

# NTA4151P, NTE4151P

## MOSFET – Single, P-Channel, Small Signal, Gate Zener, SC-75, SC-89

**-20 V, -760 mA**

### Features

- Low  $R_{DS(on)}$  for Higher Efficiency and Longer Battery Life
- Small Outline Package (1.6 x 1.6 mm)
- SC-75 Standard Gullwing Package
- ESD Protected Gate
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- High Side Load Switch
- DC-DC Conversion
- Small Drive Circuits
- Battery Operated Systems such as Cell Phones, PDAs, Digital Cameras, 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           | $I_D$          | -760       | mA               |
| Power Dissipation (Note 1)                                          | Steady State           | $P_D$          | 301        | mW               |
| SC-75                                                               |                        |                | 313        |                  |
| SC-89                                                               |                        |                |            |                  |
| Pulsed Drain Current                                                | $t_p = 10 \mu\text{s}$ | $I_{DM}$       | $\pm 1000$ | mA               |
| Operating Junction and Storage Temperature                          |                        | $T_J, T_{STG}$ | -55 to 150 | $^\circ\text{C}$ |
| Continuous Source Current (Body Diode)                              |                        | $I_S$          | -250       | mA               |
| Lead Temperature for Soldering Purposes (1/8 in from case for 10 s) |                        | $T_L$          | 260        | $^\circ\text{C}$ |
| Gate-to-Source ESD Rating – (Human Body Model, Method 3015)         |                        | ESD            | 1800       | V                |

### THERMAL RESISTANCE RATINGS

|                                             |                 |     |                    |
|---------------------------------------------|-----------------|-----|--------------------|
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ |     | $^\circ\text{C/W}$ |
| SC-75                                       |                 | 415 |                    |
| SC-89                                       |                 | 400 |                    |

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).

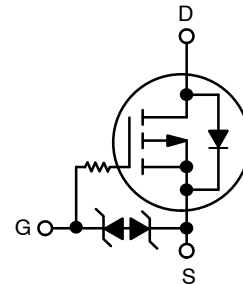


**ON Semiconductor®**

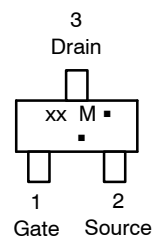
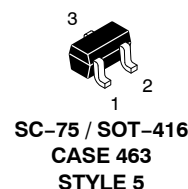
[www.onsemi.com](http://www.onsemi.com)

| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP       | $I_D$ MAX |
|---------------|------------------------|-----------|
| -20 V         | 0.26 $\Omega$ @ -4.5 V | -760 mA   |
|               | 0.35 $\Omega$ @ -2.5 V |           |
|               | 0.49 $\Omega$ @ -1.8 V |           |

### P-Channel MOSFET



### 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.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NTA4151P, NTE4151P

## 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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$ | -20 |           |          | V             |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{GS} = 0\text{ V}, V_{DS} = -16\text{ V}$         |     | -1.0      | -100     | nA            |
| Gate-to-Source Leakage Current    | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 4.5\text{ V}$     |     | $\pm 1.0$ | $\pm 10$ | $\mu\text{A}$ |

### ON CHARACTERISTICS (Note 2)

|                               |              |                                                  |       |      |      |          |
|-------------------------------|--------------|--------------------------------------------------|-------|------|------|----------|
| Gate Threshold Voltage        | $V_{GS(TH)}$ | $V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$ | -0.45 |      | -1.2 | V        |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = -4.5\text{ V}, I_D = -350\text{ mA}$   |       | 0.26 | 0.36 | $\Omega$ |
|                               |              | $V_{GS} = -2.5\text{ V}, I_D = -300\text{ mA}$   |       | 0.35 | 0.45 |          |
|                               |              | $V_{GS} = -1.8\text{ V}, I_D = -150\text{ mA}$   |       | 0.49 | 1.0  |          |
| Forward Transconductance      | $g_{FS}$     | $V_{DS} = -10\text{ V}, I_D = -250\text{ mA}$    |       | 0.4  |      | S        |

### CHARGES AND CAPACITANCES

|                              |              |                                                                      |  |       |  |    |
|------------------------------|--------------|----------------------------------------------------------------------|--|-------|--|----|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = -5.0\text{ V}$    |  | 156   |  | pF |
| Output Capacitance           | $C_{OSS}$    |                                                                      |  | 28    |  |    |
| Reverse Transfer Capacitance | $C_{RSS}$    |                                                                      |  | 18    |  |    |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = -4.5\text{ V}, V_{DD} = -10\text{ V}, I_D = -0.3\text{ A}$ |  | 2.1   |  | nC |
| Threshold Gate Charge        | $Q_{G(TH)}$  |                                                                      |  | 0.125 |  |    |
| Gate-to-Source Charge        | $Q_{GS}$     |                                                                      |  | 0.325 |  |    |
| Gate-to-Drain Charge         | $Q_{GD}$     |                                                                      |  | 0.5   |  |    |

### SWITCHING CHARACTERISTICS (Note 3)

|                     |              |                                                                                               |  |      |  |    |
|---------------------|--------------|-----------------------------------------------------------------------------------------------|--|------|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = -4.5\text{ V}, V_{DD} = -10\text{ V}, I_D = -200\text{ mA}, R_G = 10\text{ }\Omega$ |  | 8.0  |  | ns |
| Rise Time           | $t_r$        |                                                                                               |  | 8.2  |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                               |  | 29   |  |    |
| Fall Time           | $t_f$        |                                                                                               |  | 20.4 |  |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                       |          |                                             |  |       |      |   |
|-----------------------|----------|---------------------------------------------|--|-------|------|---|
| Forward Diode Voltage | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = -250\text{ mA}$ |  | -0.72 | -1.1 | V |
|-----------------------|----------|---------------------------------------------|--|-------|------|---|

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  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$ .

3. Switching characteristics are independent of operating junction temperatures.

## ORDERING INFORMATION

| Device      | Marking | Package            | Shipping <sup>†</sup> |
|-------------|---------|--------------------|-----------------------|
| NTA4151PT1G | TN      | SC-75<br>(Pb-Free) | 3000 / Tape & Reel    |
| NTE4151PT1G | TM      | 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.

TYPICAL ELECTRICAL CHARACTERISTICS

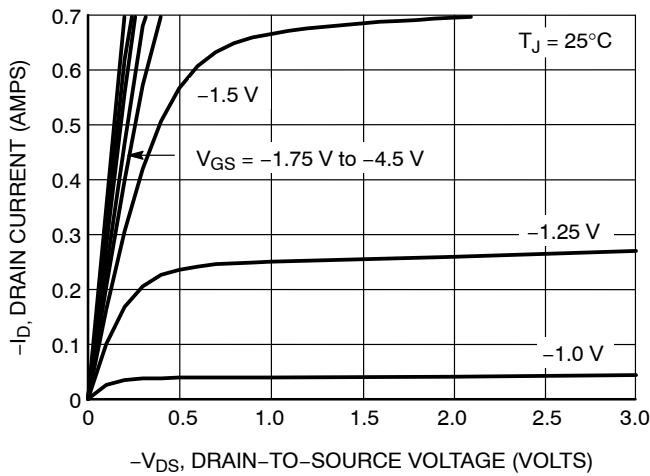


Figure 1. On-Region Characteristics

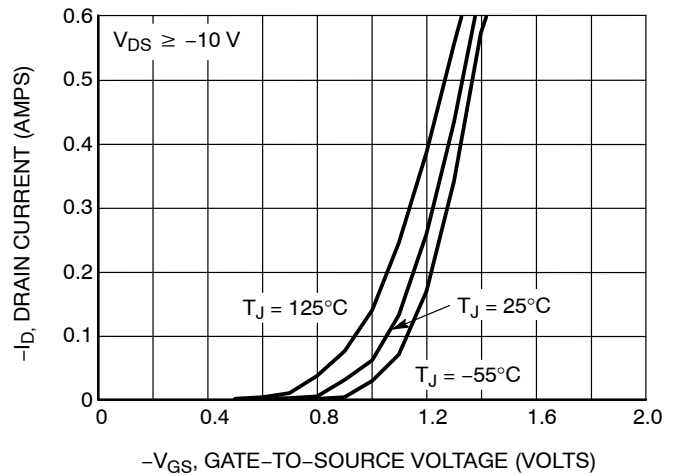


Figure 2. Transfer Characteristics

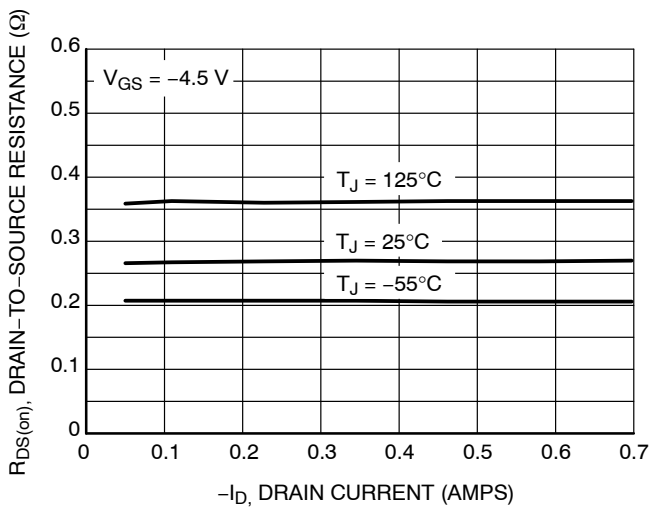


Figure 3. On-Resistance vs. Drain Current and Temperature

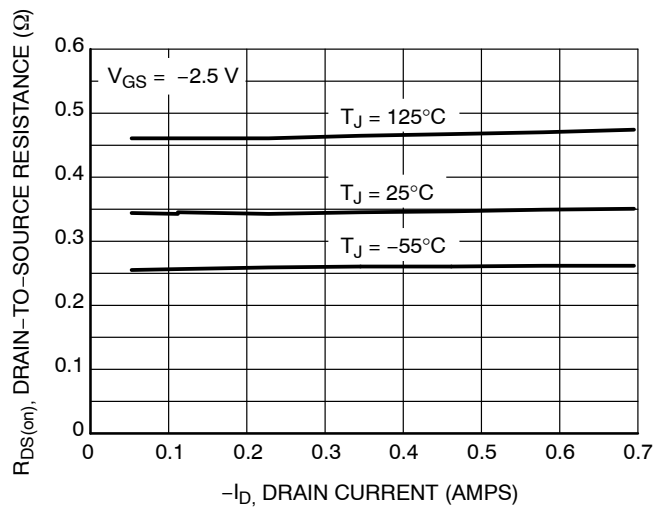


Figure 4. On-Resistance vs. Drain Current and Temperature

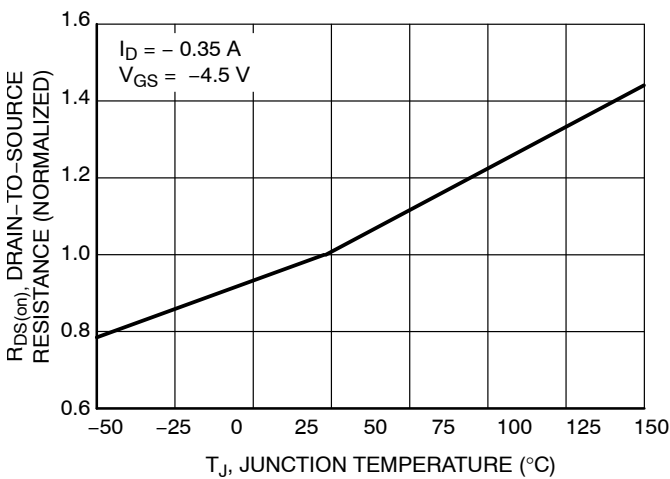


Figure 5. On-Resistance Variation with Temperature

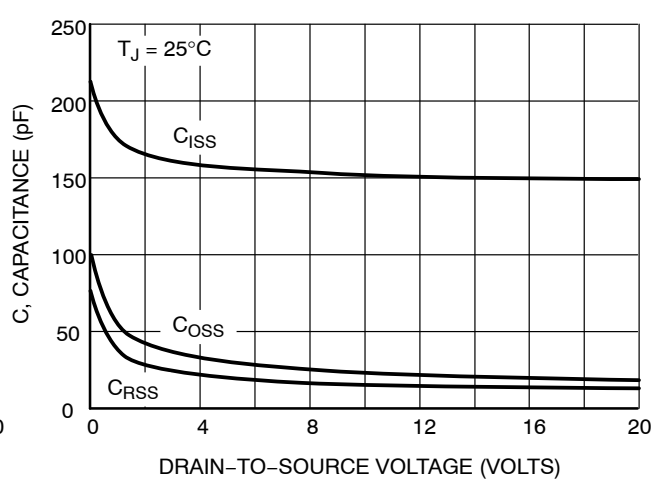


Figure 6. Capacitance Variation

TYPICAL ELECTRICAL CHARACTERISTICS

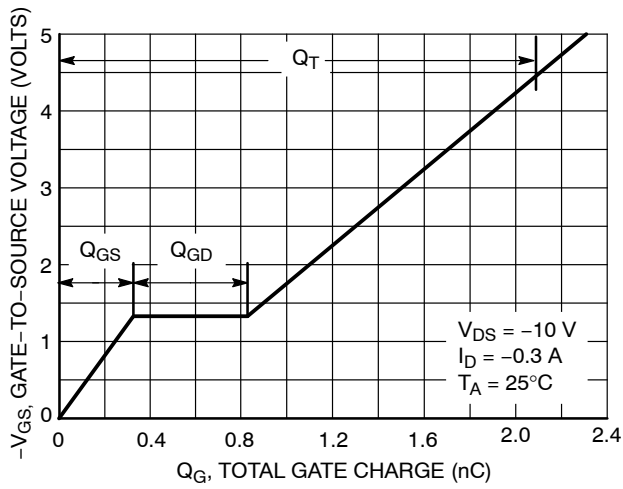


Figure 7. Gate-to-Source Voltage vs. Total Gate Charge

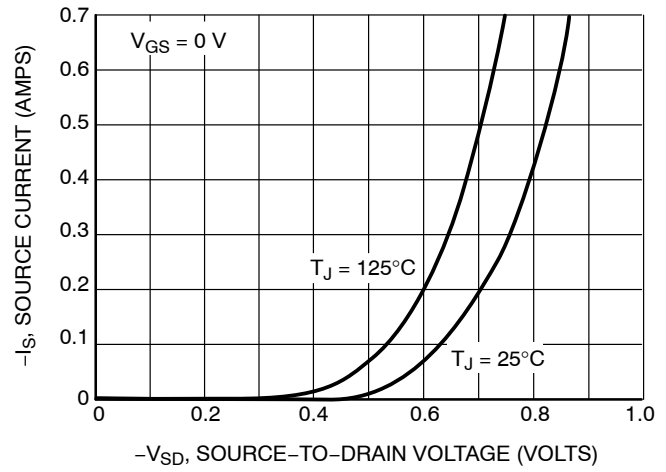


Figure 8. Diode Forward Voltage vs. Current

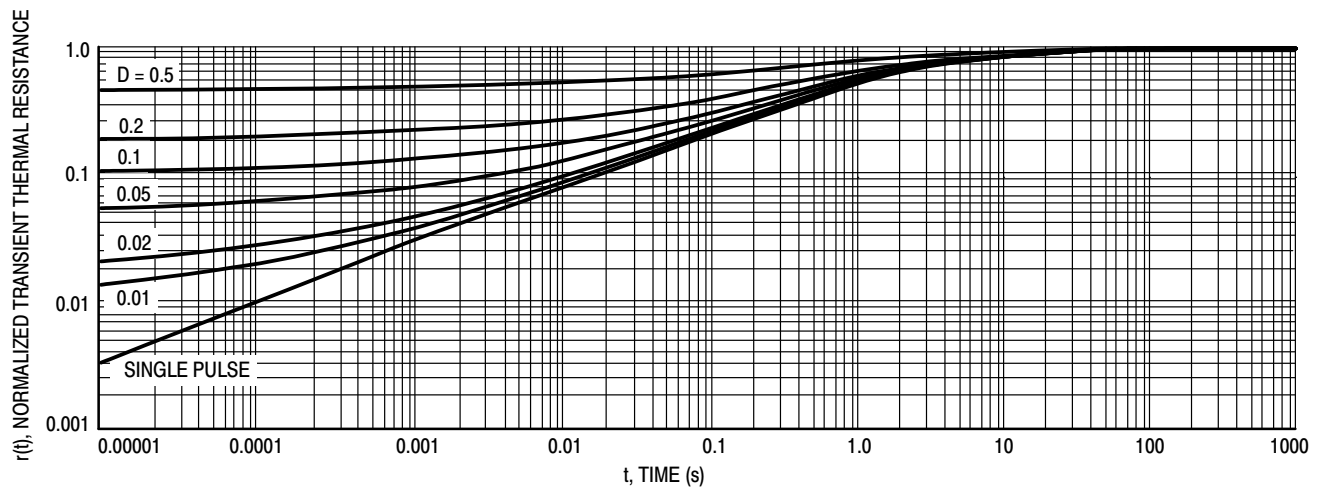
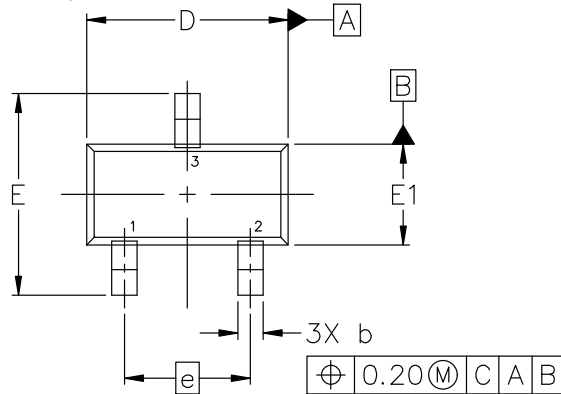


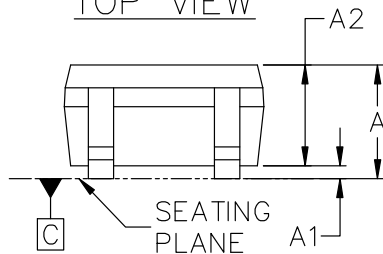
Figure 9. Normalized Thermal Response

SC75-3 1.60x0.80x0.80, 1.00P  
CASE 463  
ISSUE H

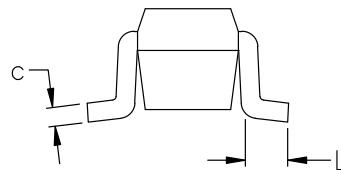
DATE 01 FEB 2024



TOP VIEW

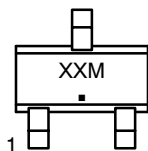


SIDE VIEW



END VIEW

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. Some products may not follow the Generic Marking.

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

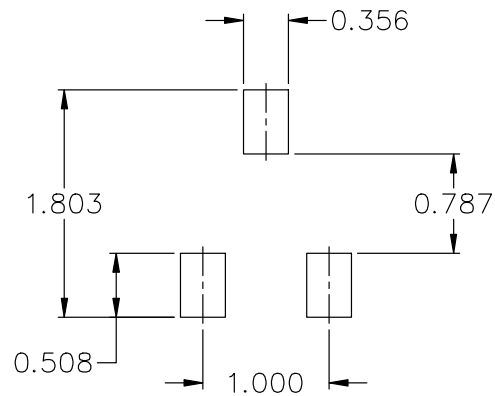
STYLE 2:  
PIN 1. ANODE  
2. N/C  
3. CATHODE

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

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.70        | 0.80 | 0.90 |
| A1  | 0.00        | 0.05 | 0.10 |
| A2  | 0.80 REF.   |      |      |
| b   | 0.15        | 0.20 | 0.30 |
| c   | 0.10        | 0.15 | 0.25 |
| D   | 1.55        | 1.60 | 1.65 |
| E   | 1.50        | 1.60 | 1.70 |
| E1  | 0.70        | 0.80 | 0.90 |
| e   | 1.00 BSC    |      |      |
| L   | 0.10        | 0.15 | 0.20 |

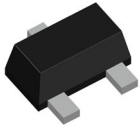


RECOMMENDED MOUNTING FOOTPRINT\*

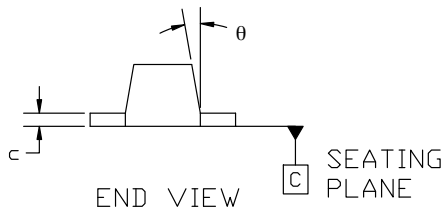
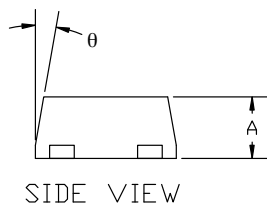
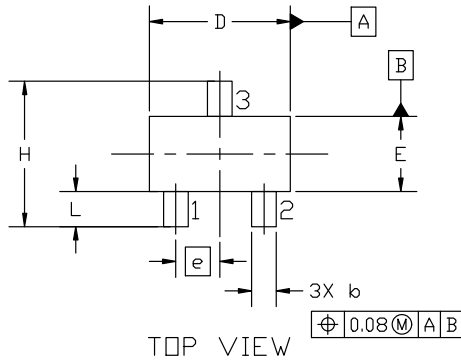
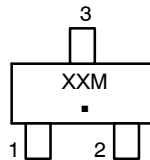
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**SC-89 3-LEAD, 1.60x0.85x0.70, 0.50P**  
**CASE 463C**  
**ISSUE D**

DATE 20 FEB 2024


**GENERIC MARKING DIAGRAM\***


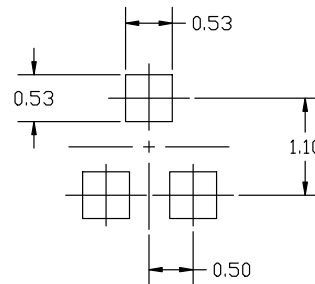
XX = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

\*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. Some products may not follow the Generic Marking.

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN.        | NOM. | MAX. |
| A   | 0.60        | 0.70 | 0.80 |
| b   | 0.23        | 0.28 | 0.33 |
| c   | 0.10        | 0.15 | 0.20 |
| D   | 1.50        | 1.60 | 1.70 |
| E   | 0.75        | 0.85 | 0.95 |
| e   | 0.50 BSC    |      |      |
| H   | 1.50        | 1.60 | 1.70 |
| L   | 0.30        | 0.40 | 0.50 |
| θ   | ---         | ---  | 10°  |


**RECOMMENDED MOUNTING 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.

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

|                         |                                            |                                                                                                                                                                                  |
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