

# Switch-mode Schottky Power Rectifier 250 V, 40 A

## MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

### Features

- 250 V Blocking Voltage
- Low Forward Voltage Drop,  $V_F = 0.86$  V
- Soft Recovery Characteristic,  $T_{RR} < 35$  ns
- Stable Switching Performance Over Temperature
- These Devices are Pb-Free and are RoHS Compliant

### Benefits

- Reduces or Eliminates Reverse Recovery Oscillations
- Minimizes Need for EMI Filtering
- Reduces Switching Losses
- Improved Efficiency

### Applications

- Power Supply
- Power Management
- Automotive
- Instrumentation

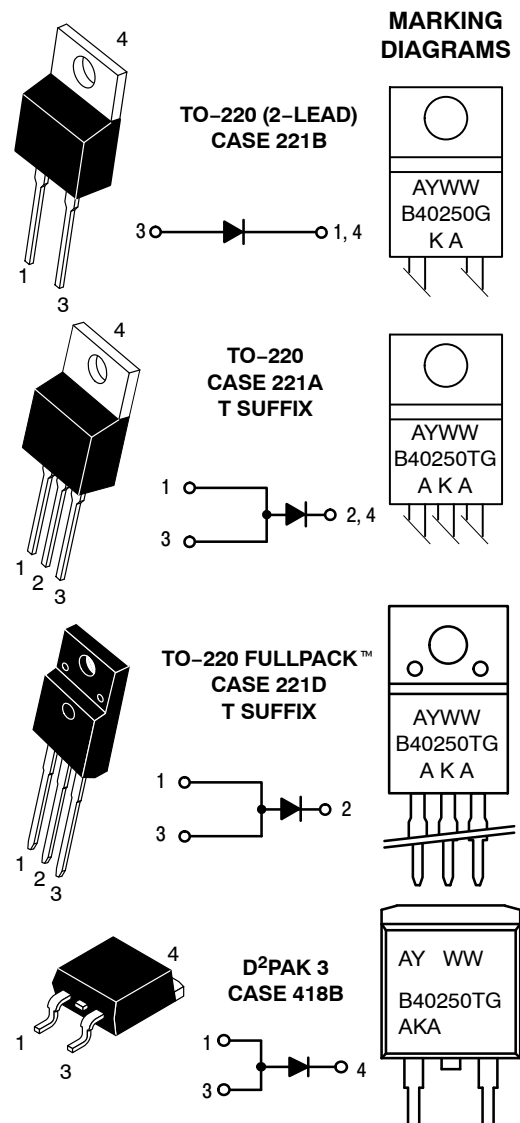
### Mechanical Characteristics

- Case: Epoxy, Molded
- 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
- Epoxy Meets UL 94 V-0 at 0.125 in



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B40250 = Device Code  
 T = 3 pins  
 A = Assembly Location  
 Y = Year  
 WW = Work Week  
 G = Pb-Free Package  
 KA, AKA = Polarity Designator

### ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

# MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

## MAXIMUM RATINGS

| Rating   | Symbol                          | Value       | Unit             |
|--|---------------------------------|-------------|------------------|
| Peak Repetitive Reverse Voltage<br>Working Peak Reverse Voltage<br>DC Blocking Voltage   | $V_{RRM}$<br>$V_{RWM}$<br>$V_R$ | 250         | V                |
| Average Rectified Forward Current<br>(Rated $V_R$ ) $T_C = 82^\circ\text{C}$ MBR40250, MBR40250T, MBRB40250T<br>(Rated $V_R$ ) $T_C = 46^\circ\text{C}$ MBRF40250T   | $I_{F(AV)}$                     | 40          | A                |
| Peak Repetitive Forward Current<br>(Rated $V_R$ , Square Wave, 20 kHz) $T_C = 82^\circ\text{C}$ MBR40250, MBR40250T, MBRB40250T<br>(Rated $V_R$ , Square Wave, 20 kHz) $T_C = 46^\circ\text{C}$ MBRF40250T | $I_{FRM}$                       | 80          | A                |
| Nonrepetitive Peak Surge Current<br>(Surge applied at rated load conditions halfwave, single phase, 60 Hz)   | $I_{FSM}$                       | 150         | A                |
| Storage Temperature  | $T_{stg}$                       | -65 to +175 | $^\circ\text{C}$ |
| Operating Junction Temperature   | $T_J$                           | -65 to +150 | $^\circ\text{C}$ |
| Voltage Rate of Change (Rated $V_R$ )  | dv/dt                           | 10,000      | V/ $\mu\text{s}$ |

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.

## THERMAL CHARACTERISTICS

| Characteristic  | Symbol          | Value          | Unit                      |
|---|-----------------|----------------|---------------------------|
| Maximum Thermal Resistance<br>Junction-to-Case<br>MBR40250(T) and MBRB40250T<br>MBRF40250 | $R_{\theta JC}$ | 2.0<br>3.0     | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient<br>MBR40250(T)<br>MBRF40250<br>MBRB40250T                             | $R_{\theta JA}$ | 60<br>50<br>50 |                           |

## ELECTRICAL CHARACTERISTICS

| Characteristic   | Symbol   | Value                        | Unit |
|--|----------|------------------------------|------|
| Maximum Instantaneous Forward Voltage (Note 1)<br>$I_F = 20\text{ A}$ , $T_C = 25^\circ\text{C}$<br>$I_F = 20\text{ A}$ , $T_C = 125^\circ\text{C}$<br>$I_F = 40\text{ A}$ , $T_C = 25^\circ\text{C}$<br>$I_F = 40\text{ A}$ , $T_C = 125^\circ\text{C}$ | $V_F$    | 0.86<br>0.71<br>0.97<br>0.86 | V    |
| Maximum Instantaneous Reverse Current (Note 1)<br>Rated DC Voltage, $T_C = 25^\circ\text{C}$<br>Rated DC Voltage, $T_C = 125^\circ\text{C}$  | $I_R$    | 0.25<br>30                   | mA   |
| Maximum Reverse Recovery Time<br>$I_F = 1.0\text{ A}$ , di/dt = 50 A/ $\mu\text{s}$ , $T_C = 25^\circ\text{C}$   | $t_{rr}$ | 35                           | ns   |

## DYNAMIC CHARACTERISTICS

| Characteristic  | Symbol | Value | Unit |
|---|--------|-------|------|
| Capacitance<br>$V_R = -5.0\text{ V}$ , $T_C = 25^\circ\text{C}$ , Frequency = 1.0 MHz | $C_T$  | 500   | pF   |

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.

1. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

# MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

## TYPICAL CHARACTERISTICS

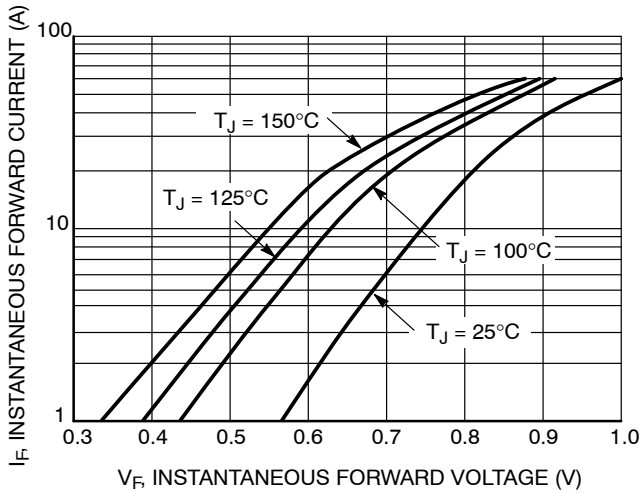


Figure 1. Typical Forward Voltage

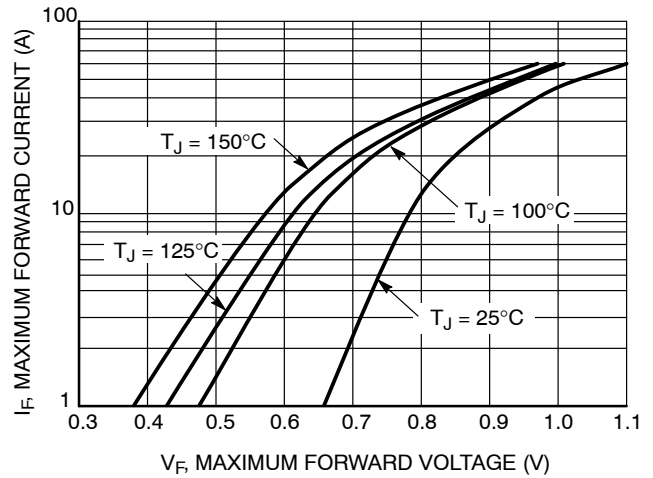


Figure 2. Maximum Forward Voltage

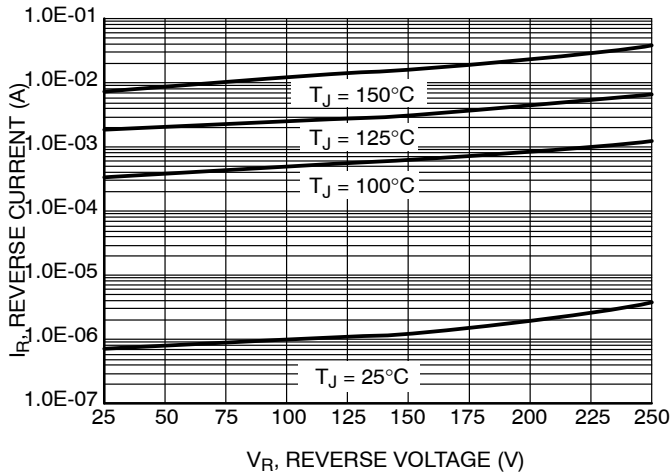


Figure 3. Typical Reverse Current

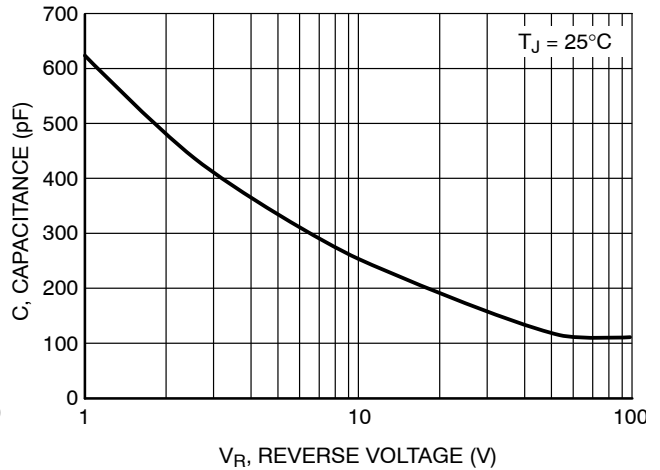


Figure 4. Typical Capacitance

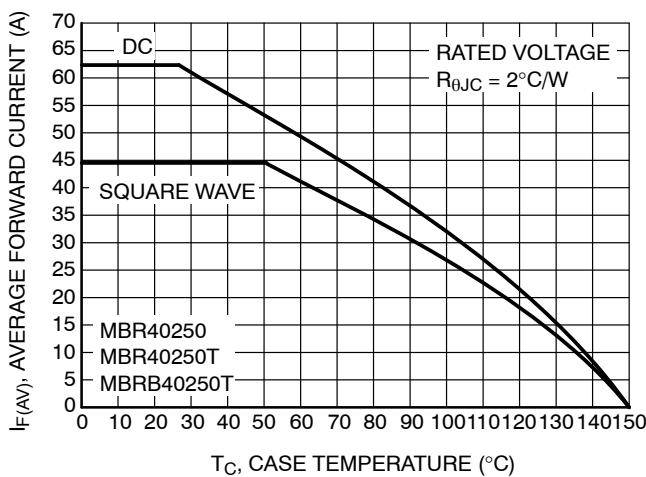


Figure 5. Current Derating (Case) for MBR40250, MBR40250T and MBRB40250T

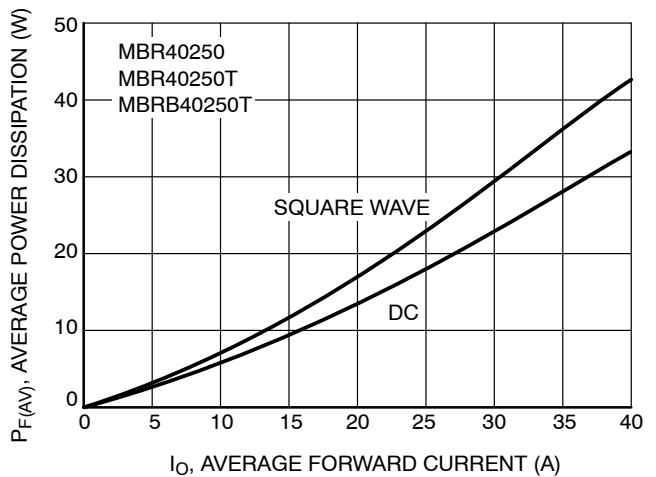


Figure 6. Forward Power Dissipation for MBR40250, MBR40250T and MBRB40250T

# MBR40250G, MBR40250TG, MBRF40250TG, MBRB40250TG

## TYPICAL CHARACTERISTICS

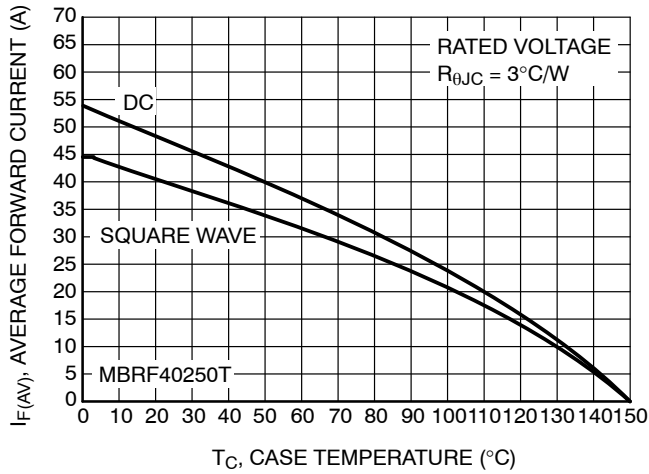


Figure 7. Current Derating (Case) for MBRF40250T

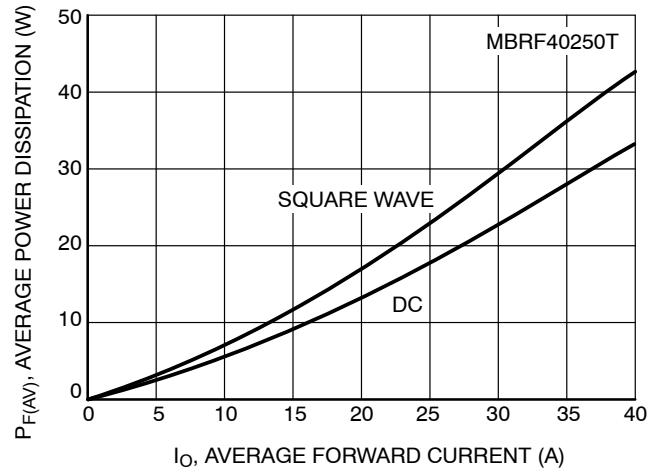


Figure 8. Forward Power Dissipation for MBRF40250T

### ORDERING INFORMATION

| Device        | Package                           | Shipping†               |
|---------------|-----------------------------------|-------------------------|
| MBR40250G     | TO-220 (2-LEAD)<br>(Pb-Free)      | 50 Units / Rail         |
| MBR40250TG    | TO-220<br>(Pb-Free)               | 50 Units / Rail         |
| MBRF40250TG   | TO-220 FULLPACK<br>(Pb-Free)      | 50 Units / Rail         |
| MBRB40250TG   | D <sup>2</sup> PAK 3<br>(Pb-Free) | 50 Units / Rail         |
| MBRB40250TT4G | D <sup>2</sup> PAK 3<br>(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.

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# 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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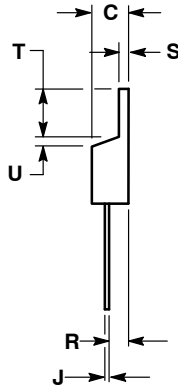
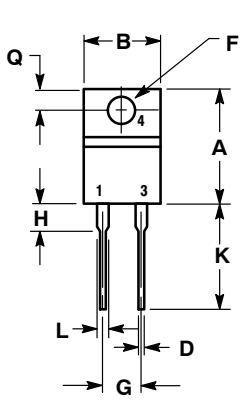


### TO-220, 2-LEAD CASE 221B-04 ISSUE F

DATE 12 APR 2013



SCALE 1:1



NOTES:

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

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.595  | 0.620 | 15.11       | 15.75 |
| B   | 0.380  | 0.405 | 9.65        | 10.29 |
| C   | 0.160  | 0.190 | 4.06        | 4.82  |
| D   | 0.025  | 0.039 | 0.64        | 1.00  |
| F   | 0.142  | 0.161 | 3.61        | 4.09  |
| G   | 0.190  | 0.210 | 4.83        | 5.33  |
| H   | 0.110  | 0.130 | 2.79        | 3.30  |
| J   | 0.014  | 0.025 | 0.36        | 0.64  |
| K   | 0.500  | 0.562 | 12.70       | 14.27 |
| L   | 0.045  | 0.060 | 1.14        | 1.52  |
| Q   | 0.100  | 0.120 | 2.54        | 3.04  |
| R   | 0.080  | 0.110 | 2.04        | 2.79  |
| S   | 0.045  | 0.055 | 1.14        | 1.39  |
| T   | 0.235  | 0.255 | 5.97        | 6.48  |
| U   | 0.000  | 0.050 | 0.000       | 1.27  |

STYLE 1:  
PIN 1. CATHODE  
2. N/A  
3. ANODE  
4. CATHODE

STYLE 2:  
PIN 1. ANODE  
2. N/A  
3. CATHODE  
4. ANODE

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# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

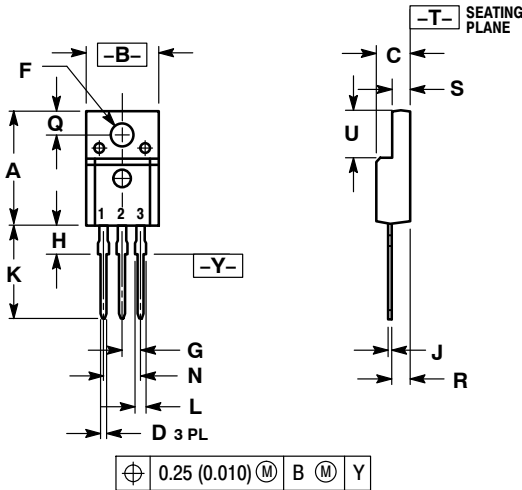
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SCALE 1:1

## 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.

| 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  |

### MARKING DIAGRAMS

- |  |   |  |
|--|---|--|
| STYLE 1:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE     | STYLE 2:<br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER | STYLE 3:<br>PIN 1. ANODE<br>2. CATHODE<br>3. ANODE |
| STYLE 4:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE | STYLE 5:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE     | STYLE 6:<br>PIN 1. MT 1<br>2. MT 2<br>3. GATE      |



**Bipolar**



**Rectifier**

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

|                         |                       |  |
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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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**D<sup>2</sup>PAK 3**  
CASE 418B-04  
ISSUE L

DATE 17 FEB 2015

SCALE 1:1

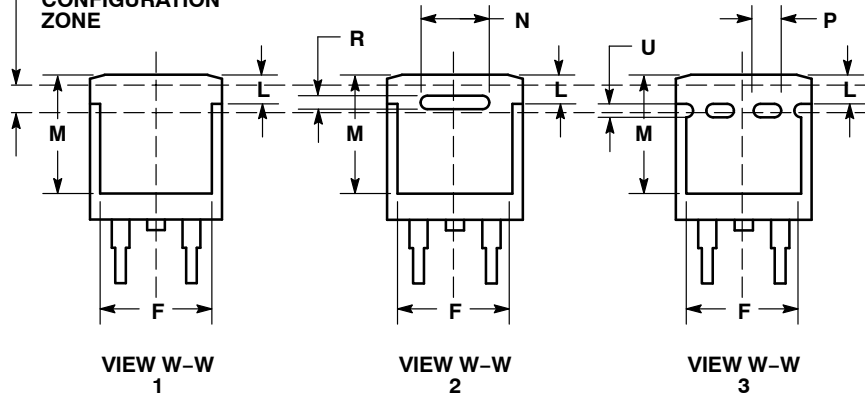


**NOTES:**

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**



- |  |   |   |  |   |  |
|--|---|---|--|---|--|
| <b>STYLE 1:</b><br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 2:</b><br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN | <b>STYLE 3:</b><br>PIN 1. ANODE<br>2. CATHODE<br>3. ANODE<br>4. CATHODE | <b>STYLE 4:</b><br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 5:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. ANODE | <b>STYLE 6:</b><br>PIN 1. NO CONNECT<br>2. CATHODE<br>3. ANODE<br>4. CATHODE |
|--|---|---|--|---|--|

**MARKING INFORMATION AND FOOTPRINT ON PAGE 2**

|                         |                           |  |
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**D<sup>2</sup>PAK 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\***



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.

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