

# Complementary Silicon Power Plastic Transistors

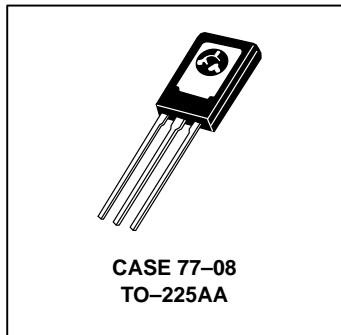
... designed for low power audio amplifier and low-current, high-speed switching applications.

- High Collector-Emitter Sustaining Voltage —  
 $V_{CE(sus)} = 100 \text{ Vdc (Min)}$  — MJE243, MJE253
- High DC Current Gain @  $I_C = 200 \text{ mAdc}$   
 $h_{FE} = 40-200$   
 $= 40-120$  — MJE243, MJE253
- 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  $V_{CB}$



\*Motorola Preferred Device

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



## 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	$I_C$	4.0	Adc
Peak		8.0	
Base Current	$I_B$	10	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	$P_D$	15	Watts
Derate above $25^\circ\text{C}$		0.12	W/ac
Total Power Dissipation @ $T_A = 25^\circ\text{C}$	$P_D$	1.5	Watts
Derate @ $25^\circ\text{C}$		0.012	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	$\theta_{JC}$	8.34	°C/W
Thermal Resistance, Junction to Ambient	$\theta_{JA}$	83.4	°C/W

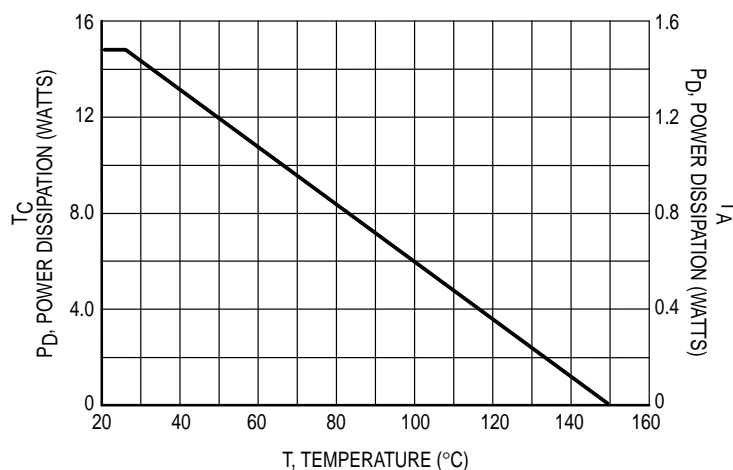


Figure 1. Power Derating

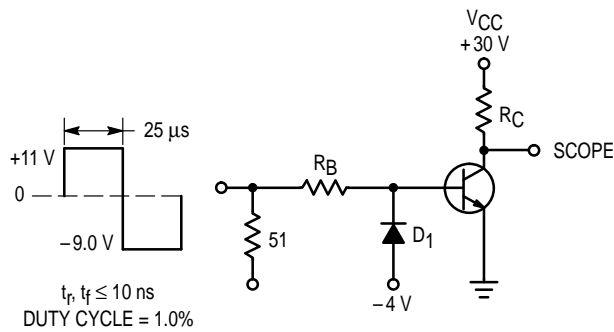
Preferred devices are Motorola recommended choices for future use and best overall value.

REV 7

# MJE243 MJE253

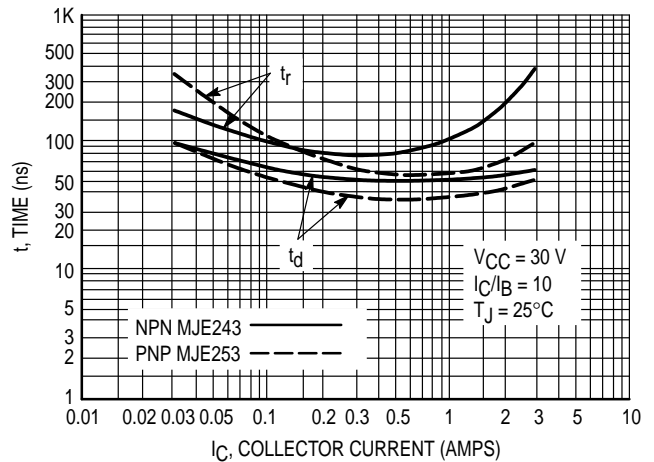
## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	100	—	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 100 Vdc, I <sub>E</sub> = 0) (V <sub>CE</sub> = 100 Vdc, I <sub>E</sub> = 0, T <sub>C</sub> = 125°C)	I <sub>CBO</sub>	—	0.1	μAdc
Emitter Cutoff Current (V <sub>BE</sub> = 7.0 Vdc, I <sub>C</sub> = 0)	I <sub>EBO</sub>	—	0.1	μAdc
<b>ON CHARACTERISTICS</b>				
DC Current Gain (I <sub>C</sub> = 200 mAdc, V <sub>CE</sub> = 1.0 Vdc) (I <sub>C</sub> = 1.0 Adc, V <sub>CE</sub> = 1.0 Vdc)	h <sub>FE</sub>	40 15	180 —	—
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 500 mAdc, I <sub>B</sub> = 50 mAdc) (I <sub>C</sub> = 1.0 Adc, I <sub>B</sub> = 100 mAdc)	V <sub>CE(sat)</sub>	— —	0.3 0.6	Vdc
Base–Emitter Saturation Voltage (I <sub>C</sub> = 2.0 Adc, I <sub>B</sub> = 200 mAdc)	V <sub>BE(sat)</sub>	—	1.8	Vdc
Base–Emitter On Voltage (I <sub>C</sub> = 500 mAdc, 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 mAdc, 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



R<sub>B</sub> and R<sub>C</sub> VARIED TO OBTAIN DESIRED CURRENT LEVELS  
 D<sub>1</sub> MUST BE FAST RECOVERY TYPE, e.g.:  
 1N5825 USED ABOVE I<sub>B</sub> ≈ 100 mA  
 MSD6100 USED BELOW I<sub>B</sub> ≈ 100 mA  
 FOR PNP TEST CIRCUIT, REVERSE ALL POLARITIES

**Figure 2. Switching Time Test Circuit**



**Figure 3. Turn–On Time**

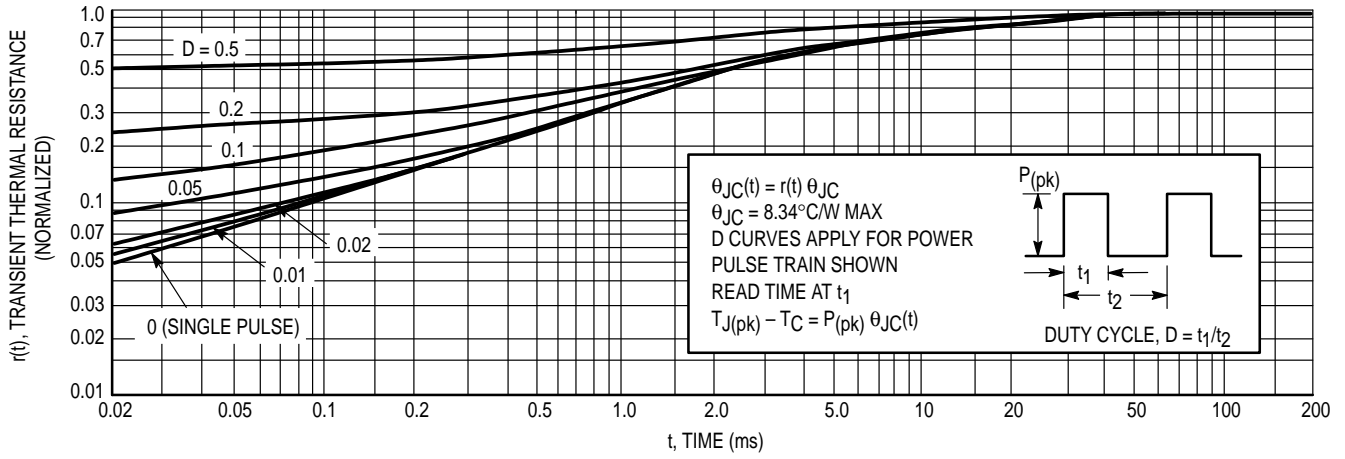


Figure 4. Thermal Response

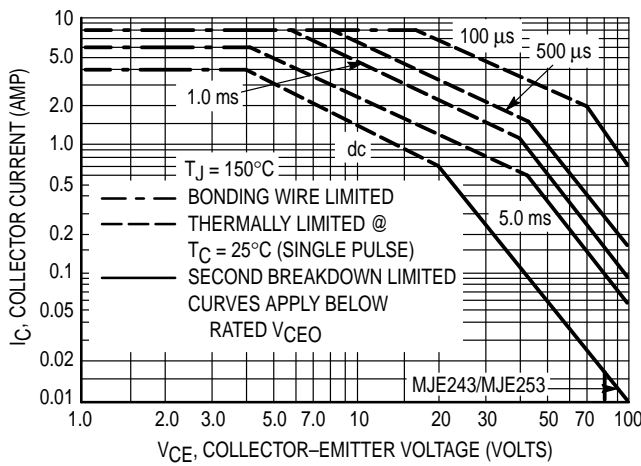


Figure 5. Active Region Safe Operating Area

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  $T_{J(pk)} = 150^{\circ}\text{C}$ ;  $T_C$  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.

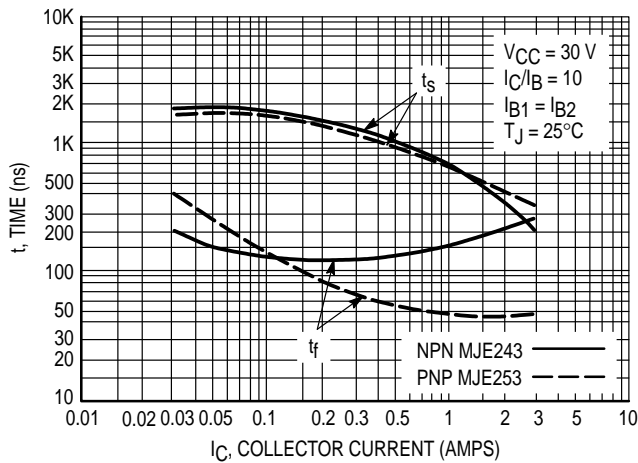


Figure 6. Turn-Off Time

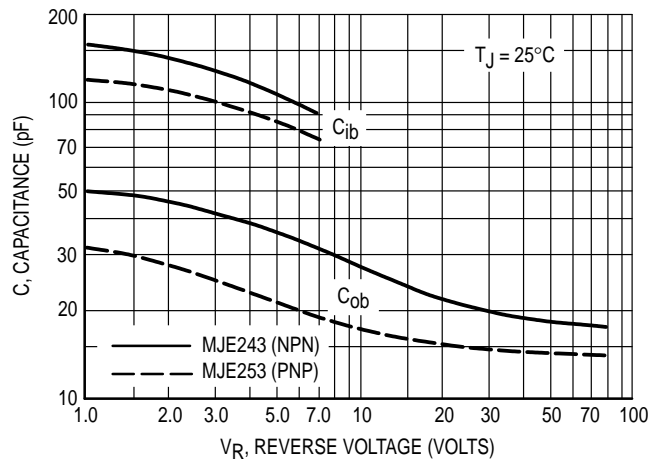


Figure 7. Capacitance

NPN  
MJE243

PNP  
MJE253

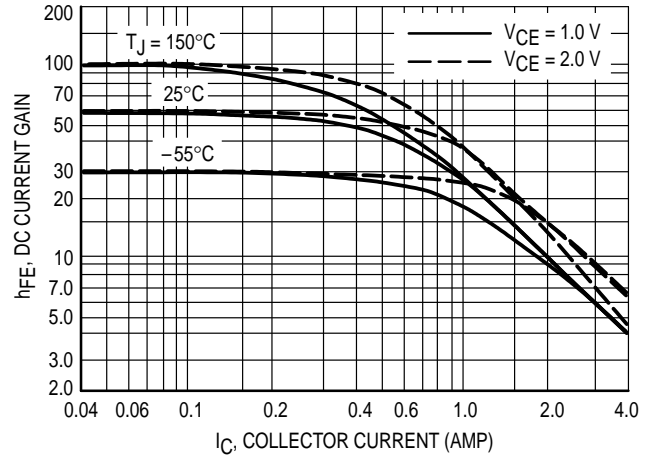
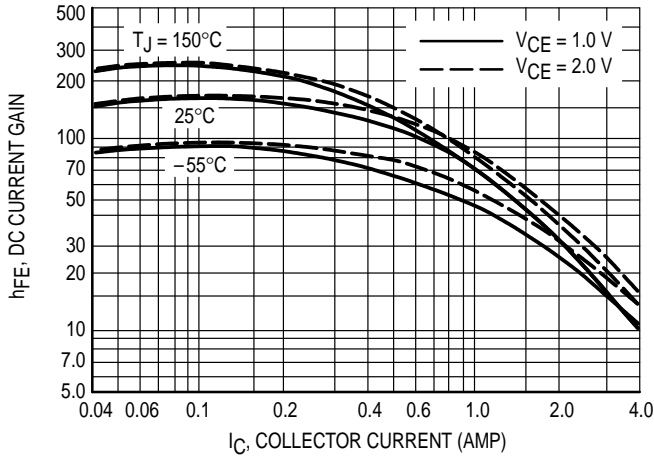


Figure 8. DC Current Gain

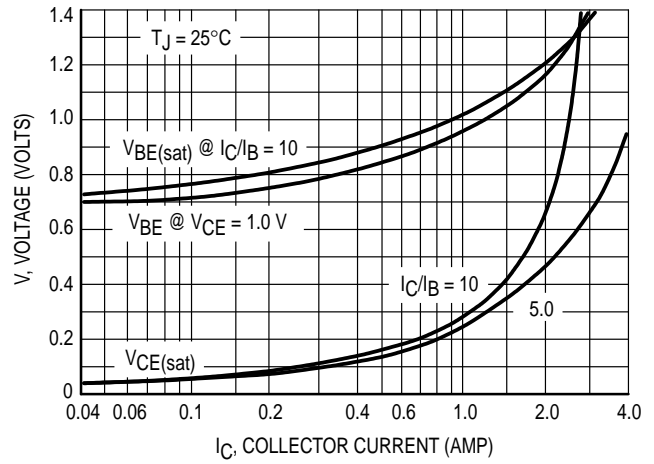
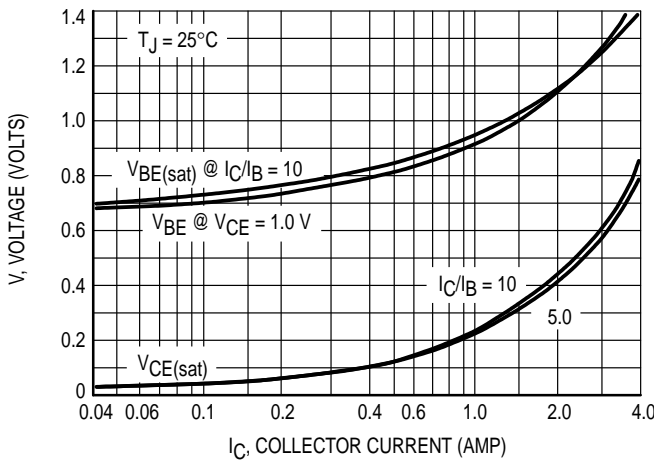


Figure 9. "On" Voltages

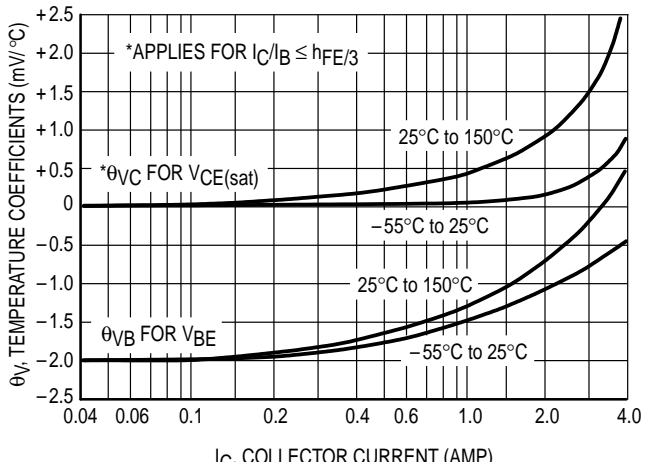
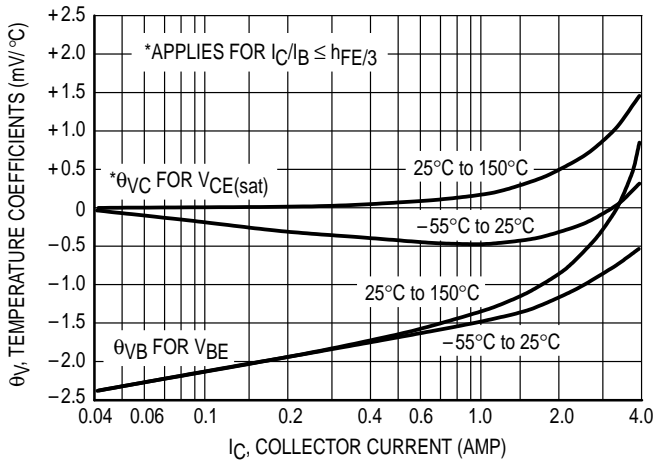
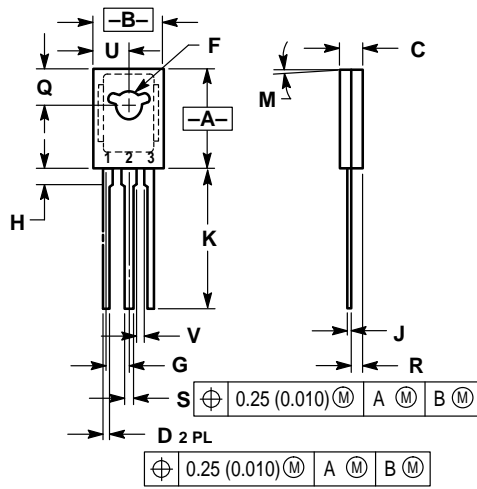


Figure 10. Temperature Coefficients

PACKAGE DIMENSIONS




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

DIM	INCHES		MILLIMETERS	
	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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