

# BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series, NSVBC847BDW1T2G, BC848CDW1T1G



ON Semiconductor®

<http://onsemi.com>

## Dual General Purpose Transistors NPN Duals

These transistors are designed for general purpose amplifier applications. They are housed in the SOT-363/SC-88 which is designed for low power surface mount applications.

### Features

- S and NSV Prefixes 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	BC846	BC847	BC848	Unit
Collector-Emitter Voltage	$V_{CEO}$	65	45	30	V
Collector-Base Voltage	$V_{CBO}$	80	50	30	V
Emitter-Base Voltage	$V_{EBO}$	6.0	6.0	5.0	V
Collector Current - Continuous	$I_C$	100	100	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

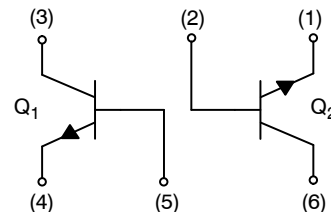
Characteristic	Symbol	Max	Unit
Total Device Dissipation Per Device FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	380 250 3.0	mW mW/ $^\circ\text{C}$ mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	328	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

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

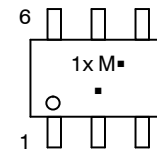
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



SOT-363  
CASE 419B  
STYLE 1



### MARKING DIAGRAM



1x = Specific Device Code  
x = B, F, G, L  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**

**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, SBC846 Series BC847, SBC847 Series, NSVBC847 BC848 Series	$V_{(BR)CEO}$	65 45 30	– – –	– – –	V
Collector – Emitter Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $V_{EB} = 0$ ) BC846, SBC846 Series BC847, SBC847 Series, NSVBC847 BC848 Series	$V_{(BR)CES}$	80 50 30	– – –	– – –	V
Collector – Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ ) BC846, SBC846 Series BC847, SBC847 Series, NSVBC847 BC848 Series	$V_{(BR)CBO}$	80 50 30	– – –	– – –	V
Emitter – Base Breakdown Voltage ( $I_E = 1.0\ \mu\text{A}$ ) BC846, SBC846 Series BC847, SBC847 Series, NSVBC847 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**

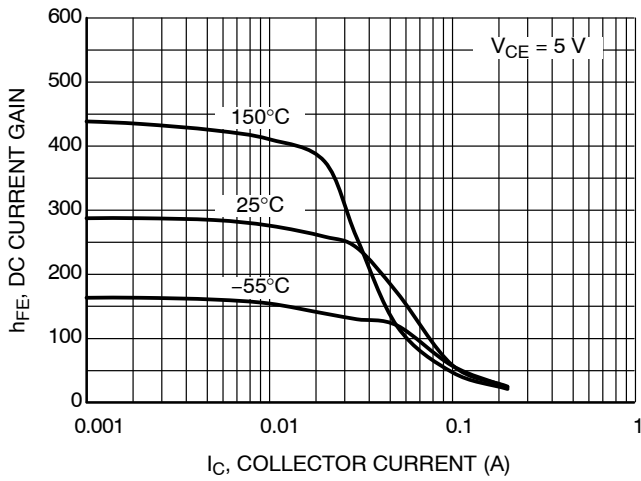
DC Current Gain ( $I_C = 10\ \mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ ) BC846B, SBC846B, BC847B, SBC847B, NSVBC847 BC847C, SBC847C, BC848C ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ ) BC846B, SBC846B, BC847B, SBC847B, NSVBC847 BC847C, SBC847C, BC848C	$h_{FE}$	– – 200 420	150 270 290 520	– – 450 800	–
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**

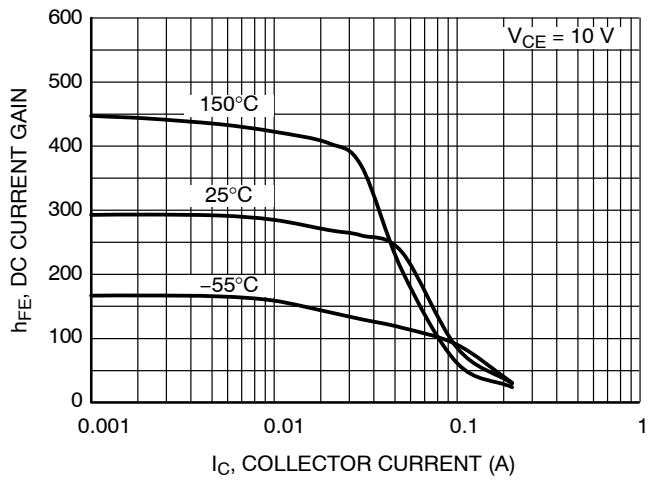
Current – Gain – Bandwidth Product ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	100	–	–	MHz
Output Capacitance ( $V_{CB} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	–	–	4.5	pF
Noise Figure ( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	–	–	10	dB

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
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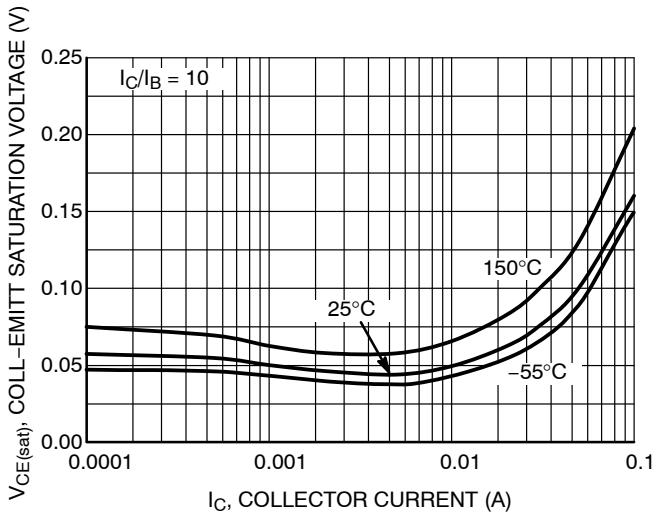
**TYPICAL CHARACTERISTICS – BC846BDW1T1G, SBC846BDW1T1G**



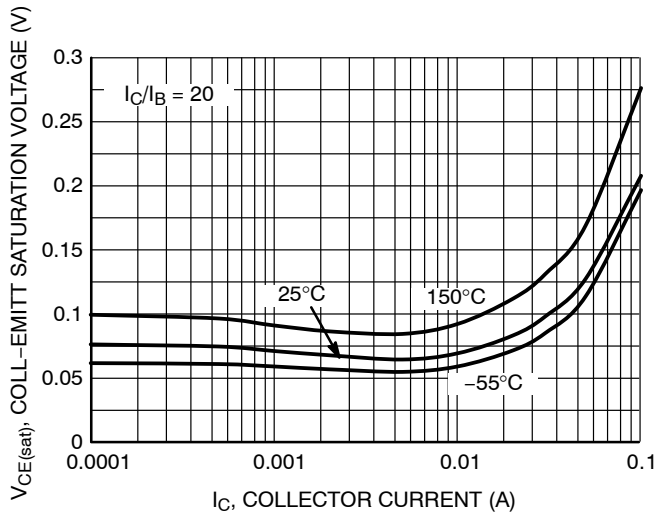
**Figure 1. DC Current Gain at  $V_{CE} = 5 V$**



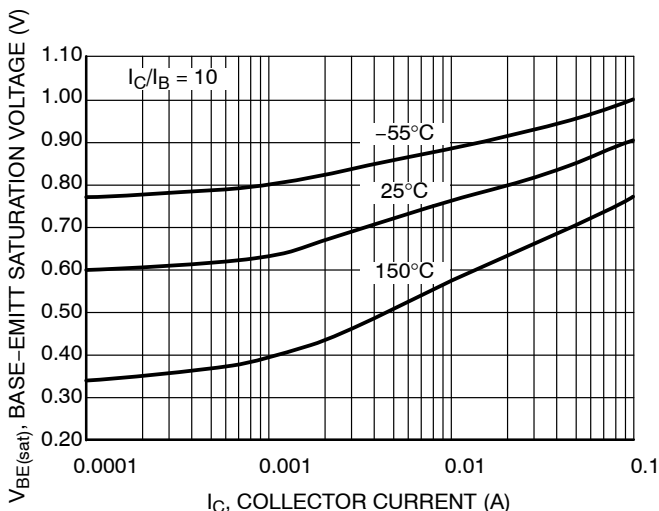
**Figure 2. DC Current Gain at  $V_{CE} = 10 V$**



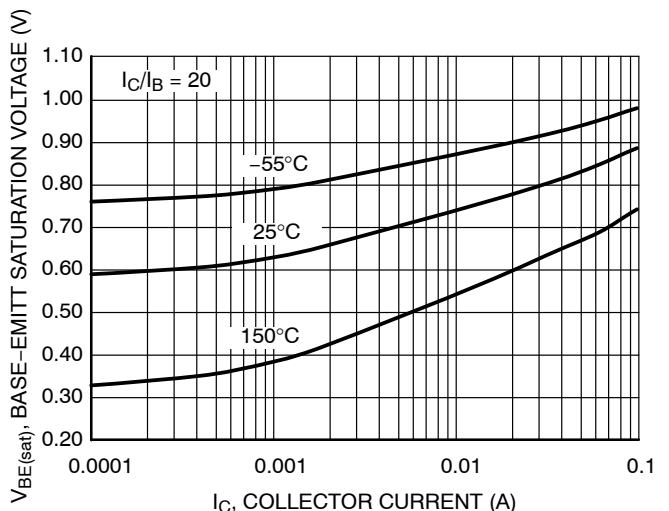
**Figure 3.  $V_{CE(sat)}$  at  $I_C/I_B = 10$**



**Figure 4.  $V_{CE(sat)}$  at  $I_C/I_B = 20$**



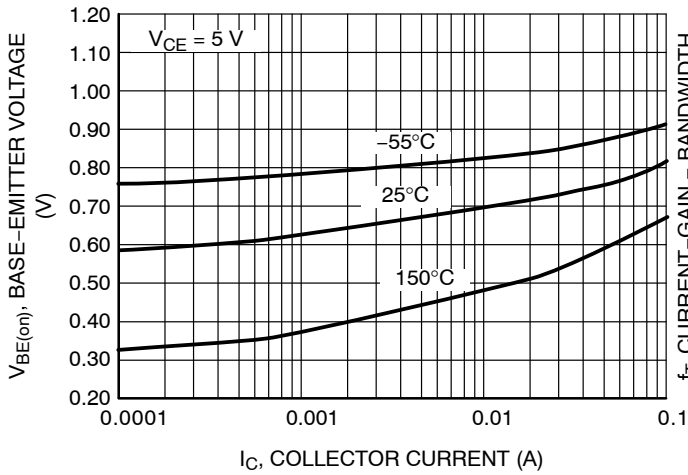
**Figure 5.  $V_{BE(sat)}$  at  $I_C/I_B = 10$**



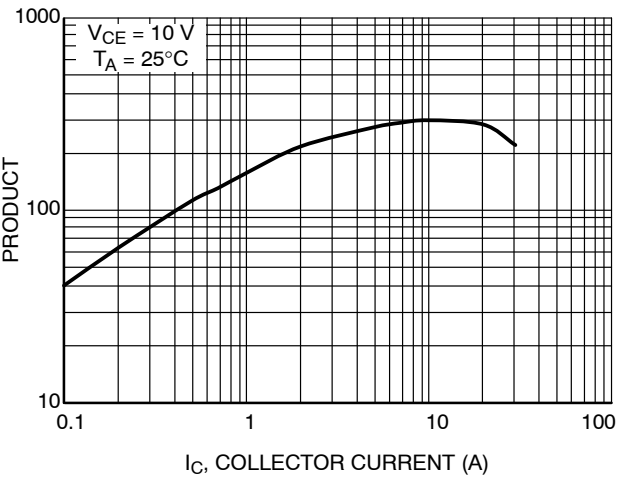
**Figure 6.  $V_{BE(sat)}$  at  $I_C/I_B = 20$**

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**

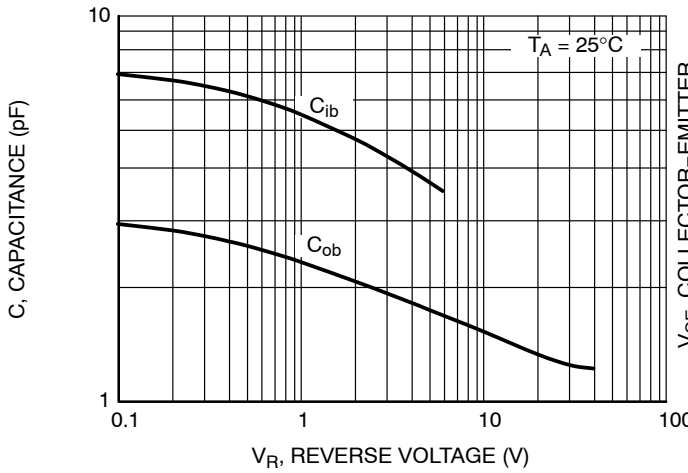
**TYPICAL CHARACTERISTICS – BC846BDW1T1G, SBC846BDW1T1G**



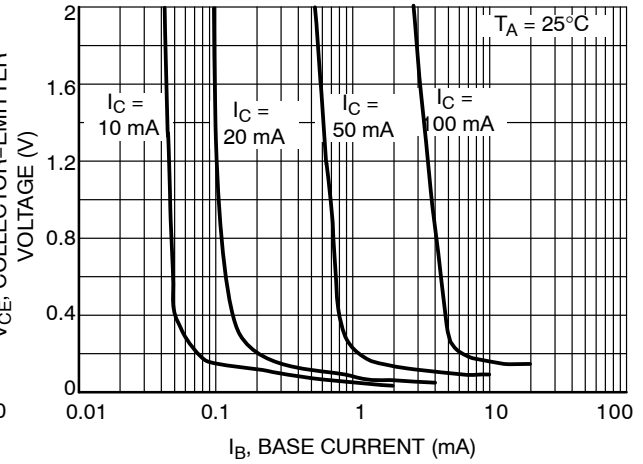
**Figure 7.  $V_{BE(on)}$  at  $V_{CE} = 5\text{ V}$**



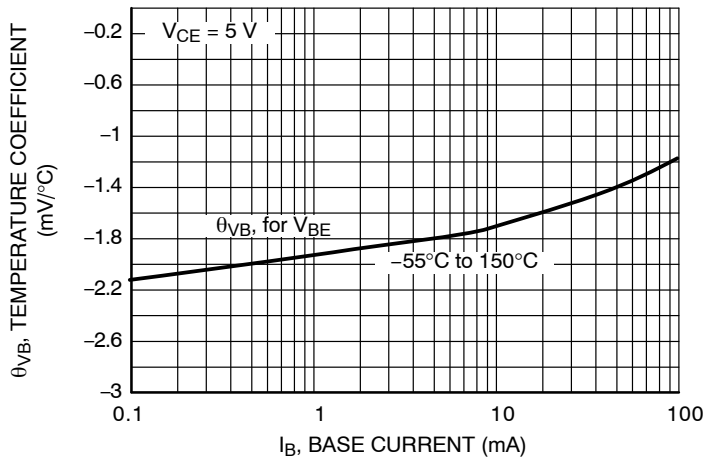
**Figure 8. Current – Gain – Bandwidth Product**



**Figure 9. Capacitances**



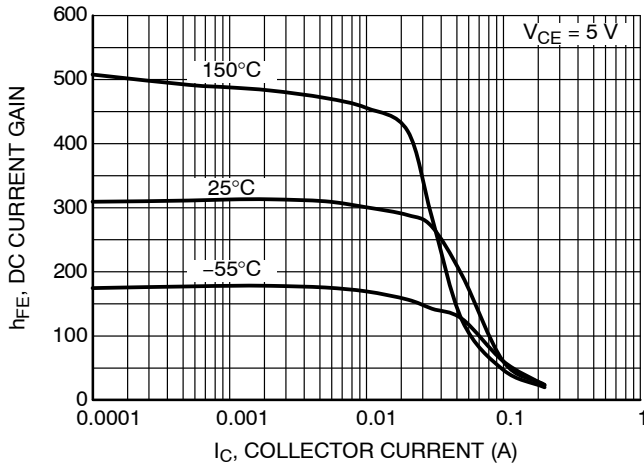
**Figure 10. Collector Saturation Region**



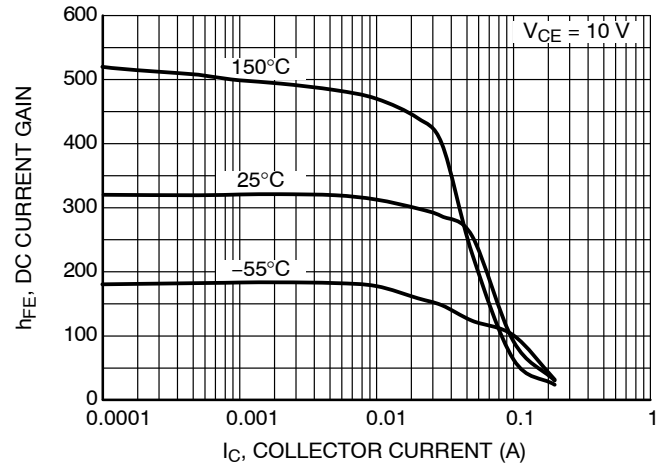
**Figure 11. Base-Emitter Temperature Coefficient**

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**

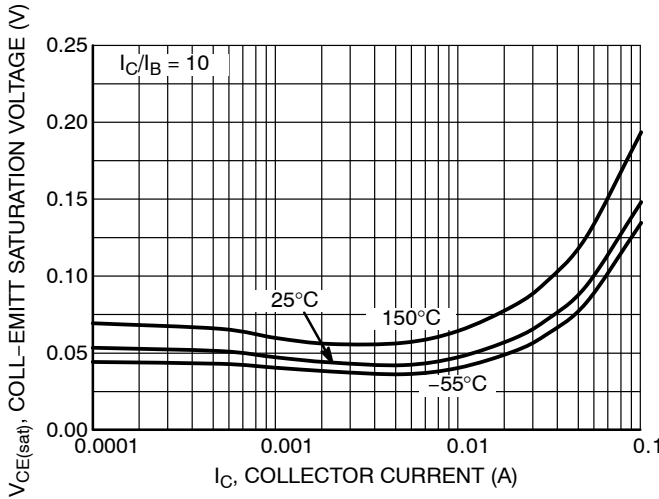
**TYPICAL CHARACTERISTICS – BC847BDW1T1G, SBC847BDW1T1G, NSVBC847BDW1T2G**



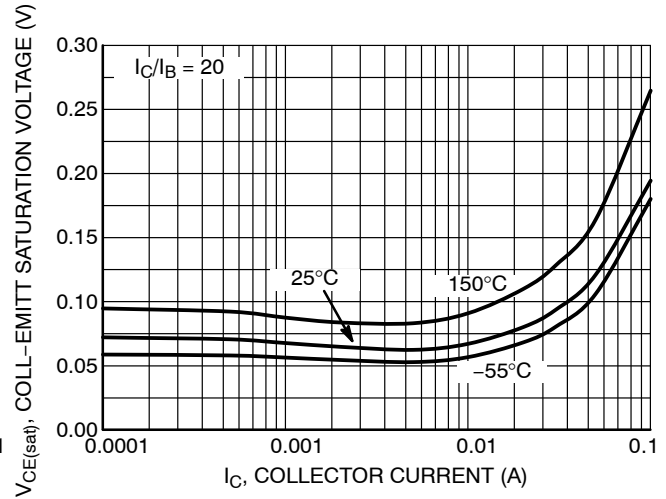
**Figure 12. DC Current Gain at  $V_{CE} = 5\text{ V}$**



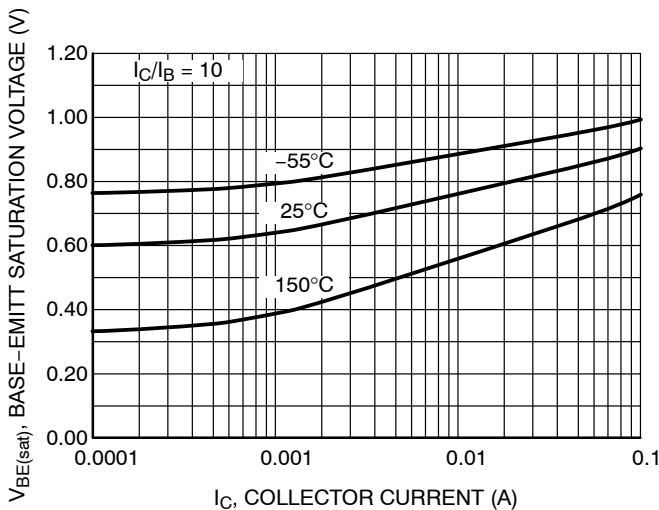
**Figure 13. DC Current Gain at  $V_{CE} = 10\text{ V}$**



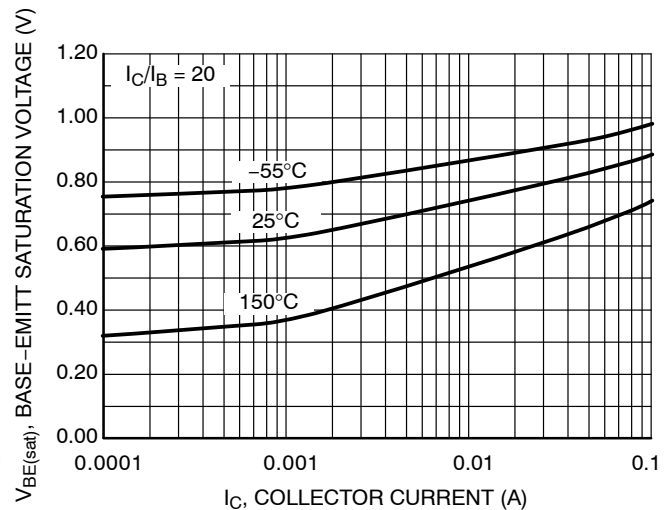
**Figure 14.  $V_{CE(sat)}$  at  $I_C/I_B = 10$**



**Figure 15.  $V_{CE(sat)}$  at  $I_C/I_B = 20$**



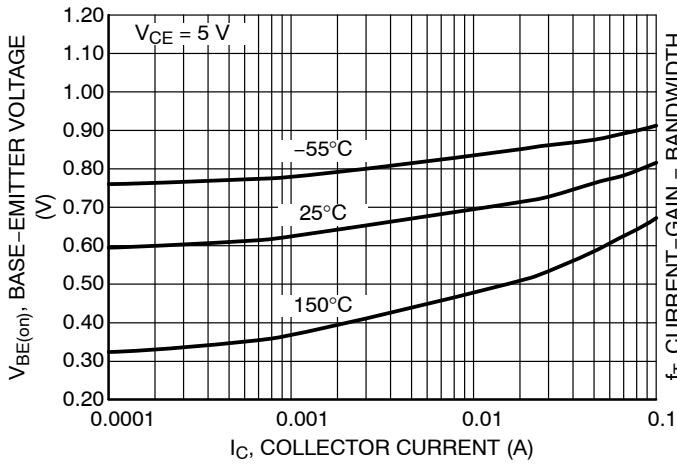
**Figure 16.  $V_{BE(sat)}$  at  $I_C/I_B = 10$**



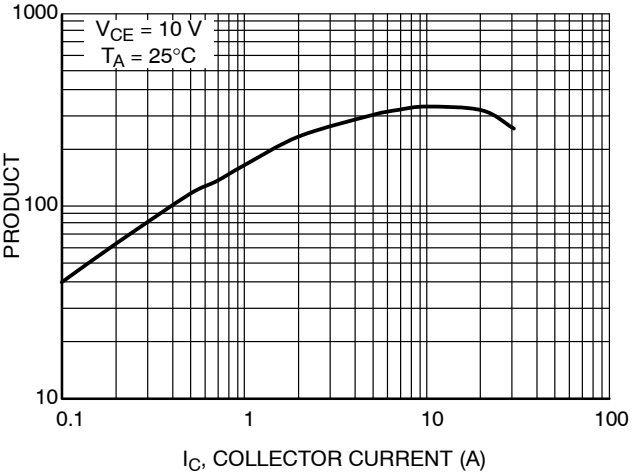
**Figure 17.  $V_{BE(sat)}$  at  $I_C/I_B = 20$**

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**

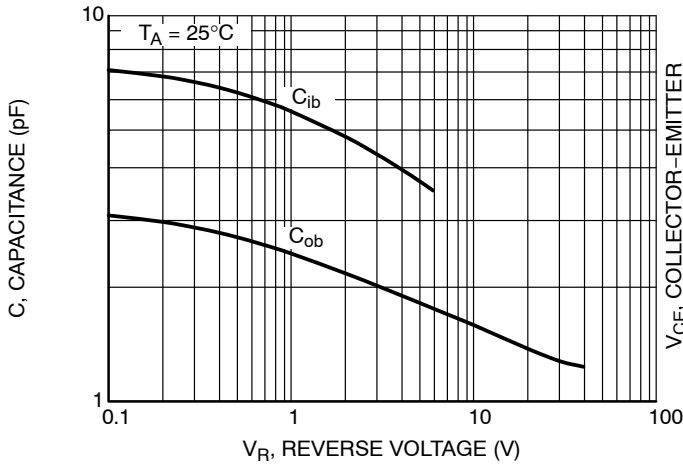
**TYPICAL CHARACTERISTICS – BC847BDW1T1G, SBC847BDW1T1G, NSVBC847BDW1T2G**



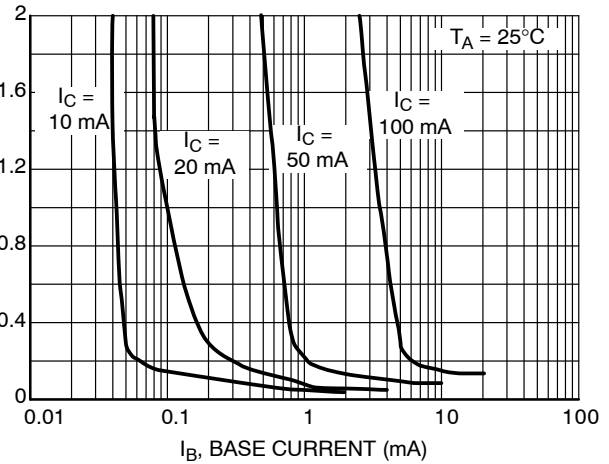
**Figure 18.  $V_{BE(on)}$  at  $V_{CE} = 5\text{ V}$**



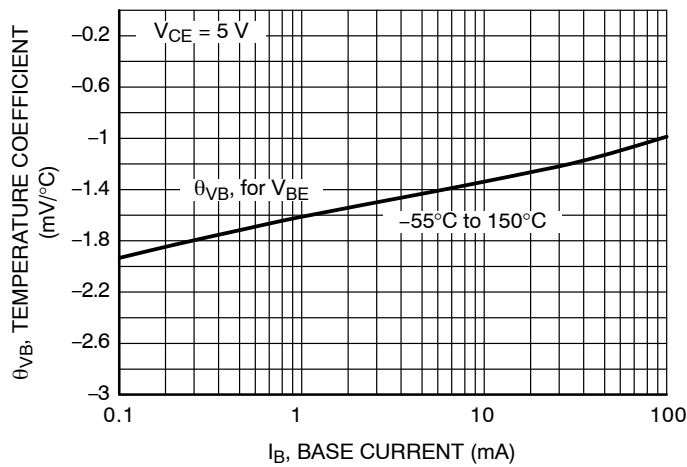
**Figure 19. Current - Gain - Bandwidth Product**



**Figure 20. Capacitances**



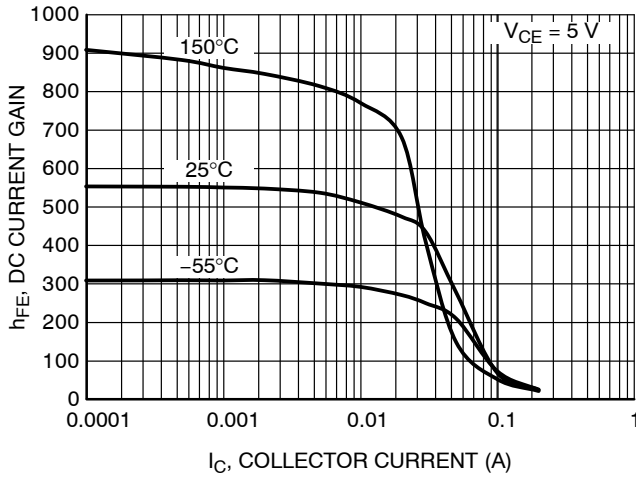
**Figure 21. Collector Saturation Region**



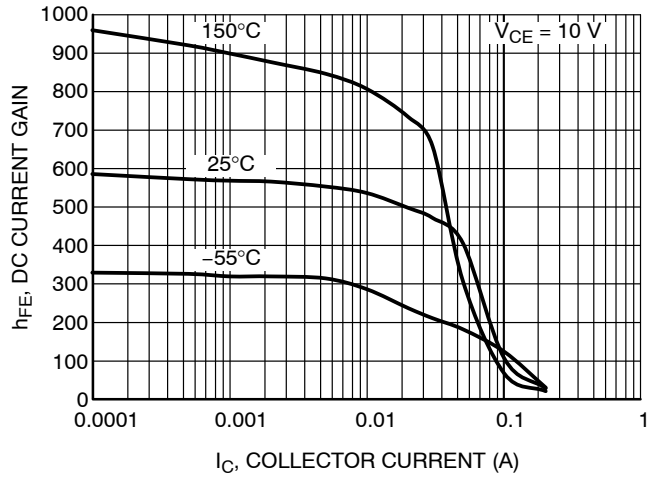
**Figure 22. Base-Emitter Temperature Coefficient**

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**

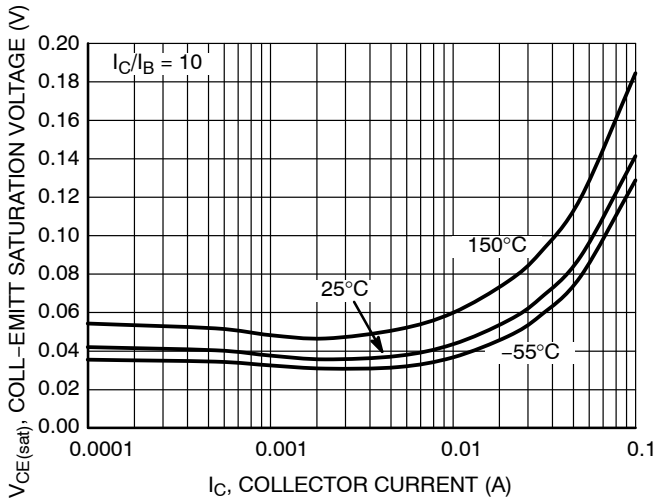
**TYPICAL CHARACTERISTICS – BC848CDW1T1G, SBC848CDW1T1G**



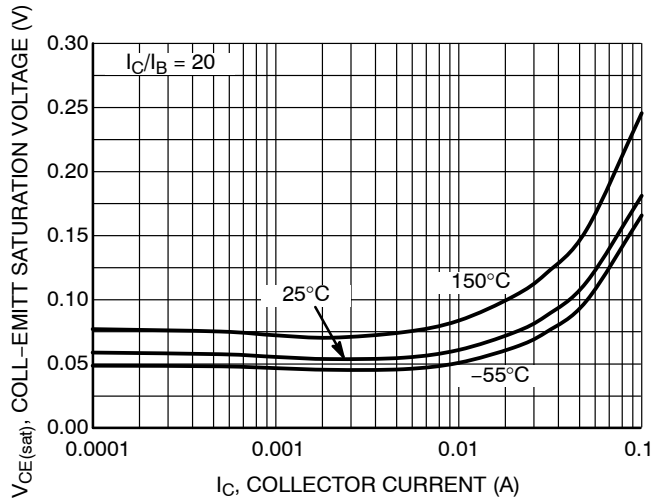
**Figure 23. DC Current Gain at  $V_{CE} = 5\text{ V}$**



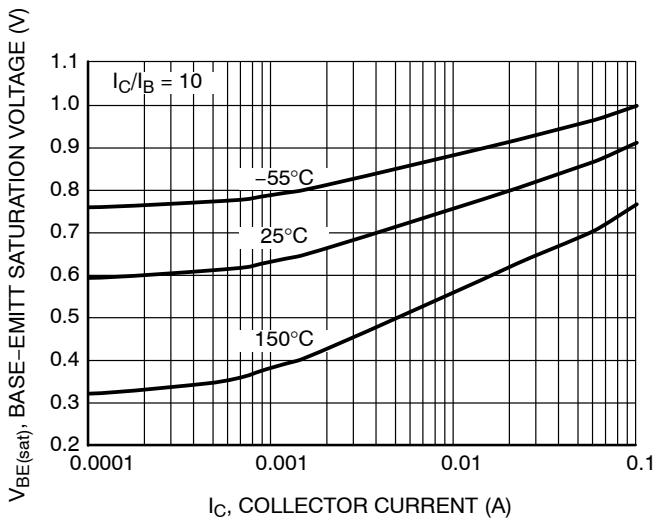
**Figure 24. DC Current Gain at  $V_{CE} = 10\text{ V}$**



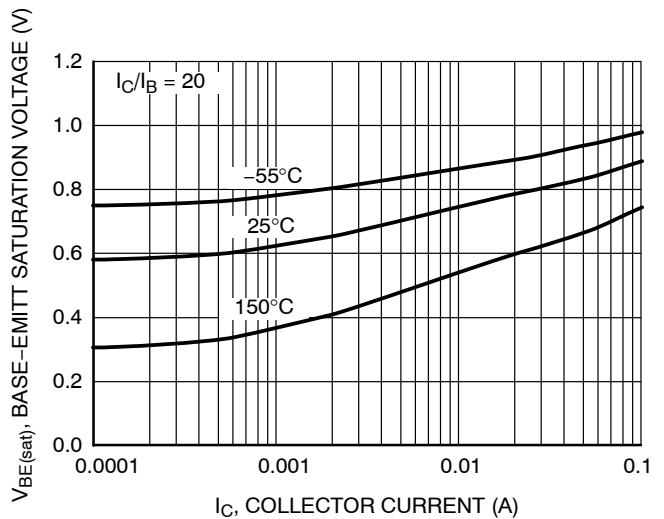
**Figure 25.  $V_{CE(sat)}$  at  $I_C/I_B = 10$**



**Figure 26.  $V_{CE(sat)}$  at  $I_C/I_B = 20$**



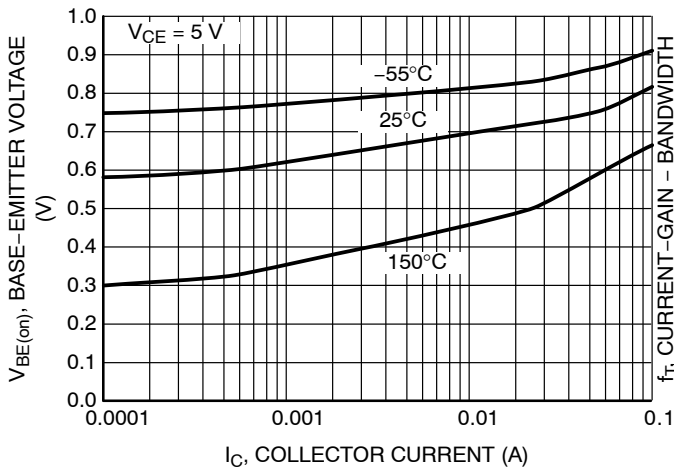
**Figure 27.  $V_{BE(sat)}$  at  $I_C/I_B = 10$**



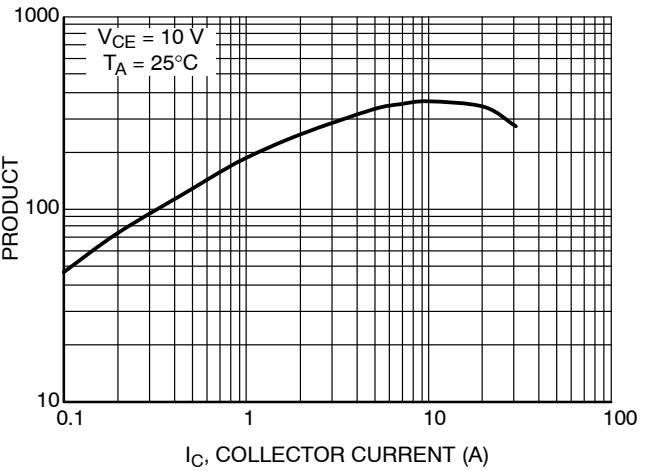
**Figure 28.  $V_{BE(sat)}$  at  $I_C/I_B = 20$**

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**

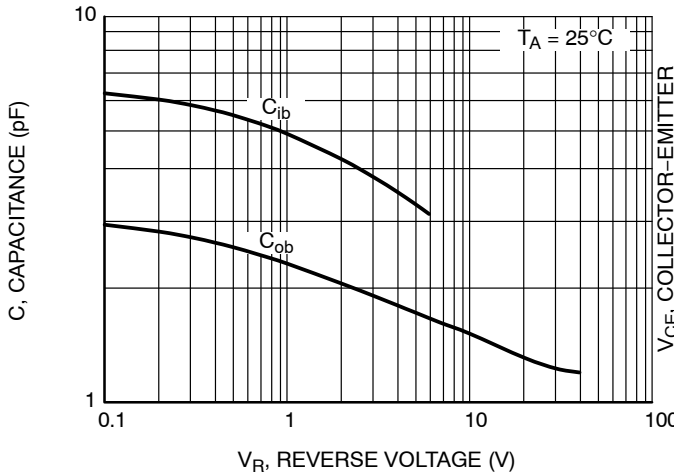
**TYPICAL CHARACTERISTICS – BC848CDW1T1G, SBC848CDW1T1G**



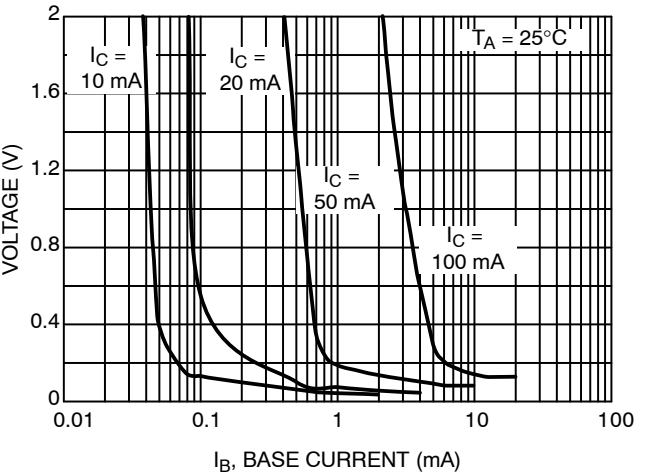
**Figure 29.  $V_{BE(on)}$  at  $V_{CE} = 5\text{ V}$**



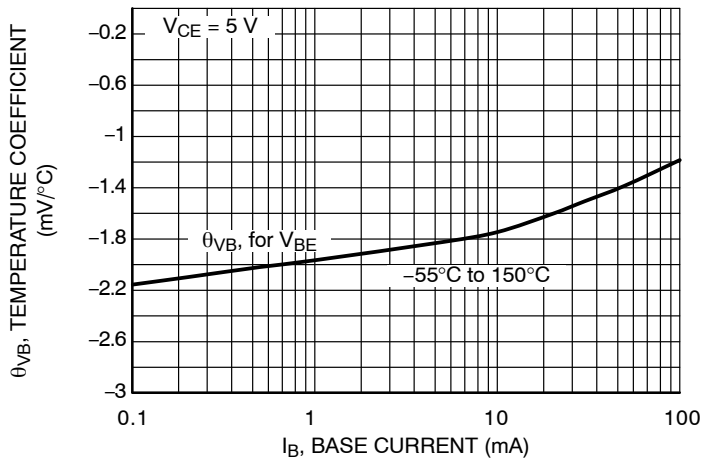
**Figure 30. Current - Gain - Bandwidth Product**



**Figure 31. Capacitances**



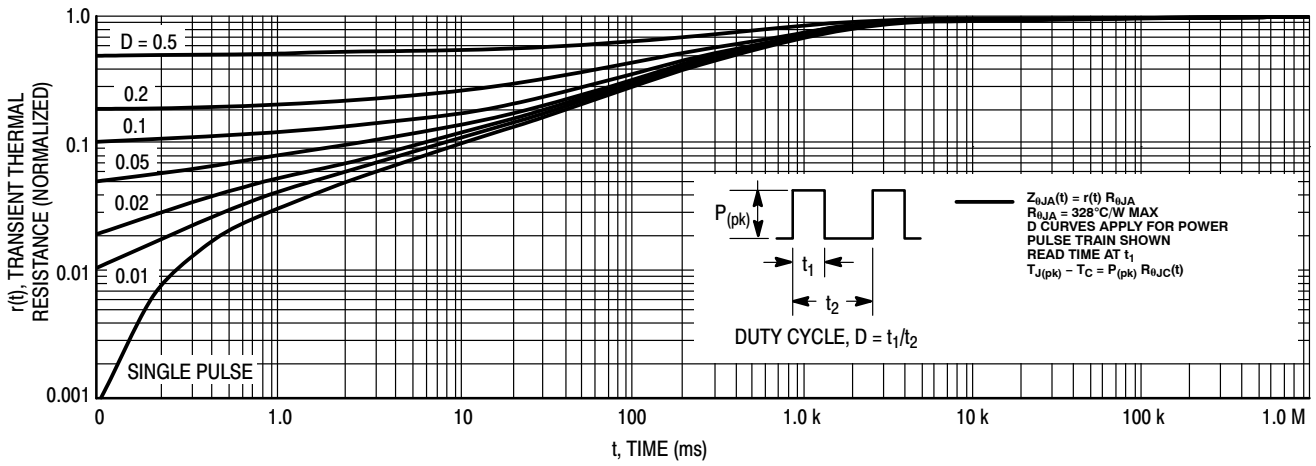
**Figure 32. Collector Saturation Region**



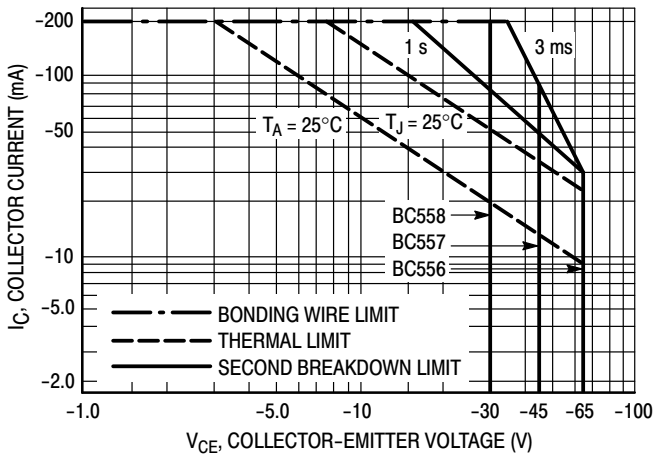
**Figure 33. Base-Emitter Temperature Coefficient**



**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**



**Figure 34. Thermal Response**



**Figure 35. Active Region Safe Operating Area**

The safe operating area curves indicate  $I_C$ - $V_{CE}$  limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 35 is based upon  $T_{J(pk)} = 150^\circ\text{C}$ ;  $T_C$  or  $T_A$  is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^\circ\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 34. At high case or ambient temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by the secondary breakdown.

**BC846BDW1T1G, SBC846BDW1T1G, BC847BDW1T1G, SBC847BDW1T1G Series,  
NSVBC847BDW1T2G, BC848CDW1T1G**

**ORDERING INFORMATION**

<b>Device</b>	<b>Markings</b>	<b>Package</b>	<b>Shipping<sup>†</sup></b>
BC846BDW1T1G	1B	SOT-363 (Pb-Free)	3,000 / Tape & Reel
SBC846BDW1T1G*	1B	SOT-363 (Pb-Free)	3,000 / Tape & Reel
BC847BDW1T1G	1F	SOT-363 (Pb-Free)	3,000 / Tape & Reel
SBC847BDW1T1G*	1F	SOT-363 (Pb-Free)	3,000 / Tape & Reel
BC847BDW1T3G	1F	SOT-363 (Pb-Free)	10,000 / Tape & Reel
SBC847BDW1T3G*	1F	SOT-363 (Pb-Free)	10,000 / Tape & Reel
NSVBC847BDW1T2G*	1F	SOT-363 (Pb-Free)	10,000 / Tape & Reel
BC847CDW1T1G	1G	SOT-363 (Pb-Free)	3,000 / Tape & Reel
SBC847CDW1T1G*	1G	SOT-363 (Pb-Free)	3,000 / Tape & Reel
BC848CDW1T1G	1L	SOT-363 (Pb-Free)	3,000 / Tape & Reel

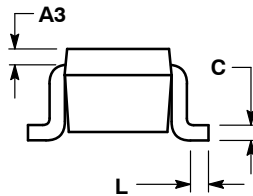
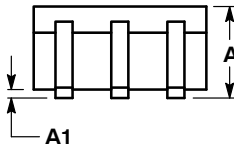
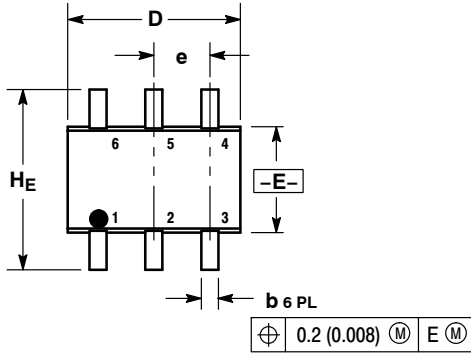
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

\*S and NSV Prefixes for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

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## PACKAGE DIMENSIONS

SC-88 (SC70-6/SOT-363)  
CASE 419B-02  
ISSUE W



NOTES:

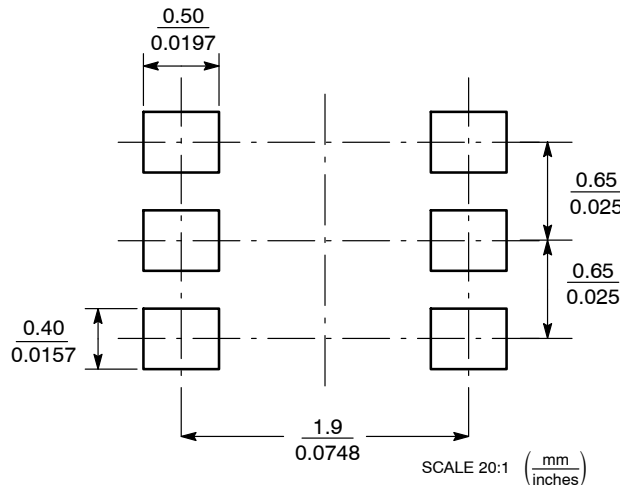
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.95	1.10	0.031	0.037	0.043
A1	0.00	0.05	0.10	0.000	0.002	0.004
A3	0.20 REF			0.008 REF		
b	0.10	0.21	0.30	0.004	0.008	0.012
C	0.10	0.14	0.25	0.004	0.005	0.010
D	1.80	2.00	2.20	0.070	0.078	0.086
E	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.10	0.20	0.30	0.004	0.008	0.012
HE	2.00	2.10	2.20	0.078	0.082	0.086

STYLE 1:

- PIN 1: EMITTER 2  
2. BASE 2  
3. COLLECTOR 1  
4. EMITTER 1  
5. BASE 1  
6. COLLECTOR 2

### 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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