2N5980 2N5981 2N5982 (SILICON)
MJE5980 MJE5981 MJE5982

HIGH POWER PNP SILICON TRANSISTORS

. . . designed for use in general-purpose amplifier and switching applications.

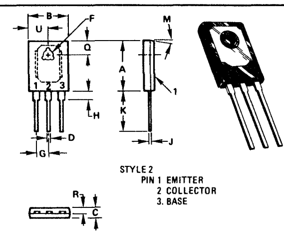
- DC Current Gain Specified to 8 Amperes –
  h_{FE} = 20-120 @ I_C = 4.0 Adc
  = 7.0 (Min) @ I_C = 8.0 Adc
- Collector-Emitter Sustaining Voltage
  $V_{CEO(sus)}$ = 40 Vdc (Min) – 2N5980, MJE5980
  = 60 Vdc (Min) – 2N5981, MJE5981
  = 80 Vdc (Min) – 2N5982, MJE5982
- High Current Gain – Bandwidth Product –
  f_T = 2.0 MHz (Min) @ I_C = 500 mAdc
- Complements to NPN Transistors – 2N5983, 2N5984, 2N5985 and MJE5983, MJE5984, MJE5985
- Choice of Packages – 2N5980 Series – Case 90
  MJE5980 Series – Case 199

8 AMPERE POWER TRANSISTORS

PNP SILICON

40-60-80 VOLTS
90 WATTS

2N5980
2N5981
2N5982



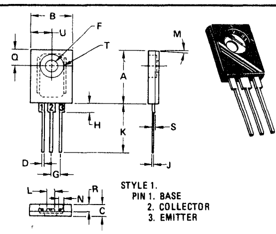
STYLE 2
PIN 1 EMITTER
2 COLLECTOR
3. BASE

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	16 13	16 38	0 635	0.645
B	12.57	12.83	0.495	0.505
C	3.18	3.43	0 125	0 135
D	1.09	1.24	0 043	0.049
F	3.51	3.76	0 138	0 148
G	4.22 BSC		0 166 BSC	
H	2.67	2.92	0.105	0 115
J	0.813	0.864	0.032	0.034
K	15.11	16.38	0.595	0.645
M	9° TYP		9° TYP	
Q	4.70	4.95	0 185	0.195
R	1.91	2.16	0.075	0 085
U	6 22	6 48	0.245	0.255

NOTE
1 LEADS WITHIN .005" RAD OF TRUE POSITION (TP) AT MMC

CASE 90-05

MJE5980
MJE5981
MJE5982



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

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	16 08	16.33	0.633	0.643
B	12.57	12.83	0.495	0.505
C	3.18	3.43	0.125	0.135
D	0.51	0.76	0.020	0.030
F	3.61	3.86	0.142	0.152
G	2.54 BSC		0.100 BSC	
H	2.67	2.92	0.105	0.115
J	0.43	0.69	0.017	0.027
K	14.73	14.99	0.580	0.590
L	2.16	2.41	0.085	0.095
M	3° TYP		3° TYP	
N	1.47	1.73	0.058	0.068
Q	4.78	5.03	0.188	0.198
R	1.91	2.16	0.075	0.085
S	0.81	0.86	0.032	0.034
T	6.99	7.24	0.275	0.285
U	6.22	6.48	0.245	0.255

1. DIM "G" IS TO CENTER LINE OF LEADS

CASE 199-04

*MAXIMUM RATINGS

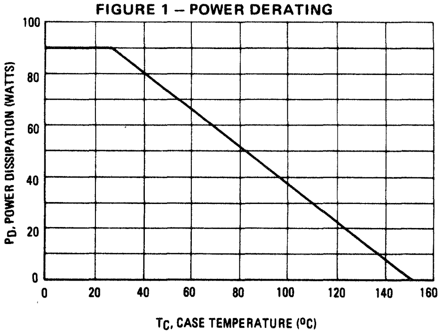
Rating	Symbol	2N5980 MJE5980	2N5981 MJE5981	2N5982 MJE5982	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector-Base Voltage	V_{CB}	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}	← 5.0 →			Vdc
Collector Current – Continuous Peak	I_C	← 8.0 → ← 15 →			Adc
Base Current	I_B	← 3.0 →			Adc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	← 90 → ← 0.72 →			Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	← -65 to +150 →			°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.39	°C/W

*Indicates JEDEC Registered Data for 2N5980 Series.

FIGURE 1 – POWER DERATING



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

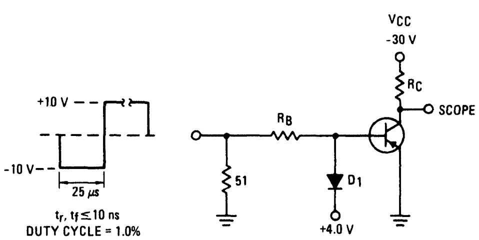
Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1)		$V_{CEO(sus)}$			Vdc
(I_C = 200 mAdc, I_B = 0)	2N5980, MJE5980		40	–	
	2N5981, MJE5981		60	–	
	2N5982, MJE5982		80	–	
Collector Cutoff Current		I_{CEO}			mA
(V_{CE} = 20 Vdc, I_B = 0)	2N5980, MJE5980		–	1.0	
(V_{CE} = 30 Vdc, I_B = 0)	2N5981, MJE5981		–	1.0	
(V_{CE} = 40 Vdc, I_B = 0)	2N5982, MJE5982		–	1.0	
Collector Cutoff Current		I_{CEX}			
(V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N5980, MJE5980		–	100	μAdc
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N5981, MJE5981		–	100	
(V_{CE} = 100 Vdc, $V_{BE(off)}$ = 1.5 Vdc)	2N5982, MJE5982		–	100	
(V_{CE} = 40 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C)	2N5980, MJE5980		–	1.0	mAdc
(V_{CE} = 60 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C)	2N5981, MJE5981		–	1.0	
(V_{CE} = 80 Vdc, $V_{BE(off)}$ = 1.5 Vdc, T_C = 125°C)	2N5982, MJE5982		–	1.0	
Emitter Cutoff Current		I_{EBO}			mAdc
(V_{BE} = 5.0 Vdc, I_C = 0)			–	1.0	
ON CHARACTERISTICS (1)					
DC Current Gain		h_{FE}			–
(I_C = 1.0 Adc, V_{CE} = 2.0 Vdc)			40	–	
(I_C = 4.0 Adc, V_{CE} = 2.0 Vdc)			20	120	
(I_C = 8.0 Adc, V_{CE} = 2.0 Vdc)			7.0	–	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 4.0 Adc, I_B = 400 mAdc)			–	0.6	
(I_C = 8.0 Adc, I_B = 1.2 Adc)			–	1.7	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C = 8.0 Adc, I_B = 1.2 Adc)			–	2.5	
Base-Emitter On Voltage		$V_{BE(on)}$			Vdc
(I_C = 4.0 Adc, V_{CE} = 2.0 Vdc)			–	1.4	
DYNAMIC CHARACTERISTICS					
Current-Gain – Bandwidth Product (2)		f_T			MHz
(I_C = 500 mAdc, V_{CE} = 10 Vdc, f_{test} = 1.0 MHz)			2.0	–	
Output Capacitance		C_{ob}			pF
(V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)			–	350	
Small-Signal Current Gain		h_{fe}			–
(I_C = 1.0 Adc, V_{CE} = 4.0 Vdc, f = 1.0 kHz)			20	–	

*Indicates JEDEC Registered Data for 2N5980 Series.

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

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

FIGURE 2 – SWITCHING TIME TEST CIRCUIT



R_B and R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS

D_1 MUST BE FAST RECOVERY TYPE, eg:
MBD5300 USED ABOVE $I_B \approx$ 100 mA
MSD6100 USED BELOW $I_B \approx$ 100 mA

FIGURE 3 – TURN-ON TIME

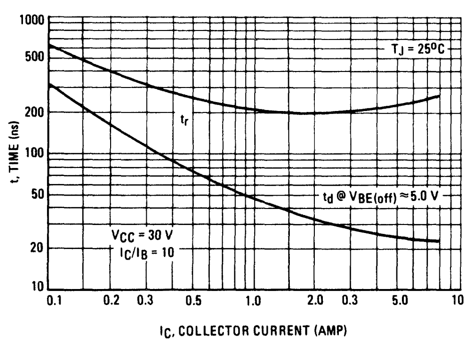


FIGURE 4 — THERMAL RESPONSE

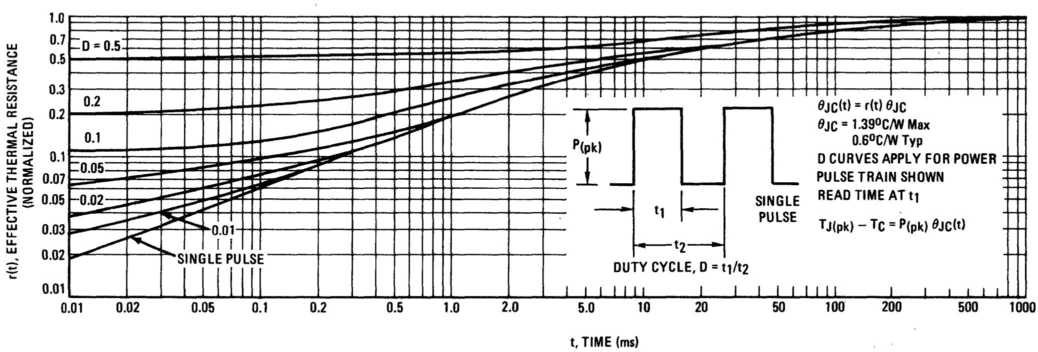
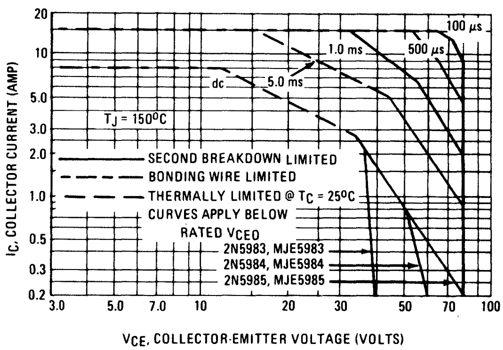


FIGURE 5 — ACTIVE-REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: 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 $T_{J(pk)} = 150^oC$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^oC$. $T_{J(pk)}$ 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. (See AN-415)

FIGURE 6 — TURN-OFF TIME

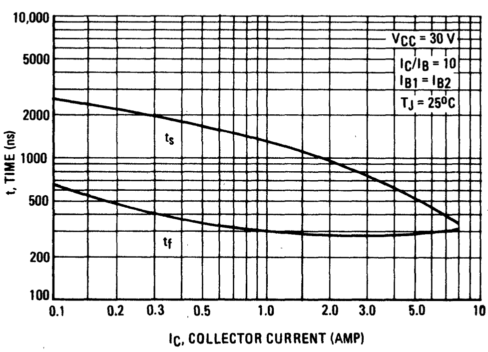


FIGURE 7 — CAPACITANCE

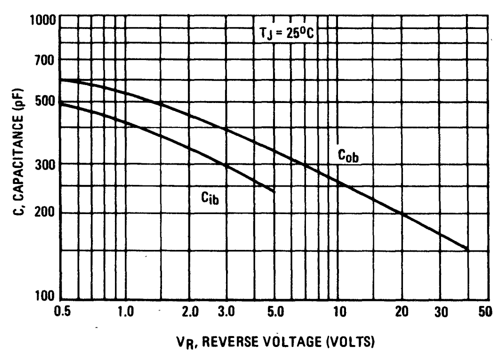


FIGURE 8 – DC CURRENT GAIN

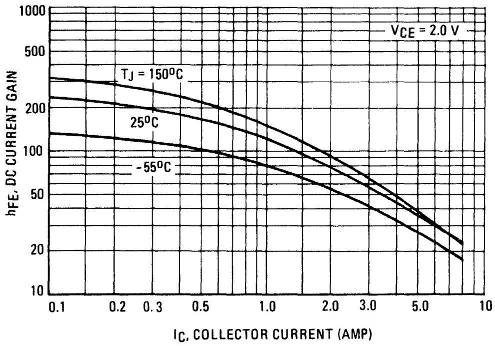


FIGURE 9 – COLLECTOR SATURATION REGION

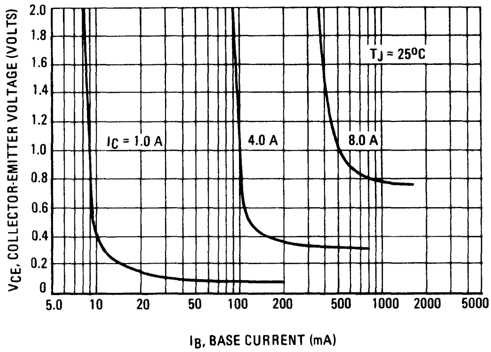


FIGURE 10 – "ON" VOLTAGES

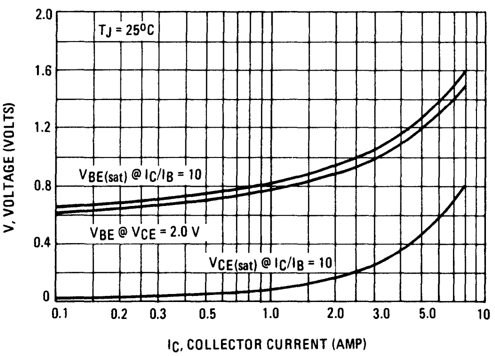


FIGURE 11 – TEMPERATURE COEFFICIENTS

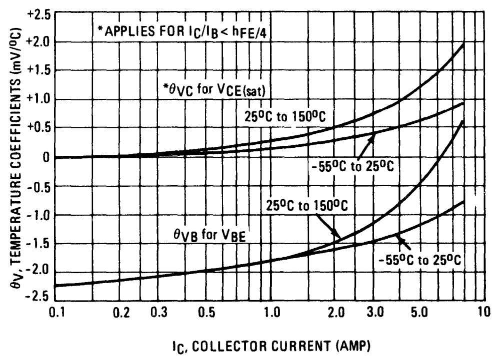


FIGURE 12 – COLLECTOR CUTOFF REGION

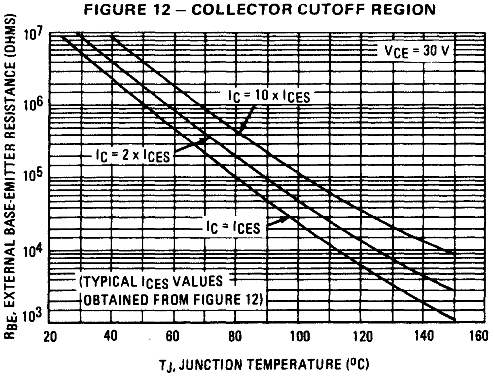


FIGURE 13 – EFFECTS OF BASE-EMITTER RESISTANCE