

BC846ALT1G Series

General Purpose Transistors

NPN Silicon

Features

- Moisture Sensitivity Level: 1
- ESD Rating – Human Body Model: > 4000 V
– Machine Model: > 400 V
- 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

| Rating | Symbol | Value | Unit |
|--|-----------|-------------------|------|
| Collector-Emitter Voltage BC846 BC847, BC850 BC848, BC849 | V_{CEO} | 65 45 30 | Vdc |
| Collector-Base Voltage BC846 BC847, BC850 BC848, BC849 | V_{CBO} | 80 50 30 | Vdc |
| Emitter-Base Voltage BC846 BC847, BC850 BC848, BC849 | V_{EBO} | 6.0 6.0 5.0 | Vdc |
| Collector Current – Continuous | I_C | 100 | mAdc |

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.

THERMAL CHARACTERISTICS

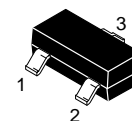
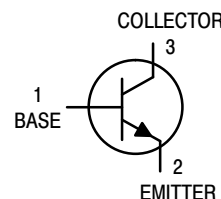
| Characteristic | Symbol | Max | Unit |
|---|-----------------|----------------|-------------|
| Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 1.8 | mW mW/°C |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 556 | °C/W |
|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

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



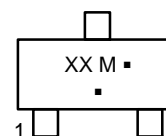
ON Semiconductor®

www.onsemi.com



SOT-23
CASE 318
STYLE 6

MARKING DIAGRAM



XX = Device Code
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 12 of this data sheet.

BC846ALT1G Series

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

| Characteristic | Symbol | Min | Typ | Max | Unit | |
|---|---|---------------|-------------------|-------------------|-------------------|---------------------|
| OFF CHARACTERISTICS | | | | | | |
| Collector–Emitter Breakdown Voltage ($I_C = 10\text{ mA}$) | BC846A, B BC847A, B, C, BC850B, C BC848A, B, C, BC849B, C | $V_{(BR)CEO}$ | 65 45 30 | – – – | – – – | V |
| Collector–Emitter Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $V_{EB} = 0$) | BC846A, B BC847A, B, C BC850B, C BC848A, B, C, BC849B, C | $V_{(BR)CES}$ | 80 50 30 | – – – | – – – | V |
| Collector–Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$) | BC846A, B BC847A, B, C, BC850B, C BC848A, B, C, BC849B, C | $V_{(BR)CBO}$ | 80 50 30 | – – – | – – – | V |
| Emitter–Base Breakdown Voltage ($I_E = 1.0\ \mu\text{A}$) | BC846A, B BC847A, B, C, BC850B, C BC848A, B, C, BC849B, C | $V_{(BR)EBO}$ | 6.0 6.0 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 5.0 | nA μA |
| ON CHARACTERISTICS | | | | | | |
| DC Current Gain ($I_C = 10\ \mu\text{A}$, $V_{CE} = 5.0\text{ V}$) | BC846A, BC847A, BC848A BC846B, BC847B, BC848B BC847C, BC848C | h_{FE} | – – – | 90 150 270 | – – – | – |
| ($I_C = 2.0\text{ mA}$, $V_{CE} = 5.0\text{ V}$) | BC846A, BC847A, BC848A BC846B, BC847B, BC848B, BC849B, BC850B BC847C, BC848C, BC849C, BC850C | | 110 200 420 | 180 290 520 | 220 450 800 | |
| Collector–Emitter Saturation Voltage ($I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$) ($I_C = 100\text{ mA}$, $I_B = 5.0\text{ mA}$) | | $V_{CE(sat)}$ | – – | – – | 0.25 0.6 | 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 Voltage ($I_C = 2.0\text{ mA}$, $V_{CE} = 5.0\text{ V}$) ($I_C = 10\text{ mA}$, $V_{CE} = 5.0\text{ V}$) | | $V_{BE(on)}$ | 580 – | 660 – | 700 770 | mV |
| 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_{obo} | – | – | 4.5 | pF |
| Noise Figure ($I_C = 0.2\text{ mA}$, $V_{CE} = 5.0\text{ Vdc}$, $R_S = 2.0\text{ k}\Omega$, $f = 1.0\text{ kHz}$, $BW = 200\text{ Hz}$) | BC846A,B, BC847A,B,C, BC848A,B,C BC849B,C, BC850B,C | 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.

BC846ALT1G Series

BC846A, BC847A, BC848A, SBC846A

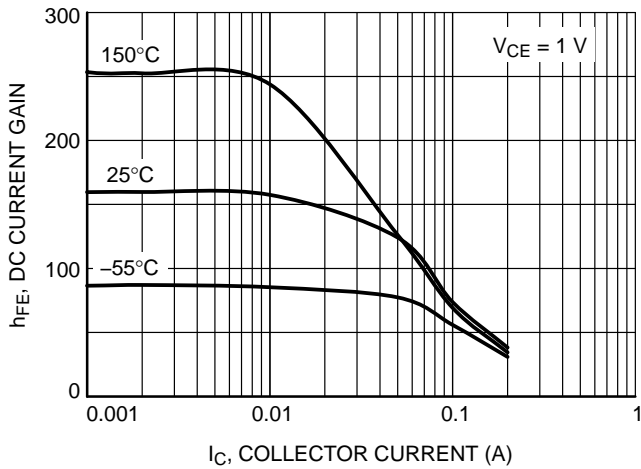


Figure 1. DC Current Gain vs. Collector Current

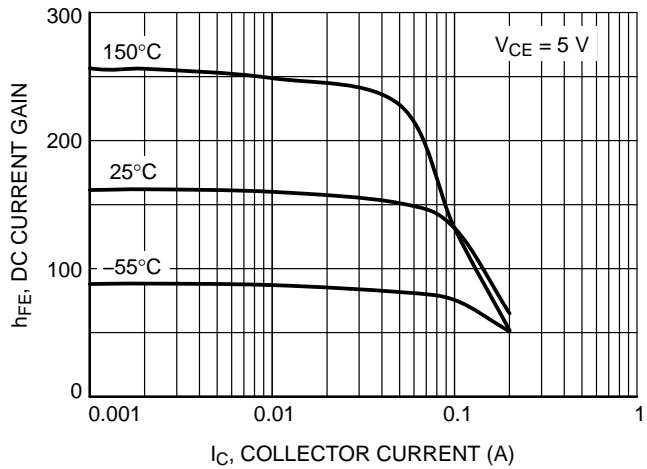


Figure 2. DC Current Gain vs. Collector Current

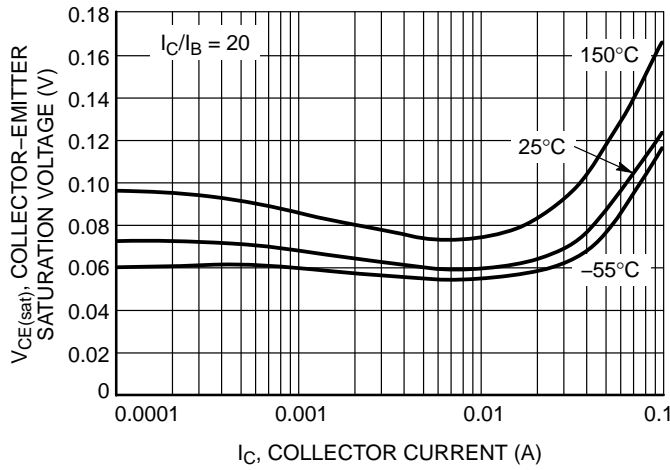


Figure 3. Collector Emitter Saturation Voltage vs. Collector Current

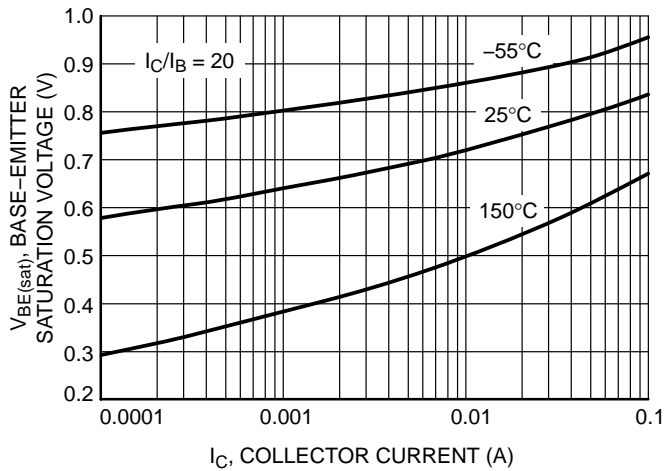


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

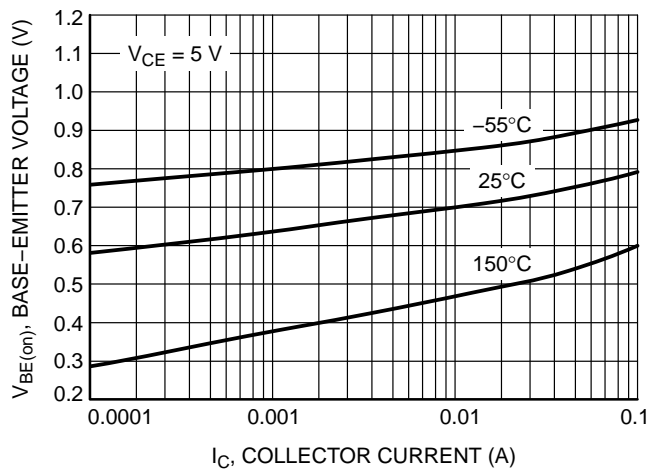


Figure 5. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series

BC846A, BC847A, BC848A, SBC846A

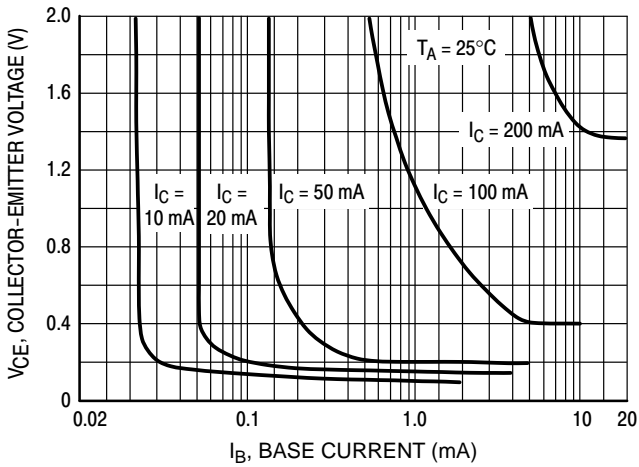


Figure 6. Collector Saturation Region

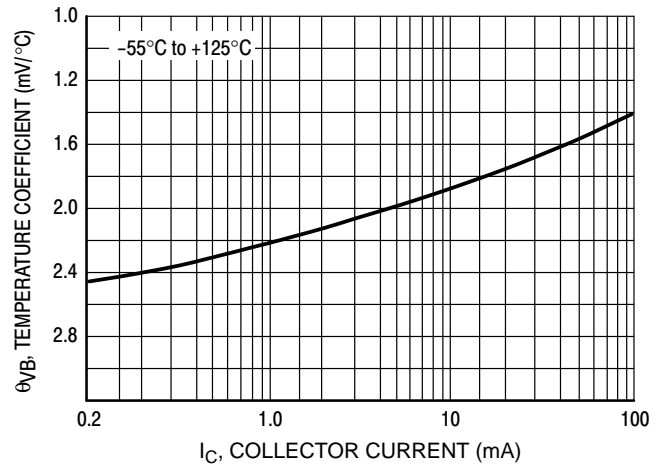


Figure 7. Base-Emitter Temperature Coefficient

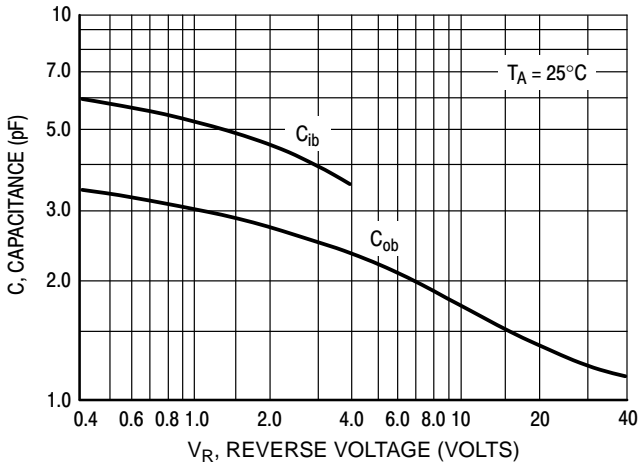


Figure 8. Capacitances

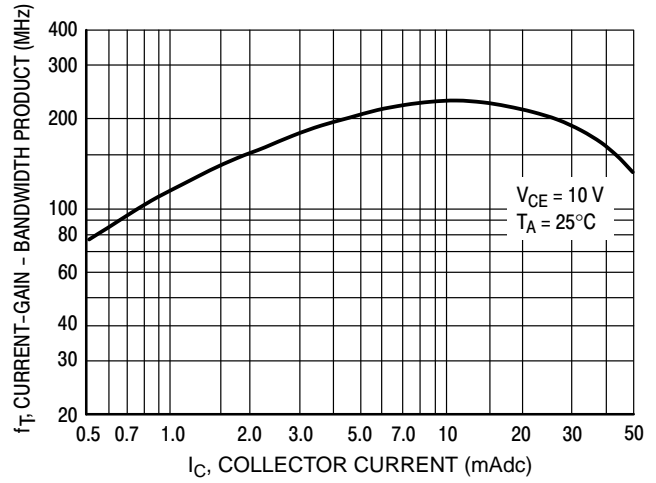


Figure 9. Current-Gain - Bandwidth Product

BC846ALT1G Series

BC846B, SBC846B

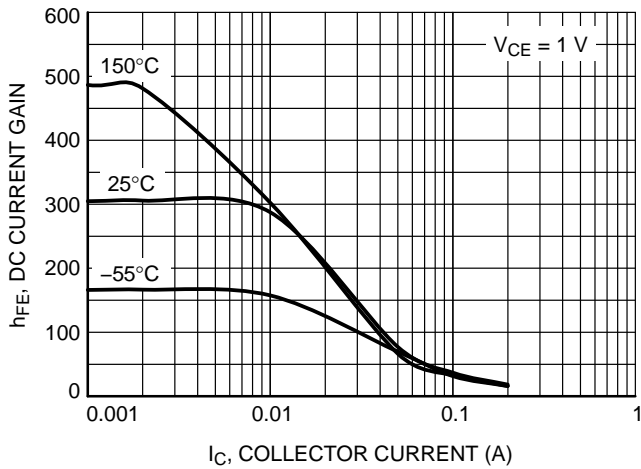


Figure 10. DC Current Gain vs. Collector Current

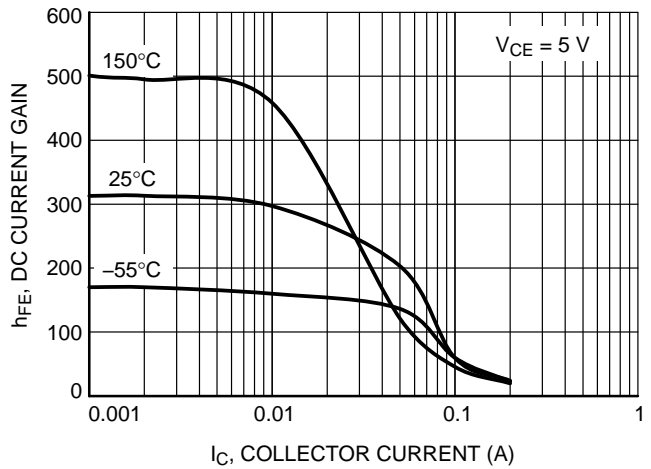


Figure 11. DC Current Gain vs. Collector Current

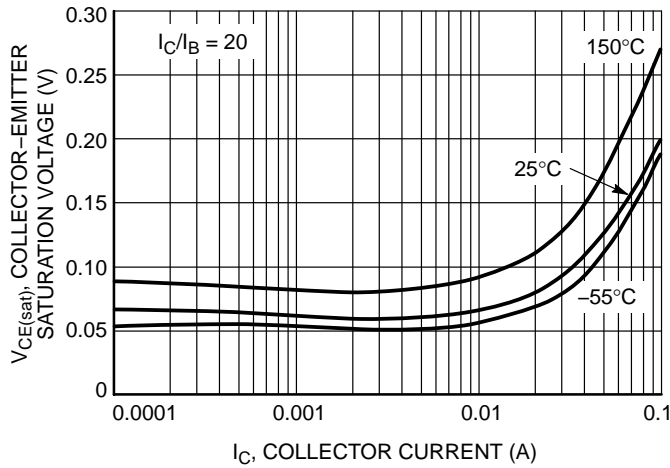


Figure 12. Collector Emitter Saturation Voltage vs. Collector Current

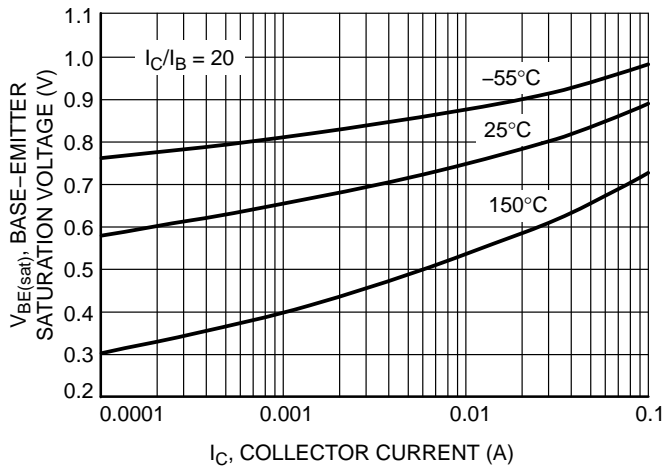


Figure 13. Base Emitter Saturation Voltage vs. Collector Current

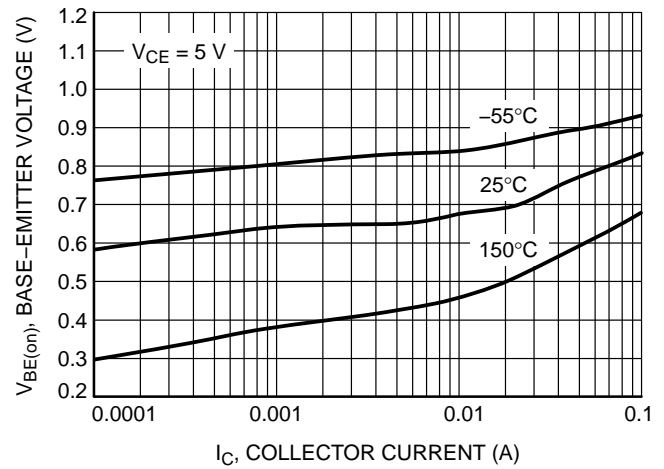


Figure 14. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series

BC846B, SBC846B

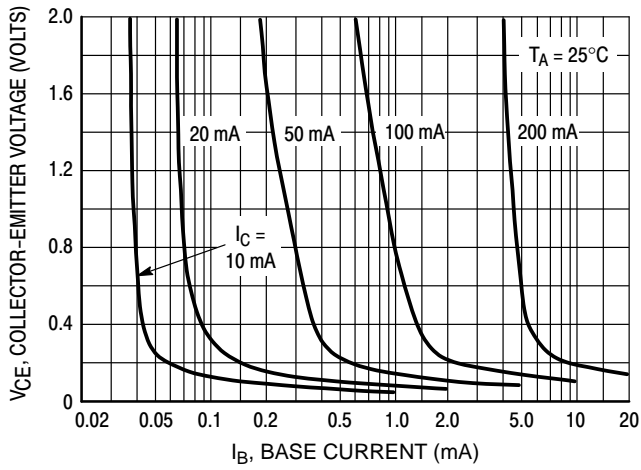


Figure 15. Collector Saturation Region

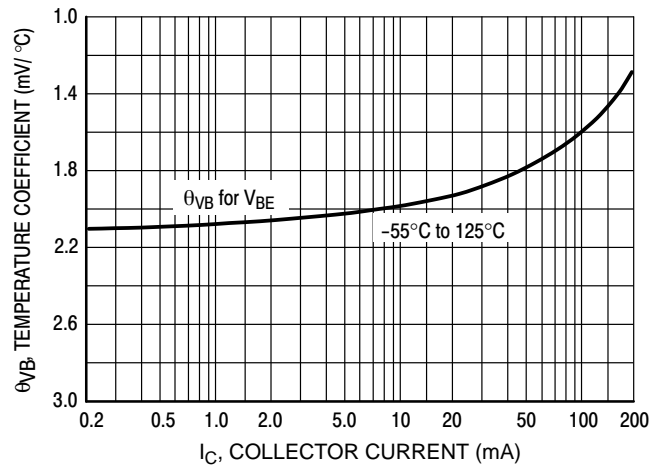


Figure 16. Base-Emitter Temperature Coefficient

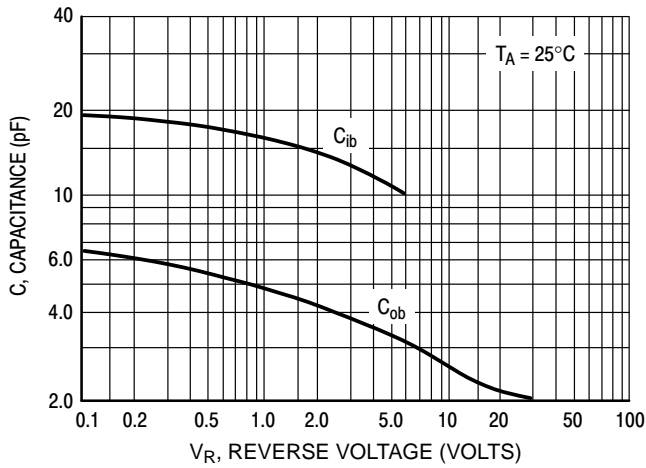


Figure 17. Capacitance

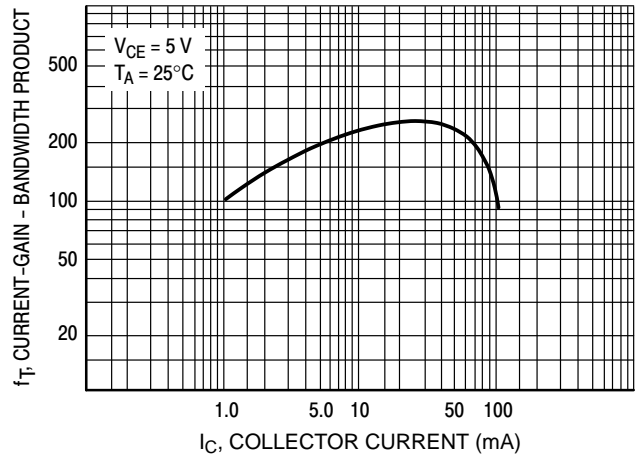


Figure 18. Current-Gain - Bandwidth Product

BC846ALT1G Series

BC847B, BC848B, BC849B, BC850B, SBC847B, SBC848B

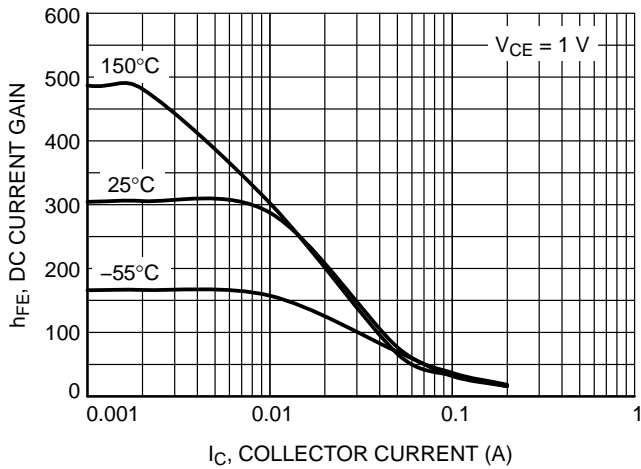


Figure 19. DC Current Gain vs. Collector Current

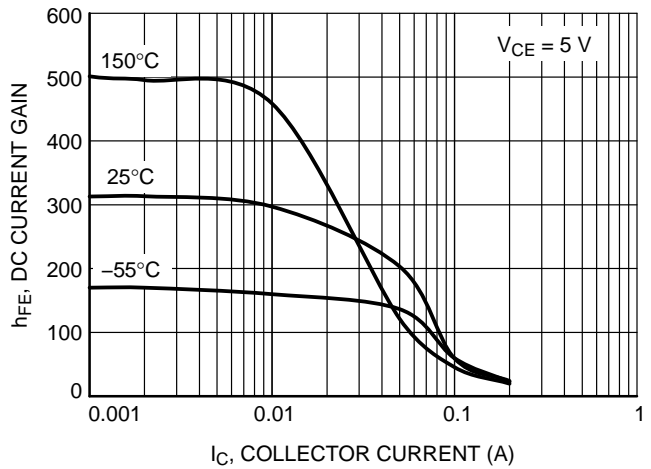


Figure 20. DC Current Gain vs. Collector Current

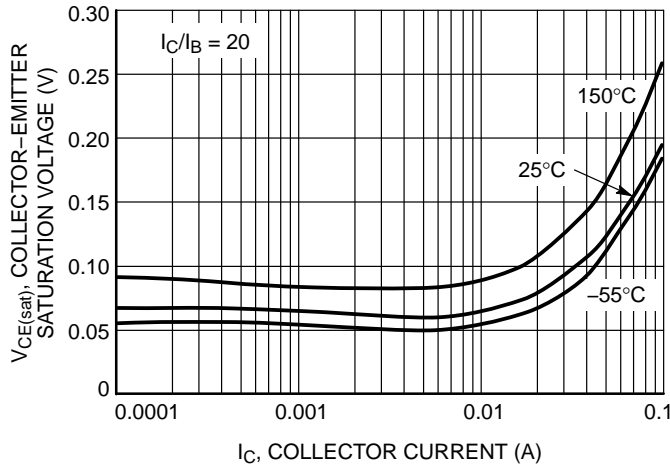


Figure 21. Collector-Emitter Saturation Voltage vs. Collector Current

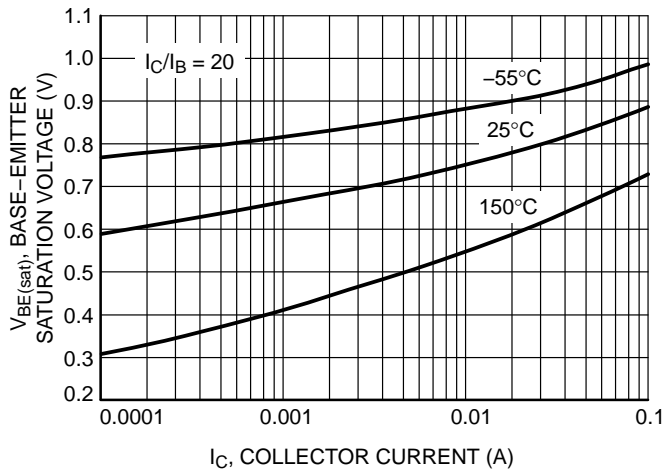


Figure 22. Base-Emitter Saturation Voltage vs. Collector Current

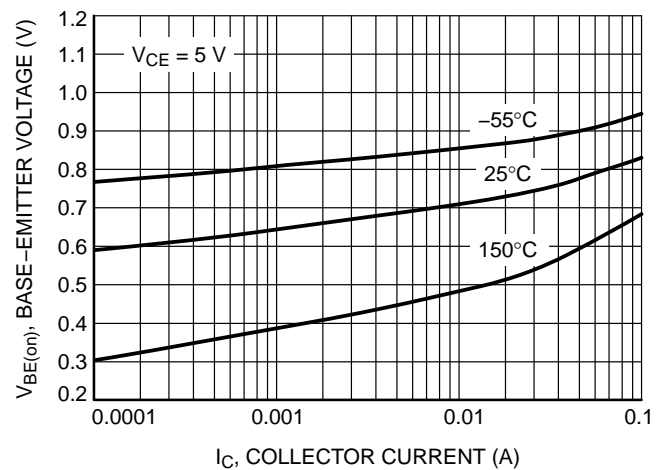


Figure 23. Base-Emitter Voltage vs. Collector Current

BC846ALT1G Series

BC847B, BC848B, BC849B, BC850B, SBC846B, SBC847B, SBC848B

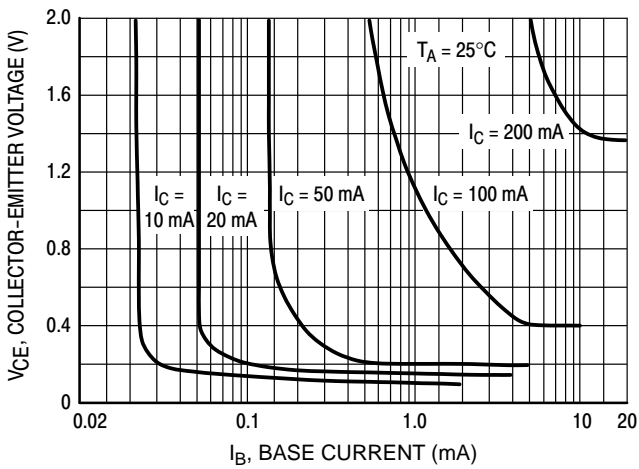


Figure 24. Collector Saturation Region

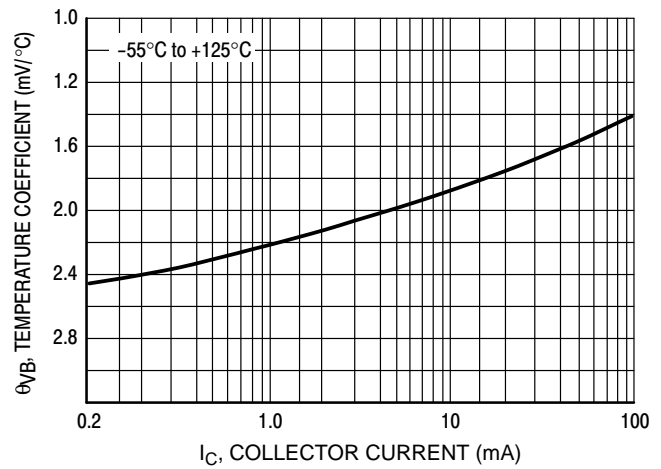


Figure 25. Base-Emitter Temperature Coefficient

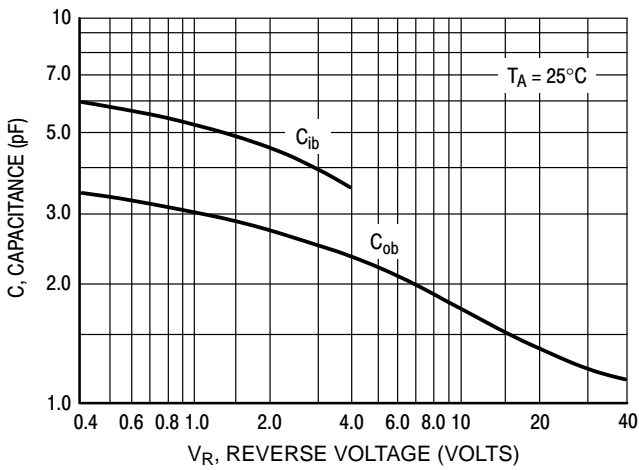


Figure 26. Capacitances

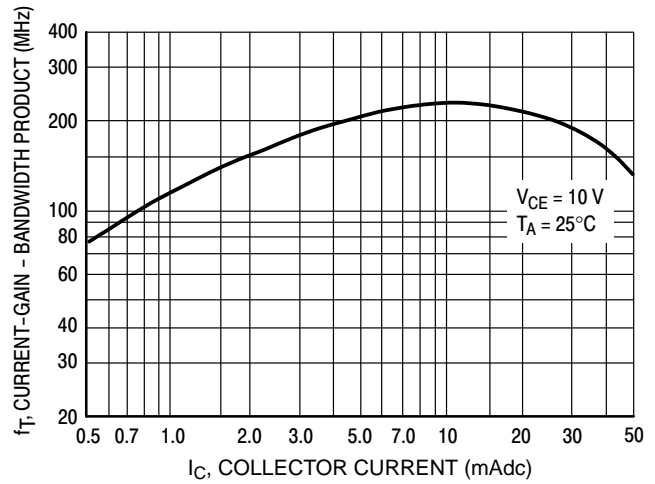


Figure 27. Current-Gain - Bandwidth Product

BC846ALT1G Series

BC847C, BC848C, BC849C, BC850C, SBC847C

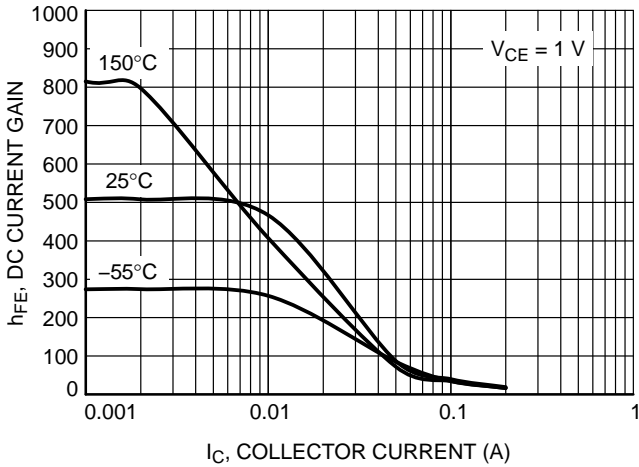


Figure 28. DC Current Gain vs. Collector Current

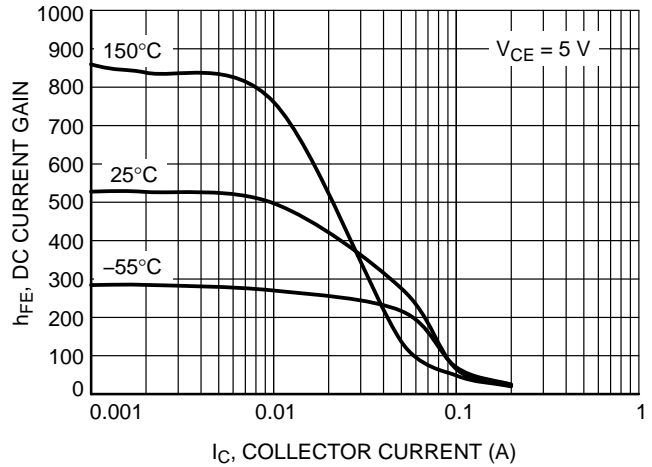


Figure 29. DC Current Gain vs. Collector Current

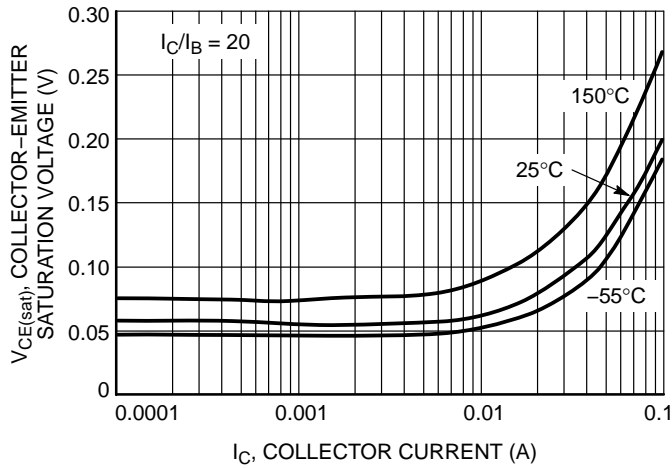


Figure 30. Collector Emitter Saturation Voltage vs. Collector Current

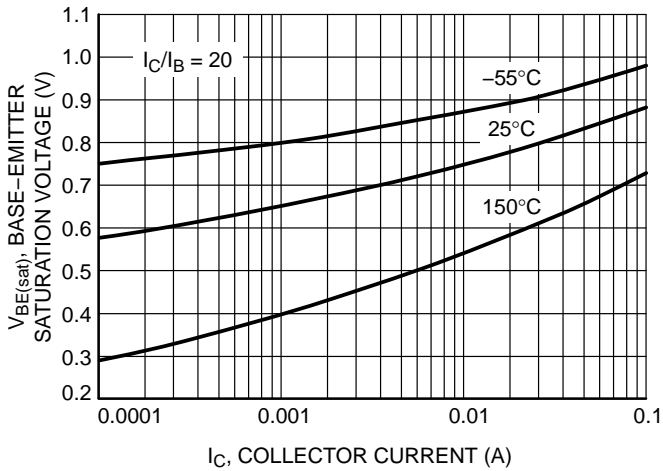


Figure 31. Base Emitter Saturation Voltage vs. Collector Current

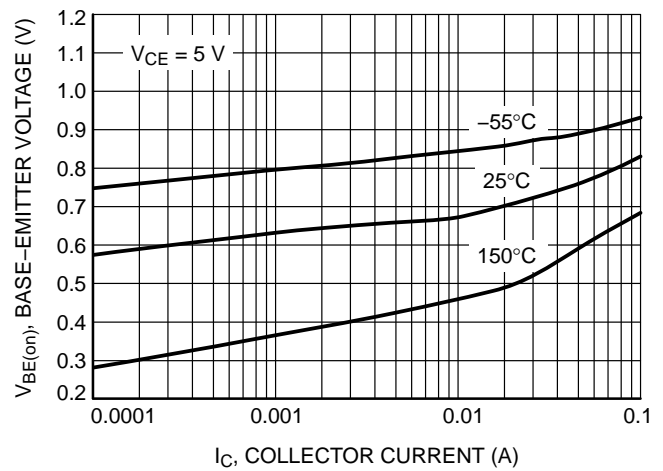


Figure 32. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series

BC847C, BC848C, BC849C, BC850C, SBC847C

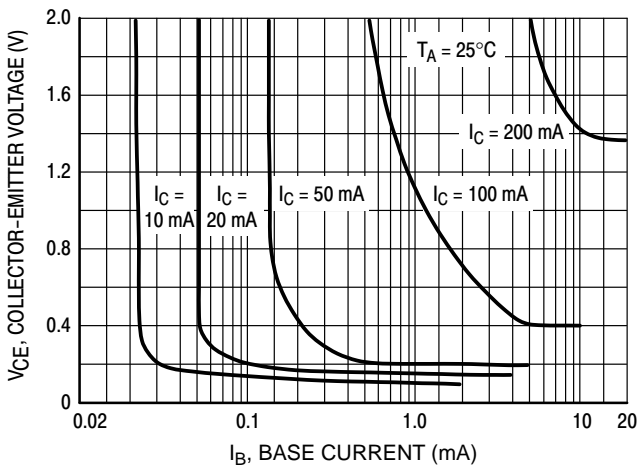


Figure 33. Collector Saturation Region

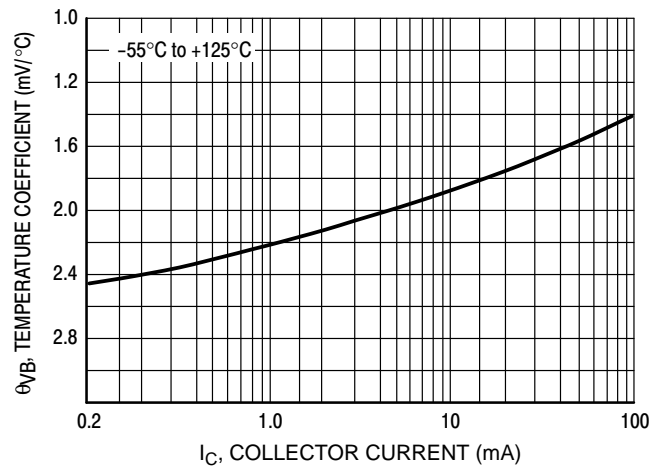


Figure 34. Base-Emitter Temperature Coefficient

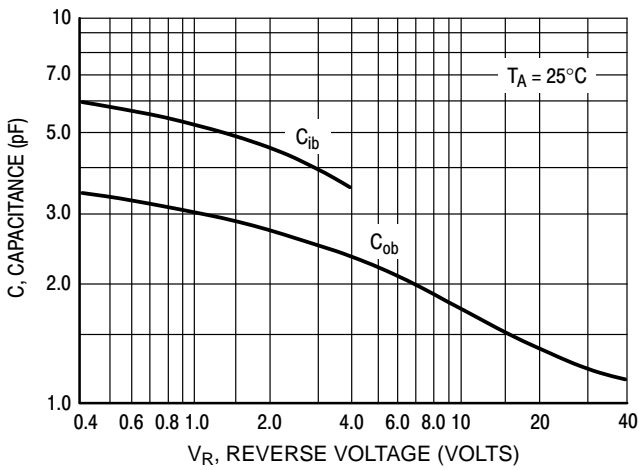


Figure 35. Capacitances

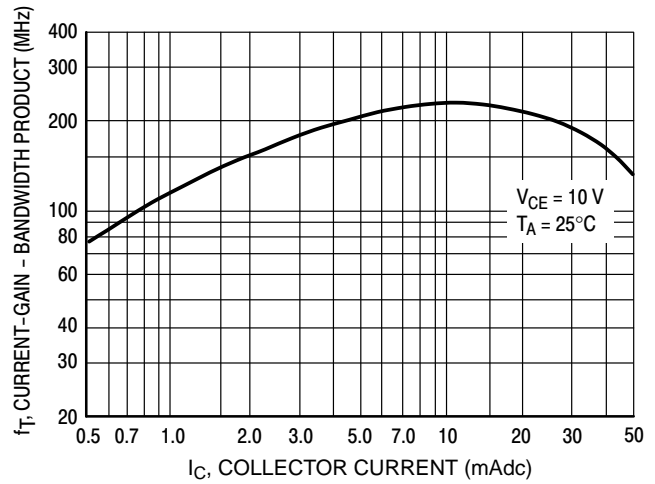


Figure 36. Current-Gain - Bandwidth Product

BC846ALT1G Series

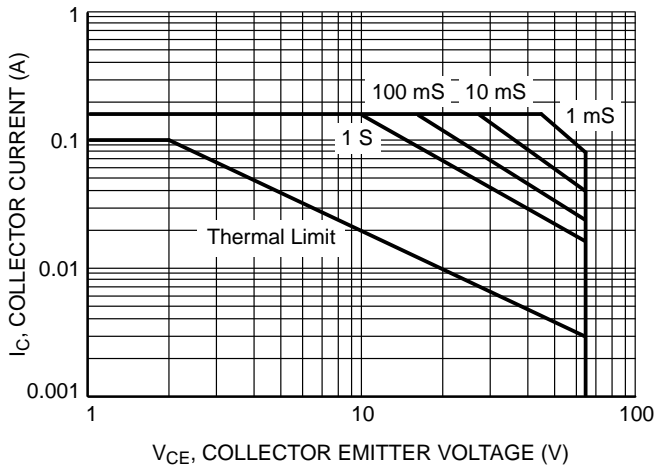


Figure 37. Safe Operating Area for BC846A, BC846B

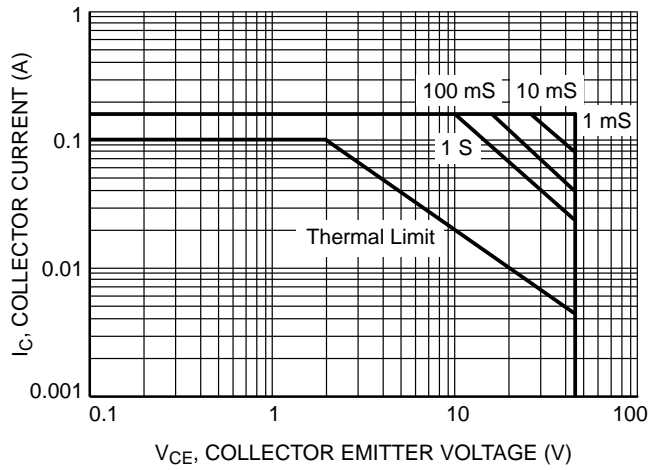


Figure 38. Safe Operating Area for BC847A, BC847B, BC847C, BC850B, BC850C



Figure 39. Safe Operating Area for BC848A, BC848B, BC848C, BC849B, BC849C

BC846ALT1G Series

ORDERING INFORMATION

| Device | Marking | Package | Shipping [†] |
|----------------|---------|----------------------|-----------------------|
| BC846ALT1G | 1A | SOT-23 (Pb-Free) | 3,000 / Tape & Reel |
| SBC846ALT1G* | | | |
| BC846ALT3G | | | 10,000 / Tape & Reel |
| BC846BLT1G | 1B | | 3,000 / Tape & Reel |
| SBC846BLT1G* | | | |
| BC846BLT3G | | | 10,000 / Tape & Reel |
| SBC846BLT3G* | | | |
| BC847ALT1G | 1E | | 3,000 / Tape & Reel |
| BC847ALT3G | | | 10,000 / Tape & Reel |
| BC847BLT1G | 1F | | 3,000 / Tape & Reel |
| SBC847BLT1G* | | | |
| BC847BLT3G | | | 10,000 / Tape & Reel |
| NSVBC847BLT3G* | | | |
| BC847CLT1G | 1G | | 3,000 / Tape & Reel |
| SBC847CLT1G* | | | |
| BC847CLT3G | | | 10,000 / Tape & Reel |
| BC848ALT1G | 1J | | 3,000 / Tape & Reel |
| BC848BLT1G | 1K | | 3,000 / Tape & Reel |
| SBC848BLT1G* | | | |
| BC848BLT3G | | | 10,000 / Tape & Reel |
| BC848CLT1G | 1L | | 3,000 / Tape & Reel |
| NSVBC848CLT1G* | | | |
| BC848CLT3G | | | 10,000 / Tape & Reel |
| BC849BLT1G | 2B | | 3,000 / Tape & Reel |
| NSVBC849BLT1G* | | | |
| BC849BLT3G | | 10,000 / Tape & Reel | |
| BC849CLT1G | 2C | 3,000 / Tape & Reel | |
| BC849CLT3G | | 10,000 / Tape & Reel | |
| BC850BLT1G | 2F | 3,000 / Tape & Reel | |
| NSVBC850BLT1G* | | | |
| BC850CLT1G | 2G | | |
| NSVBC850CLT1G* | | | |

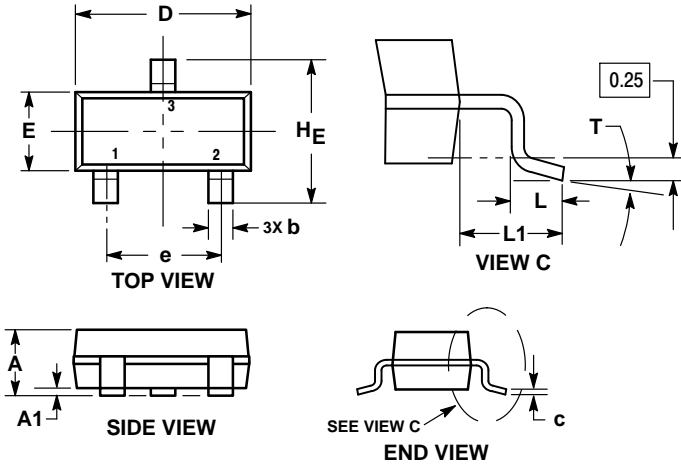
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

BC846ALT1G Series

PACKAGE DIMENSIONS

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



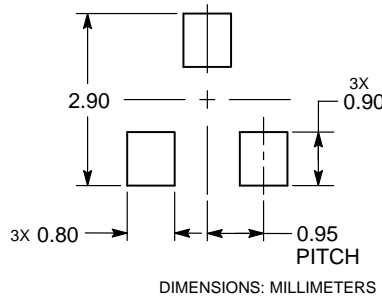
NOTES:

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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