

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
MJE202	MJE210	MJE3055	3-904	MJE2801	MJE2801		3-902
MJE2020		TIP41	3-1083	MJE2801K		MJE2801 T	3-902
MJE2021		TIP41A	3-1083	MJE2801T	MJE2801T		3-902
MJE203		MJE3055	3-904	MJE29		TIP29	3-1071
MJE204		MJE3055	3-904	MJE2901	MJE2901		3-902
MJE205		MJE3055	3-904	MJE2901K		MJE2955T	3-904
MJE2050		MJE200	3-866	MJE2901T		MJE2955T	3-904
MJE2055		MJE3055	3-904	MJE2955	MJE2955		3-904
MJE205K		TIP41A	3-1083	MJE2955K		MJE2955T	3-904
MJE2090		TIP125	3-1098	MJE2955T	MJE2955T		3-904
MJE2091		TIP125	3-1098	MJE29A		TIP29A	3-1071
MJE2092		TIP126	3-1098	MJE29B		TIP29B	3-1071
MJE2093		TIP126	3-1098	MJE29C		TIP29C	3-1071
MJE210			3-866	MJE30		TIP30	3-1071
MJE2100		TIP120	3-1098	MJE3055	MJE3055		3-904
MJE2101		TIP120	3-1098	MJE3055K		MJE3055T	3-904
MJE2102		TIP121	3-1098	MJE3055T	MJE3055T		3-904
MJE2103		TIP121	3-1098	MJE30A		TIP30A	3-1071
MJE2150		MJE210	3-866	MJE30B		TIP30B	3-1071
MJE2160		TIP48	3-1087	MJE30C		TIP30C	3-1071
MJE220	MJE2360T	MJE181	3-862	MJE31		TIP31	3-1073
MJE221		MJE181	3-862	MJE31A		TIP31A	3-1073
MJE222		MJE181	3-862	MJE31B		TIP31B	3-1073
MJE223		MJE182	3-862	MJE31C		TIP31C	3-1073
MJE224		MJE182	3-862	MJE32		TIP32	3-1073
MJE225		MJE182	3-862	MJE32A		TIP32A	3-1073
MJE230		MJE171	3-862	MJE32B		TIP32B	3-1073
MJE231		MJE171	3-862	MJE32C		TIP32C	3-1073
MJE232		MJE171	3-862	MJE33		TIP41	3-1083
MJE233		MJE172	3-862	MJE3300		2N6037	3-135
MJE234		MJE172	3-862	MJE3301		2N6038	3-135
MJE235		MJE172	3-862	MJE3302		2N6039	3-135
MJE2360		MJE2360T	3-900	MJE3310		2N6034	3-135
MJE2360T			3-900	MJE3311		2N6035	3-135
MJE2361		MJE2361T	3-900	MJE3312		2N6036	3-135
MJE2361T	MJE2361T		3-900	MJE3370		MJE3370	3-882
MJE2370		TIP32	3-1073	MJE3371		2N5193	3-89
MJE2371		TIP32A	3-1073	MJE33A		TIP41A	3-1083
MJE240	MJE240		3-870	MJE33B		TIP41B	3-1083
MJE241	MJE241		3-870	MJE33C		TIP41C	3-1083
MJE242	MJE243		3-870	MJE34		TIP42	3-1083
MJE243			3-870	MJE340	MJE340		3-876
MJE244	MJE244		3-870	MJE340K		TIP48	3-1087
MJE2480		TIP31	3-1073	MJE341	MJE341		3-878
MJE2481		TIP31A	3-1073	MJE341K		TIP47	3-1087
MJE2482		2N6121	3-154	MJE3439	MJE3439 MJE344 MJE3440		3-908
MJE2483		2N6122	3-154	MJE344			3-878
MJE2490		TIP32	3-1073	MJE3440			3-908
MJE2491		TIP32A	3-1073	MJE344K		TIP47	3-1087
MJE250	MJE250		3-870	MJE345		MJE3439	3-908
MJE251	MJE251 MJE253		3-870	MJE34A		TIP42A	3-1083
MJE252			3-870	MJE34B		TIP42B	3-1083
MJE2520		TIP31	3-1073	MJE34C		TIP42C	3-1083
MJE2521		TIP31A	3-1073	MJE350	MJE350		3-880
MJE2522		TIP31	3-1073	MJE3520		MJE520	3-886
MJE2523		TIP31A	3-1073	MJE3521		2N5190	3-85
MJE253	MJE253		3-870	MJE370	MJE370		3-882
MJE254		MJE253	3-870	MJE370K		TIP32	3-1073
MJE270	MJE270		3-874	MJE371	MJE371		3-884
MJE271	MJE271		3-874	MJE371K		TIP32	3-1073

*Consult Motorola if a direct replacement is necessary.

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

MOTOROLA SEMICONDUCTOR TECHNICAL DATA

NPN
**MJE240, MJE241
MJE243, MJE244**
PNP
MJE250 thru MJE254

COMPLEMENTARY SILICON POWER PLASTIC TRANSISTORS

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

- High Collector-Emitter Sustaining Voltage —
 $V_{CE(sus)} = 80 \text{ Vdc (Min) — MJE240, MJE250/2}$
 $= 100 \text{ Vdc (Min) — MJE243/4, MJE253/4}$
- High DC Current Gain @ $I_C = 200 \text{ mAdc}$
 $h_{FE} = 40\text{--}200 \text{ — MJE240, MJE250}$
 $= 40\text{--}120 \text{ — MJE241,243, MJE251,253}$
 $= 25 \text{ (Min) — MJE244, MJE252,54}$
- Low Collector-Emitter Saturation Voltage —
 $V_{CE(sat)} = 0.3 \text{ Vdc (Max) @ } I_C = 500 \text{ mAdc}$
- High Current Gain Bandwidth Product —
 $f_T = 40 \text{ MHz (Min) @ } I_C = 100 \text{ mAdc}$
- Annular Construction for Low Leakages
 $I_{CBO} = 100 \text{ nAdc (Max) @ Rated } V_{CB}$

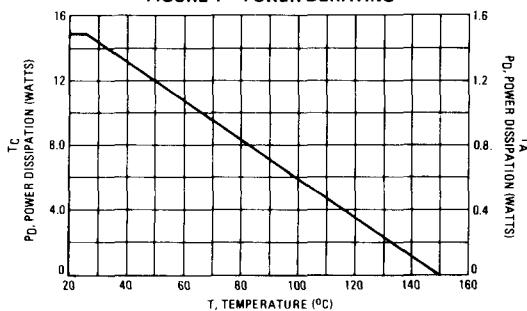
MAXIMUM RATINGS

Rating	Symbol	MJE240 MJE241 MJE250 MJE251 MJE252	MJE243 MJE244 MJE253 MJE254	Unit
Collector-Emitter Voltage	V_{CEO}	80	100	Vdc
Collector-Base Voltage	V_{CB}	80	100	Vdc
Emitter-Base Voltage	V_{EB}	7.0		Vdc
Collector Current — Continuous Peak	I_C	4.0 8.0		Adc
Base Current	I_B	1.0		Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	15 0.12		Watts W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.5 0.012		Watts W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150		$^\circ\text{C}$

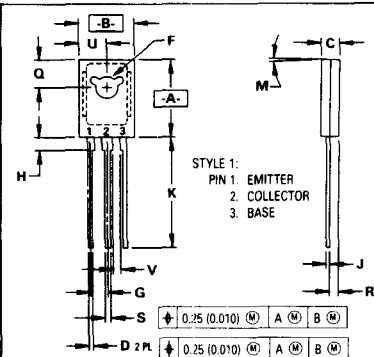
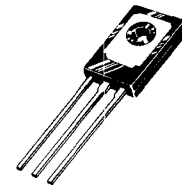
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ_{JC}	8.34	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	θ_{JA}	83.4	$^\circ\text{C/W}$

FIGURE 1 — POWER DERATING



4 AMPERE
POWER TRANSISTORS
COMPLEMENTARY SILICON
80, 100 VOLTS
15 WATTS



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

DIM	MIN	MAX	MIN	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	2.38	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

MJE240, MJE241, MJE243, MJE244, NPN, MJE250 thru MJE254, PNP

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage ($I_C = 10\text{ mA}$, $I_B = 0$)	$V_{CE(sus)}$	80 100	—	Vdc
Collector Cutoff Current ($V_{CB} = 80\text{ Vdc}$, $I_E = 0$) ($V_{CB} = 100\text{ Vdc}$, $I_E = 0$) ($V_{CE} = 80\text{ Vdc}$, $I_E = 0$, $T_C = 125^\circ\text{C}$) ($V_{CE} = 100\text{ Vdc}$, $I_E = 0$, $T_C = 125^\circ\text{C}$)	I_{CBO}	— — — —	0.1 0.1 0.1 0.1	μAdc mAdc
Emitter Cutoff Current ($V_{BE} = 7.0\text{ Vdc}$, $I_C = 0$)	I_{EBO}	—	0.1	μAdc
ON CHARACTERISTICS				
DC Current Gain ($I_C = 200\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 1.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$) ($I_C = 2.0\text{ Adc}$, $V_{CE} = 1.0\text{ Vdc}$)	h_{FE}	40 40 40 25 20 15 10 15	200 120 180 — — — — —	—
Collector-Emitter Saturation Voltage ($I_C = 500\text{ mA}$, $I_B = 50\text{ mA}$) ($I_C = 1.0\text{ Adc}$, $I_B = 100\text{ mA}$) ($I_C = 2.0\text{ Adc}$, $I_B = 200\text{ mA}$)	$V_{CE(sat)}$	— — —	0.3 0.6 0.8	Vdc
Base-Emitter Saturation Voltage ($I_C = 2.0\text{ Adc}$, $I_B = 200\text{ mA}$)	$V_{BE(sat)}$	—	1.8	Vdc
Base-Emitter On Voltage ($I_C = 500\text{ mA}$, $V_{CE} = 1.0\text{ Vdc}$)	$V_{BE(on)}$	—	1.5	Vdc
DYNAMIC CHARACTERISTICS				
Current-Gain – Bandwidth Product ($I_C = 100\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 10\text{ MHz}$)	f_T	40	—	MHz
Output Capacitance ($V_{CB} = 10\text{ Vdc}$, $I_E = 0$, $f = 0.1\text{ MHz}$)	C_{ob}	— —	50 70	pF

FIGURE 2 – SWITCHING TIME TEST CIRCUIT

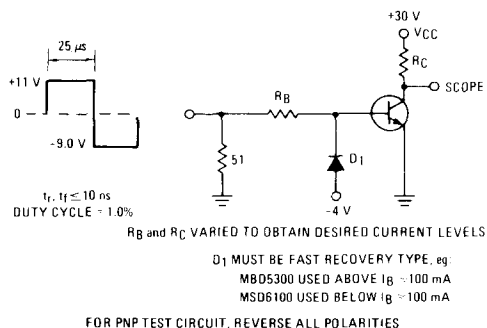
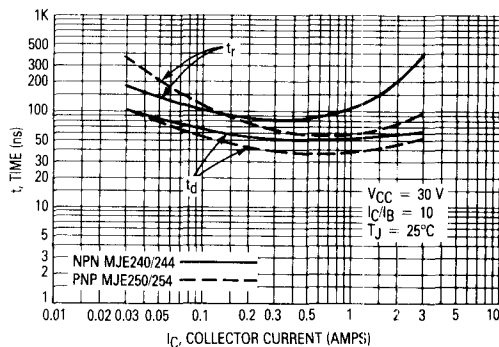


FIGURE 3 – TURN-ON TIME



MJE240, MJE241, MJE243, MJE244, NPN, MJE250 thru MJE254, PNP

FIGURE 4 – THERMAL RESPONSE

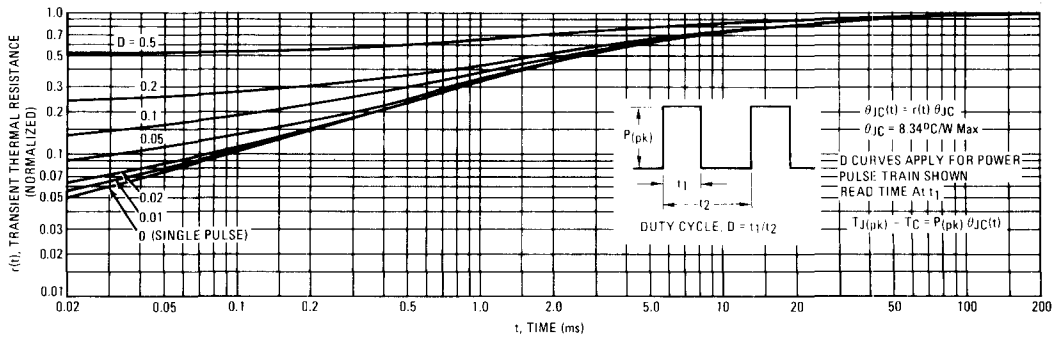
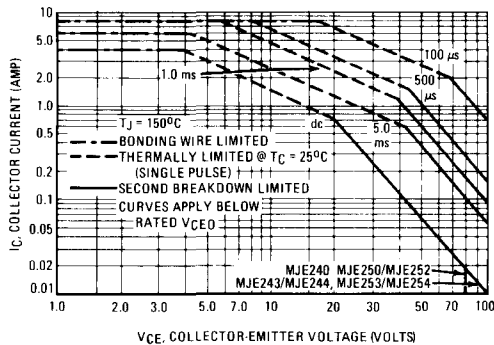


FIGURE 5 – ACTIVE-REGION SAFE OPERATING AREA



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.

FIGURE 6 – TURN-OFF TIME

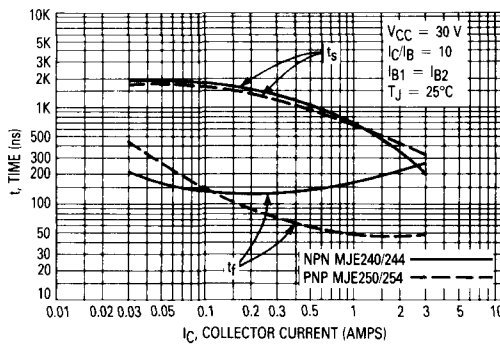
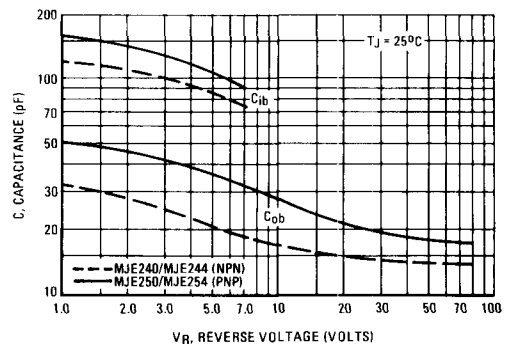


FIGURE 7 – CAPACITANCE



MJE240, MJE241, MJE243, MJE244, NPN, MJE250 thru MJE254, PNP

NPN
MJE240 thru MJE244

PNP
MJE250 thru MJE254

FIGURE 8 — DC CURRENT GAIN

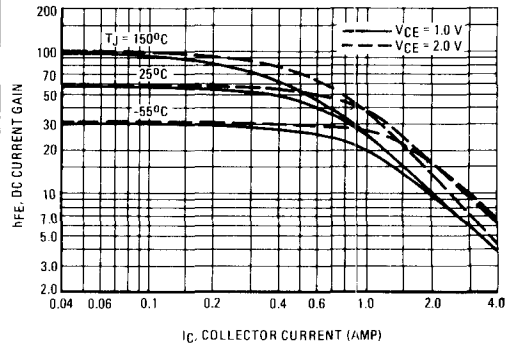
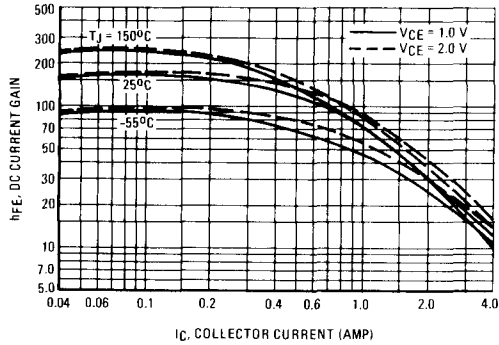


FIGURE 9 — "ON" VOLTAGES

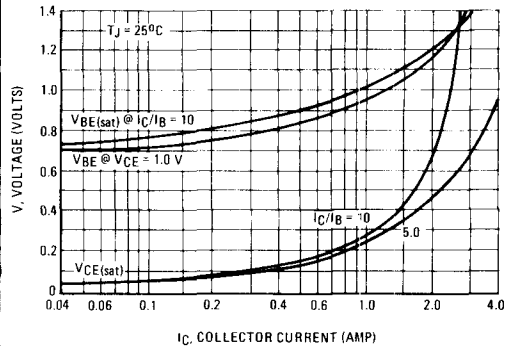
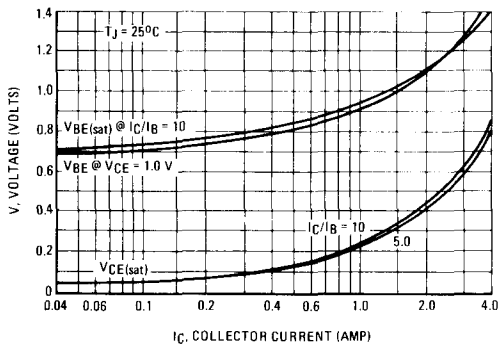


FIGURE 10 — TEMPERATURE COEFFICIENTS

