

# MJD5731

## High Voltage PNP Silicon Power Transistors

Designed for line operated audio output amplifier, SWITCHMODE power supply drivers and other switching applications.

### Features

- PNP Complements to the MJD47 thru MJD50 Series
- Epoxy Meets UL 94 V-0 @ 0.125 in
- These Devices are Pb-Free and are RoHS Compliant

### MAXIMUM RATINGS

| Rating                                                                                            | Symbol         | Max            | Unit                     |
|---------------------------------------------------------------------------------------------------|----------------|----------------|--------------------------|
| Collector-Emitter Voltage                                                                         | $V_{CEO}$      | 350            | Vdc                      |
| Emitter-Base Voltage                                                                              | $V_{EB}$       | 5              | Vdc                      |
| Collector Current – Continuous                                                                    | $I_C$          | 1.0            | Adc                      |
| Collector Current – Peak                                                                          | $I_{CM}$       | 3.0            | Adc                      |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$          | $P_D$          | 15<br>0.12     | W<br>W/ $^\circ\text{C}$ |
| Total Power Dissipation (Note 1)<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.56<br>0.0125 | W<br>W/ $^\circ\text{C}$ |
| Unclamped Inductive Load Energy<br>(See Figure 10)                                                | E              | 20             | mJ                       |
| Operating and Storage Junction<br>Temperature Range                                               | $T_J, T_{stg}$ | -55 to +150    | $^\circ\text{C}$         |
| ESD – Human Body Model                                                                            | HBM            | 3B             | V                        |
| ESD – Machine Model                                                                               | MM             | C              | V                        |

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.

1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

### THERMAL CHARACTERISTICS

| Characteristic                                      | Symbol          | Max  | Unit               |
|-----------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Case                | $R_{\theta JC}$ | 8.33 | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Ambient<br>(Note 2) | $R_{\theta JA}$ | 80   | $^\circ\text{C/W}$ |
| Lead Temperature for Soldering                      | $T_L$           | 260  | $^\circ\text{C}$   |

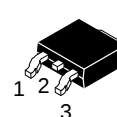
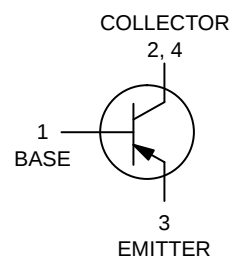
2. These ratings are applicable when surface mounted on the minimum pad sizes recommended.



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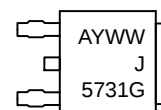
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## SILICON POWER TRANSISTORS 1.0 AMPERE 350 VOLTS, 15 WATTS



DPAK  
CASE 369C  
STYLE 1

### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
WW = Work Week  
J5731 = Device Code  
G = Pb-Free Package

### ORDERING INFORMATION

| Device     | Package           | Shipping†        |
|------------|-------------------|------------------|
| MJD5731T4G | DPAK<br>(Pb-Free) | 2500/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**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 3)<br>( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )                                           | $V_{CEO(sus)}$ | 350      | –        | Vdc  |
| Collector Cutoff Current<br>( $V_{CE} = 250\text{ Vdc}$ , $I_B = 0$ )                                                             | $I_{CEO}$      | –        | 0.1      | mAdc |
| Collector Cutoff Current<br>( $V_{CE} = 350\text{ Vdc}$ , $V_{BE} = 0$ )                                                          | $I_{CES}$      | –        | 0.01     | mAdc |
| Emitter Cutoff Current<br>( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )                                                               | $I_{EBO}$      | –        | 0.5      | mAdc |
| <b>ON CHARACTERISTICS</b> (Note 3)                                                                                                |                |          |          |      |
| 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 | 175<br>– | –    |
| Collector-Emitter Saturation Voltage<br>( $I_C = 1.0\text{ Adc}$ , $I_B = 0.2\text{ Adc}$ )                                       | $V_{CE(sat)}$  | –        | 1.0      | Vdc  |
| Base-Emitter On Voltage<br>( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ )                                                  | $V_{BE(on)}$   | –        | 1.5      | Vdc  |
| <b>DYNAMIC CHARACTERISTICS</b>                                                                                                    |                |          |          |      |
| Current Gain – Bandwidth Product<br>( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 2.0\text{ MHz}$ )                  | $f_T$          | 10       | –        | MHz  |
| Small-Signal Current Gain<br>( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                         | $h_{fe}$       | 25       | –        | –    |

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

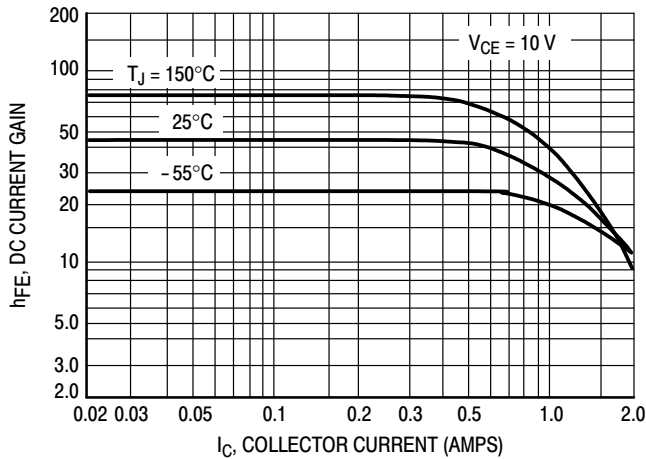


Figure 1. DC Current Gain

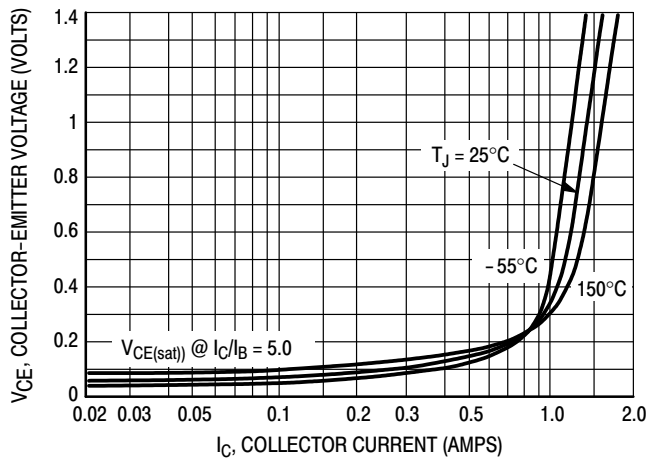


Figure 2. Collector-Emitter Saturation Voltage

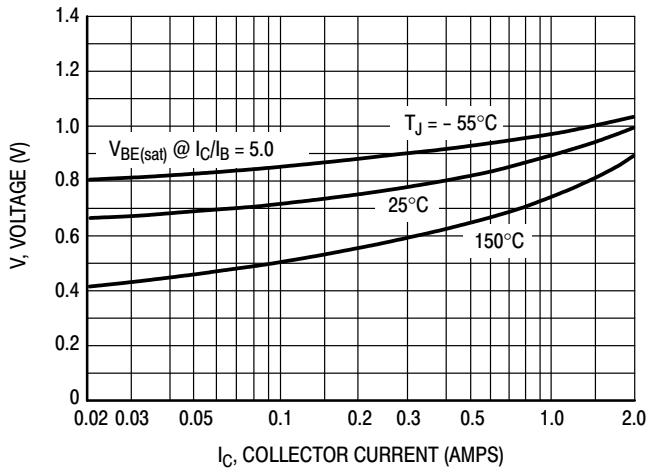


Figure 3. Base-Emitter Voltage

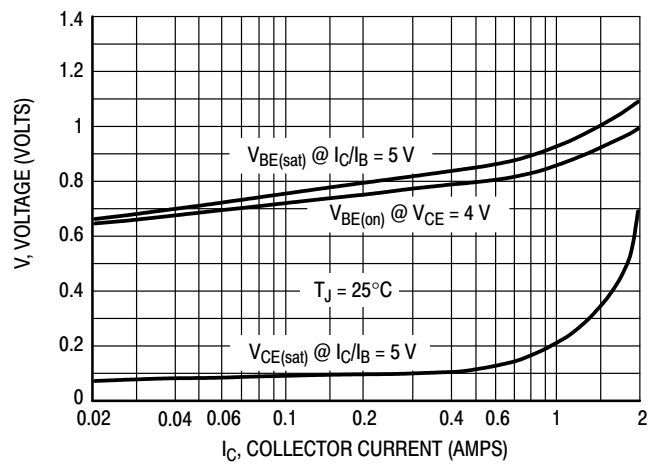


Figure 4. "On" Voltages

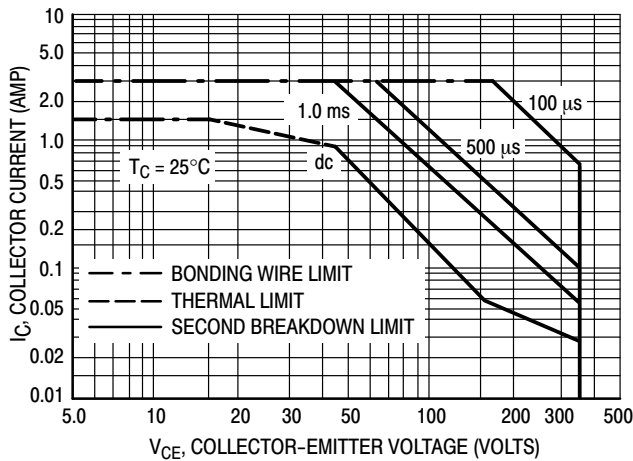


Figure 5. Forward Bias Safe Operating Area

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.

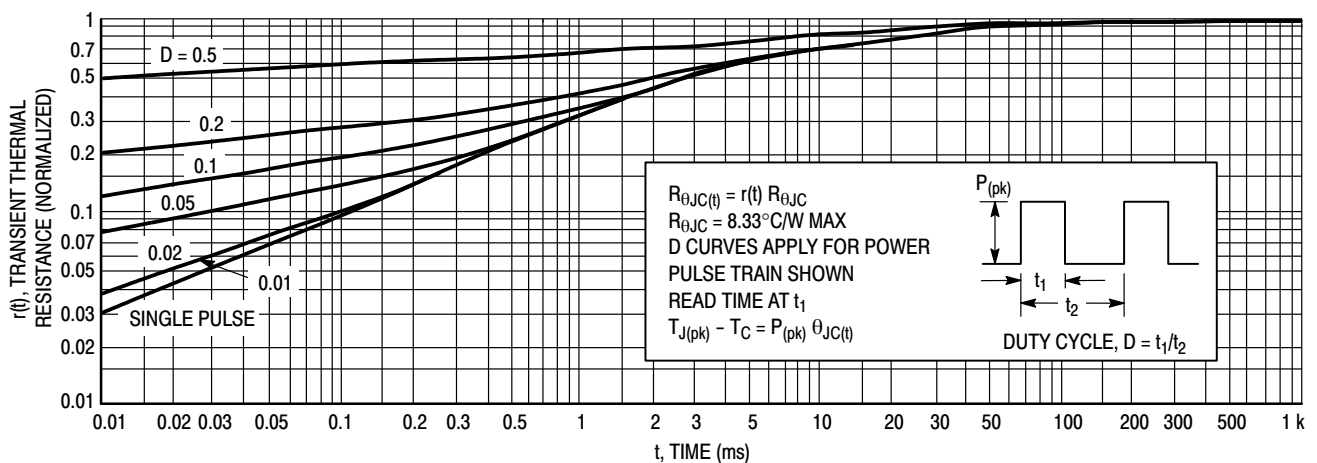


Figure 6. Thermal Response

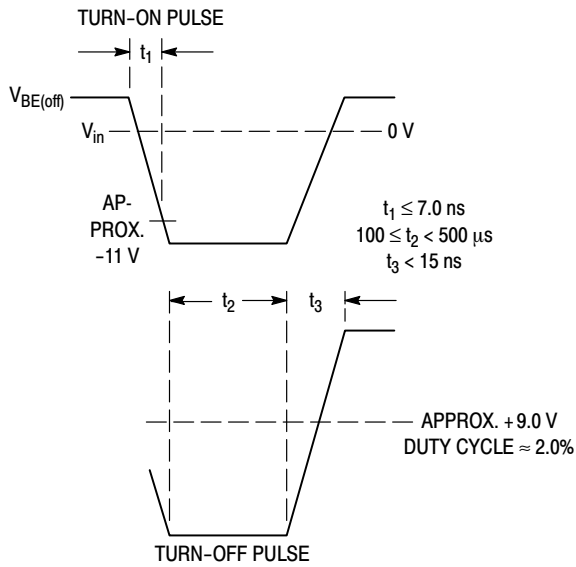


Figure 7. Switching Time Equivalent Circuit

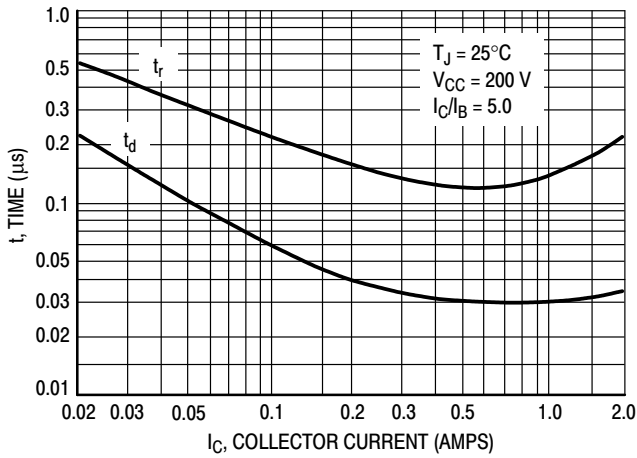
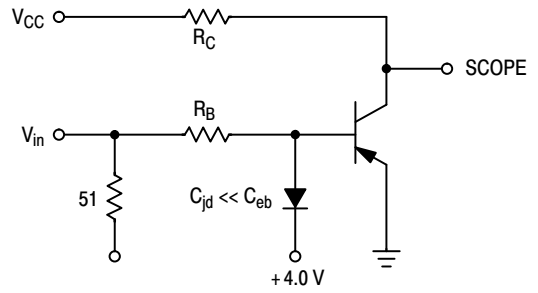


Figure 8. Turn-On Resistive Switching Times

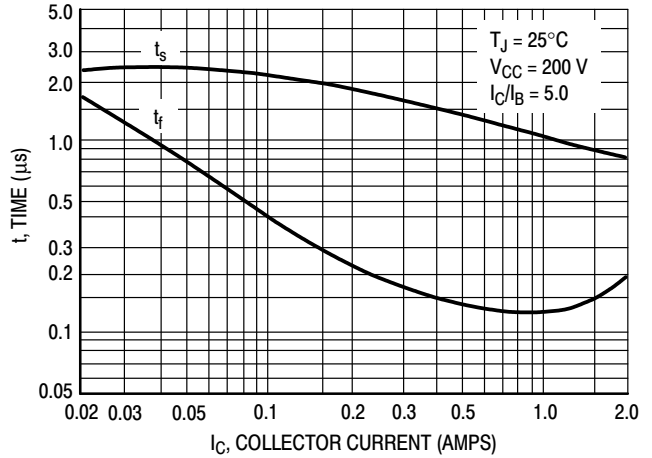


Figure 9. Resistive Turn-Off Switching Times

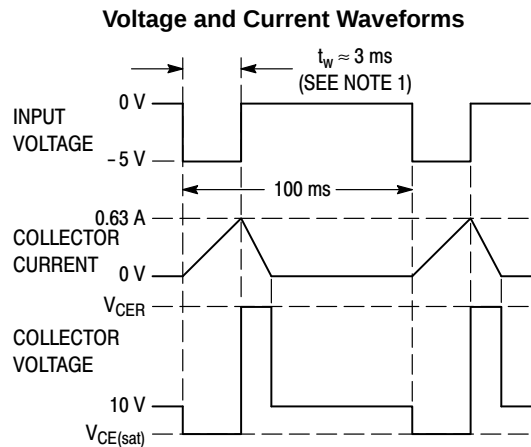
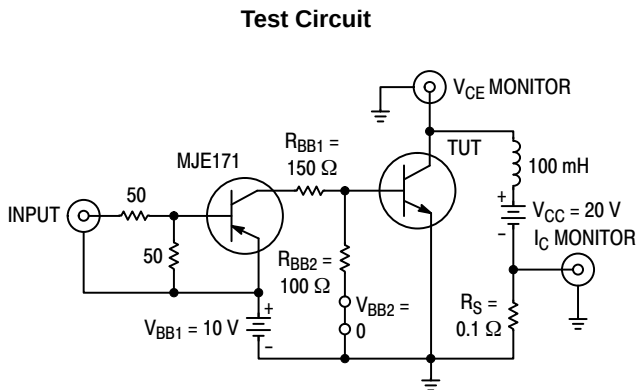
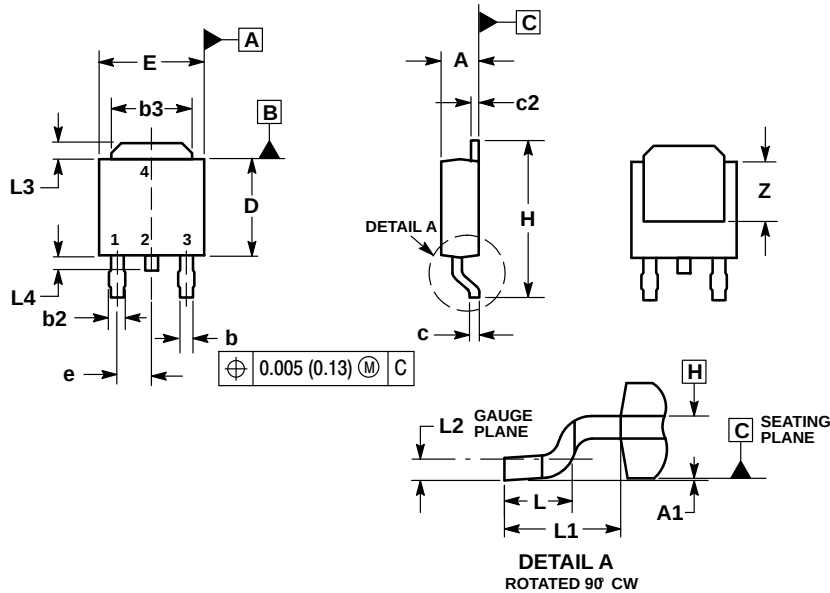


Figure 10. Inductive Load Switching

## PACKAGE DIMENSIONS

DPAK  
CASE 369C  
ISSUE D

## NOTES:

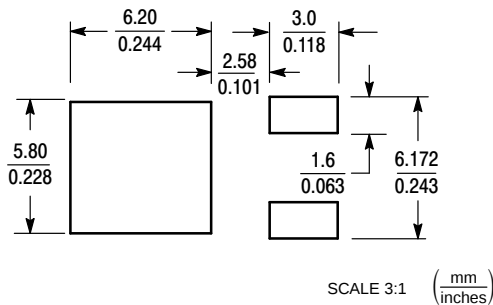
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3 and Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. DIMENSIONS D AND E ARE DETERMINED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
6. DATUMS A AND B ARE DETERMINED AT DATUM PLANE H.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.086     | 0.094 | 2.18        | 2.38  |
| A1  | 0.000     | 0.005 | 0.00        | 0.13  |
| b   | 0.025     | 0.035 | 0.63        | 0.89  |
| b2  | 0.030     | 0.045 | 0.76        | 1.14  |
| b3  | 0.180     | 0.215 | 4.57        | 5.46  |
| c   | 0.018     | 0.024 | 0.46        | 0.61  |
| c2  | 0.018     | 0.024 | 0.46        | 0.61  |
| D   | 0.235     | 0.245 | 5.97        | 6.22  |
| E   | 0.250     | 0.265 | 6.35        | 6.73  |
| e   | 0.090 BSC |       | 2.29 BSC    |       |
| H   | 0.370     | 0.410 | 9.40        | 10.41 |
| L   | 0.055     | 0.070 | 1.40        | 1.78  |
| L1  | 0.108 REF |       | 2.74 REF    |       |
| L2  | 0.020 BSC |       | 0.51 BSC    |       |
| L3  | 0.035     | 0.050 | 0.89        | 1.27  |
| L4  | ---       | 0.040 | ---         | 1.01  |
| Z   | 0.155     | ---   | 3.93        | ---   |

## STYLE 1:

- PIN 1. BASE
- COLLECTOR
- EMITTER
- COLLECTOR

## SOLDERING FOOTPRINT\*



\*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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