

# High Voltage PNP Silicon Power Transistors

## MJD5731

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

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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

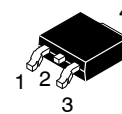
1. These ratings are applicable when surface mounted on the minimum pad sizes recommended.

### THERMAL CHARACTERISTICS

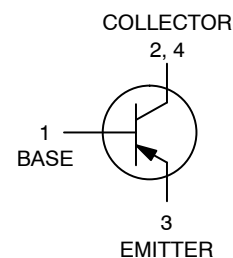
Symbol	Characteristic	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	8.33	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 2)	80	$^\circ\text{C}/\text{W}$
$T_L$	Lead Temperature for Soldering	260	$^\circ\text{C}$

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

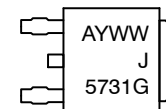
## SILICON POWER TRANSISTORS 1.0 AMPERE 350 VOLTS, 15 WATTS



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 (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 Specification Brochure, [BRD8011/D](http://www.onsemi.com/BRD8011/D).

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

Symbol	Characteristic	Min	Max	Unit
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**OFF CHARACTERISTICS**

$V_{CEO(sus)}$	Collector-Emitter Sustaining Voltage (Note 3) ( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )	350	–	Vdc
$I_{CEO}$	Collector Cutoff Current ( $V_{CE} = 250\text{ Vdc}$ , $I_B = 0$ )	–	0.1	mAdc
$I_{CES}$	Collector Cutoff Current ( $V_{CE} = 350\text{ Vdc}$ , $V_{BE} = 0$ )	–	0.01	mAdc
$I_{EBO}$	Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )	–	0.5	mAdc

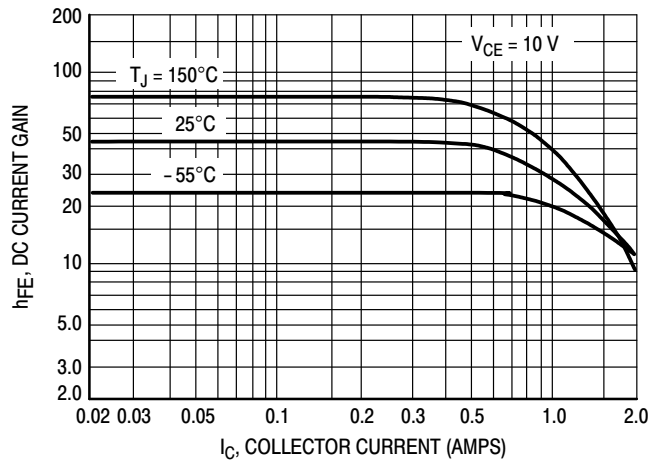
**ON CHARACTERISTICS** (Note 3)

$h_{FE}$	DC Current Gain ( $I_C = 0.3\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ ) ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ )	30 10	175 –	–
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ( $I_C = 1.0\text{ Adc}$ , $I_B = 0.2\text{ Adc}$ )	–	1.0	Vdc
$V_{BE(on)}$	Base-Emitter On Voltage ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ )	–	1.5	Vdc

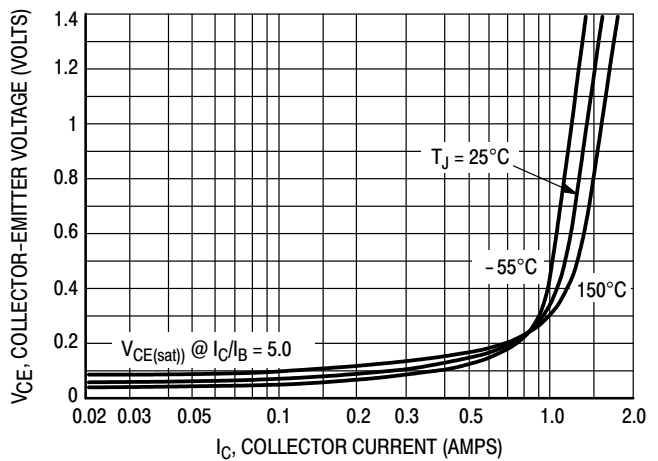
**DYNAMIC CHARACTERISTICS**

$f_T$	Current Gain – Bandwidth Product ( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 2.0\text{ MHz}$ )	10	–	MHz
$h_{fe}$	Small-Signal Current Gain ( $I_C = 0.2\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )	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**

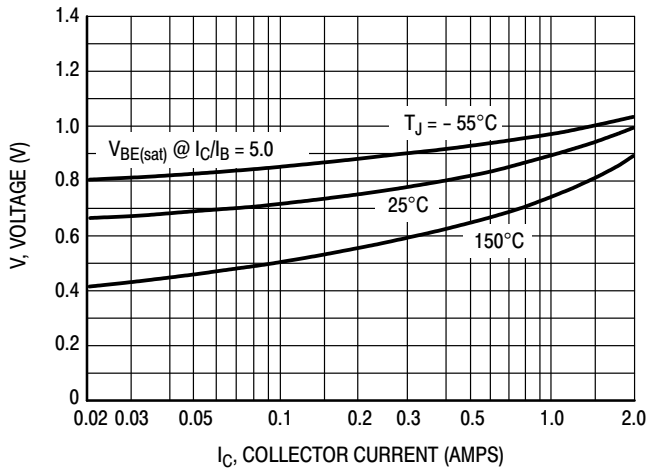


Figure 3. Base-Emitter Voltage

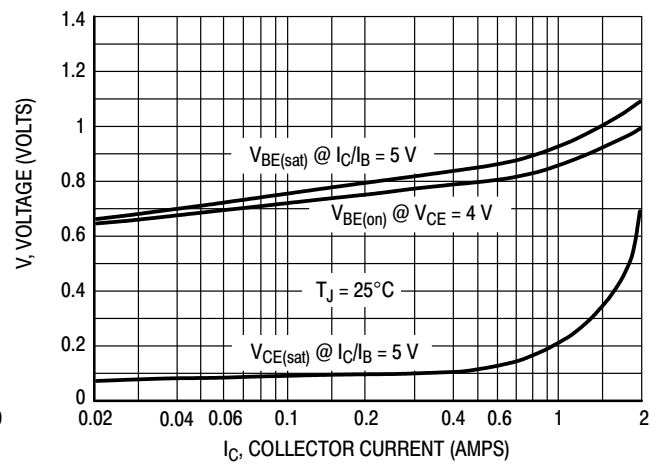


Figure 4. "On" Voltages

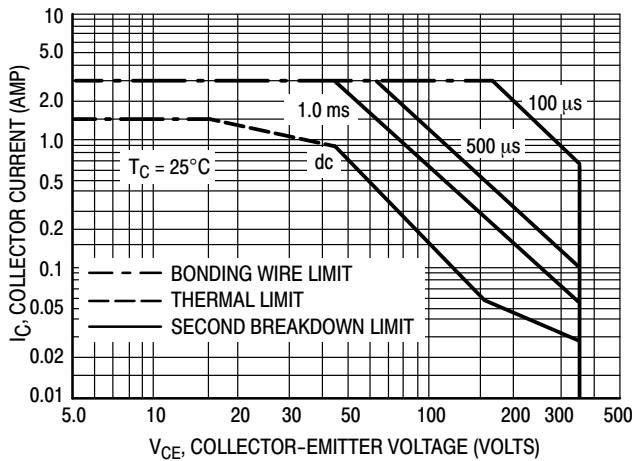


Figure 5. Forward Bias Safe Operating Area

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.

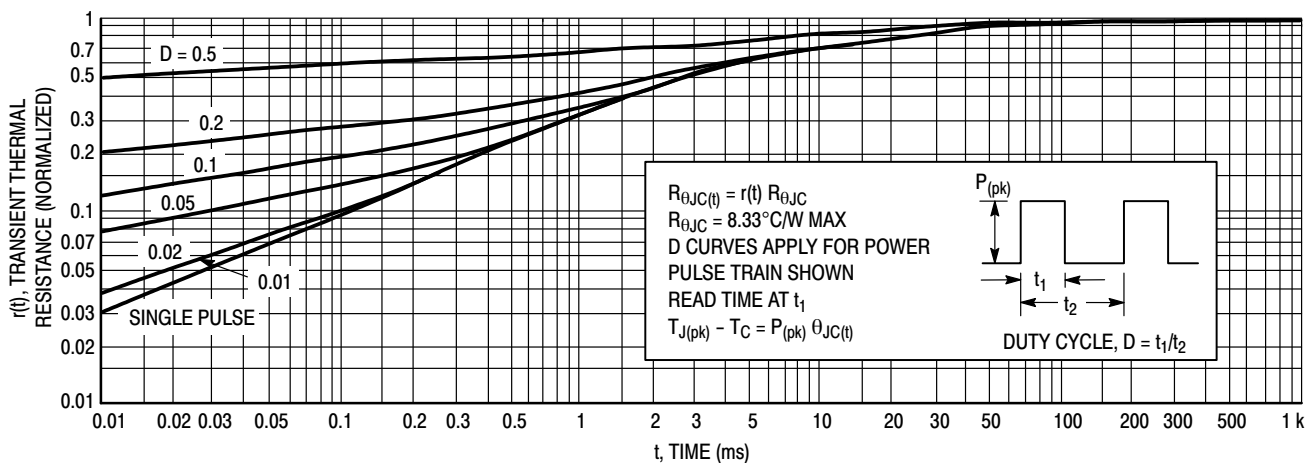


Figure 6. Thermal Response

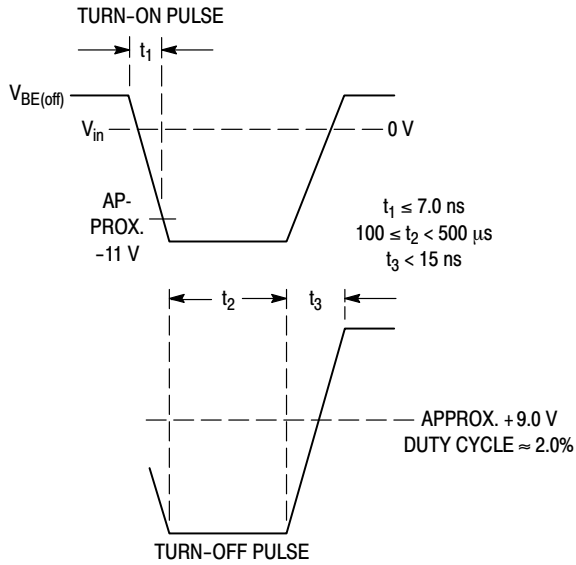


Figure 7. Switching Time Equivalent Circuit

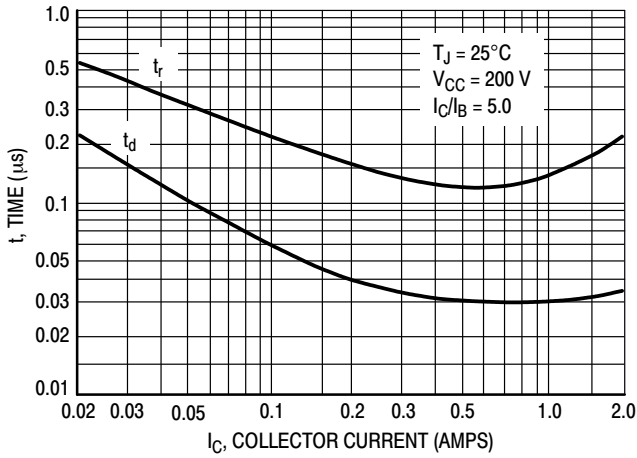
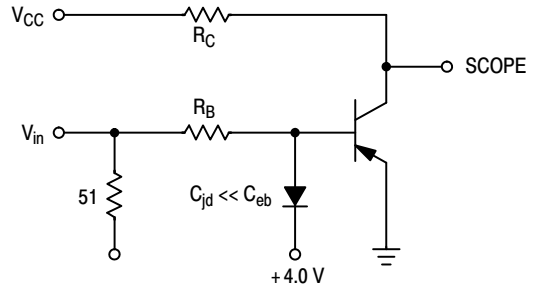


Figure 8. Turn-On Resistive Switching Times

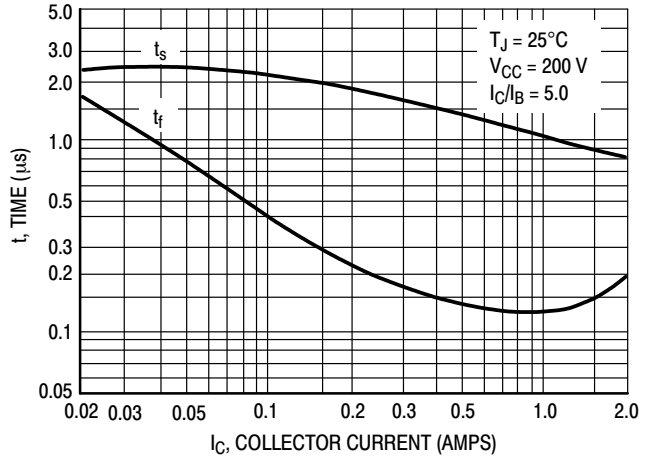


Figure 9. Resistive Turn-Off Switching Times

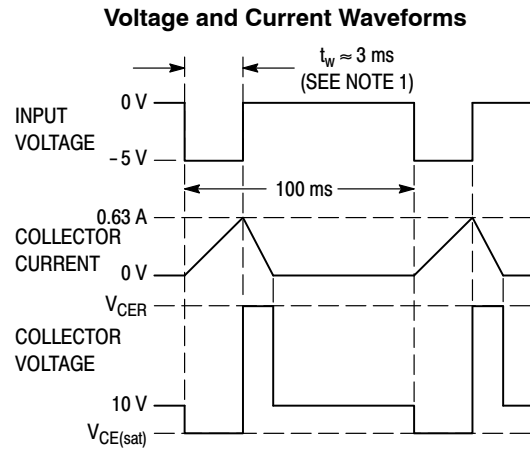
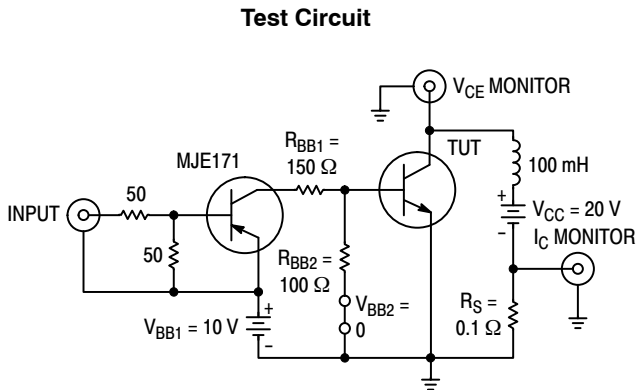
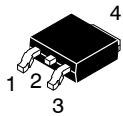


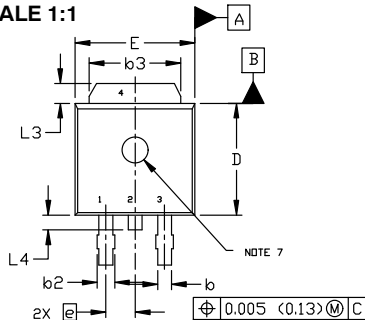
Figure 10. Inductive Load Switching



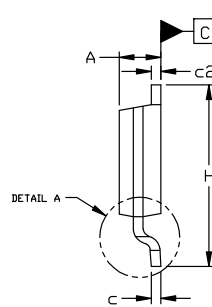
DPAK (SINGLE GAUGE)  
CASE 369C  
ISSUE G

DATE 31 MAY 2023

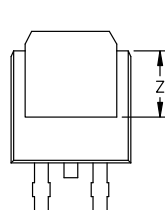
SCALE 1:1



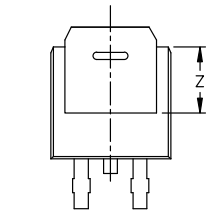
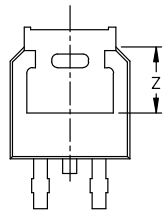
TOP VIEW



SIDE VIEW

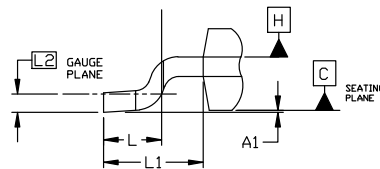
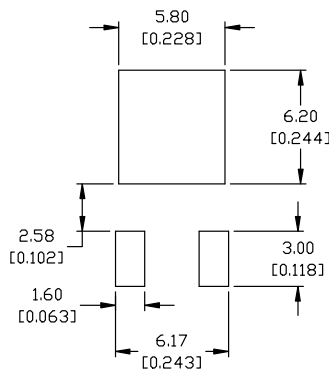


BOTTOM VIEW



BOTTOM VIEW

ALTERNATE  
CONSTRUCTIONS



DETAIL A  
ROTATED 90° CW

NOTES:

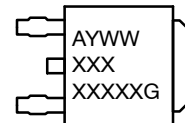
1. DIMENSIONING AND TOLERANCING ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES
3. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS b3, L3, AND Z.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.006 INCHES PER SIDE.
5. 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.
7. OPTIONAL MOLD FEATURE.

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	0.028	0.045	0.72	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	0.114	REF	2.90	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	---

GENERIC  
MARKING DIAGRAM\*



IC



Discrete

XXXXXX = Device Code  
A = Assembly Location  
L = Wafer Lot  
Y = Year  
WW = Work Week  
G = Pb-Free Package

RECOMMENDED MOUNTING 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.

STYLE 1: PIN 1. BASE 2. COLLECTOR 3. EMITTER 4. COLLECTOR	STYLE 2: PIN 1. GATE 2. DRAIN 3. SOURCE 4. DRAIN	STYLE 3: PIN 1. ANODE 2. CATHODE 3. ANODE 4. CATHODE	STYLE 4: PIN 1. CATHODE 2. ANODE 3. GATE 4. ANODE	STYLE 5: PIN 1. GATE 2. ANODE 3. CATHODE 4. ANODE
STYLE 6: PIN 1. MT1 2. MT2 3. GATE 4. MT2	STYLE 7: PIN 1. GATE 2. COLLECTOR 3. EMITTER 4. COLLECTOR	STYLE 8: PIN 1. N/C 2. CATHODE 3. ANODE 4. CATHODE	STYLE 9: PIN 1. ANODE 2. CATHODE 3. RESISTOR ADJUST 4. CATHODE	STYLE 10: PIN 1. CATHODE 2. ANODE 3. CATHODE 4. ANODE

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "•", may or may not be present. Some products may not follow the Generic Marking.

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