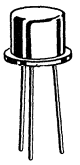
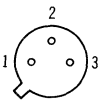
2N5336 (SILICON) thru 2N5339



Medium-power NPN silicon transistors designed for switching and wide band amplifier applications.

CASE 79
(TO-39)



STYLE 1:
PIN 1. EMITTER
2. BASE
3. COLLECTOR

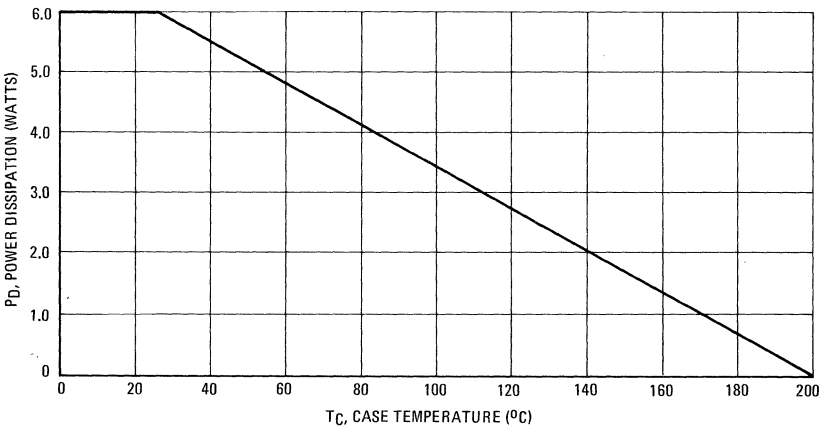
MAXIMUM RATINGS

Rating	Symbol	2N5336 2N5337	2N5338 2N5339	Unit
Collector-Emitter Voltage	V_{CEO}	80	100	Vdc
Collector-Base Voltage	V_{CB}	80	100	Vdc
Emitter-Base Voltage	V_{EB}	6.0		Vdc
Collector Current — Continuous	I_C	5.0		Adc
Base Current	I_B	1.0		Adc
Total Device Dissipation @ $T_C = 25°C$ Derate above 25°C	P_D	6.0 34.3		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	θ_{JC}	29.2	°C/W

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 = 50 mAdc, I_B = 0)	2N5336, 2N5337 2N5338, 2N5339	-	$BV_{CEO(sus)}$	80 100	- -	Vdc
Collector Cutoff Current		-	I_{CEO}			μAdc
(V_{CE} = 75 Vdc, I_B = 0)	2N5336, 2N5337			-	100	
(V_{CE} = 90 Vdc, I_B = 0)	2N5338, 2N5339			-	100	
Collector Cutoff Current		12	I_{CEX}			μAdc
(V_{CE} = 75 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5336, 2N5337			-	10	
(V_{CE} = 90 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5338, 2N5339			-	10	
(V_{CE} = 75 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N5336, 2N5337			-	1.0	mAdc
(V_{CE} = 90 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 150°C)	2N5338, 2N5339			-	1.0	
Collector Cutoff Current		-	I_{CBO}			μAdc
(V_{CB} = 80 Vdc, I_E = 0)	2N5336, 2N5337			-	10	
(V_{CB} = 100 Vdc, I_E = 0)	2N5338, 2N5339			-	10	
Emitter Cutoff Current (V_{BE} = 6.0 Vdc, I_C = 0)		-	I_{EBO}	-	100	μAdc
ON CHARACTERISTICS						
DC Current Gain (1)		8	h_{FE}			-
(I_C = 500 mAdc, V_{CE} = 2.0 Vdc)	2N5336, 2N5338			30	-	
	2N5337, 2N5339			60	-	
(I_C = 2.0 Adc, V_{CE} = 2.0 Vdc)	2N5336, 2N5338			30	120	
	2N5337, 2N5339			60	240	
(I_C = 5.0 Adc, V_{CE} = 2.0 Vdc)	2N5336, 2N5338			20	-	
	2N5337, 2N5339			40	-	
Collector-Emitter Saturation Voltage (1)		9, 11, 13	$V_{CE(sat)}$			Vdc
(I_C = 2.0 Adc, I_B = 0.2 Adc)				-	0.7	
(I_C = 5.0 Adc, I_B = 0.5 Adc)				-	1.2	
Base-Emitter Saturation Voltage (1)		11, 13	$V_{BE(sat)}$			Vdc
(I_C = 2.0 Adc, I_B = 0.2 Adc)				-	1.2	
(I_C = 5.0 Adc, I_B = 0.5 Adc)				-	1.8	
DYNAMIC CHARACTERISTICS						
Current-Gain—Bandwidth Product (I_C = 0.5 Adc, V_{CE} = 10 Vdc, f = 10 MHz)		-	f_T	30	-	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz)		7	C_{ob}	-	250	pF
Input Capacitance (V_{BE} = 2.0 Vdc, I_C = 0, f = 100 kHz)		7	C_{ib}	-	1,000	pF
SWITCHING CHARACTERISTICS						
Delay Time	(V_{CC} = 40 Vdc, $V_{EB(off)}$ = 3.0 Vdc,	2,3	t_d	-	100	ns
Rise Time	I_C = 2.0 Adc, I_{B1} = 0.2 Adc)		t_r	-	100	ns
Storage Time	(V_{CC} = 40 Vdc, I_C = 2.0 Adc,	2,6	t_s	-	2.0	μs
Fall Time	I_{B1} = I_{B2} = 0.2 Adc)		t_f	-	200	ns

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

FIGURE 2 – SWITCHING TIME TEST CIRCUIT

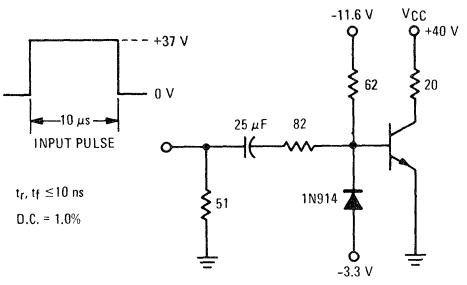


FIGURE 3 – TURN ON TIME

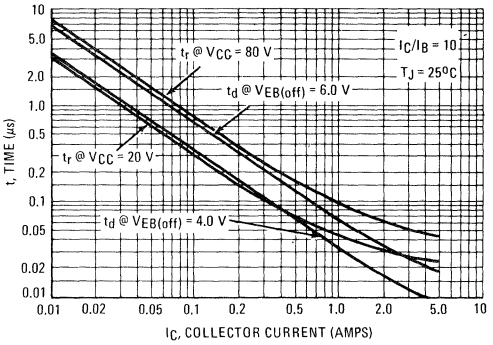


FIGURE 4 – THERMAL RESPONSE

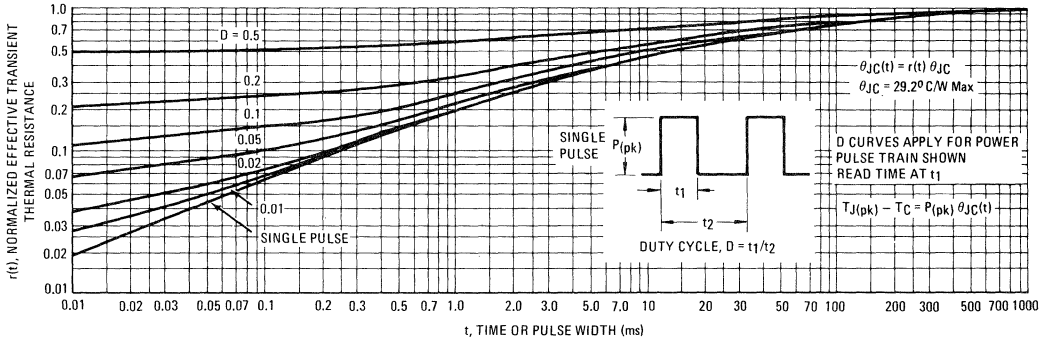
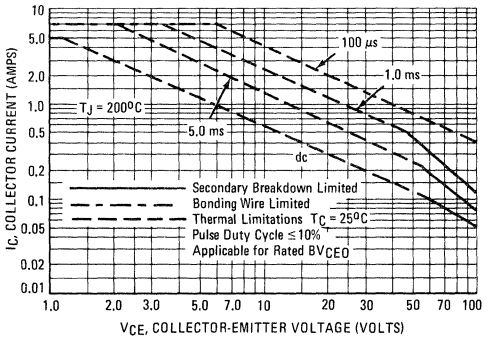


FIGURE 5 – ACTIVE-REGION SAFE OPERATING AREA



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 – TURN-OFF TIME

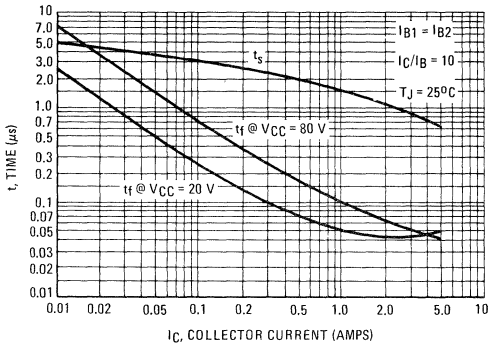


FIGURE 7 – CAPACITANCE versus VOLTAGE

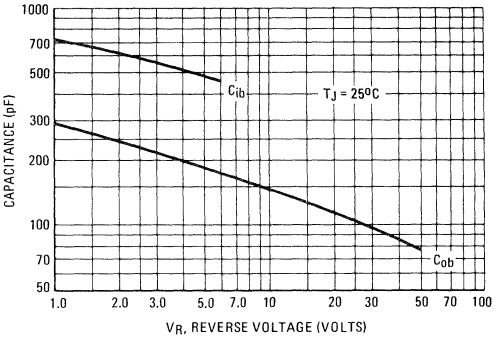


FIGURE 8 – DC CURRENT GAIN

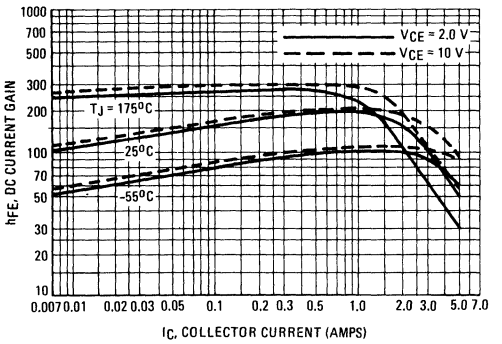


FIGURE 9 – COLLECTOR SATURATION REGION

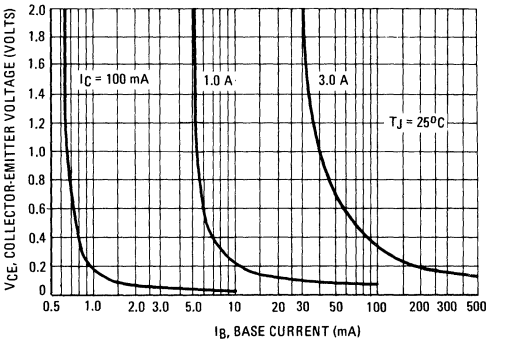


FIGURE 10 – EFFECTS OF BASE-EMITTER RESISTANCE

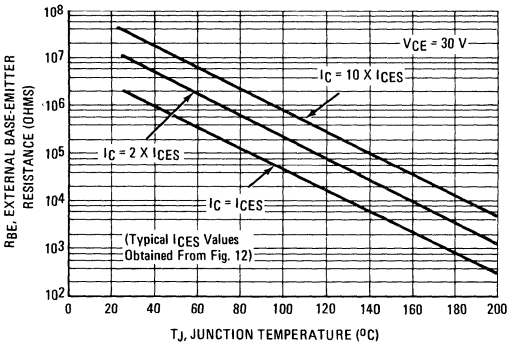


FIGURE 11 – ON VOLTAGES

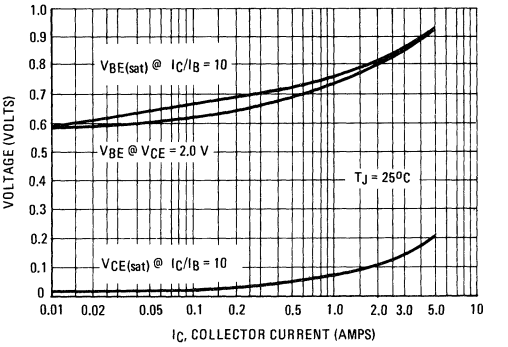


FIGURE 12 – COLLECTOR CUT-OFF REGION

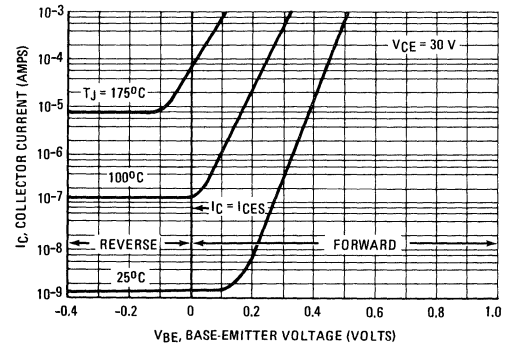


FIGURE 13 – TEMPERATURE COEFFICIENTS