

# 1SMB5913BT3 Series

## 3 Watt Plastic Surface Mount Zener Voltage Regulators

This complete new line of 3 Watt Zener diodes offers the following advantages.

### Specification Features:

- Zener Voltage Range – 3.3 V to 200 V
- ESD Rating of Class 3 (>16 KV) per Human Body Model
- Flat Handling Surface for Accurate Placement
- Package Design for Top Side or Bottom Circuit Board Mounting

### Mechanical Characteristics:

**CASE:** Void-free, transfer-molded plastic

**FINISH:** All external surfaces are corrosion resistant and leads are readily solderable

**MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES:**  
260°C for 10 Seconds

**LEADS:** Modified L-Bend providing more contact area to bond pads

**POLARITY:** Cathode indicated by polarity band

**FLAMMABILITY RATING:** UL94 V-0

### MAXIMUM RATINGS

| Rating                                                                                                                                  | Symbol          | Value          | Unit          |
|-----------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------|---------------|
| Maximum Steady State Power Dissipation<br>@ $T_L = 75^\circ\text{C}$<br>Measured at Zero Lead Length<br>Derate Above $75^\circ\text{C}$ | $P_D$           | 3.0            | W             |
| Thermal Resistance from Junction to Lead                                                                                                | $R_{\theta JL}$ | 40<br>25       | mW/°C<br>°C/W |
| Maximum Steady State Power Dissipation<br>@ $T_A = 25^\circ\text{C}$ (Note 1.)<br>Derate Above $25^\circ\text{C}$                       | $P_D$           | 550            | mW            |
| Thermal Resistance from Junction<br>to Ambient                                                                                          | $R_{\theta JA}$ | 4.4<br>226     | mW/°C<br>°C/W |
| Operating and Storage<br>Temperature Range                                                                                              | $T_J, T_{stg}$  | -65 to<br>+150 | °C            |

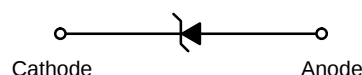
1. FR-4 board, within 1" to device, using ON Semiconductor minimum recommended footprint, as shown in case 403A outline dimensions spec.



ON Semiconductor™

<http://onsemi.com>

## PLASTIC SURFACE MOUNT ZENER VOLTAGE REGULATOR DIODES 3.3–200 VOLTS 3 WATT DC POWER



SMB  
CASE 403A  
PLASTIC

### MARKING DIAGRAM



Y = Year  
WW = Work Week  
9xxB = Specific Device Code  
(See Table Page 3)

### ORDERING INFORMATION

| Device †    | Package | Shipping         |
|-------------|---------|------------------|
| 1SMB59xxBT3 | SMB     | 2500/Tape & Reel |

Devices listed in **bold, italic** are ON Semiconductor **Preferred** devices. **Preferred** devices are recommended choices for future use and best overall value.

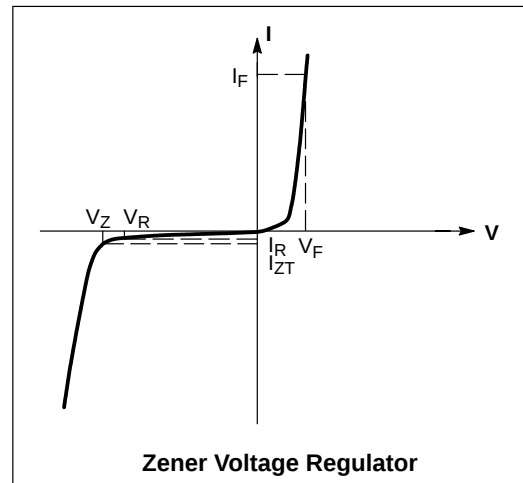
†The "T3" suffix refers to a 13 inch reel.

## 1SMB5913BT3 Series

### ELECTRICAL CHARACTERISTICS

( $T_L = 30^\circ\text{C}$  unless otherwise noted,  
 $V_F = 1.5\text{ V Max. @ } I_F = 200\text{ mA(dc)}$  for all types)

| Symbol   | Parameter                          |
|----------|------------------------------------|
| $V_Z$    | Reverse Zener Voltage @ $I_{ZT}$   |
| $I_{ZT}$ | Reverse Current                    |
| $Z_{ZT}$ | Maximum Zener Impedance @ $I_{ZT}$ |
| $I_{ZK}$ | Reverse Current                    |
| $Z_{ZK}$ | Maximum Zener Impedance @ $I_{ZK}$ |
| $I_R$    | Reverse Leakage Current @ $V_R$    |
| $V_R$    | Reverse Voltage                    |
| $I_F$    | Forward Current                    |
| $V_F$    | Forward Voltage @ $I_F$            |
| $I_{ZM}$ | Maximum DC Zener Current           |



# 1SMB5913BT3 Series

**ELECTRICAL CHARACTERISTICS** ( $T_L = 30^\circ\text{C}$  unless otherwise noted,  $V_F = 1.5\text{ V Max.}$  @  $I_F = 200\text{ mA(dc)}$  for all types)

| Device<br>(Note 2.) | Device<br>Marking | Zener Voltage (Note 3.) |            |              |                   | Zener Impedance (Note 4.)         |                                   |                                 | Leakage Current |             | I <sub>ZM</sub> |
|---------------------|-------------------|-------------------------|------------|--------------|-------------------|-----------------------------------|-----------------------------------|---------------------------------|-----------------|-------------|-----------------|
|                     |                   | V <sub>Z</sub> (Volts)  |            |              | @ 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                     | Nom        | Max          | mA                | Ω                                 | Ω                                 | mA                              | μA              | Volts       |                 |
| 1SMB5913BT3         | 913B              | 3.13                    | 3.3        | 3.47         | 113.6             | 10                                | 500                               | 1                               | 100             | 1           | 454             |
| 1SMB5914BT3         | 914B              | 3.42                    | 3.6        | 3.78         | 104.2             | 9                                 | 500                               | 1                               | 75              | 1           | 416             |
| <b>1SMB5915BT3</b>  | <b>915B</b>       | <b>3.70</b>             | <b>3.9</b> | <b>4.10</b>  | <b>96.1</b>       | <b>7.5</b>                        | <b>500</b>                        | <b>1</b>                        | <b>25</b>       | <b>1</b>    | <b>384</b>      |
| <b>1SMB5916BT3</b>  | <b>916B</b>       | <b>4.08</b>             | <b>4.3</b> | <b>4.52</b>  | <b>87.2</b>       | <b>6</b>                          | <b>500</b>                        | <b>1</b>                        | <b>5</b>        | <b>1</b>    | <b>348</b>      |
| <b>1SMB5917BT3</b>  | <b>917B</b>       | <b>4.46</b>             | <b>4.7</b> | <b>4.94</b>  | <b>79.8</b>       | <b>5</b>                          | <b>500</b>                        | <b>1</b>                        | <b>5</b>        | <b>1.5</b>  | <b>319</b>      |
| <b>1SMB5918BT3</b>  | <b>918B</b>       | <b>4.84</b>             | <b>5.1</b> | <b>5.36</b>  | <b>73.5</b>       | <b>4</b>                          | <b>350</b>                        | <b>1</b>                        | <b>5</b>        | <b>2</b>    | <b>294</b>      |
| <b>1SMB5919BT3</b>  | <b>919B</b>       | <b>5.32</b>             | <b>5.6</b> | <b>5.88</b>  | <b>66.9</b>       | <b>2</b>                          | <b>250</b>                        | <b>1</b>                        | <b>5</b>        | <b>3</b>    | <b>267</b>      |
| <b>1SMB5920BT3</b>  | <b>920B</b>       | <b>5.89</b>             | <b>6.2</b> | <b>6.51</b>  | <b>60.5</b>       | <b>2</b>                          | <b>200</b>                        | <b>1</b>                        | <b>5</b>        | <b>4</b>    | <b>241</b>      |
| 1SMB5921BT3         | 921B              | 6.46                    | 6.8        | 7.14         | 55.1              | 2.5                               | 200                               | 1                               | 5               | 5.2         | 220             |
| 1SMB5922BT3         | 922B              | 7.12                    | 7.5        | 7.88         | 50                | 3                                 | 400                               | 0.5                             | 5               | 6           | 200             |
| <b>1SMB5923BT3</b>  | <b>923B</b>       | <b>7.79</b>             | <b>8.2</b> | <b>8.61</b>  | <b>45.7</b>       | <b>3.5</b>                        | <b>400</b>                        | <b>0.5</b>                      | <b>5</b>        | <b>6.5</b>  | <b>182</b>      |
| 1SMB5924BT3         | 924B              | 8.64                    | 9.1        | 9.56         | 41.2              | 4                                 | 500                               | 0.5                             | 5               | 7           | 164             |
| <b>1SMB5925BT3</b>  | <b>925B</b>       | <b>9.5</b>              | <b>10</b>  | <b>10.5</b>  | <b>37.5</b>       | <b>4.5</b>                        | <b>500</b>                        | <b>0.25</b>                     | <b>5</b>        | <b>8</b>    | <b>150</b>      |
| <b>1SMB5926BT3</b>  | <b>926B</b>       | <b>10.45</b>            | <b>11</b>  | <b>11.55</b> | <b>34.1</b>       | <b>5.5</b>                        | <b>550</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>8.4</b>  | <b>136</b>      |
| <b>1SMB5927BT3</b>  | <b>927B</b>       | <b>11.4</b>             | <b>12</b>  | <b>12.6</b>  | <b>31.2</b>       | <b>6.5</b>                        | <b>550</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>9.1</b>  | <b>125</b>      |
| 1SMB5928BT3         | 928B              | 12.35                   | 13         | 13.65        | 28.8              | 7                                 | 550                               | 0.25                            | 1               | 9.9         | 115             |
| <b>1SMB5929BT3</b>  | <b>929B</b>       | <b>14.25</b>            | <b>15</b>  | <b>15.75</b> | <b>25</b>         | <b>9</b>                          | <b>600</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>11.4</b> | <b>100</b>      |
| 1SMB5930BT3         | 930B              | 15.2                    | 16         | 16.8         | 23.4              | 10                                | 600                               | 0.25                            | 1               | 12.2        | 93              |
| <b>1SMB5931BT3</b>  | <b>931B</b>       | <b>17.1</b>             | <b>18</b>  | <b>18.9</b>  | <b>20.8</b>       | <b>12</b>                         | <b>650</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>13.7</b> | <b>83</b>       |
| 1SMB5932BT3         | 932B              | 19                      | 20         | 21           | 18.7              | 14                                | 650                               | 0.25                            | 1               | 15.2        | 75              |
| 1SMB5933BT3         | 933B              | 20.9                    | 22         | 23.1         | 17                | 17.5                              | 650                               | 0.25                            | 1               | 16.7        | 68              |
| <b>1SMB5934BT3</b>  | <b>934B</b>       | <b>22.8</b>             | <b>24</b>  | <b>25.2</b>  | <b>15.6</b>       | <b>19</b>                         | <b>700</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>18.2</b> | <b>62</b>       |
| <b>1SMB5935BT3</b>  | <b>935B</b>       | <b>25.65</b>            | <b>27</b>  | <b>28.35</b> | <b>13.9</b>       | <b>23</b>                         | <b>700</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>20.6</b> | <b>55</b>       |
| <b>1SMB5936BT3</b>  | <b>936B</b>       | <b>28.5</b>             | <b>30</b>  | <b>31.5</b>  | <b>12.5</b>       | <b>28</b>                         | <b>750</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>22.8</b> | <b>50</b>       |
| 1SMB5937BT3         | 937B              | 31.35                   | 33         | 34.65        | 11.4              | 33                                | 800                               | 0.25                            | 1               | 25.1        | 45              |
| <b>1SMB5938BT3</b>  | <b>938B</b>       | <b>34.2</b>             | <b>36</b>  | <b>37.8</b>  | <b>10.4</b>       | <b>38</b>                         | <b>850</b>                        | <b>0.25</b>                     | <b>1</b>        | <b>27.4</b> | <b>41</b>       |
| 1SMB5939BT3         | 939B              | 37.05                   | 39         | 40.95        | 9.6               | 45                                | 900                               | 0.25                            | 1               | 29.7        | 38              |
| 1SMB5940BT3         | 940B              | 40.85                   | 43         | 45.15        | 8.7               | 53                                | 950                               | 0.25                            | 1               | 32.7        | 34              |
| 1SMB5941BT3         | 941B              | 44.65                   | 47         | 49.35        | 8                 | 67                                | 1000                              | 0.25                            | 1               | 35.8        | 31              |
| 1SMB5942BT3         | 942B              | 48.45                   | 51         | 53.55        | 7.3               | 70                                | 1100                              | 0.25                            | 1               | 38.8        | 29              |
| 1SMB5943BT3         | 943B              | 53.2                    | 56         | 58.8         | 6.7               | 86                                | 1300                              | 0.25                            | 1               | 42.6        | 26              |
| 1SMB5944BT3         | 944B              | 58.9                    | 62         | 65.1         | 6                 | 100                               | 1500                              | 0.25                            | 1               | 47.1        | 24              |
| 1SMB5945BT3         | 945B              | 64.6                    | 68         | 71.4         | 5.5               | 120                               | 1700                              | 0.25                            | 1               | 51.7        | 22              |
| 1SMB5946BT3         | 946B              | 71.25                   | 75         | 78.75        | 5                 | 140                               | 2000                              | 0.25                            | 1               | 56          | 20              |
| 1SMB5947BT3         | 947B              | 77.9                    | 82         | 86.1         | 4.6               | 160                               | 2500                              | 0.25                            | 1               | 62.2        | 18              |
| 1SMB5948BT3         | 948B              | 86.45                   | 91         | 95.55        | 4.1               | 200                               | 3000                              | 0.25                            | 1               | 69.2        | 16              |
| <b>1SMB5949BT3</b>  | <b>949B</b>       | <b>95</b>               | <b>100</b> | <b>105</b>   | <b>3.7</b>        | <b>250</b>                        | <b>3100</b>                       | <b>0.25</b>                     | <b>1</b>        | <b>76</b>   | <b>15</b>       |
| 1SMB5950BT3         | 950B              | 104.5                   | 110        | 115.5        | 3.4               | 300                               | 4000                              | 0.25                            | 1               | 83.6        | 13              |
| 1SMB5951BT3         | 951B              | 114                     | 120        | 126          | 3.1               | 380                               | 4500                              | 0.25                            | 1               | 91.2        | 12              |
| 1SMB5952BT3         | 952B              | 123.5                   | 130        | 136.5        | 2.9               | 450                               | 5000                              | 0.25                            | 1               | 98.8        | 11              |
| 1SMB5953BT3         | 953B              | 142.5                   | 150        | 157.5        | 2.5               | 600                               | 6000                              | 0.25                            | 1               | 114         | 10              |
| 1SMB5954BT3         | 954B              | 152                     | 160        | 168          | 2.3               | 700                               | 6500                              | 0.25                            | 1               | 121.6       | 9               |
| 1SMB5955BT3         | 955B              | 171                     | 180        | 189          | 2.1               | 900                               | 7000                              | 0.25                            | 1               | 136.8       | 8               |
| 1SMB5956BT3         | 956B              | 190                     | 200        | 210          | 1.9               | 1200                              | 8000                              | 0.25                            | 1               | 152         | 7               |

## 2. TOLERANCE AND TYPE NUMBER DESIGNATION

The type numbers listed indicate a tolerance of  $\pm 5\%$ .

## 3. ZENER VOLTAGE ( $V_Z$ ) MEASUREMENT

Nominal Zener voltage is measured with the device junction in thermal equilibrium with ambient temperature at  $25^\circ\text{C}$ .

## 4. ZENER IMPEDANCE ( $Z_Z$ ) DERIVATION

$Z_{ZT}$  and  $Z_{ZK}$  are measured by dividing the ac voltage drop across the device by the ac current applied. The specified limits are for  $I_{Z(ac)} = 0.1 I_{Z(dc)}$  with the ac frequency = 60 Hz.

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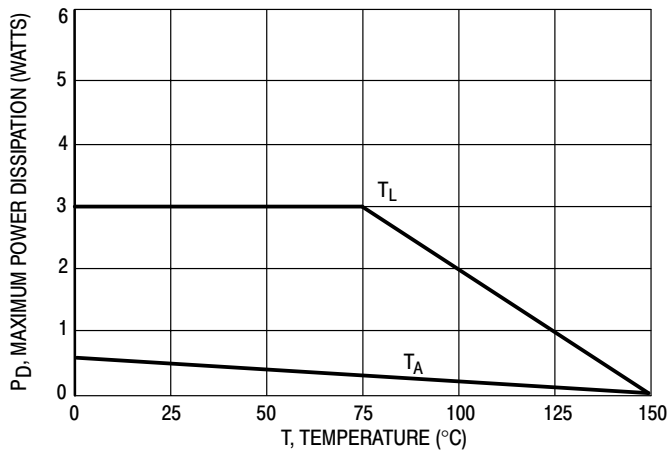


Figure 1. Steady State Power Derating

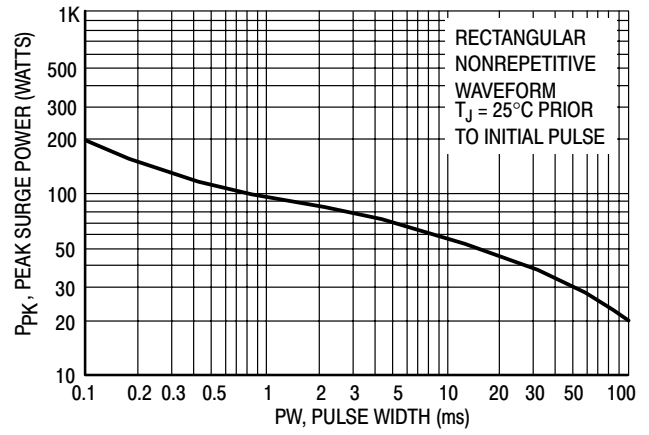


Figure 2. Maximum Surge Power

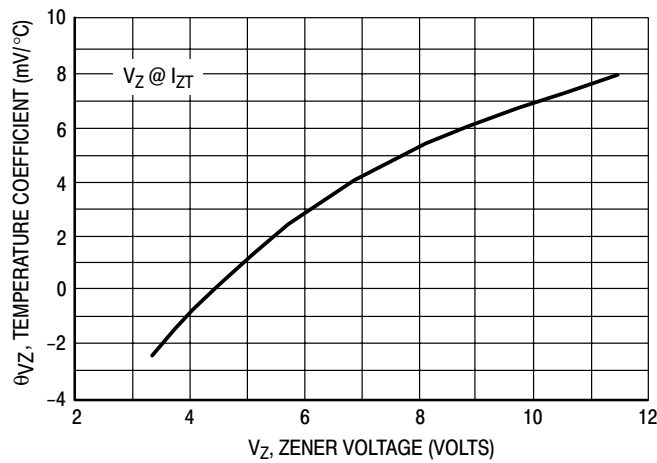


Figure 3. Zener Voltage — To 12 Volts

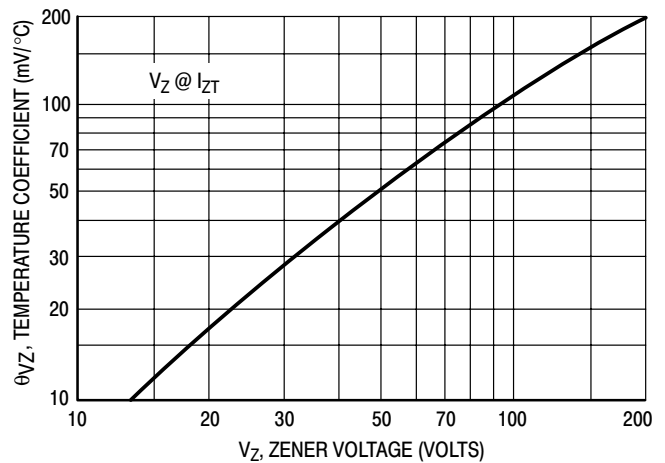


Figure 4. Zener Voltage — 14 To 200 Volts

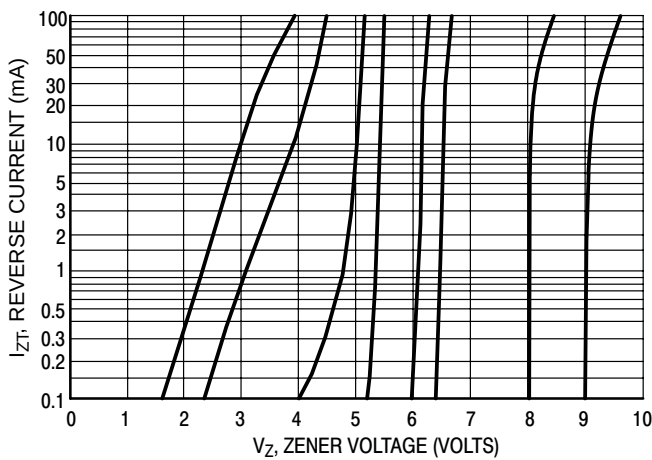


Figure 5.  $V_Z = 3.3$  thru 10 Volts

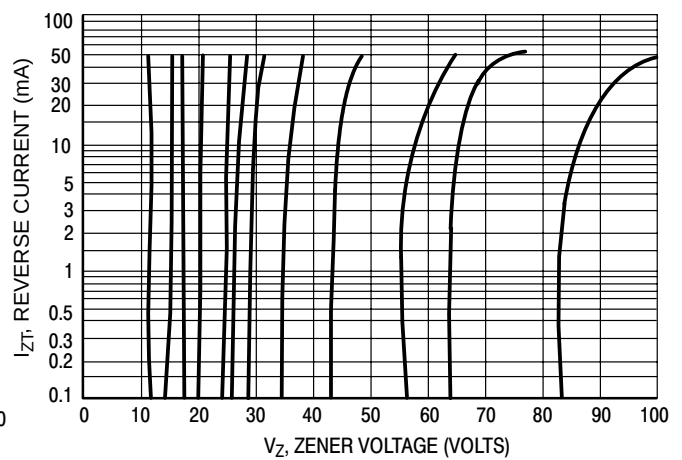


Figure 6.  $V_Z = 12$  thru 82 Volts

# 1SMB5913BT3 Series

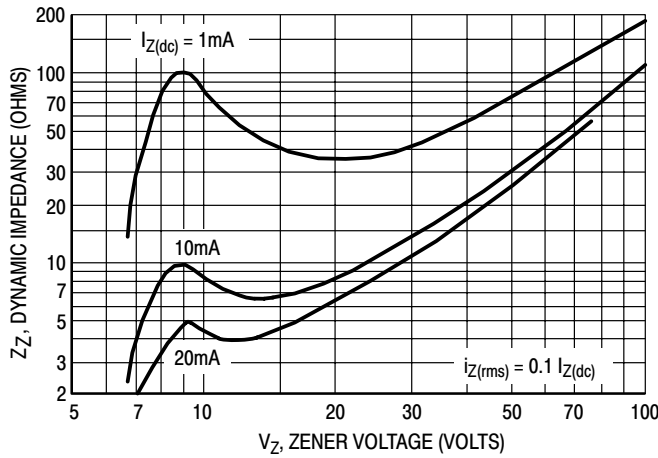


Figure 7. Effect of Zener Voltage

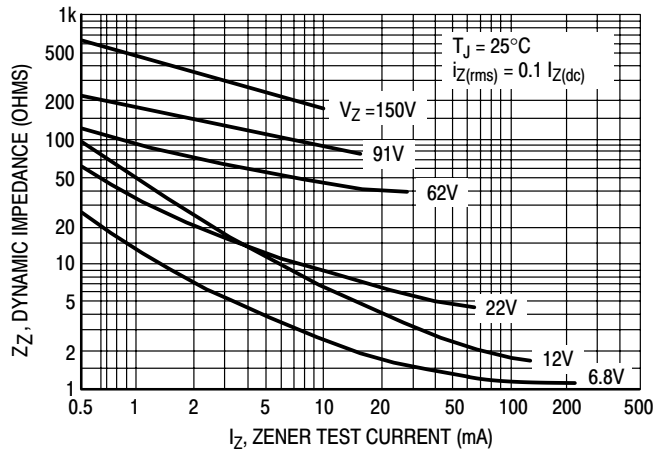


Figure 8. Effect of Zener Current

## Rating and Typical Characteristic Curves ( $T_A = 25^\circ C$ )

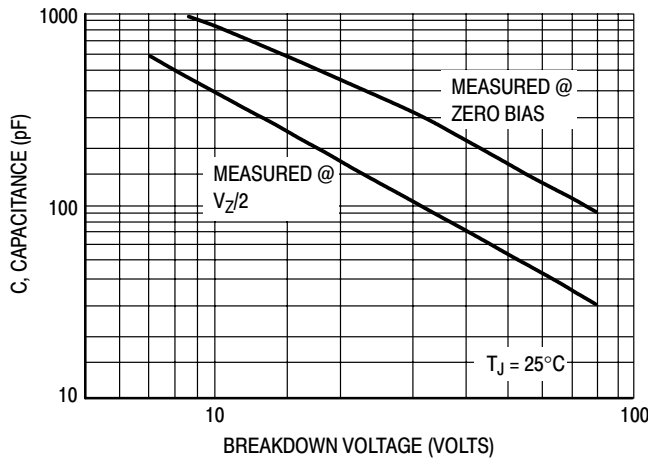


Figure 9. Capacitance Curve

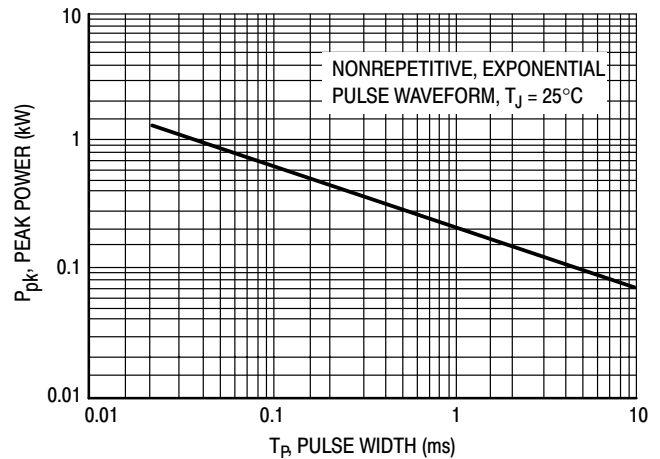


Figure 10. Typical Pulse Rating Curve

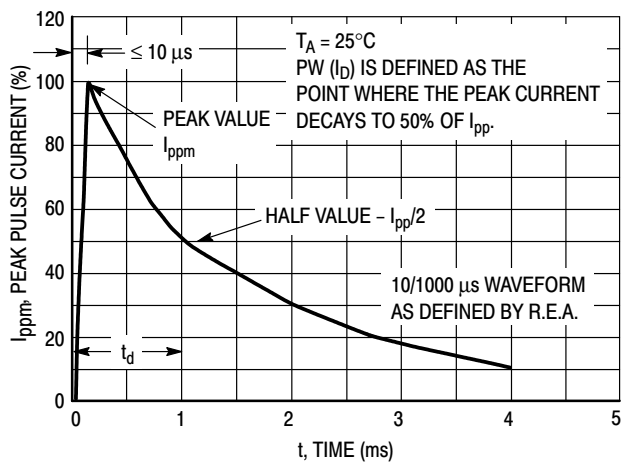


Figure 11. Pulse Waveform

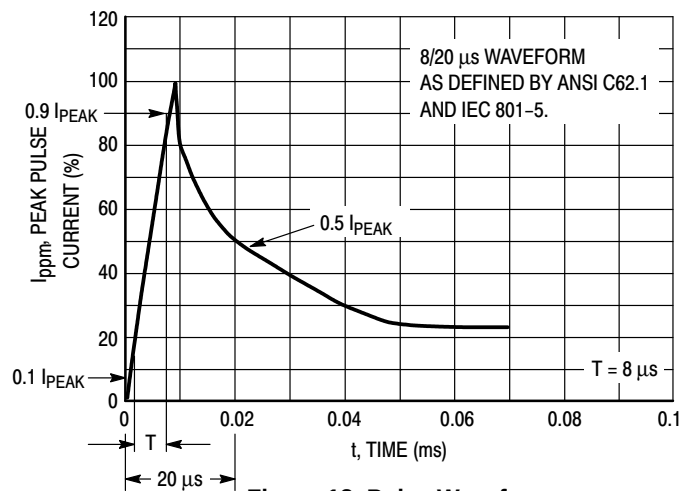
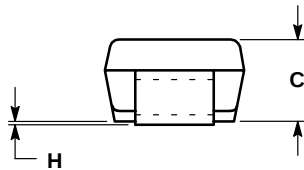
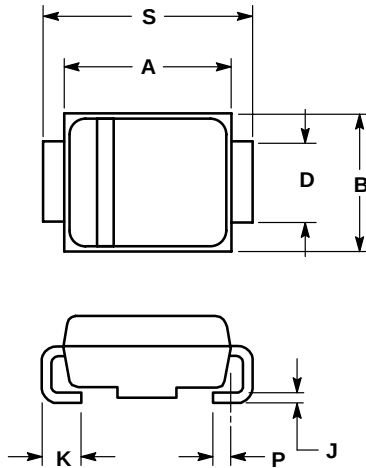


Figure 12. Pulse Waveform

# Zener Voltage Regulator Diodes – Surface Mounted

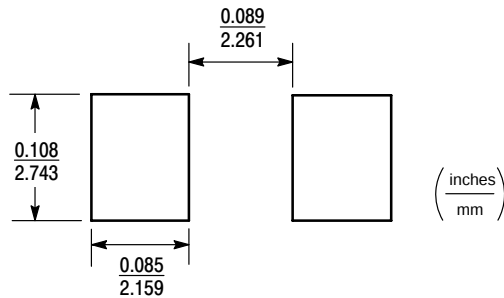
## 3 Watt DC Power

SMB  
DO-214AA  
CASE 403A-03  
ISSUE D



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. D DIMENSION SHALL BE MEASURED WITHIN DIMENSION P.

| DIM | INCHES    |        | MILLIMETERS |       |
|-----|-----------|--------|-------------|-------|
|     | MIN       | MAX    | MIN         | MAX   |
| A   | 0.160     | 0.180  | 4.06        | 4.57  |
| B   | 0.130     | 0.150  | 3.30        | 3.81  |
| C   | 0.075     | 0.095  | 1.90        | 2.41  |
| D   | 0.077     | 0.083  | 1.96        | 2.11  |
| H   | 0.0020    | 0.0060 | 0.051       | 0.152 |
| J   | 0.006     | 0.012  | 0.15        | 0.30  |
| K   | 0.030     | 0.050  | 0.76        | 1.27  |
| P   | 0.020 REF |        | 0.51 REF    |       |
| S   | 0.205     | 0.220  | 5.21        | 5.59  |



SMB Footprint

## **Notes**

# 1SMB5913BT3 Series

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