

# NPN Transistor, 100 V, 3.0 A, Low $V_{CE(sat)}$

## NSS1C301ET4G

onsemi's e<sup>2</sup>PowerEdge family of low  $V_{CE(sat)}$  transistors are surface mount devices featuring ultra low saturation voltage ( $V_{CE(sat)}$ ) and high current gain capability. These are designed for use in low voltage, high speed switching applications where affordable efficient energy control is important.

Typical applications are DC-DC converters and power management in portable and battery powered products such as cellular and cordless phones, PDAs, computers, printers, digital cameras and MP3 players. Other applications are low voltage motor controls in mass storage products such as disc drives and tape drives. In the automotive industry they can be used in air bag deployment and in the instrument cluster. The high current gain allows e<sup>2</sup>PowerEdge devices to be driven directly from PMU's control outputs, and the Linear Gain (Beta) makes them ideal components in analog amplifiers.

### Features

- Complement to NSS1C300ET4G
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

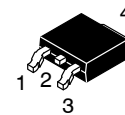
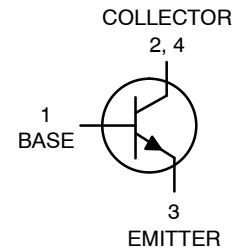
### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

| Rating                                                                                            | Symbol         | Max          | Unit                     |
|---------------------------------------------------------------------------------------------------|----------------|--------------|--------------------------|
| Collector-Base Voltage                                                                            | $V_{CBO}$      | 140          | Vdc                      |
| Collector-Emitter Voltage                                                                         | $V_{CEO}$      | 100          | Vdc                      |
| Emitter-Base Voltage                                                                              | $V_{EB}$       | 6.0          | Vdc                      |
| Collector Current - Continuous                                                                    | $I_C$          | 3.0          | Adc                      |
| Collector Current - Peak                                                                          | $I_{CM}$       | 6.0          | Adc                      |
| Base Current                                                                                      | $I_B$          | 0.5          | Adc                      |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$          | $P_D$          | 33<br>0.26   | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation (Note 1)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 2.1<br>0.017 | W<br>W/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                               | $T_J, T_{stg}$ | -65 to +150  | $^\circ\text{C}$         |

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.

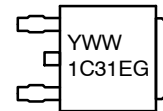
1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

100 VOLTS, 3.0 AMPS  
12.5 WATTS  
NPN LOW  $V_{CE(sat)}$  TRANSISTOR



DPAK  
CASE 369C  
STYLE 1

### MARKING DIAGRAM



Y = Year  
WW = Work Week  
1C31E = Device Code  
G = Pb-Free

### ORDERING INFORMATION

| Device       | Package           | Shipping†            |
|--------------|-------------------|----------------------|
| NSS1C301ET4G | DPAK<br>(Pb-Free) | 2500/<br>Tape & Reel |
| NSV1C301ET4G | DPAK<br>(Pb-Free) | 2500/<br>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](#).

# NSS1C301ET4G

## THERMAL CHARACTERISTICS

| Characteristic                                   | Symbol          | Max  | Unit                 |
|--------------------------------------------------|-----------------|------|----------------------|
| Thermal Resistance, Junction-to-Case             | $R_{\theta JC}$ | 3.8  | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 59.5 | $^{\circ}\text{C/W}$ |

2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                               |               |     |   |     |               |
|-------------------------------------------------------------------------------|---------------|-----|---|-----|---------------|
| Collector – Emitter Breakdown Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 0$ ) | $V_{(BR)CEO}$ | 100 | – | –   | V             |
| Collector – Base Breakdown Voltage<br>( $I_C = 0.1\text{ mA}$ , $I_E = 0$ )   | $V_{(BR)CBO}$ | 140 | – | –   | V             |
| Emitter – Base Breakdown Voltage<br>( $I_E = 0.1\text{ mA}$ , $I_C = 0$ )     | $V_{(BR)EBO}$ | 6.0 | – | –   | V             |
| Collector Cutoff Current<br>( $V_{CB} = 140\text{ V}$ , $I_E = 0$ )           | $I_{CBO}$     | –   | – | 0.1 | $\mu\text{A}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 6.0\text{ V}$ )                         | $I_{EBO}$     | –   | – | 0.1 | $\mu\text{A}$ |

### ON CHARACTERISTICS

|                                                                                                                                                                                                                                                                   |               |                         |                                  |                                  |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------------------|----------------------------------|----------------------------------|-----|
| DC Current Gain (Note 3)<br>( $I_C = 0.1\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 0.5\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 3.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )                  | $h_{FE}$      | 200<br>200<br>120<br>80 | –<br>–<br>–<br>–                 | –<br>–<br>360<br>–               | –   |
| Collector – Emitter Saturation Voltage (Note 3)<br>( $I_C = 0.1\text{ A}$ , $I_B = 10\text{ mA}$ )<br>( $I_C = 1.0\text{ A}$ , $I_B = 0.100\text{ A}$ )<br>( $I_C = 2.0\text{ A}$ , $I_B = 0.200\text{ A}$ )<br>( $I_C = 3.0\text{ A}$ , $I_B = 0.300\text{ A}$ ) | $V_{CE(sat)}$ | –<br>–<br>–<br>–        | 0.015<br>0.045<br>0.080<br>0.115 | 0.050<br>0.090<br>0.150<br>0.250 | V   |
| Base – Emitter Saturation Voltage (Note 3)<br>( $I_C = 1.0\text{ A}$ , $I_B = 0.1\text{ A}$ )                                                                                                                                                                     | $V_{BE(sat)}$ | –                       | –                                | 1.0                              | V   |
| Base – Emitter Turn-on Voltage (Note 3)<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )                                                                                                                                                                     | $V_{BE(on)}$  | –                       | –                                | 0.90                             | V   |
| Cutoff Frequency<br>( $I_C = 500\text{ mA}$ , $V_{CE} = 10\text{ V}$ , $f = 100\text{ MHz}$ )                                                                                                                                                                     | $f_T$         | –                       | 120                              | –                                | MHz |
| Input Capacitance<br>( $V_{EB} = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                                                           | $C_{ibo}$     | –                       | 360                              | –                                | pF  |
| Output Capacitance<br>( $V_{CB} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                                                           | $C_{obo}$     | –                       | 30                               | –                                | pF  |

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.

3. Pulsed Condition: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

TYPICAL CHARACTERISTICS

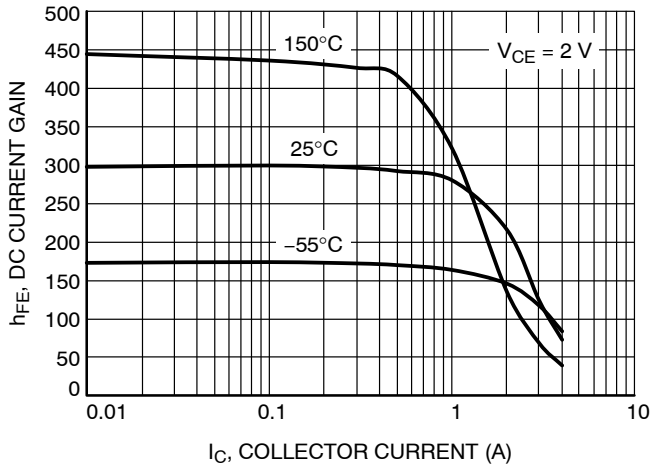


Figure 1. DC Current Gain

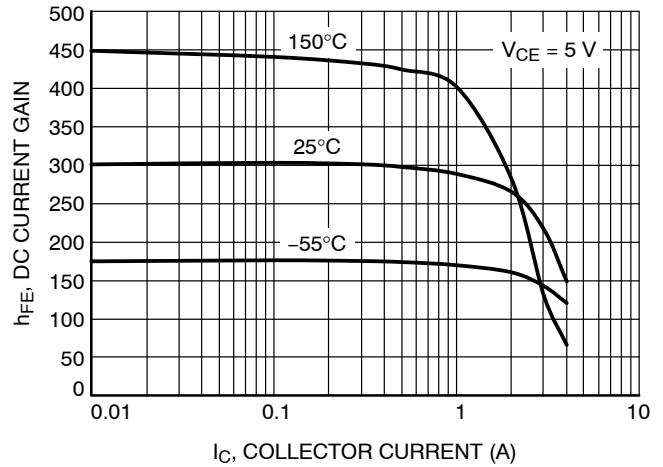


Figure 2. DC Current Gain

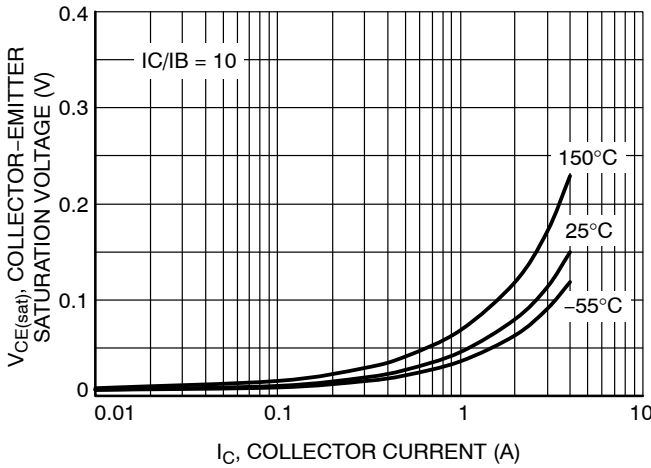


Figure 3. Collector-Emitter Saturation Voltage

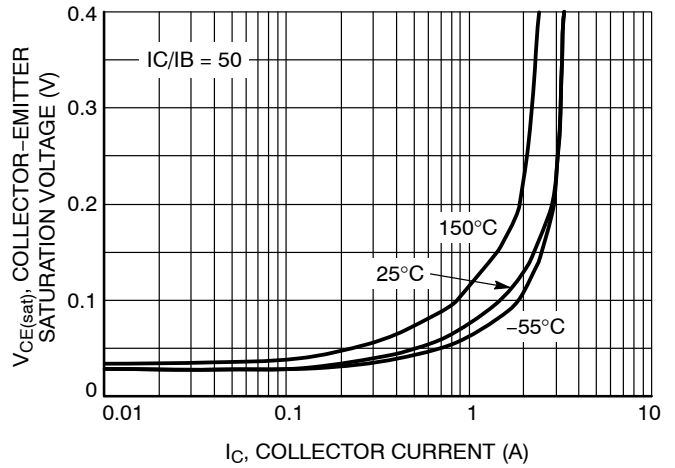


Figure 4. Collector-Emitter Saturation Voltage

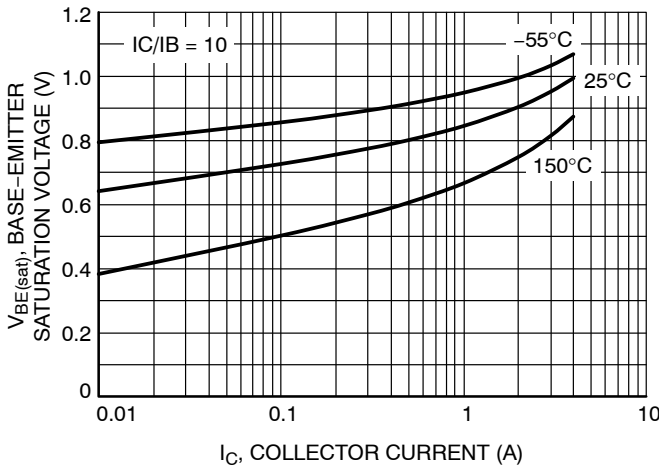


Figure 5. Base-Emitter Saturation Voltage

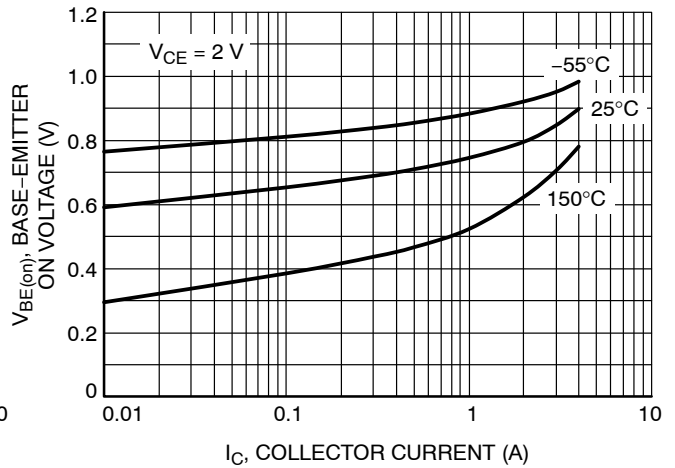


Figure 6. Base-Emitter "On" Voltage

TYPICAL CHARACTERISTICS

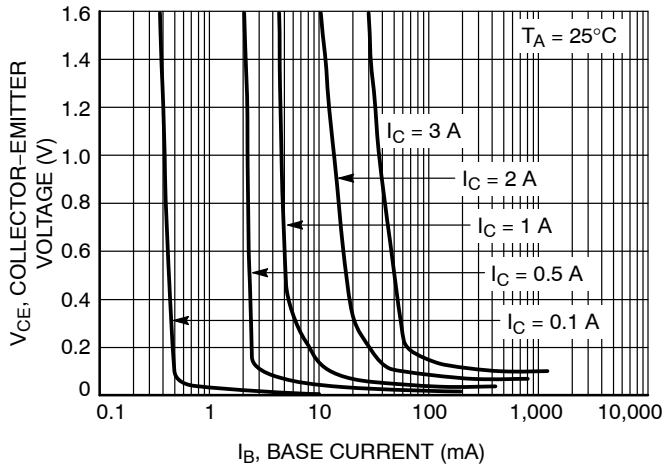


Figure 7. Collector Saturation Region

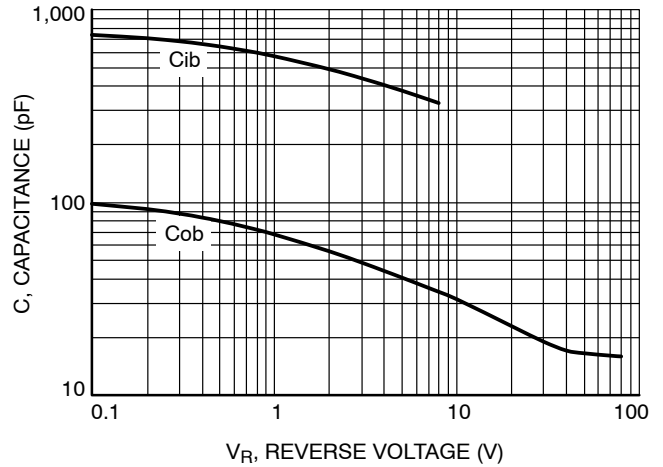


Figure 8. Capacitance

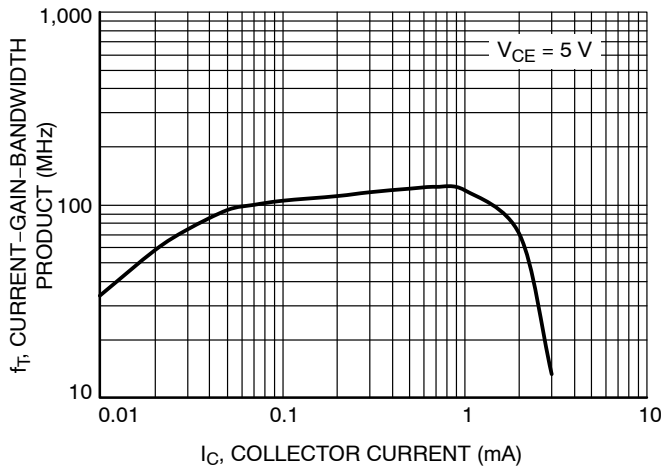


Figure 9. Current-Gain-Bandwidth Product

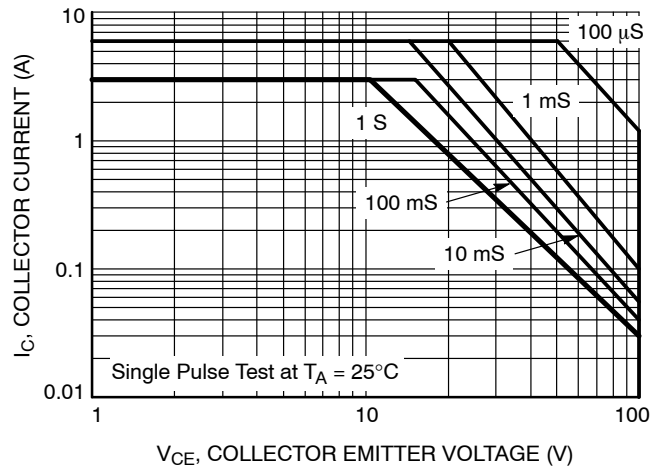


Figure 10. Safe Operating Area

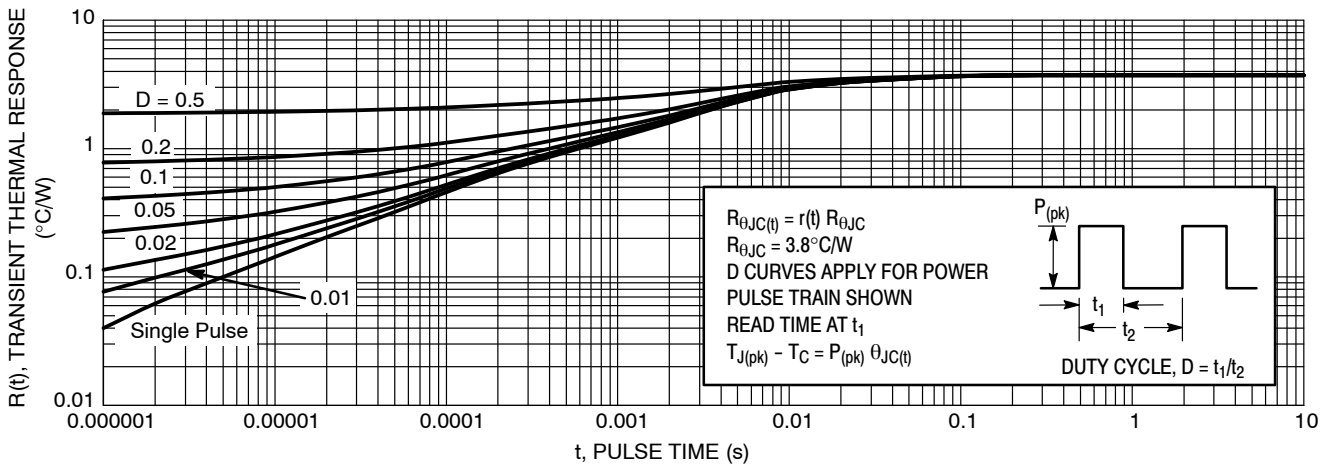
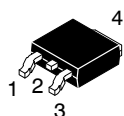


Figure 11. Typical Transient Thermal Response, Junction-to-Case

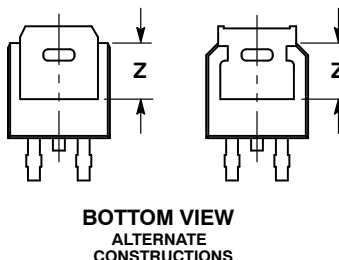
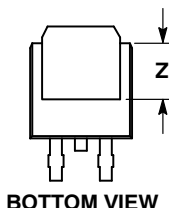
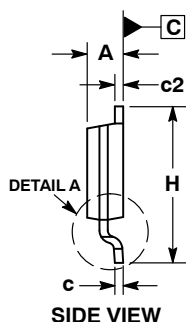
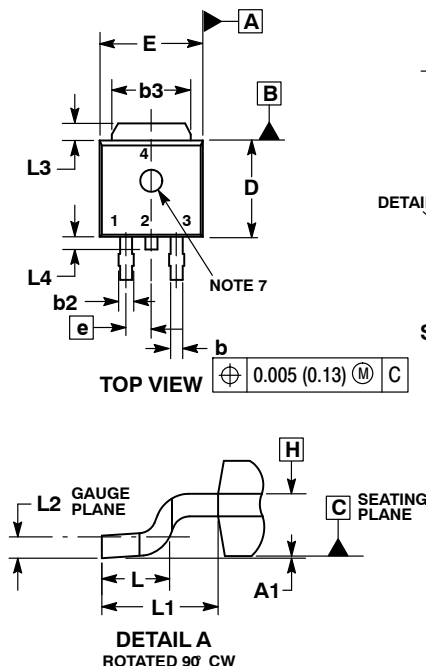
# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1

## DPAK (SINGLE GAUGE) CASE 369C ISSUE F

DATE 21 JUL 2015

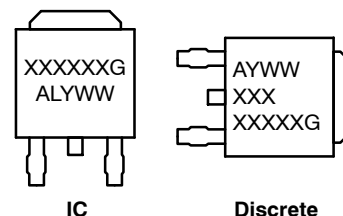


### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.
7. OPTIONAL MOLD FEATURE.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.086  | 0.094 | 2.18        | 2.38  |
| A1  | 0.000  | 0.005 | 0.00        | 0.13  |
| b   | 0.025  | 0.035 | 0.63        | 0.89  |
| b2  | 0.028  | 0.045 | 0.72        | 1.14  |
| b3  | 0.180  | 0.215 | 4.57        | 5.46  |
| c   | 0.018  | 0.024 | 0.46        | 0.61  |
| c2  | 0.018  | 0.024 | 0.46        | 0.61  |
| D   | 0.235  | 0.245 | 5.97        | 6.22  |
| E   | 0.250  | 0.265 | 6.35        | 6.73  |
| e   | 0.090  | BSC   | 2.29        | BSC   |
| H   | 0.370  | 0.410 | 9.40        | 10.41 |
| L   | 0.055  | 0.070 | 1.40        | 1.78  |
| L1  | 0.114  | REF   | 2.90        | REF   |
| L2  | 0.020  | BSC   | 0.51        | BSC   |
| L3  | 0.035  | 0.050 | 0.89        | 1.27  |
| L4  | ---    | 0.040 | ---         | 1.01  |
| Z   | 0.155  | ---   | 3.93        | ---   |

## GENERIC MARKING DIAGRAM\*

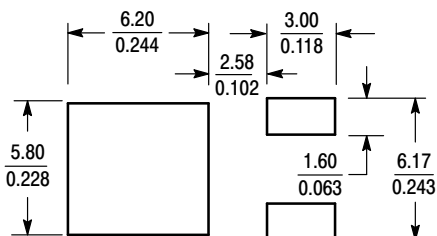


XXXXXX = Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
WW = Work Week  
G = Pb-Free Package

\*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. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 2:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN
- STYLE 3:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE
- STYLE 4:  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE
- STYLE 5:  
PIN 1. GATE  
2. ANODE  
3. CATHODE  
4. ANODE
- STYLE 6:  
PIN 1. MT1  
2. MT2  
3. GATE  
4. MT2
- STYLE 7:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR
- STYLE 8:  
PIN 1. N/C  
2. CATHODE  
3. ANODE  
4. CATHODE
- STYLE 9:  
PIN 1. ANODE  
2. CATHODE  
3. RESISTOR ADJUST  
4. CATHODE
- STYLE 10:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. ANODE

## SOLDERING FOOTPRINT\*



SCALE 3:1 (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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