

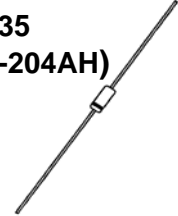
**DESCRIPTION**

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-35 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.

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

**APPEARANCE**

DO-35  
(DO-204AH)



**FEATURES**

- JEDEC registered 1N5221 to 1N5281B
- Internal bonds optionally available with "-1" suffix
- 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 with "-1" suffix.
- Surface mount equivalents available as MLL5221 to MLL5281B in the DO-213AA MELF style package including "-1" suffix options (consult factory for others)
- RoHS Compliant devices available by adding "e3" suffix
- DO-7 glass body axial-leaded Zener equivalents are also available

**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 (MIL-STD-750 Method 1020)
- Minimal capacitance (see Figure 2)
- Inherently radiation hard per MicroNote 050

**MAXIMUM RATINGS**

- Power dissipation at 25°C: 0.5 watts (also see derating in Figure 1).
- Operating and Storage temperature: -65°C to +175°C
- Thermal Resistance: 250 °C/W junction to lead at 3/8 (10 mm) lead length from body, or 310 °C/W junction to ambient when mounted on FR4 PC board (1 oz Cu) with 4 mm<sup>2</sup> copper pads and track width 1 mm, length 25 mm
- Steady-State Power: 0.5 watts at T<sub>L</sub> ≤ 50°C 3/8 inch (10 mm) from body or 0.48 W at T<sub>A</sub> ≤ 25°C when mounted on FR4 PC board as described for thermal resistance above (also see Figure1)
- Forward voltage @200 mA: 1.5 volts (maximum)
- Solder Temperatures: 260 °C for 10 s (max)

**MECHANICAL AND PACKAGING**

- CASE: Hermetically sealed axial-lead glass DO-35 (DO-204AH) package
  - FINISH: Tin-Lead or RoHS Compliant annealed matte-Tin plating 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 <sub>Z</sub> @ I <sub>ZT</sub> Volts	Test Current I <sub>ZT</sub> mA	Max Zener Impedance A & B Suffix Only Note 2		Max Reverse Current			Max Zener Voltage Temp. Coeff. (A & B Suffix Only) α <sub>VZ</sub> (% / °C) Note 3	
			Z <sub>ZT</sub> @ I <sub>ZK</sub> Ohms	Z <sub>ZK</sub> @ I <sub>ZK</sub> = 0.25 mA Ohms	A, B, C & D Suffix Only		Non-Suffix I <sub>R</sub> @ V <sub>R</sub> Used For Suffix A μA		
					I <sub>R</sub> μA	@ V <sub>R</sub> Volts			
				A	B, C & D				
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 1N5281B, e3 DO-35

500 mW GLASS AXIAL-LEAD ZENER DIODES

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1N5221-1N5281B,e3 DO-35

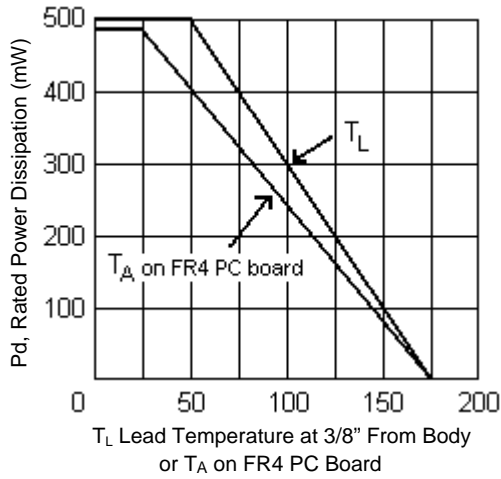
JEDEC Type No. Note 1	Nominal Zener Voltage $V_Z$ @ $I_{ZT}$ Volts	Test Current $I_{ZT}$ mA	Max Zener Impedance A & B Suffix Only Note 2		Max Reverse Current			Max Zener Voltage Temp. Coeff. (A & B Suffix Only) $\alpha_{VZ}$ (% / °C) Note 3	
			$Z_{ZT}$ @ $I_{ZK}$ Ohms	$Z_{ZK}$ @ $I_{ZK} = 0.25$ mA Ohms	A, B, C & D Suffix Only		Non-Suffix $I_R$ @ $V_R$ Used For Suffix A $\mu$ A		
					$I_R$ $\mu$ A	$V_R$ Volts			
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.

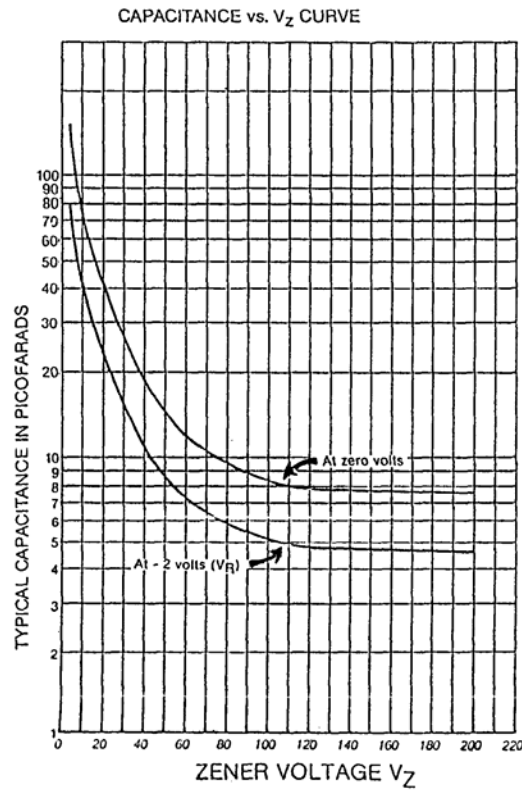
**NOTES:**

- 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 ( $\alpha_{VZ}$ ). 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

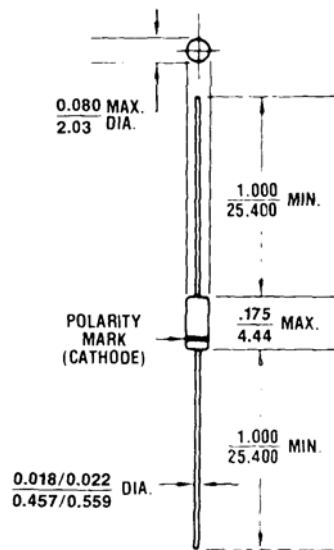


**FIGURE 1**  
POWER DERATING CURVE



**FIGURE 2**  
CAPACITANCE vs. ZENER VOLTAGE  
(TYPICAL)

PACKAGE DIMENSIONS



All dimensions in INCH  
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