# MJE243 - NPN, MJE253 - PNP

# Complementary Silicon Power Plastic Transistors

These devices are designed for low power audio amplifier and low−current, high−speed switching applications.

**Features**

- High Collector−Emitter Sustaining Voltage − $V_{CEO(sus)}$ = 100 Vdc (Min)
- High DC Current Gain @ $I_C$ = 200 mAdc $h_{FE}$ = 40 − 200 = 40 − 120
- 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 $V_{CB}$
- Pb−Free Packages are Available*

**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<br>− Peak | $I_C$ | 4.0<br>8.0 | Adc |
| Base Current | $I_B$ | 10 | Adc |
| Total Power Dissipation @ $T_C$ = 25°C<br>Derate above 25°C | $P_D$ | 15<br>120 | W<br>mW/°C |
| Total Power Dissipation @ $T_A$ = 25°C<br>Derate above 25°C | $P_D$ | 1.5<br>12 | W<br>mW/°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 |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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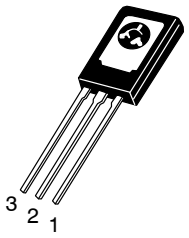
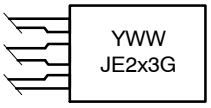
**4.0 AMPERES POWER TRANSISTORS COMPLEMENTARY SILICON 100 VOLTS, 15 WATTS**




**TO−225**
**CASE 77**
**STYLE 1**

**MARKING DIAGRAM**




Y = Year
WW = Work Week
JE2x3 = Device Code
x = 4 or 5
G = Pb−Free Package

**ORDERING INFORMATION**

| Device | Package | Shipping |
|---|---|---|
| MJE243 | TO−225 | 500 Units/Box |
| MJE243G | TO−225 (Pb−Free) | 500 Units/Box |
| MJE253 | TO−225 | 500 Units/Box |
| MJE253G | TO−225 (Pb−Free) | 500 Units/Box |

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

**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 | – | V |
| Collector Cutoff Current<br>($V_{CB}$ = 100 Vdc, $I_E$ = 0)<br>($V_{CE}$ = 100 Vdc, $I_E$ = 0, $T_C$ = 125°C) | $I_{CBO}$ | <br>–<br>– | <br>0.1<br>0.1 | <br>μA<br>mA |
| Emitter Cutoff Current ($V_{BE}$ = 7.0 Vdc, $I_C$ = 0) | $I_{EBO}$ | – | 0.1 | μAdc |
| **ON CHARACTERISTICS** | | | | |
| DC Current Gain<br>($I_C$ = 200 mAdc, $V_{CE}$ = 1.0 Vdc)<br>($I_C$ = 1.0 Adc, $V_{CE}$ = 1.0 Vdc) | $h_{FE}$ | <br>40<br>15 | <br>180<br>– | – |
| Collector–Emitter Saturation Voltage<br>($I_C$ = 500 mAdc, $I_B$ = 50 mAdc)<br>($I_C$ = 1.0 Adc, $I_B$ = 100 mAdc) | $V_{CE(sat)}$ | <br>–<br>– | <br>0.3<br>0.6 | V |
| Base–Emitter Saturation Voltage ($I_C$ = 2.0 Adc, $I_B$ = 200 mAdc) | $V_{BE(sat)}$ | – | 1.8 | V |
| Base–Emitter On Voltage ($I_C$ = 500 mAdc, $V_{CE}$ = 1.0 Vdc) | $V_{BE(on)}$ | – | 1.5 | V |
| **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 |

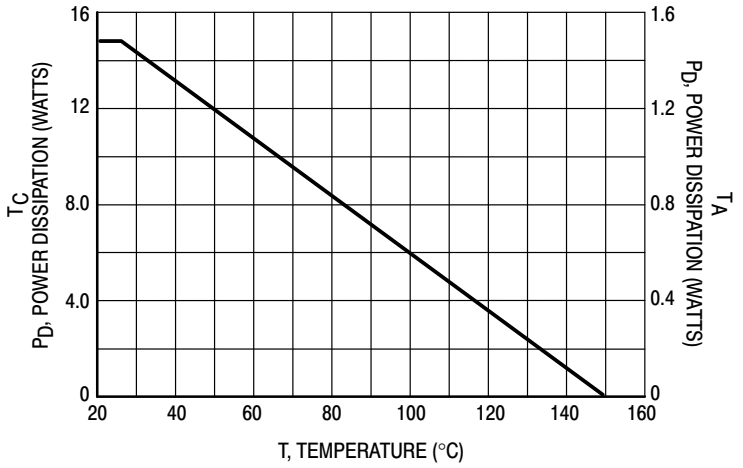



**Figure 1. Power Derating**

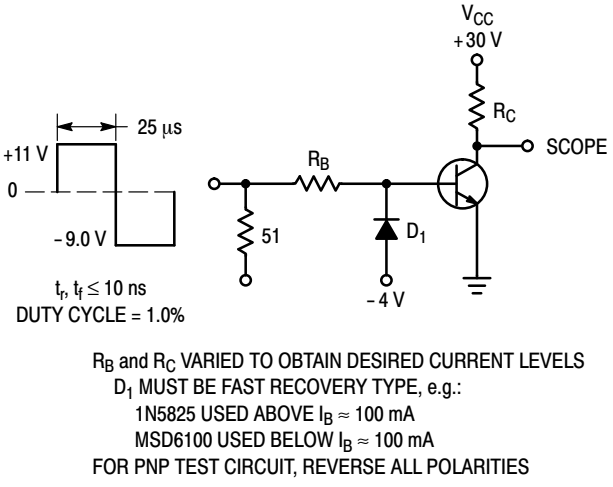



**Figure 2. Switching Time Test Circuit**

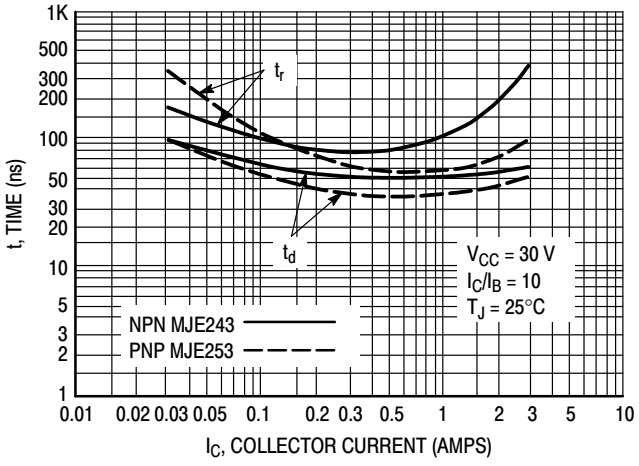



**Figure 3. Turn−On Time**

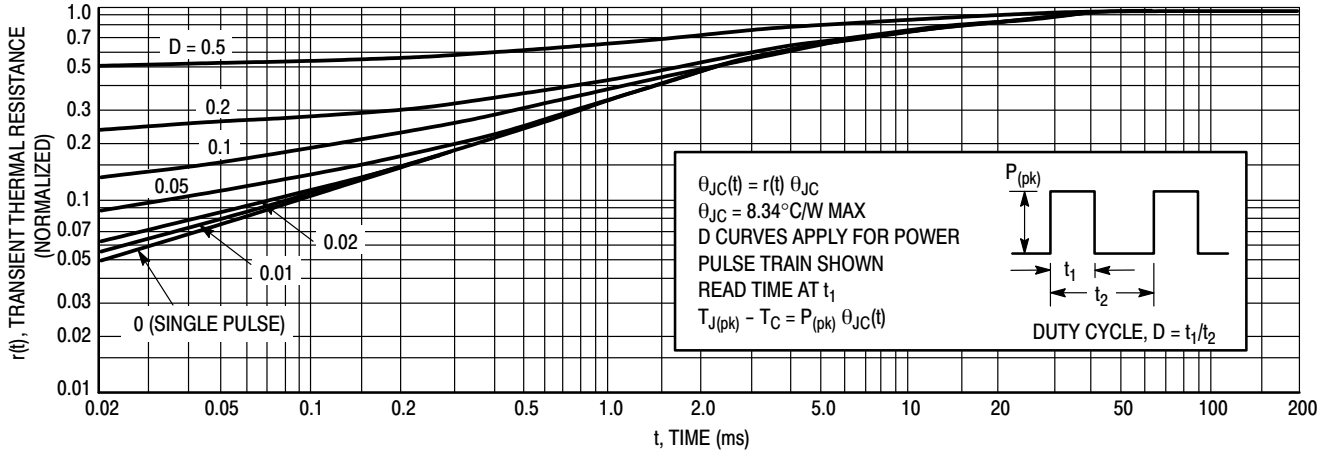



**Figure 4. Thermal Response**

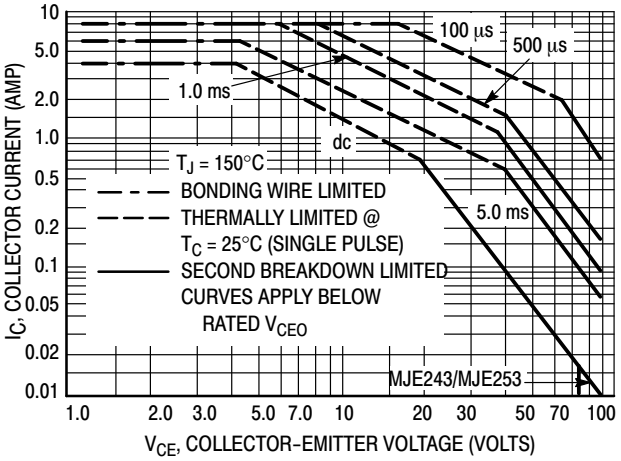



**Figure 5. Active Region Safe Operating Area**

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.

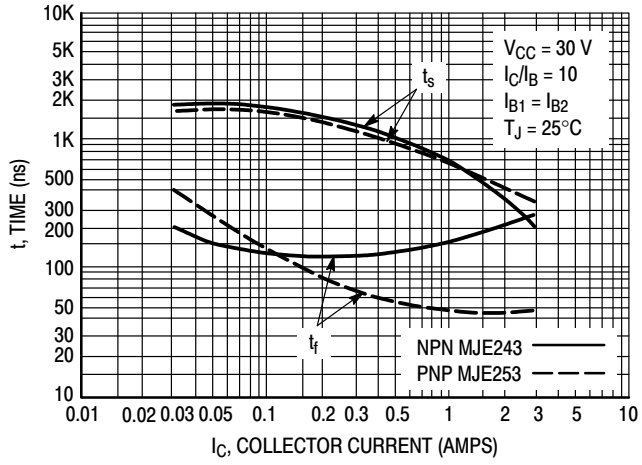



**Figure 6. Turn–Off Time**

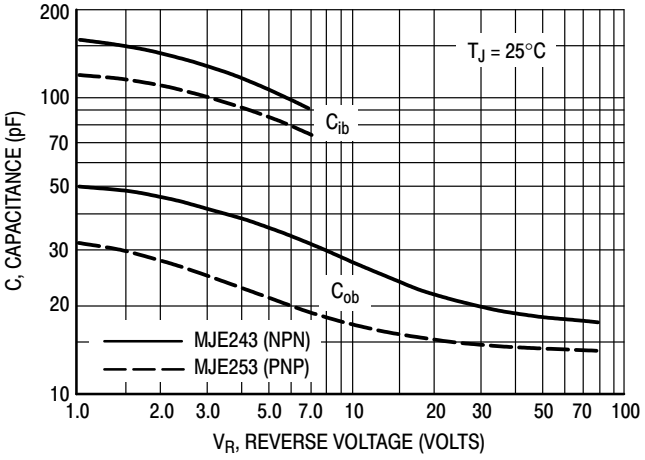
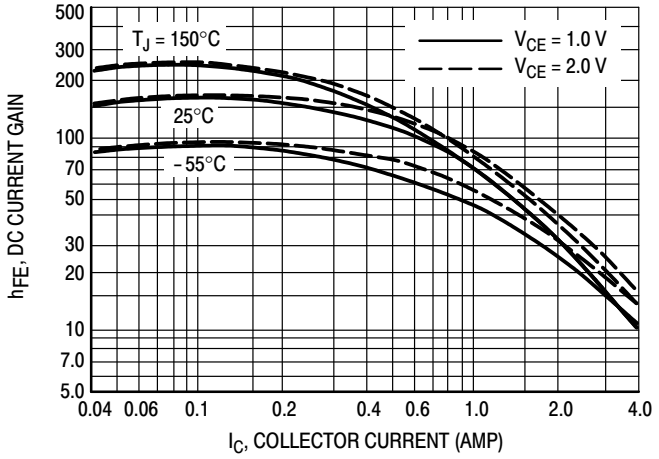



**Figure 7. Capacitance**

**NPN**
**MJE243**




**PNP**
**MJE253**

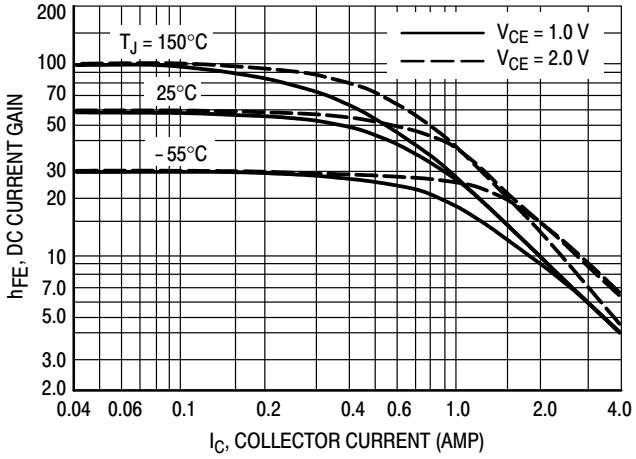
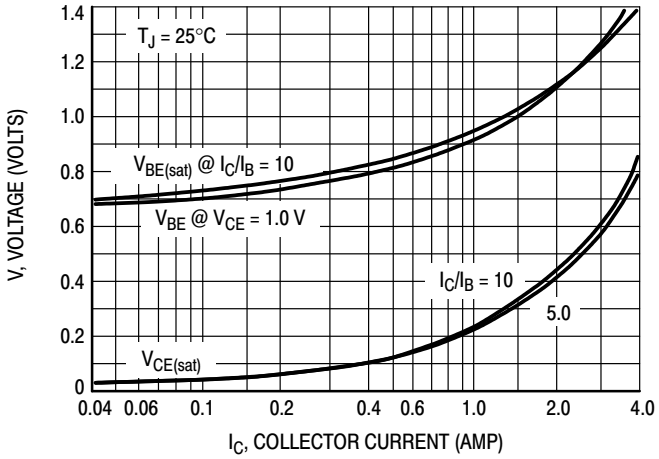



**Figure 8. DC Current Gain**



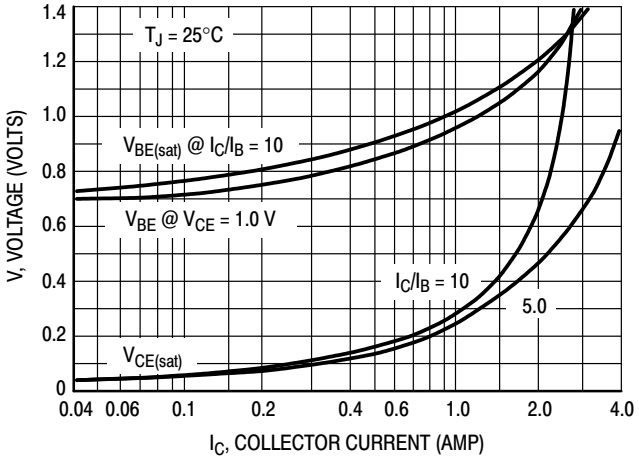
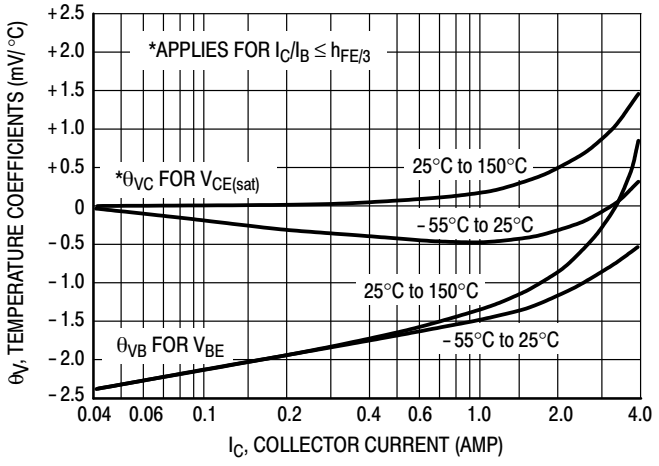




**Figure 9. “On” Voltages**



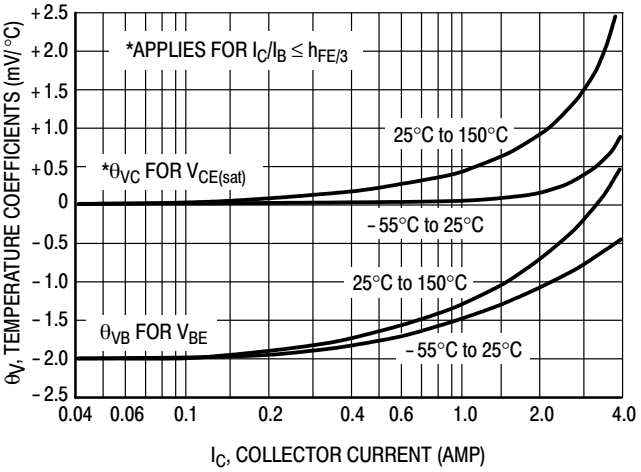
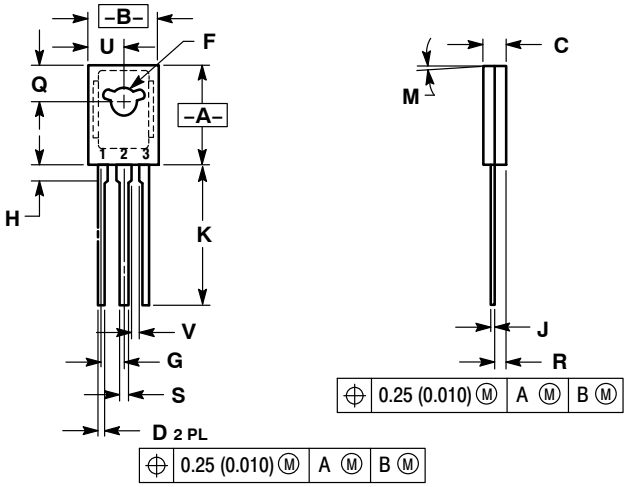




**Figure 10. Temperature Coefficients**

## PACKAGE DIMENSIONS

**TO–225**
CASE 77–09
ISSUE Z




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 077–01 THRU –08 OBSOLETE, NEW STANDARD 077–09.

| | 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 | 0.065 | 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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**MJE243/D**

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