

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

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°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.

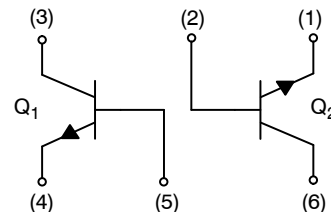


ON Semiconductor®

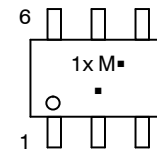
<http://onsemi.com>



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

ON CHARACTERISTICS

DC Current Gain ($I_C = 10\text{ }\mu\text{A}$, $V_{CE} = 5.0\text{ V}$) 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,
NSVBC847BDW1T2G, BC848CDW1T1G**

TYPICAL CHARACTERISTICS – BC846BDW1T1G, SBC846BDW1T1G

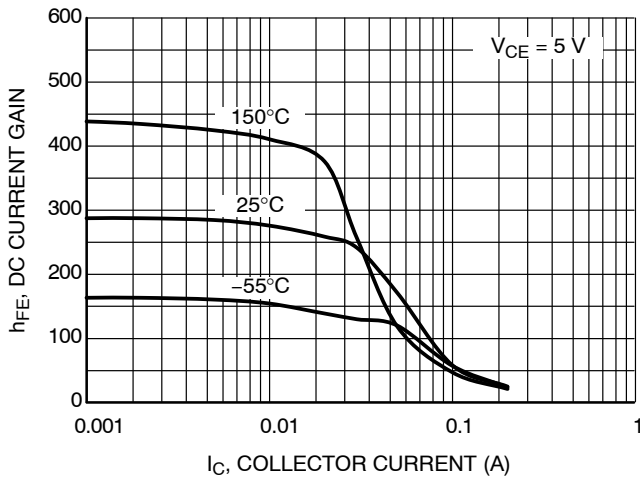


Figure 1. DC Current Gain at $V_{CE} = 5\text{ V}$

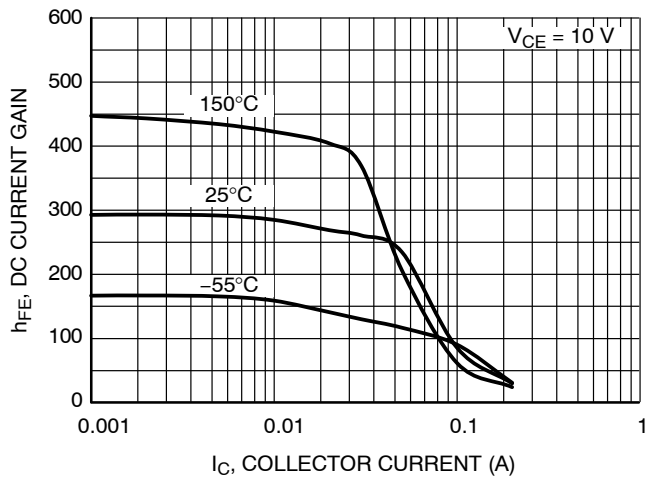


Figure 2. DC Current Gain at $V_{CE} = 10\text{ V}$

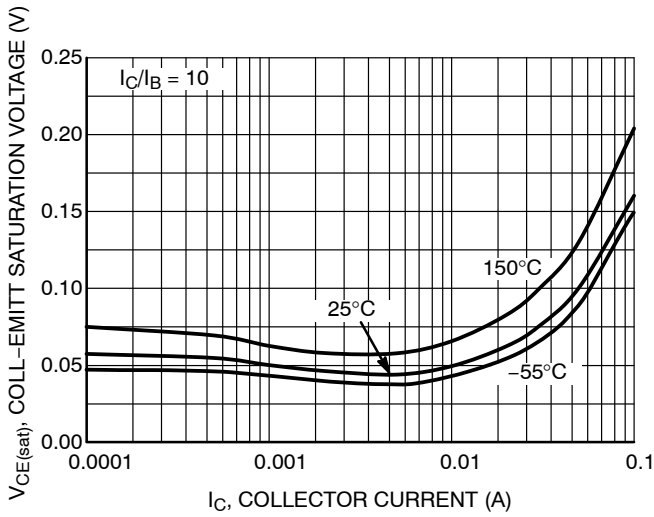


Figure 3. $V_{CE(sat)}$ at $I_C/I_B = 10$

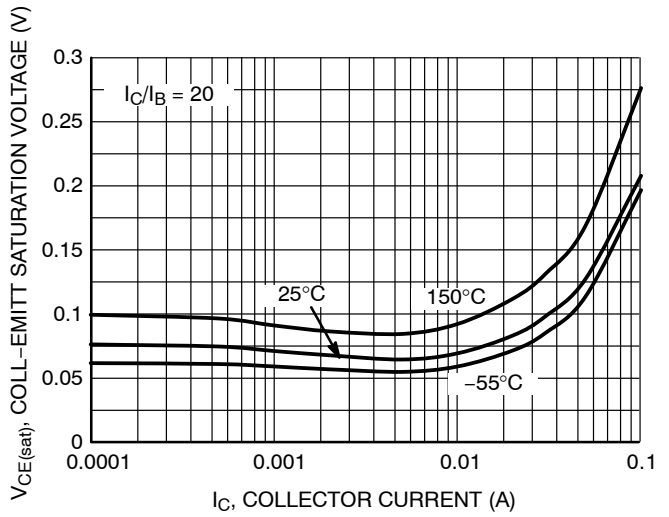


Figure 4. $V_{CE(sat)}$ at $I_C/I_B = 20$

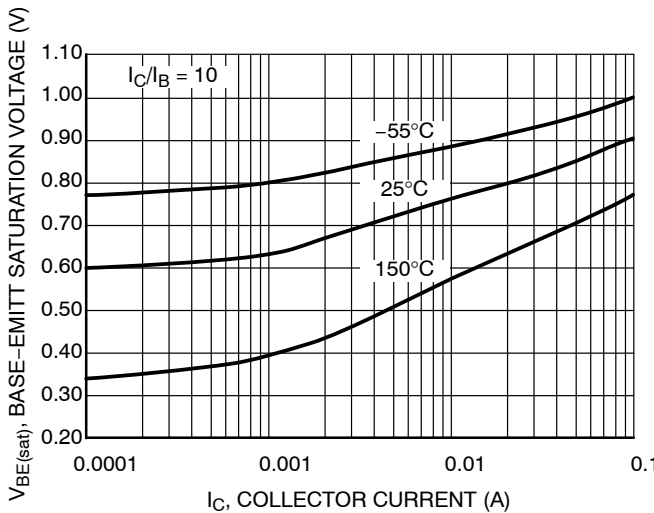


Figure 5. $V_{BE(sat)}$ at $I_C/I_B = 10$

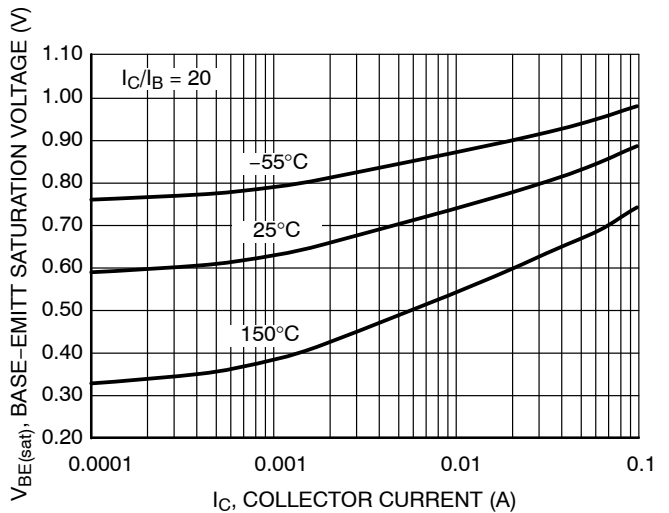


Figure 6. $V_{BE(sat)}$ at $I_C/I_B = 20$

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

TYPICAL CHARACTERISTICS – BC846BDW1T1G, SBC846BDW1T1G

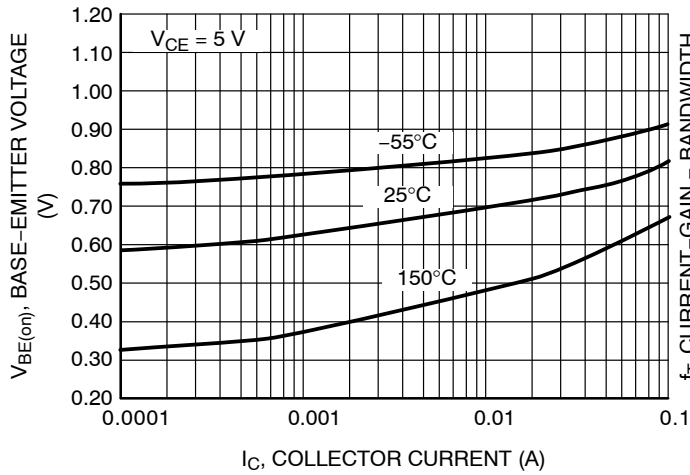


Figure 7. $V_{BE(on)}$ at $V_{CE} = 5\text{ V}$

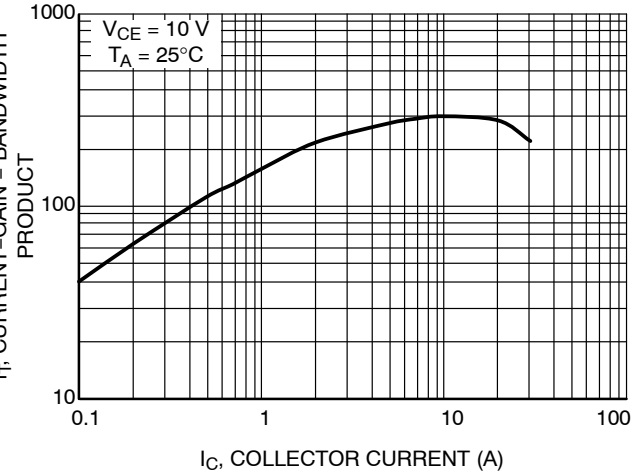


Figure 8. Current - Gain - Bandwidth Product

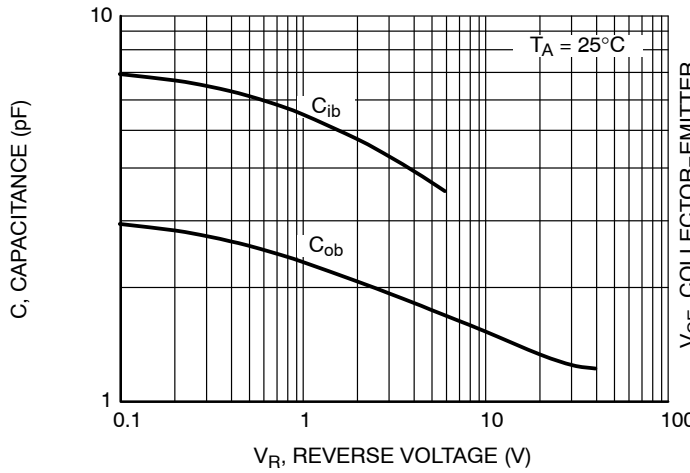


Figure 9. Capacitances

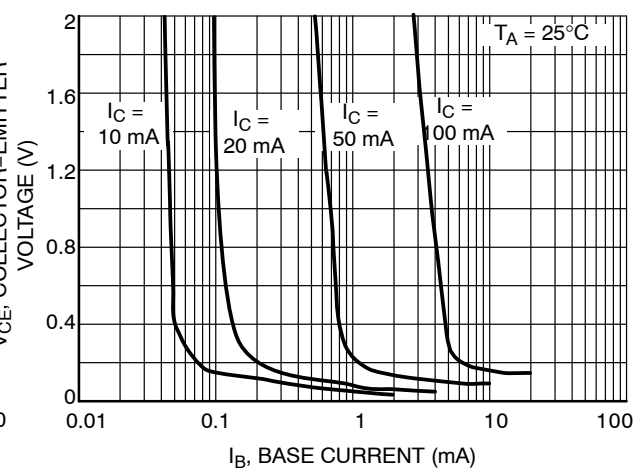


Figure 10. Collector Saturation Region

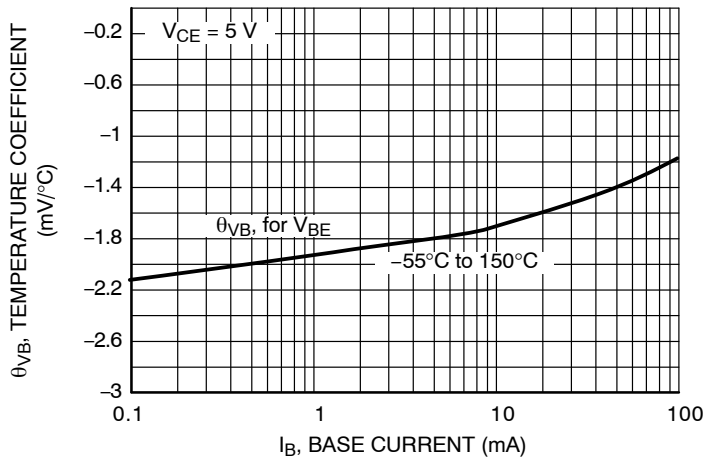


Figure 11. Base-Emitter Temperature Coefficient

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

TYPICAL CHARACTERISTICS – BC847BDW1T1G, SBC847BDW1T1G, NSVBC847BDW1T2G

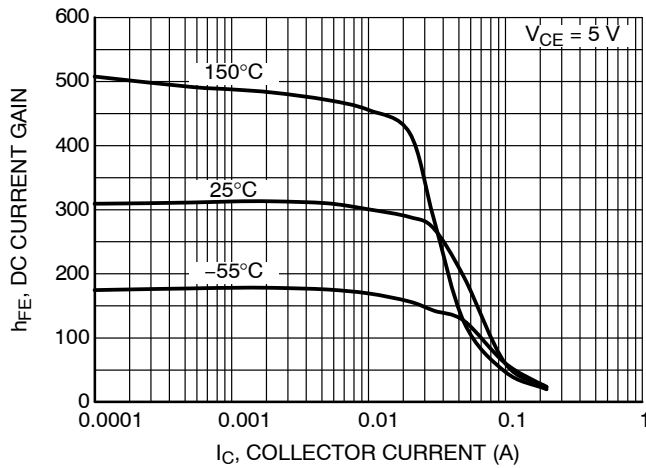


Figure 12. DC Current Gain at $V_{CE} = 5\text{ V}$

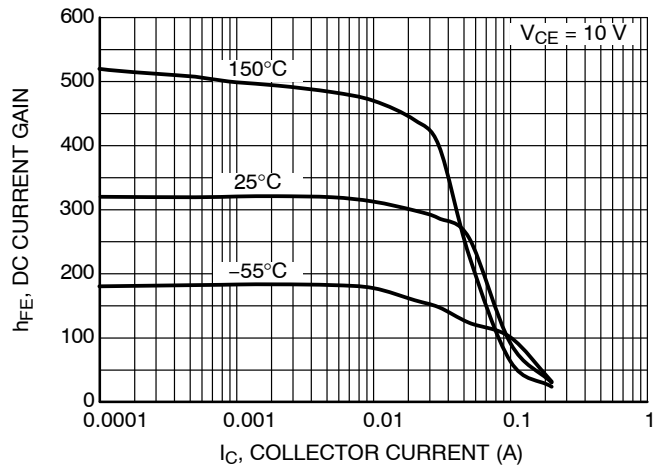


Figure 13. DC Current Gain at $V_{CE} = 10\text{ V}$

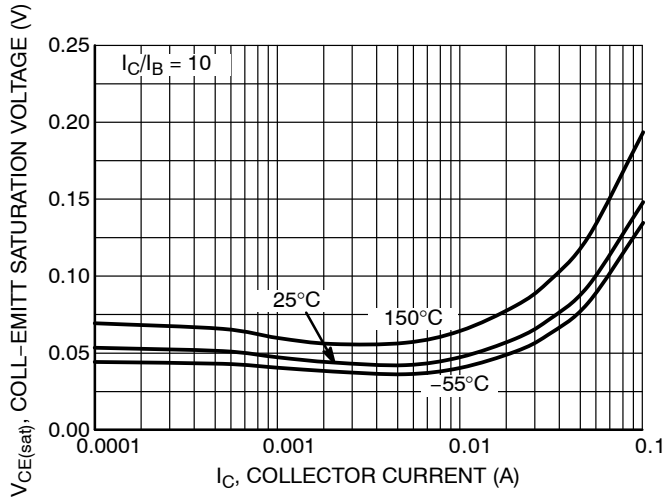


Figure 14. V_{CE} at $I_C/I_B = 10$

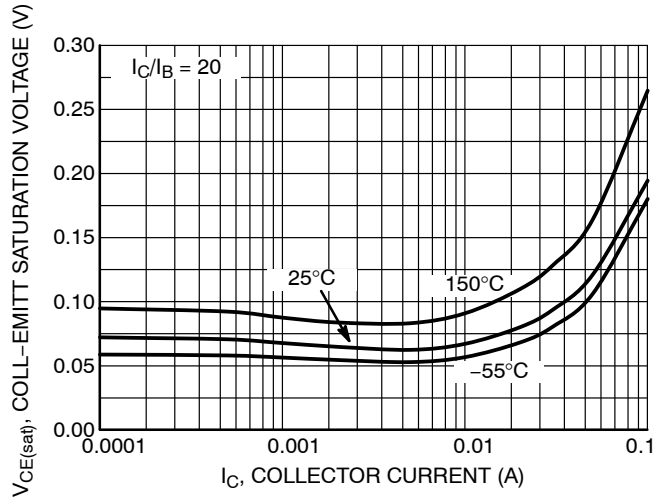


Figure 15. V_{CE} at $I_C/I_B = 20$

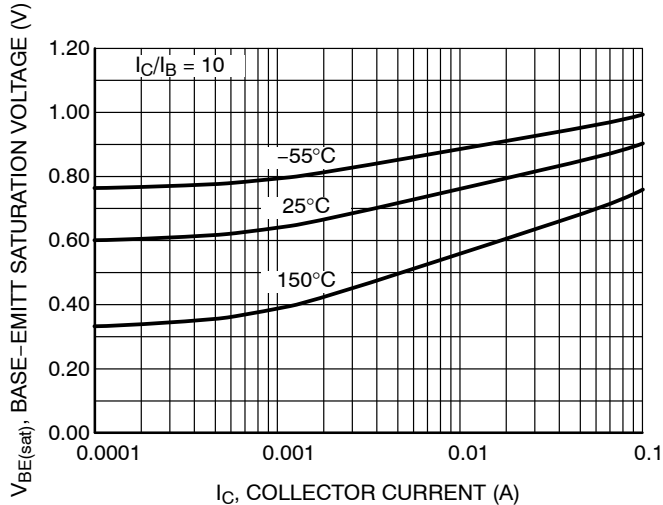


Figure 16. $V_{BE(sat)}$ at $I_C/I_B = 10$

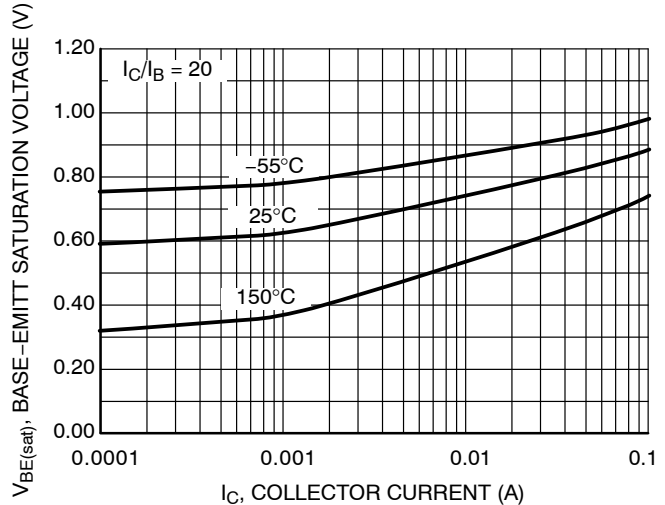


Figure 17. $V_{BE(sat)}$ at $I_C/I_B = 20$

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

TYPICAL CHARACTERISTICS – BC847BDW1T1G, SBC847BDW1T1G, NSVBC847BDW1T2G

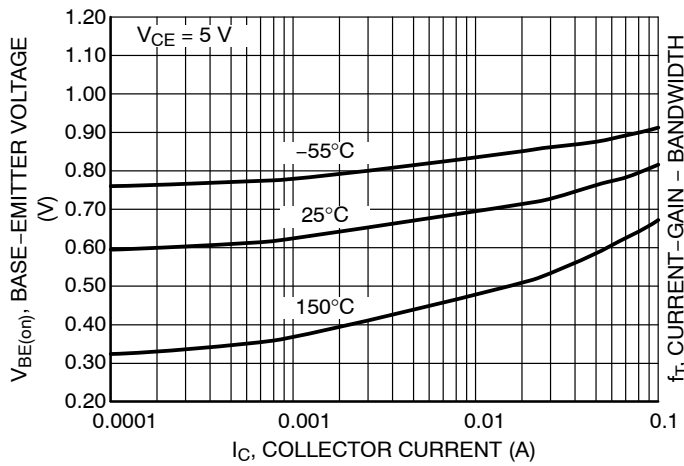


Figure 18. $V_{BE(on)}$ at $V_{CE} = 5\text{ V}$

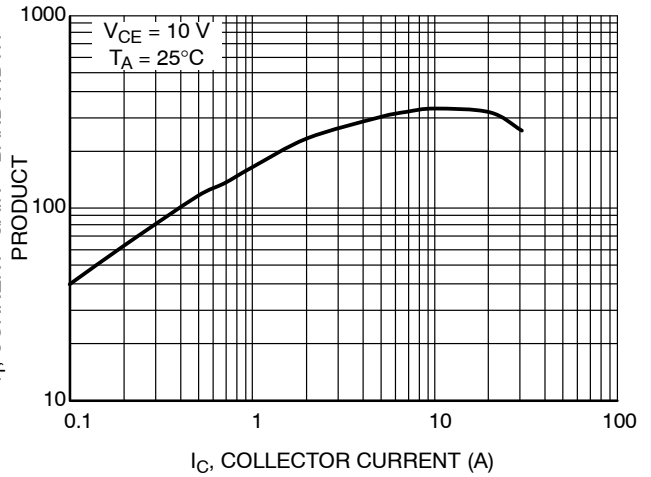


Figure 19. Current - Gain - Bandwidth Product

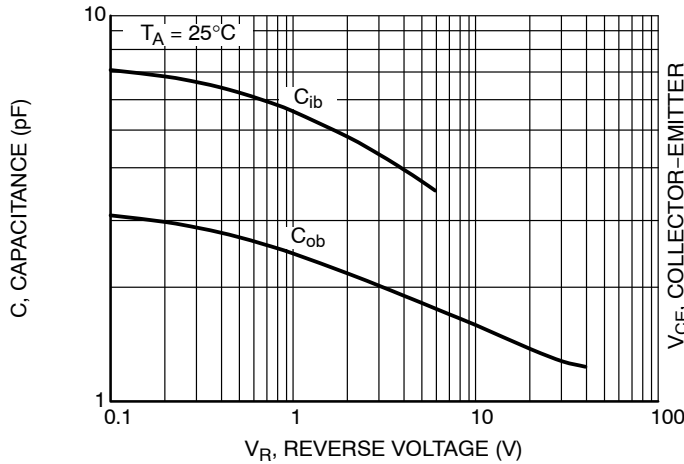


Figure 20. Capacitances

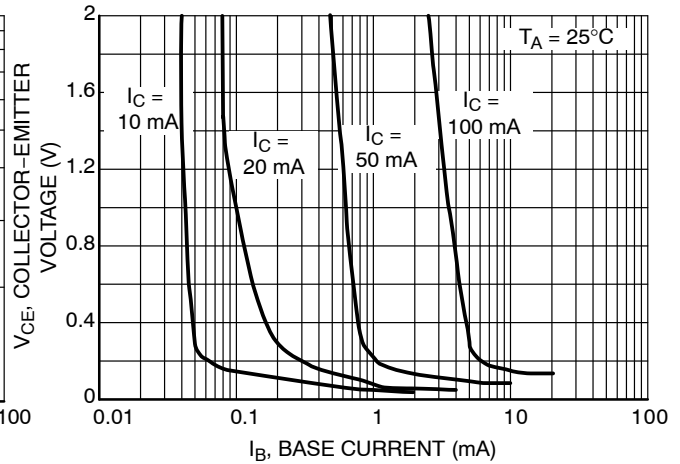


Figure 21. Collector Saturation Region

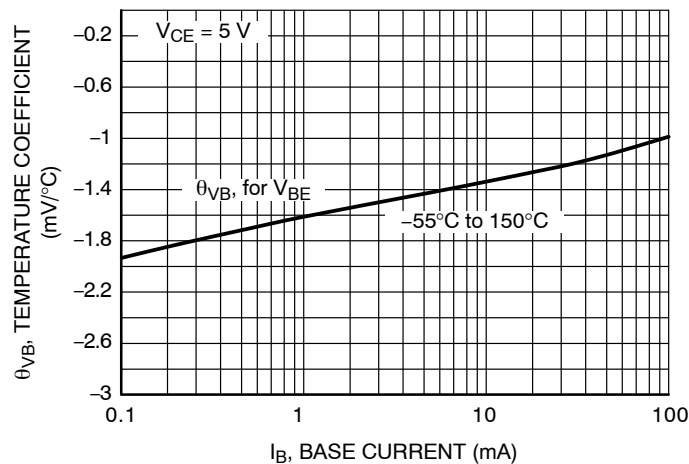


Figure 22. Base-Emitter Temperature Coefficient

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

TYPICAL CHARACTERISTICS – BC848CDW1T1G, SBC848CDW1T1G

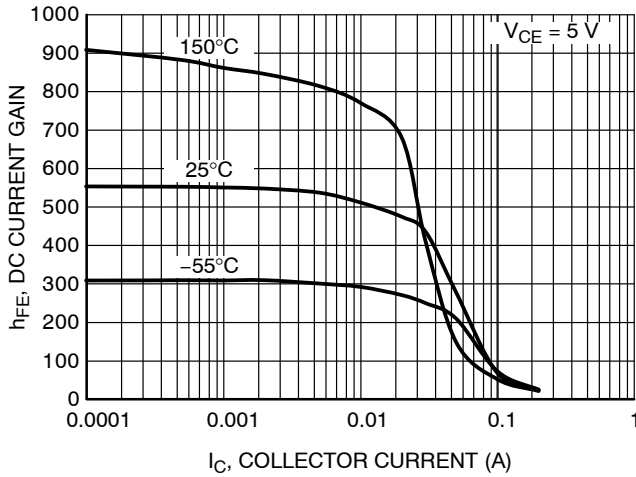


Figure 23. DC Current Gain at $V_{CE} = 5\text{ V}$

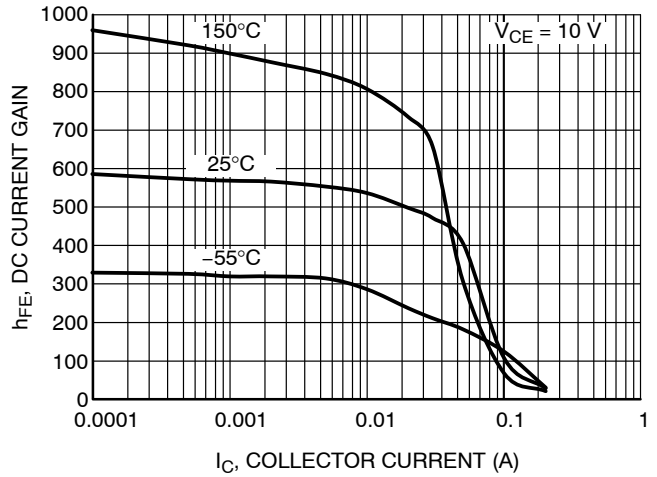


Figure 24. DC Current Gain at $V_{CE} = 10\text{ V}$

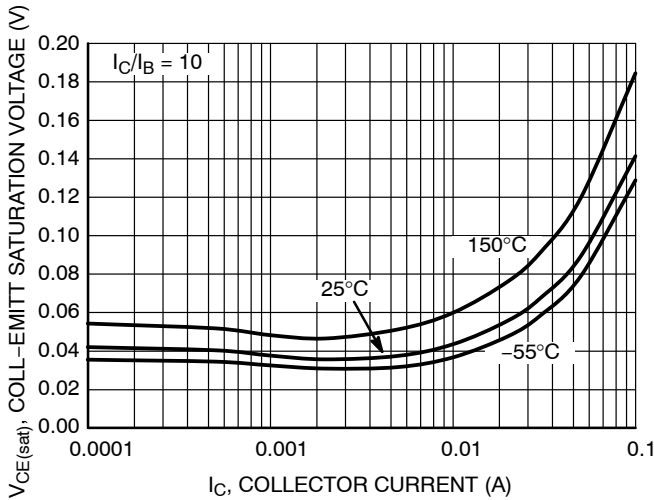


Figure 25. V_{CE} at $I_C/I_B = 10$

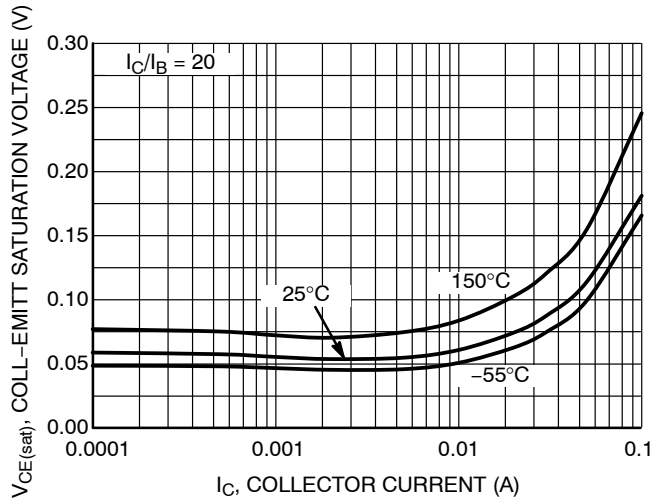


Figure 26. V_{CE} at $I_C/I_B = 20$

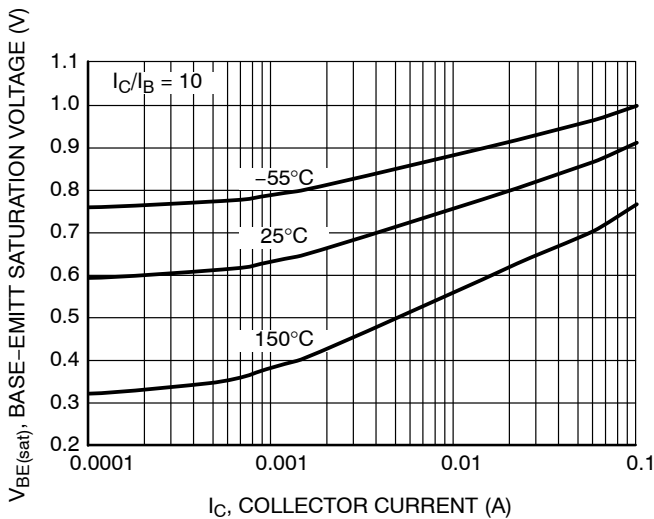


Figure 27. $V_{BE(sat)}$ at $I_C/I_B = 10$

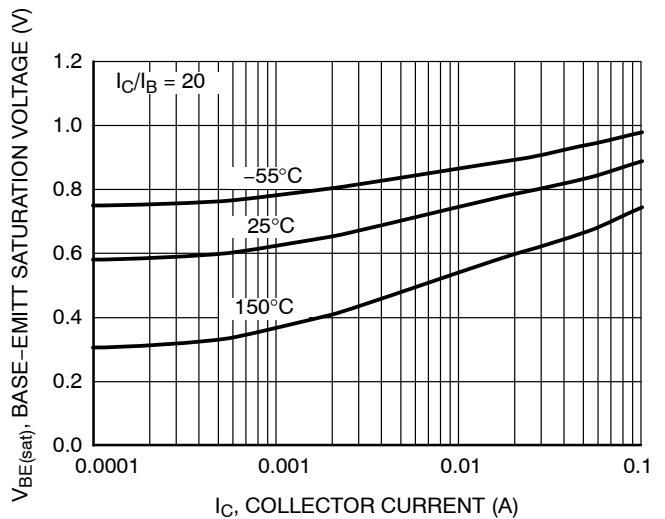


Figure 28. $V_{BE(sat)}$ at $I_C/I_B = 20$

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

TYPICAL CHARACTERISTICS – BC848CDW1T1G, SBC848CDW1T1G

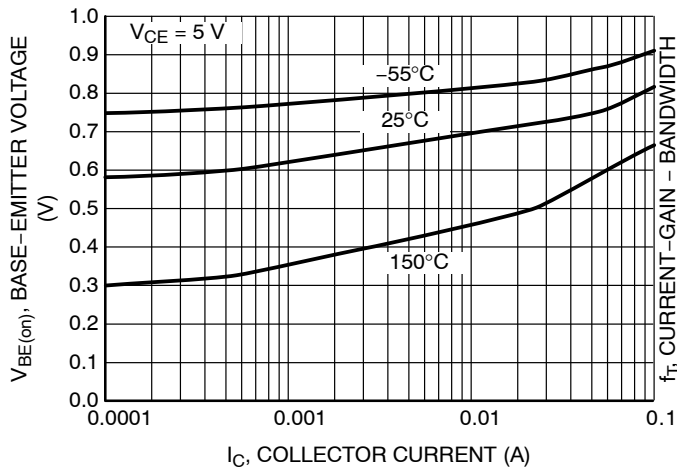


Figure 29. $V_{BE(on)}$ at $V_{CE} = 5\text{ V}$

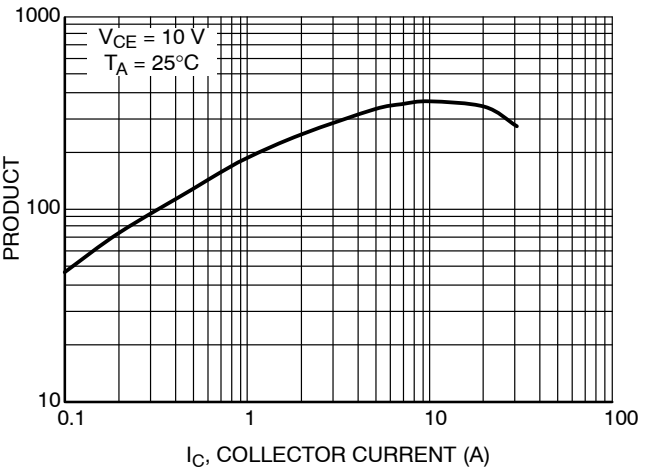


Figure 30. Current - Gain - Bandwidth Product

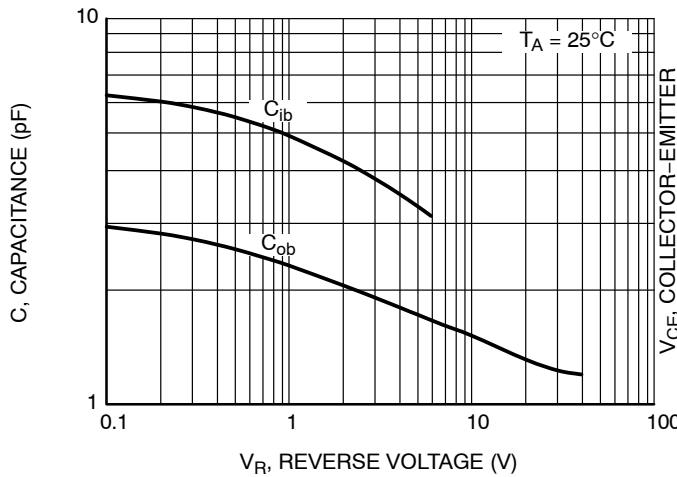


Figure 31. Capacitances

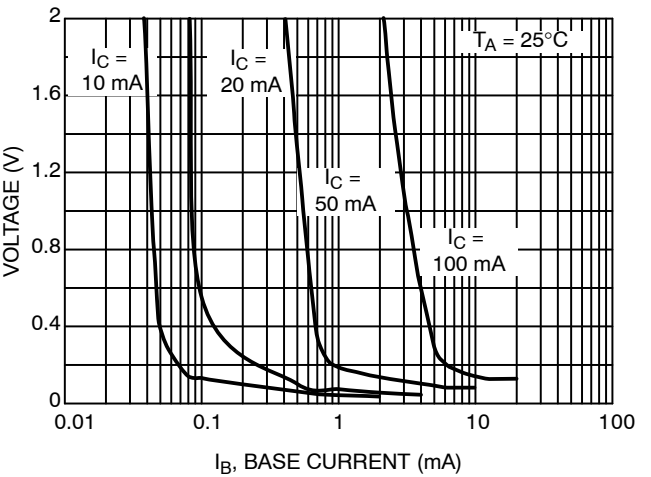


Figure 32. Collector Saturation Region

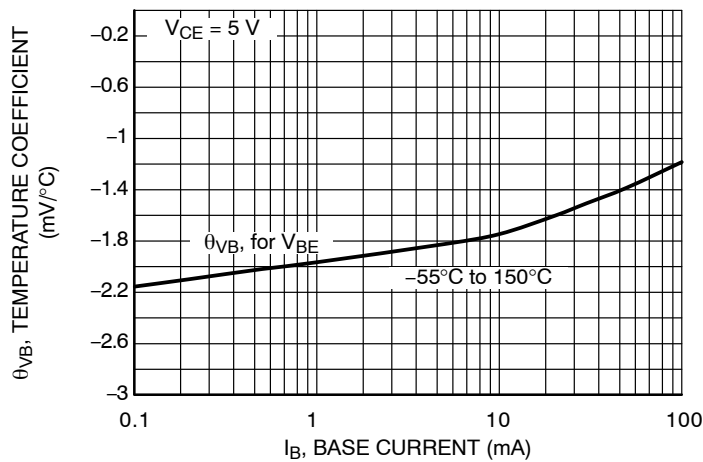


Figure 33. Base-Emitter Temperature Coefficient

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

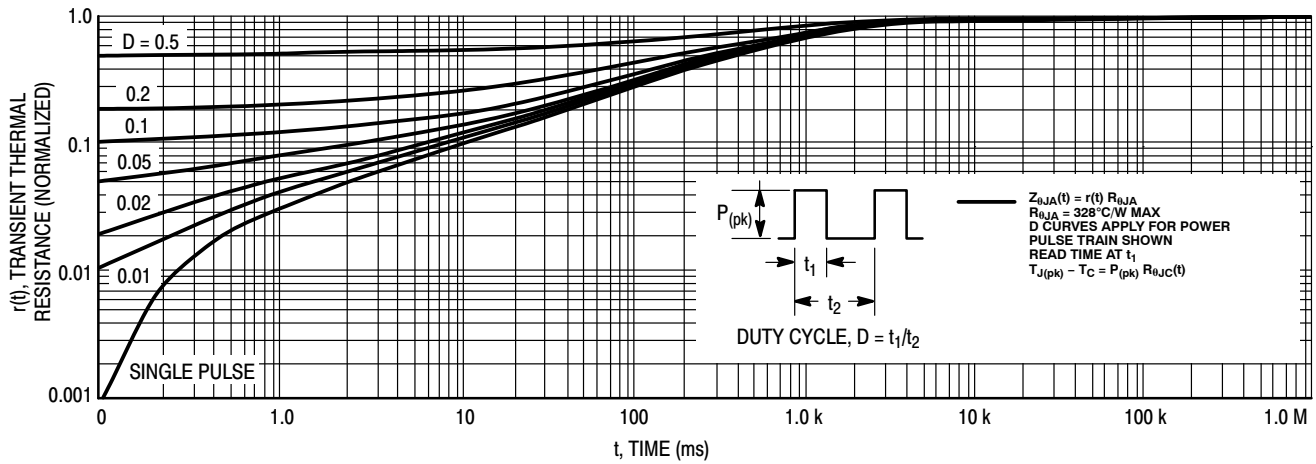


Figure 34. Thermal Response

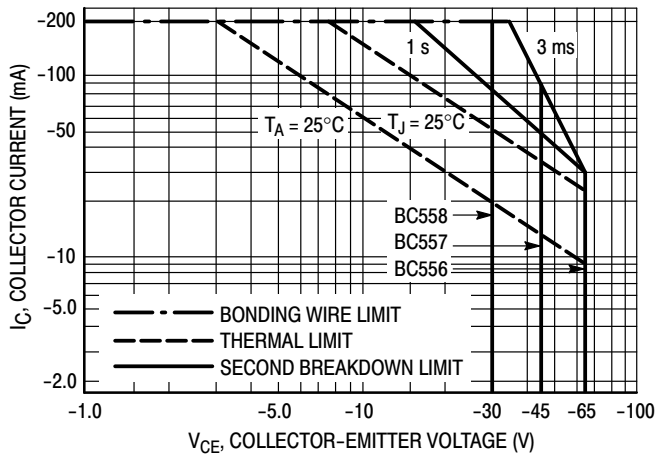


Figure 35. Active Region Safe Operating Area

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

Device	Markings	Package	Shipping [†]
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

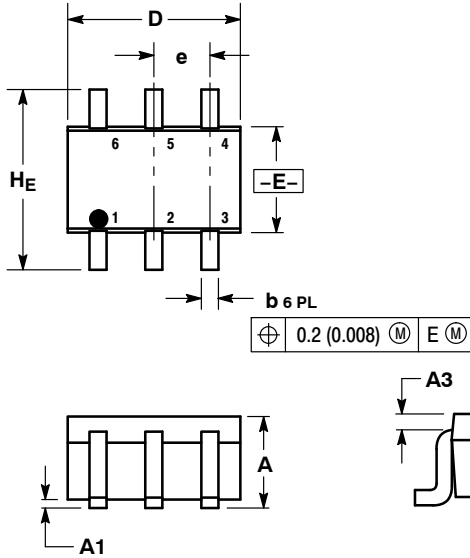
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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

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

PACKAGE DIMENSIONS

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



NOTES:

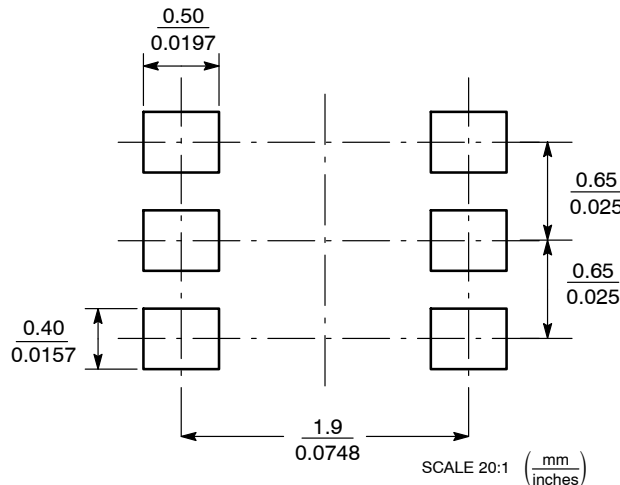
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

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.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). 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

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

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative

BC846BDW1T1/D