

## Zener Voltage Regulators

### 500 mW SOD-123 Surface Mount

Three complete series of Zener diodes are offered in the convenient, surface mount plastic SOD-123 package. These devices provide a convenient alternative to the leadless 34-package style.

#### Features

- 500 mW Rating on FR-4 or FR-5 Board
- Wide Zener Reverse Voltage Range – 2.4 V to 110 V
- Package Designed for Optimal Automated Board Assembly
- Small Package Size for High Density Applications
- General Purpose, Medium Current
- ESD Rating of Class 3 (>16 kV) per Human Body Model
- We declare that the material of product compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

#### Mechanical Characteristics:

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

**FINISH:** Corrosion resistant finish, easily solderable

#### MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:

260°C for 10 Seconds

**POLARITY:** Cathode indicated by polarity band

**FLAMMABILITY RATING:** UL 94 V-0

#### MAXIMUM RATINGS

| Rating   | Symbol          | Max         | Unit                       |
|--|-----------------|-------------|----------------------------|
| Total Power Dissipation on FR-5 Board, (Note 1) @ $T_L = 75^\circ\text{C}$<br>Derated above $75^\circ\text{C}$ | $P_D$           | 500<br>6.7  | mW<br>mW/ $^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient (Note 2)   | $R_{\theta JA}$ | 340         | $^\circ\text{C}/\text{W}$  |
| Thermal Resistance, Junction-to-Lead (Note 2)  | $R_{\theta JL}$ | 150         | $^\circ\text{C}/\text{W}$  |
| Junction and Storage Temperature Range   | $T_J, T_{stg}$  | -55 to +150 | $^\circ\text{C}$           |

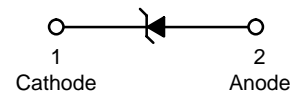
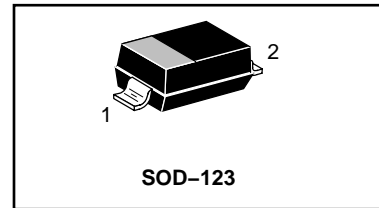
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. FR-5 = 3.5 X 1.5 inches, using the minimum recommended footprint.
2. Thermal Resistance measurement obtained via infrared Scan Method.

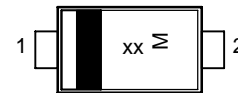
#### ORDERING INFORMATION

| Device              | Package | Shipping           |
|---------------------|---------|--------------------|
| LMSZ5221BT1G Series | SOD-123 | 3000/Tape & Reel   |
| LMSZ5221BT3G Series | SOD-123 | 10,000/Tape & Reel |

**LMSZ5221BT1G Series**  
**S-LMSZ5221BT1G Series**



#### MARKING DIAGRAM

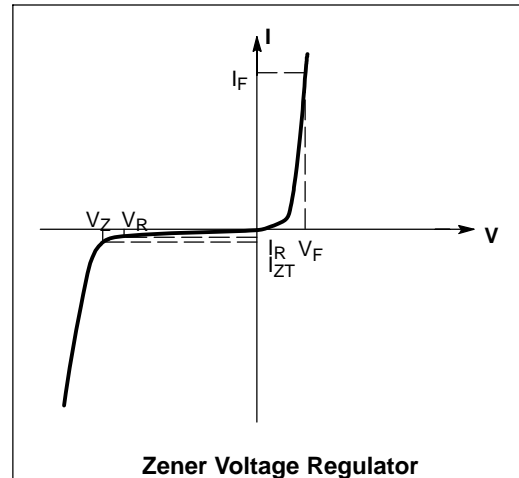


xx = Device Code  
M = Date Code

## LMSZ5221BT1G Series , S-LMSZ5221BT1G Series

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 0.9\text{ V Max. @ } I_F = 10\text{ mA}$ )

| 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 @ $I_F$            |



### LMSZ5221BT1G Series , S-LMSZ5221BT1G Series

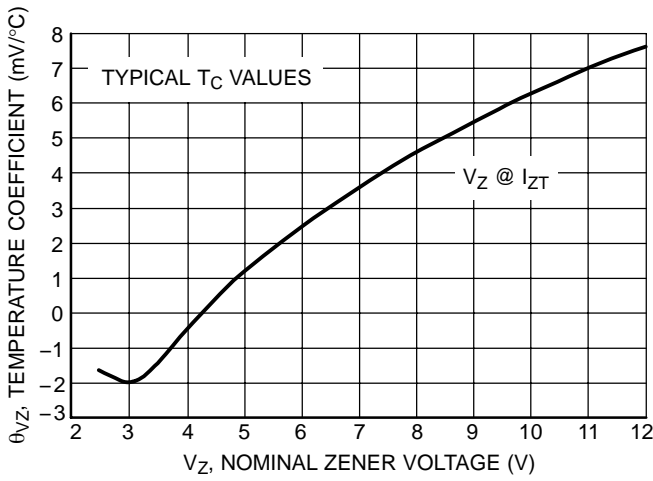
ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted, V<sub>F</sub> = 0.9 V Max. @ I<sub>F</sub> = 10 mA)

| Device              | Device Marking | Zener Voltage (Notes 3 and 4) |            |              | Zener Impedance (Note 5) |                                   |                                   | Leakage Current |                                 |            |
|---------------------|----------------|-------------------------------|------------|--------------|--------------------------|-----------------------------------|-----------------------------------|-----------------|---------------------------------|------------|
|                     |                | 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      |
| <b>LMSZ5221BT1G</b> | <b>C1</b>      | <b>2.28</b>                   | <b>2.4</b> | <b>2.52</b>  | <b>20</b>                | <b>30</b>                         | <b>1200</b>                       | <b>0.25</b>     | <b>100</b>                      | <b>1</b>   |
| <b>LMSZ5222BT1G</b> | <b>C2</b>      | <b>2.38</b>                   | <b>2.5</b> | <b>2.63</b>  | <b>20</b>                | <b>30</b>                         | <b>1250</b>                       | <b>0.25</b>     | <b>100</b>                      | <b>1</b>   |
| LMSZ5223BT1G        | C3             | 2.57                          | 2.7        | 2.84         | 20                       | 30                                | 1300                              | 0.25            | 75                              | 1          |
| LMSZ5224BT1G        | C4             | 2.66                          | 2.8        | 2.94         | 20                       | 30                                | 1400                              | 0.25            | 75                              | 1          |
| <b>LMSZ5225BT1G</b> | <b>C5</b>      | <b>2.85</b>                   | <b>3.0</b> | <b>3.15</b>  | <b>20</b>                | <b>29</b>                         | <b>1600</b>                       | <b>0.25</b>     | <b>50</b>                       | <b>1</b>   |
| LMSZ5226BT1G        | D1             | 3.14                          | 3.3        | 3.47         | 20                       | 28                                | 1600                              | 0.25            | 25                              | 1          |
| LMSZ5227BT1G        | D2             | 3.42                          | 3.6        | 3.78         | 20                       | 24                                | 1700                              | 0.25            | 15                              | 1          |
| LMSZ5228BT1G        | D3             | 3.71                          | 3.9        | 4.10         | 20                       | 23                                | 1900                              | 0.25            | 10                              | 1          |
| <b>LMSZ5229BT1G</b> | <b>D4</b>      | <b>4.09</b>                   | <b>4.3</b> | <b>4.52</b>  | <b>20</b>                | <b>22</b>                         | <b>2000</b>                       | <b>0.25</b>     | <b>5</b>                        | <b>1</b>   |
| <b>LMSZ5230BT1G</b> | <b>D5</b>      | <b>4.47</b>                   | <b>4.7</b> | <b>4.94</b>  | <b>20</b>                | <b>19</b>                         | <b>1900</b>                       | <b>0.25</b>     | <b>5</b>                        | <b>2</b>   |
| <b>LMSZ5231BT1G</b> | <b>E1</b>      | <b>4.85</b>                   | <b>5.1</b> | <b>5.36</b>  | <b>20</b>                | <b>17</b>                         | <b>1600</b>                       | <b>0.25</b>     | <b>5</b>                        | <b>2</b>   |
| <b>LMSZ5232BT1G</b> | <b>E2</b>      | <b>5.32</b>                   | <b>5.6</b> | <b>5.88</b>  | <b>20</b>                | <b>11</b>                         | <b>1600</b>                       | <b>0.25</b>     | <b>5</b>                        | <b>3</b>   |
| LMSZ5233BT1G        | E3             | 5.70                          | 6.0        | 6.30         | 20                       | 7                                 | 1600                              | 0.25            | 5                               | 3.5        |
| <b>LMSZ5234BT1G</b> | <b>E4</b>      | <b>5.89</b>                   | <b>6.2</b> | <b>6.51</b>  | <b>20</b>                | <b>7</b>                          | <b>1000</b>                       | <b>0.25</b>     | <b>5</b>                        | <b>4</b>   |
| LMSZ5235BT1G        | E5             | 6.46                          | 6.8        | 7.14         | 20                       | 5                                 | 750                               | 0.25            | 3                               | 5          |
| LMSZ5236BT1G        | F1             | 7.13                          | 7.5        | 7.88         | 20                       | 6                                 | 500                               | 0.25            | 3                               | 6          |
| LMSZ5237BT1G        | F2             | 7.79                          | 8.2        | 8.61         | 20                       | 8                                 | 500                               | 0.25            | 3                               | 6.5        |
| LMSZ5238BT1G        | F3             | 8.27                          | 8.7        | 9.14         | 20                       | 8                                 | 600                               | 0.25            | 3                               | 6.5        |
| LMSZ5239BT1G        | F4             | 8.65                          | 9.1        | 9.56         | 20                       | 10                                | 600                               | 0.25            | 3                               | 7          |
| <b>LMSZ5240BT1G</b> | <b>F5</b>      | <b>9.50</b>                   | <b>10</b>  | <b>10.50</b> | <b>20</b>                | <b>17</b>                         | <b>600</b>                        | <b>0.25</b>     | <b>3</b>                        | <b>8</b>   |
| LMSZ5241BT1G        | H1             | 10.45                         | 11         | 11.55        | 20                       | 22                                | 600                               | 0.25            | 2                               | 8.4        |
| <b>LMSZ5242BT1G</b> | <b>H2</b>      | <b>11.40</b>                  | <b>12</b>  | <b>12.60</b> | <b>20</b>                | <b>30</b>                         | <b>600</b>                        | <b>0.25</b>     | <b>1</b>                        | <b>9.1</b> |
| LMSZ5243BT1G        | H3             | 12.35                         | 13         | 13.65        | 9.5                      | 13                                | 600                               | 0.25            | 0.5                             | 9.9        |
| LMSZ5244BT1G        | H4             | 13.30                         | 14         | 14.70        | 9.0                      | 15                                | 600                               | 0.25            | 0.1                             | 10         |
| <b>LMSZ5245BT1G</b> | <b>H5</b>      | <b>14.25</b>                  | <b>15</b>  | <b>15.75</b> | <b>8.5</b>               | <b>16</b>                         | <b>600</b>                        | <b>0.25</b>     | <b>0.1</b>                      | <b>11</b>  |
| <b>LMSZ5246BT1G</b> | <b>J1</b>      | <b>15.20</b>                  | <b>16</b>  | <b>16.80</b> | <b>7.8</b>               | <b>17</b>                         | <b>600</b>                        | <b>0.25</b>     | <b>0.1</b>                      | <b>12</b>  |
| LMSZ5247BT1G        | J2             | 16.15                         | 17         | 17.85        | 7.4                      | 19                                | 600                               | 0.25            | 0.1                             | 13         |
| <b>LMSZ5248BT1G</b> | <b>J3</b>      | <b>17.10</b>                  | <b>18</b>  | <b>18.90</b> | <b>7.0</b>               | <b>21</b>                         | <b>600</b>                        | <b>0.25</b>     | <b>0.1</b>                      | <b>14</b>  |
| LMSZ5250BT1G        | J5             | 19.00                         | 20         | 21.00        | 6.2                      | 25                                | 600                               | 0.25            | 0.1                             | 15         |
| LMSZ5251BT1G        | K1             | 20.90                         | 22         | 23.10        | 5.6                      | 29                                | 600                               | 0.25            | 0.1                             | 17         |
| <b>LMSZ5252BT1G</b> | <b>K2</b>      | <b>22.80</b>                  | <b>24</b>  | <b>25.20</b> | <b>5.2</b>               | <b>33</b>                         | <b>600</b>                        | <b>0.25</b>     | <b>0.1</b>                      | <b>18</b>  |
| LMSZ5253BT1G        | K3             | 23.75                         | 25         | 26.25        | 5.0                      | 35                                | 600                               | 0.25            | 0.1                             | 19         |
| LMSZ5254BT1G        | K4             | 25.65                         | 27         | 28.35        | 4.6                      | 41                                | 600                               | 0.25            | 0.1                             | 21         |
| LMSZ5255BT1G        | K5             | 26.60                         | 28         | 29.40        | 4.5                      | 44                                | 600                               | 0.25            | 0.1                             | 21         |
| LMSZ5256BT1G        | M1             | 28.50                         | 30         | 31.50        | 4.2                      | 49                                | 600                               | 0.25            | 0.1                             | 23         |
| LMSZ5257BT1G        | M2             | 31.35                         | 33         | 34.65        | 3.8                      | 58                                | 700                               | 0.25            | 0.1                             | 25         |
| LMSZ5258BT1G        | M3             | 34.20                         | 36         | 37.80        | 3.4                      | 70                                | 700                               | 0.25            | 0.1                             | 27         |
| LMSZ5259BT1G        | M4             | 37.05                         | 39         | 40.95        | 3.2                      | 80                                | 800                               | 0.25            | 0.1                             | 30         |
| LMSZ5260BT1G        | M5             | 40.85                         | 43         | 45.15        | 3.0                      | 93                                | 900                               | 0.25            | 0.1                             | 33         |
| <b>LMSZ5261BT1G</b> | <b>N1</b>      | <b>44.65</b>                  | <b>47</b>  | <b>49.35</b> | <b>2.7</b>               | <b>105</b>                        | <b>1000</b>                       | <b>0.25</b>     | <b>0.1</b>                      | <b>36</b>  |
| LMSZ5262BT1G        | N2             | 48.45                         | 51         | 53.55        | 2.5                      | 125                               | 1100                              | 0.25            | 0.1                             | 39         |
| LMSZ5263BT1G        | N3             | 53.20                         | 56         | 58.80        | 2.2                      | 150                               | 1300                              | 0.25            | 0.1                             | 43         |
| LMSZ5264BT1G        | N4             | 57.00                         | 60         | 63.00        | 2.1                      | 170                               | 1400                              | 0.25            | 0.1                             | 46         |
| LMSZ5265BT1G        | N5             | 58.90                         | 62         | 65.10        | 2.0                      | 185                               | 1400                              | 0.25            | 0.1                             | 47         |
| LMSZ5266BT1G        | P1             | 64.60                         | 68         | 71.40        | 1.8                      | 230                               | 1600                              | 0.25            | 0.1                             | 52         |
| LMSZ5267BT1G        | P2             | 71.25                         | 75         | 78.75        | 1.7                      | 270                               | 1700                              | 0.25            | 0.1                             | 56         |
| LMSZ5268BT1G*       | P3             | 77.90                         | 82         | 86.10        | 1.5                      | 330                               | 2000                              | 0.25            | 0.1                             | 62         |
| LMSZ5269BT1G*       | P4             | 82.65                         | 87         | 91.35        | 1.4                      | 370                               | 2200                              | 0.25            | 0.1                             | 68         |
| LMSZ5270BT1G*       | P5             | 86.45                         | 91         | 95.55        | 1.4                      | 400                               | 2300                              | 0.25            | 0.1                             | 69         |
| LMSZ5272BT1G*       | R2             | 104.5                         | 110        | 115.5        | 1.1                      | 750                               | 3000                              | 0.25            | 0.1                             | 84         |

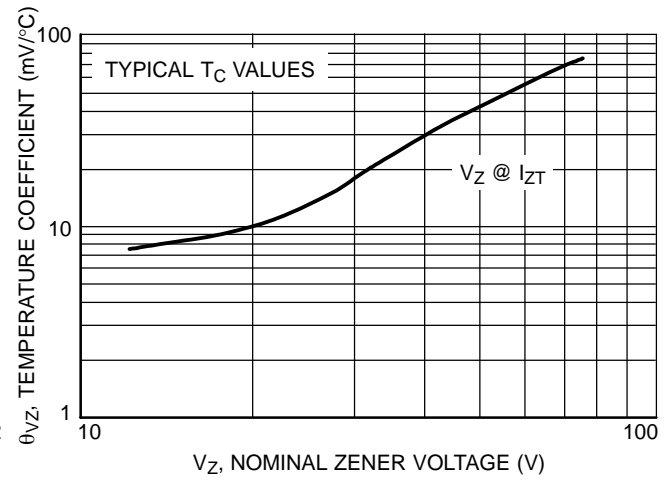
\* Not production

- The type numbers shown have a standard tolerance of ±5% on the nominal Zener voltage.
- Nominal Zener voltage is measured with the device junction in thermal equilibrium at T<sub>L</sub> = 30°C ± 1°C.
- Z<sub>ZT</sub> and Z<sub>ZK</sub> are measured by dividing the AC voltage drop across the device by the ac current applied. The specified limits are for I<sub>Z(AC)</sub> = 0.1 I<sub>Z(dc)</sub> with the AC frequency = 1 KHz.

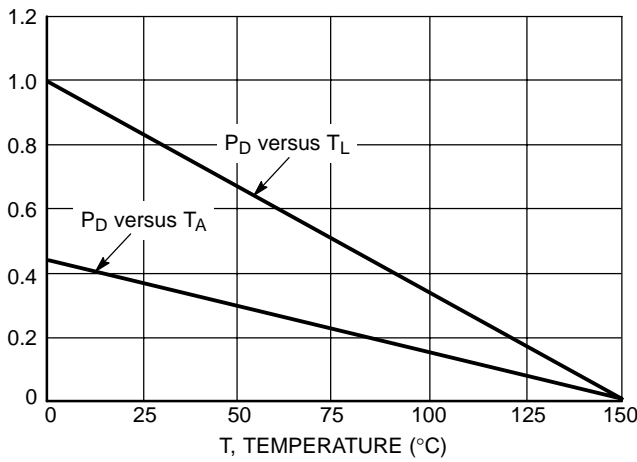
## LMSZ5221BT1G Series , S-LMSZ5221BT1G Series TYPICAL CHARACTERISTICS



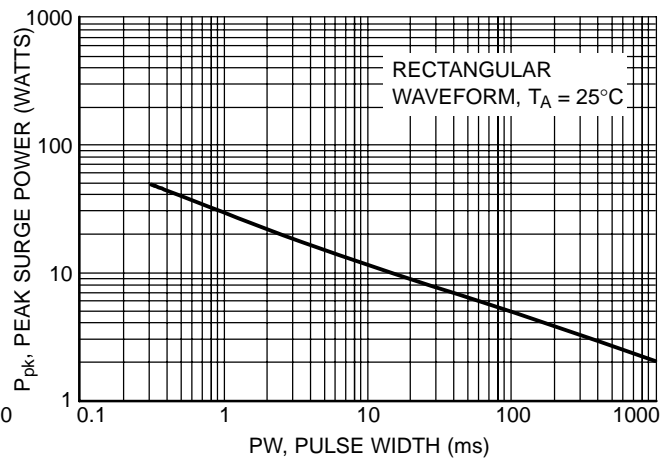
**Figure 1. Temperature Coefficients**  
(Temperature Range -55°C to +150°C)



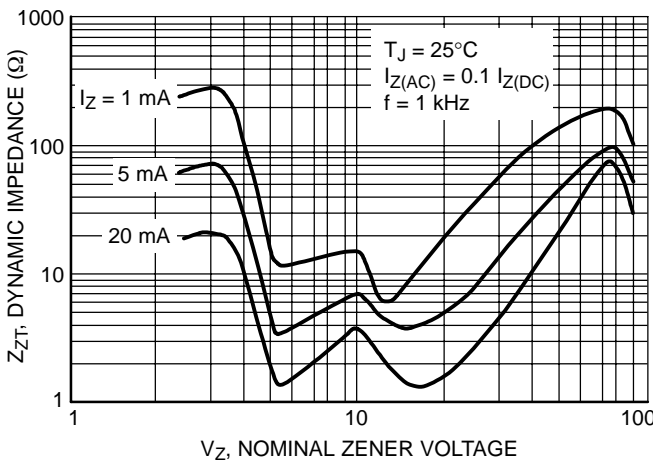
**Figure 2. Temperature Coefficients**  
(Temperature Range -55°C to +150°C)



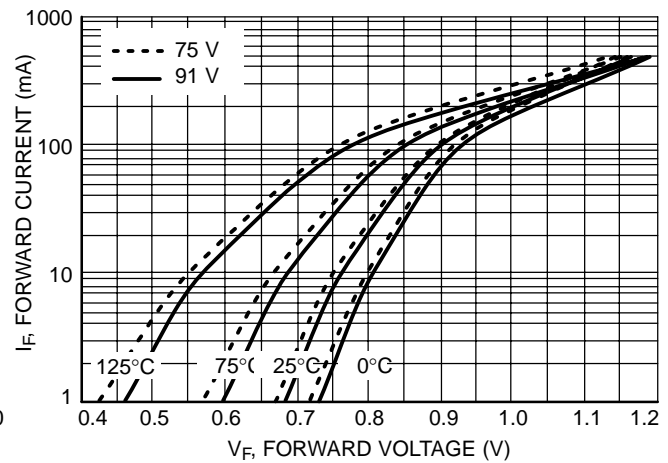
**Figure 3. Steady State Power Derating**



**Figure 4. Maximum Nonrepetitive Surge Power**



**Figure 5. Effect of Zener Voltage on Zener Impedance**



**Figure 6. Typical Forward Voltage**

## LMSZ5221BT1G Series , S-LMSZ5221BT1G Series TYPICAL CHARACTERISTICS

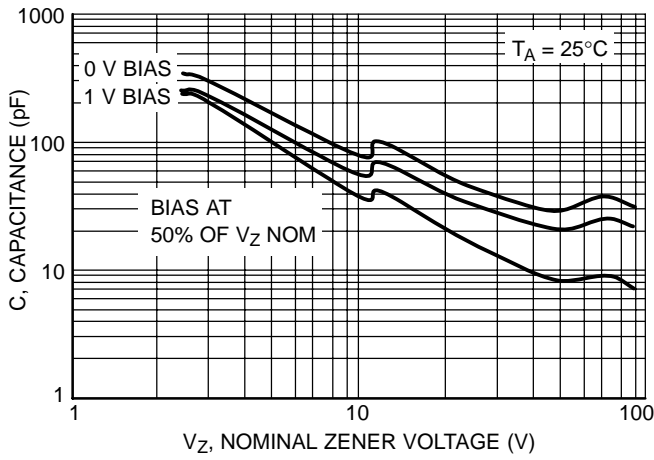


Figure 7. Typical Capacitance

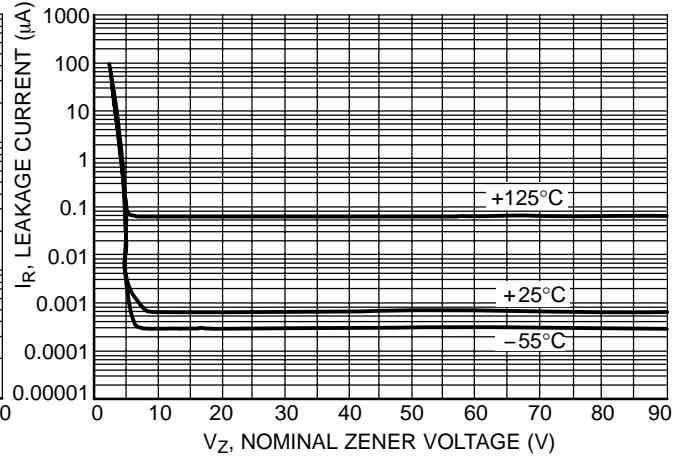


Figure 8. Typical Leakage Current

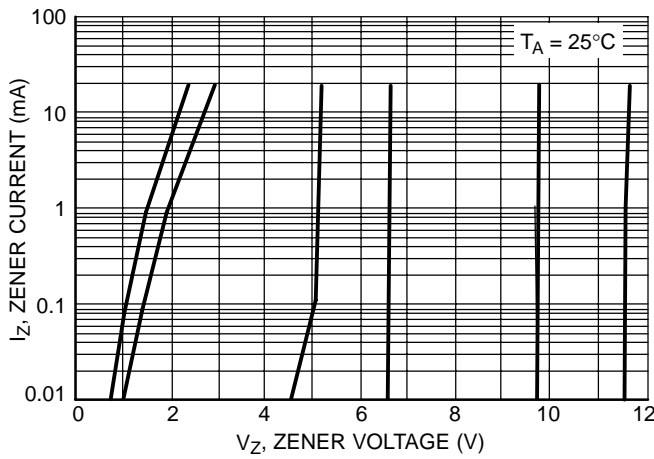


Figure 9. Zener Voltage versus Zener Current  
( $V_Z$  Up to 12 V)

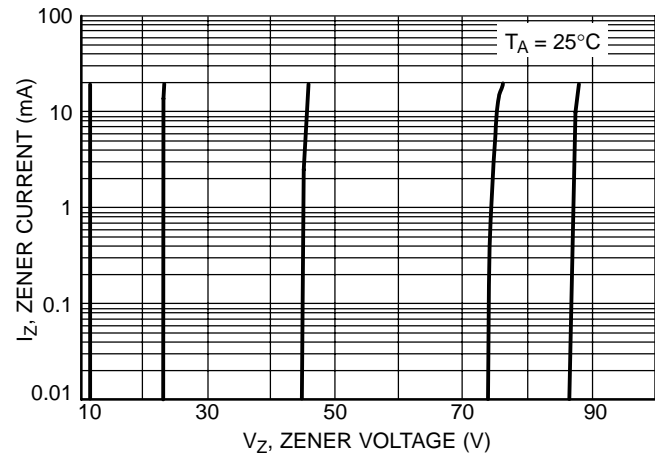
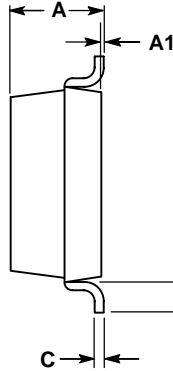
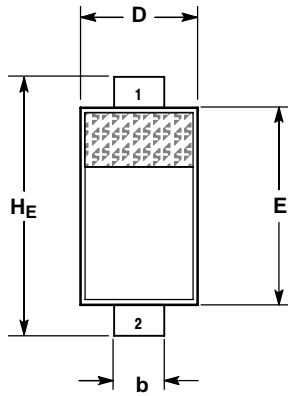


Figure 10. Zener Voltage versus Zener Current  
(12 V to 91 V)

## LMSZ5221BT1G Series , S-LMSZ5221BT1G Series

SOD-123



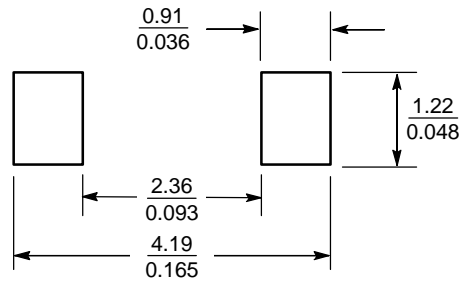
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.94        | 1.17 | 1.35 | 0.037  | 0.046 | 0.053 |
| A1  | 0.00        | 0.05 | 0.10 | 0.000  | 0.002 | 0.004 |
| b   | 0.51        | 0.61 | 0.71 | 0.020  | 0.024 | 0.028 |
| c   | ---         | ---  | 0.15 | ---    | ---   | 0.006 |
| D   | 1.40        | 1.60 | 1.80 | 0.055  | 0.063 | 0.071 |
| E   | 2.54        | 2.69 | 2.84 | 0.100  | 0.106 | 0.112 |
| HE  | 3.56        | 3.68 | 3.86 | 0.140  | 0.145 | 0.152 |
| L   | 0.25        | ---  | ---  | 0.010  | ---   | ---   |

STYLE 1:  
PIN 1. CATHODE  
2. ANODE

### SOLDERING FOOTPRINT\*



SCALE 10:1 (mm / inches)

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[1N747A](#) [1N964B](#) [1N966B](#) [1N968B](#) [1N972B](#) [JANS1N4974US](#) [JANTX1N5907](#) [1N4692](#) [1N4700](#) [1N4702](#) [1N4704](#) [1N4711](#) [1N4714](#)  
[1N4745ARL](#) [1N4752ARL](#) [1N4760ARL](#) [1N5221B](#) [1N5242BTR](#) [1N5350B](#) [1N5352B](#) [1N961BRR1](#) [1N964BRL](#) [RKZ5.1BKU#P6](#)  
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