

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

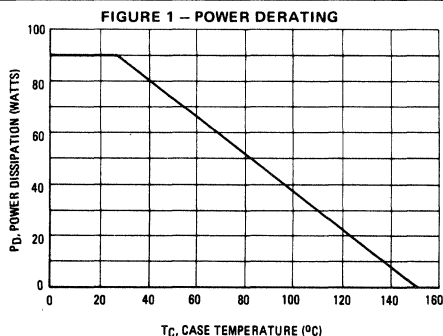
***MAXIMUM RATINGS**

Rating	Symbol	2N5980 MJE5980	2N5981 MJE5981	2N5982 MJE5982	Unit
Collector-Emitter Voltage	V_{CE}	40	80	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 @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	90 0.72			Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150			$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	1.39	$^{\circ}\text{C/W}$

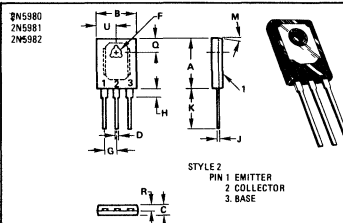
Indicates JEDEC Registered Data for 2N5980 Series.



8 AMPERE POWER TRANSISTORS

PNP SILICON

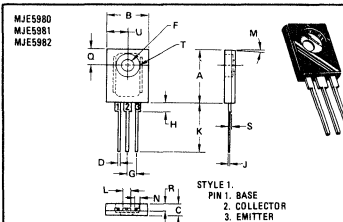
40-60-80 VOLTS
90 WATTS



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	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 ±0.08		0.166 ±0.003	
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	90° TYP		90° 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



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	16.08	16.33	0.633	0.643
B	12.57	12.83	0.496	0.506
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	3.0 TYP		3.0 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

2N5980, 2N5981, 2N5982/MJE5980, MJE5981, MJE5982 (continued)

*ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (1) ($I_C = 200\text{ mA}$, $I_B = 0$)	$V_{CE(sus)}$	40 60 80	— — —	Vdc
Collector Cutoff Current ($V_{CE} = 20\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 30\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 40\text{ Vdc}$, $I_B = 0$)	I_{CEO}	— — —	1.0 1.0 1.0	mA
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $V_{BE}(\text{off}) = 1.5\text{ Vdc}$) ($V_{CE} = 80\text{ Vdc}$, $V_{BE}(\text{off}) = 1.5\text{ Vdc}$) ($V_{CE} = 100\text{ Vdc}$, $V_{BE}(\text{off}) = 1.5\text{ Vdc}$) ($V_{CE} = 40\text{ Vdc}$, $V_{BE}(\text{off}) = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$) ($V_{CE} = 60\text{ Vdc}$, $V_{BE}(\text{off}) = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$) ($V_{CE} = 80\text{ Vdc}$, $V_{BE}(\text{off}) = 1.5\text{ Vdc}$, $T_C = 125^\circ\text{C}$)	I_{CEX}	— — — — — —	100 100 100 1.0 1.0 1.0	μAdc mAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	1.0	mAdc

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 4.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$) ($I_C = 8.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$)	h_{FE}	40 20 7.0	— 120 —	—
Collector-Emitter Saturation Voltage ($I_C = 4.0\text{ Adc}$, $I_B = 400\text{ mA}$) ($I_C = 8.0\text{ Adc}$, $I_B = 1.2\text{ Adc}$)	$V_{CE(sat)}$	— —	0.6 1.7	Vdc
Base-Emitter Saturation Voltage ($I_C = 8.0\text{ Adc}$, $I_B = 1.2\text{ Adc}$)	$V_{BE(sat)}$	—	2.5	Vdc
Base-Emitter On Voltage ($I_C = 4.0\text{ Adc}$, $V_{CE} = 2.0\text{ Vdc}$)	$V_{BE(on)}$	—	1.4	Vdc

DYNAMIC CHARACTERISTICS

Current-Gain — Bandwidth Product (2) ($I_C = 500\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f_{\text{test}} = 1.0\text{ MHz}$)	f_T	2.0	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$)	C_{ob}	—	350	pF
Small-Signal Current Gain ($I_C = 1.0\text{ Adc}$, $V_{CE} = 4.0\text{ Vdc}$, $f = 1.0\text{ kHz}$)	h_{fe}	20	—	—

*Indicates JEDEC Registered Data for 2N5980 Series.

(1) Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

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

FIGURE 2 — SWITCHING TIME TEST CIRCUIT

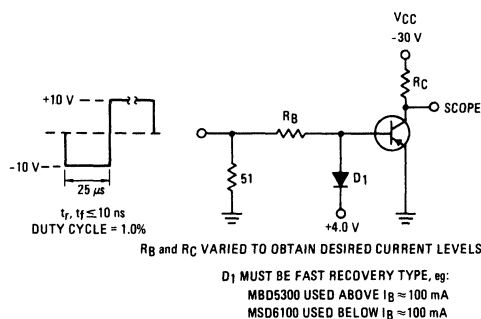


FIGURE 3 — TURN-ON TIME

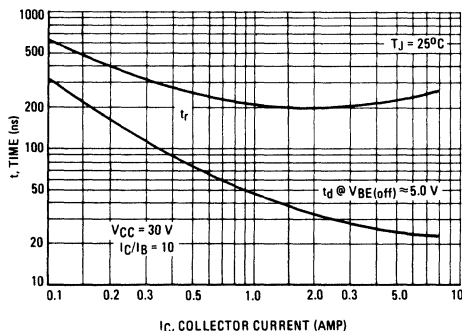


FIGURE 4 – THERMAL RESPONSE

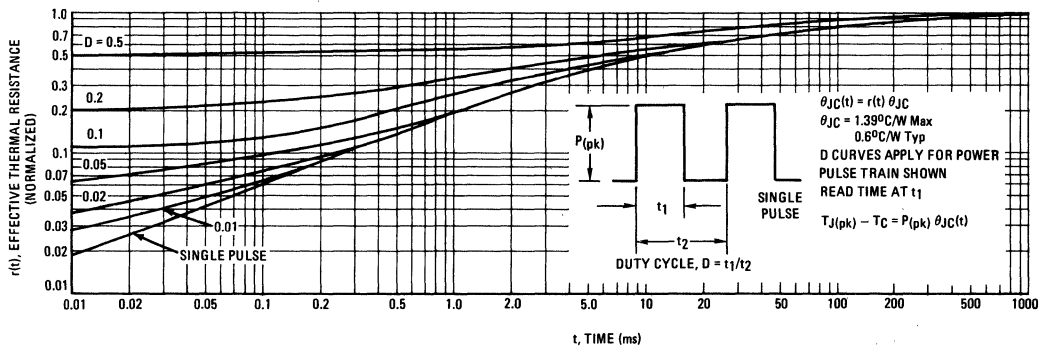
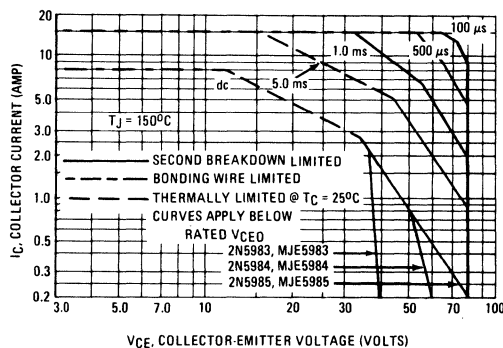


FIGURE 5 – ACTIVE-REGION SAFE OPERATING AREA



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

FIGURE 6 – TURN-OFF TIME

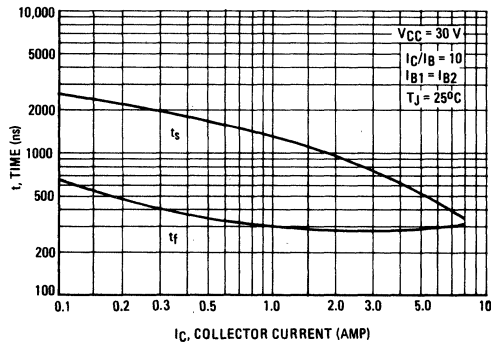


FIGURE 7 – CAPACITANCE

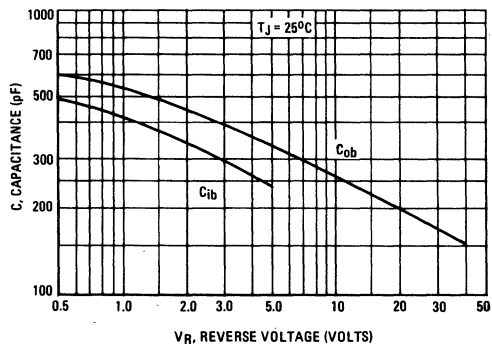


FIGURE 8 – DC CURRENT GAIN

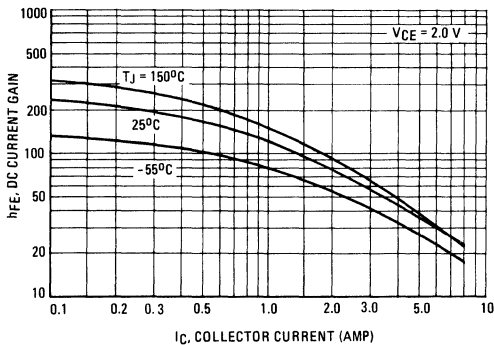


FIGURE 9 – COLLECTOR SATURATION REGION

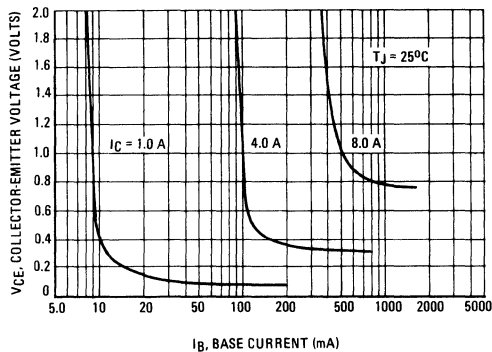


FIGURE 10 – "ON" VOLTAGES

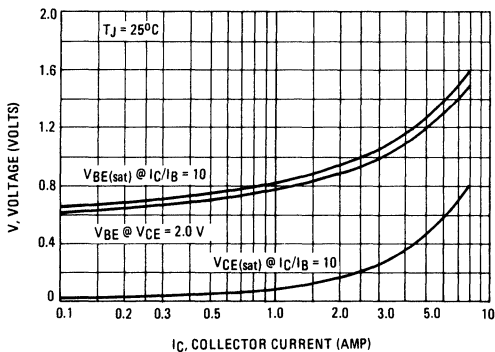


FIGURE 11 – TEMPERATURE COEFFICIENTS

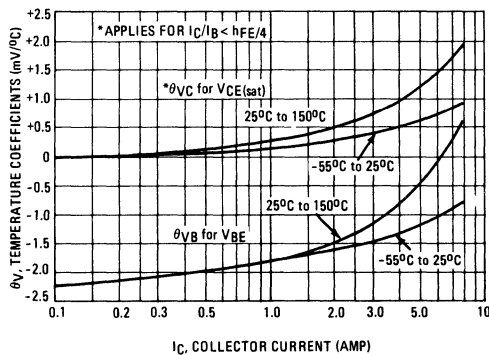


FIGURE 12 – COLLECTOR CUTOFF REGION

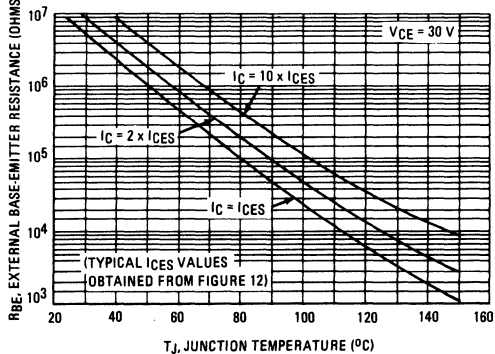


FIGURE 13 – EFFECTS OF BASE-EMITTER RESISTANCE

