



## Silicon MELF 500 mW Zener Diodes

Qualified per MIL-PRF-19500/117

*Qualified Levels\*:*  
JAN, JANTX, and JANTXV

### DESCRIPTION

The popular 1N957BUR-1 through 1N992BUR-1 series of 0.5 watt Zener voltage regulators provides a selection from 6.8 to 200 volts in a standard 5%, 2% and 1% tolerance versions. These glass MELF DO-213AA Zeners feature an internal metallurgical bond and are available in military qualified and commercial RoHS compliant versions. Military qualified versions are available on the 1N962BUR-1 through 1N992BUR-1 range of part numbers.

**Important:** For the latest information, visit our website <http://www.microsemi.com>.

### FEATURES

- JEDEC registered 1N957B to 1N992B number series.
- Internal metallurgical bond.
- \*JAN, JANTX, and JANTXV qualifications are available per MIL-PRF-19500/117 for part numbers 1N962BUR-1 through 1N992BUR-1.
- Upscreening is available in reference to MIL-PRF-19500 for the range of 1N957BUR-1 through 1N961BUR-1. (See [part nomenclature](#) for all available options.)
- RoHS compliant versions available (commercial grade only).

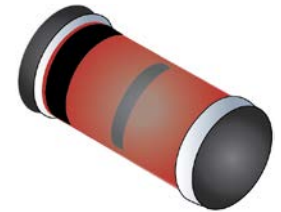
### APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range.
- Extensive selection from 6.8 to 200 V.
- Standard voltage tolerance is  $\pm 5\%$  with optional tighter tolerances of  $\pm 2\%$  or  $1\%$ .
- Small size for high density mounting using the surface mount method (see package illustration).
- Non-sensitive to ESD per MIL-STD-750 method 1020.
- Minimal capacitance.
- Inherently radiation hard as described in Microsemi [MicroNote 050](#).

### MAXIMUM RATINGS

Parameters/Test Conditions	Symbol	Value	Unit
Operating and Storage Temperature	$T_J$ and $T_{STG}$	-65 to +175	$^{\circ}C$
Thermal Resistance Junction-to-End Cap	$R_{\theta JEC}$	100	$^{\circ}C/W$
Thermal Resistance Junction-to-Ambient when mounted on PCB <sup>(1)</sup>	$R_{\theta JA}$	300	$^{\circ}C/W$
Steady-State Power Dissipation @ $T_{EC} = +125^{\circ}C$ <sup>(2)</sup> @ $T_A = 55^{\circ}C$ mounted on PCB	$P_D$	0.5 0.4	W
Forward Voltage @ $I_F = 200$ mA 1N957UR – 1N985UR 1N986UR – 1N992UR	$V_F$	1.1 1.3	V
Solder Temperature @ 10 s	$T_{SP}$	260	$^{\circ}C$

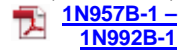
**NOTES:** 1. See [figure 1](#) for derating curves.  $T_A = +75^{\circ}C$  on an FR4 PC board with 1 oz copper metalization.  
2. Derate to 0 at +175 $^{\circ}C$ .



### DO-213AA MELF Package

Also available in:

**DO-35 (DO-204AH) package**  
(axial-leaded)



#### MSC – Lawrence

6 Lake Street,  
Lawrence, MA 01841  
Tel: 1-800-446-1158 or  
(978) 620-2600  
Fax: (978) 689-0803

#### MSC – Ireland

Gort Road Business Park,  
Ennis, Co. Clare, Ireland  
Tel: +353 (0) 65 6840044  
Fax: +353 (0) 65 6822298

Website:

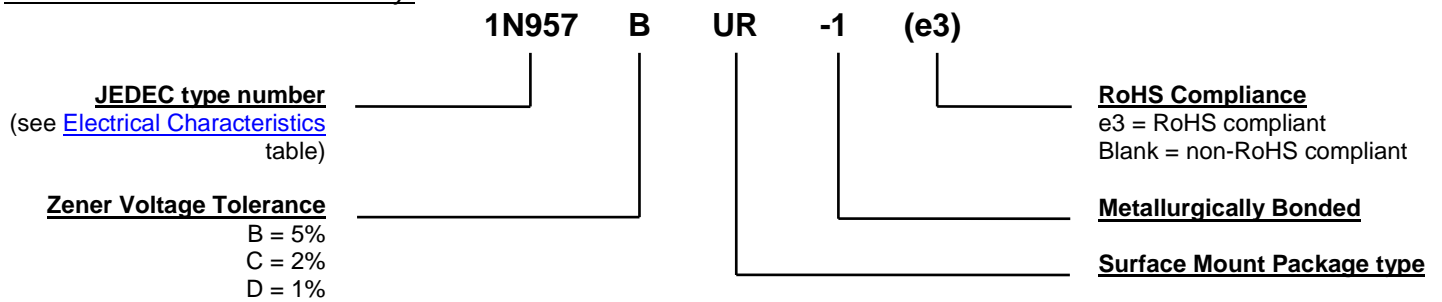
[www.microsemi.com](http://www.microsemi.com)

**MECHANICAL and PACKAGING**

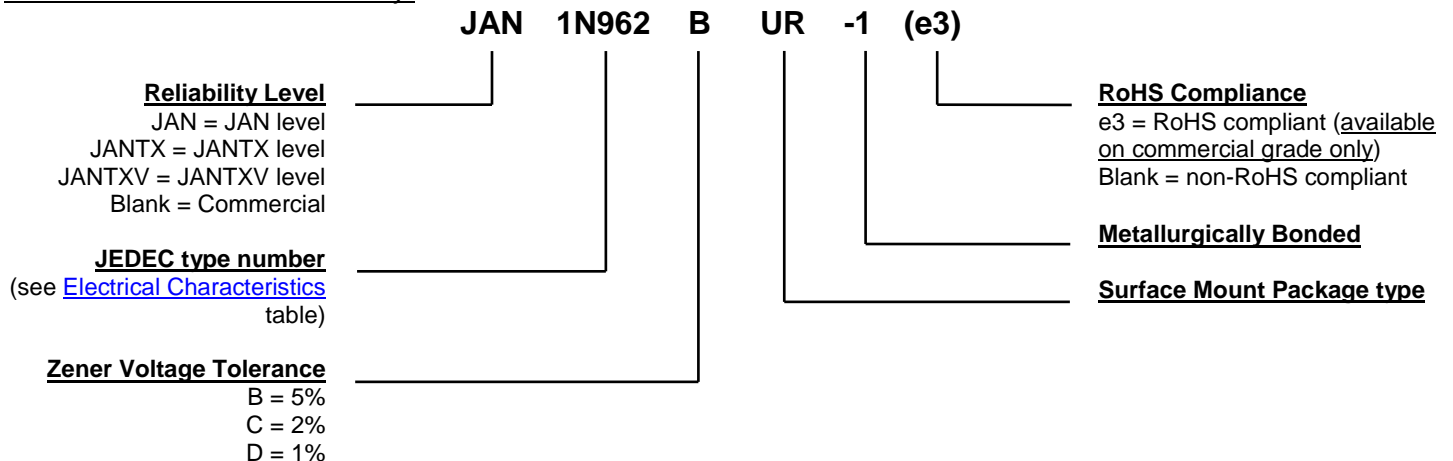
- CASE: Hermetically sealed glass case package.
- TERMINALS: Tin/lead plated or RoHS compliant matte-tin (on commercial grade only) over copper clad steel. Solderable per MIL-STD-750, method 2026.
- POLARITY: Cathode end is banded.
- MOUNTING: The axial coefficient of expansion (COE) of this device is approximately +6PPM/°C. The COE of the mounting surface system should be selected to provide a suitable match with this device.
- MARKING: Part number.
- TAPE & REEL option: Standard per EIA-296. Consult factory for quantities.
- WEIGHT: 0.04 grams.
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**

1N957BUR-1 – 1N961BUR-1 only:



1N962BUR-1 – 1N992BUR-1 only:



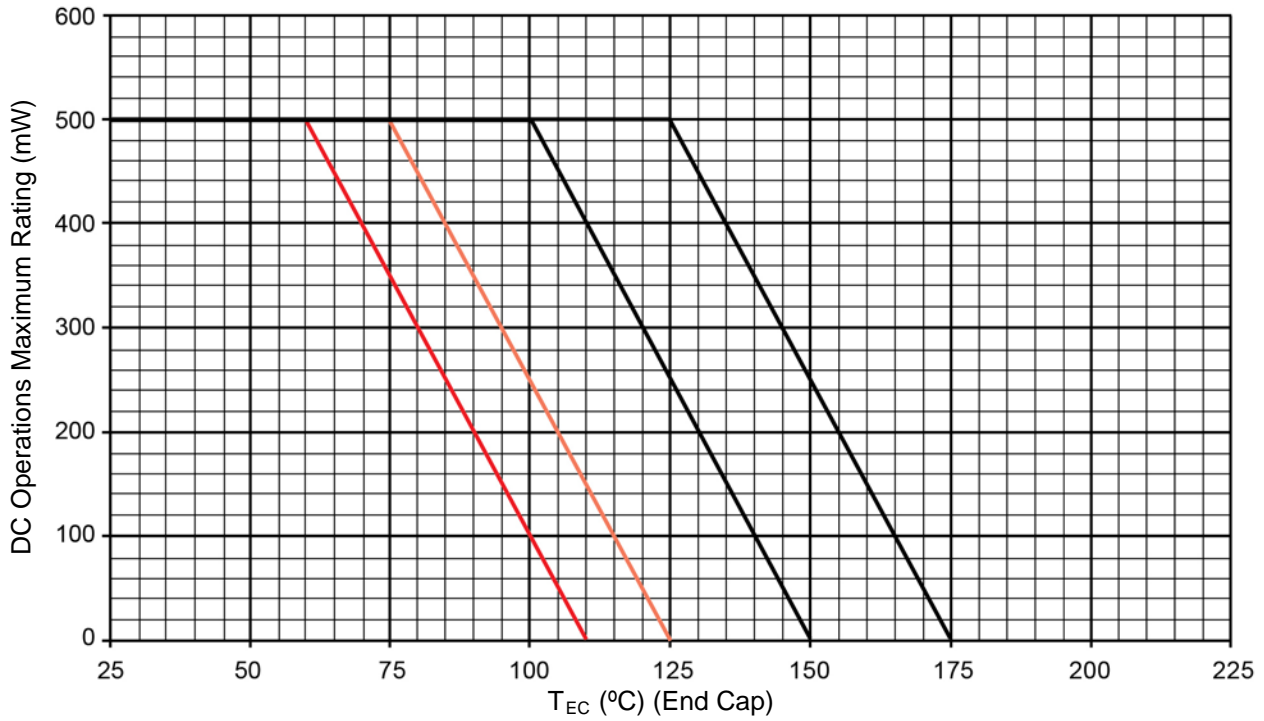
<b>SYMBOLS &amp; DEFINITIONS</b>	
<b>Symbol</b>	<b>Definition</b>
$I_R$	Reverse Current: The maximum reverse (leakage) current that will flow at the specified voltage and temperature.
$I_Z, I_{ZT}, I_{ZK}$	Regulator Current: The dc regulator current ( $I_Z$ ), at a specified test point ( $I_{ZT}$ ), near breakdown knee ( $I_{ZK}$ ).
$I_{ZM}$	Maximum Regulator (Zener) Current: The maximum rated dc current for the specified power rating.
$I_{ZSM}$	Maximum Zener Surge Current: The non-repetitive peak value of Zener surge current at a specified wave form.
$V_F$	Maximum Forward Voltage: The maximum forward voltage the device will exhibit at a specified current.
$V_R$	Reverse Voltage: The reverse voltage dc value, no alternating component.
$V_Z$	Zener Voltage: The Zener voltage the device will exhibit at a specified current ( $I_Z$ ) in its breakdown region.
$Z_{ZT}$ 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.

**ELECTRICAL CHARACTERISTICS**

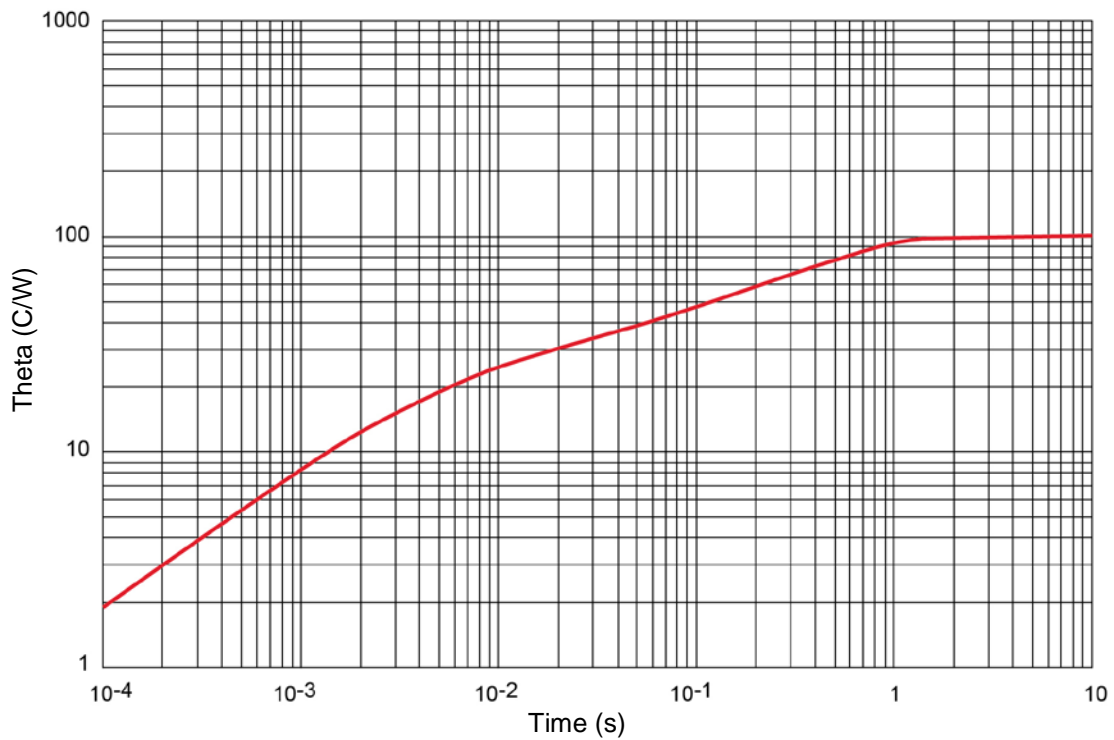
JEDEC TYPE NUMBER (NOTE 1)	NOMINAL ZENER VOLTAGE (NOTE 2)	ZENER TEST CURRENT	MAXIMUM ZENER IMPEDANCE $Z_{ZT}$			MAXIMUM DC ZENER CURRENT (NOTE 4)	MAXIMUM SURGE CURRENT (NOTE 5)	MAXIMUM REVERSE LEAKAGE CURRENT		MAXIMUM TEMPERATURE COEFFICIENT
	$V_Z$	$I_{ZT}$	$Z_Z$	$Z_{ZK}$	@ $I_{ZK}$	$I_{ZM}$	$I_{ZSM}$	$I_R$	@ $V_R$	$\alpha_{VZ}$
	Volts	mA	Ohms	Ohms	$\mu A$	mA	mA	$\mu A$	Volts	%/°C
1N957BUR-1	6.8	18.5	4.5	700	250	55	300	150	5.2	+0.050
1N958BUR-1	7.5	16.5	5.5	700	250	50	275	75	5.7	+0.058
1N959BUR-1	8.2	15.0	6.5	700	250	45	250	50	6.2	+0.065
1N960BUR-1	9.1	14.0	7.5	700	250	41	225	25	6.9	+0.068
1N961BUR-1	10	12.5	8.5	700	250	38	200	10	7.6	+0.075
1N962BUR-1	11	11.5	9.5	700	250	35	590	1.0	8.4	+0.073
1N963BUR-1	12	10.5	11.5	700	250	32	540	1.0	9.1	+0.076
1N964BUR-1	13	9.5	13.0	700	250	30	500	0.5	9.9	+0.079
1N965BUR-1	15	8.5	16	700	250	26	433	0.5	11	+0.082
1N966BUR-1	16	7.8	17	700	250	25	406	0.5	12	+0.083
1N967BUR-1	18	7.0	21	750	250	21	361	0.5	14	+0.085
1N968BUR-1	20	6.2	25	750	250	19	325	0.5	15	+0.086
1N969BUR-1	22	5.6	29	750	250	17	295	0.5	17	+0.087
1N970BUR-1	24	5.2	33	750	250	16	271	0.5	18	+0.088
1N971BUR-1	27	4.6	41	750	250	14	240	0.5	21	+0.090
1N972BUR-1	30	4.2	49	1000	250	13	216	0.5	23	+0.091
1N973BUR-1	33	3.8	58	1000	250	12	197	0.5	25	+0.092
1N974BUR-1	36	3.4	70	1000	250	11	180	0.5	27	+0.093
1N975BUR-1	39	3.2	80	1000	250	9.1	166	0.5	30	+0.094
1N976BUR-1	43	3.0	93	1000	250	8.8	151	0.5	33	+0.095
1N977BUR-1	47	2.7	105	1500	250	7.9	138	0.5	36	+0.095
1N978BUR-1	51	2.5	125	1500	250	7.4	127	0.5	39	+0.096
1N979BUR-1	56	2.2	150	2000	250	6.9	116	0.5	43	+0.096
1N980BUR-1	62	2.0	185	2000	250	6.0	105	0.5	47	+0.097
1N981BUR-1	68	1.8	230	2000	250	5.5	95	0.5	52	+0.097
1N982BUR-1	75	1.7	270	2000	250	5.1	86	0.5	56	+0.098
1N983BUR-1	82	1.5	330	3000	250	4.6	79	0.5	62	+0.098
1N984BUR-1	91	1.4	400	3000	250	4.2	71	0.5	69	+0.099
1N985BUR-1	100	1.3	500	3000	250	3.7	65	0.5	76	+0.110
1N986BUR-1	110	1.1	750	4000	250	3.3	59	0.5	84	+0.110
1N987BUR-1	120	1.0	900	4500	250	3.1	54	0.5	91	+0.110
1N988BUR-1	130	0.95	1100	5000	250	2.7	50	0.5	99	+0.110
1N989BUR-1	150	0.85	1500	6000	250	2.4	43	0.5	114	+0.110
1N990BUR-1	160	0.80	1700	6500	250	2.2	40	0.5	122	+0.110
1N991BUR-1	180	0.68	2200	7100	250	2.0	36	0.5	137	+0.110
1N992BUR-1	200	0.65	2500	8000	250	1.8	32	0.5	152	+0.110

**NOTES:**

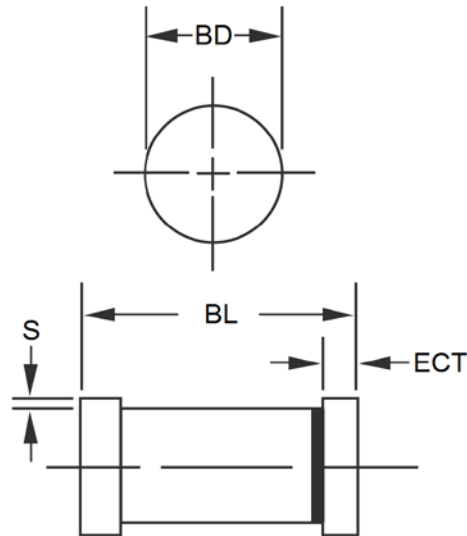
- The JEDEC type numbers shown (B suffix) have a  $\pm 5\%$  tolerance on nominal Zener voltage. The suffix C will have  $\pm 2\%$  tolerance; and suffix D will have  $\pm 1\%$  tolerance.
- Zener voltage ( $V_Z$ ) is measured after the test current has been applied for  $20 \pm 5$  seconds. Mounting clips shall be maintained at temperature of  $25 \pm 8 / - 2$  °C.
- The Zener impedance is derived when a 60 cycle 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 2 points to ensure a sharp knee on the breakdown curve and to eliminate unstable units. See [MicroNote 202](#) for variation in dynamic impedance with different Zener currents.
- The values of  $I_{ZM}$  are calculated for a  $\pm 5\%$  tolerance on nominal Zener voltage. Allowance has been made for the rise in Zener voltage above  $V_{ZT}$  which results from Zener impedance and the increase in junction temperature as power dissipation approaches 400 mW. In the case of individual diodes  $I_{ZM}$  is that value of current which results in a dissipation of 400 mW at 75°C lead temperature at 3/8" from body.
- The surge for  $I_{ZSM}$  is a square wave or equivalent half-sine wave pulse of 1/120 sec. duration.

**GRAPHS**


**FIGURE 1**  
Temperature-Power Derating Curve



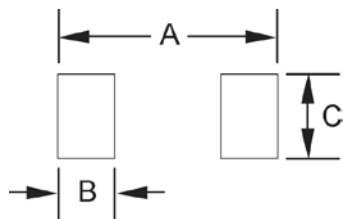
**FIGURE 2**  
Thermal Impedance

**PACKAGE DIMENSIONS**


DIM	INCH		MILLIMETERS	
	MIN	MAX	MIN	MAX
<b>BD</b>	0.063	0.067	1.60	1.70
<b>BL</b>	0.130	0.146	3.30	3.71
<b>ECT</b>	0.016	0.022	0.41	0.56
<b>S</b>	0.001	-	0.03	-

**NOTES:**

1. Dimensions are in inches. Millimeters are given for general information only.
2. Dimensions are pre-solder dip.
3. Referencing to dimension S, minimum clearance of glass body to mounting surface on all orientations.
4. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

**PAD LAYOUT**


	INCH	mm
<b>A</b>	.200	5.08
<b>B</b>	.055	1.40
<b>C</b>	.080	2.03

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