

# General Purpose Transistors

## NPN Silicon

### BC846, BC847, BC848

These transistors are designed for general purpose amplifier applications. They are housed in the SC-70/SOT-323 which is designed for low power surface mount applications.

#### 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

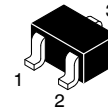
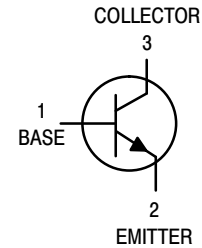
Rating	Symbol	Value	Unit
Collector-Emitter Voltage BC846 BC847 BC848	$V_{CEO}$	65 45 30	V
Collector-Base Voltage BC846 BC847 BC848	$V_{CBO}$	80 50 30	V
Emitter-Base Voltage BC846 BC847 BC848	$V_{EBO}$	6.0 6.0 5.0	V
Collector Current – Continuous	$I_C$	100	mAdc

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

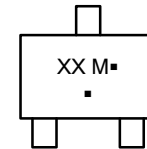
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$	$P_D$	200	mW
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	620	$^\circ\text{C/W}$
Junction and Storage Temperature	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

1. FR-5 = 1.0 x 0.75 x 0.062 in.



SC-70/SOT-323  
CASE 419  
STYLE 3

#### MARKING DIAGRAM



XX = Specific Device Code  
M = Month Code  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)

#### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 12 of this data sheet.

# BC846, BC847, BC848

## 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 ( $I_C = 10\text{ mA}$ )	BC846 Series BC847 Series BC848 Series	$V_{(BR)CEO}$	65 45 30	– – –	– – –	V
Collector - Emitter Breakdown Voltage ( $I_C = 10\text{ }\mu\text{A}$ , $V_{EB} = 0$ )	BC846 Series BC847 Series BC848 Series	$V_{(BR)CES}$	80 50 30	– – –	– – –	V
Collector - Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{A}$ )	BC846 Series BC847 Series BC848 Series	$V_{(BR)CBO}$	80 50 30	– – –	– – –	V
Emitter - Base Breakdown Voltage ( $I_E = 1.0\text{ }\mu\text{A}$ )	BC846 Series BC847 Series BC848 Series	$V_{(BR)EBO}$	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 $\mu\text{A}$

## ON CHARACTERISTICS

DC Current Gain ( $I_C = 10\text{ }\mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ )	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 BC847C, BC848C		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

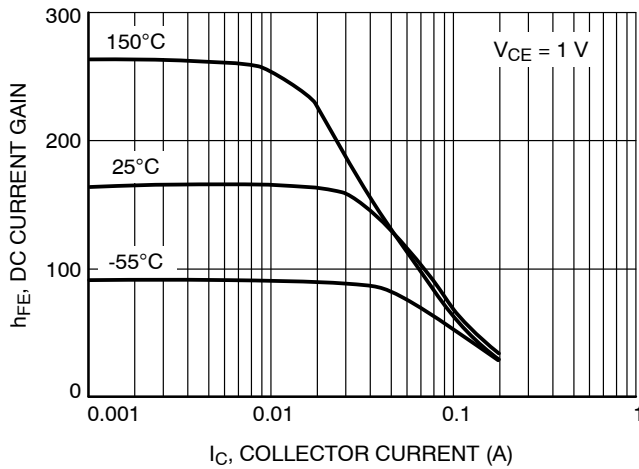
## SMALL-SIGNAL CHARACTERISTICS

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 ( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	–	–	10	dB

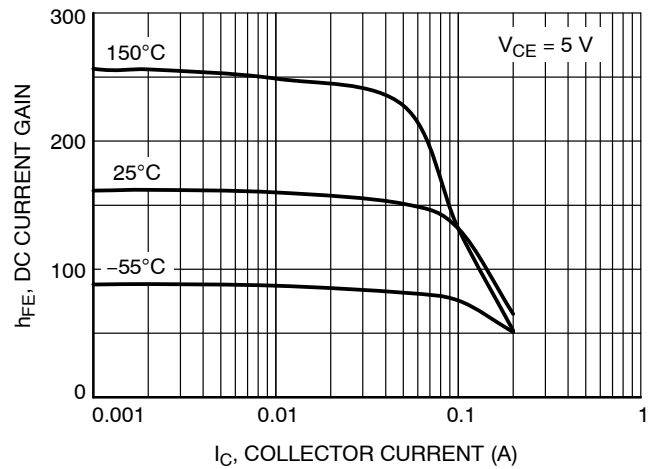
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

# BC846, BC847, BC848

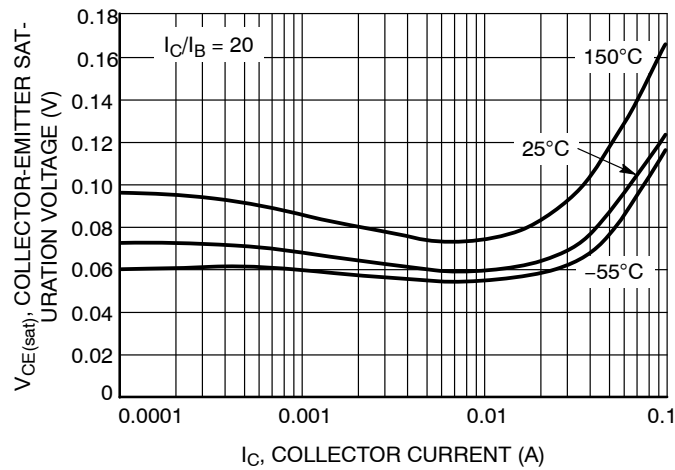
## BC846A, BC847A, BC848A



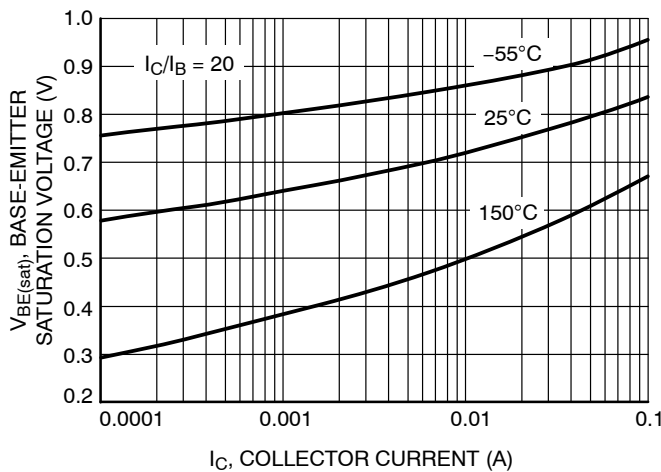
**Figure 1. DC Current Gain vs. Collector Current**



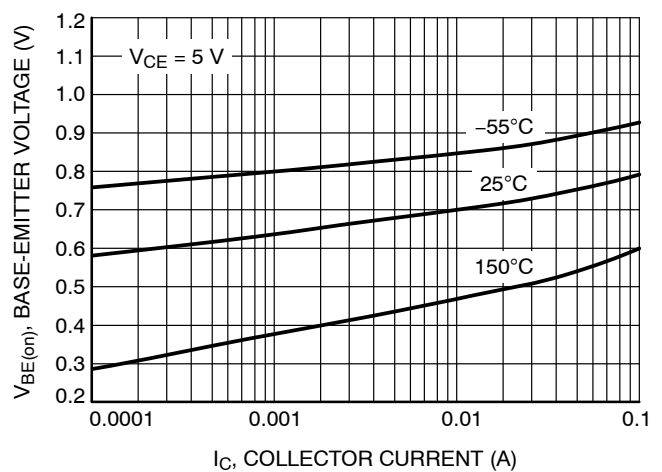
**Figure 2. DC Current Gain vs. Collector Current**



**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**

# BC846, BC847, BC848

## BC846A, BC847A, BC848A

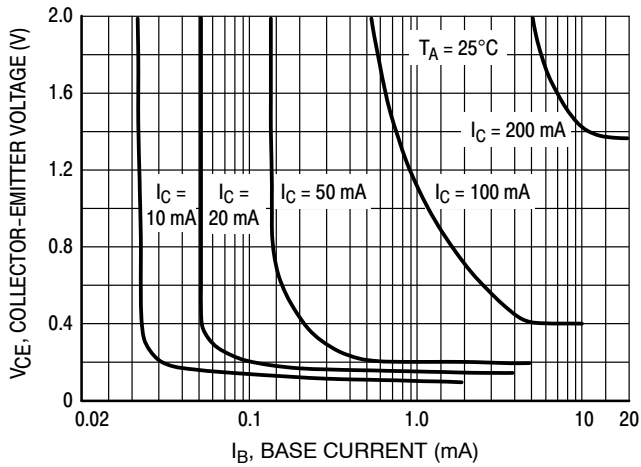


Figure 6. Collector Saturation Region

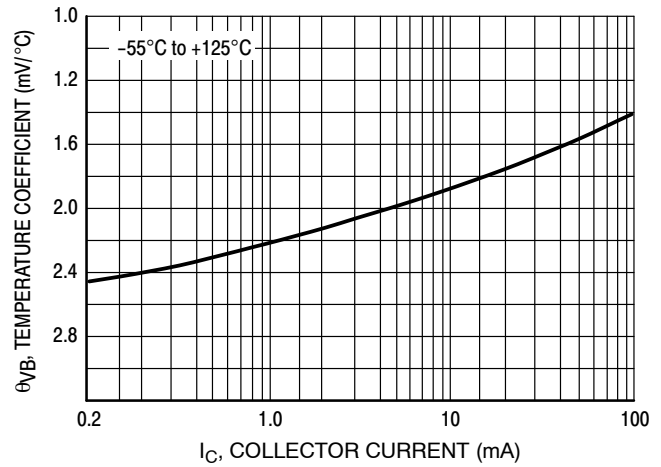


Figure 7. Base-Emitter Temperature Coefficient

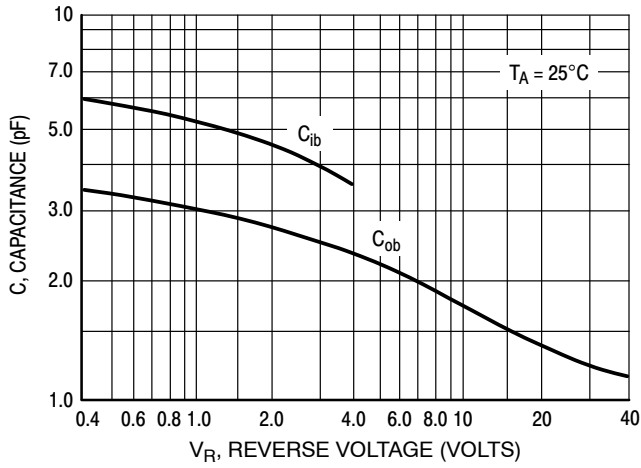


Figure 8. Capacitances

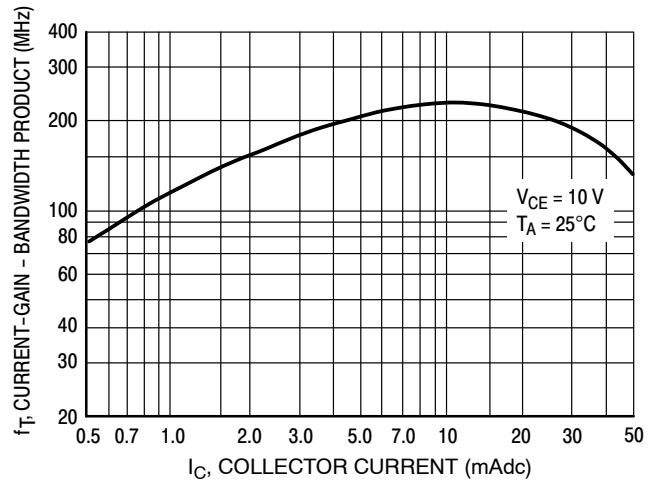
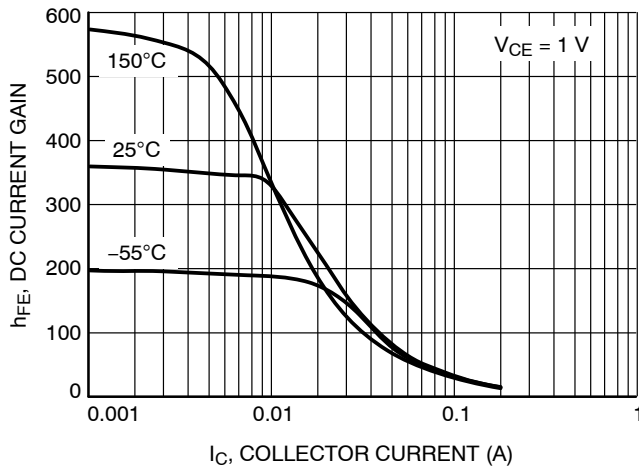


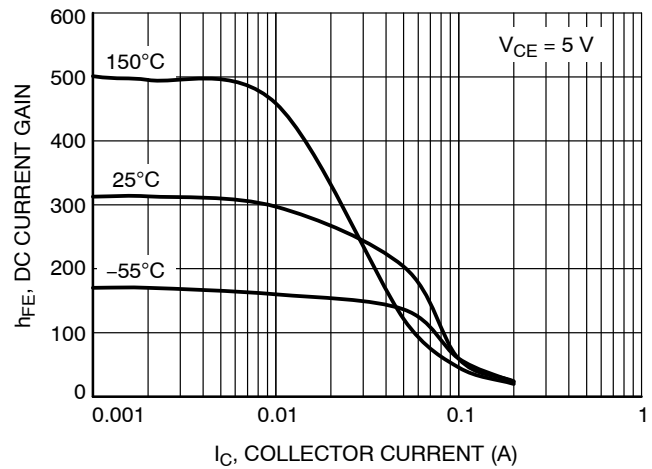
Figure 9. Current-Gain - Bandwidth Product

# BC846, BC847, BC848

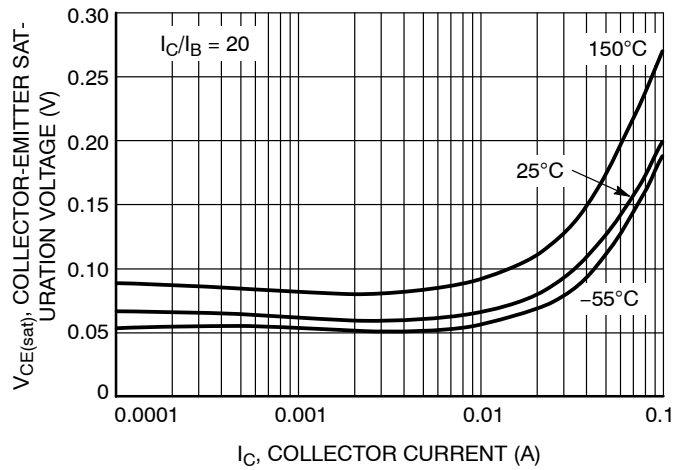
## BC846B



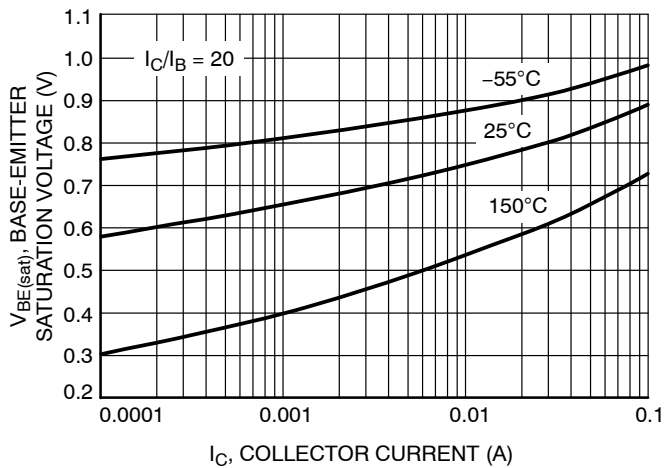
**Figure 10. DC Current Gain vs. Collector Current**



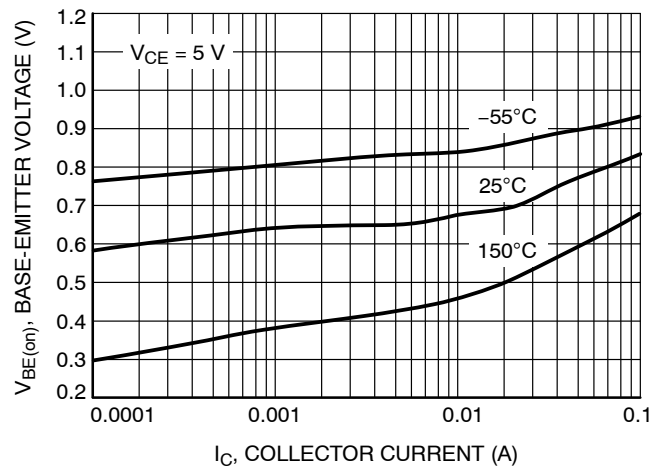
**Figure 11. DC Current Gain vs. Collector Current**



**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**

BC846B

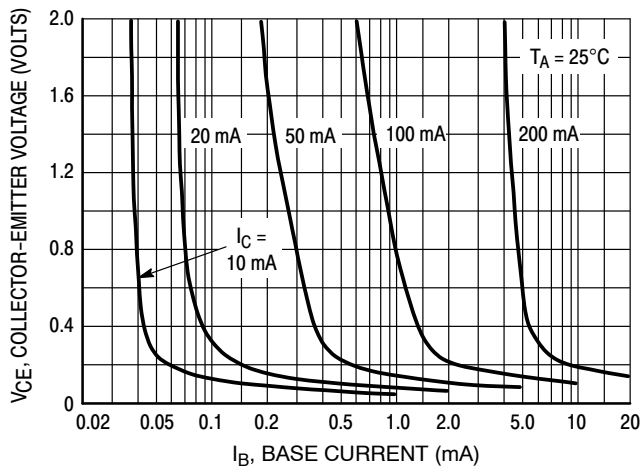


Figure 15. Collector Saturation Region

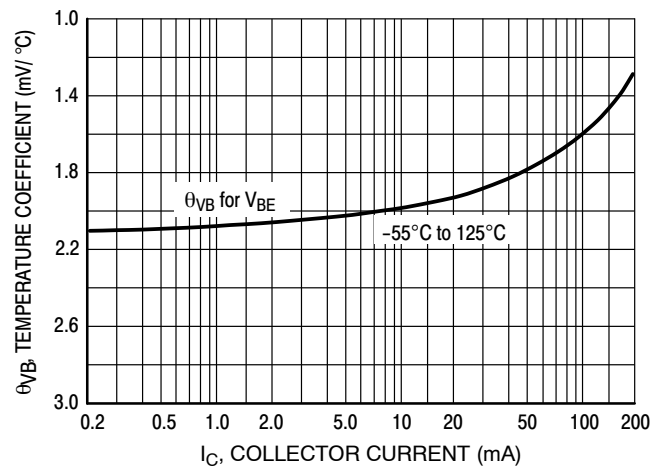


Figure 16. Base-Emitter Temperature Coefficient

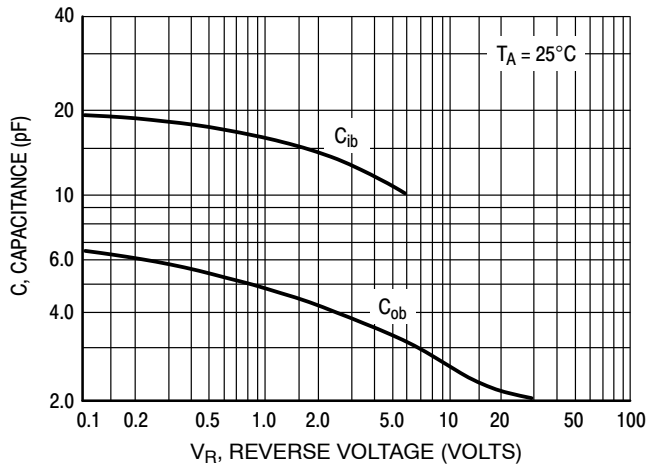


Figure 17. Capacitance

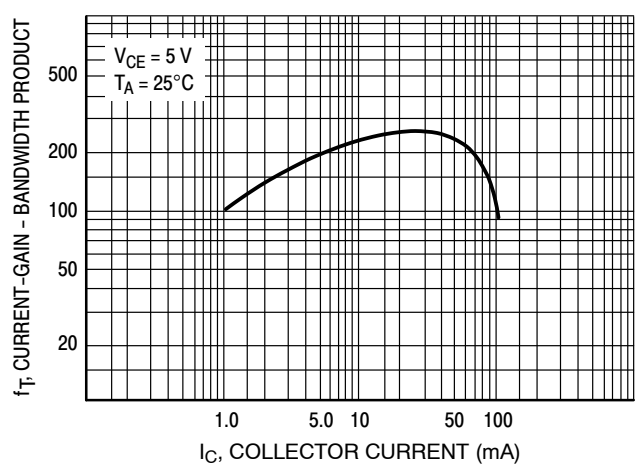
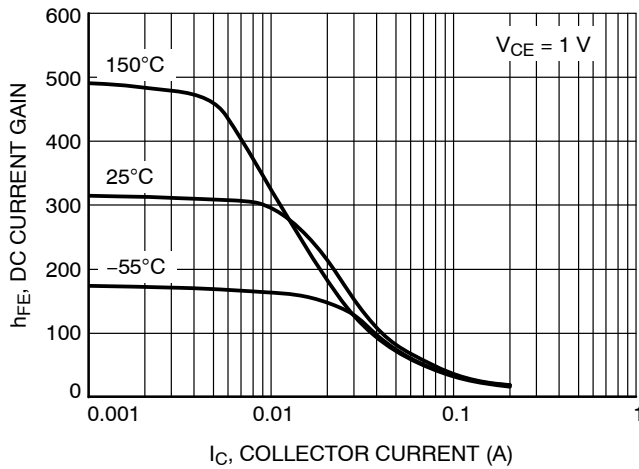


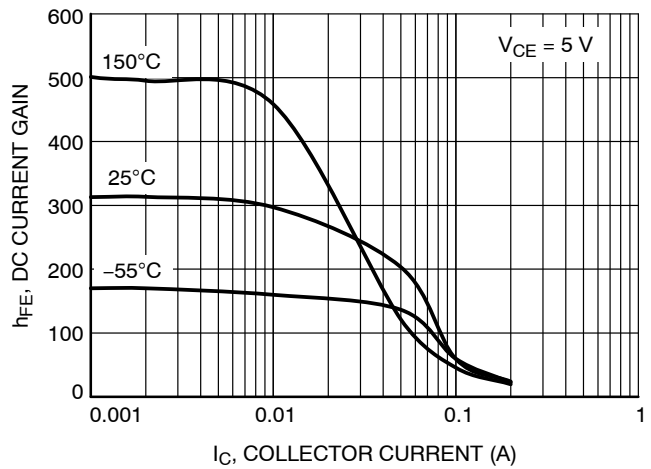
Figure 18. Current-Gain - Bandwidth Product

# BC846, BC847, BC848

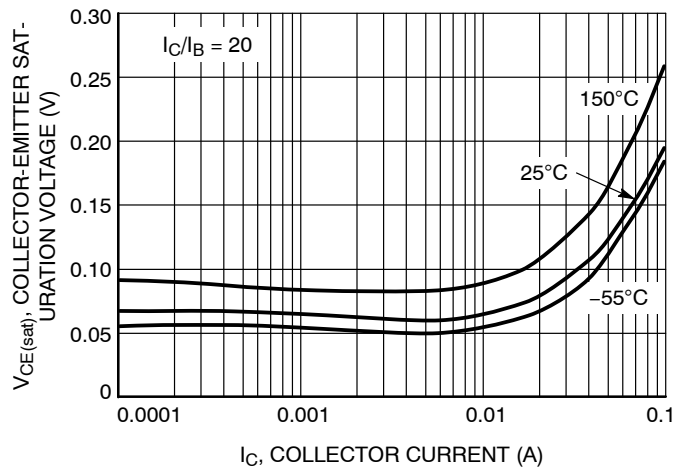
## BC847B, BC848B



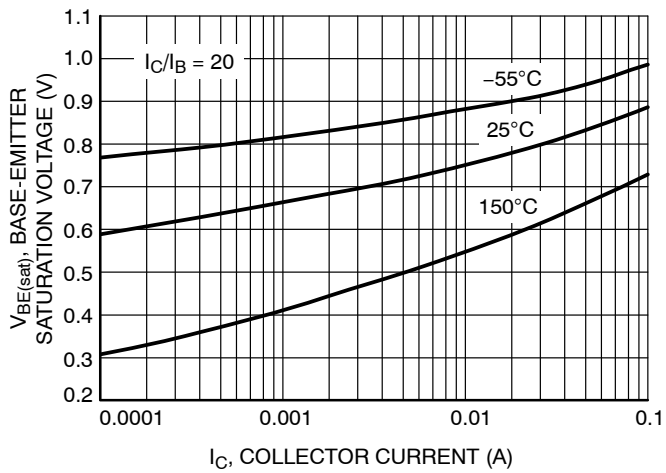
**Figure 19. DC Current Gain vs. Collector Current**



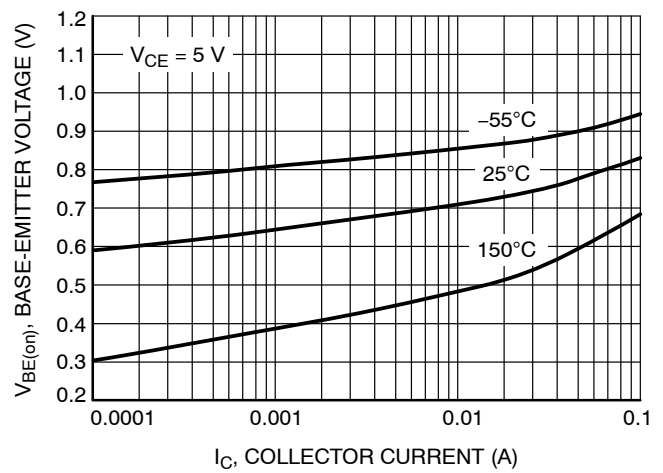
**Figure 20. DC Current Gain vs. Collector Current**



**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**

# BC846, BC847, BC848

## BC847B, BC848B

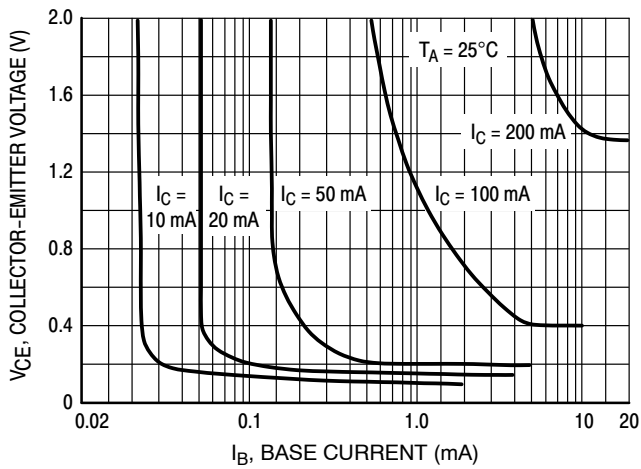


Figure 24. Collector Saturation Region

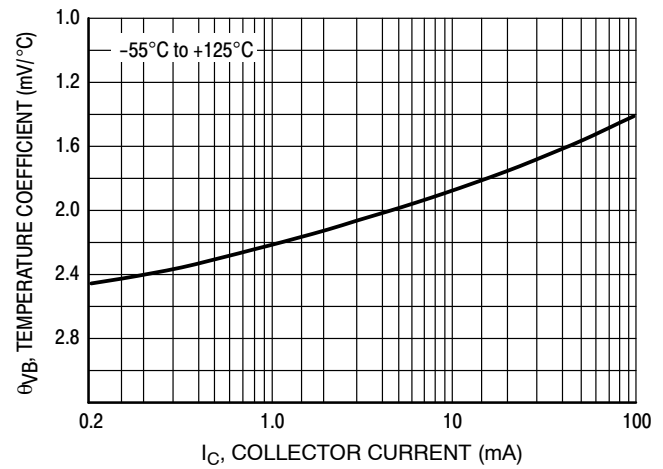


Figure 25. Base-Emitter Temperature Coefficient

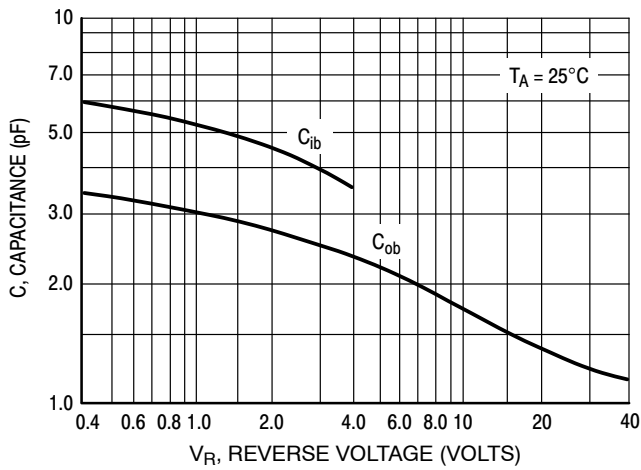


Figure 26. Capacitances

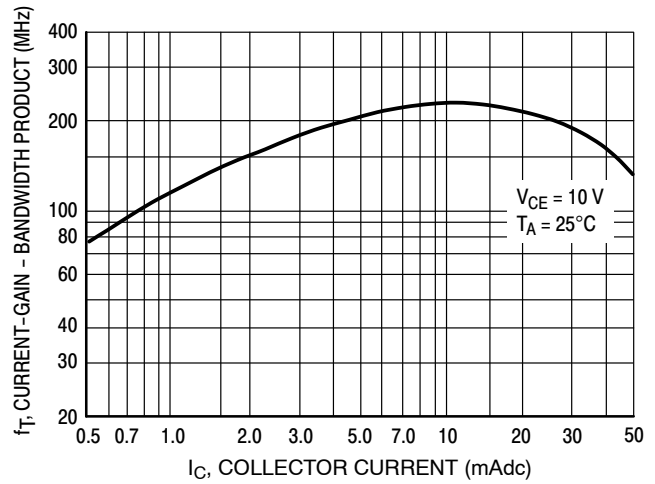
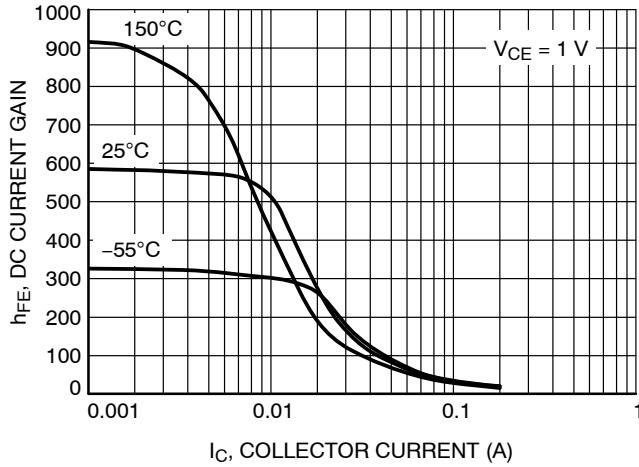


Figure 27. Current-Gain - Bandwidth Product

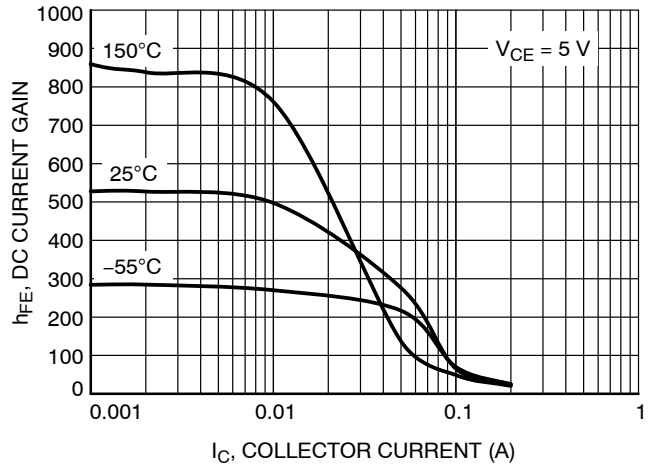


# BC846, BC847, BC848

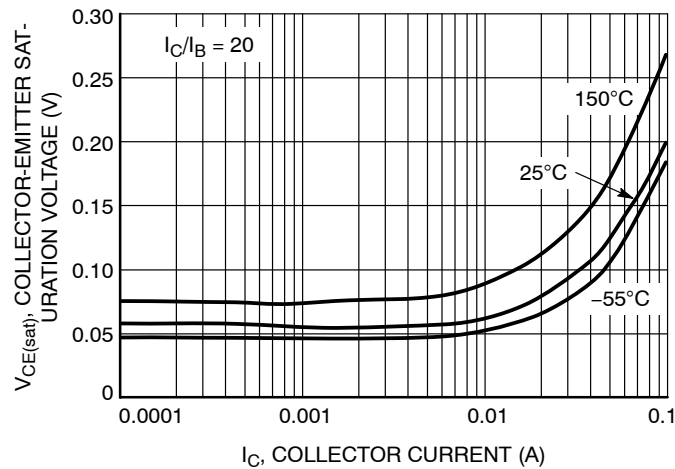
## BC847C, BC848C



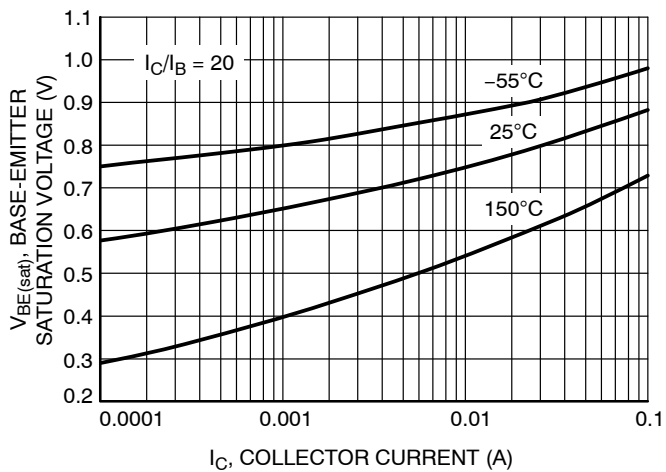
**Figure 28. DC Current Gain vs. Collector Current**



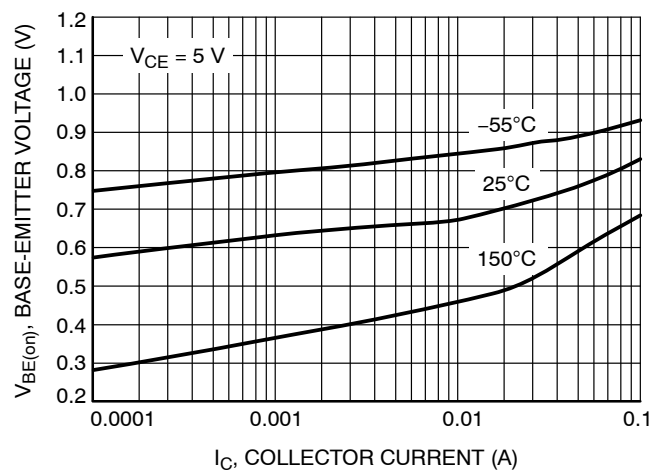
**Figure 29. DC Current Gain vs. Collector Current**



**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**

# BC846, BC847, BC848

## BC847C, BC848C

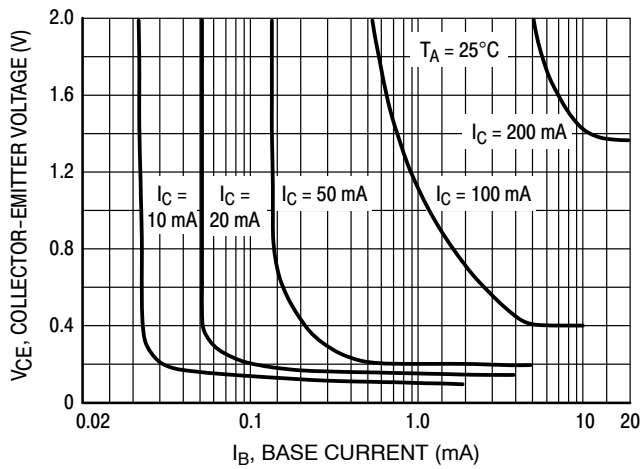


Figure 33. Collector Saturation Region

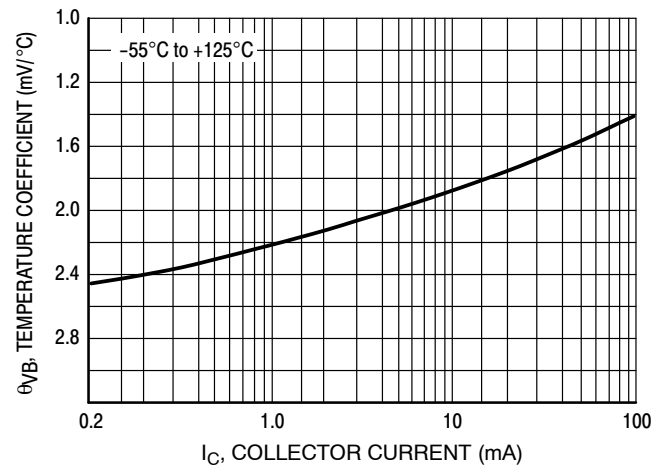


Figure 34. Base-Emitter Temperature Coefficient

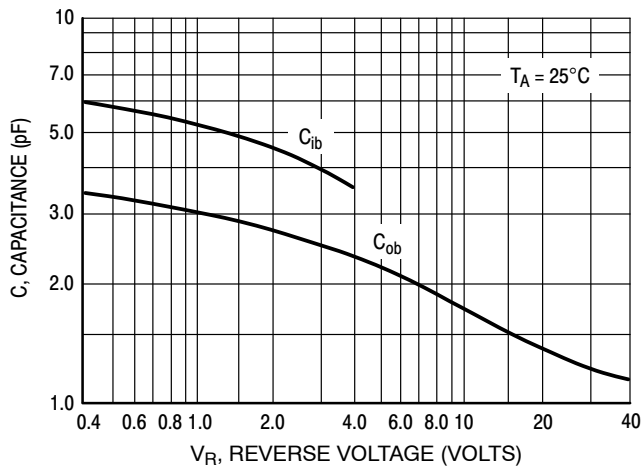


Figure 35. Capacitances

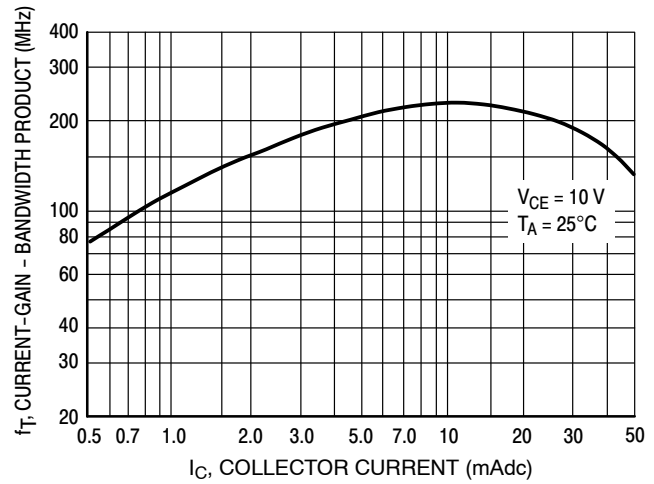
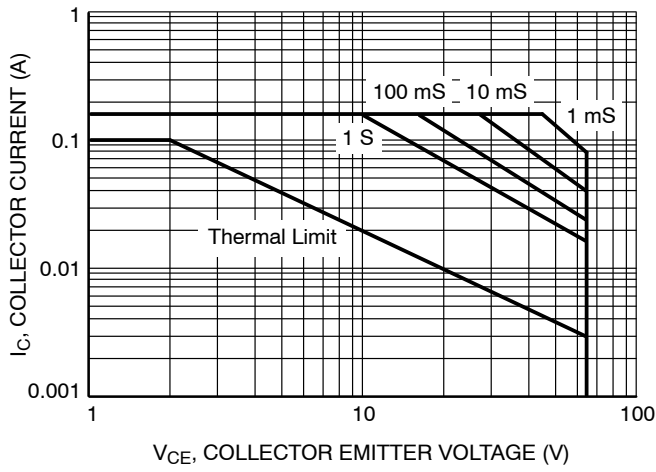
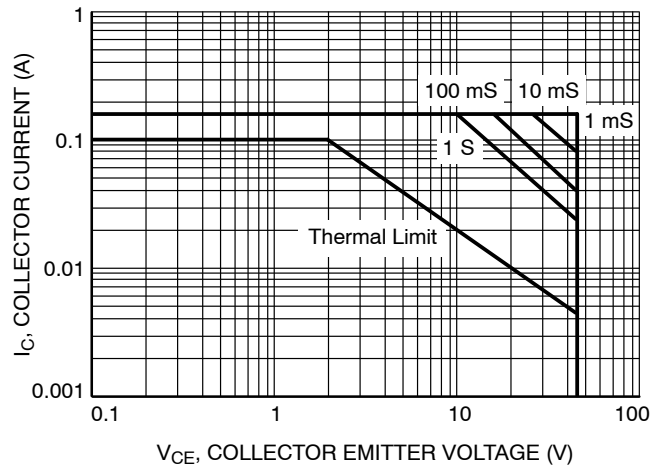


Figure 36. Current-Gain - Bandwidth Product

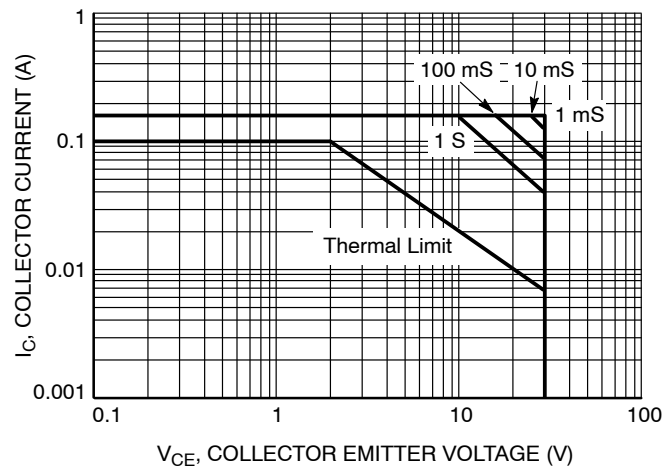
## BC846, BC847, BC848



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



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



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

## BC846, BC847, BC848

### DEVICE ORDERING AND SPECIFIC MARKING INFORMATION

Device	Specific Marking Code	Package	Shipping†
BC846BWT1G	1B	SC-70 (SOT-323) (Pb-Free)	3,000 / Tape & Reel
SBC846BWT1G*			
BC847AWT1G	1E		3,000 / Tape & Reel
SBC847AWT1G*			
BC847BWT1G	1F		3,000 / Tape & Reel
SBC847BWT1G*			
BC847CWT1G	1G		3,000 / Tape & Reel
SBC847CWT1G*			
BC847CWT3G	1G		10,000 / Tape & Reel
SBC847CWT3G*			
BC848BWT1G	1K		3,000 / Tape & Reel
NSVBC848BWT1G*			
BC848CWT1G	1L		

†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.



SCALE 4:1

**SC-70 (SOT-323)**  
**CASE 419**  
**ISSUE R**

DATE 11 OCT 2022



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH

DIM	MILLIMETERS			INCHES		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 BSC		
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.00	2.20	0.071	0.080	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.56	0.008	0.015	0.022
H <sub>E</sub>	2.00	2.10	2.40	0.079	0.083	0.095

**GENERIC  
MARKING DIAGRAM**



XX = 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.



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

**SOLDERING FOOTPRINT**

STYLE 1:  
CANCELLED

STYLE 2:  
PIN 1. ANODE  
2. N.C.  
3. CATHODE

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

STYLE 4:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 5:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

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

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

STYLE 8:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

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

STYLE 10:  
PIN 1. CATHODE  
2. ANODE  
3. ANODE-CATHODE

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

<b>DOCUMENT NUMBER:</b>	<b>98ASB42819B</b>	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
<b>DESCRIPTION:</b>	<b>SC-70 (SOT-323)</b>	<b>PAGE 1 OF 1</b>

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[www.onsemi.com/support/sales](http://www.onsemi.com/support/sales)