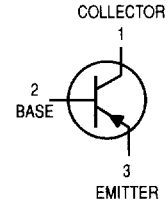
# Amplifier Transistors
## PNP Silicon

**BC556,B**
**BC557,A,B,C**
**BC558B**





**CASE 29–04, STYLE 17**
**TO–92 (TO–226AA)**

**MAXIMUM RATINGS**

| Rating | Symbol | BC556 | BC557 | BC558 | Unit |
|---|---|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | –65 | –45 | –30 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | –80 | –50 | –30 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | –5.0 | | | Vdc |
| Collector Current — Continuous | $I_C$ | –100 | | | mAdc |
| Total Device Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 625<br>5.0 | | | mW<br>mW/°C |
| Total Device Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 1.5<br>12 | | | Watt<br>mW/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | –55 to +150 | | | °C |

**THERMAL CHARACTERISTICS**

| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Ambient | $R_{\theta JA}$ | 200 | °C/W |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 83.3 | °C/W |

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

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector–Emitter Breakdown Voltage | | $V_{(BR)CEO}$ | | | | V |
| ($I_C$ = –2.0 mAdc, $I_B$ = 0) | BC556 | | –65 | — | — | |
| | BC557 | | –45 | — | — | |
| | BC558 | | –30 | — | — | |
| Collector–Base Breakdown Voltage | | $V_{(BR)CBO}$ | | | | V |
| ($I_C$ = –100 μAdc) | BC556 | | –80 | — | — | |
| | BC557 | | –50 | — | — | |
| | BC558 | | –30 | — | — | |
| Emitter–Base Breakdown Voltage | | $V_{(BR)EBO}$ | | | | V |
| ($I_E$ = –100 μAdc, $I_C$ = 0) | BC556 | | –5.0 | — | — | |
| | BC557 | | –5.0 | — | — | |
| | BC558 | | –5.0 | — | — | |
| Collector–Emitter Leakage Current | | $I_{CES}$ | | | | nA |
| ($V_{CES}$ = –40 V) | BC556 | | — | –2.0 | –100 | |
| ($V_{CES}$ = –20 V) | BC557 | | — | –2.0 | –100 | |
| | BC558 | | — | –2.0 | –100 | |
| ($V_{CES}$ = –20 V, $T_A$ = 125°C) | BC556 | | — | — | –4.0 | μA |
| | BC557 | | — | — | –4.0 | |
| | BC558 | | — | — | –4.0 | |

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted) (Continued)

| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **ON CHARACTERISTICS** | | | | | | |
| DC Current Gain | | $h_{FE}$ | | | | — |
| ($I_C$ = −10 μAdc, $V_{CE}$ = −5.0 V) | BC557A | | — | 90 | — | |
| | BC556B/557B/558B | | — | 150 | — | |
| | BC557C | | — | 270 | — | |
| ($I_C$ = −2.0 mAdc, $V_{CE}$ = −5.0 V) | BC556 | | 120 | — | 500 | |
| | BC557 | | 120 | — | 800 | |
| | BC558 | | 120 | — | 800 | |
| | BC557A | | 120 | 170 | 220 | |
| | BC556B/557B/558B | | 180 | 290 | 460 | |
| | BC557C | | 420 | 500 | 800 | |
| ($I_C$ = −100 mAdc, $V_{CE}$ = −5.0 V) | BC557A | | — | 120 | — | |
| | BC556B/557B/558B | | — | 180 | — | |
| | BC557C | | — | 300 | — | |
| Collector−Emitter Saturation Voltage | | $V_{CE(sat)}$ | | | | V |
| ($I_C$ = −10 mAdc, $I_B$ = −0.5 mAdc) | | | — | −0.075 | −0.3 | |
| ($I_C$ = −10 mAdc, $I_B$ = see Note 1) | | | — | −0.3 | −0.6 | |
| ($I_C$ = −100 mAdc, $I_B$ = −5.0 mAdc) | | | — | −0.25 | −0.65 | |
| Base−Emitter Saturation Voltage | | $V_{BE(sat)}$ | | | | V |
| ($I_C$ = −10 mAdc, $I_B$ = −0.5 mAdc) | | | — | −0.7 | — | |
| ($I_C$ = −100 mAdc, $I_B$ = −5.0 mAdc) | | | — | −1.0 | — | |
| Base−Emitter On Voltage | | $V_{BE(on)}$ | | | | V |
| ($I_C$ = −2.0 mAdc, $V_{CE}$ = −5.0 Vdc) | | | −0.55 | −0.62 | −0.7 | |
| ($I_C$ = −10 mAdc, $V_{CE}$ = −5.0 Vdc) | | | — | −0.7 | −0.82 | |
| **SMALL−SIGNAL CHARACTERISTICS** | | | | | | |
| Current−Gain — Bandwidth Product | | $f_T$ | | | | MHz |
| ($I_C$ = −10 mA, $V_{CE}$ = −5.0 V, f = 100 MHz) | BC556 | | — | 280 | — | |
| | BC557 | | — | 320 | — | |
| | BC558 | | — | 360 | — | |
| Output Capacitance ($V_{CB}$ = −10 V, $I_C$ = 0, f = 1.0 MHz) | | $C_{ob}$ | — | 3.0 | 6.0 | pF |
| Noise Figure | | NF | | | | dB |
| ($I_C$ = −0.2 mAdc, $V_{CE}$ = −5.0 V, | BC556 | | — | 2.0 | 10 | |
| $R_S$ = 2.0 kΩ, f = 1.0 kHz, Δf = 200 Hz) | BC557 | | — | 2.0 | 10 | |
| | BC558 | | — | 2.0 | 10 | |
| Small−Signal Current Gain | | $h_{fe}$ | | | | — |
| ($I_C$ = −2.0 mAdc, $V_{CE}$ = −5.0 V, f = 1.0 kHz) | BC556 | | 125 | — | 500 | |
| | BC557/558 | | 125 | — | 900 | |
| | BC557A | | 125 | 220 | 260 | |
| | BC556B/557B/558B | | 240 | 330 | 500 | |
| | BC557C | | 450 | 600 | 900 | |

Note 1: $I_C$ = −10 mAdc on the constant base current characteristics, which yields the point $I_C$ = −11 mAdc, $V_{CE}$ = −1.0 V.

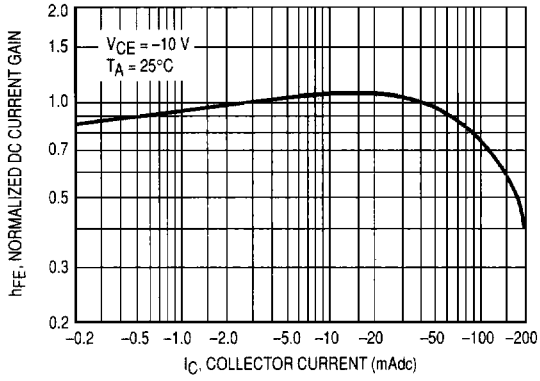



**Figure 1. Normalized DC Current Gain**

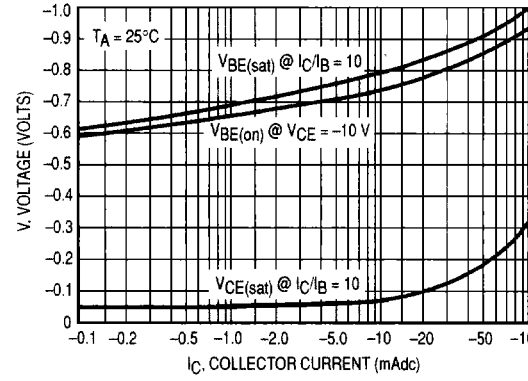



**Figure 2. "Saturation" and "On" Voltages**

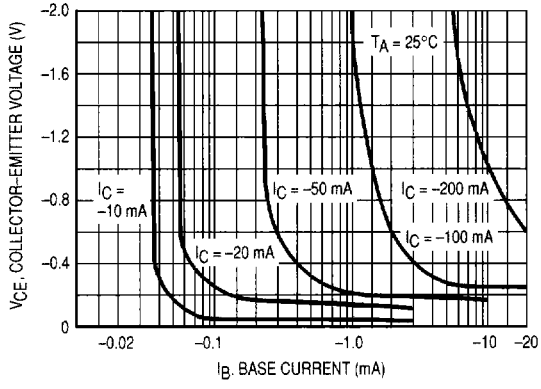



**Figure 3. Collector Saturation Region**

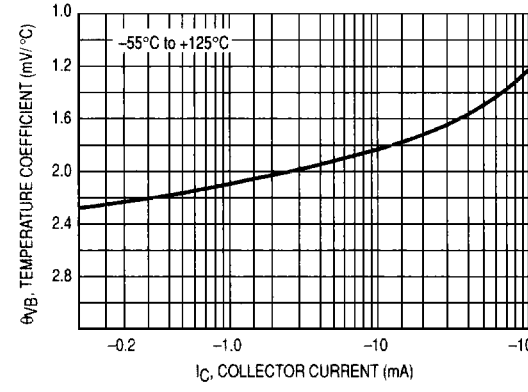



**Figure 4. Base–Emitter Temperature Coefficient**

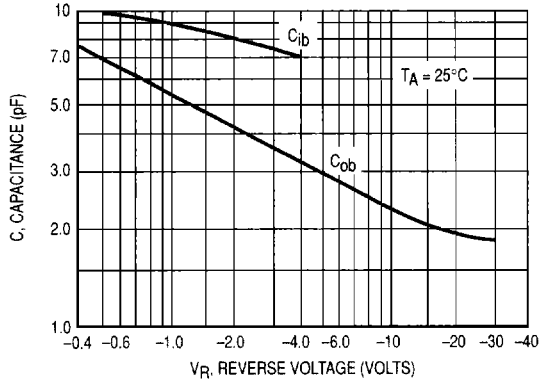



**Figure 5. Capacitances**

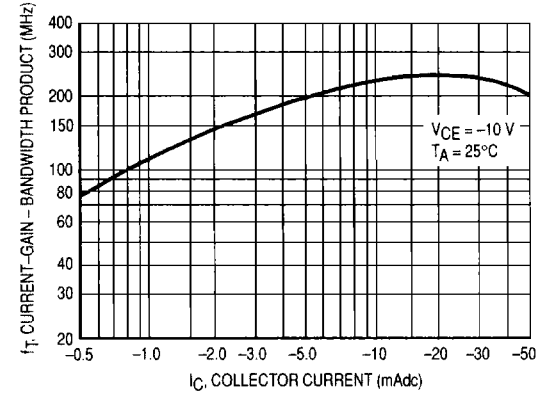



**Figure 6. Current–Gain – Bandwidth Product**

**BC556**

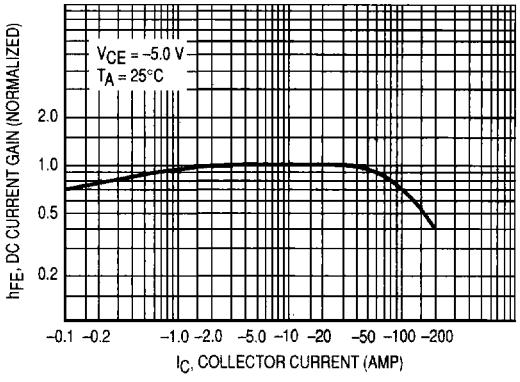



**Figure 7. DC Current Gain**

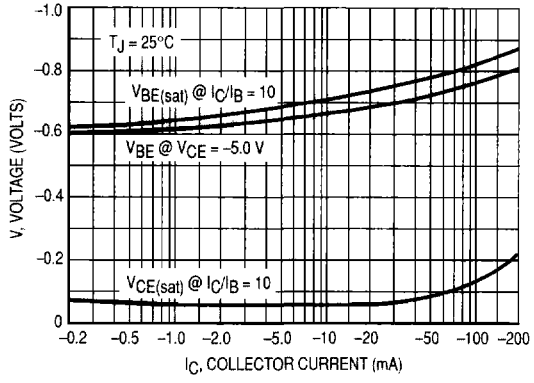



**Figure 8. "On" Voltage**

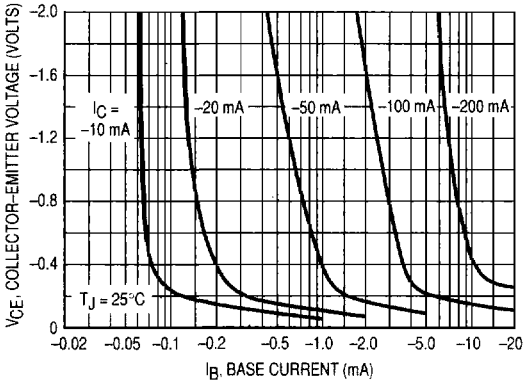



**Figure 9. Collector Saturation Region**

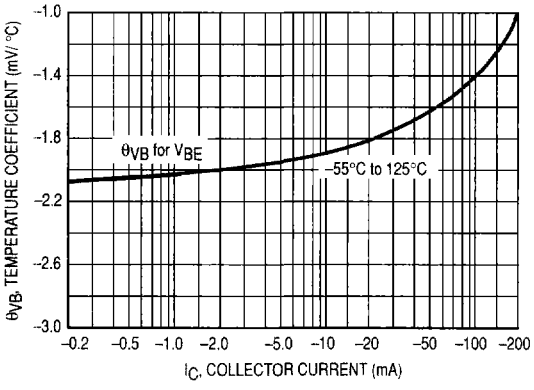



**Figure 10. Base–Emitter Temperature Coefficient**

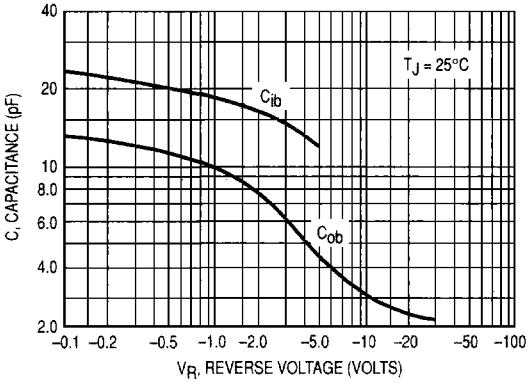



**Figure 11. Capacitance**

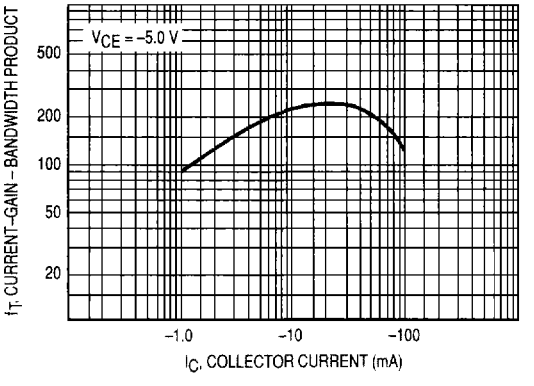



**Figure 12. Current–Gain – Bandwidth Product**

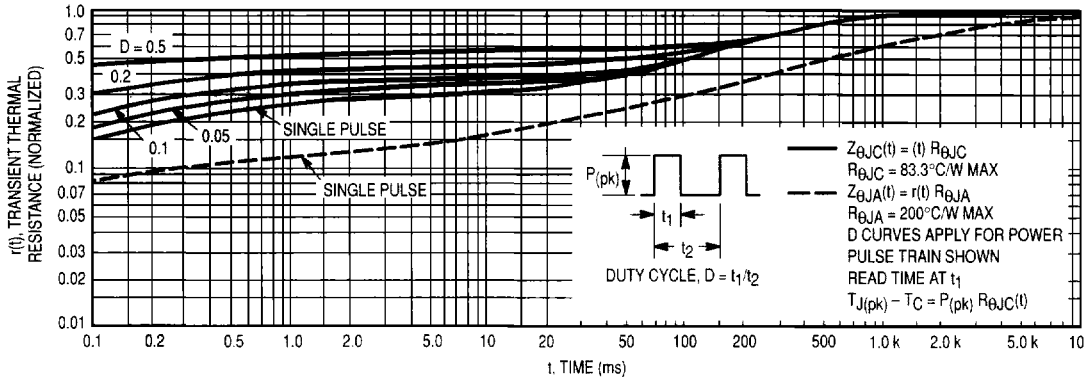



**Figure 13. Thermal Response**

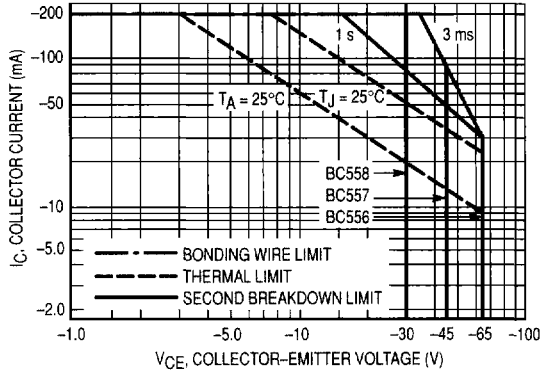



**Figure 14. Active Region — Safe Operating Area**

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°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 13. At high case or ambient temperatures, thermal limitations will reduce the power than can be handled to values less than the limitations imposed by second breakdown.