MJF6388 (NPN), MJF6668 (PNP)

Complementary Power Darlingtons

For Isolated Package Applications

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

Features

- Isolated Overmold Package
- Electrically Similar to the Popular 2N6388, 2N6668, TIP102, and TIP107
- No Isolating Washers Required, Reduced System Cost
- High DC Current Gain
- High Isolation Voltage
- UL Recognized at 3500 VRMS: File #E69369
- These Devices are Pb−Free and are RoHS Compliant*

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector−Emitter Voltage	V_{CEO}	100	Vdc
Collector−Base Voltage	V_{CB}	100	Vdc
Emitter−Base Voltage	V_{EB}	5.0	Vdc
RMS Isolation Voltage (Note 1) (t = 0.3 sec, R.H. ≤ 30%, T_A = 25°C) Per Figure 14	V_{ISOL}	4500	V
Collector Current − Continuous	I_C	10	Adc
Collector Current − Peak (Note 2)	I_{CM}	15	Adc
Base Current − Continuous	I_B	1.0	Adc
Total Power Dissipation (Note 3) @ T_C = 25°C Derate above 25°C	P_D	40 0.31	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

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.

1. Proper strike and creepage distance must be provided.
2. Pulse Test: Pulse Width = 5.0 ms, Duty Cycle ≤ 10%.
3. 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.

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction−to−Case (Note 4)	$R_{\theta JC}$	4.0	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	62.5	°C/W
Lead Temperature for Soldering Purposes	T_L	260	°C

4. 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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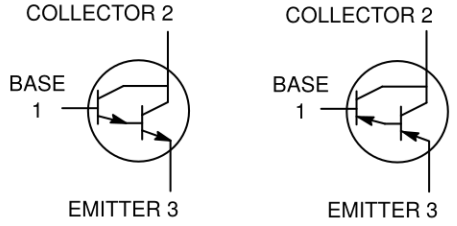
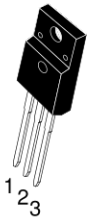
COMPLEMENTARY SILICON POWER DARLINGTONS 10 AMPERES 100 VOLTS, 40 WATTS

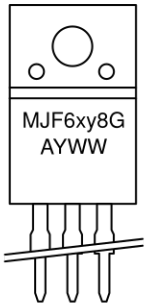


MJF6388 (NPN) **MJF6668 (PNP)**



TO−220 FULLPACK
CASE 221D
STYLE 2
UL RECOGNIZED

MARKING DIAGRAM



MJF6xy8 = Specific Device Code
x = 3 or 6
y = 6 or 8
G = Pb−Free Package
A = Assembly Location
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
MJF6388G	TO−220 FULLPACK (Pb−Free)	50 Units/Rail
MJF6668G	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 5) (I_C = 30 mAdc, I_B = 0)	$V_{CEO(sus)}$	100	–	Vdc
Collector Cutoff Current (V_{CE} = 80 Vdc, I_B = 0)	I_{CEO}	–	10	μAdc
Collector Cutoff Current (V_{CE} = 100 Vdc, $V_{EB(off)}$ = 1.5 Vdc) (V_{CE} = 100 Vdc, $V_{EB(off)}$ = 1.5 Vdc, T_C = 125°C)	I_{CEX}	– –	10 3.0	μAdc mAdc
Collector Cutoff Current (V_{CB} = 100 Vdc, I_E = 0)	I_{CBO}	–	10	μAdc
Emitter Cutoff Current (V_{BE} = 5.0 Vdc, I_C = 0)	I_{EBO}	–	2.0	mAdc
ON CHARACTERISTICS (Note 5)				
DC Current Gain (I_C = 3.0 Adc, V_{CE} = 4.0 Vdc) (I_C = 5.0 Adc, V_{CE} = 3.0 Vdc) (I_C = 8.0 Adc, V_{CE} = 4.0 Vdc) (I_C = 10 Adc, V_{CE} = 3.0 Vdc)	h_{FE}	3000 1000 200 100	15000 – – –	–
Collector−Emitter Saturation Voltage (I_C = 3.0 Adc, I_B = 6.0 mAdc) (I_C = 5.0 Adc, I_B = 0.01 Adc) (I_C = 8.0 Adc, I_B = 80 mAdc) (I_C = 10 Adc, I_B = 0.1 Adc)	$V_{CE(sat)}$	– – – –	2.0 2.0 2.5 3.0	Vdc
Base−Emitter Saturation Voltage (I_C = 5.0 Adc, I_B = 0.01 Adc) (I_C = 10 Adc, I_B = 0.1 Adc)	$V_{BE(sat)}$	– –	2.8 4.5	Vdc
Base−Emitter On Voltage (I_C = 8.0 Adc, V_{CE} = 4.0 Vdc)	$V_{BE(on)}$	–	2.5	Vdc
DYNAMIC CHARACTERISTICS				
Small−Signal Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc, f_{test} = 1.0 MHz)	$\|h_{fe}\|$	20	–	–
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz) MJF6388 MJF6668	C_{ob}	 – –	 200 300	pF
Insulation Capacitance (Collector−to−External Heatsink)	C_{c-hs}	–	3.0 Typ	pF
Small−Signal Current Gain (I_C = 1.0 Adc, V_{CE} = 5.0 Vdc, f = 1.0 kHz)	h_{fe}	1000	–	–

5. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

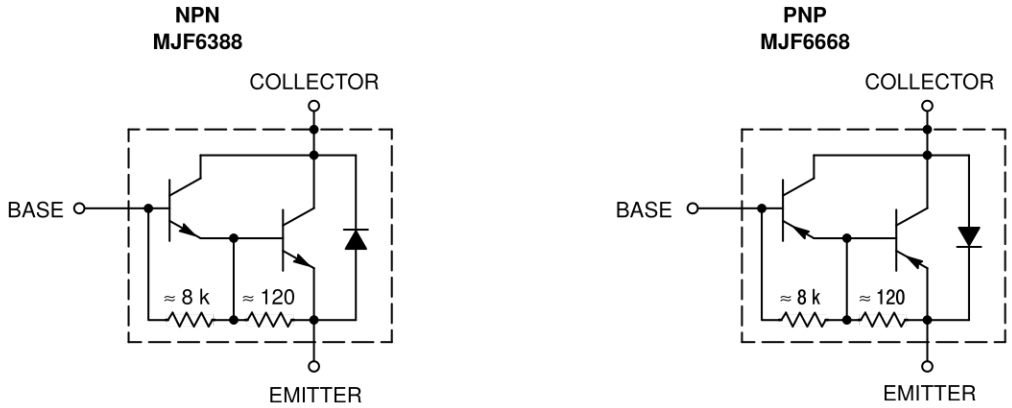


Figure 1. Darlington Schematic

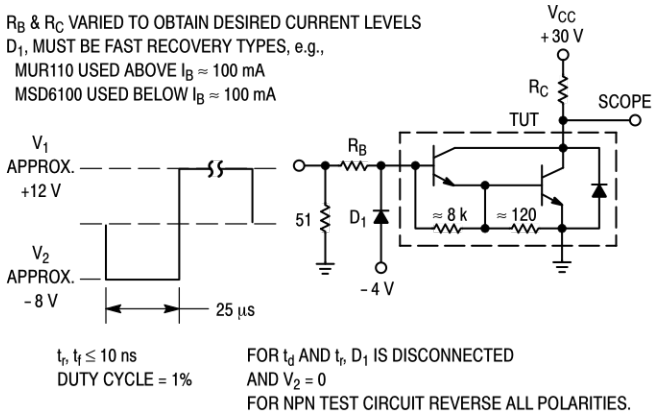


Figure 2. Switching Times Test Circuit

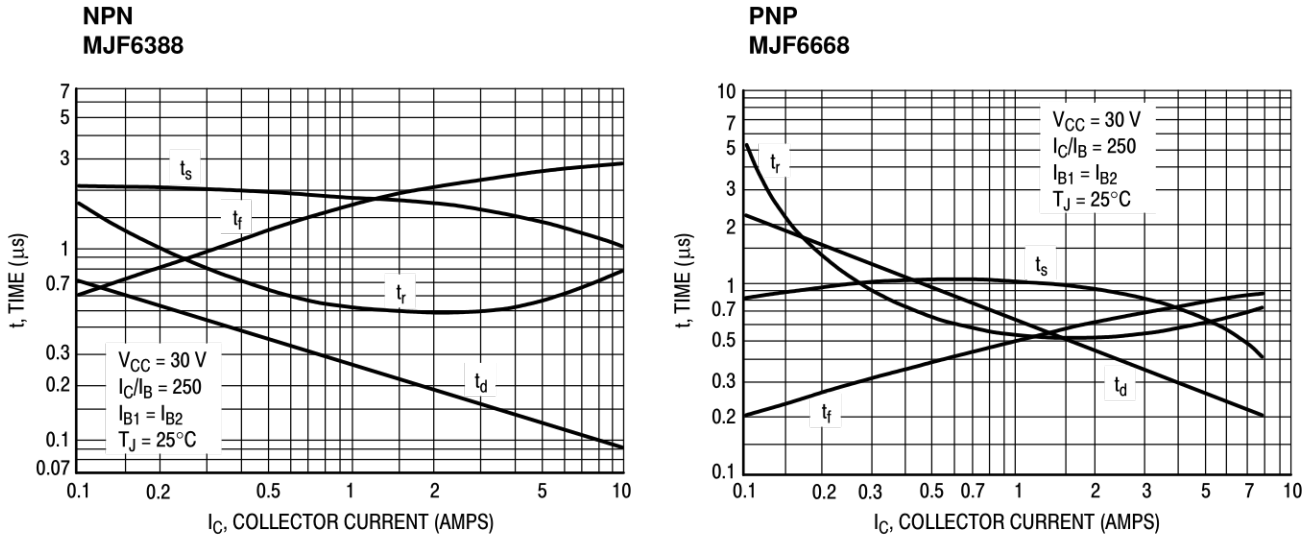


Figure 3. Typical Switching Times

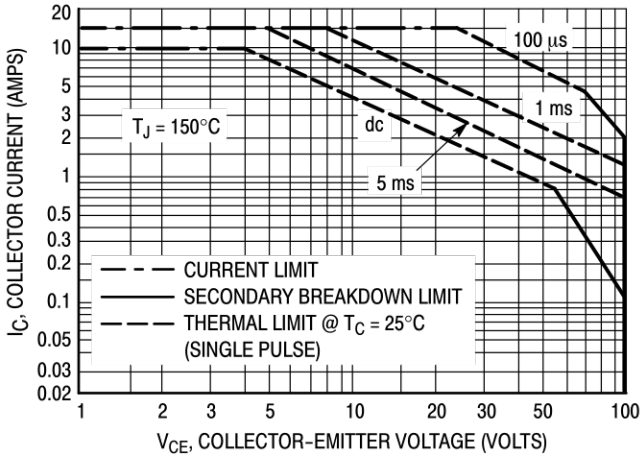


Figure 4. Maximum Forward Bias Safe Operating Area

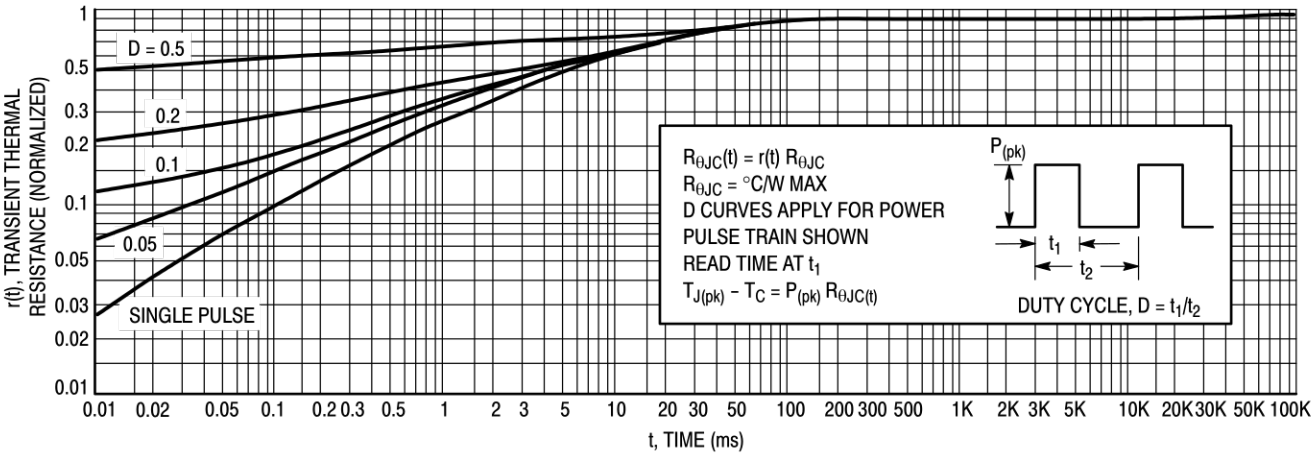


Figure 5. Thermal Response

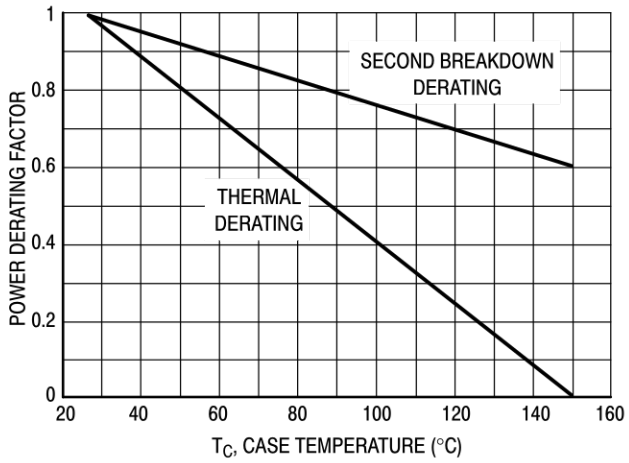


Figure 6. Maximum Power Derating

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 Figure 4 is based on $T_{J(pk)}$ = 150°C; T_C is variable depending on conditions. Secondary 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 5. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by secondary breakdown.

NPN
MJF6388

PNP
MJF6668

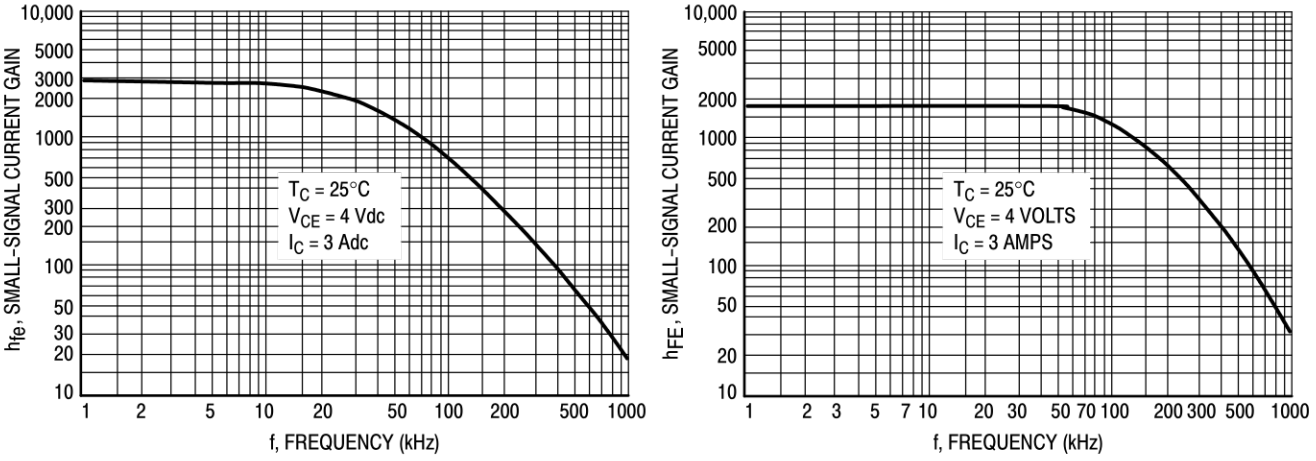


Figure 7. Typical Small−Signal Current Gain

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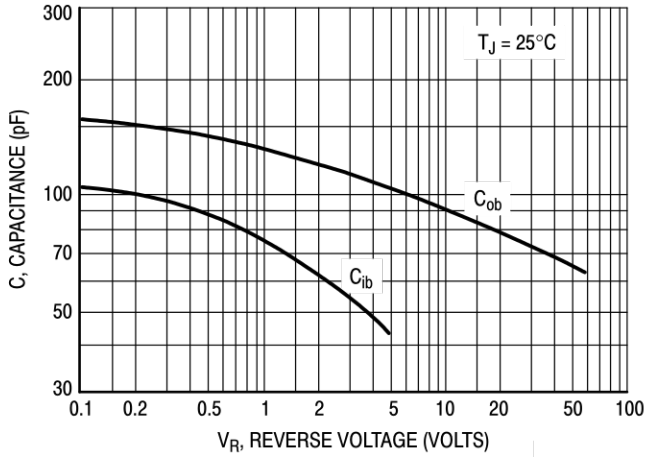
MJF6388



PNP
MJF6668

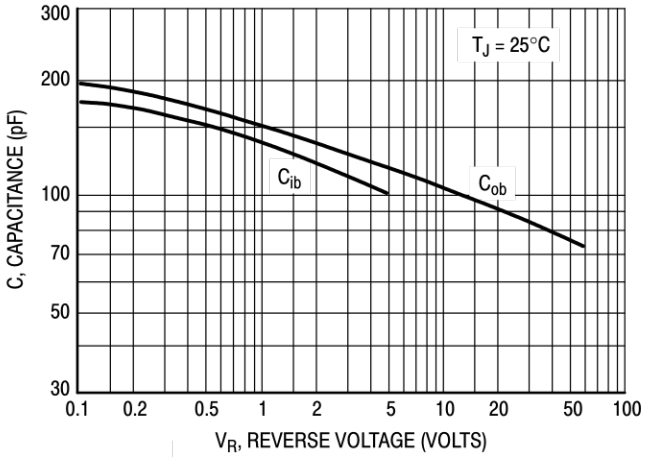
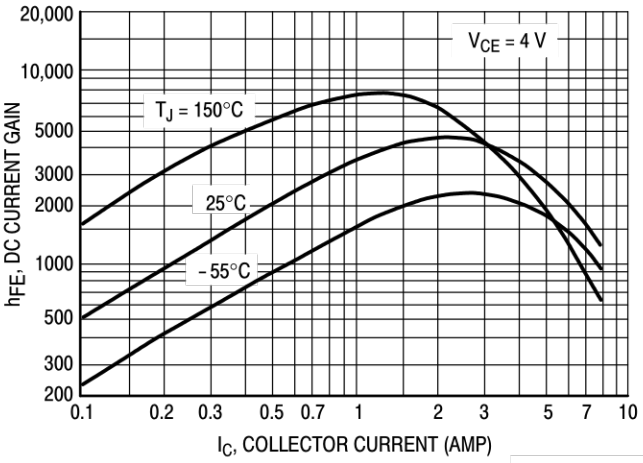


Figure 8. Typical Capacitance



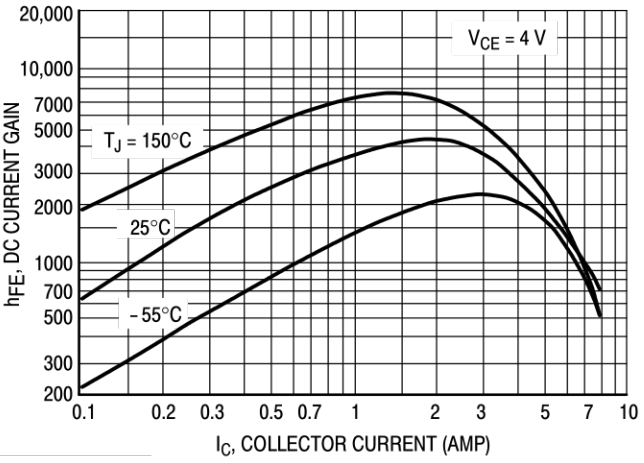
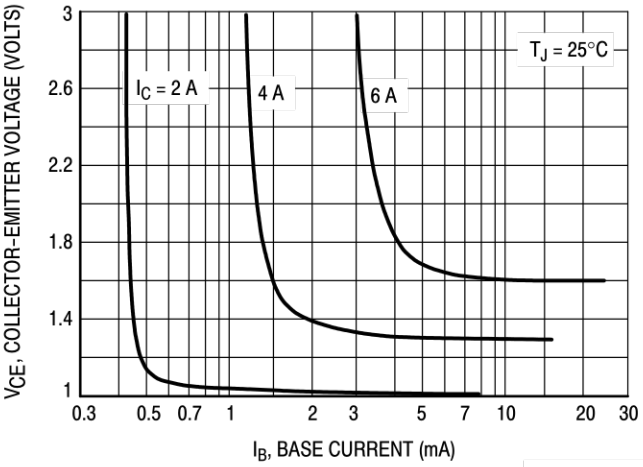


Figure 9. Typical DC Current Gain



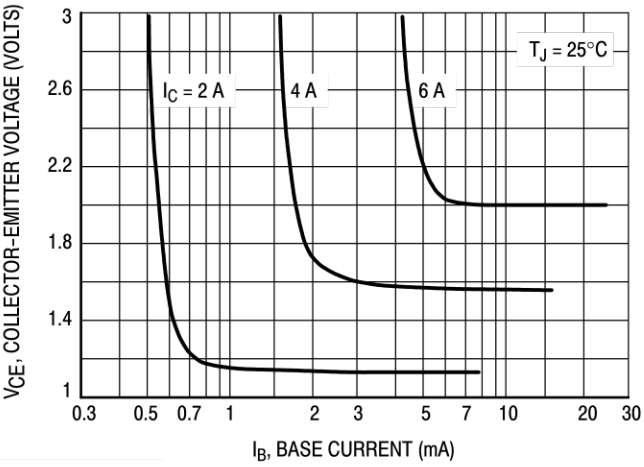
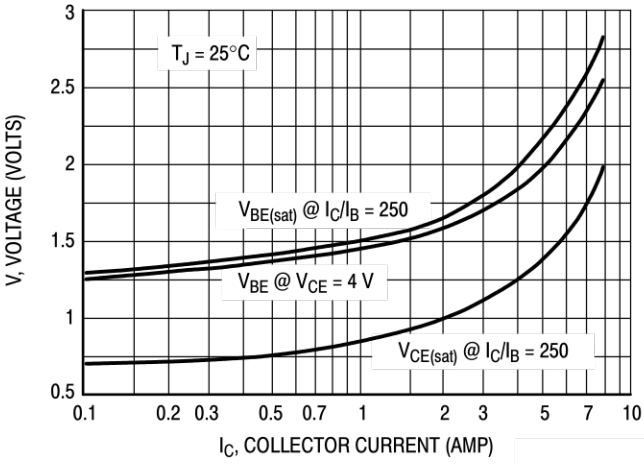


Figure 10. Typical Collector Saturation Region

NPN
MJF6388



PNP
MJF6668

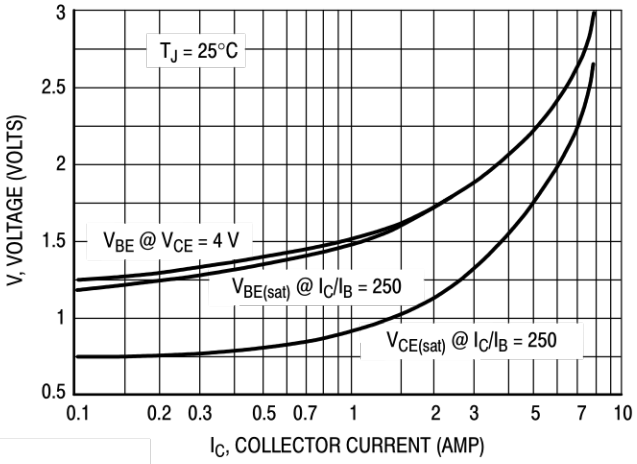
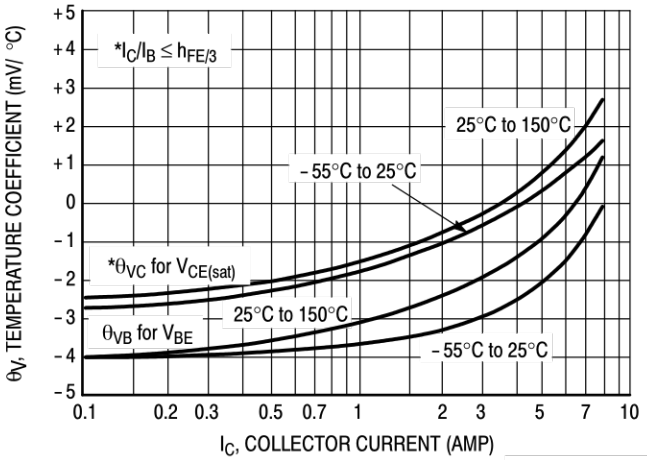


Figure 11. Typical “On” Voltages



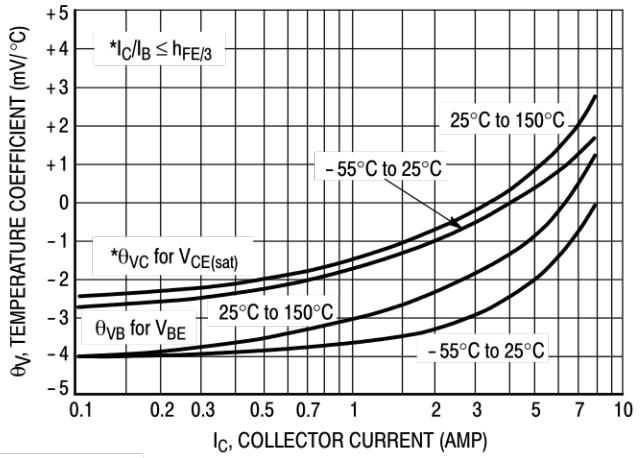
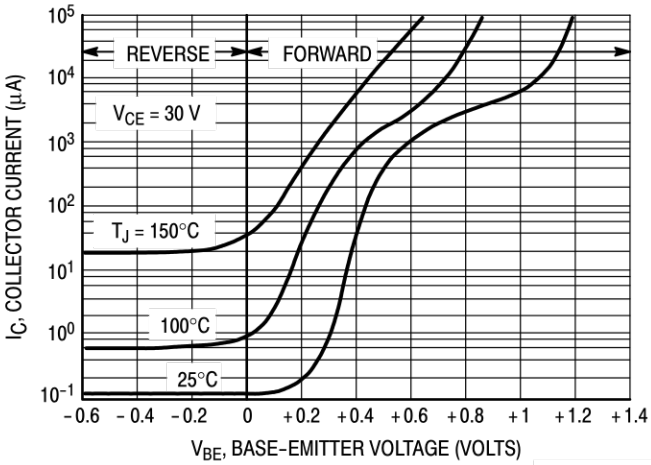


Figure 12. Typical Temperature Coefficients



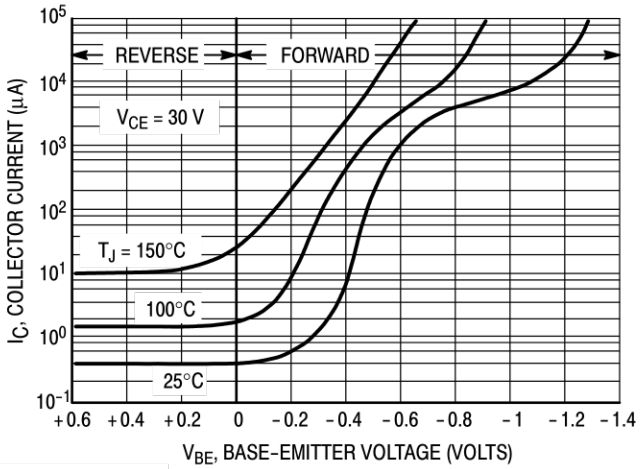


Figure 13. Typical Collector Cut−Off Region

TEST CONDITION FOR ISOLATION TEST*

FULLY ISOLATED PACKAGE

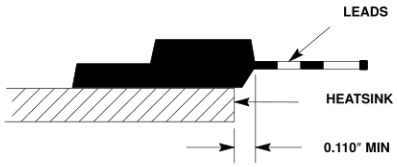


Figure 14. Mounting Position

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

MOUNTING INFORMATION

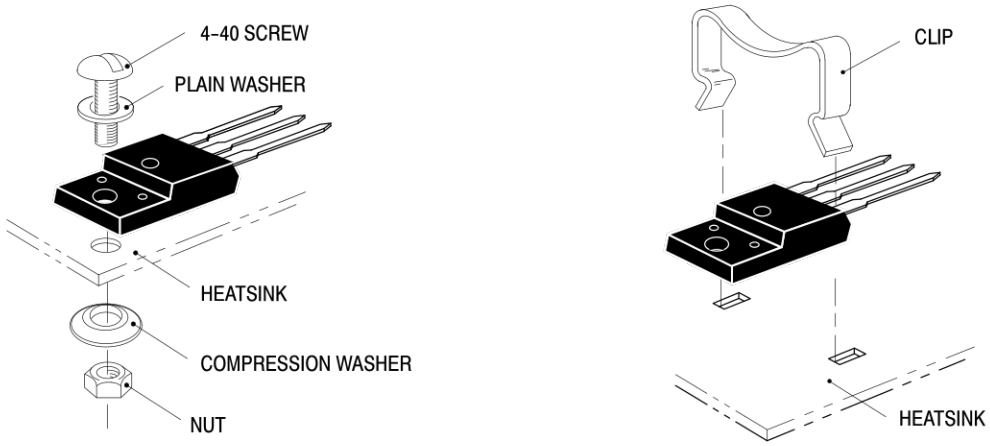


Figure 15. Typical Mounting Techniques*

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 in · 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.

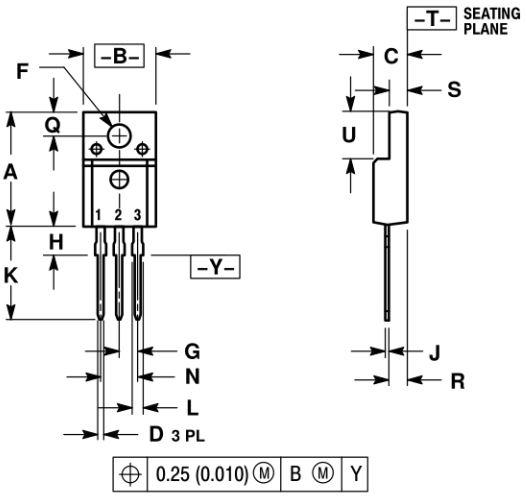
Destructive laboratory tests show that using a hex head 4−40 screw, without washers, and applying a torque in excess of 20 in · lbs will cause the plastic to crack around the mounting hole, resulting in a loss of isolation capability.

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 K



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH
3. 221D−01 THRU 221D−02 OBSOLETE, NEW STANDARD 221D−03.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.617	0.635	15.67	16.12
B	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	
H	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
2. COLLECTOR
3. EMITTER

PUBLICATION ORDERING INFORMATION

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MJF6388/D