Complementary Power Transistors

For Isolated Package Applications

Designed for general-purpose amplifier and switching applications, where the mounting surface of the device is required to be electrically isolated from the heatsink or chassis.

Features

- Electrically Similar to the Popular MJE15030 and MJE15031
- 150 V_{CEO(sus)}
- 8 A Rated Collector Current
- No Isolating Washers Required
- Reduced System Cost
- High Current Gain-Bandwidth Product -

 $f_T = 30 \text{ MHz (Min)} @ I_C$ = 500 mAdc

- UL Recognized, File #E69369, to 3500 V_{RMS} Isolation
- Pb-Free Packages are Available*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	150	Vdc
Collector-Base Voltage	V_{CB}	150	Vdc
Emitter-Base Voltage	V_{EB}	5	Vdc
RMS Isolation Voltage (Note 1) (t = 0.3 sec, R.H. \leq 30%, T _A = 25 $^{\circ}$ C) Per Figure 11	V _{ISOL}	4500	V _{RMS}
Collector Current – Continuous – Peak	I _C	8 16	Adc
Base Current	Ι _Β	2	Adc
Total Power Dissipation (Note 2) @ T _C = 25°C Derate above 25°C	P _D	36 0.016	W W/°C
Total Power Dissipation @ T _A = 25°C Derate above 25°C	P _D	2.0 0.016	W W/°C
Operating and Storage Temperature Range	T _J , T _{stg}	-65 to +150	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	°C/W
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	3.5	°C/W
Lead Temperature for Soldering Purposes	Tı	260	°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.

- 1. Proper strike and creepage distance must be provided.
- Measurement made with thermocouple contacting the bottom insulated surface (in a location beneath the die), the devices mounted on a heatsink with thermal grease and a mounting torque of ≥ 6 in. lbs.



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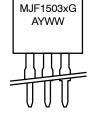
COMPLEMENTARY SILICON POWER TRANSISTORS 8 AMPERES 150 VOLTS, 36 WATTS



MARKING DIAGRAM

0

TO-220 FULLPACK CASE 221D STYLE 2



MJF1503x = Specific Device Code

x = 0 or 1

G = Pb-Free Package A = Assembly Location

Y = Year WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
MJF15030	TO-220 FULLPACK	50 Units/Rail
MJF15030G	TO-220 FULLPACK (Pb-Free)	50 Units/Rail
MJF15031	TO-220 FULLPACK	50 Units/Rail
MJF15031G	TO-220 FULLPACK (Pb-Free)	50 Units/Rail

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

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS	·			
Collector–Emitter Sustaining Voltage (Note 3) (I _C = 10 mAdc, I _B = 0)	V _{CEO(sus)}	150	-	Vdc
Collector Cutoff Current $(V_{CE} = 150 \text{ Vdc}, I_B = 0)$	I _{CEO}	-	10	μAdc
Collector Cutoff Current $(V_{CB} = 150 \text{ Vdc}, I_E = 0)$	I _{CBO}	-	10	μAdc
Emitter Cutoff Current $(V_{BE} = 5 \text{ Vdc}, I_C = 0)$	I _{EBO}	-	10	μAdc
ON CHARACTERISTICS (Note 3)				
DC Current Gain (I_C = 0.1 Adc, V_{CE} = 2 Vdc) (I_C = 2 Adc, V_{CE} = 2 Vdc) (I_C = 3 Adc, V_{CE} = 2 Vdc) (I_C = 4 Adc, V_{CE} = 2 Vdc)	h _{FE}	40 40 40 20	- - - -	-
		Тур		
DC Current Gain Linearity (V _{CE} from 2 V to 20 V, I _C from 0.1 A to 3 A) (NPN to PNP)	h _{FE}	2 3		
Collector-Emitter Saturation Voltage (I _C = 1 Adc, I _B = 0.1 Adc)	V _{CE(sat)}	_	0.5	Vdc
Base–Emitter On Voltage ($I_C = 1$ Adc, $V_{CE} = 2$ Vdc)	V _{BE(on)}	-	1	Vdc
DYNAMIC CHARACTERISTICS				
Current Gain – Bandwidth Product (Note 4) (I _C = 500 mAdc, V _{CE} = 10 Vdc, f _{test} = 10 MHz)	f _T	30	-	MHz

^{3.} Pulse Test: Pulse Width \leq 300 μ s, Duty Cycle \leq 2%. 4. $f_T = \left|h_{fe}\right| \bullet f_{test}$.

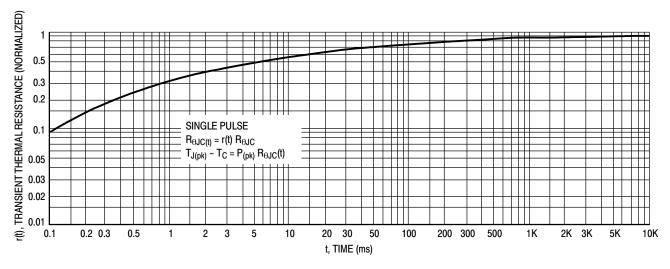
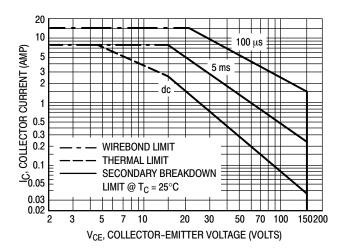


Figure 1. Thermal Response



dissipation than the curves indicate.

Figure 2. Forward Bias Safe Operating Area

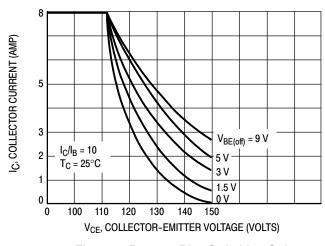


Figure 3. Reverse Bias Switching Safe **Operating Area**

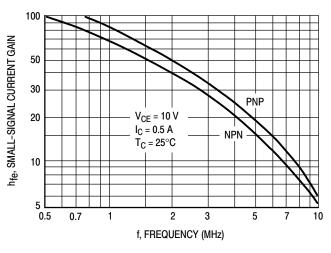


Figure 5. Small-Signal Current Gain

The data of Figures 2 and 3 is based on $T_{J(pk)} = 150^{\circ}$ 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 1. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

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

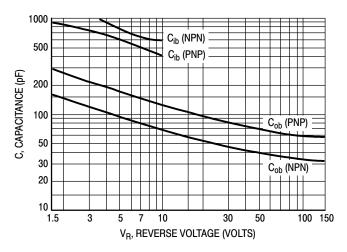


Figure 4. Capacitances

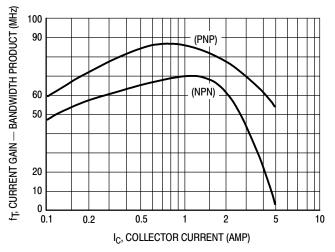
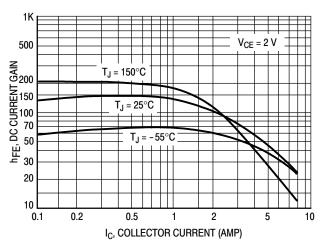


Figure 6. Current Gain — Bandwidth Product

DC CURRENT GAIN



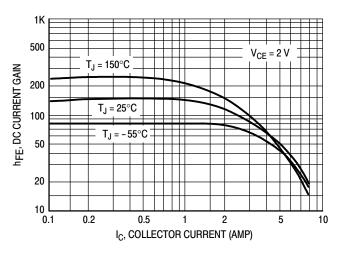
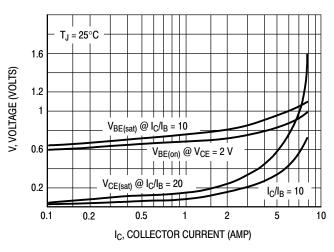


Figure 7a. MJF15030 NPN

Figure 7b. MJF15031 PNP

"ON" VOLTAGE



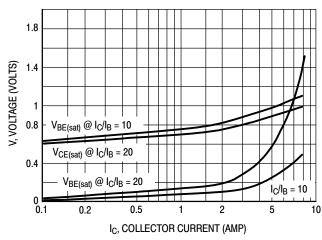
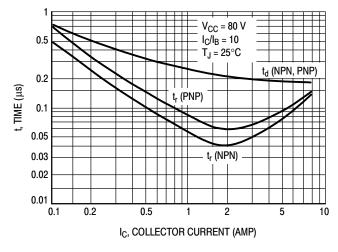


Figure 8a. MJF15030 NPN

Figure 8b. MJF15031 PNP



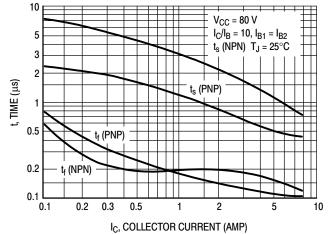


Figure 9. Turn-On Times

Figure 10. Turn-Off Times

TEST CONDITIONS FOR ISOLATION TESTS*

FULLY ISOLATED PACKAGE

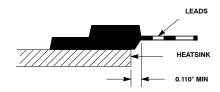


Figure 11. Mounting Position

*Measurement made between leads and heatsink with all leads shorted together.

MOUNTING INFORMATION

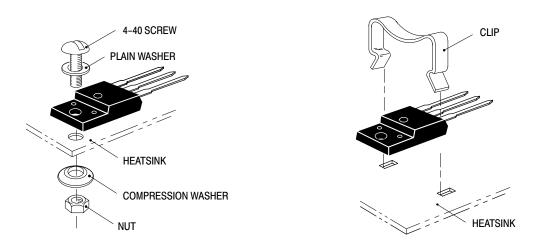


Figure 12. Typical Mounting Techniques*

Laboratory tests on a limited number of samples indicate, when using the screw and compression washer mounting technique, a screw torque of 6 to $8 \text{ in} \cdot \text{lbs}$ is sufficient to provide maximum power dissipation capability. The compression washer helps to maintain a constant pressure on the package over time and during large temperature excursions.

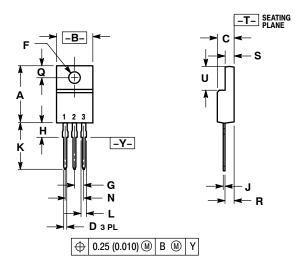
Destructive laboratory tests show that using a hex head 4-40 screw, without washers, and applying a torque in excess of 20 in · lbs will cause the plastic to crack around the mounting hole, resulting in a loss of isolation capability.

Additional tests on slotted 4–40 screws indicate that the screw slot fails between 15 to 20 in · lbs without adversely affecting the package. However, in order to positively ensure the package integrity of the fully isolated device, ON Semiconductor does not recommend exceeding 10 in · lbs of mounting torque under any mounting conditions.

^{**} For more information about mounting power semiconductors see Application Note AN1040.

PACKAGE DIMENSIONS

TO-220 FULLPAK CASE 221D-03 **ISSUE J**



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH
- 221D-01 THRU 221D-02 OBSOLETE, NEW STANDARD 221D-03.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
Α	0.617	0.635	15.67	16.12
В	0.392	0.419	9.96	10.63
C	0.177	0.193	4.50	4.90
D	0.024	0.039	0.60	1.00
F	0.116	0.129	2.95	3.28
G	0.100 BSC		2.54 BSC	
Н	0.118	0.135	3.00	3.43
J	0.018	0.025	0.45	0.63
K	0.503	0.541	12.78	13.73
L	0.048	0.058	1.23	1.47
N	0.200 BSC		5.08 BSC	
Q	0.122	0.138	3.10	3.50
R	0.099	0.117	2.51	2.96
S	0.092	0.113	2.34	2.87
U	0.239	0.271	6.06	6.88

STYLE 2:

- PIN 1 BASE
 - COLLECTOR 2.
 - **EMITTER**

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