

ALPHANUMERIC INDEX — CROSS-REFERENCE (Continued)

Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number	Industry Part Number	Motorola Direct Replacement	Motorola Similar Replacement	Page Number
MJE3738		TIP47	3-1087	MJE5655		TIP47	3-1087
MJE3739		TIP48	3-1087	MJE5656		TIP48	3-1087
MJE41		TIP41	3-1083	MJE5657		TIP49	3-1087
MJE41A		TIP41A	3-1083	MJE5730		MJE5850	3-918
MJE41B		TIP41B	3-1083	MJE5731		MJE5851	3-918
MJE41C		TIP41C	3-1083	MJE5732		MJE5852	3-918
MJE42		TIP42	3-1083	MJE5740	MJE5740		3-914
MJE42A		TIP42A	3-1083	MJE5741	MJE5741		3-914
MJE42B		TIP42B	3-1083	MJE5742	MJE5742		3-914
MJE42C		TIP42C	3-1083	MJE5850	MJE5850		3-918
MJE4340	MJE4340		3-910	MJE5851	MJE5851		3-918
MJE4341	MJE4341		3-910	MJE5852	MJE5852		3-918
MJE4342	MJE4342		3-910	MJE5960		2N6489	3-207
MJE4343	MJE4343		3-910	MJE5974		TIP42	3-1083
MJE4350	MJE4350		3-910	MJE5975		TIP42A	3-1083
MJE4351	MJE4351		3-910	MJE5976		TIP42B	3-1083
MJE4352	MJE4352		3-910	MJE5977		TIP41	3-1083
MJE4353	MJE4353		3-910	MJE5978		TIP41A	3-1083
MJE47		TIP47	3-1087	MJE5979		TIP41B	3-1083
MJE48		TIP48	3-1087	MJE5980		2N6489	3-207
MJE482		2N5190	3-85	MJE5981		2N6490	3-207
MJE483		2N5191	3-85	MJE5982		2N6491	3-207
MJE484		2N5192	3-85	MJE5983		2N6486	3-207
MJE488		2N5191	3-85	MJE5984		2N6487	3-207
MJE49		TIP49	3-1087	MJE5985		2N6488	3-207
MJE4918		TIP30	3-1071	MJE6040	MJE6040		3-139
MJE4919		TIP30A	3-1071	MJE6041	MJE6041		3-139
MJE492		2N5193	3-89	MJE6042		MJE6041	3-139
MJE4920		TIP30B	3-1071	MJE6043	MJE6043		3-139
MJE4921		TIP29	3-1071	MJE6044	MJE6044		3-139
MJE4922		TIP29A	3-1071	MJE6045	MJE6045		3-139
MJE4923		TIP29B	3-1071	MJE700	MJE700		3-888
MJE493		2N5194	3-89	MJE700T	MJE700T		3-888
MJE494		2N5195	3-89	MJE701	MJE701		3-888
MJE51		2N6497	3-211	MJE701T		TIP125	3-1098
MJE5170		MJE15031	3-972	MJE702	MJE702		3-888
MJE5171		MJE15031	3-972	MJE702T		TIP126	3-1098
MJE5172		MJE15031	3-972	MJE703	MJE703		3-888
MJE5180		MJE15030	3-972	MJE703T		TIP126	3-1098
MJE5181		MJE15030	3-972	MJE710		2N4918	3-75
MJE5182		MJE15030	3-972	MJE711		2N4919	3-75
MJE5190		2N6121	3-154	MJE712		2N4920	3-75
MJE5191		2N6122	3-154	MJE720		2N4921	3-79
MJE5192		2N6123	3-154	MJE721		2N4923	3-79
MJE5193		2N6124	3-154	MJE722		2N4923	3-79
MJE5194		2N6125	3-154	MJE800	MJE800		3-888
MJE5195		TIP32C	3-1073	MJE800T	MJE800T		3-888
MJE51T		2N6497	3-211	MJE801	MJE801		3-888
MJE52		2N6498	3-211	MJE801T		TIP120	3-1098
MJE520	MJE520		3-886	MJE802	MJE802		3-888
MJE520K		TIP31	3-1073	MJE802T		TIP121	3-1098
MJE521	MJE521		—	MJE803	MJE803		3-888
MJE521K		TIP31	3-1073	MJE803T		TIP121	3-1098
MJE5220	MJE5221		—	MJE8500	MJE8500		3-924
MJE5221	MJE5221		—	MJE8501	MJE8501		3-924
MJE5230	MJE5230		—	MJE8502	MJE8502		3-930
MJE5231	MJE5231		—	MJE8503	MJE8503		3-930
MJE52T		2N6498	3-211	MJF102	MJF102		3-1011
MJE53		MJE13005	3-944	MJF107	MJF107		3-1011
MJE53T		MJE13005	3-944	MJF122	MJF122		3-1016

*Consult Motorola if a direct replacement is necessary.

TABLE 5 — PLASTIC TO-220 (Continued)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		hFE Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
2	45	BD239	BD240	15 min	1				3	30
	60	BD239A TIP110##	BD240A TIP115##	15 min 500 min	1 2	1.7 typ	1.3 typ	2	3 25#	30 50
	80	BD239B TIP111##	BD240B TIP116##	15 min 500 min	1 2	1.7 typ	1.3 typ	2	3 25#	30 50
	100	BD239C TIP112##	BD240C TIP117##	25 min 500 min	1 2	1.7 typ	1.3 typ	2	3 25#	30 50
	400	BUX84		30 min	0.1	3.5	1.4	1	4	50
	450	BUX85		30 min	0.1	3.5	1.4	1	4	50
	900	MJE1320		3 min	1	4 typ	0.8 typ	1		80
2.5	700	MJE8500		7.5 min	0.5	4	2	1		65
	750	MJE12007		1.1 min	2		1	2	4 typ	65
	800	MJE8501		7.5 min	0.5	4	2	1		65
3	40	TIP31	TIP32	25 min	1	0.6 typ	0.3 typ	1	3	40
	45	BD241	BD242	25 min	1				3	40
	60	BD241A TIP31A	BD242A TIP32A	25 min 25 min	1 1	0.6 typ	0.3 typ	1	3 3	40 40
	80	BD241B TIP31B	BD242B TIP32B	25 min 25 min	1 1	0.6 typ	0.3 typ	1	3 3	40 40
	100	BD241C TIP31C	BD242C TIP32C	25 min 25 min	1 1	0.6 typ	0.3 typ	1	3 3	40 40
	750	MJE16032		4 min	3	2	1.5	2		80
	850	MJE16034		4 min	3	2	1.5	2		80
4	45	2N6121	2N6124	25/100	1.5	0.4 typ	0.3 typ	1.5	2.5	40
	60	2N6122 BD535 MJE800T##	2N6125 MJE700T##	25/100 25 min 750 min	1.5 2 1.5	0.4 typ	0.3 typ	1.5	2.5 3 1#	40 50 40
	80	2N6123		20/80	1.5	0.4 typ	0.3 typ	1.5	2.5	40
	300	MJE13004		6/30	3	3	0.7	3	4	60
	400	MJE13005		6/30	3	3	0.7	3	4	60
5	60	TIP120##	TIP125##	1k min	3	1.5 typ	1.5 typ	3	4#	65
	80	TIP121##	TIP126##	1k min	3	1.5 typ	1.5 typ	3	4#	65
	100	TIP122##	TIP127##	1k min	3	1.5 typ	1.5 typ	4	4#	75
	250	2N6497		10/75	2.5	1.8	0.8	2.5	5	80
	300	2N6498		10/75	2.5	1.8	0.8	2.5	5	80
	400	MJE13070		8 min	3	1.5	0.5	3		80
	450	MJE16002 MJE16004		5 min 7 min	5 5	3 2.7	0.3 0.35	3 3		80 80
	700	MJE8502		7.5 min	1	4	2	2.5		80
	800	MJE8503		7.5 min	1	4	2	2.5		80
6	40	TIP41	TIP42	15/75	3	0.4 typ	0.15 typ	3	3	65
	45	BD243	BD244	15 min	3				3	65
	60	BD243A TIP41A	BD244A TIP42A	15 min 15/75	3 3	0.4 typ	0.15 typ	3	3 3	65 65
	80	BD243B TIP41B	BD244B TIP42B	15 min 15/75	3 3	0.4 typ	0.15 typ	3	3 3	65 65
	100	BD243C TIP41C	BD244C TIP42C	15 min 15/75	3 3	0.4 typ	0.15 typ	3	3 3	65 65
7	30	2N6288	2N6111	30/150	3	0.4 typ	0.15 typ	3	4	40

[h_{FE}] @ 1 MHz, ## Darlington

(continued)

TABLE 12 — POWER DARLINGTONS (continued)

I _C Cont Amps Max	V _{CEO} (sus) Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			h _{FE} @ 1 MHz Min	P _D (Case) Watts @ 25°C	Case JEDEC/MOT
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp			
4	40	MJE3300 2N6037	MJE3310 2N6034	1k min 750/1k	1 2				20 25	15 40	TO-225AA/77R TO-225AA/77
		BD675 BD675A	BD676 BD676A BD776	750 min 750 min 750 min	1.5 2 2					40 40 15	TO-225AA/77 TO-225AA/77 TO-225AA/77
	60	BD677 BD677A BD777	BD678 BD678A BD778	750 min 750 min 750 min	1.5 2 2					15 40 40	TO-225AA/77 TO-225AA/77 TO-225AA/77
		MJE3301 MJE800 MJE800T	MJE700 MJE700T	1k min 750 min 750 min	1 1.5 1.5				20 20 1	15 40 40	TO-225AA/77R TO-225AA/77 TO-225AA/77
		MJE801 2N6038 2N6294	MJE701 2N6035 2N6296	750 min 750/18k 750/18k	2 2 2	1.7 typ 0.9 typ	1.2 typ 0.7 typ	2 2	1 25 4	40 40 50	TO-225AA/77 TO-225AA/77 TO-213AA/80
		BD679 BD679A BD779	BD680 BD680A BD780	750 min 750 min 750 min	1.5 2 2					40 40 15	TO-225AA/77 TO-225AA/77 TO-225AA/77
		MJD6039 MJE802 MJE803	MJD6036 MJE702 MJE703	1k/12k 750 min 750 min	2 1.5 2	1.7 typ 1.7 typ	1.2 typ 1.2 typ	2 2	20 25 4	15 20 40	TO-252/369A-04 TO-225AA/77 TO-225AA/77
		2N6039 2N6295	2N6036 2N6297	750/18k 750/18k	2 2	0.9 typ 0.7 typ	0.7 typ 0.7 typ	2 2	25 4	40 50	TO-225AA/77 TO-213AA/80
		BD681	BD682	750 min	1.5					40	TO-225AA/77
	100										
5	60	MJE1100 MJE1101 TIP120	MJE1090 MJE1091 TIP125	750 min 750 min 1k min	3A 4A 3				1 1 4	70 70 65	TO-225AB/90 TO-225AB/90 TO-220/221A
						1.5 typ	1.5 typ	3			
	80	MJE1102 MJE1103 TIP121	MJE1092 MJE1102 TIP126	750 min 750 min 1k min	3A 4A 3				1 1 4	70 70 65	TO-225AB/90 TO-225AB/90 TO-220/221A
7	100	MJF122 TIP122	MJF127 TIP127	2k min 1k min	3 3	1.5 typ 1.5 typ	1.5 typ 1.5 typ	3 3	4 4	28 65	—/221C-02 TO-220/221A
	300	MJ3041		250 min	2.5					100	TO-204/1
	350	MJ3042		250 min	2.5					100	TO-204/1
	375	BU522		250 min	2.5				7.5	75	TO-220/221A
	425	BU522A		250 min	2.5				7.5	75	TO-220/221A
8	450	BU522B		250 min	2.5				7.5	75	TO-220/221A
	40	2N6386		1k/20k	3				20	65	TO-220/221A
	45	BDX53 BD895 BD895A	BDX54 BD896 BD896A	750 min 750 min 750 min	3 3 4				4 1 1	60 70 70	TO-220/221A TO-220/221A TO-220/221A
	60	BDX53A BD897 BD897A	BDX54A BD898 BD898A	750 min 750 min 750 min	3 3 4				4 1 1	60 70 70	TO-220/221A TO-220/221A TO-220/221A
		MJ1000 TIP100	MJ900 TIP105	1k min 1k/20k	3 3					90	TO-204/1
		2N6043 2N6300	2N6040 2N6298	1k/10k 750k/18k	4 4	1.5 typ 1.5 typ	1.5 typ 1.5 typ	3 4	4 4	75 75	TO-220/221A TO-213AA/80
		2N6055 MJE6043	2N6053 MJE6040	750k/18k 1k/20k	4 4	1.5 typ 1.5 typ	1.5 typ 1.5 typ	4 4	4 2	100 75	TO-204/1 TO-225AB/90
	80	BDX53B BD899 BD899A	BDX54B BD900 BD900A	750 min 750 min 750 min	3 3 4				4 1 1	60 70 70	TO-220/221A TO-220/221A TO-220/221A

(continued)

MOTOROLA SEMICONDUCTOR TECHNICAL DATA

PNP
MJE700,T
thru
MJE703

NPN
MJE800,T
thru
MJE803

PLASTIC DARLINGTON COMPLEMENTARY SILICON POWER TRANSISTORS

... designed for general-purpose amplifier and low-speed switching applications.

- High DC Current Gain —
 $h_{FE} = 2000$ (Typ) @ $I_C = 2.0$ Adc
- Monolithic Construction with Built-in Base-Emitter Resistors to Limit Leakage Multiplication
- Choice of Packages —
MJE700 and MJE800 series
TO220AB, MJE700T and MJE800T

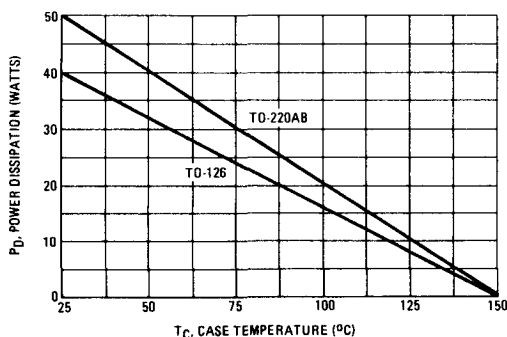
MAXIMUM RATINGS

Rating	Symbol	MJE700, T MJE701 MJE800, T MJE801	MJE702 MJE703 MJE802 MJE803	Unit
Collector-Emitter Voltage	V _{CEO}	60	80	Vdc
Collector-Base Voltage	V _{CB}	60	80	Vdc
Emitter-Base Voltage	V _{EB}	5.0		Vdc
Collector Current	I _C	4.0		Adc
Base Current	I _B	0.1		Adc
Total Power Dissipation @ T _C = 25°C Derate above 25°C	P _D	CASE 77	TO-220	Watts W/°C
		40	50	
		0.32	0.40	
Operating and Storage Junction Temperature Range	T _J , T _{stg}	-55 to +150		°C

THERMAL CHARACTERISTICS

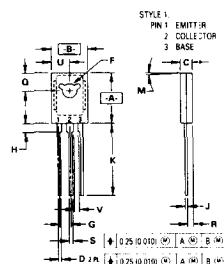
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case CASE 77 TO-220	$R_{\theta JC}$	3.13	$^\circ\text{C}/\text{W}$
		2.50	

FIGURE 1 — POWER DERATING



4.0 AMPERE DARLINGTON POWER TRANSISTORS COMPLEMENTARY SILICON

40 WATT
50 WATT

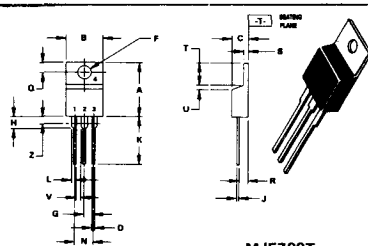


MJE700-703
MJE800-803

DIM	MIN	MAX	MIN	MAX
A	12.92	13.94	0.425	0.450
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	0.025
E	2.83	3.17	0.115	0.125
F	2.39	2.55	0.094	0.100
G	1.27	2.41	0.050	0.095
H	0.39	0.63	0.015	0.025
J	14.61	19.63	0.575	0.655
K	3.75	4.01	0.148	0.158
L	1.15	1.39	0.045	0.055
M	0.94	0.98	0.035	0.035
N	3.69	3.93	0.145	0.155
P	1.02	—	0.040	—

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

CASE 77-06
TO-225AA TYPE



MJE700T
MJE800T

DIM	MIN	MAX	MIN	MAX
A	14.48	15.75	0.570	0.620
B	5.68	10.20	0.200	0.400
C	4.07	4.82	0.160	0.190
D	0.84	0.90	0.035	0.035
E	3.61	3.72	0.142	0.147
F	2.42	2.60	0.095	0.105
G	2.86	3.80	0.110	0.150
H	0.46	0.71	0.018	0.028
J	12.70	14.27	0.500	0.562
K	1.15	1.30	0.045	0.050
L	4.83	5.50	0.190	0.210
M	2.24	2.66	0.090	0.120
N	3.66	4.25	0.100	0.170
P	1.15	1.30	0.045	0.050
Q	0.87	0.87	0.028	0.028
R	0.60	1.42	0.000	0.090
S	1.15	—	0.045	—
T	—	3.20	—	0.090

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI
Y14.5M, 1982
2. CONTROLLING DIMENSION: INCH
3. DIM J DEFINES A ZONE WHERE ALL BODY AND
LEAD IRREGULARITIES ARE ALLOWED.

CASE 221A-04
TO-220AB

PNP MJE700,T thru MJE703
NPN MJE800,T thru MJE803

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage (1) ($I_C = 50\text{ mAdc}$, $I_B = 0$)	$V_{(BR)CEO}$	60 80	-- --	Vdc
Collector Cutoff Current ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 80\text{ Vdc}$, $I_B = 0$)	I_{CEO}	-- --	100 100	μAdc
Collector Cutoff Current ($V_{CB} = \text{Rated } BV_{CEO}$, $I_E = 0$) ($V_{CB} = \text{Rated } BV_{CEO}$, $I_E = 0$, $T_C = 100^\circ\text{C}$)	I_{CBO}	-- --	100 500	μAdc
Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	--	2.0	mAdc
ON CHARACTERISTICS				
DC Current Gain (1) ($I_C = 1.5\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 4.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$)	h_{FE}	750 750 100	-- -- --	--
Collector-Emitter Saturation Voltage (1) ($I_C = 1.5\text{ Adc}$, $I_B = 30\text{ mAdc}$) ($I_C = 2.0\text{ Adc}$, $I_B = 40\text{ mAdc}$) ($I_C = 4.0\text{ Adc}$, $I_B = 40\text{ mAdc}$)	$V_{CE(sat)}$	-- -- --	2.5 2.8 3.0	Vdc
Base-Emitter On Voltage (1) ($I_C = 1.5\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$) ($I_C = 4.0\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$)	$V_{BE(on)}$	-- -- --	2.5 2.5 3.0	Vdc
DYNAMIC CHARACTERISTICS				
Small-Signal Current Gain ($I_C = 1.5\text{ Adc}$, $V_{CE} = 3.0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	$ h_{fe} $	1.0	--	--

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

FIGURE 2 – SWITCHING TIMES TEST CIRCUIT

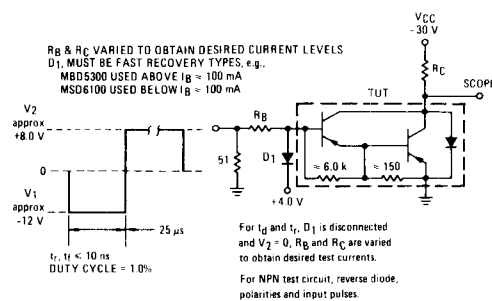


FIGURE 3 – SWITCHING TIMES

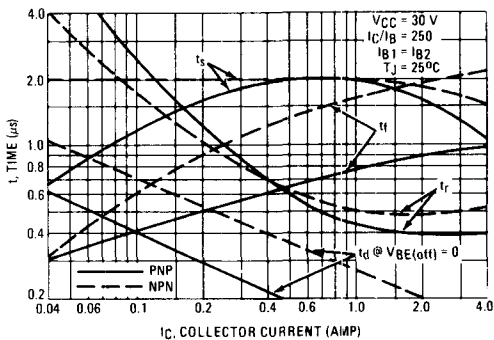
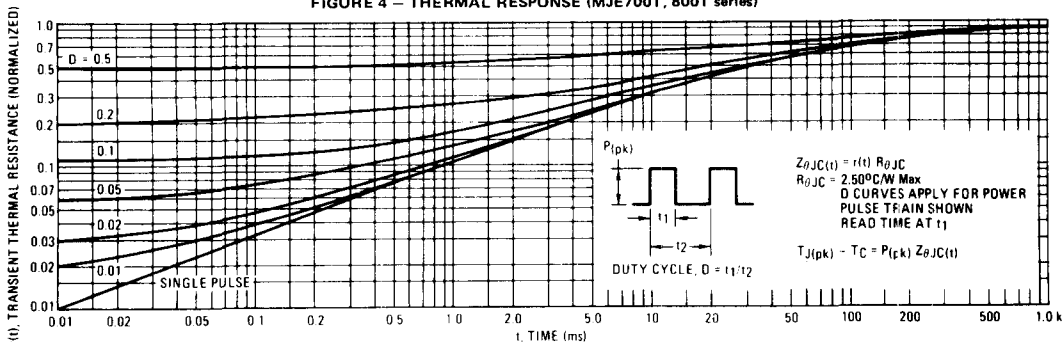
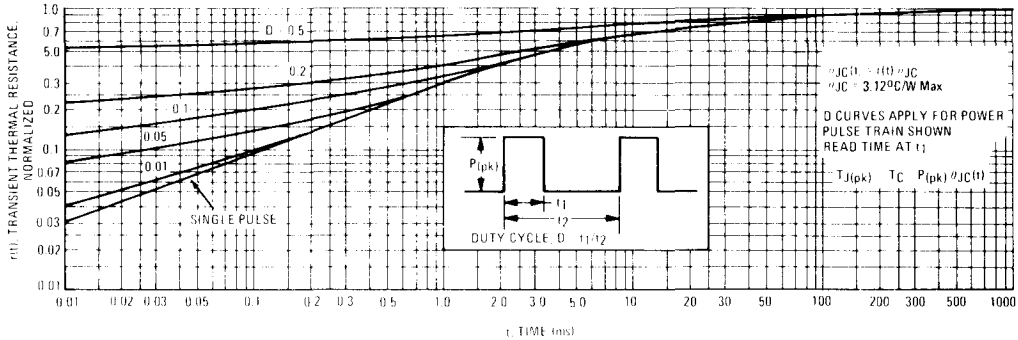


FIGURE 4 – THERMAL RESPONSE (MJE700T, 800T series)



PNP MJE700,T thru MJE703 NPN MJE800,T thru MJE803

FIGURE 5 — THERMAL RESPONSE (MJE700, 800 series)



ACTIVE-REGION SAFE-OPERATING AREA

FIGURE 6 — MJE700 series

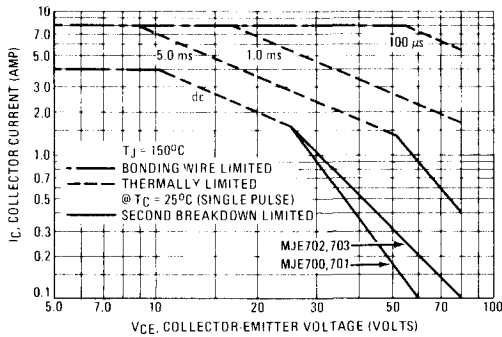
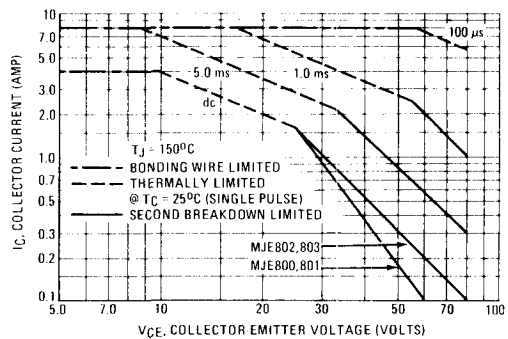


FIGURE 7 — MJE800 series



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 6 and 7 are 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 $T_{J(pk)} < 150^\circ\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 4 or 5. 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 8 — MJE700T

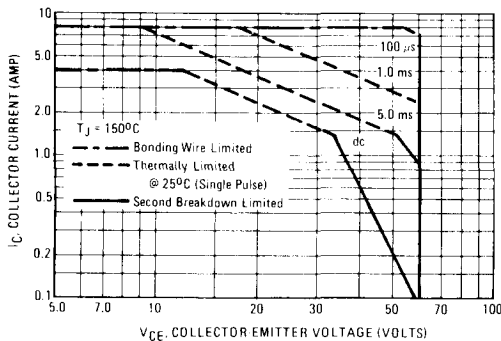
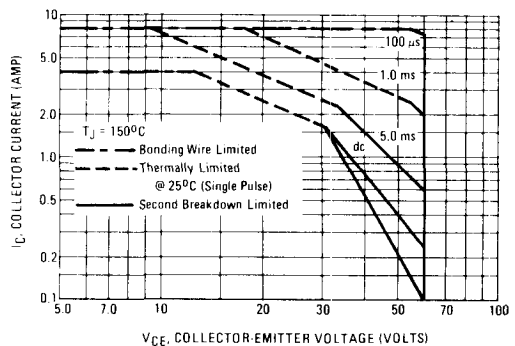


FIGURE 9 — MJE800T



PNP MJE700,T thru MJE703

NPN MJE800,T thru MJE803

PNP
MJE700,T series

NPN
MJE800,T series

FIGURE 10 – DC CURRENT GAIN

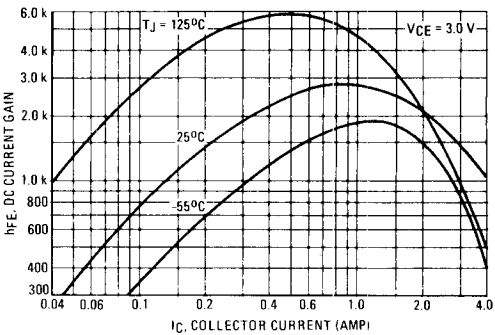
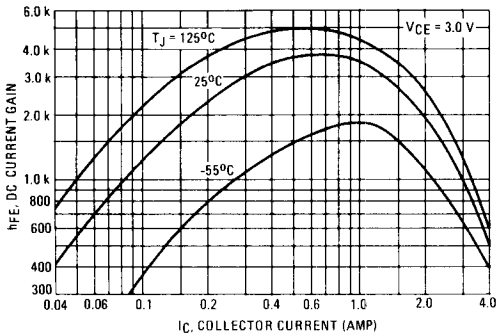


FIGURE 11 – COLLECTOR SATURATION REGION

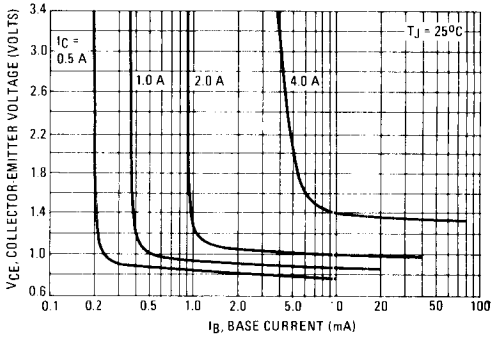
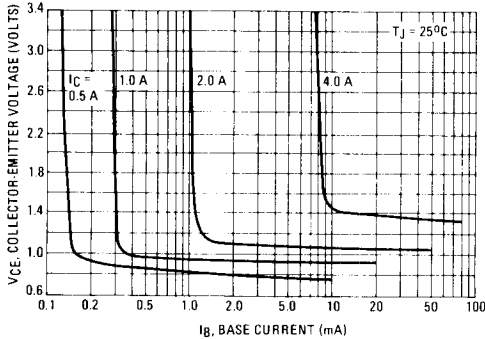


FIGURE 12 – "ON" VOLTAGES

