

# MBR2045CT

Preferred Device

## SWITCHMODE™ Power Rectifier

These state-of-the-art devices use the Schottky Barrier principle with a platinum barrier metal.

### Features

- Guardring for Stress Protection
- Low Forward Voltage
- 175°C Operating Junction Temperature
- Epoxy Meets UL 94, V-0 @ 0.125 in
- Pb-Free Package is Available\*

### 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

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage	$V_{RRM}$	45	V
Working Peak Reverse Voltage	$V_{RWM}$		
DC Blocking Voltage	$V_R$		
Average Rectified Forward Current (Rated $V_R$ , $T_C = 135^\circ\text{C}$ )	$I_{F(AV)}$	20	A
Peak Repetitive Forward Current per Diode Leg (Rated $V_R$ , Square Wave, 20 kHz, $T_C = 135^\circ\text{C}$ )	$I_{FRM}$	20	A
Non-Repetitive Peak Surge Current (Surge Applied at Rated Load Condi- tions Halfwave, Single Phase, 60 Hz)	$I_{FSM}$	150	A
Peak Repetitive Reverse Surge Current (2.0 $\mu\text{s}$ , 1.0 kHz) See Figure 11	$I_{RRM}$	1.0	A
Storage Temperature Range	$T_{stg}$	-65 to +175	°C
Operating Junction Temperature (Note 1)	$T_J$	-65 to +175	°C
Voltage Rate of Change (Rated $V_R$ )	dv/dt	1000	V/ $\mu\text{s}$

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. The heat generated must be less than the thermal conductivity from Junction-to-Ambient:  $dP_J/dT_J < 1/R_{\theta JA}$ .

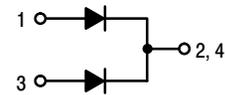
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



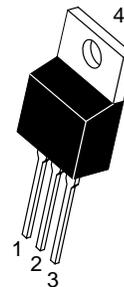
ON Semiconductor®

<http://onsemi.com>

## SCHOTTKY BARRIER RECTIFIER 20 AMPERES, 45 VOLTS



### MARKING DIAGRAM



TO-220AB  
CASE 221A  
PLASTIC



A = Assembly Location  
Y = Year  
W = Work Week  
MBR2045 = Device Code  
G = Pb-Free Package  
AKA = Diode Polarity

### ORDERING INFORMATION

Device	Package	Shipping
MBR2045CT	TO-220	50 Units / Rail
MBR2045CTG	TO-220 (Pb-Free)	50 Units / Rail

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

# MBR2045CT

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Maximum Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2.0	$^{\circ}C/W$

## ELECTRICAL CHARACTERISTICS

Maximum Instantaneous Forward Voltage (Note 2) ( $i_F = 10$ Amps, $T_C = 125^{\circ}C$ ) ( $i_F = 20$ Amps, $T_C = 125^{\circ}C$ ) ( $i_F = 20$ Amps, $T_C = 25^{\circ}C$ )	$V_F$	0.57 0.72 0.84	V
Maximum Instantaneous Reverse Current (Note 2) (Rated dc Voltage, $T_C = 125^{\circ}C$ ) (Rated dc Voltage, $T_C = 25^{\circ}C$ )	$i_R$	15 0.1	mA

2. Pulse Test: Pulse Width = 300  $\mu s$ , Duty Cycle  $\leq 2.0\%$ .

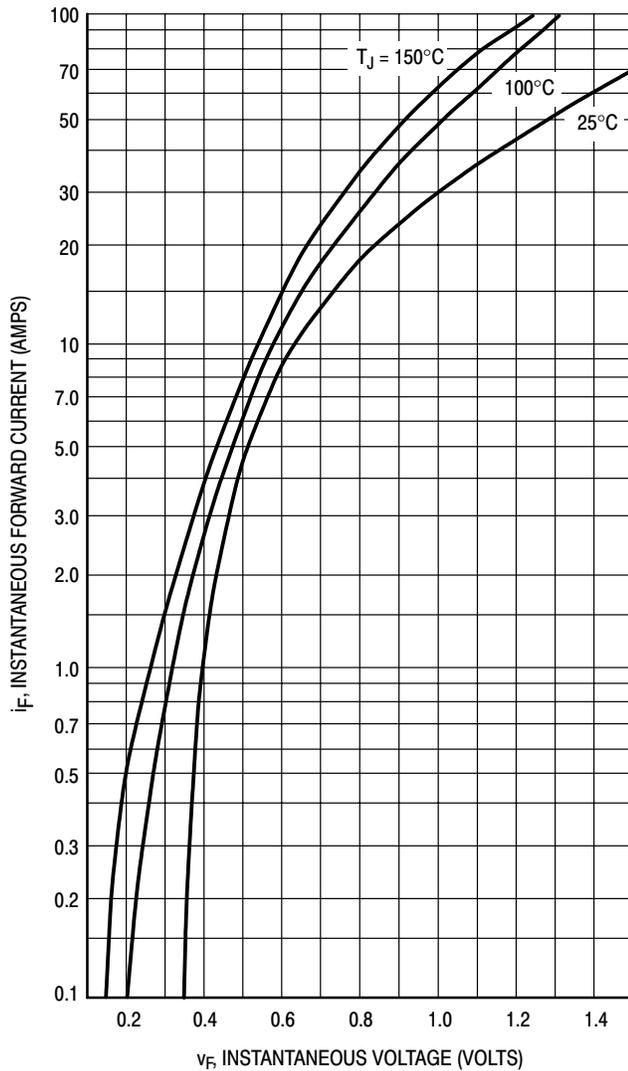


Figure 1. Maximum Forward Voltage

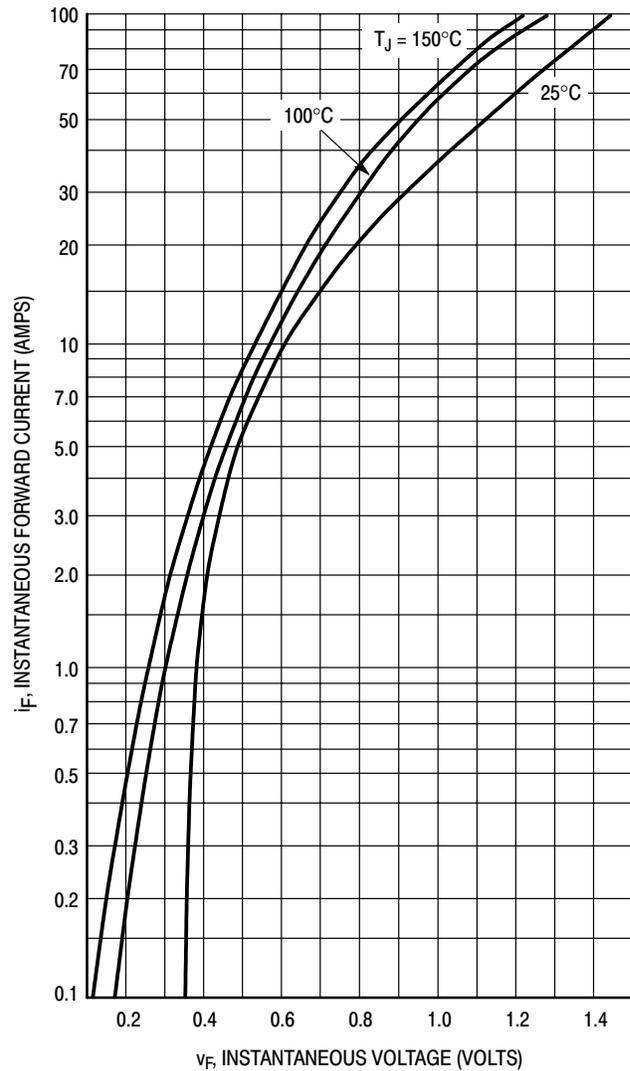


Figure 2. Typical Forward Voltage

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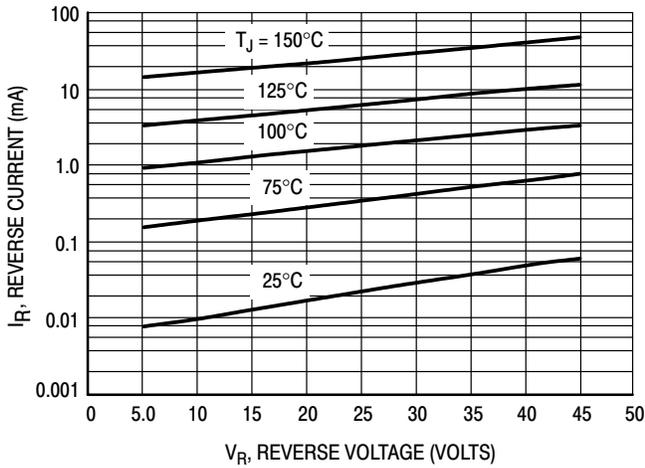


Figure 3. Maximum Reverse Current

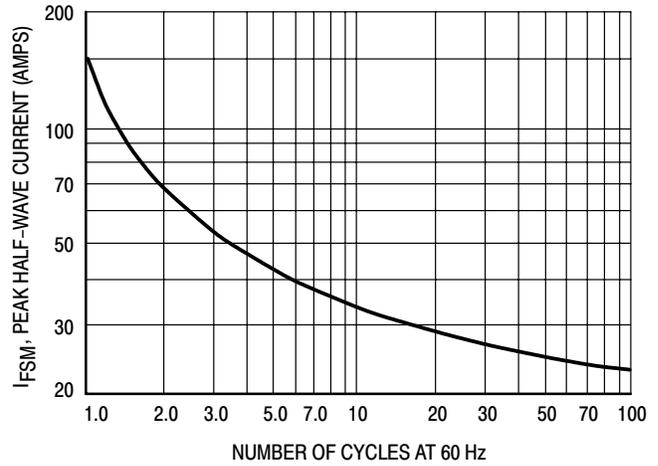


Figure 4. Maximum Surge Capability

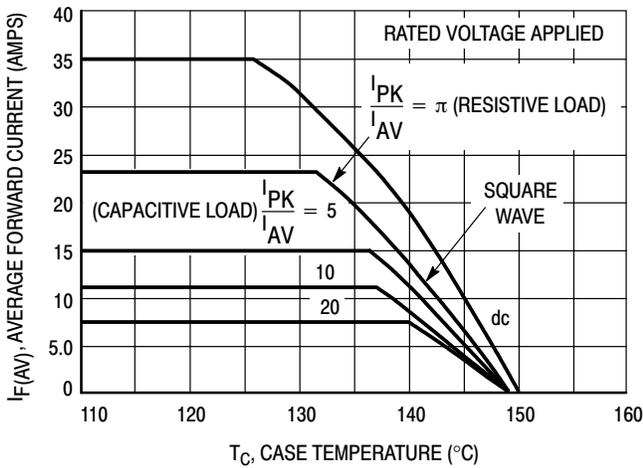


Figure 5. Current Derating, Infinite Heatsink

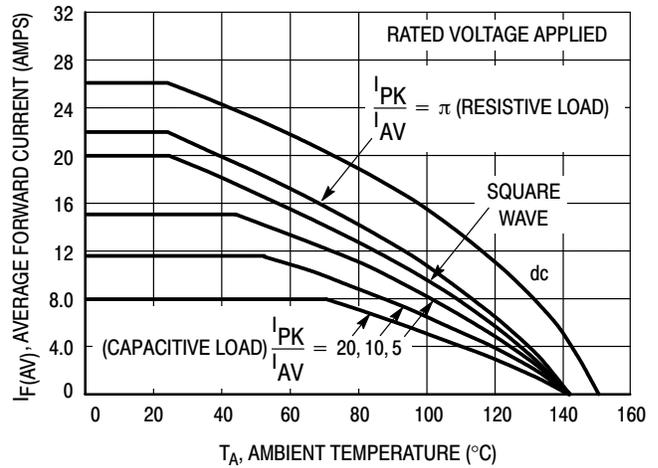


Figure 6. Current Derating,  $R_{\theta JA} = 16^{\circ}\text{C/W}$

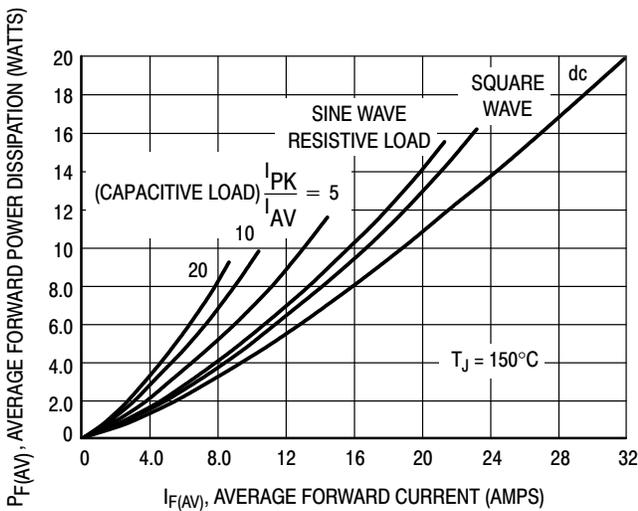


Figure 7. Forward Power Dissipation

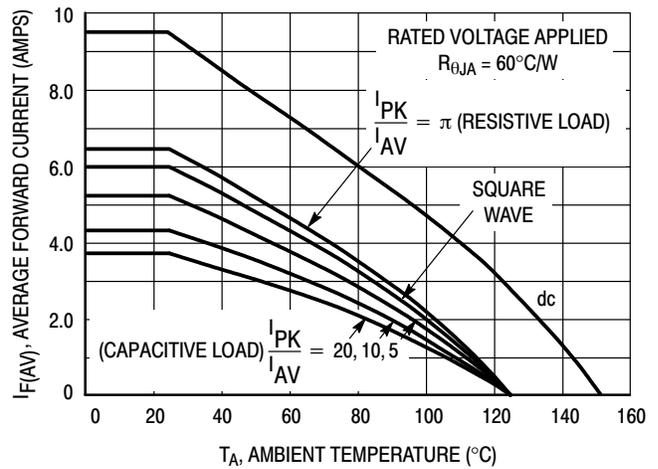


Figure 8. Current Derating, Free Air

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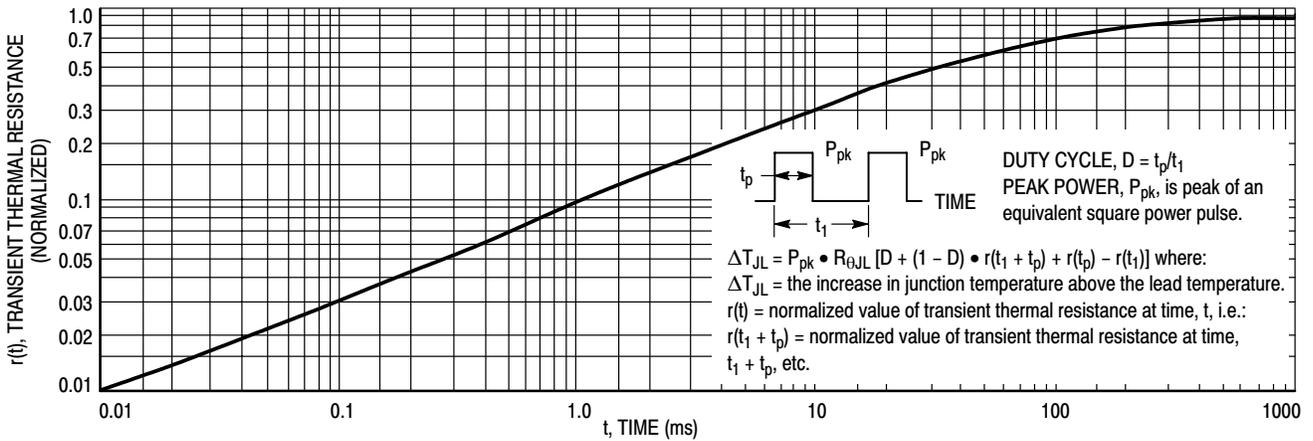


Figure 9. Thermal Response

## 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 10.)

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.

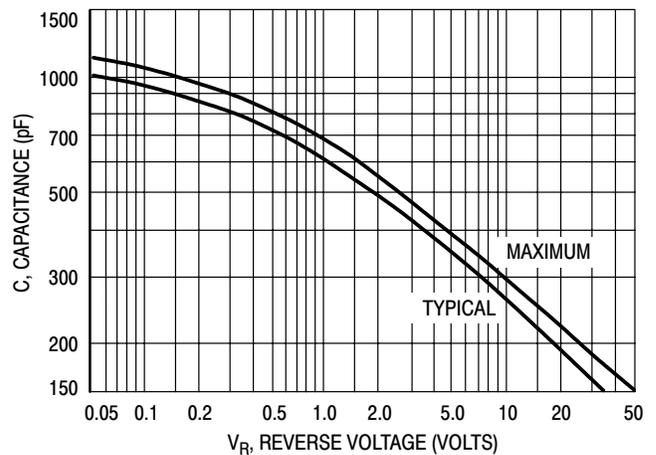


Figure 10. Capacitance

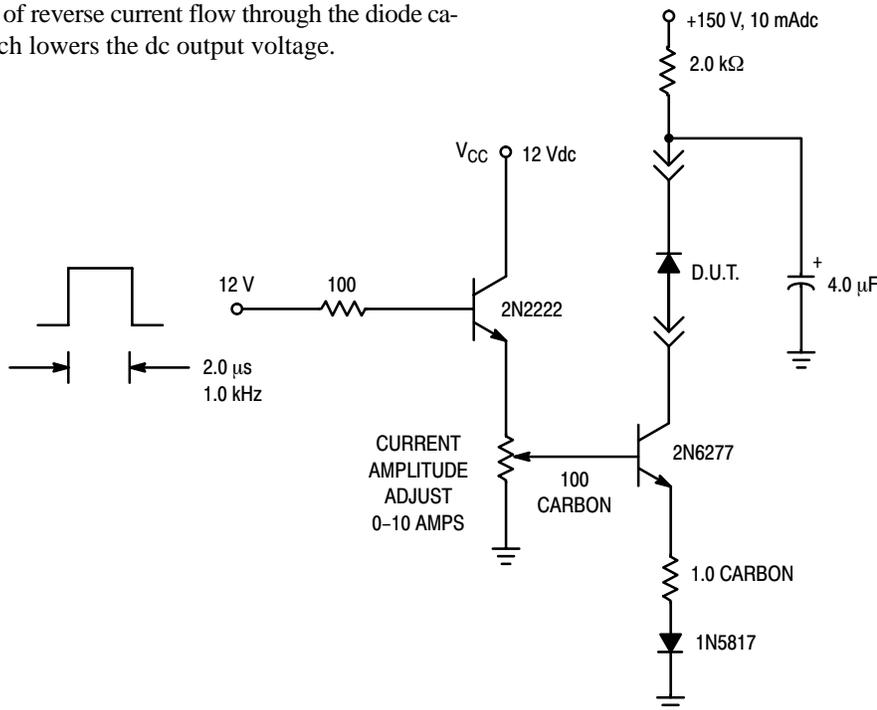
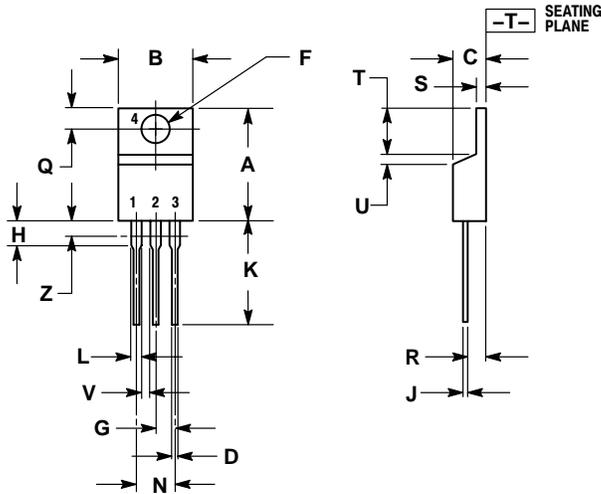


Figure 11. Test Circuit for  $dv/dt$  and Reverse Surge Current

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## PACKAGE DIMENSIONS

TO-220  
CASE 221A-09  
ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
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	1.39
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

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