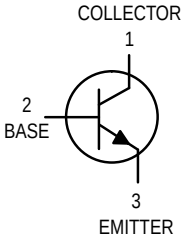
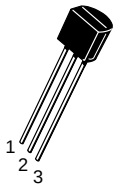
# High Current Transistors

## NPN Silicon

**BC489,A,B**




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

**MAXIMUM RATINGS**

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CEO}$ | 80 | Vdc |
| Collector–Base Voltage | $V_{CBO}$ | 80 | Vdc |
| Emitter–Base Voltage | $V_{EBO}$ | 5.0 | Vdc |
| Collector Current — Continuous | $I_C$ | 0.5 | Adc |
| 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)

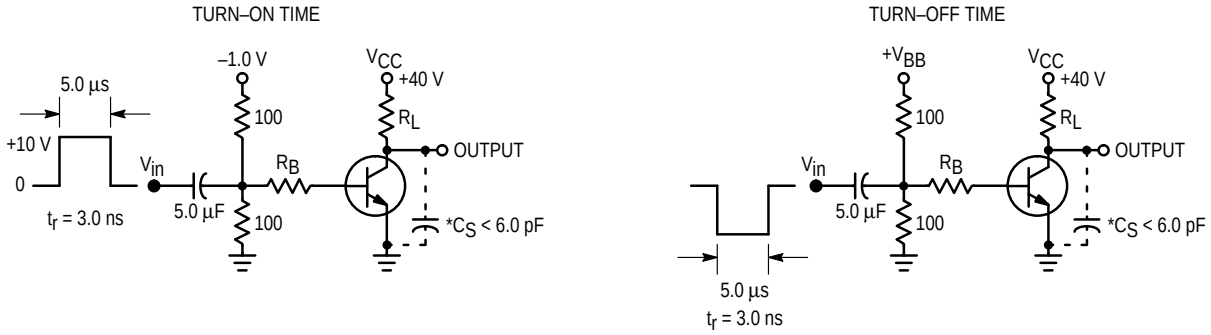
| Characteristic | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | |
| Collector–Emitter Breakdown Voltage(1)<br>($I_C$ = 10 mAdc, $I_B$ = 0) | | $V_{(BR)CEO}$ | 80 | — | — | Vdc |
| Collector–Base Breakdown Voltage<br>($I_C$ = 100 μAdc, $I_E$ = 0) | | $V_{(BR)CBO}$ | 80 | — | — | Vdc |
| Emitter–Base Breakdown Voltage<br>($I_E$ = 10 μAdc, $I_C$ = 0) | | $V_{(BR)EBO}$ | 5.0 | — | — | Vdc |
| Collector Cutoff Current<br>($V_{CB}$ = 60 Vdc, $I_E$ = 0) | | $I_{CBO}$ | — | — | 100 | nAdc |
| **ON CHARACTERISTICS*** | | | | | | |
| DC Current Gain | | $h_{FE}$ | | | | — |
| ($I_C$ = 10 mAdc, $V_{CE}$ = 2.0 Vdc) | | | 40 | — | — | |
| ($I_C$ = 100 mAdc, $V_{CE}$ = 2.0 Vdc) | BC489 | | 60 | — | 400 | |
| | BC489A | | 100 | 160 | 250 | |
| | BC489B | | 160 | 260 | 400 | |
| ($I_C$ = 1.0 Adc, $V_{CE}$ = 5.0 Vdc)* | | | 15 | — | — | |

1. Pulse Test: Pulse Width = 300 μs, Duty Cycle 2%.

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **ON CHARACTERISTICS*** (Continued) | | | | | |
| Collector–Emitter Saturation Voltage<br>($I_C$ = 500 mAdc, $I_B$ = 50 mAdc)<br>($I_C$ = 1.0 Adc, $I_B$ = 100 mAdc) | $V_{CE(sat)}$ | <br>—<br>— | <br>0.2<br>0.3 | <br>0.5<br>— | Vdc |
| Base–Emitter Saturation Voltage<br>($I_C$ = 500 mAdc, $I_B$ = 50 mAdc)<br>($I_C$ = 1.0 Adc, $I_B$ = 100 mAdc)(1) | $V_{BE(sat)}$ | <br>—<br>— | <br>0.85<br>0.9 | <br>1.2<br>— | Vdc |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Current–Gain — Bandwidth Product<br>($I_C$ = 50 mAdc, $V_{CE}$ = 2.0 Vdc, f = 100 MHz) | $f_T$ | — | 200 | — | MHz |
| Output Capacitance<br>($V_{CB}$ = 10 Vdc, $I_E$ = 0, f = 1.0 MHz) | $C_{ob}$ | — | 7.0 | — | pF |
| Input Capacitance<br>($V_{EB}$ = 0.5 Vdc, $I_C$ = 0, f = 1.0 MHz) | $C_{ib}$ | — | 50 | — | pF |

1. Pulse Test: Pulse Width = 300 μs, Duty Cycle 2.0%.




* Total Shunt Capacitance of Test Jig and Connectors
For PNP Test Circuits, Reverse All Voltage Polarities

**Figure 1. Switching Time Test Circuits**

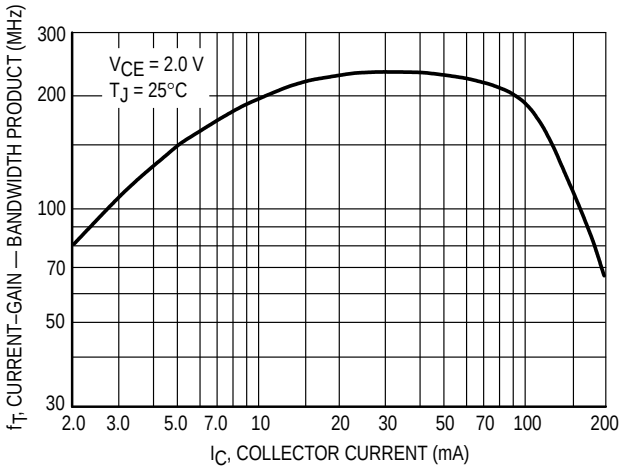



**Figure 2. Current–Gain — Bandwidth Product**

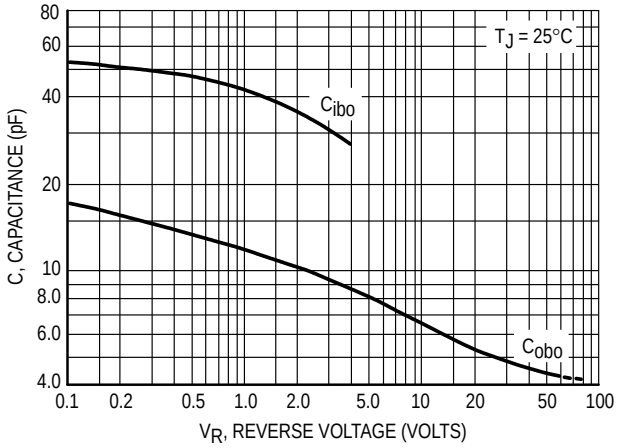



**Figure 3. Capacitance**

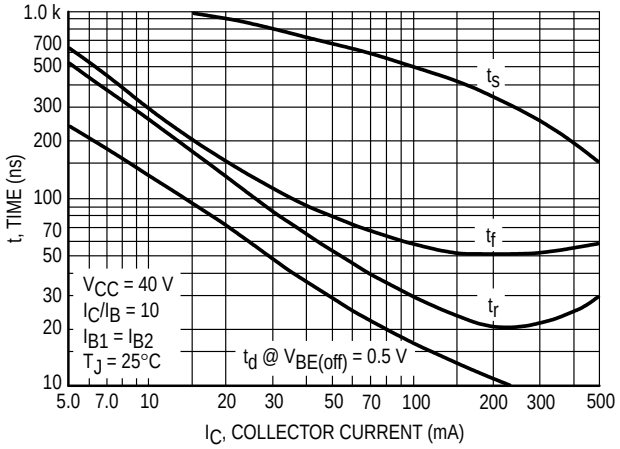



**Figure 4. Switching Time**

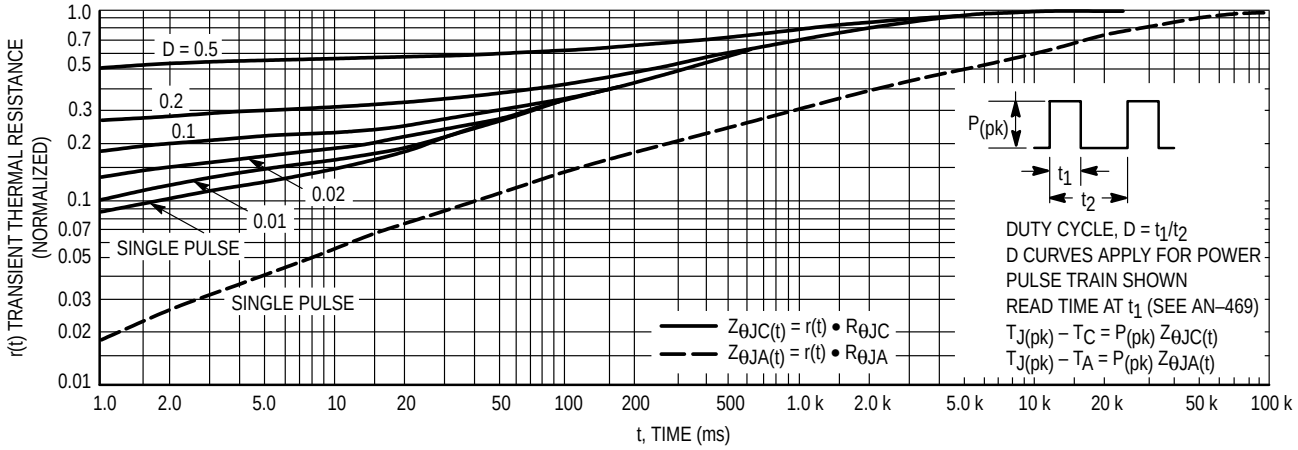



**Figure 5. Thermal Response**

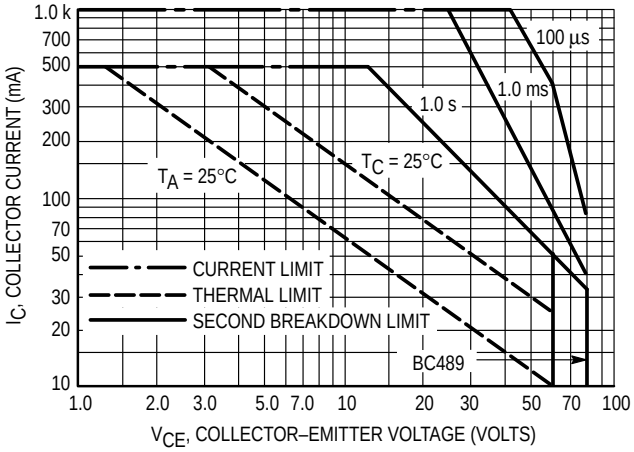



**Figure 6. Active Region — Safe Operating Area**

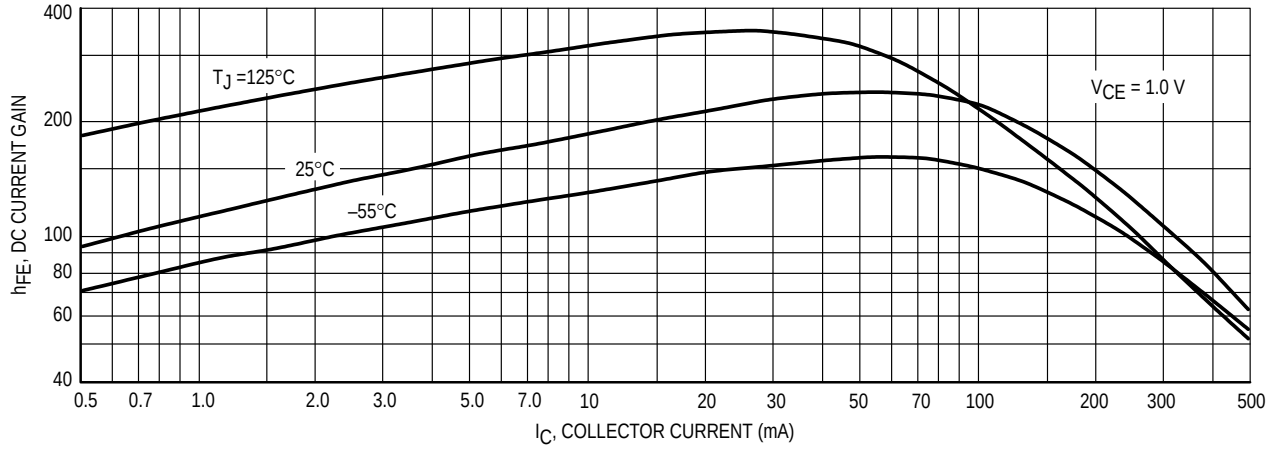



**Figure 7. DC Current Gain**

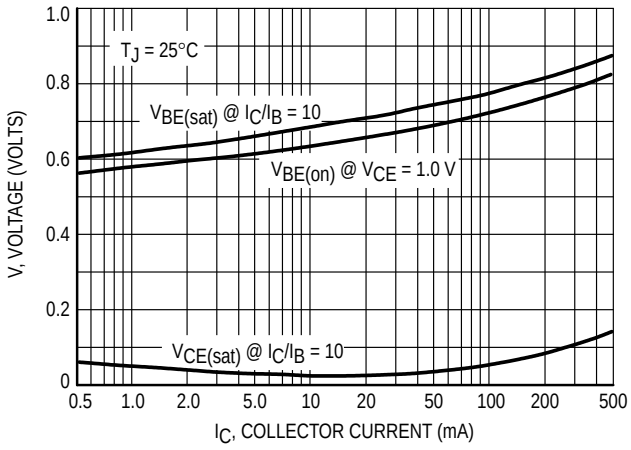



**Figure 8. “On” Voltages**

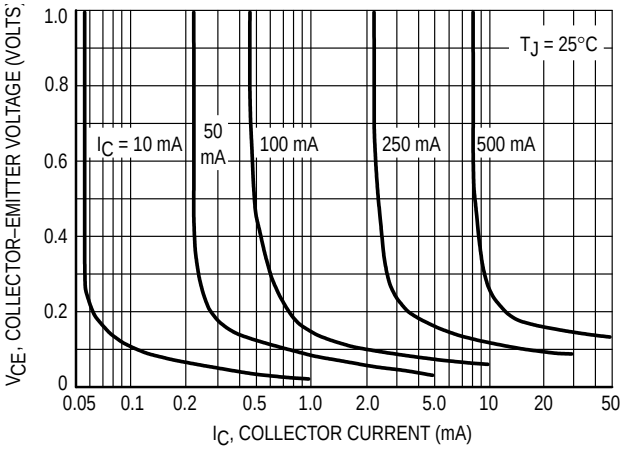



**Figure 9. Collector Saturation Region**

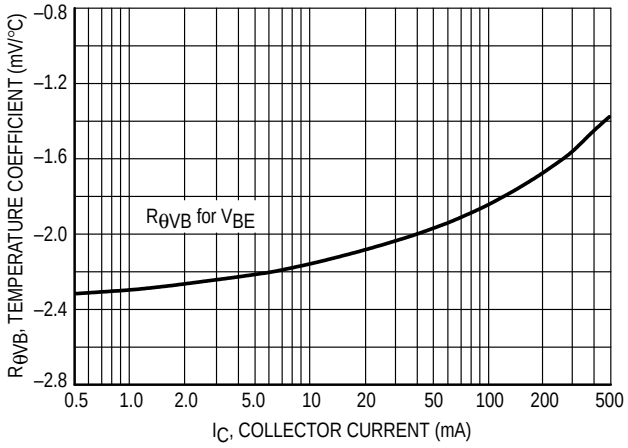



**Figure 10. Base–Emitter Temperature Coefficient**

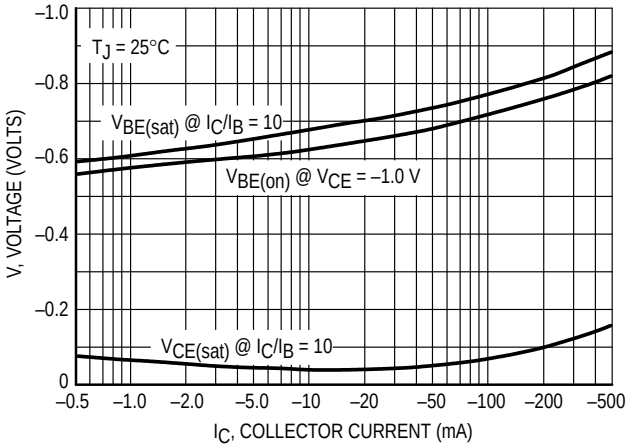



**Figure 11. “On” Voltages**

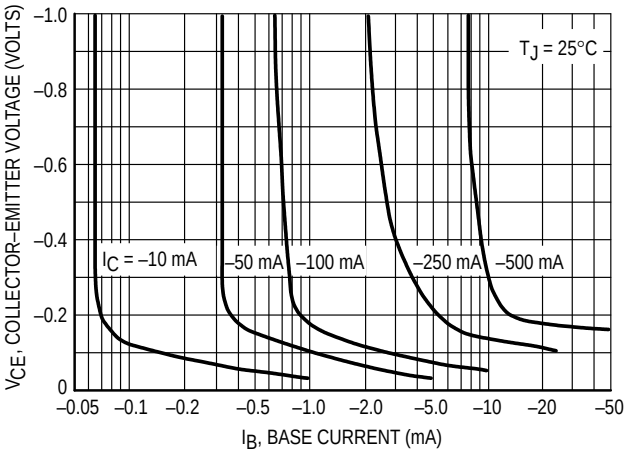



**Figure 12. Collector Saturation Region**

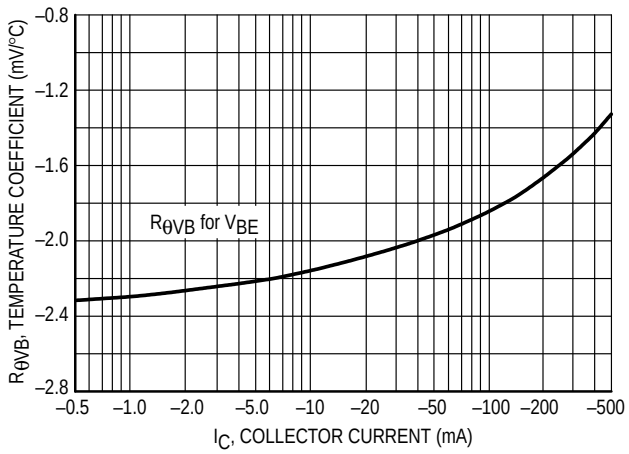
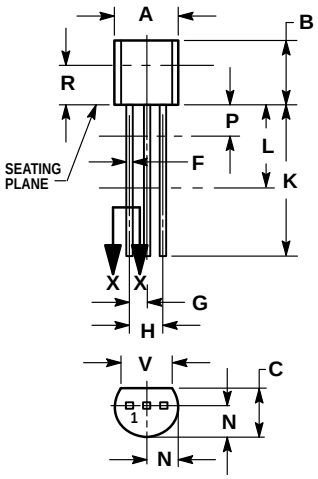
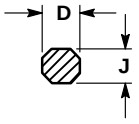



**Figure 13. Base–Emitter Temperature Coefficient**

## PACKAGE DIMENSIONS




SECTION X–X

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K MINIMUM. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 0.175 | 0.205 | 4.45 | 5.20 |
| B | 0.170 | 0.210 | 4.32 | 5.33 |
| C | 0.125 | 0.165 | 3.18 | 4.19 |
| D | 0.016 | 0.022 | 0.41 | 0.55 |
| F | 0.016 | 0.019 | 0.41 | 0.48 |
| G | 0.045 | 0.055 | 1.15 | 1.39 |
| H | 0.095 | 0.105 | 2.42 | 2.66 |
| J | 0.015 | 0.020 | 0.39 | 0.50 |
| K | 0.500 | — | 12.70 | — |
| L | 0.250 | — | 6.35 | — |
| N | 0.080 | 0.105 | 2.04 | 2.66 |
| P | — | 0.100 | — | 2.54 |
| R | 0.115 | — | 2.93 | — |
| V | 0.135 | — | 3.43 | — |

**CASE 029–04**
**(TO–226AA)**
**ISSUE AD**

STYLE 17:
PIN 1. COLLECTOR
2. BASE
3. EMITTER



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