

# 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	MJE5730 MJE5731 MJE5731A	$V_{CEO}$	300 350 375	Vdc
Collector–Base Voltage	MJE5730 MJE5731 MJE5731A	$V_{CB}$	300 350 375	Vdc
Emitter–Base Voltage		$V_{EB}$	5.0	Vdc
Collector Current – Continuous		$I_C$	1.0	Adc
– Peak		$I_{CM}$	3.0	
Base Current		$I_B$	1.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$		$P_D$	40	W
Derate above $25^\circ\text{C}$			0.32	W/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$		$P_D$	2.0	W
Derate above $25^\circ\text{C}$			0.016	W/ $^\circ\text{C}$
Unclamped Inducting Load Energy (See Figure 10)		E	20	mJ
Operating and Storage Junction 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	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction–to–Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C}/\text{W}$

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.

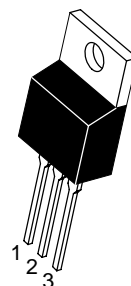
\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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**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) ( $I_C = 30\text{ mAdc}$ , $I_B = 0$ )	MJE5730 MJE5731 MJE5731A	$V_{CEO(sus)}$	300 350 375	– – –	Vdc
Collector Cutoff Current ( $V_{CE} = 200\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 250\text{ Vdc}$ , $I_B = 0$ ) ( $V_{CE} = 300\text{ Vdc}$ , $I_B = 0$ )	MJE5730 MJE5731 MJE5731A	$I_{CEO}$	– – –	1.0 1.0 1.0	mAdc
Collector Cutoff Current ( $V_{CE} = 300\text{ Vdc}$ , $V_{BE} = 0$ ) ( $V_{CE} = 350\text{ Vdc}$ , $V_{BE} = 0$ ) ( $V_{CE} = 400\text{ Vdc}$ , $V_{BE} = 0$ )	MJE5730 MJE5731 MJE5731A	$I_{CES}$	– – –	1.0 1.0 1.0	mAdc
Emitter Cutoff Current ( $V_{BE} = 5.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	–	1.0	mAdc
<b>ON CHARACTERISTICS (Note 1)</b>					
DC Current Gain ( $I_C = 0.3\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ ) ( $I_C = 1.0\text{ Adc}$ , $V_{CE} = 10\text{ Vdc}$ )		$h_{FE}$	30 10	150 –	–
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  $\leq 300\ \mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

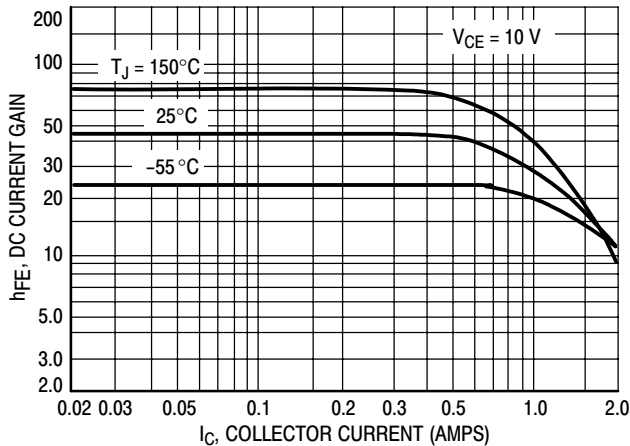


Figure 1. DC Current Gain

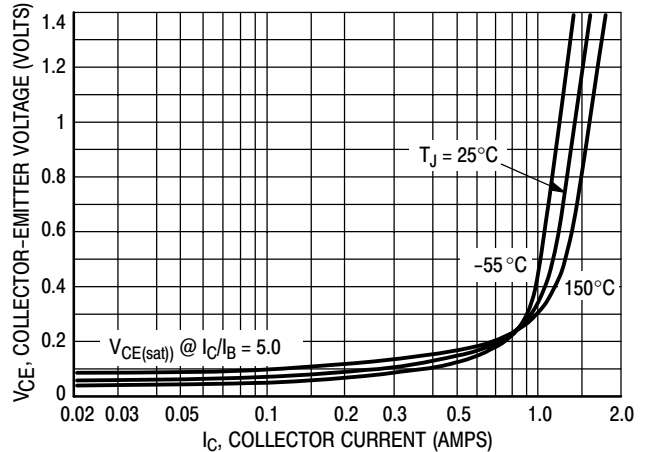


Figure 2. Collector-Emitter Saturation Voltage

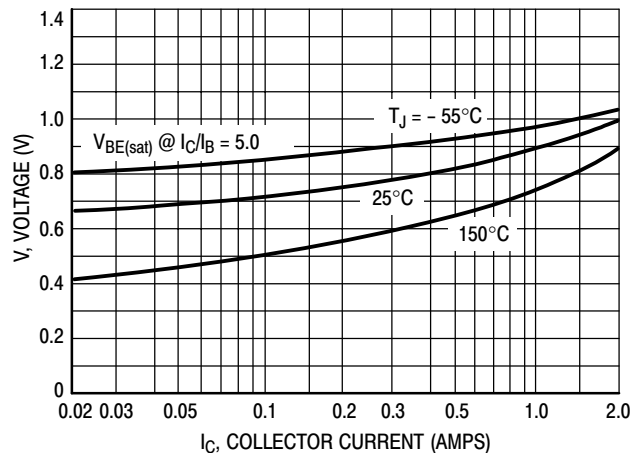


Figure 3. Base-Emitter Voltage

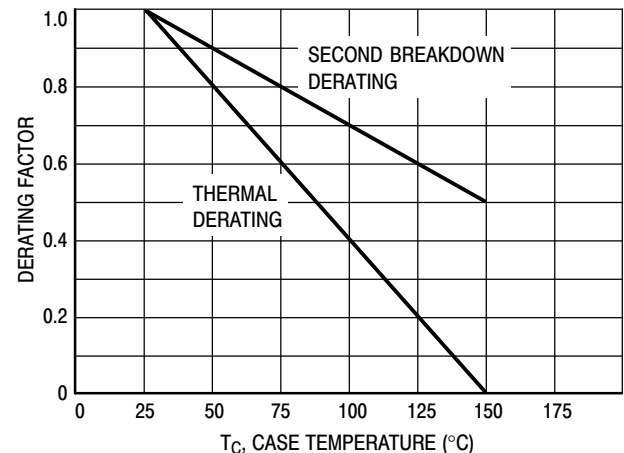


Figure 4. Normalized Power Derating

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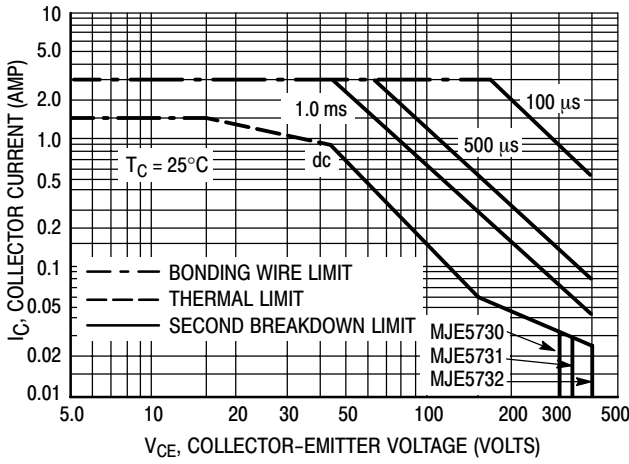


Figure 5. Forward Bias Safe Operating Area

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.

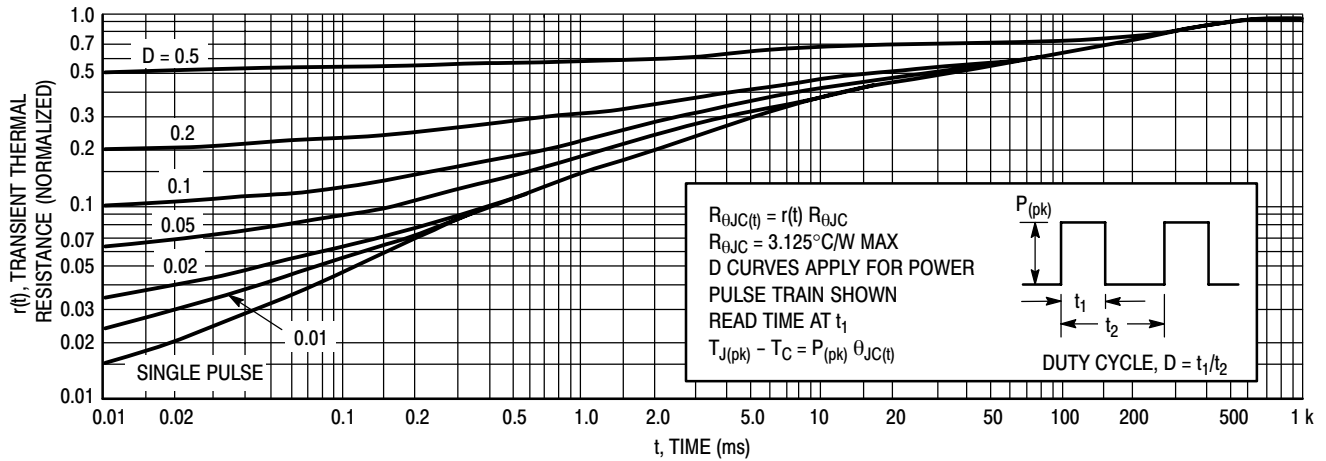


Figure 6. Thermal Response

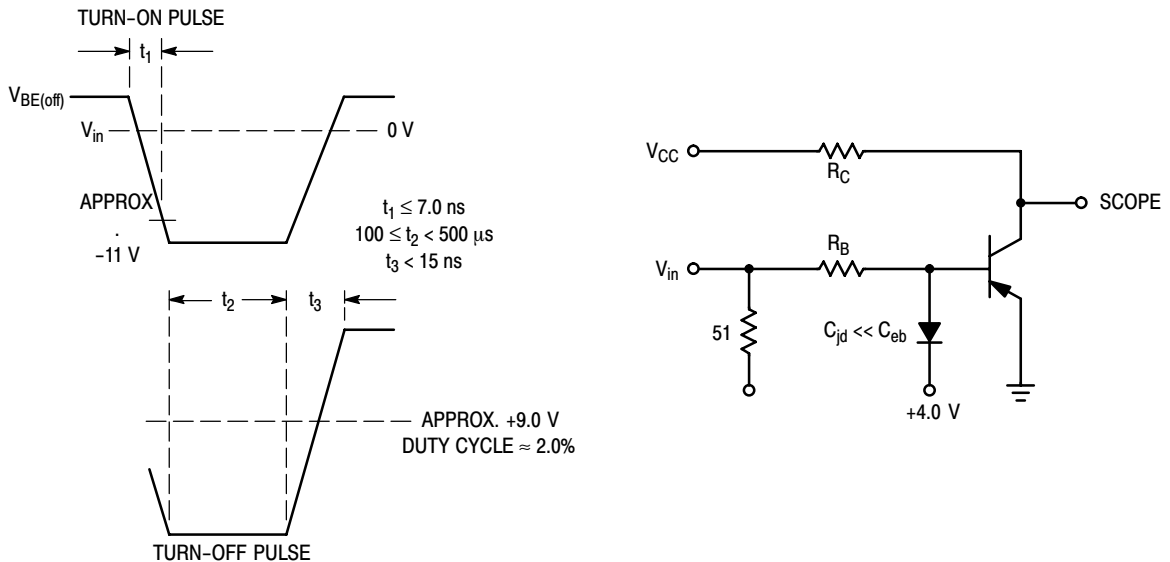


Figure 7. Switching Time Equivalent Circuit

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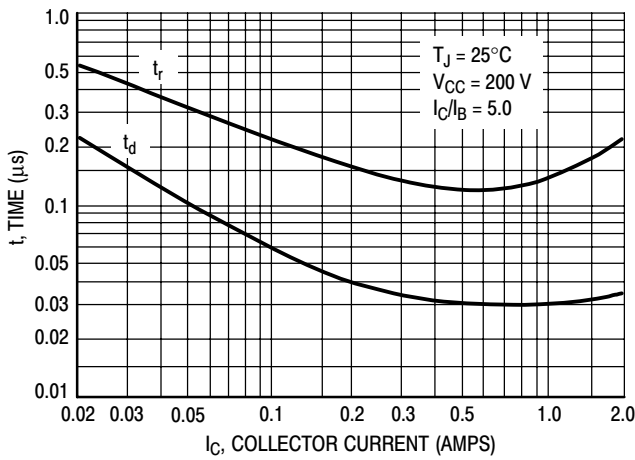


Figure 8. Turn-On Resistive Switching Times

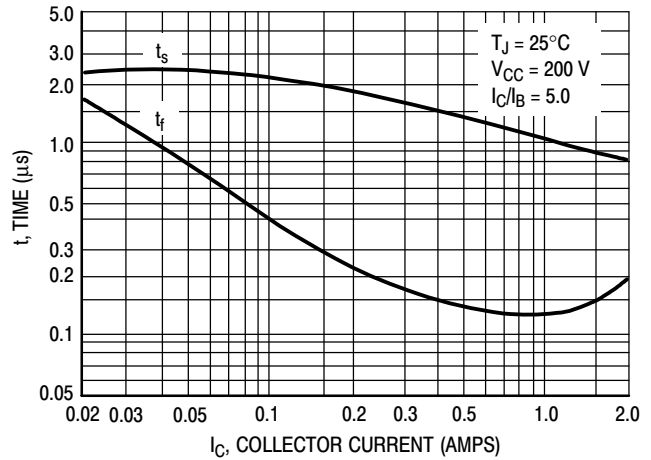
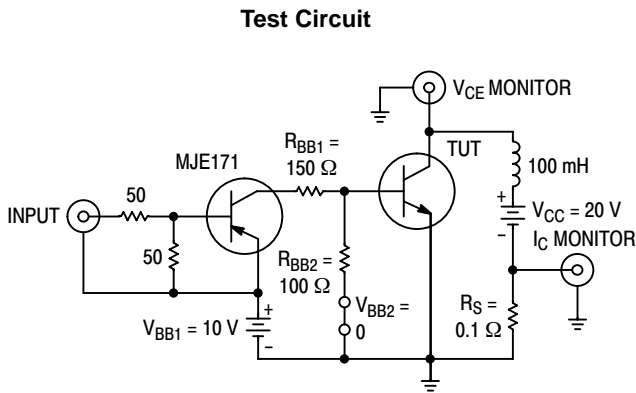


Figure 9. Resistive Turn-Off Switching Times



### Voltage and Current Waveforms

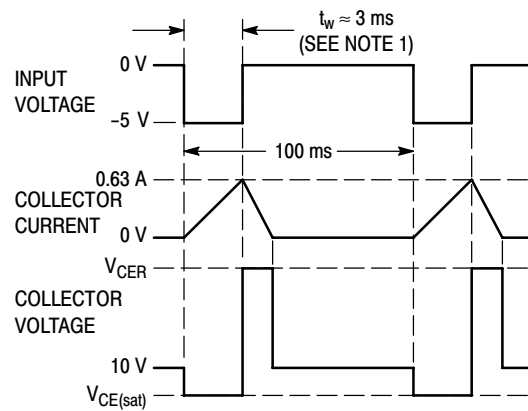


Figure 10. Inductive Load Switching

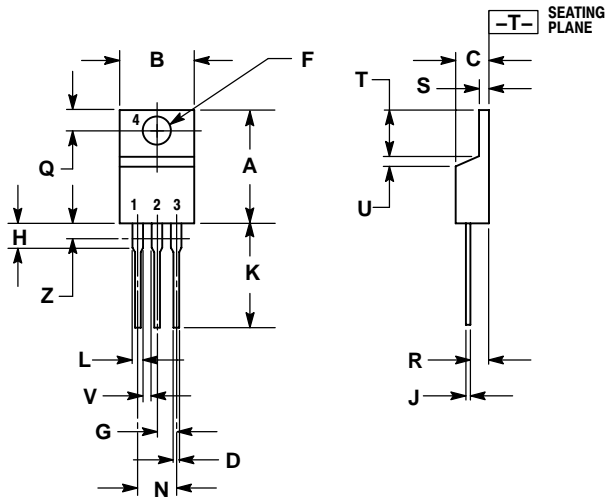
### ORDERING INFORMATION

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

# MJE5730, MJE5731, MJE5731A

## PACKAGE DIMENSIONS

TO-220AB  
CASE 221A-09  
ISSUE AA



### 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	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	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:

1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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