

BC856ALT1 Series

Preferred Devices

General Purpose Transistors

PNP Silicon

Features

- Pb-Free Packages are Available

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

| Rating | Symbol | Value | Unit |
|---|-----------|-------------------|------|
| Collector-Emitter Voltage BC856 BC857 BC858, BC859 | V_{CEO} | -65 -45 -30 | V |
| Collector-Base Voltage BC856 BC857 BC858, BC859 | V_{CBO} | -80 -50 -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, (Note 1) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 1.8 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 556 | $^\circ\text{C}/\text{W}$ |
| Total Device Dissipation Alumina Substrate, (Note 2) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 300 2.4 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 417 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |

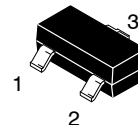
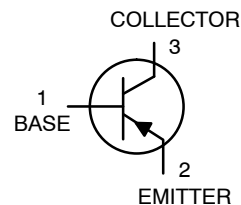
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

- FR-5 = $1.0 \times 0.75 \times 0.062$ in.
- Alumina = $0.4 \times 0.3 \times 0.024$ in 99.5% alumina.



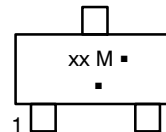
ON Semiconductor®

<http://onsemi.com>



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

MARKING DIAGRAM



- xx = Device Code
xx = (Refer to page 5)
- 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 5 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

BC856ALT1 Series

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

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|--|---------------|----------------------|-------------------|-------------------|---------------------|
| OFF CHARACTERISTICS | | | | | | |
| Collector – Emitter Breakdown Voltage ($I_C = -10\text{ mA}$) | BC856 Series BC857 Series BC858, BC859 Series | $V_{(BR)CEO}$ | -65 -45 -30 | - - - | - - - | V |
| Collector – Emitter Breakdown Voltage ($I_C = -10\ \mu\text{A}$, $V_{EB} = 0$) | BC856 Series BC857A, BC857B Only BC858, BC859 Series | $V_{(BR)CES}$ | -80 -50 -30 | - - - | - - - | V |
| Collector – Base Breakdown Voltage ($I_C = -10\ \mu\text{A}$) | BC856 Series BC857 Series BC858, BC859 Series | $V_{(BR)CBO}$ | -80 -50 -30 | - - - | - - - | V |
| Emitter – Base Breakdown Voltage ($I_E = -1.0\ \mu\text{A}$) | BC856 Series BC857 Series BC858, BC859 Series | $V_{(BR)EBO}$ | -5.0 -5.0 -5.0 | - - - | - - - | V |
| Collector Cutoff Current ($V_{CB} = -30\text{ V}$) ($V_{CB} = -30\text{ V}$, $T_A = 150^\circ\text{C}$) | | I_{CBO} | - - | - - | -15 -4.0 | nA μA |
| ON CHARACTERISTICS | | | | | | |
| DC Current Gain ($I_C = -10\ \mu\text{A}$, $V_{CE} = -5.0\text{ V}$) | BC856A, BC857A, BC858A BC856B, BC857B, BC858B BC857C, BC858C | h_{FE} | - - - | 90 150 270 | - - - | - |
| ($I_C = -2.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$) | BC856A, BC857A, BC858A BC856B, BC857B, BC858B, BC859B BC857C, BC858C, BC859C | | 125 220 420 | 180 290 520 | 250 475 800 | |
| Collector – Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -0.5\text{ mA}$) ($I_C = -100\text{ mA}$, $I_B = -5.0\text{ mA}$) | | $V_{CE(sat)}$ | - - | - - | -0.3 -0.65 | V |
| Base – Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -0.5\text{ mA}$) ($I_C = -100\text{ mA}$, $I_B = -5.0\text{ mA}$) | | $V_{BE(sat)}$ | - - | -0.7 -0.9 | - - | V |
| Base – Emitter On Voltage ($I_C = -2.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$) ($I_C = -10\text{ mA}$, $V_{CE} = -5.0\text{ V}$) | | $V_{BE(on)}$ | -0.6 - | - - | -0.75 -0.82 | V |
| SMALL-SIGNAL CHARACTERISTICS | | | | | | |
| Current – Gain – Bandwidth Product ($I_C = -10\text{ mA}$, $V_{CE} = -5.0\text{ Vdc}$, $f = 100\text{ MHz}$) | | f_T | 100 | - | - | MHz |
| Output Capacitance ($V_{CB} = -10\text{ V}$, $f = 1.0\text{ MHz}$) | | C_{ob} | - | - | 4.5 | pF |
| Noise Figure ($I_C = -0.2\text{ mA}$, $V_{CE} = -5.0\text{ Vdc}$, $R_S = 2.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$, $BW = 200\text{ Hz}$) | BC856, BC857, BC858 Series BC859 Series | NF | - - | - - | 10 4.0 | dB |

BC856ALT1 Series

BC857/BC858/BC859

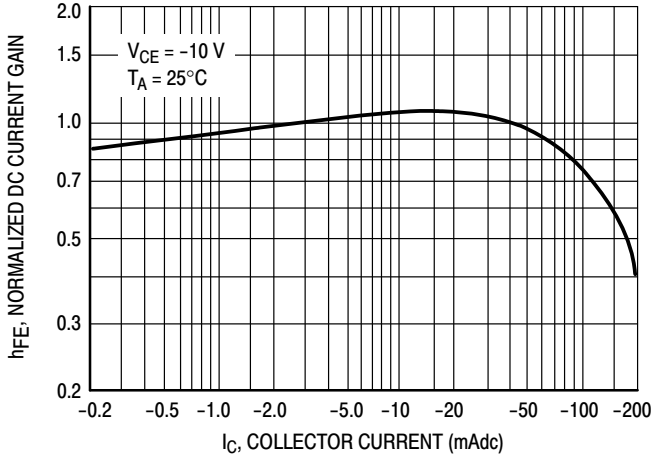


Figure 1. Normalized DC Current Gain

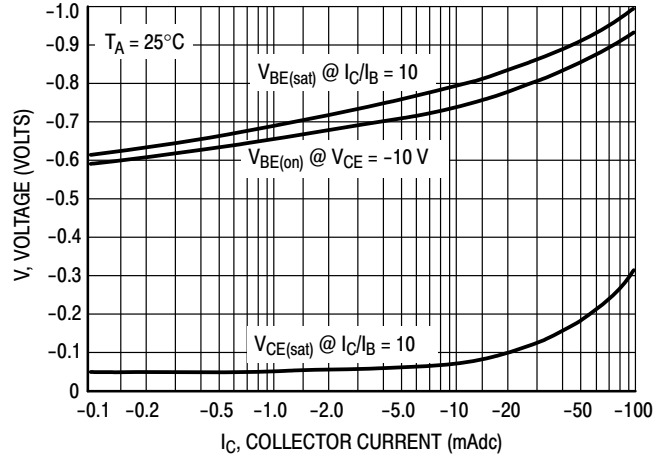


Figure 2. "Saturation" and "On" Voltages

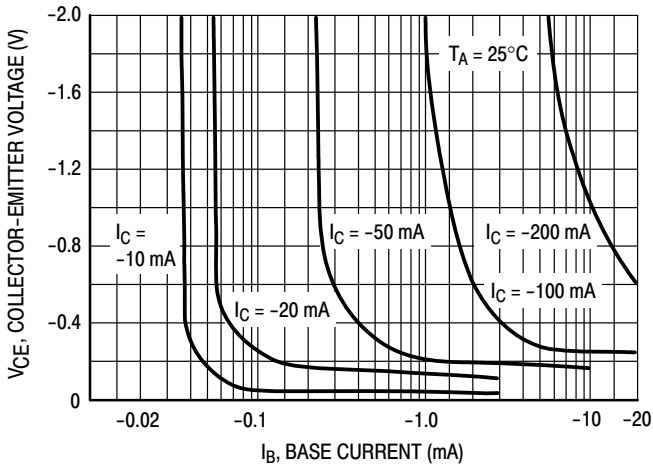


Figure 3. Collector Saturation Region

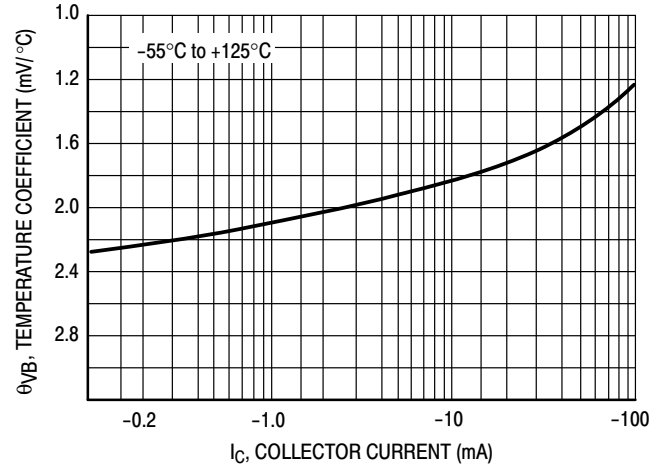


Figure 4. Base-Emitter Temperature Coefficient

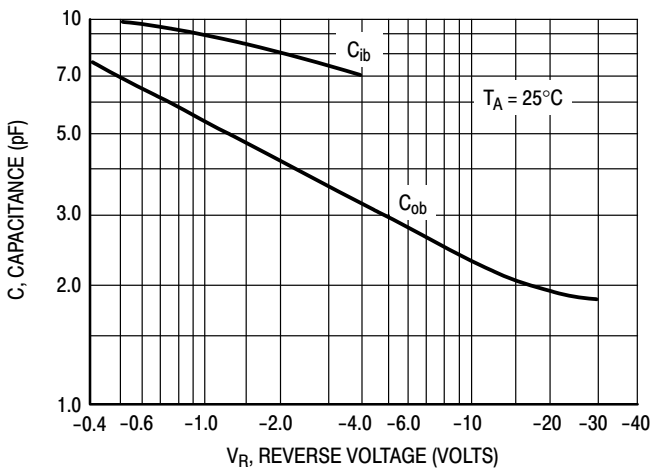


Figure 5. Capacitances

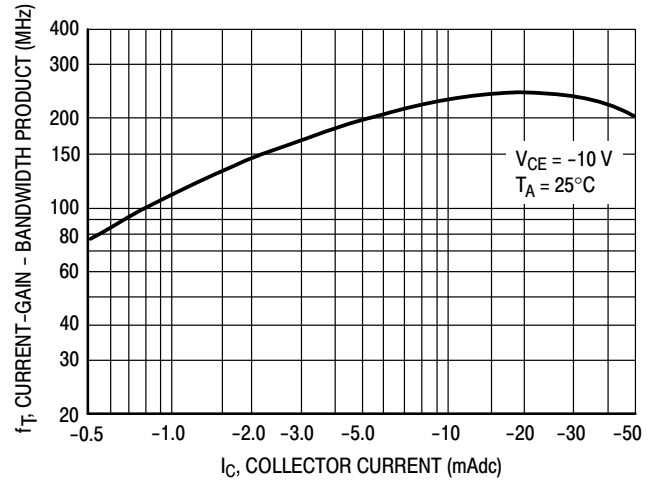


Figure 6. Current-Gain - Bandwidth Product

BC856ALT1 Series

BC856

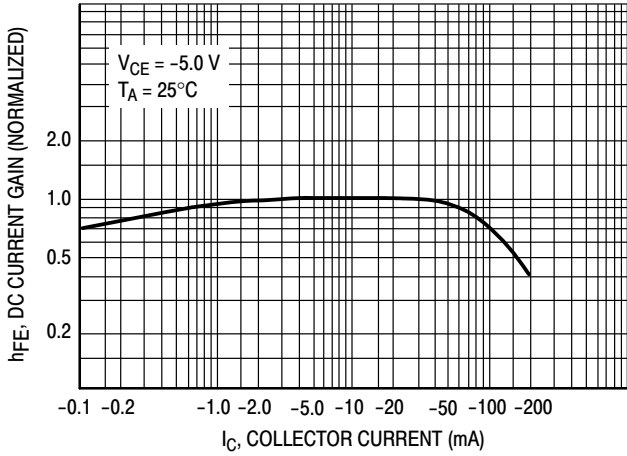


Figure 7. DC Current Gain

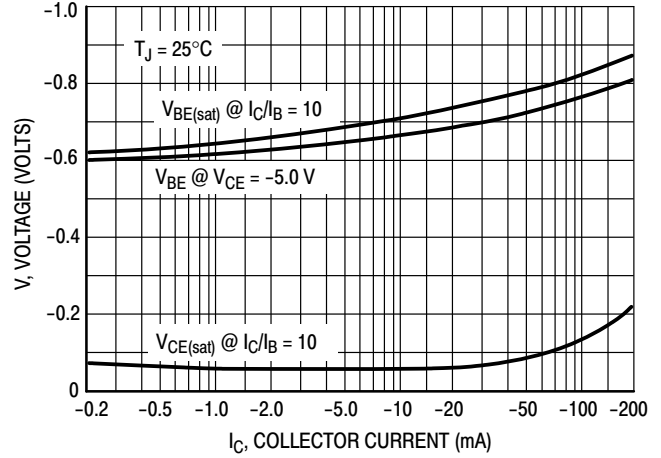


Figure 8. "On" Voltage

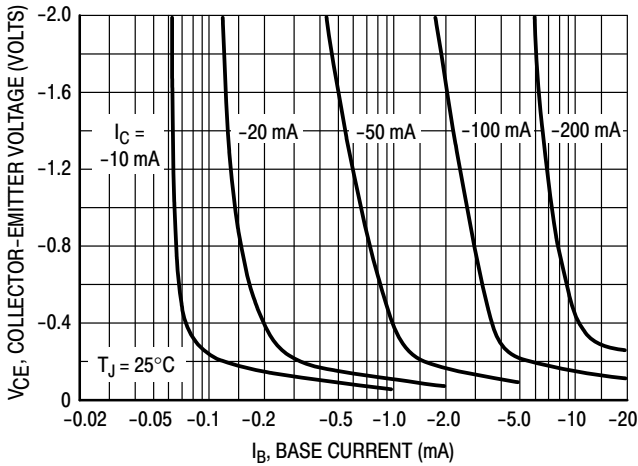


Figure 9. Collector Saturation Region

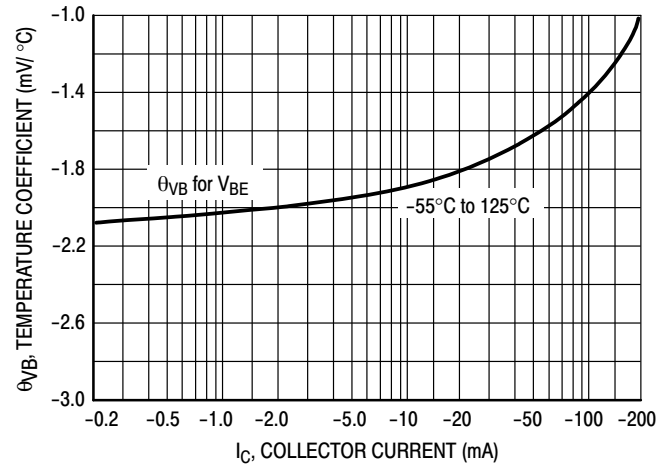


Figure 10. Base-Emitter Temperature Coefficient

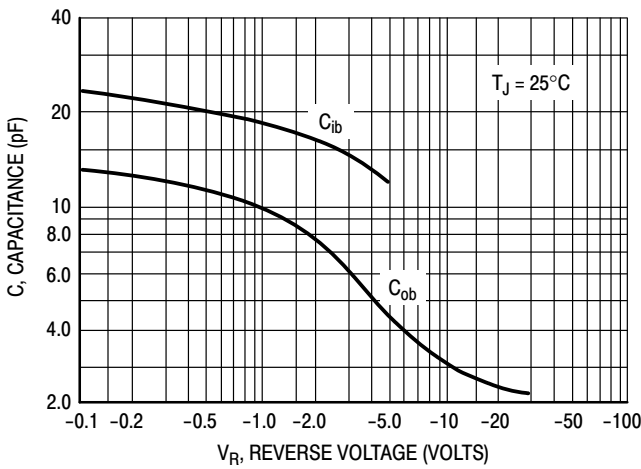


Figure 11. Capacitance

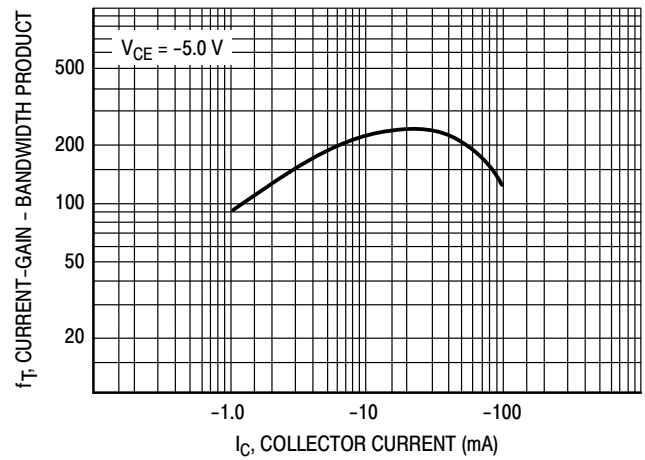


Figure 12. Current-Gain - Bandwidth Product

BC856ALT1 Series

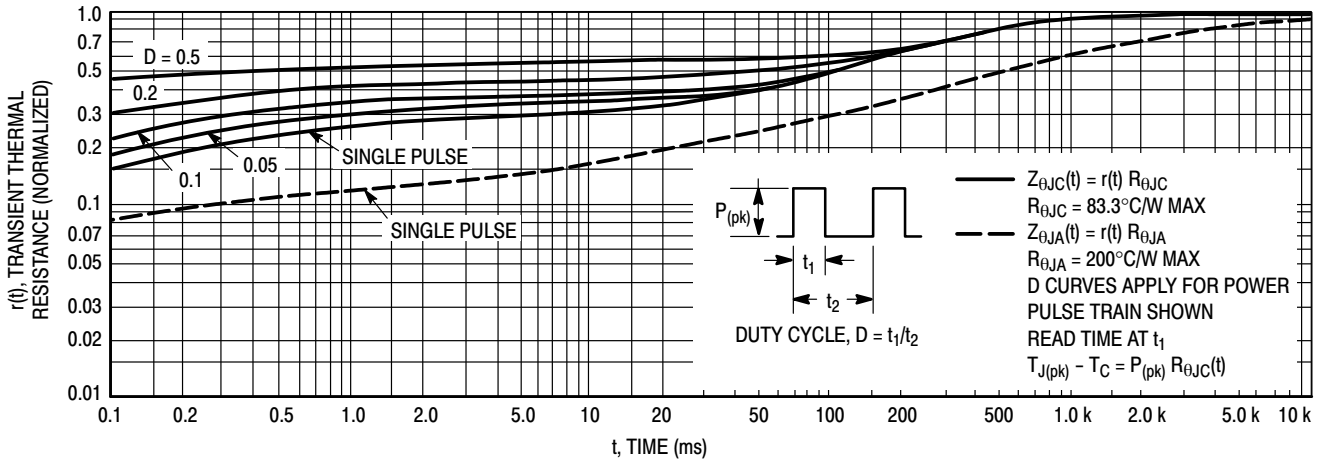


Figure 13. Thermal Response

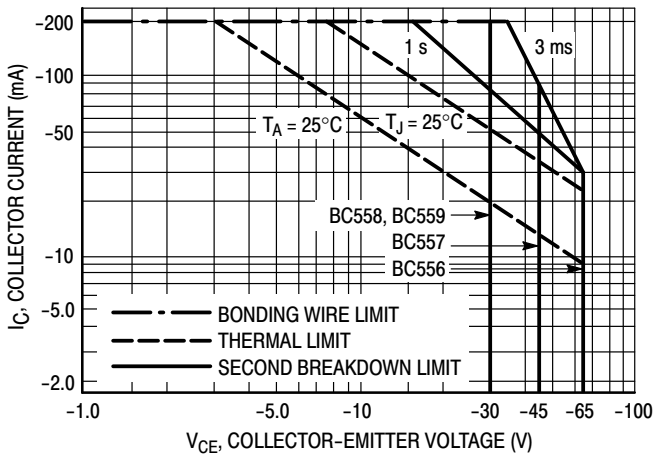


Figure 14. Active Region Safe Operating Area

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.

ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|------------|---------|------------------|----------------------|
| BC856ALT1 | 3A | SOT-23 | 3,000 / Tape & Reel |
| BC856ALT1G | | SOT-23 (Pb-Free) | |
| BC856ALT3 | | SOT-23 | 10,000 / Tape & Reel |
| BC856ALT3G | | SOT-23 (Pb-Free) | |
| BC856BLT1 | 3B | SOT-23 | 3,000 / Tape & Reel |
| BC856BLT1G | | SOT-23 (Pb-Free) | |
| BC856BLT3 | | SOT-23 | 10,000 / Tape & Reel |
| BC856BLT3G | | SOT-23 (Pb-Free) | |

†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.

BC856ALT1 Series

ORDERING INFORMATION

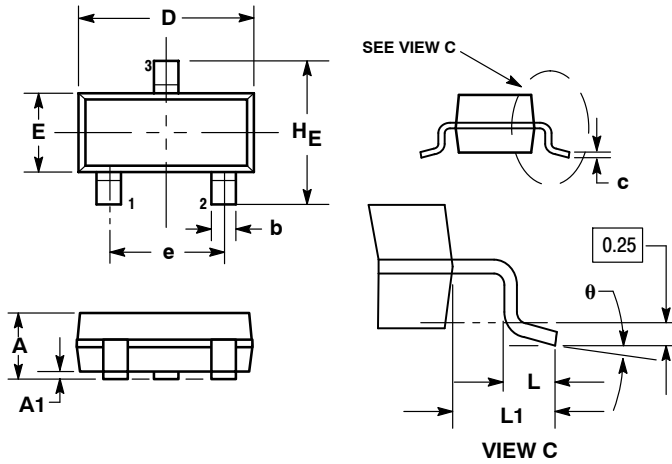
| Device | Marking | Package | Shipping† |
|------------|---------|---------------------|----------------------|
| BC857ALT1 | 3E | SOT-23 | 3,000 / Tape & Reel |
| BC857ALT1G | | SOT-23 (Pb-Free) | |
| BC857BLT1 | 3F | SOT-23 | 10,000 / Tape & Reel |
| BC857BLT1G | | SOT-23 (Pb-Free) | |
| BC857BLT3 | | SOT-23 | |
| BC857BLT3G | | SOT-23 (Pb-Free) | |
| BC857CLT1 | 3G | SOT-23 | 3,000 / Tape & Reel |
| BC857CLT1G | | SOT-23 (Pb-Free) | |
| BC857CLT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC858ALT1 | 3J | SOT-23 | 3,000 / Tape & Reel |
| BC858ALT1G | | SOT-23 (Pb-Free) | |
| BC858BLT1 | 3K | SOT-23 | 10,000 / Tape & Reel |
| BC858BLT1G | | SOT-23 (Pb-Free) | |
| BC858BLT3 | 3L | SOT-23 | 3,000 / Tape & Reel |
| BC858BLT3G | | SOT-23 (Pb-Free) | |
| BC858CLT1 | | SOT-23 | 10,000 / Tape & Reel |
| BC858CLT1G | | SOT-23 (Pb-Free) | |
| BC858CLT3 | | SOT-23 | 3,000 / Tape & Reel |
| BC858CLT3G | | SOT-23 (Pb-Free) | |
| BC859BLT1 | 4B | SOT-23 | 3,000 / Tape & Reel |
| BC859BLT1G | | SOT-23 (Pb-Free) | |
| BC859BLT3 | | SOT-23 | 10,000 / Tape & Reel |
| BC859BLT3G | | SOT-23 (Pb-Free) | |
| BC859CLT1 | 4C | SOT-23 | 3,000 / Tape & Reel |
| BC859CLT1G | | SOT-23 (Pb-Free) | |
| BC859CLT3 | | SOT-23 | 10,000 / Tape & Reel |
| BC859CLT3G | | SOT-23 (Pb-Free) | |

†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.

BC856ALT1 Series

PACKAGE DIMENSIONS

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



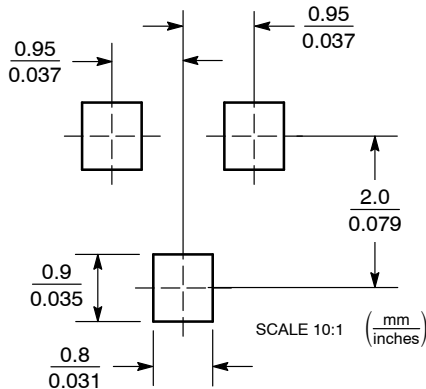
NOTES:

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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