

# BC846BPDW1T1, BC847BPDW1T1 Series, BC848CPDW1T1 Series

## 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

- 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

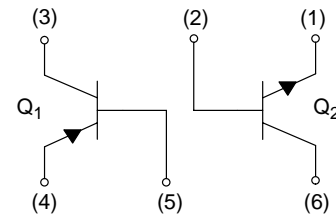
Characteristic	Symbol	Max	Unit
Total Device Dissipation Per Device FR-5 Board (Note 1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	380 250 3.0	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	328	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature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

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



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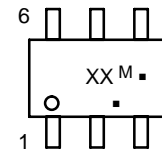
<http://onsemi.com>



#### 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.

# BC846BPDW1T1, BC847BPDW1T1 Series, BC848CPDW1T1 Series

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage ( $I_C = 10\text{ mA}$ )	BC846 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 $\mu\text{A}$
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = 10\ \mu\text{A}$ , $V_{CE} = 5.0\text{ V}$ )	BC846B, BC847B BC847C, BC848C $h_{FE}$	– –	150 270	– –	–
( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	BC846B, BC847B BC847C, 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
<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 ( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	–	–	10	dB

# BC846BPDW1T1, BC847BPDW1T1 Series, BC848CPDW1T1 Series

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage ( $I_C = -10\text{ mA}$ )	BC846 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 $\mu\text{A}$
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = -10\ \mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ )	BC846B, BC847B BC847C, BC848C $h_{FE}$	-	150 270	-	-
( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )	BC846B, BC847B BC847C, 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	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 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	V
<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 ( $V_{CB} = -10\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	-	-	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

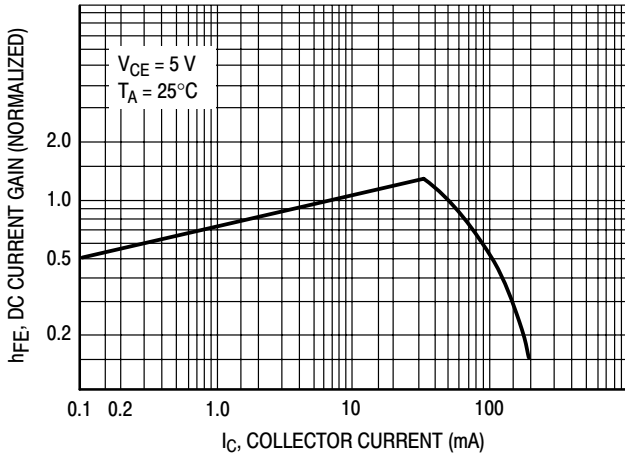


Figure 1. DC Current Gain

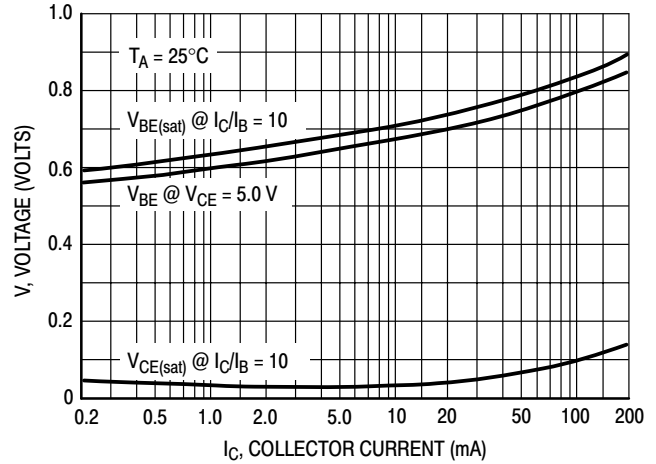


Figure 2. "On" Voltage

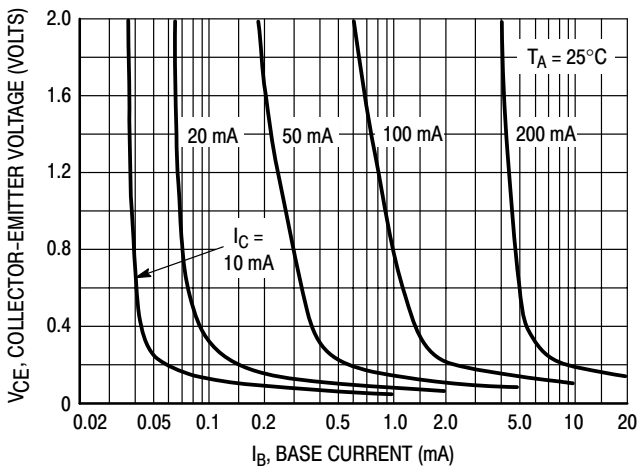


Figure 3. Collector Saturation Region

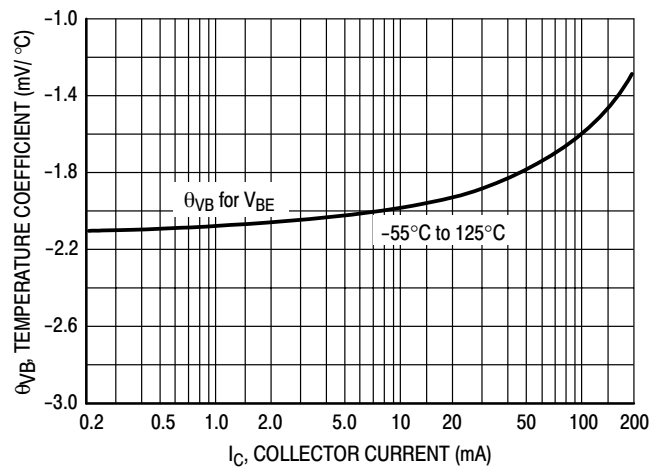


Figure 4. Base-Emitter Temperature Coefficient

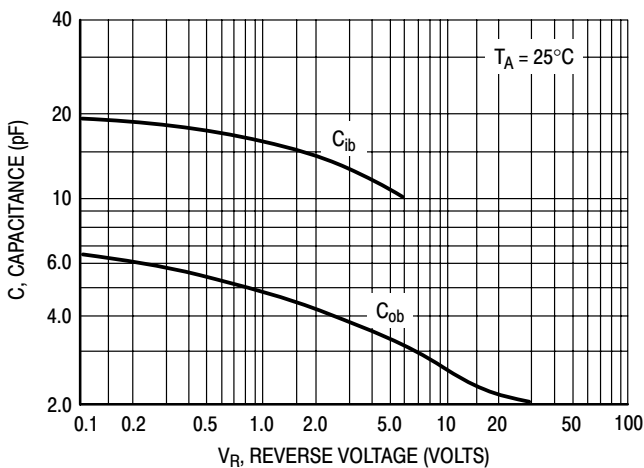


Figure 5. Capacitance

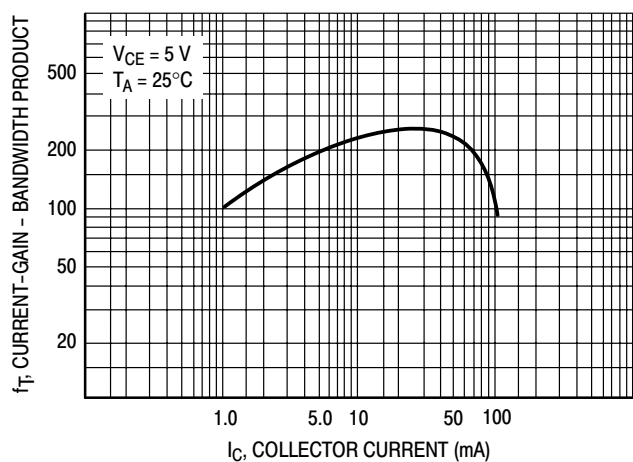


Figure 6. Current-Gain - Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC846

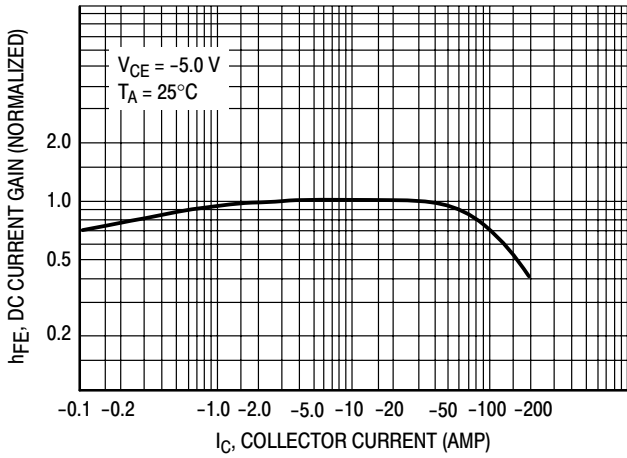


Figure 7. DC Current Gain

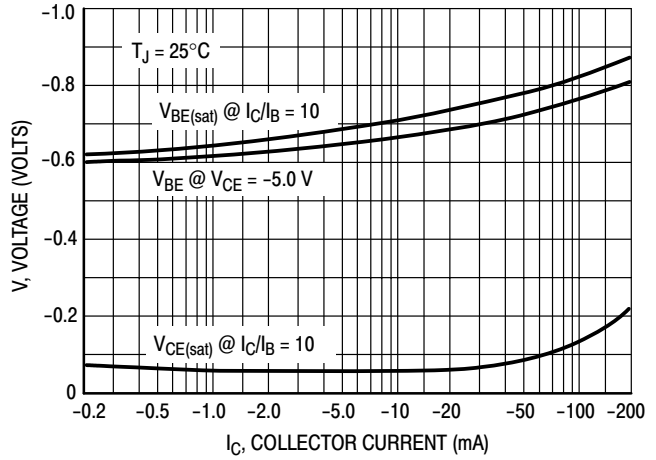


Figure 8. "On" Voltage

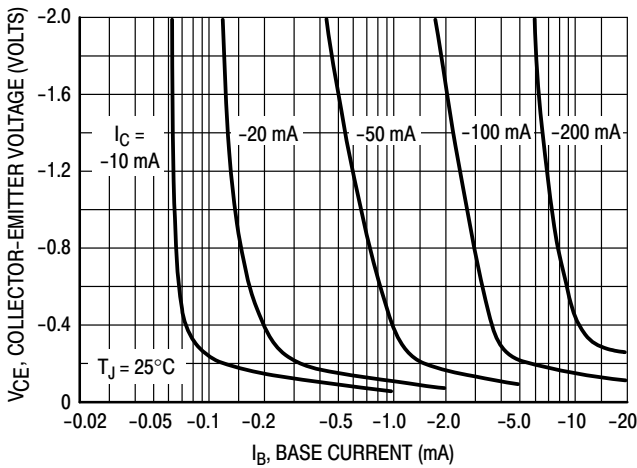


Figure 9. Collector Saturation Region

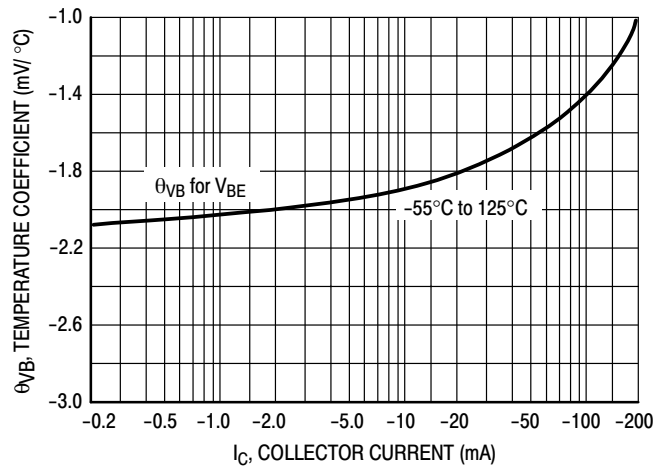


Figure 10. Base-Emitter Temperature Coefficient

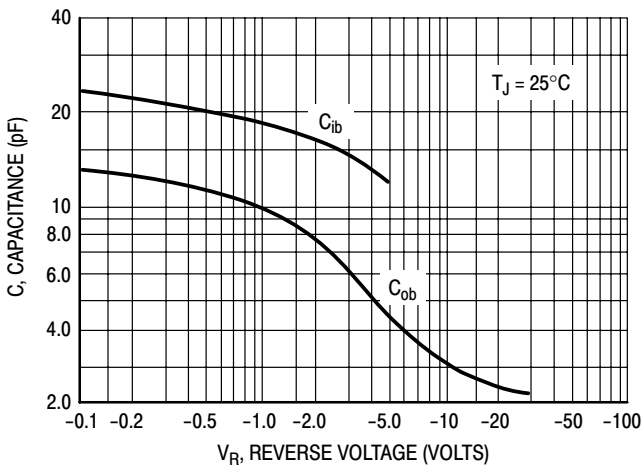


Figure 11. Capacitance

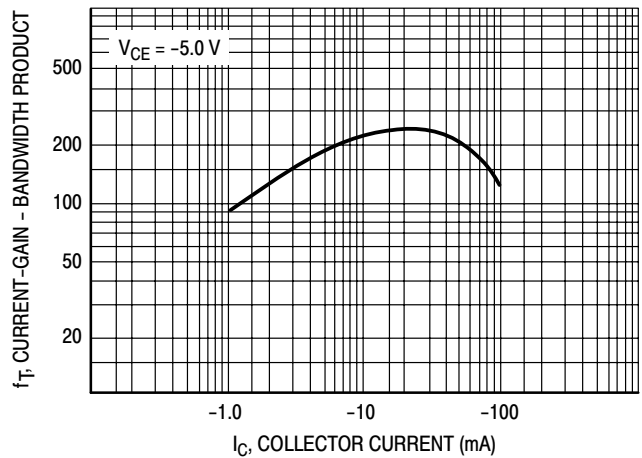


Figure 12. Current-Gain - Bandwidth Product

TYPICAL NPN CHARACTERISTICS – BC847 SERIES & BC848 SERIES

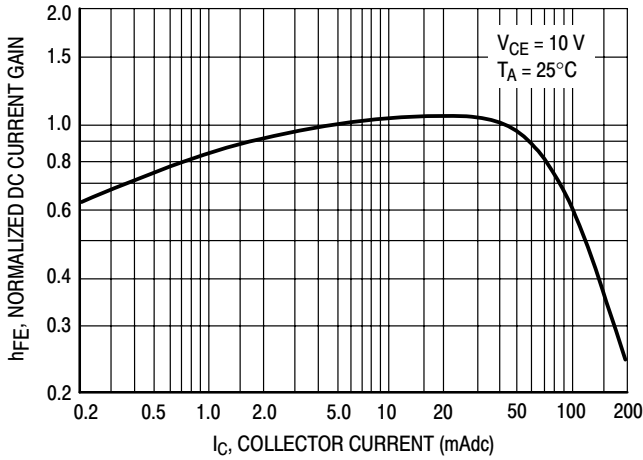


Figure 13. Normalized DC Current Gain

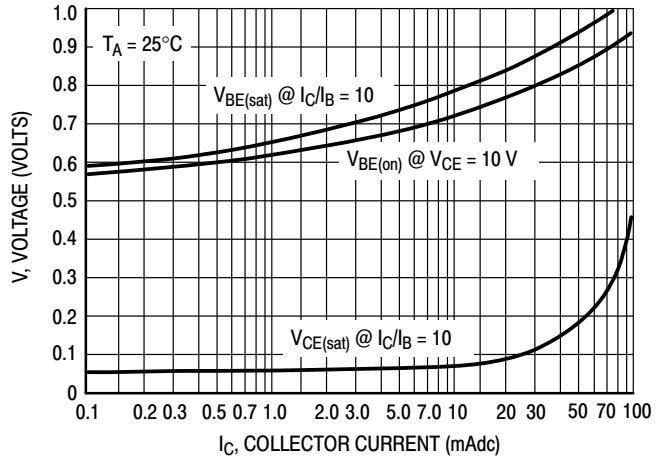


Figure 14. "Saturation" and "On" Voltages

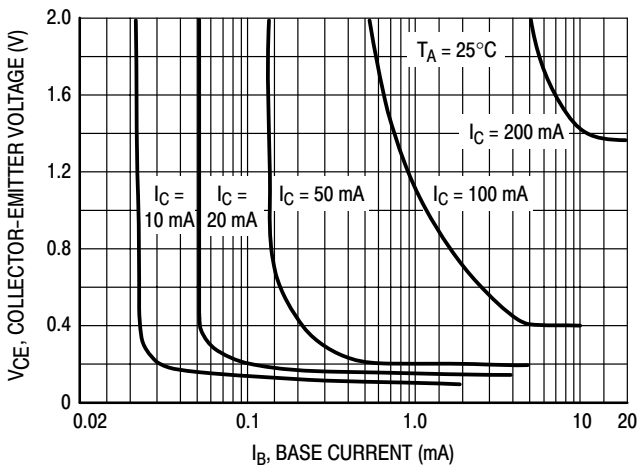


Figure 15. Collector Saturation Region

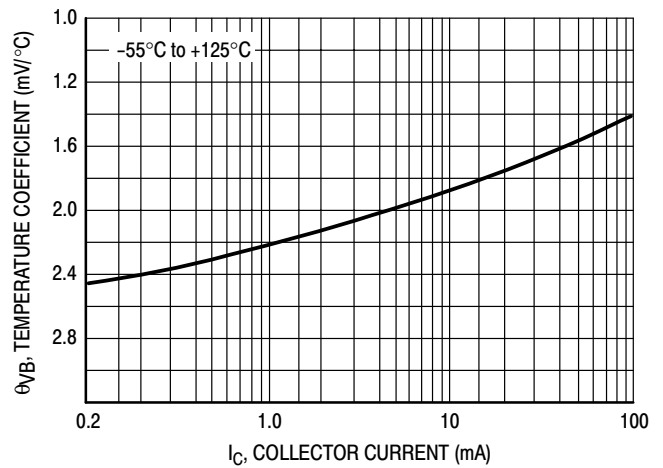


Figure 16. Base-Emitter Temperature Coefficient

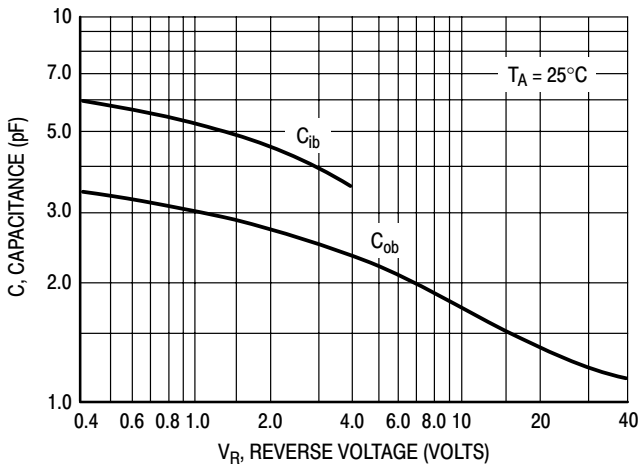


Figure 17. Capacitances

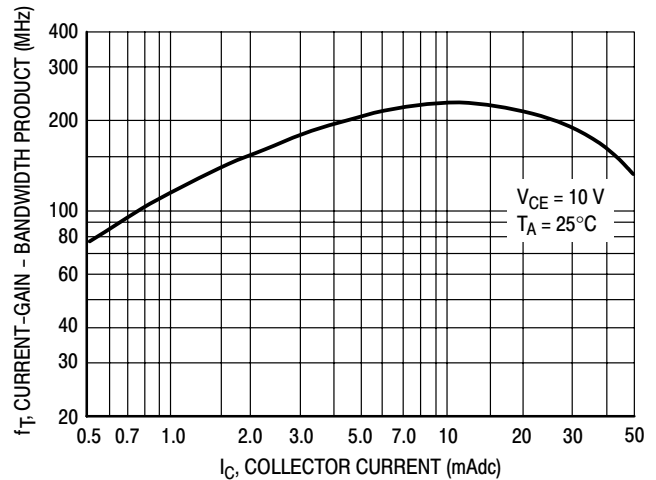


Figure 18. Current-Gain - Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC847 SERIES & BC848 SERIES

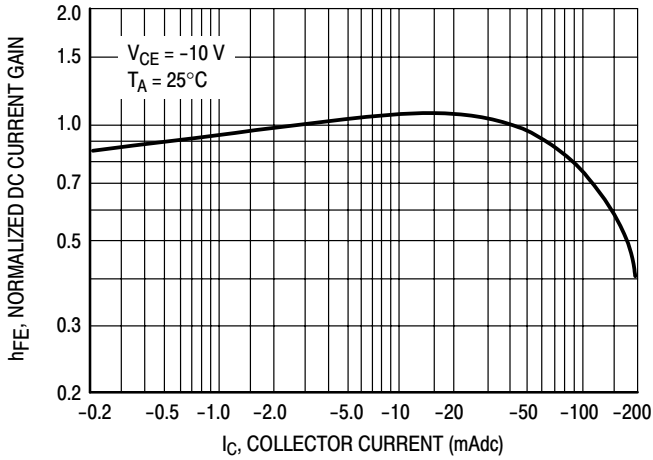


Figure 19. Normalized DC Current Gain

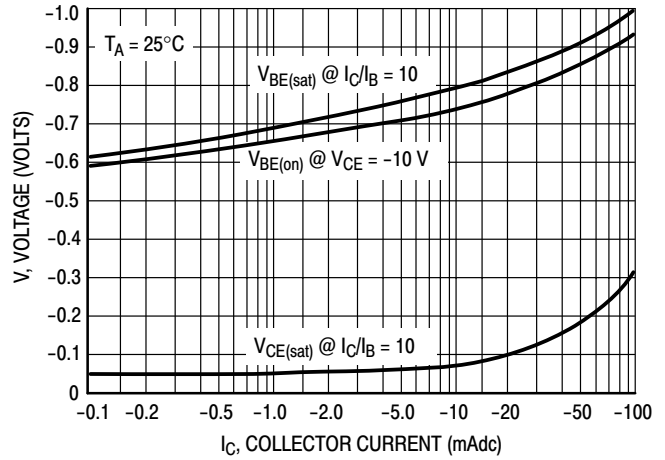


Figure 20. "Saturation" and "On" Voltages

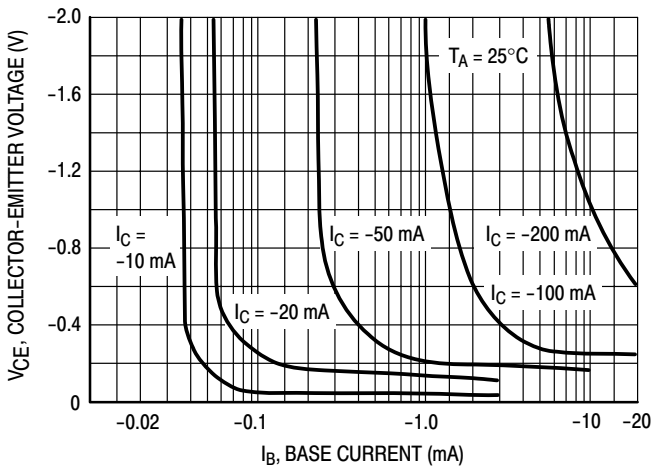


Figure 21. Collector Saturation Region

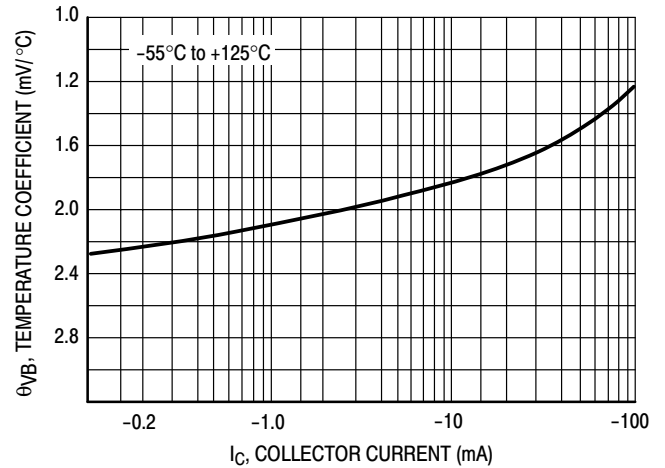


Figure 22. Base-Emitter Temperature Coefficient

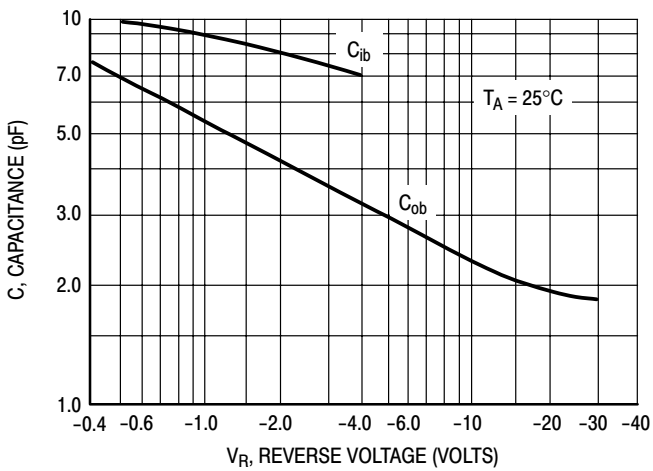


Figure 23. Capacitances

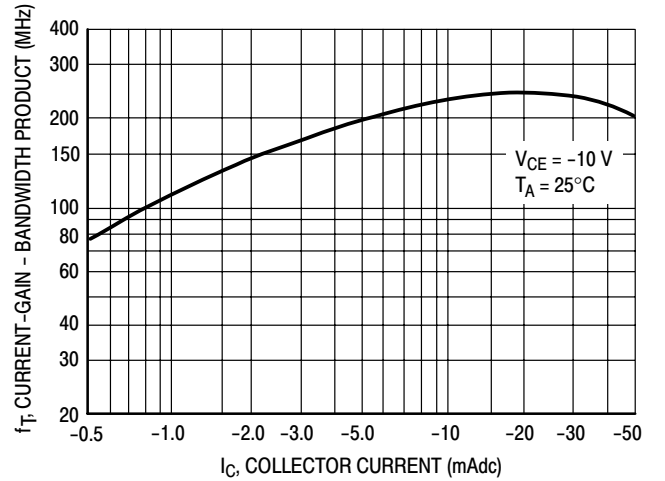


Figure 24. Current-Gain - Bandwidth Product

BC846BPDW1T1, BC847BPDW1T1 Series, BC848CPDW1T1 Series

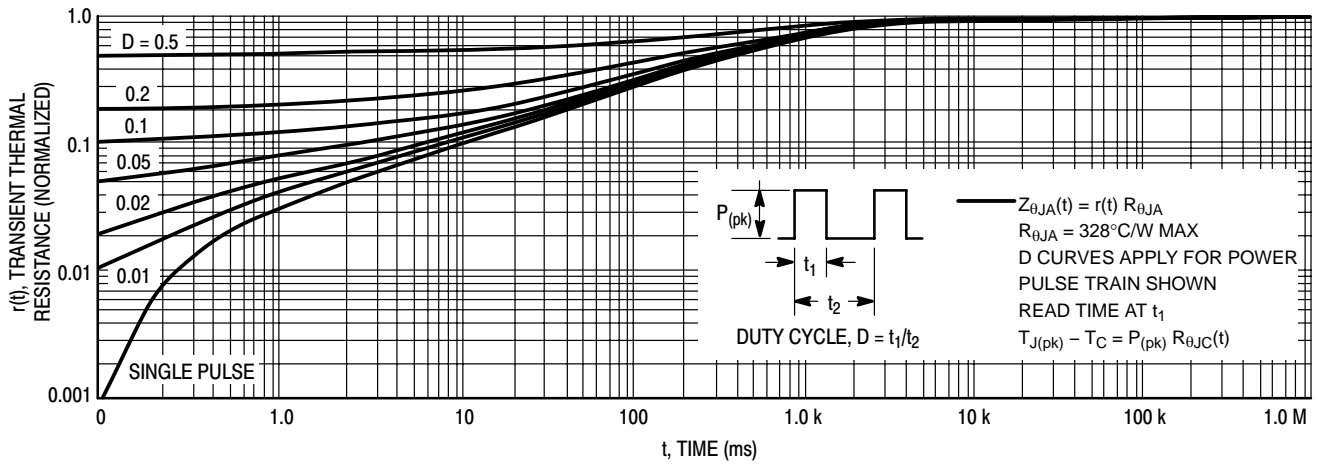


Figure 25. Thermal Response

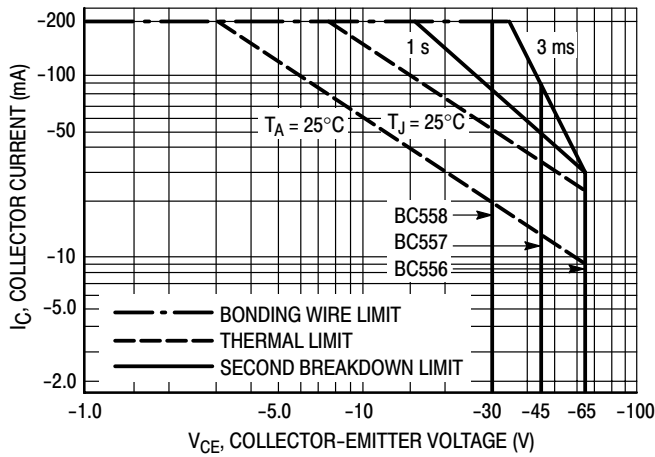


Figure 26. Active Region Safe Operating Area

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.

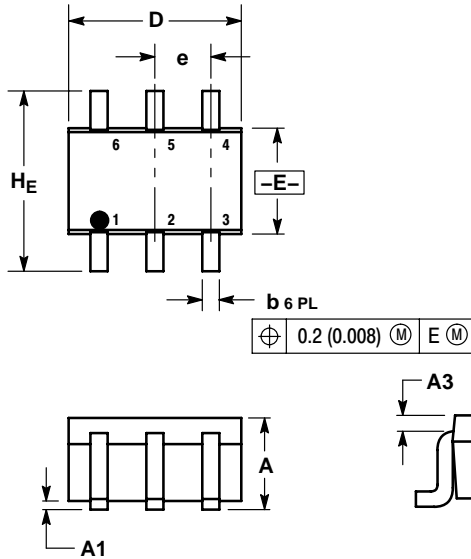
The data of Figure 26 is based upon  $T_{J(pk)} = 150^{\circ}\text{C}$ ;  $T_C$  or  $T_A$  is variable depending upon conditions. Pulse curves are valid for duty cycles to 10% provided  $T_{J(pk)} \leq 150^{\circ}\text{C}$ .  $T_{J(pk)}$  may be calculated from the data in Figure 25. At high case or ambient temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by the secondary breakdown.



# BC846BPDW1T1, BC847BPDW1T1 Series, BC848CPDW1T1 Series

## PACKAGE DIMENSIONS

SOT-363/SC-88  
CASE 419B-02  
ISSUE V



NOTES:

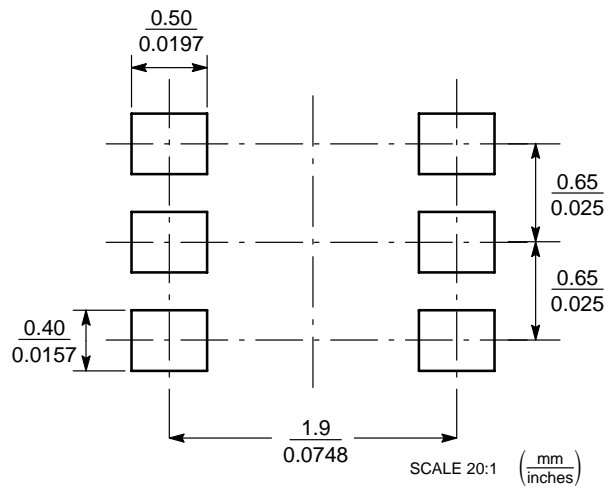
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B-01 OBSOLETE, NEW STANDARD 419B-02.

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\*



### 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.

# BC846BPDW1T1, BC847BPDW1T1 Series, BC848CPDW1T1 Series

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**BC846BPDW1T1/D**