**MOTOROLA**
**SEMICONDUCTOR TECHNICAL DATA**

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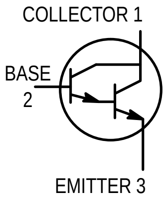
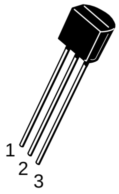
# Darlington Transistors

## NPN Silicon

**BC517**





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

### MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Collector–Emitter Voltage | $V_{CES}$ | 30 | Vdc |
| Collector–Base Voltage | $V_{CB}$ | 40 | Vdc |
| Emitter–Base Voltage | $V_{EB}$ | 10 | Vdc |
| Collector Current — Continuous | $I_C$ | 1.0 | Adc |
| Total Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 625<br>12 | mW<br>mW/°C |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 1.5<br>12 | Watts<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<br>($I_C$ = 2.0 mAdc, $V_{BE}$ = 0) | $V_{(BR)CES}$ | 30 | — | — | Vdc |
| Collector–Base Breakdown Voltage<br>($I_C$ = 10 μAdc, $I_E$ = 0) | $V_{(BR)CBO}$ | 40 | — | — | Vdc |
| Emitter–Base Breakdown Voltage<br>($I_E$ = 100 nAdc, $I_C$ = 0) | $V_{(BR)EBO}$ | 10 | — | — | Vdc |
| Collector Cutoff Current<br>($V_{CE}$ = 30 Vdc) | $I_{CES}$ | — | — | 500 | nAdc |
| Collector Cutoff Current<br>($V_{CB}$ = 30 Vdc, $I_E$ = 0) | $I_{CBO}$ | — | — | 100 | nAdc |
| Emitter Cutoff Current<br>($V_{EB}$ = 10 Vdc, $I_C$ = 0) | $I_{EBO}$ | — | — | 100 | nAdc |

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

| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **ON CHARACTERISTICS**[1] | | | | | |
| DC Current Gain<br>($I_C$ = 20 mAdc, $V_{CE}$ = 2.0 Vdc) | $h_{FE}$ | 30,000 | — | — | — |
| Collector–Emitter Saturation Voltage<br>($I_C$ = 100 mAdc, $I_B$ = 0.1 mAdc) | $V_{CE(sat)}$ | — | — | 1.0 | Vdc |
| Base–Emitter On Voltage<br>($I_C$ = 10 mAdc, $V_{CE}$ = 5.0 Vdc) | $V_{BE(on)}$ | — | — | 1.4 | Vdc |
| **SMALL–SIGNAL CHARACTERISTICS** | | | | | |
| Current–Gain — Bandwidth Product[2]<br>($I_C$ = 10 mAdc, $V_{CE}$ = 5.0 Vdc, f = 100 MHz) | $f_T$ | — | 200 | — | MHz |

1. Pulse Test: Pulse Width ≤ 2.0%.
2. $f_T = |h_{fe}| \bullet f_{test}$

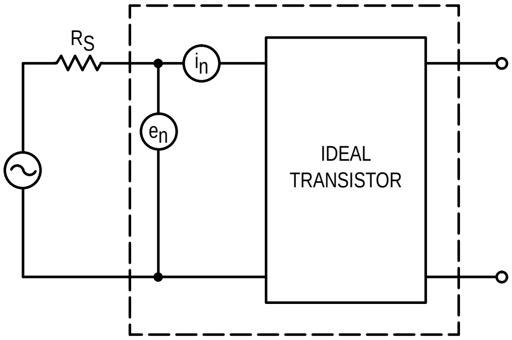


Figure 1. Transistor Noise Model

## NOISE CHARACTERISTICS

($V_{CE}$ = 5.0 Vdc, $T_A$ = 25°C)

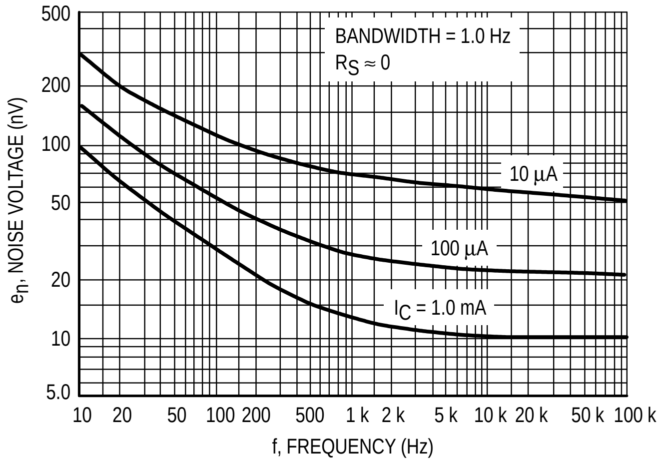


**Figure 2. Noise Voltage**

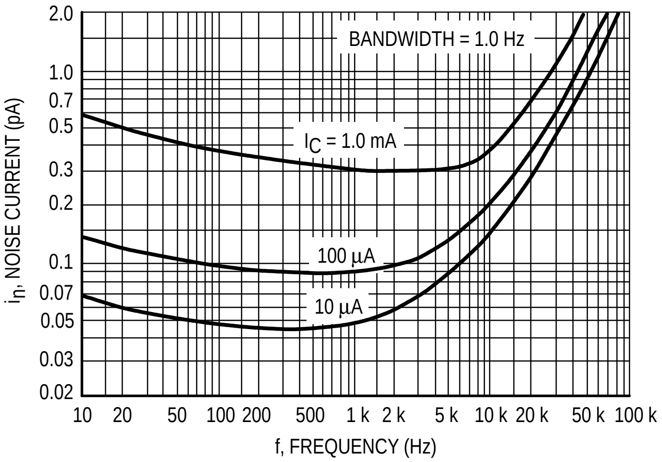


**Figure 3. Noise Current**

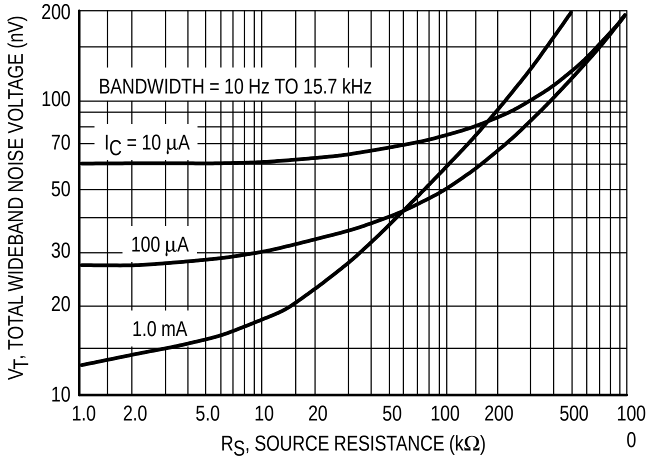


**Figure 4. Total Wideband Noise Voltage**

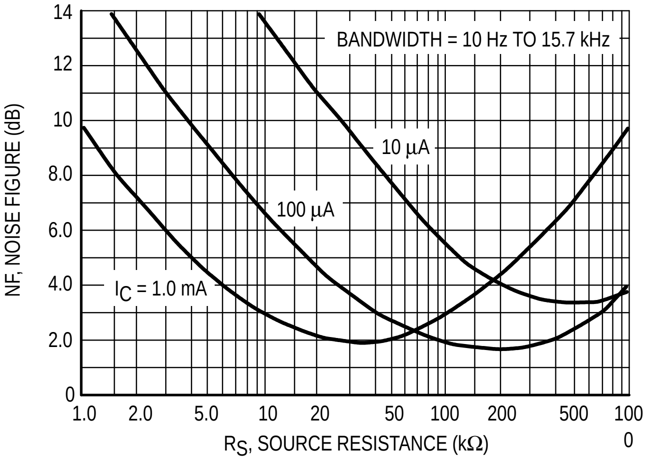


**Figure 5. Wideband Noise Figure**

## SMALL–SIGNAL CHARACTERISTICS

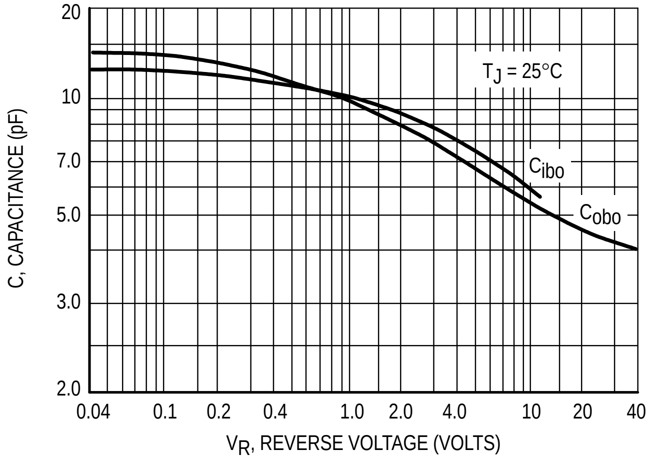


**Figure 6. Capacitance**

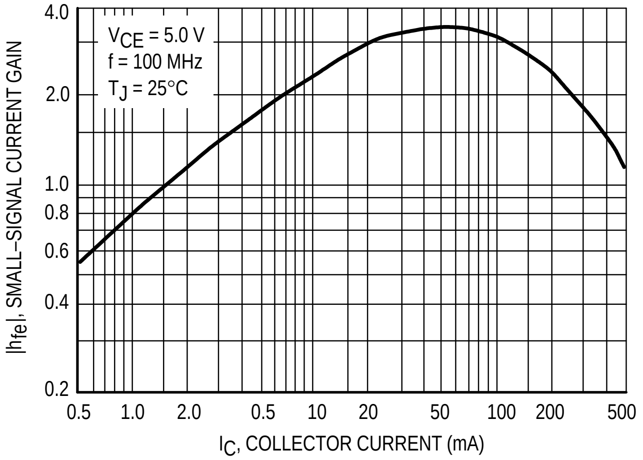


**Figure 7. High Frequency Current Gain**

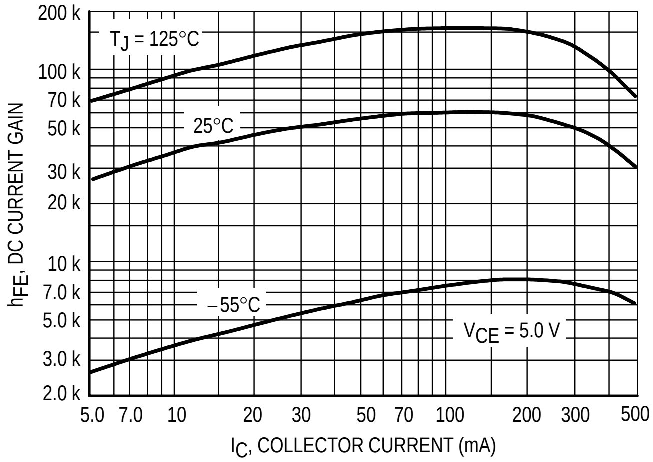


**Figure 8. DC Current Gain**

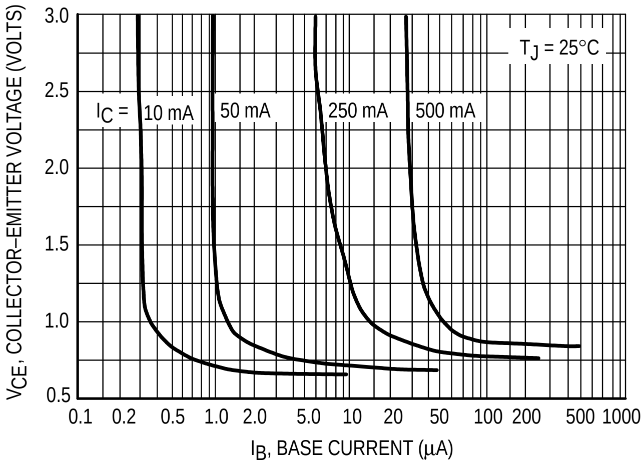


**Figure 9. Collector Saturation Region**

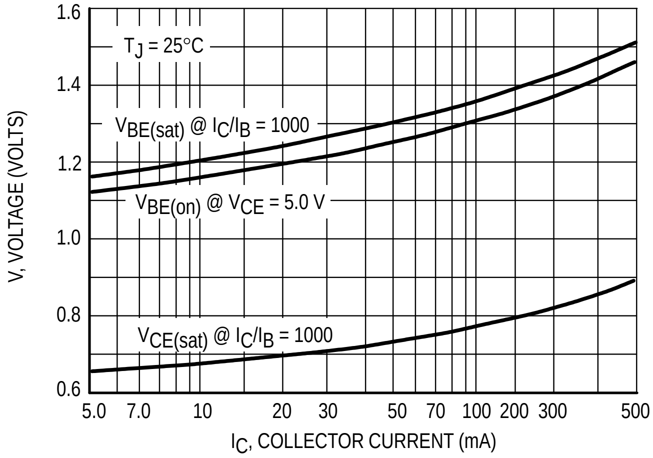


**Figure 10. "On" Voltages**

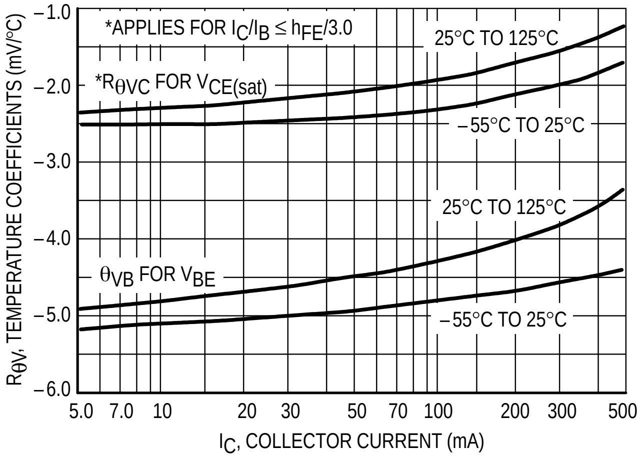


**Figure 11. Temperature Coefficients**

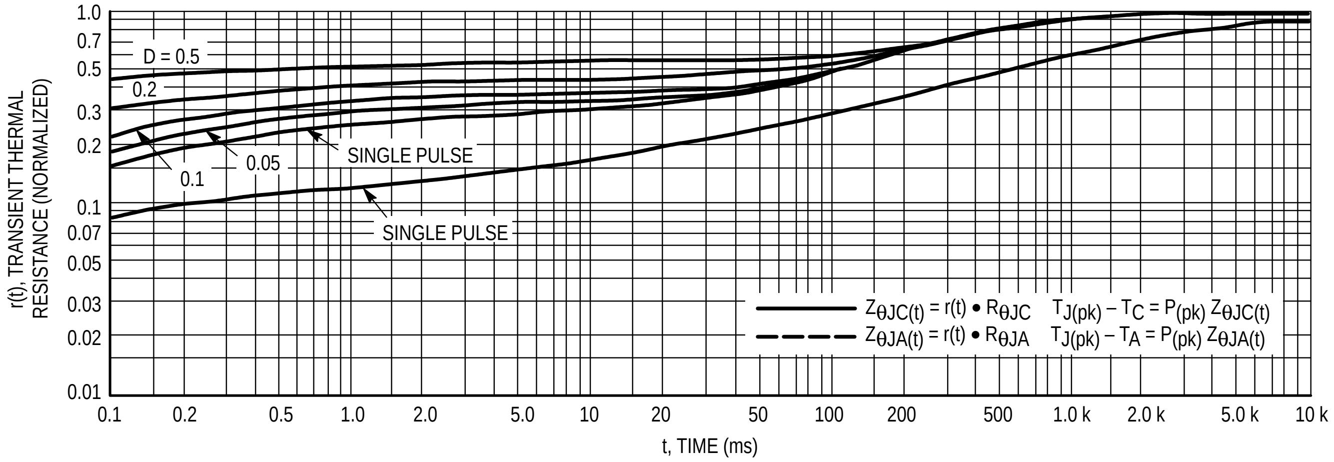


Figure 12. Thermal Response

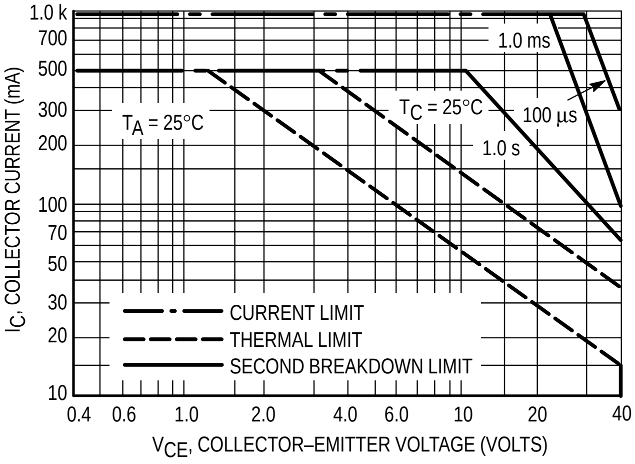
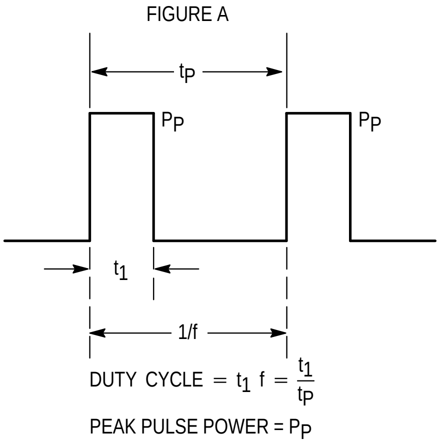
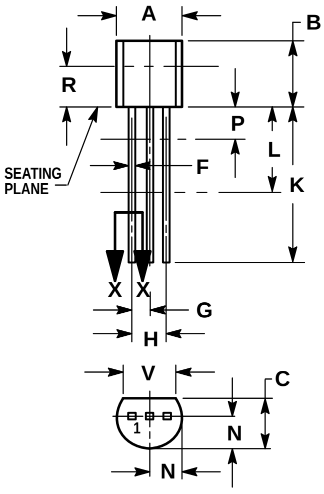


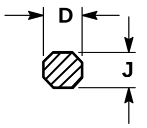
Figure 13. Active Region Safe Operating Area



Design Note: Use of Transient Thermal Resistance Data

## 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