2N4237
2N4238
2N4239

CASE 079-02, STYLE 1
TO-39 (TO-205AD)

GENERAL PURPOSE TRANSISTOR

NPN SILICON

4

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			Vdc
Collector Current — Continuous	I_C	1.0 3.0*			Adc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.0 5.3			Watt mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	6.0 34			Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200			°C

THERMAL CHARACTERISTICS

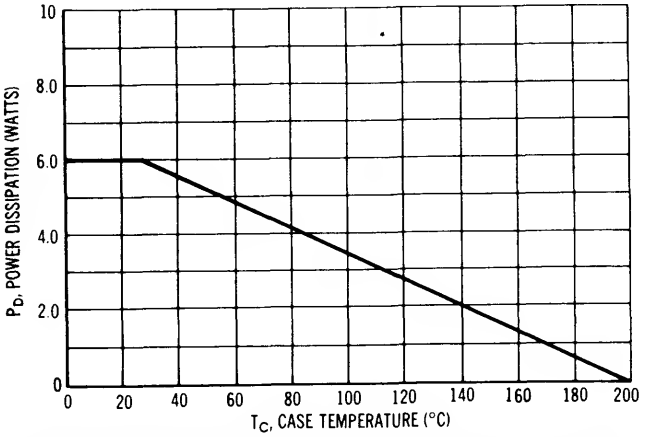
Characteristic	Symbol	Max	Unit
*Thermal Resistance, Junction to Case	$R_{\theta JC}$	29	°C/W

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

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

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle 2.0%.
*Indicates Data in addition to JEDEC Requirements.

FIGURE 1 — POWER-TEMPERATURE DERATING CURVE



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

SWITCHING CHARACTERISTICS

FIGURE 2 — SWITCHING TIME EQUIVALENT CIRCUIT

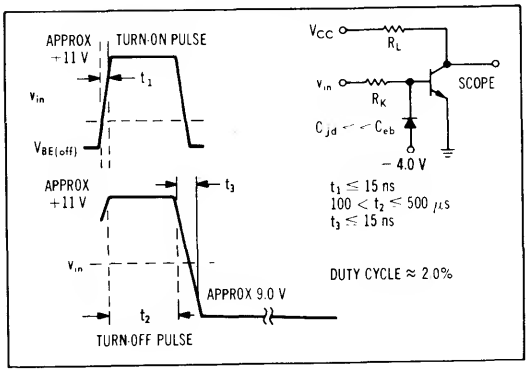


FIGURE 3 — TURN-ON TIME

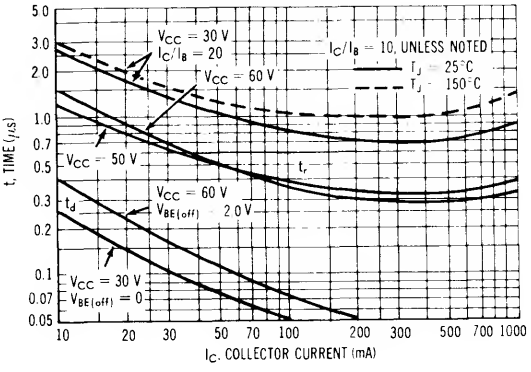


FIGURE 4 — THERMAL RESPONSE

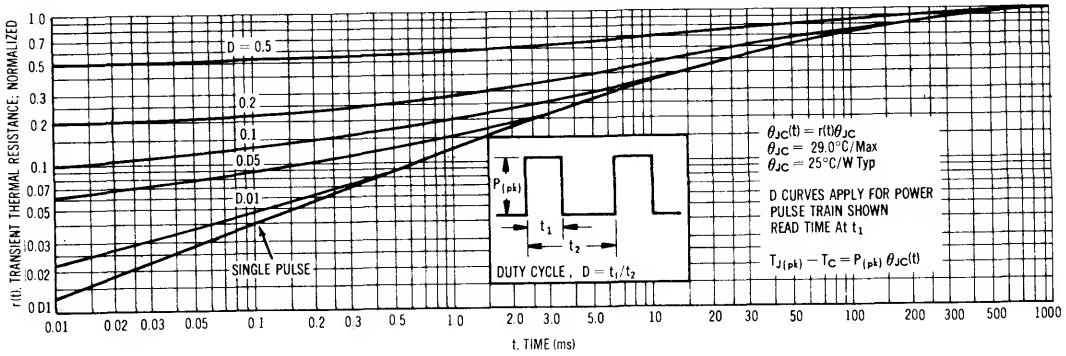
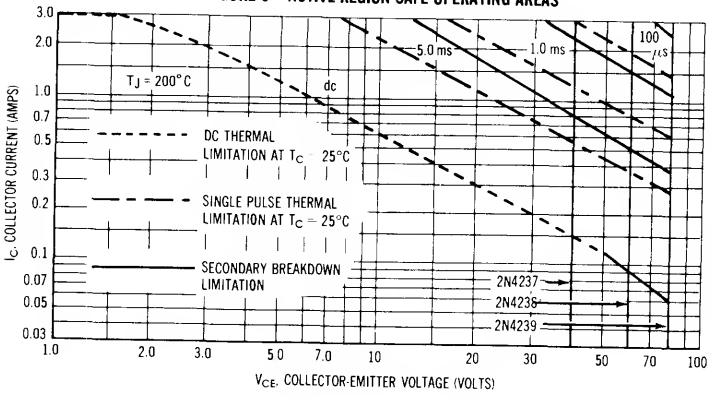


FIGURE 5 — ACTIVE-REGION SAFE OPERATING AREAS



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.

FIGURE 6 — STORAGE TIME

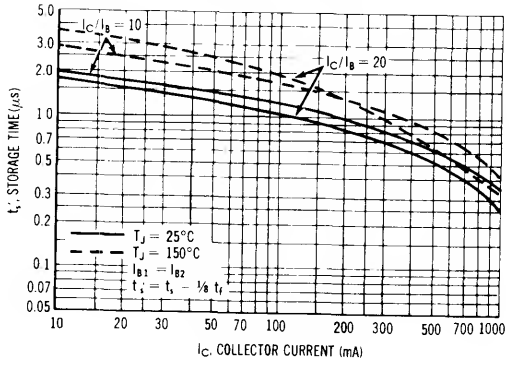
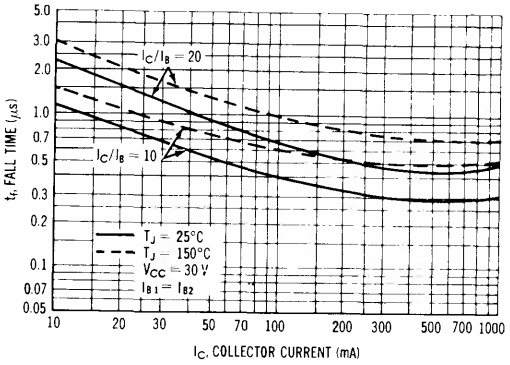


FIGURE 7 — FALL TIME



TYPICAL DC CHARACTERISTICS

FIGURE 8 — CURRENT GAIN

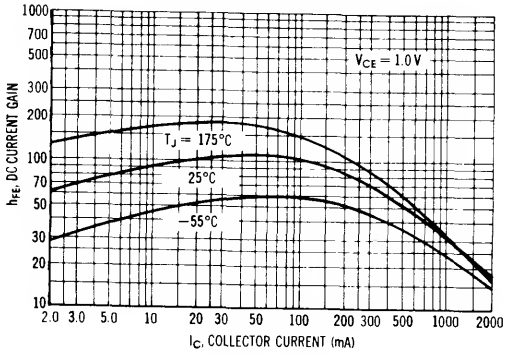


FIGURE 9 — COLLECTOR SATURATION REGION

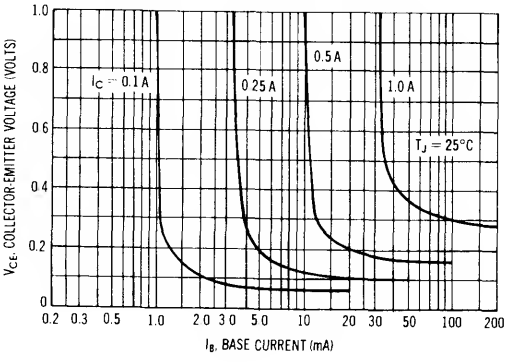


FIGURE 10 — EFFECTS OF BASE-EMITTER RESISTANCE

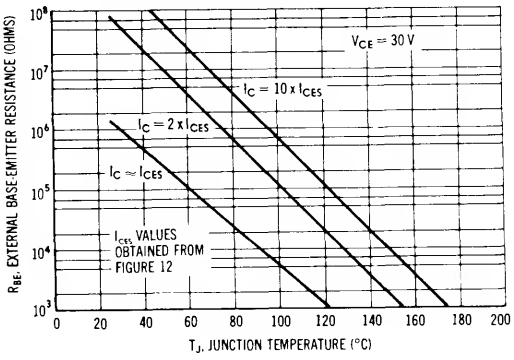


FIGURE 11 — "ON" VOLTAGE

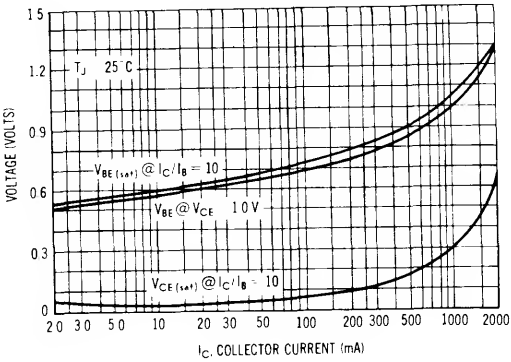


FIGURE 12 — COLLECTOR CUTOFF REGION

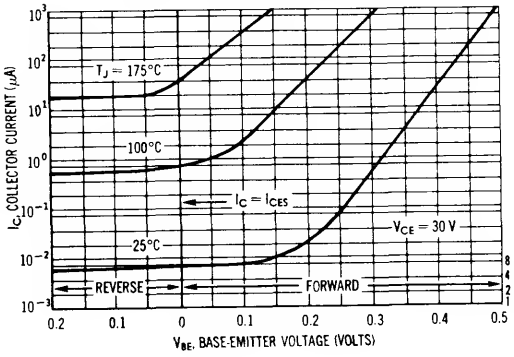


FIGURE 13 — TEMPERATURE COEFFICIENTS