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# BCP56 Series

# NPN Silicon Epitaxial Transistor

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** ($T_C$ = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector−Emitter Voltage | $V_{CEO}$ | 80 | Vdc |
| Collector−Base Voltage | $V_{CBO}$ | 100 | Vdc |
| Emitter−Base Voltage | $V_{EBO}$ | 5 | Vdc |
| Collector Current | $I_C$ | 1 | Adc |
| Collector Current − Peak (Note 1) | $I_{CM}$ | 2 | Adc |
| Total Power Dissipation<br>@ $T_A$ = 25°C (Note 2)<br>Derate above 25°C | $P_D$ | <br>1.5<br>12 | <br>W<br>mW/°C |
| Operating and Storage Temperature Range | $T_J$, $T_{stg}$ | −65 to 150 | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction−to−Ambient (surface mounted) | $R_{\theta JA}$ | 83.3 | °C/W |
| Maximum Temperature for Soldering Purposes<br>Time in Solder Bath | $T_L$ | <br>260<br>10 | <br>°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.

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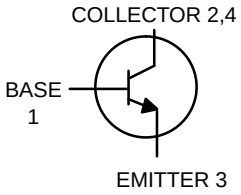
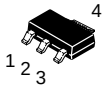
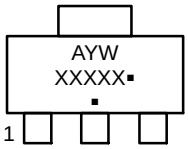
## MEDIUM POWER NPN SILICON HIGH CURRENT TRANSISTOR SURFACE MOUNT




**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 in the package dimensions section on page 5 of this data sheet.

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted)

| Characteristics | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector−Base Breakdown Voltage ($I_C$ = 100 μAdc, $I_E$ = 0) | | $V_{(BR)CBO}$ | 100 | − | − | Vdc |
| Collector−Emitter Breakdown Voltage ($I_C$ = 1.0 mAdc, $I_B$ = 0) | | $V_{(BR)CEO}$ | 80 | − | − | Vdc |
| Emitter−Base Breakdown Voltage ($I_E$ = 10 μAdc, $I_C$ = 0) | | $V_{(BR)EBO}$ | 5.0 | − | − | Vdc |
| Collector−Base Cutoff Current ($V_{CB}$ = 30 Vdc, $I_E$ = 0) | | $I_{CBO}$ | − | − | 100 | nAdc |
| Emitter−Base Cutoff Current ($V_{EB}$ = 5.0 Vdc, $I_C$ = 0) | | $I_{EBO}$ | − | − | 10 | μAdc |
| **ON CHARACTERISTICS** (Note 3) | | | | | | |
| DC Current Gain | | $h_{FE}$ | | | | − |
| ($I_C$ = 5.0 mA, $V_{CE}$ = 2.0 V) | All Part Types | | 25 | − | − | |
| ($I_C$ = 150 mA, $V_{CE}$ = 2.0 V) | BCP56 | | 40 | − | 250 | |
| | BCP56−10 | | 63 | − | 160 | |
| | BCP56−16 | | 100 | − | 250 | |
| ($I_C$ = 500 mA, $V_{CE}$ = 2.0 V) | All Types | | 25 | − | − | |
| Collector−Emitter Saturation Voltage ($I_C$ = 500 mAdc, $I_B$ = 50 mAdc) | | $V_{CE(sat)}$ | − | − | 0.5 | Vdc |
| Base−Emitter On Voltage ($I_C$ = 500 mAdc, $V_{CE}$ = 2.0 Vdc) | | $V_{BE(on)}$ | − | − | 1.0 | Vdc |
| **SWITCHING CHARACTERISTICS** | | | | | | |
| Rise Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA) | | $t_r$ | − | 14 | − | ns |
| Delay Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA) | | $t_d$ | − | 9 | − | ns |
| Storage Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA, $I_{B2}$ = 15 mA) | | $t_s$ | − | 714 | − | ns |
| Fall Time ($V_{CC}$ = 30 Vdc, $I_C$ = 150 mA, $I_{B1}$ = 15 mA, $I_{B2}$ = 15 mA) | | $t_f$ | − | 58 | − | ns |
| **DYNAMIC CHARACTERISTICS** | | | | | | |
| Current−Gain − Bandwidth Product ($I_C$ = 10 mAdc, $V_{CE}$ = 5.0 Vdc, f = 35 MHz) | | $f_T$ | − | 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%

## TYPICAL ELECTRICAL CHARACTERISTICS

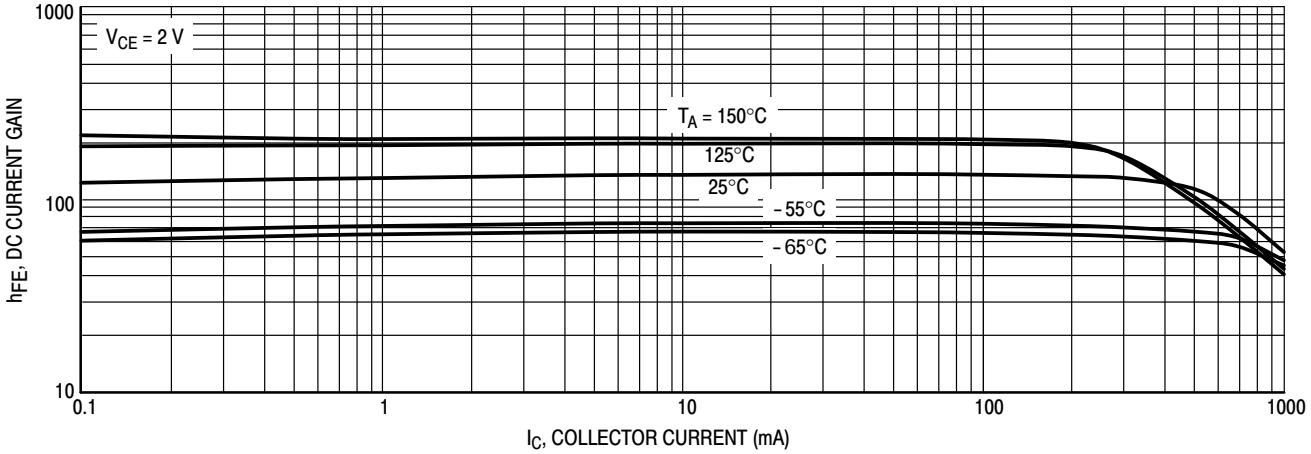



**Figure 1. DC Current Gain**

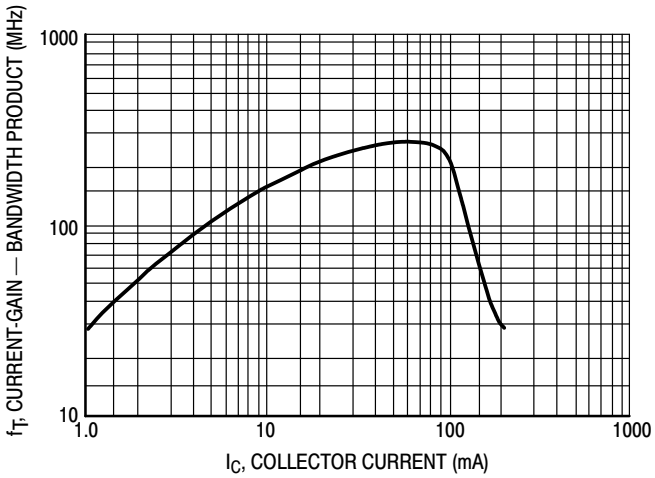



**Figure 2. Current−Gain − Bandwidth Product**

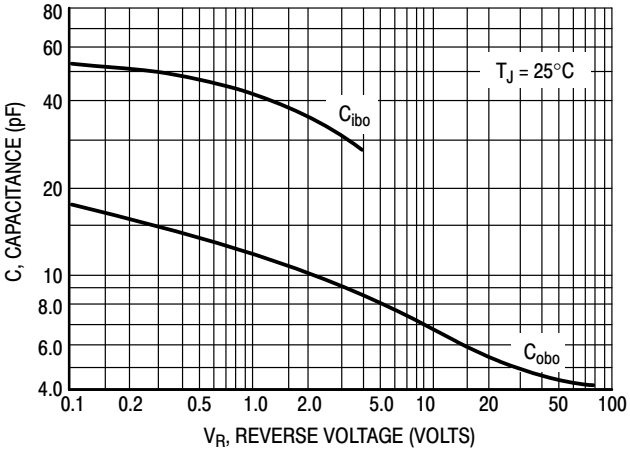



**Figure 3. Capacitance**

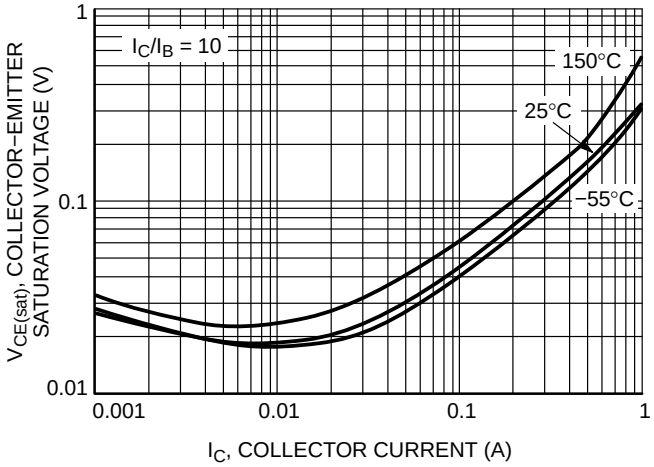



**Figure 4. Collector Emitter Saturation Voltage vs. Collector Current**

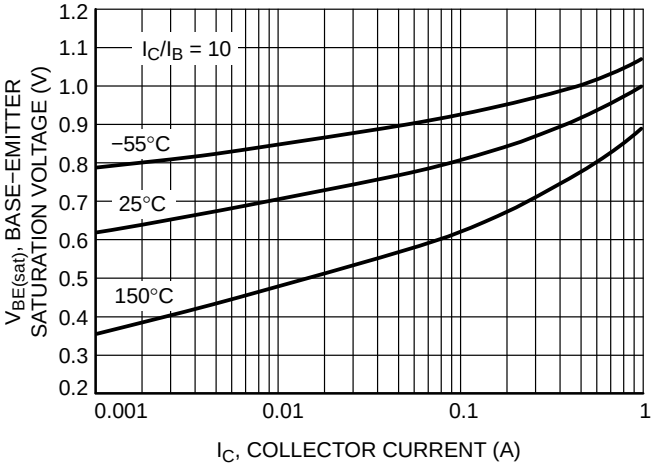



**Figure 5. Base Emitter Saturation Voltage vs. Collector Current**

## TYPICAL ELECTRICAL CHARACTERISTICS

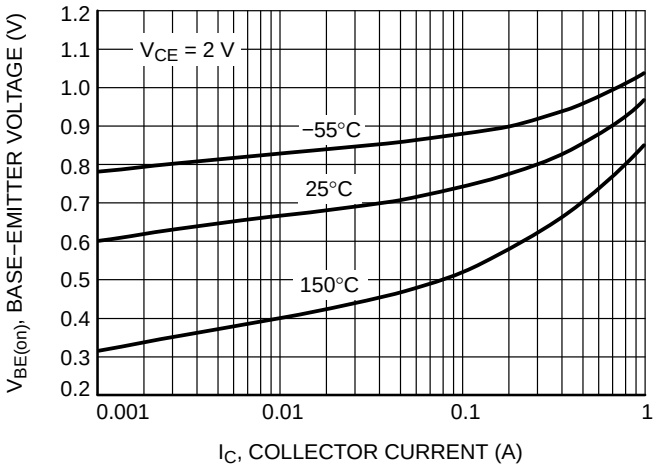



**Figure 6. Base Emitter Voltage vs. Collector Current**

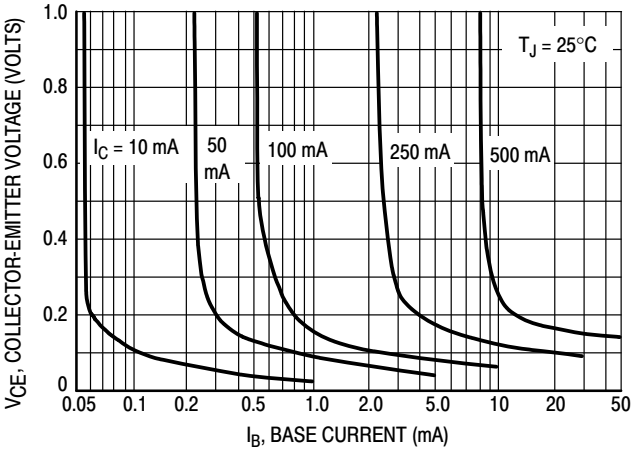



**Figure 7. Collector Saturation Region**

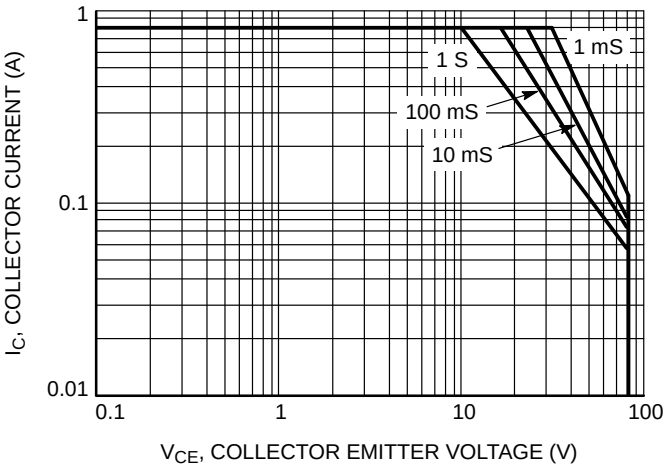



**Figure 8. Safe Operating Area**

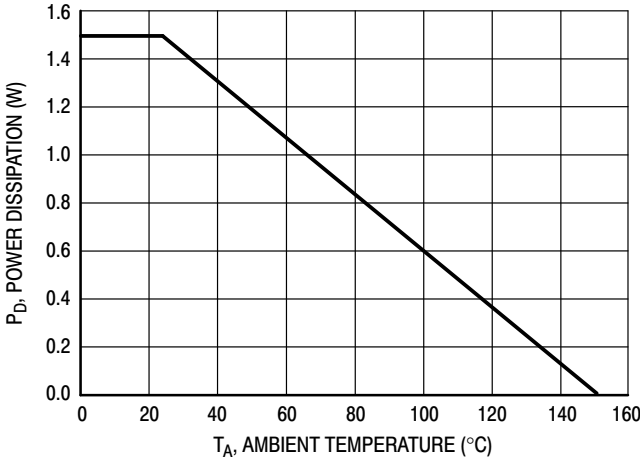



**Figure 9. Power Derating Curve**

## ORDERING INFORMATION

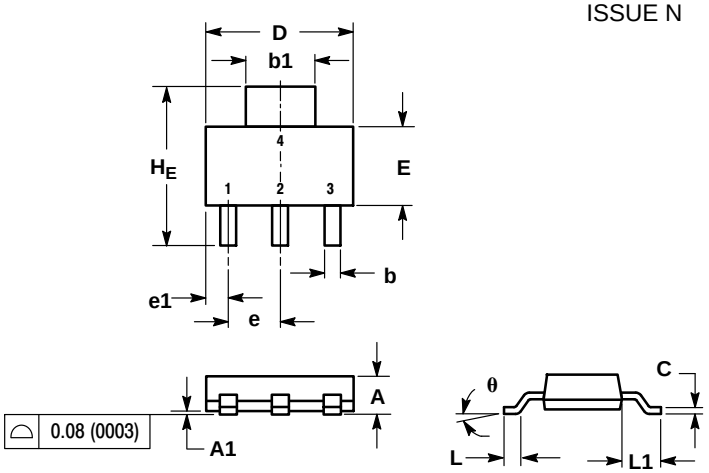
| Device | Marking | Package | Shipping† |
|---|---|---|---|
| BCP56T1G | BH | SOT−223 (Pb−Free) | 1000 / Tape & Reel |
| SBCP56T1G* | | | |
| BCP56T3G | BH | SOT−223 (Pb−Free) | 4000 / Tape & Reel |
| SBCP56T3G* | | | |
| BCP56−10T1G | BH−10 | SOT−223 (Pb−Free) | 1000 / Tape & Reel |
| SBCP56−10T1G*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

†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.

## PACKAGE DIMENSIONS

**SOT−223 (TO−261)**
CASE 318E−04
ISSUE N

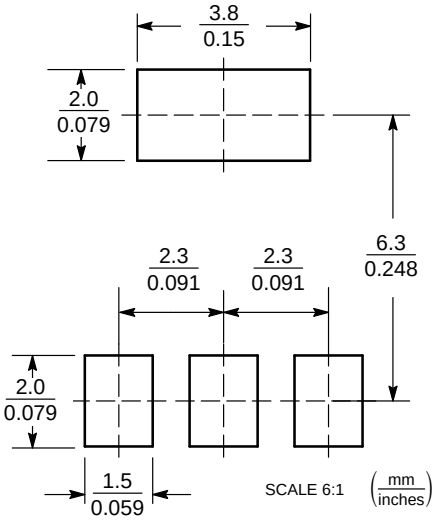



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCH.

| | MILLIMETERS | | | INCHES | | |
|---|---|---|---|---|---|---|
| DIM | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 1.50 | 1.63 | 1.75 | 0.060 | 0.064 | 0.068 |
| A1 | 0.02 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.60 | 0.75 | 0.89 | 0.024 | 0.030 | 0.035 |
| b1 | 2.90 | 3.06 | 3.20 | 0.115 | 0.121 | 0.126 |
| c | 0.24 | 0.29 | 0.35 | 0.009 | 0.012 | 0.014 |
| D | 6.30 | 6.50 | 6.70 | 0.249 | 0.256 | 0.263 |
| E | 3.30 | 3.50 | 3.70 | 0.130 | 0.138 | 0.145 |
| e | 2.20 | 2.30 | 2.40 | 0.087 | 0.091 | 0.094 |
| e1 | 0.85 | 0.94 | 1.05 | 0.033 | 0.037 | 0.041 |
| L | 0.20 | −−− | −−− | 0.008 | −−− | −−− |
| L1 | 1.50 | 1.75 | 2.00 | 0.060 | 0.069 | 0.078 |
| $H_E$ | 6.70 | 7.00 | 7.30 | 0.264 | 0.276 | 0.287 |
| θ | 0° | − | 10° | 0° | − | 10° |

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

### SOLDERING 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.



### PUBLICATION ORDERING INFORMATION

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