

# 100 V, 2.0 A, Low $V_{CE(sat)}$ NPN Transistor NSS1C201MZ4, NSV1C201MZ4

onsemi's e<sup>2</sup>PowerEdge family of low  $V_{CE(sat)}$  transistors are miniature 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

- 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, Halogen Free and are RoHS Compliant

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

| Rating                         | Symbol    | Max | Unit |
|--------------------------------|-----------|-----|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | 100 | Vdc  |
| Collector-Base Voltage         | $V_{CBO}$ | 140 | Vdc  |
| Emitter-Base Voltage           | $V_{EBO}$ | 7.0 | Vdc  |
| Collector Current – Continuous | $I_C$     | 2.0 | A    |
| Collector Current – Peak       | $I_{CM}$  | 3.0 | A    |

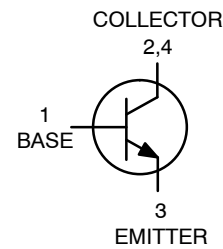
## THERMAL CHARACTERISTICS

| Characteristic                                                                          | Symbol                           | Max            | Unit                       |
|-----------------------------------------------------------------------------------------|----------------------------------|----------------|----------------------------|
| Total Device Dissipation<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$ (Note 1)                   | 800<br>6.5     | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient                                              | $R_{\theta JA}$ (Note 1)         | 155            | $^\circ\text{C}/\text{W}$  |
| Total Device Dissipation<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$ (Note 2)                   | 2.0<br>15.6    | W<br>mW/ $^\circ\text{C}$  |
| Thermal Resistance,<br>Junction-to-Ambient                                              | $R_{\theta JA}$ (Note 2)         | 64             | $^\circ\text{C}/\text{W}$  |
| Total Device Dissipation<br>(Single Pulse < 10 sec.)                                    | $P_{D\text{single}}$<br>(Note 3) | 710            | mW                         |
| Junction and Storage<br>Temperature Range                                               | $T_J, T_{stg}$                   | -55 to<br>+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. FR-4 @ 7.6 mm<sup>2</sup>, 1 oz. copper traces.
2. FR-4 @ 645 mm<sup>2</sup>, 1 oz. copper traces.
3. Thermal response.

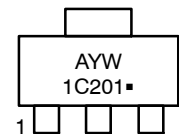
# 100 VOLTS, 2.0 AMPS NPN LOW $V_{CE(sat)}$ TRANSISTOR



## MARKING DIAGRAM

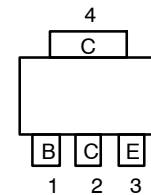


SOT-223  
CASE 318E  
STYLE 1



A = Assembly Location  
Y = Year  
W = Work Week  
1C201 = Specific Device Code  
▪ = Pb-Free Package

## PIN ASSIGNMENT



Top View Pinout

## ORDERING INFORMATION

| Device                           | Package              | Shipping <sup>†</sup> |
|----------------------------------|----------------------|-----------------------|
| NSS1C201MZ4T1G<br>NSV1C201MZ4T1G | SOT-223<br>(Pb-Free) | 1000/<br>Tape & Reel  |
| NSS1C201MZ4T3G                   | SOT-223<br>(Pb-Free) | 4000/<br>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 Specification Brochure, BRD8011/D.

# NSS1C201MZ4, NSV1C201MZ4

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

| Characteristic                                                               | Symbol        | Min | Typ | Max | Unit |
|------------------------------------------------------------------------------|---------------|-----|-----|-----|------|
| <b>OFF CHARACTERISTICS</b>                                                   |               |     |     |     |      |
| Collector – Emitter Breakdown Voltage ( $I_C = 10\text{ mAdc}$ , $I_B = 0$ ) | $V_{(BR)CEO}$ | 100 |     |     | Vdc  |
| Collector – Base Breakdown Voltage ( $I_C = 0.1\text{ mAdc}$ , $I_E = 0$ )   | $V_{(BR)CBO}$ | 140 |     |     | Vdc  |
| Emitter – Base Breakdown Voltage ( $I_E = 0.1\text{ mAdc}$ , $I_C = 0$ )     | $V_{(BR)EBO}$ | 7.0 |     |     | Vdc  |
| Collector Cutoff Current ( $V_{CB} = 140\text{ Vdc}$ , $I_E = 0$ )           | $I_{CBO}$     |     |     | 100 | nA   |
| Emitter Cutoff Current ( $V_{EB} = 6.0\text{ Vdc}$ )                         | $I_{EBO}$     |     |     | 50  | nA   |

## ON CHARACTERISTICS

|                                                                                                                                                                                                                                                                     |               |                        |     |                                  |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------------|-----|----------------------------------|-----|
| DC Current Gain (Note 4)<br>( $I_C = 10\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 500\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 2.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )                   | $h_{FE}$      | 150<br>120<br>80<br>40 |     | 360                              |     |
| Collector – Emitter Saturation Voltage (Note 4)<br>( $I_C = 0.1\text{ A}$ , $I_B = 0.010\text{ A}$ )<br>( $I_C = 0.5\text{ A}$ , $I_B = 0.050\text{ A}$ )<br>( $I_C = 1.0\text{ A}$ , $I_B = 0.100\text{ A}$ )<br>( $I_C = 2.0\text{ A}$ , $I_B = 0.200\text{ A}$ ) | $V_{CE(sat)}$ |                        |     | 0.030<br>0.060<br>0.100<br>0.180 | V   |
| Base – Emitter Saturation Voltage (Note 4)<br>( $I_C = 1.0\text{ A}$ , $I_B = 0.100\text{ A}$ )                                                                                                                                                                     | $V_{BE(sat)}$ |                        |     | 1.10                             | V   |
| Base – Emitter Turn-on Voltage (Note 4) ( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )                                                                                                                                                                          | $V_{BE(on)}$  |                        |     | 0.850                            | V   |
| Cutoff Frequency ( $I_C = 100\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ , $f = 100\text{ MHz}$ )                                                                                                                                                                         | $f_T$         |                        | 100 |                                  | MHz |
| Input Capacitance ( $V_{EB} = 0.5\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                                                                | $C_{ibo}$     |                        | 305 |                                  | pF  |
| Output Capacitance ( $V_{CB} = 3.0\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                                                               | $C_{obo}$     |                        | 22  |                                  | 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.

4. Pulsed Condition: Pulse Width = 300 msec, Duty Cycle  $\leq 2\%$ .

## TYPICAL CHARACTERISTICS

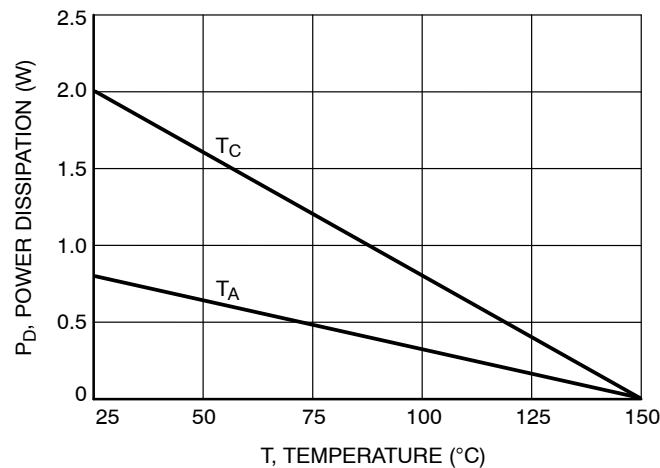


Figure 1. Power Derating

TYPICAL CHARACTERISTICS

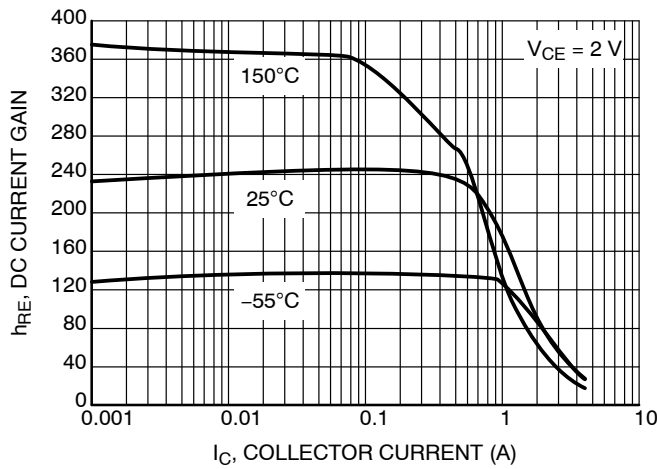


Figure 2. DC Current Gain

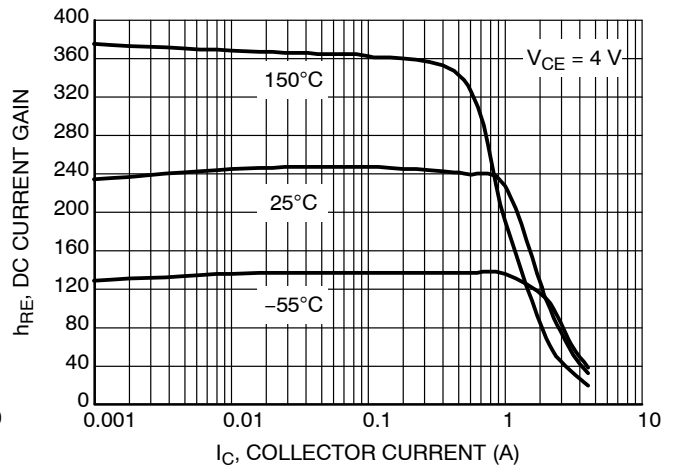


Figure 3. DC Current Gain

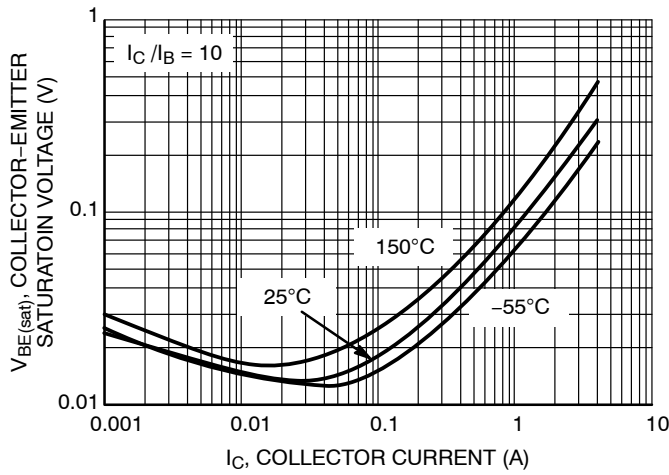


Figure 4. Collector-Emitter Saturation Voltage

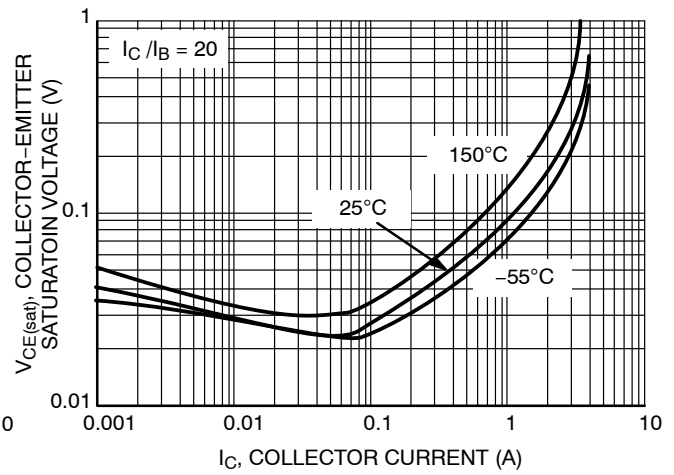


Figure 5. Collector-Emitter Saturation Voltage

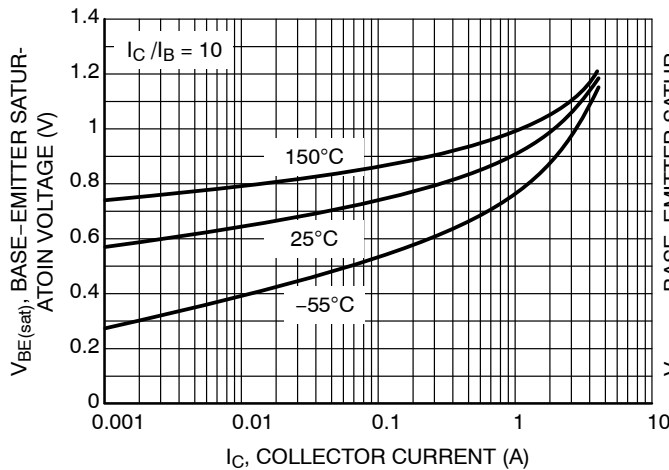


Figure 6. Base-Emitter Saturation Voltage

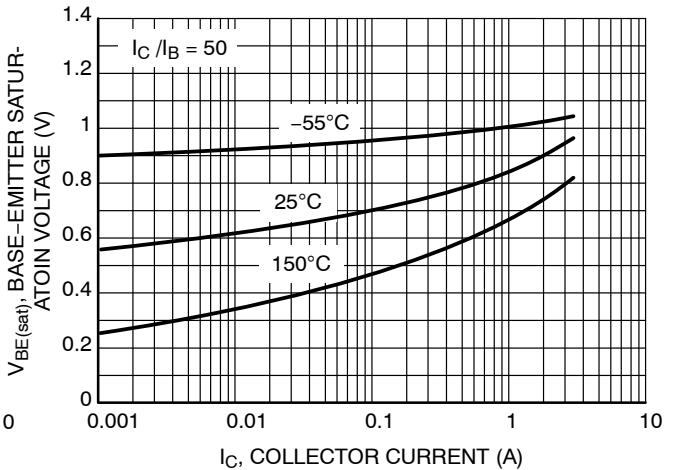
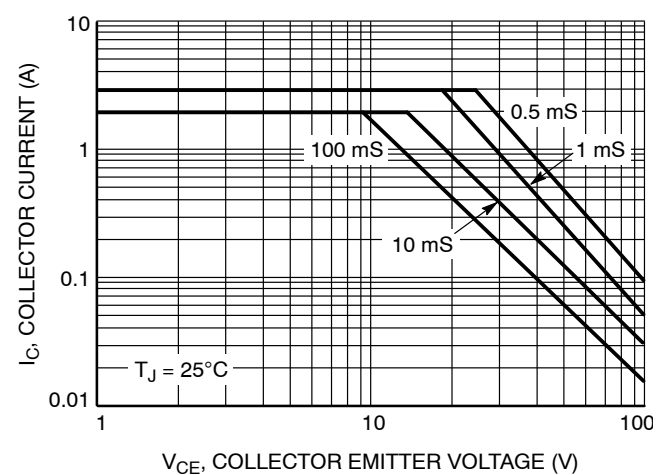
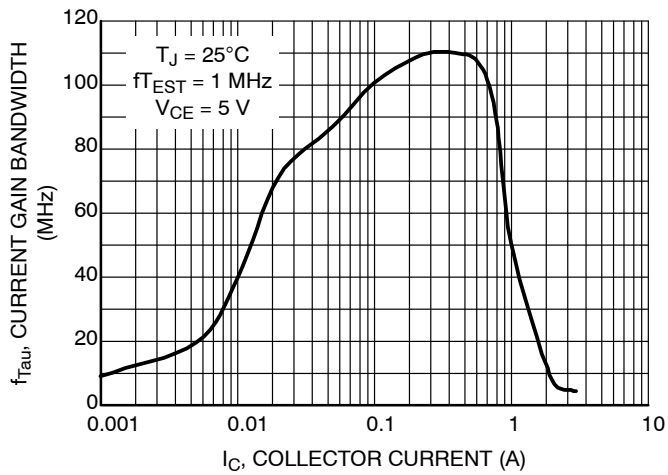
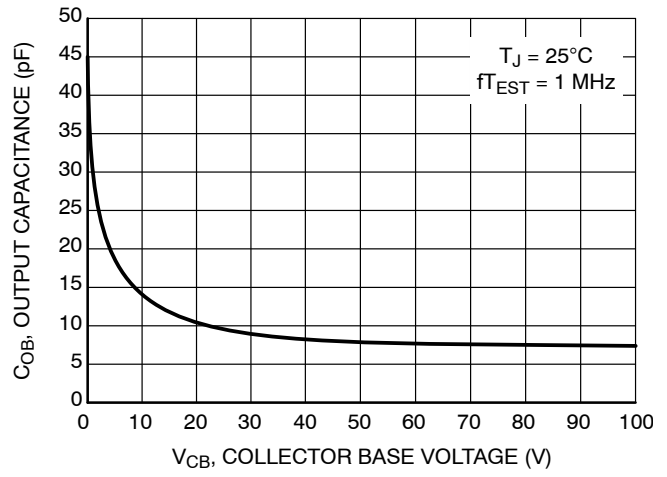
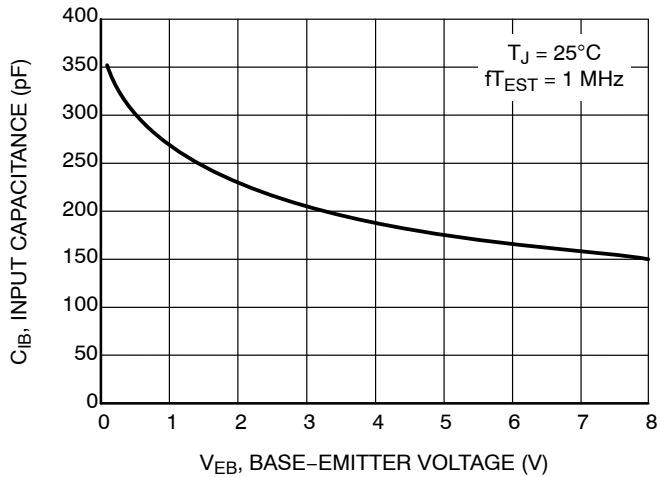
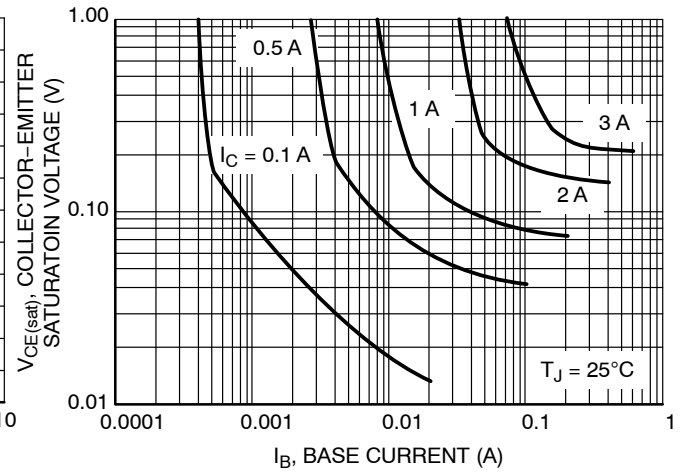
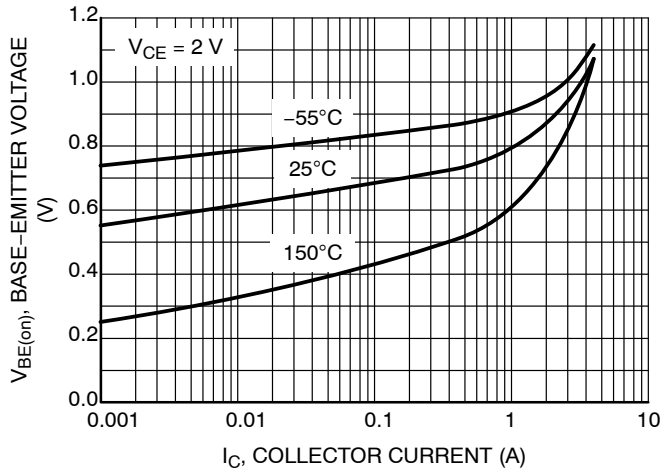


Figure 7. Base-Emitter Saturation Voltage

TYPICAL CHARACTERISTICS





SCALE 1:1

SOT-223 (TO-261)  
CASE 318E-04  
ISSUE R

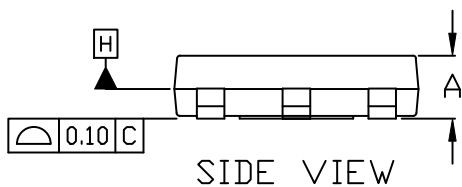
DATE 02 OCT 2018



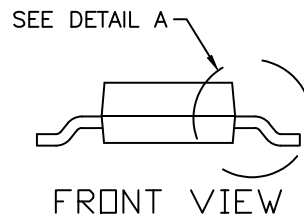
TOP VIEW



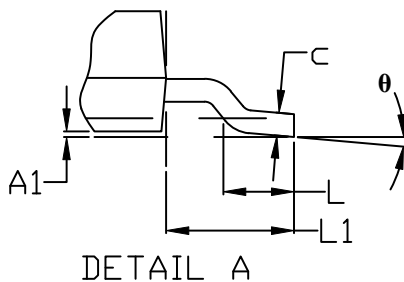
NOTE 5



SIDE VIEW



FRONT VIEW

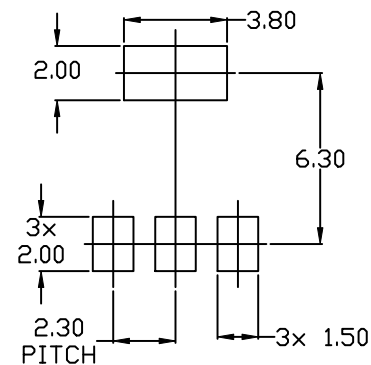


DETAIL A

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.200MM PER SIDE.
4. DATUMS A AND B ARE DETERMINED AT DATUM H.
5. A1 IS DEFINED AS THE VERTICAL DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT OF THE PACKAGE BODY.
6. POSITIONAL TOLERANCE APPLIES TO DIMENSIONS b AND b1.

| MILLIMETERS |          |      |      |
|-------------|----------|------|------|
| DIM         | MIN.     | NOM. | MAX. |
| A           | 1.50     | 1.63 | 1.75 |
| A1          | 0.02     | 0.06 | 0.10 |
| b           | 0.60     | 0.75 | 0.89 |
| b1          | 2.90     | 3.06 | 3.20 |
| c           | 0.24     | 0.29 | 0.35 |
| D           | 6.30     | 6.50 | 6.70 |
| E           | 3.30     | 3.50 | 3.70 |
| e           | 2.30 BSC |      |      |
| L           | 0.20     | ---  | ---  |
| L1          | 1.50     | 1.75 | 2.00 |
| He          | 6.70     | 7.00 | 7.30 |
| θ           | 0°       | ---  | 10°  |



RECOMMENDED MOUNTING  
FOOTPRINT

|                  |                  |                                                                                                                                                                                     |
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**SOT-223 (TO-261)**  
**CASE 318E-04**  
**ISSUE R**

DATE 02 OCT 2018

|                                                                              |                                                                             |                                                                               |                                                                       |                                                                       |
|------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------------|
| <b>STYLE 1:</b><br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 2:</b><br>PIN 1. ANODE<br>2. CATHODE<br>3. NC<br>4. CATHODE        | <b>STYLE 3:</b><br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN           | <b>STYLE 4:</b><br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE<br>4. DRAIN   | <b>STYLE 5:</b><br>PIN 1. DRAIN<br>2. GATE<br>3. SOURCE<br>4. GATE    |
| <b>STYLE 6:</b><br>PIN 1. RETURN<br>2. INPUT<br>3. OUTPUT<br>4. INPUT        | <b>STYLE 7:</b><br>PIN 1. ANODE 1<br>2. CATHODE<br>3. ANODE 2<br>4. CATHODE | <b>STYLE 8:</b><br>CANCELLED                                                  | <b>STYLE 9:</b><br>PIN 1. INPUT<br>2. GROUND<br>3. LOGIC<br>4. GROUND | <b>STYLE 10:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE<br>4. ANODE |
| <b>STYLE 11:</b><br>PIN 1. MT 1<br>2. MT 2<br>3. GATE<br>4. MT 2             | <b>STYLE 12:</b><br>PIN 1. INPUT<br>2. OUTPUT<br>3. NC<br>4. OUTPUT         | <b>STYLE 13:</b><br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR |                                                                       |                                                                       |

**GENERIC  
MARKING DIAGRAM\***



A = Assembly Location  
 Y = Year  
 W = Work Week  
 XXXXX = Specific Device Code  
 ▪ = Pb-Free Package

(Note: Microdot may be in either location)  
 \*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.

|                         |                         |                                                                                                                                                                                     |
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