

# BC857BTT1G

## General Purpose Transistor

### PNP Silicon

These transistors are designed for general purpose amplifier applications. They are housed in the SOT-416/SC-75 which is designed for low power surface mount applications.

#### Features

- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- This is a Pb-Free Device

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

| Rating                         | Symbol    | Max  | Unit |
|--------------------------------|-----------|------|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | -45  | V    |
| Collector-Base Voltage         | $V_{CBO}$ | -50  | V    |
| Emitter-Base Voltage           | $V_{EBO}$ | -5.0 | V    |
| Collector Current – Continuous | $I_C$     | -100 | mAdc |
| Collector Current – Peak       | $I_C$     | -200 | mAdc |

#### THERMAL CHARACTERISTICS

| Characteristic                                                                                                   | Symbol          | Max            | Unit                       |
|------------------------------------------------------------------------------------------------------------------|-----------------|----------------|----------------------------|
| Total Device Dissipation,<br>FR-4 Board (Note 1)<br>$T_A = 25^\circ\text{C}$<br>Derated above $25^\circ\text{C}$ | $P_D$           | 200<br>1.6     | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient (Note 1)                                                              | $R_{\theta JA}$ | 600            | $^\circ\text{C/W}$         |
| Total Device Dissipation,<br>FR-4 Board (Note 2)<br>$T_A = 25^\circ\text{C}$<br>Derated above $25^\circ\text{C}$ | $P_D$           | 300<br>2.4     | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient (Note 2)                                                              | $R_{\theta JA}$ | 400            | $^\circ\text{C/W}$         |
| Junction and Storage<br>Temperature Range                                                                        | $T_J, T_{stg}$  | -55 to<br>+150 | $^\circ\text{C}$           |

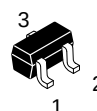
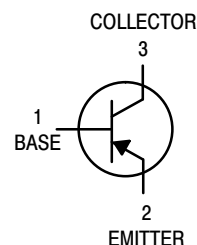
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-4 @ min pad.
2. FR-4 @  $1.0 \times 1.0$  in pad.



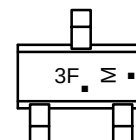
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CASE 463  
SOT-416  
STYLE 1

#### MARKING DIAGRAM



3F = Device Code  
M = Date Code  
■ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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

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

### OFF CHARACTERISTICS

|                                                                                                                 |               |        |        |             |                     |
|-----------------------------------------------------------------------------------------------------------------|---------------|--------|--------|-------------|---------------------|
| Collector–Emitter Breakdown Voltage<br>( $I_C = -10\text{ mA}$ )                                                | $V_{(BR)CEO}$ | -45    | –      | –           | V                   |
| Collector–Emitter Breakdown Voltage<br>( $I_C = -10\text{ }\mu\text{A}$ , $V_{EB} = 0$ )                        | $V_{(BR)CES}$ | -50    | –      | –           | V                   |
| Collector–Base Breakdown Voltage<br>( $I_C = -10\text{ }\mu\text{A}$ )                                          | $V_{(BR)CBO}$ | -50    | –      | –           | V                   |
| Emitter–Base Breakdown Voltage<br>( $I_E = -1.0\text{ }\mu\text{A}$ )                                           | $V_{(BR)EBO}$ | -5.0   | –      | –           | V                   |
| Collector Cutoff Current ( $V_{CB} = -30\text{ V}$ )<br>( $V_{CB} = -30\text{ V}$ , $T_A = 150^\circ\text{C}$ ) | $I_{CBO}$     | –<br>– | –<br>– | -15<br>-4.0 | nA<br>$\mu\text{A}$ |

### ON CHARACTERISTICS

|                                                                                                                                                   |               |           |              |                |   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------|--------------|----------------|---|
| DC Current Gain<br>( $I_C = -10\text{ }\mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ )<br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )         | $h_{FE}$      | –<br>220  | 150<br>290   | –<br>475       | – |
| Collector–Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ )<br>( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ ) | $V_{CE(sat)}$ | –<br>–    | –<br>–       | -0.3<br>-0.65  | V |
| Base–Emitter Saturation Voltage<br>( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ )<br>( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )      | $V_{BE(sat)}$ | –<br>–    | -0.7<br>-0.9 | –<br>–         | V |
| Base–Emitter On Voltage<br>( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )          | $V_{BE(on)}$  | -0.6<br>– | –<br>–       | -0.75<br>-0.82 | V |

### SMALL–SIGNAL CHARACTERISTICS

|                                                                                                                                                       |          |     |   |     |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|---|-----|-----|
| Current–Gain – Bandwidth Product<br>( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                     | $f_T$    | 100 | – | –   | MHz |
| Output Capacitance<br>( $V_{CB} = -10\text{ V}$ , $f = 1.0\text{ MHz}$ )                                                                              | $C_{ob}$ | –   | – | 4.5 | pF  |
| Noise Figure<br>( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ ,<br>$f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ ) | NF       | –   | – | 10  | dB  |

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.

TYPICAL CHARACTERISTICS

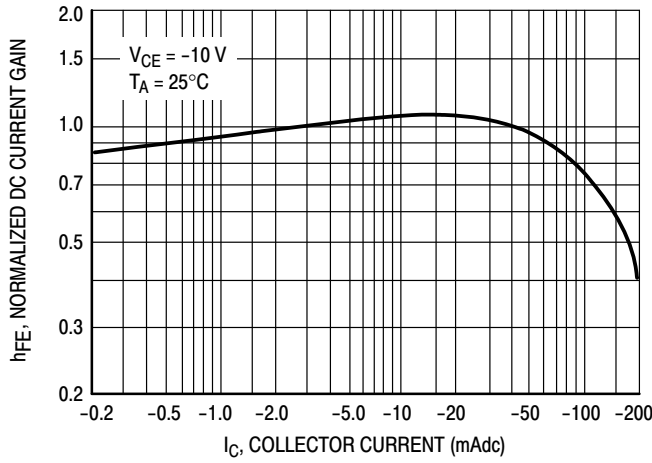


Figure 1. Normalized DC Current Gain

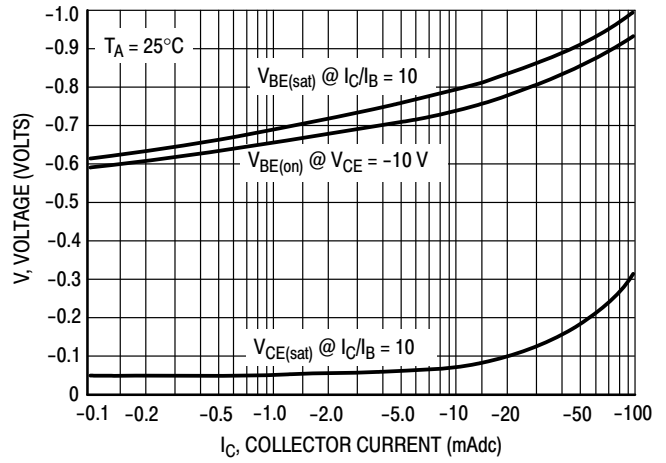


Figure 2. "Saturation" and "On" Voltages

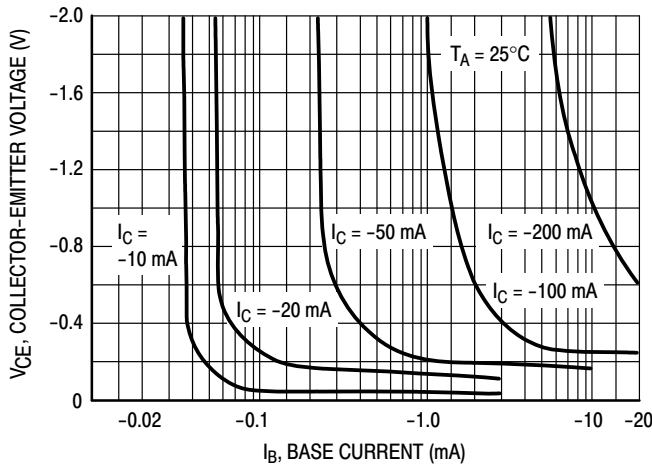


Figure 3. Collector Saturation Region

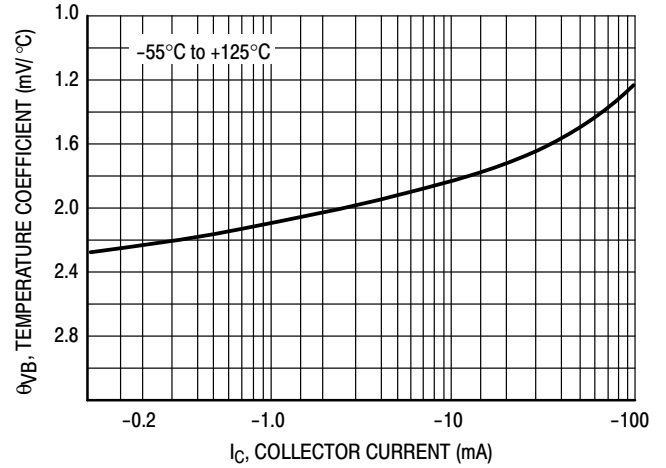


Figure 4. Base-Emitter Temperature Coefficient

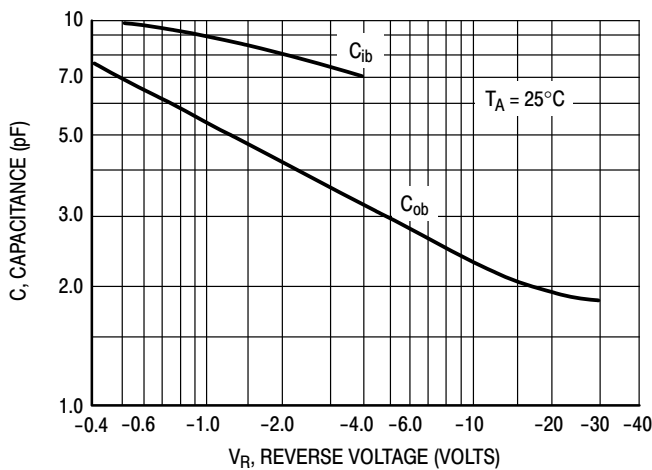


Figure 5. Capacitances

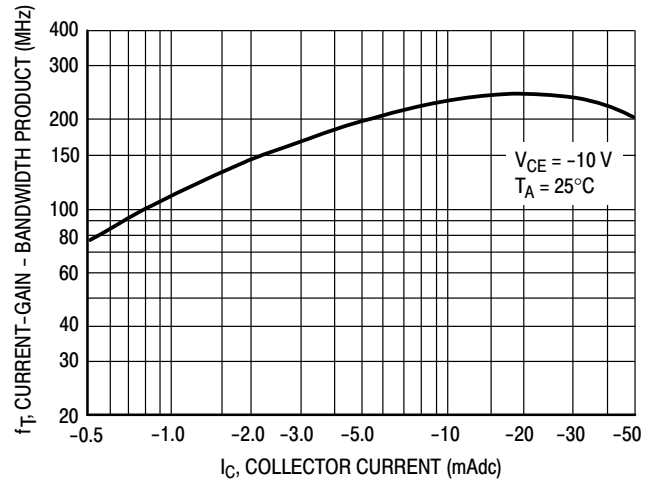


Figure 6. Current-Gain - Bandwidth Product

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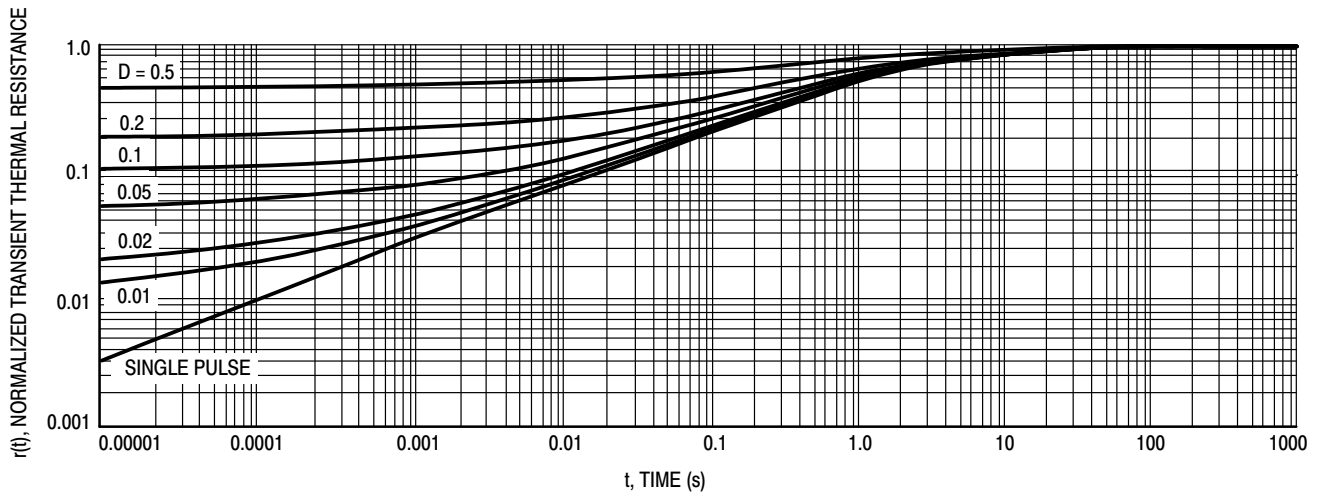


Figure 7. Thermal Response

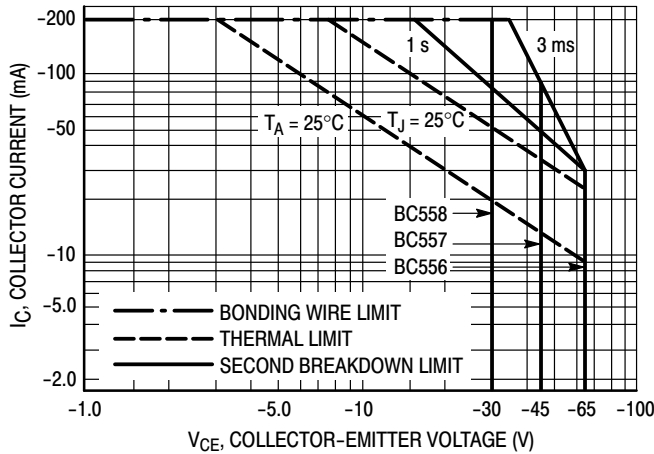


Figure 8. Active Region Safe Operating Area

The safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 8 is based upon  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  or  $T_A$  is variable depending upon conditions. Pulse curves 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 7. At high case or ambient temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by the secondary breakdown.

## ORDERING INFORMATION

| Device         | Package              | Shipping <sup>†</sup> |
|----------------|----------------------|-----------------------|
| BC857BTT1G     | SOT-416<br>(PB-Free) | 3,000 / Tape & Reel   |
| NSVBC857BTT1G* |                      |                       |

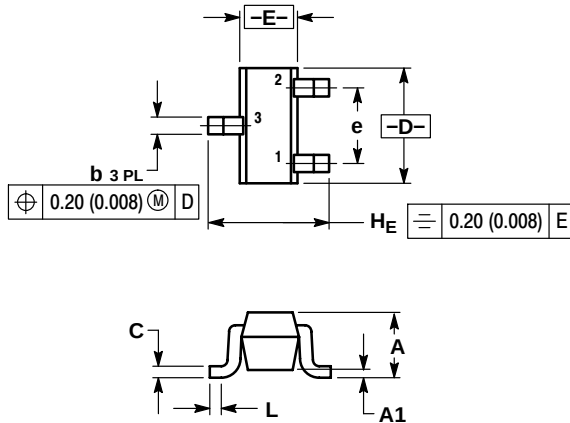
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

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## PACKAGE DIMENSIONS

### SOT-416 (SC-75) CASE 463 ISSUE F

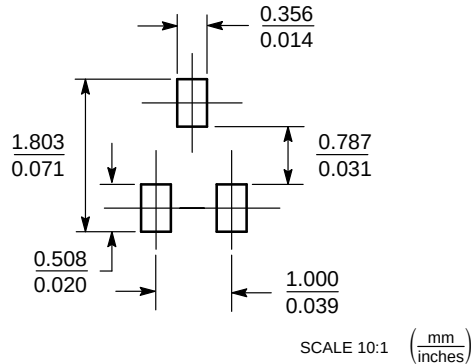


#### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.

| DIM            | MILLIMETERS |      |      | INCHES   |       |       |
|----------------|-------------|------|------|----------|-------|-------|
|                | MIN         | NOM  | MAX  | MIN      | NOM   | MAX   |
| A              | 0.70        | 0.80 | 0.90 | 0.027    | 0.031 | 0.035 |
| A1             | 0.00        | 0.05 | 0.10 | 0.000    | 0.002 | 0.004 |
| b              | 0.15        | 0.20 | 0.30 | 0.006    | 0.008 | 0.012 |
| C              | 0.10        | 0.15 | 0.25 | 0.004    | 0.006 | 0.010 |
| D              | 1.55        | 1.60 | 1.65 | 0.059    | 0.063 | 0.067 |
| E              | 0.70        | 0.80 | 0.90 | 0.027    | 0.031 | 0.035 |
| e              | 1.00 BSC    |      |      | 0.04 BSC |       |       |
| L              | 0.10        | 0.15 | 0.20 | 0.004    | 0.006 | 0.008 |
| H <sub>E</sub> | 1.50        | 1.60 | 1.70 | 0.061    | 0.063 | 0.065 |

### 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.

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