Complementary Silicon Power Plastic Transistors

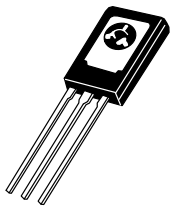
. . . designed for low power audio amplifier and low–current, high–speed switching applications.

- High Collector–Emitter Sustaining Voltage —
  $V_{CEO(sus)}$ = 100 Vdc (Min) — MJE243, MJE253
- High DC Current Gain @ I_C = 200 mAdc
  h_{FE} = 40–200
  = 40–120 — MJE243, MJE253
- Low Collector–Emitter Saturation Voltage —
  $V_{CE(sat)}$ = 0.3 Vdc (Max) @ I_C = 500 mAdc
- High Current Gain Bandwidth Product —
  f_T = 40 MHz (Min) @ I_C = 100 mAdc
- Annular Construction for Low Leakages
  I_{CBO} = 100 nAdc (Max) @ Rated V_{CB}

NPN
MJE243*
PNP
MJE253*

***Motorola Preferred Device**

4 AMPERE
POWER TRANSISTORS
COMPLEMENTARY
SILICON
100 VOLTS
15 WATTS



CASE 77–08
TO–225AA

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	100	Vdc
Collector–Base Voltage	V_{CB}	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	10	Adc
Total Power Dissipation @ T_C = 25°C Derate above 25°C	P_D	15 0.12	Watts W/ac
Total Power Dissipation @ T_A = 25°C Derate @ 25°C	P_D	1.5 0.012	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}	8.34	°C/W
Thermal Resistance, Junction to Ambient	θ_{JA}	83.4	°C/W

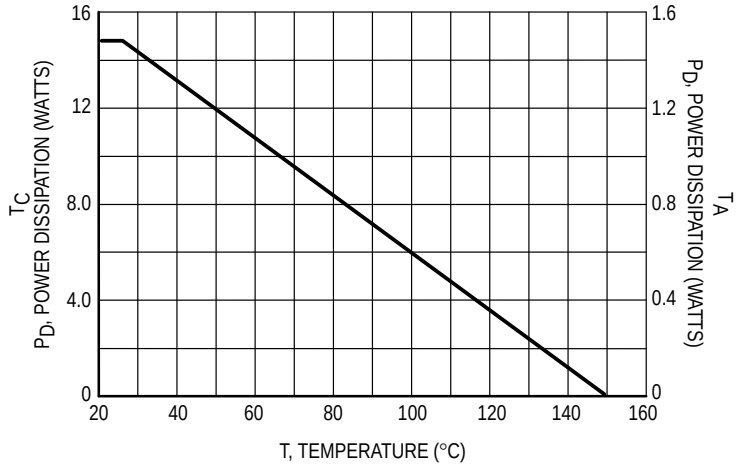


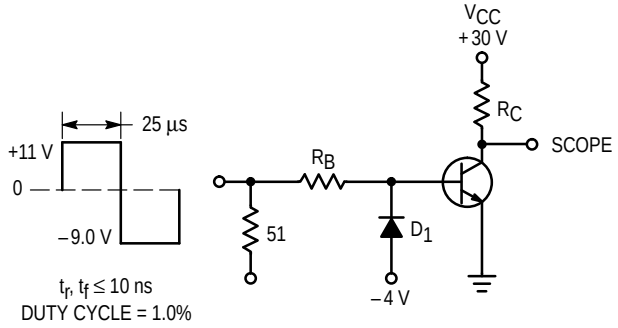
Figure 1. Power Derating

Preferred devices are Motorola recommended choices for future use and best overall value.

REV 7

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)	$V_{CEO(sus)}$	100	—	Vdc
Collector Cutoff Current (V_{CB} = 100 Vdc, I_E = 0) (V_{CE} = 100 Vdc, I_E = 0, T_C = 125°C)	I_{CBO}	— —	0.1 0.1	μAdc
Emitter Cutoff Current (V_{BE} = 7.0 Vdc, I_C = 0)	I_{EBO}	—	0.1	μAdc
ON CHARACTERISTICS				
DC Current Gain (I_C = 200 mAdc, V_{CE} = 1.0 Vdc) (I_C = 1.0 Adc, V_{CE} = 1.0 Vdc)	h_{FE}	40 15	180 —	—
Collector–Emitter Saturation Voltage (I_C = 500 mAdc, I_B = 50 mAdc) (I_C = 1.0 Adc, I_B = 100 mAdc)	$V_{CE(sat)}$	— —	0.3 0.6	Vdc
Base–Emitter Saturation Voltage (I_C = 2.0 Adc, I_B = 200 mAdc)	$V_{BE(sat)}$	—	1.8	Vdc
Base–Emitter On Voltage (I_C = 500 mAdc, V_{CE} = 1.0 Vdc)	$V_{BE(on)}$	—	1.5	Vdc
DYNAMIC CHARACTERISTICS				
Current–Gain — Bandwidth Product (I_C = 100 mAdc, V_{CE} = 10 Vdc, f_{test} = 10 MHz)	f_T	40	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	C_{ob}	—	50	pF



R_B and R_C VARIED TO OBTAIN DESIRED CURRENT LEVELS
D_1 MUST BE FAST RECOVERY TYPE, e.g.:
1N5825 USED ABOVE $I_B \approx 100$ mA
MSD6100 USED BELOW $I_B \approx 100$ mA
FOR PNP TEST CIRCUIT, REVERSE ALL POLARITIES

Figure 2. Switching Time Test Circuit

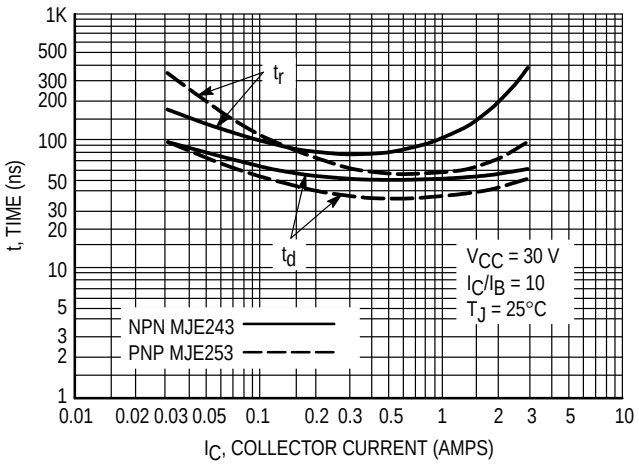


Figure 3. Turn–On Time

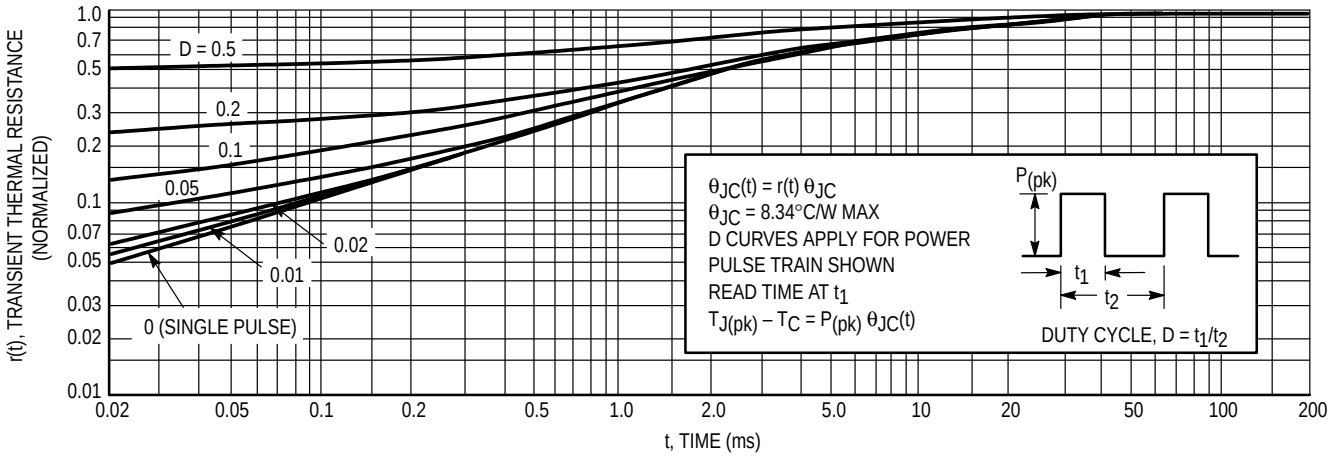


Figure 4. Thermal Response

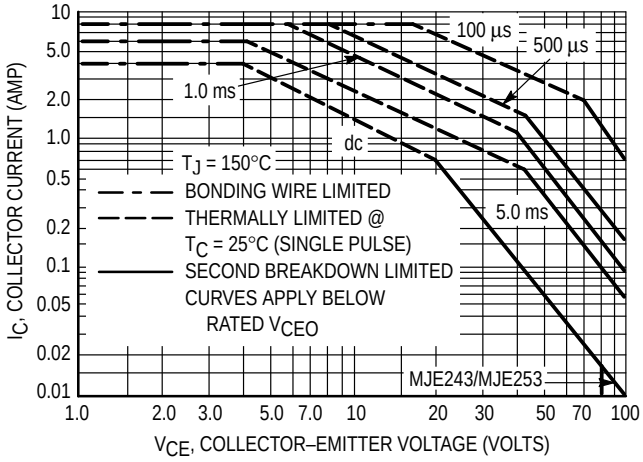


Figure 5. Active Region Safe Operating Area

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.

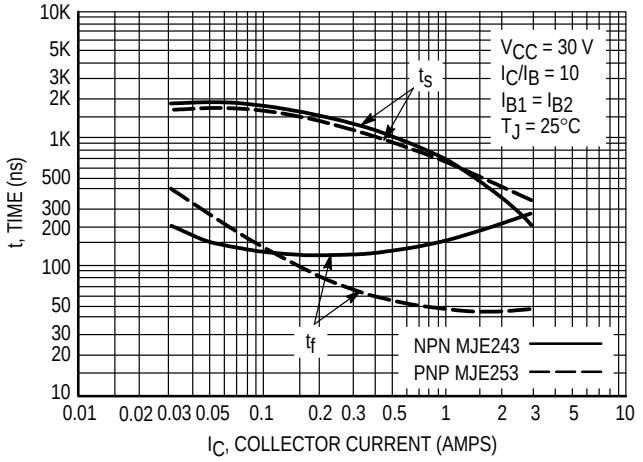


Figure 6. Turn–Off Time

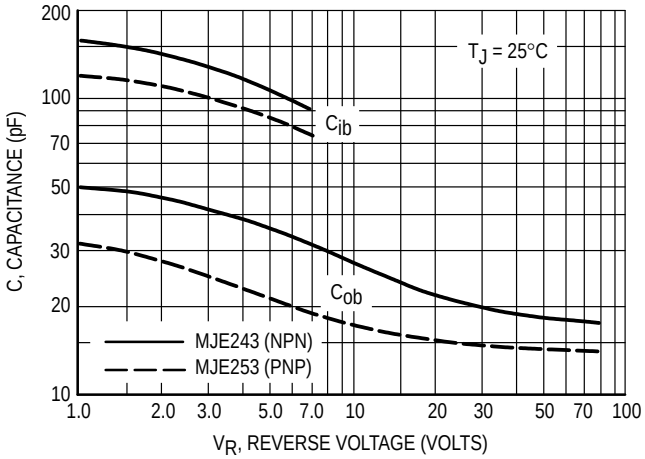
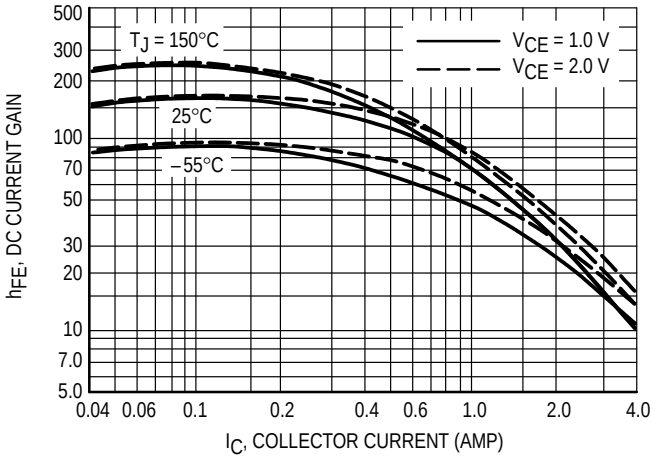


Figure 7. Capacitance

NPN
MJE243



PNP
MJE253

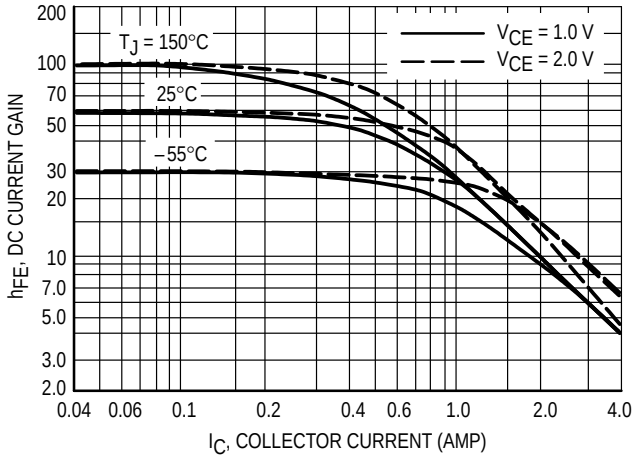
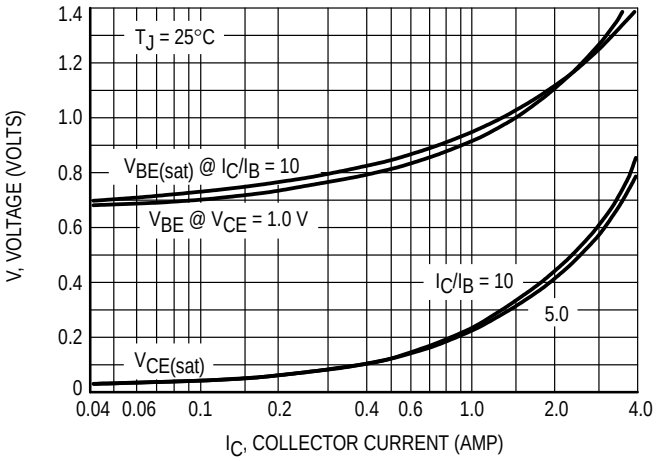


Figure 8. DC Current Gain



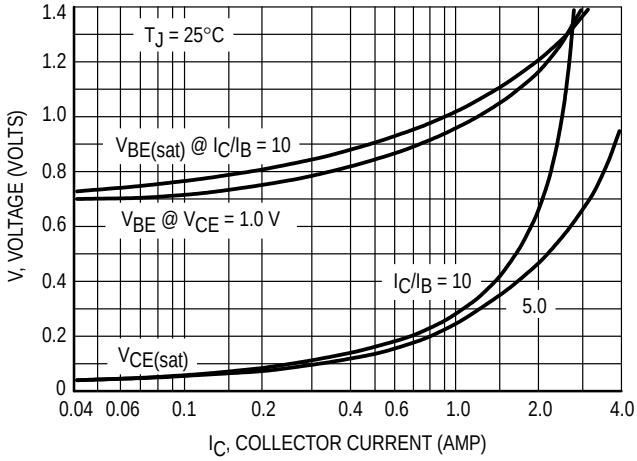
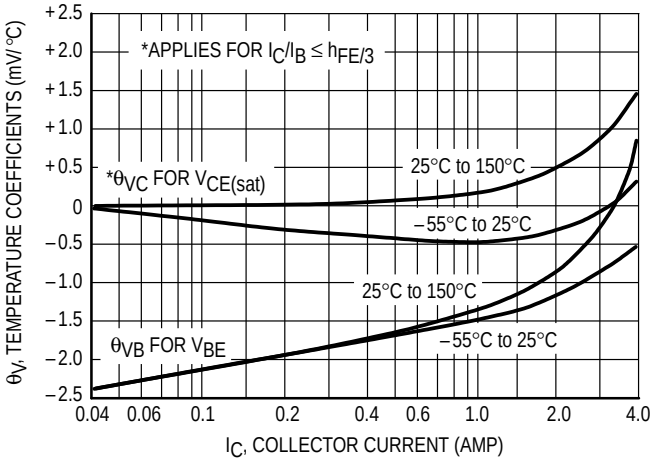


Figure 9. “On” Voltages



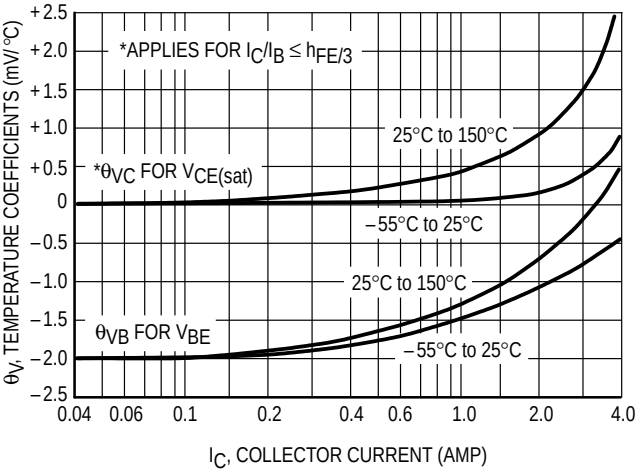
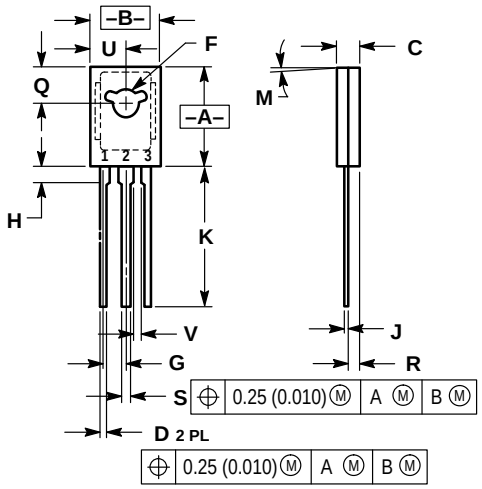


Figure 10. Temperature Coefficients

PACKAGE DIMENSIONS



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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.425	0.435	10.80	11.04
B	0.295	0.305	7.50	7.74
C	0.095	0.105	2.42	2.66
D	0.020	0.026	0.51	0.66
F	0.115	0.130	2.93	3.30
G	0.094 BSC		2.39 BSC	
H	0.050	0.095	1.27	2.41
J	0.015	0.025	0.39	0.63
K	0.575	0.655	14.61	16.63
M	5° TYP		5° TYP	
Q	0.148	0.158	3.76	4.01
R	0.045	0.055	1.15	1.39
S	0.025	0.035	0.64	0.88
U	0.145	0.155	3.69	3.93
V	0.040	—	1.02	—

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

CASE 77–08
TO–225AA
ISSUE V

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