Switch-mode Power Rectifier 100 V, 30 A

MBR30H100CTG, MBRF30H100CTG

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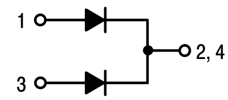
SCHOTTKY BARRIER RECTIFIER 30 AMPERES 100 VOLTS



Features and Benefits

- Low Forward Voltage: 0.67 V @ 125°C
- Low Power Loss/High Efficiency
- High Surge Capacity
- 175°C Operating Junction Temperature
- 30 A Total (15 A Per Diode Leg)
- These are Pb−Free Devices

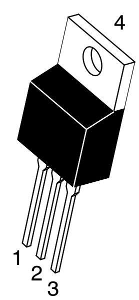
Applications

- Power Supply − Output Rectification
- Power Management
- Instrumentation

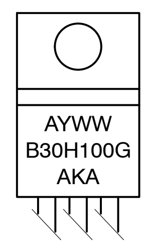
Mechanical Characteristics:

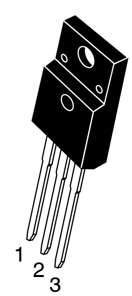
- Case: Epoxy, Molded
- Epoxy Meets UL 94 V−0 @ 0.125 in
- Weight: 1.9 Grams (Approximately)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes: 260°C Max. for 10 Seconds
- ESD Rating: Human Body Model = 3B
Machine Model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

MARKING DIAGRAMS

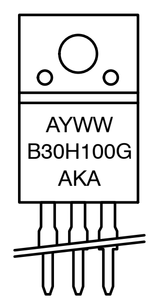


TO−220 CASE 221A STYLE 6





TO−220 FULLPAK CASE 221D



A	= Assembly Location
Y	= Year
WW	= Work Week
B30H100	= Device Code
G	= Pb−Free Package
AKA	= Polarity Designator

ORDERING INFORMATION

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

MAXIMUM RATINGS (Per Diode Leg)

Rating	Symbol	Value	Unit
Peak Repetitive Reverse Voltage Working Peak Reverse Voltage DC Blocking Voltage	V_{RRM} V_{RWM} V_R	100	V
Average Rectified Forward Current (T_C = 156°C) Per Diode Per Device	$I_{F(AV)}$	 15 30	A
Peak Repetitive Forward Current (Square Wave, 20 kHz, T_C = 151°C)	I_{FM}	30	A
Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz)	I_{FSM}	250	A
Operating Junction Temperature (Note 1)	T_J	+175	°C
Storage Temperature	T_{stg}	– 65 to +175	°C
Voltage Rate of Change (Rated V_R)	dv/dt	10,000	V/μs
Controlled Avalanche Energy (see test conditions in Figures 13 and 14)	W_{AVAL}	200	mJ
ESD Ratings: Machine Model = C Human Body Model = 3B		> 400 > 8000	V

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 (MBR30H100CTG) – Junction-to-Case – Junction-to-Ambient (MBRF30H100CTG) – Junction-to-Case – Junction-to-Ambient	 $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JC}$ $R_{\theta JA}$	 2.0 60 4.2 75	°C/W

ELECTRICAL CHARACTERISTICS (Per Diode Leg)

Characteristic	Symbol	Min	Typ	Max	Unit
Maximum Instantaneous Forward Voltage (Note 2) (i_F = 15 A, T_J = 25°C) (i_F = 15 A, T_J = 125°C) (i_F = 30 A, T_J = 25°C) (i_F = 30 A, T_J = 125°C)	v_F	 – – – –	 0.76 0.64 0.88 0.76	 0.80 0.67 0.93 0.80	V
Maximum Instantaneous Reverse Current (Note 2) (Rated DC Voltage, T_J = 125°C) (Rated DC Voltage, T_J = 25°C)	i_R	 – –	 1.1 0.0008	 6.0 0.0045	mA

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†
MBR30H100CTG	TO−220 (Pb−Free)	50 Units / Rail
MBRF30H100CTG	TO−220FP (Pb−Free)	50 Units / Rail

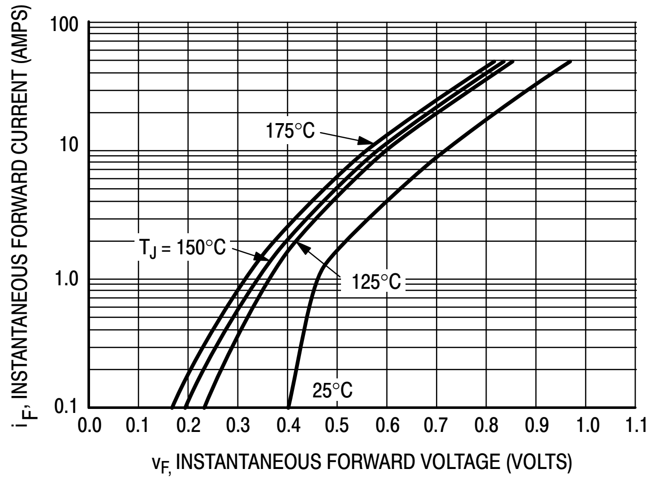


Figure 1. Typical Forward Voltage

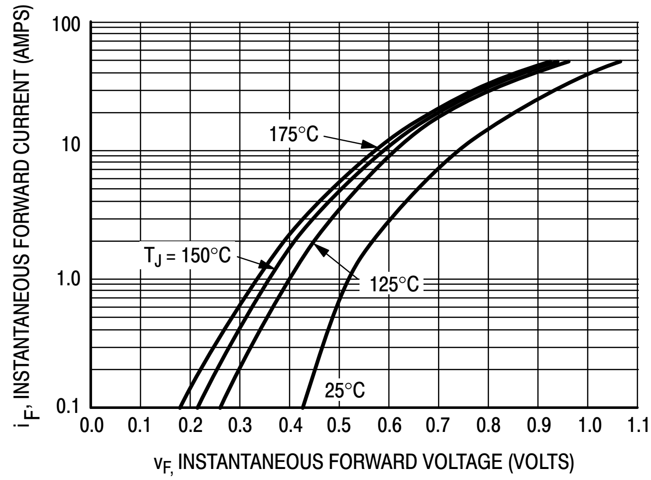


Figure 2. Maximum Forward Voltage

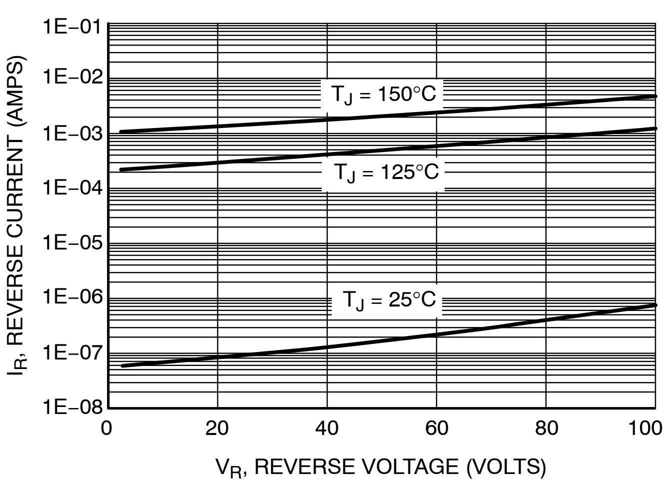


Figure 3. Typical Reverse Current

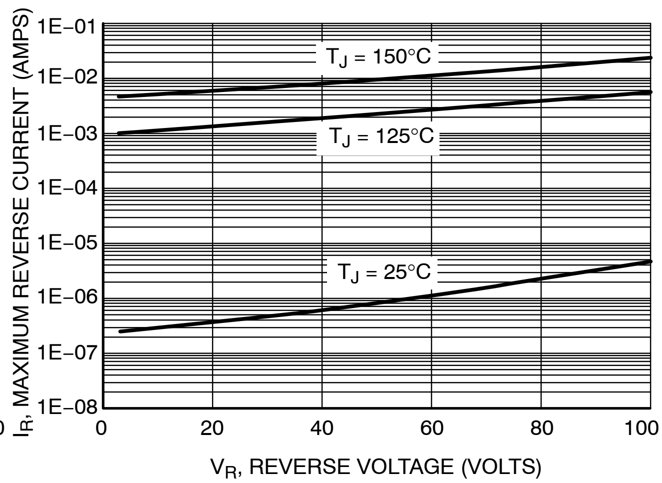


Figure 4. Maximum Reverse Current

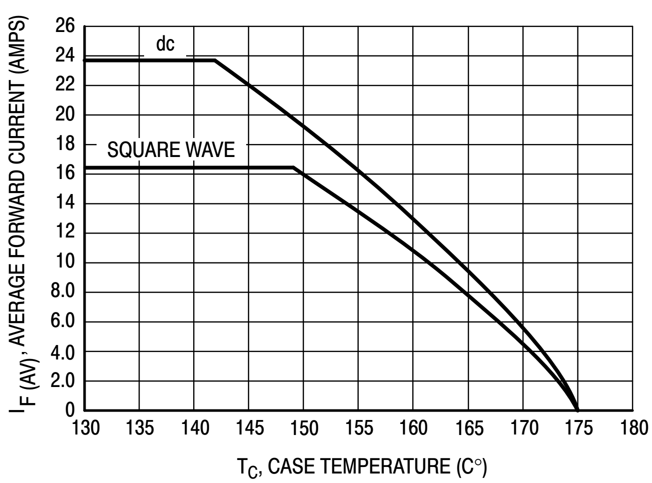


Figure 5. Current Derating, Case Per Leg

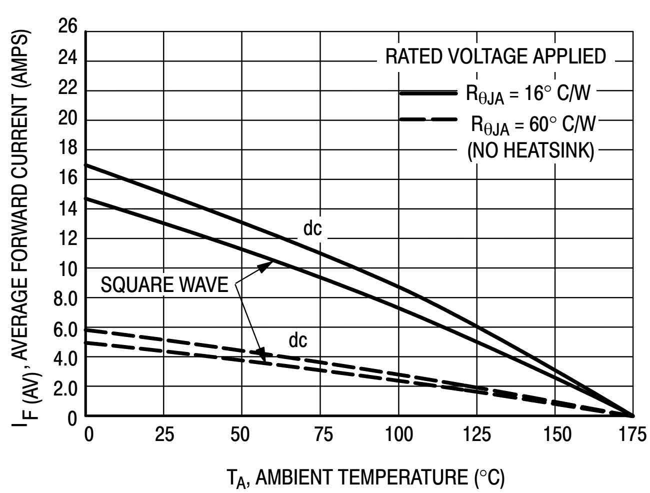


Figure 6. Current Derating, Ambient Per Leg

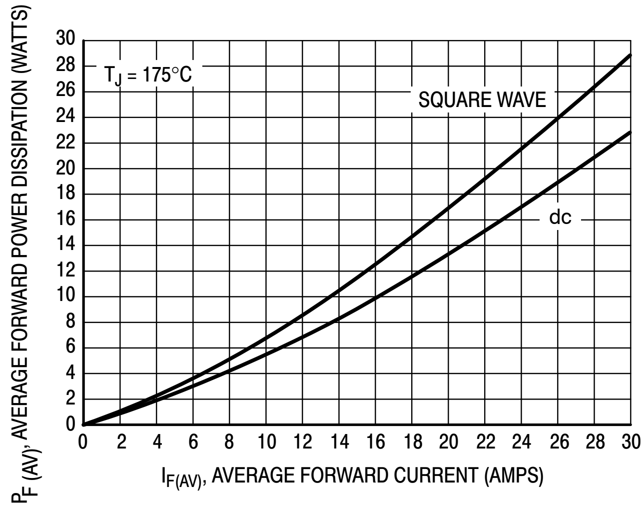


Figure 7. Forward Power Dissipation

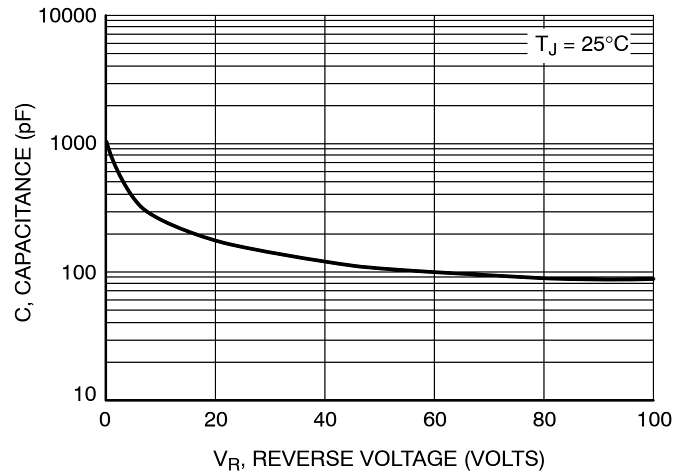


Figure 8. Capacitance

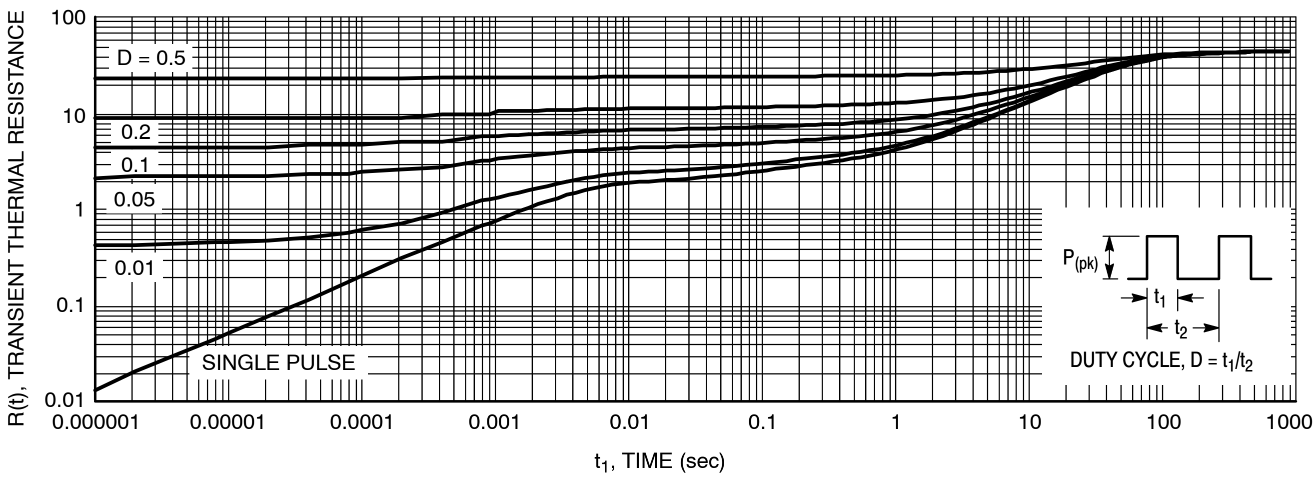


Figure 9. Thermal Response Junction−to−Ambient for MBR30H100CT

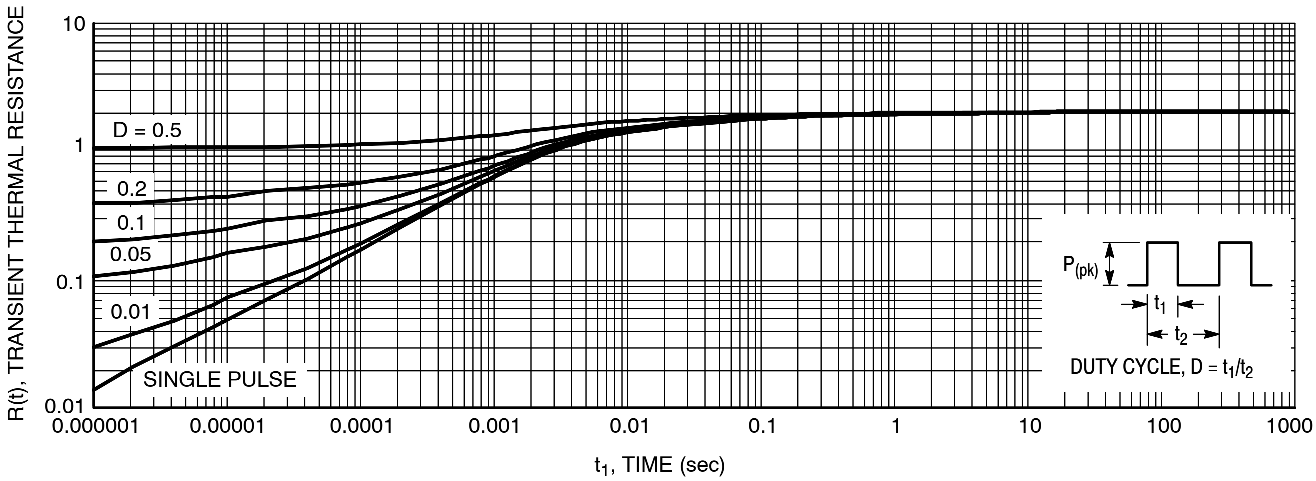


Figure 10. Thermal Response Junction−to−Case for MBR30H100CT

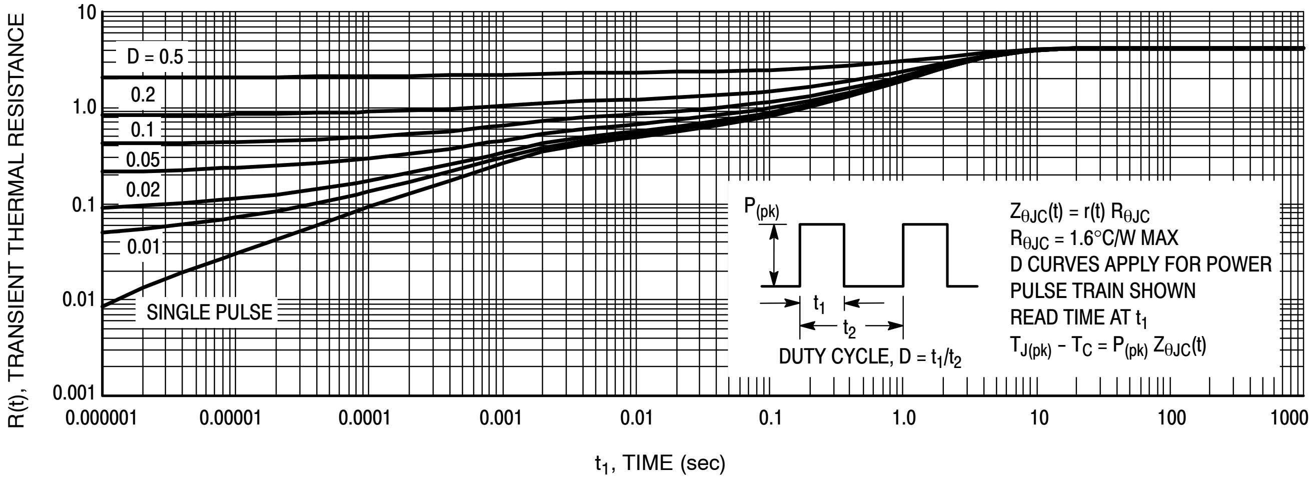


Figure 11. Thermal Response Junction−to−Case for MBRF30H100CT

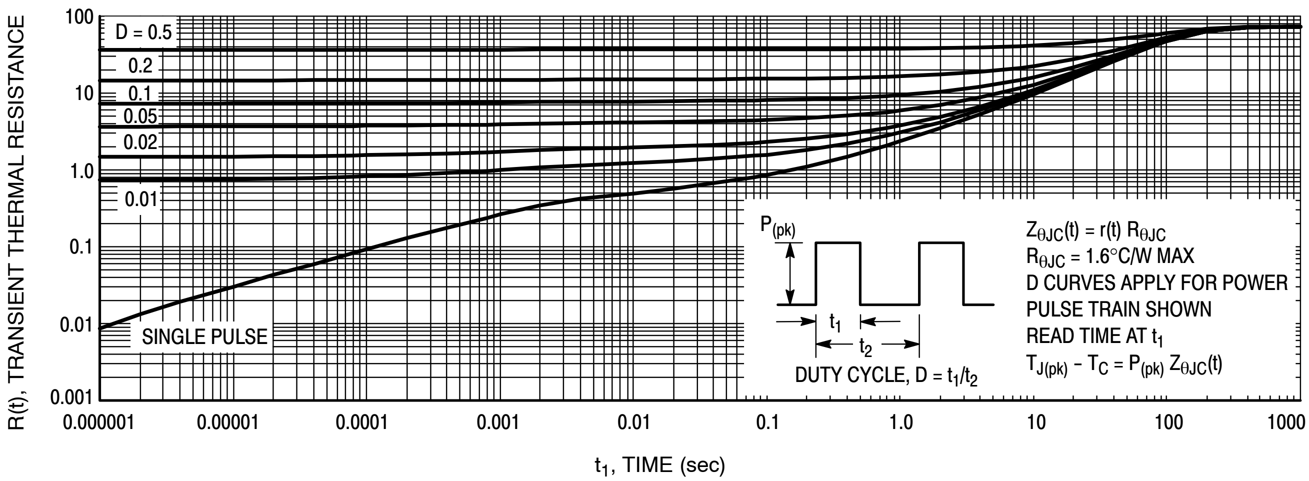


Figure 12. Thermal Response Junction−to−Ambient for MBRF30H100CT

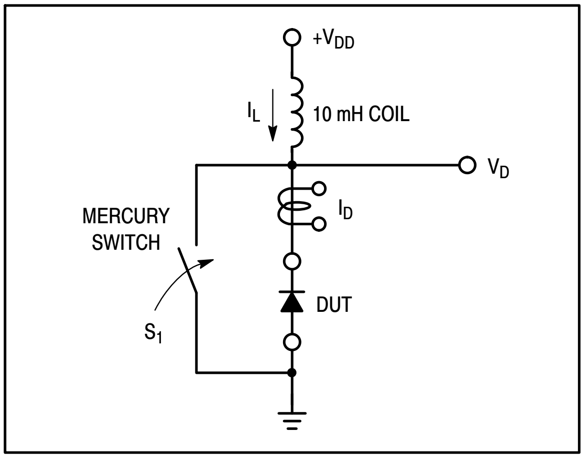


Figure 13. Test Circuit

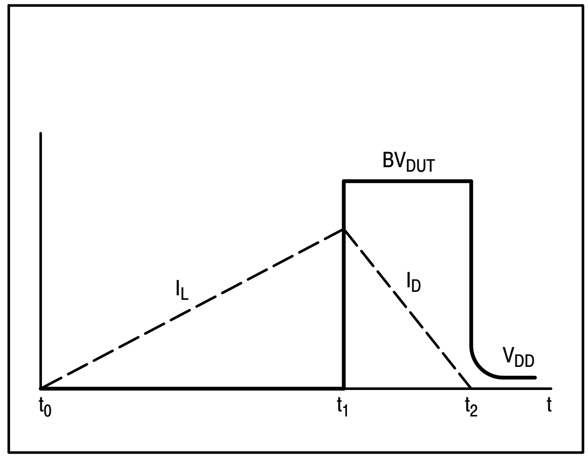


Figure 14. Current−Voltage Waveforms

The unclamped inductive switching circuit shown in Figure 13 was used to demonstrate the controlled avalanche capability of this device. A mercury switch was used instead of an electronic switch to simulate a noisy environment when the switch was being opened.

When S_1 is closed at t_0 the current in the inductor I_L ramps up linearly; and energy is stored in the coil. At t_1 the switch is opened and the voltage across the diode under test begins to rise rapidly, due to di/dt effects, when this induced voltage reaches the breakdown voltage of the diode, it is clamped at BV_{DUT} and the diode begins to conduct the full load current which now starts to decay linearly through the diode, and goes to zero at t_2.

By solving the loop equation at the point in time when S_1 is opened; and calculating the energy that is transferred to the diode it can be shown that the total energy transferred is equal to the energy stored in the inductor plus a finite amount of energy from the V_{DD} power supply while the diode is in breakdown (from t_1 to t_2) minus any losses due to finite component resistances. Assuming the component resistive elements are small Equation (1) approximates the total energy transferred to the diode. It can be seen from this equation that if the V_{DD} voltage is low compared to the breakdown voltage of the device, the amount of energy contributed by the supply during breakdown is small and the total energy can be assumed to be nearly equal to the energy stored in the coil during the time when S_1 was closed, Equation (2).

EQUATION (1):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^{2} \left(\frac{BV_{DUT}}{BV_{DUT} - V_{DD}} \right)$$

EQUATION (2):

$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^{2}$$

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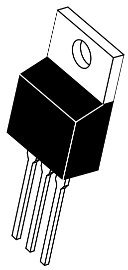
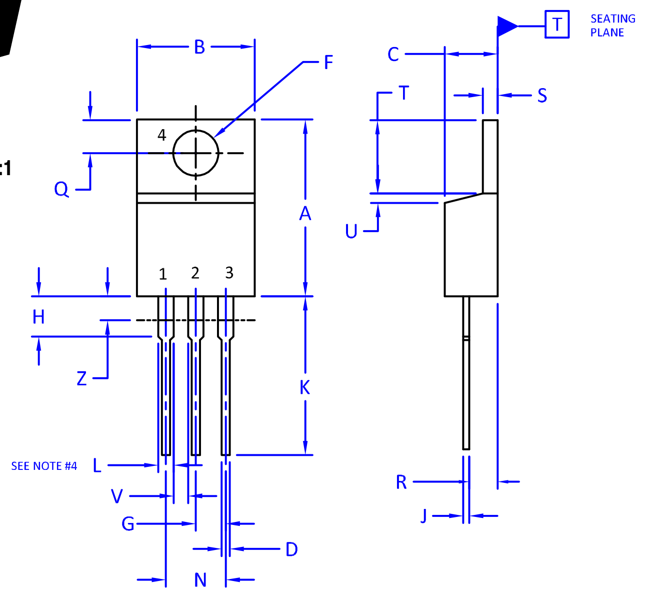


SCALE 1:1

TO−220
CASE 221A
ISSUE AK

DATE 13 JAN 2022



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
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	1.41
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 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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

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

STYLE 4:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. MAIN TERMINAL 2

STYLE 5:
PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

STYLE 6:
PIN 1. ANODE
2. CATHODE
3. ANODE
4. CATHODE

STYLE 7:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. ANODE

STYLE 8:
PIN 1. CATHODE
2. ANODE
3. EXTERNAL TRIP/DELAY
4. ANODE

STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

STYLE 10:
PIN 1. GATE
2. SOURCE
3. DRAIN
4. SOURCE

STYLE 11:
PIN 1. DRAIN
2. SOURCE
3. GATE
4. SOURCE

STYLE 12:
PIN 1. MAIN TERMINAL 1
2. MAIN TERMINAL 2
3. GATE
4. NOT CONNECTED

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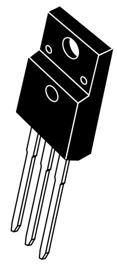

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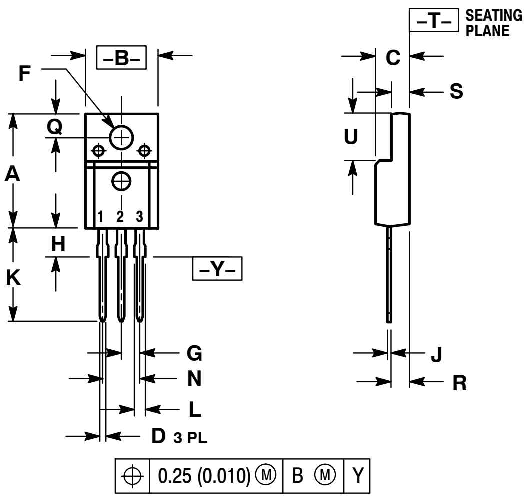
TO−220 FULLPAK
CASE 221D−03
ISSUE K

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

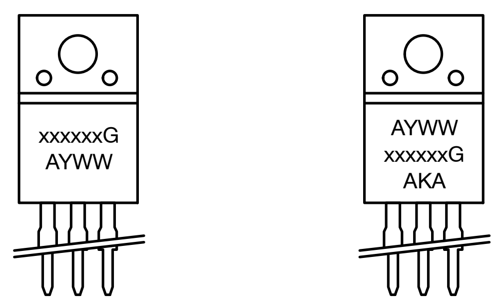
STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE

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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PUBLICATION ORDERING INFORMATION

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Europe, Middle East and Africa Technical Support:
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For additional information, please contact your local Sales Representative

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