MBR20H100CTG, MBRB20H100CTG, MBRF20H100CTG, NRVBB20H100CTT4G

Switch-mode Power Rectifier 100 V, 20 A

ON Semiconductor®

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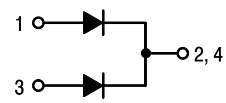
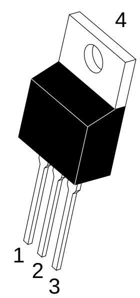
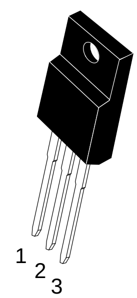
SCHOTTKY BARRIER RECTIFIER 20 AMPERES, 100 VOLTS

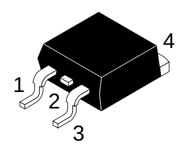




TO−220
CASE 221A
STYLE 6



TO−220 FULLPAK™
CASE 221D
STYLE 3



D^2PAK 3
CASE 418B
STYLE 3

Features and Benefits

- Low Forward Voltage: 0.64 V @ 125°C
- Low Power Loss/High Efficiency
- High Surge Capacity
- 175°C Operating Junction Temperature
- 20 A Total (10 A Per Diode Leg)
- Guard−Ring for Stress Protection
- NRVBB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

Applications

- Power Supply − Output Rectification
- Power Management
- Instrumentation

Mechanical Characteristics:

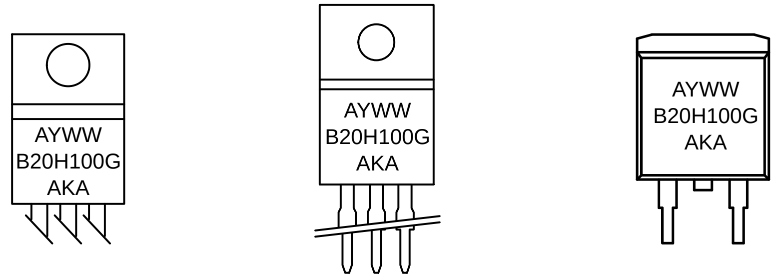
- Case: Epoxy, Molded
- Epoxy Meets UL 94 V−0 @ 0.125 in
- Weight (Approximately):
  1.9 Grams (TO−220)
  1.7 Grams (D^2PAK)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes:
  260°C Max. for 10 Seconds

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 in the package dimensions section on page 3 of this data sheet.



TO−220 | TO−220 FULLPAK | D^2PAK 3

A = Assembly Location
Y = Year
WW = Work Week
B20H100 = Device Code
G = Pb−Free Device
AKA = Polarity Designator

Figure 1. Marking Diagrams

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 (Rated V_R) T_C = 162°C	$I_{F(AV)}$	10	A
Peak Repetitive Forward Current (Rated V_R, Square Wave, 20 kHz) T_C = 160°C	I_{FRM}	20	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 11 and 12)	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 (MBR20H100CTG, MBRB20H100CTG and NRVBB20H100CTT4G) Junction−to−Case Junction−to−Ambient (MBRF20H100CTG) Junction−to−Case	 $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JC}$	 2.0 60 2.5	°C/W

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.

ELECTRICAL CHARACTERISTICS (Per Diode Leg)

Characteristic	Symbol	Value	Unit
Maximum Instantaneous Forward Voltage (Note 2) (I_F = 10 A, T_C = 25°C) (I_F = 10 A, T_C = 125°C) (I_F = 20 A, T_C = 25°C) (I_F = 20 A, T_C = 125°C)	v_F	 0.77 0.64 0.88 0.73	V
Maximum Instantaneous Reverse Current (Note 2) (Rated DC Voltage, T_C = 125°C) (Rated DC Voltage, T_C = 25°C)	i_R	 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	Shipping†
MBR20H100CTG	TO−220 (Pb−Free)	50 Units / Rail
MBRF20H100CTG	TO−220FP (Pb−Free)	50 Units / Rail
MBRB20H100CTT4G	D^2PAK 3 (Pb−Free)	800 / Tape & Reel
NRVBB20H100CTT4G*	D^2PAK 3 (Pb−Free)	800 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

*NRVBB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable.

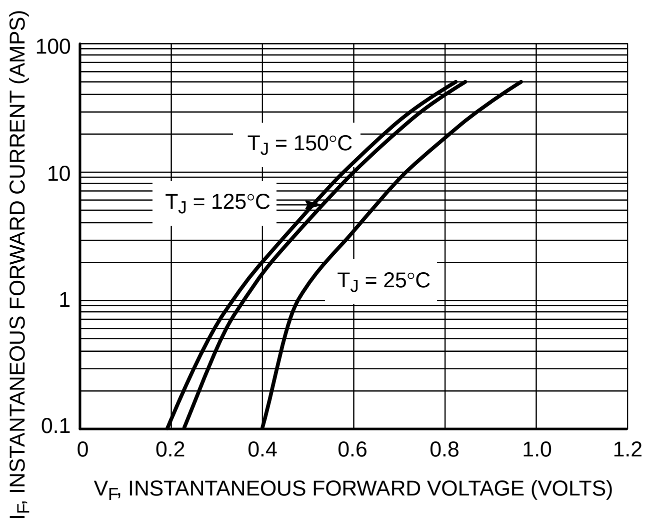


Figure 1. Typical Forward Voltage

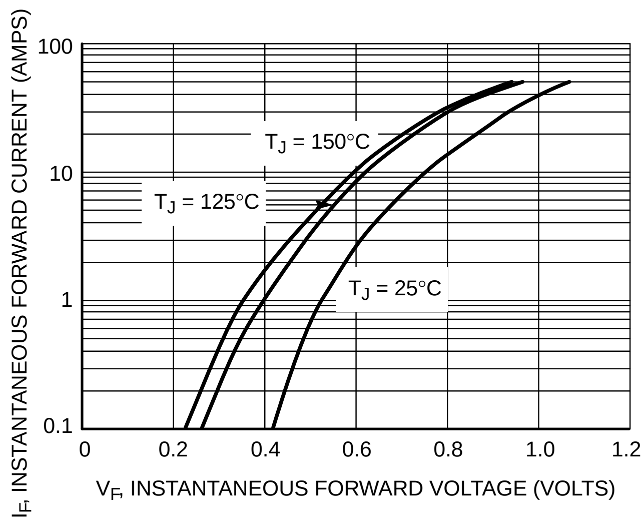


Figure 2. Maximum Forward Voltage

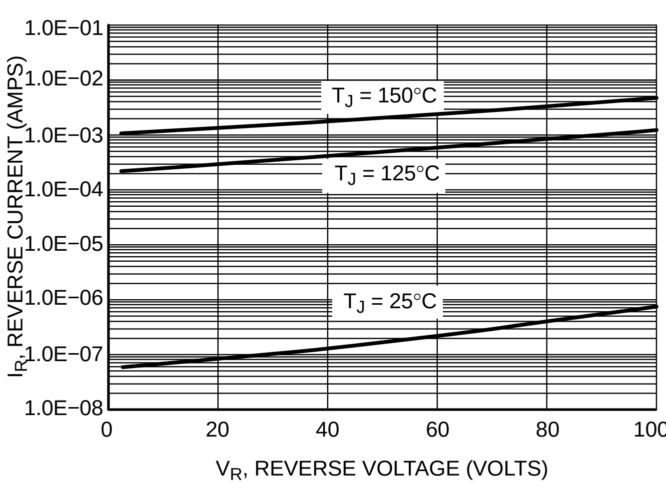


Figure 3. Typical Reverse Current

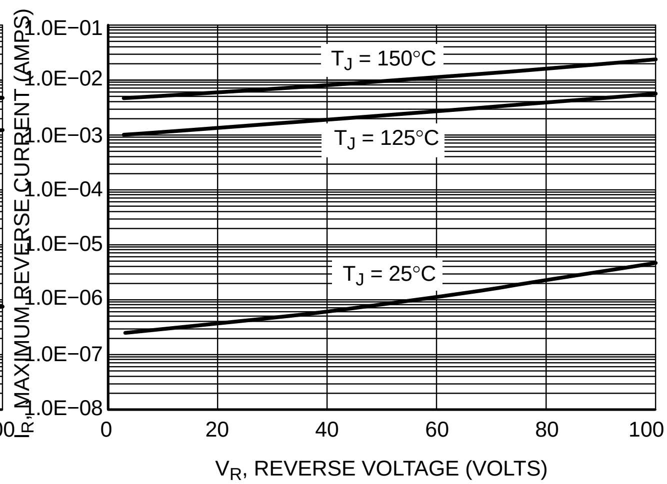


Figure 4. Maximum Reverse Current

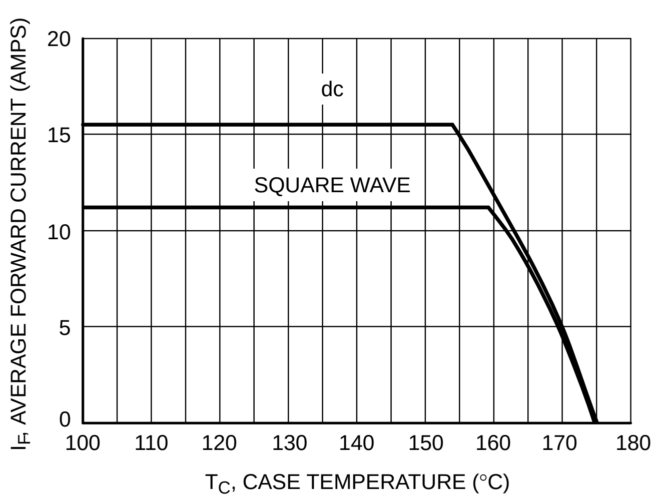


Figure 5. Current Derating

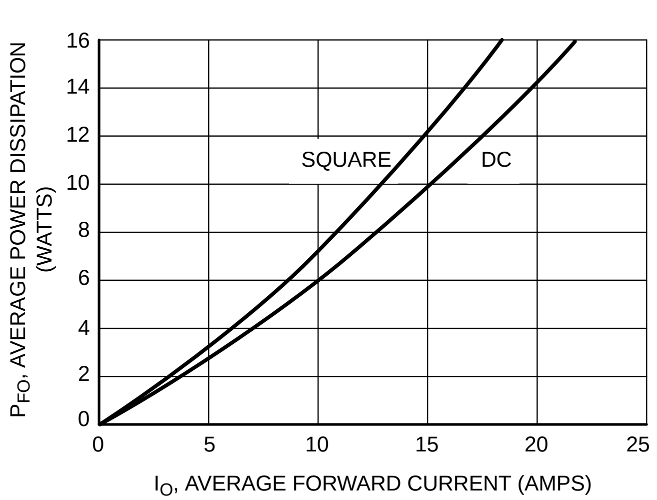


Figure 6. Forward Power Dissipation

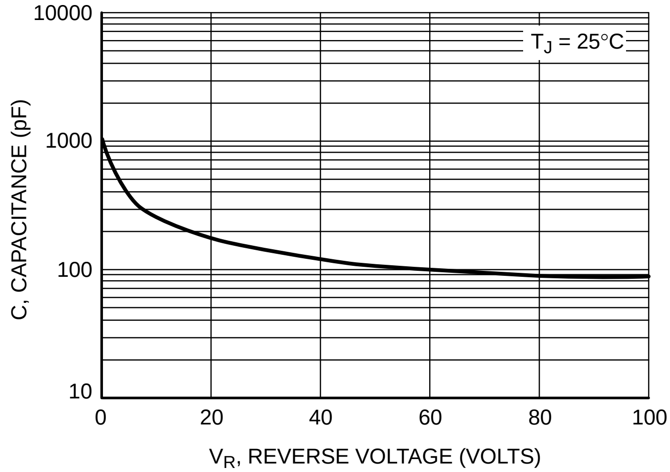


Figure 7. Capacitance

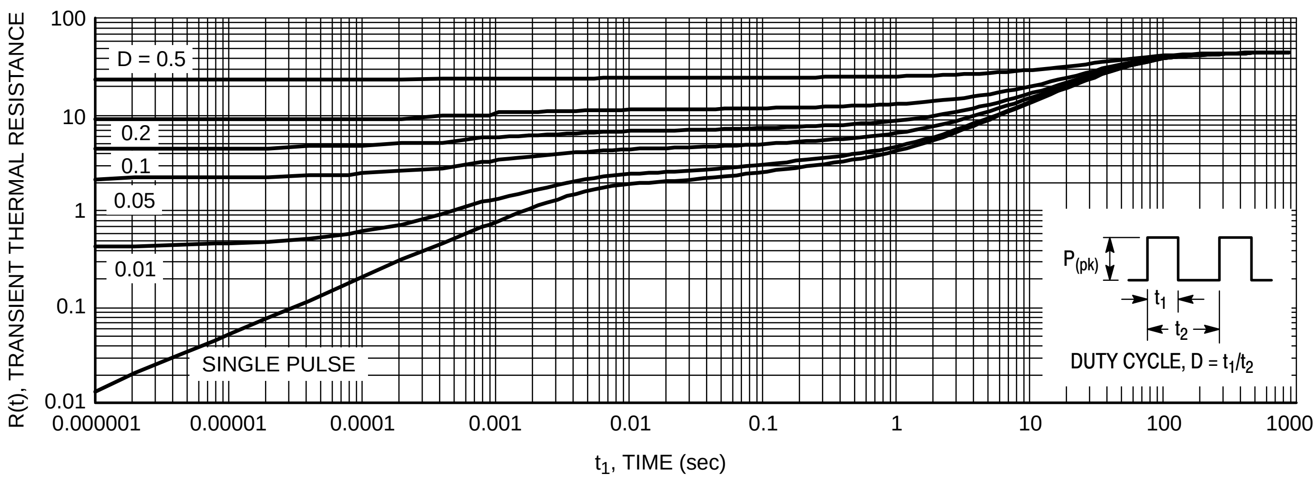


Figure 8. Thermal Response Junction−to−Ambient for MBR20H100CT, MBRB20H100CT and NRVBB20H100CTT4G

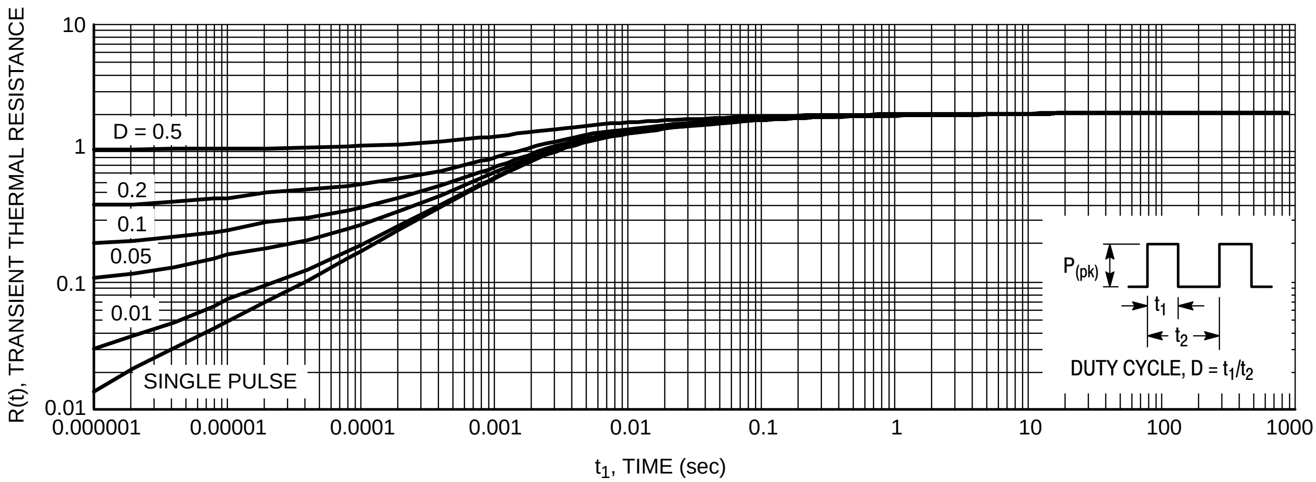


Figure 9. Thermal Response Junction−to−Case for MBR20H100CT, MBRB20H100CT and NRVBB20H100CTT4G

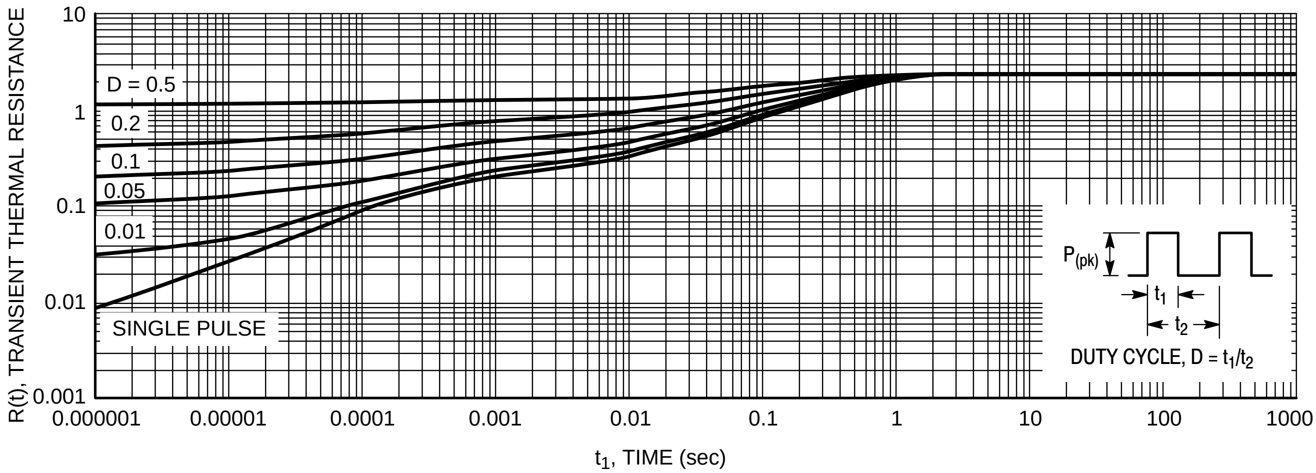


Figure 10. Thermal Response Junction−to−Case for MBRF20H100CT

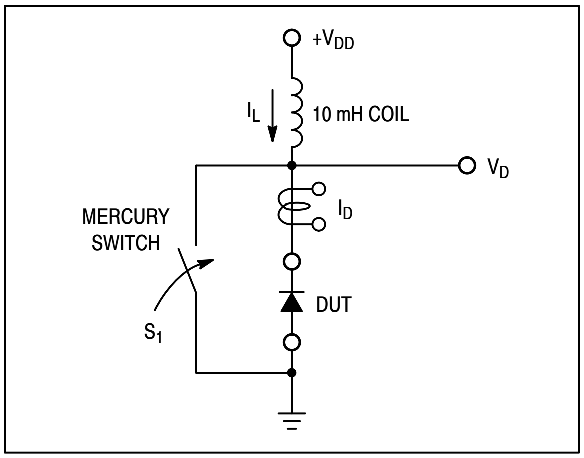


Figure 11. Test Circuit

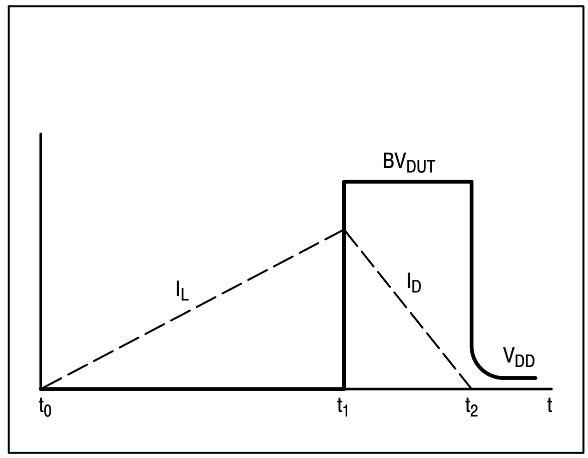


Figure 12. Current−Voltage Waveforms

The unclamped inductive switching circuit shown in Figure 11 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):

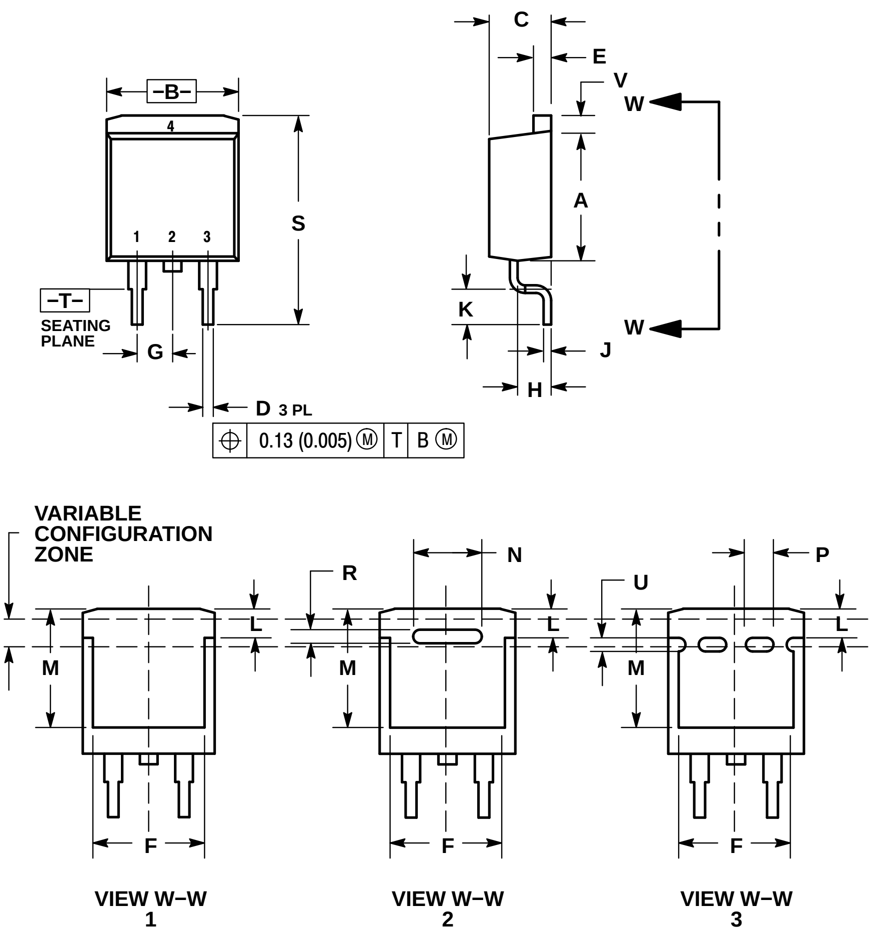
$$W_{AVAL} \approx \frac{1}{2} L I_{LPK}^{2} \left(\frac{BV_{DUT}}{BV_{DUT} - V_{DD}} \right)$$

EQUATION (2):

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

PACKAGE DIMENSIONS

D²PAK 3
CASE 418B−04
ISSUE K

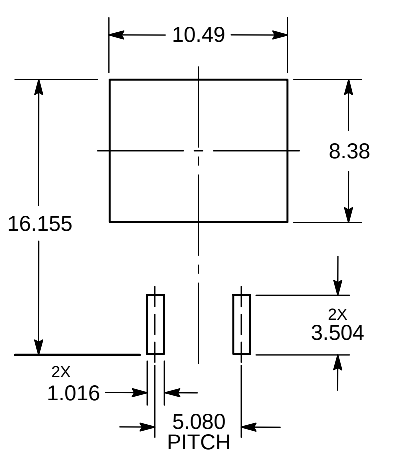


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B−01 THRU 418B−03 OBSOLETE, NEW STANDARD 418B−04.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
F	0.310	0.350	7.87	8.89
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197 REF		5.00 REF	
P	0.079 REF		2.00 REF	
R	0.039 REF		0.99 REF	
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

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

SOLDERING FOOTPRINT*

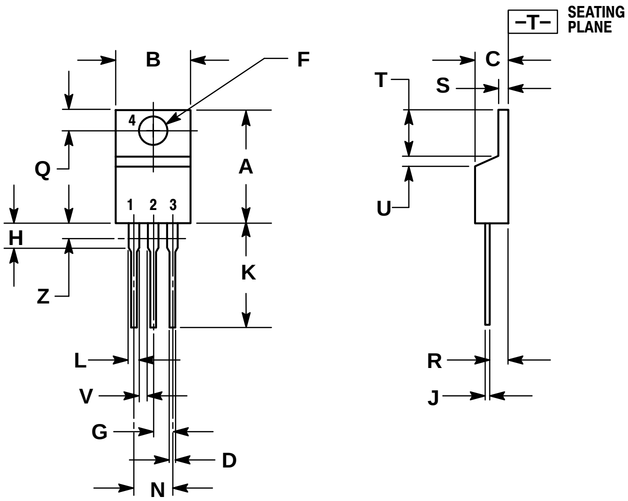


DIMENSIONS: MILLIMETERS

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

PACKAGE DIMENSIONS

TO−220
CASE 221A−09
ISSUE AH



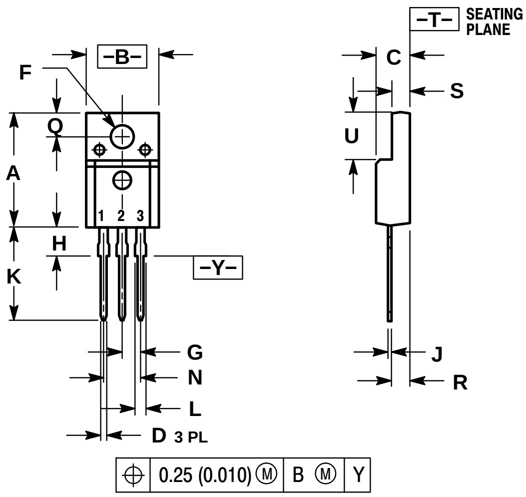
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.415	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	3.61	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	1.39
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
2. CATHODE
3. ANODE
4. CATHODE

PACKAGE DIMENSIONS

TO−220 FULLPAK
CASE 221D−03
ISSUE K



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:
PIN 1. ANODE
2. CATHODE
3. ANODE

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