



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).

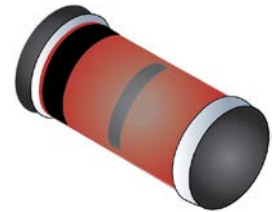
APPLICATIONS / BENEFITS

- 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 ⁽¹⁾ | $R_{\theta JA}$ | 300 | $^{\circ}C/W$ |
| Steady-State Power Dissipation @ $T_{EC} = +125^{\circ}C$ ⁽²⁾ @ $T_A = 55^{\circ}C$ 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 | $^{\circ}C$ |

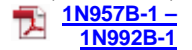
- NOTES:**
1. See [figure 1](#) for derating curves. $T_A = +75^{\circ}C$ on an FR4 PC board with 1 oz copper metalization.
 2. Derate to 0 at $+175^{\circ}C$.



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:

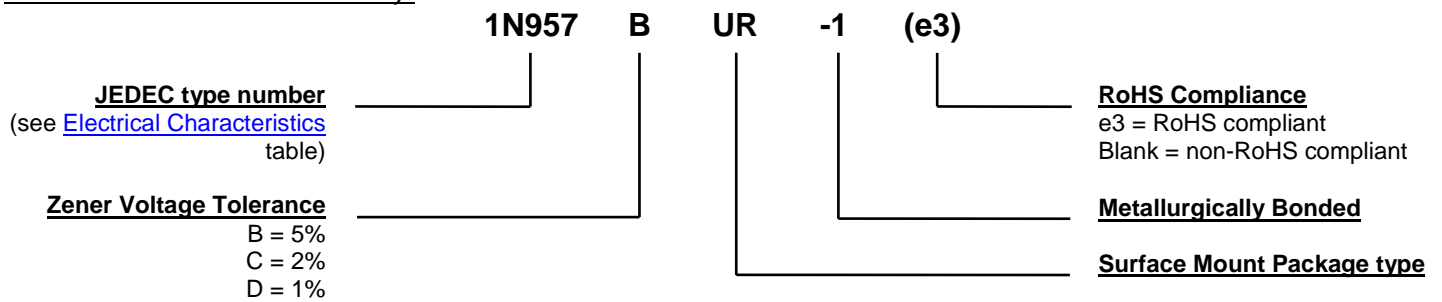
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MECHANICAL and PACKAGING

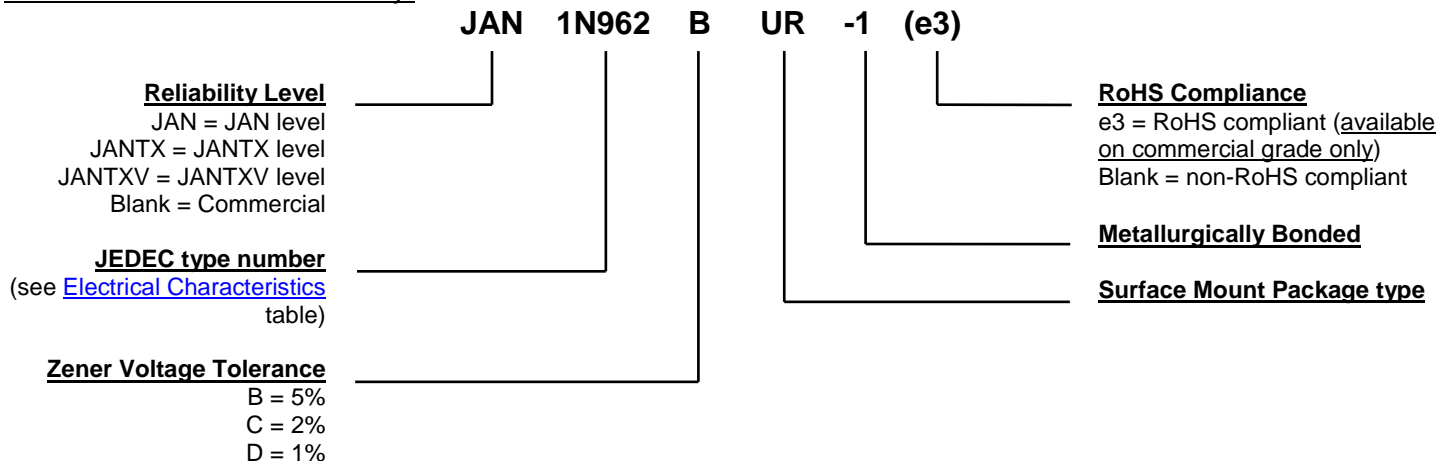
- CASE: Hermetically sealed glass case package.
- TERMINALS: Tin/lead plated or RoHS compliant matte-tin (on commercial grade only) over copper clad steel. Solderable per MIL-STD-750, method 2026.
- POLARITY: Cathode end is banded.
- MOUNTING: The axial coefficient of expansion (COE) of this device is 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:



| SYMBOLS & DEFINITIONS | |
|----------------------------------|---|
| Symbol | Definition |
| 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 | α_{VZ} |
| | Volts | mA | Ohms | Ohms | μA | mA | mA | μA | 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 ± 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.

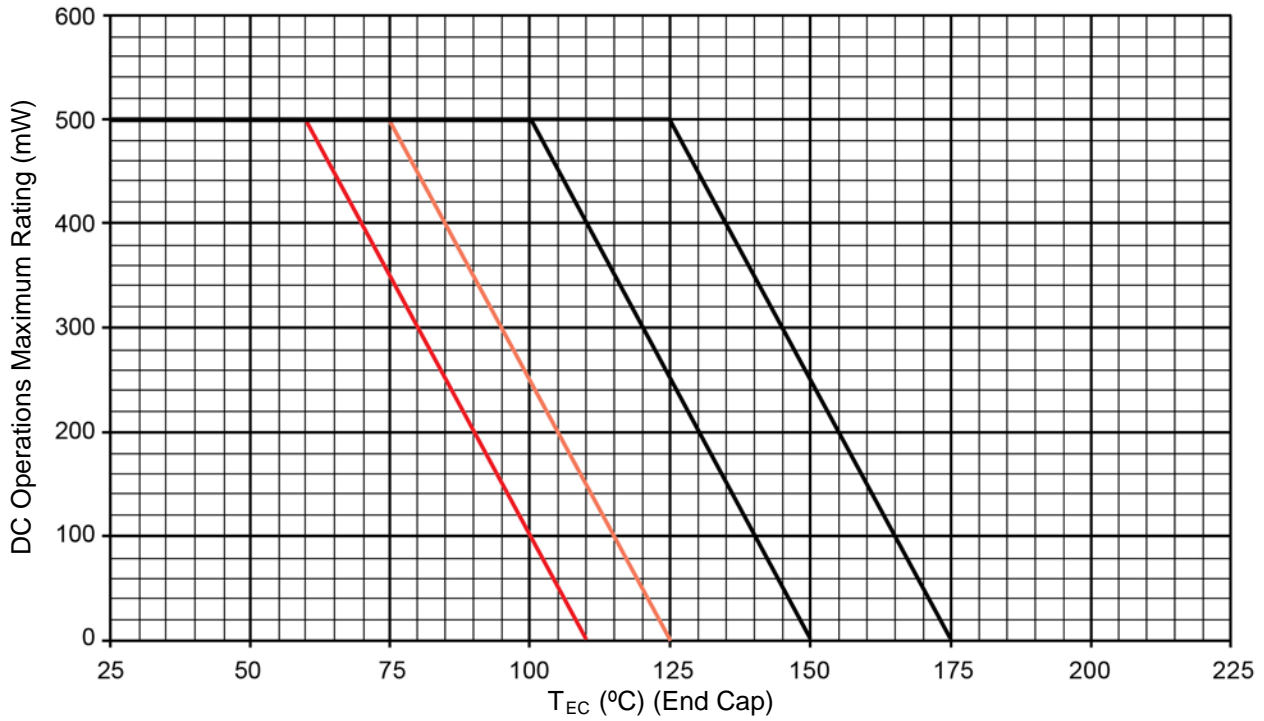
GRAPHS


FIGURE 1
Temperature-Power Derating Curve

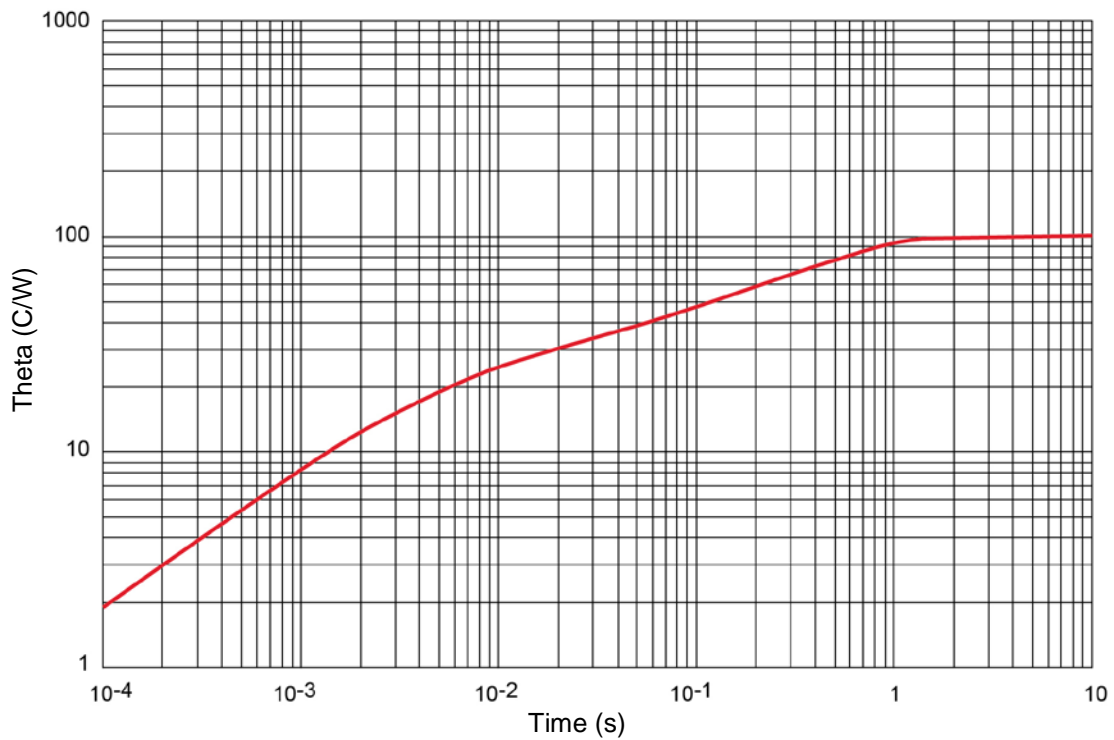
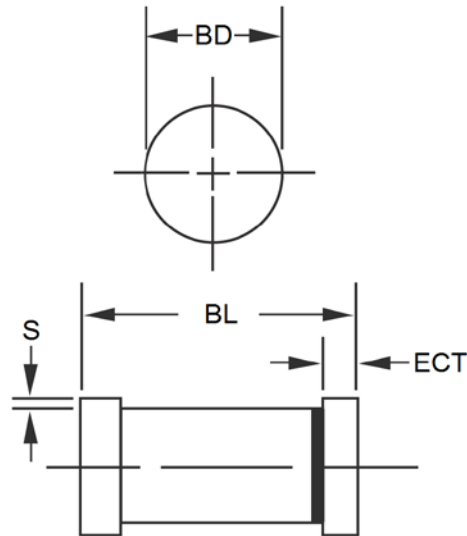


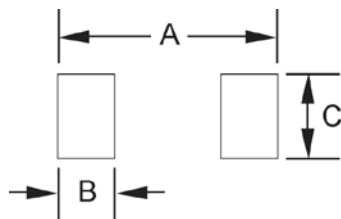
FIGURE 2
Thermal Impedance

PACKAGE DIMENSIONS


| DIM | INCH | | MILLIMETERS | |
|------------|-------|-------|-------------|------|
| | MIN | MAX | MIN | MAX |
| BD | 0.063 | 0.067 | 1.60 | 1.70 |
| BL | 0.130 | 0.146 | 3.30 | 3.71 |
| ECT | 0.016 | 0.022 | 0.41 | 0.56 |
| S | 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 Φ x symbology.

PAD LAYOUT


| | INCH | mm |
|----------|------|------|
| A | .200 | 5.08 |
| B | .055 | 1.40 |
| C | .080 | 2.03 |