

# NPN Silicon Epitaxial Transistor

## BCP56 Series

These NPN Silicon Epitaxial transistors are designed for use in audio amplifier applications. The device is housed in the SOT-223 package, which is designed for medium power surface mount applications.

### Features

- High Current: 1.0 A
- The SOT-223 package can be soldered using wave or reflow. The formed leads absorb thermal stress during soldering, eliminating the possibility of damage to the die
- Available in 12 mm Tape and Reel  
Use BCP56T1G to Order the 7 inch/1000 Unit Reel  
Use BCP56T3G to Order the 13 inch/4000 Unit Reel
- PNP Complement is BCP53T1G
- S and 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/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS (T<sub>C</sub> = 25°C unless otherwise noted)

| Rating                                                                           | Symbol                            | Value      | Unit       |
|----------------------------------------------------------------------------------|-----------------------------------|------------|------------|
| Collector-Emitter Voltage                                                        | V <sub>CEO</sub>                  | 80         | Vdc        |
| Collector-Base Voltage                                                           | V <sub>CBO</sub>                  | 100        | Vdc        |
| Emitter-Base Voltage                                                             | V <sub>EBO</sub>                  | 5          | Vdc        |
| Collector Current                                                                | I <sub>C</sub>                    | 1          | Adc        |
| Collector Current – Peak (Note 1)                                                | I <sub>CM</sub>                   | 2          | Adc        |
| Total Power Dissipation<br>@ T <sub>A</sub> = 25°C (Note 2)<br>Derate above 25°C | P <sub>D</sub>                    | 1.5<br>12  | W<br>mW/°C |
| Operating and Storage<br>Temperature Range                                       | T <sub>J</sub> , T <sub>stg</sub> | –65 to 150 | °C         |

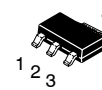
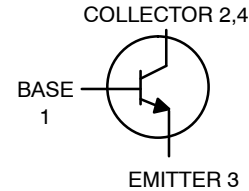
### THERMAL CHARACTERISTICS

| Characteristic                                                       | Symbol           | Max       | Unit      |
|----------------------------------------------------------------------|------------------|-----------|-----------|
| Thermal Resistance,<br>Junction-to-Ambient<br>(surface mounted)      | R <sub>θJA</sub> | 83.3      | °C/W      |
| Maximum Temperature for<br>Soldering Purposes<br>Time in Solder Bath | T <sub>L</sub>   | 260<br>10 | °C<br>Sec |

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.

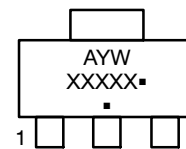
1. Reference SOA curve.
2. Device mounted on a FR-4 glass epoxy printed circuit board 1.575 in x 1.575 in x 0.0625 in; mounting pad for the collector lead = 0.93 sq in.

## MEDIUM POWER NPN SILICON HIGH CURRENT TRANSISTOR SURFACE MOUNT



SOT-223  
CASE 318E  
STYLE 1

### MARKING DIAGRAM



XXXXX = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 5.

## BCP56 Series

### ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted)

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

#### OFF CHARACTERISTICS

|                                                                                        |                      |     |   |     |      |
|----------------------------------------------------------------------------------------|----------------------|-----|---|-----|------|
| Collector–Base Breakdown Voltage<br>(I <sub>C</sub> = 100 µAdc, I <sub>E</sub> = 0)    | V <sub>(BR)CBO</sub> | 100 | – | –   | Vdc  |
| Collector–Emitter Breakdown Voltage<br>(I <sub>C</sub> = 1.0 mAdc, I <sub>B</sub> = 0) | V <sub>(BR)CEO</sub> | 80  | – | –   | Vdc  |
| Emitter–Base Breakdown Voltage<br>(I <sub>E</sub> = 10 µAdc, I <sub>C</sub> = 0)       | V <sub>(BR)EBO</sub> | 5.0 | – | –   | Vdc  |
| Collector–Base Cutoff Current<br>(V <sub>CB</sub> = 30 Vdc, I <sub>E</sub> = 0)        | I <sub>CBO</sub>     | –   | – | 100 | nAdc |
| Emitter–Base Cutoff Current<br>(V <sub>EB</sub> = 5.0 Vdc, I <sub>C</sub> = 0)         | I <sub>EBO</sub>     | –   | – | 10  | µAdc |

#### ON CHARACTERISTICS (Note 3)

|                                                                                                                                                                                       |                                                              |                      |                             |                       |                             |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------|-----------------------------|-----------------------|-----------------------------|-----|
| DC Current Gain<br>(I <sub>C</sub> = 5.0 mA, V <sub>CE</sub> = 2.0 V)<br>(I <sub>C</sub> = 150 mA, V <sub>CE</sub> = 2.0 V)<br><br>(I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 2.0 V) | All Part Types<br>BCP56<br>BCP56–10<br>BCP56–16<br>All Types | h <sub>FE</sub>      | 25<br>40<br>63<br>100<br>25 | –<br>–<br>–<br>–<br>– | –<br>250<br>160<br>250<br>– | –   |
| Collector–Emitter Saturation Voltage<br>(I <sub>C</sub> = 500 mAdc, I <sub>B</sub> = 50 mAdc)                                                                                         |                                                              | V <sub>CE(sat)</sub> | –                           | –                     | 0.5                         | Vdc |
| Base–Emitter On Voltage<br>(I <sub>C</sub> = 500 mAdc, V <sub>CE</sub> = 2.0 Vdc)                                                                                                     |                                                              | V <sub>BE(on)</sub>  | –                           | –                     | 1.0                         | Vdc |

#### SWITCHING CHARACTERISTICS

|                                                                                                                       |                |   |     |   |    |
|-----------------------------------------------------------------------------------------------------------------------|----------------|---|-----|---|----|
| Rise Time<br>(V <sub>CC</sub> = 30 Vdc, I <sub>C</sub> = 150 mA, I <sub>B1</sub> = 15 mA)                             | t <sub>r</sub> | – | 14  | – | ns |
| Delay Time<br>(V <sub>CC</sub> = 30 Vdc, I <sub>C</sub> = 150 mA, I <sub>B1</sub> = 15 mA)                            | t <sub>d</sub> | – | 9   | – | ns |
| Storage Time<br>(V <sub>CC</sub> = 30 Vdc, I <sub>C</sub> = 150 mA, I <sub>B1</sub> = 15 mA, I <sub>B2</sub> = 15 mA) | t <sub>s</sub> | – | 714 | – | ns |
| Fall Time<br>(V <sub>CC</sub> = 30 Vdc, I <sub>C</sub> = 150 mA, I <sub>B1</sub> = 15 mA, I <sub>B2</sub> = 15 mA)    | t <sub>f</sub> | – | 58  | – | ns |

#### DYNAMIC CHARACTERISTICS

|                                                                                                       |                |   |     |   |     |
|-------------------------------------------------------------------------------------------------------|----------------|---|-----|---|-----|
| Current–Gain – Bandwidth Product<br>(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 5.0 Vdc, f = 35 MHz) | f <sub>T</sub> | – | 130 | – | MHz |
|-------------------------------------------------------------------------------------------------------|----------------|---|-----|---|-----|

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. Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

# BCP56 Series

## TYPICAL ELECTRICAL CHARACTERISTICS

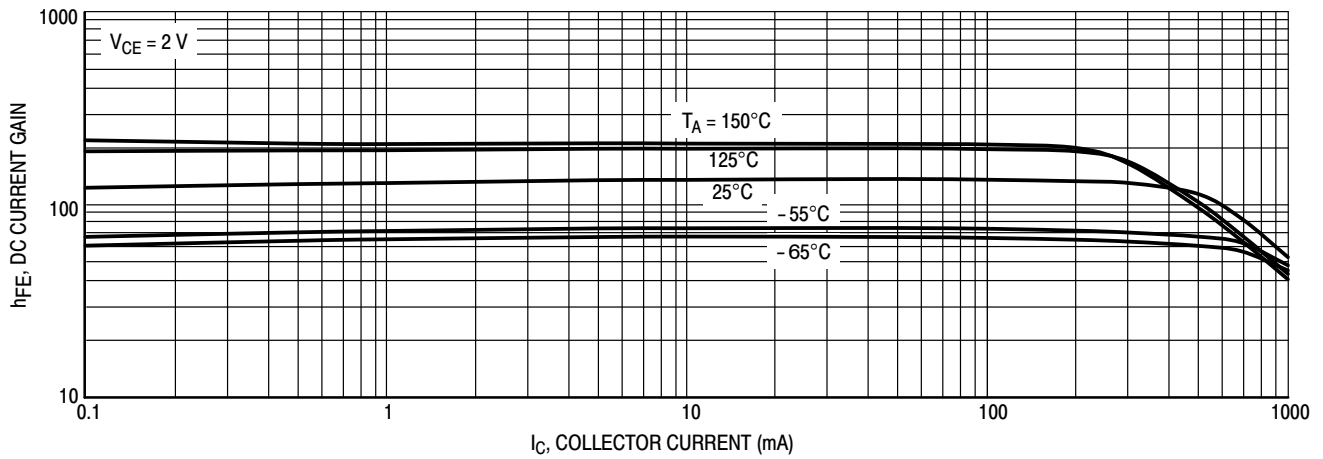


Figure 1. DC Current Gain

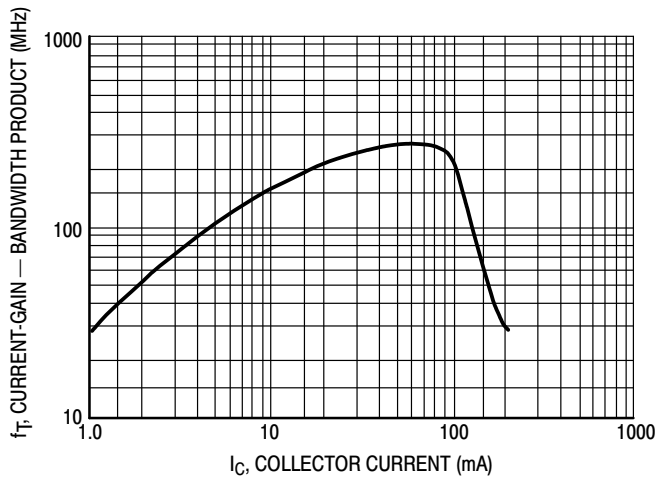


Figure 2. Current-Gain - Bandwidth Product

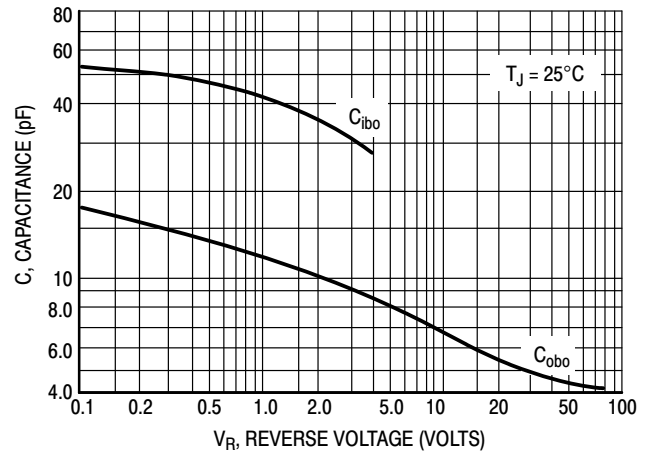


Figure 3. Capacitance

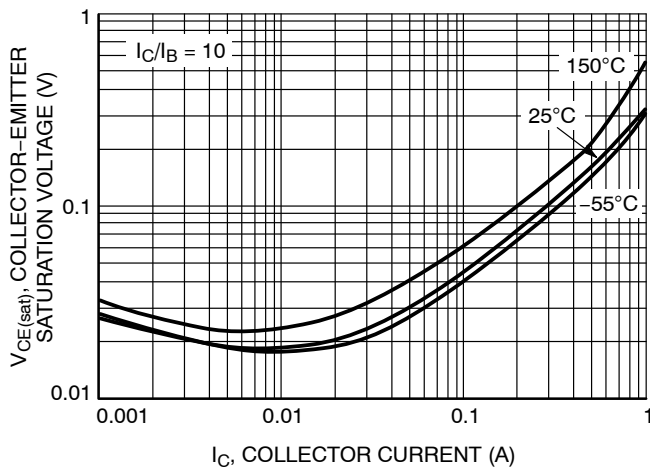


Figure 4. Collector-Emitter Saturation Voltage vs. Collector Current

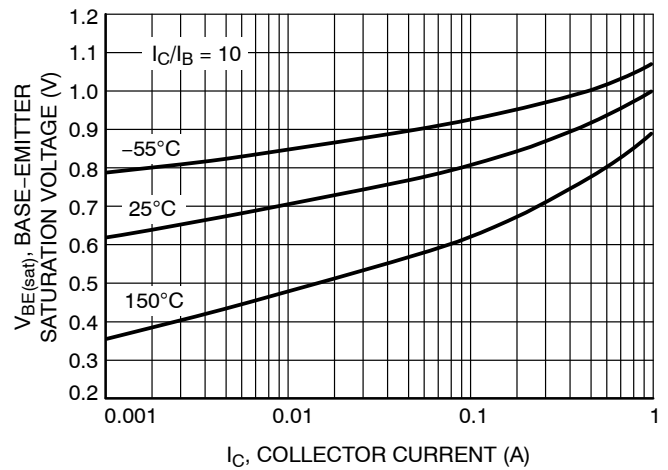
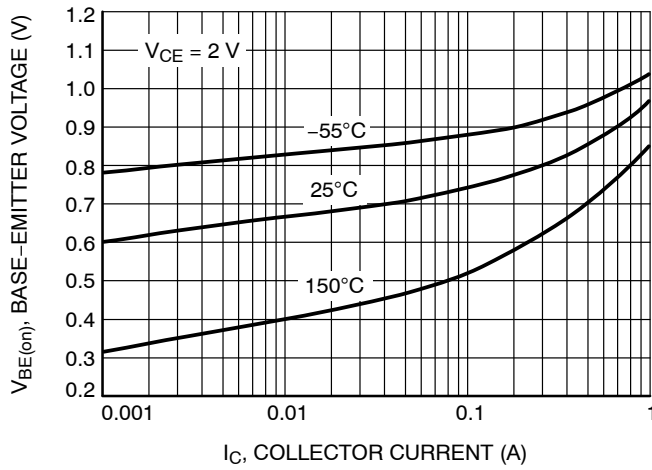


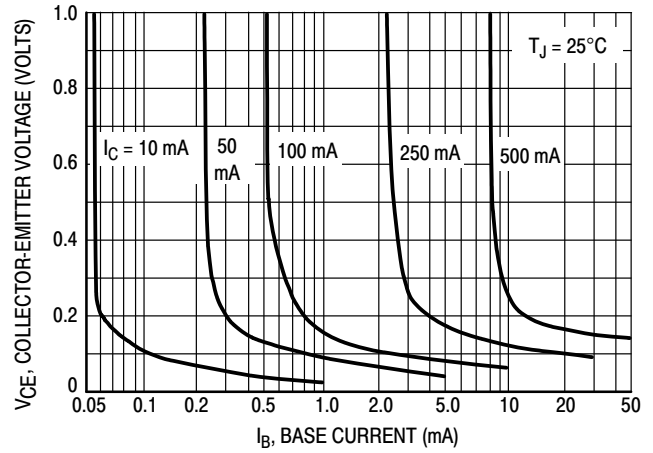
Figure 5. Base-Emitter Saturation Voltage vs. Collector Current

# BCP56 Series

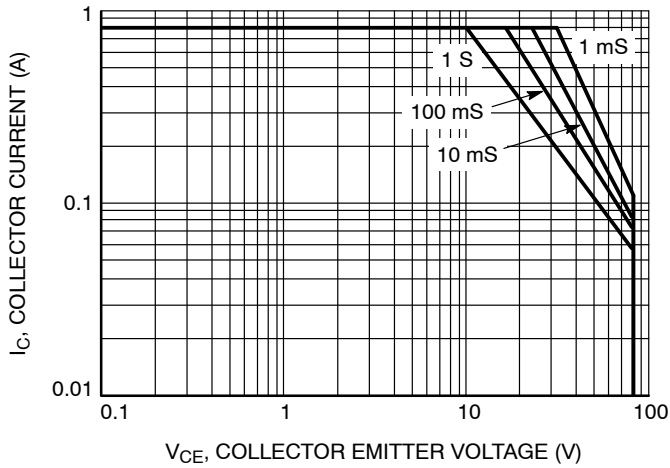
## TYPICAL ELECTRICAL CHARACTERISTICS



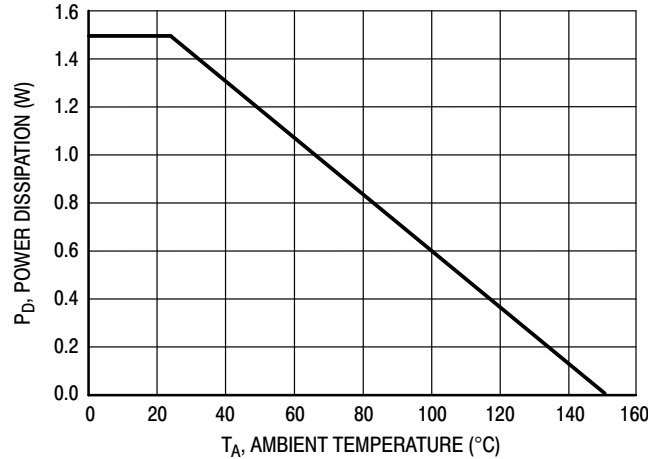
**Figure 6. Base Emitter Voltage vs. Collector Current**



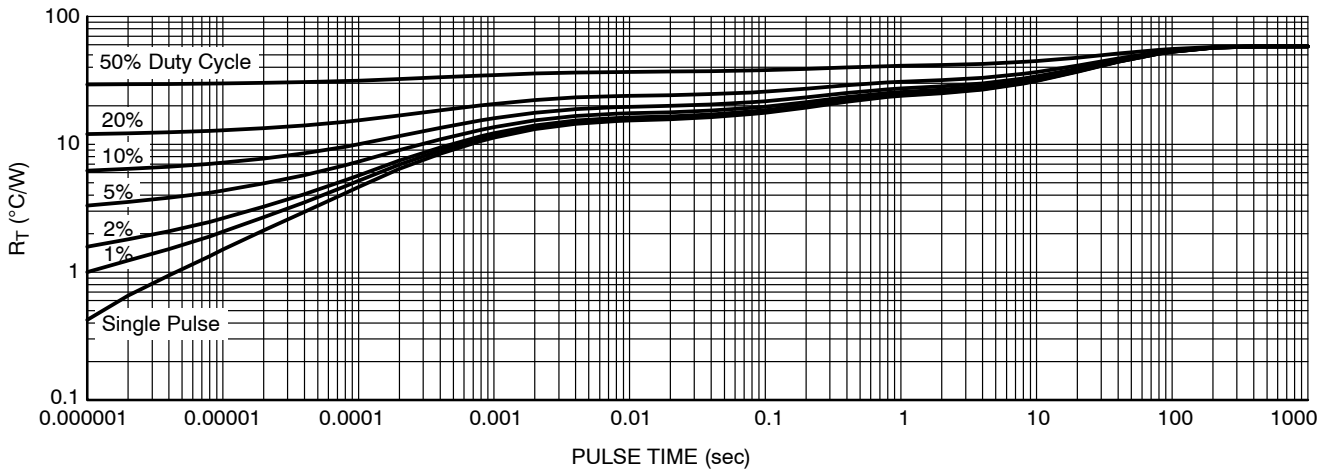
**Figure 7. Collector Saturation Region**



**Figure 8. Safe Operating Area**



**Figure 9. Power Derating Curve**



**Figure 10. Thermal Response**

## BCP56 Series

### ORDERING INFORMATION

| Device          | Marking | Package              | Shipping†          |
|-----------------|---------|----------------------|--------------------|
| BCP56T1G        | BH      | SOT-223<br>(Pb-Free) | 1000 / Tape & Reel |
| SBCP56T1G*      |         |                      |                    |
| BCP56T3G        | BH      | SOT-223<br>(Pb-Free) | 4000 / Tape & Reel |
| SBCP56T3G*      |         |                      |                    |
| BCP56-10T1G     | BH-10   | SOT-223<br>(Pb-Free) | 1000 / Tape & Reel |
| SBCP56-10T1G*   |         |                      |                    |
| NSVBCP56-10T3G* | BH-10   | SOT-223<br>(Pb-Free) | 4000 / Tape & Reel |
| BCP56-16T1G     | BH-16   | SOT-223<br>(Pb-Free) | 1000 / Tape & Reel |
| SBCP56-16T1G*   |         |                      |                    |
| BCP56-16T3G     | BH-16   | SOT-223<br>(Pb-Free) | 4000 / Tape & Reel |
| SBCP56-16T3G*   |         |                      |                    |

### DISCONTINUED (Note 4)

|             |       |                      |                    |
|-------------|-------|----------------------|--------------------|
| BCP56-10T3G | BH-10 | SOT-223<br>(Pb-Free) | 4000 / 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.

\*S and NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

4. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).



SCALE 1:1

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

DATE 02 OCT 2018



TOP VIEW



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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