

BC846BPDW1T1G, BC847BPDW1T1G, BC848CPDW1T1G



ON Semiconductor®

<http://onsemi.com>

Dual General Purpose Transistors

NPN/PNP Duals (Complementary)

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

- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

MAXIMUM RATINGS – NPN

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	V_{EBO}	6.0	V
Collector Current – Continuous	I_C	100	mAdc

MAXIMUM RATINGS – PNP

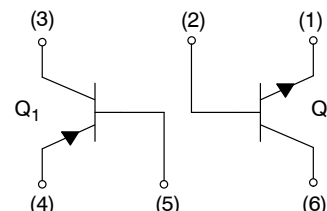
Rating	Symbol	Value	Unit
Collector-Emitter Voltage BC846 BC847 BC848	V_{CEO}	-65 -45 -30	V
Collector-Base Voltage BC846 BC847 BC848	V_{CBO}	-80 -50 -30	V
Emitter-Base Voltage	V_{EBO}	-5.0	V
Collector Current – Continuous	I_C	-100	mAdc

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 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/°C
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	328	°C/W
Junction and Storage Temperature	T_J, T_{stg}	-55 to +150	°C

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



MARKING DIAGRAM



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

ORDERING INFORMATION

Device	Mark	Package	Shipping†
BC846BPDW1T1G	BB	SOT-363 (Pb-Free)	3000 / Tape & Reel
BC847BPDW1T1G	BF	SOT-363 (Pb-Free)	3000 / Tape & Reel
BC847BPDW1T2G	BF	SOT-363 (Pb-Free)	3000 / Tape & Reel
BC848CPDW1T1G	BL	SOT-363 (Pb-Free)	3000 / Tape & Reel

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

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ELECTRICAL CHARACTERISTICS (NPN) ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit	
OFF CHARACTERISTICS						
Collector – Emitter Breakdown Voltage ($I_C = 10\text{ mA}$)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CEO}$	65 45 30	– – –	– – –	V
Collector – Emitter Breakdown Voltage ($I_C = 10\ \mu\text{A}$, $V_{EB} = 0$)	BC846 Series BC847B Only BC848 Series	$V_{(BR)CES}$	80 50 30	– – –	– – –	V
Collector – Base Breakdown Voltage ($I_C = 10\ \mu\text{A}$)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CBO}$	80 50 30	– – –	– – –	V
Emitter – Base Breakdown Voltage ($I_E = 1.0\ \mu\text{A}$)	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 μA
ON CHARACTERISTICS						
DC Current Gain ($I_C = 10\ \mu\text{A}$, $V_{CE} = 5.0\text{ V}$)	BC846B, BC847B BC848C	h_{FE}	– –	150 270	– –	–
($I_C = 2.0\text{ mA}$, $V_{CE} = 5.0\text{ V}$)	BC846B, BC847B BC848C		200 420	290 520	475 800	
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

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ELECTRICAL CHARACTERISTICS (PNP) ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector – Emitter Breakdown Voltage ($I_C = -10\text{ mA}$)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CEO}$	-65 -45 -30	- - -	V
Collector – Emitter Breakdown Voltage ($I_C = -10\ \mu\text{A}$, $V_{EB} = 0$)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CES}$	-80 -50 -30	- - -	V
Collector – Base Breakdown Voltage ($I_C = -10\ \mu\text{A}$)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CBO}$	-80 -50 -30	- - -	V
Emitter – Base Breakdown Voltage ($I_E = -1.0\ \mu\text{A}$)	BC846 Series BC847 Series BC848 Series	$V_{(BR)EBO}$	-5.0 -5.0 -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 -4.0	nA μA
ON CHARACTERISTICS					
DC Current Gain ($I_C = -10\ \mu\text{A}$, $V_{CE} = -5.0\text{ V}$)	BC846B, BC847B BC848C	h_{FE}	- -	150 270	-
($I_C = -2.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$)	BC846B, BC847B BC848C		200 420	290 520 475 800	
Collector – Emitter Saturation Voltage ($I_C = -10\text{ mA}$, $I_B = -0.5\text{ mA}$) ($I_C = -100\text{ mA}$, $I_B = -5.0\text{ mA}$)		$V_{CE(sat)}$	- -	- -	-0.3 -0.65
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	-
Base – Emitter On Voltage ($I_C = -2.0\text{ mA}$, $V_{CE} = -5.0\text{ V}$) ($I_C = -10\text{ mA}$, $V_{CE} = -5.0\text{ V}$)		$V_{BE(on)}$	-0.6 -	- -	-0.75 -0.82
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_{ob}	-	-	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

TYPICAL NPN CHARACTERISTICS – BC846

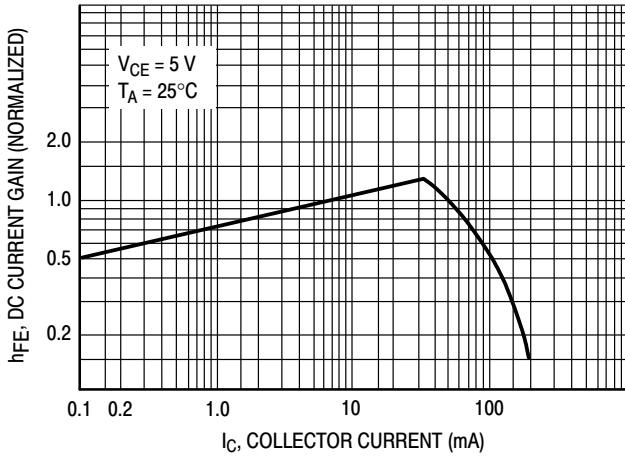


Figure 1. DC Current Gain

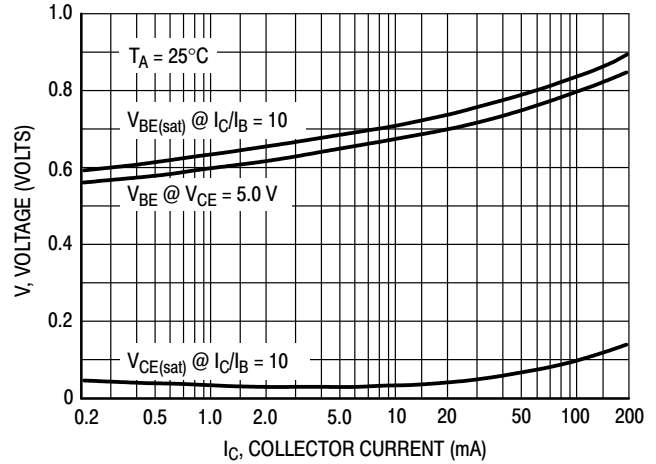


Figure 2. "On" Voltage

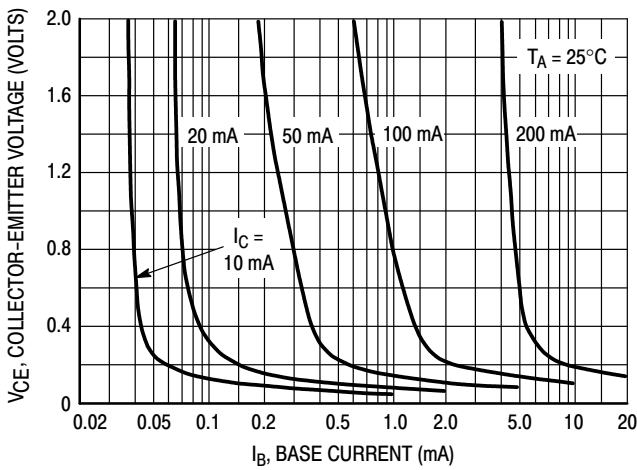


Figure 3. Collector Saturation Region

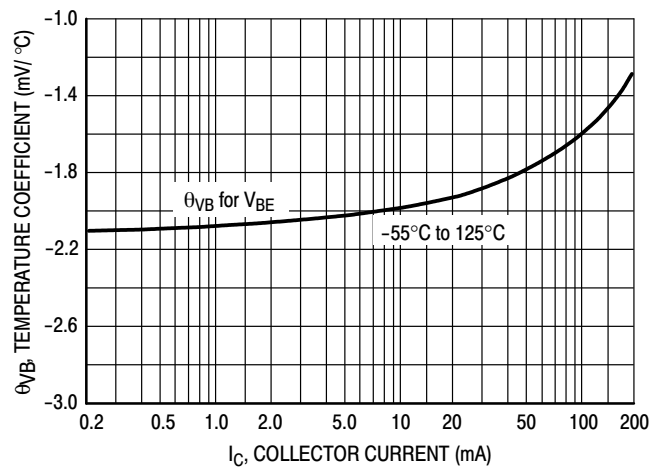


Figure 4. Base-Emitter Temperature Coefficient

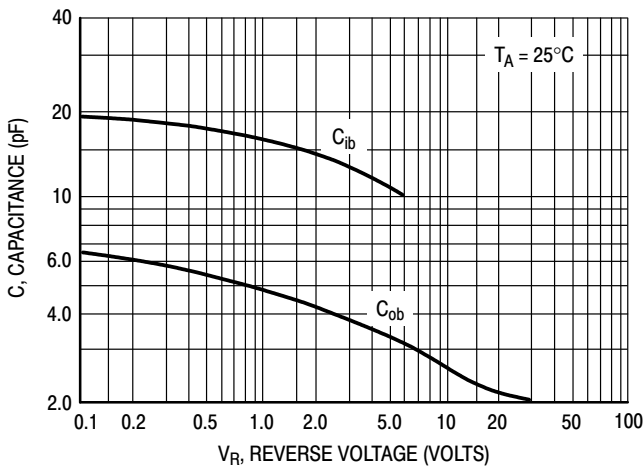


Figure 5. Capacitance

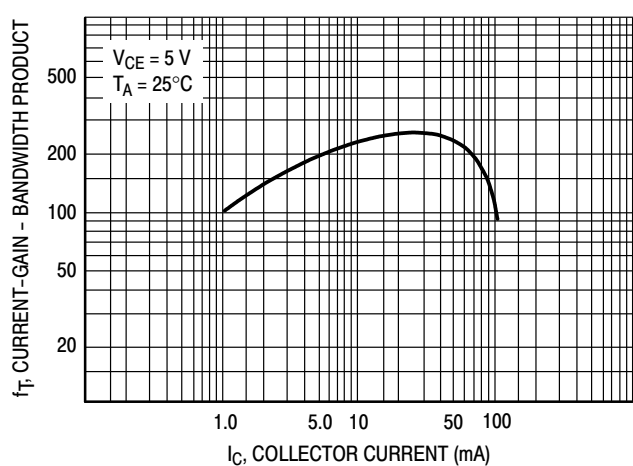


Figure 6. Current-Gain - Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC846

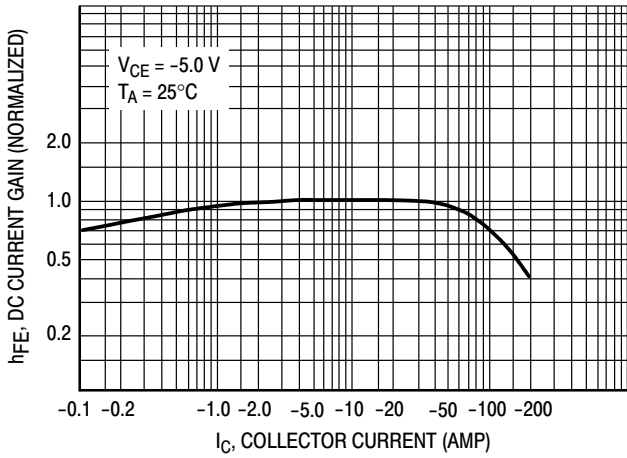


Figure 7. DC Current Gain

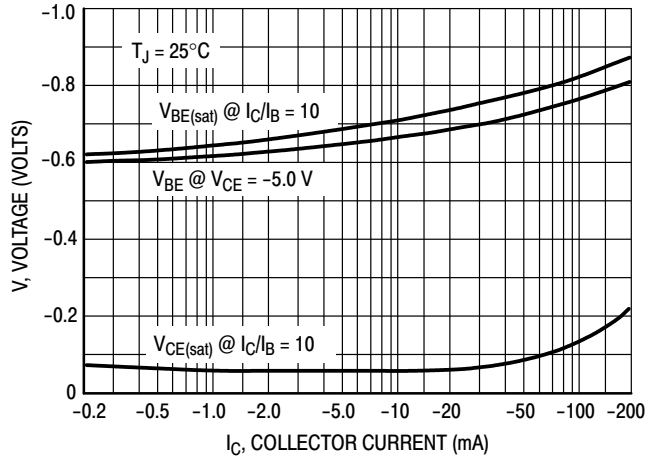


Figure 8. "On" Voltage

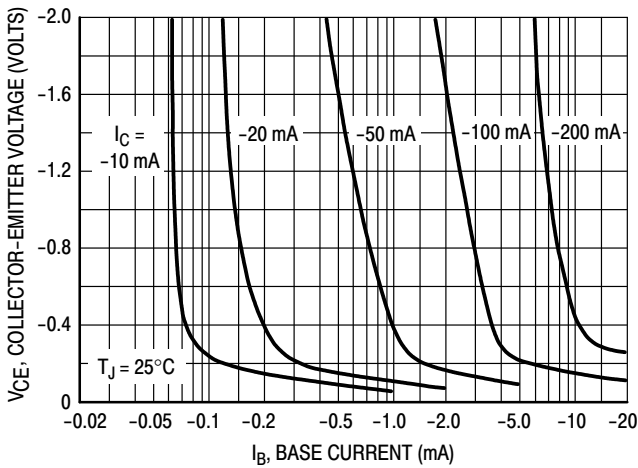


Figure 9. Collector Saturation Region

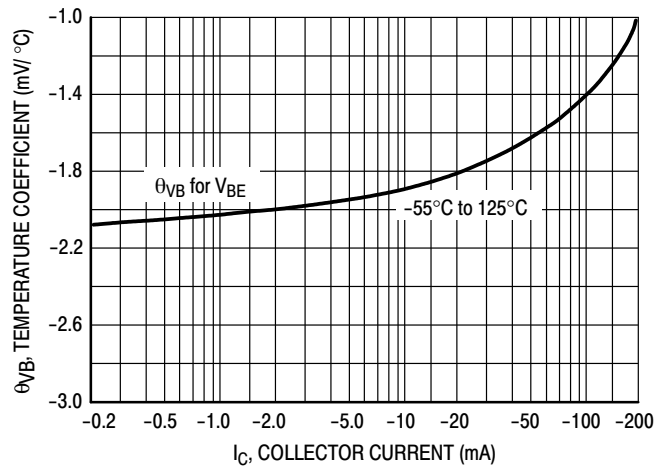


Figure 10. Base-Emitter Temperature Coefficient

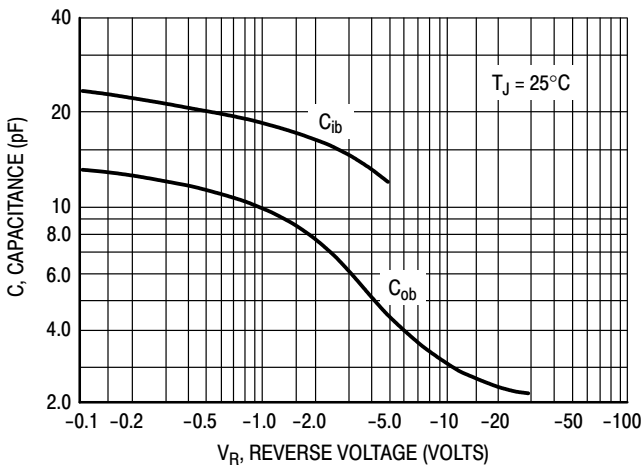


Figure 11. Capacitance

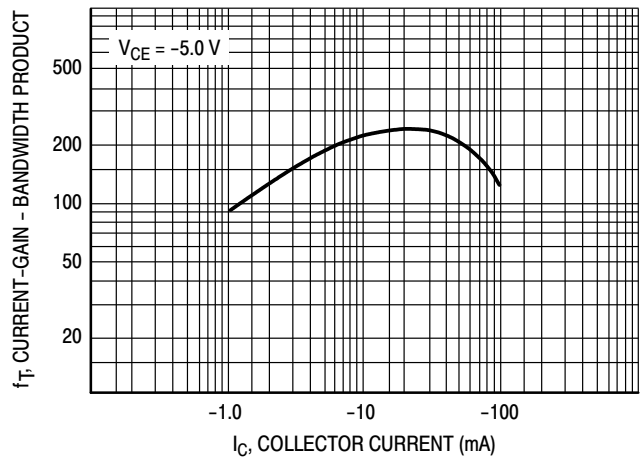


Figure 12. Current-Gain - Bandwidth Product

BC846BPDW1T1G, BC847BPDW1T1G, BC848CPDW1T1G

TYPICAL NPN CHARACTERISTICS – BC847 SERIES & BC848 SERIES

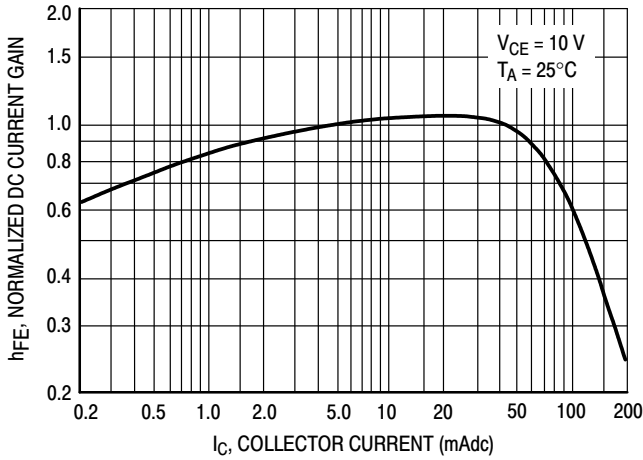


Figure 13. Normalized DC Current Gain

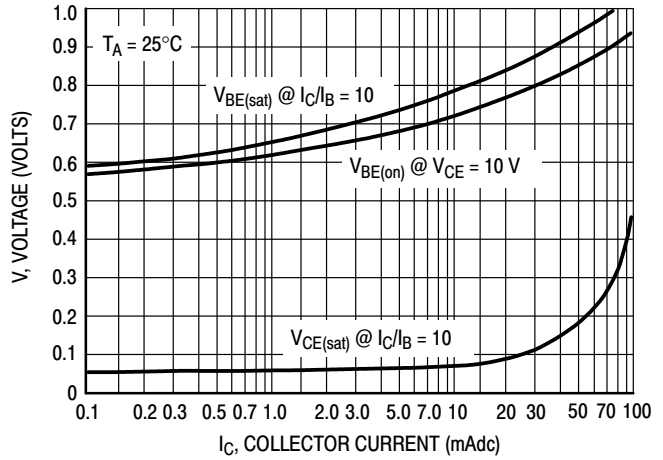


Figure 14. “Saturation” and “On” Voltages

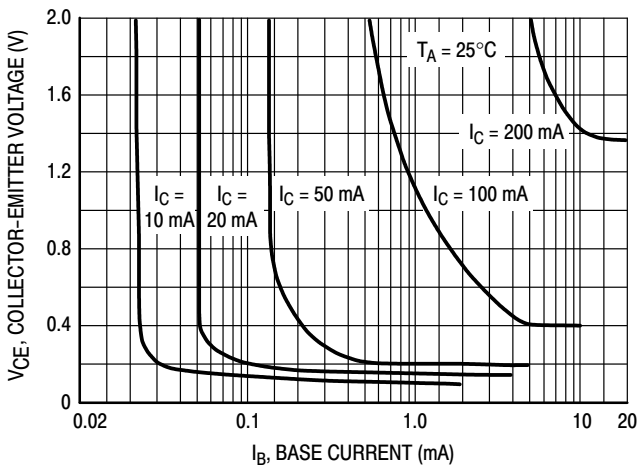


Figure 15. Collector Saturation Region

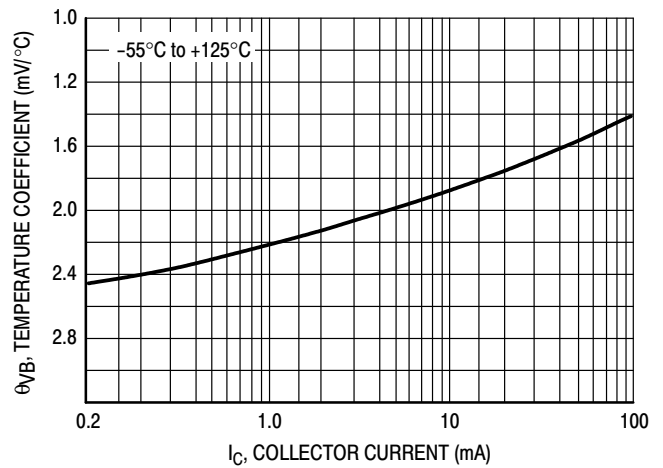


Figure 16. Base-Emitter Temperature Coefficient

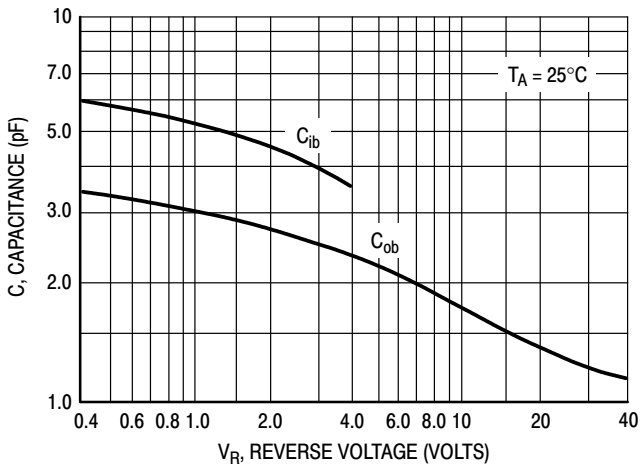


Figure 17. Capacitances

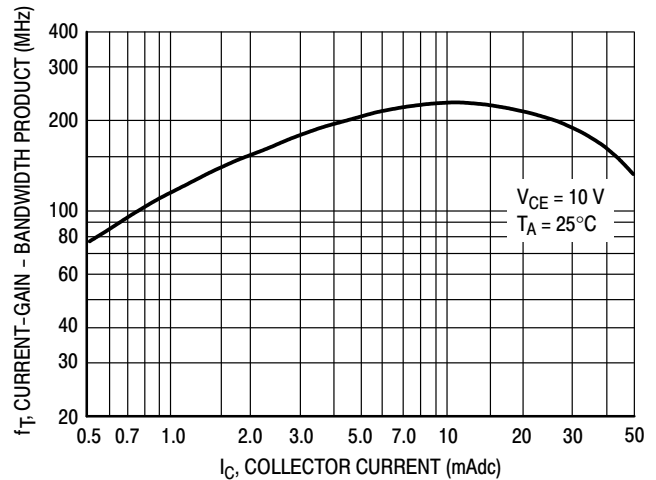


Figure 18. Current-Gain - Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC847 SERIES & BC848 SERIES

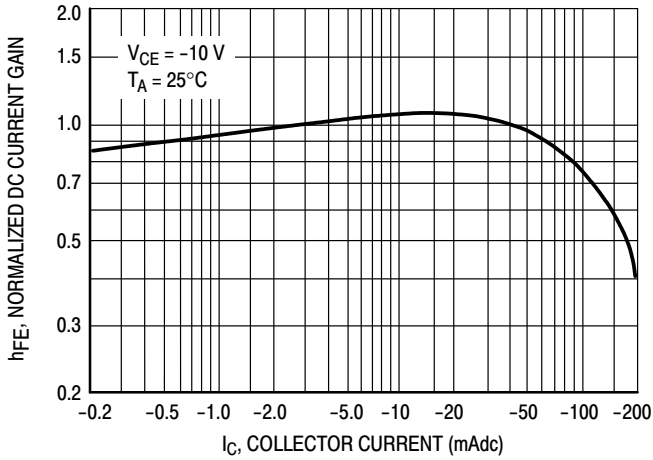


Figure 19. Normalized DC Current Gain

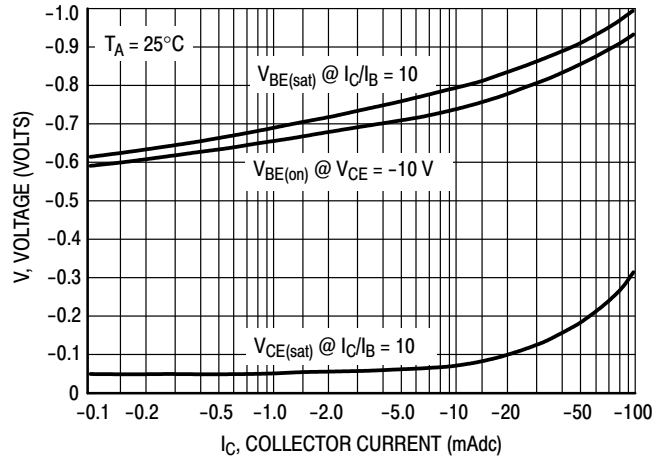


Figure 20. "Saturation" and "On" Voltages

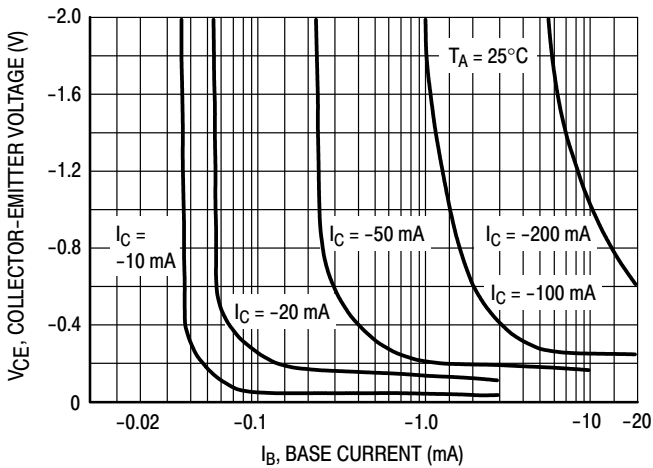


Figure 21. Collector Saturation Region

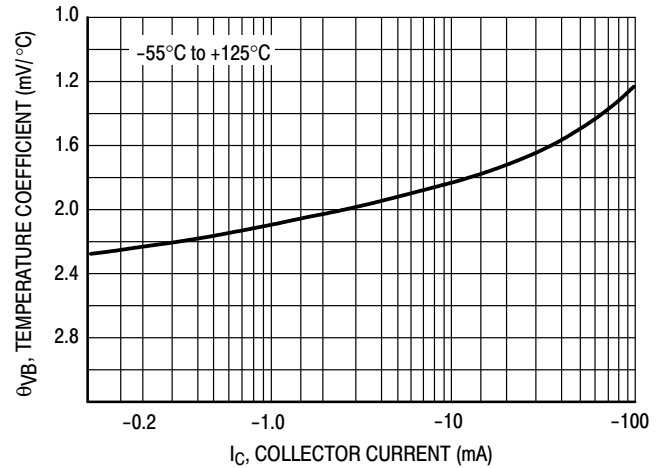


Figure 22. Base-Emitter Temperature Coefficient

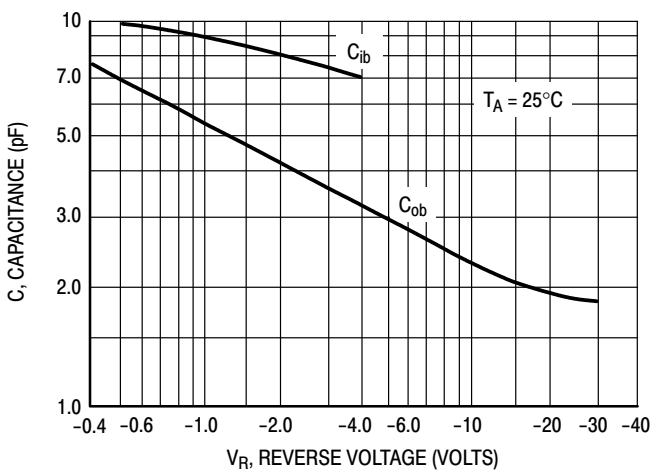


Figure 23. Capacitances

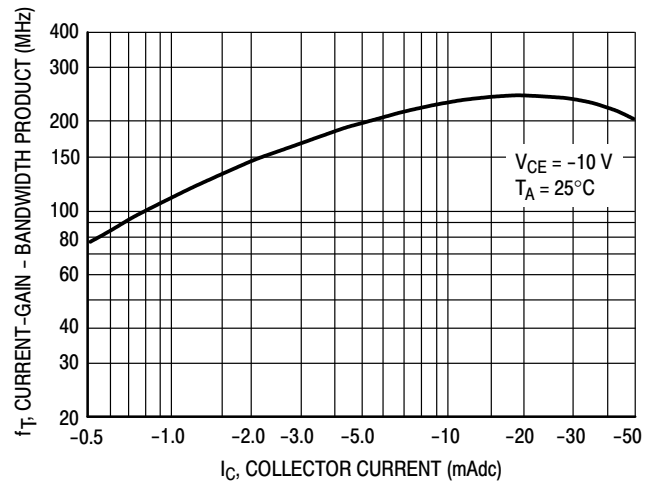


Figure 24. Current-Gain - Bandwidth Product

BC846BPDW1T1G, BC847BPDW1T1G, BC848CPDW1T1G

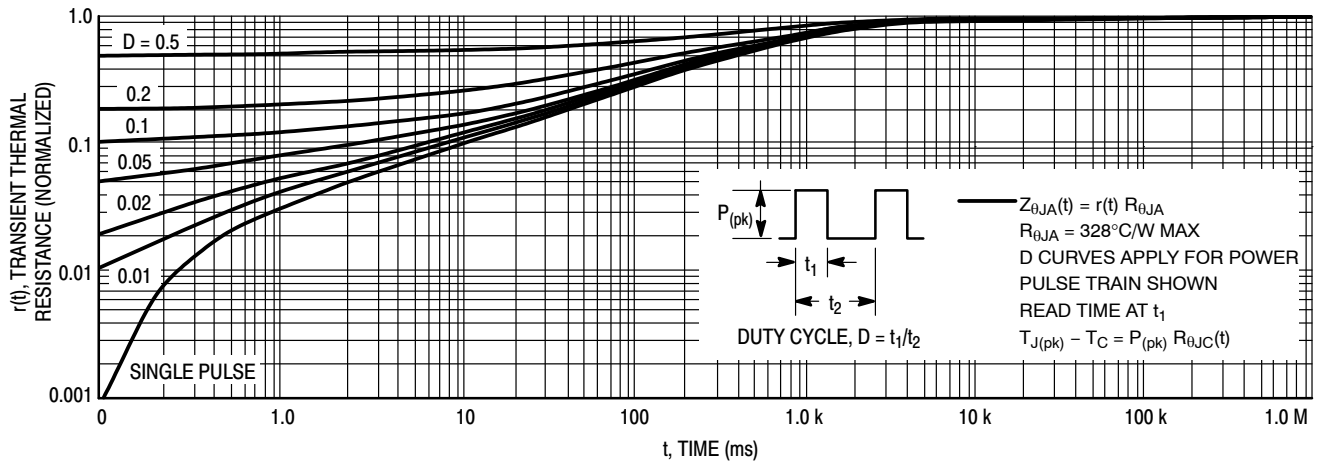


Figure 25. Thermal Response

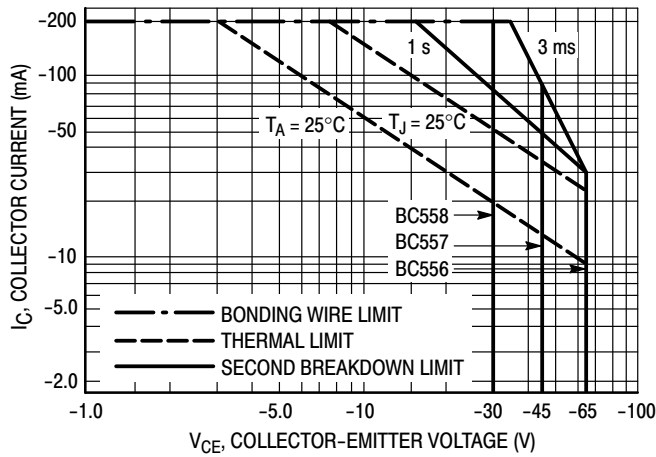


Figure 26. Active Region Safe Operating Area

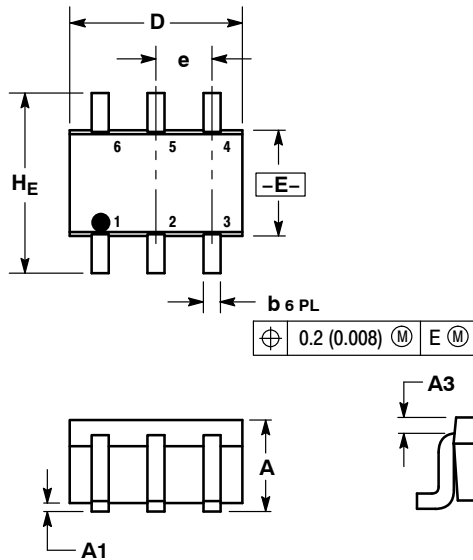
The safe operating area curves indicate I_C - V_{CE} limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 26 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 25. 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.

BC846BPDW1T1G, BC847BPDW1T1G, BC848CPDW1T1G

PACKAGE DIMENSIONS

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



NOTES:

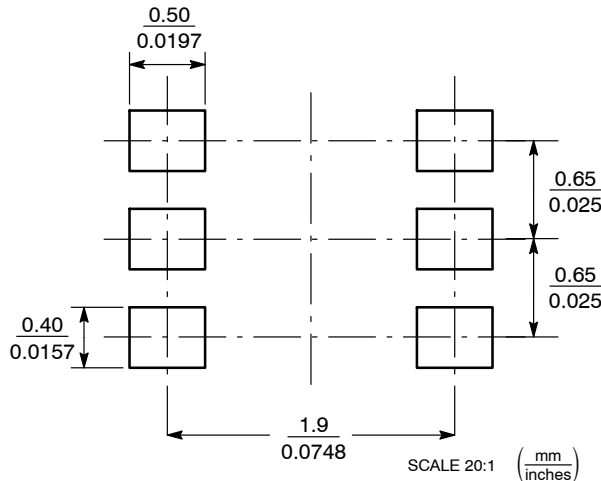
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

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
- BASE 2
- COLLECTOR 1
- EMITTER 1
- BASE 1
- COLLECTOR 2

SOLDERING FOOTPRINT*



SC-88/SC70-6/SOT-363

*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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