



SCOTTSDALE DIVISION

1N5221UR thru 1N5281BUR, e3  
(or MLL5221 thru MLL5281B, e3)

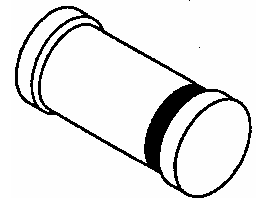
500 mW GLASS SURFACE MOUNT  
ZENER DIODES

### DESCRIPTION

The 1N5221BUR thru 1N5281BUR 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 standard 5% tolerances as well as tighter tolerances identified by different suffix letters on the part number. These are also available with an internal-metallurgical-bond option by adding a "-1" suffix (see separate data sheet). 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-213AA

### FEATURES

- Surface mount equivalents to the JEDEC registered 1N5221 thru 1N5281B series
- Hermetically sealed surface mount package
- RoHS Compliant devices available by adding "e3" suffix
- Internal metallurgical bond option available by adding a "-1" suffix (see separate data sheet for same part numbers with "-1" 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)

### MAXIMUM RATINGS

- Operating and Storage temperature:  $-65^{\circ}\text{C}$  to  $+175^{\circ}\text{C}$
- Thermal Resistance:  $150^{\circ}\text{C/W}$  junction to end cap and  $300^{\circ}\text{C/W}$  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  $T_{\text{EC}} \leq 100^{\circ}\text{C}$  or ambient temperature  $T_{\text{A}} \leq 25^{\circ}\text{C}$  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:  $260^{\circ}\text{C}$  for 10 seconds (max)

### 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

### 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



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1N5221UR thru 1N5281BUR

**ELECTRICAL CHARACTERISTICS\***

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

\* T<sub>A</sub> = 25°C unless otherwise noted. Based on dc measurements at thermal equilibrium; case temperature maintained at 30 +/- 2°C. V<sub>F</sub> = 1.1V max @ I<sub>F</sub> = 200 mA for all types. See further Notes on following page.



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**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.

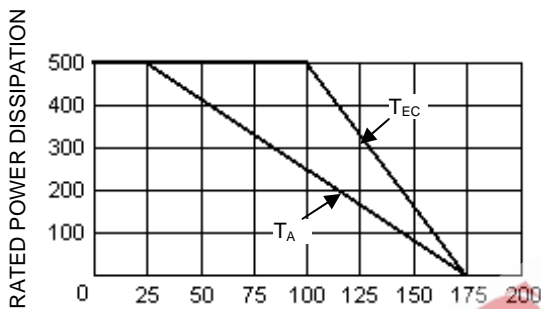
**NOTE 3:** Temperature coefficient ( $\alpha_{VZ}$ ). Test conditions for temperature coefficient are as follows:

- a.  $I_{ZT} = 7.5 \text{ mA}$ ,  $T_1 = 25^\circ\text{C}$ ,  
 $T_2 = 125^\circ\text{C}$  (1N5221AUR & BUR thru 1N5242AUR & BUR)
- b.  $I_{ZT} = \text{Rated } I_{ZT}$ ,  $T_1 = 25^\circ\text{C}$ ,  
 $T_2 = 125^\circ\text{C}$  (1N5243AUR & BUR thru 1N5281AUR & BUR)

Device to be temperature stabilized with current applied prior to reading breakdown voltage at the specified ambient temperature.

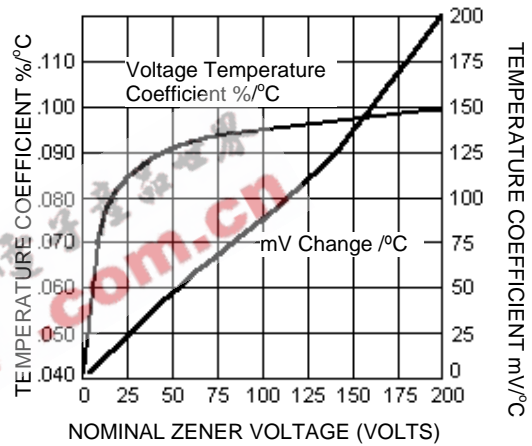
**NOTE 4:** These devices may be ordered as either 1N5221UR thru 1N5281BUR or as MLL5221 thru MLL5281B part numbers.

GRAPHS

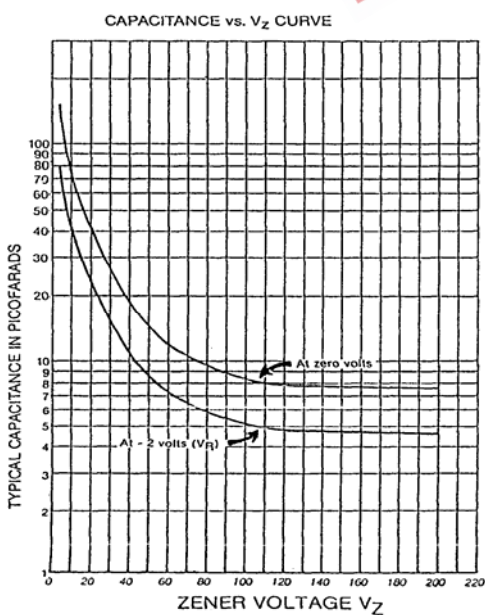


$T_{EC}$  – End Cap Temperature ( $^\circ\text{C}$ ), or  
 $T_A$  Ambient Temperature on FR4 PC BOARD

**FIGURE 1**  
POWER DERATING CURVE



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



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

PACKAGE DIMENSIONS

