



## Silicon 2.0 Watt Zener Diodes

### DESCRIPTION

The SMB(G/J)5913B – SMB(G/J)5956B series of surface mount 2.0 watt Zener diodes provides a selection from 3.3 to 200 volts with tolerance options of 10%, 5% and 2%. This series has the same electrical characteristics as the axial, JEDEC registered 1N5913 - 1N5956 series with the exception of its higher, 2.0 W power rating (versus 1.5 W for the JEDEC series). This is permitted by the lower thermal resistance of the surface mount packaging. The SMBG Gull-wing design in the DO-215AA package provides for visible solder connections. The SMBJ J-bend design in the DO-214AA package permits greater PC board mounting density. The series is available with SnPb plated leaded or RoHS compliant matte-tin plating.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

### FEATURES

- Surface mount equivalent to JEDEC registered 1N5913 thru 1N5956 number series but with a 30% higher power rating.
- Ideal for high-density and low-profile mounting.
- Zener voltage available 3.3 V to 200 V.
- Standard voltage tolerances are plus/minus 10%, 5% and 2%.
- RoHS compliant versions available.

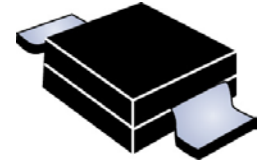
### APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range.
- Non-sensitive to ESD per MIL-STD-750 method 1020.
- Withstands high surge stresses (see [figure 2](#)).
- Minimal changes of voltage versus current.
- High specified maximum current ( $I_{ZM}$ ) when adequately heat sunk.
- Moisture classification is Level 1 per IPC/JEDEC J-STD-020B with no dry pack required.

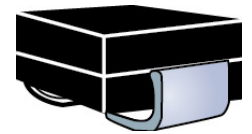
### MAXIMUM RATINGS

| Parameters/Test Conditions                                       | Symbol              | Value       | Unit |
|--|---------------------|-------------|------|
| Junction and Storage Temperature                                 | $T_J$ and $T_{STG}$ | -65 to +150 | °C   |
| Thermal Resistance Junction-to-Lead                              | $R_{\theta JL}$     | 35          | °C/W |
| Thermal Resistance Junction-to-Ambient <sup>(1)</sup>            | $R_{\theta JA}$     | 100         | °C/W |
| Steady-State Power Dissipation @ $T_L \leq 80$ °C <sup>(2)</sup> | $P_D$               | 2.0         | W    |
| Forward Voltage @ 200 mA   | $V_F$               | 1.2         | V    |
| Solder Temperature @ 10 s  | $T_{SP}$            | 260         | °C   |

**Notes:** 1. When mounted on FR4 PC board (1oz Cu) with recommended footprint (see [last page](#)).  
2. Or 1.25 watts at  $T_A = 25$  °C when mounted on FR4 PC board with recommended footprint (also see [figure 1](#).)



**DO-215AA  
Gull-wing Package**



**DO-214AA  
J-bend Package**

**NOTE:** All SMB series are equivalent to prior SMS package identifications.

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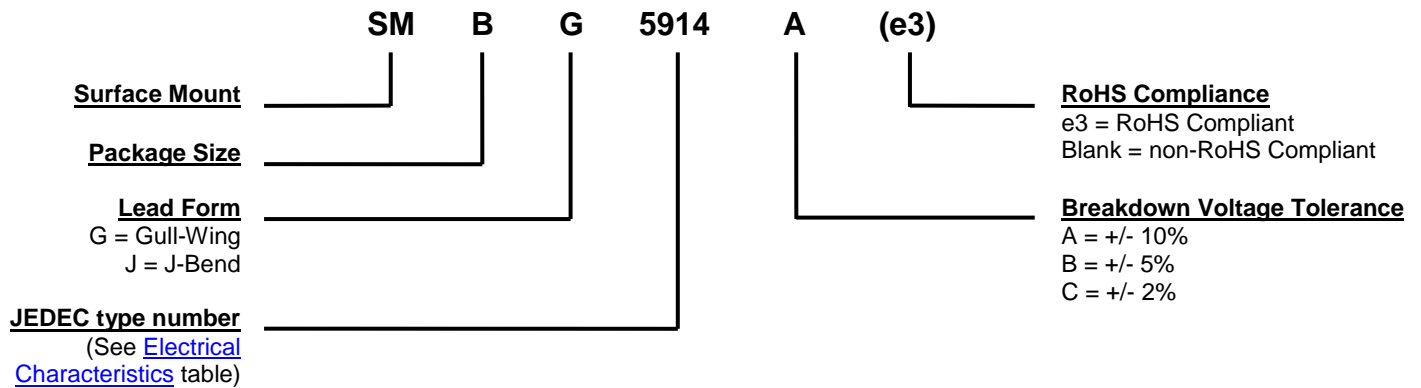
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**MECHANICAL and PACKAGING**

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0.
- TERMINALS: Tin-lead or RoHS compliant annealed matte-tin plating solderable per MIL-STD-750, method 2026.
- MARKING: Part number without SMBx prefix (e.g. 5914B, 5914Be3, MX5946C, 5956A, etc.).
- POLARITY: Cathode indicated by band. Diode to be operated with the banded end positive with respect to the opposite end for Zener regulation.
- TAPE & REEL option: Standard per EIA-481-1-A with 12 mm tape (add “TR” suffix to part number). Consult factory for quantities.
- WEIGHT: 0.1 grams.
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**

**SYMBOLS & DEFINITIONS**

| Symbol                | Definition  |
|-----------------------|---|
| $I_R$                 | Reverse Current: The maximum reverse (leakage) current that will flow at the specified voltage and temperature.   |
| $I_Z, I_{ZT}, I_{ZK}$ | Regulator Current: The dc regulator current ( $I_Z$ ), at a specified test point ( $I_{ZT}$ ), near breakdown knee ( $I_{ZK}$ ).  |
| $I_{ZM}$              | Maximum Regulator (Zener) Current: The maximum rated dc current for the specified power rating.   |
| $V_R$                 | Reverse Voltage: The reverse voltage dc value, no alternating component.  |
| $V_Z$                 | Zener Voltage: The Zener voltage the device will exhibit at a specified current ( $I_Z$ ) in its breakdown region.  |
| $Z_{ZT}$ or $Z_{ZK}$  | Dynamic Impedance: The small signal impedance of the diode when biased to operate in its breakdown region at a specified rms current modulation (typically 10% of $I_{ZT}$ or $I_{ZK}$ ) and superimposed on $I_{ZT}$ or $I_{ZK}$ respectively. |

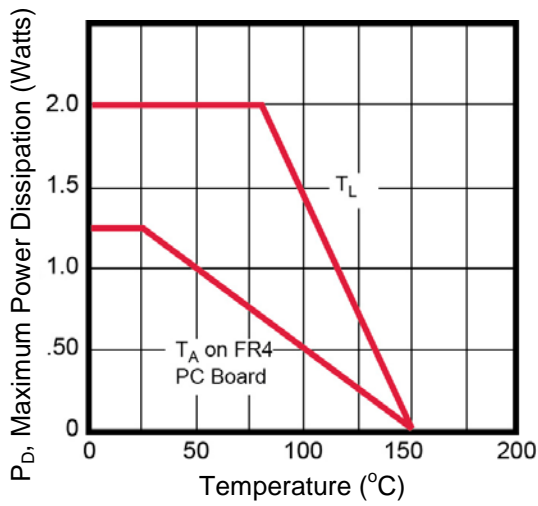
**ELECTRICAL CHARACTERISTICS @  $T_L = +30\text{ }^\circ\text{C}$** 

| PART NUMBER |           | ZENER VOLTAGE<br>$V_Z$ | TEST CURRENT<br>$I_{ZT}$ | DYNAMIC IMPEDANCE<br>$Z_{ZT}$ | KNEE CURRENT<br>$I_{ZK}$ | KNEE IMPEDANCE<br>$Z_{ZK}$ | REVERSE CURRENT<br>$I_R$ | REVERSE VOLTAGE<br>$V_R$ | MAX. DC CURRENT<br>$I_{ZM}$ |
|-------------|-----------|------------------------|--------------------------|-------------------------------|--------------------------|----------------------------|--------------------------|--------------------------|-----------------------------|
| Gull-Wing   | J-Bend    | Volts                  | mA                       | Ohms                          | mA                       | Ohms                       | $\mu\text{A}$            | Volts                    | mA                          |
| SMBG5913B   | SMBJ5913B | 3.3                    | 113.6                    | 10.0                          | 1.0                      | 500                        | 100.0                    | 1.0                      | 606                         |
| SMBG5914B   | SMBJ5914B | 3.6                    | 104.2                    | 9.0                           | 1.0                      | 500                        | 75.0                     | 1.0                      | 554                         |
| SMBG5915B   | SMBJ5915B | 3.9                    | 96.1                     | 7.5                           | 1.0                      | 500                        | 25.0                     | 1.0                      | 512                         |
| SMBG5916B   | SMBJ5916B | 4.3                    | 87.2                     | 6.0                           | 1.0                      | 500                        | 10.0                     | 1.0                      | 464                         |
| SMBG5917B   | SMBJ5917B | 4.7                    | 79.8                     | 5.0                           | 1.0                      | 500                        | 5.0                      | 1.5                      | 425                         |
| SMBG5918B   | SMBJ5918B | 5.1                    | 73.5                     | 4.0                           | 1.0                      | 400                        | 5.0                      | 2.0                      | 392                         |
| SMBG5919B   | SMBJ5919B | 5.6                    | 66.9                     | 2.0                           | 1.0                      | 300                        | 5.0                      | 3.0                      | 356                         |
| SMBG5920B   | SMBJ5920B | 6.2                    | 60.5                     | 2.0                           | 1.0                      | 200                        | 5.0                      | 4.0                      | 321                         |
| SMBG5921B   | SMBJ5921B | 6.8                    | 55.1                     | 2.5                           | 1.0                      | 200                        | 5.0                      | 5.2                      | 293                         |
| SMBG5922B   | SMBJ5922B | 7.5                    | 50.0                     | 3.0                           | 0.5                      | 400                        | 5.0                      | 6.0                      | 266                         |
| SMBG5923B   | SMBJ5923B | 8.2                    | 45.7                     | 3.5                           | 0.5                      | 400                        | 5.0                      | 6.5                      | 242                         |
| SMBG5924B   | SMBJ5924B | 9.1                    | 41.2                     | 4.0                           | 0.5                      | 500                        | 5.0                      | 7.0                      | 218                         |
| SMBG5925B   | SMBJ5925B | 10                     | 37.5                     | 4.5                           | 0.25                     | 500                        | 5.0                      | 8.0                      | 200                         |
| SMBG5926B   | SMBJ5926B | 11                     | 34.1                     | 5.5                           | 0.25                     | 550                        | 1.0                      | 8.4                      | 181                         |
| SMBG5927B   | SMBJ5927B | 12                     | 31.2                     | 6.5                           | 0.25                     | 550                        | 1.0                      | 9.1                      | 166                         |
| SMBG5928B   | SMBJ5928B | 13                     | 28.8                     | 7.0                           | 0.25                     | 550                        | 1.0                      | 9.9                      | 153                         |
| SMBG5929B   | SMBJ5929B | 15                     | 25.0                     | 9.0                           | 0.25                     | 600                        | 1.0                      | 11.4                     | 133                         |
| SMBG5930B   | SMBJ5930B | 16                     | 23.4                     | 10.0                          | 0.25                     | 600                        | 1.0                      | 12.2                     | 122                         |
| SMBG5931B   | SMBJ5931B | 18                     | 20.8                     | 12.0                          | 0.25                     | 650                        | 1.0                      | 13.7                     | 110                         |
| SMBG5932B   | SMBJ5932B | 20                     | 18.7                     | 14.0                          | 0.25                     | 650                        | 1.0                      | 15.2                     | 100                         |
| SMBG5933B   | SMBJ5933B | 22                     | 17.0                     | 17.5                          | 0.25                     | 650                        | 1.0                      | 16.7                     | 90                          |
| SMBG5934B   | SMBJ5934B | 24                     | 15.6                     | 19.0                          | 0.25                     | 700                        | 1.0                      | 18.2                     | 82                          |
| SMBG5935B   | SMBJ5935B | 27                     | 13.9                     | 23.0                          | 0.25                     | 700                        | 1.0                      | 20.6                     | 73                          |
| SMBG5936B   | SMBJ5936B | 30                     | 12.5                     | 28.0                          | 0.25                     | 750                        | 1.0                      | 22.8                     | 66                          |
| SMBG5937B   | SMBJ5937B | 33                     | 11.4                     | 33.0                          | 0.25                     | 800                        | 1.0                      | 25.1                     | 60                          |
| SMBG5938B   | SMBJ5938B | 36                     | 10.4                     | 38.0                          | 0.25                     | 850                        | 1.0                      | 27.4                     | 54                          |
| SMBG5939B   | SMBJ5939B | 39                     | 9.6                      | 45.0                          | 0.25                     | 900                        | 1.0                      | 29.7                     | 50                          |
| SMBG5940B   | SMBJ5940B | 43                     | 8.7                      | 53.0                          | 0.25                     | 950                        | 1.0                      | 32.7                     | 45                          |
| SMBG5941B   | SMBJ5941B | 47                     | 8.0                      | 67.0                          | 0.25                     | 1000                       | 1.0                      | 35.8                     | 41                          |
| SMBG5942B   | SMBJ5942B | 51                     | 7.3                      | 70.0                          | 0.25                     | 1100                       | 1.0                      | 38.8                     | 38                          |
| SMBG5943B   | SMBJ5943B | 56                     | 6.7                      | 86.0                          | 0.25                     | 1300                       | 1.0                      | 42.6                     | 34                          |
| SMBG5944B   | SMBJ5944B | 62                     | 6.0                      | 100.0                         | 0.25                     | 1500                       | 1.0                      | 47.1                     | 32                          |
| SMBG5945B   | SMBJ5945B | 68                     | 5.5                      | 120.0                         | 0.25                     | 1700                       | 1.0                      | 51.2                     | 29                          |
| SMBG5946B   | SMBJ5946B | 75                     | 5.0                      | 140.0                         | 0.25                     | 2000                       | 1.0                      | 56.0                     | 26                          |
| SMBG5947B   | SMBJ5947B | 82                     | 4.6                      | 160.0                         | 0.25                     | 2500                       | 1.0                      | 62.2                     | 24                          |
| SMBG5948B   | SMBJ5948B | 91                     | 4.1                      | 200.0                         | 0.25                     | 3000                       | 1.0                      | 69.2                     | 10                          |
| SMBG5949B   | SMBJ5949B | 100                    | 3.7                      | 250.0                         | 0.25                     | 3100                       | 1.0                      | 76.0                     | 20                          |
| SMBG5950B   | SMBJ5950B | 110                    | 3.4                      | 300.0                         | 0.25                     | 4000                       | 1.0                      | 83.6                     | 17                          |
| SMBG5951B   | SMBJ5951B | 120                    | 3.1                      | 380.0                         | 0.25                     | 4500                       | 1.0                      | 91.2                     | 16                          |
| SMBG5952B   | SMBJ5952B | 130                    | 2.9                      | 450.0                         | 0.25                     | 5000                       | 1.0                      | 98.8                     | 14                          |
| SMBG5953B   | SMBJ5953B | 150                    | 2.5                      | 600.0                         | 0.25                     | 6000                       | 1.0                      | 114.0                    | 13                          |
| SMBG5954B   | SMBJ5954B | 160                    | 2.3                      | 700.0                         | 0.25                     | 6500                       | 1.0                      | 121.6                    | 12                          |
| SMBG5955B   | SMBJ5955B | 180                    | 2.1                      | 900.0                         | 0.25                     | 7000                       | 1.0                      | 136.8                    | 10                          |
| SMBG5956B   | SMBJ5956B | 200                    | 1.9                      | 1200.0                        | 0.25                     | 8000                       | 1.0                      | 152.0                    | 9                           |

**NOTE 1:** Zener voltage ( $V_Z$ ) is measured at  $T_L = 30\text{ }^\circ\text{C}$  and 20 seconds after application of dc current.

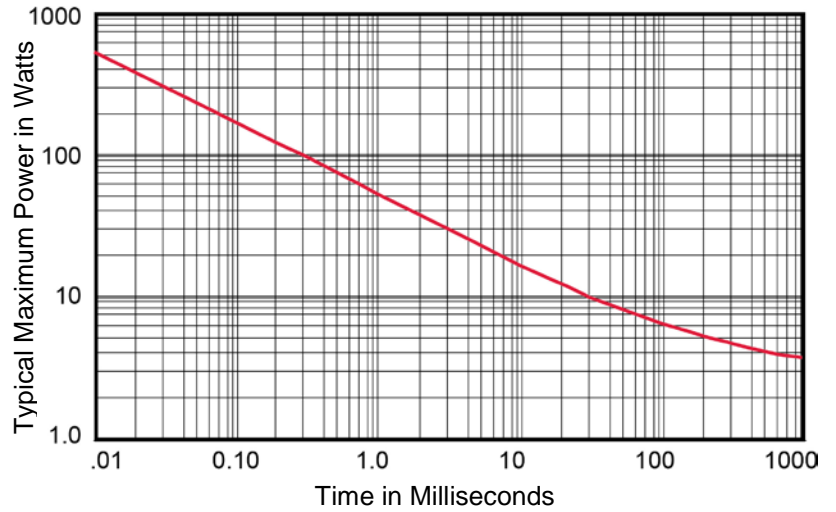
**NOTE 2:** The Zener impedance is derived from 1 kHz ac voltage resulting from an ac current modulation having an rms value equal to 10% of the dc Zener current ( $I_{ZT}$  or  $I_{ZK}$ ) superimposed on  $I_{ZT}$  or  $I_{ZK}$ . See [MicroNote 202](#) for Zener impedance variation with different operating currents.

**NOTE 3:** The maximum dc current ( $I_{ZM}$ ) is based only on the maximum power of 2.0 watts at  $T_L \leq 80\text{ }^\circ\text{C}$ . These values must be reduced by 37.5% (1.25 W) when mounted on PC boards as described in [maximum ratings](#).

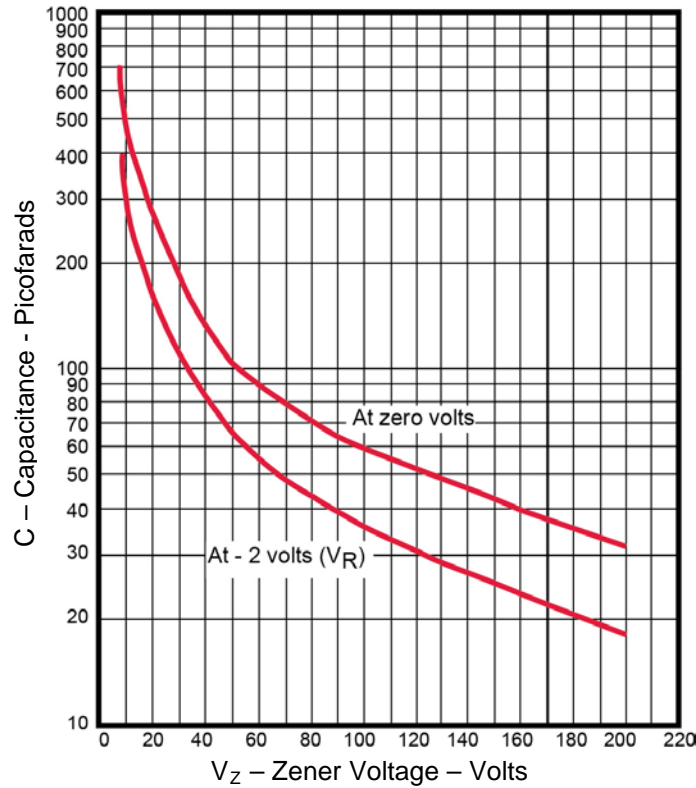
**GRAPHS**


$T_L$  Lead temp (°C), or  $T_A$  on FR4 PC Board

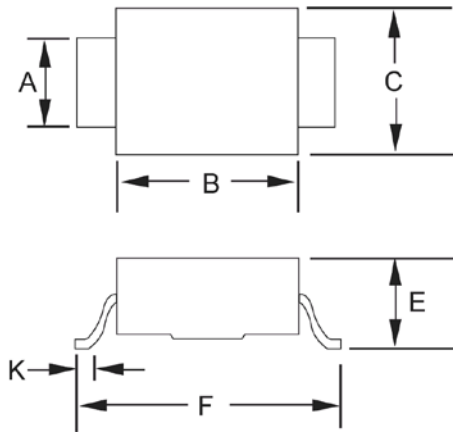
**FIGURE 1 – Power Derating Curve**



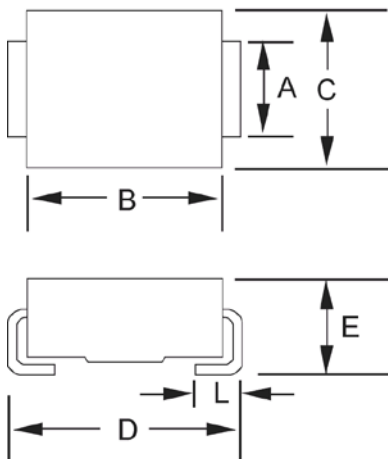
**FIGURE 2 – Transient Surge Capability  
Square-Wave Pulse Width  
(non-Repetitive) in Milliseconds**



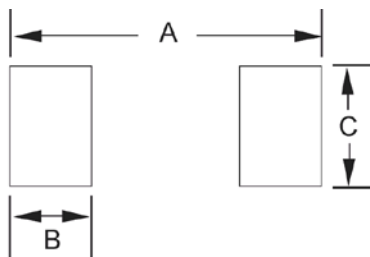
**FIGURE 3 – Capacitance vs Zener Voltage**

**PACKAGE DIMENSIONS**

**SMBG (DO-215AA)**

| Ltr      | Dimensions |       |             |       |
|----------|------------|-------|-------------|-------|
|          | Inch       |       | Millimeters |       |
|          | Min        | Max   | Min         | Max   |
| <b>A</b> | 0.077      | 0.083 | 1.96        | 2.10  |
| <b>B</b> | 0.160      | 0.180 | 4.06        | 4.57  |
| <b>C</b> | 0.130      | 0.155 | 3.30        | 3.94  |
| <b>E</b> | 0.077      | 0.104 | 1.95        | 2.65  |
| <b>F</b> | 0.235      | 0.255 | 5.97        | 6.48  |
| <b>K</b> | 0.015      | 0.030 | 0.381       | 0.762 |


**SMBJ (DO-214AA)**

| Ltr      | Dimensions |       |             |      |
|----------|------------|-------|-------------|------|
|          | Inch       |       | Millimeters |      |
|          | Min        | Max   | Min         | Max  |
| <b>A</b> | 0.077      | 0.083 | 1.96        | 2.10 |
| <b>B</b> | 0.160      | 0.180 | 4.06        | 4.57 |
| <b>C</b> | 0.130      | 0.155 | 3.30        | 3.94 |
| <b>D</b> | 0.205      | 0.220 | 5.21        | 5.59 |
| <b>E</b> | 0.077      | 0.104 | 1.95        | 2.65 |
| <b>L</b> | 0.030      | 0.060 | 0.760       | 1.52 |

**PAD LAYOUT**


| SMBG (DO-215AA) |       |             |
|-----------------|-------|-------------|
| Ltr             | Inch  | Millimeters |
| <b>A</b>        | 0.320 | 8.13        |
| <b>B</b>        | 0.085 | 2.16        |
| <b>C</b>        | 0.110 | 2.79        |

| SMBJ (DO-214AA) |       |             |
|-----------------|-------|-------------|
| Ltr             | Inch  | Millimeters |
| <b>A</b>        | 0.260 | 6.60        |
| <b>B</b>        | 0.085 | 2.16        |
| <b>C</b>        | 0.110 | 2.79        |

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