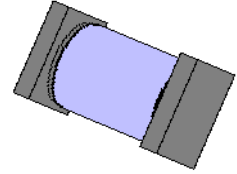


**DESCRIPTION**

This surface mount Zener Voltage Regulator series is military qualified to MIL-PRF-19500/356 and is ideal for high-reliability applications where a failure cannot be tolerated. These industry-recognized 5 Watt Zener Voltage Regulators are hermetically sealed with voidless-glass construction using an internal metallurgical bond. It includes Zener selections from 3.3 to 390 volts in standard 5% tolerances as well as tighter tolerances identified by different suffix letters on the part number. They are also available in axial-leaded packages for thru hole mounting by deleting the "US" suffix (see separate data sheet for 1N4954 thru 1N4996, 1N5968 thru 1N5969, and 1N6632 thru 1N6637). Microsemi also offers numerous other Zener products to meet higher and lower power ratings in both thru-hole and surface mount packages.

**IMPORTANT:** For the most current data, consult MICROSEMI's website: <http://www.microsemi.com>

**APPEARANCE**



**"E" Package  
(or "D-5B")**

**FEATURES**

- Popular JEDEC registered series
- Voidless hermetically sealed glass package
- Triple-layer passivation
- Internal "Category I" Metallurgical bonds for 1N4954US thru 1N4996US, and "Category III" for 1N6632US thru 1N6637US as well as 1N5968US thru 1N5969US
- JAN, JANTX, JANTXV, and JANS available per MIL-PRF-19500/356
- Axial-leaded equivalents (see separate data sheet for 1N4954 thru 1N4996, 1N6632 thru 1N6637 and 1N5968 thru 1N5969)

**APPLICATIONS / BENEFITS**

- Regulates voltage over a broad operating current and temperature range
- Extensive selection from 3.3 to 390 V
- Standard voltage tolerances are plus/minus 5% with no suffix
- Tight tolerances available in plus or minus 2% or 1% with C or D suffix respectively
- Extremely robust construction
- Nonsensitive to ESD per MIL-STD-750 Method 1020
- Inherently radiation hard as described in Microsemi MicroNote 050

**MAXIMUM RATINGS**

- Operating ( $T_J$ ) Temperature:  $-65^{\circ}\text{C}$  to  $+175^{\circ}\text{C}$ .
- Storage Temperature:  $-65^{\circ}\text{C}$  to  $+175^{\circ}\text{C}$ .
- Power Dissipation: 5 Watts @  $T_{EC} = 140^{\circ}\text{C}$  for 1N4954US thru 1N4996US or @  $T_{EC} = 125^{\circ}\text{C}$  for both the 1N6632US thru 1N6637US & 1N5968US thru 1N5969US. Derate linearly above these temperatures to zero at  $175^{\circ}\text{C}$ .
- Thermal Resistance:  $7^{\circ}\text{C}/\text{W}$  junction to end cap for 1N4954US thru 1N4996US and  $10^{\circ}\text{C}/\text{W}$  for 1N6632US thru 1N6637US as well as 1N5968US thru 1N5969US
- Thermal Impedance at 10 ms:  $1.8^{\circ}\text{C}/\text{W}$  for 1N4954US thru 1N4996US, and  $3.0^{\circ}\text{C}/\text{W}$  for both the 1N6632US thru 1N6637US & 1N5968US thru 1N5969US
- Forward Voltage: 1.50 V at 1.0 A

**MECHANICAL AND PACKAGING**

- CASE: Hermetically sealed voidless hard glass with Tungsten slugs
- TERMINATIONS: End caps are Copper with Tin/Lead (Sn/Pb) finish. Note: Previous inventory had solid Silver end caps with Tin/Lead (Sn/Pb) finish.
- MARKING: None
- POLARITY: Cathode indicated by band
- Tape & Reel option: Standard per EIA-481-B
- Weight: 539 mg

**ELECTRICAL CHARACTERISTICS @ 25°C**

| TYPE*    | NOMINAL<br>ZENER<br>VOLTAGE<br>$V_Z @ I_{ZT}$ | TEST<br>CURRENT<br>$I_{ZT}$ | MAXIMUM<br>DYNAMIC<br>IMPEDANCE |                              | VOLTAGE<br>REGULATION<br>(Note 1)<br>$\Delta V_Z$ | MAXIMUM REVERSE<br>LEAKAGE CURRENT<br>VOLTAGE |       | MAXIMUM<br>TEMPERATURE<br>COEFF.<br>$\alpha_{VZ} @ I_{ZT}$ | MAXIMUM<br>CONTINUOUS<br>CURRENT<br>$I_{ZM}$ | SURGE<br>CURRENT<br>@ 8.3 ms<br>sq. wave<br>$I_{ZSM}$ |
|----------|---|-----------------------------|---------------------------------|------------------------------|---|---|-------|--|--|---|
|          |   |                             | $Z_z @$<br>$I_{ZT}$             | $Z_{zk}^* @$<br>$I_{ZK}=1mA$ |   | $I_R$   | $V_R$ |  |  |   |
|          |   |                             | OHMS                            | OHMS                         |   | $\mu A$                                       | VOLTS |  |  |   |
| 1N6632US | 3.3   | 380                         | 3.0                             | 500                          | 0.90  | 300   | 1.0   | -.075  | 1440   | 20.0  |
| 1N6633US | 3.6   | 350                         | 2.5                             | 500                          | 0.80  | 250   | 1.0   | -.070  | 1320   | 18.7  |
| 1N6634US | 3.9   | 320                         | 2.0                             | 500                          | 0.75  | 175   | 1.0   | -.060  | 1220   | 17.6  |
| 1N6635US | 4.3   | 290                         | 2.0                             | 500                          | 0.70  | 25  | 1.0   | -.050  | 1100   | 16.4  |
| 1N6636US | 4.7   | 260                         | 2.0                             | 450                          | 0.60  | 20  | 1.0   | +/- .025   | 1010   | 15.3  |
| 1N6637US | 5.1   | 240                         | 1.5                             | 400                          | 0.50  | 5   | 1.0   | +/- .030   | 930  | 14.4  |
| 1N5968US | 5.6   | 220                         | 1.0                             | 400                          | 0.4   | 5000  | 4.28  | .04  | 865  | 20  |
| 1N5969US | 6.2   | 220                         | 1.0                             | 1000                         | 0.5   | 1000  | 4.74  | .04  | 765  | 20  |
| 1N4954US | 6.8   | 175                         | 1.0                             | 1000                         | 0.7   | 150   | 5.2   | .05  | 700  | 29.3  |
| 1N4955US | 7.5   | 175                         | 1.5                             | 800                          | 0.7   | 100   | 5.7   | .06  | 630  | 26.4  |
| 1N4956US | 8.2   | 150                         | 1.5                             | 600                          | 0.7   | 50  | 6.2   | .06  | 580  | 24  |
| 1N4957US | 9.1   | 150                         | 2.0                             | 400                          | 0.7   | 25  | 6.9   | .06  | 520  | 22  |
| 1N4958US | 10.0  | 125                         | 2.0                             | 125                          | 0.8   | 25  | 7.6   | .07  | 475  | 20  |
| 1N4959US | 11  | 125                         | 2.5                             | 130                          | 0.8   | 10  | 8.4   | .07  | 430  | 19  |
| 1N4960US | 12  | 100                         | 2.5                             | 140                          | 0.8   | 10  | 9.1   | .07  | 395  | 18  |
| 1N4961US | 13  | 100                         | 3.0                             | 145                          | 0.9   | 10  | 9.9   | .08  | 365  | 16  |
| 1N4962US | 15  | 75                          | 3.5                             | 150                          | 1.0   | 5   | 11.4  | .08  | 315  | 12  |
| 1N4963US | 16  | 75                          | 3.5                             | 155                          | 1.1   | 5   | 12.2  | .08  | 294  | 10  |
| 1N4964US | 18  | 65                          | 4.0                             | 160                          | 1.2   | 5   | 13.7  | .085   | 264  | 9.0   |
| 1N4965US | 20  | 65                          | 4.5                             | 165                          | 1.5   | 2   | 15.2  | .085   | 237  | 8.0   |
| 1N4966US | 22  | 50                          | 5.0                             | 170                          | 1.8   | 2   | 16.7  | .085   | 216  | 7.0   |
| 1N4967US | 24  | 50                          | 5.0                             | 175                          | 2.0   | 2   | 18.2  | .090   | 198  | 6.5   |
| 1N4968US | 27  | 50                          | 6.0                             | 180                          | 2.0   | 2   | 20.6  | .090   | 176  | 6.0   |
| 1N4969US | 30  | 40                          | 8                               | 190                          | 2.5   | 2   | 22.8  | .090   | 158  | 5.5   |
| 1N4970US | 33  | 40                          | 10                              | 200                          | 2.8   | 2   | 25.1  | .095   | 144  | 5.0   |
| 1N4971US | 36  | 30                          | 11                              | 220                          | 3.0   | 2   | 27.4  | .095   | 132  | 4.5   |
| 1N4972US | 39  | 30                          | 14                              | 230                          | 3.0   | 2   | 29.7  | .095   | 122  | 4.0   |
| 1N4973US | 43  | 30                          | 20                              | 240                          | 3.3   | 2   | 32.7  | .095   | 110  | 3.5   |
| 1N4974US | 47  | 25                          | 25                              | 250                          | 3.5   | 2   | 35.8  | .095   | 100  | 3.2   |
| 1N4975US | 51  | 25                          | 27                              | 270                          | 4.0   | 2   | 38.8  | .095   | 92   | 3.0   |
| 1N4976US | 56  | 20                          | 35                              | 320                          | 4.4   | 2   | 42.6  | .095   | 84   | 2.8   |
| 1N4977US | 62  | 20                          | 42                              | 400                          | 5.0   | 2   | 47.1  | .100   | 76   | 2.5   |
| 1N4978US | 68  | 20                          | 50                              | 500                          | 5.5   | 2   | 51.7  | .100   | 70   | 2.2   |
| 1N4979US | 75  | 20                          | 55                              | 620                          | 6.0   | 2   | 56.0  | .100   | 63.0   | 2.0   |
| 1N4980US | 82  | 15                          | 80                              | 720                          | 6.6   | 2   | 62.2  | .100   | 58.0   | 1.8   |
| 1N4981US | 91  | 15                          | 90                              | 760                          | 7.5   | 2   | 69.2  | .100   | 52.5   | 1.6   |
| 1N4982US | 100   | 12                          | 110                             | 800                          | 8.0   | 2   | 76.0  | .100   | 47.5   | 1.4   |
| 1N4983US | 110   | 12                          | 125                             | 1000                         | 9.0   | 2   | 83.6  | .100   | 43.0   | 1.2   |
| 1N4984US | 120   | 10                          | 170                             | 1150                         | 10  | 2   | 91.2  | .100   | 39.5   | 1.00  |
| 1N4985US | 130   | 10                          | 190                             | 1250                         | 11  | 2   | 98.8  | .105   | 36.6   | 0.80  |
| 1N4986US | 150   | 8                           | 330                             | 1500                         | 13  | 2   | 114.0 | .105   | 31.6   | 0.75  |
| 1N4987US | 160   | 8                           | 350                             | 1650                         | 14  | 2   | 121.6 | .105   | 29.4   | 0.70  |
| 1N4988US | 180   | 5                           | 450                             | 1750                         | 16  | 2   | 136.8 | .110   | 26.4   | 0.60  |
| 1N4989US | 200   | 5                           | 500                             | 1850                         | 18  | 2   | 152   | .110   | 23.6   | 0.50  |
| 1N4990US | 220   | 5                           | 550                             | 2000                         | 19  | 2   | 167   | .115   | 21.6   | 0.50  |
| 1N4991US | 240   | 5                           | 650                             | 2050                         | 22  | 2   | 182   | .115   | 19.8   | 0.40  |
| 1N4992US | 270   | 5                           | 800                             | 2100                         | 25  | 2   | 206   | .120   | 17.5   | 0.35  |
| 1N4993US | 300   | 4                           | 950                             | 2150                         | 28  | 2   | 228   | .120   | 15.6   | 0.30  |
| 1N4994US | 330   | 4                           | 1175                            | 2200                         | 32  | 2   | 251   | .120   | 14.4   | 0.25  |
| 1N4995US | 360   | 3                           | 1400                            | 2300                         | 35  | 2   | 274   | .120   | 13.0   | 0.22  |
| 1N4996US | 390   | 3                           | 1800                            | 2500                         | 40  | 2   | 297   | .120   | 12.0   | 0.20  |

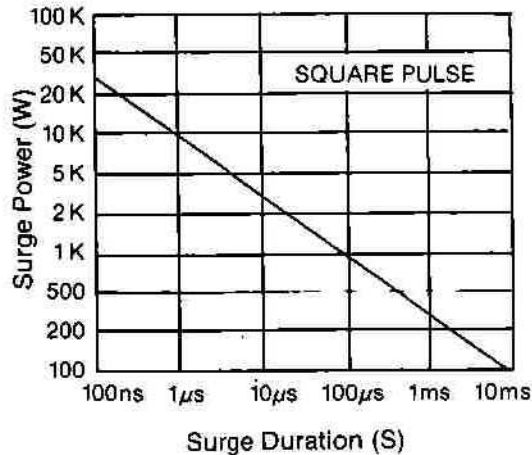
\* $I_{ZK} = 5$  mA for 1N5968

NOTE 1: Maximum voltage change  $\Delta V_Z$  between 10% of  $I_{ZM}$  and 50% of  $I_{ZM}$

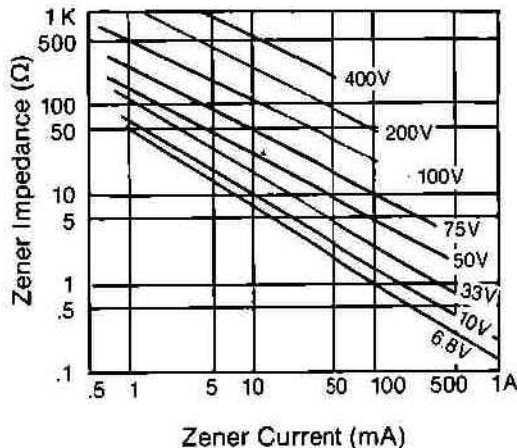
**SYMBOLS & DEFINITIONS**

| 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 ( $I_{ZT}$ ), or near breakdown knee ( $I_{ZK}$ ).   |
| $Z_{ZT}$ 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. |
| $V_F$                 | Maximum Forward Voltage: The maximum forward voltage the device will exhibit at a specified current.  |
| $I_R$                 | Maximum Reverse Current: The maximum reverse (leakage) current that will flow at the specified voltage and temperature.   |
| $I_{ZM}$              | Maximum Regulator (Zener) Current: The maximum rated dc current for the specified power rating.   |
| $I_{ZSM}$             | Maximum Zener Surge Current: The nonrepetitive peak value of zener surge current at a specified wave form.  |

**GRAPHS**



**FIGURE 1**  
SURGE POWER vs.  
SURGE DURATION

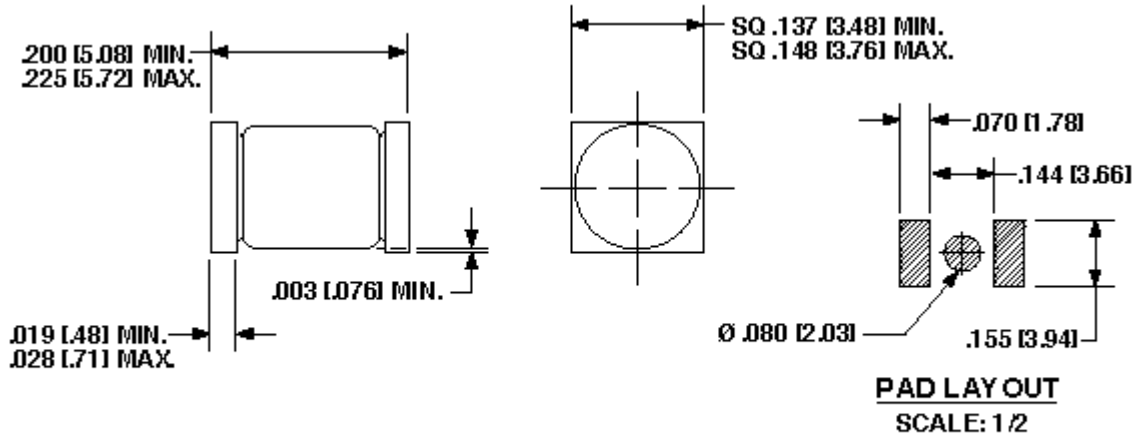


**FIGURE 2**  
TYPICAL ZENER IMPEDANCE vs.  
ZENER CURRENT



1N4954US thru 1N4996US  
1N5968US thru 1N5969US  
1N6632US thru 1N6637US

**PACKAGE DIMENSIONS AND PAD LAYOUT**



**NOTE: DIMENSIONS IN INCHES [MM]**

This Package Outline has also previously  
been identified as "D-5B"

**Note:** If mounting requires adhesive separate from the solder,  
an additional 0.080 inch diameter contact may be placed in the  
center between the pads as an optional spot for cement as  
shown in the pad layout.



1N4954US thru 1N4996US  
1N5968US thru 1N5969US  
1N6632US thru 1N6637US