



## Silicon 3.0 Watt Zener Diode

### DESCRIPTION

The SMAJ5913Be3 – SMAJ5956Be3 series of surface mount 3.0 watt Zeners provides voltage regulation in a selection from 3.3 to 200 volts with different tolerances as identified by suffix letter on the part number. It is equivalent to the JEDEC registered 1N5913B through 1N5956B series with identical electrical characteristics except it is rated at 3.0 W instead of 1.5 W with the lower thermal resistance features of this surface mount packaging. These plastic encapsulated Zeners have a moisture classification of Level 1 with no dry pack required.

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

### FEATURES

- Ideal for high-density and low-profile mounting.
- Zener voltage available 3.3V to 200V.
- Available voltage tolerances are 10%, 5%, 2%, and 1%.
- RoHS compliant.

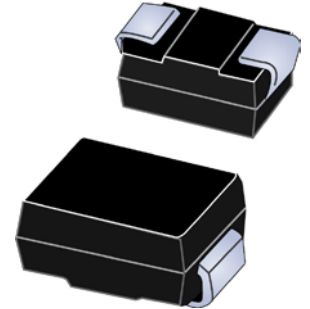
### APPLICATIONS / BENEFITS

- Regulates voltage over a broad range of current and temperature.
- Nonsensitive to ESD per MIL-STD-750 method 1020.
- High specified maximum current ( $I_{ZM}$ ) with adequately heat sinking.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B.

### 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  | $R_{\theta JL}$     | 15          | °C/W |
| Thermal Resistance Junction-to-Ambient <sup>(1)</sup>  | $R_{\theta JA}$     | 80          | °C/W |
| Rated Average Power Dissipation @ +25 °C<br>(also see derating in <a href="#">Figure 1</a> ) | $P_{M(AV)}$         | 3.0         | 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](#)).



**DO-214AC or BA  
(SMAJ) Package**

Also available in:

**DO-41 package**

(plastic axial leaded)



[1N5913BP – 1N5956BP](#)

**DO-216 package**

(tabbed surface mount)



[1PMT5913B – 1PMT5956B](#)

#### **MSC – Lawrence**

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#### **MSC – Ireland**

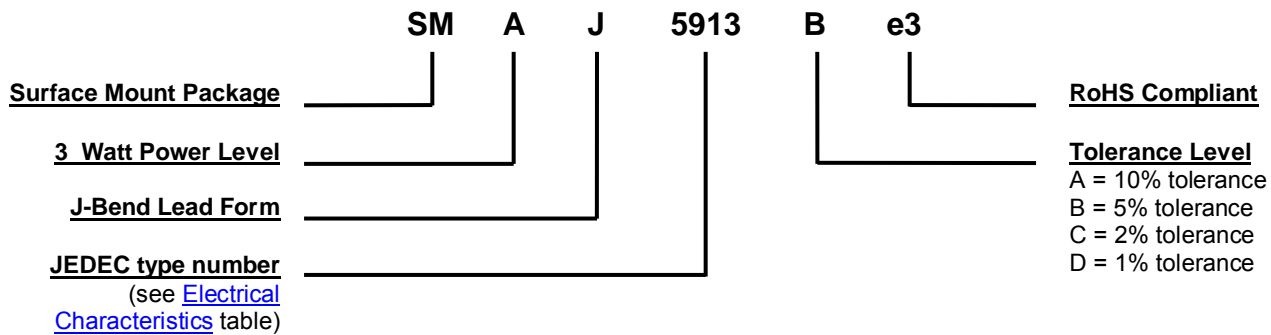
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**MECHANICAL and PACKAGING**

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0.
- TERMINALS: RoHS compliant annealed matte-tin plating. Solderable to MIL-STD-750, method 2026.
- MARKING: Includes part number without prefix (e.g. 5913B, 5916Be3, 5926C, 5951De3, 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: Approximately 0.064 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 $V_R$ 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.   |
| $V_F$                 | Maximum Forward Voltage: The maximum forward voltage the device will exhibit at a specified current.  |
| $V_R$                 | Reverse Voltage: The dc voltage applied in the reverse direction below the breakdown region.  |
| $V_Z$                 | 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 mms current modulation (typically 10% of $I_{ZT}$ or $I_{ZK}$ ) and superimposed on $I_{ZT}$ or $I_{ZK}$ respectively. |

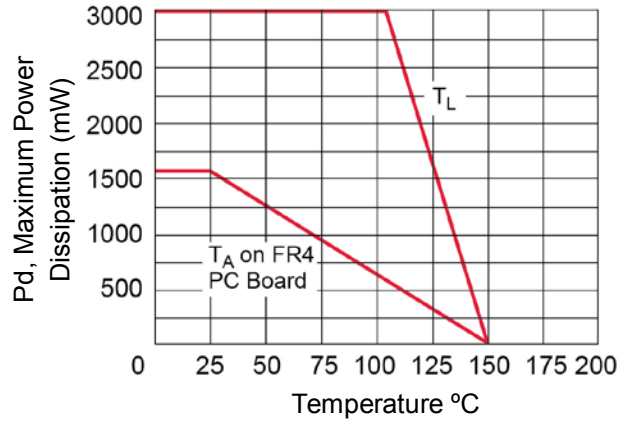
**ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise stated**

| JEDEC TYPE 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>$I_R$ (MAX.) | REVERSE VOLTAGE<br>$V_R$ | MAX. DC CURRENT<br>$I_{ZM}$ |
|-------------------|------------------------|--------------------------|-------------------------------|--------------------------|----------------------------|---------------------------------|--------------------------|-----------------------------|
|                   | Volts                  | mA                       | Ohms                          | mA                       | Ohms                       | $\mu$ A                         | Volts                    | mA                          |
| SMAJ5913B         | 3.3                    | 113.6                    | 10                            | 1.0                      | 500                        | 100                             | 1.0                      | 908                         |
| SMAJ5914B         | 3.6                    | 104.2                    | 9.0                           | 1.0                      | 500                        | 75                              | 1.0                      | 832                         |
| SMAJ5915B         | 3.9                    | 96.1                     | 7.5                           | 1.0                      | 500                        | 25                              | 1.0                      | 768                         |
| SMAJ5916B         | 4.3                    | 87.2                     | 6.0                           | 1.0                      | 500                        | 5.0                             | 1.0                      | 696                         |
| SMAJ5917B         | 4.7                    | 79.8                     | 5.0                           | 1.0                      | 500                        | 5.0                             | 1.5                      | 638                         |
| SMAJ5918B         | 5.1                    | 73.5                     | 4.0                           | 1.0                      | 350                        | 5.0                             | 2.0                      | 588                         |
| SMAJ5919B         | 5.6                    | 66.9                     | 2.0                           | 1.0                      | 250                        | 5.0                             | 3.0                      | 534                         |
| SMAJ5920B         | 6.2                    | 60.5                     | 2.0                           | 1.0                      | 200                        | 5.0                             | 4.0                      | 482                         |
| SMAJ5921B         | 6.8                    | 55.1                     | 2.5                           | 1.0                      | 200                        | 5.0                             | 5.2                      | 440                         |
| SMAJ5922B         | 7.5                    | 50                       | 3.0                           | 0.5                      | 400                        | 5.0                             | 6.0                      | 400                         |
| SMAJ5923B         | 8.2                    | 45.7                     | 3.5                           | 0.5                      | 400                        | 5.0                             | 6.5                      | 364                         |
| SMAJ5924B         | 9.1                    | 41.2                     | 4.0                           | 0.5                      | 500                        | 5.0                             | 7.0                      | 328                         |
| SMAJ5925B         | 10                     | 37.5                     | 4.5                           | 0.25                     | 500                        | 5.0                             | 8.0                      | 300                         |
| SMAJ5926B         | 11                     | 34.1                     | 5.5                           | 0.25                     | 550                        | 1.0                             | 8.4                      | 272                         |
| SMAJ5927B         | 12                     | 31.2                     | 6.5                           | 0.25                     | 550                        | 1.0                             | 9.1                      | 250                         |
| SMAJ5928B         | 13                     | 28.8                     | 7.0                           | 0.25                     | 550                        | 1.0                             | 9.9                      | 230                         |
| SMAJ5929B         | 15                     | 25                       | 9.0                           | 0.25                     | 600                        | 1.0                             | 11.4                     | 200                         |
| SMAJ5930B         | 16                     | 23.4                     | 10                            | 0.25                     | 600                        | 1.0                             | 12.2                     | 186                         |
| SMAJ5931B         | 18                     | 20.8                     | 12                            | 0.25                     | 650                        | 1.0                             | 13.7                     | 166                         |
| SMAJ5932B         | 20                     | 18.7                     | 14                            | 0.25                     | 650                        | 1.0                             | 15.2                     | 150                         |
| SMAJ5933B         | 22                     | 17                       | 17.5                          | 0.25                     | 650                        | 1.0                             | 16.7                     | 136                         |
| SMAJ5934B         | 24                     | 15.6                     | 19                            | 0.25                     | 700                        | 1.0                             | 18.2                     | 124                         |
| SMAJ5935B         | 27                     | 13.9                     | 23                            | 0.25                     | 700                        | 1.0                             | 20.6                     | 110                         |
| SMAJ5936B         | 30                     | 12.5                     | 28                            | 0.25                     | 750                        | 1.0                             | 22.8                     | 100                         |
| SMAJ5937B         | 33                     | 11.4                     | 33                            | 0.25                     | 800                        | 1.0                             | 25.1                     | 90                          |
| SMAJ5938B         | 36                     | 10.4                     | 38                            | 0.25                     | 850                        | 1.0                             | 27.4                     | 82                          |
| SMAJ5939B         | 39                     | 9.6                      | 45                            | 0.25                     | 900                        | 1.0                             | 29.7                     | 76                          |
| SMAJ5940B         | 43                     | 8.7                      | 53                            | 0.25                     | 950                        | 1.0                             | 32.7                     | 68                          |
| SMAJ5941B         | 47                     | 8.0                      | 67                            | 0.25                     | 1000                       | 1.0                             | 35.8                     | 62                          |
| SMAJ5942B         | 51                     | 7.3                      | 70                            | 0.25                     | 1100                       | 1.0                             | 38.8                     | 58                          |
| SMAJ5943B         | 56                     | 6.7                      | 86                            | 0.25                     | 1300                       | 1.0                             | 42.6                     | 52                          |
| SMAJ5944B         | 62                     | 6.0                      | 100                           | 0.25                     | 1500                       | 1.0                             | 47.1                     | 48                          |
| SMAJ5945B         | 68                     | 5.5                      | 120                           | 0.25                     | 1700                       | 1.0                             | 51.2                     | 44                          |
| SMAJ5946B         | 75                     | 5.0                      | 140                           | 0.25                     | 2000                       | 1.0                             | 56                       | 40                          |
| SMAJ5947B         | 82                     | 4.6                      | 160                           | 0.25                     | 2500                       | 1.0                             | 62.2                     | 36                          |
| SMAJ5948B         | 91                     | 4.1                      | 200                           | 0.25                     | 3000                       | 1.0                             | 69.2                     | 32                          |
| SMAJ5949B         | 100                    | 3.7                      | 250                           | 0.25                     | 3100                       | 1.0                             | 76                       | 30                          |
| SMAJ5950B         | 110                    | 3.4                      | 300                           | 0.25                     | 4000                       | 1.0                             | 83.6                     | 26                          |
| SMAJ5951B         | 120                    | 3.1                      | 380                           | 0.25                     | 4500                       | 1.0                             | 91.2                     | 24                          |
| SMAJ5952B         | 130                    | 2.9                      | 450                           | 0.25                     | 5000                       | 1.0                             | 98.8                     | 22                          |
| SMAJ5953B         | 150                    | 2.5                      | 600                           | 0.25                     | 6000                       | 1.0                             | 114                      | 20                          |
| SMAJ5954B         | 160                    | 2.3                      | 700                           | 0.25                     | 6500                       | 1.0                             | 121.6                    | 18                          |
| SMAJ5955B         | 180                    | 2.1                      | 900                           | 0.25                     | 7000                       | 1.0                             | 136.8                    | 16                          |
| SMAJ5956B         | 200                    | 1.9                      | 1200                          | 0.25                     | 8000                       | 1.0                             | 152                      | 14                          |

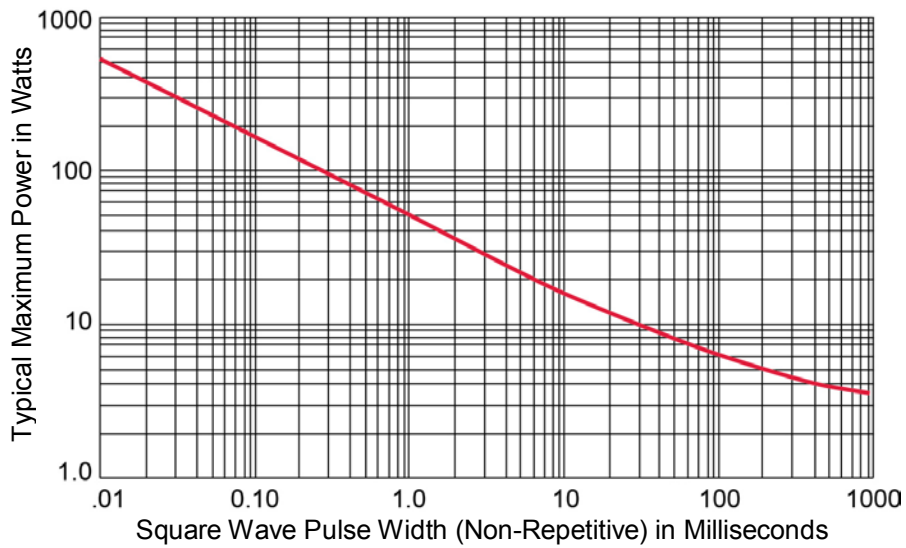
**NOTES:**

- Suffix B (shown) denotes a +/-5% tolerance on nominal  $V_Z$ , A denotes a +/-10% tolerance, C denotes a 2% tolerance, and D denotes a +/-1% tolerance.
- Zener voltage ( $V_Z$ ) is measured at  $T_L = 30^\circ\text{C}$  and 90 seconds after application of dc current.
- 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  $I_{ZK}$ .
- The maximum dc current ( $I_{ZM}$ ) is based only on the maximum power of 3.0 watts at  $T_L \leq 105^\circ\text{C}$ . These values must be reduced by 48% (1.56 W) when mounted on PC boards as described in [Maximum Ratings](#).

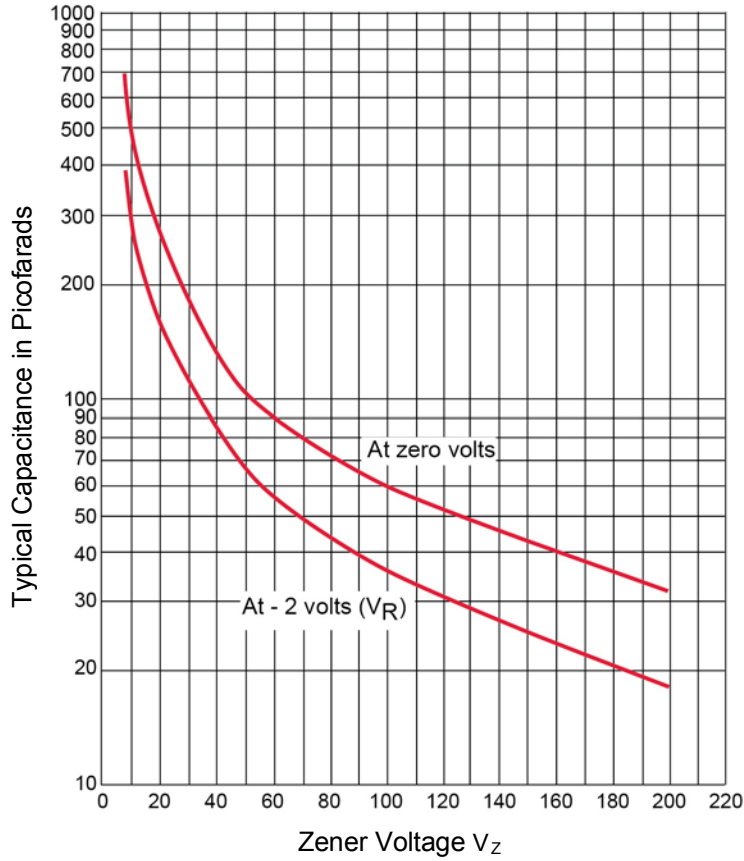
GRAPHS



**FIGURE 1**  
POWER DERATING CURVE

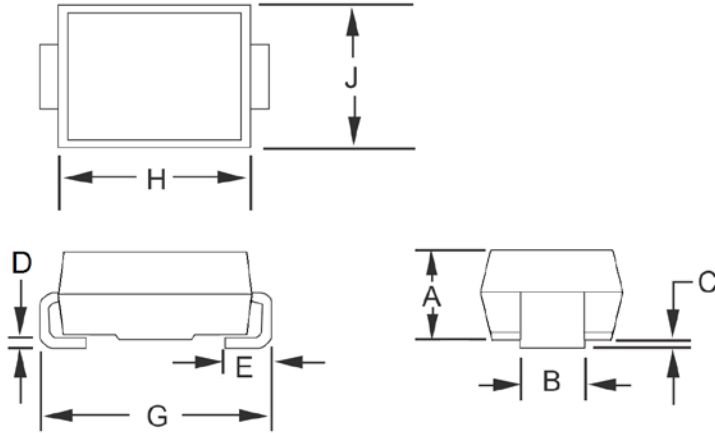


**FIGURE 2**  
TRANSIENT SURGE CAPABILITY

**GRAPHS**


**FIGURE 3**  
CAPACITANCE vs.  $V_Z$  CURVE

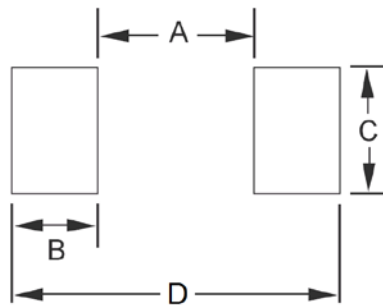
**PACKAGE DIMENSIONS**



| Ltr      | Dimensions |       |             |      |
|----------|------------|-------|-------------|------|
|          | Inch       |       | Millimeters |      |
|          | Min        | Max   | Min         | Max  |
| <b>A</b> | 0.075      | 0.089 | 1.90        | 2.25 |
| <b>B</b> | 0.050      | 0.064 | 1.27        | 1.63 |
| <b>C</b> | 0.004      | 0.008 | 0.10        | 0.20 |
| <b>D</b> | 0.006      | 0.012 | 0.15        | 0.31 |
| <b>E</b> | 0.031      | 0.059 | 0.80        | 1.50 |
| <b>G</b> | 0.189      | 0.205 | 4.80        | 5.20 |
| <b>H</b> | 0.157      | 0.181 | 4.00        | 4.60 |
| <b>J</b> | 0.095      | 0.104 | 2.40        | 2.65 |

**NOTES:** Dimension "A" is within DO-214BA but higher than DO-214AC standard JEDEC outlines.  
 Dimension "B" is wider than both JEDEC outlines for lower thermal resistance.

**PAD LAYOUT**



| Ltr            | Inch  | Millimeters |
|----------------|-------|-------------|
| <b>A (MAX)</b> | 0.074 | 2.413       |
| <b>B (MIN)</b> | 0.060 | 1.52        |
| <b>C (MIN)</b> | 0.066 | 1.68        |
| <b>D (TYP)</b> | 0.208 | 5.28        |