

# Complementary Plastic Silicon Power Transistors

## MJE170G, MJE171G, MJE172G (PNP), MJE180G, MJE181G, MJE182G (NPN)

The MJE170/180 series is designed for low power audio amplifier and low current, high speed switching applications.

### Features

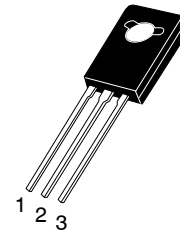
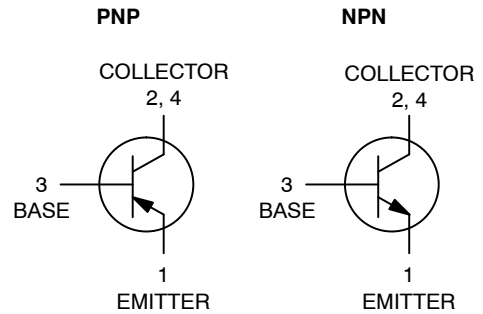
- High DC Current Gain
- High Current-Gain – Bandwidth Product
- Annular Construction for Low Leakages
- Epoxy Meets UL 94 V-0 @ 0.125 in
- These Devices are Pb-Free and are RoHS Compliant\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Base Voltage MJE170G, MJE180G MJE171G, MJE181G MJE172G, MJE182G	$V_{CB}$	60 80 100	Vdc
Collector-Emitter Voltage MJE170G, MJE180G MJE171G, MJE181G MJE172G, MJE182G	$V_{CEO}$	40 60 80	Vdc
Emitter-Base Voltage	$V_{EB}$	7.0	Vdc
Collector Current – Continuous	$I_C$	3.0	Adc
Collector Current – Peak	$I_{CM}$	6.0	Adc
Base Current	$I_B$	1.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	12.5 0.012	W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5 0.1	W W/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$
ESD – Human Body Model	HBM	3B	V
ESD – Machine Model	MM	C	V

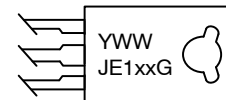
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

**3 AMPERES**  
**POWER TRANSISTORS**  
**COMPLEMENTARY SILICON**  
**40 – 60 – 80 VOLTS**  
**12.5 WATTS**



TO-225  
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.

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

**MJE170G, MJE171G, MJE172G (PNP), MJE180G, MJE181G, MJE182G (NPN)**

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	10	$^{\circ}\text{C/W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	83.4	$^{\circ}\text{C/W}$

### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
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## OFF CHARACTERISTICS

<b>Collector-Emitter Sustaining Voltage</b> $(I_C = 10 \text{ mAdc}, I_E = 0)$ MJE170G, MJE180G MJE171G, MJE181G MJE172G, MJE182G	$V_{CEO(sus)}$	40 60 80	– – –	Vdc
<b>Collector Cutoff Current</b> $(V_{CB} = 60 \text{ Vdc}, I_E = 0)$ MJE170G, MJE180G $(V_{CB} = 80 \text{ Vdc}, I_E = 0)$ MJE171G, MJE181G $(V_{CB} = 100 \text{ Vdc}, I_E = 0)$ MJE172G, MJE182G $(V_{CB} = 60 \text{ Vdc}, I_E = 0, T_C = 150^\circ\text{C})$ MJE170G, MJE180G $(V_{CB} = 80 \text{ Vdc}, I_E = 0, T_C = 150^\circ\text{C})$ MJE171G, MJE181G $(V_{CB} = 100 \text{ Vdc}, I_E = 0, T_C = 150^\circ\text{C})$ MJE172G, MJE182G	$I_{CBO}$	– – – – – – –	0.1 0.1 0.1 0.1 0.1 0.1 0.1	$\mu\text{Adc}$       mAdc
<b>Emitter Cutoff Current</b> $(V_{BE} = 7.0 \text{ Vdc}, I_C = 0)$	$I_{EBO}$	–	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 <sub>C</sub> = 100 mA <sub>DC</sub> , V <sub>CE</sub> = 10 V <sub>DC</sub> , f <sub>test</sub> = 10 MHz)	f <sub>T</sub>	50	–	MHz
Output Capacitance (V <sub>CB</sub> = 10 V <sub>DC</sub> , I <sub>E</sub> = 0, f = 0.1 MHz)	C <sub>ob</sub>			pF
MJE171G/MJE172G		–	60	
MJE181G/MJE182G		–	40	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

$$1. f_T = |h_{fe}| \cdot f_{\text{test.}}$$

# MJE170G, MJE171G, MJE172G (PNP), MJE180G, MJE181G, MJE182G (NPN)

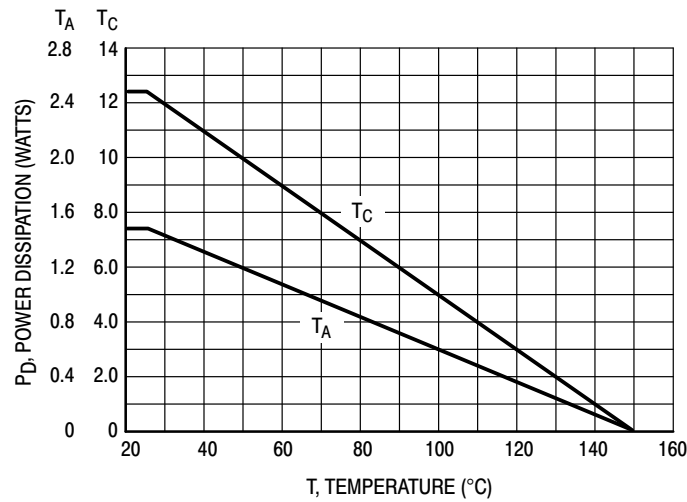


Figure 1. Power Derating

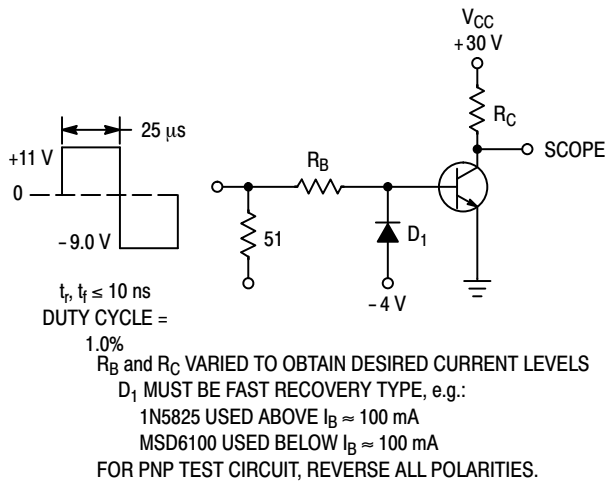


Figure 2. Switching Time Test Circuit

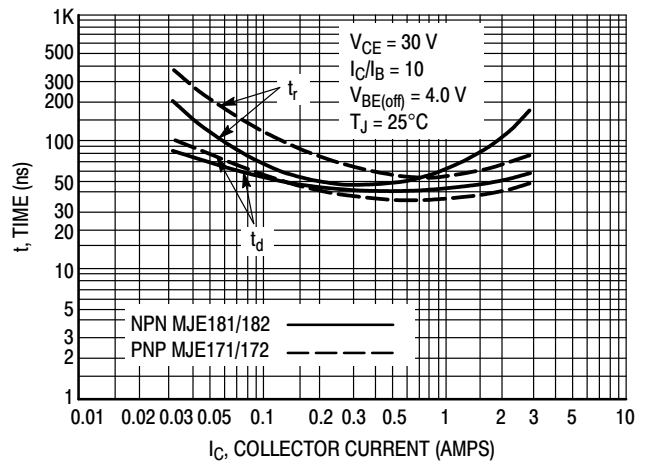


Figure 3. Turn-On Time

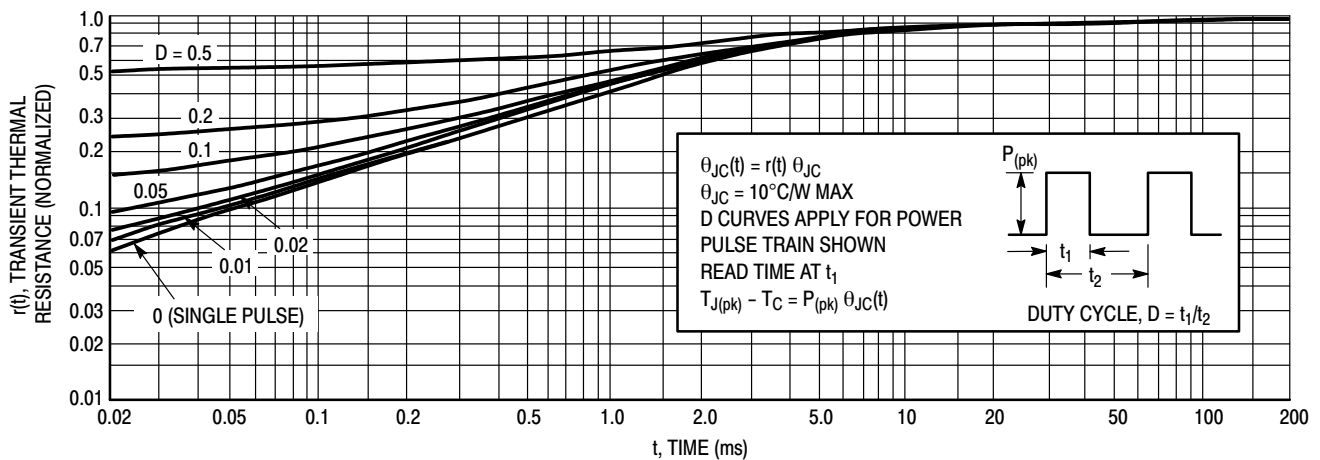


Figure 4. Thermal Response

# MJE170G, MJE171G, MJE172G (PNP), MJE180G, MJE181G, MJE182G (NPN)

## ACTIVE-REGION SAFE OPERATING AREA

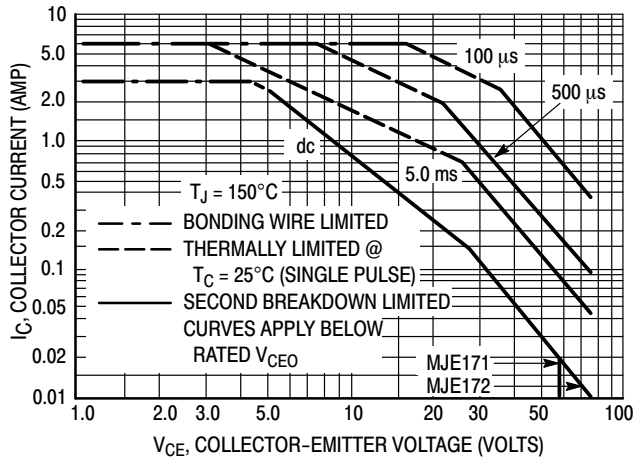


Figure 5. MJE171, MJE172

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.

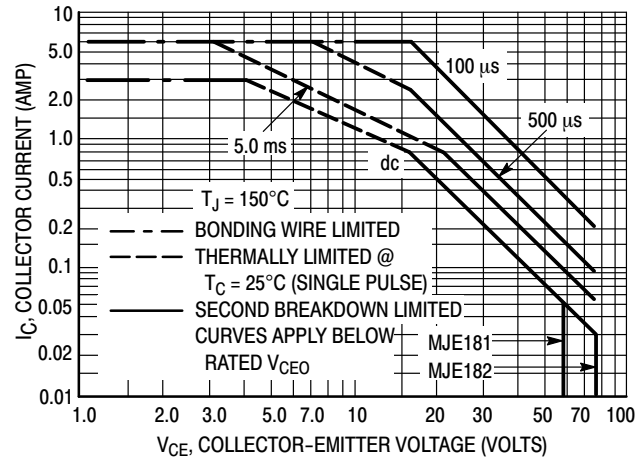


Figure 6. MJE181, MJE182

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.

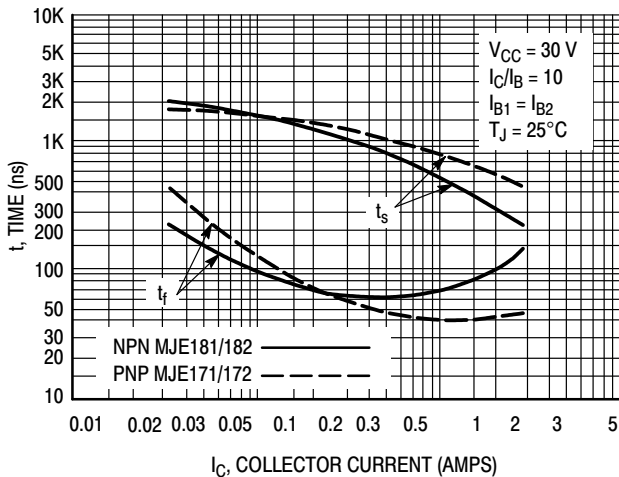


Figure 7. Turn-Off Time

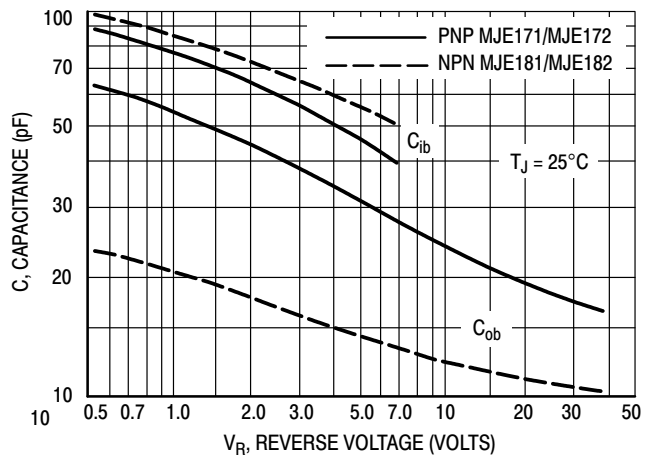
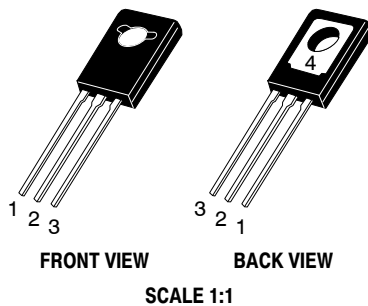


Figure 8. Capacitance

## MJE170G, MJE171G, MJE172G (PNP), MJE180G, MJE181G, MJE182G (NPN)

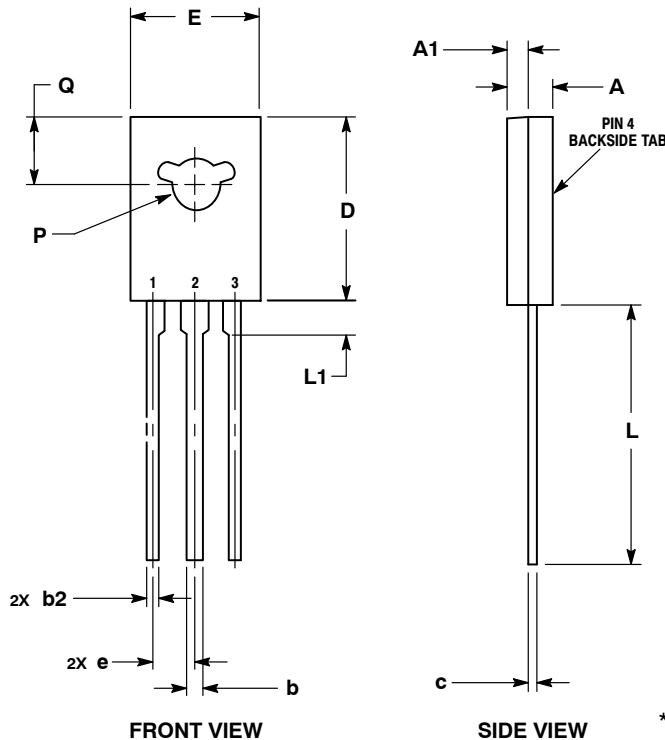
### ORDERING INFORMATION

Device	Package	Shipping
MJE170G	TO-225 (Pb-Free)	500 Units / Box
MJE171G	TO-225 (Pb-Free)	500 Units / Box
MJE172G	TO-225 (Pb-Free)	500 Units / Box
MJE180G	TO-225 (Pb-Free)	500 Units / Box
MJE181G	TO-225 (Pb-Free)	500 Units / Box
MJE182G	TO-225 (Pb-Free)	500 Units / Box



**TO-225**  
**CASE 77-09**  
**ISSUE AD**

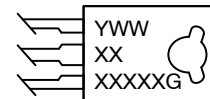
DATE 25 MAR 2015



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  2. CONTROLLING DIMENSION: MILLIMETERS.
  3. NUMBER AND SHAPE OF LUGS OPTIONAL.

MILLIMETERS		
DIM	MIN	MAX
A	2.40	3.00
A1	1.00	1.50
b	0.60	0.90
b2	0.51	0.88
c	0.39	0.63
D	10.60	11.10
E	7.40	7.80
e	2.04	2.54
L	14.50	16.63
L1	1.27	2.54
P	2.90	3.30
Q	3.80	4.20

**GENERIC MARKING DIAGRAM\***



Y = Year  
WW = Work Week  
XXXXX = Device Code  
G = Pb-Free Package

\*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.

STYLE 1: PIN 1. EMITTER 2., 4. COLLECTOR 3. BASE	STYLE 2: PIN 1. CATHODE 2., 4. ANODE 3. GATE	STYLE 3: PIN 1. BASE 2., 4. COLLECTOR 3. EMITTER	STYLE 4: PIN 1. ANODE 1 2., 4. ANODE 2 3. GATE	STYLE 5: PIN 1. MT 1 2., 4. MT 2 3. GATE
STYLE 6: PIN 1. CATHODE 2., 4. GATE 3. ANODE	STYLE 7: PIN 1. MT 1 2., 4. GATE 3. MT 2	STYLE 8: PIN 1. SOURCE 2., 4. GATE 3. DRAIN	STYLE 9: PIN 1. GATE 2., 4. DRAIN 3. SOURCE	STYLE 10: PIN 1. SOURCE 2., 4. DRAIN 3. GATE

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