



## Temperature Compensated Zener Reference Diodes

Qualified per MIL-PRF-19500/156

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

### DESCRIPTION

The popular 1N935B-1 through 1N938B-1 series of Zero-TC (Temperature Compensated) reference diodes provides a selection of 9.0 V nominal voltages and temperature coefficients to as low as 0.001 %/°C for minimal voltage change with temperature when operated at 7.5 mA. These glass axial-leaded DO-35 reference diodes are also available in JAN, JANTX, JANTXV and JANS military qualifications. For commercial applications it is also available as RoHS compliant.

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

### FEATURES

- JEDEC registered 1N935 through 1N938 number series.
- Standard reference voltage of 9.0V +/- 5%.
- Temperature compensated.
- Internal metallurgical bond.
- Double plug construction.
- JAN, JANTX, JANTXV and JANS qualification are available per MIL-PRF-19500/156.
- RoHS compliant versions available (commercial grade only).

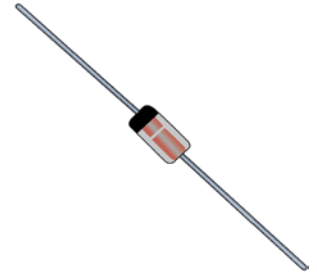
### APPLICATIONS / BENEFITS

- Provides minimal voltage changes over a broad temperature range.
- For instrumentation and other circuit designs requiring a stable voltage reference.
- Maximum temperature coefficient selections available from 0.01 %/°C to 0.001 %/°C.
- Flexible axial-lead mounting terminals.
- Non-sensitive to ESD per MIL-STD-750 method 1020.

### MAXIMUM RATINGS @ T<sub>A</sub> = 25 °C unless otherwise stated


Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage temperature	T <sub>J</sub> and T <sub>STG</sub>	-65 to +175	°C
Power Dissipation <sup>(1)</sup>	P <sub>D</sub>	500	mW
Maximum Zener Current	I <sub>ZM</sub>	50	mA
Solder Pad Temperatures at 10 s	T <sub>SP</sub>	260	°C

**Notes:** 1. @ T<sub>L</sub> = 50 °C maximum (see [figure 1](#)). For optimum voltage-temperature stability, I<sub>Z</sub> = 7.5 mA (less than 50 mW in dissipated power). Derate at 3.33 mW/°C above T<sub>A</sub> = +25 °C.



**DO-35 (DO-204AH)  
Package**

Also available in:

 **DO-213AA MELF**  
(surface mount)  
[1N935BUR-1 – 1N938BUR-1](#)

#### MSC – Lawrence

6 Lake Street,  
Lawrence, MA 01841  
1-800-446-1158  
Tel: (978) 620-2600  
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#### MSC – Ireland

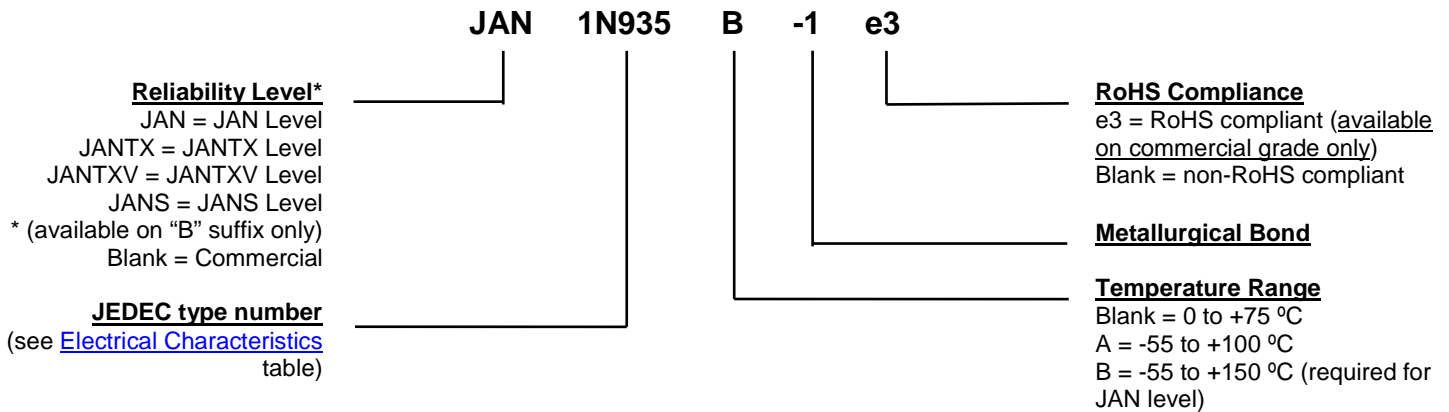
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**Website:**

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

**MECHANICAL and PACKAGING**

- CASE: Hermetically sealed glass case. DO-35 (DO-204AH) package.
- TERMINALS: Tin-lead or RoHS compliant annealed matte-tin plating (commercial grade only) over copper clad steel. Solderable per MIL-STD-750, method 2026.
- MARKING: Part number and cathode band.
- POLARITY: Reference diode to be operated with the banded (cathode) end positive with respect to the opposite end.
- TAPE & REEL option: Standard per EIA-296 (add “TR” suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 0.2 grams.
- See [package dimensions](#) on last page.

**PART NOMENCLATURE**

**SYMBOLS & DEFINITIONS**

Symbol	Definition
$I_{ZM}$	Maximum Zener Current: The maximum rated dc current for the specified power rating.
$I_Z, I_{ZT}, I_{ZK}$	Regulator Current: The dc regulator current ( $I_Z$ ), at a specified test point ( $I_{ZT}$ ), near breakdown knee ( $I_{ZK}$ ).
$V_Z$	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.

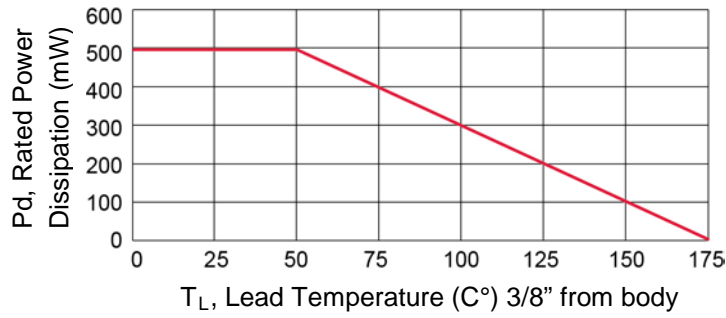
**ELECTRICAL CHARACTERISTICS @ 25 °C unless otherwise specified**

MIL-PRF-19500/156	JEDEC TYPE NUMBER	ZENER VOLTAGE	ZENER TEST CURRENT	MAXIMUM ZENER IMPEDANCE (Note 1)	VOLTAGE TEMPERATURE STABILITY $\Delta V_{ZT}$ MAXIMUM (Note 2)	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT $\alpha_{vz}$
		$V_Z @ I_{ZT}$	$I_{ZT}$	$Z_{ZT}$			
		Volts	mA	Ohms	mV	°C	% / °C
1N935B-1	1N935-1	8.55 – 9.45	7.5	20	67	0 to +75	0.01
	1N935A-1	8.55 – 9.45	7.5	20	139	-55 to +100	0.01
	1N935B-1	8.55 – 9.45	7.5	20	184	-55 to +150	0.01
	1N936-1	8.55 – 9.45	7.5	20	34	0 to +75	0.055
	1N936A-1	8.55 – 9.45	7.5	20	70	-55 to +100	0.005
	1N936B-1	8.55 – 9.45	7.5	20	92	-55 to +150	0.005
1N937B-1	1N937-1	8.55 – 9.45	7.5	20	13	0 to +75	0.002
	1N937A-1	8.55 – 9.45	7.5	20	28	-55 to +100	0.002
	1N937B-1	8.55 – 9.45	7.5	20	37	-55 to +150	0.002
1N938B-1	1N938-1	8.55 – 9.45	7.5	20	6.7	0 to +75	0.001
	1N938A-1	8.55 – 9.45	7.5	20	13.9	-55 to +100	0.001
	1N938B-1	8.55 – 9.45	7.5	20	19	-55 to +150	0.001

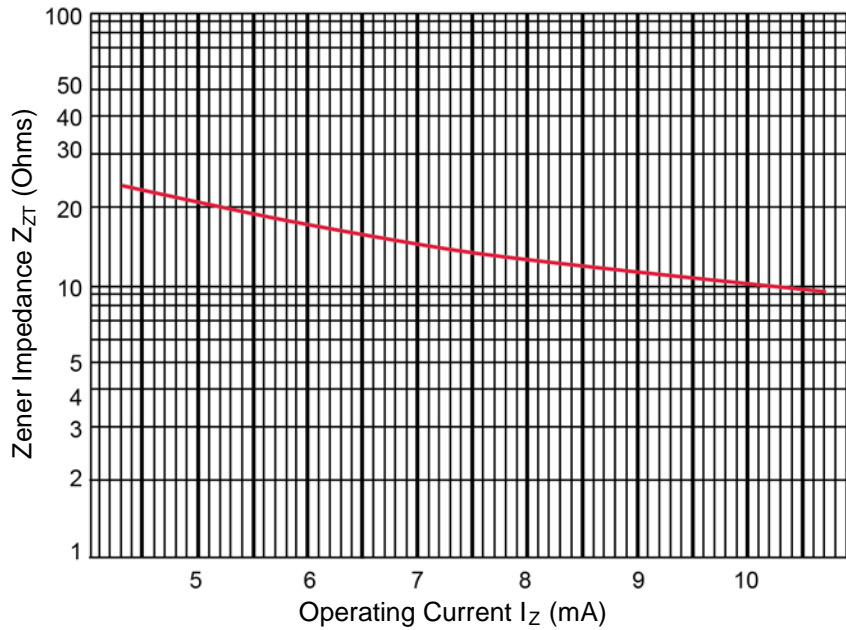
**NOTE 1:** Zener impedance is derived by superimposing on  $I_{ZT}$  A 60 Hz rms ac current equal to 10% of  $I_{ZT}$ .

**NOTE 2:** The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV at any discrete temperature between the established limits, per JEDEC standard No. 5.

GRAPHS

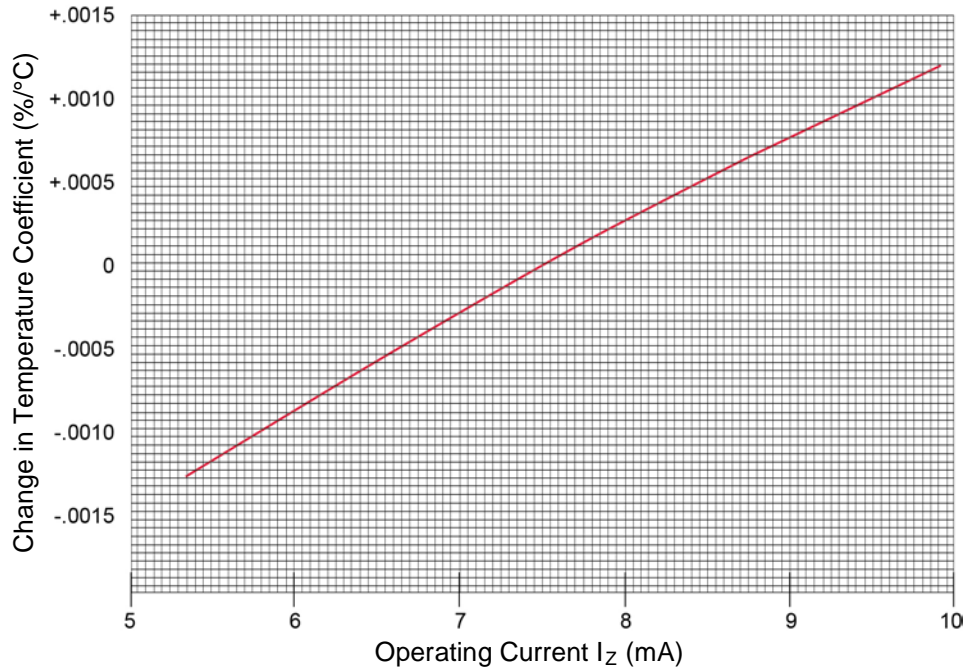


**FIGURE 1**  
Power Derating Curve

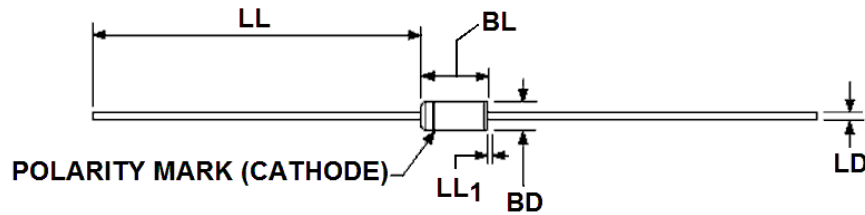


**FIGURE 2**  
Zener Impedance vs. Operating Current

GRAPHS



**FIGURE 3**  
Typical Change of Temperature Coefficient with Change in Operating Current

**PACKAGE DIMENSIONS**


Ltr	Dimensions				Notes
	Inch		Millimeters		
	Min	Max	Min	Max	
<b>BD</b>	0.060	0.075	1.52	1.91	3
<b>BL</b>	0.140	0.180	3.56	4.57	3
<b>LD</b>	0.018	0.022	0.46	0.56	
<b>LL</b>	1.000	1.500	25.40	38.10	
<b>LL<sub>1</sub></b>		0.050		1.27	4

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Package contour optional within BD and length BL. Heat slugs, if any shall be included within this cylinder but shall not be subject to minimum limit of BD.
4. Within this zone, lead diameter may vary to allow for lead finishes and irregularities, other than heat slugs.
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.
6. The dimensions shown are tighter in tolerance than dimensions shown in the military slash sheet (/156) since Microsemi now only offers the smaller DO-35 package option rather than the larger DO-7.