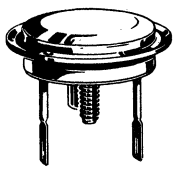
2N277 (GERMANIUM)
2N278
2N173
2N1099



CASE 5
(TO-36)

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

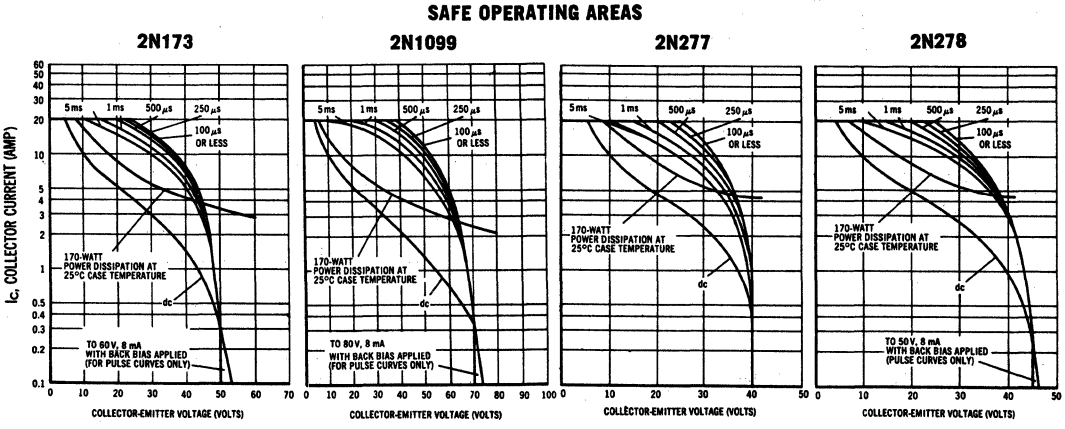
MAXIMUM RATINGS

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 @ $T_C = 25^oC$ Derate above 25^oC	P_D	170 2.0				Watts $W/^oC$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +110				^oC

THERMAL CHARACTERISTICS

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

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.

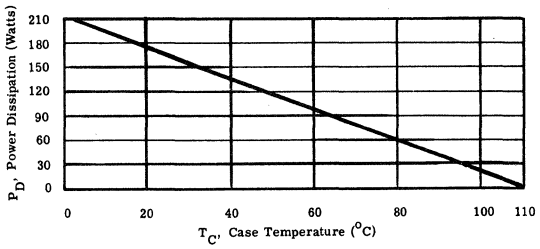
2N277, 2N278, 2N173, 2N1099 (continued)

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

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

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

POWER-TEMPERATURE DERATING CURVE

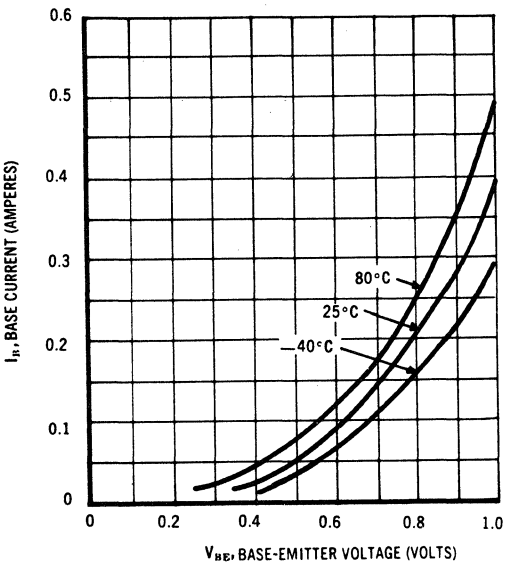


The maximum continuous power is related to maximum junction temperature by the thermal resistance factor.

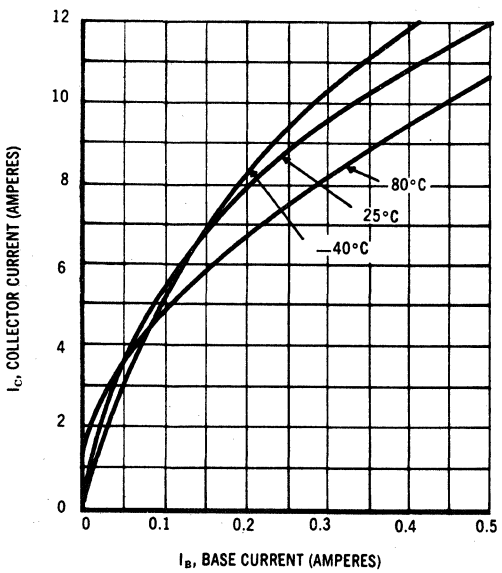
This curve has a value of 150 Watts at case temperatures of 25°C and is 0 Watts at 110°C with a linear relation between the two temperatures such that:

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

INPUT CHARACTERISTICS



CURRENT TRANSFER CHARACTERISTICS



TRANSCONDUCTANCE CHARACTERISTICS