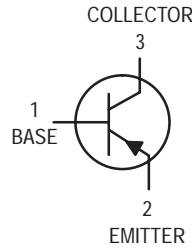


# General Purpose Transistors

## PNP Silicon

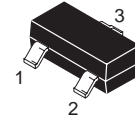


**BC856ALT1,BLT1  
BC857ALT1,BLT1  
BC858ALT1,BLT1,  
CLT1**

Motorola Preferred Devices

### MAXIMUM RATINGS

Rating	Symbol	BC856	BC857	BC858	Unit
Collector–Emitter Voltage	$V_{CEO}$	–65	–45	–30	V
Collector–Base Voltage	$V_{CBO}$	–80	–50	–30	V
Emitter–Base Voltage	$V_{EBO}$	–5.0	–5.0	–5.0	V
Collector Current — Continuous	$I_C$	–100	–100	–100	mAdc



CASE 318–08, STYLE 6  
SOT–23 (TO–236AB)

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR–5 Board, (1) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Device Dissipation Alumina Substrate, (2) $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature	$T_J, T_{stg}$	–55 to +150	$^\circ\text{C}$

### DEVICE MARKING

BC856ALT1 = 3A; BC856BLT1 = 3B; BC857ALT1 = 3E; BC857BLT1 = 3F;  
BC858ALT1 = 3J; BC858BLT1 = 3K; BC858CLT1 = 3L

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage ( $I_C = -10\text{ mA}$ )	BC856 Series BC857 Series BC858 Series	$V_{(BR)CEO}$	–65 –45 –30	— — —	— — —	V
Collector–Emitter Breakdown Voltage ( $I_C = -10\ \mu\text{A}, V_{EB} = 0$ )	BC856 Series BC857 Series BC858 Series	$V_{(BR)CES}$	–80 –50 –30	— — —	— — —	V
Collector–Base Breakdown Voltage ( $I_C = -10\ \mu\text{A}$ )	BC856 Series BC857 Series BC858 Series	$V_{(BR)CBO}$	–80 –50 –30	— — —	— — —	V
Emitter–Base Breakdown Voltage ( $I_E = -1.0\ \mu\text{A}$ )	BC856 Series BC857 Series BC858 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 $\mu\text{A}$

1. FR–5 = 1.0 x 0.75 x 0.062 in    2. Alumina = 0.4 x 0.3 x 0.024 in. 99.5% alumina.

Preferred devices are Motorola recommended choices for future use and best overall value.

**BC856ALT1,BLT1 BC857ALT1,BLT1 BC858ALT1,BLT1,CLT1**

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>ON CHARACTERISTICS</b>					
DC Current Gain ( $I_C = -10\ \mu\text{A}$ , $V_{CE} = -5.0\ \text{V}$ )	BC856A, BC857A, BC858A BC856A, BC857A, BC858A BC858C	$h_{FE}$	— — —	90 150 270	— — —
( $I_C = -2.0\ \text{mA}$ , $V_{CE} = -5.0\ \text{V}$ )	BC856A, BC857A, BC858A BC856B, BC857B, BC858B BC858C		125 220 420	180 290 520	250 475 800
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

BC857/BC858

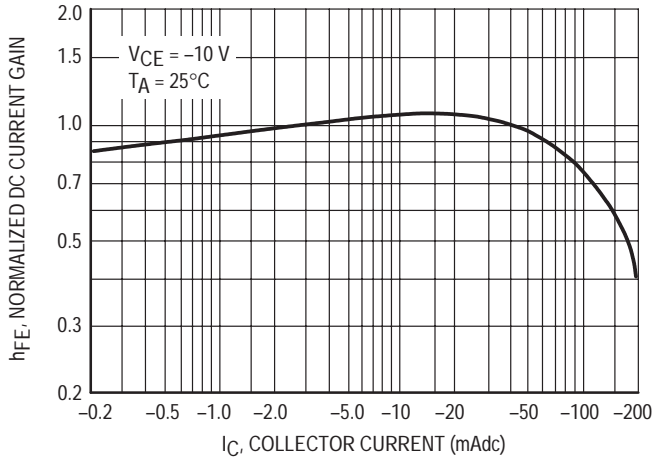


Figure 1. Normalized DC Current Gain

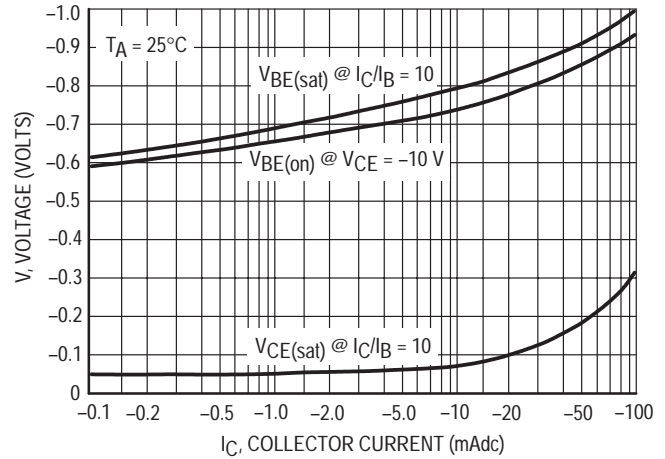


Figure 2. "Saturation" and "On" Voltages

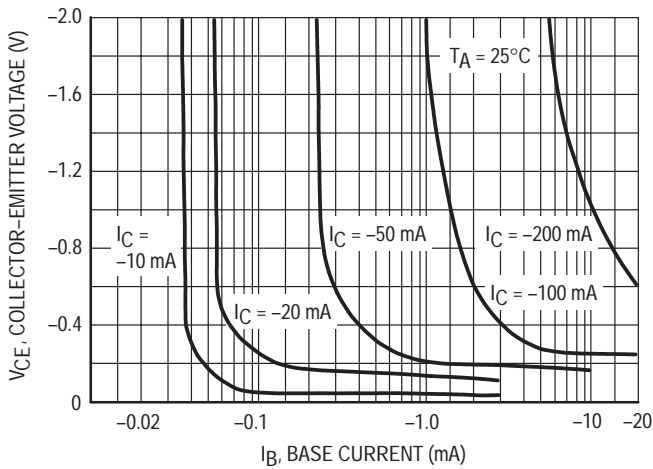


Figure 3. Collector Saturation Region

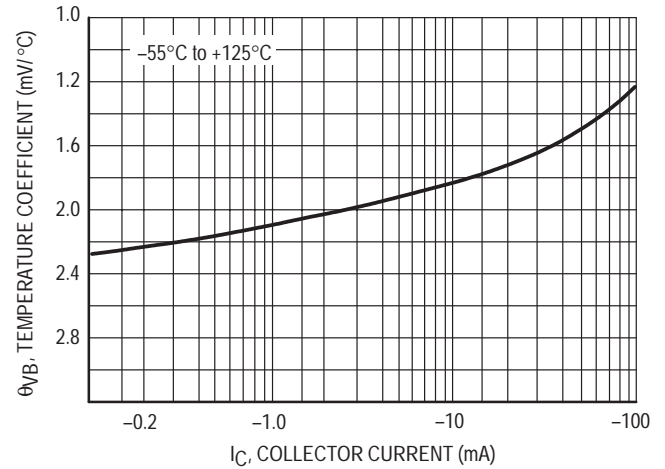


Figure 4. Base-Emitter Temperature Coefficient

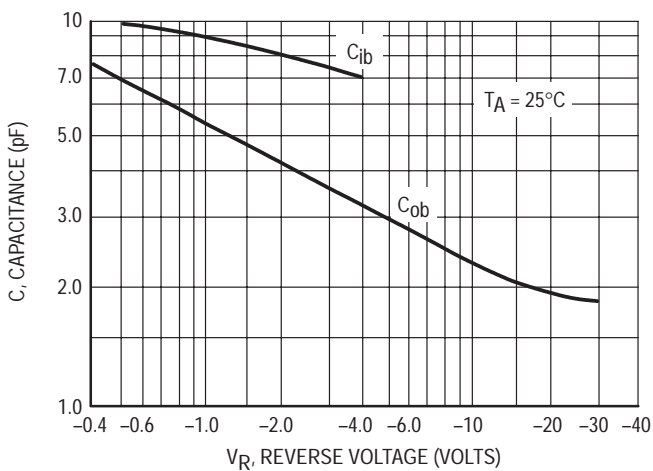


Figure 5. Capacitances

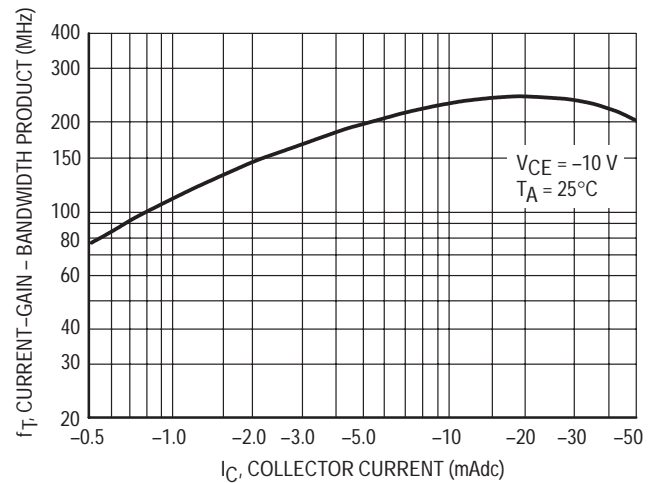


Figure 6. Current-Gain - Bandwidth Product

BC856

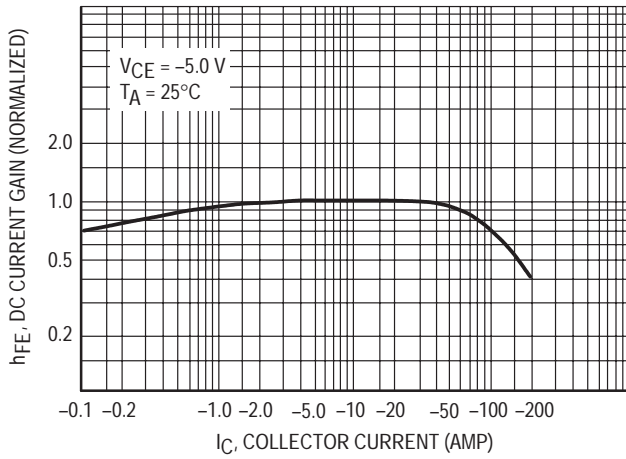


Figure 7. DC Current Gain

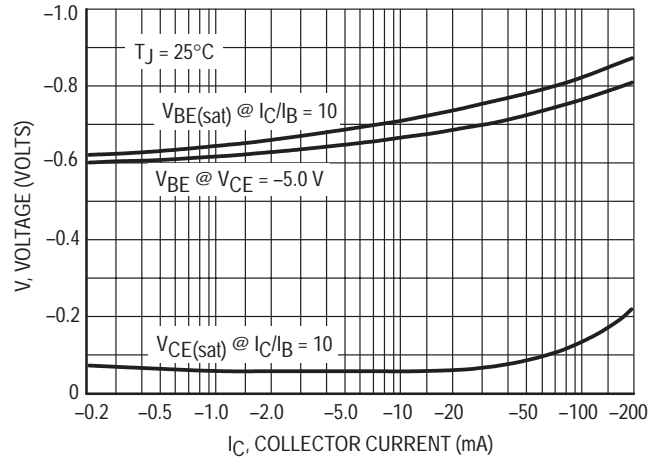


Figure 8. "On" Voltage

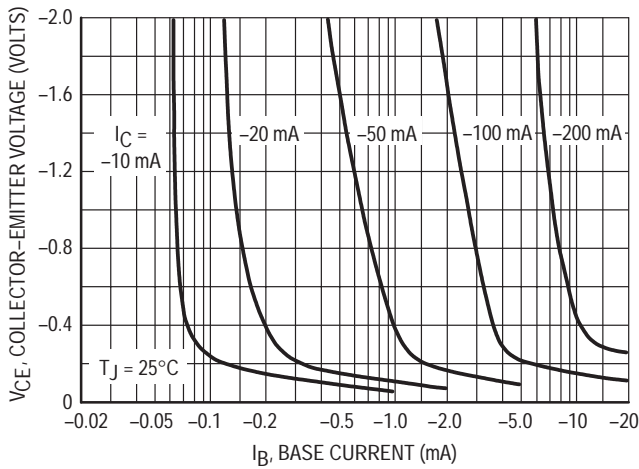


Figure 9. Collector Saturation Region

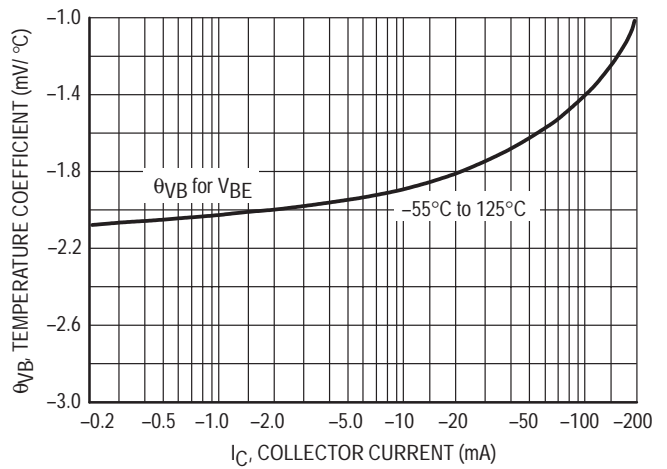


Figure 10. Base-Emitter Temperature Coefficient

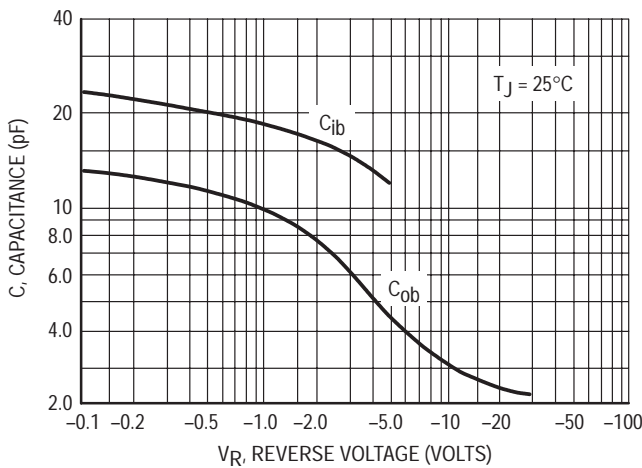


Figure 11. Capacitance

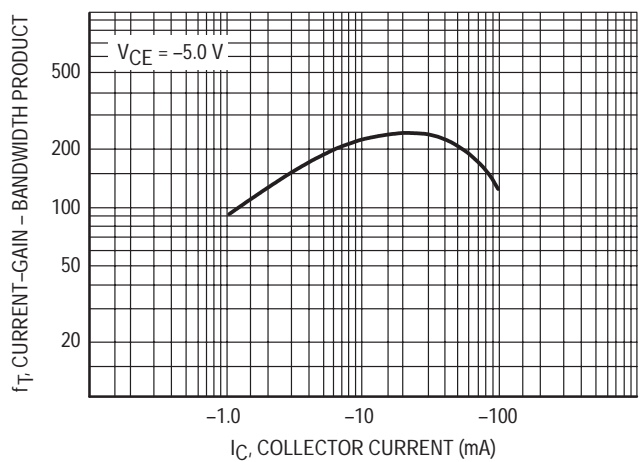
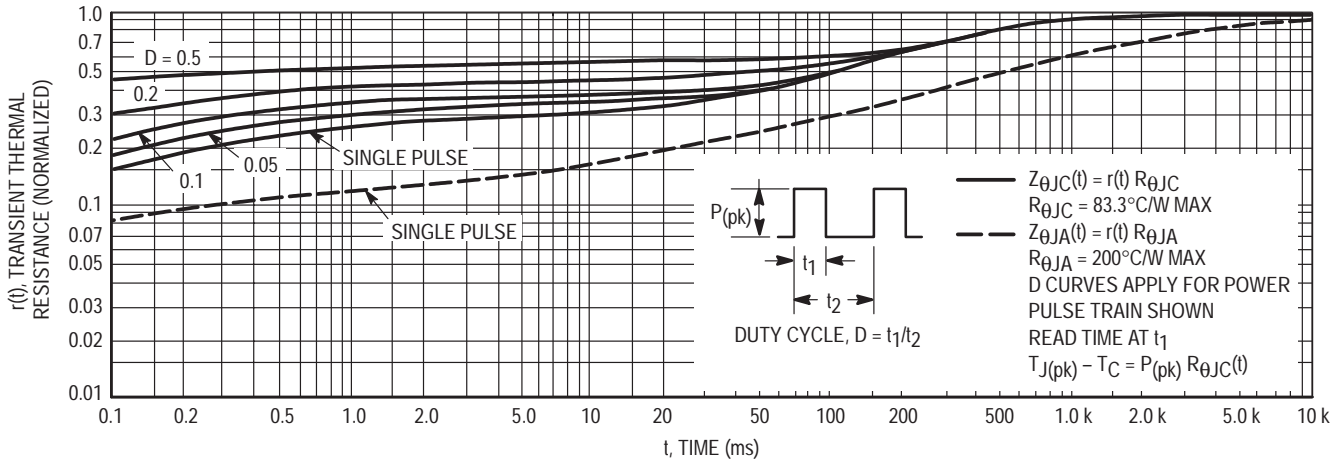
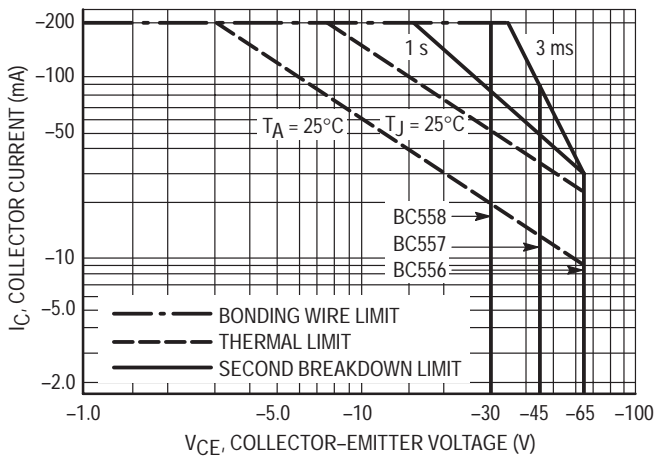


Figure 12. Current-Gain - Bandwidth Product

**BC856ALT1,BLT1 BC857ALT1,BLT1 BC858ALT1,BLT1,CLT1**



**Figure 13. Thermal Response**



**Figure 14. 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 14 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 13. 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.