

# MJE5730, MJE5731, MJE5731A

## High Voltage PNP Silicon Plastic Power Transistors

These devices are designed for line operated audio output amplifier, SWITCHMODE power supply drivers and other switching applications.

### Features

- 300 V to 400 V (Min) –  $V_{CEO(sus)}$
- 1.0 A Rated Collector Current
- Popular TO-220 Plastic Package
- PNP Complements to the TIP47 thru TIP50 Series
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

| Rating                                                                                 | Symbol            | Value             | Unit                     |
|----------------------------------------------------------------------------------------|-------------------|-------------------|--------------------------|
| Collector-Emitter Voltage<br>MJE5730<br>MJE5731<br>MJE5731A                            | $V_{CEO}$         | 300<br>350<br>375 | Vdc                      |
| Collector-Base Voltage<br>MJE5730<br>MJE5731<br>MJE5731A                               | $V_{CB}$          | 300<br>350<br>375 | Vdc                      |
| Emitter-Base Voltage                                                                   | $V_{EB}$          | 5.0               | Vdc                      |
| Collector Current – Continuous<br>– Peak                                               | $I_C$<br>$I_{CM}$ | 1.0<br>3.0        | Adc                      |
| Base Current                                                                           | $I_B$             | 1.0               | Adc                      |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 40<br>0.32        | W<br>W/ $^\circ\text{C}$ |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$             | 2.0<br>0.016      | W<br>W/ $^\circ\text{C}$ |
| Unclamped Inducting Load Energy<br>(See Figure 10)                                     | E                 | 20                | mJ                       |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$    | -65 to +150       | $^\circ\text{C}$         |

### THERMAL CHARACTERISTICS

| Characteristics                         | Symbol          | Max   | Unit               |
|-----------------------------------------|-----------------|-------|--------------------|
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$ | 3.125 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 62.5  | $^\circ\text{C/W}$ |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

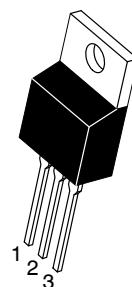
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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**1.0 AMPERE  
POWER TRANSISTORS  
PCP SILICON  
300-350-400 VOLTS  
50 WATTS**



TO-220AB  
CASE 221A-09  
STYLE 1

### MARKING DIAGRAM



MJE573x = Device Code  
x = 0, 1, or 1A  
G = Pb-Free Package  
A = Assembly Location  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 4 of this data sheet.

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

| Characteristic                                                                                                                                                        | Symbol         | Min               | Max               | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------|-------------------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                            |                |                   |                   |      |
| Collector-Emitter Sustaining Voltage (Note 1) ( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )                                                                                  | $V_{CEO(sus)}$ | 300<br>350<br>375 | –<br>–<br>–       | Vdc  |
| Collector Cutoff Current ( $V_{CE} = 200\text{ Vdc}$ , $I_B = 0$ )<br>( $V_{CE} = 250\text{ Vdc}$ , $I_B = 0$ )<br>( $V_{CE} = 300\text{ Vdc}$ , $I_B = 0$ )          | $I_{CEO}$      | –<br>–<br>–       | 1.0<br>1.0<br>1.0 | mAdc |
| Collector Cutoff Current ( $V_{CE} = 300\text{ Vdc}$ , $V_{BE} = 0$ )<br>( $V_{CE} = 350\text{ Vdc}$ , $V_{BE} = 0$ )<br>( $V_{CE} = 400\text{ Vdc}$ , $V_{BE} = 0$ ) | $I_{CES}$      | –<br>–<br>–       | 1.0<br>1.0<br>1.0 | mAdc |
| Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )                                                                                                      | $I_{EBO}$      | –                 | 1.0               | mAdc |
| <b>ON CHARACTERISTICS</b> (Note 1)                                                                                                                                    |                |                   |                   |      |
| DC Current Gain<br>( $I_C = 0.3\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ )<br>( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ )                                     | $h_{FE}$       | 30<br>10          | 150<br>–          | –    |
| Collector-Emitter Saturation Voltage ( $I_C = 1.0\text{ Adc}$ , $I_B = 0.2\text{ Adc}$ )                                                                              | $V_{CE(sat)}$  | –                 | 1.0               | Vdc  |
| Base-Emitter On Voltage ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ )                                                                                         | $V_{BE(on)}$   | –                 | 1.5               | Vdc  |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                                                        |                |                   |                   |      |
| Current Gain – Bandwidth Product ( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 2.0\text{ MHz}$ )                                                         | $f_T$          | 10                | –                 | MHz  |
| Small-Signal Current Gain ( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                                                                | $h_{fe}$       | 25                | –                 | –    |

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

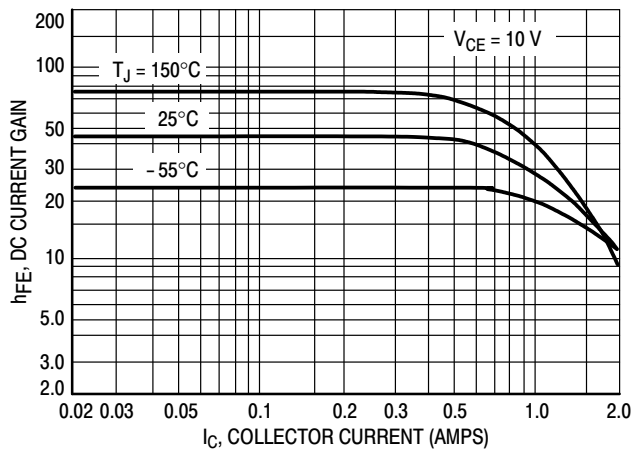


Figure 1. DC Current Gain

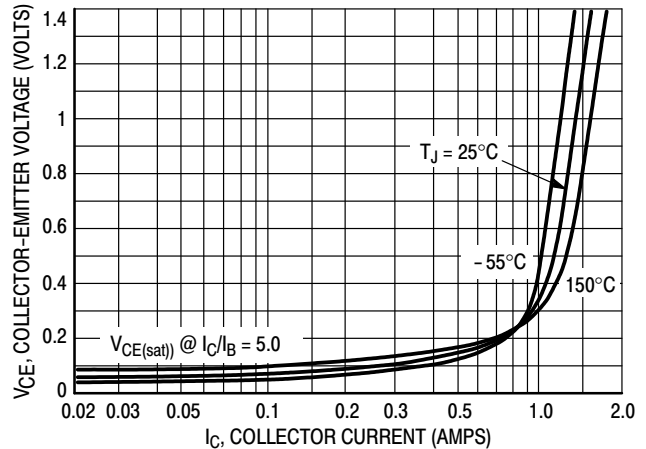


Figure 2. Collector-Emitter Saturation Voltage

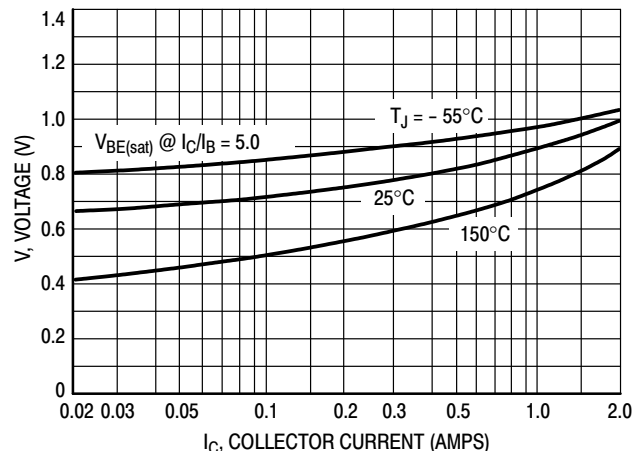


Figure 3. Base-Emitter Voltage

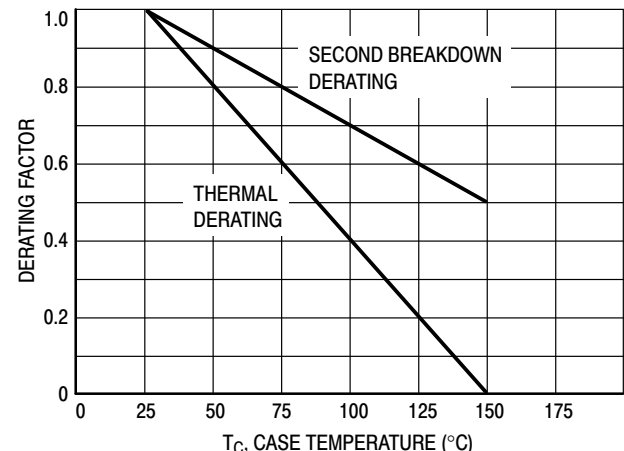


Figure 4. Normalized Power Derating

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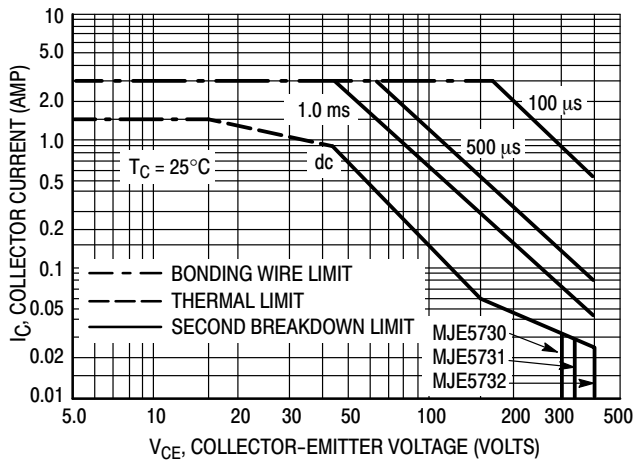


Figure 5. Forward Bias Safe Operating Area

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 6. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

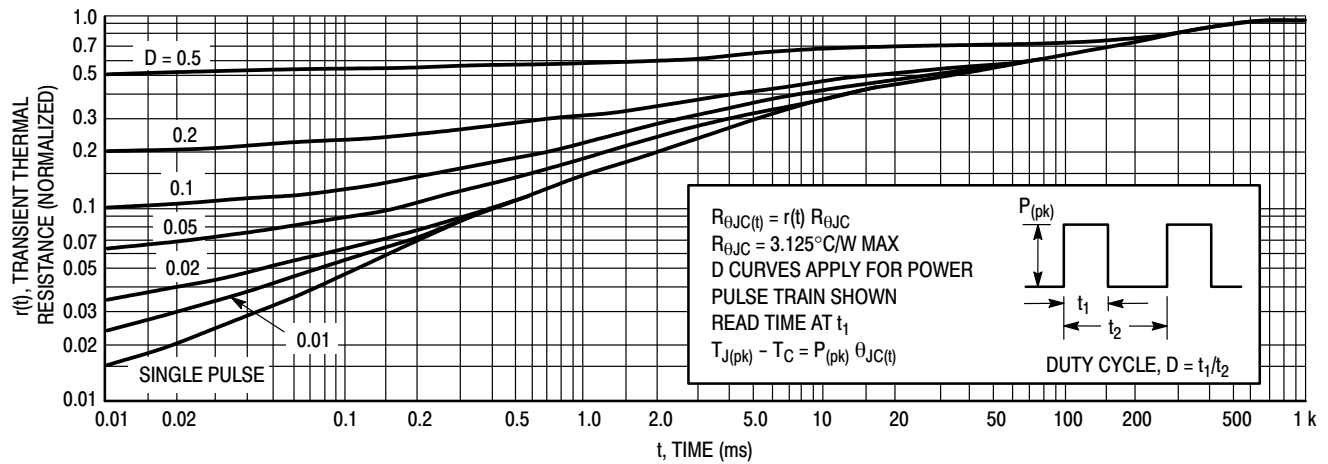


Figure 6. Thermal Response

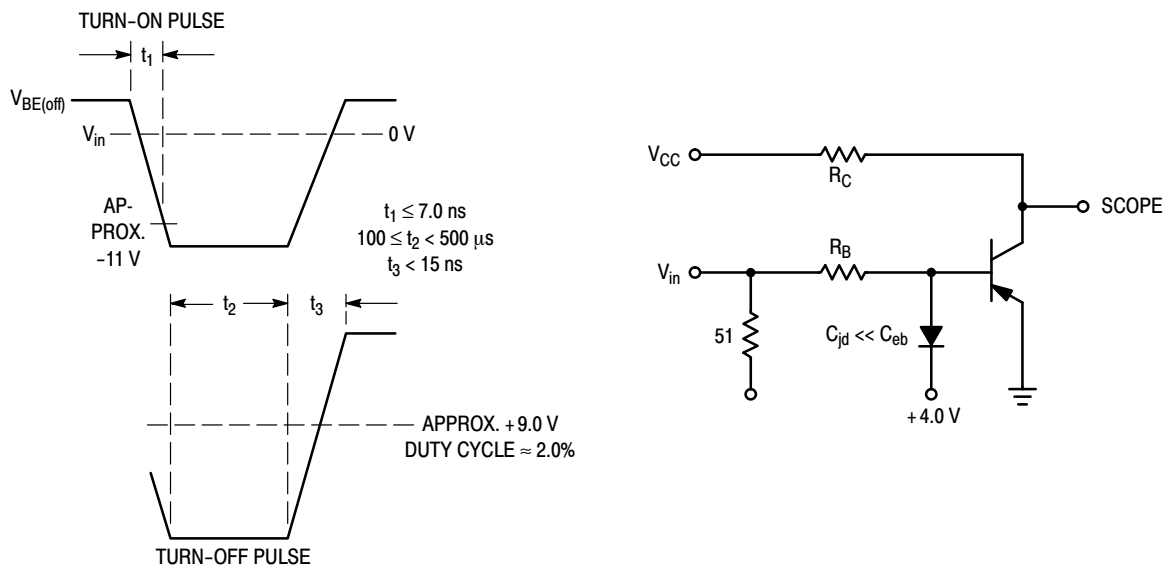


Figure 7. Switching Time Equivalent Circuit

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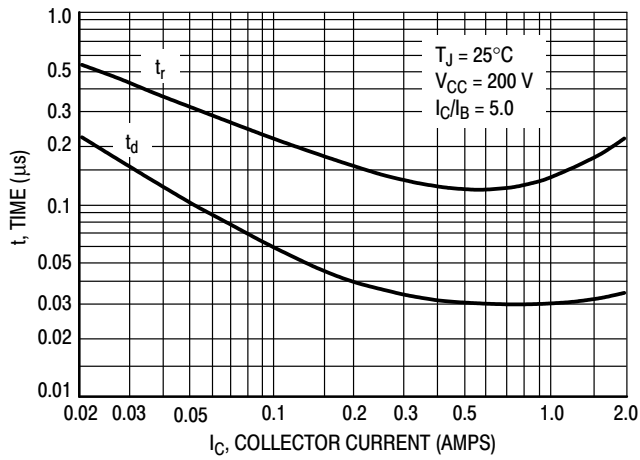


Figure 8. Turn-On Resistive Switching Times

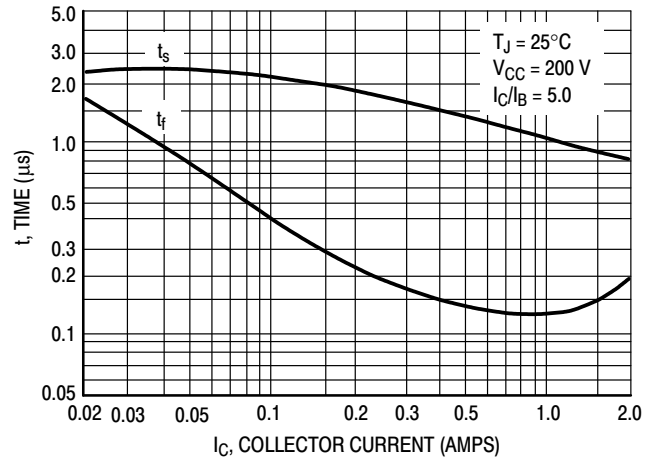
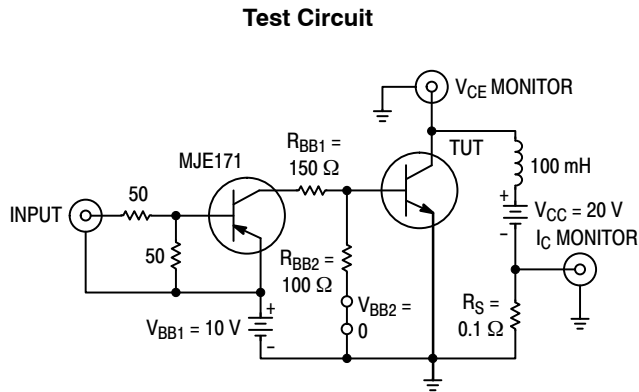


Figure 9. Resistive Turn-Off Switching Times



### Voltage and Current Waveforms

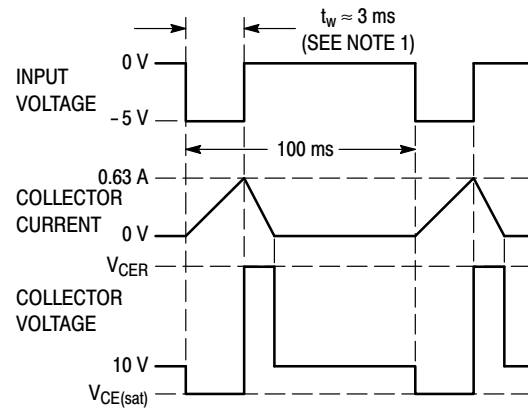


Figure 10. Inductive Load Switching

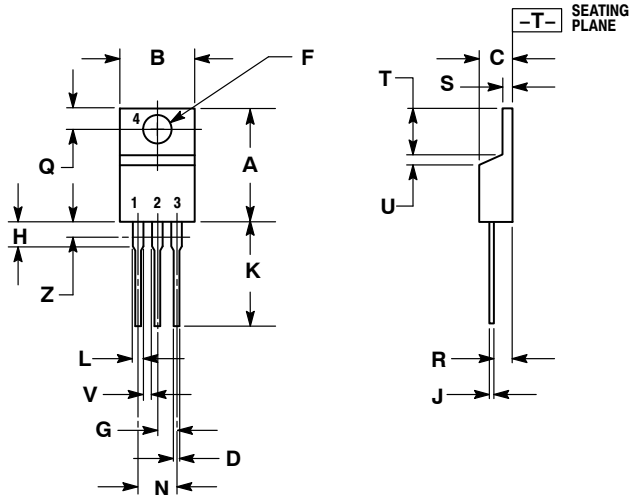
### ORDERING INFORMATION

| Device    | Package             | Shipping        |
|-----------|---------------------|-----------------|
| MJE5730   | TO-220              | 50 Units / Rail |
| MJE5730G  | TO-220<br>(Pb-Free) |                 |
| MJE5731   | TO-220              |                 |
| MJE5731G  | TO-220<br>(Pb-Free) |                 |
| MJE5731A  | TO-220              |                 |
| MJE5731AG | TO-220<br>(Pb-Free) |                 |

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## PACKAGE DIMENSIONS

TO-220  
CASE 221A-09  
ISSUE AG



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.570  | 0.620 | 14.48       | 15.75 |
| B   | 0.380  | 0.405 | 9.66        | 10.28 |
| C   | 0.160  | 0.190 | 4.07        | 4.82  |
| D   | 0.025  | 0.036 | 0.64        | 0.91  |
| F   | 0.142  | 0.161 | 3.61        | 4.09  |
| G   | 0.095  | 0.105 | 2.42        | 2.66  |
| H   | 0.110  | 0.161 | 2.80        | 4.10  |
| J   | 0.014  | 0.025 | 0.36        | 0.64  |
| K   | 0.500  | 0.562 | 12.70       | 14.27 |
| L   | 0.045  | 0.060 | 1.15        | 1.52  |
| N   | 0.190  | 0.210 | 4.83        | 5.33  |
| Q   | 0.100  | 0.120 | 2.54        | 3.04  |
| R   | 0.080  | 0.110 | 2.04        | 2.79  |
| S   | 0.045  | 0.055 | 1.15        | 1.39  |
| T   | 0.235  | 0.255 | 5.97        | 6.47  |
| U   | 0.000  | 0.050 | 0.00        | 1.27  |
| V   | 0.045  | ---   | 1.15        | ---   |
| Z   | ---    | 0.080 | ---         | 2.04  |

- STYLE 1:
- PIN 1. BASE
  - COLLECTOR
  - EMITTER
  - COLLECTOR

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