

MOTOROLA SEMICONDUCTOR TECHNICAL DATA

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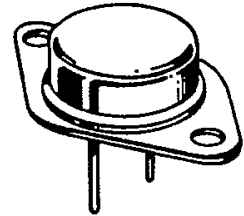
2N6377 thru 2N6379

HIGH-POWER PNP SILICON TRANSISTORS

... designed for use in industrial-military power amplifier and switching circuit applications.

- High Collector Emitter Sustaining Voltage –
 $V_{CE(sus)} = 80 \text{ Vdc (Min) – 2N6377}$
 $= 100 \text{ Vdc (Min) – 2N6378}$
 $= 120 \text{ Vdc (Min) – 2N6379}$
- High DC Current Gain –
 $h_{FE} = 30-120 @ I_C = 20 \text{ Adc}$
 $= 10 \text{ (Min) @ } I_C = 50 \text{ Adc}$
- Low Collector-Emitter Saturation Voltage –
 $V_{CE(sat)} = 1.0 \text{ Vdc (Max) @ } I_C = 20 \text{ Adc}$
- Fast Switching Times @ $I_C = 20 \text{ Adc}$
 $t_r = 0.35 \mu\text{s (Max)}$
 $t_s = 0.8 \mu\text{s (Max)}$
 $t_f = 0.25 \mu\text{s (Max)}$
- Complement to 2N6274–77

**50 AMPERE
POWER TRANSISTORS
PNP SILICON**
80, 100, 120 VOLTS
250 WATTS



* MAXIMUM RATINGS

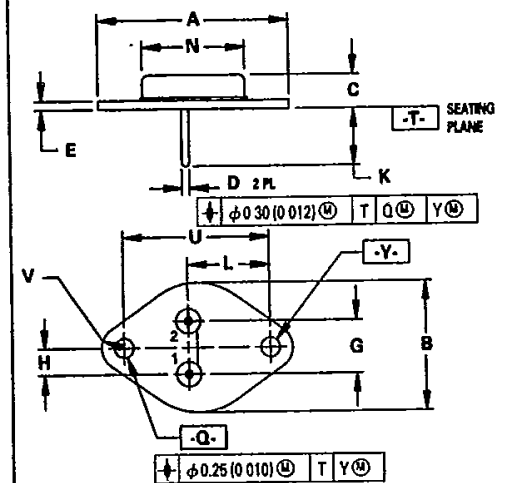
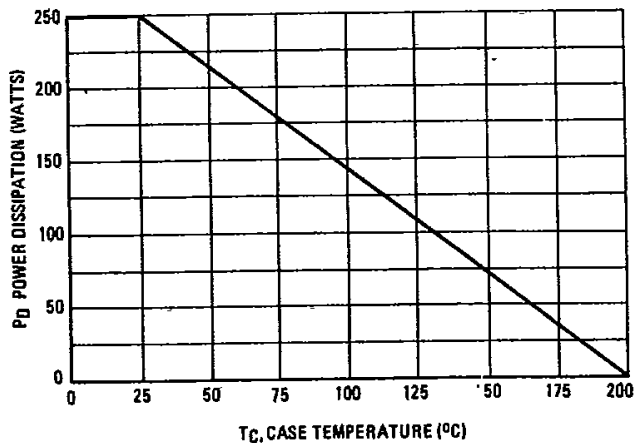
Rating	Symbol	2N6377	2N6378	2N6379	Unit
Collector-Base Voltage	V_{CB}	100	120	140	Vdc
Collector-Emitter Voltage	V_{CEO}	80	100	120	Vdc
Emitter-Base Voltage	V_{EB}	← 6.0 →			Vdc
Collector Current – Continuous	I_C	← 50 →			A dc
Peak		← 100 →			
Base Current	I_B	← 20 →			A dc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$	P_D	← 250 →			Watts
Derate above 25°C		← 1.43 →			$\text{W}/^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	← -65 to +200 →			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	0.7	$^\circ\text{C}/\text{W}$

* Indicates JEDEC Registered Data.

FIGURE 1 – POWER DERATING



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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	38.86 REF		1.530 REF	
B	25.15	26.67	0.990	1.050
C	6.35	8.25	0.250	0.325
D	1.45	1.60	0.057	0.063
E	1.53	1.77	0.060	0.070
G	10.92 BSC		0.430 BSC	
H	5.46 BSC		0.215 BSC	
K	11.18	12.19	0.440	0.480
L	16.89 BSC		0.665 BSC	
N	19.31	21.08	0.760	0.830
Q	3.84	4.19	0.151	0.165
U	30.15 BSC		1.187 BSC	
V	3.33	4.77	0.131	0.188

CASE 197A-02
TO-204AE
(TO-3)

2N6377 thru 2N6379

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

Characteristic	Symbol	Min	Max	Unit	
*OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1) (I _C = 50 mA _{dc} , I _B = 0)	2N6377 2N6378 2N6379	V _{CEO(sus)}	80 100 120	— — —	V _{dc}
Collector Cutoff Current (V _{CE} = 50 V _{dc} , I _B = 0) (V _{CE} = 60 V _{dc} , I _B = 0) (V _{CE} = 70 V _{dc} , I _B = 0)	2N6377 2N6378 2N6379	I _{CEO}	— — —	50 50 50	μA _{dc}
Collector Cutoff Current (V _{CE} = 90% Rated V _{CB} , V _{BE(off)} = 1.5 V _{dc}) (V _{CE} = 90% Rated V _{CB} , V _{BE(off)} = 1.5 V _{dc} , T _C = 150°C)		I _{CEX}	— —	10 1.0	μA _{dc} mA _{dc}
Emitter Cutoff Current (V _{EB} = 6.0 V _{dc} , I _C = 0)		I _{EBO}	—	100	μA _{dc}

*ON CHARACTERISTICS (1)

DC Current Gain (I _C = 1.0 A _{dc} , V _{CE} = 4.0 V _{dc}) (I _C = 20 A _{dc} , V _{CE} = 4.0 V _{dc}) (I _C = 50 A _{dc} , V _{CE} = 4.0 V _{dc})	h _{FE}	50 30 10	— 120 —	—
Collector-Emitter Saturation Voltage (I _C = 20 A _{dc} , I _B = 2.0 A _{dc}) (I _C = 50 A _{dc} , I _B = 10 A _{dc})	V _{CE(sat)}	— — —	1.2 3.0	V _{dc}
Base-Emitter Saturation Voltage (I _C = 20 A _{dc} , I _B = 2.0 A _{dc}) (I _C = 50 A _{dc} , I _B = 10 A _{dc})	V _{BE(sat)}	— —	1.8 3.5	V _{dc}

DYNAMIC CHARACTERISTICS

* Current-Gain – Bandwidth Product (2) (I _C = 1.0 A _{dc} , V _{CE} = 10 V _{dc} , f _{test} = 10 MHz)	f _T	30	—	MHz
* Output Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f = 0.1 MHz)	C _{ob}	—	1500	pF

*SWITCHING CHARACTERISTICS (Figure 2)

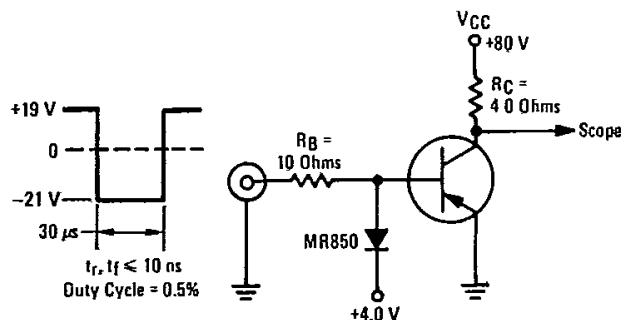
Rise Time	(V _{CC} = 80 V _{dc} , I _C = 20 A _{dc} , I _{B1} = I _{B2} = 2.0 A _{dc})	t _r	—	0.35	μs
Storage Time		t _s	—	0.80	μs
Fall Time		t _f	—	0.25	μs

*Indicates JEDEC Registered Data.

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

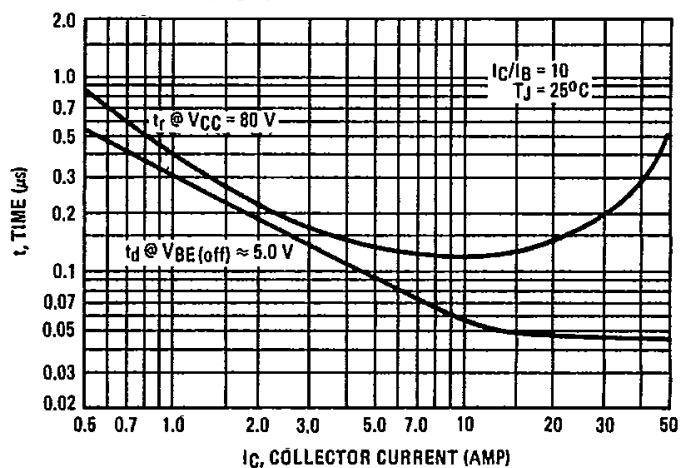
$$(2) f_T = |h_{fe}| \cdot f_{test}$$

FIGURE 2 – SWITCHING TIMES TEST CIRCUIT



Note: For information on Figures 3 & 6, R_B and R_C were varied to obtain desired test conditions.

FIGURE 3 – TURN ON TIME



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FIGURE 4 – THERMAL RESPONSE

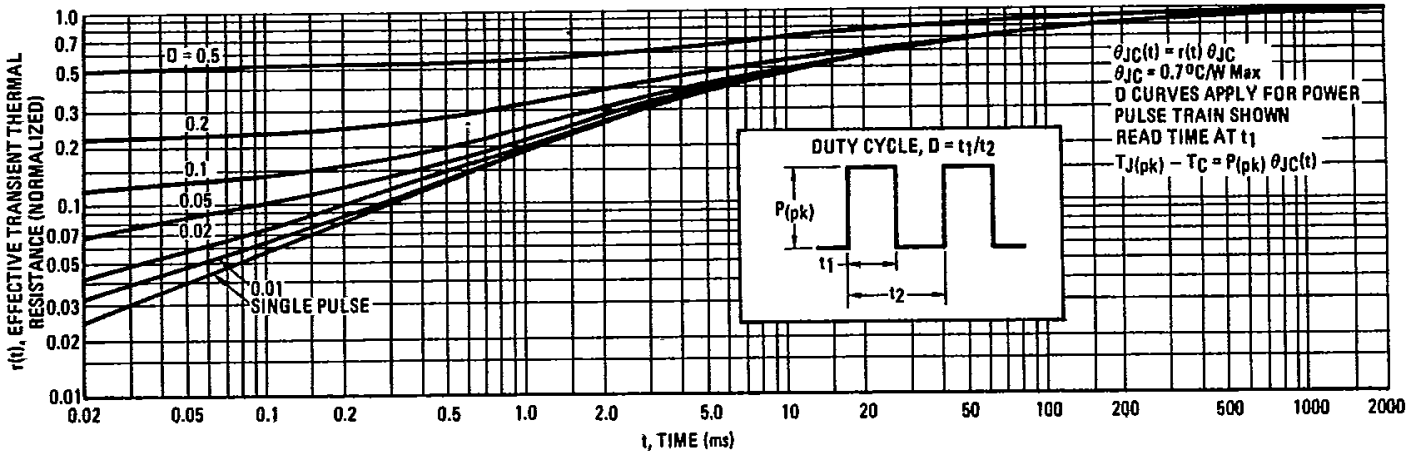
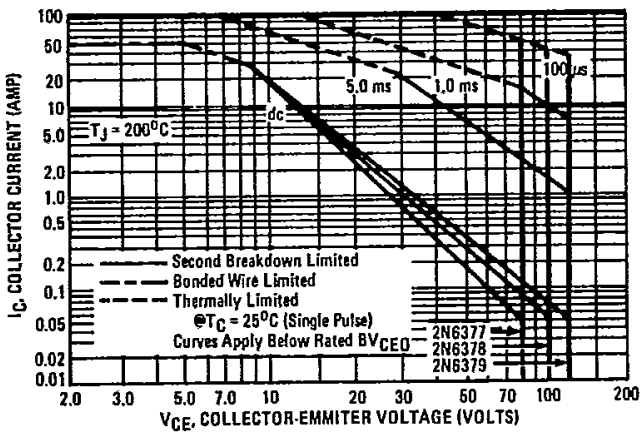


FIGURE 5 – ACTIVE REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: average junction temperature and second 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 $T_J(pk) = 200^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_J(pk) \leq 200^\circ\text{C}$. $T_J(pk)$ 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 second breakdown.

FIGURE 6 – TURN-OFF TIME

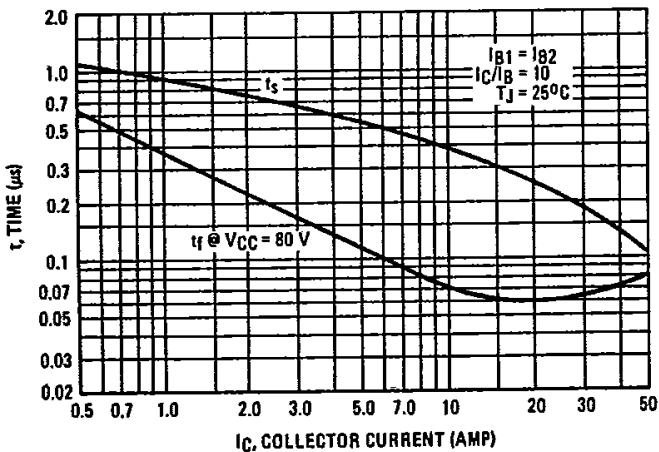
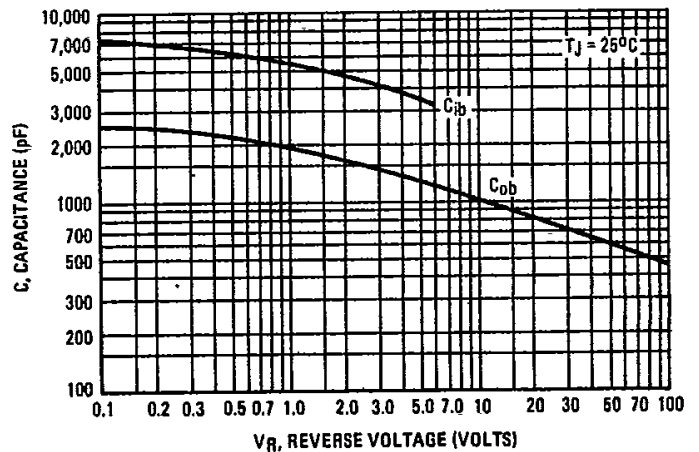


FIGURE 7 – CAPACITANCE



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FIGURE 8 – DC CURRENT GAIN

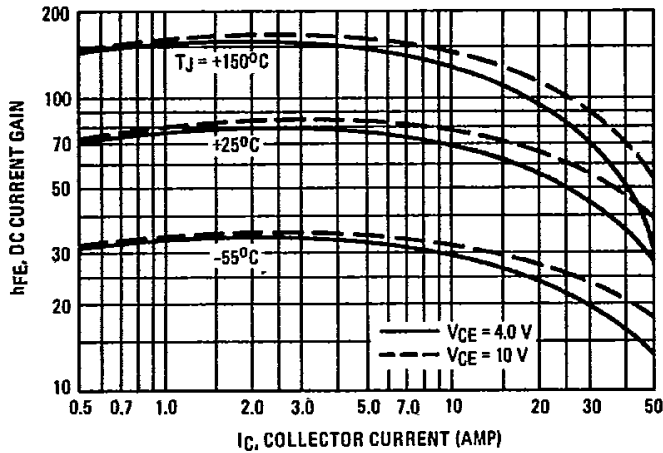


FIGURE 9 – COLLECTOR SATURATION REGION

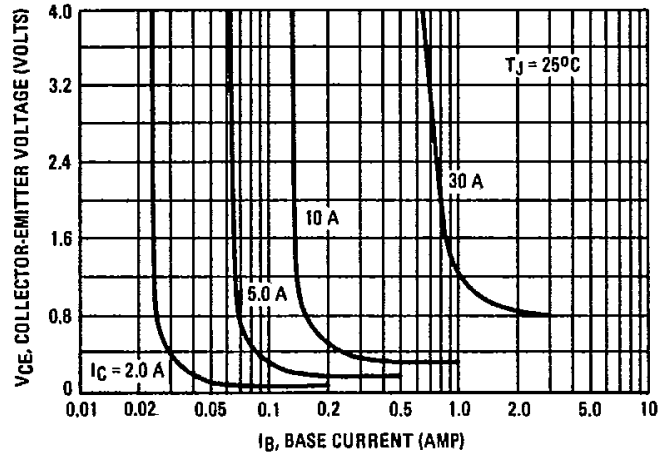


FIGURE 10 – "ON" VOLTAGES

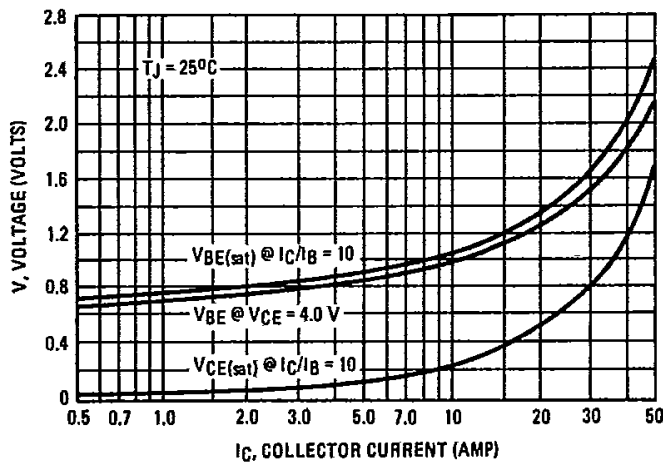


FIGURE 11 – TEMPERATURE COEFFICIENTS

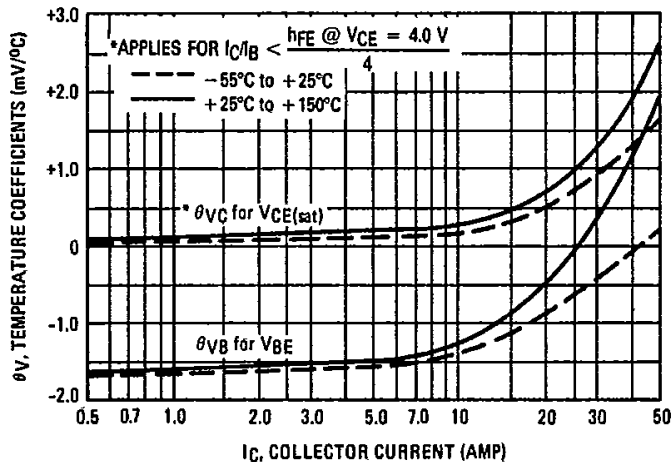


FIGURE 12 – COLLECTOR CUT-OFF REGION

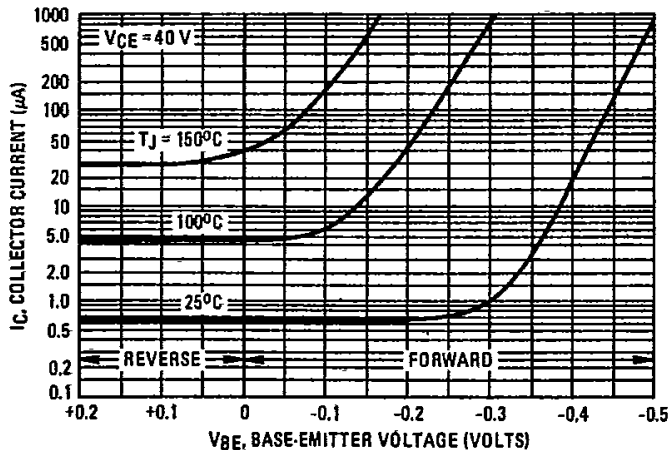


FIGURE 13 – BASE CUTOFF REGION

