SWITCHMODE™ Schottky Power Rectifier

MBRF1045

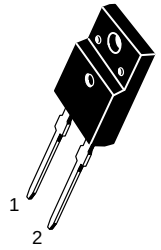
Motorola Preferred Device

SCHOTTKY BARRIER RECTIFIER 10 AMPERES 45 VOLTS

The SWITCHMODE Power Rectifier employs the Schottky Barrier principle in a large area metal–to–silicon power diode. State–of–the–art geometry features epitaxial construction with oxide passivation and metal overlay contact. Ideally suited for use as rectifiers in very low–voltage, high–frequency switching power supplies, free wheeling diodes and polarity protection diodes.

- Highly Stable Oxide Passivated Junction
- Very Low Forward Voltage Drop
- High Junction Temperature Capability
- High dv/dt Capability
- Excellent Ability to Withstand Reverse Avalanche Energy Transients
- Guardring for Stress Protection
- Epoxy Meets UL94, VO at 1/8″
- Electrically Isolated. No Isolation Hardware Required.
- UL Recognized File #E69369(1)





CASE 221E–01 ISOLATED TO–220

Mechanical Characteristics

- Case: Epoxy, Molded
- Weight: 1.9 grams (approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- Shipped 50 units per plastic tube
- Marking: B1045

MAXIMUM RATINGS

Rating		Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage		V_{RRM} V_{RWM} V_R	45	Volts
Average Rectified Forward Current (Rated V_R), T_C = 135°C		$I_{F(AV)}$	10	Amps
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20 kHz), T_C = 135°C		I_{FRM}	20	Amps
Non–repetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)		I_{FSM}	150	Amps
Peak Repetitive Reverse Surge Current (2.0 μs, 1.0 kHz) Figure 6		I_{RRM}	1.0	Amp
Operating Junction and Storage Temperature		T_J, T_{stg}	– 65 to +150	°C
Voltage Rate of Change (Rated V_R)		dv/dt	10000	V/μs
RMS Isolation Voltage (t = 1 second, R.H. ≤ 30%, T_A = 25°C)(2)	Per Figure 8 Per Figure 9(1) Per Figure 10	V_{iso1} V_{iso2} V_{iso3}	4500 3500 1500	Volts

THERMAL CHARACTERISTICS

Maximum Thermal Resistance, Junction to Case	$R_{\theta JC}$	4.0	°C/W
Lead Temperature for Soldering Purposes: 1/8″ from Case for 5 seconds	T_L	260	°C

(1) UL Recognized mounting method is per Figure 9.
(2) Proper strike and creepage distance must be provided.

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Preferred devices are Motorola recommended choices for future use and best overall value.

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ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Maximum Instantaneous Forward Voltage (3) (i_F = 20 Amp, T_C = 25°C) (i_F = 20 Amp, T_C = 125°C) (i_F = 10 Amp, T_C = 125°C)	v_F	 0.84 0.72 0.57	Volts
Maximum Instantaneous Reverse Current (3) (Rated DC Voltage, T_C = 25°C) (Rated DC Voltage, T_C = 125°C)	i_R	 0.1 15	mA

(3) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2.0%

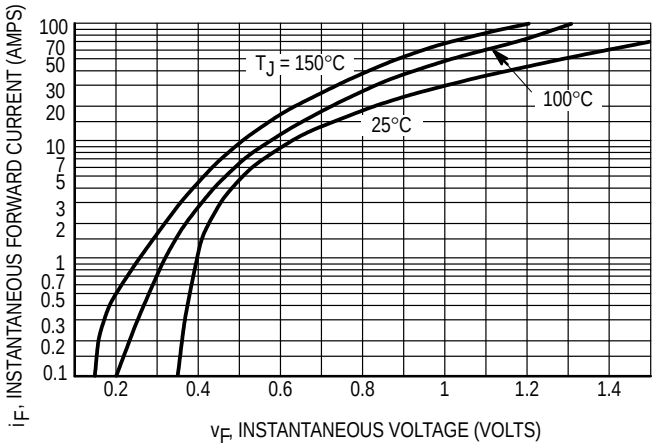


Figure 1. Maximum Forward Voltage

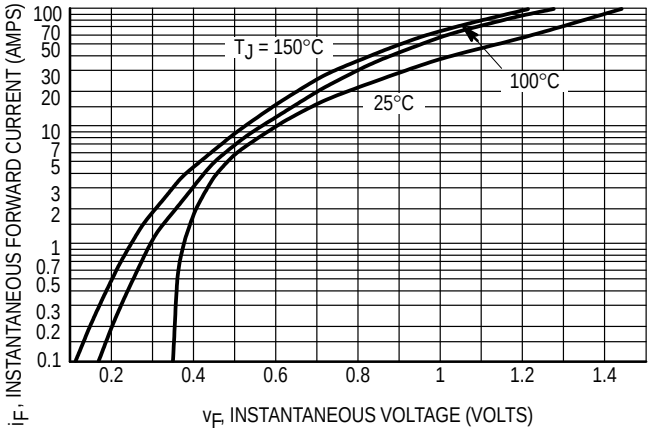


Figure 2. Typical Forward Voltage

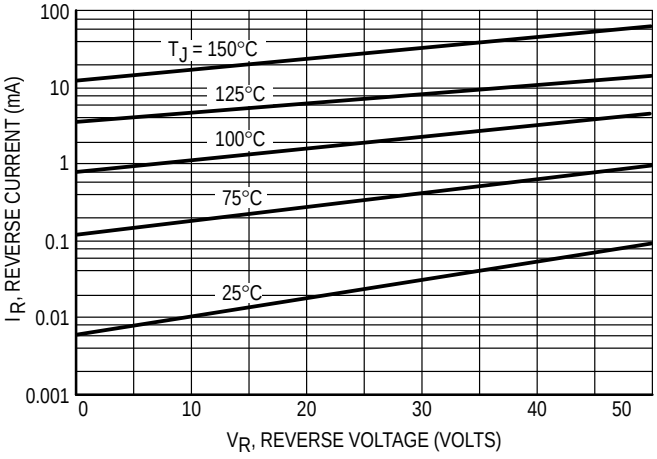


Figure 3. Maximum Reverse Current

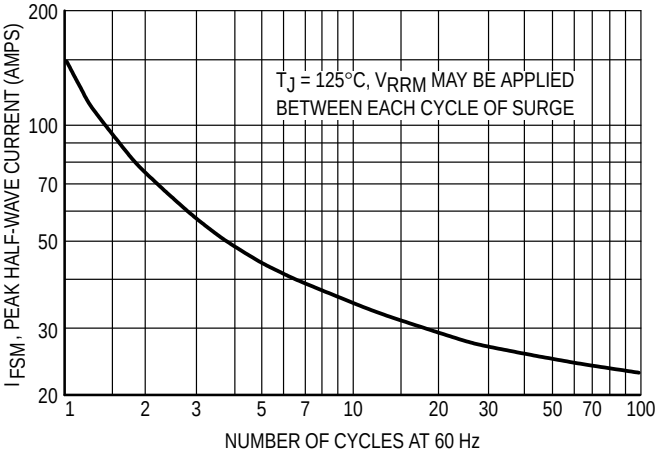


Figure 4. Maximum Surge Capability

HIGH FREQUENCY OPERATION

Since current flow in a Schottky rectifier is the result of majority carrier conduction, it is not subject to junction diode forward and reverse recovery transients due to minority carrier injection and stored charge. Satisfactory circuit analysis work may be performed by using a model consisting of an ideal diode in parallel with a variable capacitance. (See Figure 5.)

Rectification efficiency measurements show that operation will be satisfactory up to several megahertz. For example, relative waveform rectification efficiency is approximately 70 percent at 2.0 MHz, e.g., the ratio of dc power to RMS power in the load is 0.28 at this frequency, whereas perfect rectification would yield 0.406 for sine wave inputs. However, in contrast to ordinary junction diodes, the loss in waveform efficiency is not indicative of power loss; it is simply a result of reverse current flow through the diode capacitance, which lowers the dc output voltage.

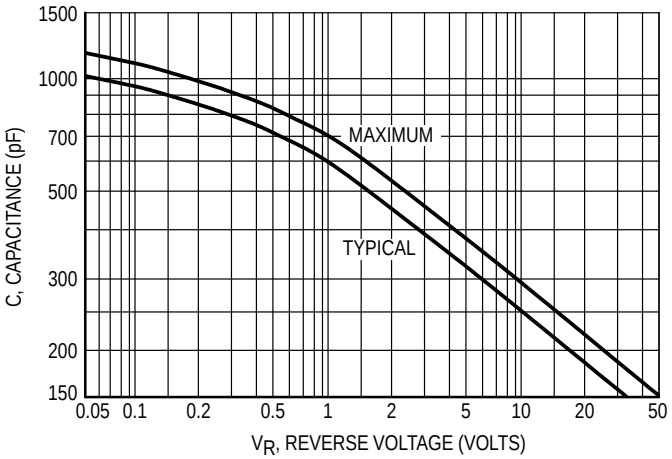


Figure 5. Capacitance

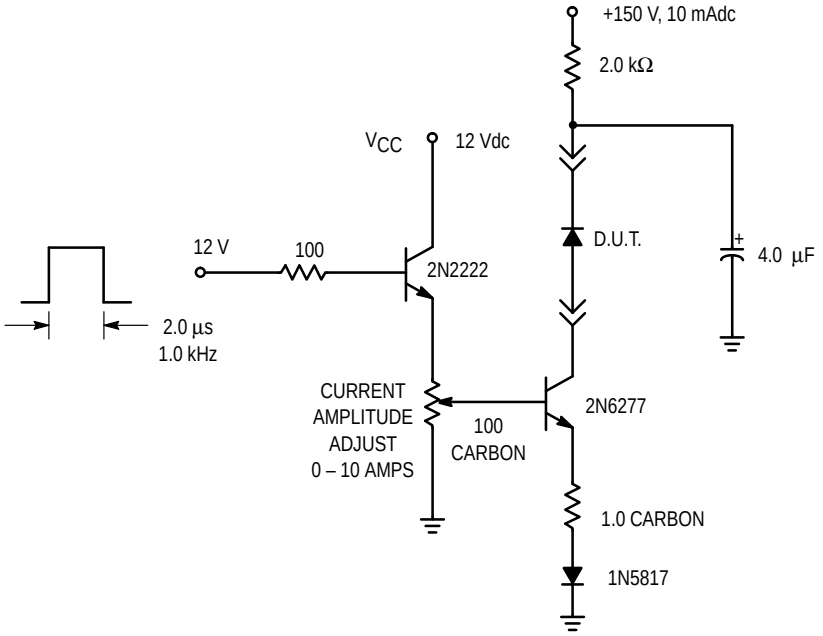


Figure 6. Test Circuit for dv/dt and Reverse Surge Current

TEST CONDITIONS FOR ISOLATION TESTS*

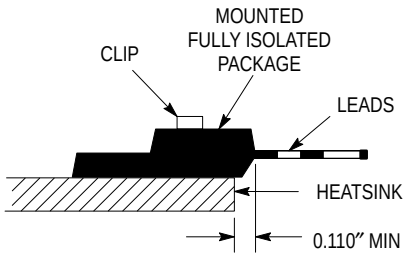


Figure 7. Clip Mounting Position for Isolation Test Number 1

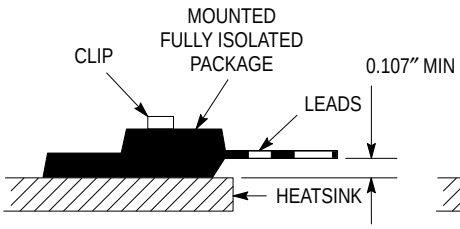


Figure 8. Clip Mounting Position for Isolation Test Number 2

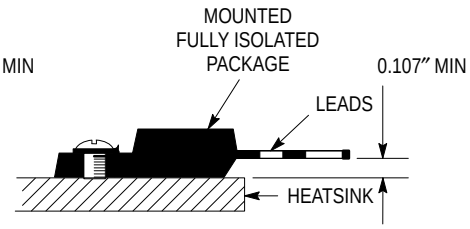
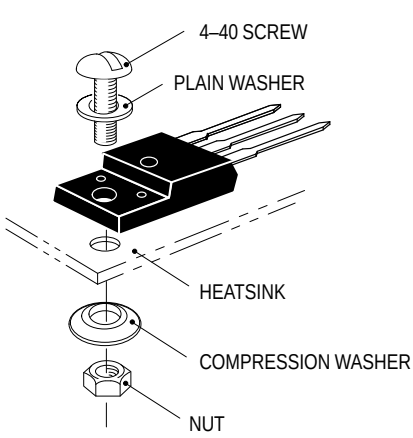


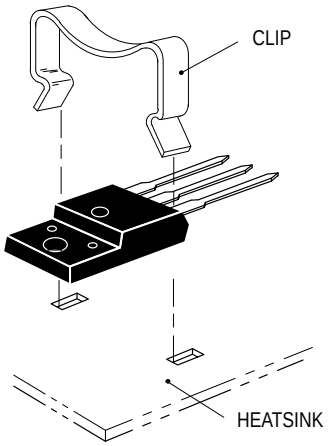
Figure 9. Screw Mounting Position for Isolation Test Number 3

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

MOUNTING INFORMATION**



10a. Screw–Mounted



10b. Clip–Mounted

Figure 10. Typical Mounting Techniques

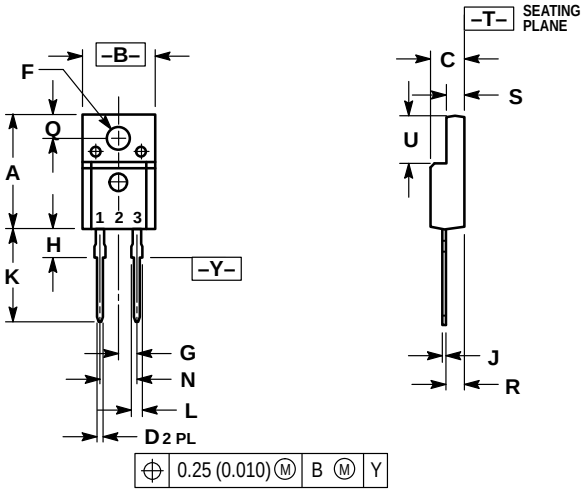
Laboratory tests on a limited number of samples indicate, when using the screw and compression washer mounting technique, a screw torque of 6 to 8 in · lbs is sufficient to provide maximum power dissipation capability. The compression washer helps to maintain a constant pressure on the package over time 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, Motorola 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



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.621	0.629	15.78	15.97
B	0.394	0.402	10.01	10.21
C	0.181	0.189	4.60	4.80
D	0.026	0.034	0.67	0.86
F	0.121	0.129	3.08	3.27
G	0.100 BSC		2.54 BSC	
H	0.123	0.129	3.13	3.27
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.14	1.52
N	0.200 BSC		5.08 BSC	
Q	0.126	0.134	3.21	3.40
R	0.107	0.111	2.72	2.81
S	0.096	0.104	2.44	2.64
U	0.259	0.267	6.58	6.78

STYLE 1:
PIN 1. CATHODE
2. N/A
3. ANODE

CASE 221E–01
ISSUE O

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