2N5983 2N5984 2N5985 (SILICON)
MJE5983 MJE5984 MJE5985

HIGH POWER NPN SILICON TRANSISTORS

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

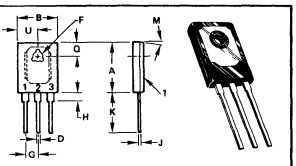
- DC Current Gain Specified to 8 Amperes
  h_{FE} = 20-120 @ I_C = 4.0 Adc
  = 7.0 (Min) @ I_C = 8.0 Adc
- Collector-Emitter Sustaining Voltage –
  $V_{CEO(sus)}$ = 40 Vdc (Min) – 2N5983, MJE5983
  = 60 Vdc (Min) – 2N5984, MJE5984
  = 80 Vdc (Min) – 2N5985, MJE5985
- High Current Gain – Bandwidth Product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

8 AMPERE POWER TRANSISTORS

NPN SILICON

40-60-80 VOLTS
90 WATTS

2N5983
2N5984
2N5985



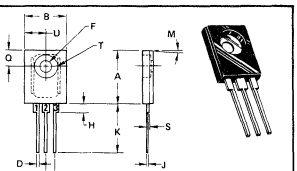
STYLE 2
PIN 1. EMITTER
2 COLLECTOR
3 BASE

DIM	MILLIMETERS MIN	MAX	INCHES 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 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

MJE5983
MJE5984
MJE5985



STYLE 1
PIN 1 BASE
2. COLLECTOR
3 EMITTER

DIM	MILLIMETERS MIN	MAX	INCHES MIN	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	4.76	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

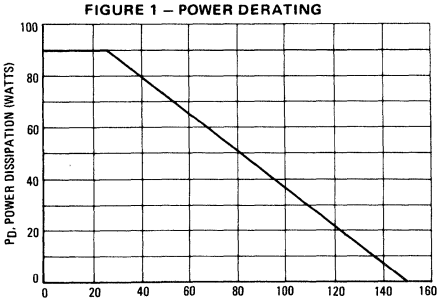
Rating	Symbol	2N5983 MJE5983	2N5984 MJE5984	2N5985 MJE5985	Unit
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Collector-Base Voltage	V_{CB}	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}	5.0			Vdc
Collector Current - Continuous	I_C	8.0			Adc
Peak		15			
Base Current	I_B	3.0			Adc
Total Device Dissipation @ T_C = 25°C	P_D	90			Watts
Derate above 25°C		0.72			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 2N5983 Series.

FIGURE 1 – POWER DERATING



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

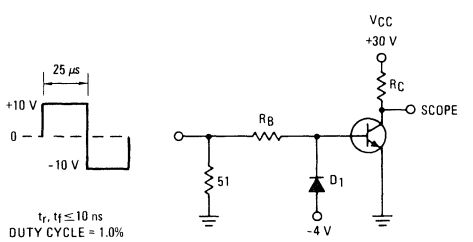
Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (1)		$V_{CEO(sus)}$			Vdc
(I_C = 200 mAdc, I_B = 0)	2N5983, MJE5983		40	–	
	2N5984, MJE5984		60	–	
	2N5985, MJE5985		80		
Collector Cutoff Current		I_{CEO}			mAdc
(V_{CE} = 20 Vdc, I_B = 0)	2N5983, MJE5983		–	1.0	
(V_{CE} = 30 Vdc, I_B = 0)	2N5984, MJE5984		–	1.0	
(V_{CE} = 40 Vdc, I_B = 0)	2N5985, MJE5985		–	1.0	
Collector Cutoff Current		I_{CEX}			
(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5983, MJE5983		–	100	μAdc
(V_{CE} = 80 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5984, MJE5984		–	100	
(V_{CE} = 100 Vdc, $V_{EB(off)}$ = 1.5 Vdc)	2N5985, MJE5985		–	100	
(V_{CE} = 40 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)	2N5983, MJE5983		–	1.0	mAdc
(V_{CE} = 60 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)	2N5984, MJE5984		–	1.0	
(V_{CE} = 80 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)	2N5985, MJE5985		–	1.0	
Emitter Cutoff Current		I_{EBO}			mAdc
(V_{BE} = 5.0 Vdc, I_C = 0)			–	1.0	
ON CHARACTERISTICS					
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)			–	250	
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 2N5983 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 ≈ 100 mA
MSD6100 USED BELOW I_B ≈ 100 mA

FIGURE 3 – TURN-ON TIME

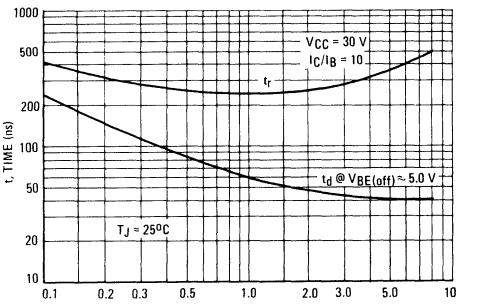


FIGURE 4 – THERMAL RESPONSE

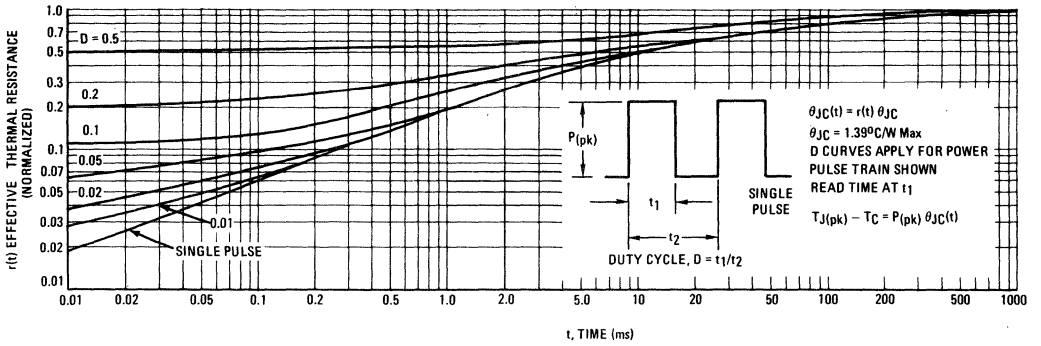
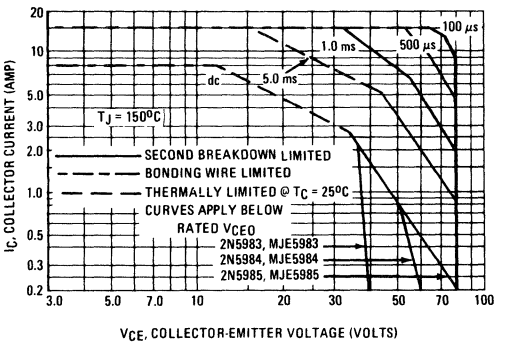


FIGURE 5 – ACTIVE-REGION SAFE OPERATING AREA



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°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150°C$. $T_{J(pk)}$ 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

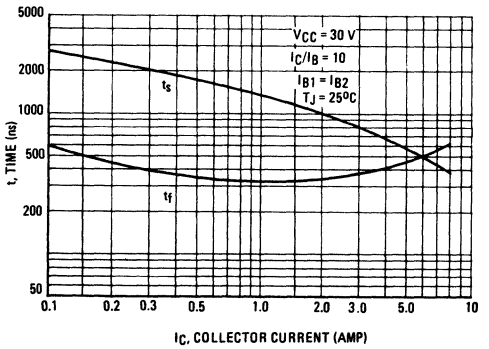


FIGURE 7 – CAPACITANCES

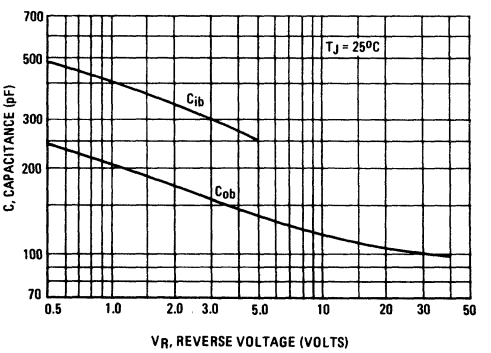


FIGURE 8 – DC CURRENT GAIN

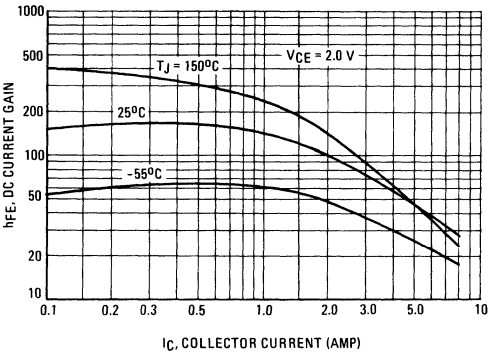


FIGURE 9 – COLLECTOR SATURATION REGION

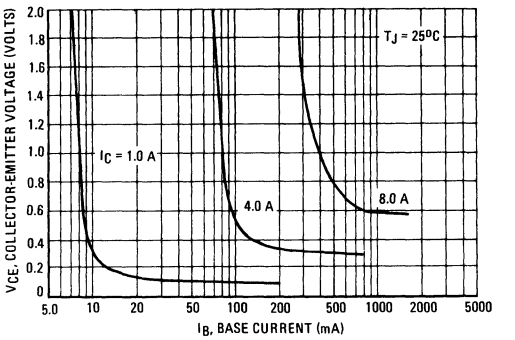


FIGURE 10 – "ON" VOLTAGES

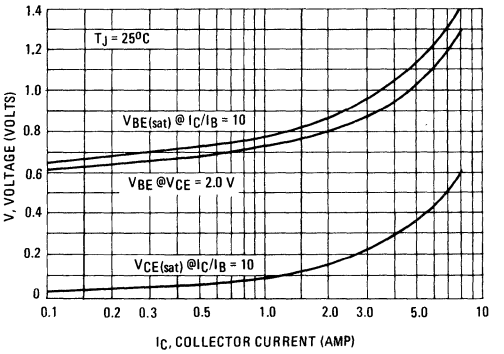


FIGURE 11 – TEMPERATURE COEFFICIENTS

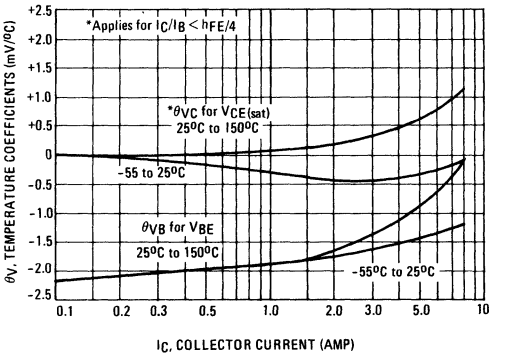


FIGURE 12 – COLLECTOR CUT-OFF REGION

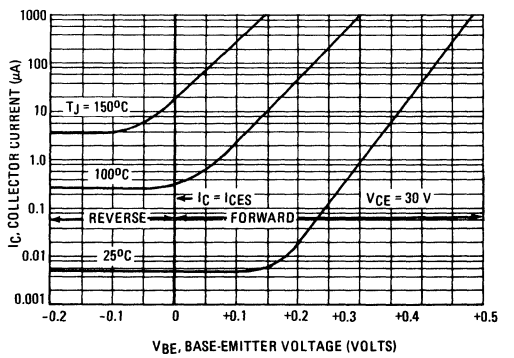


FIGURE 13 – EFFECTS OF BASE-EMITTER RESISTANCE