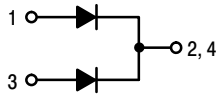
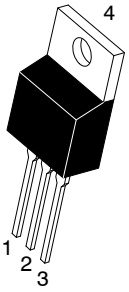
# Switch-mode Power Rectifier 100 V, 20 A

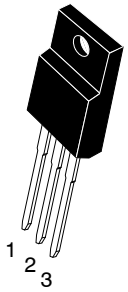
# MBR20H100CTG, MBRB20H100CTG, MBRF20H100CTG, NRVBB20H100CTT4G

## SCHOTTKY BARRIER RECTIFIER 20 AMPERES, 100 VOLTS

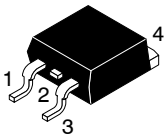



**TO−220**
**CASE 221A**
**STYLE 6**




**TO−220 FULLPAK™**
**CASE 221D**
**STYLE 3**




**D²PAK 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:

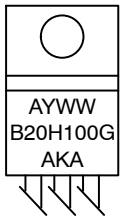
- Case: Epoxy, Molded
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Weight (Approximately):
  1.9 Grams (TO-220)
  1.7 Grams ($D^2PAK$)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes:
  260°C Max. for 10 Seconds

### DEVICE MARKING INFORMATION

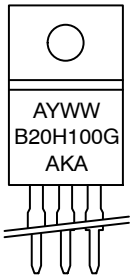
See general marking information in the device marking section on page 2 of this data sheet.

### ORDERING INFORMATION

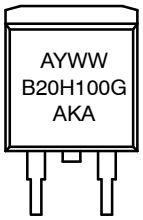
See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.




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<br>Working Peak Reverse Voltage<br>DC Blocking Voltage‘ | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 100 | V |
| Average Rectified Forward Current<br>(Rated $V_R$) $T_C$ = 162 °C | $I_{F(AV)}$ | 10 | A |
| Peak Repetitive Forward Current<br>(Rated $V_R$, Square Wave, 20 kHz) $T_C$ = 160 °C | $I_{FRM}$ | 20 | A |
| Nonrepetitive Peak Surge Current<br>(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:<br>Machine Model = C<br>Human Body Model = 3B | | <br>> 400<br>> 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<br>(MBR20H100CTG, MBRB20H100CTG and NRVBB20H100CTT4G)<br>Junction−to−Case<br>Junction−to−Ambient<br>(MBRF20H100CTG)<br>Junction−to−Case | <br><br>$R_{\theta JC}$<br>$R_{\theta JA}$<br><br>$R_{\theta JC}$ | <br><br>2.0<br>60<br><br>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)<br>($I_F$ = 10 A, $T_C$ = 25 °C)<br>($I_F$ = 10 A, $T_C$ = 125 °C)<br>($I_F$ = 20 A, $T_C$ = 25 °C)<br>($I_F$ = 20 A, $T_C$ = 125 °C) | $v_F$ | <br>0.77<br>0.64<br>0.88<br>0.73 | V |
| Maximum Instantaneous Reverse Current (Note 2)<br>(Rated DC Voltage, $T_C$ = 125 °C)<br>(Rated DC Voltage, $T_C$ = 25 °C) | $i_R$ | <br>6.0<br>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† |
|---|---|---|
| MBRB20H100CTT4G | $D^2$PAK 3<br>(Pb−Free) | 800 / Tape & Reel |

**DISCONTINUED** (Note 3)

| Device | Package | Shipping† |
|---|---|---|
| MBR20H100CTG | TO−220<br>(Pb−Free) | 50 Units / Rail |
| MBRF20H100CTG | TO−220FP<br>(Pb−Free) | 50 Units / Rail |
| NRVBB20H100CTT4G* | $D^2$PAK 3<br>(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.

3. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on www.onsemi.com.

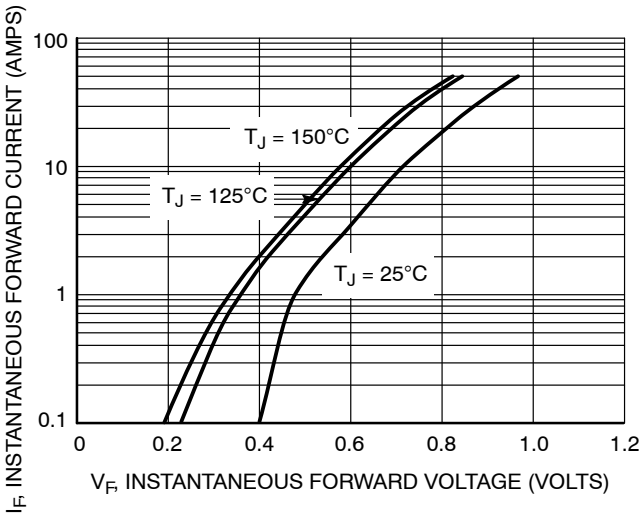



**Figure 1. Typical Forward Voltage**

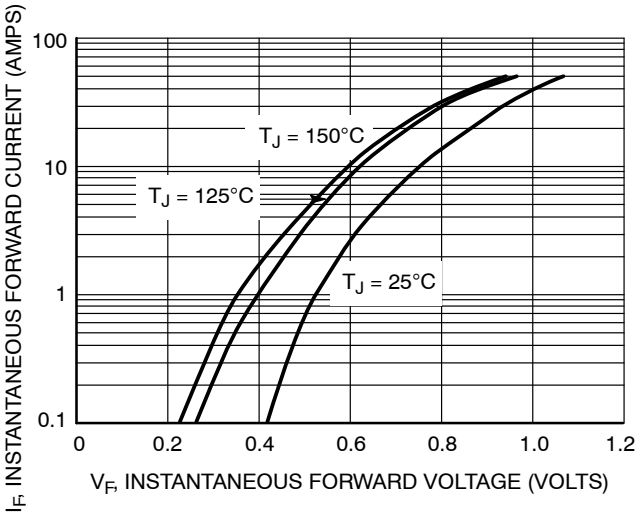



**Figure 2. Maximum Forward Voltage**

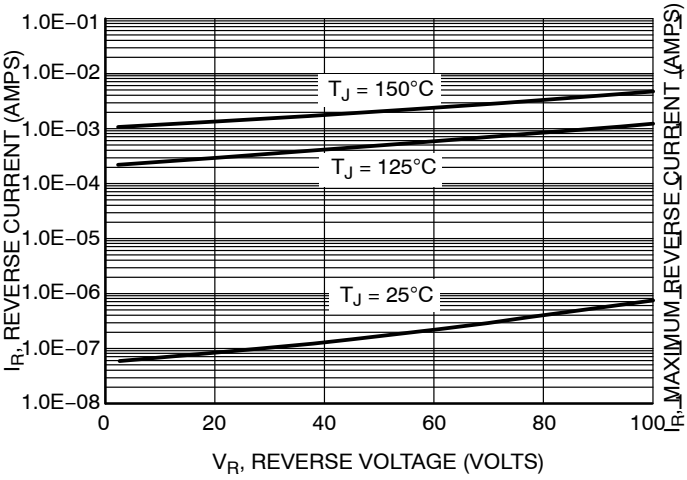



**Figure 3. Typical Reverse Current**

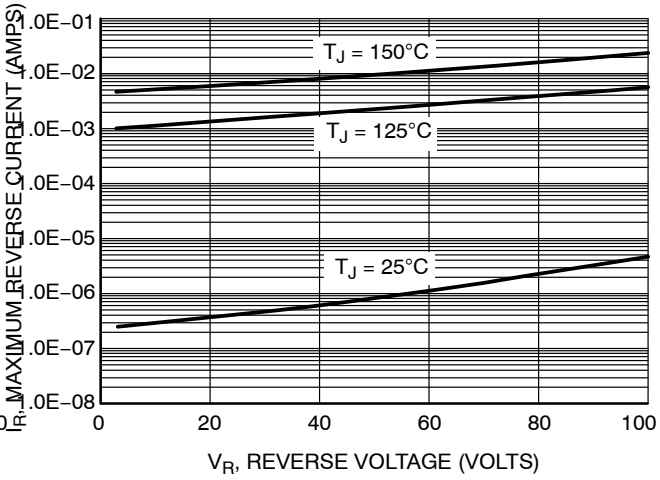



**Figure 4. Maximum Reverse Current**

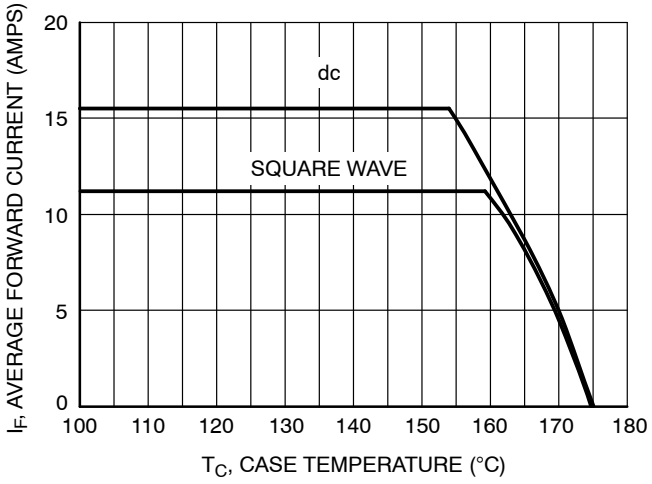



**Figure 5. Current Derating**

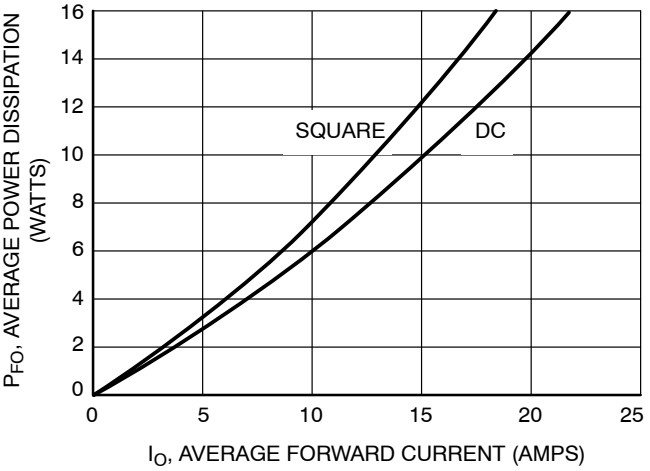



**Figure 6. Forward Power Dissipation**

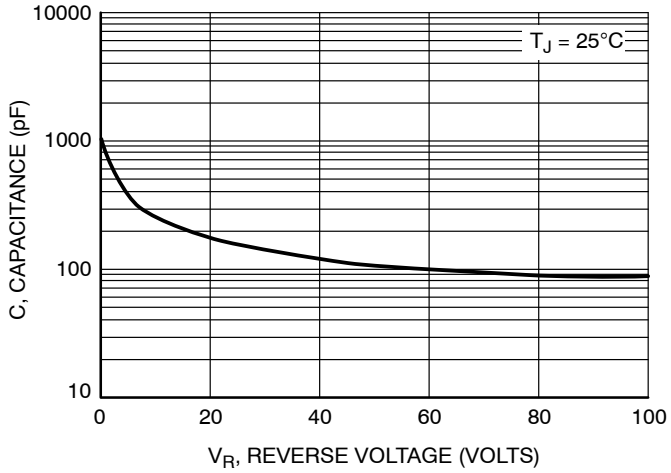



**Figure 7. Capacitance**

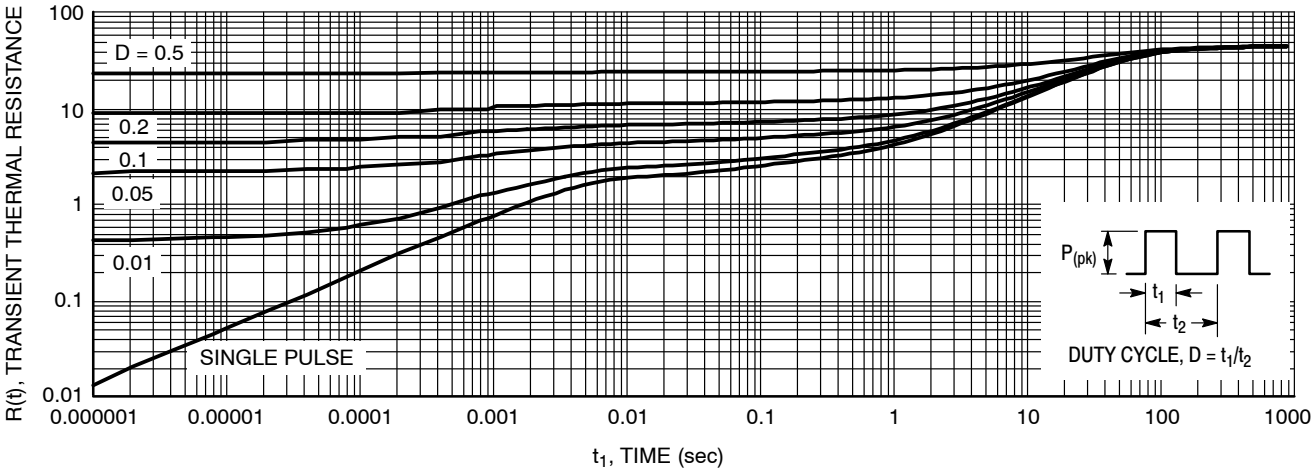



**Figure 8. Thermal Response Junction−to−Ambient for MBR20H100CT, MBRB20H100CT and NRVBB20H100CTT4G**

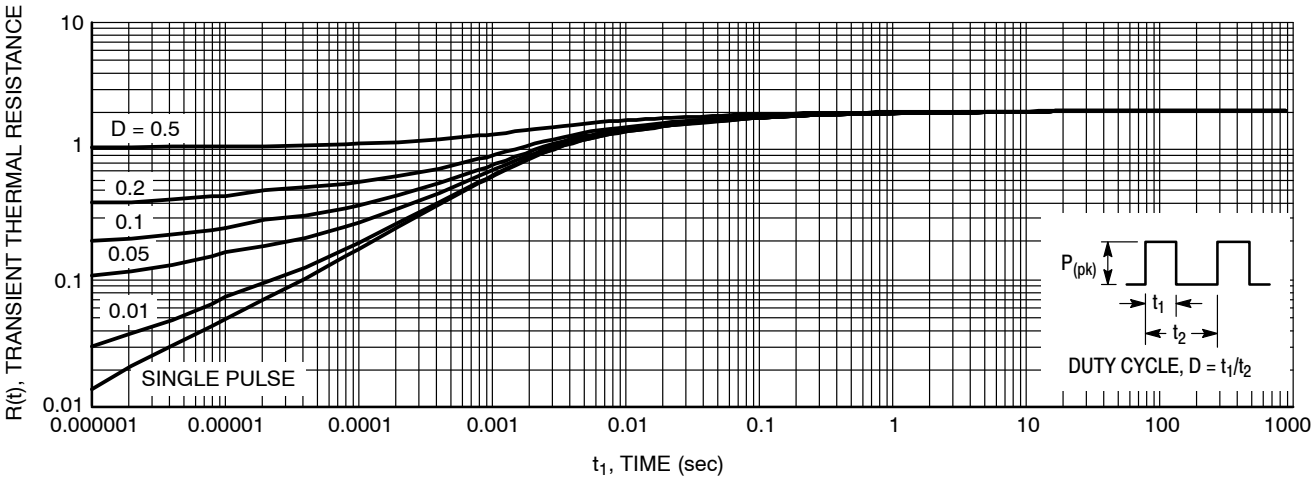



**Figure 9. Thermal Response Junction−to−Case for MBR20H100CT, MBRB20H100CT and NRVBB20H100CTT4G**

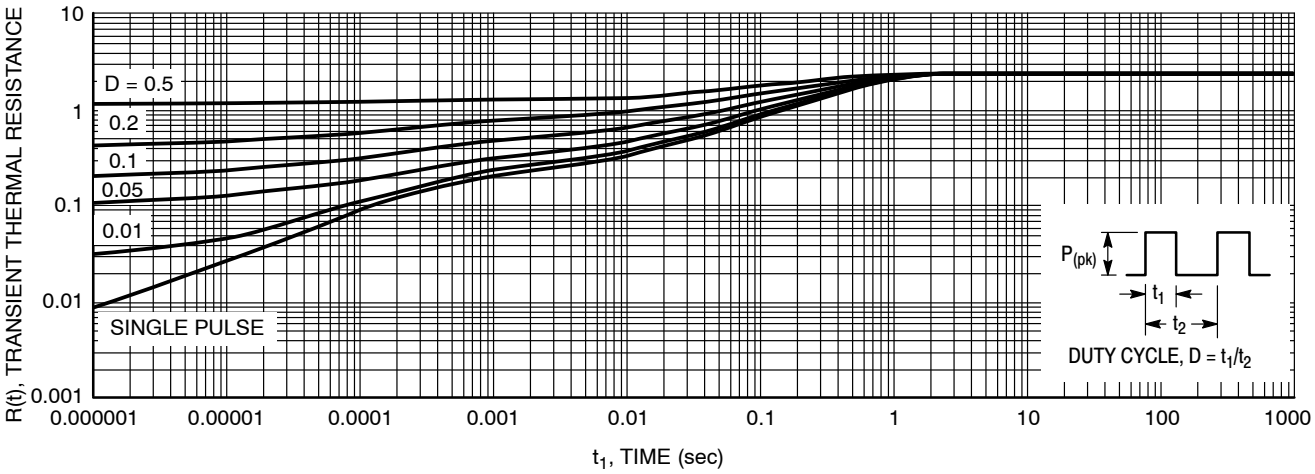



**Figure 10. Thermal Response Junction−to−Case for MBRF20H100CT**

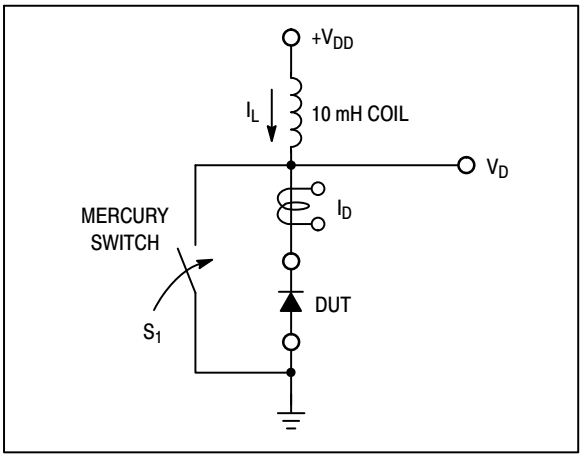



**Figure 11. Test Circuit**

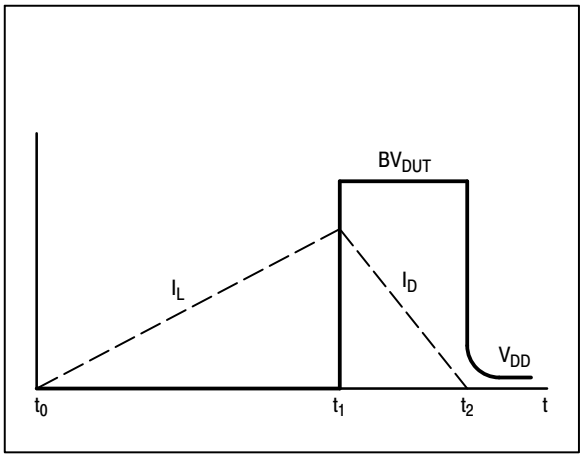



**Figure 12. Current−Voltage Waveforms**

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):**

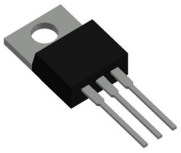
$$W_{AVAL} \approx \frac{1}{2} LI_{LPK}^2 \left( \frac{BV_{DUT}}{BV_{DUT} - V_{DD}} \right)$$

**EQUATION (2):**

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

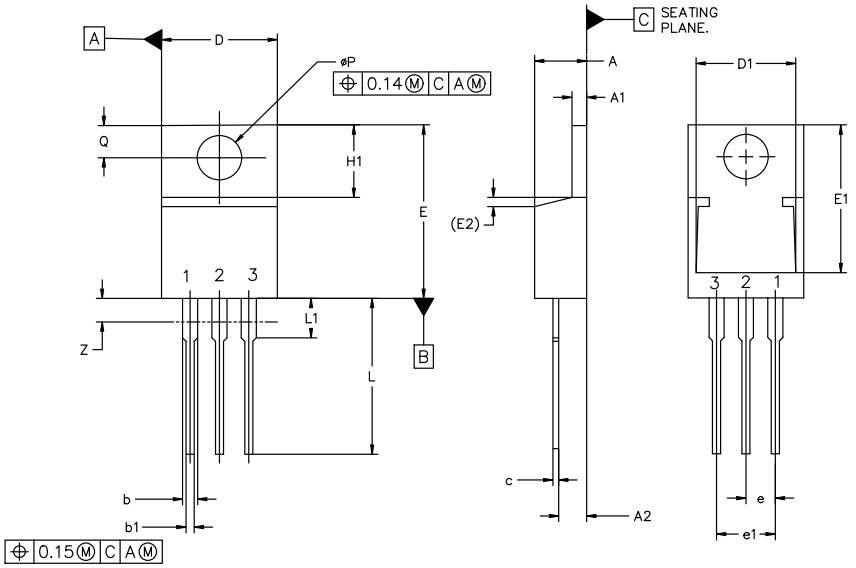
**REVISION HISTORY**

| Revision | Description of Changes | Date |
|---|---|---|
| 13 | MBR20H100CTG, MBRF20H100CTG, NRVBB20H100CTT4G* OPN Marked as Discontinued + Rebranded the Data Sheet to onsemi format | 6/25/2025 |



**TO−220−3 10.10x15.12x4.45, 2.54P**
CASE 221A
ISSUE AL

DATE 05 FEB 2025




| MILLIMETERS | | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| A | 4.07 | 4.45 | 4.83 |
| A1 | 1.15 | 1.28 | 1.41 |
| A2 | 2.04 | 2.42 | 2.79 |
| b | 1.15 | 1.34 | 1.52 |
| b1 | 0.64 | 0.80 | 0.96 |
| c | 0.36 | 0.49 | 0.61 |
| D | 9.66 | 10.10 | 10.53 |
| D1 | 8.43 | 8.63 | 8.83 |
| E | 14.48 | 15.12 | 15.75 |
| E1 | 12.58 | 12.78 | 12.98 |
| E2 | 1.27 REF | | |

| MILLIMETERS | | | |
|---|---|---|---|
| DIM | MIN | NOM | MAX |
| e | 2.42 | 2.54 | 2.66 |
| e1 | 4.83 | 5.08 | 5.33 |
| H1 | 5.97 | 6.22 | 6.47 |
| L | 12.70 | 13.49 | 14.27 |
| L1 | 2.80 | 3.45 | 4.10 |
| Q | 2.54 | 2.79 | 3.04 |
| øP | 3.60 | 3.85 | 4.09 |
| Z | −.−− | −.−− | 3.48 |

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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

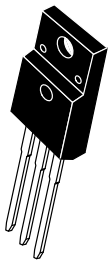
STYLE 9:
PIN 1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

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

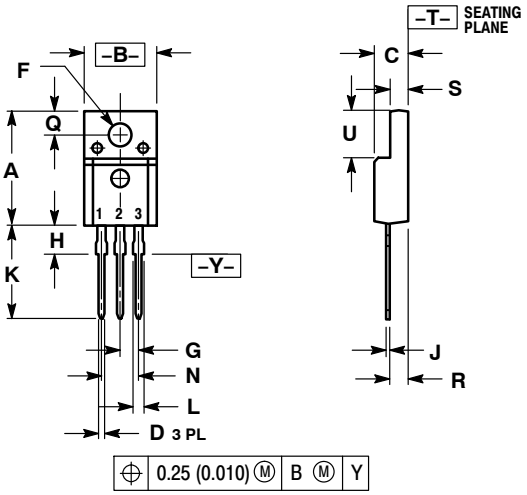
| | | |
|---|---|---|
| **DOCUMENT NUMBER:** | **98ASB42148B** | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| **DESCRIPTION:** | **TO−220−3 10.10x15.12x4.45, 2.54P** | **PAGE 1 OF 1** |



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

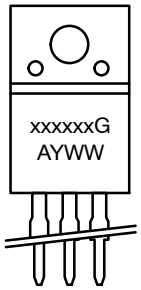
STYLE 3:
PIN 1. ANODE
2. CATHODE
3. ANODE

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

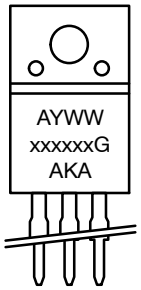
STYLE 5:
PIN 1. CATHODE
2. ANODE
3. GATE

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

## MARKING DIAGRAMS




**Bipolar**

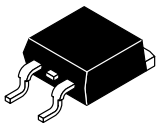



**Rectifier**

| | |
|---|---|
| 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 |

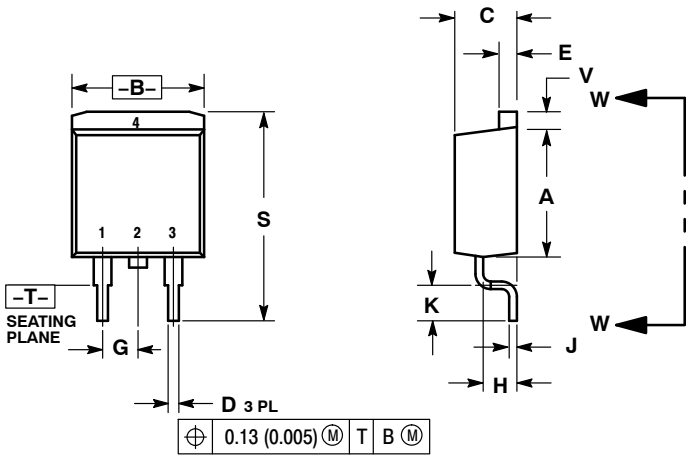
| | | |
|---|---|---|
| **DOCUMENT NUMBER:** | **98ASB42514B** | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| **DESCRIPTION:** | **TO−220 FULLPAK** | **PAGE 1 OF 1** |



**SCALE 1:1**

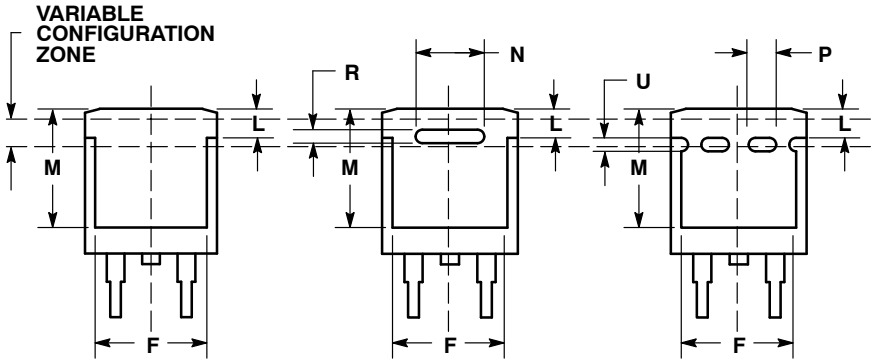
**D²PAK 3**
CASE 418B–04
ISSUE L

DATE 17 FEB 2015




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 |




VIEW W–W 1 | VIEW W–W 2 | VIEW W–W 3

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

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

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

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

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

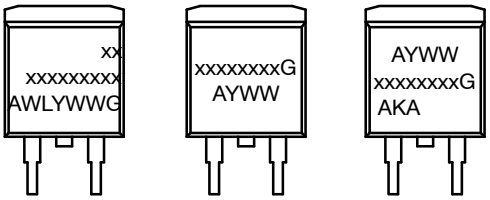
STYLE 6:
PIN 1. NO CONNECT
2. CATHODE
3. ANODE
4. CATHODE

**MARKING INFORMATION AND FOOTPRINT ON PAGE 2**

**D²PAK 3**
CASE 418B−04
ISSUE L

DATE 17 FEB 2015

## GENERIC MARKING DIAGRAM*

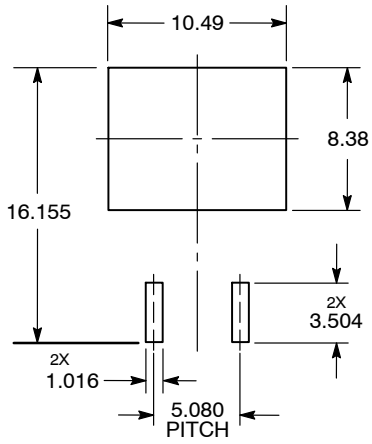



**IC** **Standard** **Rectifier**

| | |
|---|---|
| xx | = Specific Device Code |
| A | = Assembly Location |
| WL | = Wafer Lot |
| Y | = Year |
| WW | = Work Week |
| G | = Pb−Free Package |
| AKA | = Polarity Indicator |

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

## SOLDERING FOOTPRINT*




DIMENSIONS: MILLIMETERS

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

| | | | |
|---|---|---|---|
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| **DESCRIPTION:** | **D²PAK 3** | | **PAGE 2 OF 2** |

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