

# BC846ALT1G Series, SBC846ALT1G Series



**ON Semiconductor®**

<http://onsemi.com>

## General Purpose Transistors

### NPN Silicon

#### Features

- Moisture Sensitivity Level: 1
- ESD Rating – Human Body Model: >4000 V  
– Machine Model: >400 V
- AEC-Q101 Qualified and PPAP Capable
- S Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

#### MAXIMUM RATINGS

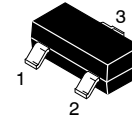
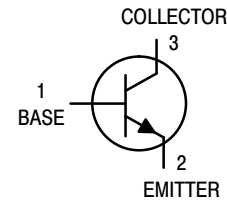
Rating	Symbol	Value	Unit
Collector-Emitter Voltage BC846, SBC846 BC847, BC850, SBC847 BC848, BC849, SBC848	$V_{CEO}$	65 45 30	Vdc
Collector-Base Voltage BC846, SBC846 BC847, BC850, SBC847 BC848, BC849, SBC848	$V_{CBO}$	80 50 30	Vdc
Emitter-Base Voltage BC846, SBC846 BC847, BC850, SBC847 BC848, BC849, SBC848	$V_{EBO}$	6.0 6.0 5.0	Vdc
Collector Current – Continuous	$I_C$	100	mAdc

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

#### THERMAL CHARACTERISTICS

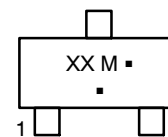
Characteristic	Symbol	Max	Unit
Total Device Dissipation FR-5 Board, (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient (Note 1)	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate (Note 2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
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 × 0.75 × 0.062 in.
2. Alumina = 0.4 × 0.3 × 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, SBC846ALT1G 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, SBC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B	$V_{(BR)CEO}$	65 45 30	– – –	– – –	V
Collector – Emitter Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $V_{EB} = 0$ )	BC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B	$V_{(BR)CES}$	80 50 30	– – –	– – –	V
Collector – Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ )	BC846A, B, SBC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B	$V_{(BR)CBO}$	80 50 30	– – –	– – –	V
Emitter – Base Breakdown Voltage ( $I_E = 1.0\ \mu\text{A}$ )	BC846A, B, SBC846A, B BC847A, B, C, BC850B, C, SBC847C BC848A, B, C, BC849B, C, SBC848B	$V_{(BR)EBO}$	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, SBC846A BC846B, BC847B, BC848B, SBC846B, SBC848B BC847C, BC848C, SBC847C	$h_{FE}$	– – –	90 150 270	– – –	–
( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	BC846A, BC847A, BC848A, SBC846A, SBC846A BC846B, BC847B, BC848B, BC849B, BC850B, SBC846B, SBC848B BC847C, BC848C, BC849C, BC850C, SBC847C		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, SBC846A, B, SBC847C, SBC848B BC849B,C, BC850B,C	NF	– –	– –	10 4.0	dB

BC846ALT1G Series, SBC846ALT1G Series

BC846A, BC847A, BC848A, SBC846A

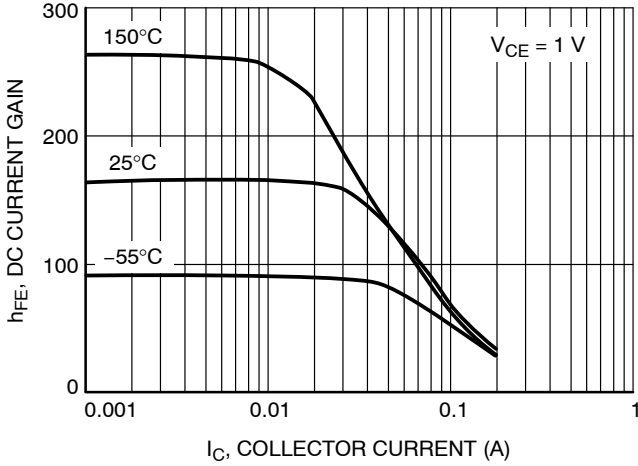


Figure 1. DC Current Gain vs. Collector Current

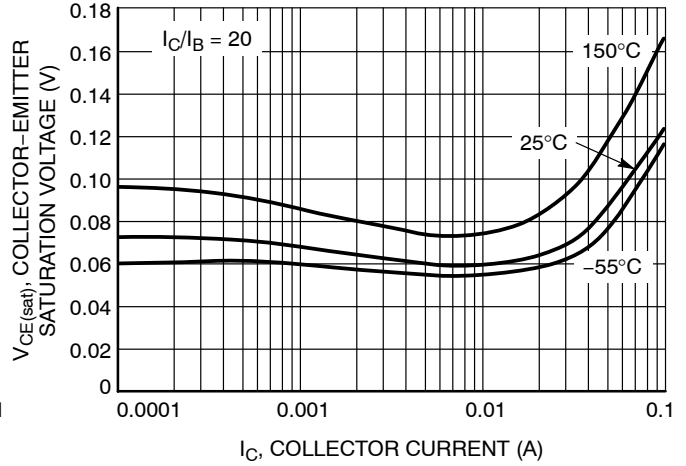


Figure 2. Collector Emitter Saturation Voltage vs. Collector Current

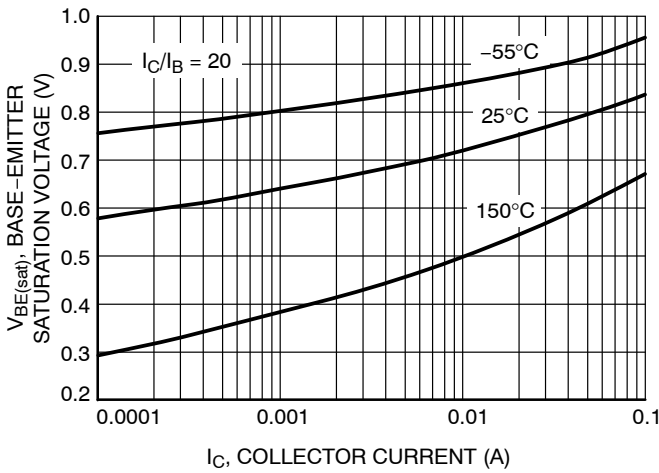


Figure 3. Base Emitter Saturation Voltage vs. Collector Current

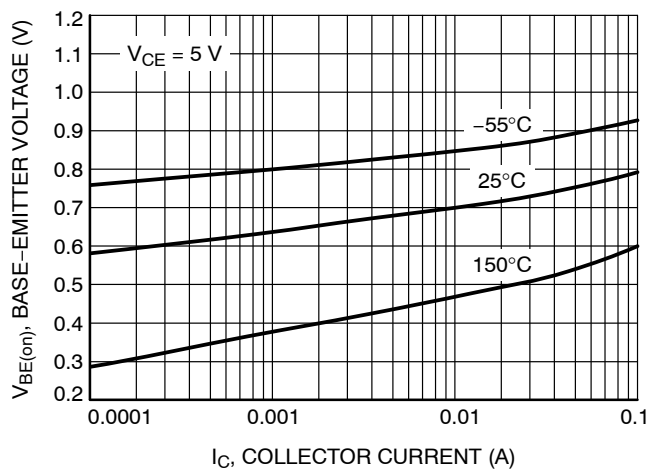


Figure 4. Base Emitter Voltage vs. Collector Current

# BC846ALT1G Series, SBC846ALT1G Series

## BC846A, BC847A, BC848A, SBC846A

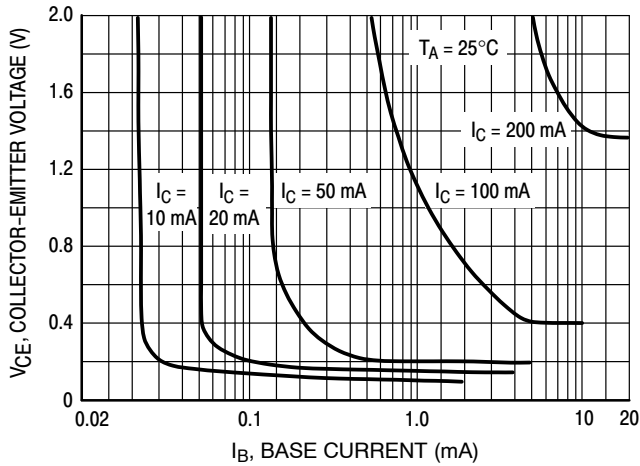


Figure 5. Collector Saturation Region

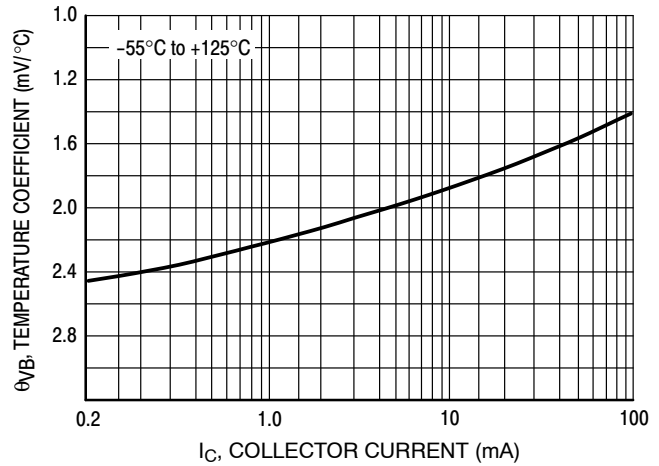


Figure 6. Base-Emitter Temperature Coefficient

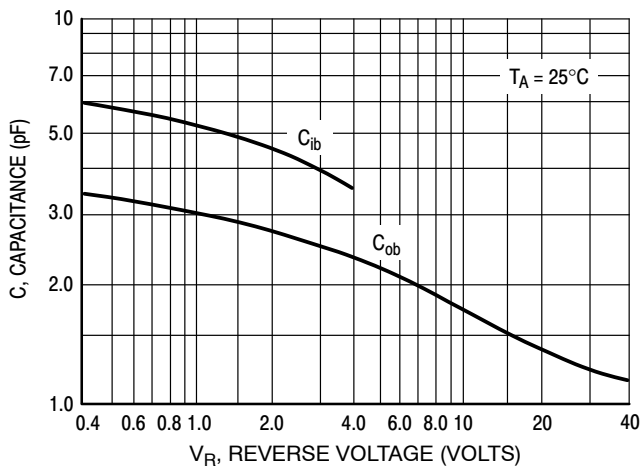


Figure 7. Capacitances

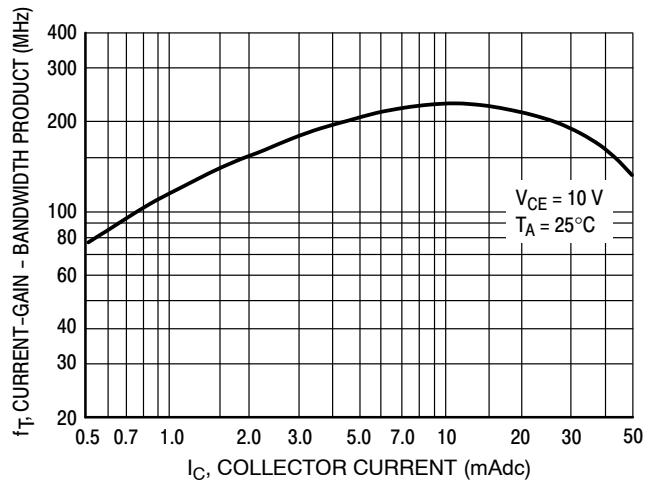


Figure 8. Current-Gain - Bandwidth Product

BC846ALT1G Series, SBC846ALT1G Series

BC846B, SBC846B

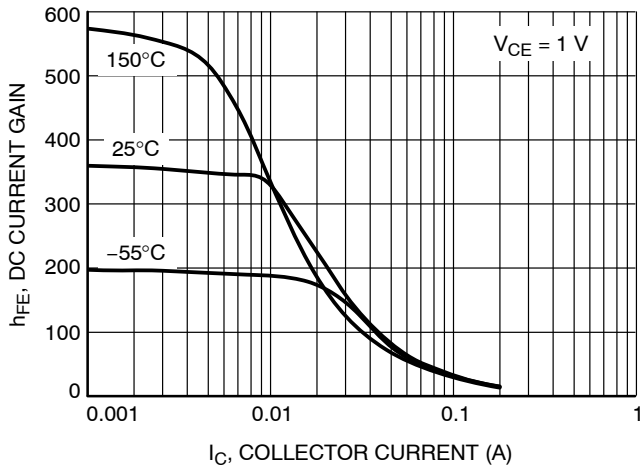


Figure 9. DC Current Gain vs. Collector Current

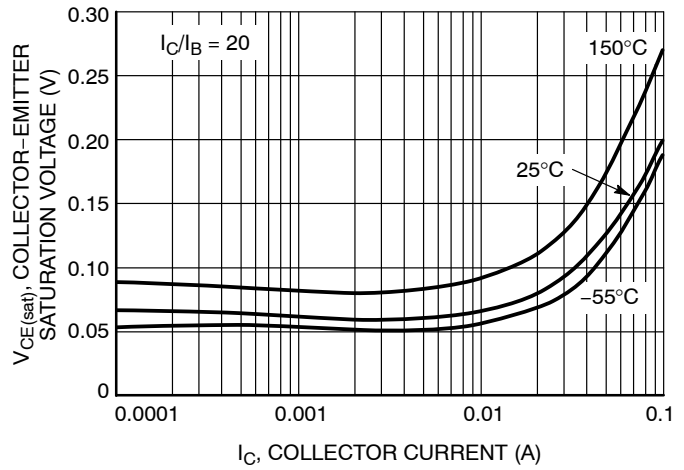


Figure 10. Collector Emitter Saturation Voltage vs. Collector Current

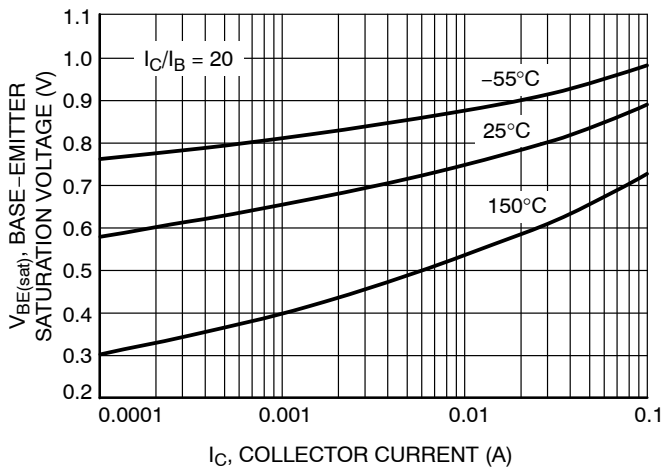


Figure 11. Base Emitter Saturation Voltage vs. Collector Current

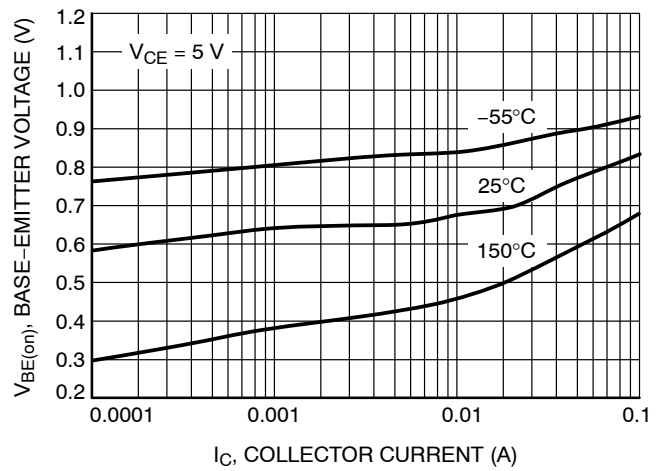


Figure 12. Base Emitter Voltage vs. Collector Current

# BC846ALT1G Series, SBC846ALT1G Series

## BC846B, SBC846B

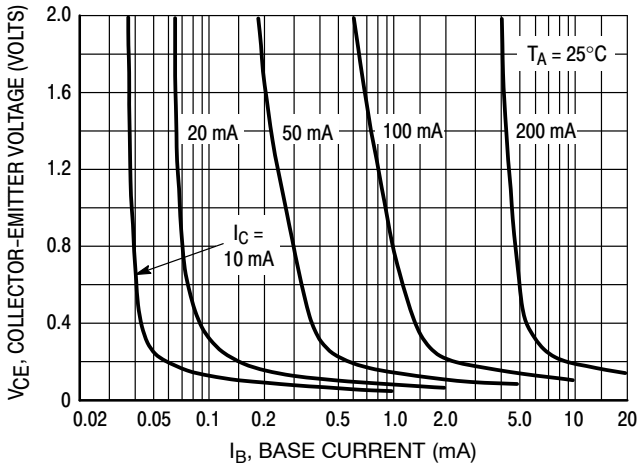


Figure 13. Collector Saturation Region

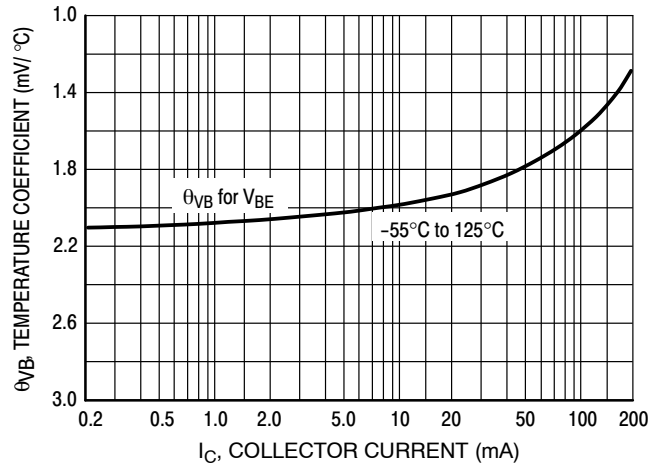


Figure 14. Base-Emitter Temperature Coefficient

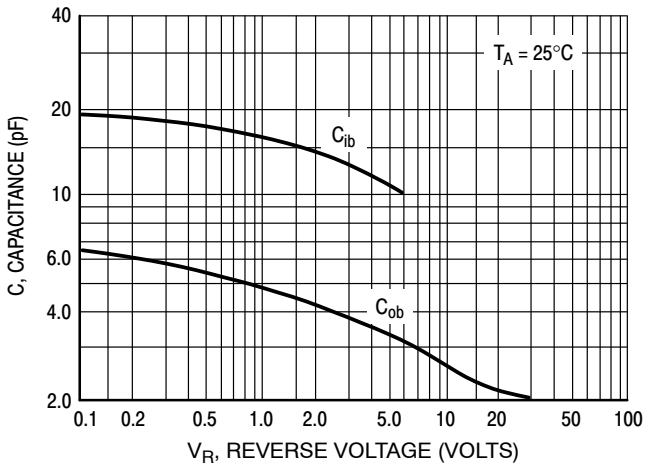


Figure 15. Capacitance

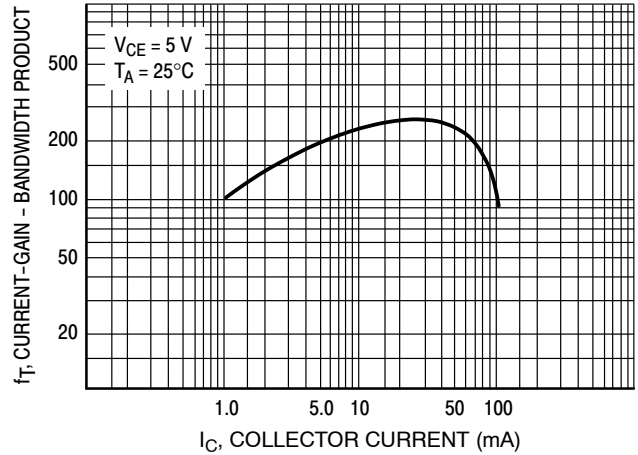


Figure 16. Current-Gain - Bandwidth Product

# BC846ALT1G Series, SBC846ALT1G Series

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

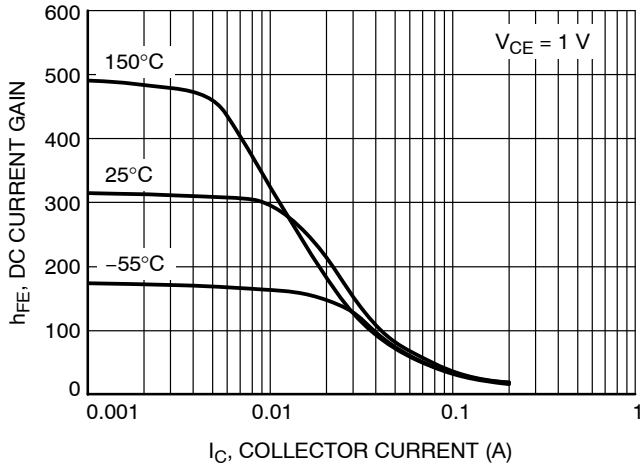


Figure 17. DC Current Gain vs. Collector Current

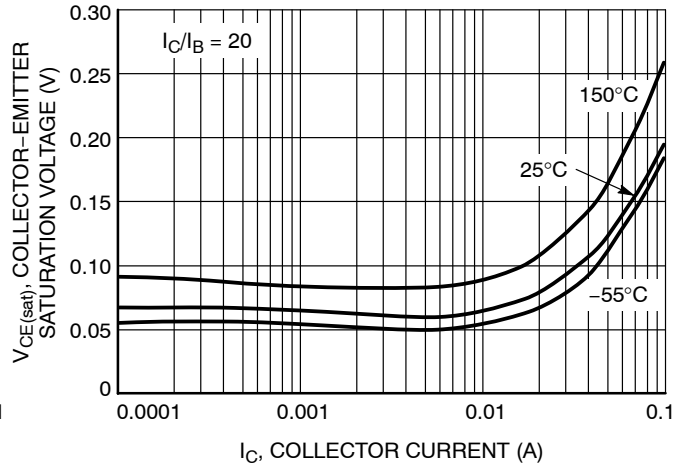


Figure 18. Collector Emitter Saturation Voltage vs. Collector Current

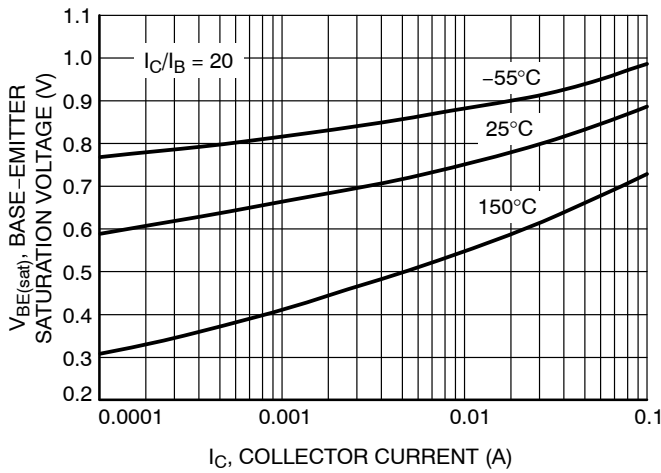


Figure 19. Base Emitter Saturation Voltage vs. Collector Current

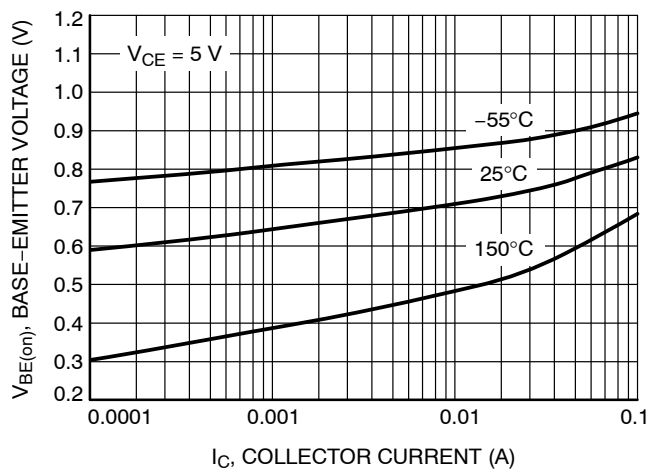


Figure 20. Base Emitter Voltage vs. Collector Current

# BC846ALT1G Series, SBC846ALT1G Series

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

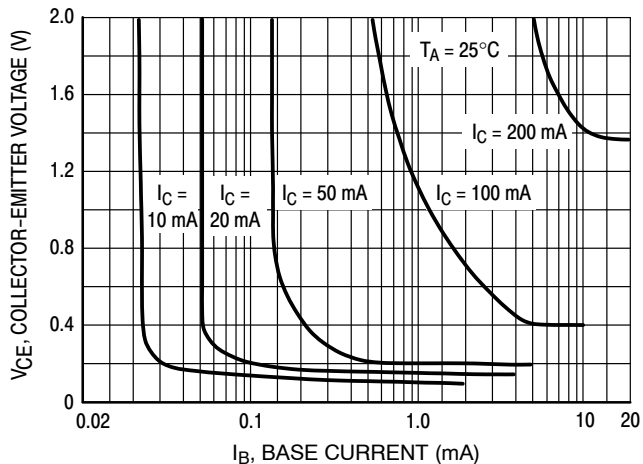


Figure 21. Collector Saturation Region

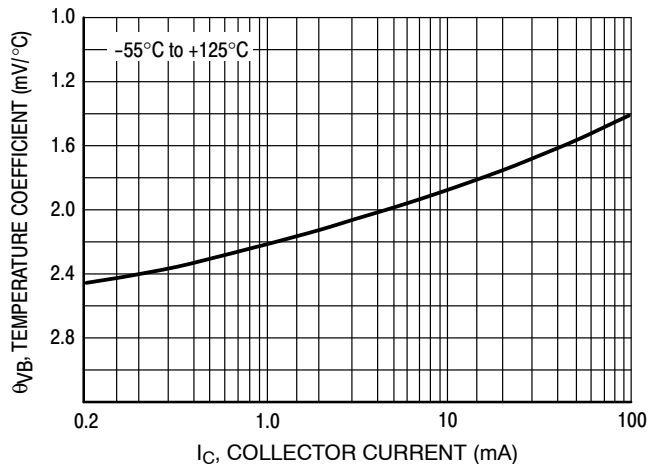


Figure 22. Base-Emitter Temperature Coefficient

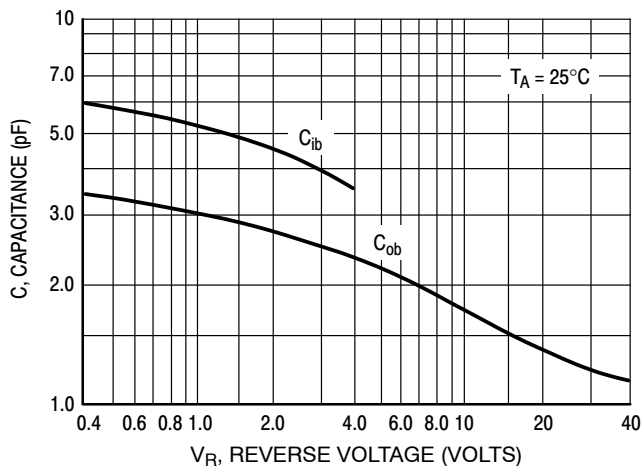


Figure 23. Capacitances

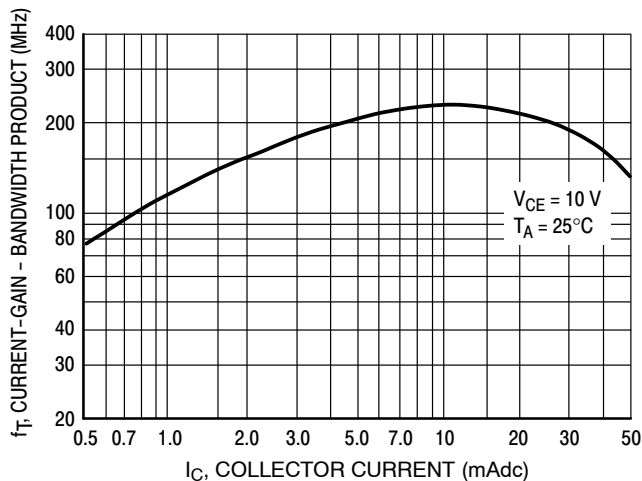


Figure 24. Current-Gain - Bandwidth Product



BC846ALT1G Series, SBC846ALT1G Series

BC847C, BC848C, BC849C, BC850C, SBC847C

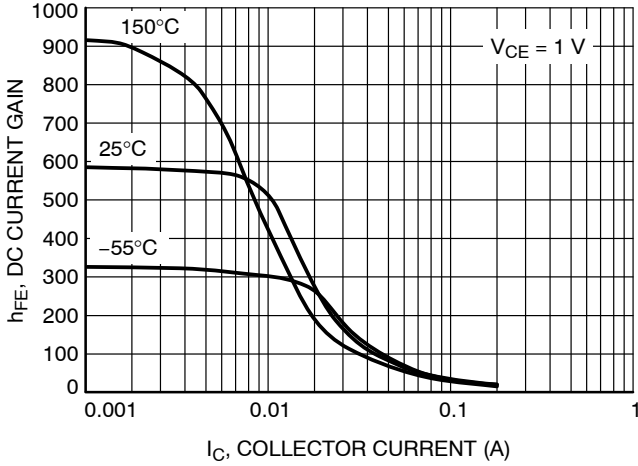


Figure 25. DC Current Gain vs. Collector Current

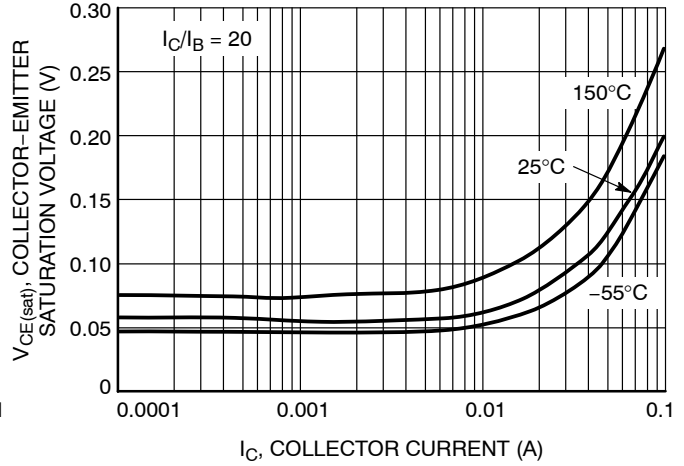


Figure 26. Collector Emitter Saturation Voltage vs. Collector Current

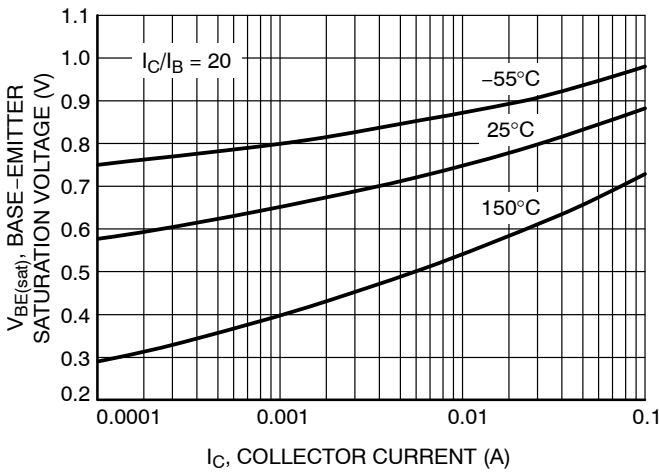


Figure 27. Base Emitter Saturation Voltage vs. Collector Current

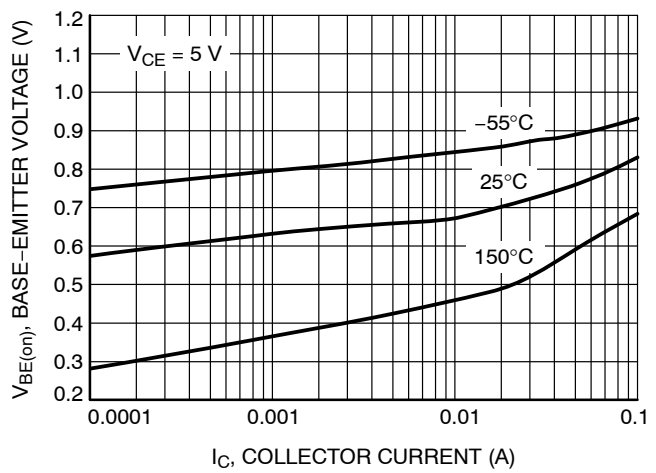


Figure 28. Base Emitter Voltage vs. Collector Current

BC846ALT1G Series, SBC846ALT1G Series

BC847C, BC848C, BC849C, BC850C, SBC847C

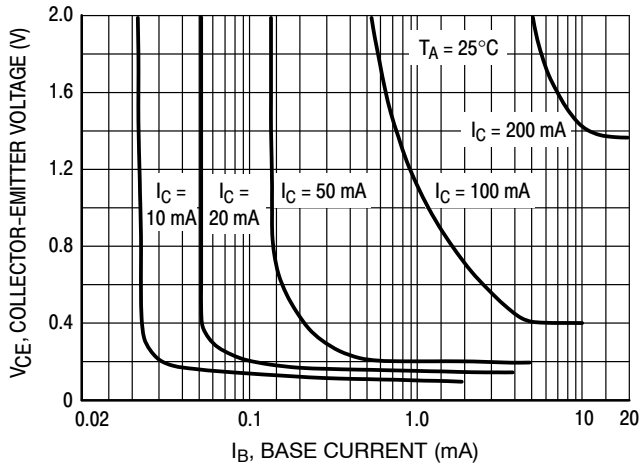


Figure 29. Collector Saturation Region

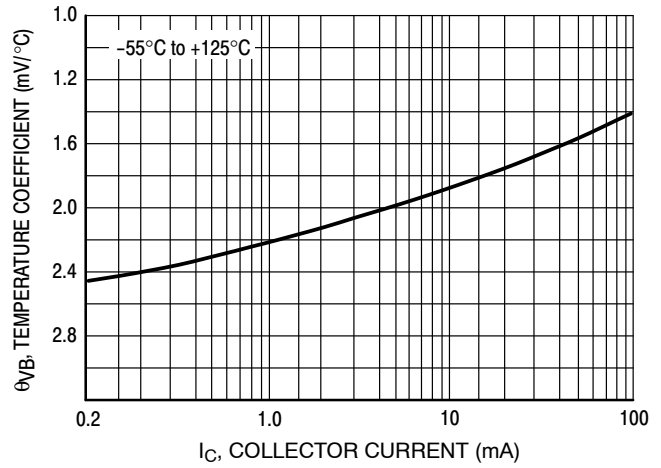


Figure 30. Base-Emitter Temperature Coefficient

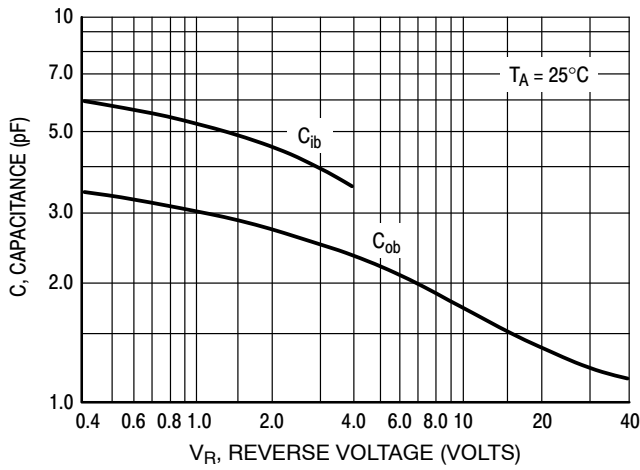


Figure 31. Capacitances

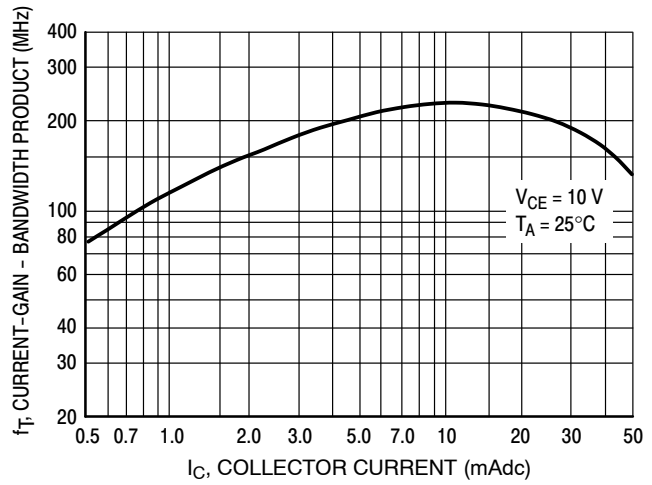
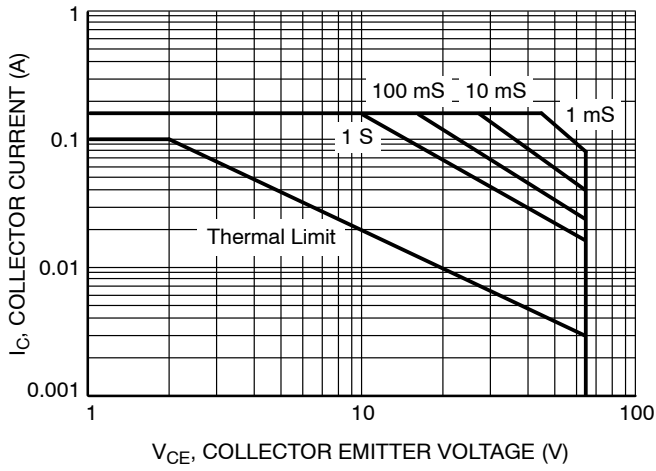
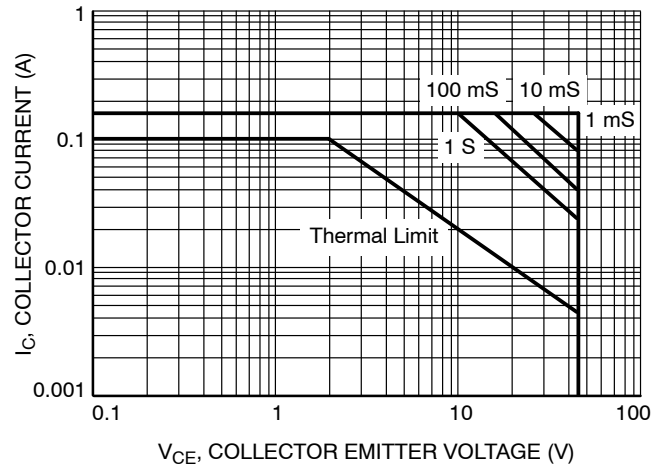


Figure 32. Current-Gain - Bandwidth Product

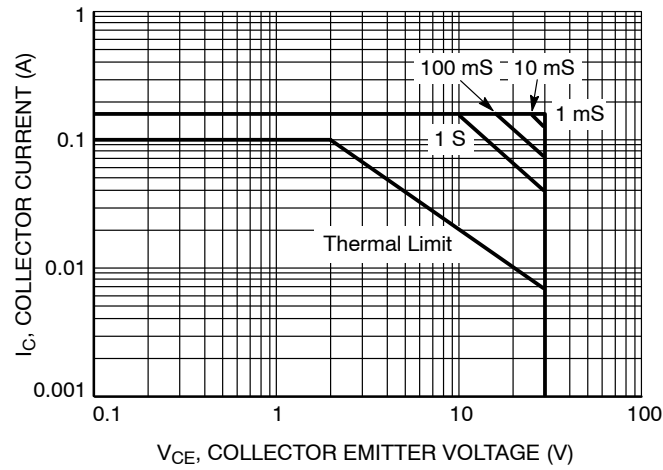
**BC846ALT1G Series, SBC846ALT1G Series**



**Figure 33. Safe Operating Area for BC846A, BC846B**



**Figure 34. Safe Operating Area for BC847A, BC847B, BC847C, BC850B, BC850C**



**Figure 35. Safe Operating Area for BC848A, BC848B, BC848C, BC849B, BC849C**

## BC846ALT1G Series, SBC846ALT1G Series

### ORDERING INFORMATION

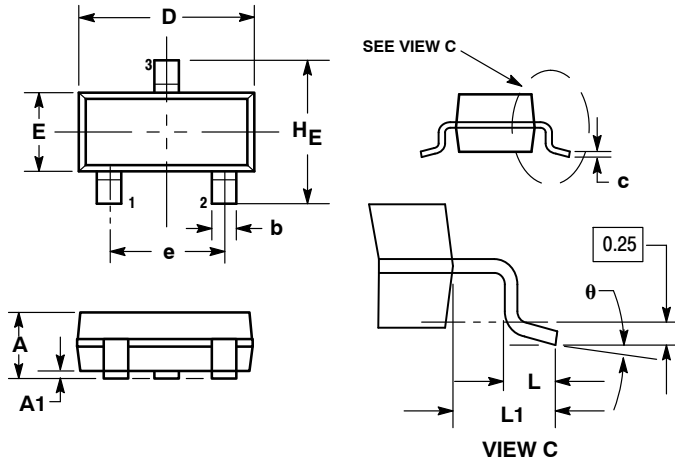
Device	Marking	Package	Shipping†
BC846ALT1G	1A	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SBC846ALT1G			
BC846ALT3G	1A	SOT-23 (Pb-Free)	10,000 / Tape & Reel
BC846BLT1G	1B	SOT-23 (Pb-Free)	3,000 / Tape & Reel
SBC846BLT1G			
BC846BLT3G	1B	SOT-23 (Pb-Free)	10,000 / Tape & Reel
SBC846BLT3G			
BC847ALT1G	1E	SOT-23 (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
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)	

†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.

# BC846ALT1G Series, SBC846ALT1G Series

## PACKAGE DIMENSIONS

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

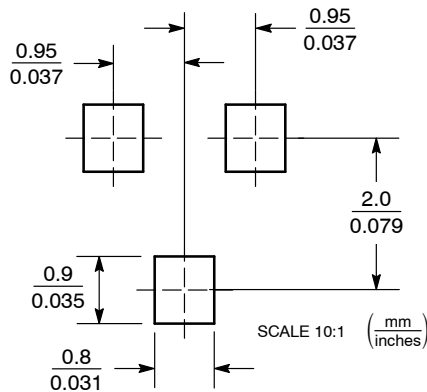


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

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:  
PIN 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.

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