

# Complementary Silicon Power Plastic Transistors

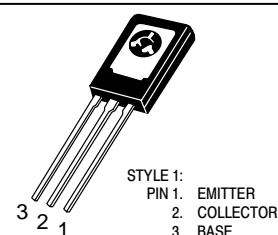
...designed for low power audio amplifier and low-current, high-speed switching applications.

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

**NPN**  
**MJE243\***  
**PNP**  
**MJE253\***

\*ON Semiconductor Preferred Device

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



**CASE 77-09**  
**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 @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	15 0.12	Watts W/ac
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate @ $25^\circ\text{C}$	$P_D$	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	$\theta_{JC}$	8.34	$^\circ\text{C/W}$
Thermal Resistance, Junction to Ambient	$\theta_{JA}$	83.4	$^\circ\text{C/W}$

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

## MJE243 MJE253

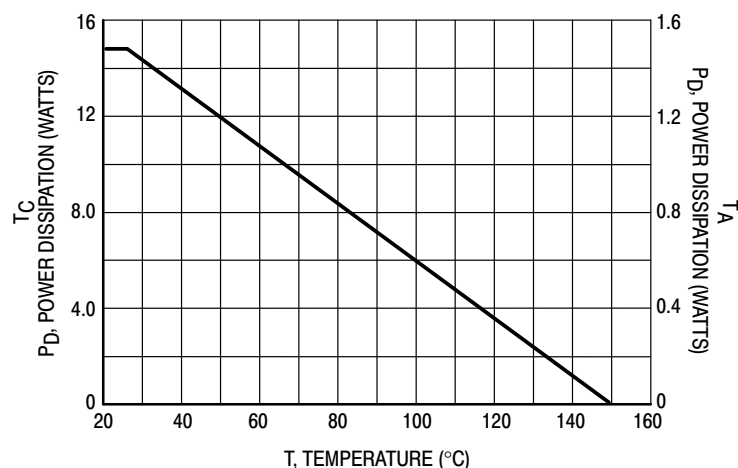


Figure 1. Power Derating

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

Characteristic	Symbol	Min	Max	Unit
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#### OFF CHARACTERISTICS

Collector–Emitter Sustaining Voltage ( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )	$V_{CEO(sus)}$	100	—	Vdc
Collector Cutoff Current ( $V_{CB} = 100\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CE} = 100\text{ Vdc}$ , $I_E = 0$ , $T_C = 125^\circ\text{C}$ )	$I_{CBO}$	—	0.1	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{BE} = 7.0\text{ Vdc}$ , $I_C = 0$ )	$I_{EBO}$	—	0.1	$\mu\text{Adc}$

#### ON CHARACTERISTICS

DC Current Gain ( $I_C = 200\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ ) ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 1.0\text{ Vdc}$ )	$h_{FE}$	40 15	180 —	—
Collector–Emitter Saturation Voltage ( $I_C = 500\text{ mAdc}$ , $I_B = 50\text{ mAdc}$ ) ( $I_C = 1.0\text{ Adc}$ , $I_B = 100\text{ mAdc}$ )	$V_{CE(sat)}$	— —	0.3 0.6	Vdc
Base–Emitter Saturation Voltage ( $I_C = 2.0\text{ Adc}$ , $I_B = 200\text{ mAdc}$ )	$V_{BE(sat)}$	—	1.8	Vdc
Base–Emitter On Voltage ( $I_C = 500\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )	$V_{BE(on)}$	—	1.5	Vdc

#### DYNAMIC CHARACTERISTICS

Current–Gain — Bandwidth Product ( $I_C = 100\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $f_{test} = 10\text{ MHz}$ )	$f_T$	40	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 0.1\text{ MHz}$ )	$C_{ob}$	—	50	pF

## MJE243 MJE253

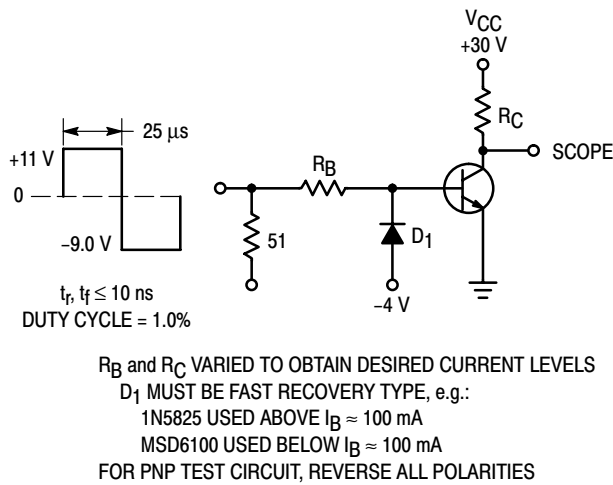


Figure 2. Switching Time Test Circuit

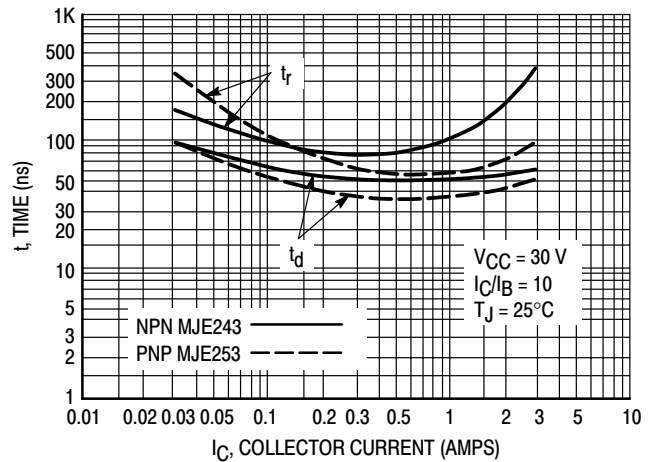


Figure 3. Turn-On Time

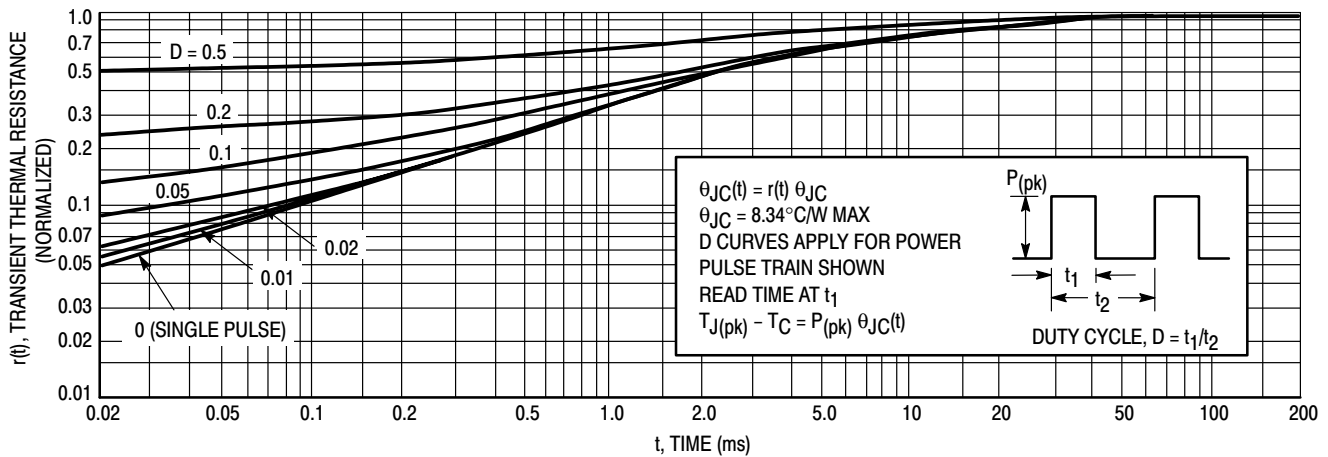


Figure 4. Thermal Response

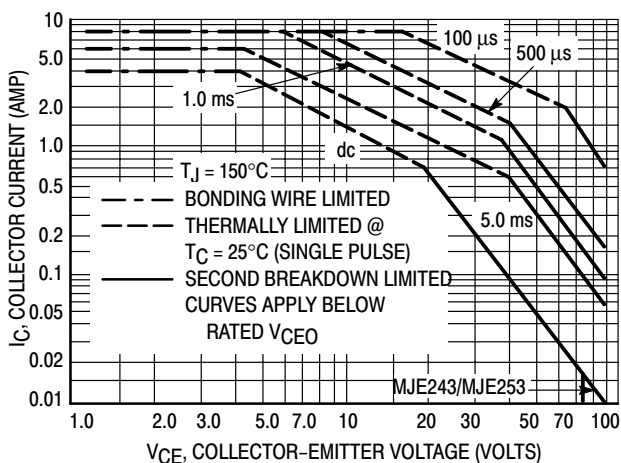


Figure 5. Active Region Safe Operating Area

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.

## MJE243 MJE253

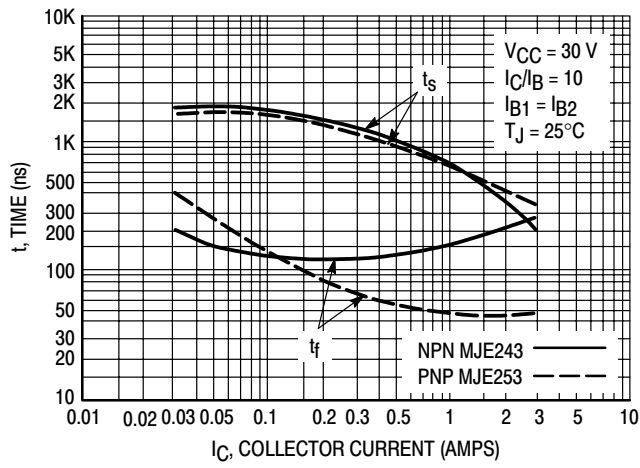


Figure 6. Turn-Off Time

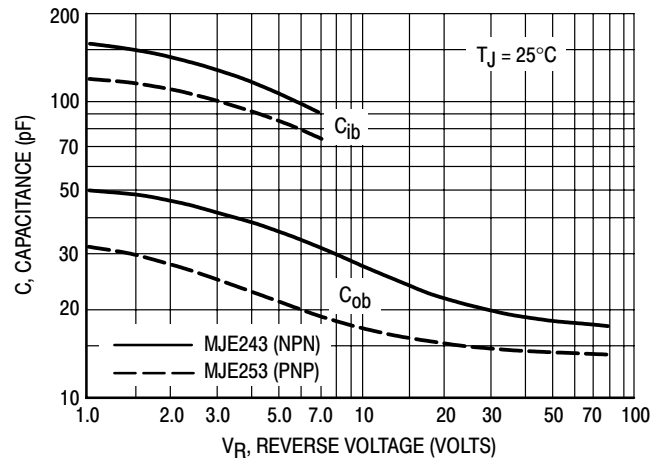
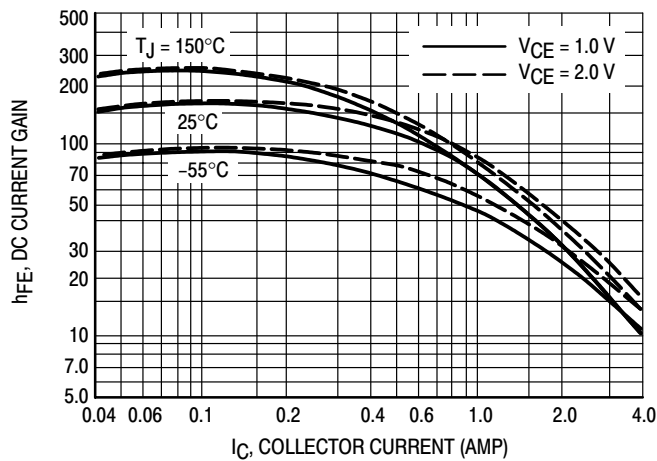


Figure 7. Capacitance

# MJE243 MJE253

## NPN MJE243



## PNP MJE253

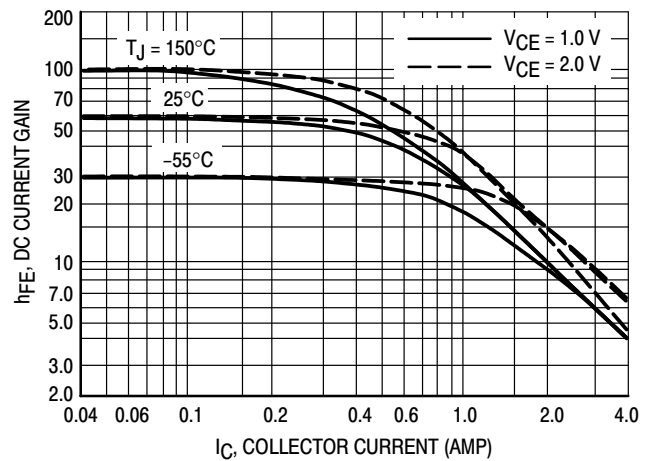


Figure 8. DC Current Gain

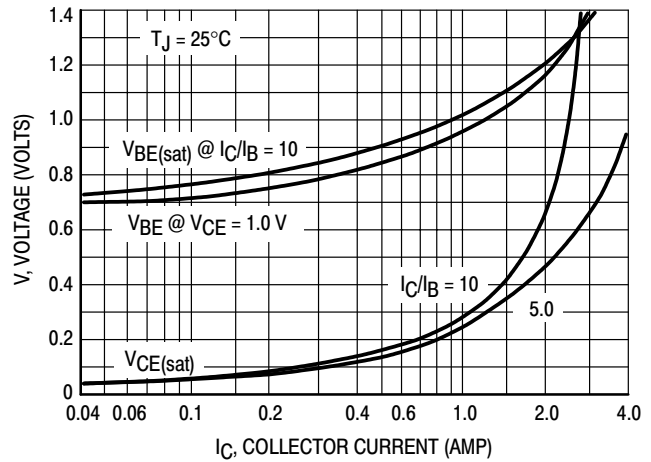
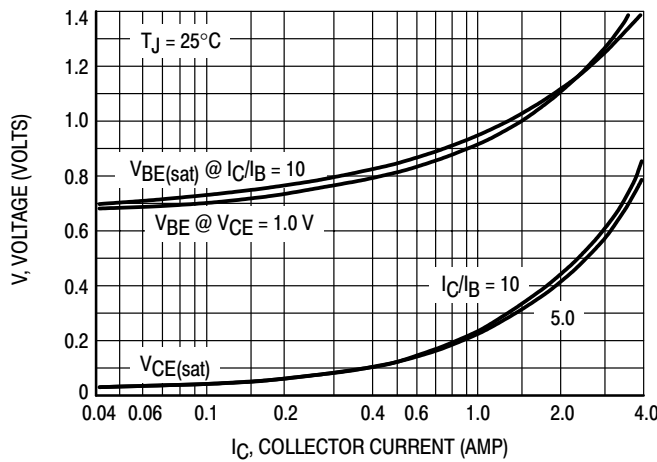


Figure 9. "On" Voltages

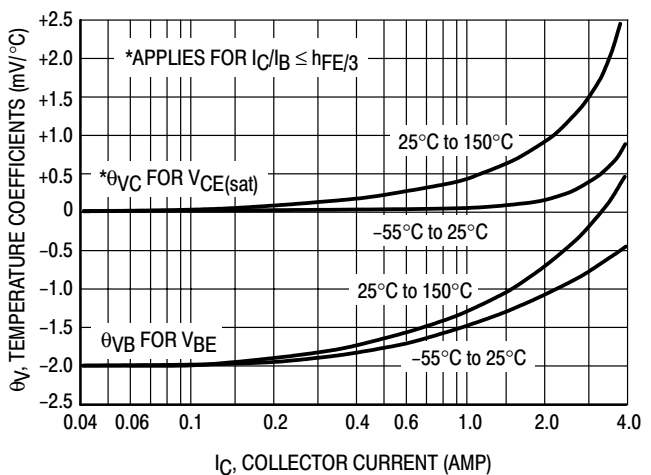
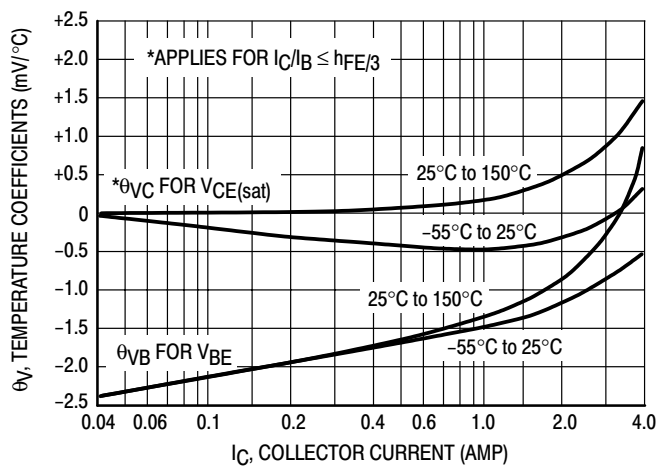
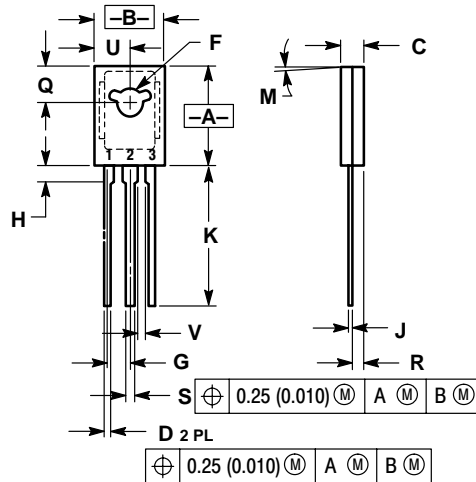


Figure 10. Temperature Coefficients

# MJE243 MJE253

## PACKAGE DIMENSIONS

TO-225AA  
CASE 77-09  
ISSUE W




- 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	0.065	1.15	1.65
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

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