

# BC856ALT1G Series

## General Purpose Transistors

### PNP Silicon

#### Features

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

| Rating  | Symbol    | Value             | Unit |
|---|-----------|-------------------|------|
| Collector-Emitter Voltage<br>BC856<br>BC857<br>BC858, BC859 | $V_{CEO}$ | -65<br>-45<br>-30 | V    |
| Collector-Base Voltage<br>BC856<br>BC857<br>BC858, BC859    | $V_{CBO}$ | -80<br>-50<br>-30 | V    |
| Emitter-Base Voltage  | $V_{EBO}$ | -5.0              | V    |
| Collector Current – Continuous                              | $I_C$     | -100              | mAdc |

#### THERMAL CHARACTERISTICS

| Characteristic  | Symbol          | Max         | Unit                       |
|---|-----------------|-------------|----------------------------|
| Total Device Dissipation FR-5 Board,<br>(Note 1) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$        | $P_D$           | 225<br>1.8  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient  | $R_{\theta JA}$ | 556         | $^\circ\text{C}/\text{W}$  |
| Total Device Dissipation Alumina<br>Substrate, (Note 2) $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 300<br>2.4  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance,<br>Junction-to-Ambient  | $R_{\theta JA}$ | 417         | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature  | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$           |

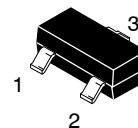
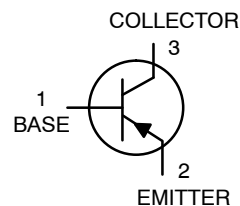
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. FR-5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in 99.5% alumina.



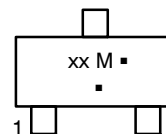
ON Semiconductor®

<http://onsemi.com>



SOT-23 (TO-236AB)  
CASE 318  
STYLE 6

#### MARKING DIAGRAM



- xx = Device Code  
xx = (Refer to page 6)
- M = Date Code\*
- = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation and/or overbar may vary depending upon manufacturing location.

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

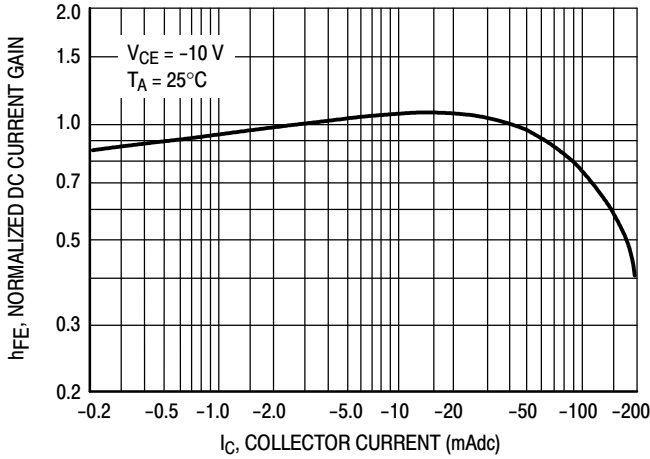
## BC856ALT1G Series

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

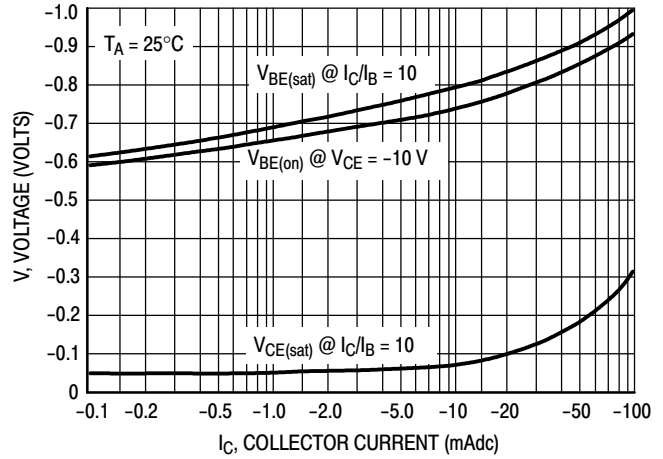
| Characteristic  |  | Symbol        | Min                  | Typ               | Max               | Unit                |
|---|--|---------------|----------------------|-------------------|-------------------|---------------------|
| <b>OFF CHARACTERISTICS</b>  |  |               |                      |                   |                   |                     |
| Collector – Emitter Breakdown Voltage<br>( $I_C = -10\text{ mA}$ )  | BC856 Series<br>BC857 Series<br>BC858, BC859 Series                                | $V_{(BR)CEO}$ | -65<br>-45<br>-30    | -<br>-<br>-       | -<br>-<br>-       | V                   |
| Collector – Emitter Breakdown Voltage<br>( $I_C = -10\ \mu\text{A}$ , $V_{EB} = 0$ )  | BC856 Series<br>BC857A, BC857B Only<br>BC858, BC859 Series                         | $V_{(BR)CES}$ | -80<br>-50<br>-30    | -<br>-<br>-       | -<br>-<br>-       | V                   |
| Collector – Base Breakdown Voltage<br>( $I_C = -10\ \mu\text{A}$ )  | BC856 Series<br>BC857 Series<br>BC858, BC859 Series                                | $V_{(BR)CBO}$ | -80<br>-50<br>-30    | -<br>-<br>-       | -<br>-<br>-       | V                   |
| Emitter – Base Breakdown Voltage<br>( $I_E = -1.0\ \mu\text{A}$ )   | BC856 Series<br>BC857 Series<br>BC858, BC859 Series                                | $V_{(BR)EBO}$ | -5.0<br>-5.0<br>-5.0 | -<br>-<br>-       | -<br>-<br>-       | 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>$\mu\text{A}$ |
| <b>ON CHARACTERISTICS</b>   |  |               |                      |                   |                   |                     |
| DC Current Gain<br>( $I_C = -10\ \mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ )  | BC856A, BC857A, BC858A<br>BC856B, BC857B, BC858B<br>BC857C, BC858C                 | $h_{FE}$      | -<br>-<br>-          | 90<br>150<br>270  | -<br>-<br>-       | -                   |
| ( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )   | BC856A, BC857A, BC858A<br>BC856B, BC857B, BC858B, BC859B<br>BC857C, BC858C, BC859C |               | 125<br>220<br>420    | 180<br>290<br>520 | 250<br>475<br>800 |                     |
| 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                   |
| <b>SMALL-SIGNAL CHARACTERISTICS</b>   |  |               |                      |                   |                   |                     |
| 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>( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )  | BC856, BC857, BC858 Series<br>BC859 Series   | NF            | -<br>-               | -<br>-            | 10<br>4.0         | dB                  |

# BC856ALT1G Series

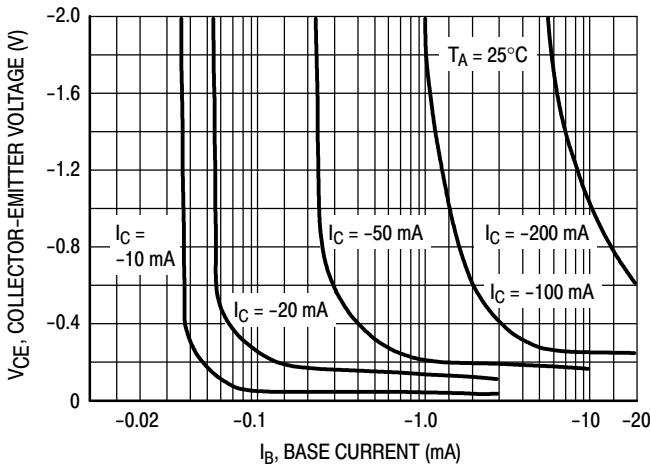
## BC857/BC858/BC859



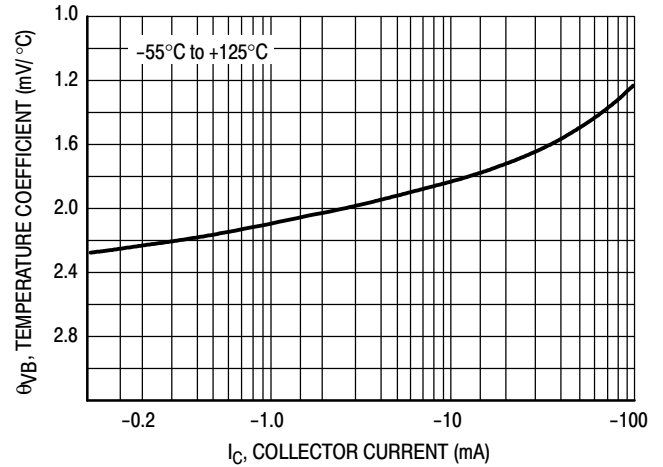
**Figure 1. Normalized DC Current Gain**



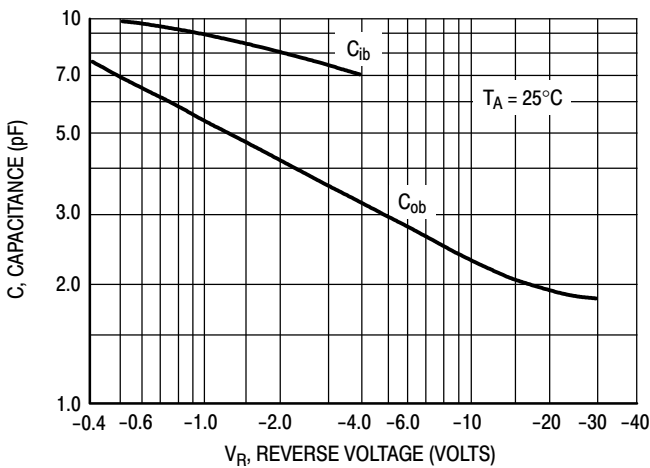
**Figure 2. "Saturation" and "On" Voltages**



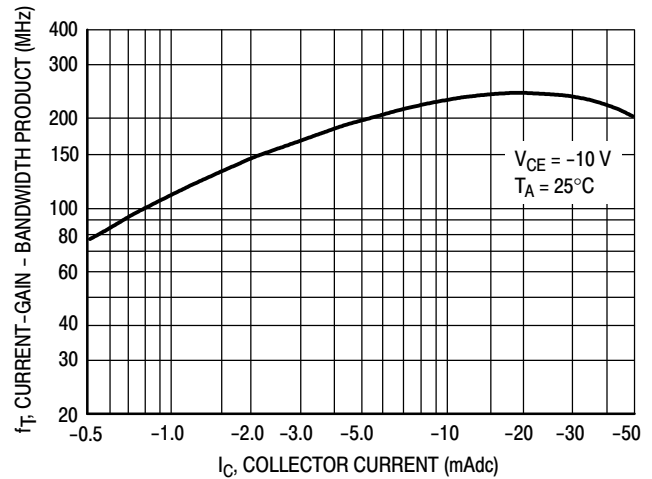
**Figure 3. Collector Saturation Region**



**Figure 4. Base-Emitter Temperature Coefficient**



**Figure 5. Capacitances**



**Figure 6. Current-Gain - Bandwidth Product**

# BC856ALT1G Series

## BC856

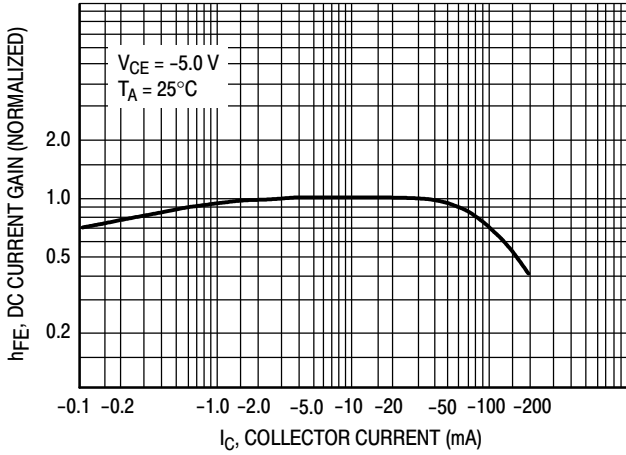


Figure 7. DC Current Gain

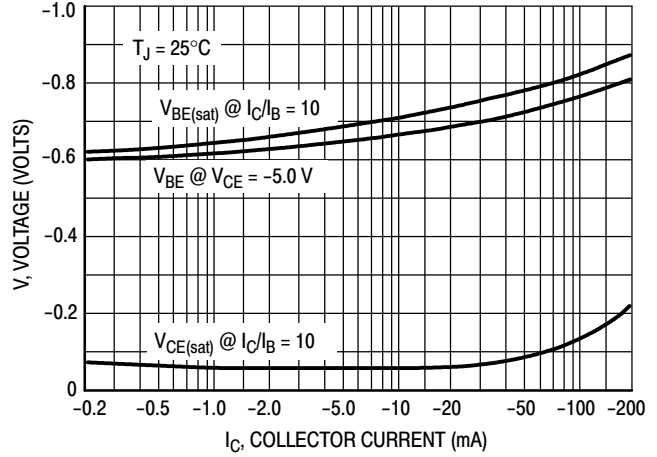


Figure 8. "On" Voltage

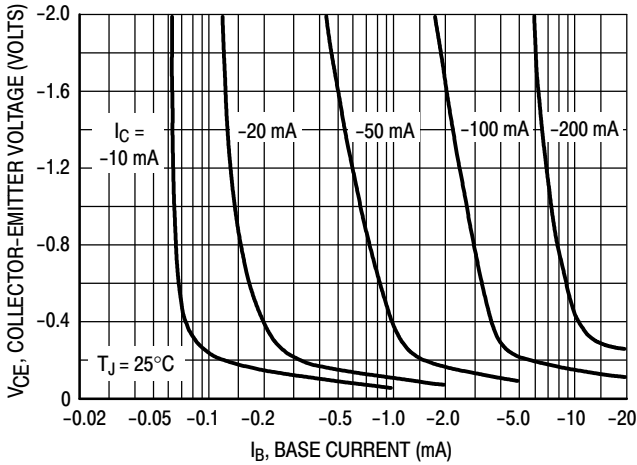


Figure 9. Collector Saturation Region

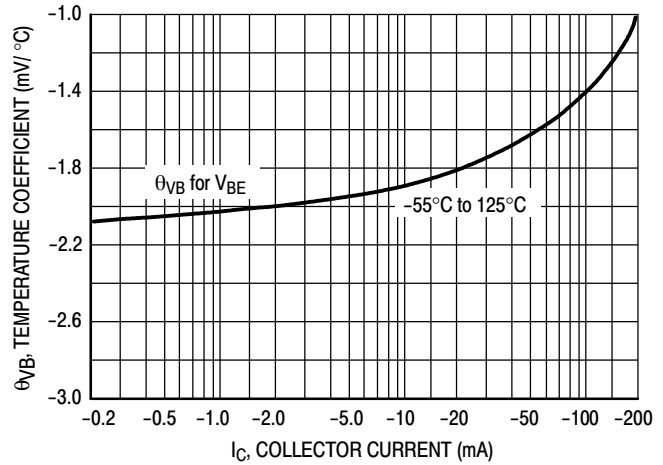


Figure 10. Base-Emitter Temperature Coefficient

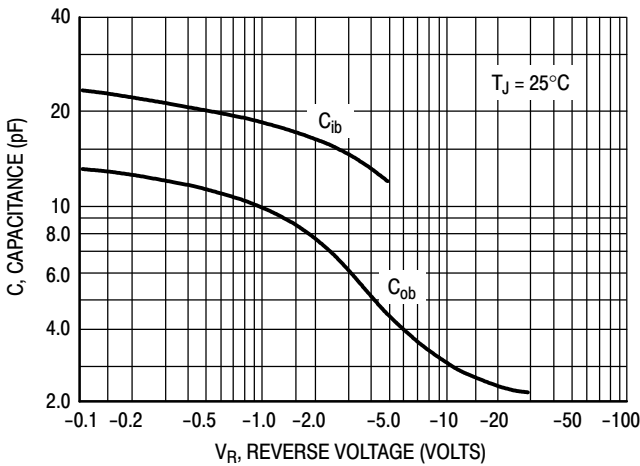


Figure 11. Capacitance

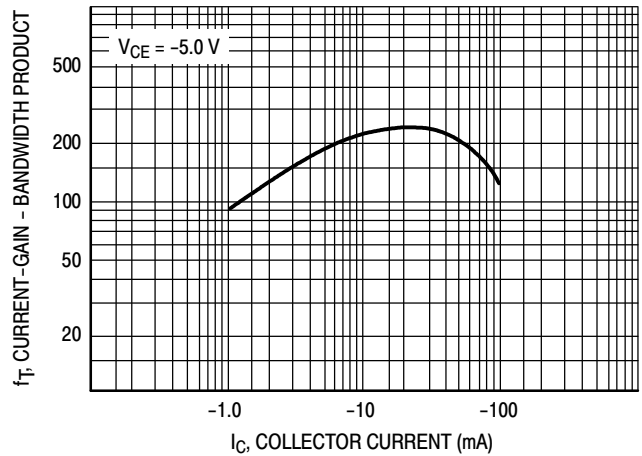
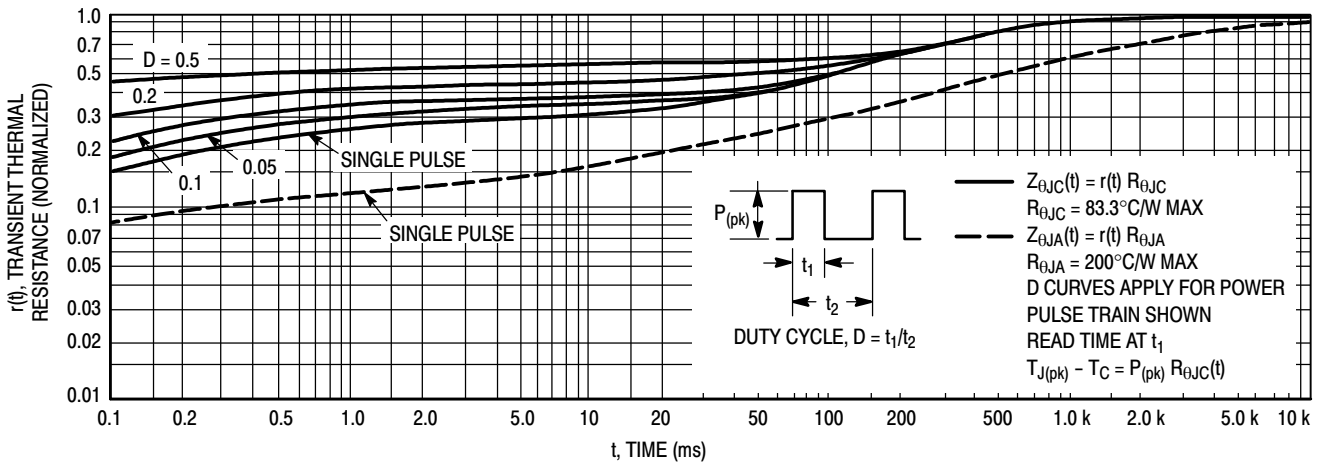
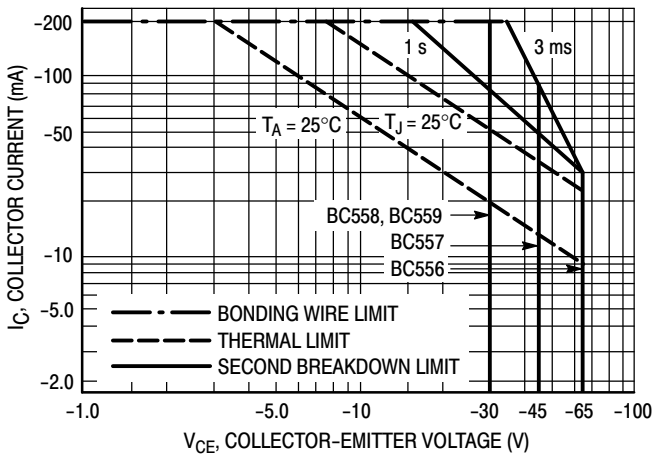


Figure 12. Current-Gain - Bandwidth Product

## BC856ALT1G Series



**Figure 13. Thermal Response**



**Figure 14. 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 14 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 13. 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.

## BC856ALT1G Series

### ORDERING INFORMATION

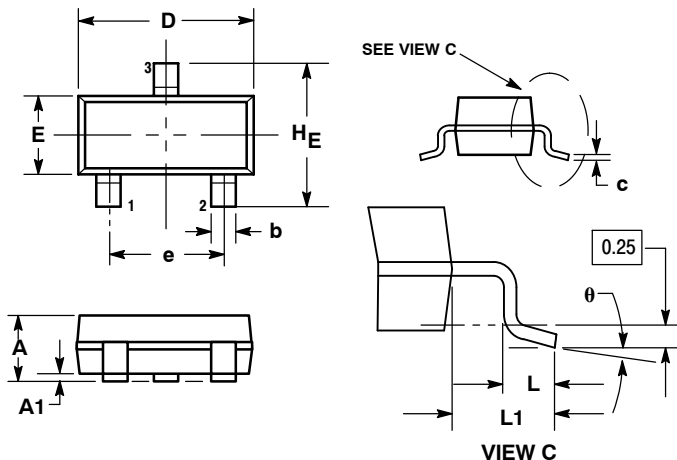
| Device     | Marking | Package             | Shipping <sup>†</sup> |
|------------|---------|---------------------|-----------------------|
| BC856ALT1G | 3A      | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC856ALT3G |         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| BC856BLT1G | 3B      | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC856BLT3G |         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| BC857ALT1G | 3E      | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC857BLT1G | 3F      | SOT-23<br>(Pb-Free) |                       |
| BC857BLT3G |         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| BC857CLT1G | 3G      | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC857CLT3G |         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| BC858ALT1G | 3J      | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC858BLT1G | 3K      | SOT-23<br>(Pb-Free) |                       |
| BC858BLT3G | 3L      | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| BC858CLT1G |         | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC858CLT3G |         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| BC859BLT1G | 4B      | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC859BLT3G |         | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel  |
| BC859CLT1G | 4C      | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel   |
| BC859CLT3G |         | SOT-23<br>(Pb-Free) | 10,000 / 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 Specifications Brochure, BRD8011/D.

# BC856ALT1G Series

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AN



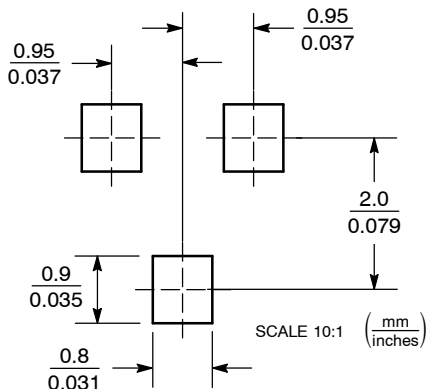
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.040 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.018 | 0.020 |
| c   | 0.09        | 0.13 | 0.18 | 0.003  | 0.005 | 0.007 |
| D   | 2.80        | 2.90 | 3.04 | 0.110  | 0.114 | 0.120 |
| E   | 1.20        | 1.30 | 1.40 | 0.047  | 0.051 | 0.055 |
| e   | 1.78        | 1.90 | 2.04 | 0.070  | 0.075 | 0.081 |
| L   | 0.10        | 0.20 | 0.30 | 0.004  | 0.008 | 0.012 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.029 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. 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.

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