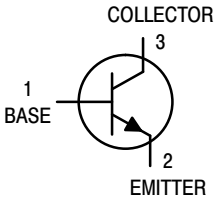
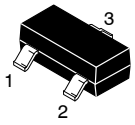
# General Purpose Transistors
## NPN Silicon

# BC846ALT1G Series




**SOT-23**
**CASE 318**
**STYLE 6**

### 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<br>BC846<br>BC847, BC850<br>BC848, BC849 | $V_{CEO}$ | <br>65<br>45<br>30 | Vdc |
| Collector-Base Voltage<br>BC846<br>BC847, BC850<br>BC848, BC849 | $V_{CBO}$ | <br>80<br>50<br>30 | Vdc |
| Emitter-Base Voltage<br>BC846<br>BC847, BC850<br>BC848, BC849 | $V_{EBO}$ | <br>6.0<br>6.0<br>5.0 | Vdc |
| Collector Current - Continuous | $I_C$ | 100 | mAdc |

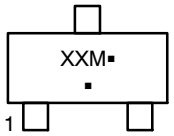
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Total Device Dissipation FR-5 Board, (Note 1)<br>$T_A$ = 25 °C<br>Derate above 25 °C | $P_D$ | 225<br><br>1.8 | mW<br><br>mW/°C |
| Thermal Resistance, Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 556 | °C/W |
| Total Device Dissipation Alumina Substrate (Note 2)<br>$T_A$ = 25 °C<br>Derate above 25 °C | $P_D$ | 300<br><br>2.4 | mW<br><br>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 × 0.75 × 0.062 in.
2. Alumina = 0.4 × 0.3 × 0.024 in 99.5% alumina.

### 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.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 12.

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**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25 °C unless otherwise noted)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector - Emitter Breakdown Voltage ($I_C$ = 10 mA) | BC846A, B, C | $V_{(BR)CEO}$ | 65 | - | - | V |
| | BC847A, B, C, BC850B, C | | 45 | - | - | |
| | BC848A, B, C, BC849B, C | | 30 | - | - | |
| Collector - Emitter Breakdown Voltage ($I_C$ = 10 μA, $V_{EB}$ = 0) | BC846A, B, C | $V_{(BR)CES}$ | 80 | - | - | V |
| | BC847A, B, C BC850B, C | | 50 | - | - | |
| | BC848A, B, C, BC849B, C | | 30 | - | - | |
| Collector - Base Breakdown Voltage ($I_C$ = 10 μA) | BC846A, B, C | $V_{(BR)CBO}$ | 80 | - | - | V |
| | BC847A, B, C, BC850B, C | | 50 | - | - | |
| | BC848A, B, C, BC849B, C | | 30 | - | - | |
| Emitter - Base Breakdown Voltage ($I_E$ = 1.0 μA) | BC846A, B, C | $V_{(BR)EBO}$ | 6.0 | - | - | V |
| | BC847A, B, C, BC850B, C | | 6.0 | - | - | |
| | BC848A, B, C, BC849B, C | | 5.0 | - | - | |
| Collector Cutoff Current ($V_{CB}$ = 30 V) | | $I_{CBO}$ | - | - | 15 | nA |
| ($V_{CB}$ = 30 V, $T_A$ = 150°C) | | | - | - | 5.0 | μA |
| **ON CHARACTERISTICS** | | | | | | |
| DC Current Gain | BC846A, BC847A, BC848A | $h_{FE}$ | - | 90 | - | - |
| ($I_C$ = 10 μA, $V_{CE}$ = 5.0 V) | BC846B, BC847B, BC848B | | - | 150 | - | |
| | BC846C, BC847C, BC848C | | - | 270 | - | |
| ($I_C$ = 2.0 mA, $V_{CE}$ = 5.0 V) | BC846A, BC847A, BC848A | | 110 | 180 | 220 | |
| | BC846B, BC847B, BC848B, BC849B, BC850B | | 200 | 290 | 450 | |
| | BC846C, BC847C, BC848C, BC849C, BC850C | | 420 | 520 | 800 | |
| Collector - Emitter Saturation Voltage ($I_C$ = 10 mA, $I_B$ = 0.5 mA) | | $V_{CE(sat)}$ | - | - | 0.25 | V |
| ($I_C$ = 100 mA, $I_B$ = 5.0 mA) | | | - | - | 0.6 | |
| Base - Emitter Saturation Voltage ($I_C$ = 10 mA, $I_B$ = 0.5 mA) | | $V_{BE(sat)}$ | - | 0.7 | - | V |
| ($I_C$ = 100 mA, $I_B$ = 5.0 mA) | | | - | 0.9 | - | |
| Base - Emitter Voltage ($I_C$ = 2.0 mA, $V_{CE}$ = 5.0 V) | | $V_{BE(on)}$ | 580 | 660 | 700 | mV |
| ($I_C$ = 10 mA, $V_{CE}$ = 5.0 V) | | | - | - | 770 | |
| **SMALL-SIGNAL CHARACTERISTICS** | | | | | | |
| Current - Gain - Bandwidth Product ($I_C$ = 10 mA, $V_{CE}$ = 5.0 Vdc, f = 100 MHz) | | $f_T$ | 100 | - | - | MHz |
| Output Capacitance ($V_{CB}$ = 10 V, f = 1.0 MHz) | | $C_{obo}$ | - | - | 4.5 | pF |
| Noise Figure ($I_C$ = 0.2 mA, $V_{CE}$ = 5.0 Vdc, $R_S$ = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz) | BC846A,B,C, BC847A,B,C, BC848A,B,C | NF | - | - | 10 | dB |
| | BC849B,C, BC850B,C | | - | - | 4.0 | |

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.



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## BC846A, BC847A, BC848A, SBC846A

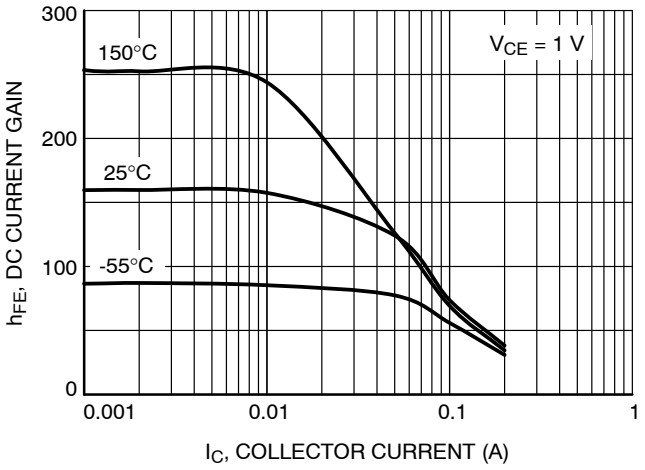



**Figure 1. DC Current Gain vs. Collector Current**

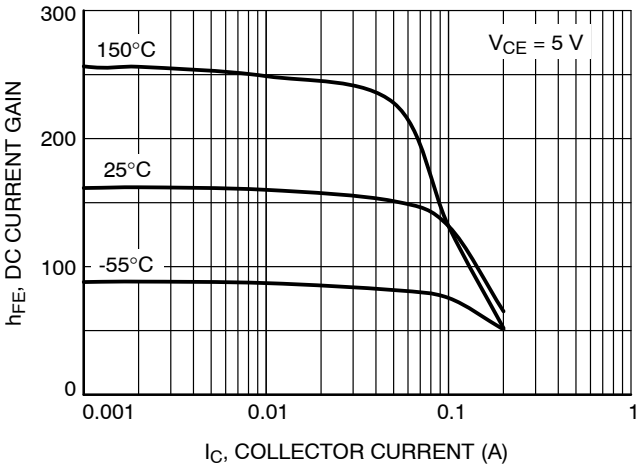



**Figure 2. DC Current Gain vs. Collector Current**

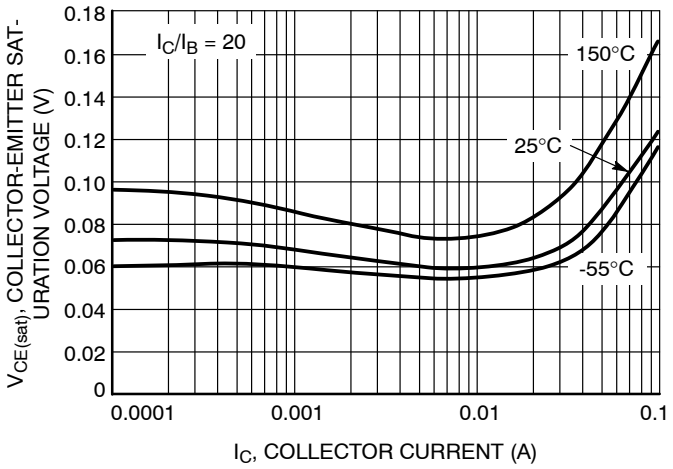



**Figure 3. Collector Emitter Saturation Voltage vs. Collector Current**

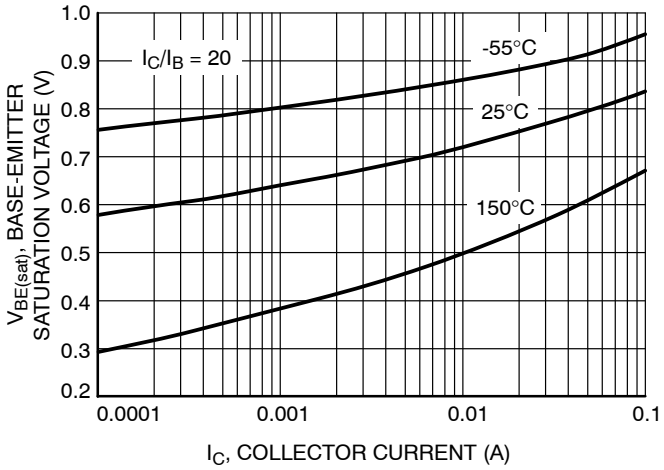



**Figure 4. Base Emitter Saturation Voltage vs. Collector Current**

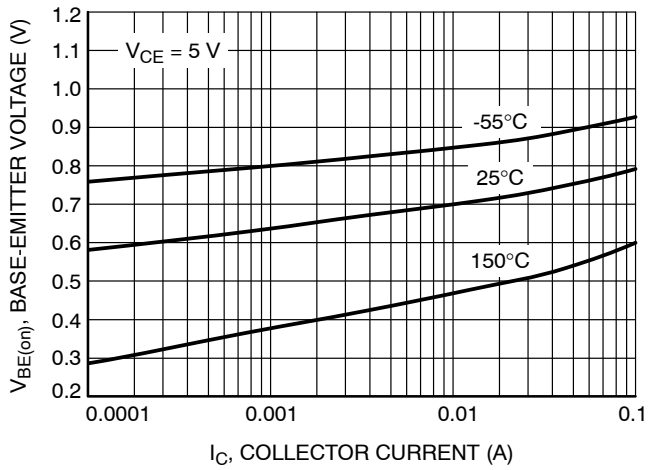



**Figure 5. Base Emitter Voltage vs. Collector Current**



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## BC846A, BC847A, BC848A, SBC846A

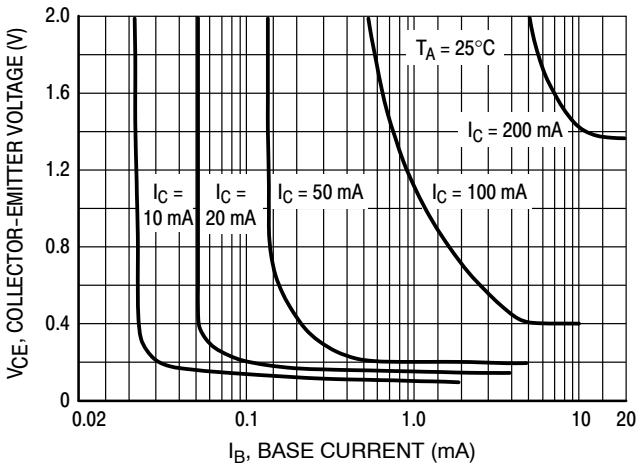



**Figure 6. Collector Saturation Region**

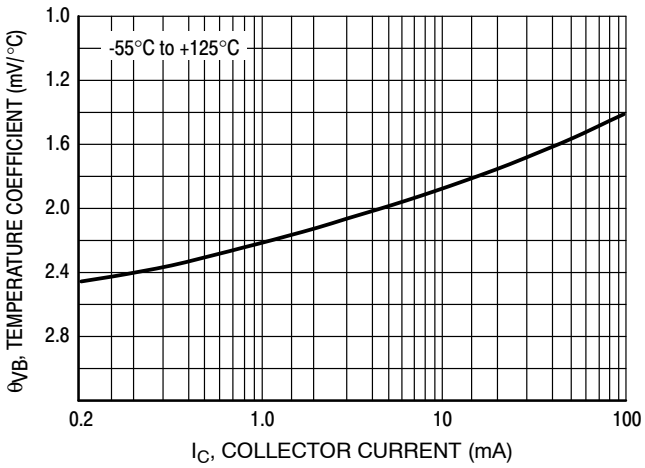



**Figure 7. Base-Emitter Temperature Coefficient**

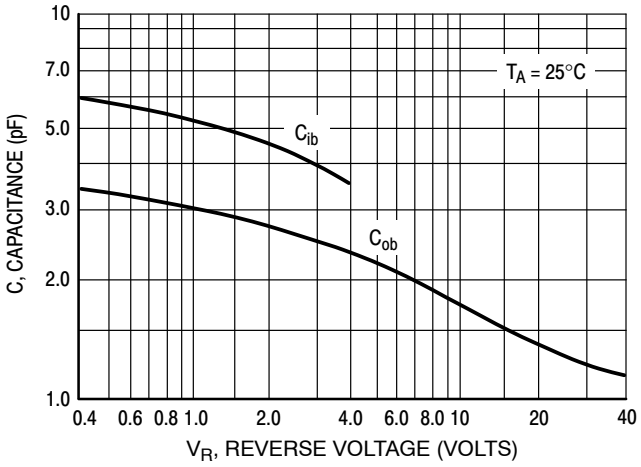



**Figure 8. Capacitances**

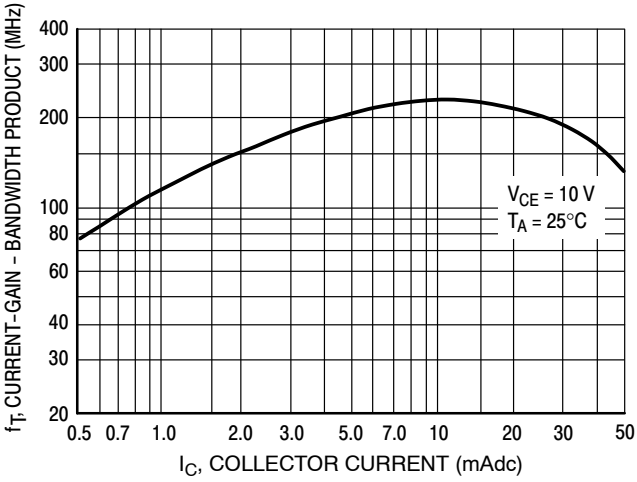



**Figure 9. Current-Gain - Bandwidth Product**



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## BC846B, SBC846B

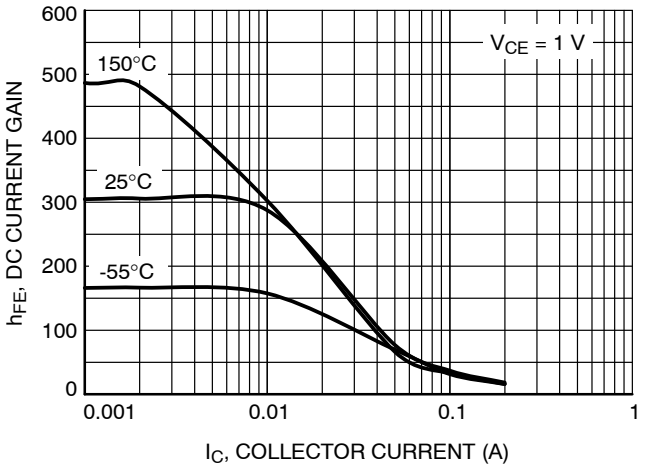



**Figure 10. DC Current Gain vs. Collector Current**

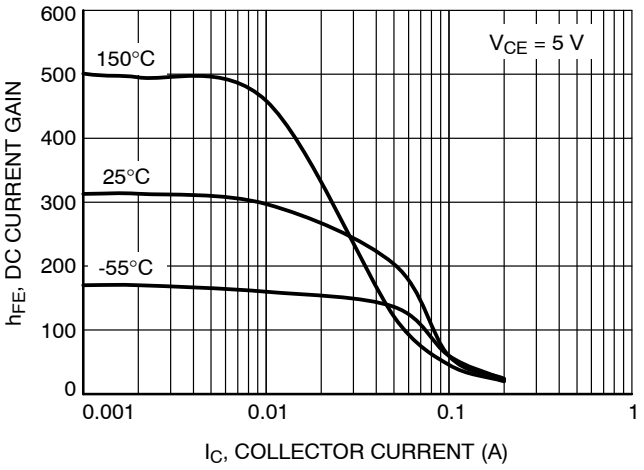



**Figure 11. DC Current Gain vs. Collector Current**

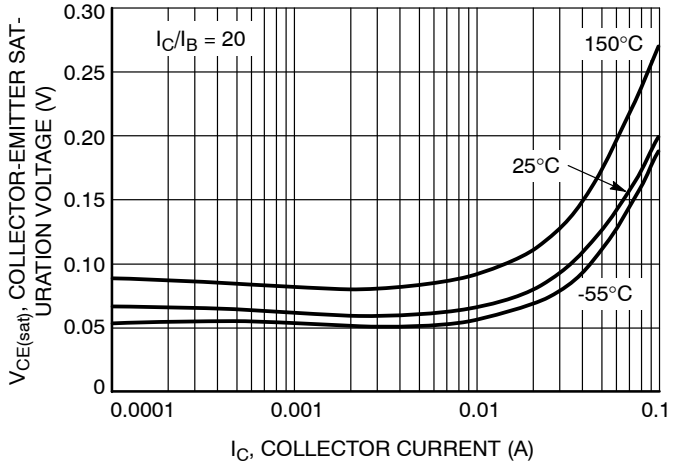



**Figure 12. Collector Emitter Saturation Voltage vs. Collector Current**

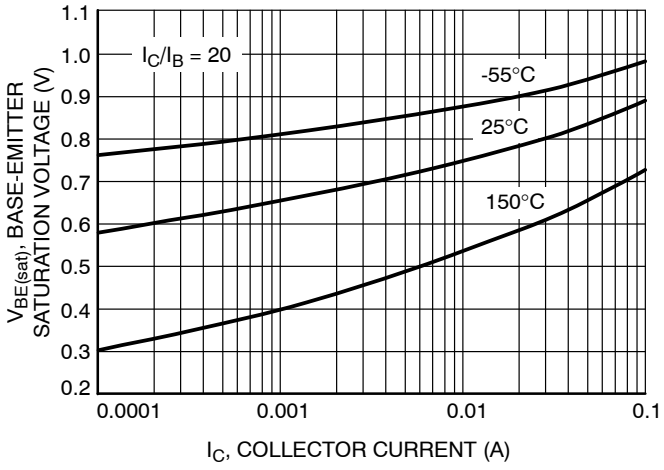



**Figure 13. Base Emitter Saturation Voltage vs. Collector Current**

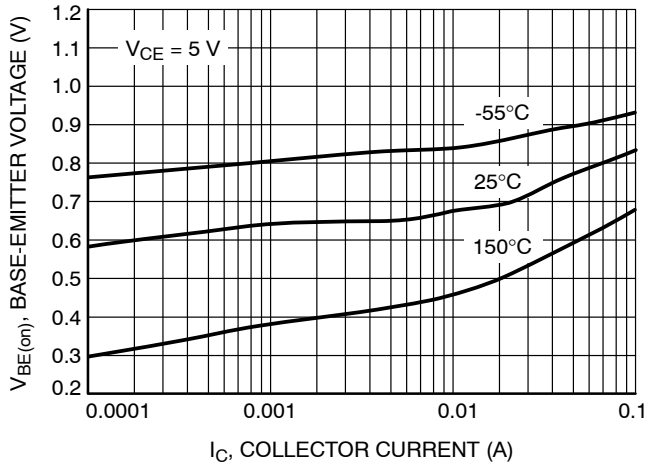



**Figure 14. Base Emitter Voltage vs. Collector Current**



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## BC846B, SBC846B

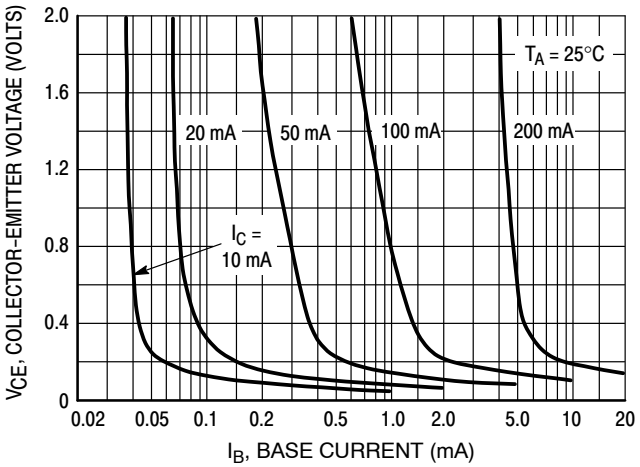



**Figure 15. Collector Saturation Region**

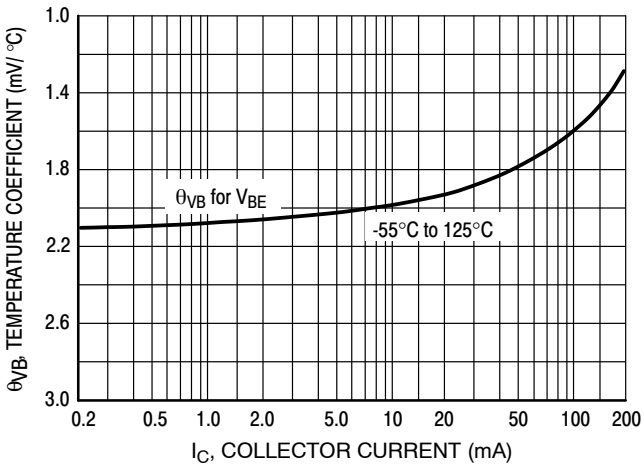



**Figure 16. Base-Emitter Temperature Coefficient**

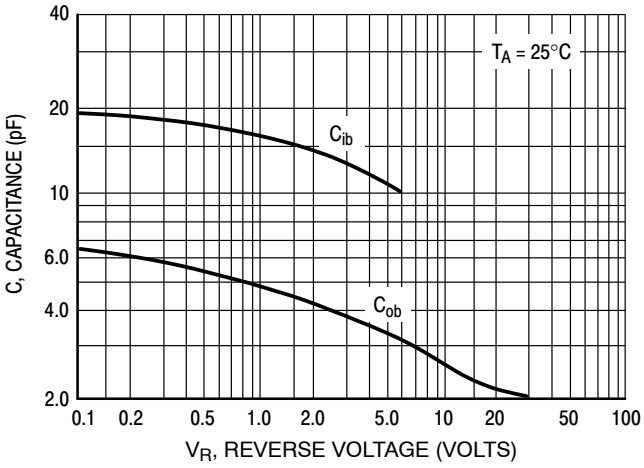



**Figure 17. Capacitance**

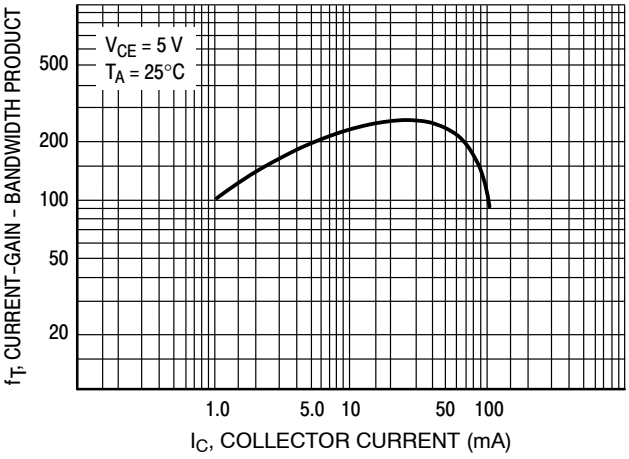



**Figure 18. Current-Gain - Bandwidth Product**



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## BC847B, BC848B, BC849B, BC850B, SBC847B, SBC848B

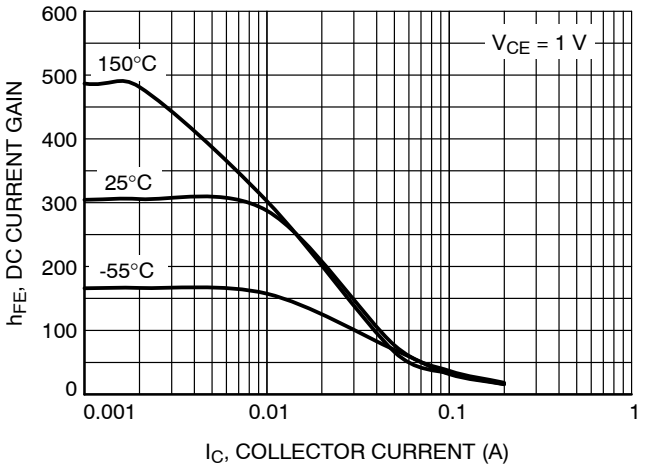



**Figure 19. DC Current Gain vs. Collector Current**

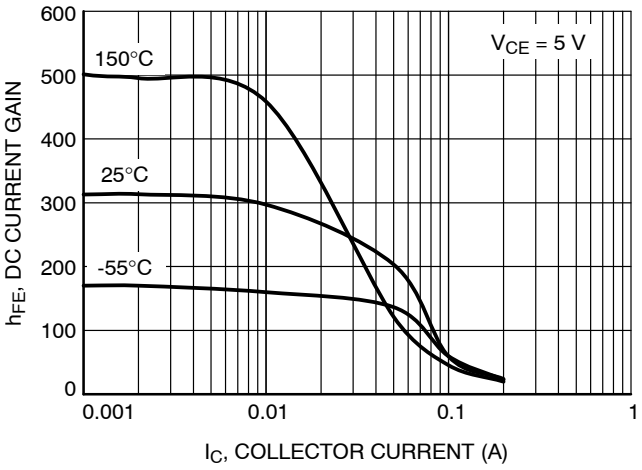



**Figure 20. DC Current Gain vs. Collector Current**

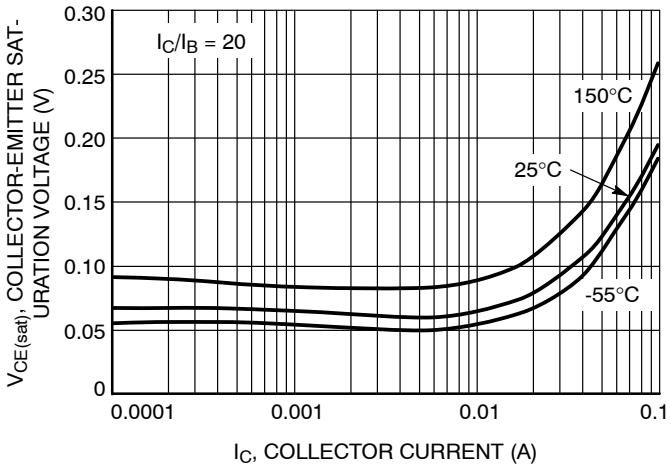



**Figure 21. Collector Emitter Saturation Voltage vs. Collector Current**

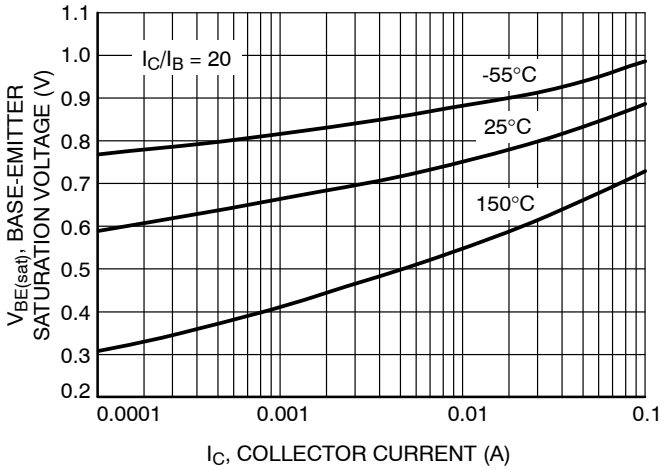



**Figure 22. Base Emitter Saturation Voltage vs. Collector Current**

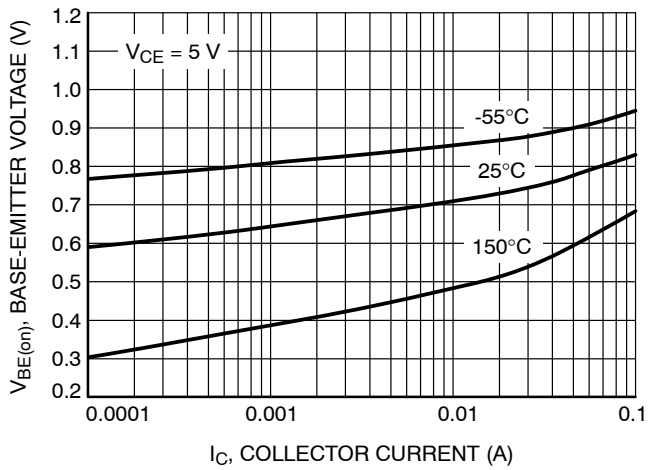



**Figure 23. Base Emitter Voltage vs. Collector Current**



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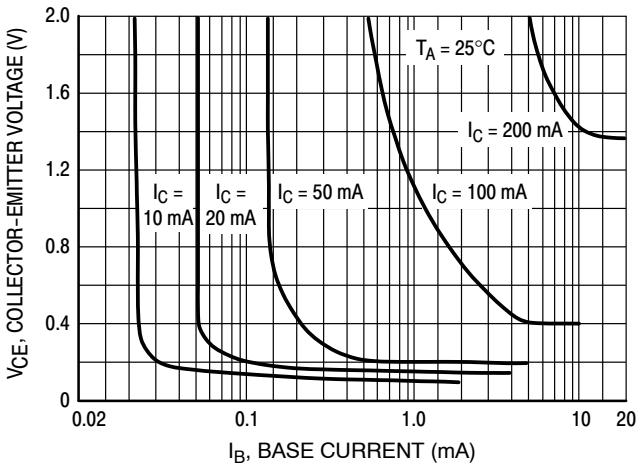



**Figure 24. Collector Saturation Region**

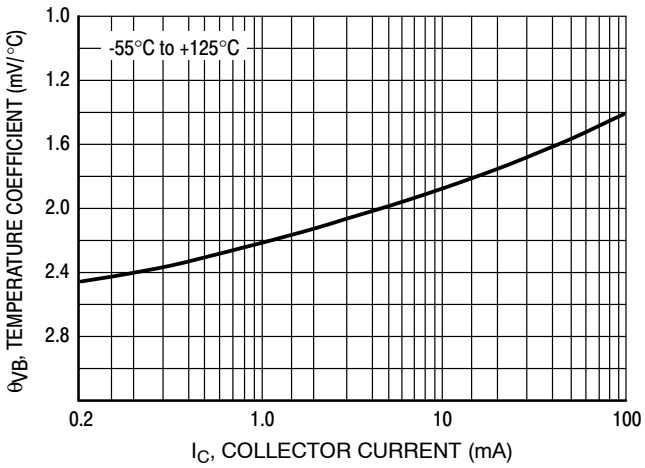



**Figure 25. Base-Emitter Temperature Coefficient**

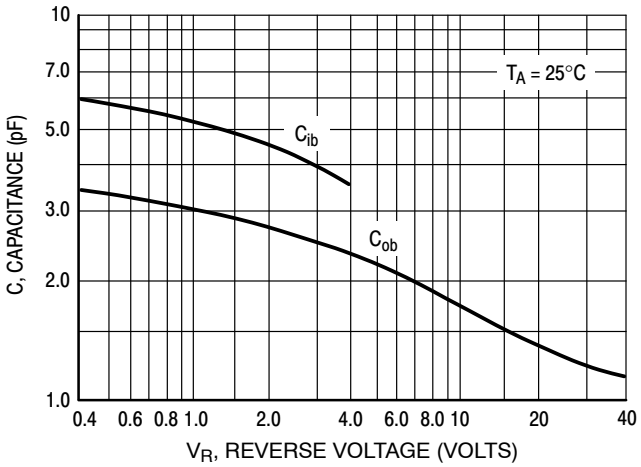



**Figure 26. Capacitances**

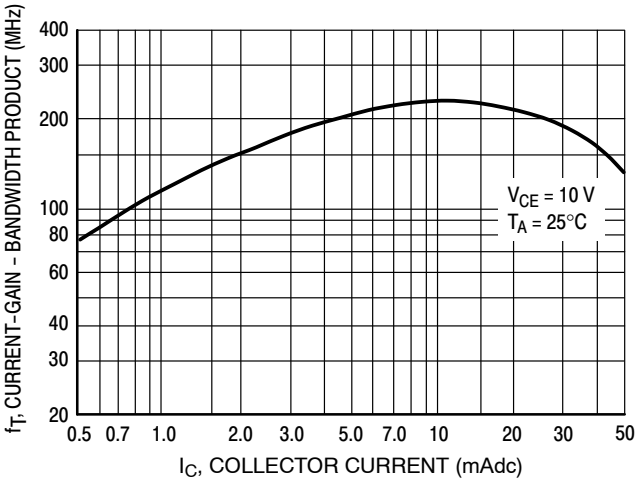



**Figure 27. Current-Gain - Bandwidth Product**



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## BC846C, BC847C, BC848C, BC849C, BC850C, SBC847C

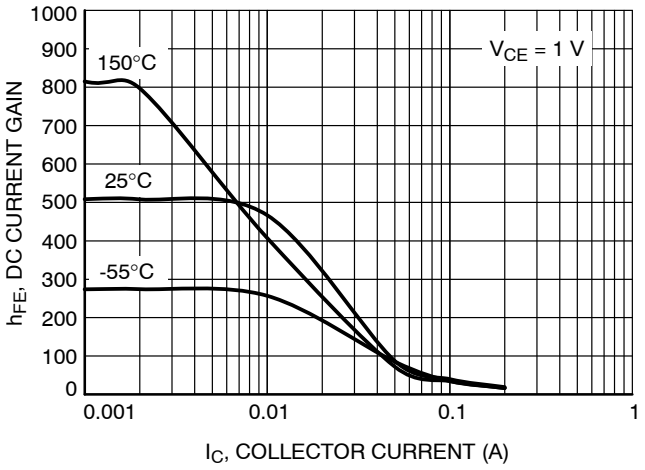



**Figure 28. DC Current Gain vs. Collector Current**

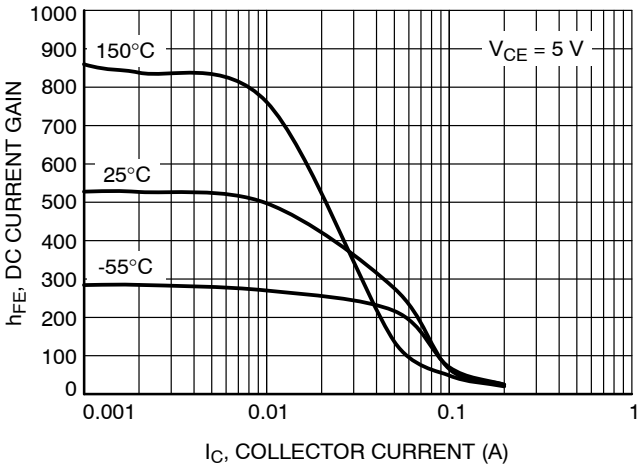



**Figure 29. DC Current Gain vs. Collector Current**

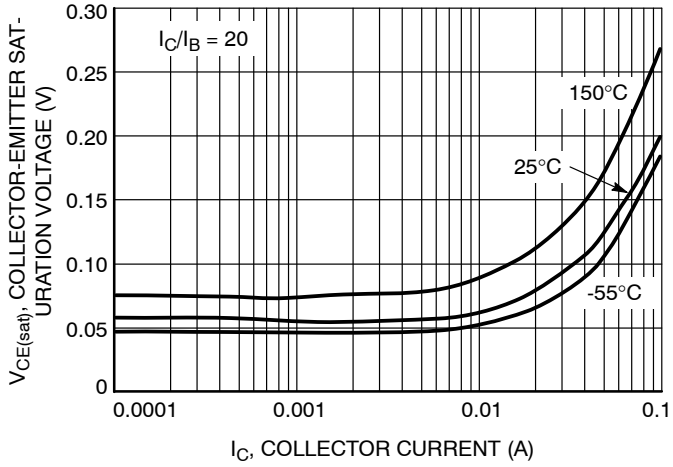



**Figure 30. Collector Emitter Saturation Voltage vs. Collector Current**

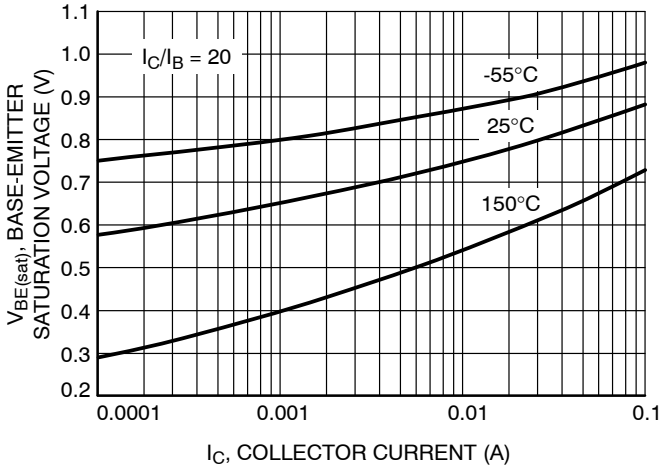



**Figure 31. Base Emitter Saturation Voltage vs. Collector Current**

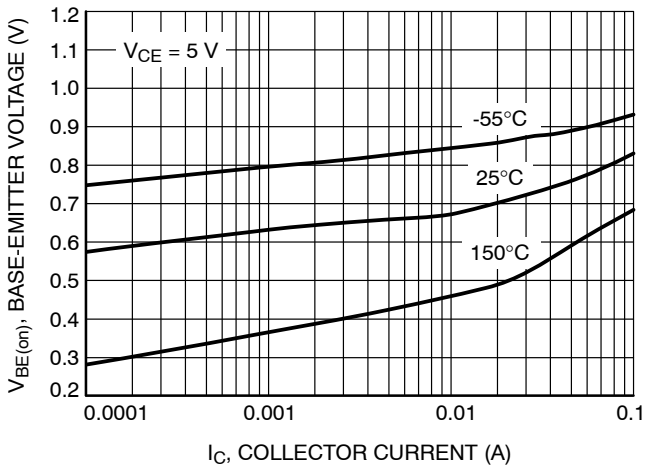



**Figure 32. Base Emitter Voltage vs. Collector Current**



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**BC846C, BC847C, BC848C, BC849C, BC850C, SBC847C**

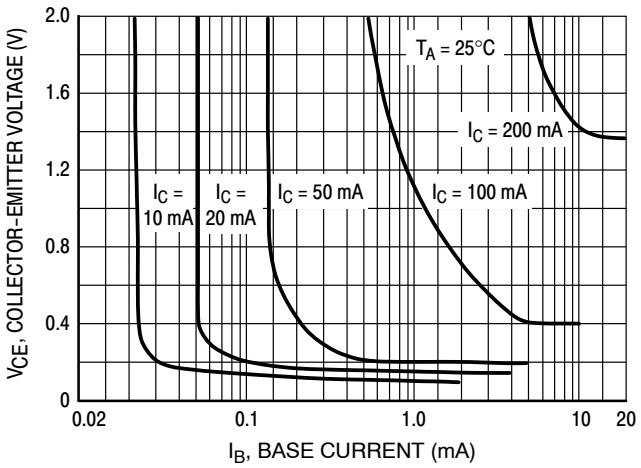



**Figure 33. Collector Saturation Region**

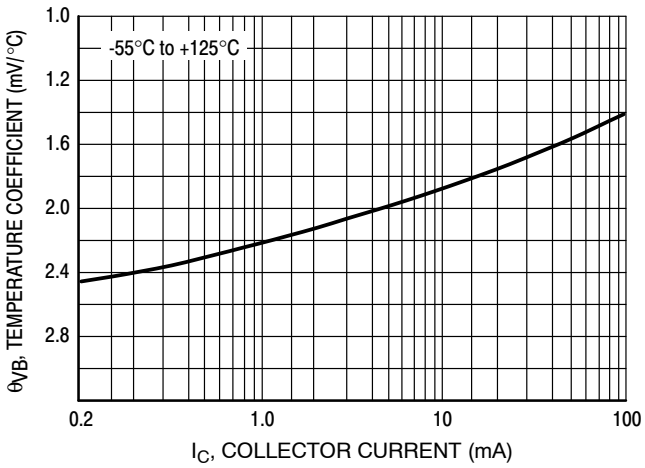



**Figure 34. Base-Emitter Temperature Coefficient**

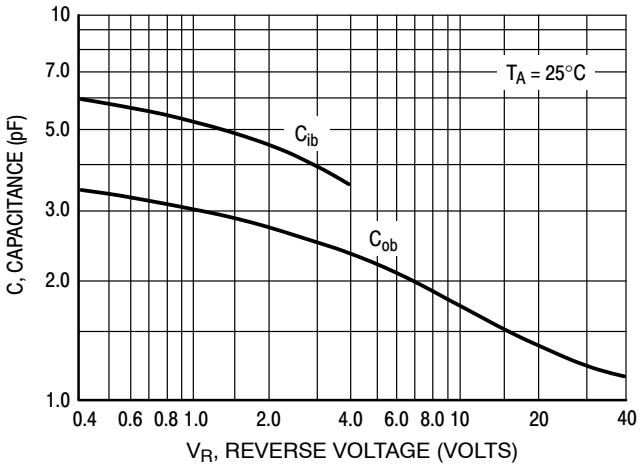



**Figure 35. Capacitances**

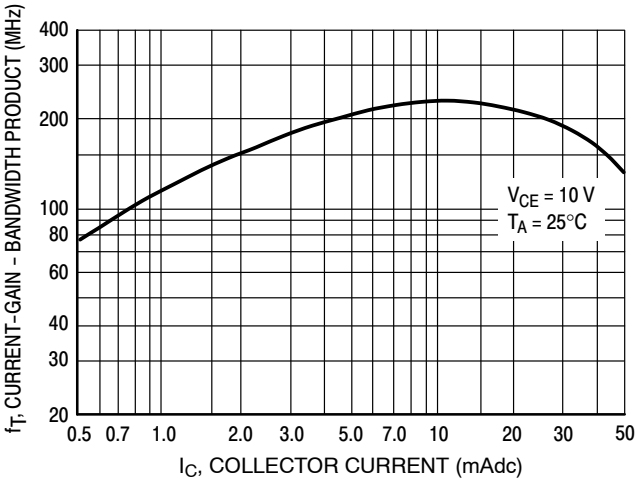



**Figure 36. Current-Gain - Bandwidth Product**



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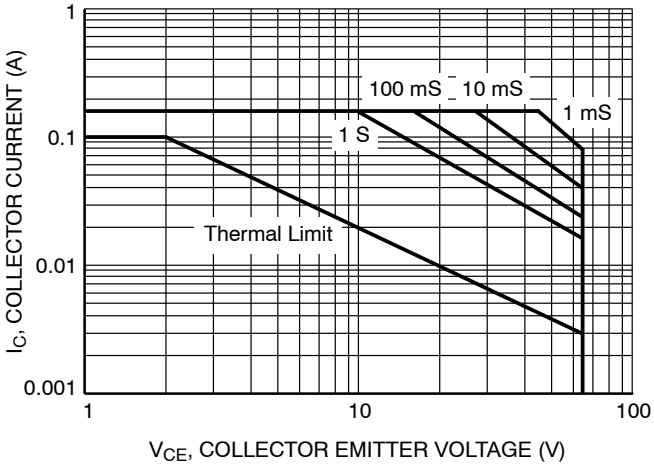



**Figure 37. Safe Operating Area for BC846A, BC846B, BC846C**

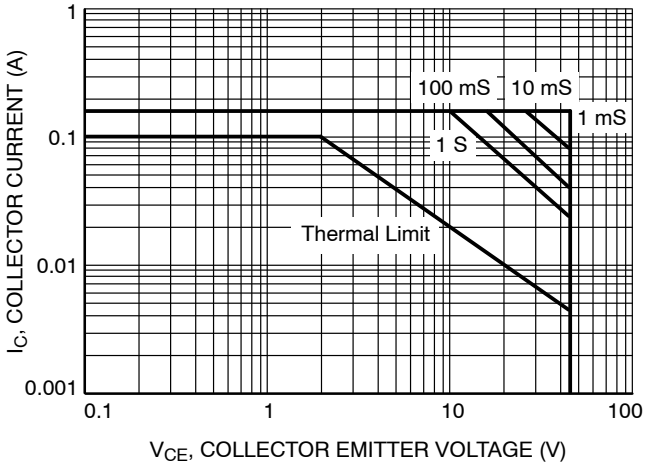



**Figure 38. Safe Operating Area for BC847A, BC847B, BC847C, BC850B, BC850C**

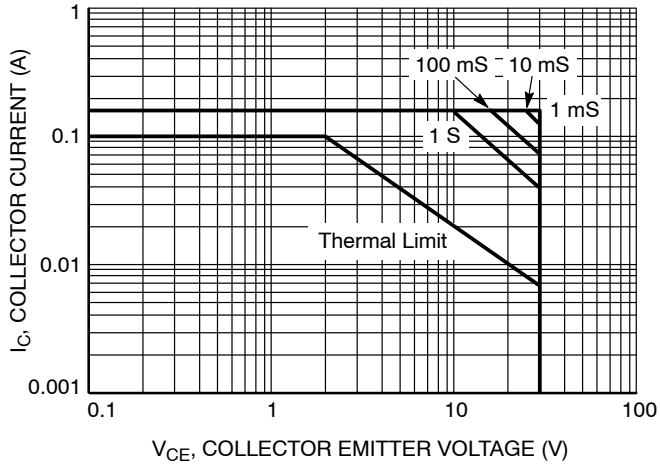



**Figure 39. Safe Operating Area for BC848A, BC848B, BC848C, BC849B, BC849C**



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## ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|---|---|---|---|
| BC846ALT1G<br>BC846ALT1G-NC<br>SBC846ALT1G*<br>SBC846ALT1G-NC* | 1A | SOT-23<br>(Pb-Free) | 3,000 / Tape & Reel |
| BC846ALT3G<br>BC846ALT3G-NC | | | 10,000 / Tape & Reel |
| BC846BLT1G<br>BC846BLT1G-NC<br>SBC846BLT1G*<br>SBC846BLT1G-NC* | 1B | | 3,000 / Tape & Reel |
| BC846BLT3G<br>BC846BLT3G-NC<br>SBC846BLT3G*<br>SBC846BLT3G-NC* | | | 10,000 / Tape & Reel |
| BC846CLT1G<br>BC846CLT1G-NC<br>NSVBC846CLT1G* | 3C | | 3,000 / Tape & Reel |
| BC847ALT1G<br>BC847ALT1G-NC | 1E | | 3,000 / Tape & Reel |
| BC847BLT1G<br>BC847BLT1G-NC<br>SBC847BLT1G*<br>SBC847BLT1G-NC* | 1F | | 3,000 / Tape & Reel |
| BC847BLT3G<br>BC847BLT3G-NC<br>NSVBC847BLT3G*<br>NSVBC847BLT3G-NC* | | | 10,000 / Tape & Reel |
| BC847CLT1G<br>BC847CLT1G−NC<br>SBC847CLT1G*<br>SBC847CLT1G−NC* | 1G | | 3,000 / Tape & Reel |
| BC847CLT3G<br>BC847CLT3G−NC | | | 10,000 / Tape & Reel |
| BC848ALT1G<br>BC848ALT1G-NC | 1J | | 3,000 / Tape & Reel |
| BC848BLT1G<br>BC848BLT1G-NC<br>SBC848BLT1G*<br>SBC848BLT1G-NC* | 1K | | 3,000 / Tape & Reel |
| BC848BLT3G<br>BC848BLT3G-NC | | | 10,000 / Tape & Reel |
| BC848CLT1G<br>BC848CLT1G-NC<br>NSVBC848CLT1G*<br>NSVBC848CLT1G-NC* | 1L | | 3,000 / Tape & Reel |
| BC848CLT3G<br>BC848CLT3G-NC | | | 10,000 / Tape & Reel |
| BC849BLT1G<br>BC849BLT1G-NC | 2B | | 3,000 / Tape & Reel |
| BC849CLT1G<br>BC849CLT1G-NC | 2C | | 3,000 / 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.

3. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.



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## ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|---|---|---|---|
| BC850BLT1G<br>BC850BLT1G-NC<br>NSVBC850BLT1G*<br>NSVBC850BLT1G-NC* | 2F | | 3,000 / Tape & Reel |
| BC850CLT1G<br>BC850CLT1G-NC<br>NSVBC850CLT1G*<br>NSVBC850CLT1G-NC* | 2G | | |

**DISCONTINUED** (Note 3)

| | | | |
|---|---|---|---|
| BC847ALT3G | 1E | SOT-23<br>(Pb-Free) | 10,000 / Tape & Reel |
| NSVBC849BLT1G* | 2B | | 3,000 / Tape & Reel |
| BC849BLT3G | | | 10,000 / Tape & Reel |
| BC849CLT3G | 2C | | 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.

3. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.



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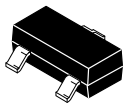
## REVISION HISTORY

| Revision | Description of Changes | Date |
|---|---|---|
| 21 | Added “–NC” OPNs to order table. | 9/2/2026 |

This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.



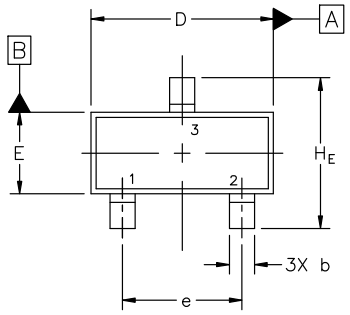
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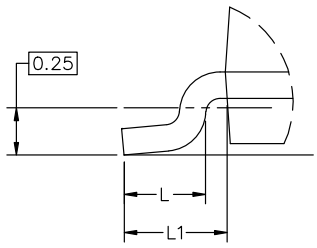
**SCALE 4:1**

**SOT−23 (TO−236) 2.90x1.30x1.00 1.90P**
CASE 318
ISSUE AU

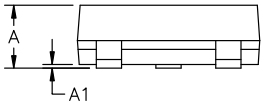
DATE 14 AUG 2024



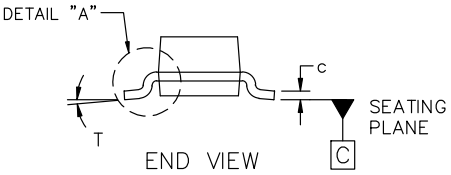

TOP VIEW




DETAIL "A"
Scale 3:1




SIDE VIEW

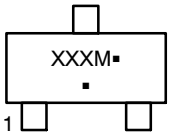



END VIEW

| MILLIMETERS | | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 |
| A1 | 0.01 | 0.06 | 0.10 |
| b | 0.37 | 0.44 | 0.50 |
| c | 0.08 | 0.14 | 0.20 |
| D | 2.80 | 2.90 | 3.04 |
| E | 1.20 | 1.30 | 1.40 |
| e | 1.78 | 1.90 | 2.04 |
| L | 0.30 | 0.43 | 0.55 |
| L1 | 0.35 | 0.54 | 0.69 |
| $H_E$ | 2.10 | 2.40 | 2.64 |
| T | 0° | −−− | 10° |

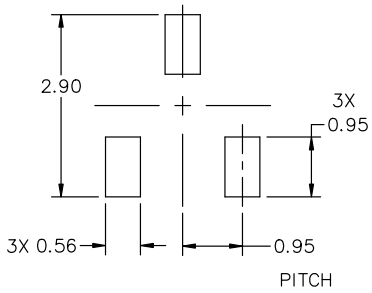
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

**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. Some products may not follow the Generic Marking.




RECOMMENDED
MOUNTING FOOTPRINT

* For additional information on our Pb−Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**STYLES ON PAGE 2**

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**SOT−23 (TO−236) 2.90x1.30x1.00 1.90P**
CASE 318
ISSUE AU

DATE 14 AUG 2024

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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