RoHS Available

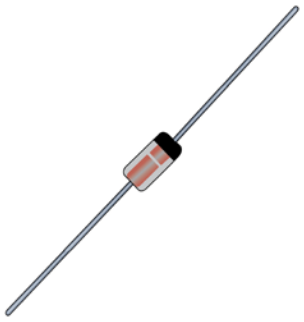
# Axial-Leaded 1.5 Watt Glass Zener Diodes

*Screening in reference to MIL-PRF-19500 available*

## DESCRIPTION

The 1N5913BG-5956BG series of 1.5 watt Zeners provides voltage regulation in a selection from 3.3 to 200 volts with a variety of tolerances available. They are also available in various military equivalent screening levels for high reliability. These glass encapsulated Zeners with a G suffix provide hermetic-sealed qualities and higher rated temperature beyond that optionally provided in equivalent plastic-body constructions (P suffix) for the same JEDEC part numbers. Both package options are available from Microsemi.

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



**DO-41 (DO-204AL) Package**

## FEATURES

- JEDEC registered 1N5913B TO 1N5956B number series.
- Zener voltage available 3.3 V to 200 V.
- Voltage tolerances of 10%, 5%, 2% and 1% are available.
- Screening in reference to MIL-PRF-19500 is available. (See part nomenclature for all available options.)
- RoHS compliant versions available (commercial grade only).
- Optional plastic body axial-leaded Zeners available as 1N5913BP – 1N5956BP. (See separate data sheet)

## APPLICATIONS / BENEFITS

- Regulates voltage over a broad range of operating current and temperature.
- Flexible axial-lead mounting terminals.
- Metallurgically enhanced internal contact design for greater reliability and lower thermal resistance in glass hermetically sealed package
- Non-sensitive to ESD per MIL-STD-750 method 1020.
- Hermetically sealed glass body construction.
- Inherently radiation hard as described in Microsemi MicroNote 050.

## MAXIMUM RATINGS @ $T_A$= 25 °C unless otherwise specified

| Parameters/Test Conditions | Symbol | Value | Unit |
|---|---|---|---|
| Junction and Storage Temperature | $T_J$ & $T_{STG}$ | -65 to +175 | °C |
| Thermal Resistance Junction-to-Lead @ 3/8 inch (10 mm) lead length from body | $R_{\Theta JL}$ | 60 | °C/W |
| Thermal Resistance Junction-to-Ambient (1) | $R_{\Theta JA}$ | 120 | °C/W |
| Steady State Power Dissipation @ $T_L \leq 85$ °C (2)<br>@ $T_A$ = 25 °C (1) | $P_D$ | 1.5<br>1.25 | W |
| Rated Average Power Dissipation (also see figure 1) | $P_{M(AV)}$ | 1.5 | 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 (1 oz Cu) with 4 mm$^2$ copper pads and track width 1 mm, length 25 mm..
2. At 3/8 inch (10 mm) lead length from body.

Also available in:

**DO-213AB package**
(MELF surface mount)
1N5913BUR-1 – 1N5956BUR-1

**SMB package**
(tabbed surface mount)
SMBG(J)5913B – SMBG(J)5956B

**SMAJ package**
(tabbed surface mount)
SMAJ5913B – SMAJ5956B

**Powermite package**
(tabbed surface mount)
1PMT5913B – 1PMT5956B

**MSC – Lawrence**
6 Lake Street, Lawrence, MA 01841
Tel: 1-800-446-1158 or (978) 620-2600
Fax: (978) 689-0803

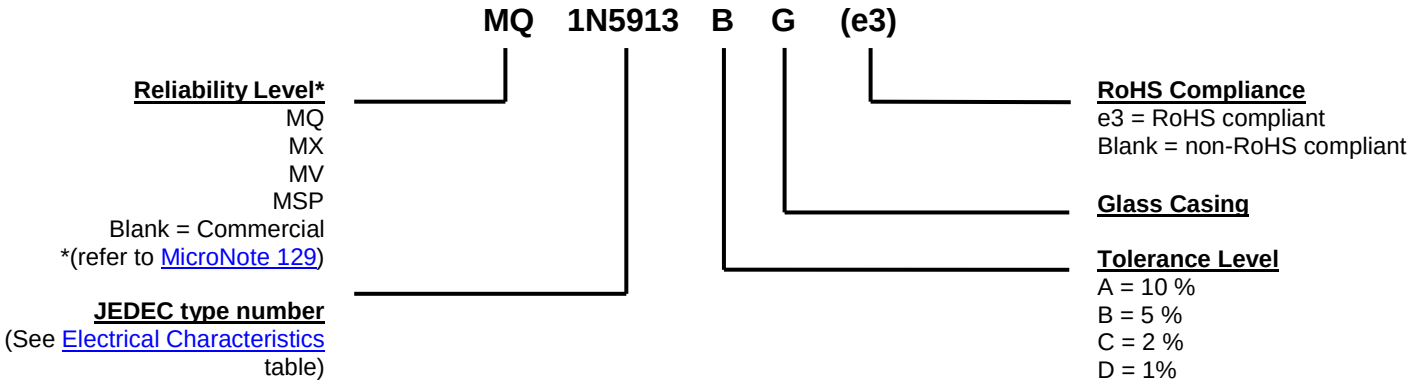
**MSC – Ireland**
Gort Road Business Park, Ennis, Co. Clare, Ireland
Tel: +353 (0) 65 6840044
Fax: +353 (0) 65 6822298

**Website:**
www.microsemi.com

## MECHANICAL and PACKAGING

- CASE: Hermetically sealed voidless hard glass with tungsten slugs.
- TERMINALS: Tin/lead or RoHS compliant matte/tin over copper. Solderable per MIL-STD-750, method 2026.
- MARKING: Part number.
- 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-296 (add TR suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 340 milligrams.
- See package dimensions on last page.

## PART NOMENCLATURE




## SYMBOLS & DEFINITIONS

| Symbol | Definition |
|---|---|
| $V_Z$ | Zener Voltage: The Zener voltage the device will exhibit at a specified current ($I_Z$) in its breakdown region. |
| $I_Z$, $I_{ZT}$, $I_{ZK}$ | Regulator Current: The dc regulator current ($I_Z$), at a specified test point ($I_{ZT}$), near breakdown knee ($I_{ZK}$). |
| $Z_{ZT}$ or $Z_{ZK}$ | Regulator Impedance: The small signal impedance of the diode when biased to operate in its breakdown region with $I_{ZT}$ applied at $I_Z$ or $I_{ZK}$ respectively. This has also been known as Zener or dynamic impedance ($Z_{ZT}$ or $Z_{ZK}$). |
| $V_F$ | Forward Voltage: The positive dc anode-cathode voltage the device will exhibit at a specified forward current. |
| $I_R$ | Reverse Current: The dc current flowing from the external circuit into the cathode terminal at the specified voltage $V_R$. |
| $I_{ZM}$ | Maximum Regulator (Zener) Current: The maximum rated dc current for the specified power rating. |

## ELECTRICAL CHARACTERISTICS @ $T_L$ = 30 ºC

| JEDEC TYPE NUMBER | ZENER VOLTAGE $V_Z$ | TEST CURRENT $I_{ZT}$ | MAXIMUM DYNAMIC IMPEDANCE $Z_{ZT}$ (Note 2) | KNEE CURRENT $I_{ZK}$ | MAXIMUM KNEE IMPEDANCE $Z_{ZK}$ (Note 2) | MAXIMUM REVERSE CURRENT $I_R$ @ $V_R$ | REVERSE VOLTAGE $V_R$ | MAX. DC CURRENT $I_{ZM}$ |
|---|---|---|---|---|---|---|---|---|
| | Volts | mA | Ohms | mA | Ohms | µA | Volts | mA |
| 1N5913BG | 3.3 | 113.6 | 10 | 1.0 | 500 | 100 | 1.0 | 454 |
| 1N5914BG | 3.6 | 104.2 | 9.0 | 1.0 | 500 | 75 | 1.0 | 416 |
| 1N5915BG | 3.9 | 96.1 | 7.5 | 1.0 | 500 | 25 | 1.0 | 384 |
| 1N5916BG | 4.3 | 87.2 | 6.0 | 1.0 | 500 | 5.0 | 1.0 | 348 |
| 1N5917BG | 4.7 | 79.8 | 5.0 | 1.0 | 500 | 5.0 | 1.5 | 319 |
| 1N5918BG | 5.1 | 73.5 | 4.0 | 1.0 | 350 | 5.0 | 2.0 | 294 |
| 1N5919BG | 5.6 | 66.9 | 2.0 | 1.0 | 250 | 5.0 | 3.0 | 267 |
| 1N5920BG | 6.2 | 60.5 | 2.0 | 1.0 | 200 | 5.0 | 4.0 | 241 |
| 1N5921BG | 6.8 | 55.1 | 2.5 | 1.0 | 200 | 5.0 | 5.2 | 220 |
| 1N5922BG | 7.5 | 50 | 3.0 | 0.5 | 400 | 5.0 | 6.0 | 200 |
| 1N5923BG | 8.2 | 45.7 | 3.5 | 0.5 | 400 | 5.0 | 6.5 | 182 |
| 1N5924BG | 9.1 | 41.2 | 4.0 | 0.5 | 500 | 5.0 | 7.0 | 164 |
| 1N5925BG | 10 | 37.5 | 4.5 | 0.25 | 500 | 5.0 | 8.0 | 150 |
| 1N5926BG | 11 | 34.1 | 5.5 | 0.25 | 550 | 1.0 | 8.4 | 136 |
| 1N5927BG | 12 | 31.2 | 6.5 | 0.25 | 550 | 1.0 | 9.1 | 125 |
| 1N5928BG | 13 | 28.8 | 7.0 | 0.25 | 550 | 1.0 | 9.9 | 115 |
| 1N5929BG | 15 | 25 | 9.0 | 0.25 | 600 | 1.0 | 11.4 | 100 |
| 1N5930BG | 16 | 23.4 | 10 | 0.25 | 600 | 1.0 | 12.2 | 93 |
| 1N5931BG | 18 | 20.8 | 12 | 0.25 | 650 | 1.0 | 13.7 | 83 |
| 1N5932BG | 20 | 18.7 | 14 | 0.25 | 650 | 1.0 | 15.2 | 75 |
| 1N5933BG | 22 | 17 | 17.5 | 0.25 | 650 | 1.0 | 16.7 | 68 |
| 1N5934BG | 24 | 15.6 | 19 | 0.25 | 700 | 1.0 | 18.2 | 62 |
| 1N5935BG | 27 | 13.9 | 23 | 0.25 | 700 | 1.0 | 20.6 | 55 |
| 1N5936BG | 30 | 12.5 | 28 | 0.25 | 750 | 1.0 | 22.8 | 50 |
| 1N5937BG | 33 | 11.4 | 33 | 0.25 | 800 | 1.0 | 25.1 | 45 |
| 1N5938BG | 36 | 10.4 | 38 | 0.25 | 850 | 1.0 | 27.4 | 41 |
| 1N5939BG | 39 | 9.6 | 45 | 0.25 | 900 | 1.0 | 29.7 | 38 |
| 1N5940BG | 43 | 8.7 | 53 | 0.25 | 950 | 1.0 | 32.7 | 34 |
| 1N5941BG | 47 | 8.0 | 67 | 0.25 | 1000 | 1.0 | 35.8 | 31 |
| 1N5942BG | 51 | 7.3 | 70 | 0.25 | 1100 | 1.0 | 38.8 | 29 |
| 1N5943BG | 56 | 6.7 | 86 | 0.25 | 1300 | 1.0 | 42.6 | 26 |
| 1N5944BG | 62 | 6.0 | 100 | 0.25 | 1500 | 1.0 | 47.1 | 24 |
| 1N5945BG | 68 | 5.5 | 120 | 0.25 | 1700 | 1.0 | 51.2 | 22 |
| 1N5946BG | 75 | 5.0 | 140 | 0.25 | 2000 | 1.0 | 56 | 20 |
| 1N5947BG | 82 | 4.6 | 160 | 0.25 | 2500 | 1.0 | 62.2 | 18 |
| 1N5948BG | 91 | 4.1 | 200 | 0.25 | 3000 | 1.0 | 69.2 | 16 |
| 1N5949BG | 100 | 3.7 | 250 | 0.25 | 3100 | 1.0 | 76 | 15 |
| 1N5950BG | 110 | 3.4 | 300 | 0.25 | 4000 | 1.0 | 83.6 | 13 |
| 1N5951BG | 120 | 3.1 | 380 | 0.25 | 4500 | 1.0 | 91.2 | 12 |
| 1N5952BG | 130 | 2.9 | 450 | 0.25 | 5000 | 1.0 | 98.8 | 11 |
| 1N5953BG | 150 | 2.5 | 600 | 0.25 | 6000 | 1.0 | 114 | 10 |
| 1N5954BG | 160 | 2.3 | 700 | 0.25 | 6500 | 1.0 | 121.6 | 9.0 |
| 1N5955BG | 180 | 2.1 | 900 | 0.25 | 7000 | 1.0 | 136.8 | 8.0 |
| 1N5956BG | 200 | 1.9 | 1200 | 0.25 | 8000 | 1.0 | 152 | 7.0 |

**NOTES:**

1. Zener voltage ($V_Z$) is measured at $T_L$ = 30 °C and 90 seconds after application of dc current.
2. The Zener impedance is derived from the 60 Hz ac voltage, which results when an ac current having an rms value equal to 10% of the dc Zener current ($I_{ZT}$ or $I_{ZK}$) is superimposed on $I_{ZT}$ or $I_{ZK}$. See MicroNote 202 for Zener impedance variation with different operating currents.

## GRAPHS

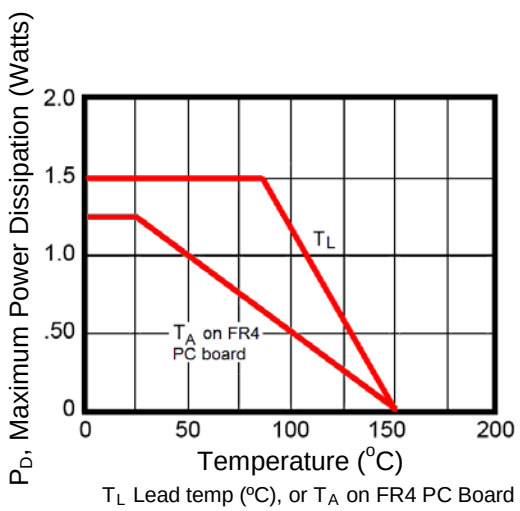



**FIGURE 1 –** Power Derating Curve

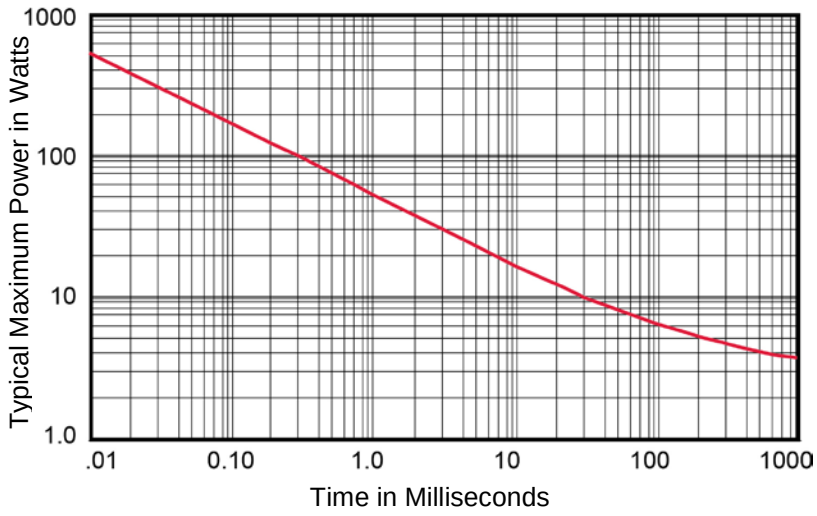



**FIGURE 2** – Transient Surge Capability Square-Wave Pulse Width (non-Repetitive) in Milliseconds

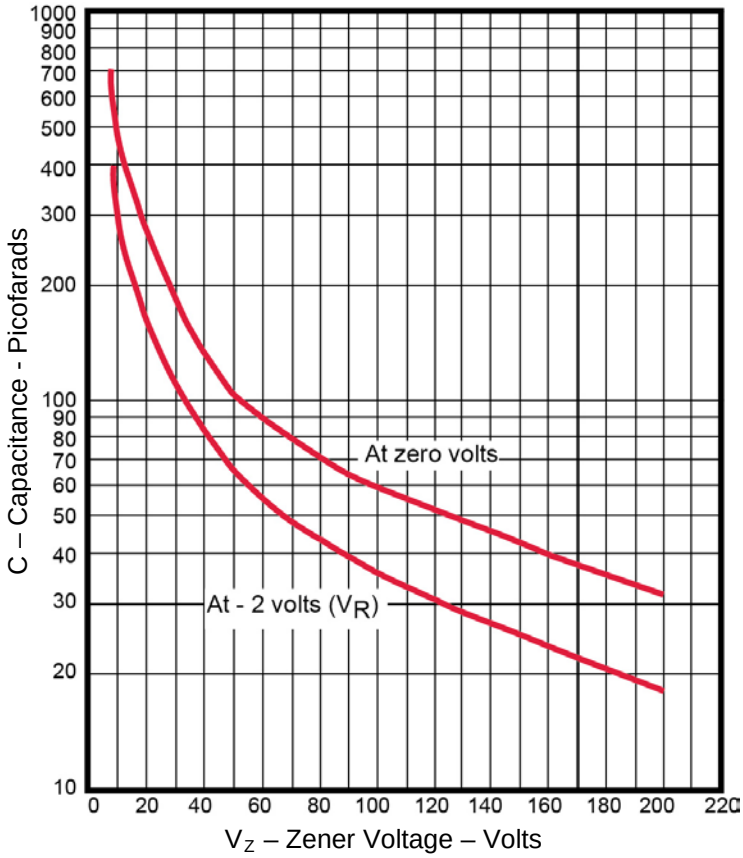
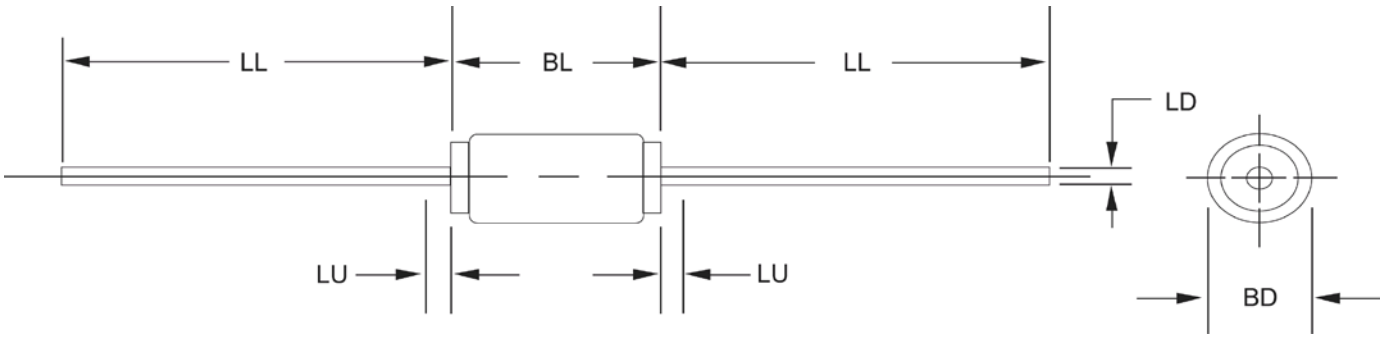



**FIGURE 3 –** Capacitance vs Zener Voltage

## PACKAGE DIMENSIONS




**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for information only.
3. Package contour optional with BD and length BL. Heat slugs, if any, shall be included within this cylinder length but shall not be subject to minimum limit of BD.
4. The specified lead diameters apply in the zone between 0.050 inch (1.27 mm) from the diode body and the end of the lead.
5. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

| Ltr | DIMENSIONS | | | | Notes |
|---|---|---|---|---|---|
| | INCH | | MILLIMETERS | | |
| | Min | Max | Min | Max | |
| **BD** | 0.060 | 0.085 | 1.52 | 2.16 | 3 |
| **BL** | 0.106 | 0.160 | 2.69 | 4.06 | 3 |
| **LD** | 0.028 | 0.032 | 0.71 | 0.81 | |
| **LL** | 0.800 | 1.300 | 20.32 | 33.02 | |
| **LU** | - | 0.050 | - | 1.27 | 4 |

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- Консультации по применению компонента;
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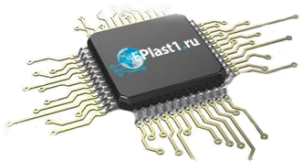


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