

# 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

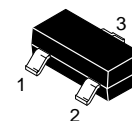
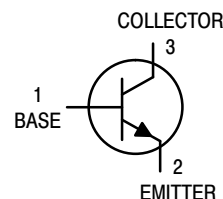
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225	mW
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate (Note 2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	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	$^\circ\text{C}$

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.



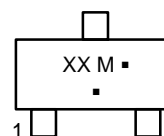
ON Semiconductor®

<http://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	
<b>OFF CHARACTERISTICS</b>						
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 $\mu\text{A}$
<b>ON CHARACTERISTICS</b>						
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
<b>SMALL–SIGNAL CHARACTERISTICS</b>						
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

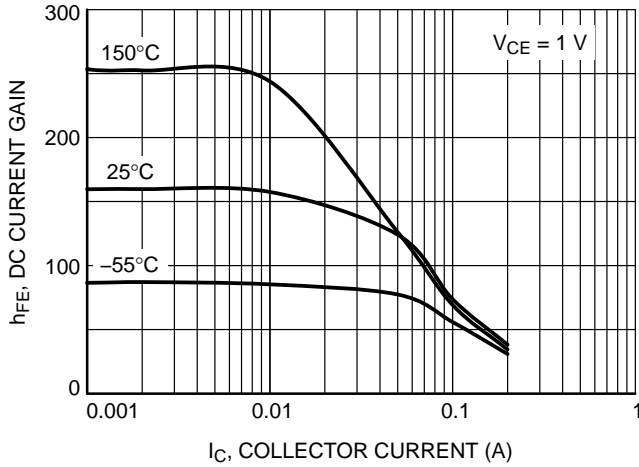


Figure 1. DC Current Gain vs. Collector Current

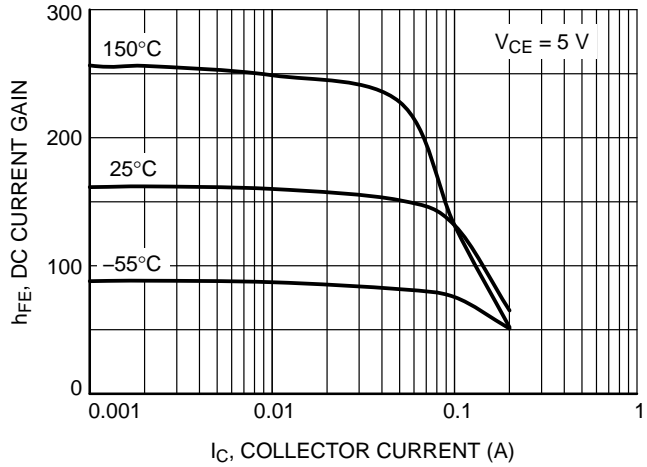


Figure 2. DC Current Gain vs. Collector Current

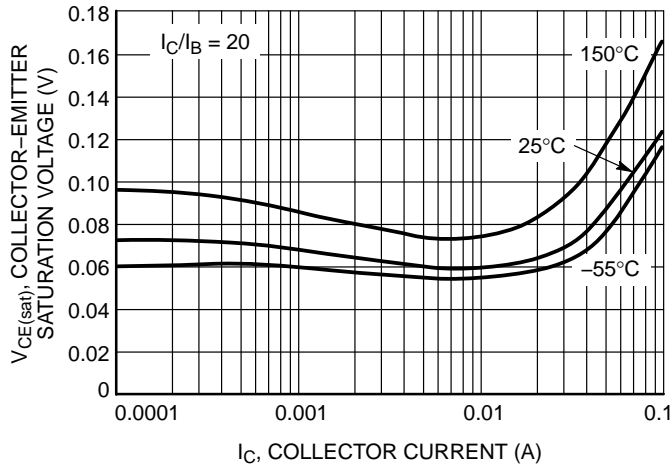


Figure 3. Collector Emitter Saturation Voltage vs. Collector Current

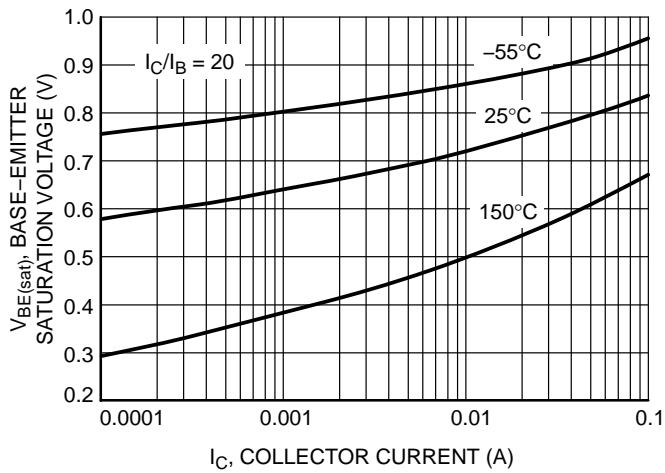


Figure 4. Base Emitter Saturation Voltage vs. Collector Current

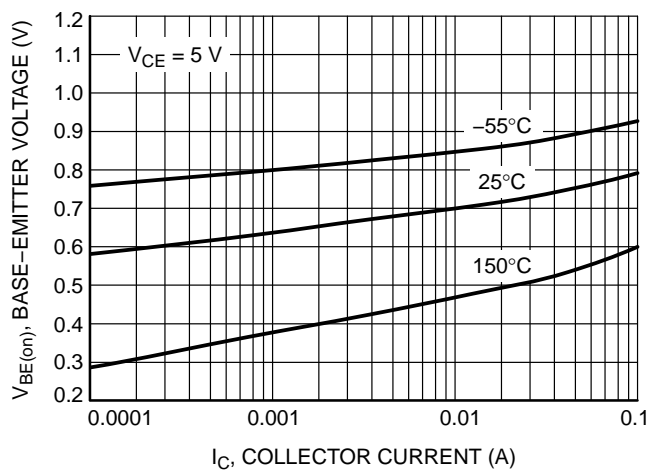


Figure 5. Base Emitter Voltage vs. Collector Current

# BC846ALT1G Series

## BC846A, BC847A, BC848A, SBC846A

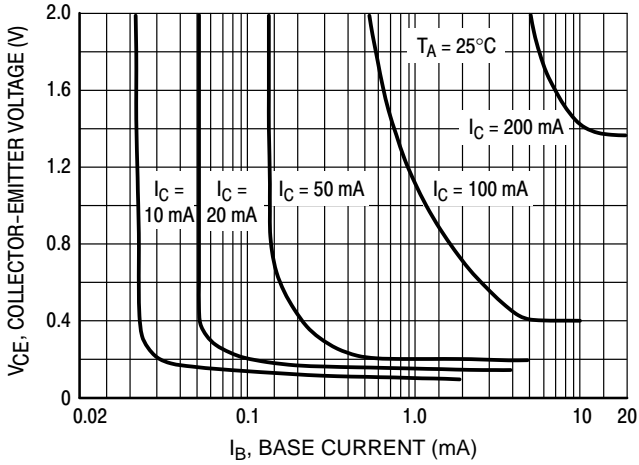


Figure 6. Collector Saturation Region

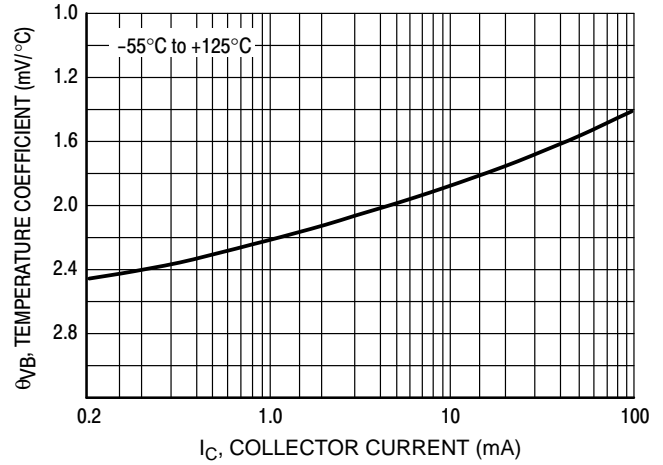


Figure 7. Base-Emitter Temperature Coefficient

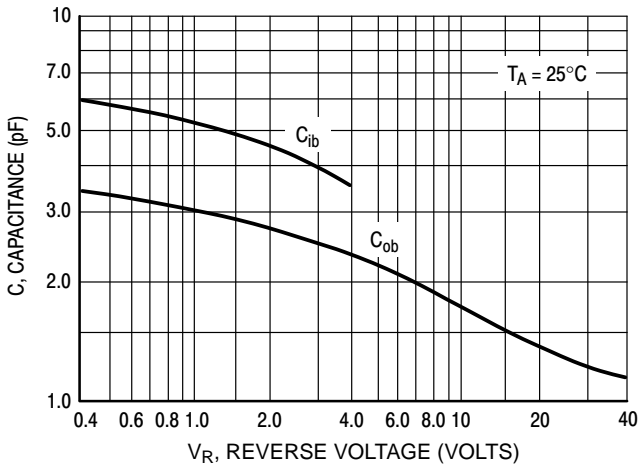


Figure 8. Capacitances

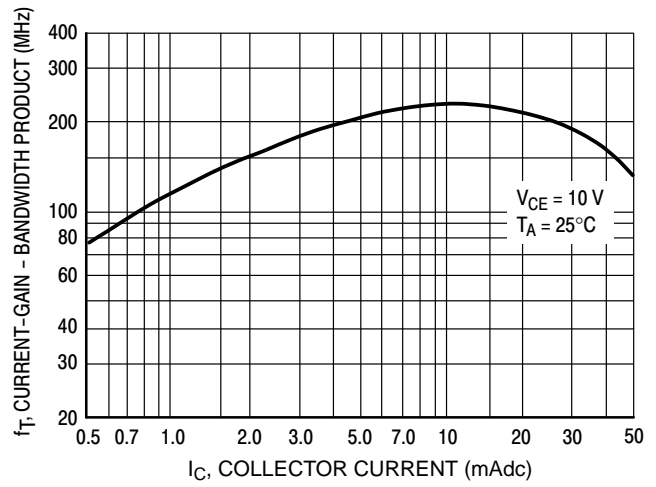
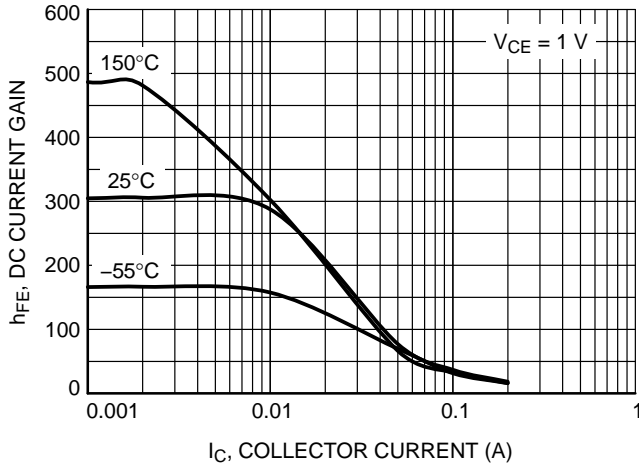


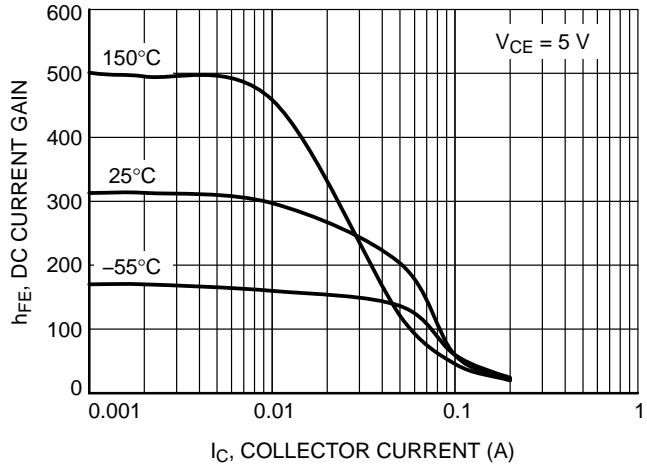
Figure 9. Current-Gain - Bandwidth Product

# BC846ALT1G Series

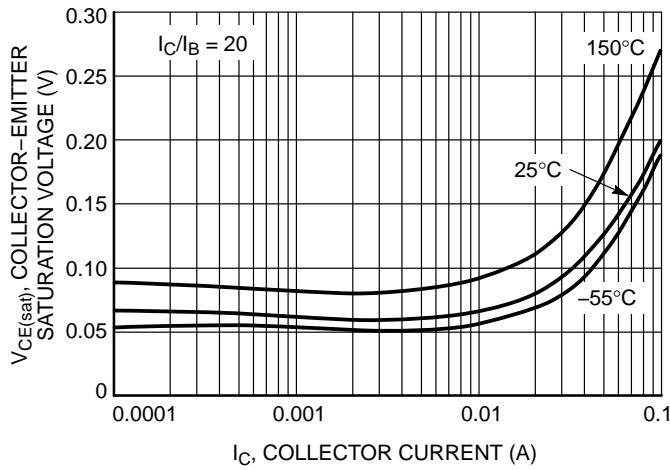
## BC846B, SBC846B



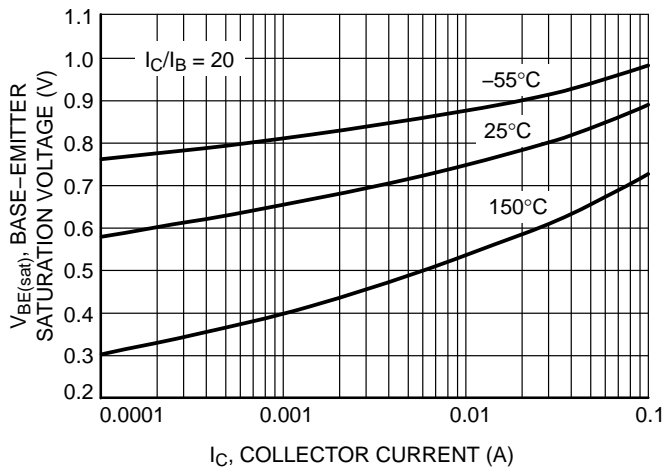
**Figure 10. DC Current Gain vs. Collector Current**



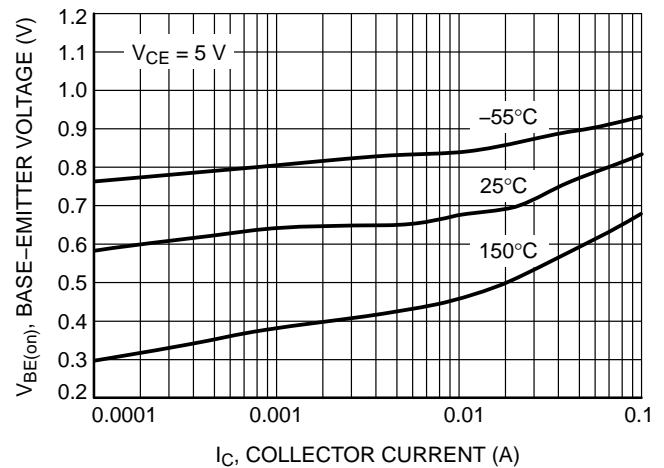
**Figure 11. DC Current Gain vs. Collector Current**



**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

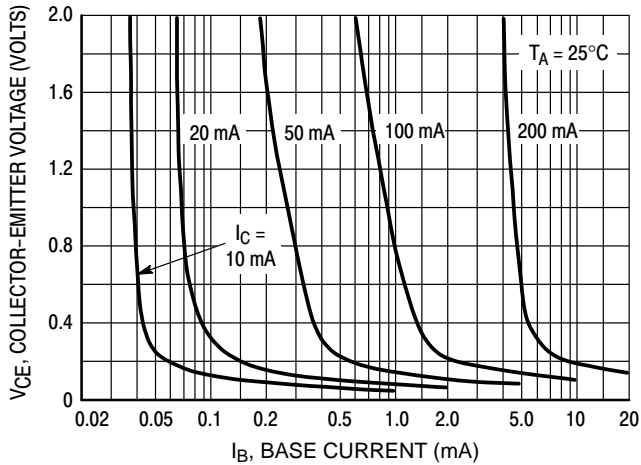


Figure 15. Collector Saturation Region

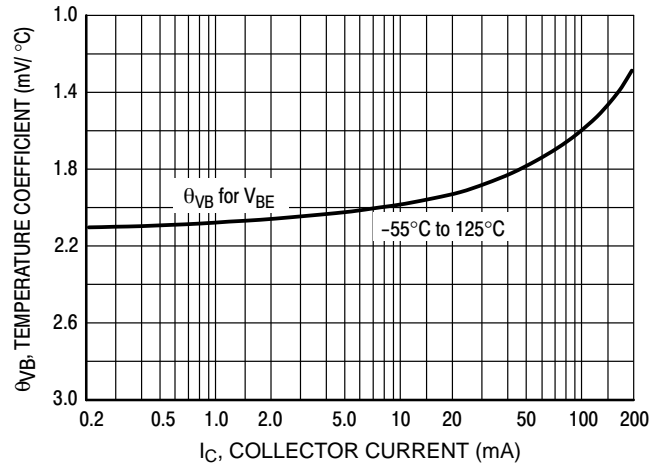


Figure 16. Base-Emitter Temperature Coefficient

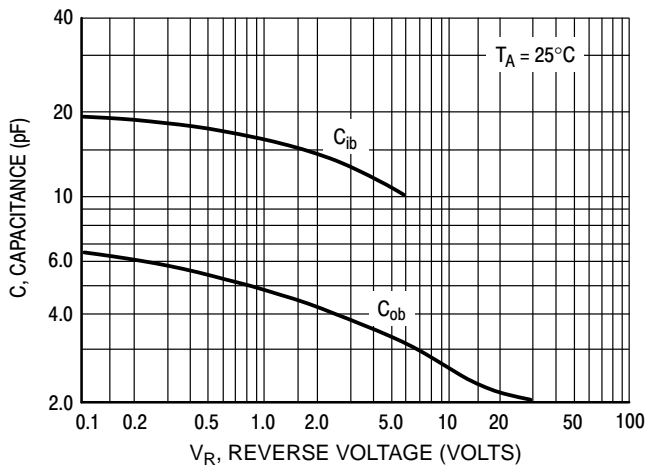


Figure 17. Capacitance

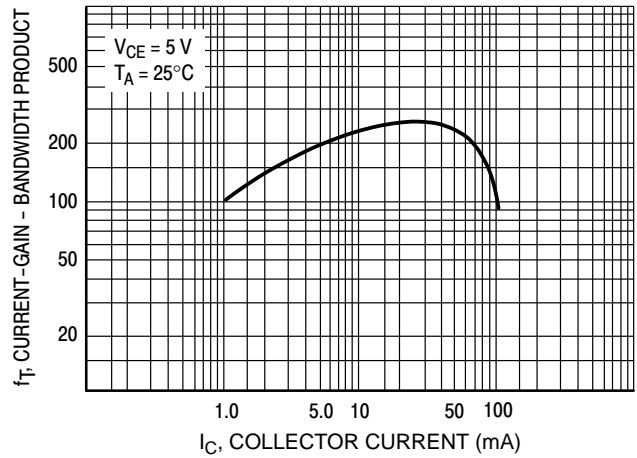
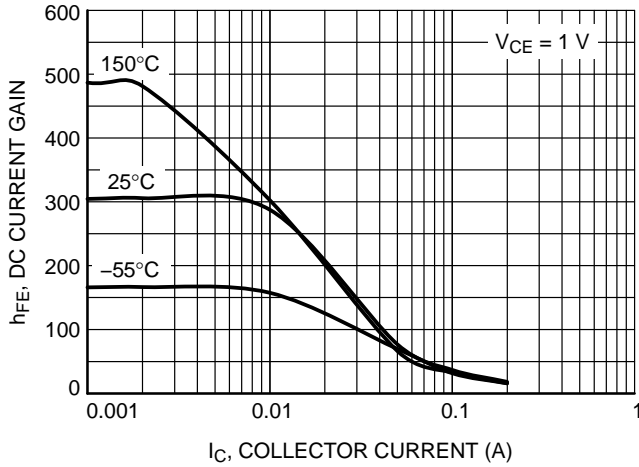


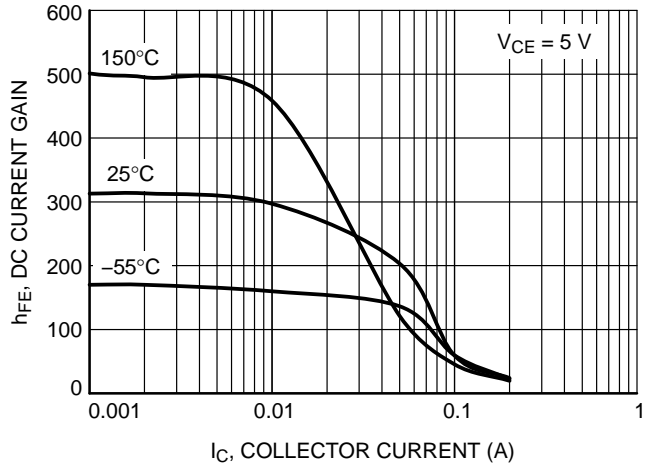
Figure 18. Current-Gain - Bandwidth Product

# BC846ALT1G Series

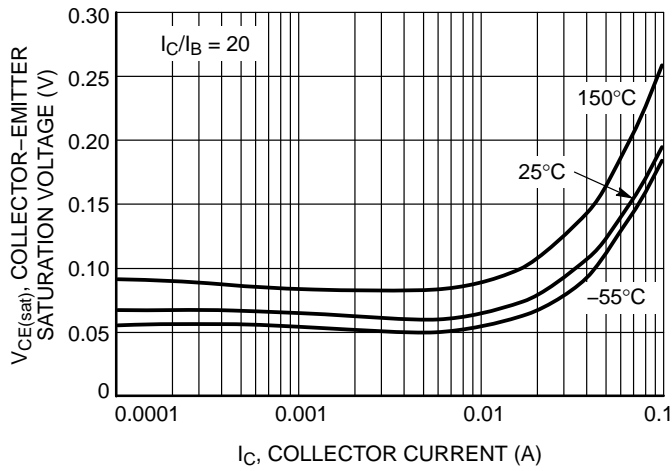
BC847B, BC848B, BC849B, BC850B, SBC847B, SBC848B



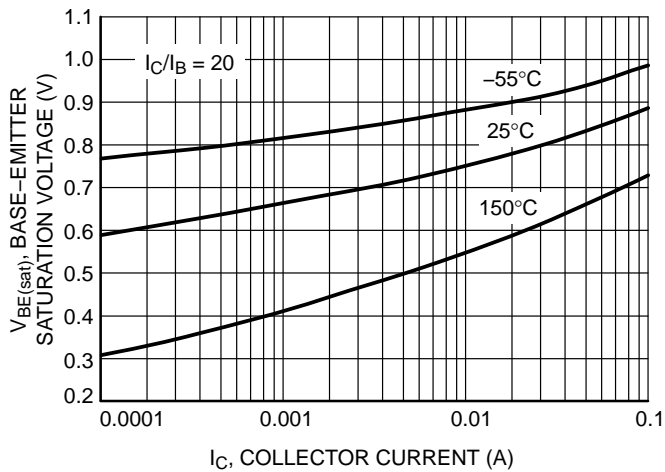
**Figure 19. DC Current Gain vs. Collector Current**



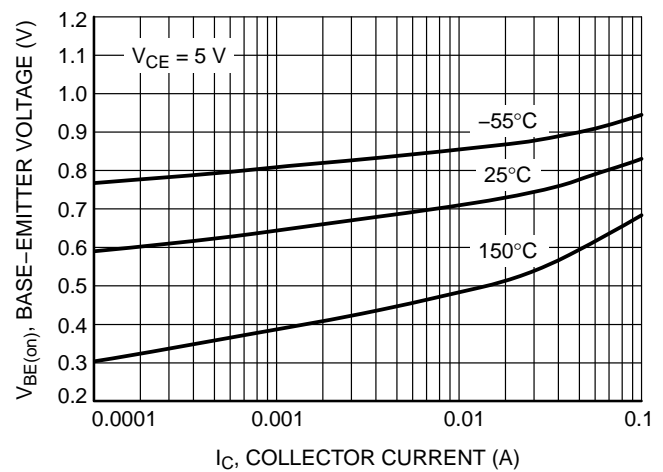
**Figure 20. DC Current Gain vs. Collector Current**



**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

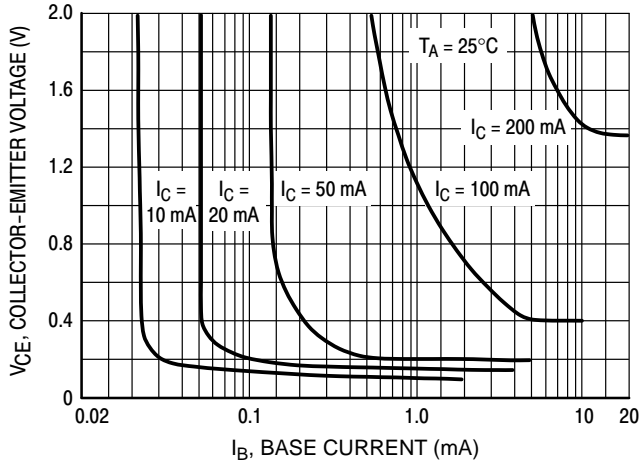


Figure 24. Collector Saturation Region

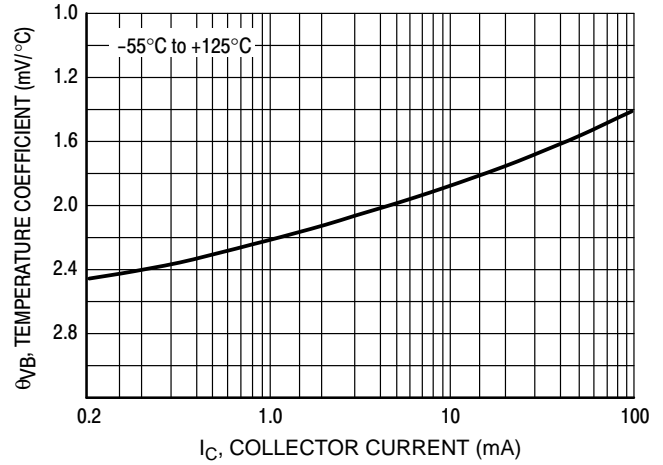


Figure 25. Base-Emitter Temperature Coefficient

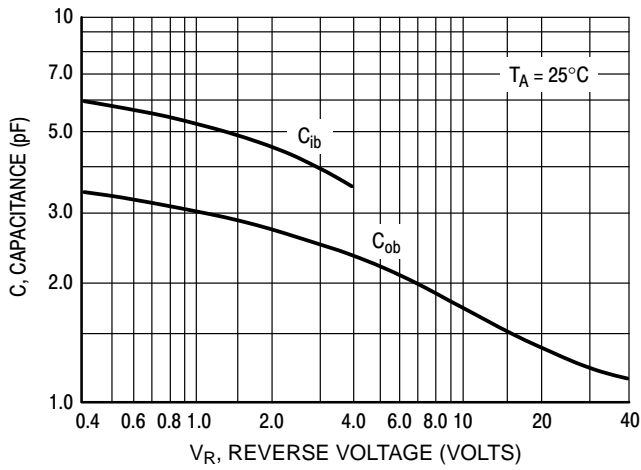


Figure 26. Capacitances

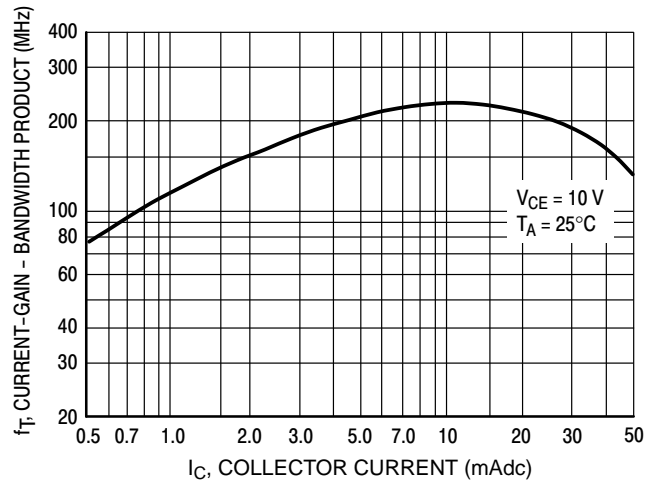
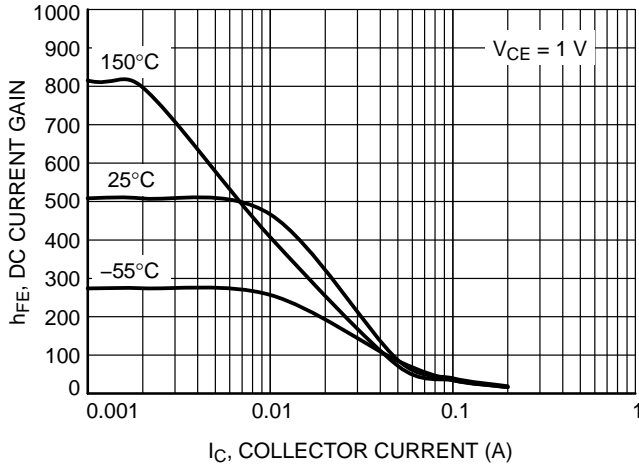


Figure 27. Current-Gain - Bandwidth Product

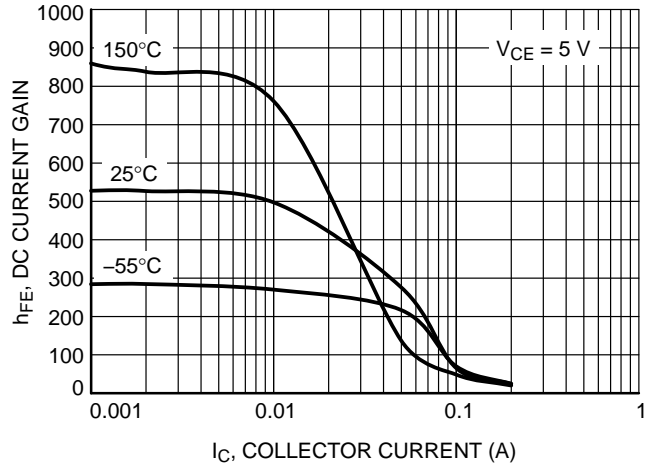


# BC846ALT1G Series

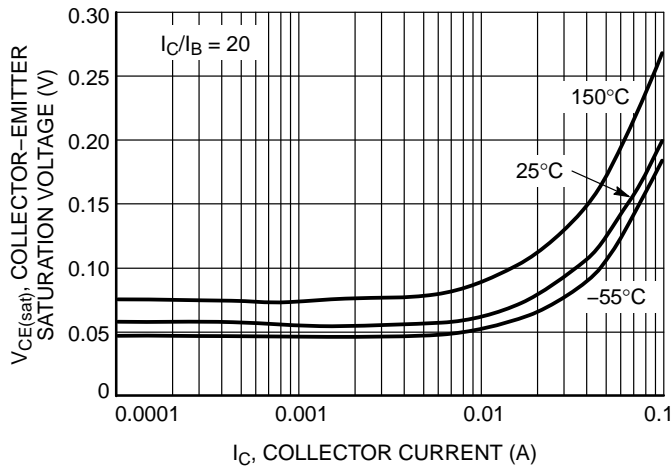
BC847C, BC848C, BC849C, BC850C, SBC847C



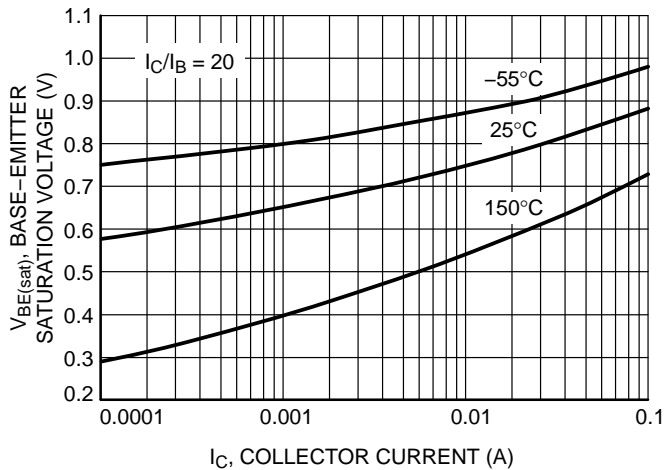
**Figure 28. DC Current Gain vs. Collector Current**



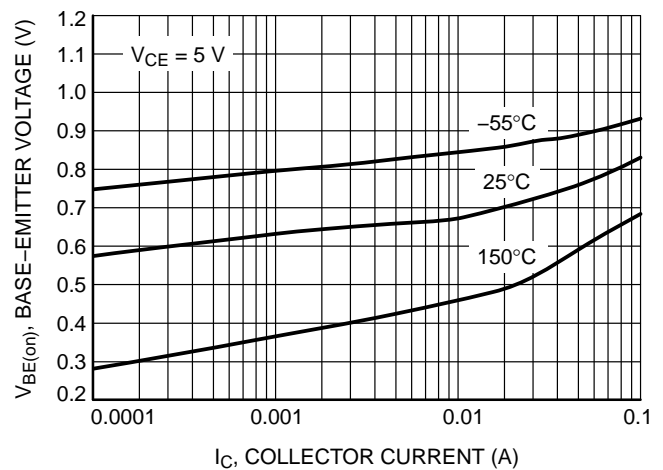
**Figure 29. DC Current Gain vs. Collector Current**



**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

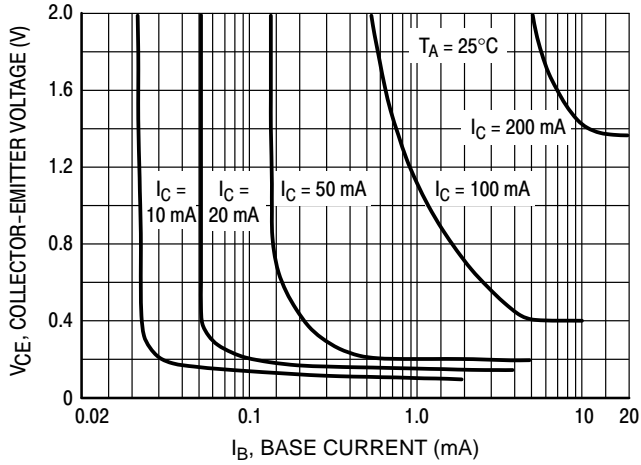


Figure 33. Collector Saturation Region

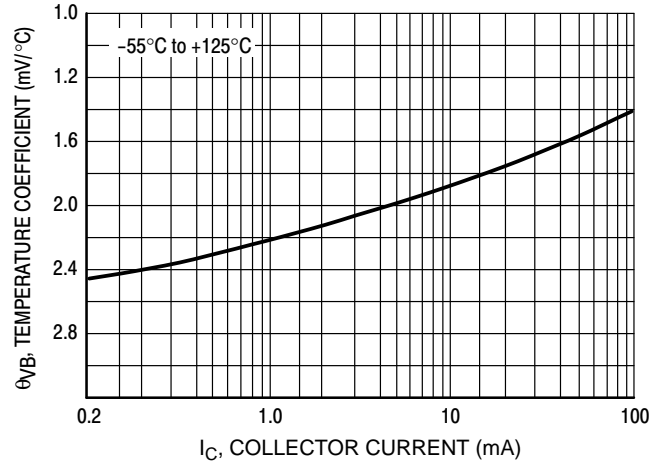


Figure 34. Base-Emitter Temperature Coefficient

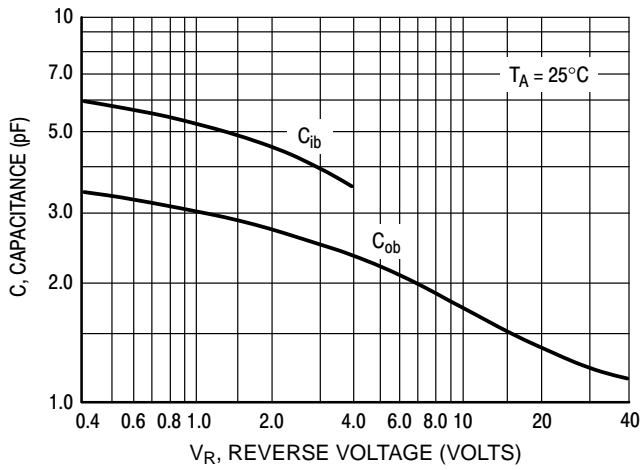


Figure 35. Capacitances

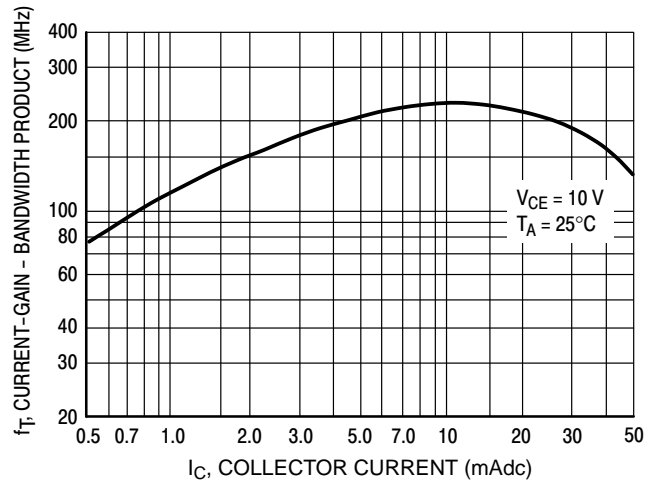
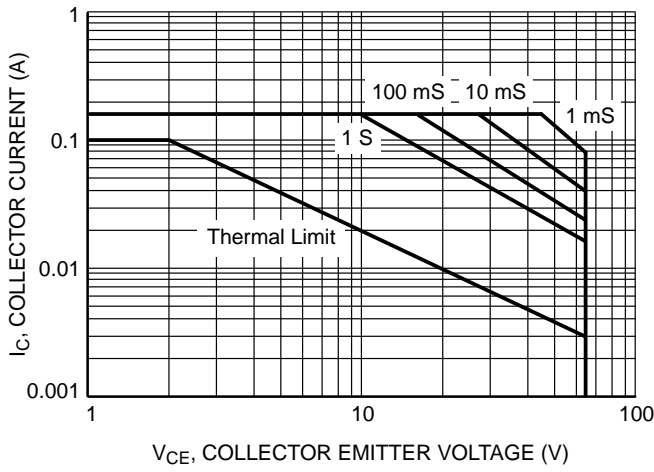
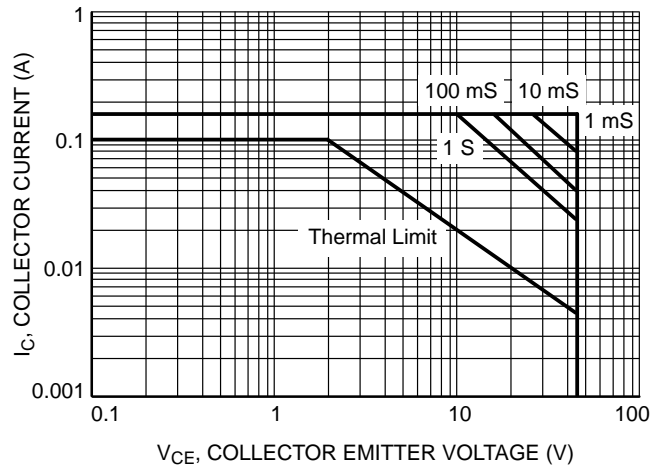


Figure 36. Current-Gain - Bandwidth Product

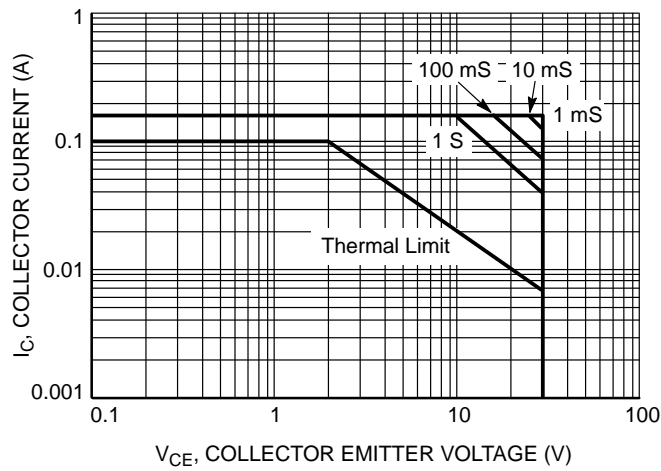
# BC846ALT1G Series



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

<sup>†</sup>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.

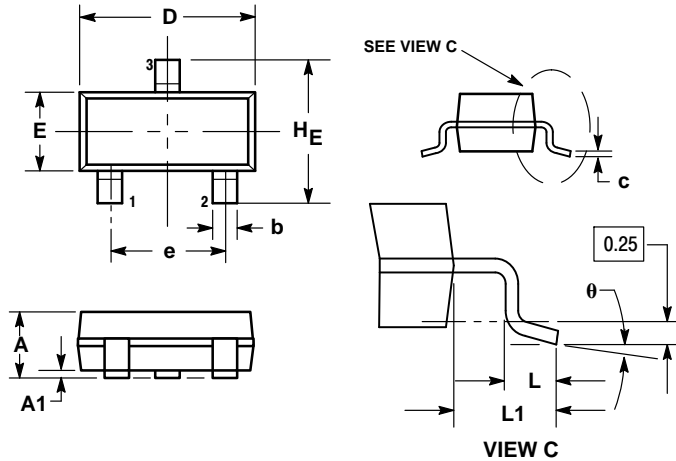
# BC846ALT1G Series

## PACKAGE DIMENSIONS

SOT-23 (TO-236)

CASE 318-08

ISSUE AP



**NOTES:**

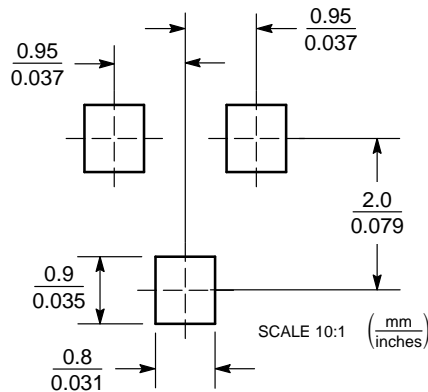
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.89	1.00	1.11	0.035	0.040	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
θ	0°	—	10°	0°	—	10°

**STYLE 6:**

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.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

### PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT:**  
Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative