

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

Complementary Plastic Silicon Power Transistors

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 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	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°C	P_D	12.5 0.012	W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°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 Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

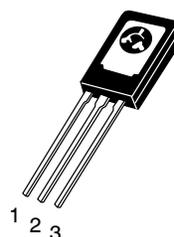
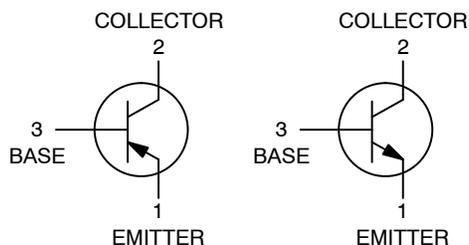


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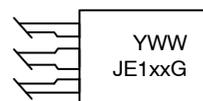
**3 AMPERES
POWER TRANSISTORS
COMPLEMENTARY SILICON
40 – 60 – 80 VOLTS
12.5 WATTS**

COMPLEMENTARY



TO-225
CASE 77
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.

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

THERMAL CHARACTERISTICS

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

ELECTRICAL CHARACTERISTICS ($T_C = 25^{\circ}C$ 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	$V_{CE(sus)}$	40 60 80	- - -	Vdc
Collector Cutoff Current ($V_{CB} = 60 \text{ Vdc}$, $I_E = 0$) MJE170, MJE180 ($V_{CB} = 80 \text{ Vdc}$, $I_E = 0$) MJE171, MJE181 ($V_{CB} = 100 \text{ Vdc}$, $I_E = 0$) MJE172, MJE182 ($V_{CB} = 60 \text{ Vdc}$, $I_E = 0$, $T_C = 150^{\circ}C$) MJE170, MJE180 ($V_{CB} = 80 \text{ Vdc}$, $I_E = 0$, $T_C = 150^{\circ}C$) MJE171, MJE181 ($V_{CB} = 100 \text{ Vdc}$, $I_E = 0$, $T_C = 150^{\circ}C$) MJE172, MJE182	I_{CBO}	- - -	0.1 0.1 0.1	μAdc mAdc
Emitter Cutoff Current ($V_{BE} = 7.0 \text{ Vdc}$, $I_C = 0$)	I_{EBO}	-	0.1	μAdc

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)

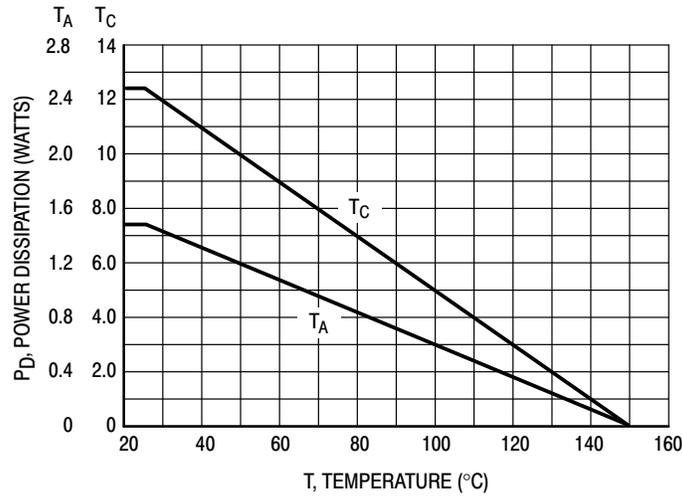


Figure 1. Power Derating

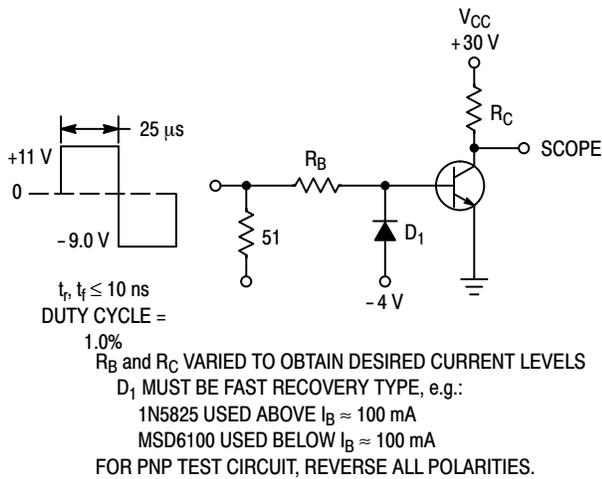


Figure 2. Switching Time Test Circuit

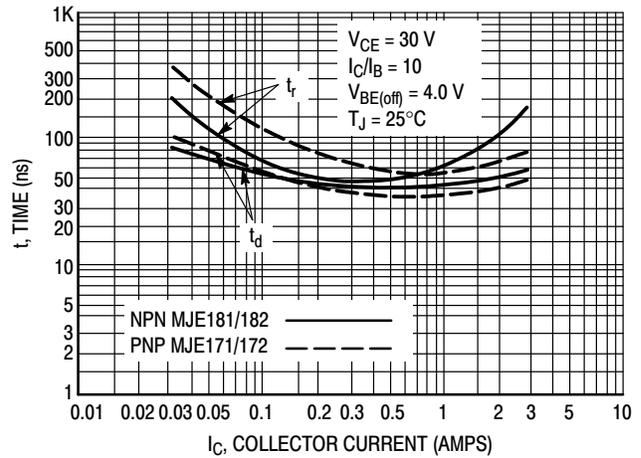


Figure 3. Turn-On Time

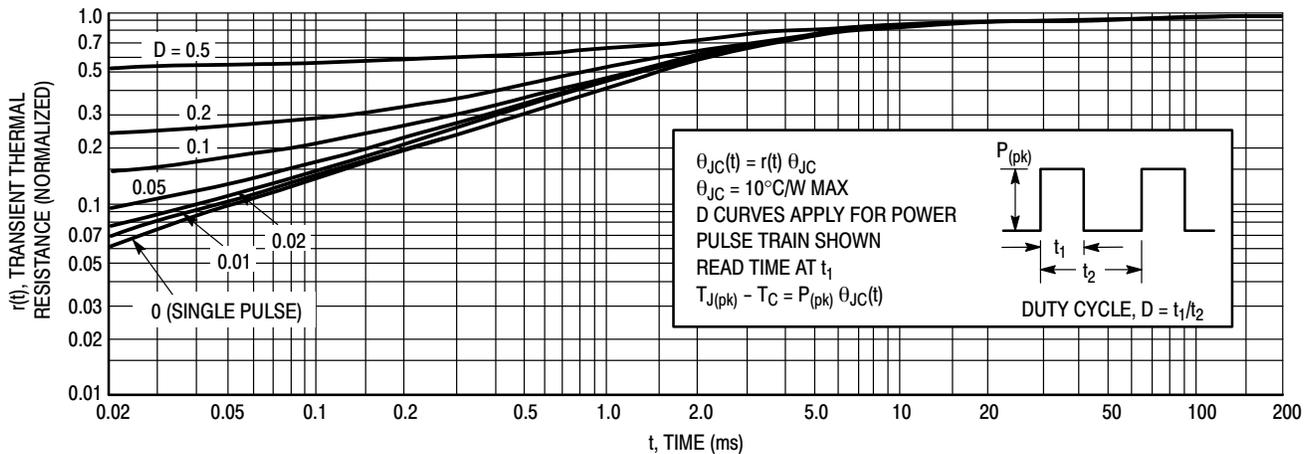


Figure 4. Thermal Response

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

ACTIVE-REGION SAFE OPERATING AREA

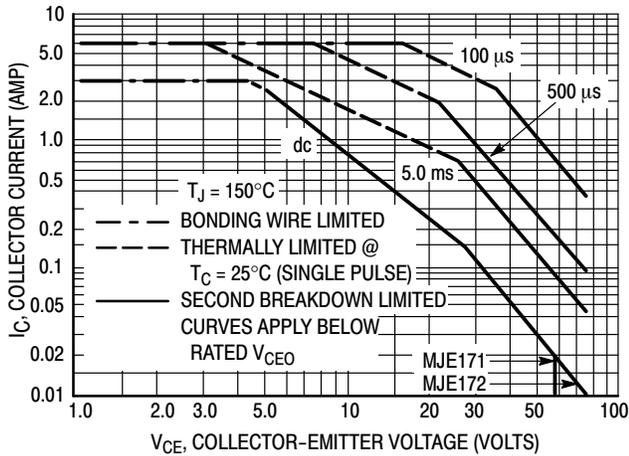


Figure 5. MJE171, MJE172

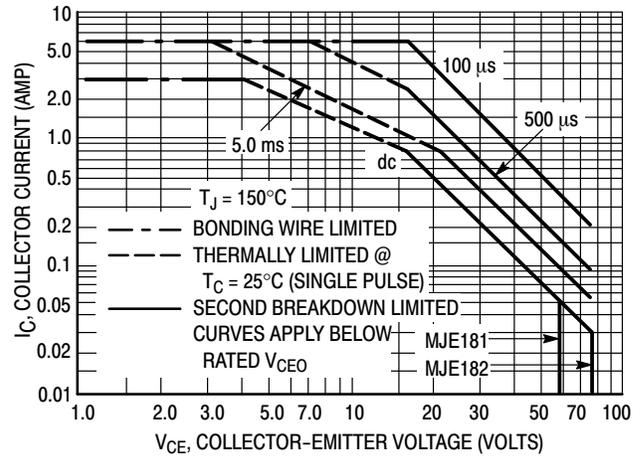


Figure 6. MJE181, MJE182

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.

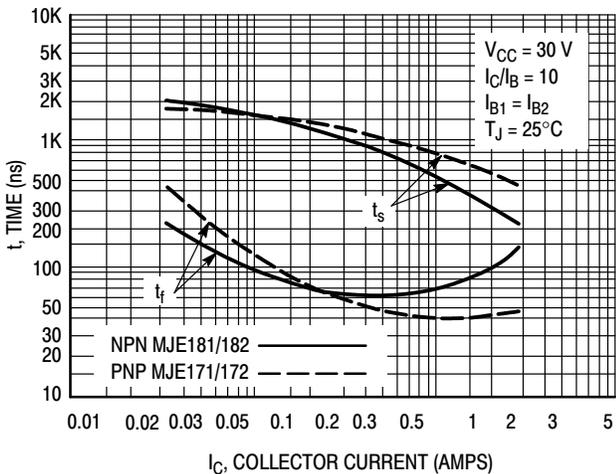


Figure 7. Turn-Off Time

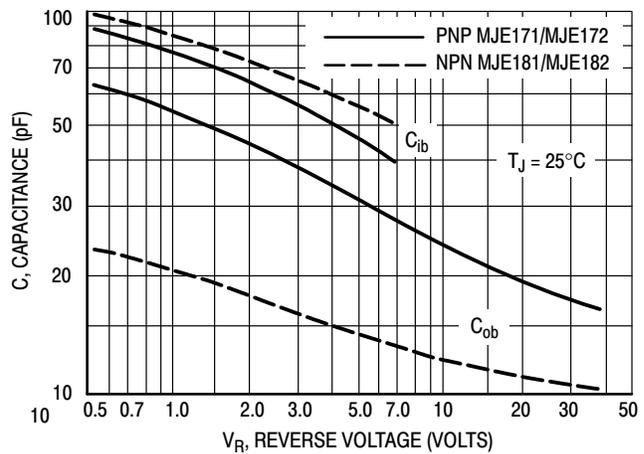


Figure 8. Capacitance

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

ORDERING INFORMATION

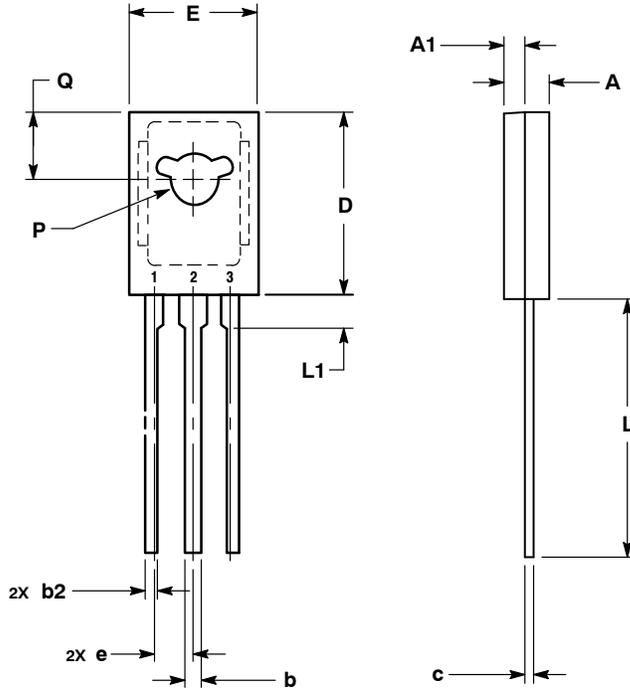
Device	Package	Shipping [†]
MJE170G	TO-225 (Pb-Free)	500 Units / Box
MJE171G	TO-225 (Pb-Free)	500 Units / Box
MJE172G	TO-225 (Pb-Free)	500 Units / Box
MJE180G	TO-225 (Pb-Free)	500 Units / Box
MJE181G	TO-225 (Pb-Free)	500 Units / Box
MJE182G	TO-225 (Pb-Free)	500 Units / Box

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

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

PACKAGE DIMENSIONS

TO-225
CASE 77-09
ISSUE AB



NOTES:

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

DIM	MILLIMETERS	
	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

STYLE 1:

- PIN 1. EMITTER
- COLLECTOR
- BASE

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