

# NSB9435T1G, NSV9435T1G

## High Current Bias Resistor Transistor

### PNP Silicon

#### Features

- Collector–Emitter Sustaining Voltage –  
 $V_{CEO(sus)} = 30 \text{ Vdc (Min) @ } I_C = 10 \text{ mAdc}$
- High DC Current Gain –  
 $h_{FE} = 125 \text{ (Min) @ } I_C = 0.8 \text{ Adc}$   
 $= 90 \text{ (Min) @ } I_C = 3.0 \text{ Adc}$
- Low Collector–Emitter Saturation Voltage –  
 $V_{CE(sat)} = 0.275 \text{ Vdc (Max) @ } I_C = 1.2 \text{ Adc}$   
 $= 0.55 \text{ Vdc (Max) @ } I_C = 3.0 \text{ Adc}$
- SOT–223 Surface Mount Packaging
- ESD Rating – Human Body Model: Class 1B  
– Machine Model: Class B
- AEC–Q101 Qualified and PPAP Capable
- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant\*

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

| Rating                                                                                                                                                                                                                                                                                                                         | Symbol         | Value                         | Unit                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------|-----------------------------------------|
| Collector–Emitter Voltage                                                                                                                                                                                                                                                                                                      | $V_{CEO}$      | 30                            | Vdc                                     |
| Collector–Base Voltage                                                                                                                                                                                                                                                                                                         | $V_{CB}$       | 45                            | Vdc                                     |
| Emitter–Base Voltage                                                                                                                                                                                                                                                                                                           | $V_{EB}$       | $\pm 6.0$                     | Vdc                                     |
| Base Current – Continuous                                                                                                                                                                                                                                                                                                      | $I_B$          | 1.0                           | Adc                                     |
| Collector Current<br>Continuous<br>Peak                                                                                                                                                                                                                                                                                        | $I_C$          | 3.0<br>5.0                    | Adc                                     |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$<br>Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 1" sq.<br>(645 sq. mm) Collector pad on FR–4 bd<br>material<br>Total $P_D$ @ $T_A = 25^\circ\text{C}$ mounted on 0.012"<br>sq. (7.6 sq. mm) Collector pad on FR–4 bd<br>material | $P_D$          | 3.0<br>24<br>1.56<br><br>0.72 | W<br>mW/ $^\circ\text{C}$<br>W<br><br>W |
| Operating and Storage Junction<br>Temperature Range                                                                                                                                                                                                                                                                            | $T_J, T_{stg}$ | –55 to<br>+150                | $^\circ\text{C}$                        |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

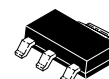
\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



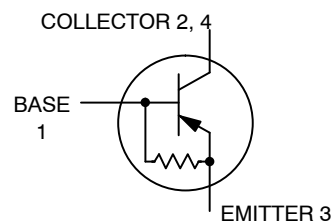
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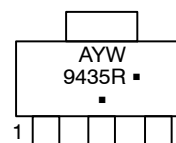
**POWER BJT**  
 **$I_C = 3.0 \text{ AMPERES}$**   
 **$BV_{CEO} = 30 \text{ VOLTS}$**   
 **$V_{CE(sat)} = 0.275 \text{ VOLTS}$**



**SOT–223**  
**CASE 318E**  
**STYLE 1**



#### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
9435R = Device Code  
▪ = Pb–Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device     | Package              | Shipping†         |
|------------|----------------------|-------------------|
| NSB9435T1G | SOT–223<br>(Pb–Free) | 1,000/Tape & Reel |
| NSV9435T1G | SOT–223<br>(Pb–Free) | 1,000/Tape & Reel |

†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.

# NSB9435T1G, NSV9435T1G

## THERMAL CHARACTERISTICS

| Characteristic                                                                                                                                                                                                   | Symbol                                                | Value           | Unit                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-----------------|----------------------|
| Thermal Resistance<br>Junction-to-Case<br>Junction-to-Ambient on 1" sq. (645 sq. mm) Collector pad on FR-4 board material<br>Junction-to-Ambient on 0.012" sq. (7.6 sq. mm) Collector pad on FR-4 board material | $R_{\theta JC}$<br>$R_{\theta JA}$<br>$R_{\theta JA}$ | 42<br>80<br>174 | $^{\circ}\text{C/W}$ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 5 s                                                                                                                                          | $T_L$                                                 | 260             | $^{\circ}\text{C}$   |

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

| Characteristics | Symbol | Min | Typ | Max | Unit |
|-----------------|--------|-----|-----|-----|------|
|-----------------|--------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                                          |               |        |        |           |                 |
|--------------------------------------------------------------------------------------------------------------------------|---------------|--------|--------|-----------|-----------------|
| Collector-Emitter Sustaining Voltage<br>( $I_C = 10 \text{ mAdc}$ , $I_B = 0 \text{ Adc}$ )                              | $V_{CE(sus)}$ | 30     | –      | –         | Vdc             |
| Emitter-Base Voltage<br>( $I_E = 50 \mu\text{Adc}$ , $I_C = 0 \text{ Adc}$ )                                             | $V_{EBO}$     | 6.0    | –      | –         | Vdc             |
| Collector Cutoff Current<br>( $V_{CE} = 25 \text{ Vdc}$ )<br>( $V_{CE} = 25 \text{ Vdc}$ , $T_J = 125^{\circ}\text{C}$ ) | $I_{CER}$     | –<br>– | –<br>– | 20<br>200 | $\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{BE} = 5.0 \text{ Vdc}$ )                                                                 | $I_{EBO}$     | –      | –      | 700       | $\mu\text{Adc}$ |

### ON CHARACTERISTICS (Note 1)

|                                                                                                                                                                                                                 |               |                  |                 |                         |            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|-----------------|-------------------------|------------|
| Collector-Emitter Saturation Voltage<br>( $I_C = 0.8 \text{ Adc}$ , $I_B = 20 \text{ mAdc}$ )<br>( $I_C = 1.2 \text{ Adc}$ , $I_B = 20 \text{ mAdc}$ )<br>( $I_C = 3.0 \text{ Adc}$ , $I_B = 0.3 \text{ Adc}$ ) | $V_{CE(sat)}$ | –<br>–<br>–      | 0.155<br>–<br>– | 0.210<br>0.275<br>0.550 | Vdc        |
| Base-Emitter Saturation Voltage<br>( $I_C = 3.0 \text{ Adc}$ , $I_B = 0.3 \text{ Adc}$ )                                                                                                                        | $V_{BE(sat)}$ | –                | –               | 1.25                    | Vdc        |
| Base-Emitter On Voltage<br>( $I_C = 1.2 \text{ Adc}$ , $V_{CE} = 4.0 \text{ Vdc}$ )                                                                                                                             | $V_{BE(on)}$  | –                | –               | 1.10                    | Vdc        |
| DC Current Gain<br>( $I_C = 0.8 \text{ Adc}$ , $V_{CE} = 1.0 \text{ Vdc}$ )<br>( $I_C = 1.2 \text{ Adc}$ , $V_{CE} = 1.0 \text{ Vdc}$ )<br>( $I_C = 3.0 \text{ Adc}$ , $V_{CE} = 1.0 \text{ Vdc}$ )             | $h_{FE}$      | 125<br>110<br>90 | 220<br>–<br>–   | –<br>–<br>–             | –          |
| Resistor                                                                                                                                                                                                        | R1            | 7.5              | 10              | 12.5                    | k $\Omega$ |

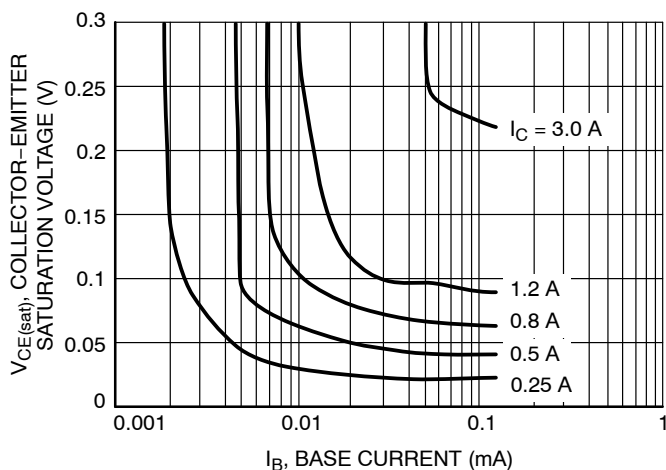
### DYNAMIC CHARACTERISTICS

|                                                                                                                                  |          |   |     |     |     |
|----------------------------------------------------------------------------------------------------------------------------------|----------|---|-----|-----|-----|
| Output Capacitance<br>( $V_{CB} = 10 \text{ Vdc}$ , $I_E = 0 \text{ Adc}$ , $f = 1.0 \text{ MHz}$ )                              | $C_{ob}$ | – | 100 | 150 | pF  |
| Input Capacitance<br>( $V_{EB} = 8.0 \text{ Vdc}$ )                                                                              | $C_{ib}$ | – | 135 | –   | pF  |
| Current-Gain – Bandwidth Product (Note 2)<br>( $I_C = 500 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ , $f_{test} = 1.0 \text{ MHz}$ ) | $f_T$    | – | 110 | –   | MHz |

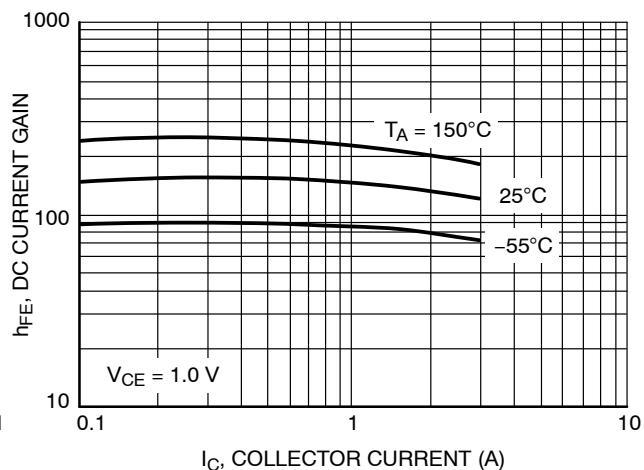
1. Pulse Test: Pulse Width  $\leq 300 \mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

2.  $f_T = |h_{FE}| \cdot f_{test}$

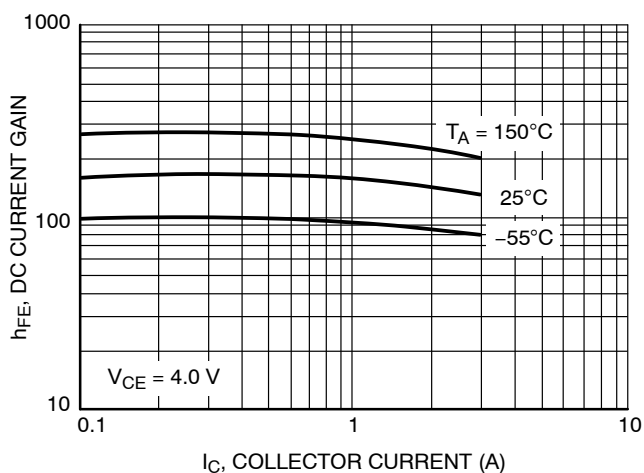
# NSB9435T1G, NSV9435T1G



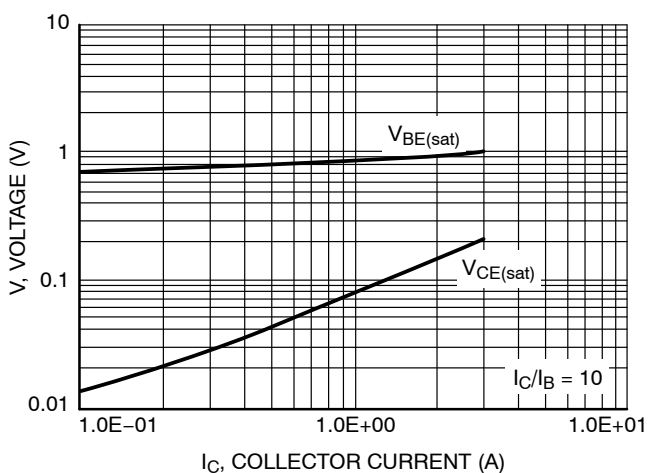
**Figure 1. Collector Saturation Region**



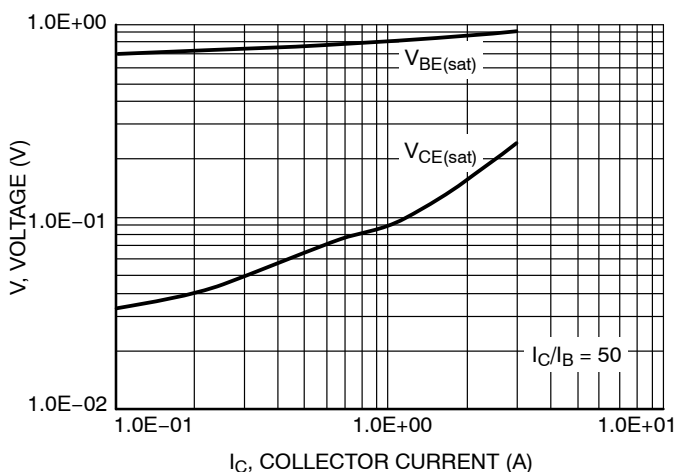
**Figure 2. DC Current Gain**



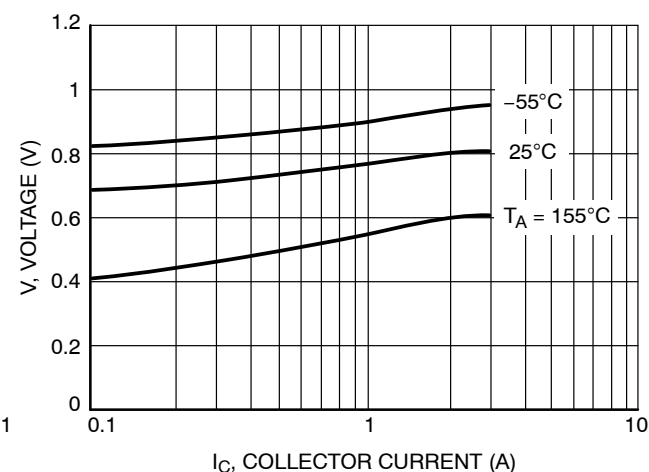
**Figure 3. DC Current Gain**



**Figure 4. "ON" Voltages**

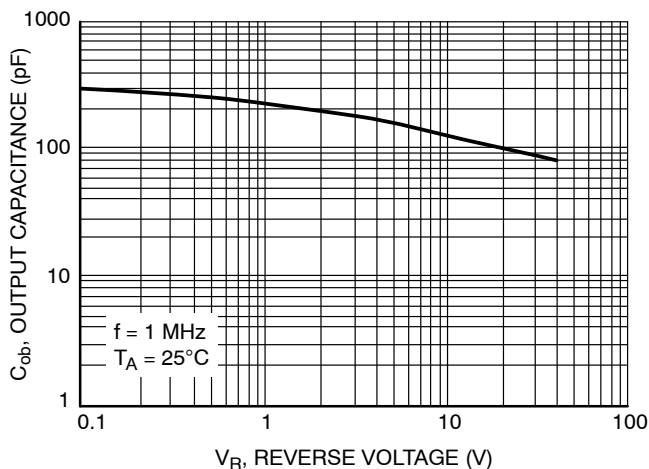


**Figure 5. "ON" Voltages**

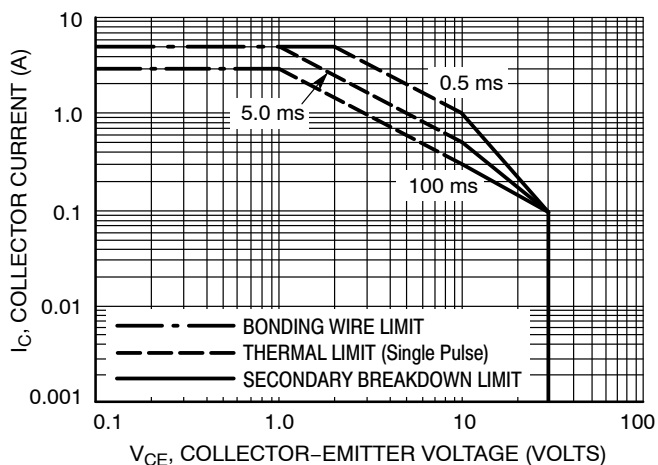


**Figure 6.  $V_{BE(on)}$  Voltage**

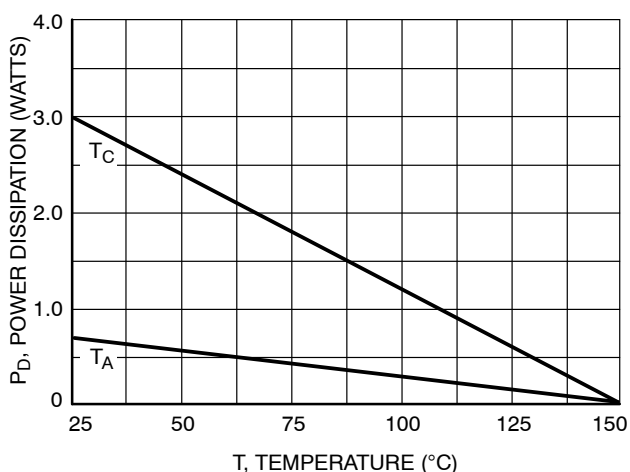
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**Figure 7. Output Capacitance**



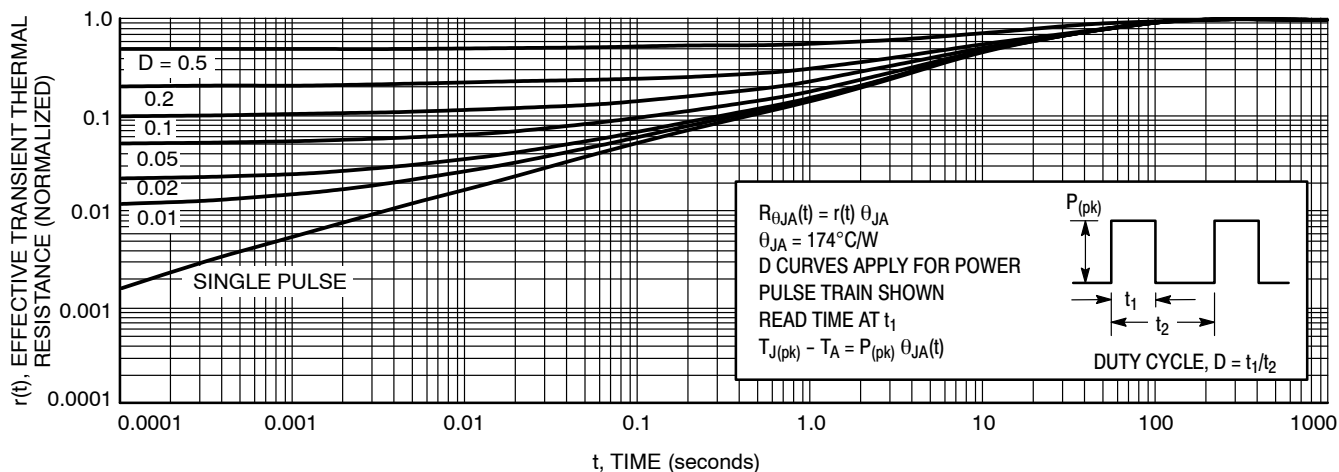
**Figure 8. Active Region Safe Operating Area**



**Figure 9. Power Derating**

There are two limitations on the power handling ability of a transistor: average junction temperature and secondary breakdown. Safe operating area curves indicate  $I_C - V_{CE}$  limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 8 is based on  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  is variable depending on conditions. Secondary breakdown pulse limits are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 10. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.



**Figure 10. Thermal Response**

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

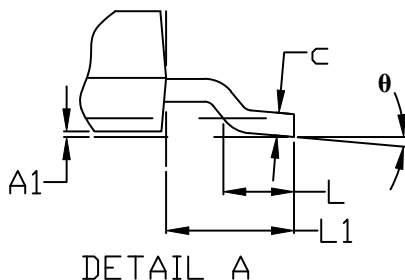
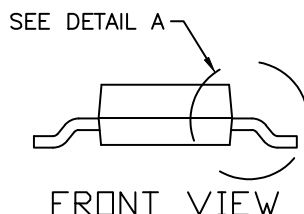
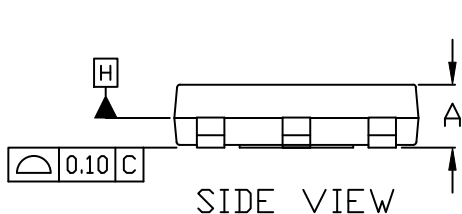
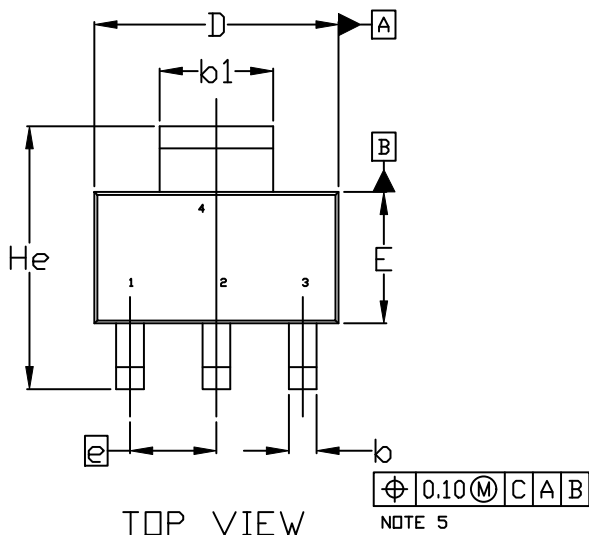
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SCALE 1:1

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

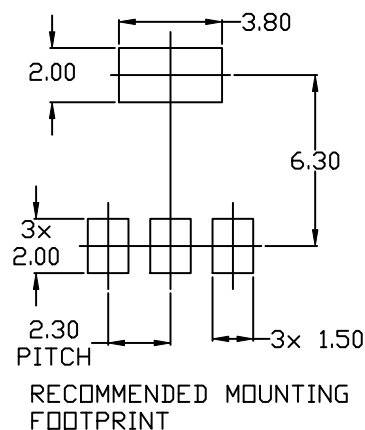
DATE 02 OCT 2018



## 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 |
| $\theta$    | 0°       | ---  | 10°  |



|                         |                         |                                                                                                                                                                                     |
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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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