

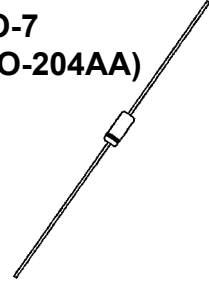
ALSO
AVAILABLE IN
SURFACE
MOUNT

DESCRIPTION

The popular 1N5221 thru 1N5281B series of 0.5 watt Zener Voltage Regulators provides a selection from 2.4 to 200 volts in standard 5% or 10% tolerances as well as tighter tolerances identified by different suffix letters on the part number. These glass axial-leaded DO-7 Zeners are also available in various military screening levels by adding a prefix identifier as described in the Features section. Microsemi also offers numerous other Zener products to meet higher and lower power applications.

APPEARANCE

DO-7
(DO-204AA)



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

FEATURES

- JEDEC registered 1N5221 to 1N5281B
- Internally solder bonded
- 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.
- Surface mount equivalents available as MLL5221 to MLL5281B in the DO-213AA MELF style package (consult factory for others)
- Smaller DO-35 glass body axial-leaded Zener equivalents also available (see separate data sheet)

APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range
- Extensive selection from 2.4 to 200 V
- Standard voltage tolerances are plus/minus 5% with B suffix, 10 % with A suffix identification
- 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
- Minimal capacitance (see Figure 2)
- Inherently radiation hard per MicroNote 050

MAXIMUM RATINGS

- Operating and Storage temperature: -65°C to +175°C
- Thermal Resistance: 300 °C/W junction to lead at 3/8 (10 mm) lead length from body, or 360 °C/W junction to ambient when mounted on FR4 PC board (1 oz Cu) with 4 mm² copper pads and track width 1 mm, length 25 mm
- Steady-State Power: 0.5 watts at T_L ≤ 25°C 3/8 inch (10 mm) from body or 0.417 W at T_A ≤ 25°C when mounted on FR4 PC board as described for thermal resistance above (also see Figure1)
- Forward voltage @200 mA: 1.1 volts (maximum)
- Solder Temperatures: 260 °C for 10 s (max)

MECHANICAL AND PACKAGING

- CASE: Hermetically sealed axial-lead glass DO-7 (DO-204AA) package
- TERMINALS: Leads, tin-lead plated solderable per MIL-STD-750, method 2026
- POLARITY: Cathode indicated by band. Diode to be operated with the banded end positive with respect to the opposite end for Zener regulation
- MARKING: Part number
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number)
- WEIGHT: 0.2 grams
- See package dimensions on last page

ELECTRICAL CHARACTERISTICS @ 25°C

| JEDEC Type No. Note 1 | Nominal Zener Voltage V _Z @ I _{ZT} Volts | Test Current I _{ZT} mA | Max Zener Impedance A & B Suffix Only Note 2 | | Max Reverse Current | | | Max Zener Voltage Temp. Coeff. (A & B Suffix Only) α _{VZ} (% / °C) Note 3 | |
|-----------------------|--|---------------------------------|--|--|-------------------------|------------------------|---|--|----------|
| | | | Z _{ZT} @ I _{ZK} Ohms | Z _{ZK} @ I _{ZK} = 0.25 mA Ohms | A, B, C & D Suffix Only | | Non-Suffix I _R @ V _R Used For Suffix A μA | | |
| | | | | | I _R μA | @ V _R Volts | | | A |
| 1N5221 | 2.4 | 20 | 30 | 1200 | 100 | 0.95 | 1.0 | 200 | -0.085 |
| 1N5222 | 2.5 | 20 | 30 | 1250 | 100 | 0.95 | 1.0 | 200 | -0.085 |
| 1N5223 | 2.7 | 20 | 30 | 1300 | 75 | 0.95 | 1.0 | 150 | -0.080 |
| 1N5224 | 2.8 | 20 | 30 | 1400 | 75 | 0.95 | 1.0 | 150 | -0.080 |
| 1N5225 | 3.0 | 20 | 29 | 1600 | 50 | 0.95 | 1.0 | 100 | -0.075 |
| 1N5226 | 3.3 | 20 | 28 | 1600 | 25 | 0.95 | 1.0 | 100 | -0.070 |
| 1N5227 | 3.6 | 20 | 24 | 1700 | 15 | 0.95 | 1.0 | 100 | -0.065 |
| 1N5228 | 3.9 | 20 | 23 | 1900 | 10 | 0.95 | 1.0 | 75 | -0.060 |
| 1N5229 | 4.3 | 20 | 22 | 2000 | 5.0 | 0.95 | 1.0 | 50 | +/-0.055 |
| 1N5230 | 4.7 | 20 | 19 | 1900 | 50 | 1.9 | 2.0 | 50 | +/-0.030 |



1N5221 thru 1N5281, DO-7

500 mW GLASS AXIAL-LEAD ZENER DIODES

www.Microsemi.com

1N5221 – 1N5281 (DO-7)

| JEDEC Type No. Note 1 | Nominal Zener Voltage $V_Z @ I_{ZT}$ Volts | Test Current I_{ZT} mA | Max Zener Impedance A & B Suffix Only Note 2 | | Max Reverse Leakage Current | | | Max Zener Voltage Temp. Coeff. (A & B Suffix Only) α_{VZ} (% / °C) Note 3 | |
|-----------------------|--|--------------------------|--|----------------------------------|-----------------------------|---------------|---------------------------------------|--|----------|
| | | | $Z_{ZT} @ I_{ZK}$ Ohms | $Z_{ZK} @ I_{ZK} = 0.25$ mA Ohms | A, B, C & D Suffix Only | | Non-Suffix | | |
| | | | | | I_R μ A | @ V_R Volts | | | |
| | | | | | A | B, C & D | $I_R @ V_R$ Used For Suffix A μ A | | |
| 1N5231 | 5.1 | 20 | 17 | 1600 | 5.0 | 1.9 | 2.0 | 50 | +/-0.030 |
| 1N5232 | 5.6 | 20 | 11 | 1600 | 5.0 | 2.9 | 3.0 | 50 | +0.038 |
| 1N5233 | 6.0 | 20 | 7.0 | 1600 | 5.0 | 3.3 | 3.5 | 50 | +0.038 |
| 1N5234 | 6.2 | 20 | 7.0 | 1000 | 5.0 | 3.8 | 4.0 | 50 | +0.045 |
| 1N5235 | 6.8 | 20 | 5.0 | 750 | 3.0 | 4.8 | 5.0 | 30 | +0.050 |
| 1N5236 | 7.5 | 20 | 6.0 | 500 | 3.0 | 5.7 | 6.0 | 30 | +0.058 |
| 1N5237 | 8.2 | 20 | 8.0 | 500 | 3.0 | 6.2 | 6.5 | 30 | +0.062 |
| 1N5238 | 8.7 | 20 | 8.0 | 600 | 3.0 | 6.2 | 6.5 | 30 | +0.065 |
| 1N5239 | 9.1 | 20 | 10 | 600 | 3.0 | 6.7 | 7.0 | 30 | +0.068 |
| 1N5240 | 10 | 20 | 17 | 600 | 3.0 | 7.6 | 8.0 | 30 | +0.075 |
| 1N5241 | 11 | 20 | 22 | 600 | 2.0 | 8.0 | 8.4 | 30 | +0.076 |
| 1N5242 | 12 | 20 | 30 | 600 | 1.0 | 8.7 | 9.1 | 10 | +0.077 |
| 1N5243 | 13 | 9.5 | 13 | 600 | 0.5 | 9.4 | 9.9 | 10 | +0.079 |
| 1N5244 | 14 | 9.0 | 15 | 600 | 0.1 | 9.5 | 10 | 10 | +0.082 |
| 1N5245 | 15 | 8.5 | 16 | 600 | 0.1 | 10.5 | 11 | 10 | +0.082 |
| 1N5246 | 16 | 7.8 | 17 | 600 | 0.1 | 11.4 | 12 | 10 | +0.083 |
| 1N5247 | 17 | 7.4 | 19 | 600 | 0.1 | 12.4 | 13 | 10 | +0.084 |
| 1N5248 | 18 | 7.0 | 21 | 600 | 0.1 | 13.3 | 14 | 10 | +0.085 |
| 1N5249 | 19 | 6.6 | 23 | 600 | 0.1 | 13.3 | 14 | 10 | +0.086 |
| 1N5250 | 20 | 6.2 | 25 | 600 | 0.1 | 14.3 | 15 | 10 | +0.086 |
| 1N5251 | 22 | 5.6 | 29 | 600 | 0.1 | 16.2 | 17 | 10 | +0.087 |
| 1N5252 | 24 | 5.2 | 33 | 600 | 0.1 | 17.1 | 18 | 10 | +0.088 |
| 1N5253 | 25 | 5.0 | 35 | 600 | 0.1 | 18.1 | 19 | 10 | +0.089 |
| 1N5254 | 27 | 4.6 | 41 | 600 | 0.1 | 20 | 21 | 10 | +0.090 |
| 1N5255 | 28 | 4.5 | 44 | 600 | 0.1 | 20 | 21 | 10 | +0.091 |
| 1N5256 | 30 | 4.2 | 49 | 600 | 0.1 | 22 | 23 | 10 | +0.091 |
| 1N5257 | 33 | 3.8 | 58 | 700 | 0.1 | 24 | 25 | 10 | +0.092 |
| 1N5258 | 36 | 3.4 | 70 | 700 | 0.1 | 26 | 27 | 10 | +0.093 |
| 1N5259 | 39 | 3.2 | 80 | 800 | 0.1 | 29 | 30 | 10 | +0.094 |
| 1N5260 | 43 | 3.0 | 93 | 900 | 0.1 | 31 | 33 | 10 | +0.095 |
| 1N5261 | 47 | 2.7 | 105 | 1000 | 0.1 | 34 | 36 | 10 | +0.095 |
| 1N5262 | 51 | 2.5 | 125 | 1100 | 0.1 | 37 | 39 | 10 | +0.096 |
| 1N5263 | 56 | 2.2 | 150 | 1300 | 0.1 | 41 | 43 | 10 | +0.096 |
| 1N5264 | 60 | 2.1 | 170 | 1400 | 0.1 | 44 | 46 | 10 | +0.097 |
| 1N5265 | 62 | 2.0 | 185 | 1400 | 0.1 | 45 | 47 | 10 | +0.097 |
| 1N5266 | 68 | 1.8 | 230 | 1600 | 0.1 | 49 | 52 | 10 | +0.097 |
| 1N5267 | 75 | 1.7 | 270 | 1700 | 0.1 | 53 | 56 | 10 | +0.098 |
| 1N5268 | 82 | 1.5 | 330 | 2000 | 0.1 | 59 | 62 | 10 | +0.098 |
| 1N5269 | 87 | 1.4 | 370 | 2200 | 0.1 | 65 | 68 | 10 | +0.099 |
| 1N5270 | 91 | 1.4 | 400 | 2300 | 0.1 | 66 | 69 | 10 | +0.099 |
| 1N5271 | 100 | 1.3 | 500 | 2600 | 0.1 | 72 | 76 | 10 | +0.110 |
| 1N5272 | 110 | 1.1 | 750 | 3000 | 0.1 | 80 | 84 | 10 | +0.110 |
| 1N5273 | 120 | 1.0 | 900 | 4000 | 0.1 | 86 | 91 | 10 | +0.110 |
| 1N5274 | 130 | 0.95 | 1100 | 4500 | 0.1 | 94 | 99 | 10 | +0.110 |
| 1N5275 | 140 | 0.90 | 1300 | 4500 | 0.1 | 101 | 106 | 10 | +0.110 |
| 1N5276 | 150 | 0.85 | 1500 | 5000 | 0.1 | 108 | 114 | 10 | +0.110 |
| 1N5277 | 160 | 0.80 | 1700 | 5500 | 0.1 | 116 | 122 | 10 | +0.110 |
| 1N5278 | 170 | 0.74 | 1900 | 5500 | 0.1 | 123 | 129 | 10 | +0.110 |
| 1N5279 | 180 | 0.68 | 2200 | 6000 | 0.1 | 130 | 137 | 10 | +0.110 |
| 1N5280 | 190 | 0.66 | 2400 | 6500 | 0.1 | 137 | 144 | 10 | +0.110 |
| 1N5281 | 200 | 0.65 | 2500 | 7000 | 0.1 | 144 | 152 | 10 | +0.110 |

*JEDEC registered data. JEDEC type numbers listed 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% tolerance and suffix B for +/-5% tolerance. Also available with suffix C or D which indicates 2% and 1% tolerance respectively.

NOTES:

- The electrical characteristics are measured after allowing the device to stabilize for 20 seconds when mounted with a 3/8" (10 mm) minimum lead length from the case.
- The zener impedance is derived from the 60 Hz ac voltage that results when an ac current having an rms value equal to 10% of the dc zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK} . Zener impedance is measured at two points to ensure a sharp knee on the breakdown curve, thereby eliminating unstable units. Also see MicroNote 202 for variation in dynamic impedance with different operating currents.
- Temperature coefficient (α_{VZ}). Test conditions for temperature coefficient are as follows:
 - $I_{ZT} = 7.5$ mA, $T_1 = 25^\circ\text{C}$, $T_2 = 125^\circ\text{C}$ (1N5221A, B thru 1N5242A, B).
 - $I_{ZT} = \text{Rated } I_{ZT}$, $T_1 = 25^\circ\text{C}$, $T_2 = 125^\circ\text{C}$ (1N5243A, B thru 1N5281A, B).
 (Device to be temperature stabilized with current applied prior to reading breakdown voltage at the specified ambient temp.)

GRAPHS

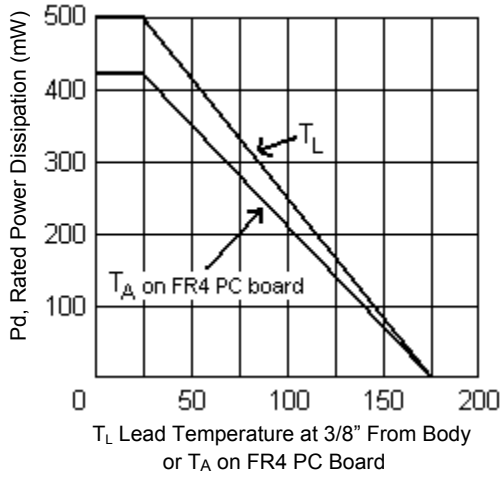


FIGURE 1
POWER DERATING CURVE

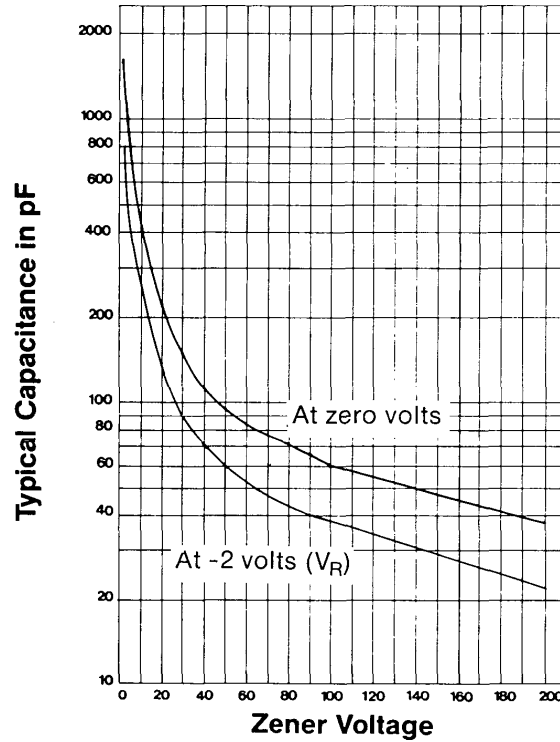
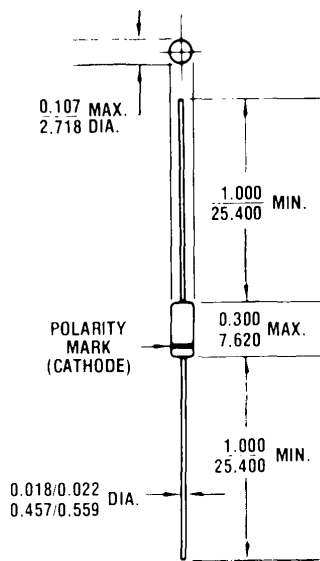


FIGURE 2
CAPACITANCE vs. ZENER VOLTAGE
(TYPICAL)

PACKAGE DIMENSIONS



All dimensions in INCH
mm