

**MOTOROLA SEMICONDUCTOR TECHNICAL DATA**

T-33-07  
T-33-17

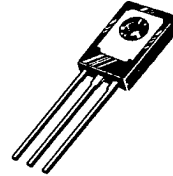
NPN  
**MJE240, MJE241**  
**MJE243, MJE244**  
PNP  
**MJE250 thru MJE254**

**COMPLEMENTARY SILICON POWER PLASTIC TRANSISTORS**

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

- High Collector-Emitter Sustaining Voltage —  
V<sub>CEO(sus)</sub> = 80 Vdc (Min) — MJE240, MJE250/2  
= 100 Vdc (Min) — MJE243/4, MJE253/4
- High DC Current Gain @ I<sub>C</sub> = 200 mAdc  
h<sub>FE</sub> = 40-200 — MJE240, MJE250  
= 40-120 — MJE241, 243, MJE251, 253  
= 25 (Min) — MJE244, MJE252, 54
- Low Collector-Emitter Saturation Voltage —  
V<sub>CE(sat)</sub> = 0.3 Vdc (Max) @ I<sub>C</sub> = 500 mAdc
- High Current Gain Bandwidth Product —  
f<sub>T</sub> = 40 MHz (Min) @ I<sub>C</sub> = 100 mAdc
- Annular Construction for Low Leakages  
I<sub>CBO</sub> = 100 nAdc (Max) @ Rated V<sub>CB</sub>

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



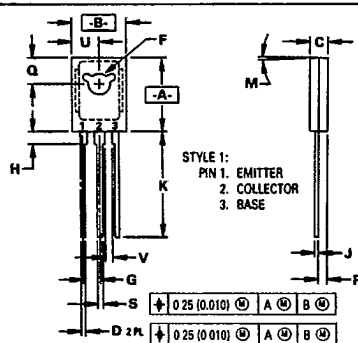
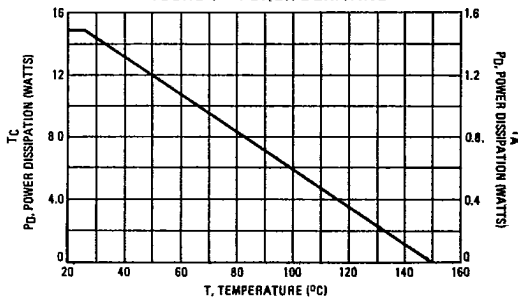
**MAXIMUM RATINGS**

Rating	Symbol	MJE240 MJE241 MJE250 MJE251 MJE252	MJE243 MJE244 MJE253 MJE254	Unit
Collector-Emitter Voltage	V <sub>CEO</sub>	80	100	Vdc
Collector-Base Voltage	V <sub>CB</sub>	80	100	Vdc
Emitter-Base Voltage	V <sub>EB</sub>	7.0		Vdc
Collector Current — Continuous Peak	I <sub>C</sub>	4.0 8.0		Adc
Base Current	I <sub>B</sub>	1.0		Adc
Total Power Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	15 0.12		Watts W/°C
Total Power Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	1.5 0.012		Watts W/°C
Operating and Storage Junction Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-65 to +150		°C

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	θ <sub>JC</sub>	83.4	°C/W
Thermal Resistance, Junction to Ambient	θ <sub>JA</sub>	83.4	°C/W

**FIGURE 1 — POWER DERATING**



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

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	10.80	11.04	0.425	0.433
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	2.29 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

T-33-07

T-33-17

ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Sustaining Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0)	V <sub>CE(sus)</sub>	80	—	Vdc
		100	—	
Collector Cutoff Current (V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	—	0.1	μA
(V <sub>CB</sub> = 100 Vdc, I <sub>E</sub> = 0)		—	0.1	
(V <sub>CE</sub> = 80 Vdc, I <sub>E</sub> = 0, T <sub>C</sub> = 125°C)		—	0.1	mA
(V <sub>CE</sub> = 100 Vdc, I <sub>E</sub> = 0, T <sub>C</sub> = 125°C)		—	0.1	
Emitter Cutoff Current (V <sub>BE</sub> = 7.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	0.1	μA
<b>ON CHARACTERISTICS</b>				
DC Current Gain (I <sub>C</sub> = 200 mA, V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	40	200	—
		40	120	
		40	180	
		25	—	
(I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 1.0 Vdc)		20	—	
(I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 1.0 Vdc)		15	—	
(I <sub>C</sub> = 2.0 A, V <sub>CE</sub> = 1.0 Vdc)		15	—	
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 500 mA, I <sub>B</sub> = 50 mA)	V <sub>CE(sat)</sub>	—	0.3	Vdc
(I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 100 mA)		—	0.6	
(I <sub>C</sub> = 2.0 A, I <sub>B</sub> = 200 mA)		—	0.8	
Base-Emitter Saturation Voltage (I <sub>C</sub> = 2.0 A, I <sub>B</sub> = 200 mA)	V <sub>BE(sat)</sub>	—	1.8	Vdc
Base-Emitter On Voltage (I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 1.0 Vdc)	V <sub>BE(on)</sub>	—	1.5	Vdc
<b>DYNAMIC CHARACTERISTICS</b>				
Current-Gain – Bandwidth Product (I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 10 Vdc, f <sub>test</sub> = 10 MHz)	f <sub>T</sub>	40	—	MHz
Output Capacitance (V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, f = 0.1 MHz)	C <sub>ob</sub>	—	50	pF
		—	70	

3

FIGURE 2 – SWITCHING TIME TEST CIRCUIT

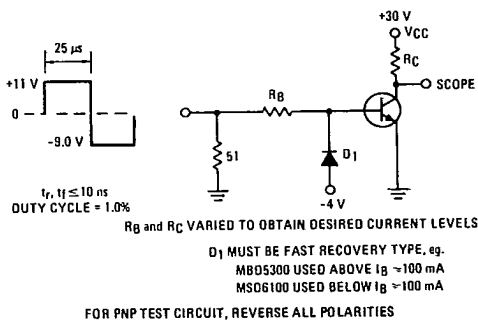
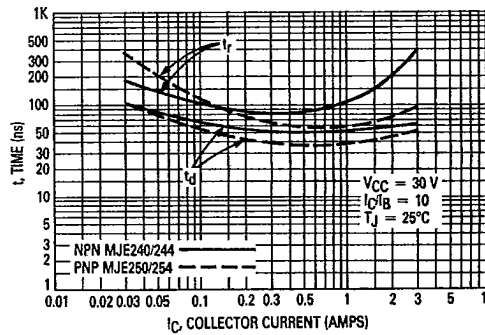


FIGURE 3 – TURN-ON TIME



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

T-33-07

T-33-17

FIGURE 4 - THERMAL RESPONSE

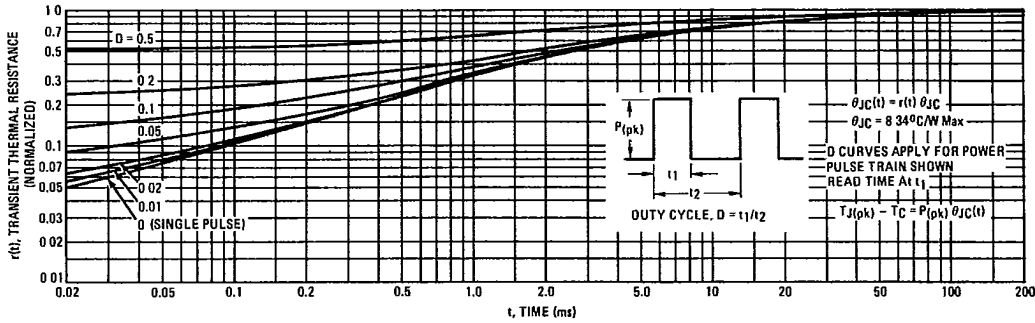
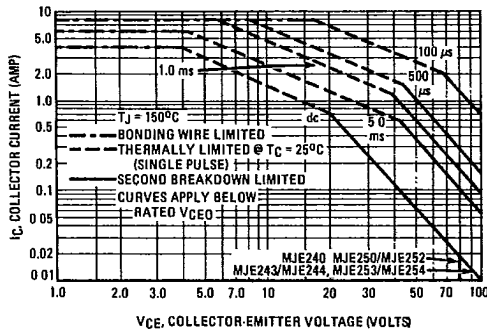


FIGURE 5 - ACTIVE-REGION SAFE OPERATING AREA



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

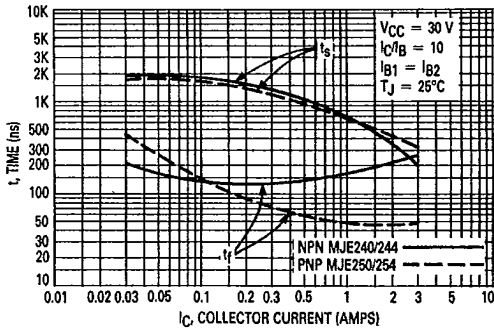
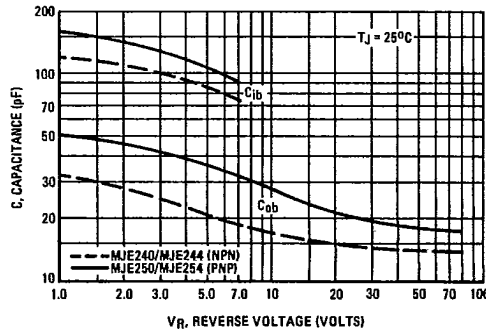


FIGURE 7 - CAPACITANCE



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

T-33-07

T-33-17

NPN  
MJE240 thru MJE244

PNP  
MJE250 thru MJE254

FIGURE 8 - DC CURRENT GAIN

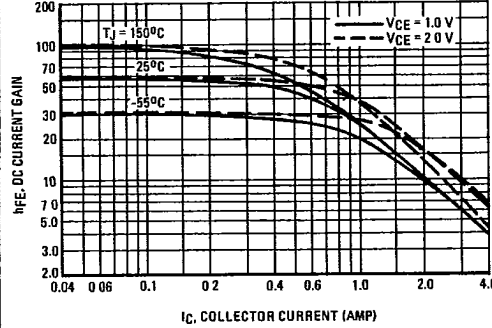
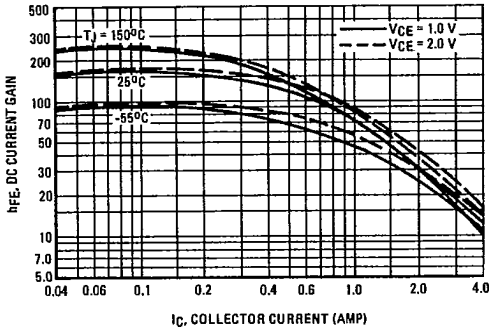


FIGURE 9 - "ON" VOLTAGES

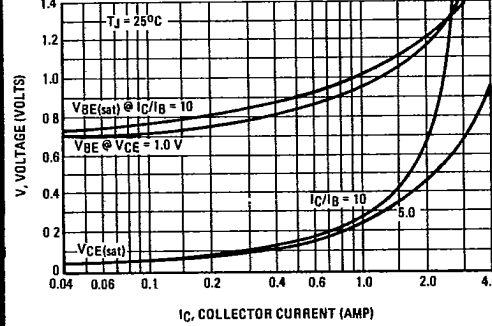
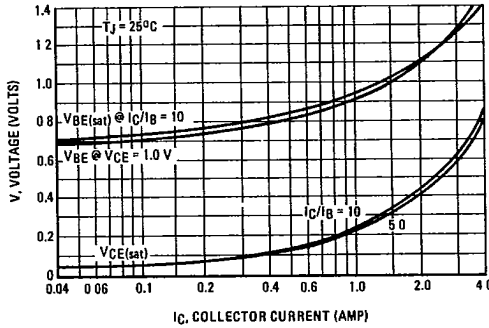
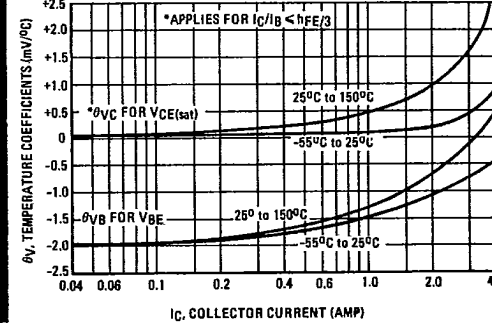
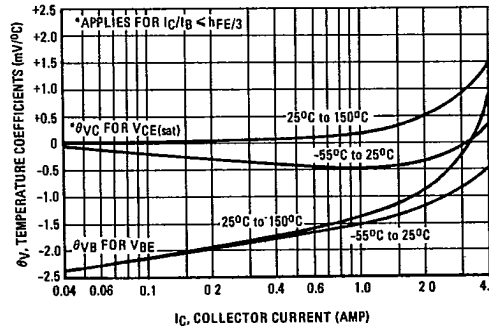


FIGURE 10 - TEMPERATURE COEFFICIENTS



3