Complementary Plastic Silicon Power Transistors

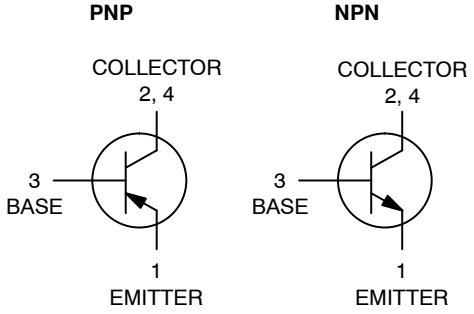
MJE170G, MJE171G, MJE172G (PNP), MJE180G, MJE181G, MJE182G (NPN)

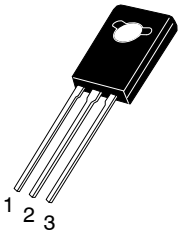
3 AMPERES
POWER TRANSISTORS
COMPLEMENTARY SILICON
40 – 60 – 80 VOLTS
12.5 WATTS

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*





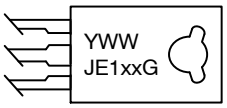
TO−225
CASE 77−09
STYLE 1

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°C Derate above 25°C	P_D	 12.5 0.012	 W W/°C
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	 1.5 0.1	 W W/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°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.

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.

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THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	10	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	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) MJE170G, MJE180G MJE171G, MJE181G MJE172G, MJE182G	$V_{CEO(sus)}$	 40 60 80	 − − −	Vdc
Collector Cutoff Current (V_{CB} = 60 Vdc, I_E = 0) MJE170G, MJE180G (V_{CB} = 80 Vdc, I_E = 0) MJE171G, MJE181G (V_{CB} = 100 Vdc, I_E = 0) MJE172G, MJE182G (V_{CB} = 60 Vdc, I_E = 0, T_C = 150°C) MJE170G, MJE180G (V_{CB} = 80 Vdc, I_E = 0, T_C = 150°C) MJE171G, MJE181G (V_{CB} = 100 Vdc, I_E = 0, T_C = 150°C) MJE172G, MJE182G	I_{CBO}	 − − − − −	 0.1 0.1 0.1 0.1 0.1	 μAdc mAdc
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) MJE171G/MJE172G MJE181G/MJE182G	C_{ob}	 − −	 60 40	pF

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

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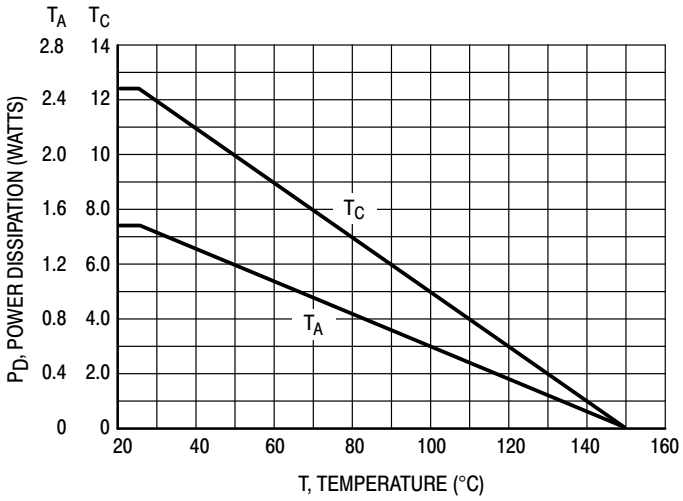

Figure 1. Power Derating

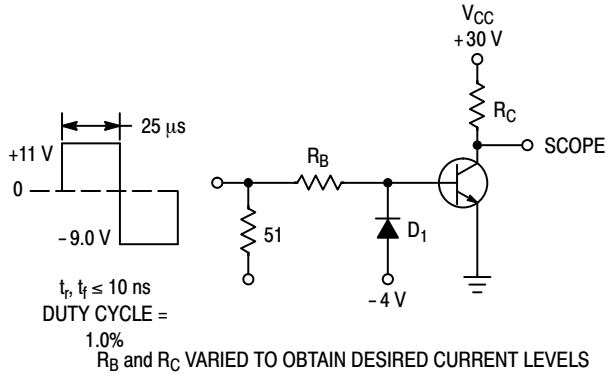

Figure 2. Switching Time Test Circuit

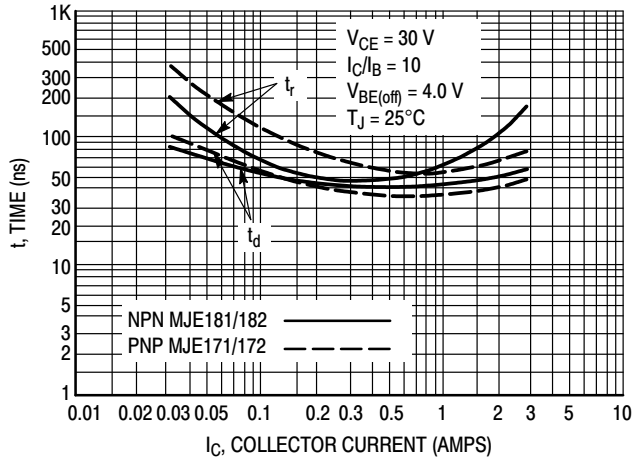

Figure 3. Turn−On Time

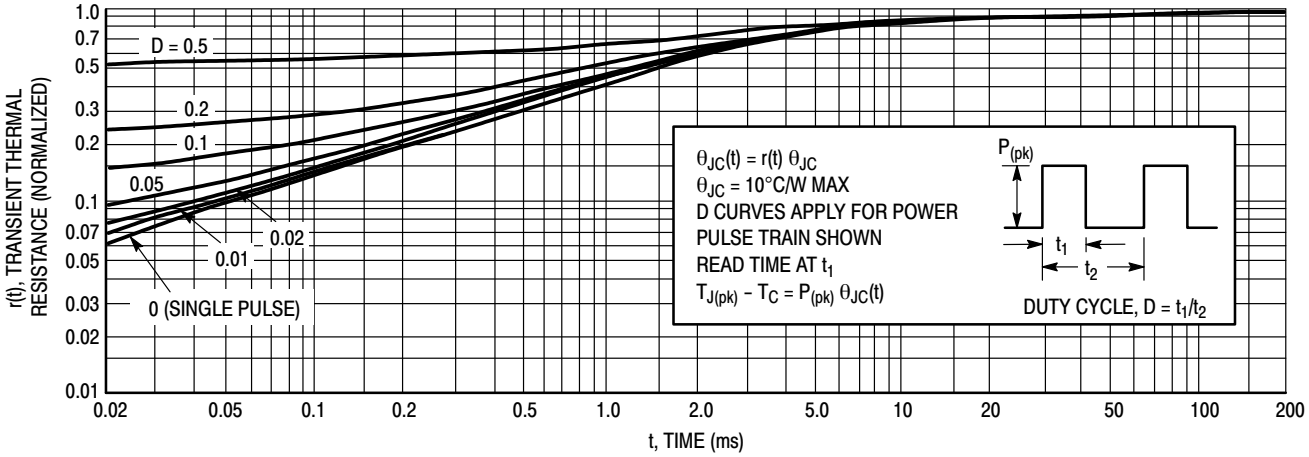

Figure 4. Thermal Response

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ACTIVE−REGION SAFE OPERATING AREA

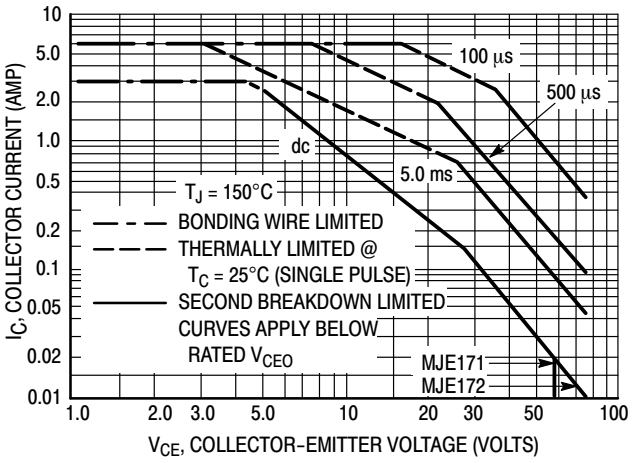

Figure 5. MJE171, MJE172

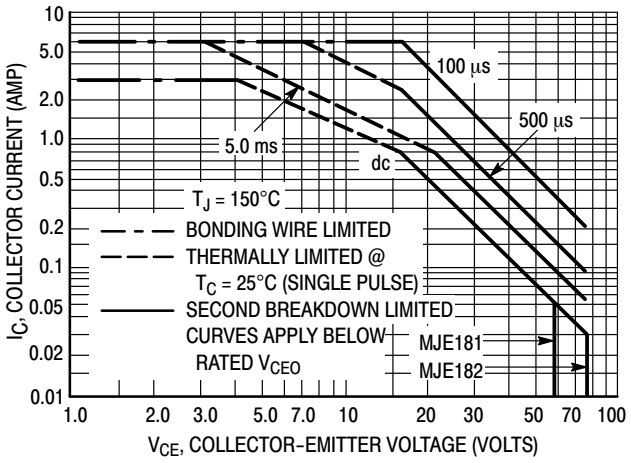

Figure 6. MJE181, MJE182

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.

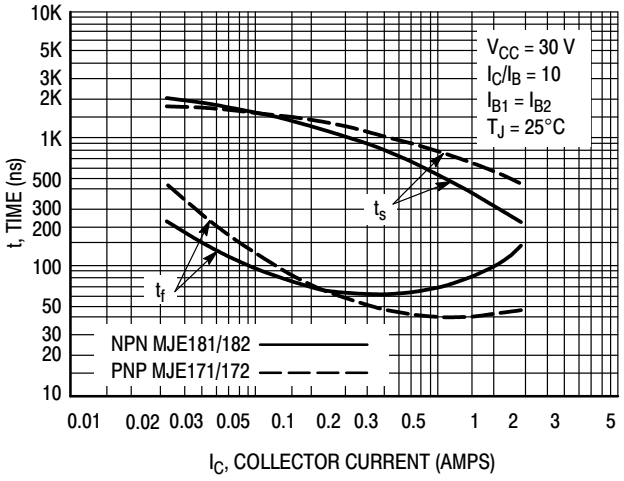

Figure 7. Turn−Off Time

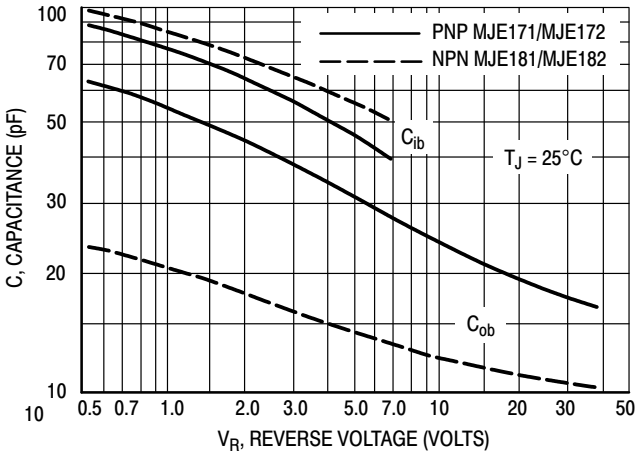

Figure 8. Capacitance

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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

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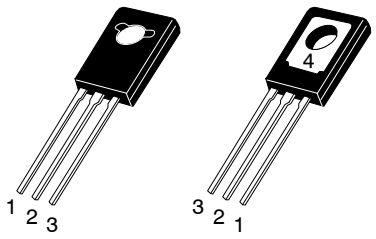
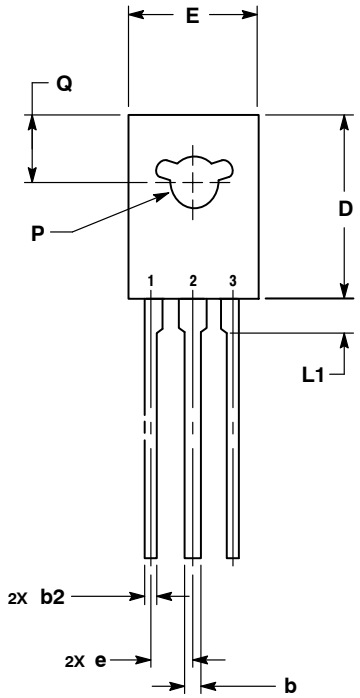
TO−225
CASE 77−09
ISSUE AD

DATE 25 MAR 2015

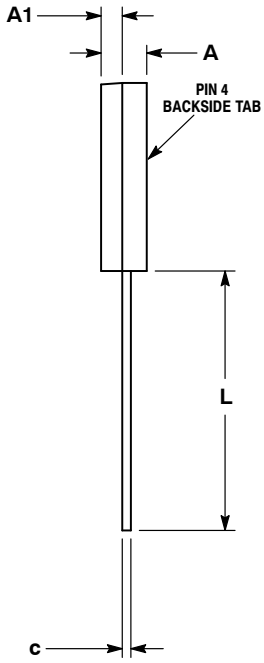


FRONT VIEW **BACK VIEW**

SCALE 1:1



FRONT VIEW

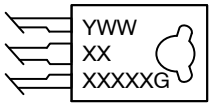


SIDE VIEW

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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