Switch-mode Power Rectifier

MBR2045CTG, MBRF2045CTG

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SCHOTTKY BARRIER RECTIFIER
20 AMPERES, 45 VOLTS

Features and Benefits

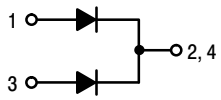
- Low Forward Voltage
- Low Power Loss / High Efficiency
- High Surge Capacity
- 175°C Operating Junction Temperature
- 20 A Total (10 A Per Diode Leg)
- These Devices are Pb−Free and are RoHS Compliant

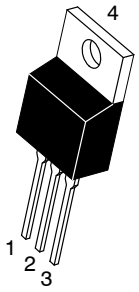
Applications

- Power Supply − Output Rectification
- Power Management
- Instrumentation

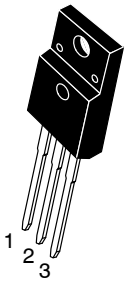
Mechanical Characteristics

- 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





TO−220AB
CASE 221A
STYLE 6



TO−220
FULLPAK™
CASE 221D

DEVICE MARKING INFORMATION

See general marking information in the device marking section on page 2 of this data sheet.

ORDERING INFORMATION

See detailed ordering and shipping information on page 3 of this data sheet.

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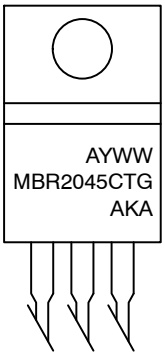

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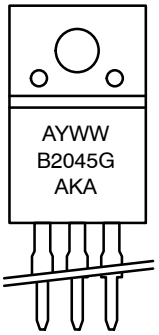

TO−220 FULLPAK™

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

Figure 1. Marking Diagrams

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°C)	$I_{F(AV)}$	 20 10	A
Peak Repetitive Forward Current per Diode Leg (Square Wave, 20 kHz, T_C = 163°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 μs, 1.0 kHz) See Figure 13	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	10,000	V/μs

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.

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				°C/W
(MBR2045CTG)	− Junction−to−Case	$R_{\theta JC}$	2.0	
	− Junction−to−Ambient	$R_{\theta JA}$	60	
(MBRF2045CTG)	− Junction−to−Case	$R_{\theta JC}$	4.75	
	− Junction−to−Ambient	$R_{\theta JA}$	75	

ELECTRICAL CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Instantaneous Forward Voltage (Note 2)	v_F				V
(i_F = 10 A, T_J = 125°C)		–	0.50	0.57	
(i_F = 20 A, T_J = 125°C)		–	0.67	0.72	
(i_F = 20 A, T_J = 25°C)		–	0.71	0.84	
Instantaneous Reverse Current (Note 2)	i_R				mA
(Rated dc Voltage, T_J = 125°C)		–	10.4	15	
(Rated dc Voltage, T_J = 25°C)		–	0.02	0.1	

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.

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

ORDERING INFORMATION

Device Order Number	Package Type	Shipping†
MBR2045CTG	TO−220 (Pb−Free)	50 Units / Rail
MBRF2045CTG	TO−220FP (Pb−Free)	50 Units / Rail

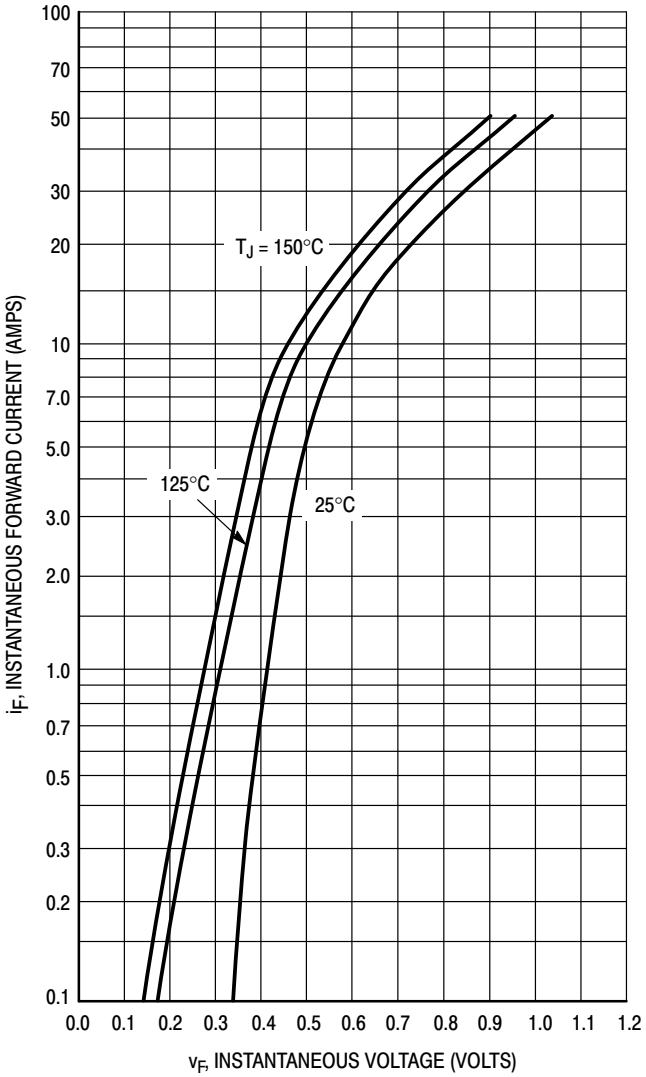

Figure 1. Typical Forward Voltage

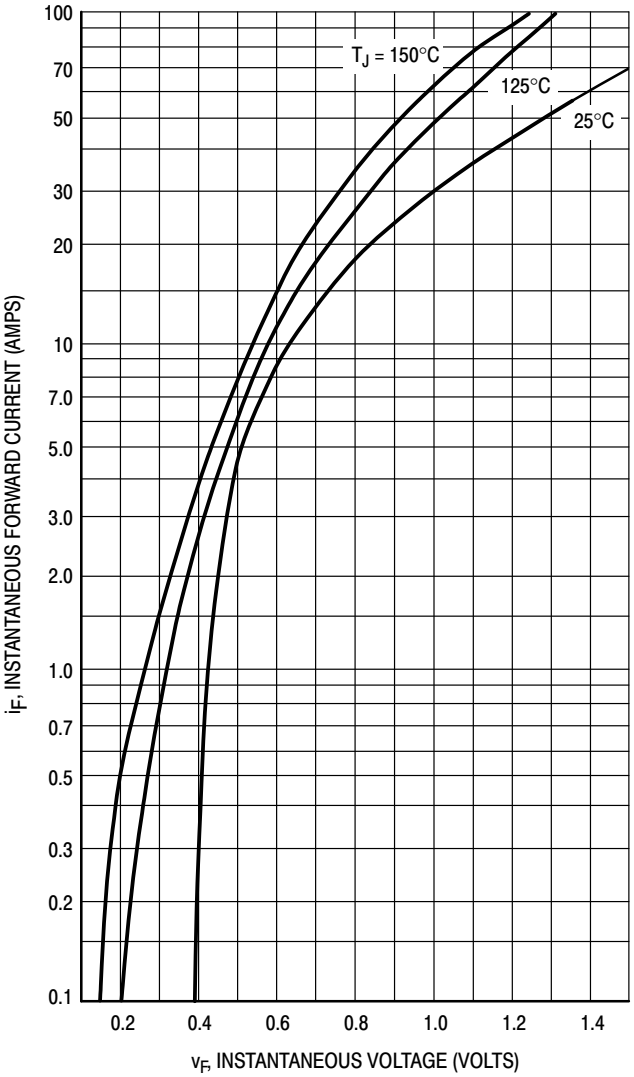

Figure 2. Maximum Forward Voltage

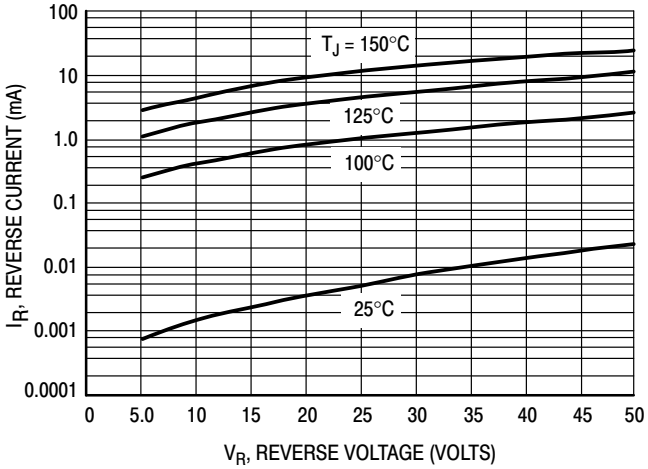

Figure 3. Typical Reverse Current

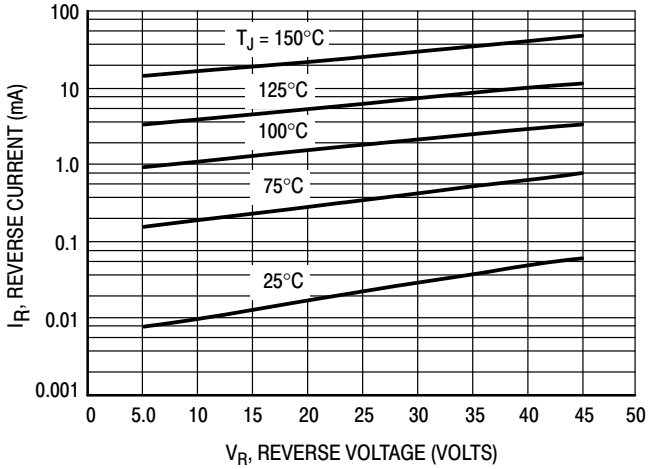

Figure 4. Maximum Reverse Current

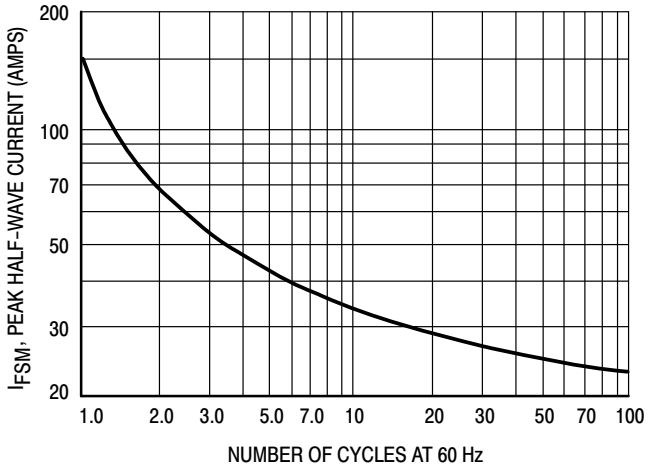

Figure 5. Maximum Surge Capability

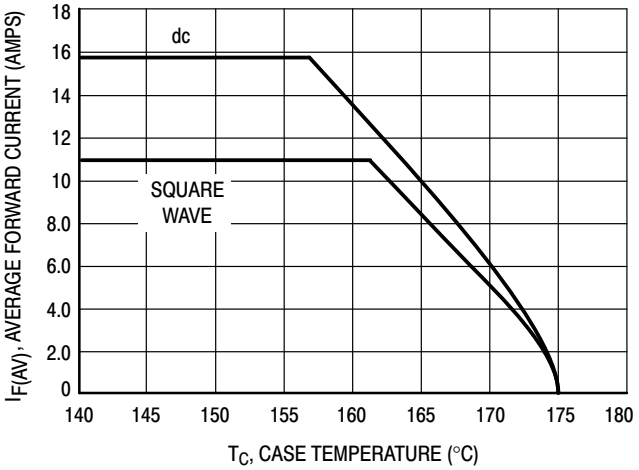

Figure 6. Current Derating, Case, Per Leg

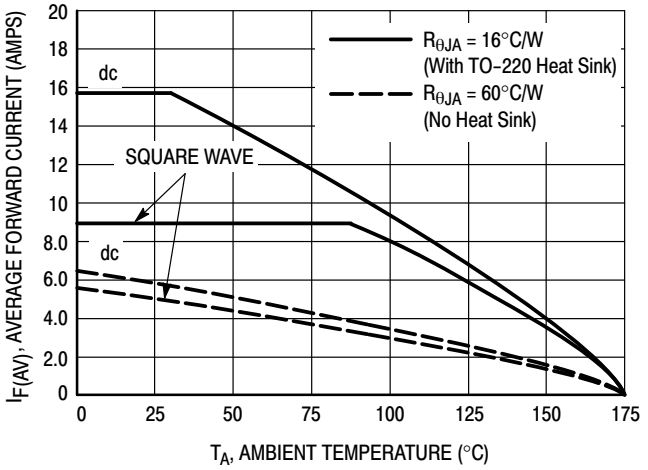

Figure 7. Current Derating, Ambient, Per Leg

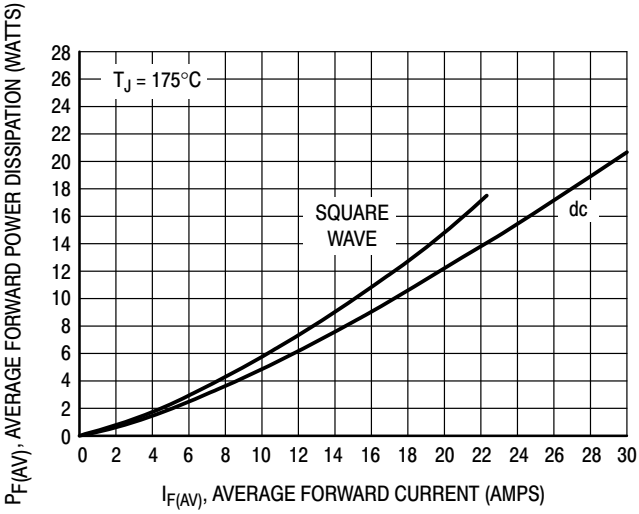

Figure 8. Forward Power Dissipation

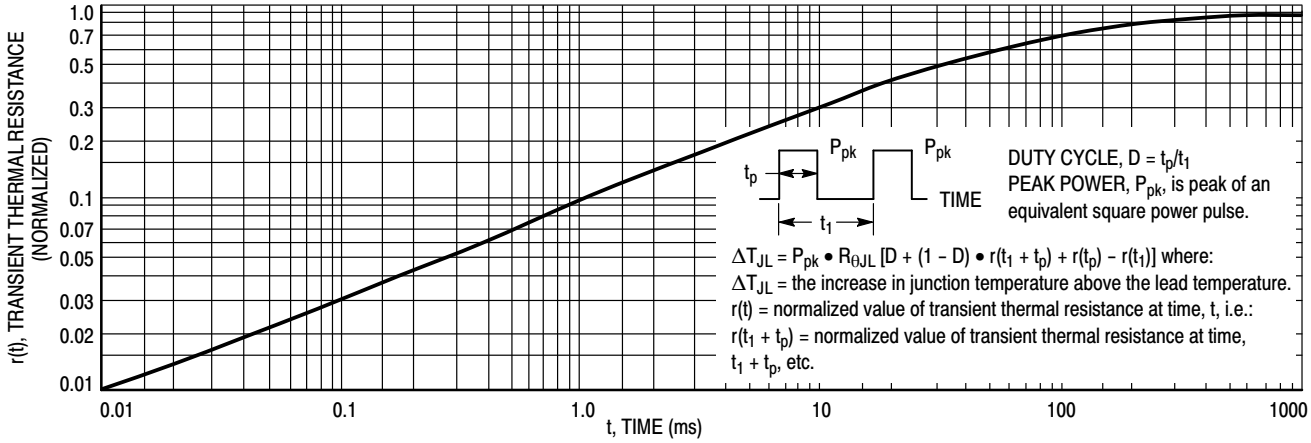

Figure 9. Thermal Response for MBR2045CT

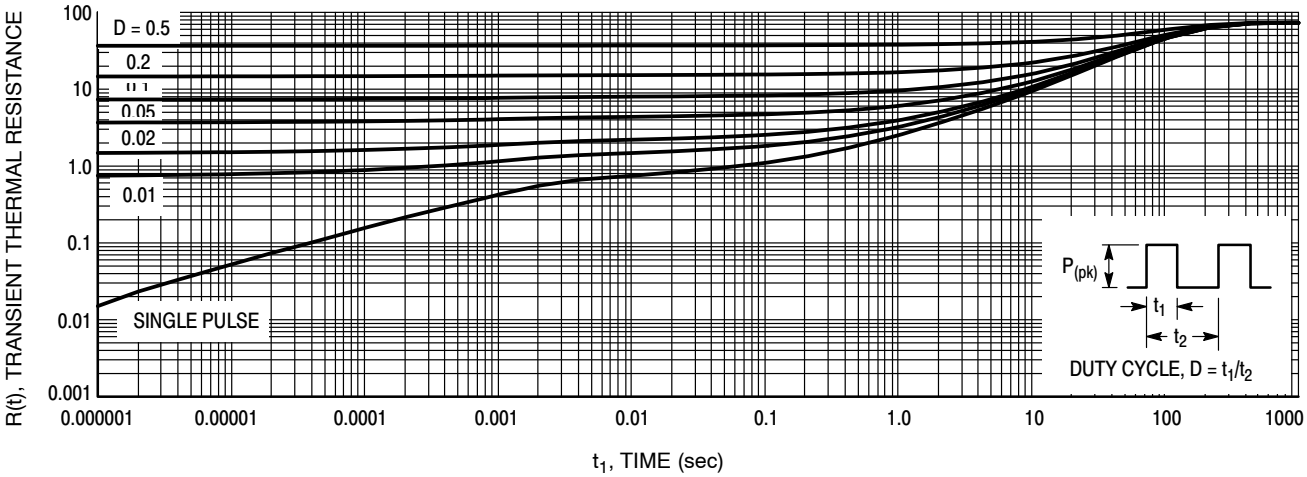

Figure 10. Thermal Response Junction−to−Ambient for MBRF2045CT

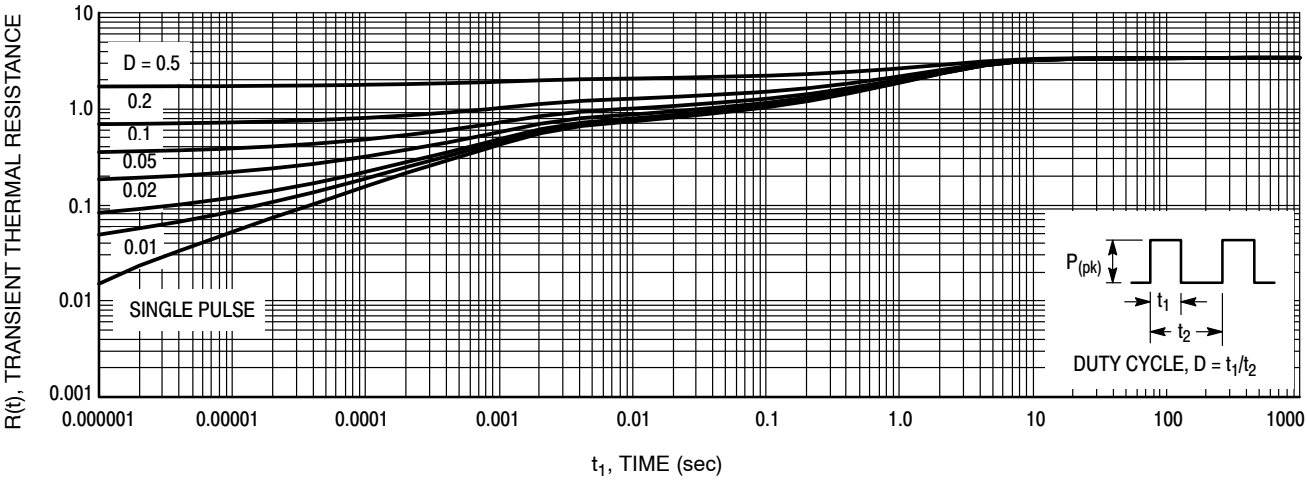

Figure 11. Thermal Response Junction−to−Case for MBRF2045CT

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.

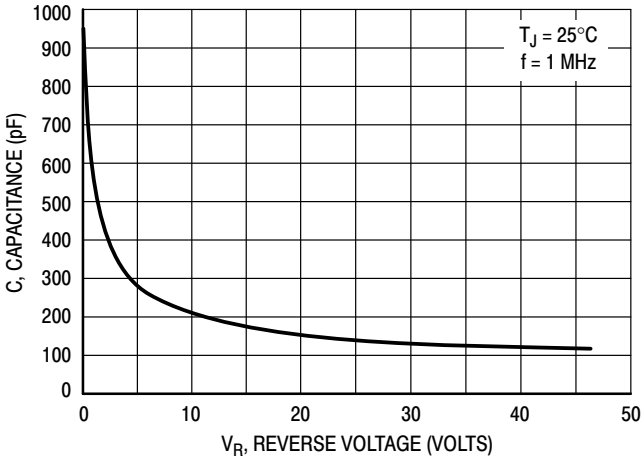

Figure 12. Typical Capacitance

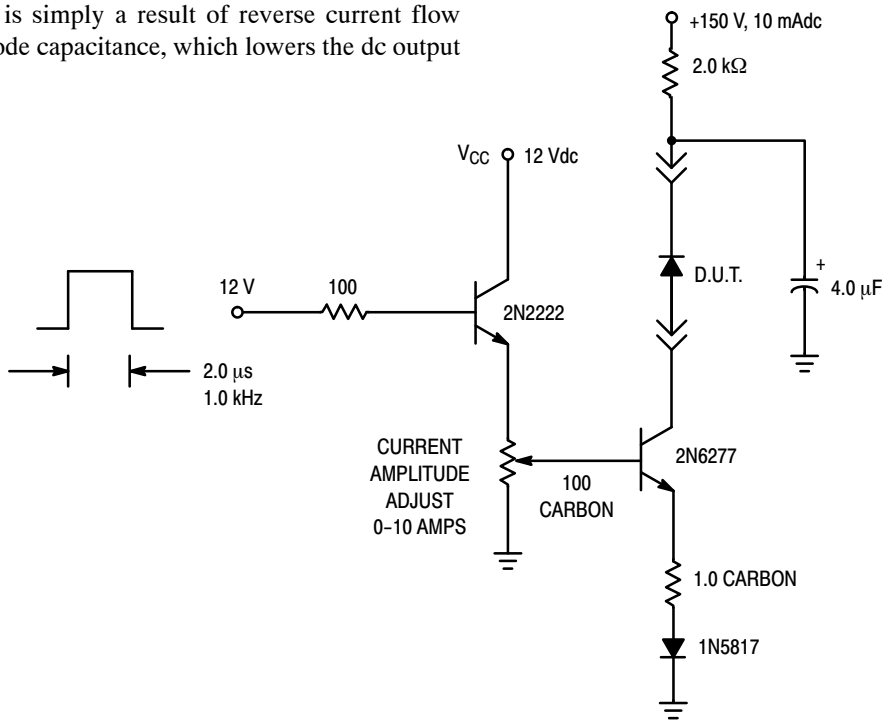

Figure 13. Test Circuit for dv/dt and Reverse Surge Current

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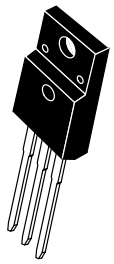
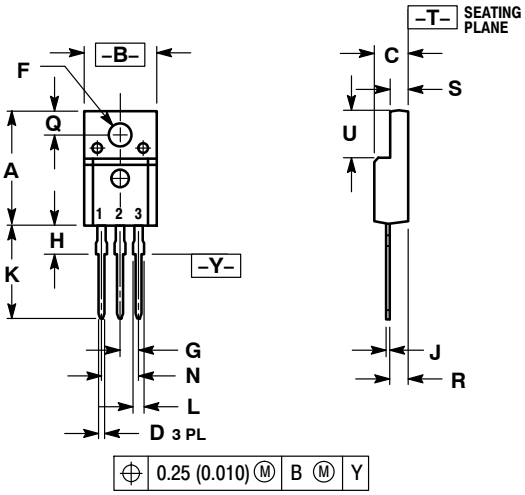


SCALE 1:1

TO−220 FULLPAK
CASE 221D−03
ISSUE K

DATE 27 FEB 2009



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 1:
PIN 1. GATE
2. DRAIN
3. SOURCE

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

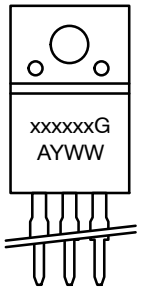
STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE

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

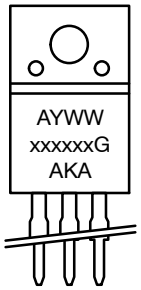
STYLE 5:
PIN 1. CATHODE
2. ANODE
3. GATE

STYLE 6:
PIN 1. MT 1
2. MT 2
3. GATE

MARKING DIAGRAMS



Bipolar



Rectifier

xxxxxx	= Specific Device Code
G	= Pb−Free Package
A	= Assembly Location
Y	= Year
WW	= Work Week

A	= Assembly Location
Y	= Year
WW	= Work Week
xxxxxx	= Device Code
G	= Pb−Free Package
AKA	= Polarity Designator

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