

**VOIDLESS-HERMETICALLY-SEALED  
5 WATT GLASS ZENER DIODES**

ALSO  
AVAILABLE IN  
SURFACE  
MOUNT

**DESCRIPTION**

This 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 surface-mount packages (see separate data sheet for 1N4954US thru 1N4996US, 1N5968US thru 1N5969US, and 1N6632US thru 1N6637US). Microsemi also offers numerous other Zener products to meet higher and lower power ratings in both thru-hole and surface mount packages.

**"E" Package**

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

**FEATURES**

- Popular JEDEC registered series
- Voidless hermetically sealed glass package
- Extremely robust construction
- Triple-layer passivation
- Internal "Category I" Metallurgical bonds for 1N4954 thru 1N4996, and "Category III" for 1N6632 thru 1N6637 as well as 1N5968 thru 1N5969
- JAN, JANTX, JANTXV, and JANS available per MIL-PRF-19500/356
- Surface mount equivalents also available in a square end-cap MELF configuration with "US" suffix (see separate data sheet for 1N4954US thru 1N4996US, 1N6632US thru 1N6637US and 1N5968US thru 1N5969US)

**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
- Flexible axial-lead mounting terminals
- Nonsensitive to ESD per MIL-STD-750 Method 1020
- Inherently radiation hard as described in Microsemi MicroNote 050

**MAXIMUM RATINGS**

- Operating Temperature: -65°C to +175°C.
- Storage Temperature: -65°C to +175°C.
- Power Dissipation: 5 Watts @ T<sub>A</sub> = 25°C
- Thermal Resistance: 22°C/W junction to lead at 3/8 inch (10 mm) from body for 1N4954 thru 1N4996 and 30°C/W for 1N6632 thru 1N6637, 1N5968 thru 1N5969
- Thermal Impedance at 10 ms: 1.8°C/W for 1N4954 thru 1N4996, and 3.0°C/W for both the 1N6632 thru 1N6637 & 1N5968 thru 1N5969
- Forward Voltage: 1.50 V at 1.0 A

**MECHANICAL AND PACKAGING**

- CASE: Hermetically sealed voidless hard glass with Tungsten slugs
- TERMINATIONS: Axial-leads are Tin/Lead (Sn/Pb) over Copper except for JANS with solid Silver (Ag) and no finish
- MARKING: Body painted and part number, etc.
- POLARITY: Cathode indicated by band
- Tape & Reel option: Standard per EIA-296
- Weight: 750 mg

**ELECTRICAL CHARACTERISTICS @ 25°C**

| TYPE*  | NOMINAL ZENER VOLTAGE<br>$V_Z @ I_{ZT}$ | TEST CURRENT<br>$I_{ZT}$ | MAXIMUM ZENER IMPEDANCE |                         | VOLTAGE REGULATION<br>(Note 1)<br>$\Delta V_Z$ | MAXIMUM REVERSE LEAKAGE CURRENT VOLTAGE |       | MAXIMUM TEMPERATURE COEFF.<br>$\alpha_{VZ} @ I_{ZT}$ | MAXIMUM CONTINUOUS CURRENT<br>$I_{ZM}$ | SURGE CURRENT<br>$I_{ZSM}$ |
|--------|---|--------------------------|-------------------------|-------------------------|--|---|-------|--|--|----------------------------|
|        |   |                          | $Z_Z @ I_{ZT}$          | $Z_{ZK}^* @ I_{ZK}=1mA$ |  | $I_R$                                   | $V_R$ |  |  |                            |
|        |   |                          | OHMS                    | OHMS                    |  | $\mu A$                                 | VOLTS |  |  |                            |
| 1N6632 | 3.3                                     | 380                      | 3.0                     | 500                     | 0.90   | 300                                     | 1.0   | -.075  | 1440                                   | 20.0                       |
| 1N6633 | 3.6                                     | 350                      | 2.5                     | 500                     | 0.80   | 250                                     | 1.0   | -.070  | 1320                                   | 18.7                       |
| 1N6634 | 3.9                                     | 320                      | 2.0                     | 500                     | 0.75   | 175                                     | 1.0   | -.060  | 1220                                   | 17.6                       |
| 1N6635 | 4.3                                     | 290                      | 2.0                     | 500                     | 0.70   | 25                                      | 1.0   | -.050  | 1100                                   | 16.4                       |
| 1N6636 | 4.7                                     | 260                      | 2.0                     | 450                     | 0.60   | 20                                      | 1.0   | +/- .025   | 1010                                   | 15.3                       |
| 1N6637 | 5.1                                     | 240                      | 1.5                     | 400                     | 0.50   | 5                                       | 1.0   | +/- .030   | 930                                    | 14.4                       |
| 1N5968 | 5.6                                     | 220                      | 1.0                     | 400                     | 0.4  | 5000                                    | 4.28  | .04  | 865                                    | 20                         |
| 1N5969 | 6.2                                     | 220                      | 1.0                     | 1000                    | 0.5  | 1000                                    | 4.74  | .04  | 765                                    | 20                         |
| 1N4954 | 6.8                                     | 175                      | 1.0                     | 1000                    | 0.7  | 150                                     | 5.2   | .05  | 700                                    | 29.3                       |
| 1N4955 | 7.5                                     | 175                      | 1.5                     | 800                     | 0.7  | 100                                     | 5.7   | .06  | 630                                    | 26.4                       |
| 1N4956 | 8.2                                     | 150                      | 1.5                     | 600                     | 0.7  | 50                                      | 6.2   | .06  | 580                                    | 24                         |
| 1N4957 | 9.1                                     | 150                      | 2.0                     | 400                     | 0.7  | 25                                      | 6.9   | .06  | 520                                    | 22                         |
| 1N4958 | 10.0                                    | 125                      | 2.0                     | 125                     | 0.8  | 25                                      | 7.6   | .07  | 475                                    | 20                         |
| 1N4959 | 11                                      | 125                      | 2.5                     | 130                     | 0.8  | 10                                      | 8.4   | .07  | 430                                    | 19                         |
| 1N4960 | 12                                      | 100                      | 2.5                     | 140                     | 0.8  | 10                                      | 9.1   | .07  | 395                                    | 18                         |
| 1N4961 | 13                                      | 100                      | 3.0                     | 145                     | 0.9  | 10                                      | 9.9   | .08  | 365                                    | 16                         |
| 1N4962 | 15                                      | 75                       | 3.5                     | 150                     | 1.0  | 5                                       | 11.4  | .08  | 315                                    | 12                         |
| 1N4963 | 16                                      | 75                       | 3.5                     | 155                     | 1.1  | 5                                       | 12.2  | .08  | 294                                    | 10                         |
| 1N4964 | 18                                      | 65                       | 4.0                     | 160                     | 1.2  | 5                                       | 13.7  | .085   | 264                                    | 9.0                        |
| 1N4965 | 20                                      | 65                       | 4.5                     | 165                     | 1.5  | 2                                       | 15.2  | .085   | 237                                    | 8.0                        |
| 1N4966 | 22                                      | 50                       | 5.0                     | 170                     | 1.8  | 2                                       | 16.7  | .085   | 216                                    | 7.0                        |
| 1N4967 | 24                                      | 50                       | 5.0                     | 175                     | 2.0  | 2                                       | 18.2  | .090   | 198                                    | 6.5                        |
| 1N4968 | 27                                      | 50                       | 6.0                     | 180                     | 2.0  | 2                                       | 20.6  | .090   | 176                                    | 6.0                        |
| 1N4969 | 30                                      | 40                       | 8                       | 190                     | 2.5  | 2                                       | 22.8  | .090   | 158                                    | 5.5                        |
| 1N4970 | 33                                      | 40                       | 10                      | 200                     | 2.8  | 2                                       | 25.1  | .095   | 144                                    | 5.0                        |
| 1N4971 | 36                                      | 30                       | 11                      | 220                     | 3.0  | 2                                       | 27.4  | .095   | 132                                    | 4.5                        |
| 1N4972 | 39                                      | 30                       | 14                      | 230                     | 3.0  | 2                                       | 29.7  | .095   | 122                                    | 4.0                        |
| 1N4973 | 43                                      | 30                       | 20                      | 240                     | 3.3  | 2                                       | 32.7  | .095   | 110                                    | 3.5                        |
| 1N4974 | 47                                      | 25                       | 25                      | 250                     | 3.5  | 2                                       | 35.8  | .095   | 100                                    | 3.2                        |
| 1N4975 | 51                                      | 25                       | 27                      | 270                     | 4.0  | 2                                       | 38.8  | .095   | 92                                     | 3.0                        |
| 1N4976 | 56                                      | 20                       | 35                      | 320                     | 4.4  | 2                                       | 42.6  | .095   | 84                                     | 2.8                        |
| 1N4977 | 62                                      | 20                       | 42                      | 400                     | 5.0  | 2                                       | 47.1  | .100   | 76                                     | 2.5                        |
| 1N4978 | 68                                      | 20                       | 50                      | 500                     | 5.5  | 2                                       | 51.7  | .100   | 70                                     | 2.2                        |
| 1N4979 | 75                                      | 20                       | 55                      | 620                     | 6.0  | 2                                       | 56.0  | .100   | 63.0                                   | 2.0                        |
| 1N4980 | 82                                      | 15                       | 80                      | 720                     | 6.6  | 2                                       | 62.2  | .100   | 58.0                                   | 1.8                        |
| 1N4981 | 91                                      | 15                       | 90                      | 760                     | 7.5  | 2                                       | 69.2  | .100   | 52.5                                   | 1.6                        |
| 1N4982 | 100                                     | 12                       | 110                     | 800                     | 8.0  | 2                                       | 76.0  | .100   | 47.5                                   | 1.4                        |
| 1N4983 | 110                                     | 12                       | 125                     | 1000                    | 9.0  | 2                                       | 83.6  | .100   | 43.0                                   | 1.2                        |
| 1N4984 | 120                                     | 10                       | 170                     | 1150                    | 10   | 2                                       | 91.2  | .100   | 39.5                                   | 1.00                       |
| 1N4985 | 130                                     | 10                       | 190                     | 1250                    | 11   | 2                                       | 98.8  | .105   | 36.6                                   | 0.80                       |
| 1N4986 | 150                                     | 8                        | 330                     | 1500                    | 13   | 2                                       | 114.0 | .105   | 31.6                                   | 0.75                       |
| 1N4987 | 160                                     | 8                        | 350                     | 1650                    | 14   | 2                                       | 121.6 | .105   | 29.4                                   | 0.70                       |
| 1N4988 | 180                                     | 5                        | 450                     | 1750                    | 16   | 2                                       | 136.8 | .110   | 26.4                                   | 0.60                       |
| 1N4989 | 200                                     | 5                        | 500                     | 1850                    | 18   | 2                                       | 152   | .110   | 23.6                                   | 0.50                       |
| 1N4990 | 220                                     | 5                        | 550                     | 2000                    | 19   | 2                                       | 167   | .115   | 21.6                                   | 0.50                       |
| 1N4991 | 240                                     | 5                        | 650                     | 2050                    | 22   | 2                                       | 182   | .115   | 19.8                                   | 0.40                       |
| 1N4992 | 270                                     | 5                        | 800                     | 2100                    | 25   | 2                                       | 206   | .120   | 17.5                                   | 0.35                       |
| 1N4993 | 300                                     | 4                        | 950                     | 2150                    | 28   | 2                                       | 228   | .120   | 15.6                                   | 0.30                       |
| 1N4994 | 330                                     | 4                        | 1175                    | 2200                    | 32   | 2                                       | 251   | .120   | 14.4                                   | 0.25                       |
| 1N4995 | 360                                     | 3                        | 1400                    | 2300                    | 35   | 2                                       | 274   | .120   | 13.0                                   | 0.22                       |
| 1N4996 | 390                                     | 3                        | 1800                    | 2500                    | 40   | 2                                       | 297   | .120   | 12.0                                   | 0.20                       |

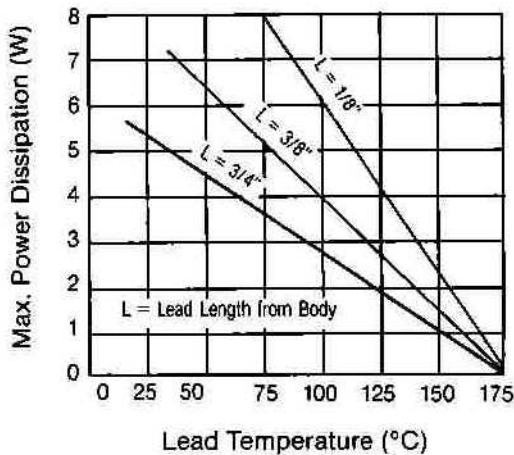
\* $I_{ZK} = 5$  mA for 1N5968

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

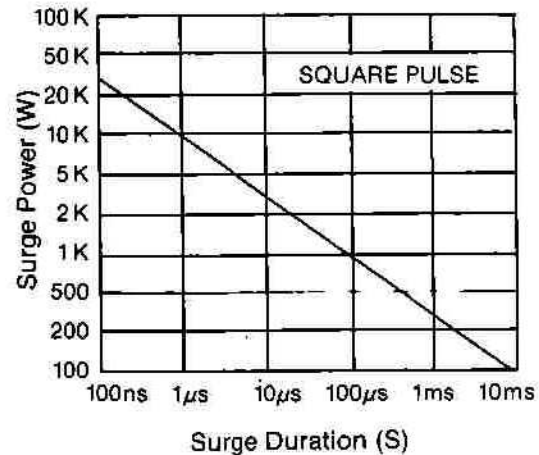
**SYMBOLS & DEFINITIONS**

| 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.  |

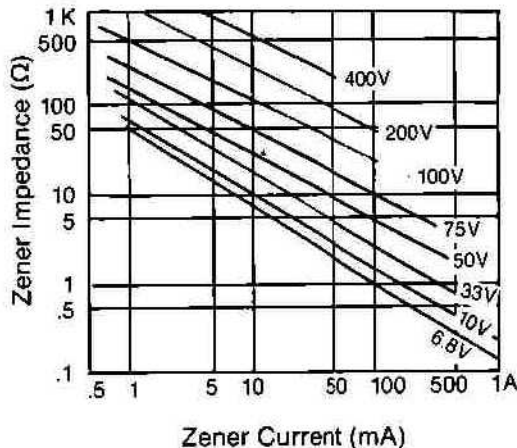
**GRAPHS**



**FIGURE 1**  
POWER DISSIPATION vs. LEAD  
TEMPERATURE DERATING CURVE

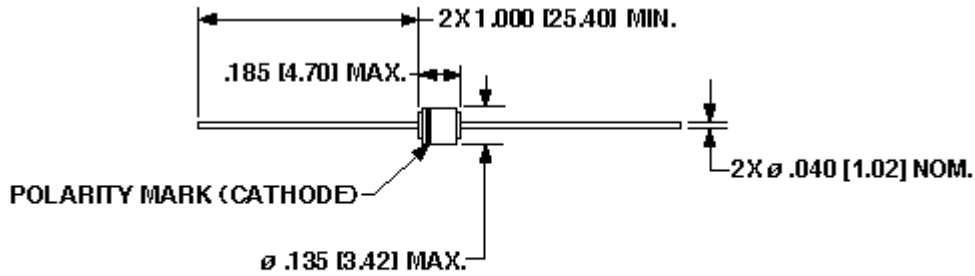


**FIGURE 2**  
SURGE POWER vs.  
SURGE DURATION



**FIGURE 3**  
TYPICAL ZENER IMPEDANCE vs.  
ZENER CURRENT

**PACKAGE DIMENSIONS**



NOTE: DIMENSIONS IN INCHES [MM]