

MJE170, MJE171, MJE172 (PNP), MJE180, MJE181, MJE182 (NPN)

Preferred Device

Complementary Plastic Silicon Power Transistors

The MJE170/180 series is designed for low power audio amplifier and low current, high speed switching applications.

Features

- Collector–Emitter Sustaining Voltage –
 $V_{CEO(sus)} = 40 \text{ Vdc}$ – MJE170, MJE180
 $= 60 \text{ Vdc}$ – MJE171, MJE181
 $= 80 \text{ Vdc}$ – MJE172, MJE182
- DC Current Gain –
 $h_{FE} = 30 \text{ (Min) @ } I_C = 0.5 \text{ Adc}$
 $= 12 \text{ (Min) @ } I_C = 1.5 \text{ Adc}$
- Current–Gain – Bandwidth Product –
 $f_T = 50 \text{ MHz (Min) @ } I_C = 100 \text{ mAdc}$
- Annular Construction for Low Leakages –
 $I_{CBO} = 100 \text{ nA (Max) @ Rated } V_{CB}$
- Epoxy Meets UL 94 V–0 @ 0.125 in
- ESD Ratings: Machine Model, C
Human Body Model, 3B
- Pb–Free Packages are Available*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|-----------------|--------------------------|
| Collector–Base Voltage MJE170, MJE180 MJE171, MJE181 MJE172, MJE182 | V_{CB} | 60 80 100 | Vdc |
| Collector–Emitter Voltage MJE170, MJE180 MJE171, MJE181 MJE172, MJE182 | V_{CEO} | 40 60 80 | Vdc |
| Emitter–Base Voltage | V_{EB} | 7.0 | Vdc |
| Collector Current – Continuous – Peak | I_C | 3.0 6.0 | Adc |
| Base Current | I_B | 1.0 | Adc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 1.5 0.012 | W W/ $^\circ\text{C}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 12.5 0.1 | W W/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 to +150 | $^\circ\text{C}$ |

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.

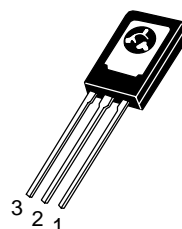
*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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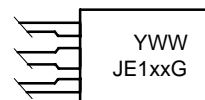
<http://onsemi.com>

**3 AMPERES
POWER TRANSISTORS
COMPLEMENTARY SILICON
40 – 60 – 80 VOLTS
12.5 WATTS**



TO–225AA
CASE 77–09
STYLE 1

MARKING DIAGRAM



Y = Year
 WW = Work Week
 JE1xx = Specific Device Code
 x = 70, 71, 72, 80, 81, or 82
 G = Pb–Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

MJE170, MJE171, MJE172 (PNP), MJE180, MJE181, MJE182 (NPN)

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|---------------|------|-----------------------------|
| Thermal Resistance, Junction-to-Case | θ_{JC} | 10 | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient | θ_{JA} | 83.4 | $^{\circ}\text{C}/\text{W}$ |

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | |
|--|--|----------------|-----------------------|---------------------------------|---------------------------------|
| Collector-Emitter Sustaining Voltage ($I_C = 10 \text{ mAdc}$, $I_B = 0$) | MJE170, MJE180 MJE171, MJE181 MJE172, MJE182 | $V_{CEO(sus)}$ | 40 60 80 | – – | Vdc |
| Collector Cutoff Current ($V_{CB} = 60 \text{ Vdc}$, $I_E = 0$) ($V_{CB} = 80 \text{ Vdc}$, $I_E = 0$) ($V_{CB} = 100 \text{ Vdc}$, $I_E = 0$) ($V_{CB} = 60 \text{ Vdc}$, $I_E = 0$, $T_C = 150^{\circ}\text{C}$) ($V_{CB} = 80 \text{ Vdc}$, $I_E = 0$, $T_C = 150^{\circ}\text{C}$) ($V_{CB} = 100 \text{ Vdc}$, $I_E = 0$, $T_C = 150^{\circ}\text{C}$) | MJE170, MJE180 MJE171, MJE181 MJE172, MJE182 MJE170, MJE180 MJE171, MJE181 MJE172, MJE182 | I_{CBO} | – – – – – | 0.1 0.1 0.1 0.1 0.1 | μAdc mAdc |
| Emitter Cutoff Current ($V_{BE} = 7.0 \text{ Vdc}$, $I_C = 0$) | | I_{EBO} | – | 0.1 | μAdc |

ON CHARACTERISTICS

| | | | | | |
|--|--|---------------|----------------|-------------------|-----|
| DC Current Gain ($I_C = 100 \text{ mAdc}$, $V_{CE} = 1.0 \text{ Vdc}$) ($I_C = 500 \text{ mAdc}$, $V_{CE} = 1.0 \text{ Vdc}$) ($I_C = 1.5 \text{ Adc}$, $V_{CE} = 1.0 \text{ Vdc}$) | | h_{FE} | 50 30 12 | 250 – – | – |
| Collector-Emitter Saturation Voltage ($I_C = 500 \text{ mAdc}$, $I_B = 50 \text{ mAdc}$) ($I_C = 1.5 \text{ Adc}$, $I_B = 150 \text{ mAdc}$) ($I_C = 3.0 \text{ Adc}$, $I_B = 600 \text{ mAdc}$) | | $V_{CE(sat)}$ | – – – | 0.3 0.9 1.7 | Vdc |
| Base-Emitter Saturation Voltage ($I_C = 1.5 \text{ Adc}$, $I_B = 150 \text{ mAdc}$) ($I_C = 3.0 \text{ Adc}$, $I_B = 600 \text{ mAdc}$) | | $V_{BE(sat)}$ | – – | 1.5 2.0 | Vdc |
| Base-Emitter On Voltage ($I_C = 500 \text{ mAdc}$, $V_{CE} = 1.0 \text{ Vdc}$) | | $V_{BE(on)}$ | – | 1.2 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | | |
|---|--------------------------------|----------|--------|----------|-----|
| Current-Gain – Bandwidth Product (Note 1) ($I_C = 100 \text{ mAdc}$, $V_{CE} = 10 \text{ Vdc}$, $f_{test} = 10 \text{ MHz}$) | | f_T | 50 | – | MHz |
| Output Capacitance ($V_{CB} = 10 \text{ Vdc}$, $I_E = 0$, $f = 0.1 \text{ MHz}$) | MJE171/MJE172 MJE181/MJE182 | C_{ob} | – – | 60 40 | pF |

1. $f_T = |h_{fe}| \cdot f_{test}$

MJE170, MJE171, MJE172 (PNP), MJE180, MJE181, MJE182 (NPN)

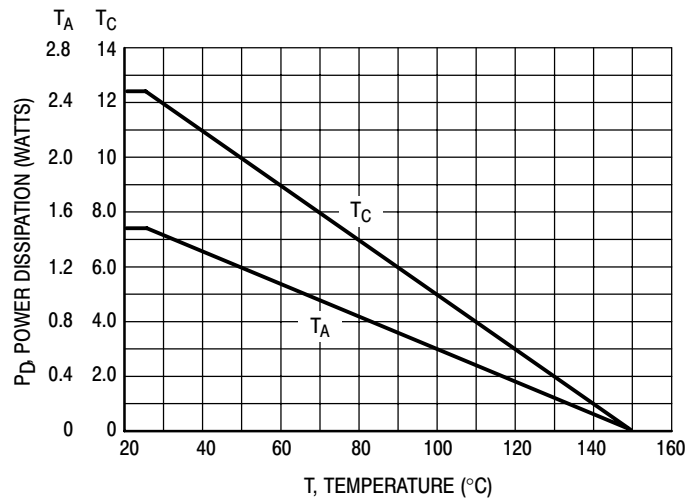


Figure 1. Power Derating

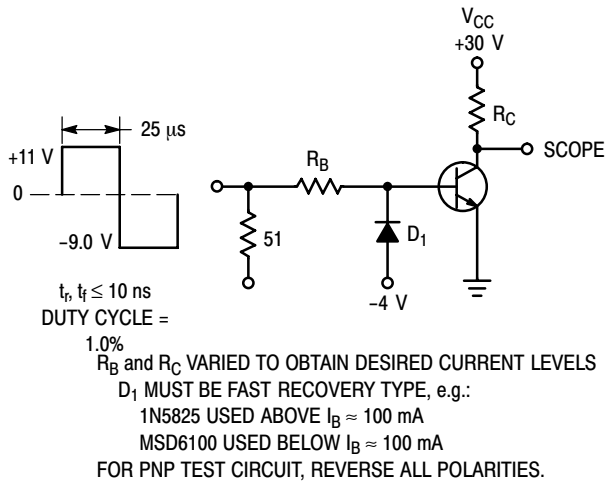


Figure 2. Switching Time Test Circuit

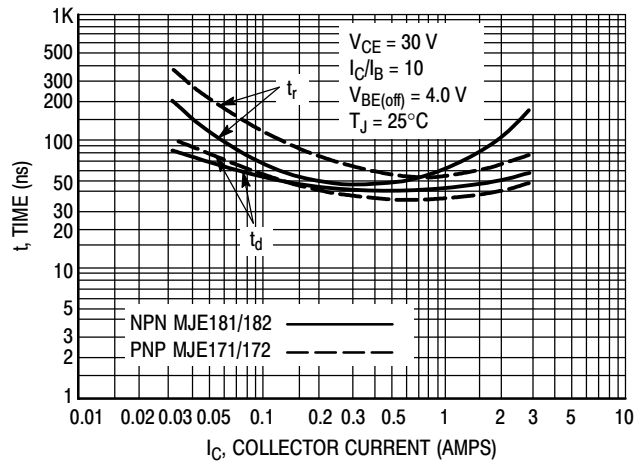


Figure 3. Turn-On Time

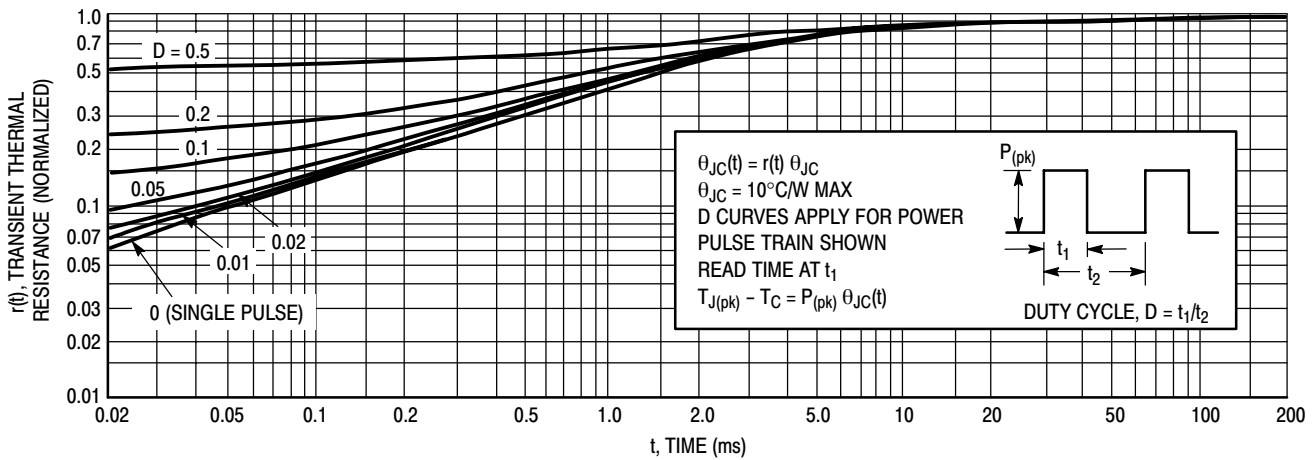


Figure 4. Thermal Response

MJE170, MJE171, MJE172 (PNP), MJE180, MJE181, MJE182 (NPN)

ACTIVE-REGION SAFE OPERATING AREA

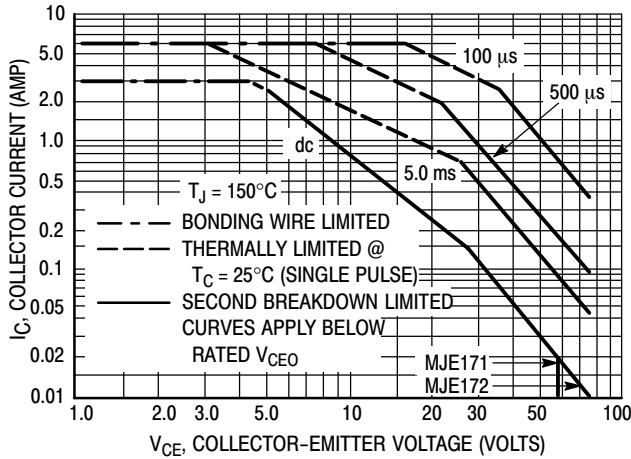


Figure 5. MJE171, MJE172

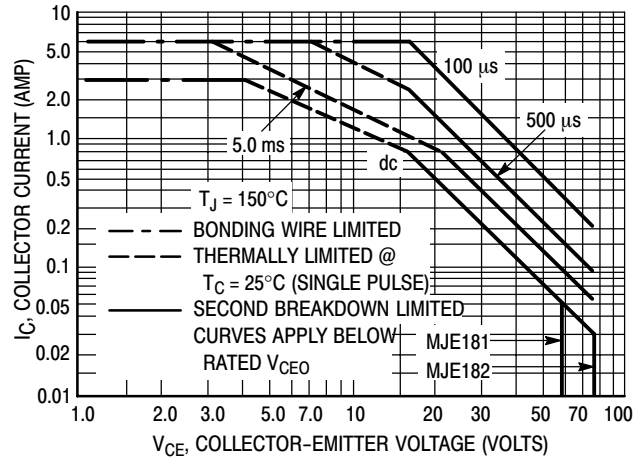


Figure 6. MJE181, MJE182

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 Figures 5 and 6 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 $T_{J(pk)} < 150^\circ\text{C}$. $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperature, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

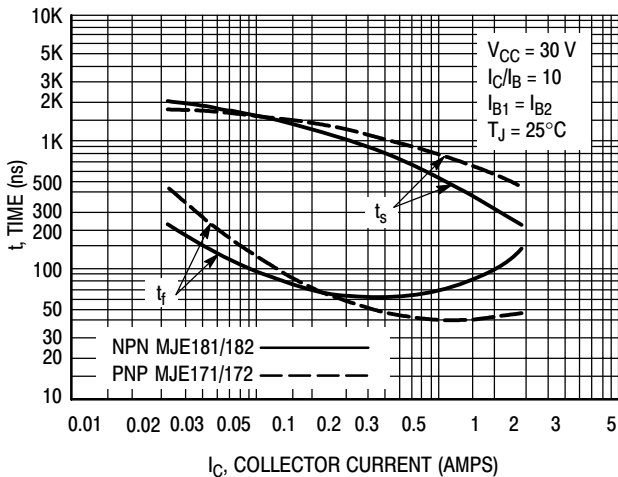


Figure 7. Turn-Off Time

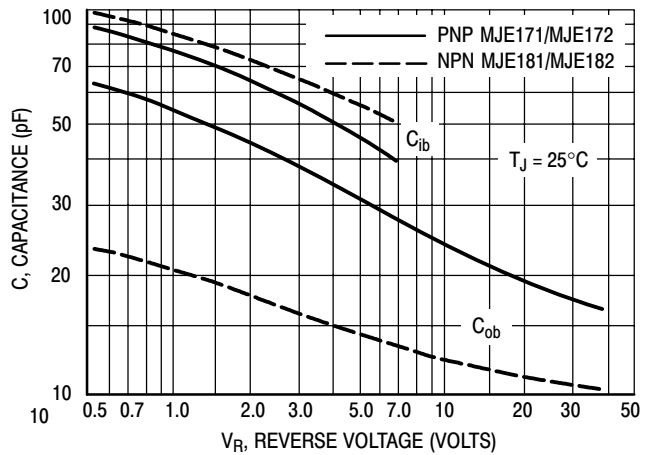


Figure 8. Capacitance

MJE170, MJE171, MJE172 (PNP), MJE180, MJE181, MJE182 (NPN)

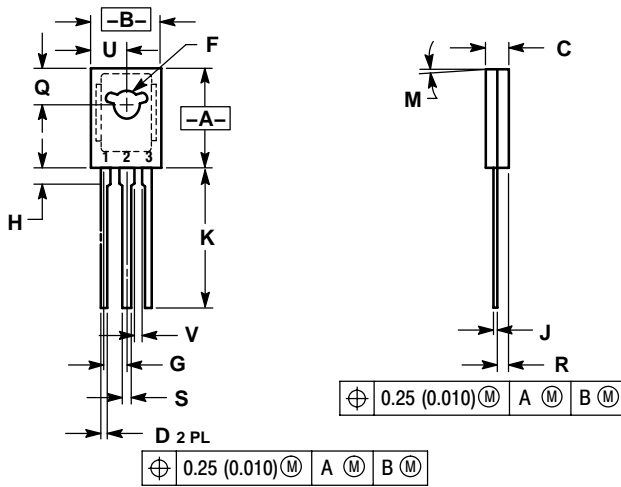
ORDERING INFORMATION

| Device | Package | Shipping |
|---------|---------------------|-----------------|
| MJE170 | TO-225 | 500 Units / Box |
| MJE170G | TO-225 (Pb-Free) | |
| MJE171 | TO-225 | |
| MJE171G | TO-225 (Pb-Free) | |
| MJE172 | TO-225 | |
| MJE172G | TO-225 (Pb-Free) | |
| MJE180 | TO-225 | |
| MJE180G | TO-225 (Pb-Free) | |
| MJE181 | TO-225 | |
| MJE181G | TO-225 (Pb-Free) | |
| MJE182 | TO-225 | |
| MJE182G | TO-225 (Pb-Free) | |

MJE170, MJE171, MJE172 (PNP), MJE180, MJE181, MJE182 (NPN)

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.

| 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:

1. EMITTER
2. COLLECTOR
3. BASE

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