

# MBR2045CT, MBRF2045CT

## SWITCHMODE™ Power Rectifier

### Features and Benefits

- Low Forward Voltage
- Low Power Loss / High Efficiency
- High Surge Capacity
- 175°C Operating Junction Temperature
- 20 A Total (10 A Per Diode Leg)
- Pb-Free Package is Available\*

### Applications

- Power Supply – Output Rectification
- Power Management
- Instrumentation

### Mechanical Characteristics

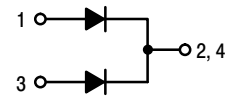
- Case: Epoxy, Molded
- Epoxy Meets UL 94, V-0 @ 0.125 in
- Weight: 1.9 Grams (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- ESD Rating: Human Body Model = 3B  
Machine Model = C



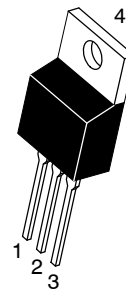
**ON Semiconductor®**

<http://onsemi.com>

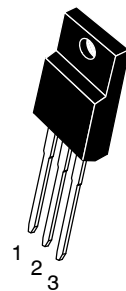
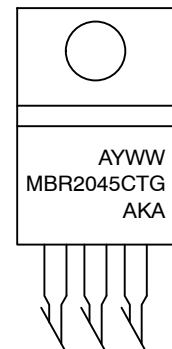
## SCHOTTKY BARRIER RECTIFIER 20 AMPERES, 45 VOLTS



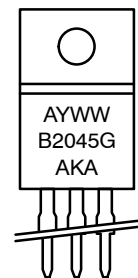
### MARKING DIAGRAMS



TO-220AB  
CASE 221A  
STYLE 6



TO-220 FULLPAK  
CASE 221D  
STYLE 3



A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package  
AKA = Diode Polarity

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

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# MBR2045CT, MBRF2045CT

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	$V_{RRM}$ $V_{RWM}$ $V_R$	45	V
Average Rectified Forward Current Per Device Per Diode ( $T_C = 165^\circ\text{C}$ )	$I_{F(AV)}$	20 10	A
Peak Repetitive Forward Current per Diode Leg (Square Wave, 20 kHz, $T_C = 163^\circ\text{C}$ )	$I_{FRM}$	20	A
Non-Repetitive Peak Surge Current (Surge Applied at Rated Load Conditions Halfwave, Single Phase, 60 Hz)	$I_{FSM}$	150	A
Peak Repetitive Reverse Surge Current (2.0 $\mu\text{s}$ , 1.0 kHz) See Figure 13	$I_{RRM}$	1.0	A
Storage Temperature Range	$T_{stg}$	-65 to +175	$^\circ\text{C}$
Operating Junction Temperature (Note 1)	$T_J$	-65 to +175	$^\circ\text{C}$
Voltage Rate of Change (Rated $V_R$ )	dv/dt	10,000	V/ $\mu\text{s}$

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

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Maximum Thermal Resistance (MBR2045CT) - Junction-to-Case - Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	2.0 60	$^\circ\text{C}/\text{W}$
(MBRF2045CT) - Junction-to-Case - Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	4.75 75	

## ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Forward Voltage (Note 2) ( $i_F = 10$ Amps, $T_J = 125^\circ\text{C}$ ) ( $i_F = 20$ Amps, $T_J = 125^\circ\text{C}$ ) ( $i_F = 20$ Amps, $T_J = 25^\circ\text{C}$ )	$V_F$	- - -	0.50 0.67 0.71	0.57 0.72 0.84	V
Instantaneous Reverse Current (Note 2) (Rated dc Voltage, $T_J = 125^\circ\text{C}$ ) (Rated dc Voltage, $T_J = 25^\circ\text{C}$ )	$i_R$	- -	10.4 0.02	15 0.1	mA

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

## DEVICE ORDERING INFORMATION

Device Order Number	Package Type	Shipping <sup>†</sup>
MBR2045CT	TO-220	50 Units / Rail
MBR2045CTG	TO-220 (Pb-Free)	50 Units / Rail
MBRF2045CTG	TO-220FP (Pb-Free)	50 Units / Rail

# MBR2045CT, MBRF2045CT

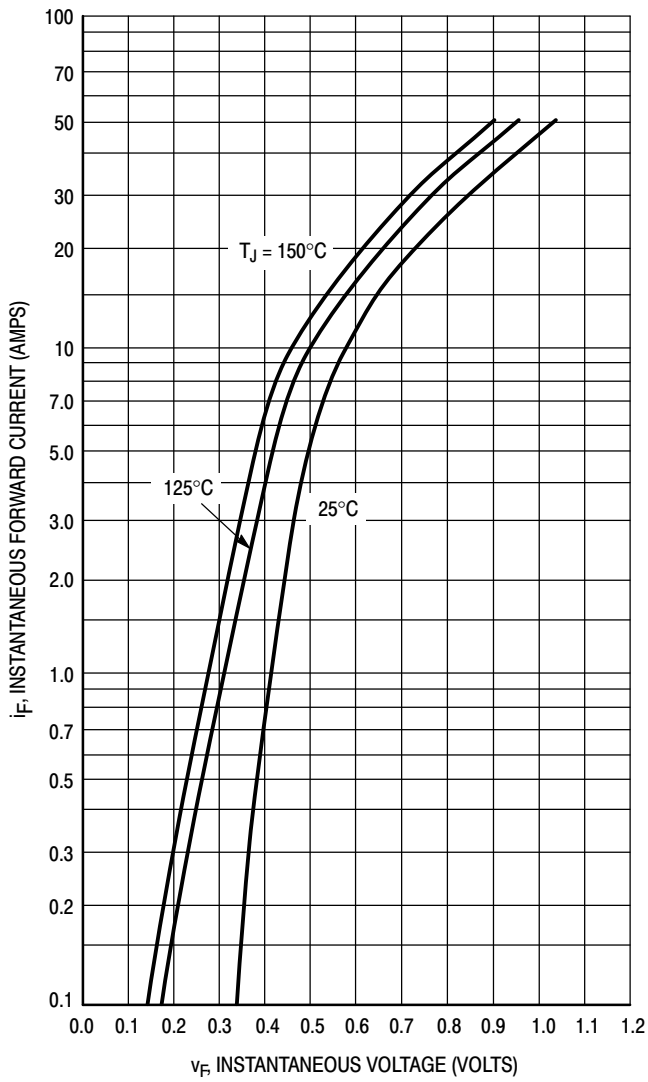


Figure 1. Typical Forward Voltage

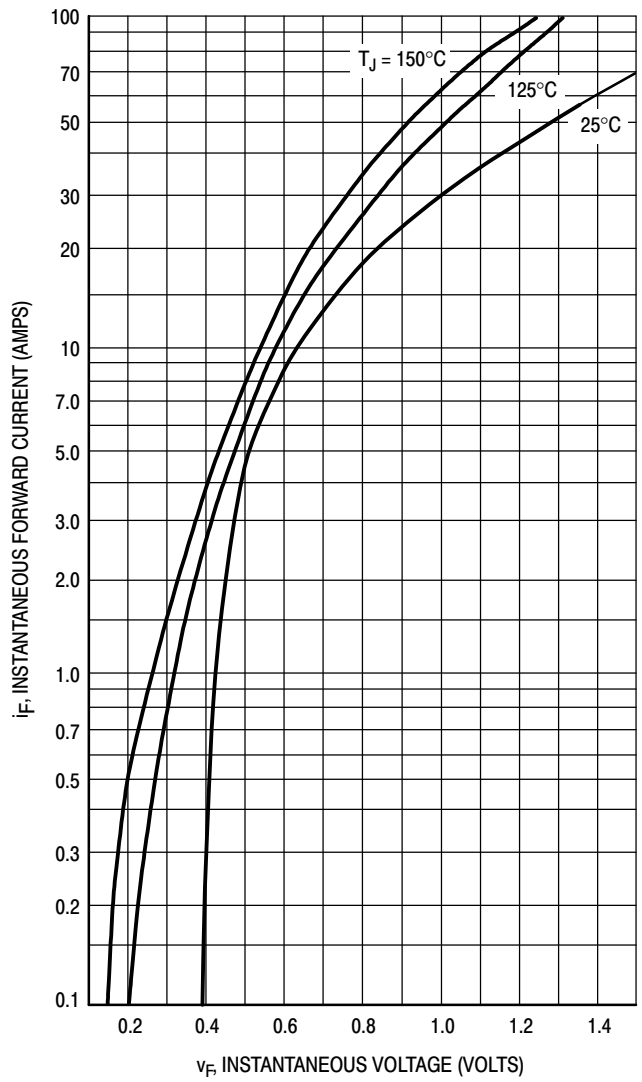


Figure 2. Maximum Forward Voltage

# MBR2045CT, MBRF2045CT

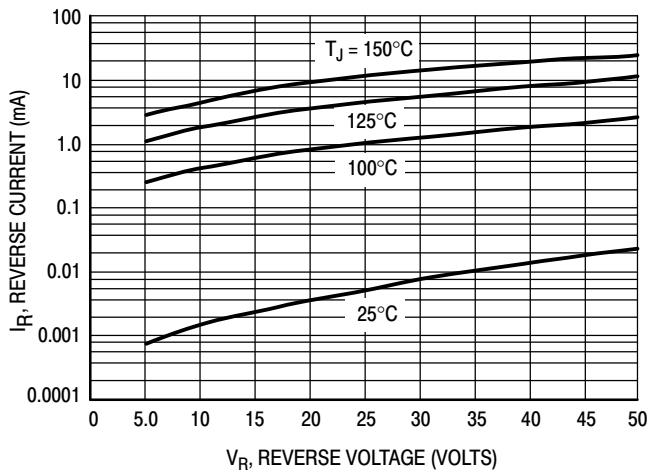


Figure 3. Typical Reverse Current

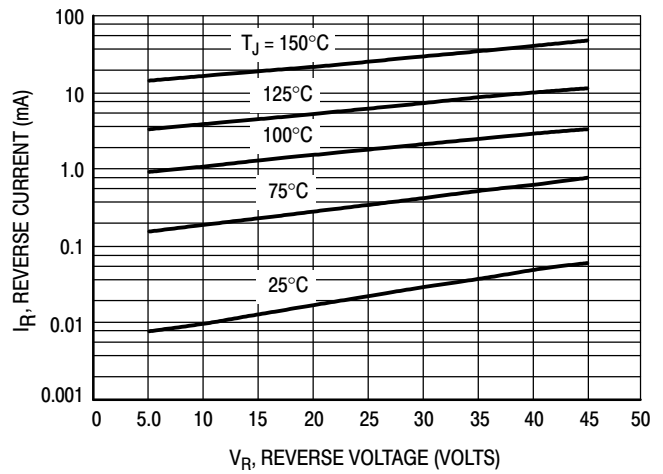


Figure 4. Maximum Reverse Current

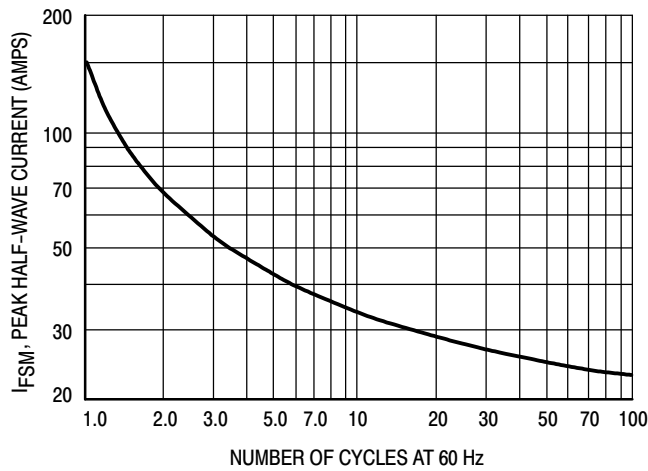


Figure 5. Maximum Surge Capability

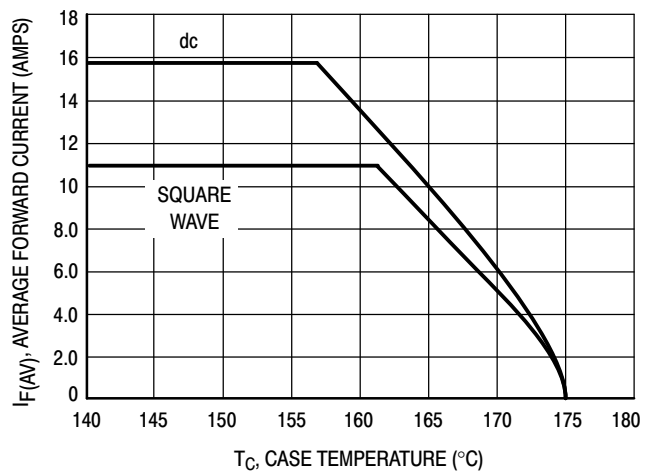


Figure 6. Current Derating, Case, Per Leg

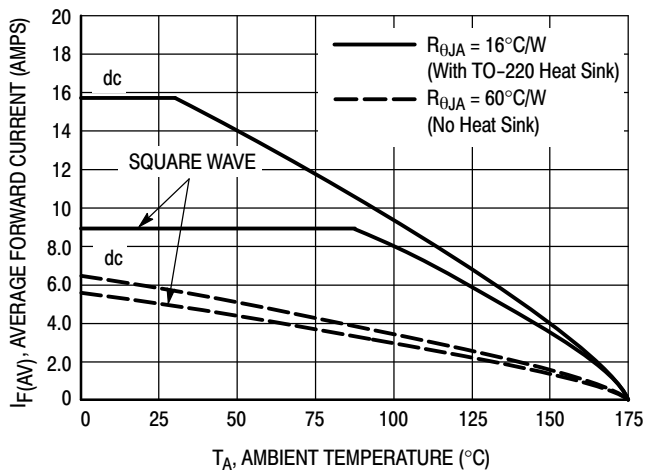


Figure 7. Current Derating, Ambient, Per Leg

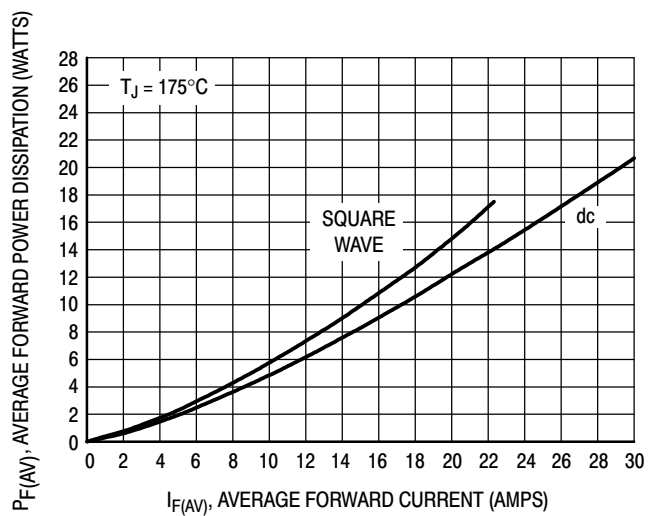


Figure 8. Forward Power Dissipation

# MBR2045CT, MBRF2045CT

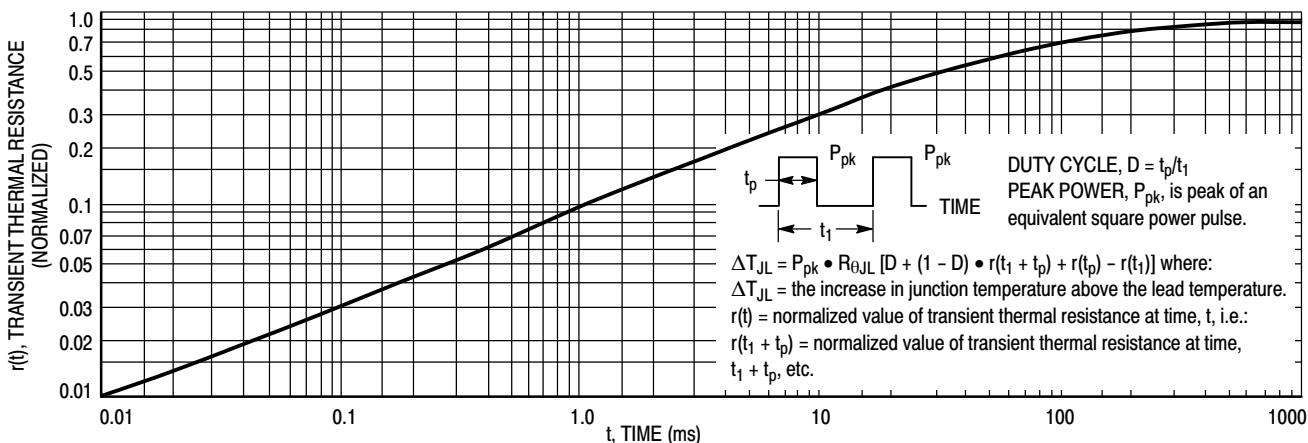


Figure 9. Thermal Response for MBR2045CT

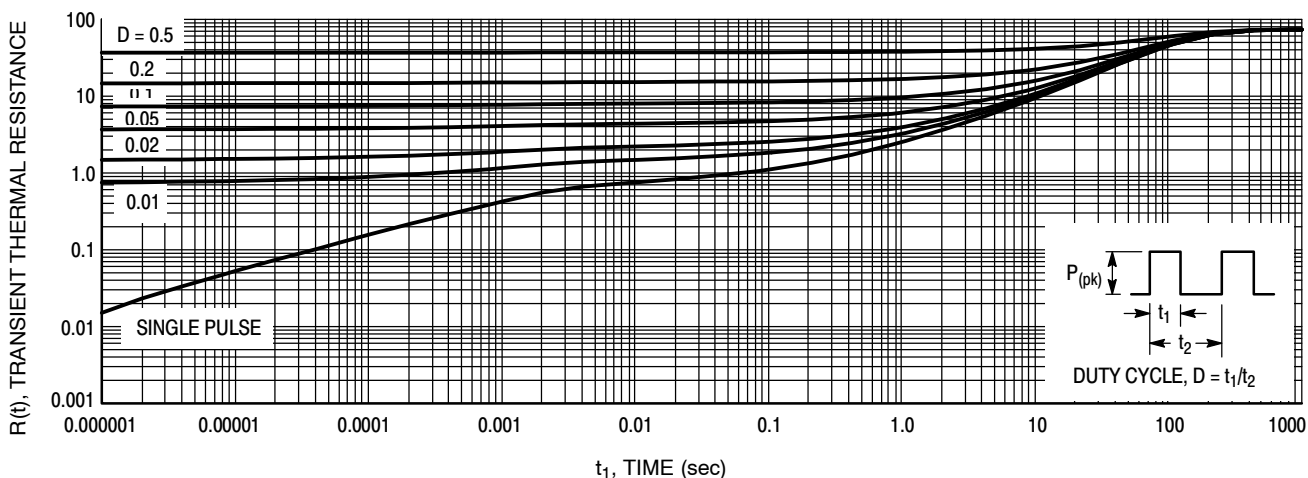


Figure 10. Thermal Response Junction-to-Ambient for MBRF2045CT

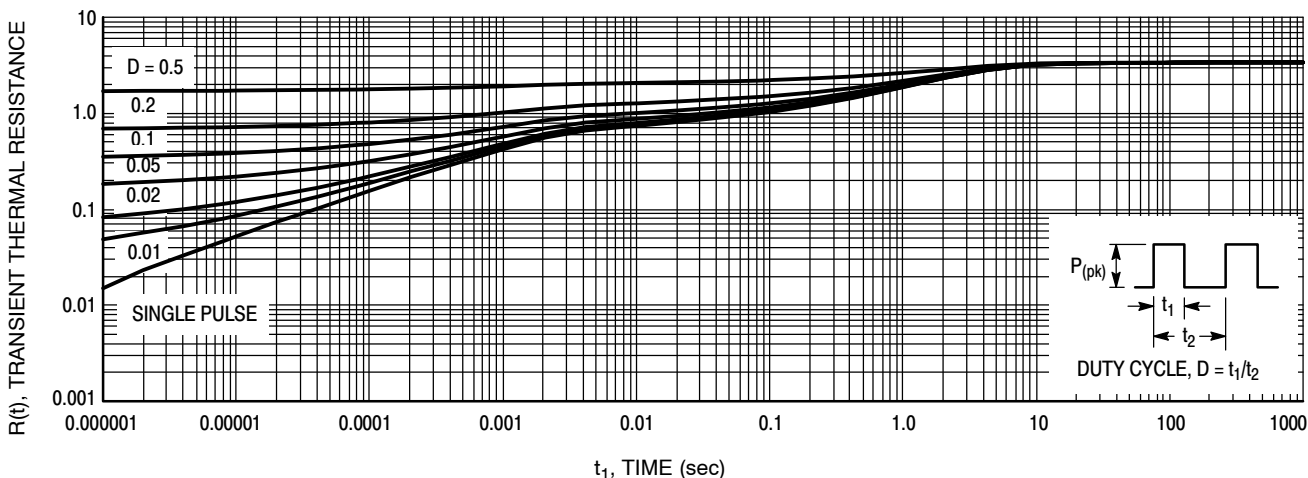


Figure 11. Thermal Response Junction-to-Case for MBRF2045CT

# MBR2045CT, MBRF2045CT

## 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 12.)

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.

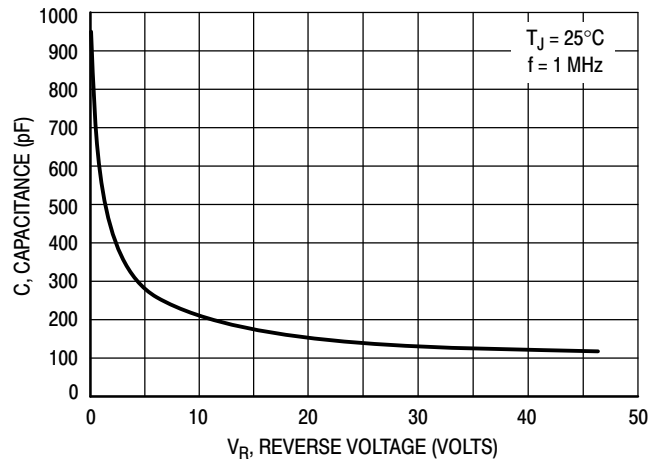


Figure 12. Typical Capacitance

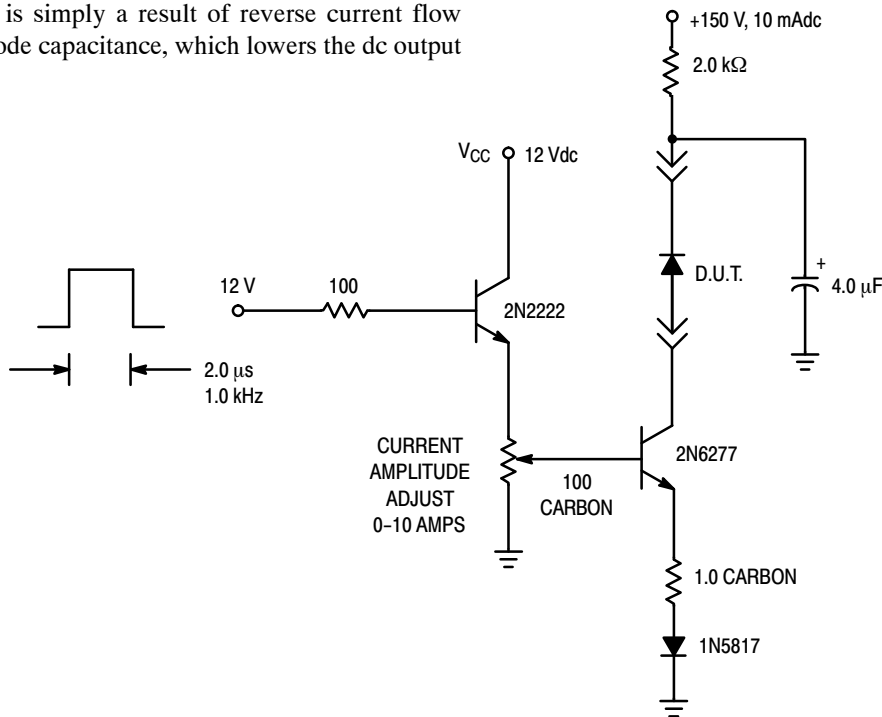
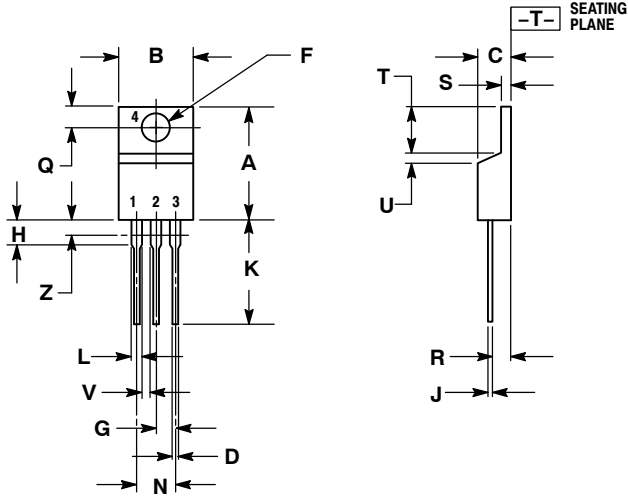


Figure 13. Test Circuit for dv/dt and Reverse Surge Current

# MBR2045CT, MBRF2045CT

## PACKAGE DIMENSIONS

TO-220  
CASE 221A-09  
ISSUE AF



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	0.161	3.61	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.014	0.025	0.36	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

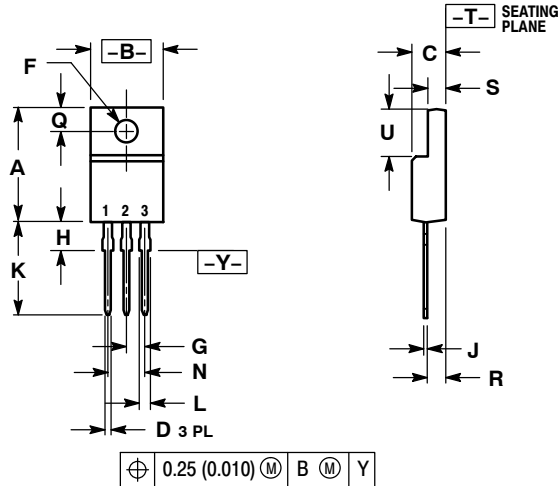
STYLE 6:

- PIN 1. ANODE
- CATHODE
- ANODE
- CATHODE

# MBR2045CT, MBRF2045CT

## PACKAGE DIMENSIONS

TO-220 FULLPAK  
CASE 221D-03  
ISSUE J



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.

DIM	INCHES		MILLIMETERS	
	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 3:

1. ANODE
2. CATHODE
3. ANODE

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