RoHS
*Available on commercial versions*

# 1 Watt Surface Mount Zener Diodes

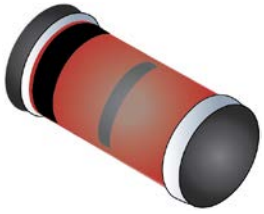
***Qualified per MIL-PRF-19500/115***

*Qualified Levels: JAN, JANTX, and JANTXV*

## DESCRIPTION

This surface mountable Zener diode series is similar to the 1N3016B-1 through 1N3045B-1 JEDEC registration in the DO-13 package except that it meets the surface mount DO-213AB outline. It is an ideal selection for applications of high density and low parasitic requirements. Due to its glass hermetic seal qualities and metallurgically enhanced internal construction, it is also well suited for high-reliability applications where it is available in JAN, JANTX, and JANTXV military qualifications. Lower voltages are also available in the 1N3821AUR-1 through 1N3828AUR-1 series (3.3 V to 7.5 V) in the same package (see separate data sheet).

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



**DO-213AB (MELF, LL41) Package**

Also available in:

**DO-41 package**
(glass axial-leaded)
1N3016B-1 – 1N3045B-1

## FEATURES

- Leadless surface mount equivalents to the JEDEC registered 1N3016 through 1N3045 number series.
- Zener voltage range: 6.8 volts to 110 volts.
- Hermetically sealed, double plug glass construction.
- Metallurgically bonded.
- Voltage tolerances of 5%, 2%, and 1% available.
- JAN, JANTX, and JANTXV qualifications also available per MIL-PRF-19500/115.
  (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.
- Wide selection from 6.8 to 110 V.
- Low reverse (leakage) currents.
- Leadless package for surface mounting.
- Ideal for high-density situations.
- Metallurgically enhanced internal contact design for greater reliability and lower thermal resistance.
- Non-sensitive to ESD.
- Inherently radiation hard as described in Microsemi "MicroNote 050".

## MAXIMUM RATINGS

| Parameters/Test Conditions | Symbol | Value | Unit |
|---|---|---|---|
| Junction and Storage Temperature | $T_J$ and $T_{STG}$ | -55 to +175 | ºC |
| Thermal Resistance Junction-to-End Cap | $R_{\Theta JEC}$ | 50 | ºC/W |
| DC Power Dissipation (1) | $P_D$ | 1.0 | W |
| Forward Voltage @ 200 mA | $V_F$ | 1.2 | V |
| Solder Temperature @ 10 s | $T_{SP}$ | 260 | °C |

**Notes:** 1. Derate linearly starting at $T_{EC}$ 125 ºC to zero at 175 ºC (see Figure1).

**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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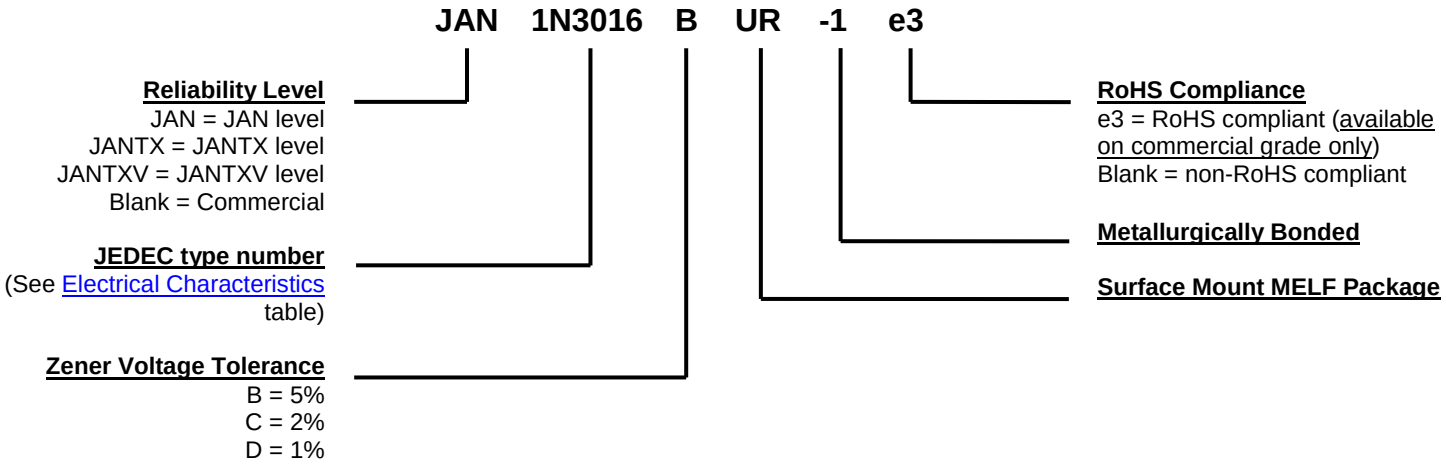
## MECHANICAL and PACKAGING

- CASE: Hermetically sealed glass MELF package.
- TERMINALS: Tin/lead or RoHS compliant matte-tin finished copper clad steel available (commercial grade only). Solderable per MIL-STD-750, method 2026.
- MARKING: Cathode band.
- POLARITY: Diode to be operated with the banded end positive with respect to the opposite end for Zener regulation.
- MOUNTING SURFACE SELECTION: 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.
- TAPE & REEL optional: Standard per EIA-481-1-A with 12 mm tape. Consult factory for quantities.
- WEIGHT: Approximately 0.05 grams.
- See Package Dimensions on last page.

## PART NOMENCLATURE




## 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. |
| $V_F$ | 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. |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## *ELECTRICAL CHARACTERISTICS @ 25 °C

| JEDEC TYPE NUMBER | NOMINAL ZENER VOLTAGE $V_Z$ @ $I_{ZT}$ (Note 1) | ZENER TEST CURRENT $I_{ZT}$ | MAXIMUM ZENER IMPEDANCE (Note 3) | | | MAXIMUM ZENER CURRENT $I_{ZM}$ (Note 3) | MAXIMUM REVERSE LEAKAGE CURRENT† $I_R$ @ $V_R$ | | MAXIMUM TEMP. COEFF. OF ZENER VOLTAGE $\alpha_{VZ}$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | $Z_{ZT}$ @ $I_{ZT}$ | $Z_{ZK}$ @ $I_{ZK}$ | | | | | |
| | Volts | mA | Ohms | Ohms | mA | mA | µA | Volts | %/°C |
| 1N3016BUR-1 | 6.8 | 37 | 3.5 | 700 | 1.0 | 140 | 150 | 5.2 | 0.061 |
| 1N3017BUR-1 | 7.5 | 34 | 4.0 | 700 | .5 | 125 | 100 | 5.7 | 0.065 |
| 1N3018BUR-1 | 8.2 | 31 | 4.5 | 700 | .5 | 115 | 50 | 6.2 | 0.070 |
| 1N3019BUR-1 | 9.1 | 28 | 6 | 700 | .5 | 105 | 25 | 6.9 | 0.073 |
| 1N3020BUR-1 | 10 | 25 | 7 | 700 | .25 | 95 | 25 | 7.6 | 0.076 |
| 1N3021BUR-1 | 11 | 23 | 8 | 700 | .25 | 85 | 10 | 8.4 | 0.078 |
| 1N3022BUR-1 | 12 | 21 | 9 | 700 | .25 | 80 | 10 | 9.1 | 0.081 |
| 1N3023BUR-1 | 13 | 19 | 10 | 700 | .25 | 74 | 10 | 9.9 | 0.085 |
| 1N3024BUR-1 | 15 | 17 | 14 | 700 | .25 | 63 | 10 | 11.4 | 0.088 |
| 1N3025BUR-1 | 16 | 15.5 | 16 | 700 | .25 | 60 | 10 | 12.2 | 0.089 |
| 1N3026BUR-1 | 18 | 14 | 20 | 750 | .25 | 52 | 10 | 13.7 | 0.091 |
| 1N3027BUR-1 | 20 | 12.5 | 22 | 750 | .25 | 47 | 10 | 15.2 | 0.092 |
| 1N3028BUR-1 | 22 | 11.5 | 23 | 750 | .25 | 43 | 10 | 16.7 | 0.093 |
| 1N3029BUR-1 | 24 | 10.5 | 25 | 750 | .25 | 40 | 10 | 18.2 | 0.094 |
| 1N3030BUR-1 | 27 | 9.5 | 35 | 750 | .25 | 34 | 10 | 20.6 | 0.096 |
| 1N3031BUR-1 | 30 | 8.5 | 40 | 1000 | .25 | 31 | 10 | 22.8 | 0.098 |
| 1N3032BUR-1 | 33 | 7.5 | 45 | 1000 | .25 | 28 | 10 | 25.1 | 0.099 |
| 1N3033BUR-1 | 36 | 7.0 | 50 | 1000 | .25 | 26 | 10 | 27.4 | 0.100 |
| 1N3034BUR-1 | 39 | 6.5 | 60 | 1000 | .25 | 23 | 10 | 29.7 | 0.101 |
| 1N3035BUR-1 | 43 | 6.0 | 70 | 1500 | .25 | 21 | 10 | 32.7 | 0.102 |
| 1N3036BUR-1 | 47 | 5.5 | 80 | 1500 | .25 | 19 | 10 | 35.8 | 0.102 |
| 1N3037BUR-1 | 51 | 5.0 | 95 | 1500 | .25 | 18 | 10 | 38.8 | 0.103 |
| 1N3038BUR-1 | 56 | 4.5 | 110 | 2000 | .25 | 17 | 10 | 42.6 | 0.103 |
| 1N3039BUR-1 | 62 | 4.0 | 125 | 2000 | .25 | 15 | 10 | 47.1 | 0.104 |
| 1N3040BUR-1 | 68 | 3.7 | 150 | 2000 | .25 | 14 | 10 | 51.7 | 0.104 |
| 1N3041BUR-1 | 75 | 3.3 | 175 | 2000 | .25 | 12 | 10 | 56.0 | 0.105 |
| 1N3042BUR-1 | 82 | 3.0 | 200 | 3000 | .25 | 11 | 10 | 62.2 | 0.106 |
| 1N3043BUR-1 | 91 | 2.8 | 250 | 3000 | .25 | 10 | 10 | 69.2 | 0.108 |
| 1N3044BUR-1 | 100 | 2.5 | 350 | 3000 | .25 | 9.0 | 10 | 76.0 | 0.11 |
| 1N3045BUR-1 | 110 | 2.3 | 450 | 4000 | .25 | 8.3 | 10 | 83.6 | 0.11 |

*JEDEC Registered Data. †Not JEDEC Data.

**NOTES:** 1. Zener voltage ($V_Z$) is measured with junction in thermal equilibrium with still air at a temperature of 25 °C. The test currents ($I_{ZT}$) at nominal voltages provide a constant 0.25 watts.

2. 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.

3. These values of $I_{ZM}$ may often be exceeded in the case of individual diodes. The values shown are calculated for a unit at the high voltage end of its tolerance range. Allowance has also been made for the rise in Zener voltage above $V_{ZT}$ that results from Zener impedance and the increase in junction temperature as a unit approaches thermal equilibrium at a dissipation of 1 watt. The $I_{ZM}$ values shown for +/- 5% tolerance units may be used with little error for +/- 10% tolerance units, but should be reduced by 7% to include a +/- 20% tolerance unit near the high voltage end of its tolerance range.


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## GRAPHS

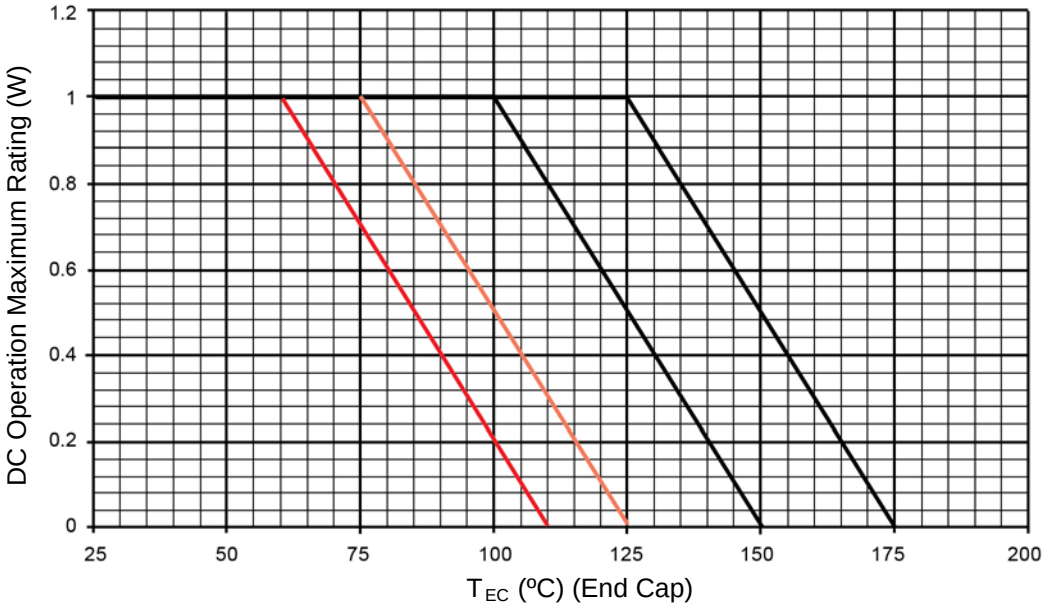


**FIGURE 1**
Temperature-Power Derating Curve


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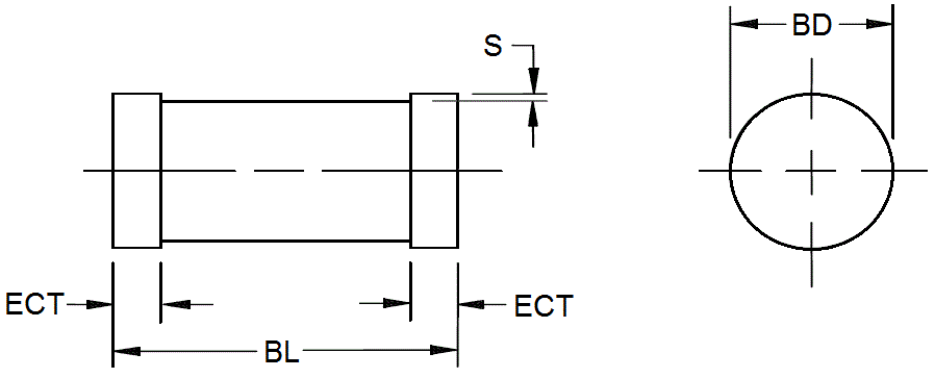
## PACKAGE DIMENSIONS

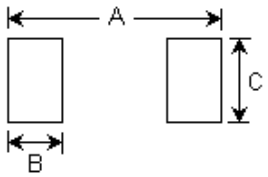



| Symbol | Dimensions | | | |
|---|---|---|---|---|
| | Inch | | Millimeters | |
| | Min | Max | Min | Max |
| **BD** | 0.094 | 0.105 | 2.39 | 2.67 |
| **BL** | 0.189 | 0.205 | 4.80 | 5.21 |
| **ECT** | 0.014 | 0.022 | 0.360 | 0.560 |
| **S** | 0.001 min | | 0.03 min | |

**NOTES:**

1. Dimensions are in inches. Millimeters are given for general information only.
2. Gap not controlled, shape of body and gap not controlled.
3. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

## PAD LAYOUT




| Ltr | Inch | mm |
|---|---|---|
| **A** | 0.276 | 7.00 |
| **B** | 0.070 | 1.8 |
| **C** | 0.110 | 2.8 |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