


**Features**

- 3.0W Power Dissipation
- Ideally Suited for Automated Assembly
- 3.3V - 200V Nominal Zener Voltage Range
- Standard  $V_Z$  Tolerance is  $\pm 5\%$
- ESD Rating of Class 3 ( $>16kV$ ) per Human Body Model
- **Lead-Free Finish; RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

**Mechanical Data**

- Case: SMB
- Case Material: Molded Plastic. UL Flammability Classification Rating 94V-0
- Moisture Sensitivity: Level 1 per J-STD-020
- Copper Alloy Leadframe with Lead-Free Plating (Matte Tin Finish). Solderable per MIL-STD-202, Method 208 
- Polarity: Cathode Band
- Weight: 0.096 grams (Approximate)

**SMB**



Top View



Bottom View

**Ordering Information** (Note 4)

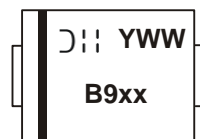
| Device*      | Packaging | Shipping          |
|--------------|-----------|-------------------|
| 1SMB59xxB-13 | SMB       | 3,000/Tape & Reel |

\*x = Device Voltage, e.g., 1SMB5920B-13.

- Notes:
1. EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant. All applicable RoHS exemptions applied.
  2. See [http://www.diodes.com/quality/lead\\_free.html](http://www.diodes.com/quality/lead_free.html) for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
  3. Halogen- and Antimony-free "Green" products are defined as those which contain  $<900ppm$  bromine,  $<900ppm$  chlorine ( $<1500ppm$  total Br + Cl) and  $<1000ppm$  antimony compounds.
  4. For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

**Marking Information**

**SMB**



B9xx = Product Type Marking Code (See Electric Characteristics Table)  
 ⌋⌋⌋ = Manufacturers' Code Marking  
 YWW = Date Code Marking  
 Y = Last Digit of Year (ex: 4 for 2014)  
 WW = Week Code (01 - 53)

**Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Characteristic                           | Symbol          | Value                           | Unit |
|--|-----------------|---------------------------------|------|
| Forward Voltage @ I <sub>F</sub> = 200mA | V <sub>F</sub>  | 1.5                             | V    |
| Zener Current (See Page 3)               | I <sub>ZM</sub> | P <sub>D</sub> / V <sub>Z</sub> | mA   |

**Thermal Characteristics**

| Characteristic                                     | Symbol                            | Value       | Unit  |
|--|-----------------------------------|-------------|-------|
| Power Dissipation @T <sub>L</sub> = +75°C          | P <sub>D</sub>                    | 3.0         | W     |
| Derate Above +75°C (Note 5)                        |                                   | 40          | mW/°C |
| Thermal Resistance - Junction to Terminal (Note 5) | R <sub>θJT</sub>                  | 25          | °C/W  |
| Power Dissipation @T <sub>A</sub> = +25°C          | P <sub>D</sub>                    | 550         | mW    |
| Derate Above +25°C (Note 5)                        |                                   | 4.4         | mW/°C |
| Thermal Resistance - Junction to Ambient (Note 5)  | R <sub>θJA</sub>                  | 226         | °C/W  |
| Operating and Storage Temperature Range            | T <sub>J</sub> , T <sub>STG</sub> | -65 to +150 | °C    |

Note: 5. Device mounted on FR-4 PCB; pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at <http://www.diodes.com>.

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Type Number | Marking Code | Zener Voltage Range (Note 6)     |         |         | Test Current | Maximum Zener Impedance (Note 7) |                                   |                                   | Maximum Reverse Current (Note 6) |                                 | I <sub>ZM</sub> Max |
|-------------|--------------|----------------------------------|---------|---------|--------------|----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|---------------------------------|---------------------|
|             |              | V <sub>Z</sub> @ I <sub>ZT</sub> |         |         |              | I <sub>ZT</sub>                  | Z <sub>ZT</sub> @ I <sub>ZT</sub> | Z <sub>ZK</sub> @ I <sub>ZK</sub> |                                  | I <sub>R</sub> @ V <sub>R</sub> |                     |
|             |              | Min (V)                          | Typ (V) | Max (V) | mA           | Ω                                | Ω                                 | mA                                | μA                               | V                               |                     |
| 1SMB5913B   | B913         | 3.13                             | 3.3     | 3.47    | 113.6        | 10                               | 500                               | 1                                 | 100                              | 1                               | 454                 |
| 1SMB5914B   | B914         | 3.42                             | 3.6     | 3.78    | 104.2        | 9                                | 500                               | 1                                 | 75                               | 1                               | 416                 |
| 1SMB5915B   | B915         | 3.7                              | 3.9     | 4.1     | 96.1         | 7.5                              | 500                               | 1                                 | 25                               | 1                               | 384                 |
| 1SMB5916B   | B916         | 4.08                             | 4.3     | 4.52    | 87.2         | 6                                | 500                               | 1                                 | 5                                | 1                               | 348                 |
| 1SMB5917B   | B917         | 4.46                             | 4.7     | 4.94    | 79.8         | 5                                | 500                               | 1                                 | 5                                | 1.5                             | 319                 |
| 1SMB5920B   | B920         | 5.89                             | 6.2     | 6.51    | 60.5         | 2                                | 200                               | 1                                 | 5                                | 4                               | 241                 |
| 1SMB5921B   | B921         | 6.46                             | 6.8     | 7.14    | 55.1         | 2.5                              | 200                               | 1                                 | 5                                | 5.2                             | 220                 |
| 1SMB5922B   | B922         | 7.12                             | 7.5     | 7.88    | 50           | 3                                | 400                               | 0.5                               | 5                                | 6                               | 200                 |
| 1SMB5923B   | B923         | 7.79                             | 8.2     | 8.61    | 45.7         | 3.5                              | 400                               | 0.5                               | 5                                | 6.5                             | 182                 |
| 1SMB5924B   | B924         | 8.64                             | 9.1     | 9.56    | 41.2         | 4                                | 500                               | 0.5                               | 5                                | 7                               | 164                 |
| 1SMB5925B   | B925         | 9.5                              | 10      | 10.5    | 37.5         | 4.5                              | 500                               | 0.25                              | 5                                | 8                               | 150                 |
| 1SMB5926B   | B926         | 10.45                            | 11      | 11.55   | 34.1         | 5.5                              | 550                               | 0.25                              | 1                                | 8.4                             | 136                 |
| 1SMB5927B   | B927         | 11.4                             | 12      | 12.6    | 31.2         | 6.5                              | 550                               | 0.25                              | 1                                | 9.1                             | 125                 |
| 1SMB5928B   | B928         | 12.35                            | 13      | 13.65   | 28.8         | 7                                | 550                               | 0.25                              | 1                                | 9.9                             | 115                 |
| 1SMB5929B   | B929         | 14.25                            | 15      | 15.75   | 25           | 9                                | 600                               | 0.25                              | 1                                | 11.4                            | 100                 |
| 1SMB5930B   | B930         | 15.2                             | 16      | 16.8    | 23.4         | 10                               | 600                               | 0.25                              | 1                                | 12.2                            | 93                  |
| 1SMB5931B   | B931         | 17.1                             | 18      | 18.9    | 20.8         | 12                               | 650                               | 0.25                              | 1                                | 13.7                            | 83                  |
| 1SMB5932B   | B932         | 19                               | 20      | 21      | 18.7         | 14                               | 650                               | 0.25                              | 1                                | 15.2                            | 75                  |
| 1SMB5933B   | B933         | 20.9                             | 22      | 23.1    | 17           | 17.5                             | 650                               | 0.25                              | 1                                | 16.7                            | 68                  |
| 1SMB5934B   | B934         | 22.8                             | 24      | 25.2    | 15.6         | 19                               | 700                               | 0.25                              | 1                                | 18.2                            | 62                  |
| 1SMB5935B   | B935         | 25.65                            | 27      | 28.35   | 13.9         | 23                               | 700                               | 0.25                              | 1                                | 20.6                            | 55                  |
| 1SMB5936B   | B936         | 28.5                             | 30      | 31.5    | 12.5         | 28                               | 750                               | 0.25                              | 1                                | 22.8                            | 50                  |
| 1SMB5937B   | B937         | 31.35                            | 33      | 34.65   | 11.4         | 33                               | 800                               | 0.25                              | 1                                | 25.1                            | 45                  |
| 1SMB5938B   | B938         | 34.2                             | 36      | 37.8    | 10.4         | 38                               | 850                               | 0.25                              | 1                                | 27.4                            | 41                  |
| 1SMB5939B   | B939         | 37.05                            | 39      | 40.95   | 9.6          | 45                               | 900                               | 0.25                              | 1                                | 29.7                            | 38                  |
| 1SMB5940B   | B940         | 40.85                            | 43      | 45.15   | 8.7          | 53                               | 950                               | 0.25                              | 1                                | 32.7                            | 34                  |
| 1SMB5941B   | B941         | 44.65                            | 47      | 49.35   | 8            | 67                               | 1000                              | 0.25                              | 1                                | 35.8                            | 31                  |
| 1SMB5942B   | B942         | 48.45                            | 51      | 53.55   | 7.3          | 70                               | 1100                              | 0.25                              | 1                                | 38.8                            | 29                  |
| 1SMB5943B   | B943         | 53.2                             | 56      | 58.8    | 6.7          | 86                               | 1300                              | 0.25                              | 1                                | 42.6                            | 26                  |
| 1SMB5944B   | B944         | 58.9                             | 62      | 65.1    | 6            | 100                              | 1500                              | 0.25                              | 1                                | 47.1                            | 24                  |
| 1SMB5945B   | B945         | 64.6                             | 68      | 71.4    | 5.5          | 120                              | 1700                              | 0.25                              | 1                                | 51.7                            | 22                  |
| 1SMB5946B   | B946         | 71.25                            | 75      | 78.75   | 5            | 140                              | 2000                              | 0.25                              | 1                                | 56                              | 20                  |
| 1SMB5947B   | B947         | 77.9                             | 82      | 86.1    | 4.6          | 160                              | 2500                              | 0.25                              | 1                                | 62.2                            | 18                  |
| 1SMB5948B   | B948         | 86.45                            | 91      | 95.55   | 4.1          | 200                              | 3000                              | 0.25                              | 1                                | 69.2                            | 16                  |
| 1SMB5949B   | B949         | 95                               | 100     | 105     | 3.7          | 250                              | 3100                              | 0.25                              | 1                                | 76                              | 15                  |
| 1SMB5950B   | B950         | 104.5                            | 110     | 115.5   | 3.4          | 300                              | 4000                              | 0.25                              | 1                                | 83.6                            | 13                  |
| 1SMB5951B   | B951         | 114                              | 120     | 128     | 3.1          | 380                              | 4500                              | 0.25                              | 1                                | 91.2                            | 12                  |
| 1SMB5952B   | B952         | 123.5                            | 130     | 136.5   | 2.9          | 450                              | 5000                              | 0.25                              | 1                                | 98.8                            | 11                  |
| 1SMB5953B   | B953         | 142.5                            | 150     | 157.5   | 2.5          | 600                              | 6000                              | 0.25                              | 1                                | 114                             | 10                  |
| 1SMB5954B   | B954         | 152                              | 160     | 168     | 2.3          | 700                              | 6500                              | 0.25                              | 1                                | 121.6                           | 9                   |
| 1SMB5955B   | B955         | 171                              | 180     | 189     | 2.1          | 900                              | 7000                              | 0.25                              | 1                                | 136.8                           | 8                   |
| 1SMB5956B   | B956         | 190                              | 200     | 210     | 1.9          | 1200                             | 8000                              | 0.25                              | 1                                | 152                             | 7                   |

Notes: 6. Short duration pulse test used to minimize self-heating effect.  
7. ZENER IMPEDANCE (Z<sub>Z</sub>) DERIVATION Z<sub>ZT</sub> and Z<sub>ZK</sub> are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for I<sub>Z(AC)</sub> = 0.1 I<sub>Z(DC)</sub> with the AC frequency = 60 Hz.



Figure Power Dissipation vs. Ambient Temperature

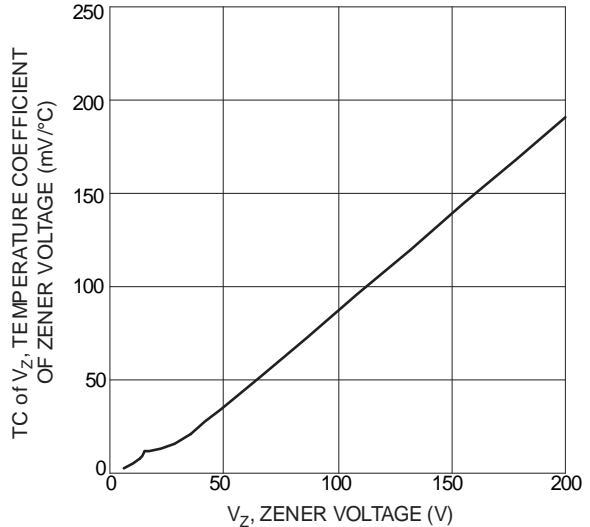


Figure 2 Typical Temperature Coefficient of Zener Voltage vs. Zener Voltage



Figure 3 Typical Zener Breakdown Characteristics

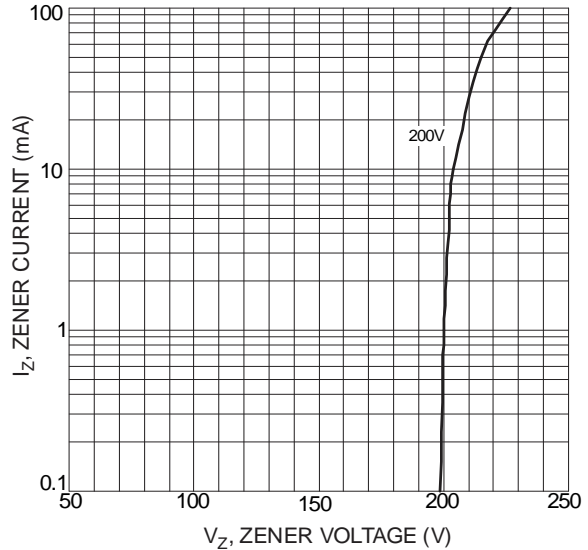


Figure 4 Typical Zener Breakdown Characteristics

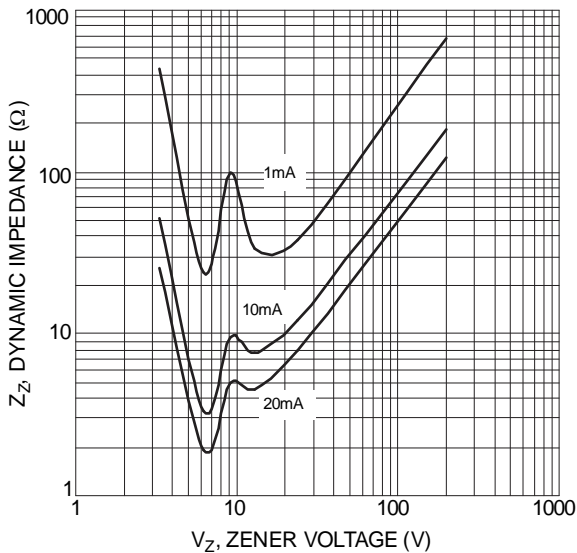


Figure 5 Effect of Zener Voltage

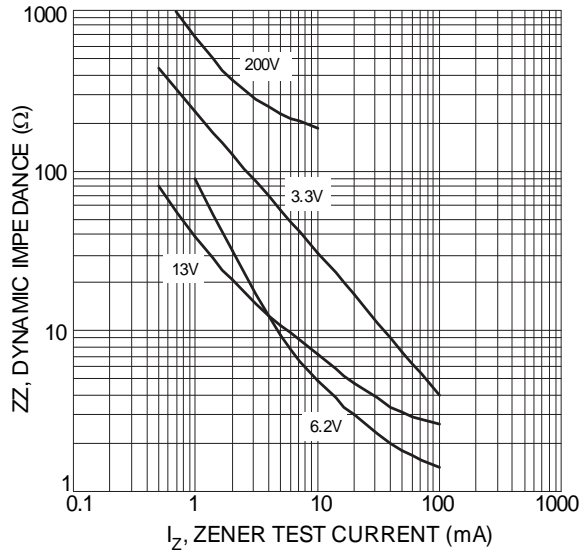
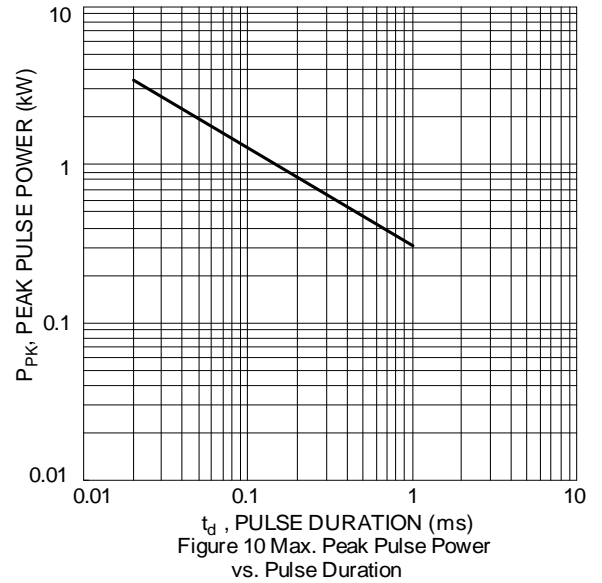
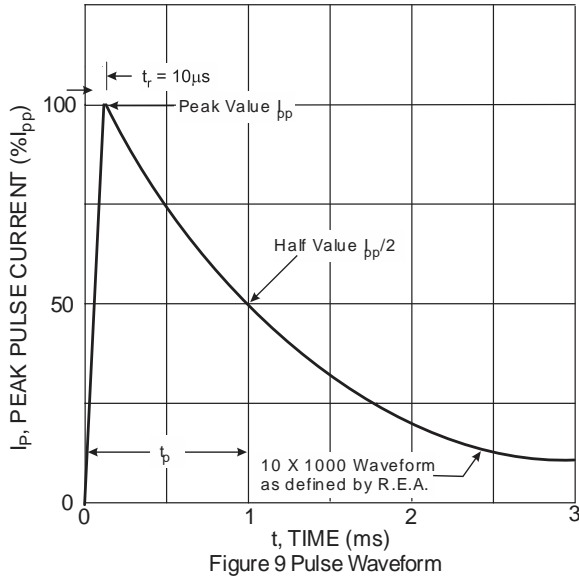
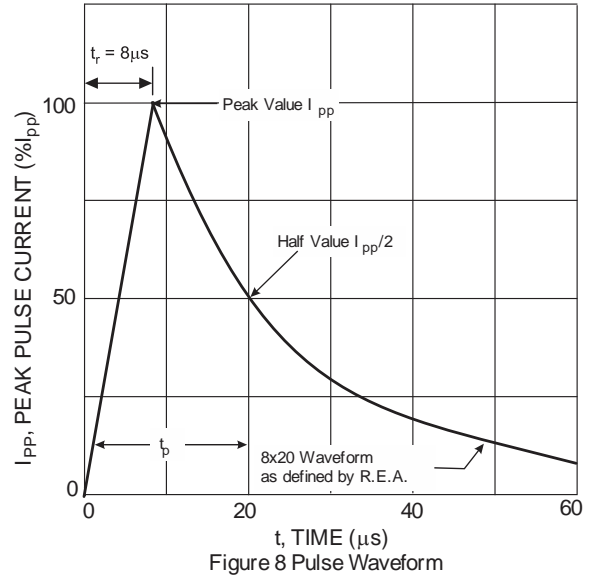
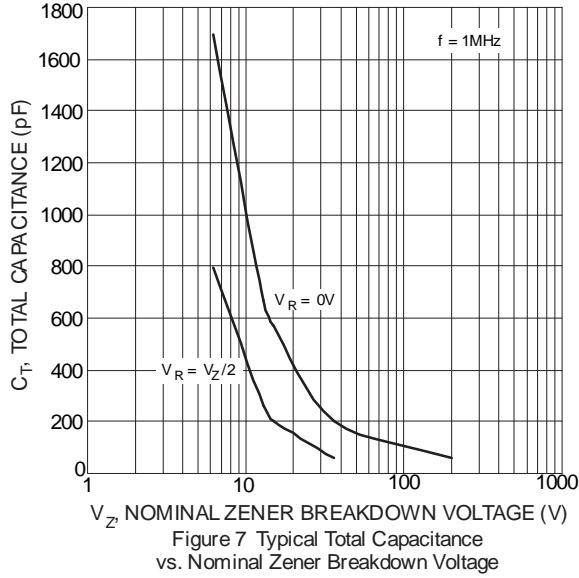
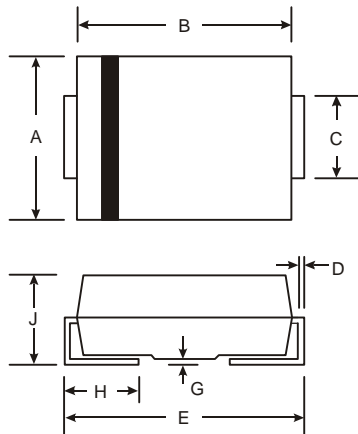


Figure 6 Effect of Zener Current



**Package Outline Dimensions**

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| SMB                         |      |      |
|-----------------------------|------|------|
| Dim                         | Min  | Max  |
| A                           | 3.30 | 3.94 |
| B                           | 4.06 | 4.57 |
| C                           | 1.96 | 2.21 |
| D                           | 0.15 | 0.31 |
| E                           | 5.00 | 5.59 |
| G                           | 0.05 | 0.20 |
| H                           | 0.76 | 1.52 |
| J                           | 2.00 | 2.50 |
| <b>All Dimensions in mm</b> |      |      |

## Suggested Pad Layout

Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for the latest version.



| Dimensions | Value (in mm) |
|------------|---------------|
| C          | 4.30          |
| G          | 1.80          |
| X          | 2.50          |
| X1         | 6.80          |
| Y          | 2.30          |

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