

# 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 $25^\circ\text{C}$	$P_D$	1.5 0.012	W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	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.

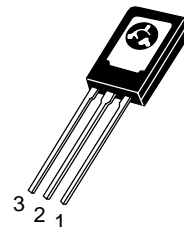
\*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



ON Semiconductor®

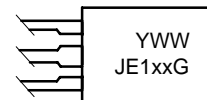
<http://onsemi.com>

**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	$\theta_{JC}$	10	$^{\circ}\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$\theta_{JA}$	83.4	$^{\circ}\text{C}/\text{W}$

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

Characteristic	Symbol	Min	Max	Unit
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### 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	$\mu\text{Adc}$   mAdc
Emitter Cutoff Current ( $V_{BE} = 7.0 \text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$	-	0.1	$\mu\text{Adc}$

### 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)

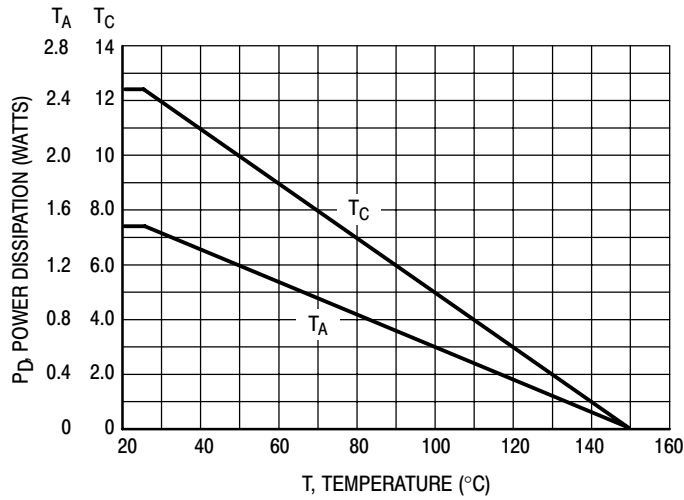


Figure 1. Power Derating

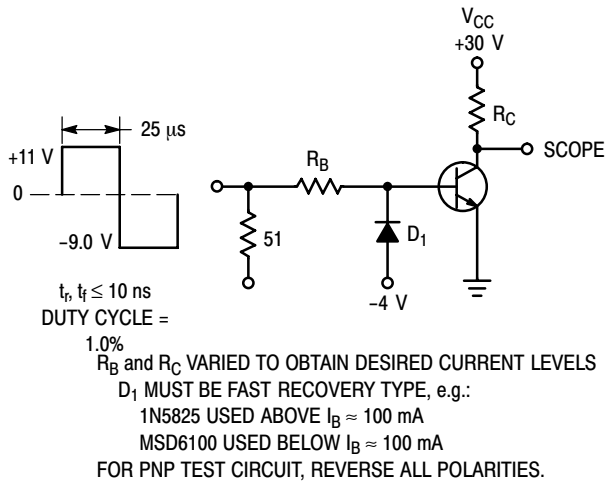


Figure 2. Switching Time Test Circuit

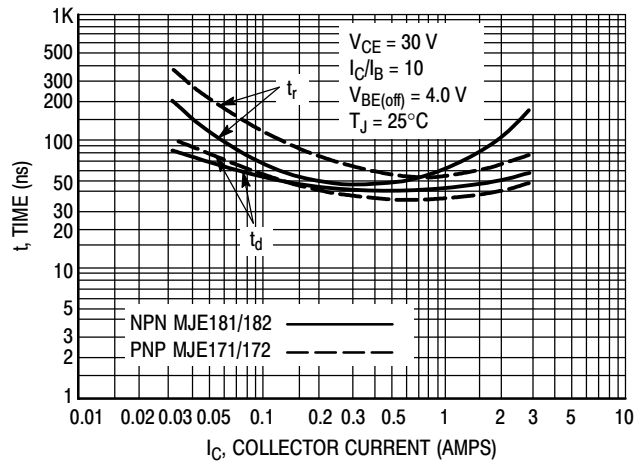


Figure 3. Turn-On Time

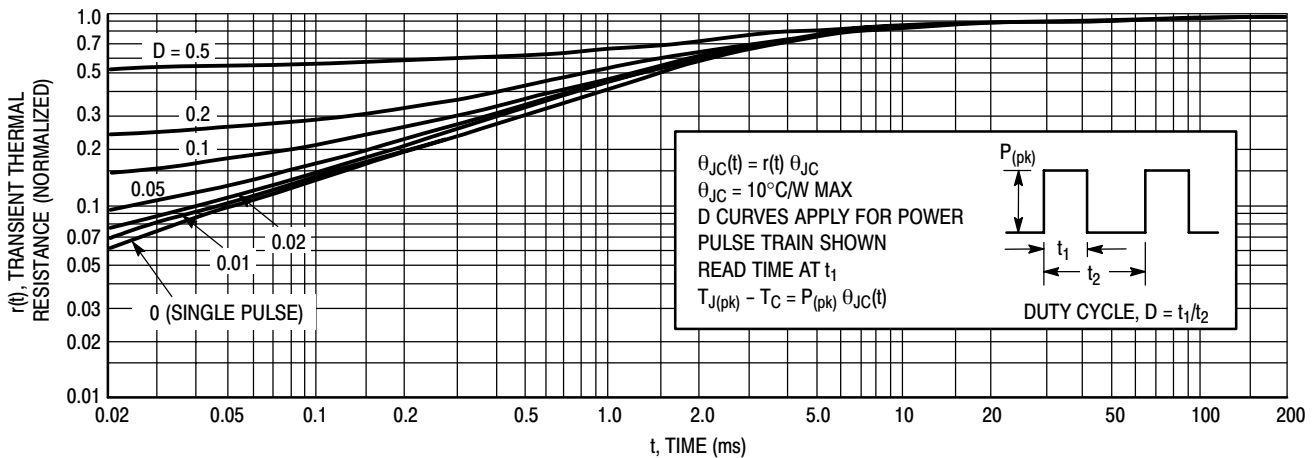


Figure 4. Thermal Response

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

## ACTIVE-REGION SAFE OPERATING AREA

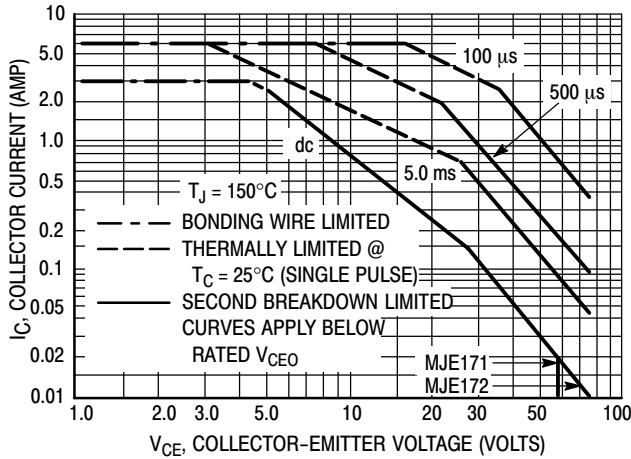


Figure 5. MJE171, MJE172

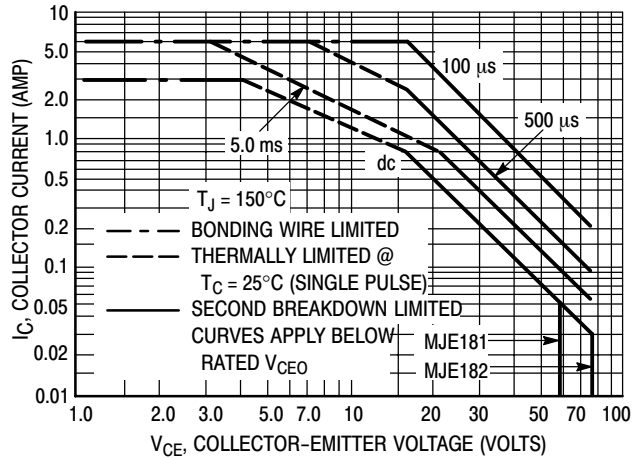


Figure 6. MJE181, MJE182

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.

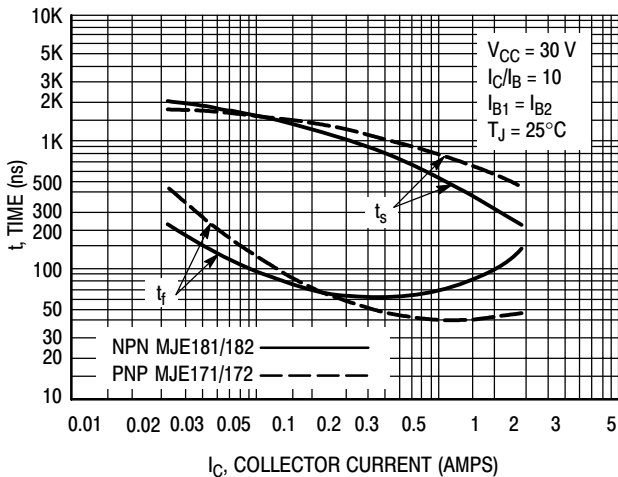


Figure 7. Turn-Off Time

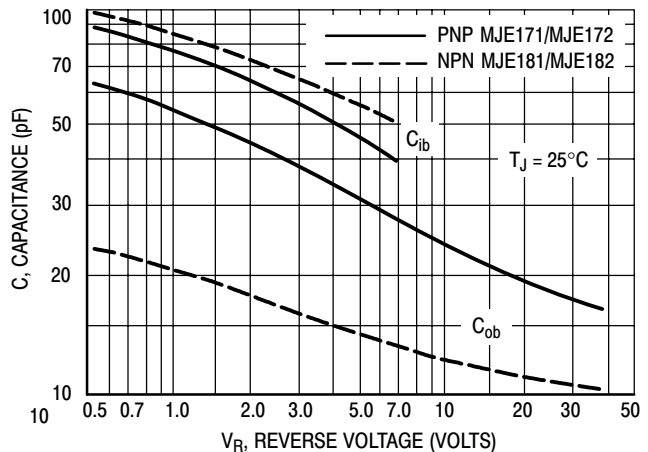


Figure 8. Capacitance

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

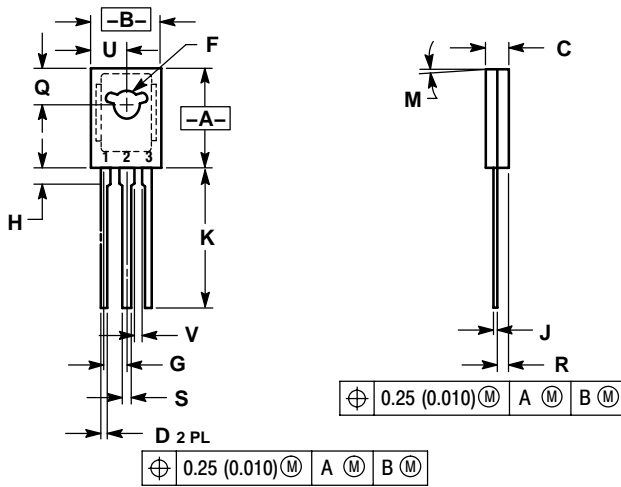
## ORDERING INFORMATION

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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