

# MJE15032 (NPN), MJE15033 (PNP)

## Complementary Silicon Plastic Power Transistors

Designed for use as high-frequency drivers in audio amplifiers.

### Features

- High DC Current Gain
- High Current Gain – Bandwidth Product
- TO-220 Compact Package
- 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-Emitter Voltage	$V_{CEO}$	250	Vdc
Collector-Base Voltage	$V_{CB}$	250	Vdc
Emitter-Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current – Continuous	$I_C$	8.0	Adc
Collector Current – Peak	$I_{CM}$	16	Adc
Base Current	$I_B$	2.0	Adc
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	50 0.40	W W/ $^\circ\text{C}$
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	2.0 0.016	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 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.

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	$^\circ\text{C}/\text{W}$

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

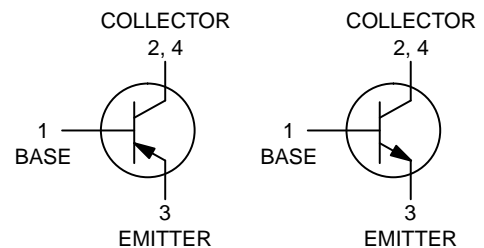


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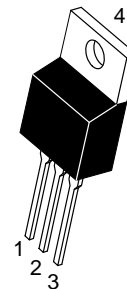
<http://onsemi.com>

## 8.0 AMPERES POWER TRANSISTORS COMPLEMENTARY SILICON 250 VOLTS, 50 WATTS

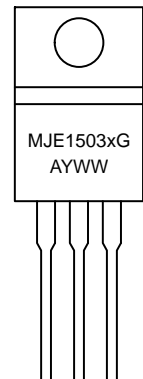
### COMPLEMENTARY



### MARKING DIAGRAM



**TO-220  
CASE 221A  
STYLE 1**



MJE1503x = Specific Device Code  
 x = 2 or 3  
 A = Assembly Location  
 Y = Year  
 WW = Work Week  
 G = Pb-Free Package

### ORDERING INFORMATION

Device	Package	Shipping
MJE15032G	TO-220 (Pb-Free)	50 Units/Rail
MJE15033G	TO-220 (Pb-Free)	50 Units/Rail

## MJE15032 (NPN), MJE15033 (PNP)

### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Sustaining Voltage (Note 1) (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 0)	V <sub>CEO(sus)</sub>	250	–	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 250 V <sub>dc</sub> , I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	10	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>BE</sub> = 5.0 V <sub>dc</sub> , I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	10	μA <sub>dc</sub>
<b>ON CHARACTERISTICS (Note 1)</b>				
DC Current Gain (I <sub>C</sub> = 0.5 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> ) (I <sub>C</sub> = 1.0 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> ) (I <sub>C</sub> = 2.0 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> )	h <sub>FE</sub>	70 50 10	– – –	–
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 1.0 A <sub>dc</sub> , I <sub>B</sub> = 0.1 A <sub>dc</sub> )	V <sub>CE(sat)</sub>	–	0.5	V <sub>dc</sub>
Base–Emitter On Voltage (I <sub>C</sub> = 1.0 A <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> )	V <sub>BE(on)</sub>	–	1.0	V <sub>dc</sub>
<b>DYNAMIC CHARACTERISTICS</b>				
Current Gain – Bandwidth Product (Note 2) (I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , f <sub>test</sub> = 1.0 MHz)	f <sub>T</sub>	30	–	MHz

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. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
2. f<sub>T</sub> = |h<sub>fe</sub>| • f<sub>test</sub>.

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Figure 1. Thermal Response

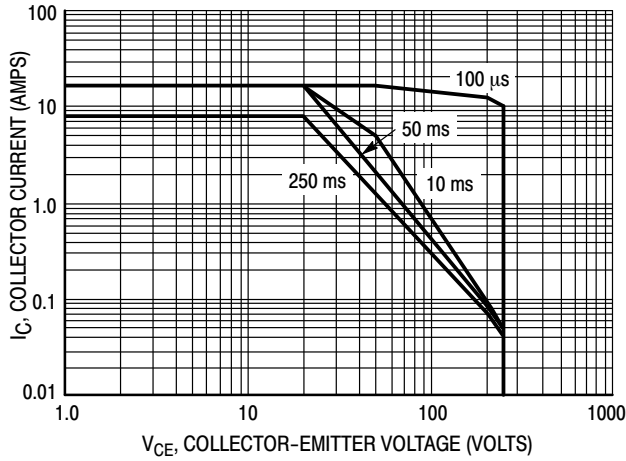


Figure 2. MJE15032 & MJE15033 Safe Operating Area

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 2 and 4 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 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.

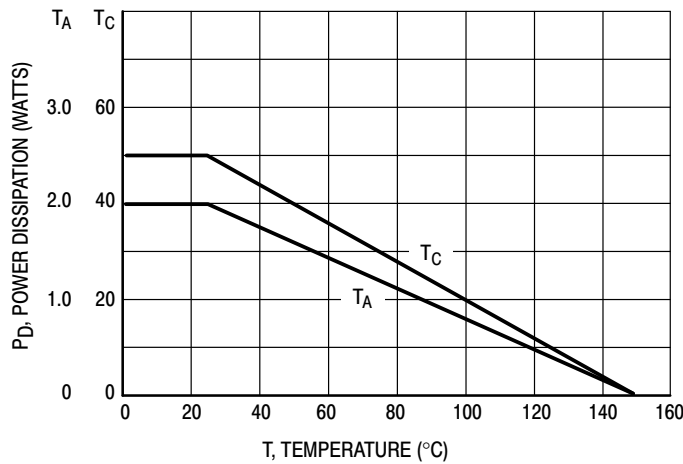
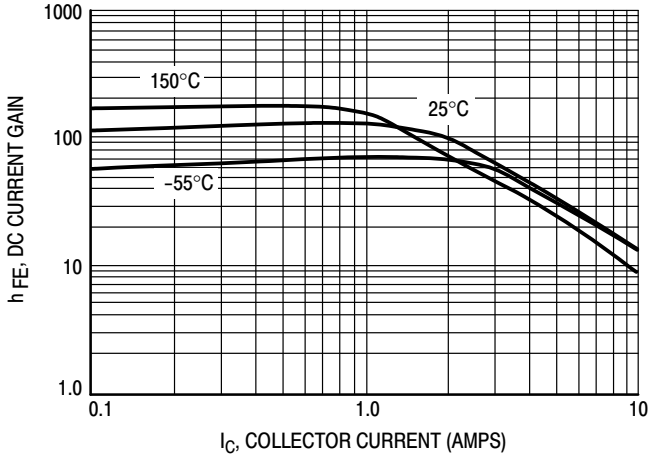


Figure 3. Power Derating

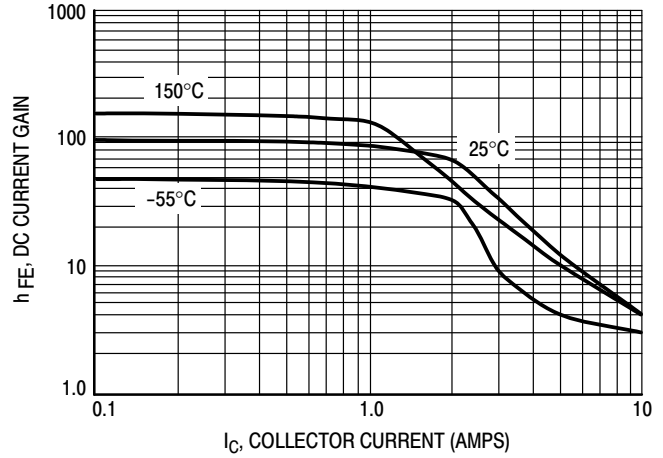
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**NPN – MJE15032**

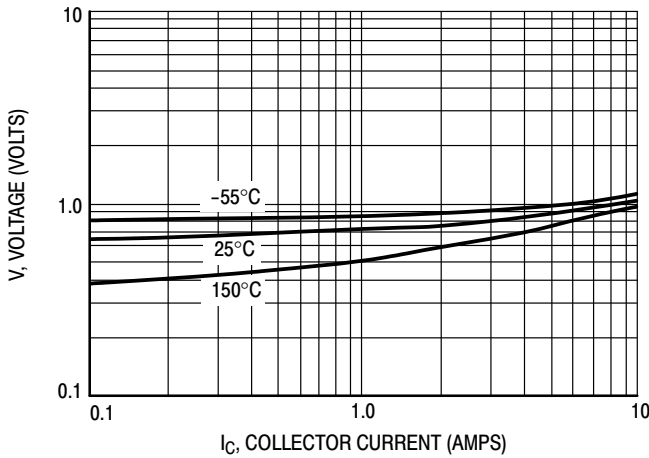


**Figure 4. NPN – MJE15032**  
 $V_{CE} = 5\text{ V DC Current Gain}$

**PNP – MJE15033**



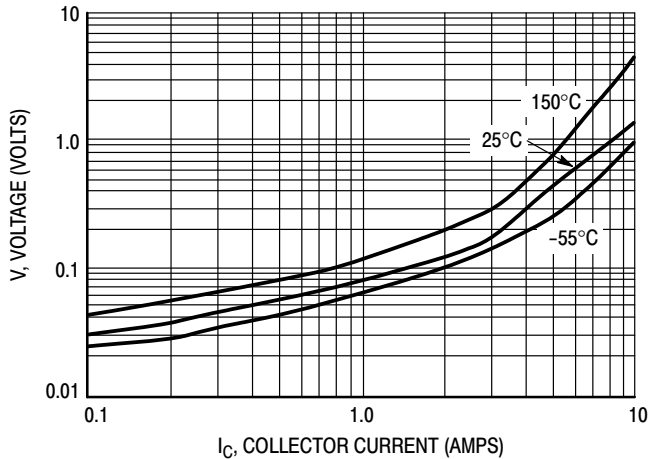
**Figure 5. PNP – MJE15033**  
 $V_{CE} = 5\text{ V DC Current Gain}$



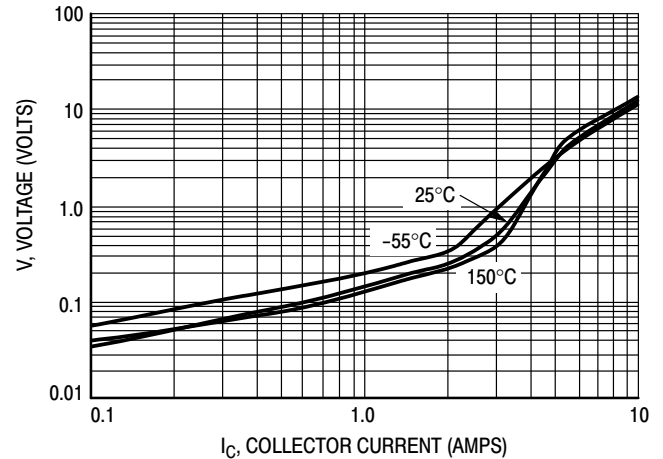
**Figure 6. NPN – MJE15032**  
 $V_{CE} = 5\text{ V } V_{BE(on)} \text{ Curve}$



**Figure 7. PNP – MJE15033**  
 $V_{CE} = 5\text{ V } V_{BE(on)} \text{ Curve}$



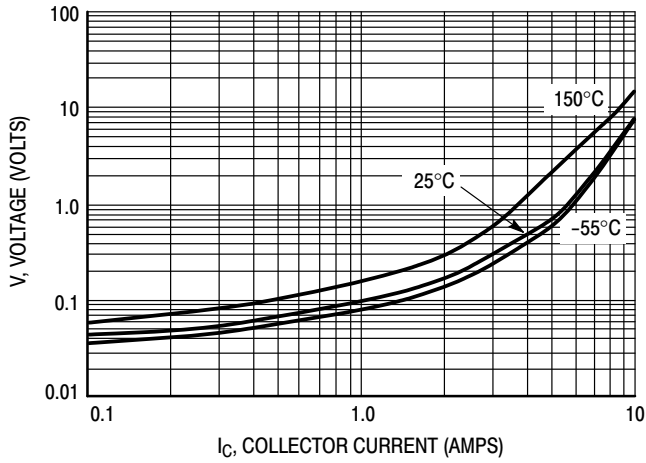
**Figure 8. NPN – MJE15032**  
 $V_{CE(sat)} I_C/I_B = 10$



**Figure 9. PNP – MJE15033**  
 $V_{CE(sat)} I_C/I_B = 10$

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**NPN – MJE15032**

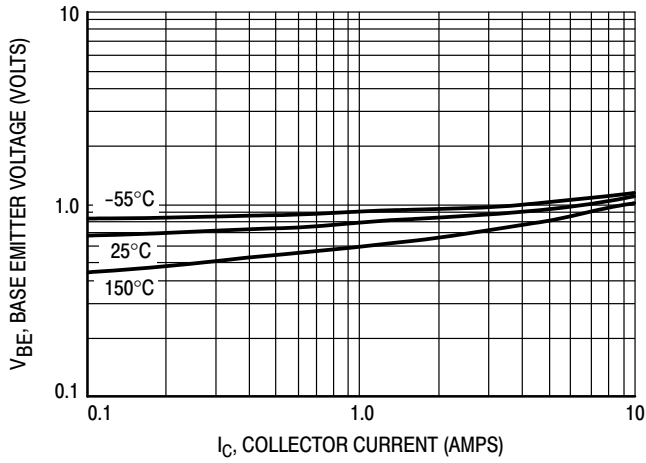


**Figure 10. NPN – MJE15032**  
 $V_{CE(sat)} I_C/I_B = 20$

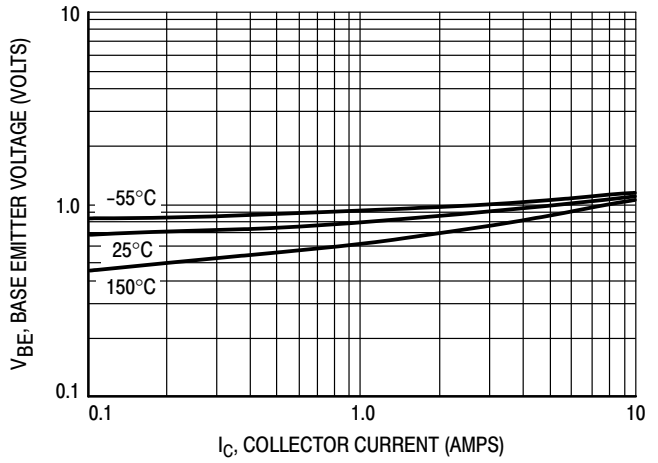
**PNP – MJE15033**



**Figure 11. PNP – MJE15033**  
 $V_{CE(sat)} I_C/I_B = 20$



**Figure 12. NPN – MJE15032**  
 $V_{BE(sat)} I_C/I_B = 10$



**Figure 13. PNP – MJE15033**  
 $V_{BE(sat)} I_C/I_B = 10$

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 1:1



## TO-220 CASE 221A ISSUE AK

DATE 13 JAN 2022

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.41
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 1:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

STYLE 2:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR  
4. EMITTER

STYLE 3:  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE

STYLE 4:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. MAIN TERMINAL 2

STYLE 5:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

STYLE 6:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE

STYLE 7:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. ANODE

STYLE 8:  
PIN 1. CATHODE  
2. ANODE  
3. EXTERNAL TRIP/DELAY  
4. ANODE

STYLE 9:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

STYLE 10:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN  
4. SOURCE

STYLE 11:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE  
4. SOURCE

STYLE 12:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. NOT CONNECTED

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