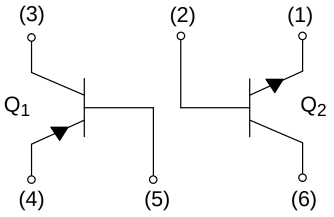
BC846BPDW1T1, BC847BPDW1T1 Series, BC848CPDW1T1 Series

Dual General Purpose Transistors

NPN/PNP Duals (Complementary)

ON Semiconductor®

http://onsemi.com



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

- Pb−Free Packages are Available

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

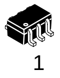
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

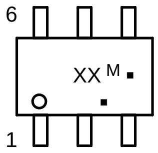
Characteristic	Symbol	Max	Unit
Total Device Dissipation Per Device FR−5 Board (Note 1) $T_A = 25°C$ Derate above 25°C	P_D	380 250 3.0	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	328	°C/W
Junction and Storage Temperature	T_J, T_{stg}	−55 to +150	°C

1. FR−5 = 1.0 x 0.75 x 0.062 in.

MARKING DIAGRAM



SOT−363
CASE 419B
STYLE 1



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

ORDERING INFORMATION

Device	Mark	Package	Shipping†
BC846BPDW1T1	BB	SOT−363	3000 Units/Reel
BC846BPDW1T1G	BB	SOT−363 (Pb−Free)	3000 Units/Reel
BC847BPDW1T1	BF	SOT−363	3000 Units/Reel
BC847BPDW1T1G	BF	SOT−363 (Pb−Free)	3000 Units/Reel
BC847CPDW1T1	BG	SOT−363	3000 Units/Reel
BC848CPDW1T1	BL	SOT−363	3000 Units/Reel
BC848CPDW1T1G	BL	SOT−363 (Pb−Free)	3000 Units/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.

July, 2005 − Rev. 4

ELECTRICAL CHARACTERISTICS (NPN) (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (I_C = 10 mA)	$V_{(BR)CEO}$				V
BC846 Series		65	–	–	
BC847 Series		45	–	–	
BC848 Series		30	–	–	
Collector−Emitter Breakdown Voltage (I_C = 10 μA, V_{EB} = 0)	$V_{(BR)CES}$				V
BC846 Series		80	–	–	
BC847B Only		50	–	–	
BC848 Series		30	–	–	
Collector−Base Breakdown Voltage (I_C = 10 μA)	$V_{(BR)CBO}$				V
BC846 Series		80	–	–	
BC847 Series		50	–	–	
BC848 Series		30	–	–	
Emitter−Base Breakdown Voltage (I_E = 1.0 μA)	$V_{(BR)EBO}$				V
BC846 Series		6.0	–	–	
BC847 Series		6.0	–	–	
BC848 Series		5.0	–	–	
Collector Cutoff Current (V_{CB} = 30 V)	I_{CBO}	–	–	15	nA
(V_{CB} = 30 V, T_A = 150°C)		–	–	5.0	μA
ON CHARACTERISTICS					
DC Current Gain	h_{FE}				–
(I_C = 10 μA, V_{CE} = 5.0 V) BC846B, BC847B		–	150	–	
BC847C, BC848C		–	270	–	
(I_C = 2.0 mA, V_{CE} = 5.0 V) BC846B, BC847B		200	290	475	
BC847C, BC848C		420	520	800	
Collector−Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.5 mA)	$V_{CE(sat)}$	–	–	0.25	V
(I_C = 100 mA, I_B = 5.0 mA)		–	–	0.6	
Base−Emitter Saturation Voltage (I_C = 10 mA, I_B = 0.5 mA)	$V_{BE(sat)}$	–	0.7	–	V
(I_C = 100 mA, I_B = 5.0 mA)		–	0.9	–	
Base−Emitter Voltage (I_C = 2.0 mA, V_{CE} = 5.0 V)	$V_{BE(on)}$	580	660	700	mV
(I_C = 10 mA, V_{CE} = 5.0 V)		–	–	770	
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain − Bandwidth Product (I_C = 10 mA, V_{CE} = 5.0 Vdc, f = 100 MHz)	f_T	100	–	–	MHz
Output Capacitance (V_{CB} = 10 V, f = 1.0 MHz)	C_{obo}	–	–	4.5	pF
Noise Figure (I_C = 0.2 mA, V_{CE} = 5.0 Vdc, R_S = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz)	NF	–	–	10	dB

ELECTRICAL CHARACTERISTICS (PNP) (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage	$V_{(BR)CEO}$				V
(I_C = −10 mA) BC846 Series		−65	−	−	
BC847 Series		−45	−	−	
BC848 Series		−30	−	−	
Collector−Emitter Breakdown Voltage	$V_{(BR)CES}$				V
(I_C = −10 μA, V_{EB} = 0) BC846 Series		−80	−	−	
BC847 Series		−50	−	−	
BC848 Series		−30	−	−	
Collector−Base Breakdown Voltage	$V_{(BR)CBO}$				V
(I_C = −10 μA) BC846 Series		−80	−	−	
BC847 Series		−50	−	−	
BC848 Series		−30	−	−	
Emitter−Base Breakdown Voltage	$V_{(BR)EBO}$				V
(I_E = −1.0 μA) BC846 Series		−5.0	−	−	
BC847 Series		−5.0	−	−	
BC848 Series		−5.0	−	−	
Collector Cutoff Current (V_{CB} = −30 V)	I_{CBO}	−	−	−15	nA
(V_{CB} = −30 V, T_A = 150°C)		−	−	−4.0	μA
ON CHARACTERISTICS					
DC Current Gain	h_{FE}				−
(I_C = −10 μA, V_{CE} = −5.0 V) BC846B, BC847B		−	150	−	
BC847C, BC848C		−	270	−	
(I_C = −2.0 mA, V_{CE} = −5.0 V) BC846B, BC847B		200	290	475	
BC847C, BC848C		420	520	800	
Collector−Emitter Saturation Voltage	$V_{CE(sat)}$				V
(I_C = −10 mA, I_B = −0.5 mA)		−	−	−0.3	
(I_C = −100 mA, I_B = −5.0 mA)		−	−	−0.65	
Base−Emitter Saturation Voltage	$V_{BE(sat)}$				V
(I_C = −10 mA, I_B = −0.5 mA)		−	−0.7	−	
(I_C = −100 mA, I_B = −5.0 mA)		−	−0.9	−	
Base−Emitter On Voltage	$V_{BE(on)}$				V
(I_C = −2.0 mA, V_{CE} = −5.0 V)		−0.6	−	−0.75	
(I_C = −10 mA, V_{CE} = −5.0 V)		−	−	−0.82	
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain − Bandwidth Product (I_C = −10 mA, V_{CE} = −5.0 Vdc, f = 100 MHz)	f_T	100	−	−	MHz
Output Capacitance (V_{CB} = −10 V, f = 1.0 MHz)	C_{ob}	−	−	4.5	pF
Noise Figure (I_C = −0.2 mA, V_{CE} = −5.0 Vdc, R_S = 2.0 kΩ, f = 1.0 kHz, BW = 200 Hz)	NF	−	−	10	dB

TYPICAL NPN CHARACTERISTICS − BC846

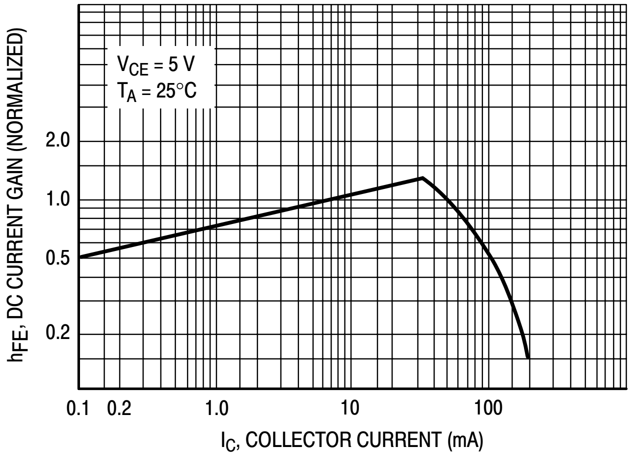


Figure 1. DC Current Gain

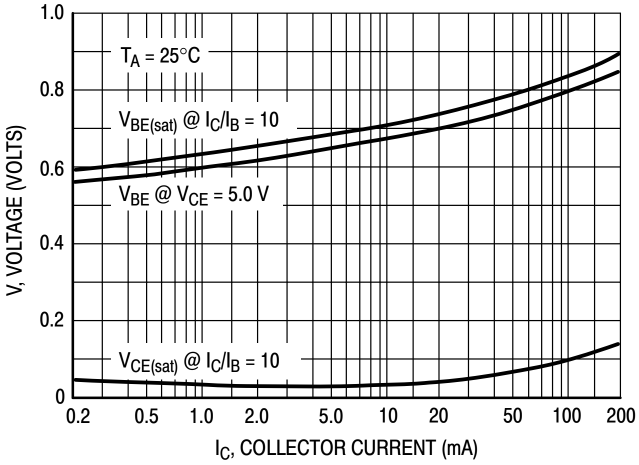


Figure 2. “On” Voltage

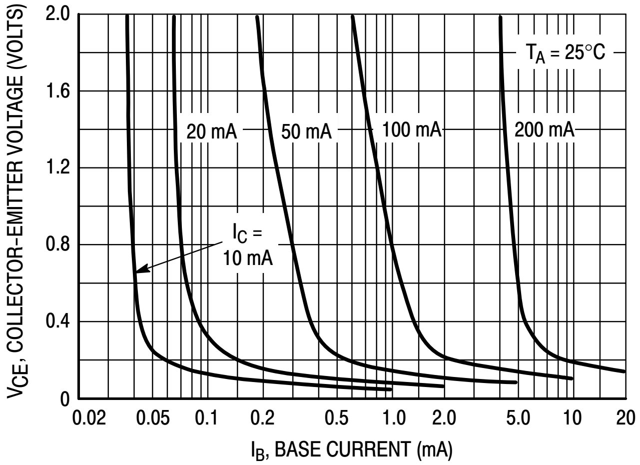


Figure 3. Collector Saturation Region

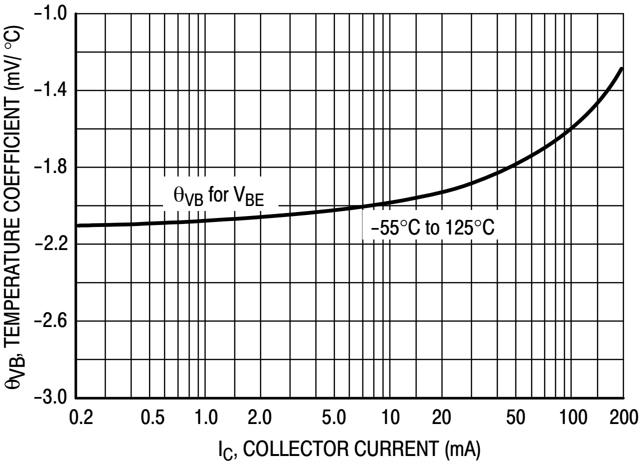


Figure 4. Base−Emitter Temperature Coefficient

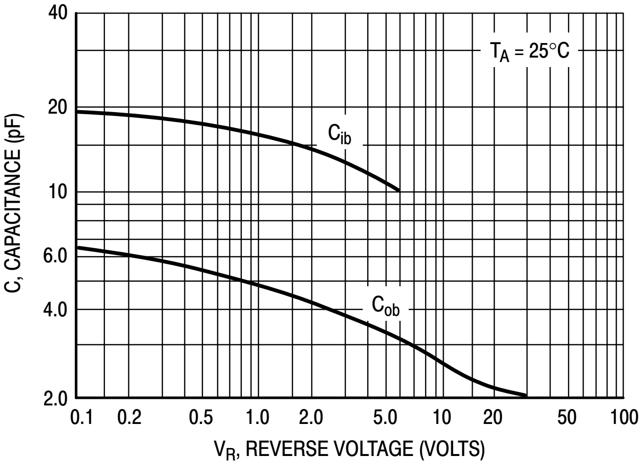


Figure 5. Capacitance

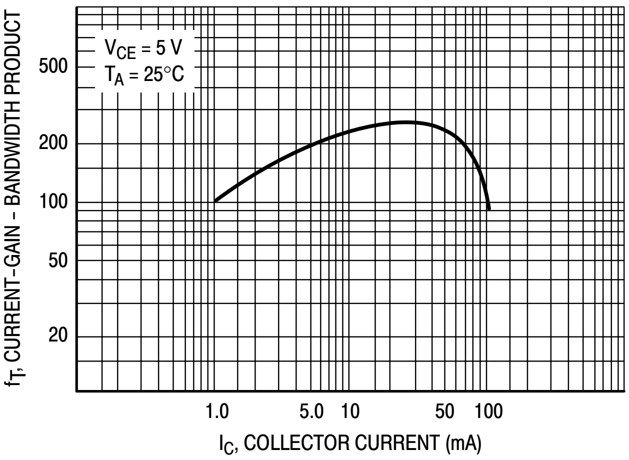


Figure 6. Current−Gain − Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC846

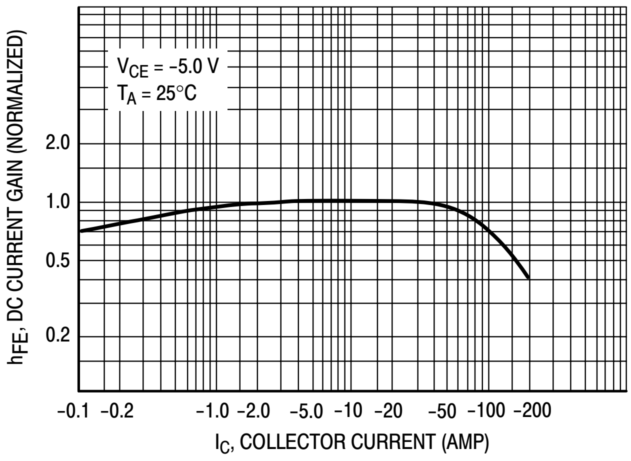


Figure 7. DC Current Gain

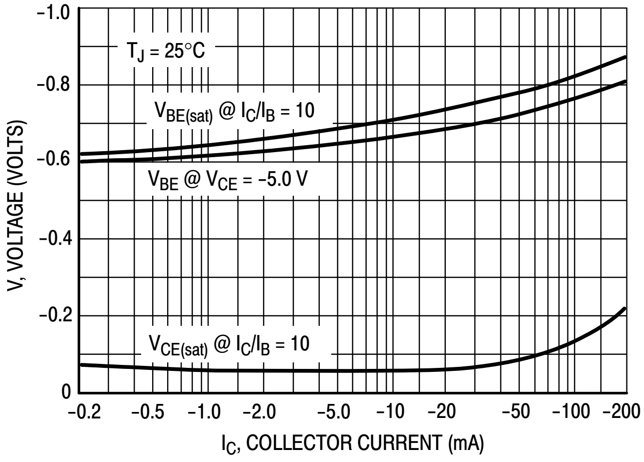


Figure 8. “On” Voltage

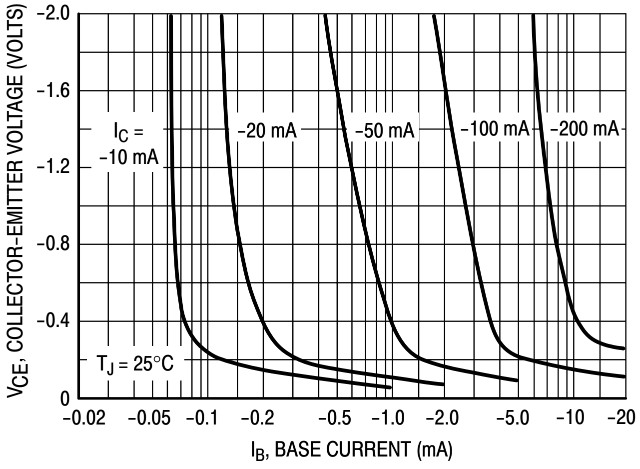


Figure 9. Collector Saturation Region

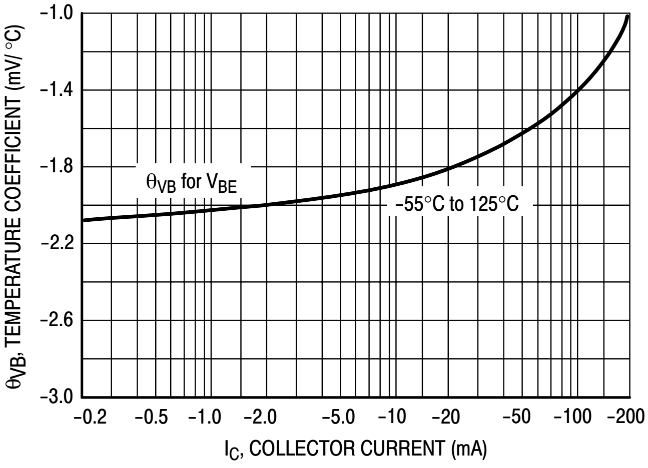


Figure 10. Base−Emitter Temperature Coefficient

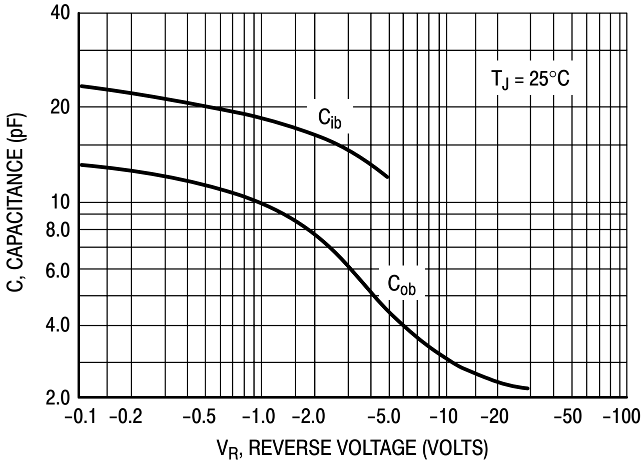


Figure 11. Capacitance

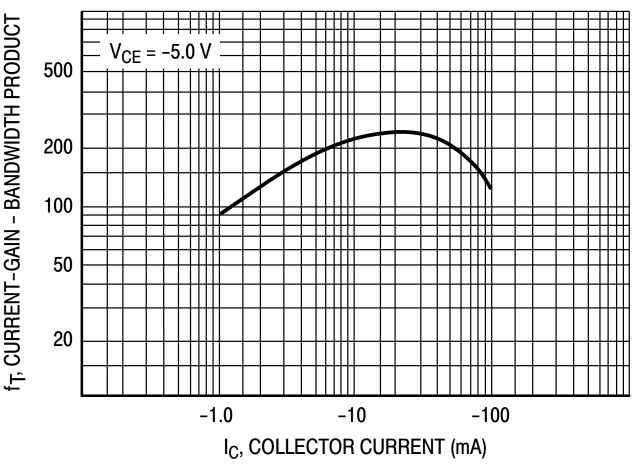


Figure 12. Current−Gain − Bandwidth Product

TYPICAL NPN CHARACTERISTICS − BC847 SERIES & BC848 SERIES

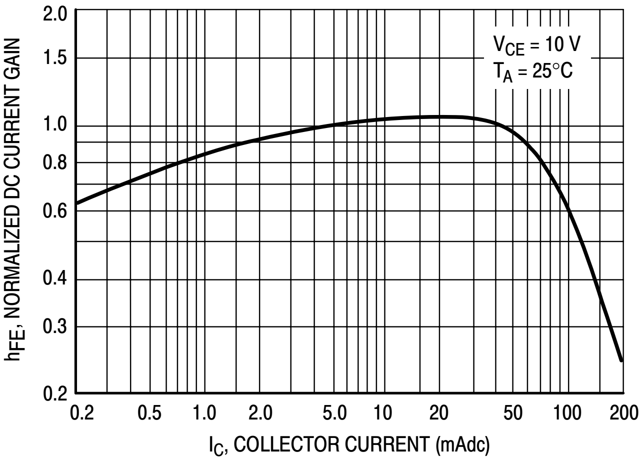


Figure 13. Normalized DC Current Gain

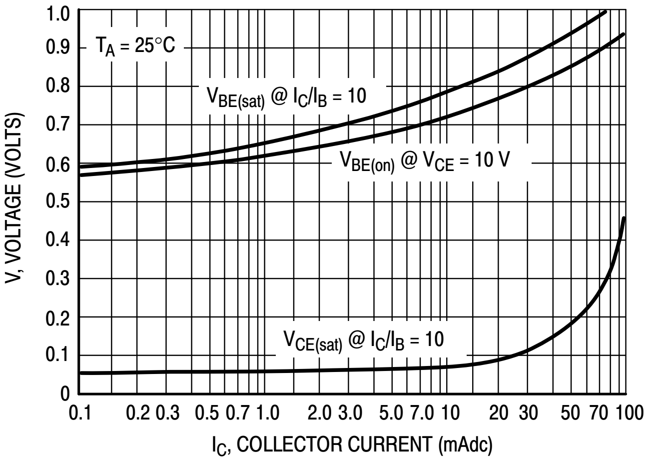


Figure 14. "Saturation" and "On" Voltages

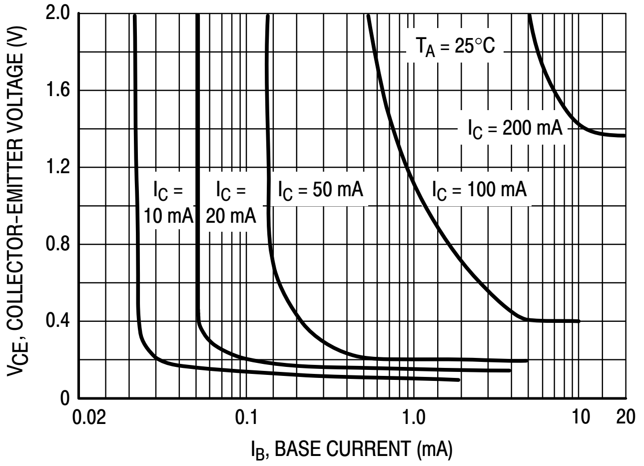


Figure 15. Collector Saturation Region

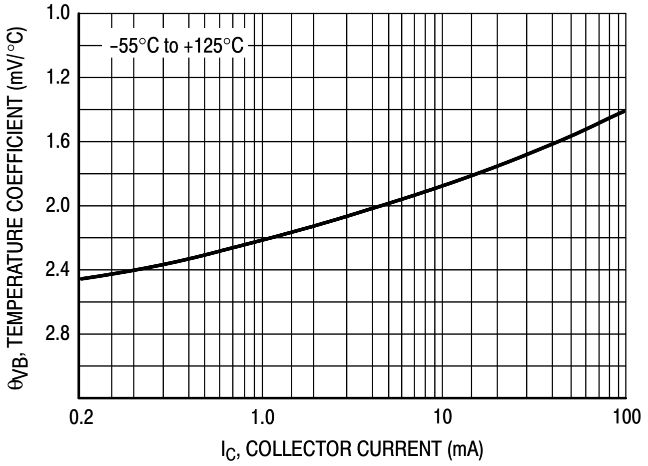


Figure 16. Base−Emitter Temperature Coefficient

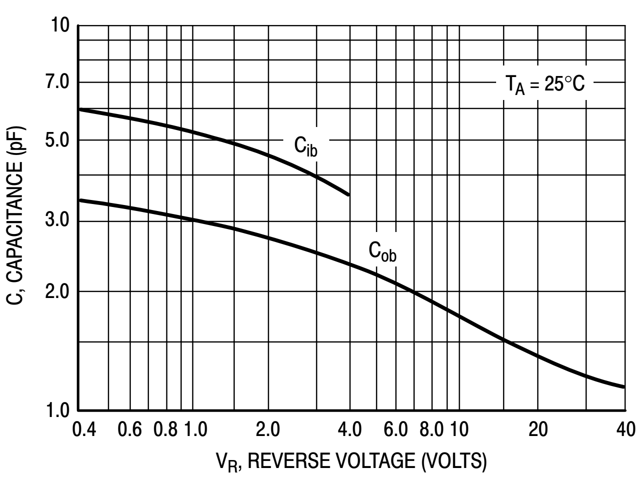


Figure 17. Capacitances

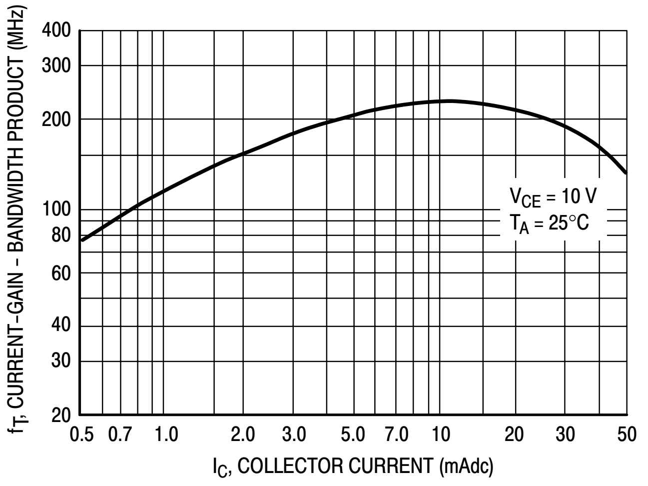


Figure 18. Current−Gain − Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC847 SERIES & BC848 SERIES

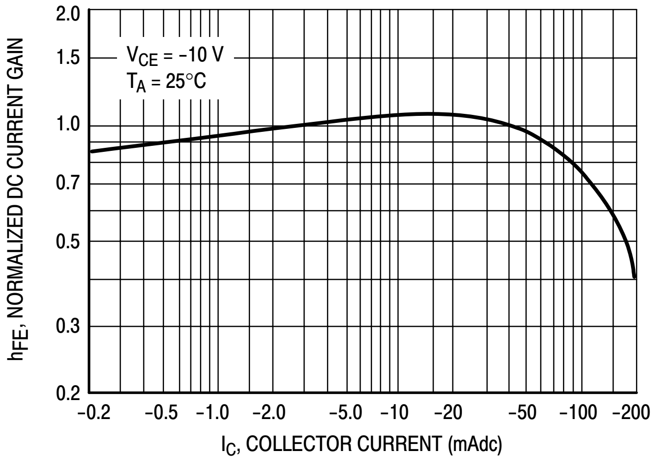


Figure 19. Normalized DC Current Gain

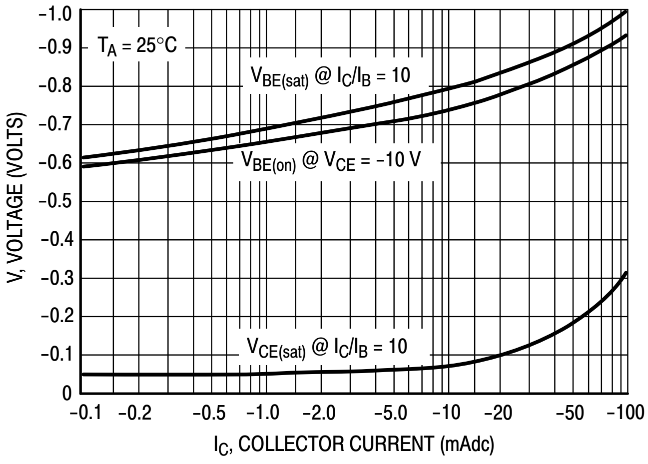


Figure 20. “Saturation” and “On” Voltages

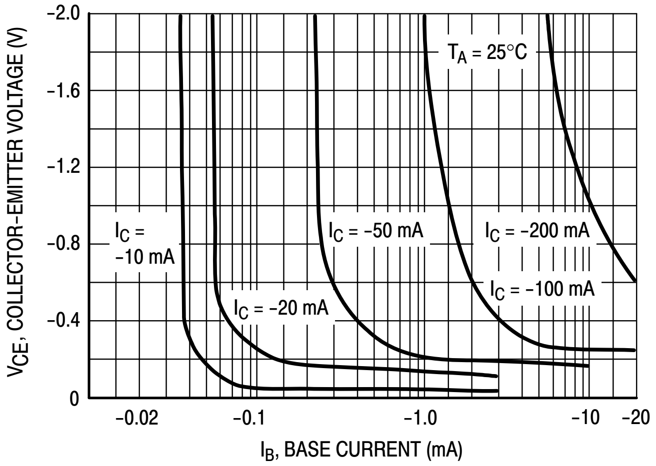


Figure 21. Collector Saturation Region

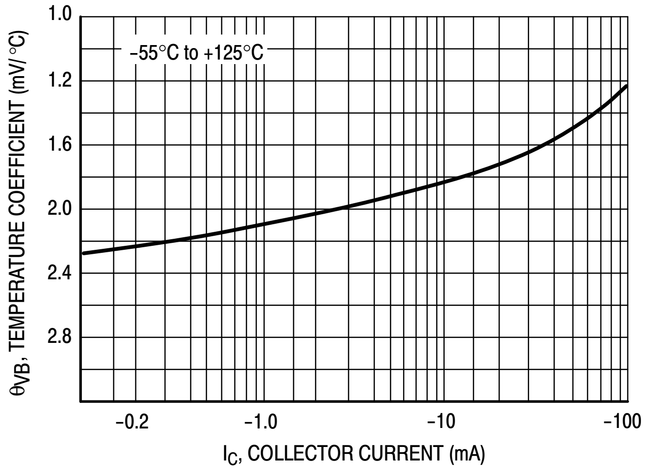


Figure 22. Base−Emitter Temperature Coefficient

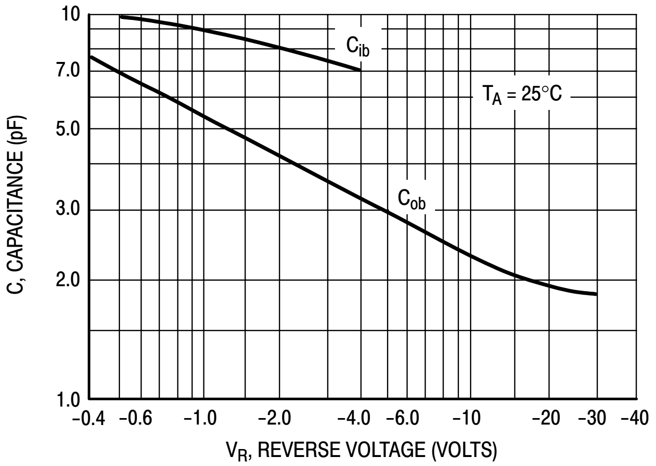


Figure 23. Capacitances

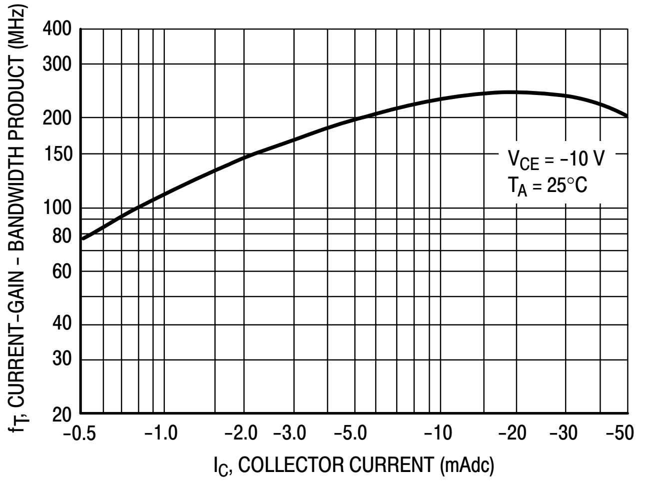


Figure 24. Current−Gain − Bandwidth Product

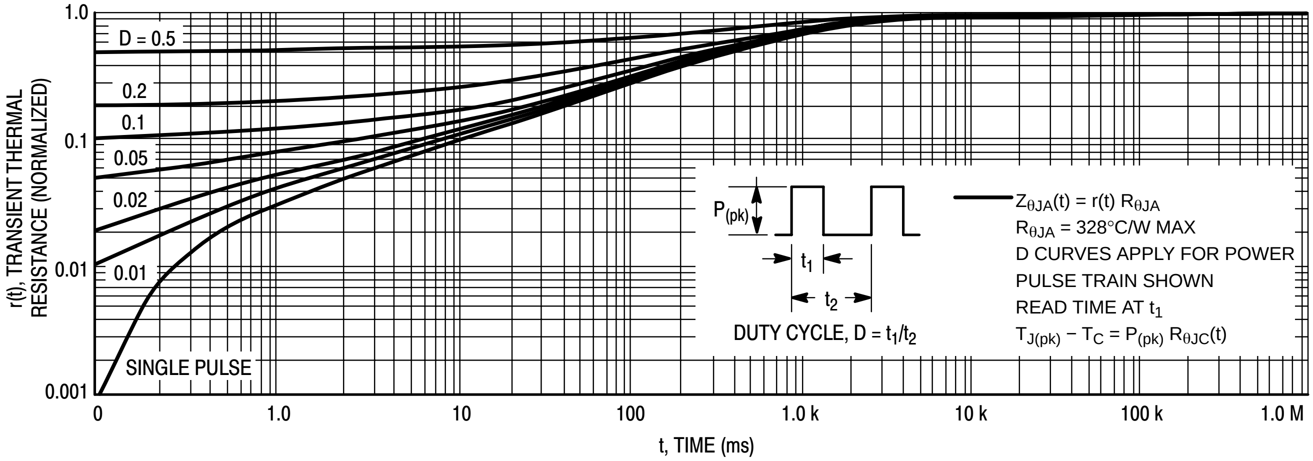


Figure 25. Thermal Response

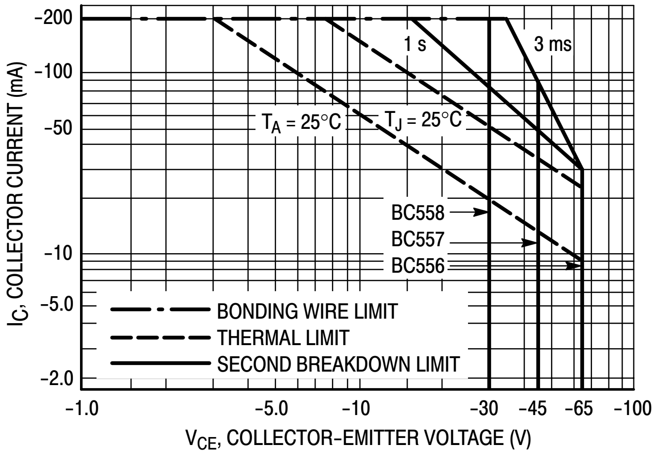


Figure 26. Active Region Safe Operating Area

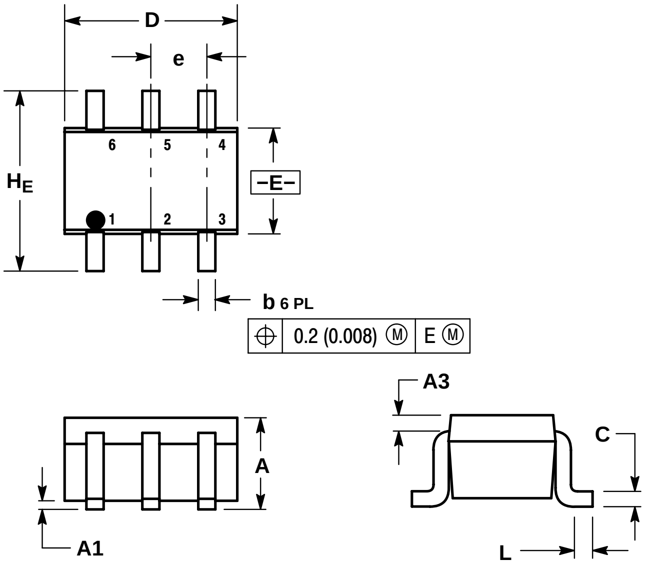
The safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation. Collector load lines for specific circuits must fall below the limits indicated by the applicable curve.

The data of Figure 26 is based upon $T_{J(pk)} = 150°C$; T_C or T_A is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided $T_{J(pk)} \le 150°C$. $T_{J(pk)}$ 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.

PACKAGE DIMENSIONS

SOT−363/SC−88

CASE 419B−02
ISSUE V

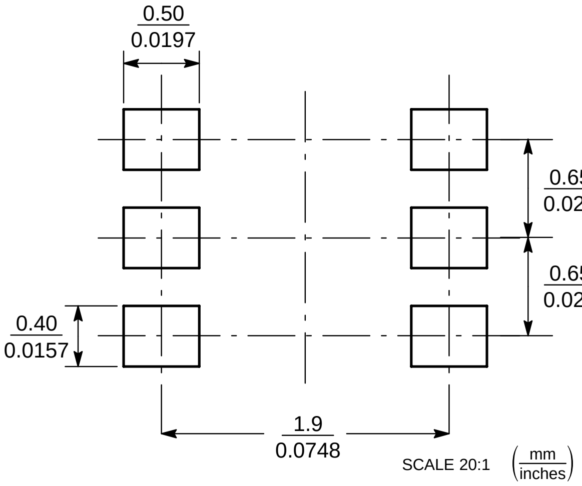


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B−01 OBSOLETE, NEW STANDARD 419B−02.

	MILLIMETERS			INCHES		
DIM	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
H_E	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*



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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