

2N277 (GERMANIUM)

2N278

2N173

2N1099



CASE 5
(TO-36)

PNP germanium power transistors for general purpose power amplifier and switching applications. Power and temperature ratings exceed EIA registration.

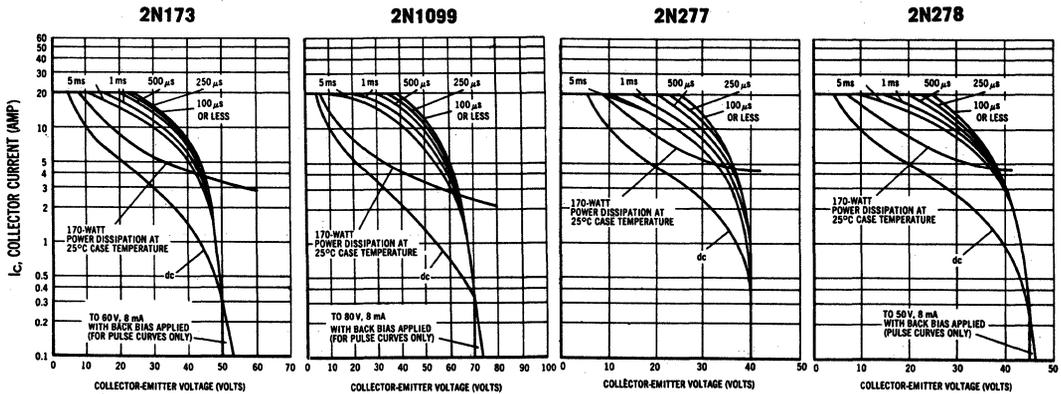
MAXIMUM RATINGS

Rating	Symbol	2N277	2N278	2N173	2N1099	Unit
Collector-Base Voltage	V_{CB}	40	50	60	80	Vdc
Emitter-Base Voltage	V_{EB}	20	30	40	40	Vdc
Emitter Current-Continuous	I_E	15				Adc
Base Current	I_B	4.0				Adc
Total Device Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	170				Watts
		2.0				$W/^\circ C$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +110				$^\circ C$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	0.5	$^\circ C/W$

SAFE OPERATING AREAS



The Safe Operating Area Curves indicate $I_C - V_{CE}$ limits below which the device will not go into secondary breakdown. Collector load lines for specific circuits must fall within the applicable Safe Area to avoid causing a collector-emitter short.

(Duty cycle of the excursions make no significant change in these safe areas.) To insure operation below the maximum T_J , the power-temperature derating curve must be observed for both steady state and pulse power conditions.

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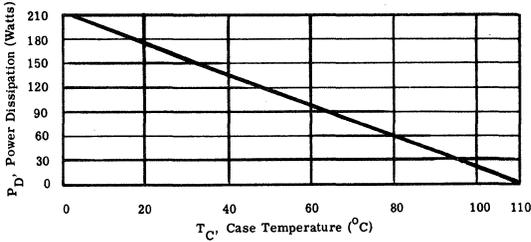
ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic		Symbol	Minimum	Typical	Maximum	Unit
Collector-Base Cutoff Current $V_{CB0} = 2\text{ V}$		I_{CBO}	—	100	—	μA
Collector-Base Cutoff Current $V_{EB} = 1.5\text{ V}, V_{CB} = 40\text{ V}$	2N277 50 60 80 2N1099	I_{CBX}	— — — —	2.0 2.0 2.0 2.0	8.0 8.0 8.0 8.0	mA
Emitter-Base Cutoff Current $V_{EBO} = 20\text{ V}$	2N277 30 40 40 2N1099	I_{EBO}	— — — —	1.0 1.0 1.0 1.0	8.0 8.0 8.0 8.0	mA
Collector-Base Cutoff Current $V_{CB0} = 40\text{ V}, 71^\circ\text{C}$	2N277 50 60 80 2N1099	I_{CBO}	— — — —	— — — —	15 15 15 15	mA
Collector-Emitter Voltage $I_C = 300\text{ mA}, V_{EB} = 0$	2N277 2N278 2N173 2N1099	BV_{CES}^*	40 45 50 70	— — — —	— — — —	Vdc
Collector-Emitter Voltage $I_C = 1\text{ Amp}, I_B = 0$	2N277 2N278 2N173 2N1099	BV_{CEO}^*	25 30 45 55	— — — —	— — — —	Vdc
Floating Potential $I_E = 0, V_{CB} = 40\text{ V}$	2N277 50 60 80 2N1099	V_{fl}	— — — —	0.15 0.15 0.15 0.15	1.0 1.0 1.0 1.0	volt
Current Gain $I_C = 5\text{ Amp}, V_{CB} = 2\text{ V}$ $I_C = 12\text{ Amp}, V_{CB} = 2\text{ V}$		h_{FE}	35 —	— 25	70 —	—
Base-Emitter Voltage $I_C = 5\text{ Amp}, V_{CB} = 2\text{ V}$	2N277 2N278 2N173 2N1099	V_{BE}	— — — —	0.65 0.65 0.65 0.65	— — — 0.9	Vdc
Saturation Voltage $I_C = 12\text{ Amp}, I_B = 2\text{ Amp}$	2N277 2N278 2N173 2N1099	$V_{CE(SAT)}$	— — — —	0.3 0.3 0.3 0.3	— 1.0 1.0 0.7	Vdc
Common-Emitter Current Amplification Cutoff Frequency $I_C = 5\text{ Amp}, V_{CE} = 6\text{ V}$		$f_{\alpha e}$	0.3	10	—	kHz
Rise Time "on" $I_C = 12\text{ Adc}$, $I_B = 2\text{ Adc}, V_{CE} = 12\text{ V}$		t_r	—	15	—	μs
Fall Time "off" $I_C = 0$, $V_{EB} = 6\text{ V}, R_{EB} = 10\text{ Ohms}$		t_f	—	15	—	μs

* To avoid excessive heating of the collector junction, perform these tests with the sweep method.

2N277, 2N278, 2N173, 2N1099 (continued)

POWER-TEMPERATURE DERATING CURVE

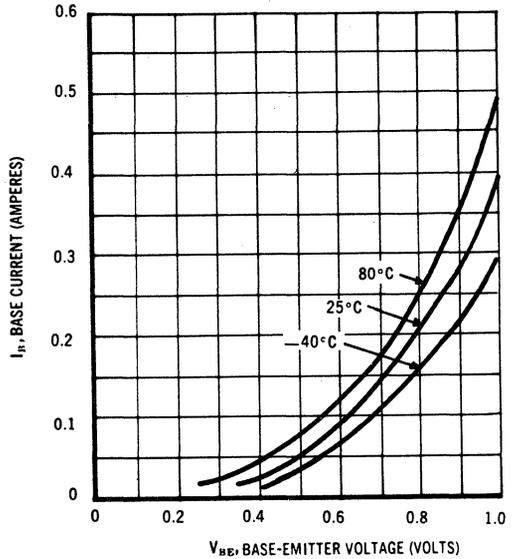


The maximum continuous power is related to maximum junction temperature by the thermal resistance factor.

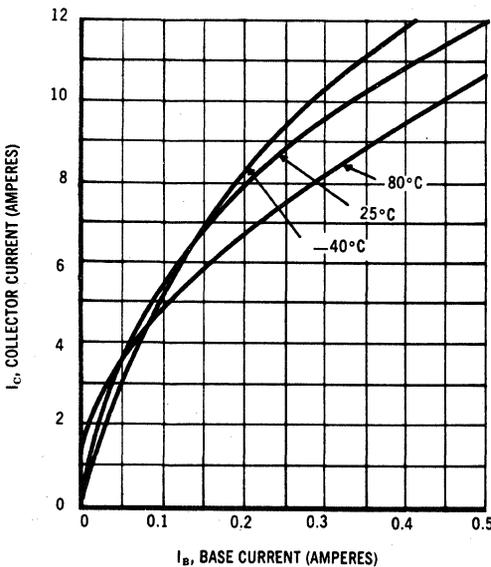
This curve has a value of 150 Watts at case temperatures of 25°C and is 0 Watts at 110°C with a linear relation between the two temperatures such that:

$$\text{allowable } P_D = \frac{110 - T_C}{0.5}$$

INPUT CHARACTERISTICS



CURRENT TRANSFER CHARACTERISTICS



TRANSCONDUCTANCE CHARACTERISTICS

