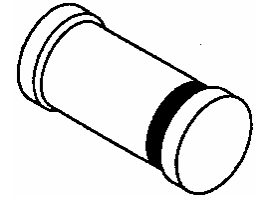


### DESCRIPTION

The 1N5221BUR-1 thru 1N5281BUR-1 series of 0.5 watt Zener Voltage Regulators provides a surface mount equivalent to the popular JEDEC registered 1N5221B to 1N5281B for 2.4 to 200 volts in a metallurgically bonded configuration. They are available with standard 5%, 10%, or 20% tolerances as well as tighter tolerances identified by different suffix letters on the part number. Microsemi also offers numerous other Zener products to meet higher and lower power applications.

### APPEARANCE



**DO-213AA**

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

### FEATURES

- Surface mount equivalents to the JEDEC registered 1N5221 thru 1N5281B series
- Hermetically sealed surface mount package
- Internal metallurgical bond
- Options for screening in accordance with MIL-PRF-19500 for JAN, JANTX, JANTXV, and JANS are available by adding MQ, MX, MV, or MSP prefixes respectively to part numbers
- RoHS Compliant devices available by adding "e3" suffix
- DO-7 or DO-35 glass body axial-leaded Zener equivalents also available per JEDEC registration (see separate data sheet for part numbers 1N5221 thru 1N5281B series)

### APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range
- Selection from 2.4 to 200 V
- Standard voltage tolerances are plus/minus 5% with B suffix identification and 10 % with A suffix
- Tight tolerances available in plus or minus 2% or 1% with C or D suffix respectively
- Nonsensitive to ESD per MIL-STD-750 Method 1020
- Minimal capacitance (see Figure 3)
- Inherently radiation hard as described in Microsemi MicroNote 050

### MAXIMUM RATINGS

- Operating and Storage temperature: -65°C to +175°C
- Thermal Resistance: 100°C/W junction to end cap and 250°C/W junction to ambient when mounted on FR4 PC board (1 oz Cu) with recommended footprint (see last page)
- Steady-State Power: 0.5 watts at end cap temperature  $T_{EC} \leq 125^{\circ}\text{C}$  or ambient temperature  $T_A \leq 50^{\circ}\text{C}$  when mounted on FR4 PC board as described for thermal resistance above (see Figure 2 for derating)
- Forward voltage @200 mA: 1.1 volts (maximum)
- Solder Temperatures: 260°C for 10 seconds (max)

### MECHANICAL AND PACKAGING

- CASE: Hermetically sealed glass DO-213AA (SOD80 or MLL34) MELF style package
- FINISH: End caps Tin-Lead or RoHS Compliant annealed matte-Tin plating solderable per MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band where diode is to be operated with the banded end positive with respect to the opposite end for Zener regulation
- MARKING: cathode band only
- TAPE & REEL option: Standard per EIA-481-B with 12 mm tape, 2000 per 7 inch reel or 5000 per 13 inch reel (add "TR" suffix to part number)
- WEIGHT: 0.04 grams
- See package dimensions on last page

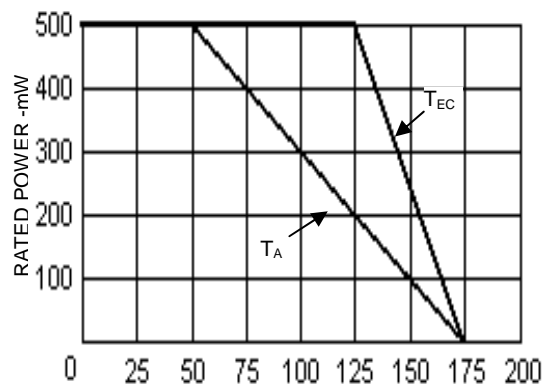
**ELECTRICAL CHARACTERISTICS\***

| INDUSTRY PART NUMBER (NOTES 1 & 4) | Nominal Zener Voltage $V_Z$ @ $I_{ZT}$ (Note 2) | Test Current $I_{ZT}$ | Max Zener Impedance |      | Max Reverse Leakage Current |                                   |   | Max Zener Voltage Temperature Coeff. (A and B Suffix only) (Note 3) |   |
|------------------------------------|---|-----------------------|---------------------|------|-----------------------------|-----------------------------------|---|---|---|
|                                    |   |                       | A and B suffix only |      | A and B Suffix only         |                                   | Non-Suffix                              |   |   |
|                                    |   |                       | Volts               | mA   | $Z_{ZT}$ @ $I_{ZT}$ Ohms    | $Z_{ZK}$ @ $I_{ZK} = 0.25Ma$ Ohms | $I_R$ @ $V_R$ Used for Suffix A $\mu A$ | $I_R$ @ $V_R$ Used for Suffix B $\mu A$                             | $I_R$ @ $V_R$ Used for Suffix A $\mu A$ |
| 1N5221UR-1                         | 2.4   | 20                    | 30                  | 1200 | 100                         | 0.95                              | 1.0                                     | 200   | -0.085                                  |
| 1N5222UR-1                         | 2.5   | 20                    | 30                  | 1250 | 100                         | 0.95                              | 1.0                                     | 200   | -0.085                                  |
| 1N5223UR-1                         | 2.7   | 20                    | 30                  | 1300 | 75                          | 0.95                              | 1.0                                     | 150   | -0.080                                  |
| 1N5224UR-1                         | 2.8   | 20                    | 30                  | 1400 | 75                          | 0.95                              | 1.0                                     | 150   | -0.080                                  |
| 1N5225UR-1                         | 3.0   | 20                    | 29                  | 1600 | 50                          | 0.95                              | 1.0                                     | 100   | -0.075                                  |
| 1N5226UR-1                         | 3.3   | 20                    | 28                  | 1600 | 25                          | 0.95                              | 1.0                                     | 100   | -0.070                                  |
| 1N5227UR-1                         | 3.6   | 20                    | 24                  | 1700 | 15                          | 0.95                              | 1.0                                     | 100   | -0.065                                  |
| 1N5228UR-1                         | 3.9   | 20                    | 23                  | 1900 | 10                          | 0.95                              | 1.0                                     | 75  | -0.060                                  |
| 1N5229UR-1                         | 4.3   | 20                    | 22                  | 2000 | 5.0                         | 0.95                              | 1.0                                     | 50  | +/-0.055                                |
| 1N5230UR-1                         | 4.7   | 20                    | 19                  | 1900 | 5.0                         | 1.9                               | 2.0                                     | 50  | +/-0.030                                |
| 1N5231UR-1                         | 5.1   | 20                    | 17                  | 1600 | 5.0                         | 1.9                               | 2.0                                     | 50  | +/-0.030                                |
| 1N5232UR-1                         | 5.6   | 20                    | 11                  | 1600 | 5.0                         | 2.9                               | 3.0                                     | 50  | +0.038                                  |
| 1N5233UR-1                         | 6.0   | 20                    | 7.0                 | 1600 | 5.0                         | 3.3                               | 3.5                                     | 50  | +0.038                                  |
| 1N5234UR-1                         | 6.2   | 20                    | 7.0                 | 1000 | 5.0                         | 3.8                               | 4.0                                     | 50  | +0.045                                  |
| 1N5235UR-1                         | 6.8   | 20                    | 5.0                 | 750  | 3.0                         | 4.8                               | 5.0                                     | 30  | +0.050                                  |
| 1N5236UR-1                         | 7.5   | 20                    | 6.0                 | 500  | 3.0                         | 5.7                               | 6.0                                     | 30  | +0.058                                  |
| 1N5237UR-1                         | 8.2   | 20                    | 8.0                 | 500  | 3.0                         | 6.2                               | 6.5                                     | 30  | +0.062                                  |
| 1N5238UR-1                         | 8.7   | 20                    | 8.0                 | 600  | 3.0                         | 6.2                               | 6.5                                     | 30  | +0.065                                  |
| 1N5239UR-1                         | 9.1   | 20                    | 10                  | 600  | 3.0                         | 6.7                               | 7.0                                     | 30  | +0.068                                  |
| 1N5240UR-1                         | 10  | 20                    | 17                  | 600  | 3.0                         | 7.6                               | 8.0                                     | 30  | +0.075                                  |
| 1N5241UR-1                         | 11  | 20                    | 22                  | 600  | 2.0                         | 8.0                               | 8.4                                     | 30  | +0.076                                  |
| 1N5242UR-1                         | 12  | 20                    | 30                  | 600  | 1.0                         | 8.7                               | 9.1                                     | 10  | +0.077                                  |
| 1N5243UR-1                         | 13  | 9.5                   | 13                  | 600  | 0.5                         | 9.4                               | 9.9                                     | 10  | +0.079                                  |
| 1N5244UR-1                         | 14  | 9.0                   | 15                  | 600  | 0.1                         | 9.5                               | 10                                      | 10  | +0.082                                  |
| 1N5245UR-1                         | 15  | 8.5                   | 16                  | 600  | 0.1                         | 10.5                              | 11                                      | 10  | +0.082                                  |
| 1N5246UR-1                         | 16  | 7.8                   | 17                  | 600  | 0.1                         | 11.4                              | 12                                      | 10  | +0.083                                  |
| 1N5247UR-1                         | 17  | 7.4                   | 19                  | 600  | 0.1                         | 12.4                              | 13                                      | 10  | +0.084                                  |
| 1N5248UR-1                         | 18  | 7.0                   | 21                  | 600  | 0.1                         | 13.3                              | 14                                      | 10  | +0.085                                  |
| 1N5249UR-1                         | 19  | 6.6                   | 23                  | 600  | 0.1                         | 13.3                              | 14                                      | 10  | +0.086                                  |
| 1N5250UR-1                         | 20  | 6.2                   | 25                  | 600  | 0.1                         | 14.3                              | 15                                      | 10  | +0.086                                  |
| 1N5251UR-1                         | 22  | 5.6                   | 29                  | 600  | 0.1                         | 16.2                              | 17                                      | 10  | +0.087                                  |
| 1N5252UR-1                         | 24  | 5.2                   | 33                  | 600  | 0.1                         | 17.1                              | 18                                      | 10  | +0.088                                  |
| 1N5253UR-1                         | 25  | 5.0                   | 35                  | 600  | 0.1                         | 18.1                              | 19                                      | 10  | +0.089                                  |
| 1N5254UR-1                         | 27  | 4.6                   | 41                  | 600  | 0.1                         | 20                                | 21                                      | 10  | +0.090                                  |
| 1N5255UR-1                         | 28  | 4.5                   | 44                  | 600  | 0.1                         | 20                                | 21                                      | 10  | +0.091                                  |
| 1N5256UR-1                         | 30  | 4.2                   | 49                  | 600  | 0.1                         | 22                                | 23                                      | 10  | +0.091                                  |
| 1N5257UR-1                         | 33  | 3.8                   | 58                  | 700  | 0.1                         | 24                                | 25                                      | 10  | +0.092                                  |
| 1N5258UR-1                         | 36  | 3.4                   | 70                  | 700  | 0.1                         | 26                                | 27                                      | 10  | +0.093                                  |
| 1N5259UR-1                         | 39  | 3.2                   | 80                  | 800  | 0.1                         | 29                                | 30                                      | 10  | +0.094                                  |
| 1N5260UR-1                         | 43  | 3.0                   | 93                  | 900  | 0.1                         | 31                                | 33                                      | 10  | +0.095                                  |
| 1N5261UR-1                         | 47  | 2.7                   | 105                 | 1000 | 0.1                         | 34                                | 36                                      | 10  | +0.095                                  |
| 1N5262UR-1                         | 51  | 2.5                   | 125                 | 1100 | 0.1                         | 37                                | 39                                      | 10  | +0.096                                  |
| 1N5263UR-1                         | 56  | 2.2                   | 150                 | 1300 | 0.1                         | 41                                | 43                                      | 10  | +0.096                                  |
| 1N5264UR-1                         | 60  | 2.1                   | 170                 | 1400 | 0.1                         | 44                                | 46                                      | 10  | +0.097                                  |
| 1N5265UR-1                         | 62  | 2.0                   | 185                 | 1400 | 0.1                         | 45                                | 47                                      | 10  | +0.097                                  |
| 1N5266UR-1                         | 68  | 1.8                   | 230                 | 1600 | 0.1                         | 49                                | 52                                      | 10  | +0.097                                  |
| 1N5267UR-1                         | 75  | 1.7                   | 270                 | 1700 | 0.1                         | 53                                | 56                                      | 10  | +0.098                                  |
| 1N5268UR-1                         | 82  | 1.5                   | 330                 | 2000 | 0.1                         | 59                                | 62                                      | 10  | +0.098                                  |
| 1N5269UR-1                         | 87  | 1.4                   | 370                 | 2200 | 0.1                         | 65                                | 68                                      | 10  | +0.099                                  |
| 1N5270UR-1                         | 91  | 1.4                   | 400                 | 2300 | 0.1                         | 66                                | 69                                      | 10  | +0.099                                  |
| 1N5271UR-1                         | 100   | 1.3                   | 500                 | 2600 | 0.1                         | 72                                | 76                                      | 10  | +0.0110                                 |
| 1N5272UR-1                         | 110   | 1.1                   | 750                 | 3000 | 0.1                         | 80                                | 84                                      | 10  | +0.0110                                 |
| 1N5273UR-1                         | 120   | 1.0                   | 900                 | 4000 | 0.1                         | 86                                | 91                                      | 10  | +0.0110                                 |
| 1N5274UR-1                         | 130   | .95                   | 1100                | 4500 | 0.1                         | 94                                | 99                                      | 10  | +0.0110                                 |
| 1N5275UR-1                         | 140   | .90                   | 1300                | 4500 | 0.1                         | 101                               | 106                                     | 10  | +0.0110                                 |
| 1N5276UR-1                         | 150   | .85                   | 1500                | 5000 | 0.1                         | 108                               | 114                                     | 10  | +0.0110                                 |
| 1N5277UR-1                         | 160   | .80                   | 1700                | 5500 | 0.1                         | 116                               | 122                                     | 10  | +0.0110                                 |
| 1N5278UR-1                         | 170   | .74                   | 1900                | 5500 | 0.1                         | 123                               | 129                                     | 10  | +0.0110                                 |
| 1N5279UR-1                         | 180   | .68                   | 2200                | 6000 | 0.1                         | 130                               | 137                                     | 10  | +0.0110                                 |
| 1N5280UR-1                         | 190   | .66                   | 2400                | 6500 | 0.1                         | 137                               | 144                                     | 10  | +0.0110                                 |
| 1N5281UR-1                         | 200   | .65                   | 2500                | 7000 | 0.1                         | 144                               | 152                                     | 10  | +0.0110                                 |

\*  $T_A = 25^\circ C$  unless otherwise noted. Based on dc measurements at thermal equilibrium; case temperature maintained at  $30 \pm 2^\circ C$ .  $V_F = 1.1V$  max @  $I_F = 200 mA$  for all types. See further Notes on following page.

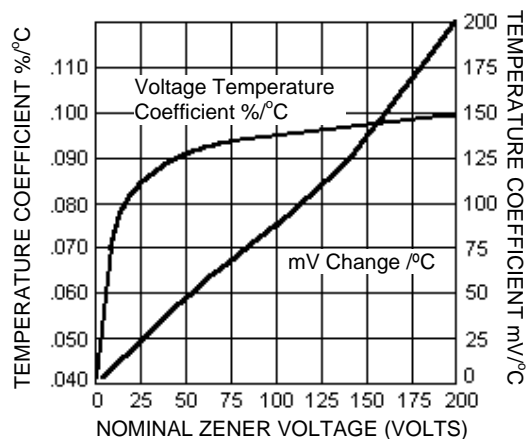
- NOTE 1:** Table as shown lists type numbers, which indicate a tolerance of +/-20% with guaranteed limits on only  $V_Z$ ,  $I_R$ , and  $V_F$ . Devices with guaranteed limits on all six parameters are indicated by suffix "A" for +/-10%, "B" for +/-5%, "C" for +/-2%, and "D" for +/-1% tolerance.
- NOTE 2:** The electrical characteristics are measured after allowing the device to stabilize for 20 seconds.
- NOTE 3:** Temperature coefficient ( $\alpha_{VZ}$ ). Test conditions for temperature coefficient are as follows:
- $I_{ZT} = 7.5 \text{ mA}$ ,  $T_1 = 25^\circ\text{C}$ ,  
 $T_2 = 125^\circ\text{C}$  (1N5221AUR-1 & BUR-1 thru 1N5242AUR-1 & BUR-1)
  - $I_{ZT} = \text{Rated } I_{ZT}$ ,  $T_1 = 25^\circ\text{C}$ ,  
 $T_2 = 125^\circ\text{C}$  (1N5243AUR-1 & BUR-1 thru 1N5281AUR-1 & BUR-1)
- Device to be temperature stabilized with current applied prior to reading breakdown voltage at the specified ambient temperature.
- NOTE 4:** These devices may be ordered as either 1N5221UR-1 thru 1N5281BUR-1 or as MLL5221-1 thru MLL5281B-1 part numbers.

**GRAPHS**

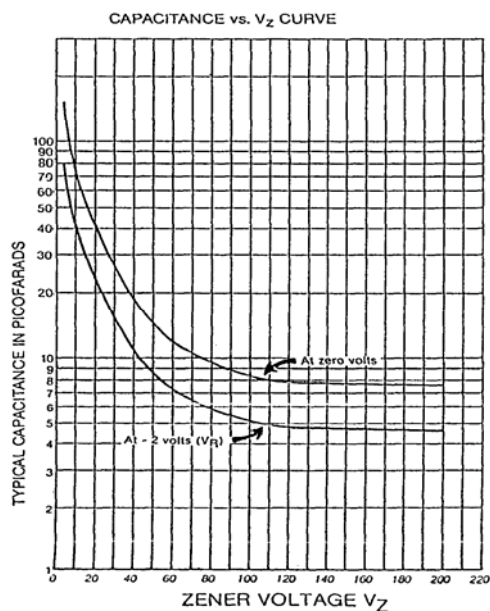


$T_{EC}$  End Cap Temperature ( $^\circ\text{C}$ ), or  
 $T_A$  Ambient Temperature on FR4 PC BOARD

**FIGURE 1**  
POWER DERATING CURVE



**FIGURE 2**  
ZENER VOLTAGE TEMPERATURE  
COEFFICIENT vs. ZENER VOLTAGE



**FIGURE 3**  
CAPACITANCE vs. ZENER VOLTAGE  
(TYPICAL)

**PACKAGE DIMENSIONS**

