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) BC846 Series BC847 Series BC848 Series	$V_{(BR)CEO}$	65 45 30	– – –	– – –	V
Collector–Emitter Breakdown Voltage ($I_C = 10$ μA, $V_{EB} = 0$) BC846 Series BC847B Only BC848 Series	$V_{(BR)CES}$	80 50 30	– – –	– – –	V
Collector–Base Breakdown Voltage ($I_C = 10$ μA) BC846 Series BC847 Series BC848 Series	$V_{(BR)CBO}$	80 50 30	– – –	– – –	V
Emitter–Base Breakdown Voltage ($I_E = 1.0$ μA) BC846 Series BC847 Series BC848 Series	$V_{(BR)EBO}$	6.0 6.0 5.0	– – –	– – –	V
Collector Cutoff Current ($V_{CB} = 30$ V) ($V_{CB} = 30$ V, $T_A = 150°C$)	I_{CBO}	– –	– –	15 5.0	nA μA
ON CHARACTERISTICS					
DC Current Gain ($I_C = 10$ μA, $V_{CE} = 5.0$ V) BC846B, BC847B BC847C, BC848C ($I_C = 2.0$ mA, $V_{CE} = 5.0$ V) BC846B, BC847B BC847C, BC848C	h_{FE}	– – 200 420	150 270 290 520	– – 475 800	–
Collector–Emitter Saturation Voltage ($I_C = 10$ mA, $I_B = 0.5$ mA) ($I_C = 100$ mA, $I_B = 5.0$ mA)	$V_{CE(sat)}$	– –	– –	0.25 0.6	V
Base–Emitter Saturation Voltage ($I_C = 10$ mA, $I_B = 0.5$ mA) ($I_C = 100$ mA, $I_B = 5.0$ mA)	$V_{BE(sat)}$	– –	0.7 0.9	– –	V
Base–Emitter Voltage ($I_C = 2.0$ mA, $V_{CE} = 5.0$ V) ($I_C = 10$ mA, $V_{CE} = 5.0$ V)	$V_{BE(on)}$	580 –	660 –	700 770	mV
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 ($I_C = -10$ mA)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CEO}$	-65 -45 -30	– – –	– – –	V
Collector–Emitter Breakdown Voltage ($I_C = -10$ μA, $V_{EB} = 0$)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CES}$	-80 -50 -30	– – –	– – –	V
Collector–Base Breakdown Voltage ($I_C = -10$ μA)	BC846 Series BC847 Series BC848 Series	$V_{(BR)CBO}$	-80 -50 -30	– – –	– – –	V
Emitter–Base Breakdown Voltage ($I_E = -1.0$ μA)	BC846 Series BC847 Series BC848 Series	$V_{(BR)EBO}$	-5.0 -5.0 -5.0	– – –	– – –	V
Collector Cutoff Current ($V_{CB} = -30$ V) ($V_{CB} = -30$ V, $T_A = 150$°C)		I_{CBO}	– –	– –	-15 -4.0	nA μA
ON CHARACTERISTICS						
DC Current Gain ($I_C = -10$ μA, $V_{CE} = -5.0$ V) BC846B, BC847B BC847C, BC848C ($I_C = -2.0$ mA, $V_{CE} = -5.0$ V) BC846B, BC847B BC847C, BC848C		h_{FE}	– – 200 420	150 270 290 520	– – 475 800	–
Collector–Emitter Saturation Voltage ($I_C = -10$ mA, $I_B = -0.5$ mA) ($I_C = -100$ mA, $I_B = -5.0$ mA)		$V_{CE(sat)}$	– –	– –	-0.3 -0.65	V
Base–Emitter Saturation Voltage ($I_C = -10$ mA, $I_B = -0.5$ mA) ($I_C = -100$ mA, $I_B = -5.0$ mA)		$V_{BE(sat)}$	– –	-0.7 -0.9	– –	V
Base–Emitter On Voltage ($I_C = -2.0$ mA, $V_{CE} = -5.0$ V) ($I_C = -10$ mA, $V_{CE} = -5.0$ V)		$V_{BE(on)}$	-0.6 –	– –	-0.75 -0.82	V
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

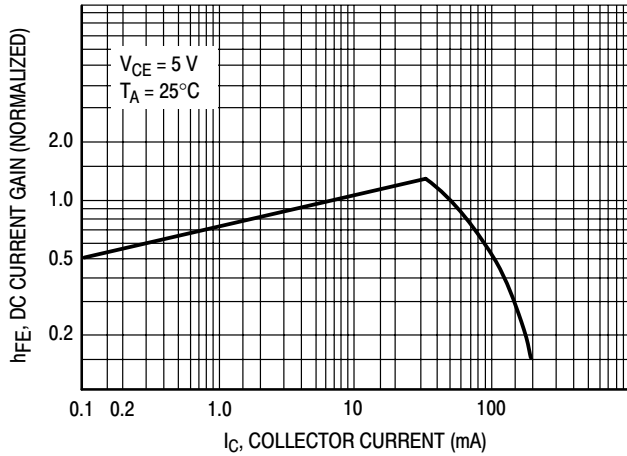## TYPICAL NPN CHARACTERISTICS − BC846

Figure 1. DC Current Gain

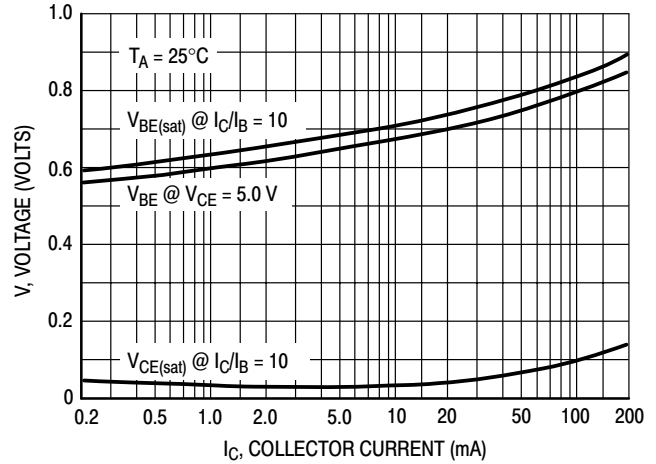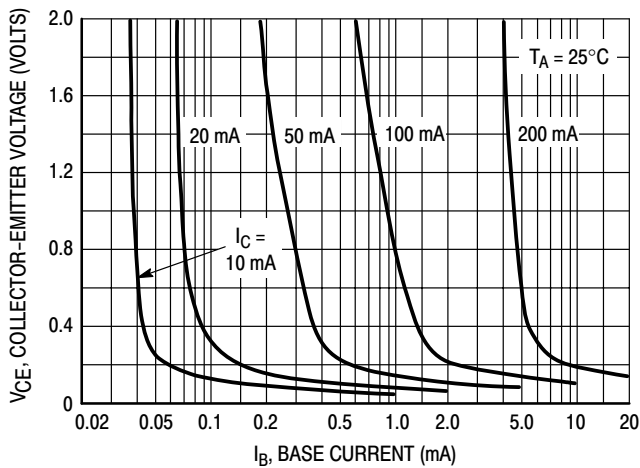
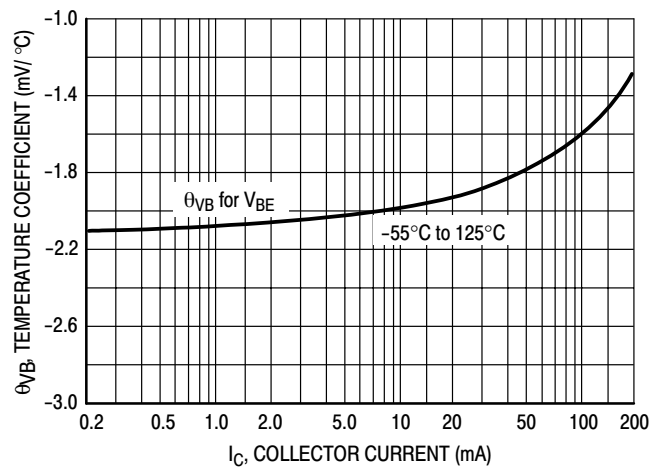Figure 2. "On" Voltage

Figure 3. Collector Saturation Region
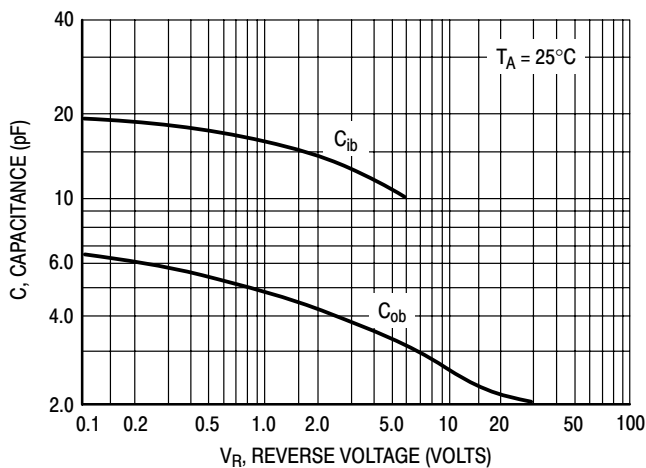

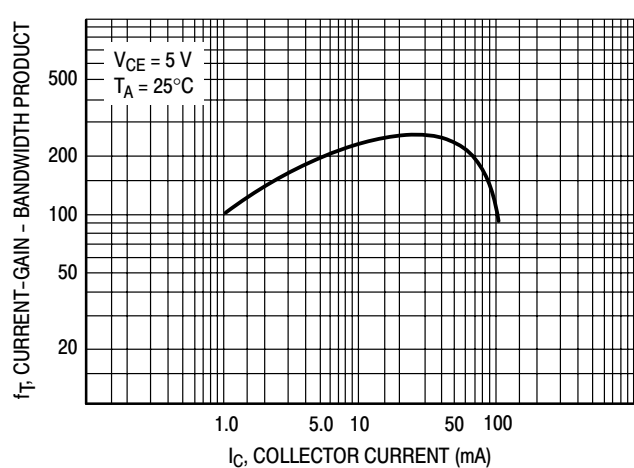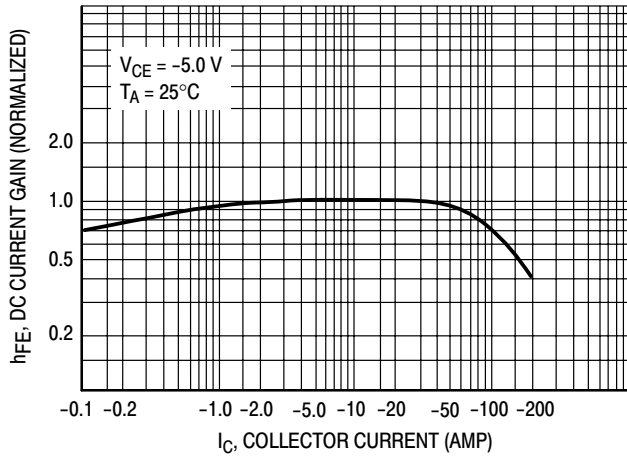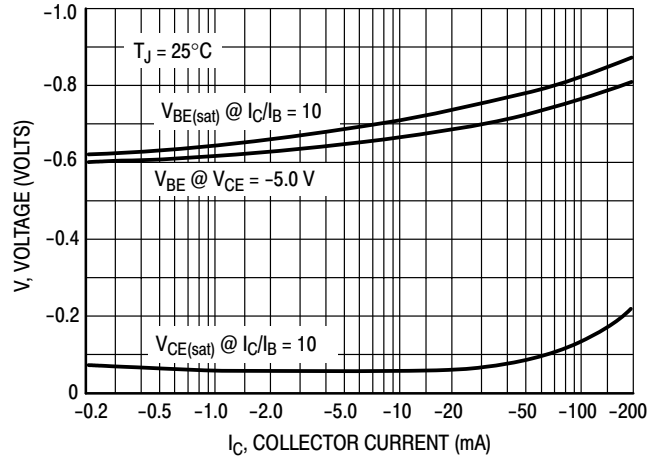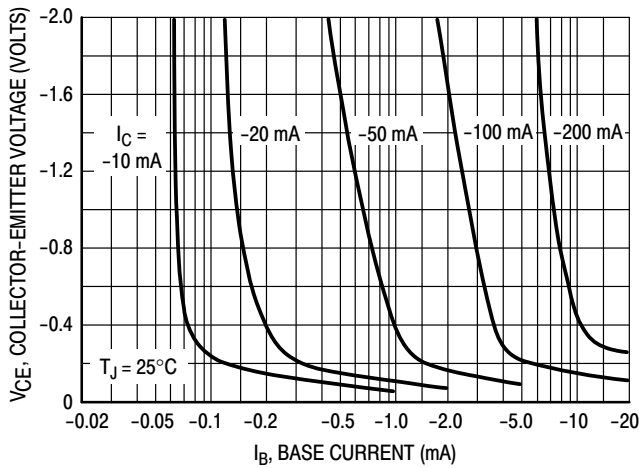Figure 4. Base−Emitter Temperature Coefficient

Figure 5. Capacitance

Figure 6. Current−Gain − Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC846

Figure 7. DC Current Gain

Figure 8. "On" Voltage
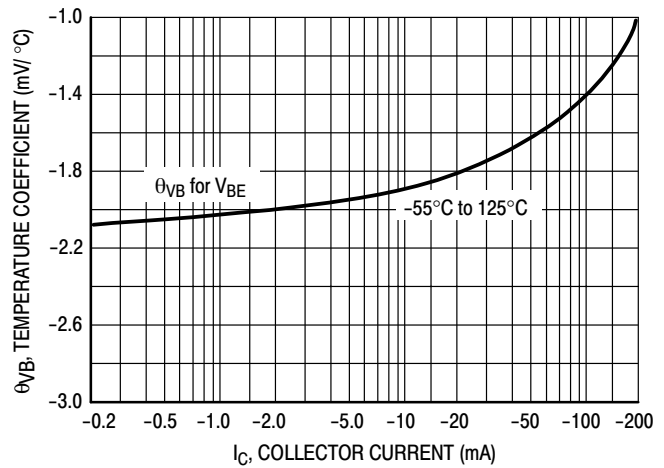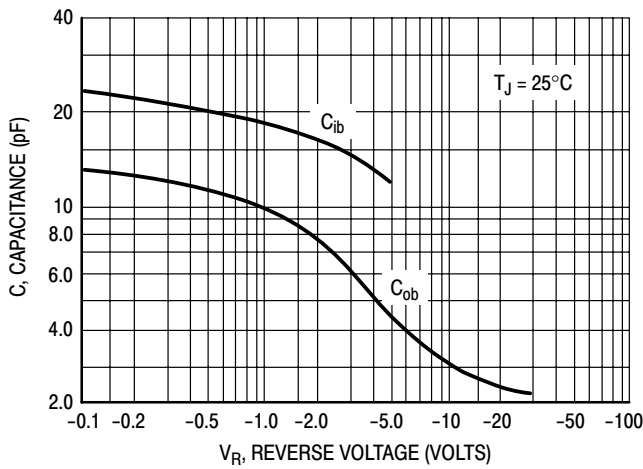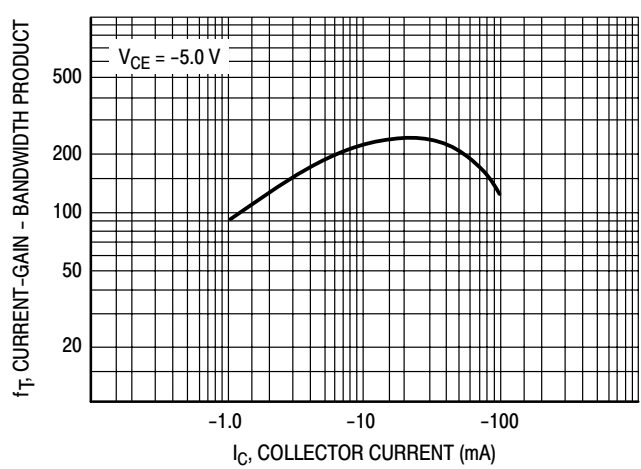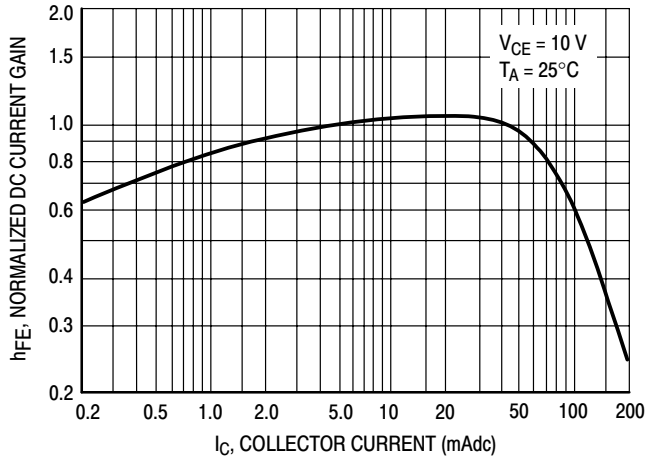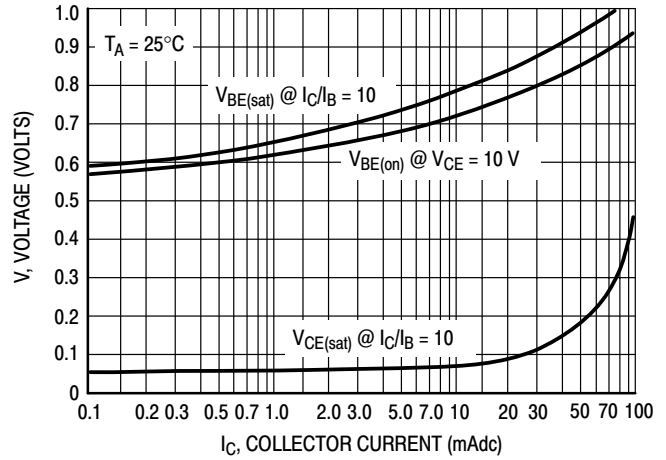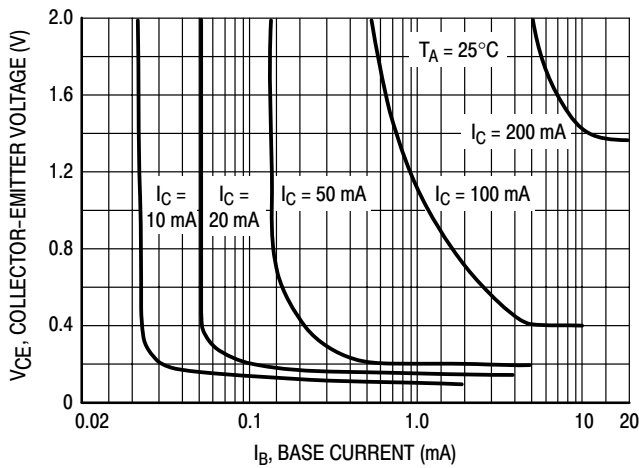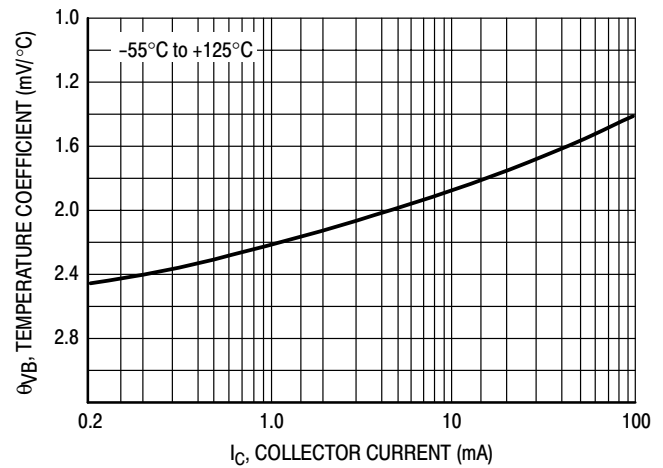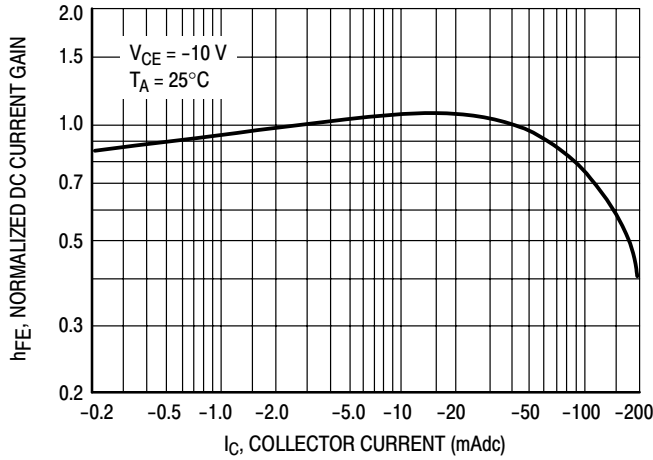

Figure 9. Collector Saturation Region

Figure 10. Base−Emitter Temperature Coefficient

Figure 11. Capacitance

Figure 12. Current−Gain – Bandwidth Product

TYPICAL NPN CHARACTERISTICS – BC847 SERIES & BC848 SERIES
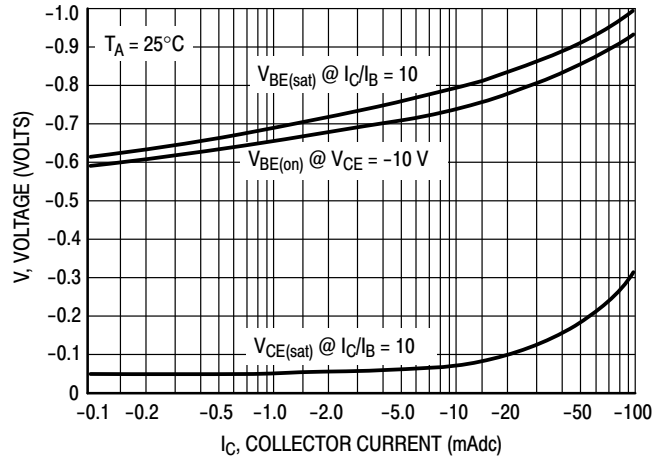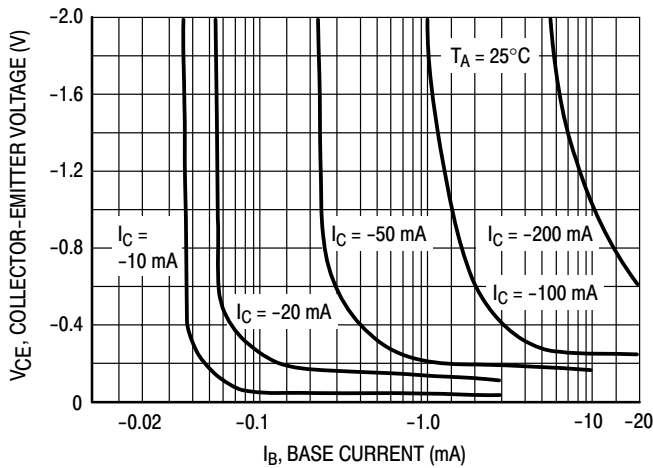
Figure 13. Normalized DC Current Gain

Figure 14. "Saturation" and "On" Voltages

Figure 15. Collector Saturation Region

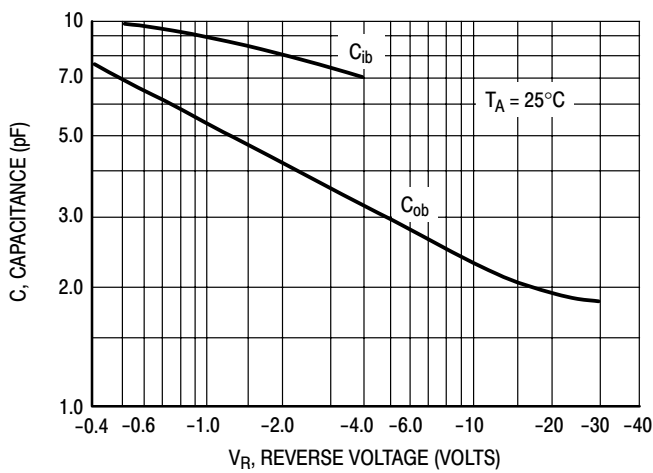**Figure 16. Base–Emitter Temperature Coefficient**
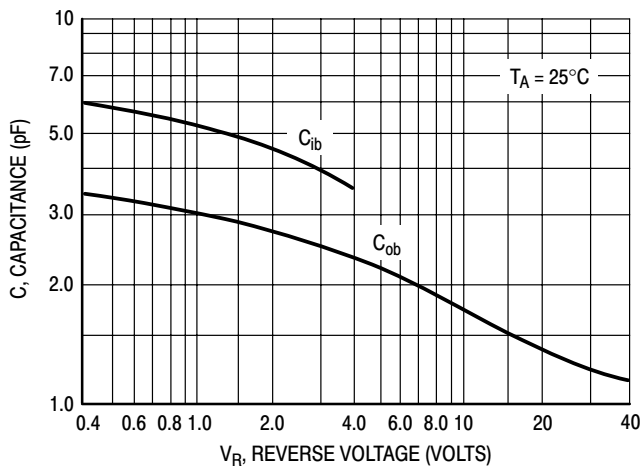
Figure 17. Capacitances
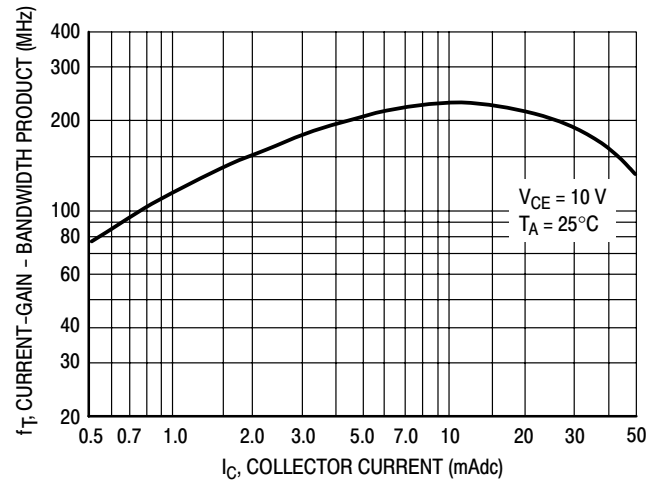
Figure 18. Current–Gain – Bandwidth Product

TYPICAL PNP CHARACTERISTICS — BC847 SERIES & BC848 SERIES

Figure 19. Normalized DC Current Gain

Figure 20. "Saturation" and "On" Voltages

Figure 21. Collector Saturation Region
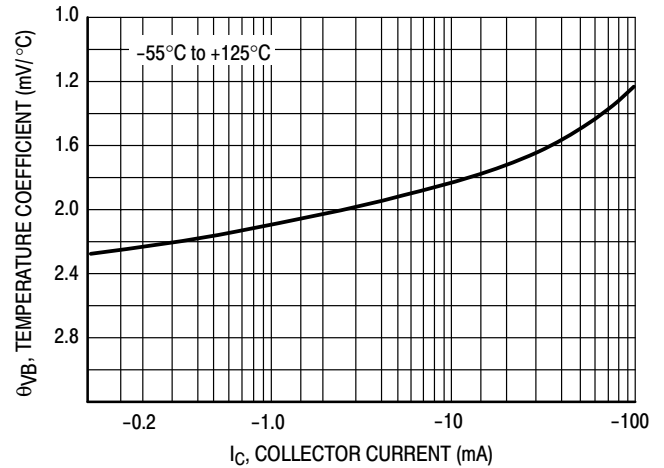
Figure 22. Base–Emitter Temperature Coefficient

Figure 23. Capacitances
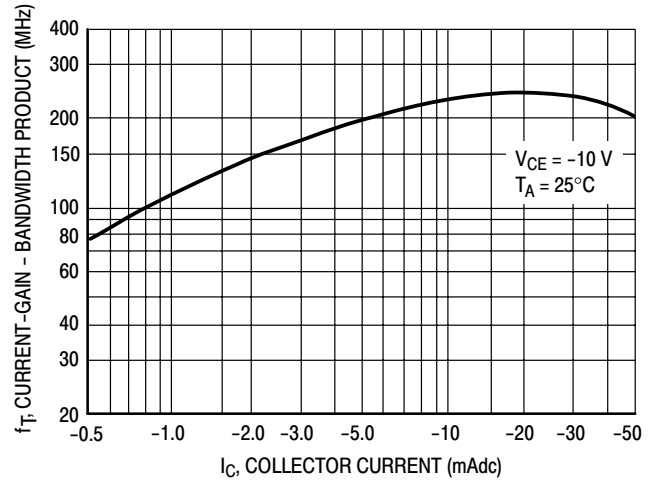
Figure 24. Current–Gain – Bandwidth Product
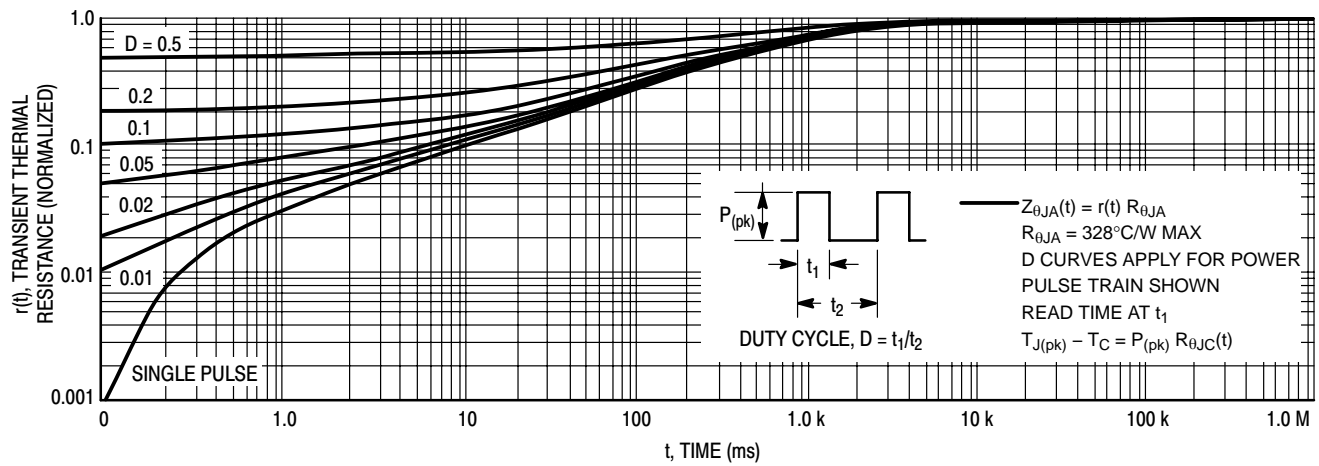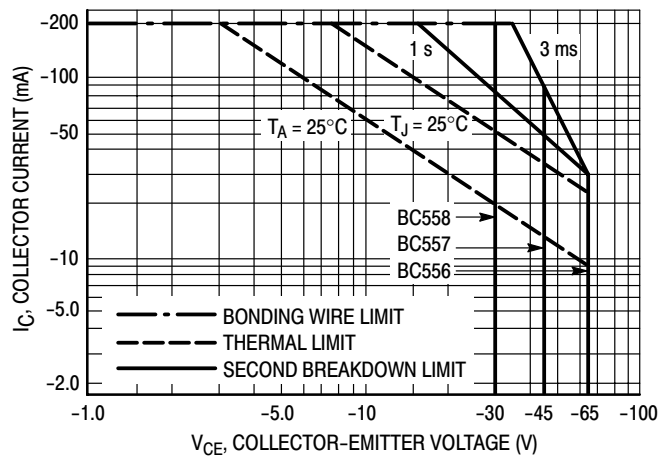
Figure 25. Thermal Response

**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 $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ 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
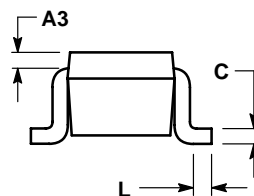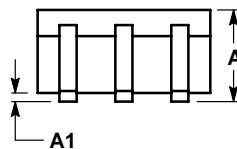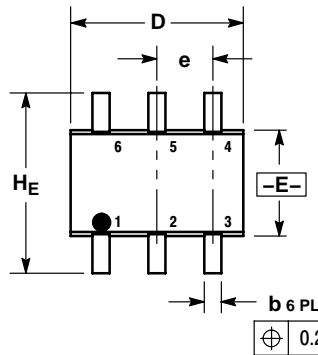
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 419B–01 OBSOLETE, NEW STANDARD 419B–02.

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
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*

SCALE 20:1 $\left(\dfrac{mm}{inches}\right)$
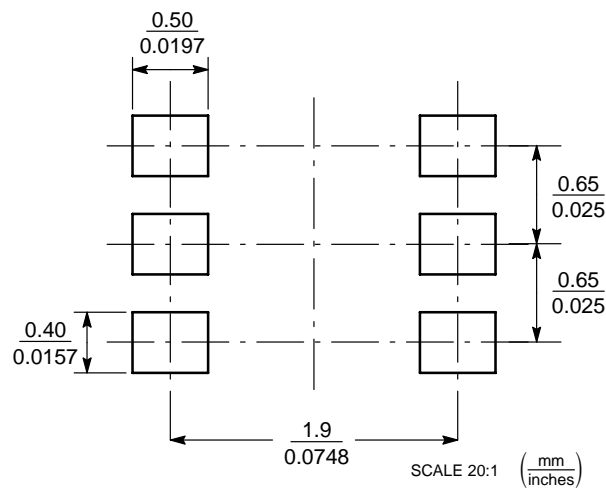
SC–88/SC70–6/SOT–363

*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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