

BC856ALT1G Series

General Purpose Transistors

PNP Silicon

Features

- 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_A = 25°C unless otherwise noted)

| Rating | Symbol | Value | Unit |
|---|------------------|-------------------|------|
| Collector-Emitter Voltage BC856, SBC856 BC857, SBC857 BC858, NSVBC858, BC859 | V _{CEO} | -65 -45 -30 | V |
| Collector-Base Voltage BC856, SBC856 BC857, SBC857 BC858, NSVBC858, BC859 | V _{CBO} | -80 -50 -30 | 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 FR-5 Board, (Note 1) T _A = 25°C Derate above 25°C | P _D | 225 1.8 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient | R _{θJA} | 556 | °C/W |
| Total Device Dissipation Alumina Substrate, (Note 2) T _A = 25°C Derate above 25°C | P _D | 300 2.4 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient | R _{θJA} | 417 | °C/W |
| Junction and Storage Temperature | T _J , T _{stg} | -55 to +150 | °C |

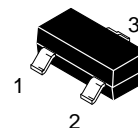
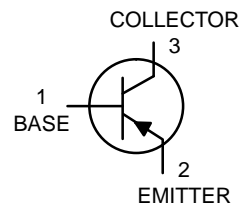
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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



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SOT-23 (TO-236)
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 |
|---|--|---------------|----------------------|-------------|---------------------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C = -10\text{ mA}$) | BC856, SBC856 Series BC857, SBC857 Series BC858, NSVBC858 BC859 Series | $V_{(BR)CEO}$ | -65 -45 -30 | - - - | V |
| Collector–Emitter Breakdown Voltage ($I_C = -10\ \mu\text{A}$, $V_{EB} = 0$) | BC856 S, SBC856series BC857A, SBC857A, BC857B, SBC857B Only BC858, NSVB858, BC859 Series | $V_{(BR)CES}$ | -80 -50 -30 | - - - | V |
| Collector–Base Breakdown Voltage ($I_C = -10\ \mu\text{A}$) | BC856, SBC856 Series BC857, SBC857 Series BC858, NSVBC858, BC859 Series | $V_{(BR)CBO}$ | -80 -50 -30 | - - - | V |
| Emitter–Base Breakdown Voltage ($I_E = -1.0\ \mu\text{A}$) | BC856, SBC856 Series BC857, SBC857 Series BC858, NSVBC858, 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} | - - | - - | nA μA |

ON CHARACTERISTICS

| | | | | | | |
|---|---|---------------|-------------------|-------------------|-------------------|---|
| DC Current Gain ($I_C = -10\ \mu\text{A}$, $V_{CE} = -5.0\text{ V}$) | BC856A, SBC856A, BC857A, SBC857A, BC858A BC856B, SBC856B, BC857B, SBC857B, BC858B, NSVBC858B BC857C, SBC857C BC858C | h_{FE} | - - - | 90 150 270 | - - - | - |
| ($I_C = -2.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$) | BC856A, SBC856A, BC857A, SBC857A, BC858A BC856B, SBC856B, BC857B, SBC857B, BC858B, NSVBC858B, BC859B BC857C, SBC857C, 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, SBC856, BC857, SBC857, BC858, NSVBC858 Series BC859 Series | | NF | - - | - - | 10 4.0 | 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.

BC856ALT1G Series

BC857/BC858/BC859/SBC857/NSVBC858

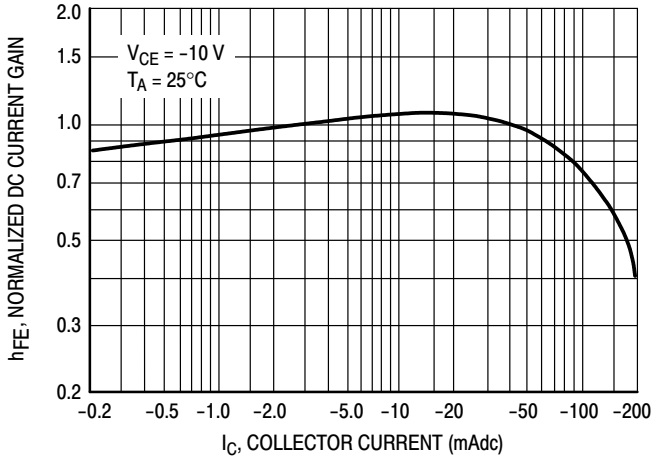


Figure 1. Normalized DC Current Gain

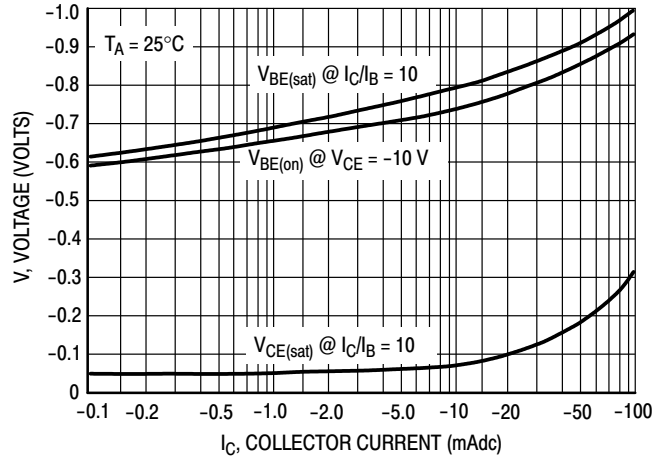


Figure 2. "Saturation" and "On" Voltages

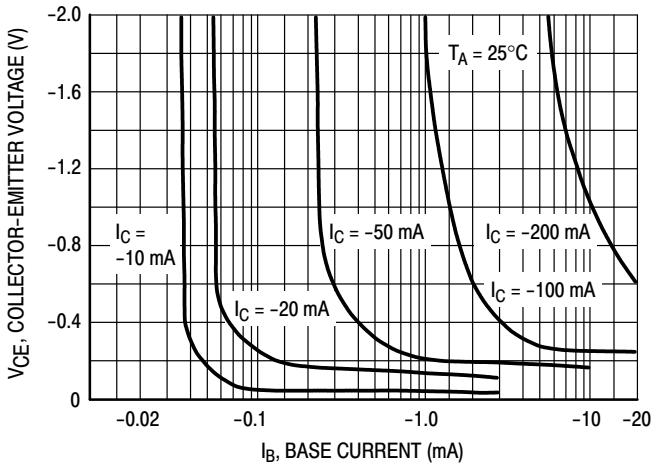


Figure 3. Collector Saturation Region

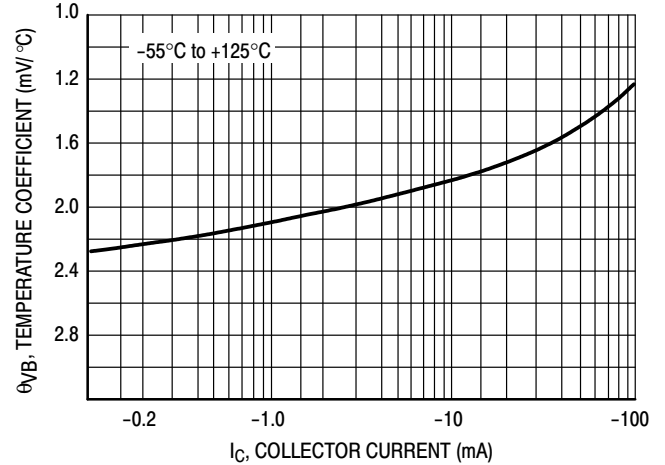


Figure 4. Base-Emitter Temperature Coefficient

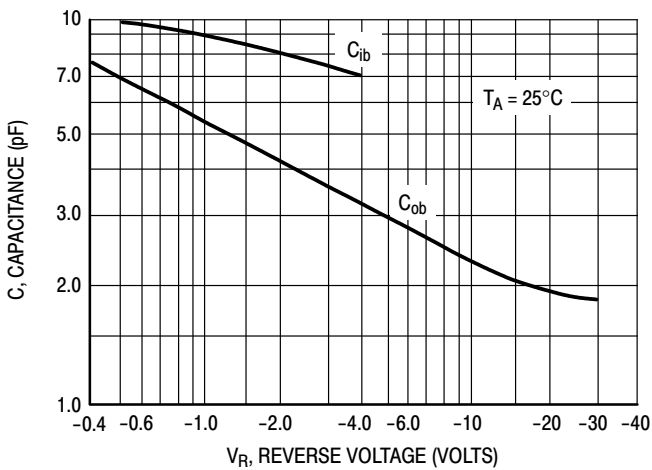


Figure 5. Capacitances

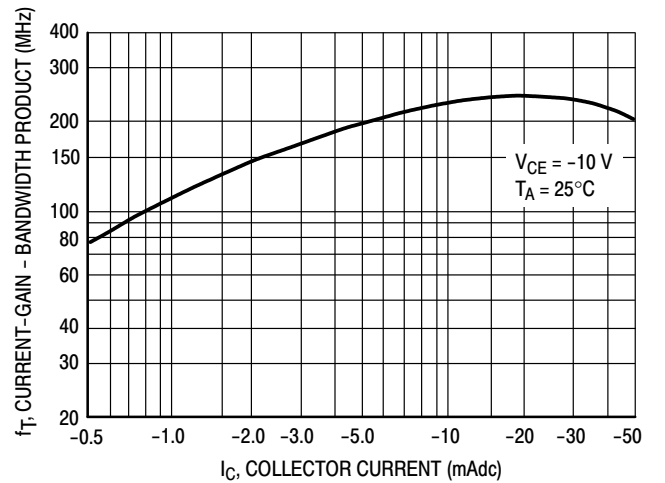


Figure 6. Current-Gain - Bandwidth Product

BC856ALT1G Series

BC856/SBC856

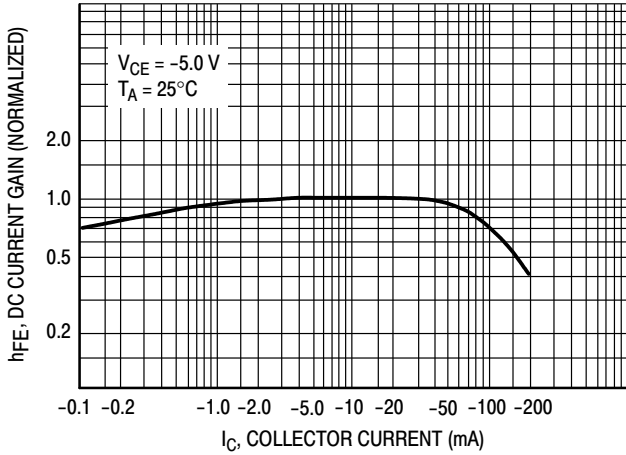


Figure 7. DC Current Gain

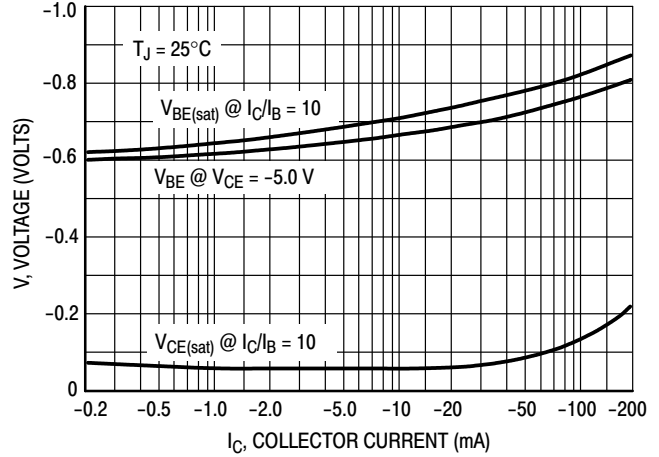


Figure 8. "On" Voltage

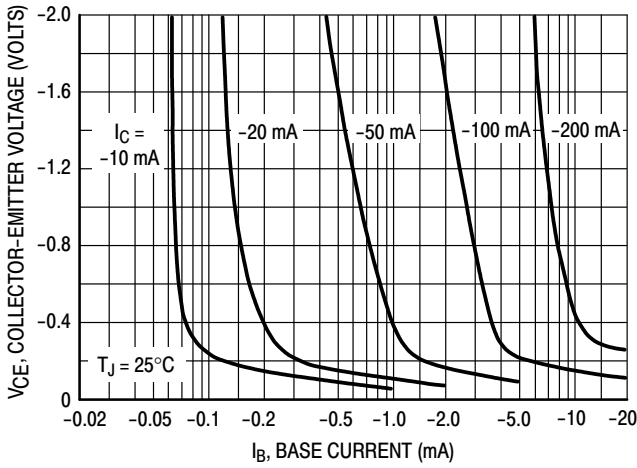


Figure 9. Collector Saturation Region

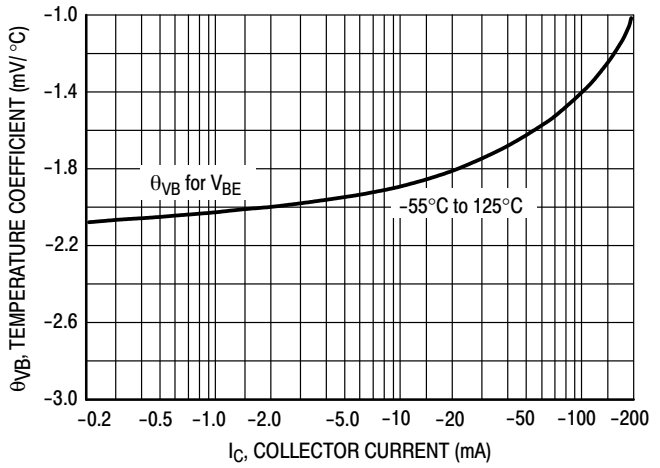


Figure 10. Base-Emitter Temperature Coefficient

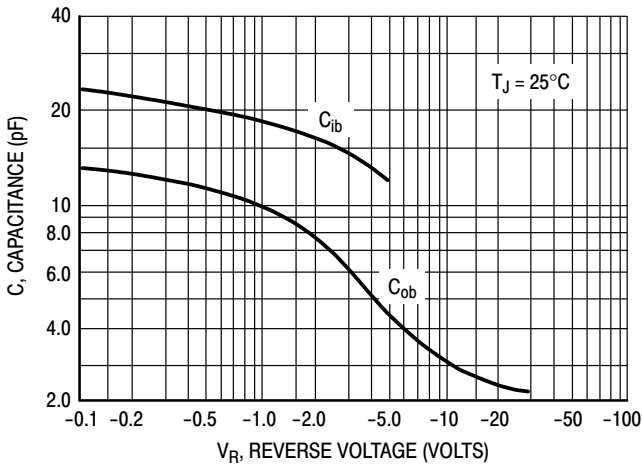


Figure 11. Capacitance

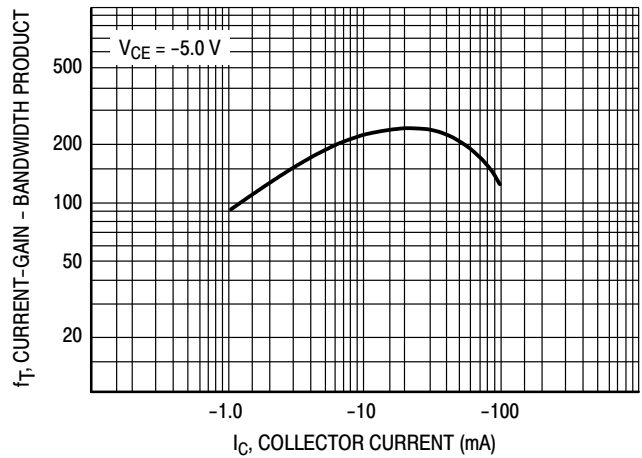


Figure 12. Current-Gain - Bandwidth Product

BC856ALT1G Series

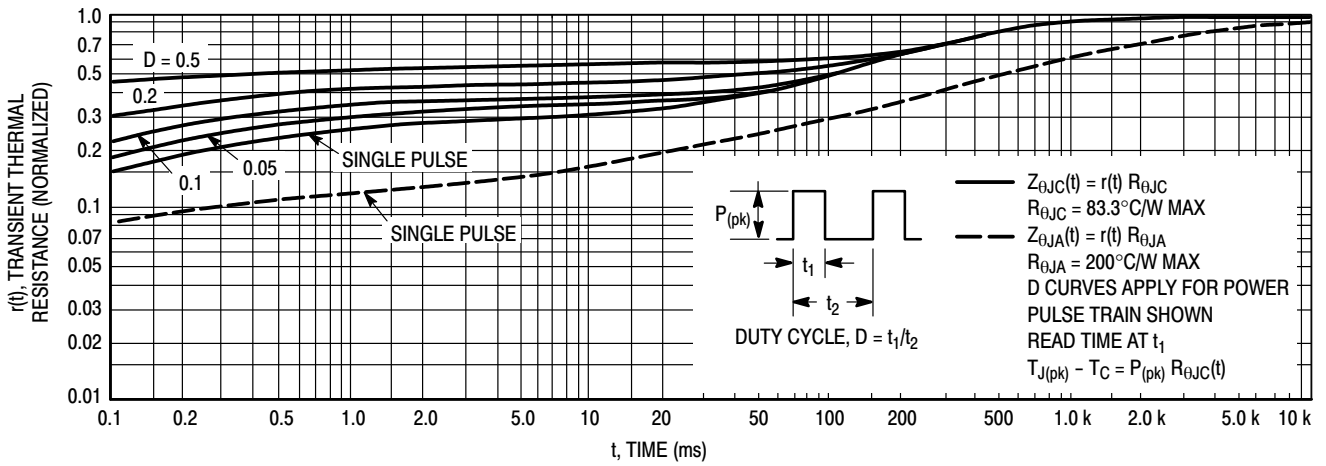


Figure 13. Thermal Response

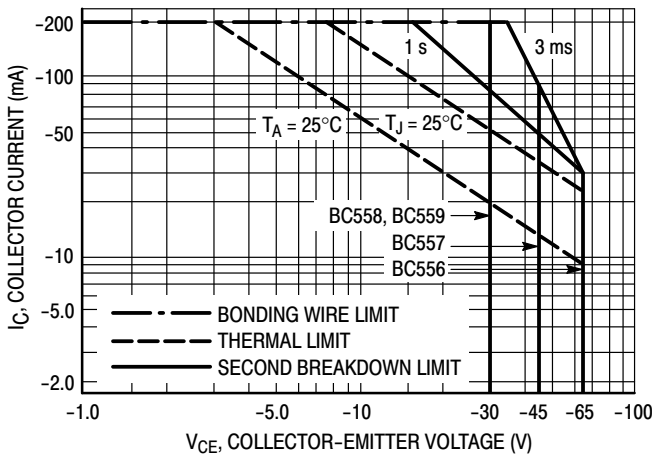


Figure 14. Active Region Safe Operating Area

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† |
|----------------|---------|---------------------|----------------------|
| BC856ALT1G | 3A | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC856ALT1G* | | | |
| BC856ALT3G | | | 10,000 / Tape & Reel |
| BC856BLT1G | 3B | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC856BLT1G* | | | |
| BC856BLT3G | | | 10,000 / Tape & Reel |
| SBC856BLT3G* | | | |
| BC857ALT1G | 3E | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC857ALT1G* | | | |
| BC857BLT1G | 3F | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC857BLT1G* | | | |
| BC857BLT3G | | | 10,000 / Tape & Reel |
| NSVBC857BLT3G* | | | |
| BC857CLT1G | 3G | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC857CLT1G* | | | |
| BC857CLT3G | | | 10,000 / Tape & Reel |
| BC858ALT1G | 3J | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC858BLT1G | 3K | SOT-23 (Pb-Free) | |
| NSVBC858BLT1G* | | | |
| BC858BLT3G | 3L | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC858CLT1G | | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC858CLT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| | | | |
| BC859BLT1G | 4B | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC859BLT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |
| BC859CLT1G | 4C | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| BC859CLT3G | | SOT-23 (Pb-Free) | 10,000 / Tape & Reel |

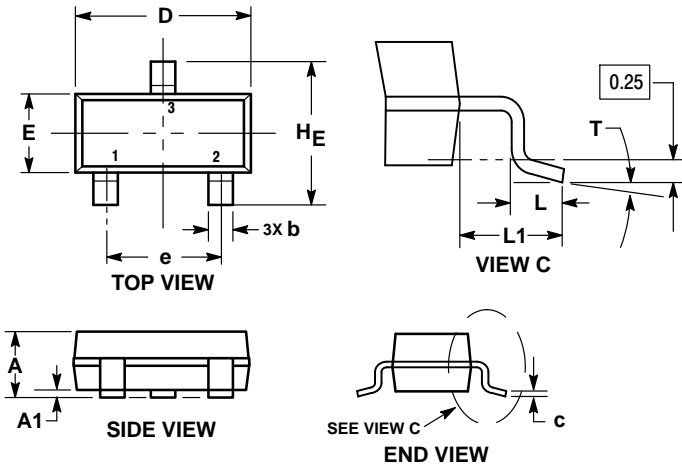
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

BC856ALT1G Series

PACKAGE DIMENSIONS

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

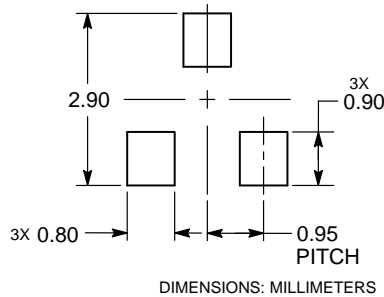


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
 4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.039 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.000 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.017 | 0.020 |
| c | 0.08 | 0.14 | 0.20 | 0.003 | 0.006 | 0.008 |
| 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 | 0.080 |
| L | 0.30 | 0.43 | 0.55 | 0.012 | 0.017 | 0.022 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.027 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |
| T | 0° | --- | 10° | 0° | --- | 10° |

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

RECOMMENDED 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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