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# 1 Watt Glass Case Zener Diodes

Qualified per MIL-PRF-19500/115

Qualified Levels:  
JAN, JANTX, and  
JANTXV

## DESCRIPTION

This well established Zener diode series for the 1N3016B-1 through 1N3045B-1 JEDEC registration in the glass DO-41 package provides a glass hermetic seal for 6.8 to 110 volts. 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 1N3821 through 1N3828 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>.

## FEATURES

- JEDEC registered 1N3016 through 1N3045 numbers.
- Zener voltage range: 6.8 volts to 110 volts.
- Hermetically sealed DO-41 glass package.
- Metallurgically bonded.
- Double plug construction.
- 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).

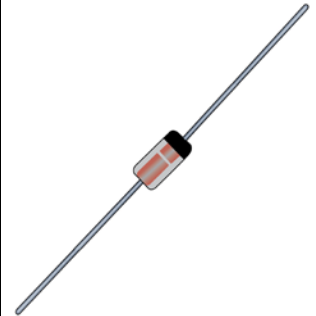
## APPLICATIONS / BENEFITS

- Regulates voltage over a broad operating current and temperature range.
- Wide selection from 6.8 to 110 volts.
- Low reverse (leakage) currents.
- 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 <sub>J</sub> and T <sub>STG</sub> | -55 to +175 | °C   |
| Thermal Resistance Junction-to-Lead <sup>(1)</sup> | R <sub>θJL</sub>                    | 80          | °C/W |
| DC Power Dissipation <sup>(2)</sup>                | P <sub>D</sub>                      | 1.0         | W    |
| Forward Voltage @ 200 mA                           | V <sub>F</sub>                      | 1.2         | V    |
| Solder Temperature @ 10 s                          | T <sub>SP</sub>                     | 260         | °C   |

- Notes:**
1. At L = 0.375 inches (10 mm) from body.
  2. At T<sub>L</sub> ≤ +95 °C 3/8" (10 mm) from body or 1.0 watts at T<sub>L</sub> ≤ +65 °C when mounted on FR4 PC board as described for thermal resistance above (also see [Figure 1](#)). (Derate power to 0 at T<sub>L</sub> = +175 °C).



**DO-41 Package**

Also available in:  
**DO-213AB package**

(surface mount)  
 [1N3016BUR-1 – 1N3045BUR-1](#)

**MSC – Lawrence**

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

**MSC – Ireland**

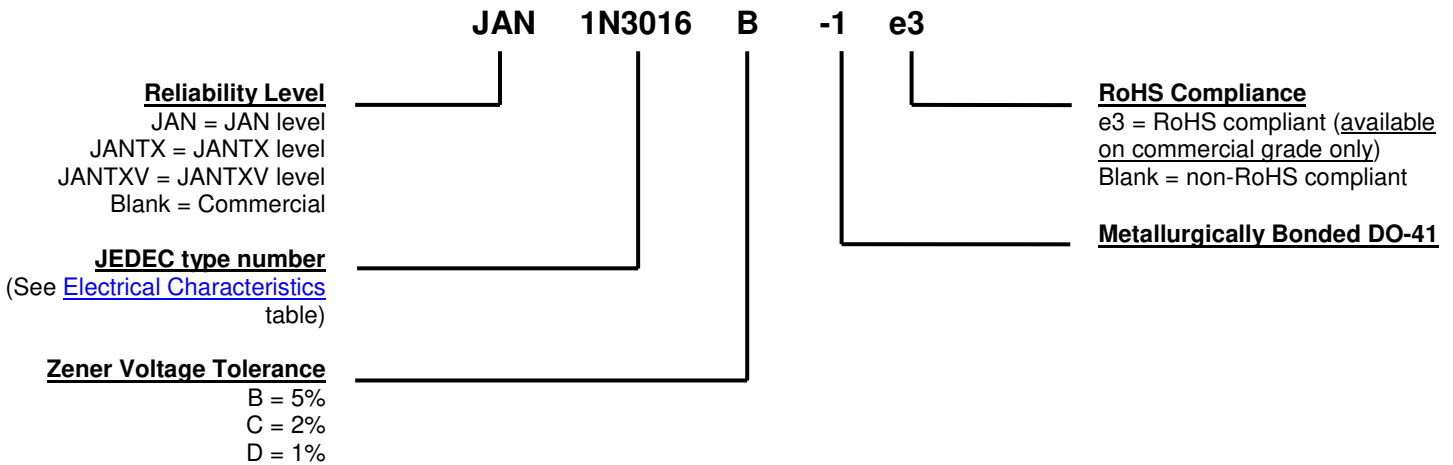
Gort Road Business Park,  
Ennis, Co. Clare, Ireland  
Tel: +353 (0) 65 6840044  
Fax: +353 (0) 65 6822298

**Website:**

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

**MECHANICAL and PACKAGING**

- CASE: Hermetically sealed voidless hard glass with tungsten slugs.
- TERMINALS: Tin/lead or RoHS compliant matte/tin (commercial grade only) over copper.
- MARKING: Body coated in blue with part number.
- POLARITY: Cathode indicated by band.
- TAPE & REEL option: Standard per EIA-296. Consult factory for quantities.
- WEIGHT: 340 milligrams.
- 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. |

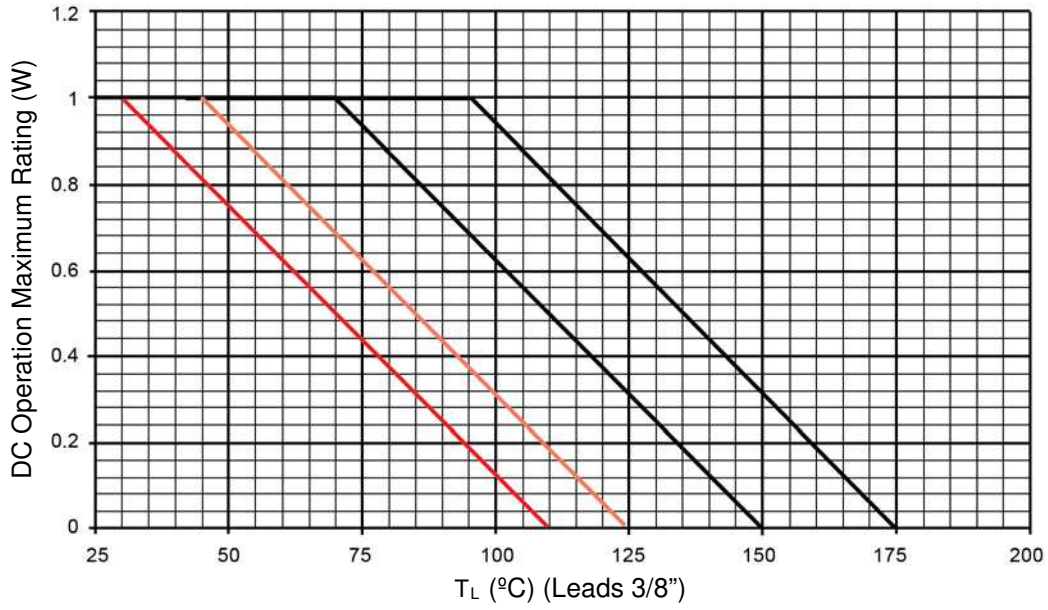
**\*ELECTRICAL CHARACTERISTICS @ 25°C**

| JEDEC<br>TYPE<br>NUMBER | NOMINAL<br>ZENER<br>VOLTAGE<br>$V_Z @ I_{ZT}$<br>(Note 1) | ZENER<br>TEST<br>CURRENT<br>$I_{ZT}$ | MAXIMUM ZENER IMPEDANCE<br>(Note 3) |                   |      | MAXIMUM<br>ZENER<br>CURRENT<br>$I_{ZM}$<br>(Note 3) | MAXIMUM<br>REVERSE<br>LEAKAGE<br>CURRENT†<br>$I_R @ V_R$ |       | MAXIMUM<br>TEMP. COEFF.<br>OF ZENER<br>VOLTAGE<br>$\alpha_{VZ}$ |
|-------------------------|---|--------------------------------------|-------------------------------------|-------------------|------|---|--|-------|---|
|                         |   |                                      | $Z_{ZT} @ I_{ZT}$                   | $Z_{ZK} @ I_{ZK}$ |      |   | $\mu A$  | Volts |   |
|                         |   |                                      |                                     | Ohms              | Ohms |   |  |       |   |
| 1N3016B-1               | 6.8   | 37                                   | 3.5                                 | 700               | 1.0  | 140   | 150  | 5.2   | 0.061   |
| 1N3017B-1               | 7.5   | 34                                   | 4.0                                 | 700               | .5   | 125   | 100  | 5.7   | 0.065   |
| 1N3018B-1               | 8.2   | 31                                   | 4.5                                 | 700               | .5   | 115   | 50   | 6.2   | 0.070   |
| 1N3019B-1               | 9.1   | 28                                   | 6                                   | 700               | .5   | 105   | 25   | 6.9   | 0.073   |
| 1N3020B-1               | 10  | 25                                   | 7                                   | 700               | .25  | 95  | 25   | 7.6   | 0.076   |
| 1N3021B-1               | 11  | 23                                   | 8                                   | 700               | .25  | 85  | 10   | 8.4   | 0.078   |
| 1N3022B-1               | 12  | 21                                   | 9                                   | 700               | .25  | 80  | 10   | 9.1   | 0.081   |
| 1N3023B-1               | 13  | 19                                   | 10                                  | 700               | .25  | 74  | 10   | 9.9   | 0.085   |
| 1N3024B-1               | 15  | 17                                   | 14                                  | 700               | .25  | 63  | 10   | 11.4  | 0.088   |
| 1N3025B-1               | 16  | 15.5                                 | 16                                  | 700               | .25  | 60  | 10   | 12.2  | 0.089   |
| 1N3026B-1               | 18  | 14                                   | 20                                  | 750               | .25  | 52  | 10   | 13.7  | 0.091   |
| 1N3027B-1               | 20  | 12.5                                 | 22                                  | 750               | .25  | 47  | 10   | 15.2  | 0.092   |
| 1N3028B-1               | 22  | 11.5                                 | 23                                  | 750               | .25  | 43  | 10   | 16.7  | 0.093   |
| 1N3029B-1               | 24  | 10.5                                 | 25                                  | 750               | .25  | 40  | 10   | 18.2  | 0.094   |
| 1N3030B-1               | 27  | 9.5                                  | 35                                  | 750               | .25  | 34  | 10   | 20.6  | 0.096   |
| 1N3031B-1               | 30  | 8.5                                  | 40                                  | 1000              | .25  | 31  | 10   | 22.8  | 0.098   |
| 1N3032B-1               | 33  | 7.5                                  | 45                                  | 1000              | .25  | 28  | 10   | 25.1  | 0.099   |
| 1N3033B-1               | 36  | 7.0                                  | 50                                  | 1000              | .25  | 26  | 10   | 27.4  | 0.100   |
| 1N3034B-1               | 39  | 6.5                                  | 60                                  | 1000              | .25  | 23  | 10   | 29.7  | 0.101   |
| 1N3035B-1               | 43  | 6.0                                  | 70                                  | 1500              | .25  | 21  | 10   | 32.7  | 0.102   |
| 1N3036B-1               | 47  | 5.5                                  | 80                                  | 1500              | .25  | 19  | 10   | 35.8  | 0.102   |
| 1N3037B-1               | 51  | 5.0                                  | 95                                  | 1500              | .25  | 18  | 10   | 38.8  | 0.103   |
| 1N3038B-1               | 56  | 4.5                                  | 110                                 | 2000              | .25  | 17  | 10   | 42.6  | 0.103   |
| 1N3039B-1               | 62  | 4.0                                  | 125                                 | 2000              | .25  | 15  | 10   | 47.1  | 0.104   |
| 1N3040B-1               | 68  | 3.7                                  | 150                                 | 2000              | .25  | 14  | 10   | 51.7  | 0.104   |
| 1N3041B-1               | 75  | 3.3                                  | 175                                 | 2000              | .25  | 12  | 10   | 56.0  | 0.105   |
| 1N3042B-1               | 82  | 3.0                                  | 200                                 | 3000              | .25  | 11  | 10   | 62.2  | 0.106   |
| 1N3043B-1               | 91  | 2.8                                  | 250                                 | 3000              | .25  | 10  | 10   | 69.2  | 0.108   |
| 1N3044B-1               | 100   | 2.5                                  | 350                                 | 3000              | .25  | 9.0   | 10   | 76.0  | 0.11  |
| 1N3045B-1               | 110   | 2.3                                  | 450                                 | 4000              | .25  | 8.3   | 10   | 83.6  | 0.11  |

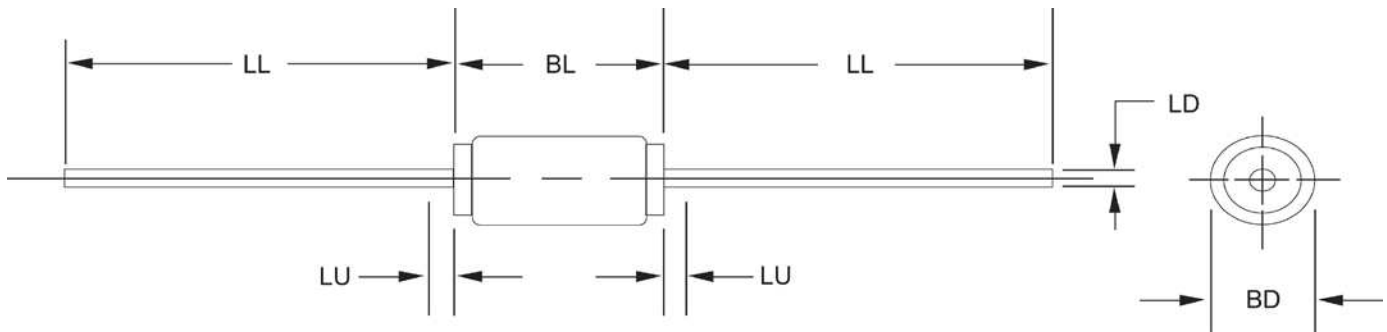
\*JEDEC Registered Data. †Not JEDEC Data.

- 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.

GRAPHS



**FIGURE 1**  
Temperature-Power Derating Curve

**PACKAGE DIMENSIONS**

**NOTES:**

1. Dimensions are in inches. Millimeters are given for general information only.
2. Package contour optional with BD and length BL. Heat slugs, if any, shall be included within this cylinder length but shall not be subject to minimum limit of BD.
3. Within this zone lead, diameter may vary to allow for lead finishes and irregularities other than heat slugs.
4. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi x$  symbology.

| Ltr       | DIMENSIONS |       |             |      | Notes |
|-----------|------------|-------|-------------|------|-------|
|           | INCH       |       | MILLIMETERS |      |       |
|           | Min        | Max   | Min         | Max  |       |
| <b>BD</b> | 0.080      | 0.107 | 2.03        | 2.72 | 2     |
| <b>BL</b> | 0.160      | 0.205 | 4.06        | 5.21 | 2     |
| <b>LD</b> | 0.028      | 0.034 | 0.71        | 0.86 |       |
| <b>LL</b> | 1.000      | -     | 25.40       | -    |       |
| <b>LU</b> | -          | 0.050 | -           | 1.27 | 3     |