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MJ804		MJ12004	3-644
MJ8100		2N6193	3-158
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MJ8501	MJ8501		3-546
MJ8502	MJ8502		3-552
MJ8503	MJ8503		3-552
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MJ900	MJ900		3-528
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MJD31	MJD31		3-797
MJD31-1	MJD31-1		3-797
MJD31C	MJD31C		3-797
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MJE102		MJE2955	3-904
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MJE105	MJE105		3-860
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MJE1091	MJE1093		—
MJE1092	MJE1092		—
MJE1093	MJE1093		—
MJE1100	MJE1100		—
MJE1101	MJE1101		—
MJE1102	MJE1102		—
MJE1103	MJE1103		—
MJE12007	MJE12007		3-936
MJE1290		2N5988	3-131
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MJE13003	MJE13003		3-938
MJE13004	MJE13004		3-944
MJE13005	MJE13005		3-944
MJE13006	MJE13006		3-950
MJE13007	MJE13007		3-950
MJE13008	MJE13008		3-958
MJE13009	MJE13009		3-958
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MJE13071		MJE16002	3-976
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MJE15028	MJE15028		3-972
MJE15029	MJE15029		3-972
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MJE16002	MJE16002		3-976
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MJE170	MJE170		3-862
MJE171	MJE171		3-862
MJE172	MJE172		3-862
MJE180	MJE180		3-862
MJE181	MJE181		3-862
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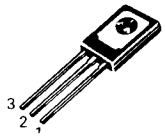
*Consult Motorola if a direct replacement is necessary.

TABLE 7 — PLASTIC TO-225 Type (Formerly TO-126 Type)

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



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

CASE 77-06

I_C Cont Amps Max	$V_{CEO(sus)}$ Volts Min	Device Type NPN	Device Type PNP	h_{FE} Min/Max	@ I_C Amp	Resistive Switching t_s μs Max	Resistive Switching t_f μs Max	Resistive Switching @ I_C Amp	f_T MHz Min	P_D (Case) Watts @ 25°C
0.3	250	MJE3440		40/160	0.02				15	15
	350	MJE3439		40/160	0.02				15	15
0.5	150	MJE341		25/200	0.05				15	20.8
	200	MJE344		30/300	0.05				15	20.8
	250	2N5655 BD157		30/250 30/240	0.1 0.05	3.5 typ	0.24 typ	0.1	10	20 20
	300	BD158 BD232 MJE340 2N5656	 MJE350 	30/240 20 min 30/240 30/250	0.05 0.15 0.05 0.1	 3.5 typ	 0.24 typ	 0.1	 10	20 20 20.8 20
	350	2N5657 BD159		30/250 30/240	0.1 0.05	3.5 typ	0.24 typ	0.1	10	20 20
1	40	2N4921	2N4918	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
	60	2N4922	2N4919	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
	80	2N4923	2N4920	20/100	0.5	0.6 typ	0.3 typ	0.5	3	30
1.5	45	BD165 BD135 BD135.6 BD135.10 BD135.16	BD166 BD136 BD136.6 BD136.10 BD136.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	60	BD167 BD137 BD137.6 BD137.10 BD137.16	 BD138 BD138.6 BD138.10 BD138.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	80	BD169 BD139 BD139.6 BD139.10 BD139.16	 BD140 BD140.6 BD140.10 BD140.16	15 min 40/250 40/100 63/160 100/250	0.5 0.15 0.15 0.15 0.15				6	20 12.5 12.5 12.5 12.5
	300	MJE13002•		5/25	1	4	0.7	1	5	40
	400	MJE13003•		5/25	1	4	0.7	1	5	40
2	45		BD234	25 min	1				3	25
	60	BD235	BD236	25 min	1				3	25
	80	BD237		25 min	1				3	25
	100	*MJE270##*	*MJE271##*	1.5k min	0.12				6	15
3	30	MJE520	MJE370	25 min	1					25
	40	MJE180	MJE170	50/250	0.1	0.6 typ	0.12 typ	0.1	50	12.5

• Case 77 (Style 3), # $|h_{fe}|$ @ 1 MHz, ## Darlington

(continued)

2

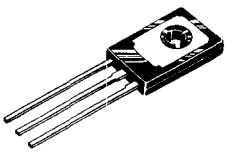
PNP
MJE170 thru MJE172
NPN
MJE180 thru MJE182

COMPLEMENTARY PLASTIC SILICON POWER TRANSISTORS

. . . designed for low power audio amplifier and low current, high speed switching applications.

- Collector-Emitter Sustaining Voltage –
  $V_{CEO(sus)}$ = 40 Vdc – MJE170, MJE180
  = 60 Vdc – MJE171, MJE181
  = 80 Vdc – MJE172, MJE182
- DC Current Gain –
  h_{FE} = 30 (Min) @ I_C = 0.5 Adc
  = 12 (Min) @ I_C = 1.5 Adc
- Current-Gain – Bandwidth Product –
  f_T = 50 MHz (Min) @ I_C = 100 mAdc
- Annular Construction for Low Leakages –
  I_{CBO} = 100 nA (Max) @ Rated V_{CB}

3 AMPERE
POWER TRANSISTORS COMPLEMENTARY SILICON
40-60-80 VOLTS
12.5 WATTS



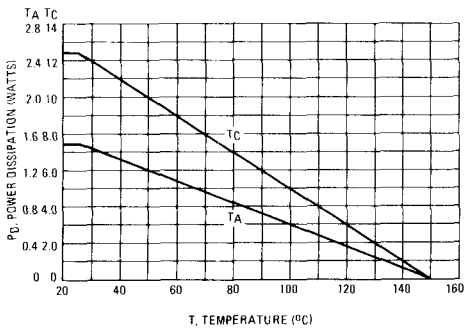
MAXIMUM RATINGS

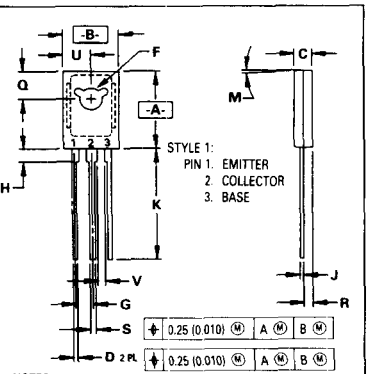
Rating	Symbol	MJE170 MJE180	MJE171 MJE181	MJE172 MJE182	Unit
Collector-Base Voltage	V_{CB}	60	80	100	Vdc
Collector-Emitter Voltage	V_{CEO}	40	60	80	Vdc
Emitter-Base Voltage	V_{EB}	7.0			Vdc
Collector Current Continuous Peak	I_C	3.0 6.0			Adc
Base Current	I_B	1.0			Adc
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	1.5 0.012			Watts W/°C
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	12.5 0.1			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}	10	°C/W
Thermal Resistance, Junction to Ambient	θ_{JA}	83.4	°C/W

FIGURE 1 – POWER DERATING





NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	MILLIMETERS MIN	MILLIMETERS MAX	INCHES MIN	INCHES MAX
A	10.80	11.04	0.425	0.435
B	7.50	7.74	0.295	0.305
C	2.42	2.66	0.095	0.105
D	0.51	0.66	0.020	0.026
F	2.93	3.17	0.115	0.125
G	2.39 BSC		0.094 BSC	
H	1.27	2.41	0.050	0.095
J	0.39	0.63	0.015	0.025
K	14.61	16.63	0.575	0.655
M	3° TYP		3° TYP	
Q	3.76	4.01	0.148	0.158
R	1.15	1.39	0.045	0.055
S	0.64	0.88	0.025	0.035
U	3.69	3.93	0.145	0.155
V	1.02	—	0.040	—

CASE 77-06
TO-225AA TYPE

3

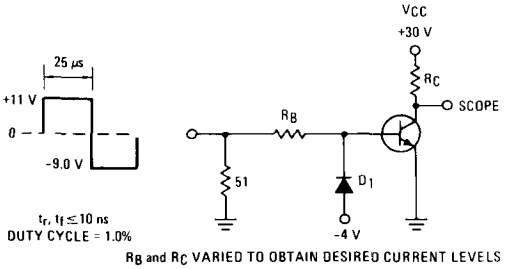
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage (I_C = 10 mAdc, I_B = 0)	MJE170, MJE180	$V_{CEO(sus)}$	40	–	Vdc
	MJE171, MJE181		60	–	
	MJE172, MJE182		80	–	
Collector Cutoff Current		I_{CBO}			μAdc
(V_{CB} = 60 Vdc, I_E = 0)	MJE170, MJE180		–	0.1	
(V_{CB} = 80 Vdc, I_E = 0)	MJE171, MJE181		–	0.1	
(V_{CB} = 100 Vdc, I_E = 0)	MJE172, MJE182		–	0.1	
(V_{CB} = 60 Vdc, I_E = 0, T_C = 150°C)	MJE170, MJE180		–	0.1	mAdc
(V_{CB} = 80 Vdc, I_E = 0, T_C = 150°C)	MJE171, MJE181		–	0.1	
(V_{CB} = 100 Vdc, I_E = 0, T_C = 150°C)	MJE172, MJE182		–	0.1	
Emitter Cutoff Current (V_{BE} = 7.0 Vdc, I_C = 0)		I_{EBO}	–	0.1	μAdc
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			–
(I_C = 100 mAdc, V_{CE} = 1.0 Vdc)			50	250	
(I_C = 500 mAdc, V_{CE} = 1.0 Vdc)			30	–	
(I_C = 1.5 Adc, V_{CE} = 1.0 Vdc)			12	–	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 500 mAdc, I_B = 50 mAdc)			–	0.3	
(I_C = 1.5 Adc, I_B = 150 mAdc)			–	0.9	
(I_C = 3.0 Adc, I_B = 600 mAdc)			–	1.7	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C = 1.5 Adc, I_B = 150 mAdc)			–	1.5	
(I_C = 3.0 Adc, I_B = 600 mAdc)			–	2.0	
Base-Emitter On Voltage (I_C = 500 mAdc, V_{CE} = 1.0 Vdc)		$V_{BE(on)}$	–	1.2	Vdc
DYNAMIC CHARACTERISTICS					
Current-Gain – Bandwidth Product (1) (I_C = 100 mAdc, V_{CE} = 10 Vdc, f_{test} = 10 MHz)		f_T	50	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	MJE170/MJE172	C_{ob}	–	60	pF
	MJE180/MJE182		–	40	

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

3

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

For PNP test circuit, reverse all polarities.

FIGURE 3 – TURN-ON TIME

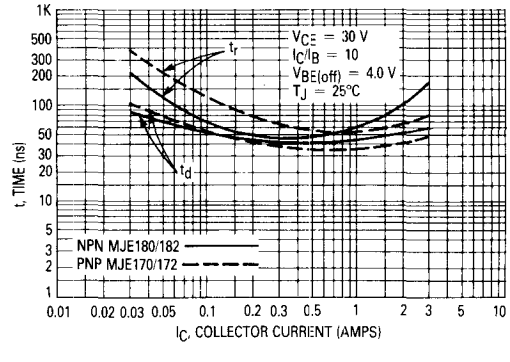
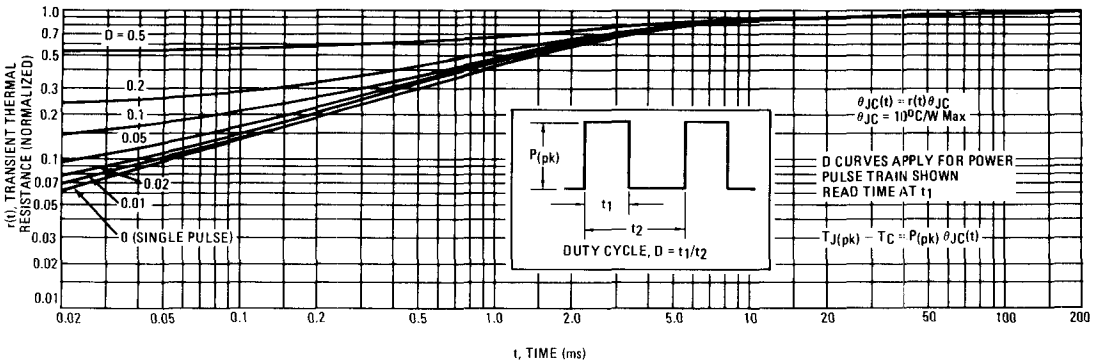


FIGURE 4 – THERMAL RESPONSE



ACTIVE-REGION SAFE OPERATING AREA

FIGURE 5 – MJE170, MJE171, MJE172

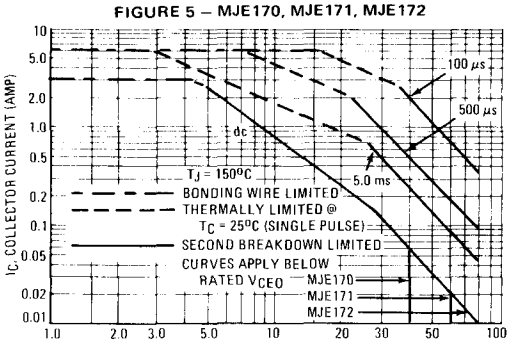
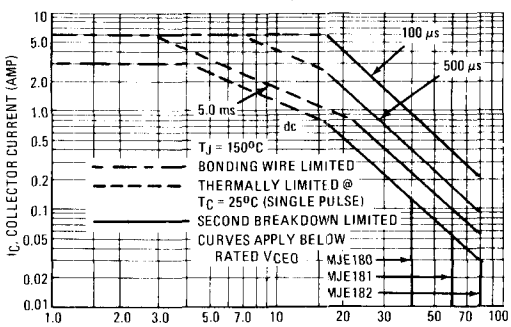


FIGURE 6 – MJE180, MJE181, MJE182



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 Figures 5 and 6 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 $T_{J(pk)} < 150^oC$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperature, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

FIGURE 7 – TURN-OFF TIME

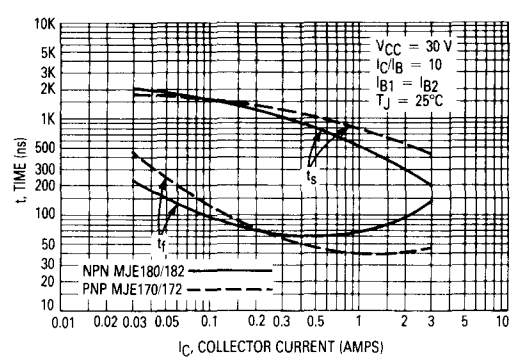
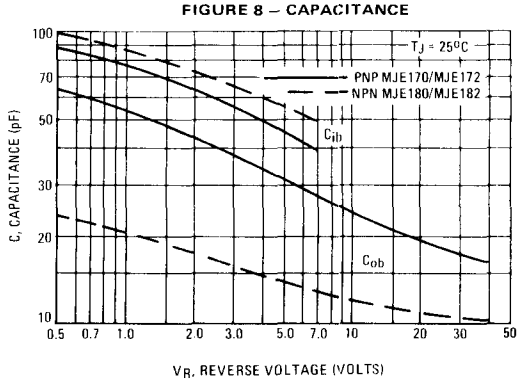


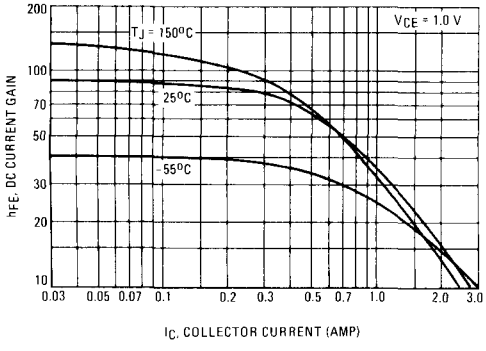
FIGURE 8 – CAPACITANCE



PNP
MJE170, MJE171, MJE172

NPN
MJE180, MJE181, MJE182

FIGURE 9 – DC CURRENT GAIN



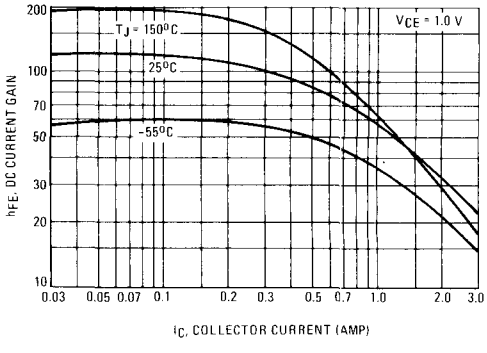
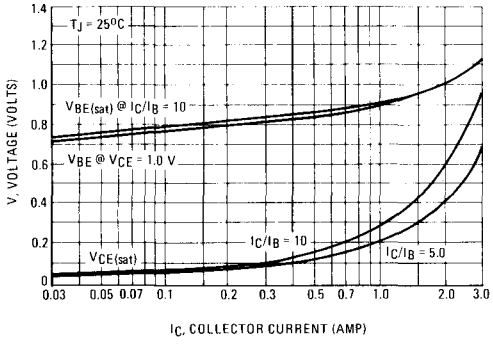


FIGURE 10 – "ON" VOLTAGES



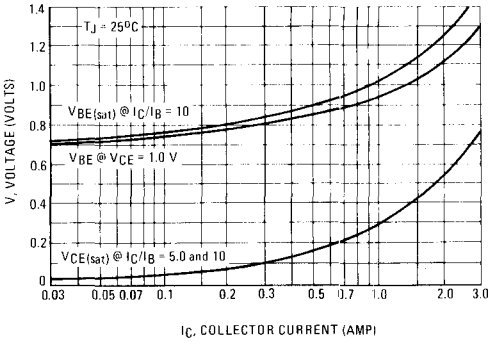
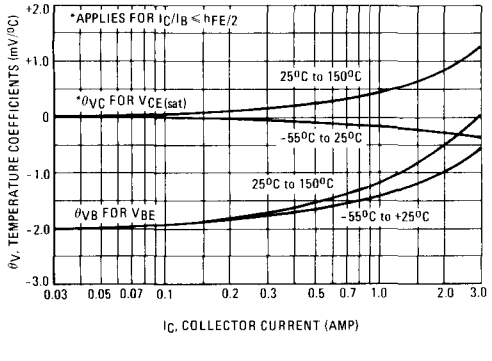
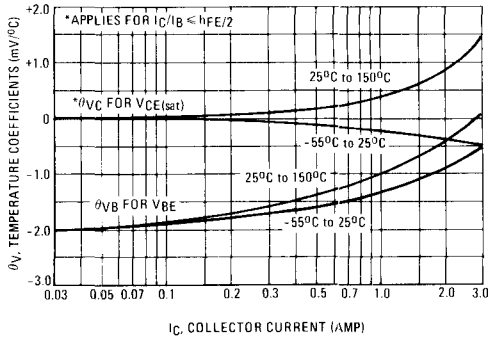


FIGURE 11 – TEMPERATURE COEFFICIENTS





3