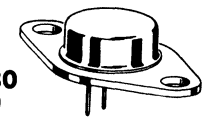
2N4910 thru 2N4912 (SILICON)



CASE 80
(TO-66)

Medium-power NPN silicon transistors designed for driver circuits, switching, and amplifier applications. Complement to PNP 2N4898 thru 2N4900.

Collector connected to case

MAXIMUM RATINGS

Rating	Symbol	2N4910	2N4911	2N4912	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	Vdc
Emitter-Base Voltage	V_{EB}	← 5.0 →			Vdc
Collector Current — Continuous*	I_C*	← 1.0 → ← 4.0 →			Adc
Base Current — Continuous	I_B	← 1.0 →			Adc
Total Device Dissipation T_C = 25°C	P_D	← 25 →			Watts
Derate above 25°C		← 0.143 →			mW/°C
Operating & Storage Junction Temperature Range	T_J, T_{stg}	← -65 to +200 →			°C

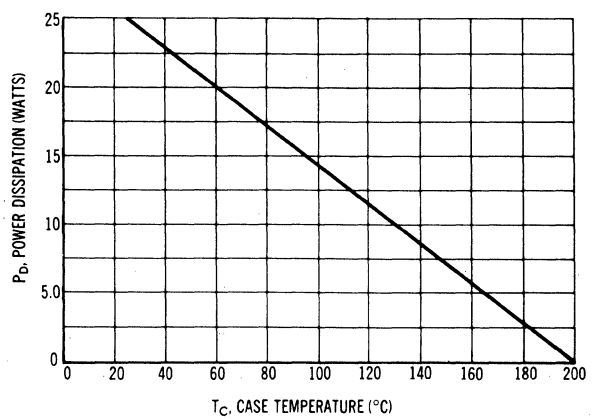
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	7.0	°C/W

* The 1.0 Amp maximum I_C value is based upon JEDEC current gain requirements.

The 4.0 Amp maximum value is based upon actual current-handling capability of the device (see Figure 5).

FIGURE 1 — POWER-TEMPERATURE DERATING CURVE



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

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

Characteristic	Fig. No.	Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1) (I_C = 0.1 Adc, I_B = 0) 2N4910	-	$BV_{CEO(sus)}$	40	-	Vdc
2N4911			60	-	
2N4912			80	-	
Collector Cutoff Current (V_{CE} = 20 Vdc, I_B = 0) 2N4910	-	I_{CEO}	-	0.5	mAdc
(V_{CE} = 30 Vdc, I_B = 0) 2N4911			-	0.5	
(V_{CE} = 40 Vdc, I_B = 0) 2N4912			-	0.5	
Collector Cutoff Current (V_{CE} = Rated V_{CEO}, $V_{EB(off)}$ = 1.5 Vdc)	12	I_{CEX}	-	0.1	mAdc
(V_{CE} = Rated V_{CEO}, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)			-	1.0	
Collector Cutoff Current (V_{CB} = Rated V_{CB}, I_E = 0)	-	I_{CBO}	-	0.1	mAdc
Emitter Cutoff Current (V_{EB} = 5.0 Vdc, I_C = 0)	-	I_{EBO}	-	1.0	mAdc
ON CHARACTERISTICS (1)					
DC Current Gain (I_C = 50 mAdc, V_{CE} = 1.0 Vdc)	8	h_{FE}	40	-	-
(I_C = 500 mAdc, V_{CE} = 1.0 Vdc)			20	100	
(I_C = 1.0 Adc, V_{CE} = 1.0 Vdc)			10	-	
Collector-Emitter Saturation Voltage (I_C = 1.0 Adc, I_B = 0.1 Adc)	9, 11, 13	$V_{CE(sat)}$	-	0.6	Vdc
Base-Emitter Saturation Voltage (I_C = 1.0 Adc, I_B = 0.1 Adc)	11, 13	$V_{BE(sat)}$	-	1.3	Vdc
Base-Emitter On Voltage (I_C = 1.0 Adc, V_{CE} = 1.0 Vdc)	11, 13	$V_{BE(on)}$	-	1.3	Vdc
SMALL SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I_C = 250 mAdc, V_{CE} = 10 Vdc, f = 1.0 MHz)	-	f_T	3.0	-	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)	-	C_{ob}	-	100	pF
Small-Signal Current Gain (I_C = 250 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	-	h_{fe}	25	-	

(1) Pulse Test: PW ≈ 300 μs, Duty Cycle ≈ 2.0%

FIGURE 2 — SWITCHING TIME EQUIVALENT CIRCUIT

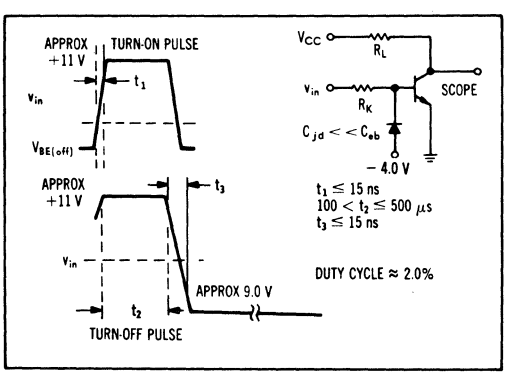


FIGURE 3 — TURN-ON TIME

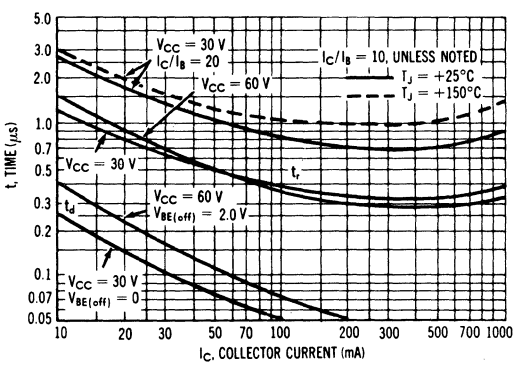


FIGURE 4 — THERMAL RESPONSE

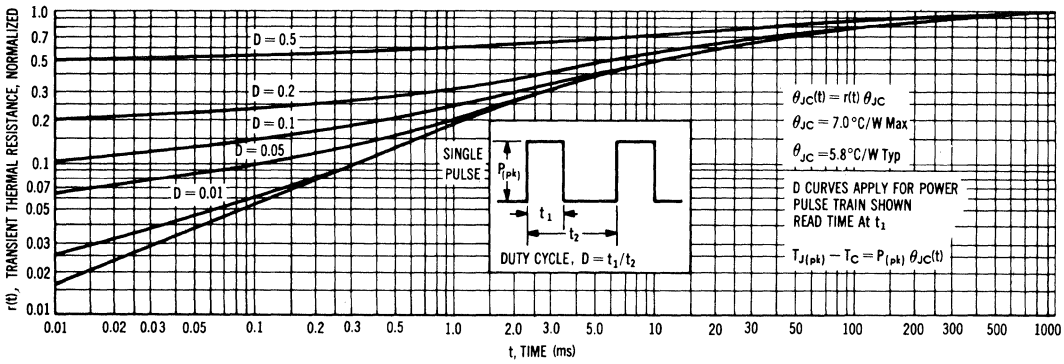
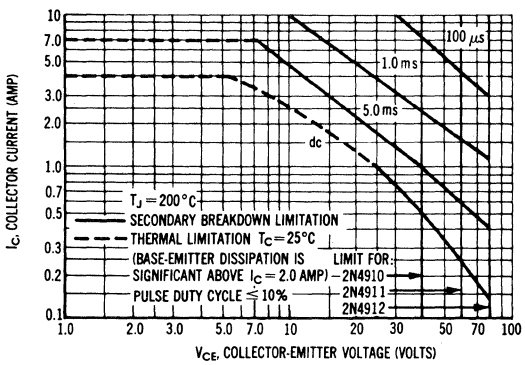


FIGURE 5 — ACTIVE-REGION SAFE OPERATING AREA



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.

The data of Figure 5 is based on $T_{J(pk)} = 200°C$; T_C is variable depending on conditions. Pulse curves are valid for duty cycles of 10% provided $T_{J(pk)} \leq 200°C$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

FIGURE 6 — STORAGE TIME

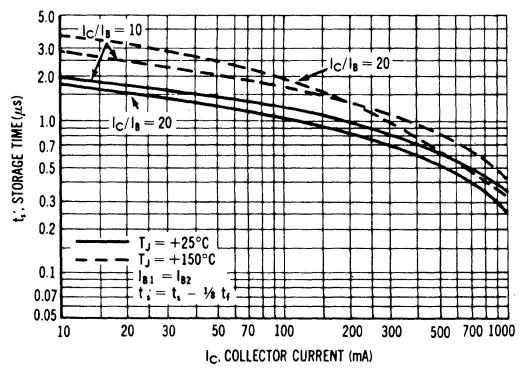
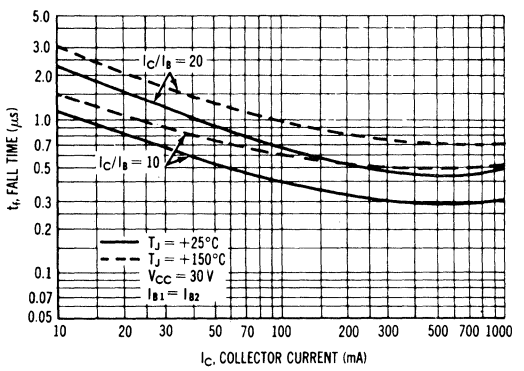


FIGURE 7 — FALL TIME



TYPICAL DC CHARACTERISTICS

FIGURE 8 — CURRENT GAIN

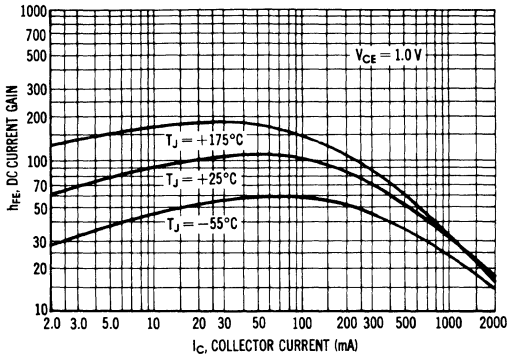


FIGURE 9 — COLLECTOR SATURATION REGION

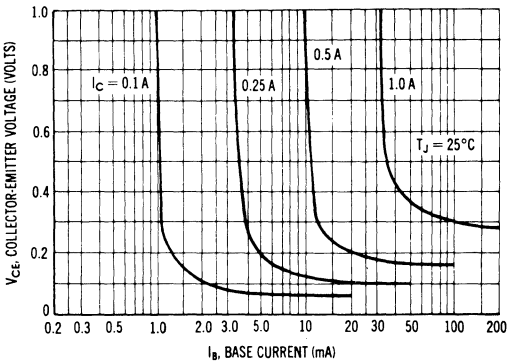


FIGURE 10 — EFFECTS OF BASE-EMITTER RESISTANCE

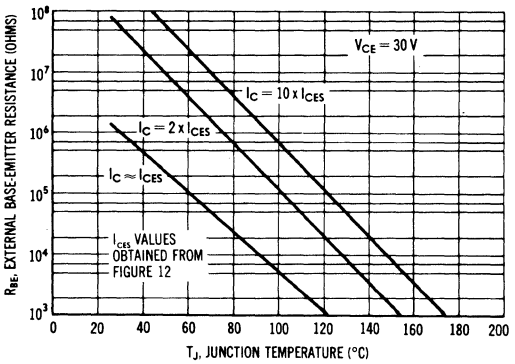


FIGURE 11 — "ON" VOLTAGE

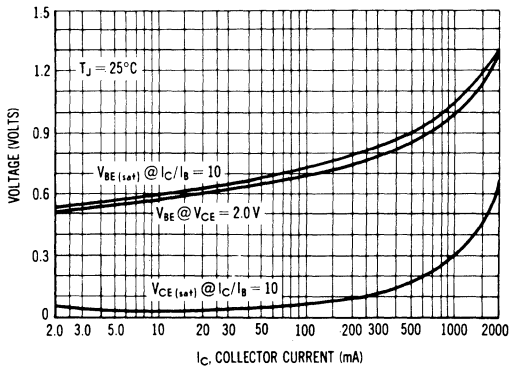


FIGURE 12 — COLLECTOR CUTOFF REGION

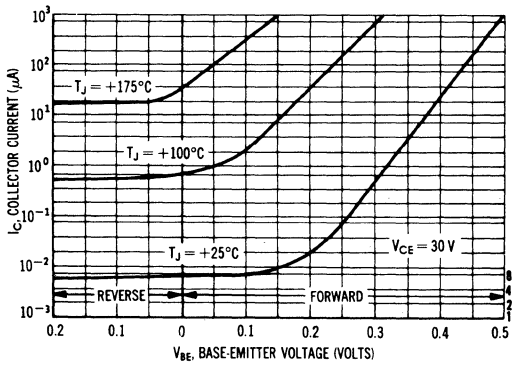


FIGURE 13 — TEMPERATURE COEFFICIENTS