

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

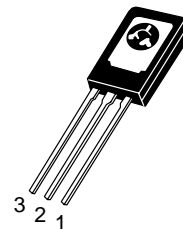
- Pb-Free Package is Available
- Collector-Emitter Sustaining Voltage –
 $V_{CEO(sus)} = 40 \text{ Vdc} - \text{MJE170, MJE180}$
 $= 60 \text{ Vdc} - \text{MJE171, MJE181}$
 $= 80 \text{ Vdc} - \text{MJE172, MJE182}$
- DC Current Gain –
 $h_{FE} = 30 \text{ (Min) @ } I_C = 0.5 \text{ Adc}$
 $= 12 \text{ (Min) @ } I_C = 1.5 \text{ Adc}$
- 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



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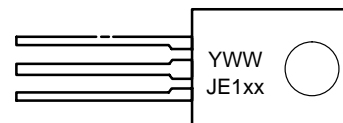
<http://onsemi.com>

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



TO-225AA
CASE 77-09
STYLE 1

MARKING DIAGRAM



JE1xx = Specific Device Code
Y = Year
WW = Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

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

MAXIMUM RATINGS

Rating	Symbol	MJE170 MJE180	MJE171 MJE181	MJE172 MJE182	Unit
Collector–Base Voltage	V_{CB}	60	80	100	Vdc
Collector–Emitter Voltage	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 @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	1.5 0.012			W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°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.

THERMAL CHARACTERISTICS

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

ORDERING INFORMATION

Device	Package	Shipping†
MJE170	TO–225	500 Units / Box
MJE171	TO–225	500 Units / Box
MJE172	TO–225	500 Units / Box
MJE180	TO–225	500 Units / Box
MJE181	TO–225	500 Units / Box
MJE182	TO–225	500 Units / Box
MJE182G	TO–225 (Pb–Free)	500 Units / Box

†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.

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

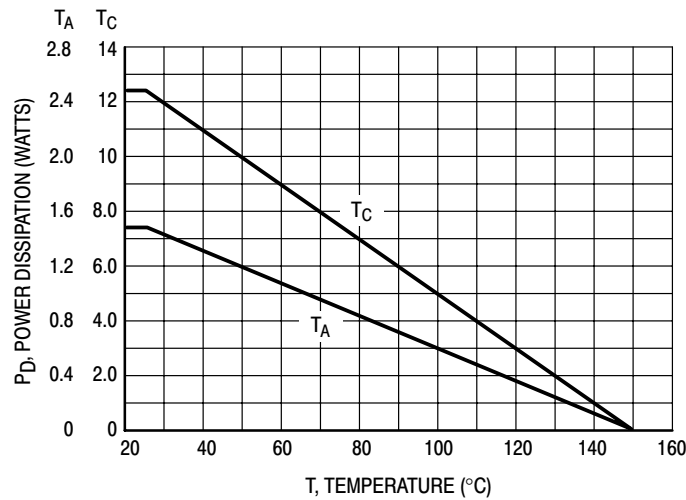


Figure 1. Power Derating

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector–Emitter Sustaining Voltage (I _C = 10 mAdc, I _B = 0)	MJE170, MJE180 MJE171, MJE181 MJE172, MJE182	V _{CEO(sus)}	40 60 80	– – –	Vdc
Collector Cutoff Current (V _{CB} = 60 Vdc, I _E = 0)	MJE170, MJE180	I _{CBO}	–	0.1	μAdc
(V _{CB} = 80 Vdc, I _E = 0)	MJE171, MJE181		–	0.1	
(V _{CB} = 100 Vdc, I _E = 0)	MJE172, MJE182		–	0.1	mAdc
(V _{CB} = 60 Vdc, I _E = 0, T _C = 150°C)	MJE170, MJE180		–	0.1	
(V _{CB} = 80 Vdc, I _E = 0, T _C = 150°C)	MJE171, MJE181		–	0.1	
(V _{CB} = 100 Vdc, I _E = 0, T _C = 150°C)	MJE172, MJE182		–	0.1	
Emitter Cutoff Current (V _{BE} = 7.0 Vdc, I _C = 0)		I _{EBO}	–	0.1	μAdc
ON CHARACTERISTICS					
DC Current Gain (I _C = 100 mAdc, V _{CE} = 1.0 Vdc) (I _C = 500 mAdc, V _{CE} = 1.0 Vdc) (I _C = 1.5 Adc, V _{CE} = 1.0 Vdc)		h _{FE}	50 30 12	250 – –	–
Collector–Emitter Saturation Voltage (I _C = 500 mAdc, I _B = 50 mAdc) (I _C = 1.5 Adc, I _B = 150 mAdc) (I _C = 3.0 Adc, I _B = 600 mAdc)		V _{CE(sat)}	– – –	0.3 0.9 1.7	Vdc
Base–Emitter Saturation Voltage (I _C = 1.5 Adc, I _B = 150 mAdc) (I _C = 3.0 Adc, I _B = 600 mAdc)		V _{BE(sat)}	– –	1.5 2.0	Vdc
Base–Emitter On Voltage (I _C = 500 mAdc, V _{CE} = 1.0 Vdc)		V _{BE(on)}	–	1.2	Vdc
DYNAMIC CHARACTERISTICS					
Current–Gain – Bandwidth Product (Note 1) (I _C = 100 mAdc, V _{CE} = 10 Vdc, f _{test} = 10 MHz)		f _T	50	–	MHz
Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 0.1 MHz)	MJE171/MJE172 MJE181/MJE182	C _{ob}	– –	60 40	pF

1. f_T = |h_{fe}| • f_{test}.

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

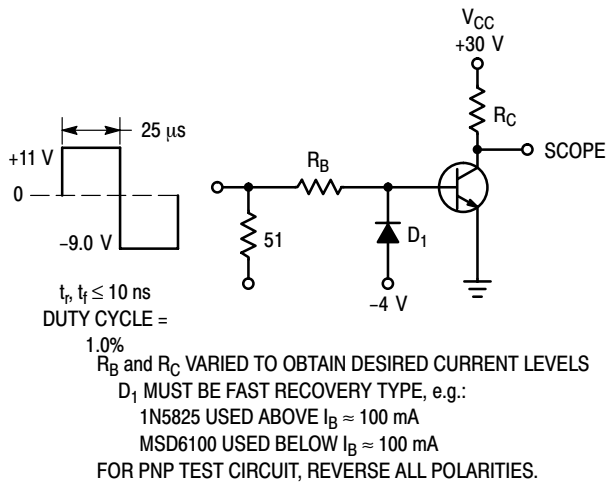


Figure 2. Switching Time Test Circuit

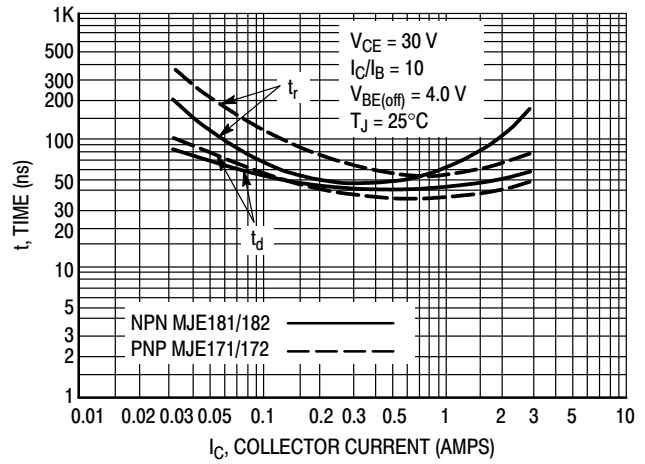


Figure 3. Turn-On Time

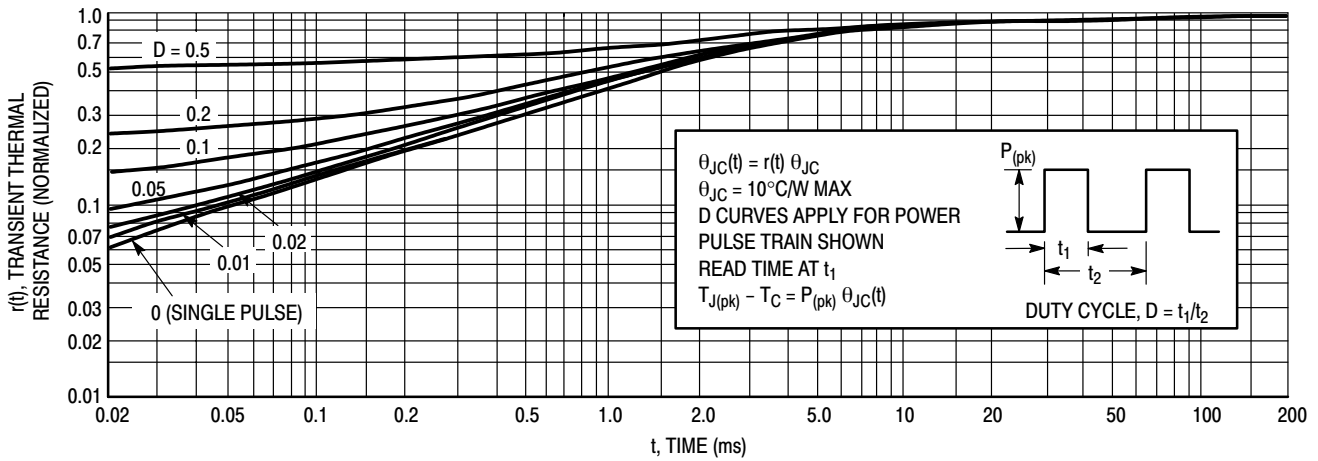


Figure 4. Thermal Response

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

ACTIVE-REGION SAFE OPERATING AREA

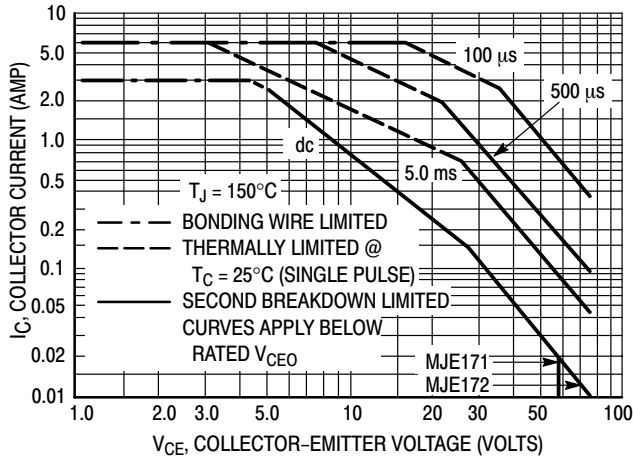


Figure 5. MJE171, MJE172

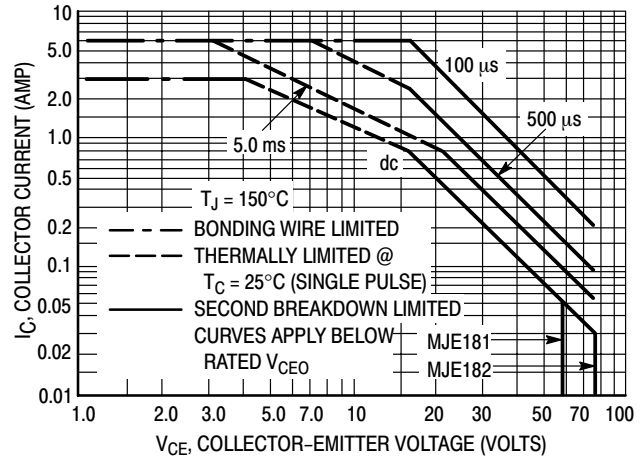


Figure 6. MJE181, MJE182

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.

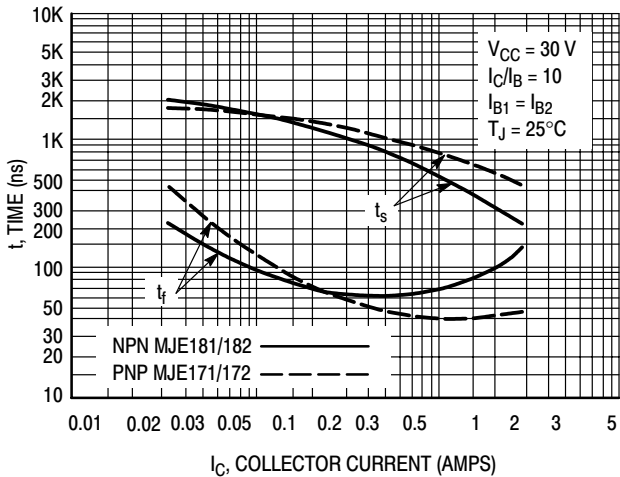


Figure 7. Turn-Off Time

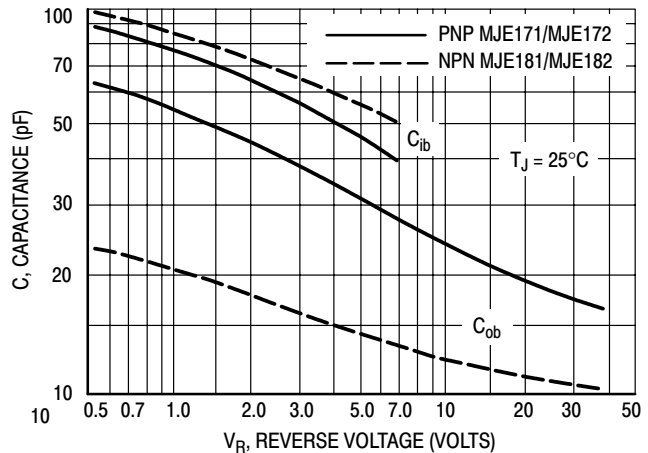
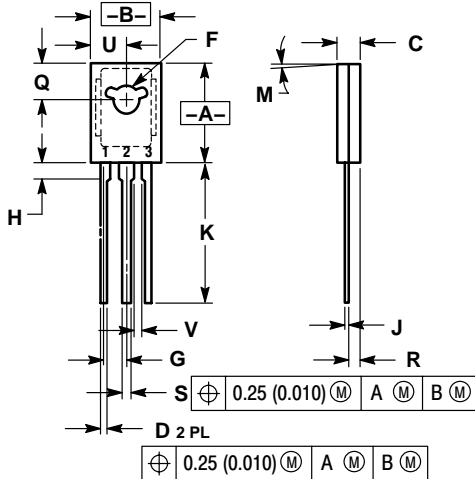


Figure 8. Capacitance

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

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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