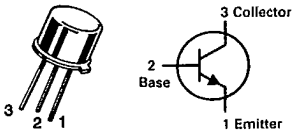
# 2N4237 thru 2N4239

**CASE 79-04, STYLE 1**
**TO-39 (TO-205AD)**




**GENERAL PURPOSE TRANSISTORS**

**NPN SILICON**

**Boca Semicondcutor Corp.**

**bocasemi.com**

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## MAXIMUM RATINGS

| Rating | Symbol | 2N4237 | 2N4238 | 2N4239 | Unit |
|---|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 40 | 60 | 80 | Vdc |
| Collector-Base Voltage | $V_{CBO}$ | 50 | 80 | 100 | Vdc |
| Emitter-Base Voltage | $V_{EBO}$ | | 6.0 | | Vdc |
| Base Current | $I_B$ | | 500 | | mA |
| Collector Current — Continuous | $I_C$ | | 1.0<br>3.0* | | Adc |
| Total Device Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | | 1.0<br>5.3 | | Watt<br>mW/°C |
| Total Device Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | | 6.0<br>34 | | Watts<br>mW/°C |
| Operating and Storage Junction Temperature Range | $T_J$, $T_{stg}$ | | −65 to +200 | | °C |

## THERMAL CHARACTERISTICS

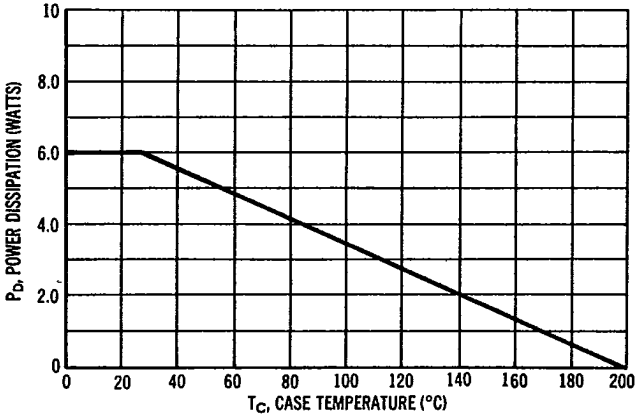
| Characteristic | Symbol | Max | Unit |
|---|---|---|---|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 29 | °C/W |

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

| Characteristic | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector-Emitter Sustaining Voltage(1)<br>($I_C$ = 100 mAdc, $I_B$ = 0) | 2N4237<br>2N4238<br>2N4239 | $V_{CEO(sus)}$ | <br>40<br>60<br>80 | <br>—<br>—<br>— | Vdc |
| Collector Cutoff Current<br>($V_{CE}$ = 50 Vdc, $V_{EB}$ = 1.5 Vdc)<br>($V_{CE}$ = 80 Vdc, $V_{EB}$ = 1.5 Vdc)<br><br>($V_{CE}$ = 100 Vdc, $V_{EB}$ = 1.5 Vdc)<br>($V_{CE}$ = 30 Vdc, $V_{EB}$ = 1.5 Vdc, $T_C$ = 150°C)<br><br>($V_{CE}$ = 50 Vdc, $V_{EB}$ = 1.5 Vdc, $T_C$ = 150°C)<br>($V_{CE}$ = 70 Vdc, $V_{EB}$ = 1.5 Vdc, $T_C$ = 150°C) | <br>2N4237<br>2N4238<br><br>2N4239<br>2N4237<br><br>2N4238<br>2N4239 | $I_{CEX}$ | <br>—<br>—<br><br>—<br>—<br><br>—<br>— | <br>0.1<br>0.1<br><br>0.1<br>1.0<br><br>1.0<br>1.0 | mAdc |
| Collector Cutoff Current<br>($V_{CB}$ = Rated $V_{CBO}$, $I_E$ = 0)<br>($V_{CE}$ = Rated $V_{CEO}$, $I_B$ = 0) | | $I_{CBO}$ | <br>— | 0.1<br>.07 | mAdc |
| Emitter Cutoff Current<br>($V_{EB}$ = 6.0 Vdc, $I_C$ = 0) | | $I_{EBO}$ | — | 0.5 | mAdc |
| **ON CHARACTERISTICS** | | | | | |
| DC Current Gain(1)<br>($I_C$ = 50 mAdc, $V_{CE}$ = 1.0 Vdc)<br>($I_C$ = 250 mAdc, $V_{CE}$ = 1.0 Vdc)<br>($I_C$ = 500 mAdc, $V_{CE}$ = 1.0 Vdc)<br>($I_C$ = 1.0 Adc, $V_{CE}$ = 1.0 Vdc) | | $h_{FE}$ | <br>30<br>30<br>30<br>15 | <br>—<br>150<br>—<br>— | — |
| Collector-Emitter Saturation Voltage(1)<br>($I_C$ = 500 mAdc, $I_B$ = 50 mAdc)<br>($I_C$ = 1.0 Adc, $I_B$ = 0.1 Adc) | | $V_{CE(sat)}$ | <br>—<br>— | <br>0.3<br>0.6 | Vdc |
| Base-Emitter Saturation Voltage(1)<br>($I_C$ = 1.0 Adc, $I_B$ = 0.1 Adc) | | $V_{BE(sat)}$ | — | 1.5 | Vdc |
| Base-Emitter On Voltage(1)<br>($I_C$ = 250 mAdc, $V_{CE}$ = 1.0 Vdc) | | $V_{BE(on)}$ | — | 1.0 | Vdc |
| **SMALL-SIGNAL CHARACTERISTICS** | | | | | |
| Output Capacitance<br>($V_{CB}$ = 10 Vdc, $I_C$ = 0, f = 0.1 MHz) | | $C_{obo}$ | — | 100 | pF |
| Small Signal Current Gain<br>($I_C$ = 100 mAdc, $V_{CE}$ = 10 Vdc, f = 1.0 kHz) | | $h_{fe}$ | 30 | — | — |
| Current Gain — High Frequency<br>($V_{CE}$ = 10 V, $I_C$ = 100 mA, f = 1 MHz) | | $\|h_{fe}\|$ | 1.0 | — | — |

T-27-21.

FIGURE 1 — POWER-TEMPERATURE DERATING CURVE




**Safe Area Curves are indicated by Figure 5. All limits are applicable and must be observed.**



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## SWITCHING CHARACTERISTICS

FIGURE 2 — SWITCHING TIME EQUIVALENT CIRCUIT

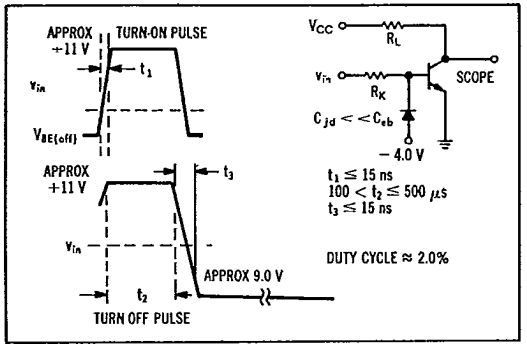



FIGURE 3 — TURN-ON TIME

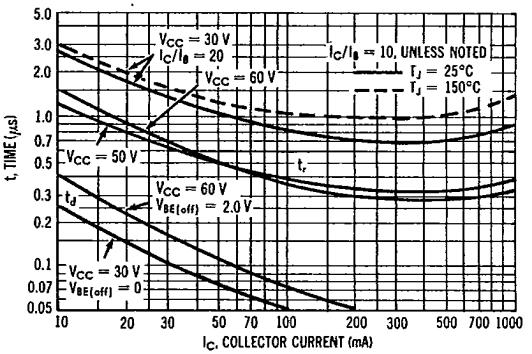



FIGURE 4 — THERMAL RESPONSE

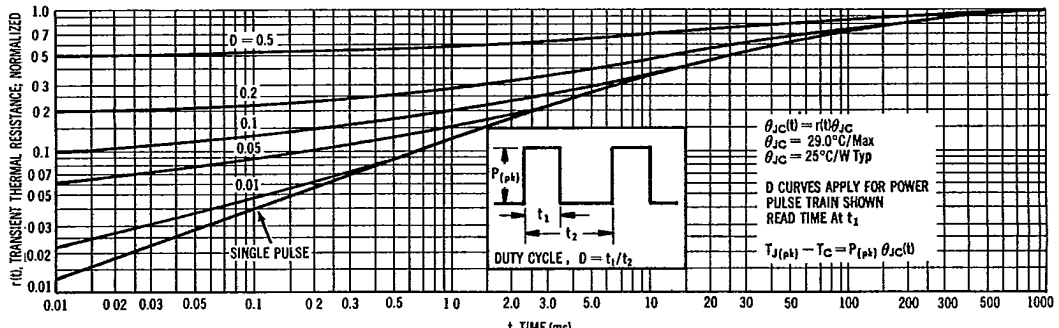
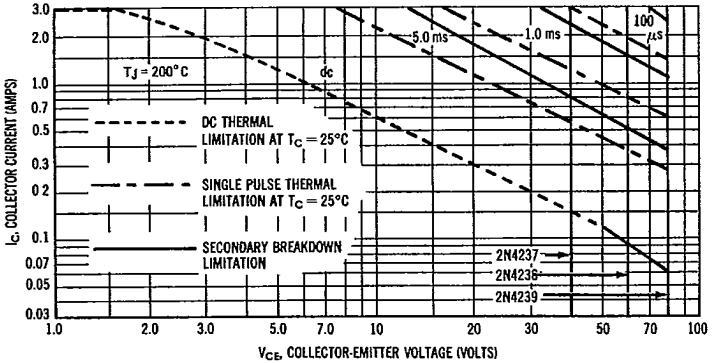


FIGURE 5 — ACTIVE-REGION SAFE OPERATING AREAS




There are two limitations on the power handling ability of a transistor: junction temperature and secondary breakdown. Safe operating area curves indicate $I_C$—$V_{CE}$ limits of the transistor that must be observed for reliable operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

For this particular transistor family, the thermal curves are the limiting design values, except for a small portion of the dc curve. The pulse secondary breakdown curves are shown for information only.

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FIGURE 6 — STORAGE TIME

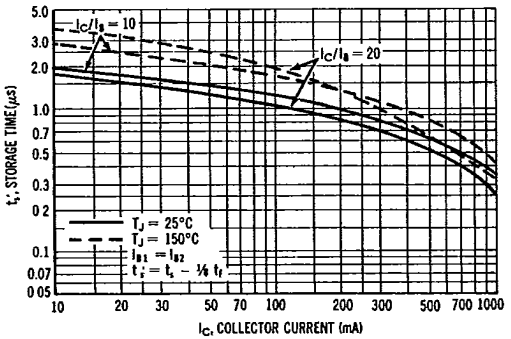
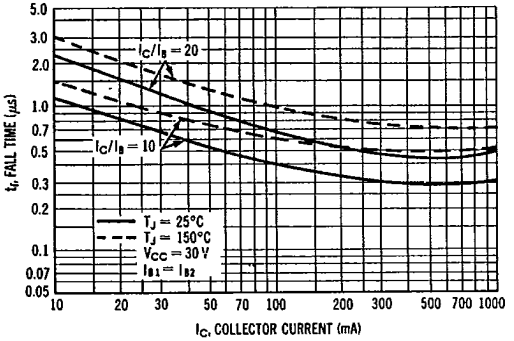



FIGURE 7 — FALL TIME




TYPICAL DC CHARACTERISTICS



FIGURE 8 — CURRENT GAIN

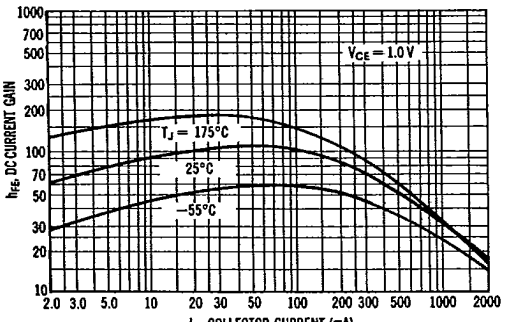



FIGURE 9 — COLLECTOR SATURATION REGION

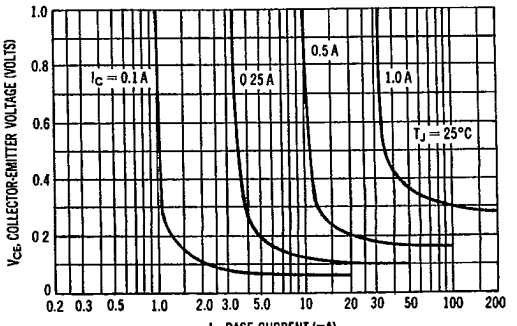


FIGURE 10 — EFFECTS OF BASE-EMITTER RESISTANCE

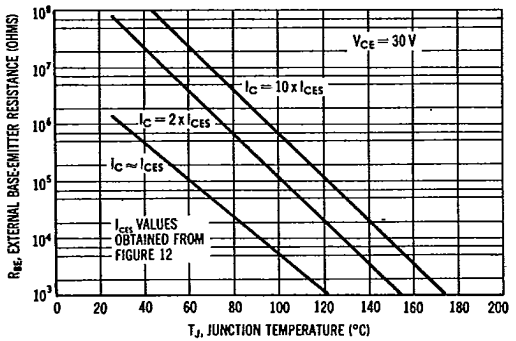



FIGURE 11 — "ON" VOLTAGE

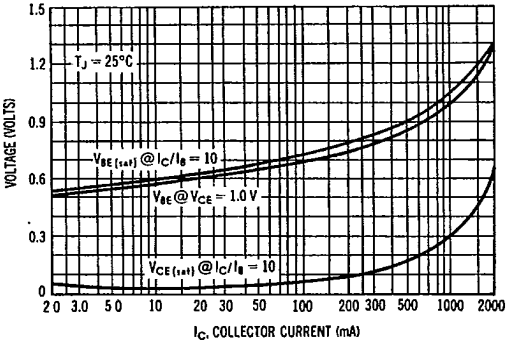



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FIGURE 12 — COLLECTOR CUTOFF REGION

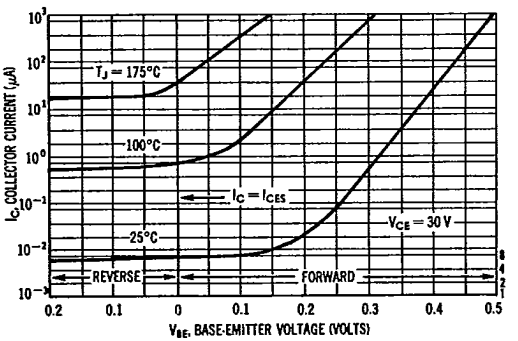


FIGURE 13 — TEMPERATURE COEFFICIENTS