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 Vdc − MJE170, MJE180
  = 60 Vdc − MJE171, MJE181
  = 80 Vdc − MJE172, MJE182
- DC Current Gain −
  h_{FE} = 30 (Min) @ I_C = 0.5 Adc
  = 12 (Min) @ I_C = 1.5 Adc
- Current−Gain − Bandwidth Product −
  f_T = 50 MHz (Min) @ I_C = 100 mAdc
- Annular Construction for Low Leakages −
  I_{CBO} = 100 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°C Derate above 25°C	P_D	1.5 0.012	W W/°C
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	12.5 0.1	W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°C

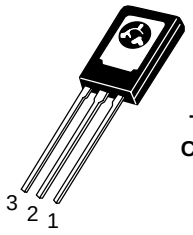
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur 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®

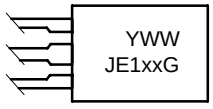
http://onsemi.com

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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	θ_{JC}	10	°C/W
Thermal Resistance, Junction−to−Ambient	θ_{JA}	83.4	°C/W

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		I_{CBO}			μAdc
(V_{CB} = 60 Vdc, I_E = 0)	MJE170, MJE180		−	0.1	
(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				
(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		h_{FE}			−
(I_C = 100 mAdc, V_{CE} = 1.0 Vdc)			50	250	
(I_C = 500 mAdc, V_{CE} = 1.0 Vdc)			30	−	
(I_C = 1.5 Adc, V_{CE} = 1.0 Vdc)			12	−	
Collector−Emitter Saturation Voltage		$V_{CE(sat)}$			Vdc
(I_C = 500 mAdc, I_B = 50 mAdc)			−	0.3	
(I_C = 1.5 Adc, I_B = 150 mAdc)			−	0.9	
(I_C = 3.0 Adc, I_B = 600 mAdc)			−	1.7	
Base−Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C = 1.5 Adc, I_B = 150 mAdc)			−	1.5	
(I_C = 3.0 Adc, I_B = 600 mAdc)			−	2.0	
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		C_{ob}			pF
(V_{CB} = 10 Vdc, I_E = 0, f = 0.1 MHz)	MJE171/MJE172		−	60	
	MJE181/MJE182		−	40	

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

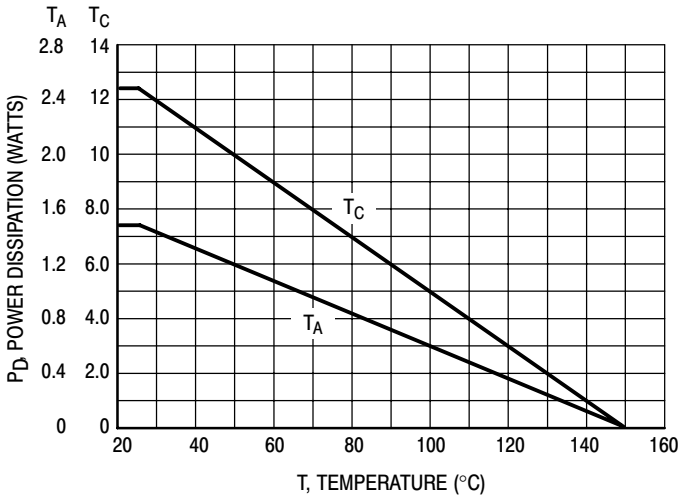


Figure 1. Power Derating

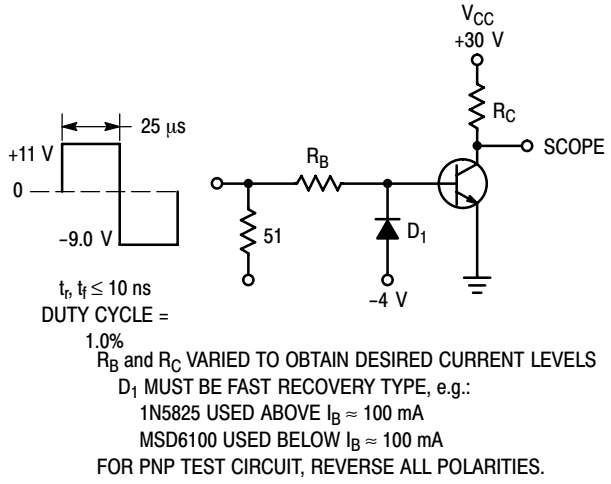


Figure 2. Switching Time Test Circuit

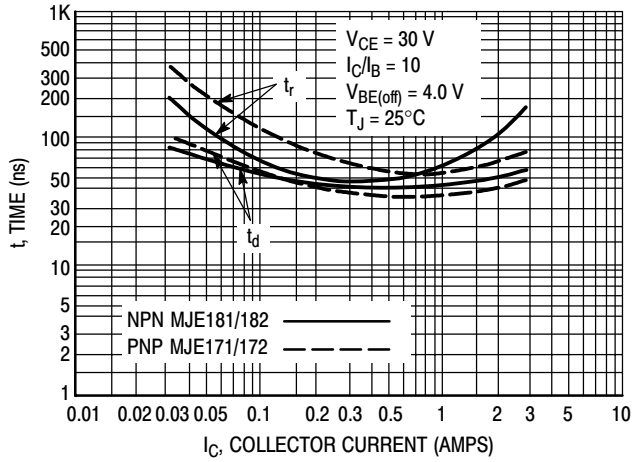


Figure 3. Turn−On Time

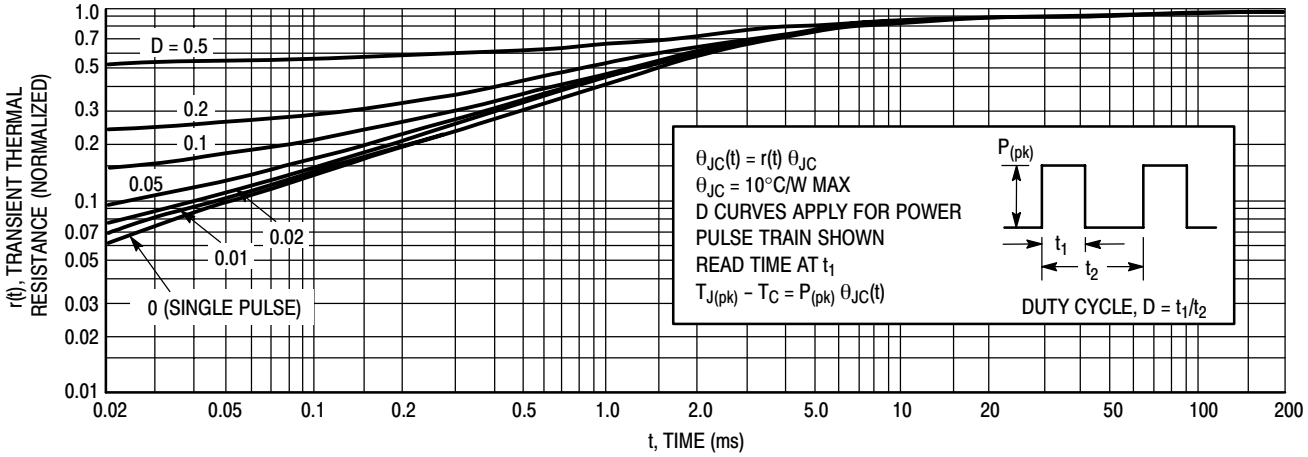


Figure 4. Thermal Response

ACTIVE−REGION SAFE OPERATING AREA

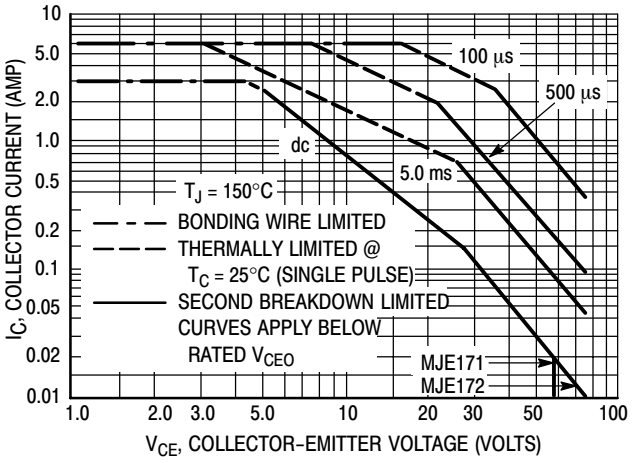


Figure 5. MJE171, MJE172

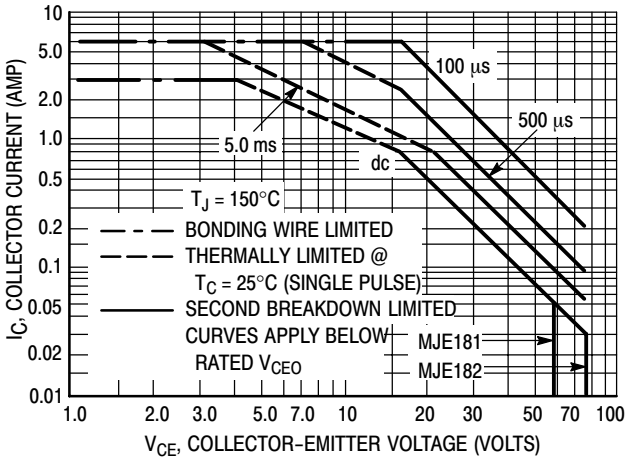


Figure 6. MJE181, MJE182

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°C; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150°C$. $T_{J(pk)}$ 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.

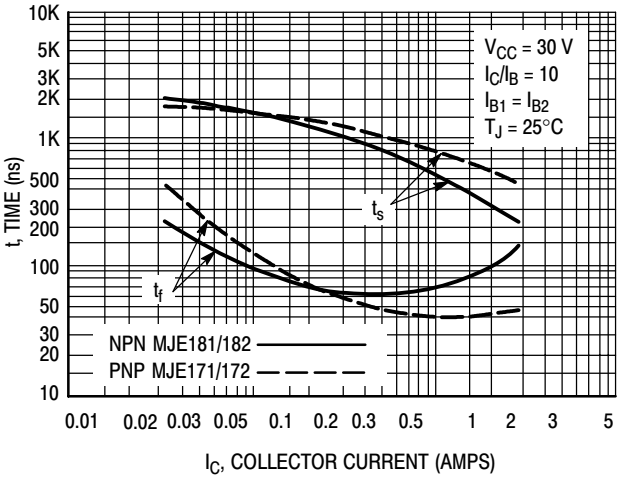


Figure 7. Turn−Off Time

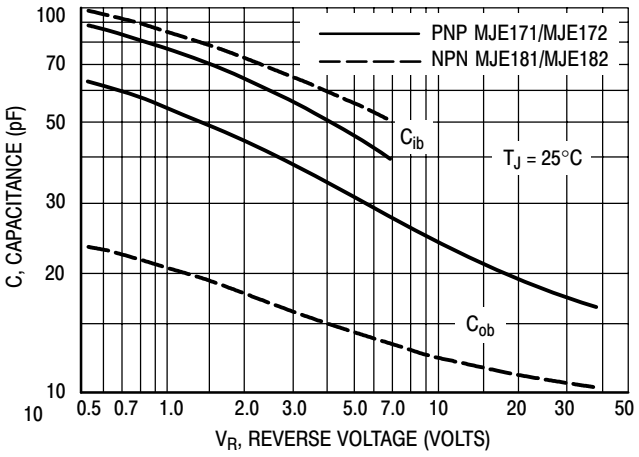


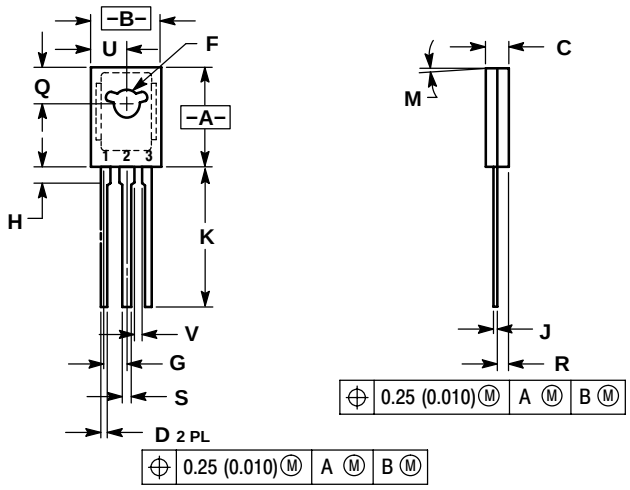
Figure 8. Capacitance

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)	

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.

	INCHES		MILLIMETERS	
DIM	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:
PIN 1. EMITTER
2. COLLECTOR
3. BASE

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 61312, Phoenix, Arizona 85082−1312 USA
Phone: 480−829−7710 or 800−344−3860 Toll Free USA/Canada
Fax: 480−829−7709 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada

Japan: ON Semiconductor, Japan Customer Focus Center
2−9−1 Kamimeguro, Meguro−ku, Tokyo, Japan 153−0051
Phone: 81−3−5773−3850

ON Semiconductor Website: http://onsemi.com

Order Literature: http://www.onsemi.com/litorder

For additional information, please contact your local Sales Representative.

MJE171/D