



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.

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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.

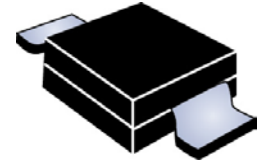
APPLICATIONS / BENEFITS

- 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.

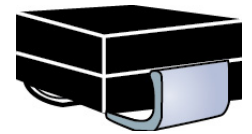
MAXIMUM RATINGS

| 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 ⁽¹⁾ | $R_{\theta JA}$ | 100 | °C/W |
| Steady-State Power Dissipation @ $T_L \leq 80$ °C ⁽²⁾ | 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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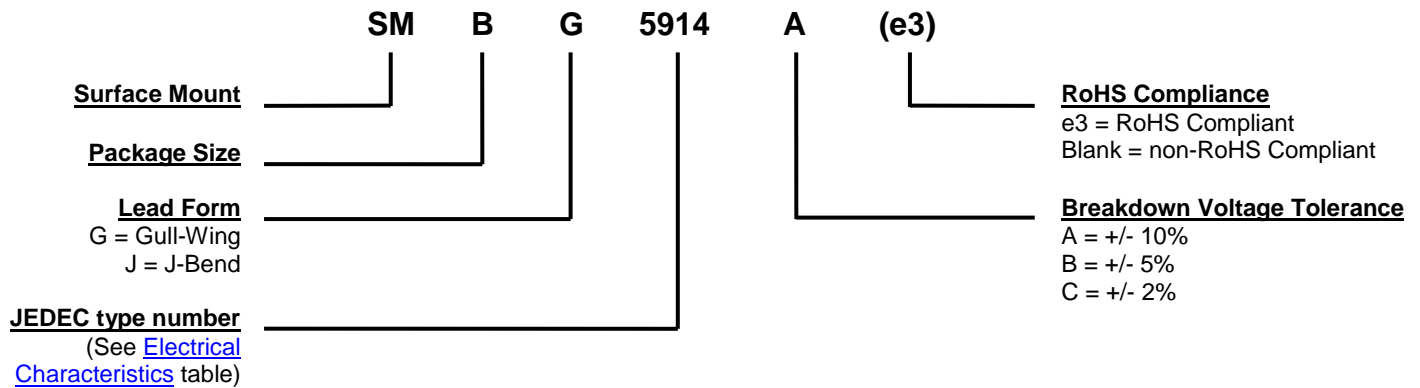
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MECHANICAL and PACKAGING

- 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. |

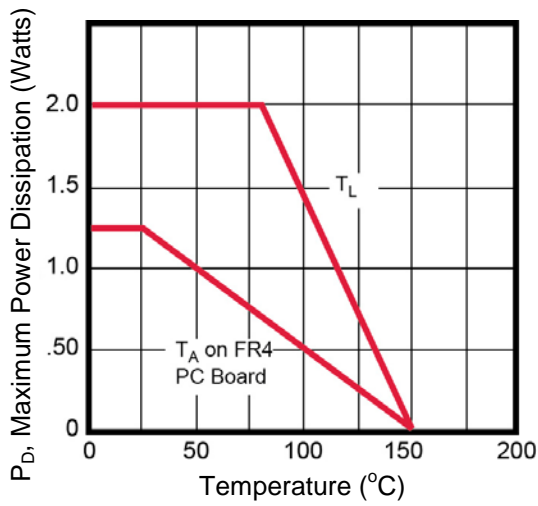
ELECTRICAL CHARACTERISTICS @ $T_L = +30\text{ }^\circ\text{C}$

| PART NUMBER | | ZENER VOLTAGE V_Z | TEST CURRENT I_{ZT} | DYNAMIC IMPEDANCE Z_{ZT} | KNEE CURRENT I_{ZK} | KNEE IMPEDANCE Z_{ZK} | REVERSE CURRENT I_R | REVERSE VOLTAGE V_R | MAX. DC CURRENT I_{ZM} |
|-------------|-----------|------------------------|--------------------------|-------------------------------|--------------------------|----------------------------|--------------------------|--------------------------|-----------------------------|
| Gull-Wing | J-Bend | Volts | mA | Ohms | mA | Ohms | μA | 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.

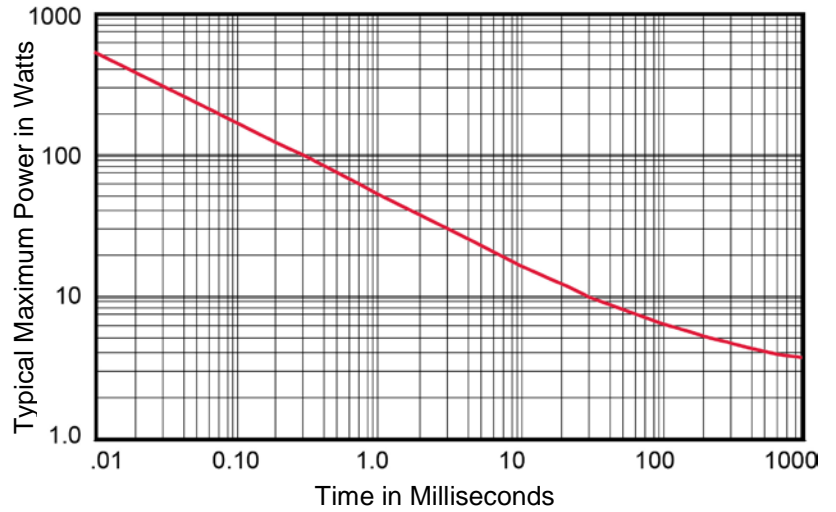
NOTE 2: The Zener impedance is derived from 1 kHz ac voltage resulting from an ac current modulation having an rms value equal to 10% of the dc Zener current (I_{ZT} or I_{ZK}) superimposed on I_{ZT} or I_{ZK} . See [MicroNote 202](#) for Zener impedance variation with different operating currents.

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**

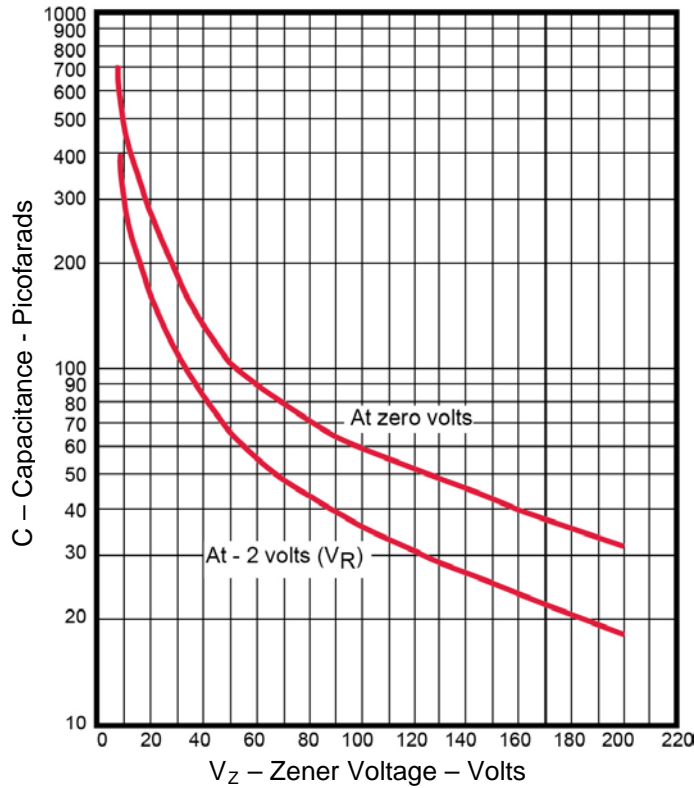
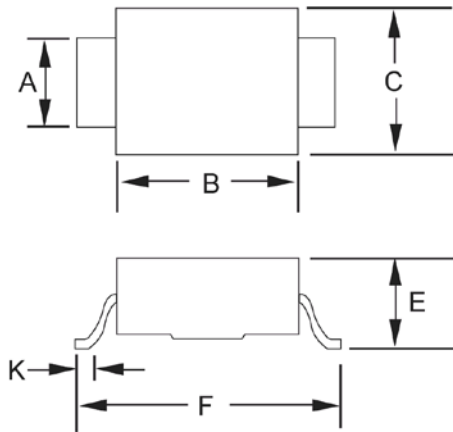
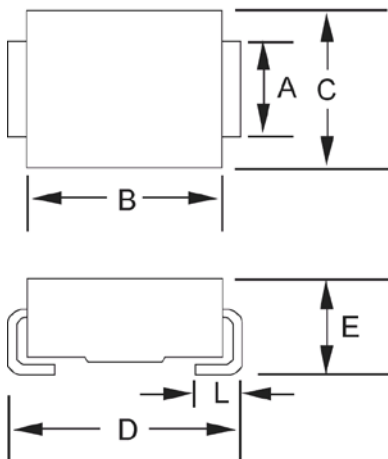


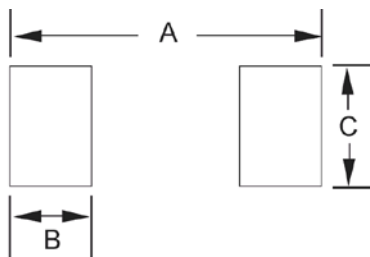
FIGURE 3 – Capacitance vs Zener Voltage

PACKAGE DIMENSIONS

SMBG (DO-215AA)

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


SMBJ (DO-214AA)

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

PAD LAYOUT


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

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

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