

Switch-mode Power Rectifier 100 V, 40 A

MBR41H100CT, NRVBB41H100CT Series

Features and Benefits

- Low Forward Voltage: 0.67 V @ 125°C
- Low Power Loss/High Efficiency
- High Surge Capacity
- 175°C Operating Junction Temperature
- 40 A Total (20 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, Halogen Free/BFR Free and are RoHS Compliant
- MBR41H100CTH and MBRB41H100CT-1H are Halide-Free

Applications

- Power Supply – Output Rectification
- Power Management
- Instrumentation

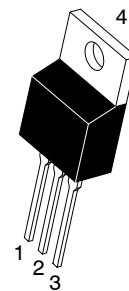
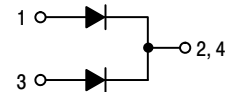
Mechanical Characteristics:

- Case: Epoxy, Molded
- Epoxy Meets UL 94 V-0 @ 0.125 in
- Weight (Approximately): 1.9 Grams (TO-220)
1.7 Grams (D²PAK-3)
1.5 Grams (TO-262)
- Finish: All External Surfaces Corrosion Resistant and Terminal Leads are Readily Solderable
- Lead Temperature for Soldering Purposes:
260°C Max. for 10 Seconds



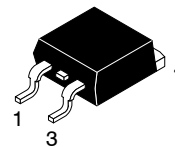
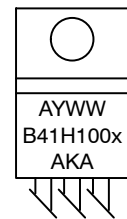
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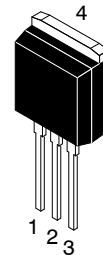
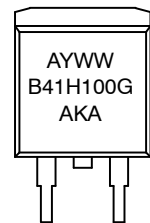


TO-220
CASE 221A
STYLE 6

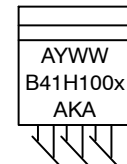
MARKING DIAGRAMS



D²PAK-3
CASE 418B
STYLE 3



I²PAK (TO-262)
CASE 418D
STYLE 3



A = Assembly Location
Y = Year
WW = Work Week
x = G or H
G = Pb-Free Package
H = Halide-Free Package
AKA = Polarity Designator

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

MBR41H100CT, NRVBB41H100CT Series

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) $T_C = 150^\circ\text{C}$ | $I_{F(AV)}$ | 20 | A |
| Peak Repetitive Forward Current (Rated V_R , Square Wave, 20 kHz) $T_C = 145^\circ\text{C}$ | I_{FRM} | 40 | A |
| Nonrepetitive Peak Surge Current (Surge applied at rated load conditions halfwave, single phase, 60 Hz) | I_{FSM} | 350 | A |
| Operating Junction Temperature (Note 1) | T_J | +175 | $^\circ\text{C}$ |
| Storage Temperature | T_{stg} | -65 to +175 | $^\circ\text{C}$ |
| Voltage Rate of Change (Rated V_R) | dv/dt | 10,000 | V/ μs |
| Controlled Avalanche Energy (see test conditions in Figures 10 and 11) | W_{AVAIL} | 400 | 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 (Per Diode Leg)

| Characteristic | Symbol | Value | Unit |
|---|------------------------------------|-----------|---------------------------|
| Maximum Thermal Resistance Junction-to-Case Junction-to-Ambient | $R_{\theta JC}$ $R_{\theta JA}$ | 2.0 70 | $^\circ\text{C}/\text{W}$ |

ELECTRICAL CHARACTERISTICS (Per Diode Leg)

| Characteristic | Symbol | Value | Unit |
|--|--------|------------------------------|------|
| Maximum Instantaneous Forward Voltage (Note 2) ($I_F = 20\text{ A}$, $T_C = 25^\circ\text{C}$) ($I_F = 20\text{ A}$, $T_C = 125^\circ\text{C}$) ($I_F = 40\text{ A}$, $T_C = 25^\circ\text{C}$) ($I_F = 40\text{ A}$, $T_C = 125^\circ\text{C}$) | V_F | 0.80 0.67 0.90 0.76 | V |
| Maximum Instantaneous Reverse Current (Note 2) (Rated DC Voltage, $T_C = 125^\circ\text{C}$) (Rated DC Voltage, $T_C = 25^\circ\text{C}$) | i_R | 10 0.01 | 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 $\leq 2.0\%$.

MBR41H100CT, NRVBB41H100CT Series

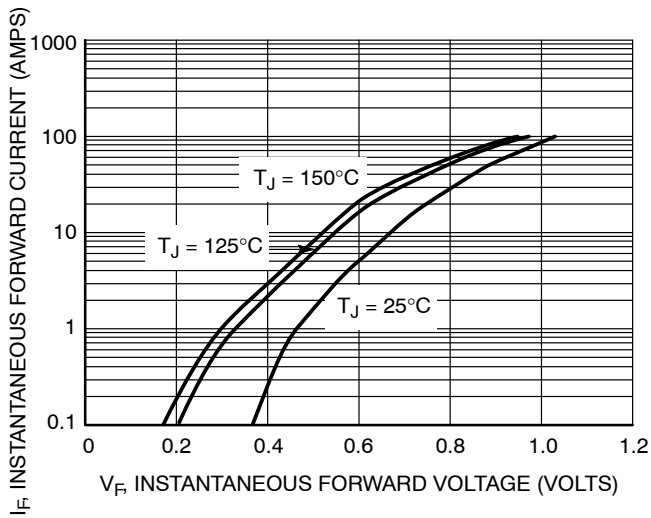


Figure 1. Typical Forward Voltage

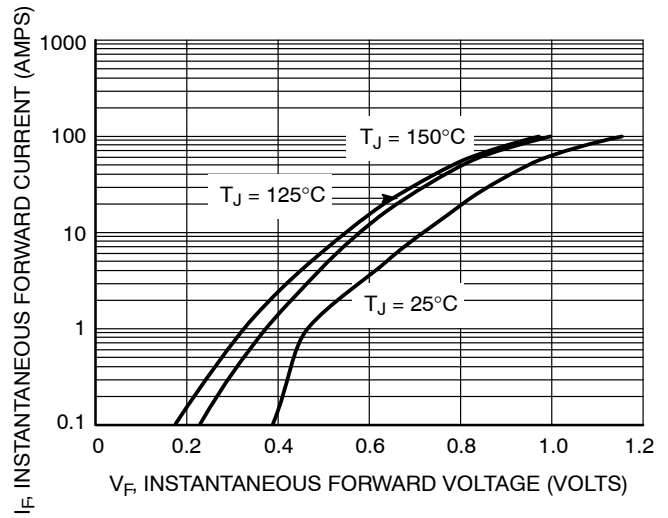


Figure 2. Maximum Forward Voltage

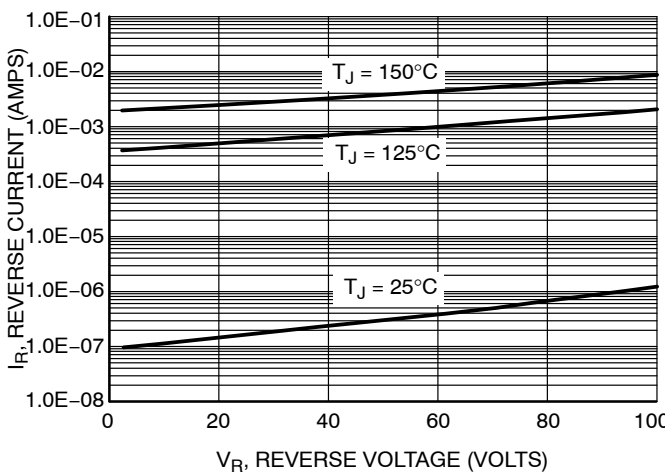


Figure 3. Typical Reverse Current

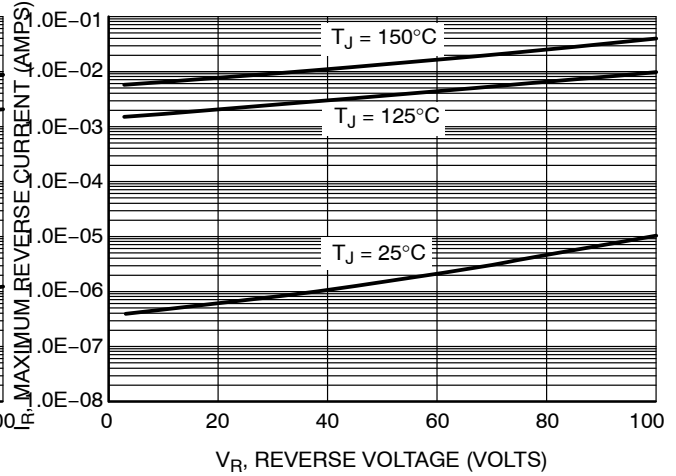


Figure 4. Maximum Reverse Current

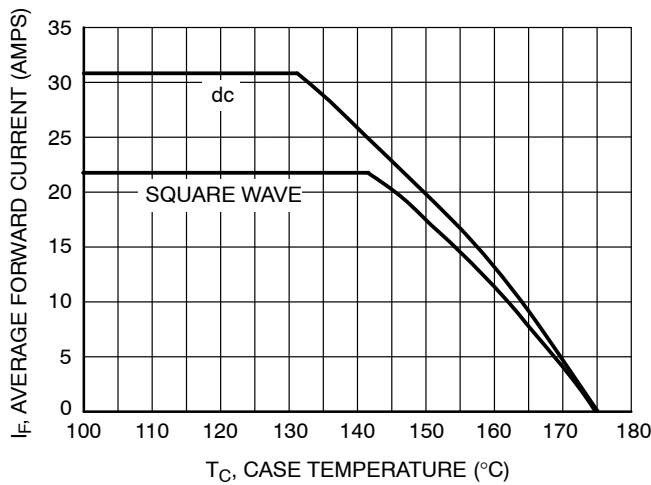


Figure 5. Current Derating

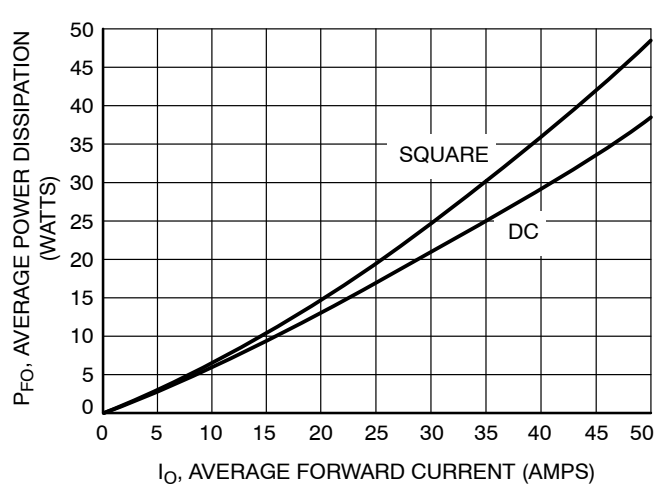


Figure 6. Forward Power Dissipation

MBR41H100CT, NRVBB41H100CT Series

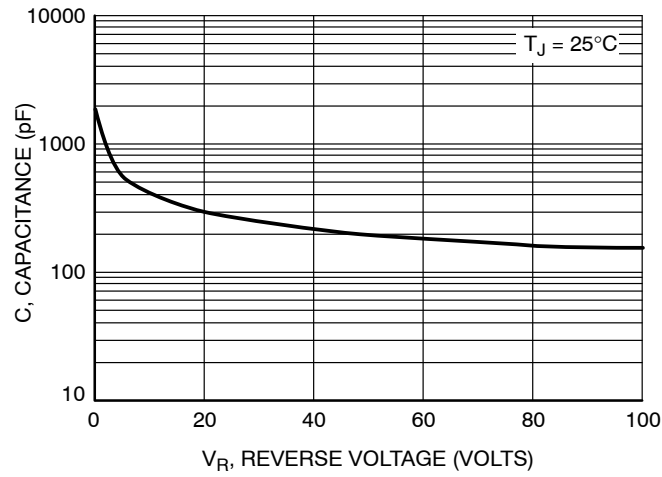


Figure 7. Capacitance

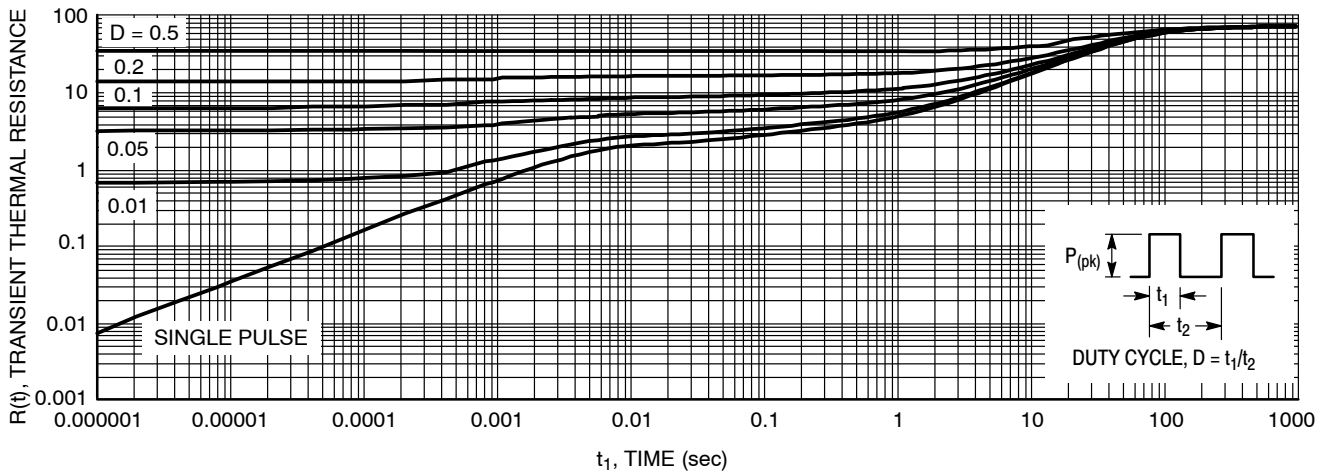


Figure 8. Thermal Response Junction-to-Ambient

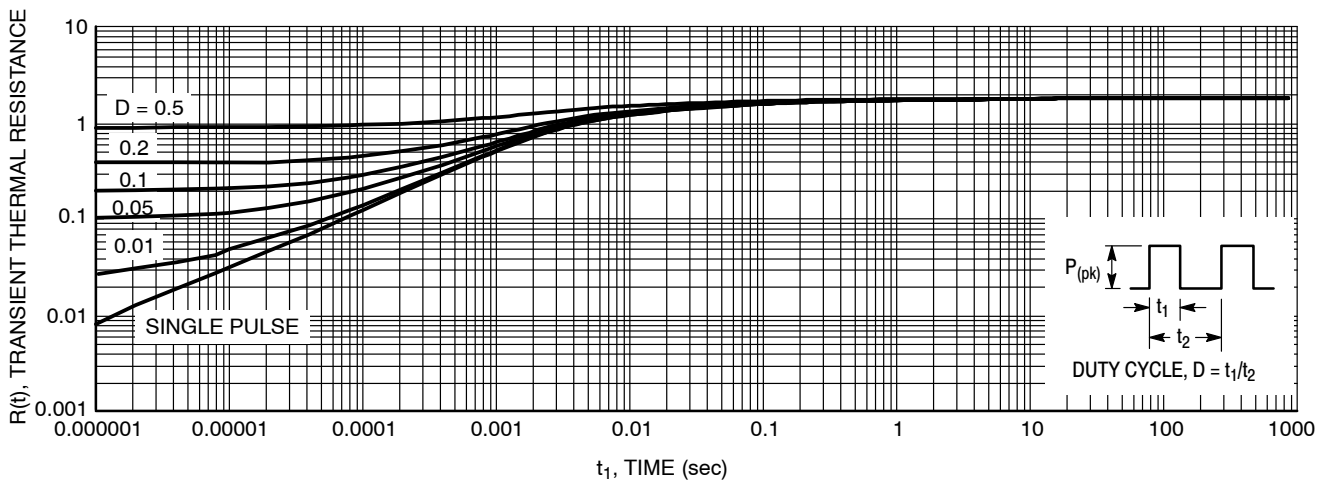


Figure 9. Thermal Response Junction-to-Case

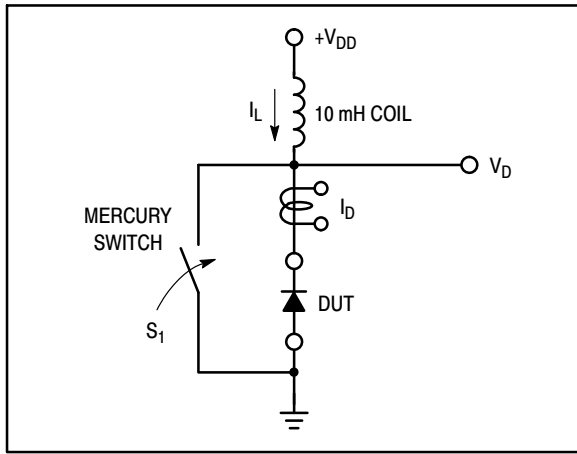


Figure 10. Test Circuit

The unclamped inductive switching circuit shown in Figure 10 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

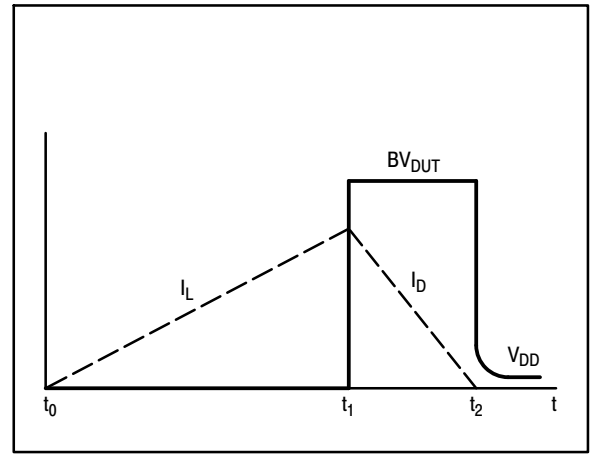


Figure 11. Current-Voltage Waveforms

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):

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

MBR41H100CT, NRVBB41H100CT Series

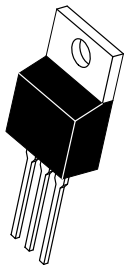
ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------------------------------|-------------------------------------|-------------------------|
| MBR41H100CTG | TO-220 (Pb-Free) | 50 Units / Rail |
| MBR41H100CTH | TO-220 (Halide-Free) | 50 Units / Rail |
| MBRB41H100CT-1G | I ² PAK (Pb-Free) | 50 Units / Rail |
| MBRB41H100CT-1H (In Development) | I ² PAK (Halide-Free) | 50 Units / Rail |
| MBRB41H100CTT4G | D ² PAK 3 (Pb-Free) | 800 Units / Tape & Reel |
| NRVBB41H100CTT4G* | D ² PAK 3 (Pb-Free) | 800 Units / Tape & Reel |

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

*NRVBB Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



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

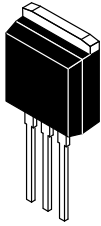
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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

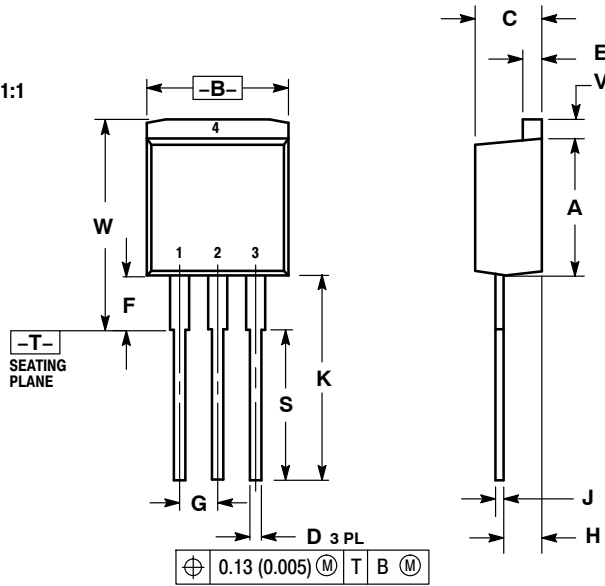
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SCALE 1:1

I²PAK (TO-262)
CASE 418D-01
ISSUE D

DATE 16 OCT 2007



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.335 | 0.380 | 8.51 | 9.65 |
| B | 0.380 | 0.406 | 9.65 | 10.31 |
| C | 0.160 | 0.185 | 4.06 | 4.70 |
| D | 0.026 | 0.035 | 0.66 | 0.89 |
| E | 0.045 | 0.055 | 1.14 | 1.40 |
| F | 0.122 REF | | 3.10 REF | |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.094 | 0.110 | 2.39 | 2.79 |
| J | 0.013 | 0.025 | 0.33 | 0.64 |
| K | 0.500 | 0.562 | 12.70 | 14.27 |
| S | 0.390 REF | | 9.90 REF | |
| V | 0.045 | 0.070 | 1.14 | 1.78 |
| W | 0.522 | 0.551 | 13.25 | 14.00 |

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

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MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

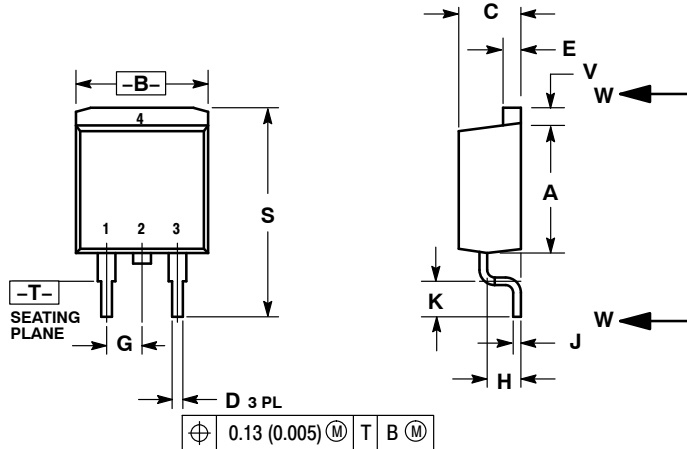
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D²PAK 3
CASE 418B-04
ISSUE L

DATE 17 FEB 2015

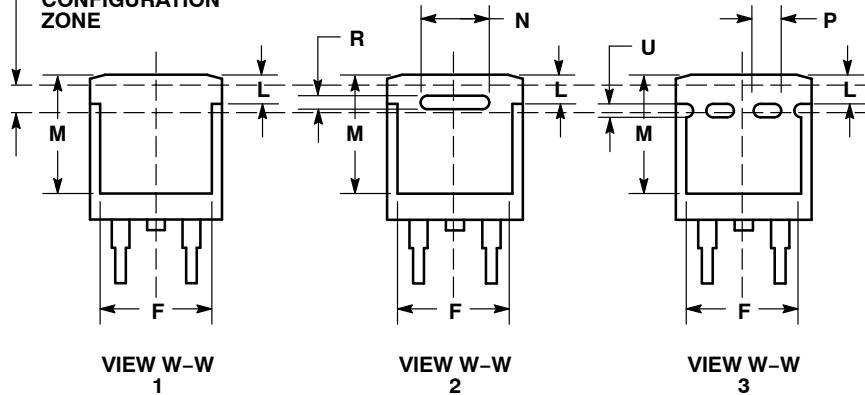
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- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

| DIM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | 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 |

VARIABLE CONFIGURATION ZONE



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

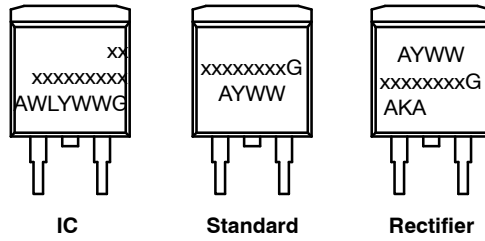
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D²PAK 3
CASE 418B-04
ISSUE L

DATE 17 FEB 2015

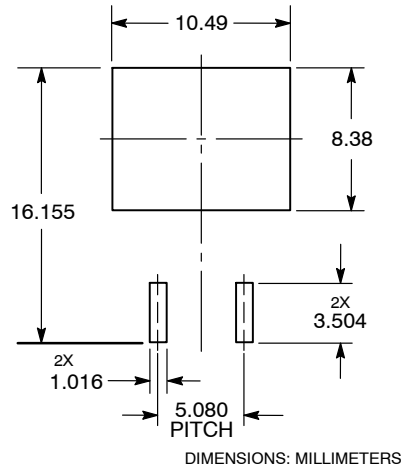
**GENERIC
MARKING DIAGRAM***



- 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.

SOLDERING FOOTPRINT*



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

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