

General Purpose Transistors

NPN Silicon



ON Semiconductor®

www.onsemi.com

BC846ALT1G Series

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

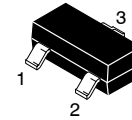
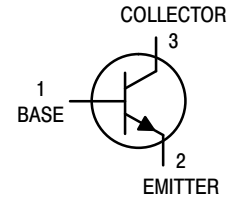
| Rating | Symbol | Value | Unit |
|--|-----------|-------------------|------|
| Collector-Emitter Voltage BC846 BC847, BC850 BC848, BC849 | V_{CEO} | 65 45 30 | Vdc |
| Collector-Base Voltage BC846 BC847, BC850 BC848, BC849 | V_{CBO} | 80 50 30 | Vdc |
| Emitter-Base Voltage BC846 BC847, BC850 BC848, 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

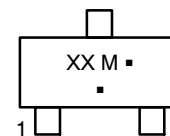
| Characteristic | Symbol | Max | Unit |
|---|-----------------|----------------|---------------------------|
| Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 225 | mW |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 556 | $^\circ\text{C}/\text{W}$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

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



**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, C 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, C 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, C 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, C 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 BC846C, 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 BC846C, 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,C, 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

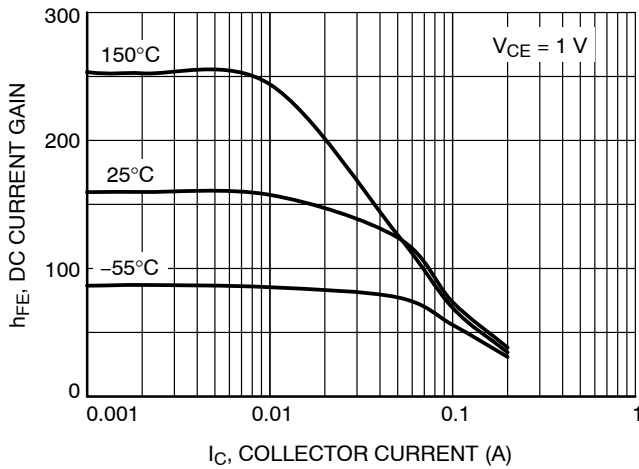


Figure 1. DC Current Gain vs. Collector Current

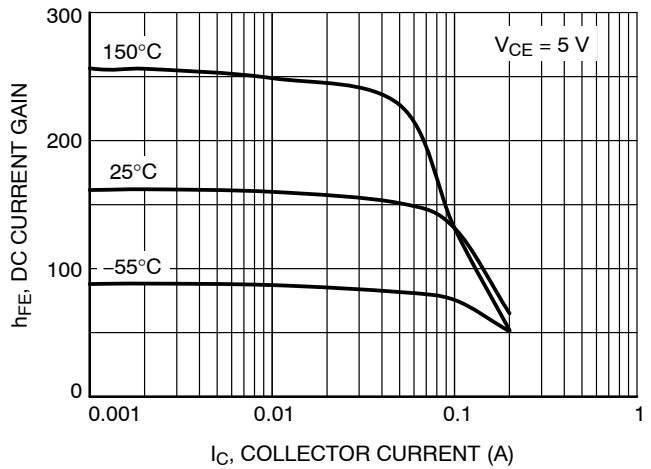


Figure 2. DC Current Gain vs. Collector Current

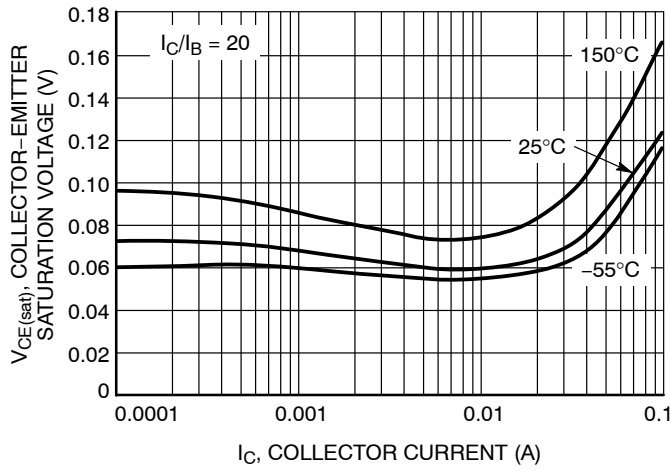


Figure 3. Collector Emitter Saturation Voltage vs. Collector Current

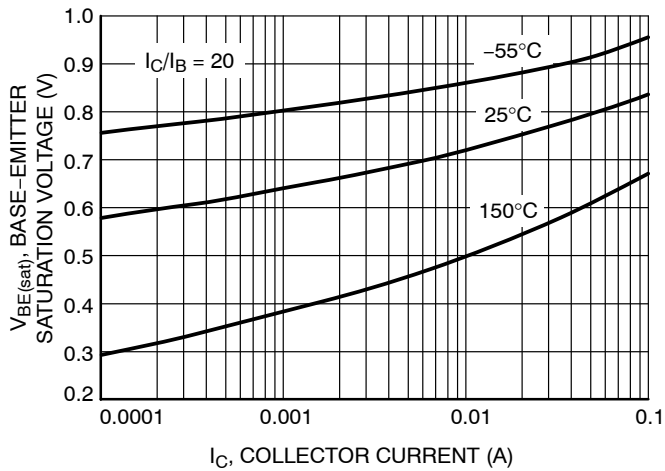


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

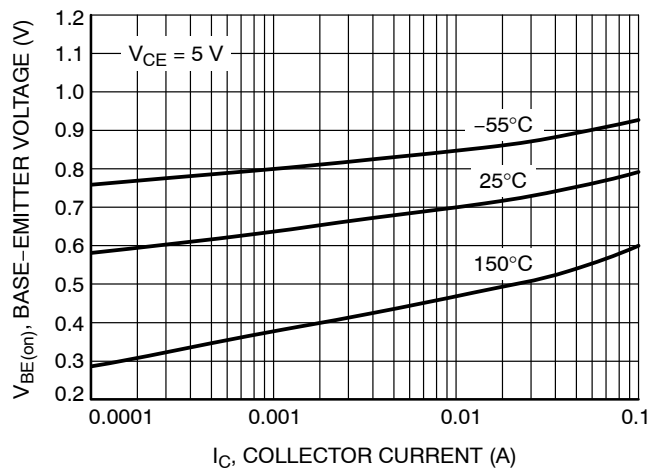


Figure 5. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series

BC846A, BC847A, BC848A, SBC846A

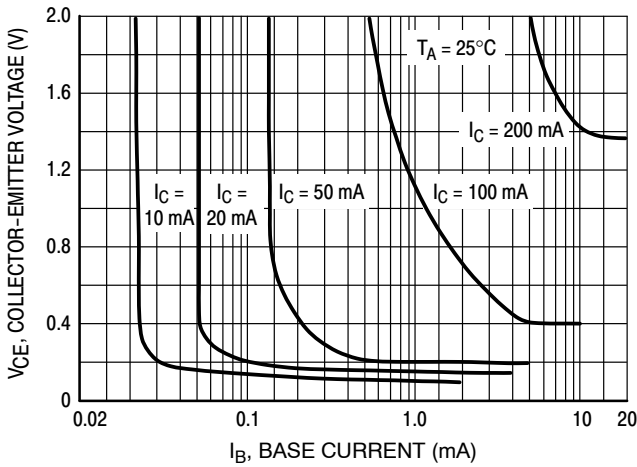


Figure 6. Collector Saturation Region



Figure 7. Base-Emitter Temperature Coefficient

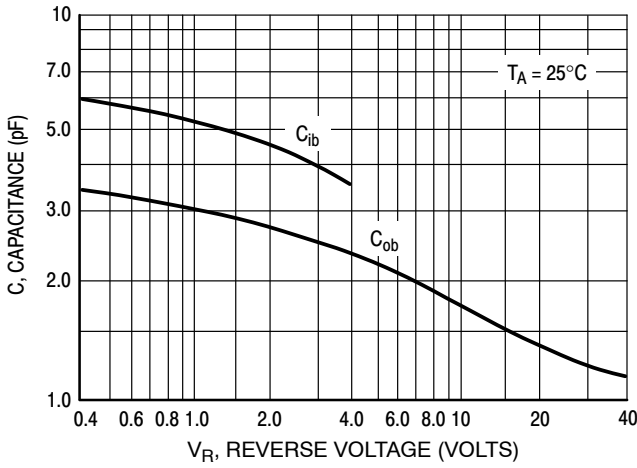


Figure 8. Capacitances

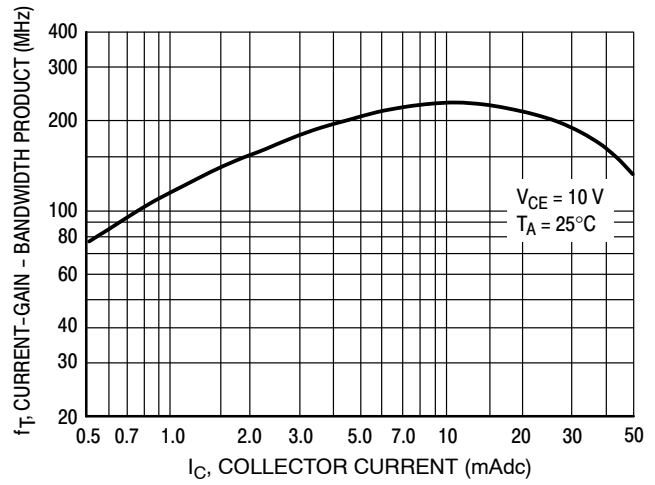


Figure 9. Current-Gain - Bandwidth Product

BC846ALT1G Series

BC846B, SBC846B

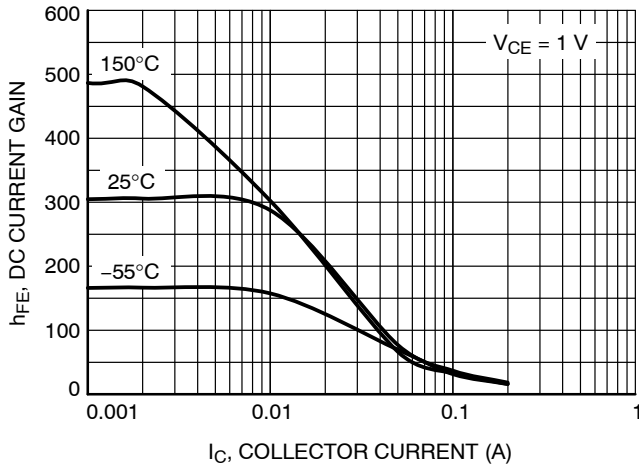


Figure 10. DC Current Gain vs. Collector Current

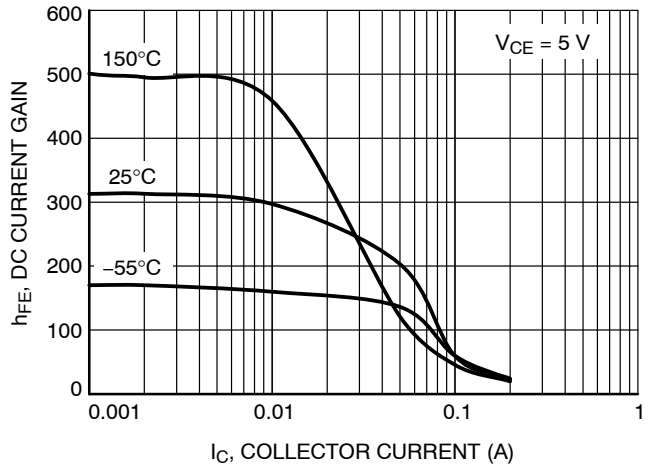


Figure 11. DC Current Gain vs. Collector Current

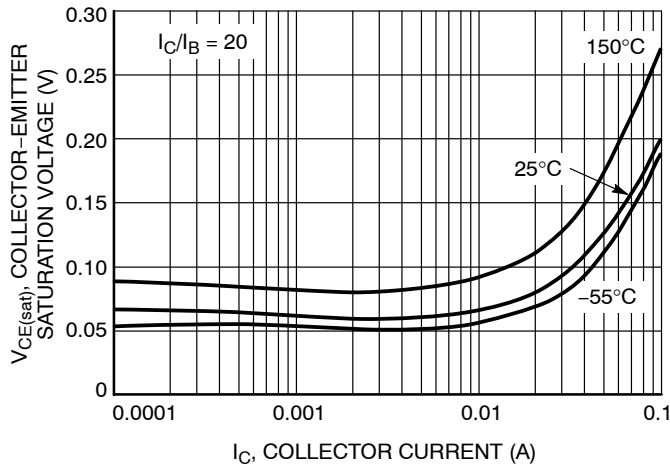


Figure 12. Collector Emitter Saturation Voltage vs. Collector Current

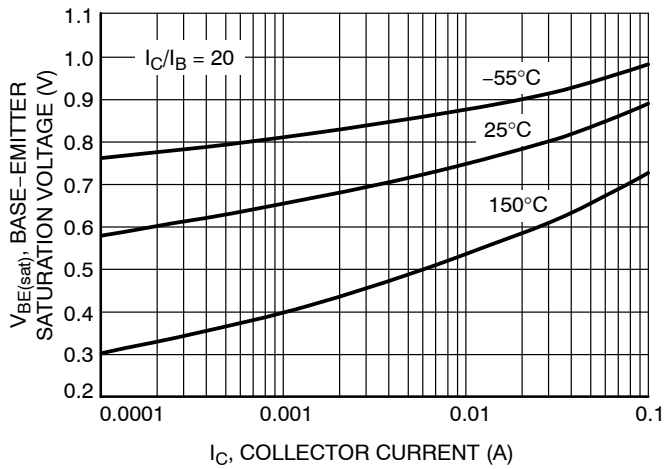


Figure 13. Base Emitter Saturation Voltage vs. Collector Current

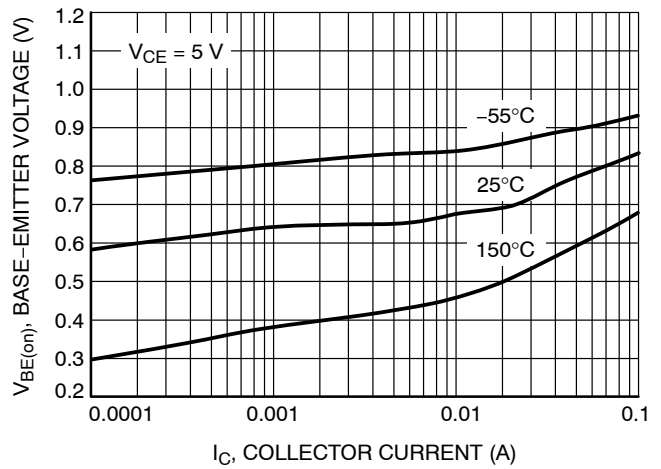


Figure 14. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series

BC846B, SBC846B

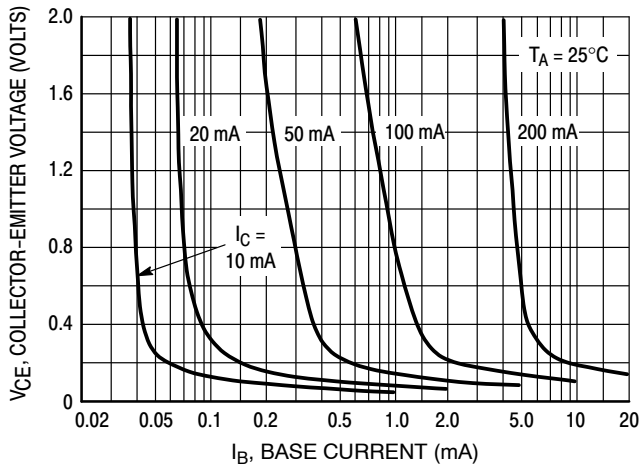


Figure 15. Collector Saturation Region

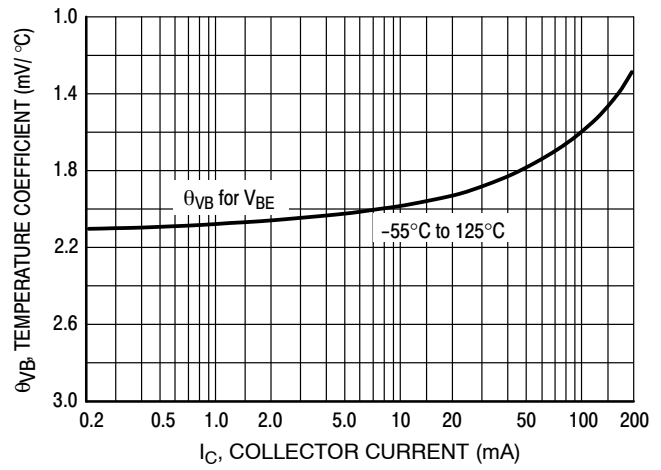


Figure 16. Base-Emitter Temperature Coefficient

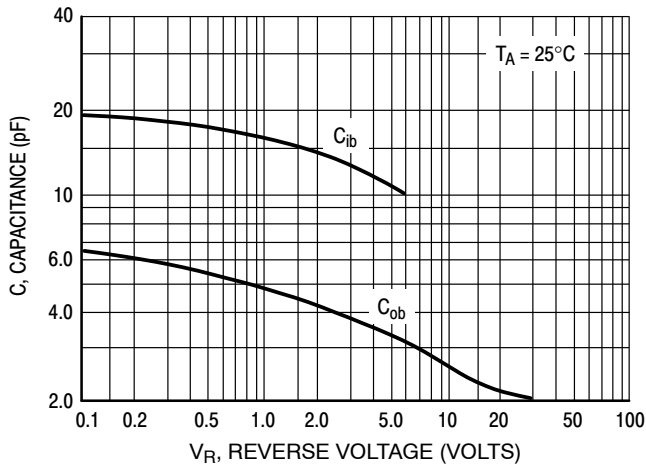


Figure 17. Capacitance

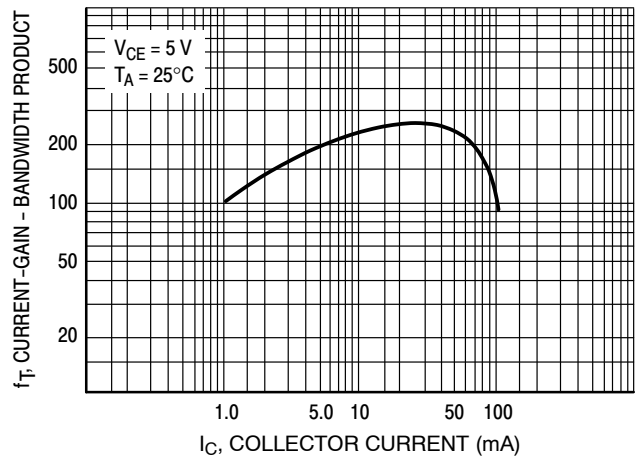


Figure 18. Current-Gain - Bandwidth Product

BC846ALT1G Series

BC847B, BC848B, BC849B, BC850B, SBC847B, SBC848B

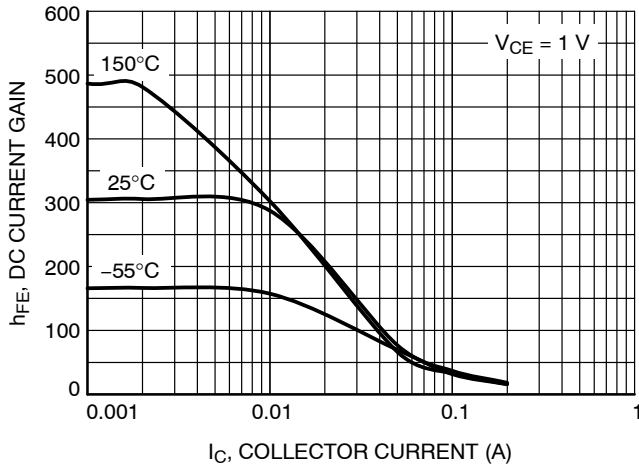


Figure 19. DC Current Gain vs. Collector Current

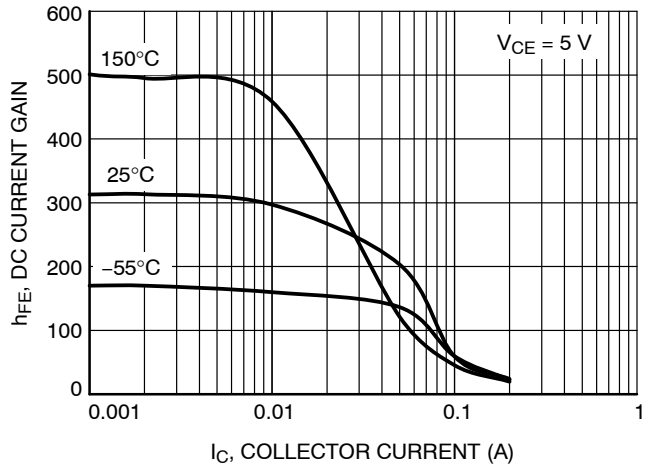


Figure 20. DC Current Gain vs. Collector Current

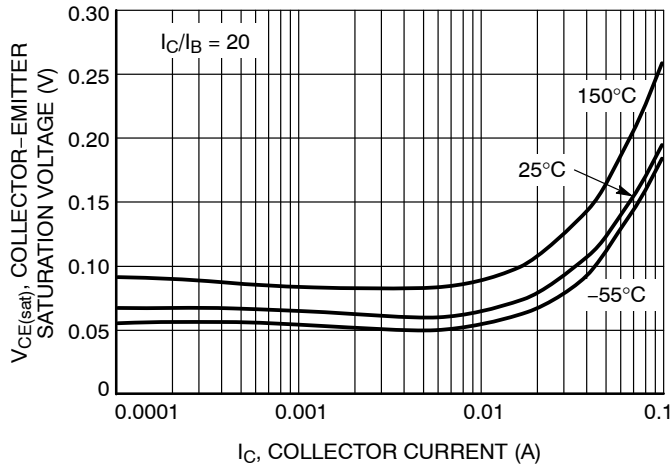


Figure 21. Collector Emitter Saturation Voltage vs. Collector Current

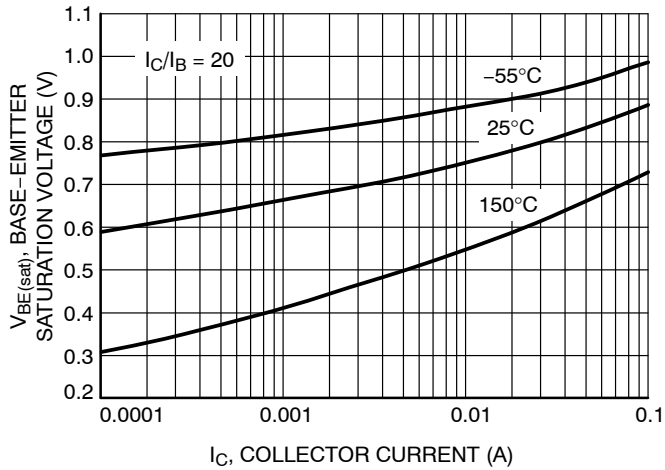


Figure 22. Base Emitter Saturation Voltage vs. Collector Current

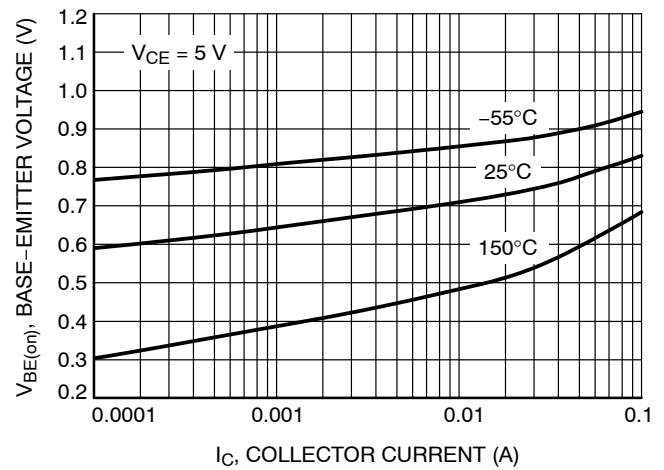


Figure 23. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series

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

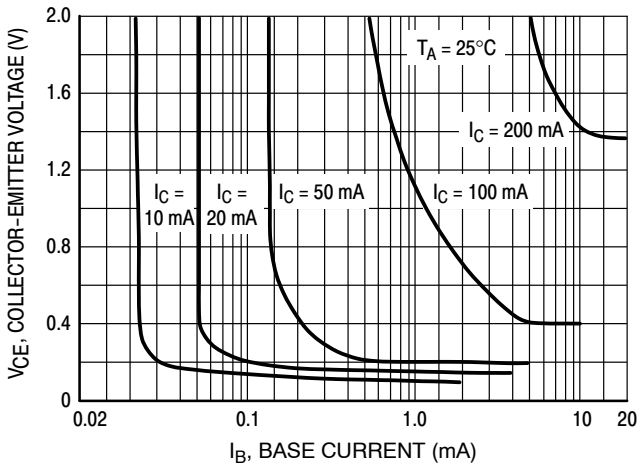


Figure 24. Collector Saturation Region



Figure 25. Base-Emitter Temperature Coefficient



Figure 26. Capacitances

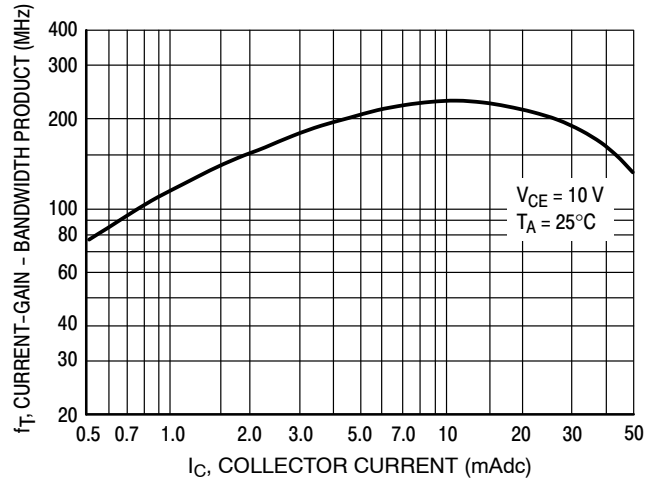


Figure 27. Current-Gain - Bandwidth Product

BC846ALT1G Series

BC846C, BC847C, BC848C, BC849C, BC850C, SBC847C



Figure 28. DC Current Gain vs. Collector Current

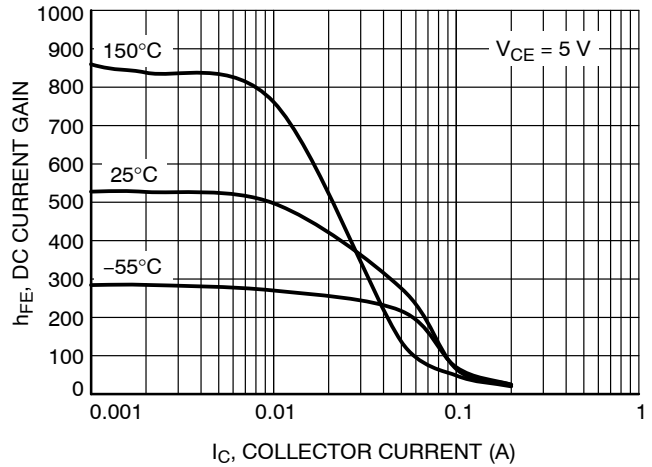


Figure 29. DC Current Gain vs. Collector Current

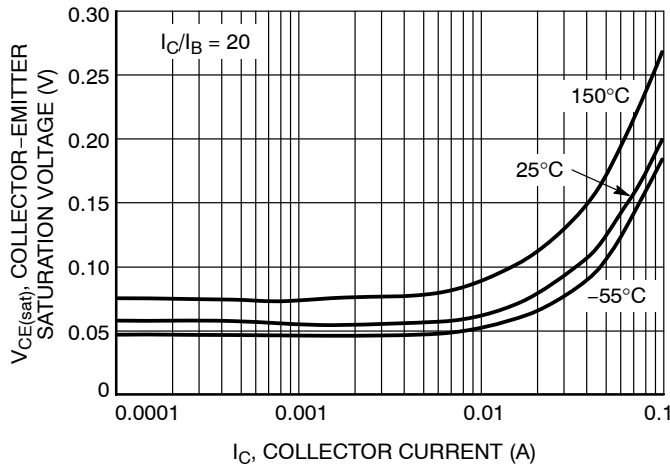


Figure 30. Collector Emitter Saturation Voltage vs. Collector Current



Figure 31. Base Emitter Saturation Voltage vs. Collector Current



Figure 32. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series

BC846C, BC847C, BC848C, BC849C, BC850C, SBC847C

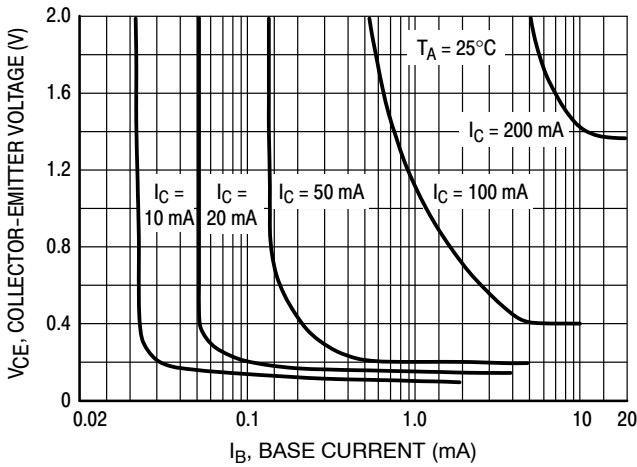


Figure 33. Collector Saturation Region



Figure 34. Base-Emitter Temperature Coefficient



Figure 35. Capacitances

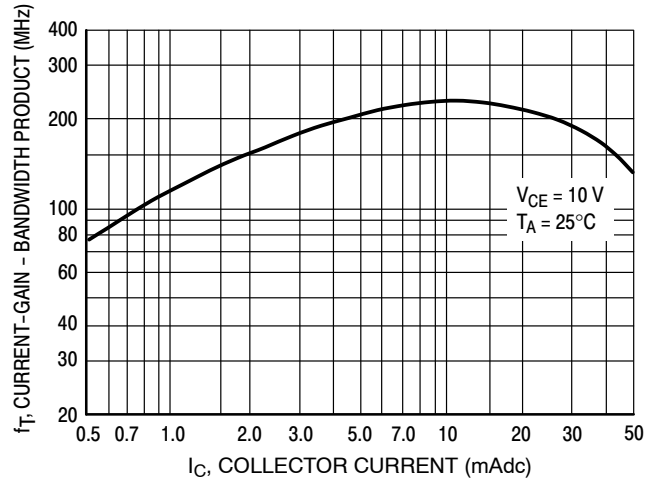


Figure 36. Current-Gain - Bandwidth Product

BC846ALT1G Series

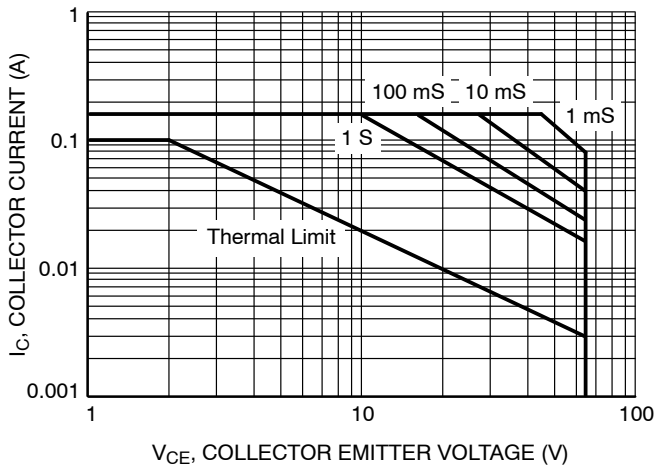


Figure 37. Safe Operating Area for BC846A, BC846B, BC846C

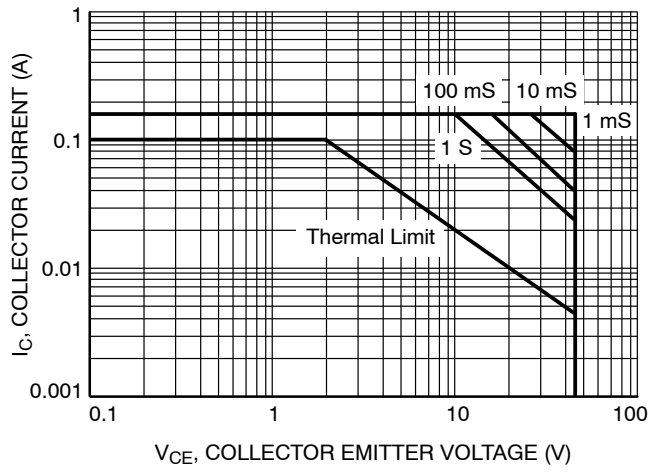


Figure 38. Safe Operating Area for BC847A, BC847B, BC847C, BC850B, BC850C

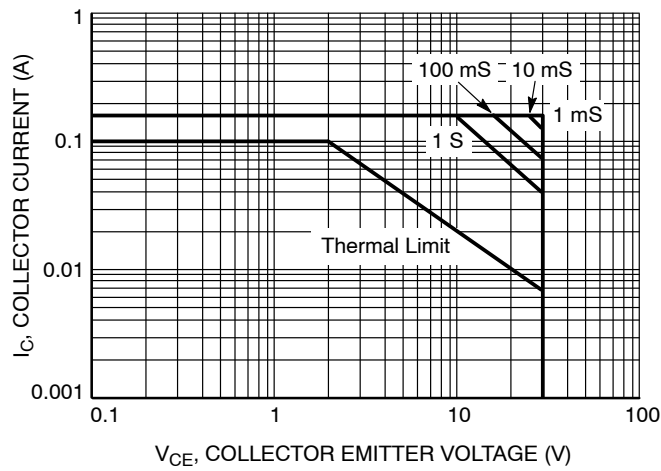


Figure 39. Safe Operating Area for BC848A, BC848B, BC848C, BC849B, BC849C

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* | | | |
| BC846CLT1G | 3C | | 3,000 / Tape & Reel |
| 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.

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

ON Semiconductor®



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

DATE 30 JAN 2018

SCALE 4:1



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° |

RECOMMENDED SOLDERING FOOTPRINT



GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code
▪ = Pb-Free Package

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

STYLE 1 THRU 5:
CANCELLED

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

STYLE 7:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

STYLE 8:
PIN 1. ANODE
2. NO CONNECTION
3. CATHODE

STYLE 9:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 10:
PIN 1. DRAIN
2. SOURCE
3. GATE

STYLE 11:
PIN 1. ANODE
2. CATHODE
3. CATHODE-ANODE

STYLE 12:
PIN 1. CATHODE
2. CATHODE
3. ANODE

STYLE 13:
PIN 1. SOURCE
2. DRAIN
3. GATE

STYLE 14:
PIN 1. CATHODE
2. GATE
3. ANODE

STYLE 15:
PIN 1. GATE
2. CATHODE
3. ANODE

STYLE 16:
PIN 1. ANODE
2. CATHODE
3. CATHODE

STYLE 17:
PIN 1. NO CONNECTION
2. ANODE
3. CATHODE

STYLE 18:
PIN 1. NO CONNECTION
2. CATHODE
3. ANODE

STYLE 19:
PIN 1. CATHODE
2. ANODE
3. CATHODE-ANODE

STYLE 20:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 21:
PIN 1. GATE
2. SOURCE
3. DRAIN

STYLE 22:
PIN 1. RETURN
2. OUTPUT
3. INPUT

STYLE 23:
PIN 1. ANODE
2. ANODE
3. CATHODE

STYLE 24:
PIN 1. GATE
2. DRAIN
3. SOURCE

STYLE 25:
PIN 1. ANODE
2. CATHODE
3. GATE

STYLE 26:
PIN 1. CATHODE
2. ANODE
3. NO CONNECTION

STYLE 27:
PIN 1. CATHODE
2. CATHODE
3. CATHODE

STYLE 28:
PIN 1. ANODE
2. ANODE
3. ANODE

| | | |
|-------------------------|------------------------|--|
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