15 | 0.20 | 0.004     | 0.006 | 0.008 |
| K   | 0.30        | 0.40 | 0.50 | 0.012     | 0.016 | 0.020 |
| L   | 1.10 REF    |      |      | 0.043 REF |       |       |
| M   | ---         | ---  | 10   | ---       | ---   | 10    |
| N   | ---         | ---  | 10   | ---       | ---   | 10    |
| S   | 1.50        | 1.60 | 1.70 | 0.059     | 0.063 | 0.067 |

#### GENERIC MARKING DIAGRAM\*



xx = Specific Device Code  
D = Date Code

\*This information is generic. Please refer to device data sheet for actual part marking.

|                  |               |                                                                                                                                                                                     |
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Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**

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