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RoHS
Available on commercial versions

6.2 & 6.55 Volt Zener Reference Diodes

Qualified per MIL-PRF-19500/159

**Qualified Levels:*
JAN, JANTX, JANTXV and JANS
(available on some part numbers)

DESCRIPTION

The popular 1N821-1 – 1N829A-1 series of temperature compensated reference diodes provides both 6.2 V and 6.55 V nominal voltages and temperature coefficients as low as 0.0005 %/ºC at a Zener test current of 7.5 mA. These DO-35 packaged (glass, axial leaded) reference diodes are optionally available as RoHS compliant. This type of bonded Zener package construction is also available in JAN, JANTX, JANTXV and JANS military qualifications where the RoHS compliant "e3" is not an option. Microsemi also offers other Zener Reference Diode products for a variety of voltages up to 200 V.

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

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

Also available in:

DO-213AA MELF
(surface mount)
1N821UR-1 – 1N829AUR-1

FEATURES

- JEDEC registered 1N821 – 1N829 series.
- Zener impedance values of 10 ohms and 15 ohms are available.
- Reference voltage selection of 6.2 V & 6.55 V +/-5% with further tight tolerance options on commercial at lower voltage. (Excludes 1N826 and 1N828.)
- Temperature compensated.
- Internal metallurgical bond.
- Double plug construction.
- *JAN, JANTX, JANTXV and JANS qualification per MIL-PRF-19500/159 available on 1N821-1, 823-1, 825-1, 827-1 and 829-1.
- 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 %/ºC to 0.0005 %/ºC.
- Tight reference voltage tolerances of 1%, 2%, 3%, etc, available on commercial with center nominal value of 6.2 V by special request. (Excludes 1N826 and 1N828.)
- Flexible axial-lead mounting terminals.
- Non-sensitive to ESD per MIL-STD-750 method 1020.
- Typical low capacitance of 100 pF or less.

MAXIMUM RATINGS @ T_A = +25 ºC unless otherwise specified

Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage temperature	T_J and T_{STG}	-55 to +175	°C
Power Dissipation (1)	P_D	500	mW
Maximum Zener Current	I_{ZM}	70	mA
Solder Pad Temperatures at 10 s	T_{SP}	260	°C

Notes: 1. At T_L = 25 °C and maximum current I_{ZM} of 70 mA. For optimum voltage-temperature stability, I_Z = 7.5 mA (less than 50 mW in dissipated power). Derate at 3.33 mW/°C above T_A = +25 °C.

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MECHANICAL and PACKAGING

- CASE: Hermetically sealed glass case. DO-35 (DO-204AH) package.
- TERMINALS: Tin-lead (military) or RoHS compliant annealed matte-tin plating (commercial grade only) solderable per MIL-STD-750, method 2026.
- MARKING: Part number and cathode band (except double anode 1N822-1 and 1N824-1).
- POLARITY: Reference diode to be operated with the banded 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

Applicable to: JAN, JANTX, JANTXV and JANS of 1N821, 1N823, 1N825, 1N827, and 1N829 only:

JAN 1N821 -1

Reliability Level
JAN = JAN Level
JANTX = JANTX Level
JANTXV = JANTXV Level
JANS = JANS Level
Blank = Commercial

Metallurgical Bond

JEDEC type number
(see Electrical Characteristics table)

Applicable to: commercial 1N821, 1N823, 1N825, 1N827, and 1N829 only:

1N821 A -1 (e3)

JEDEC type number
(see Electrical Characteristics table)

Zener Impedance
A = 10 ohms
Blank = 15 ohms

RoHS Compliance
e3 = RoHS compliant
Blank = non-RoHS compliant

Metallurgical Bond

Applicable to: 1N822, 1N824, 1N826 and 1N828 only:

1N822 -1 (e3)

JEDEC type number
(see Electrical Characteristics table)

Metallurgical Bond

RoHS Compliance
e3 = RoHS compliant
Blank = non-RoHS compliant

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}).
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)

JEDEC TYPE NUMBER	ZENER VOLTAGE V_Z @ I_{ZT} (Note 3)	ZENER TEST CURRENT I_{ZT}	MAXIMUM ZENER IMPEDANCE Z_{ZT} @ I_{ZT} (Note 1)	MAXIMUM REVERSE CURRENT I_R @ 3 V	VOLTAGE TEMPERATURE STABILITY (ΔV_{ZT} MAX) -55°C to +100°C (Note 2 and 3)	EFFECTIVE TEMPERATURE COEFFICIENT α_{VZ}
	Volts	mA	Ohms	µA	mV	% / °C
1N821-1	5.89-6.51	7.5	15	2	96	0.01
1N821A-1	5.89-6.51	7.5	10	2	96	0.01
1N822-1†	5.9-6.5	7.5	15	2	96	0.01
1N823-1	5.89-6.51	7.5	15	2	48	0.005
1N823A-1	5.89-6.51	7.5	10	2	48	0.005
1N824-1†	5.9-6.5	7.5	15	2	48	0.005
1N825-1	5.89-6.51	7.5	15	2	19	0.002
1N825A-1	5.89-6.51	7.5	10	2	19	0.002
1N826-1	6.2-6.9	7.5	15	2	20	0.002
1N827-1	5.89-6.51	7.5	15	2	9	0.001
1N827A-1	5.89-6.51	7.5	10	2	9	0.001
1N828-1	6.2-6.9	7.5	15	2	10	0.001
1N829-1	5.89-6.51	7.5	15	2	5	0.0005
1N829A-1	5.89-6.51	7.5	10	2	5	0.0005

† Double Anode: Electrical specifications apply under both bias polarities.

NOTES:
1. Zener impedance is measured by superimposing 0.75 mA ac rms on 7.5 mA dc @ 25 °C.
2. The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the specified mV change at any discrete temperature between the established limits.
3. Voltage measurements to be performed 15 seconds after application of dc current.

GRAPHS

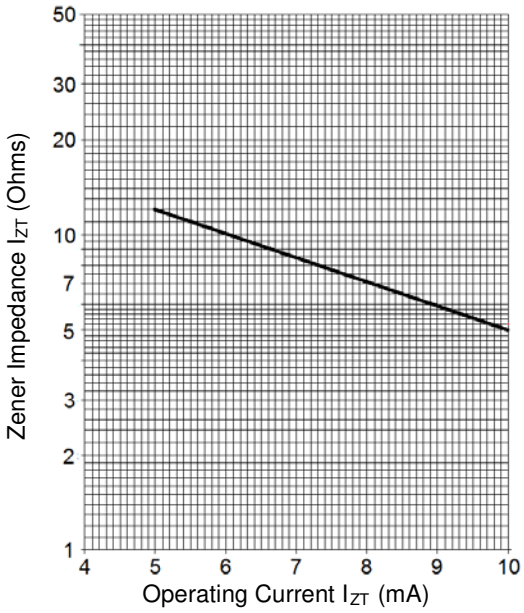


FIGURE 1
TYPICAL ZENER IMPEDANCE vs OPERATING CURRENT

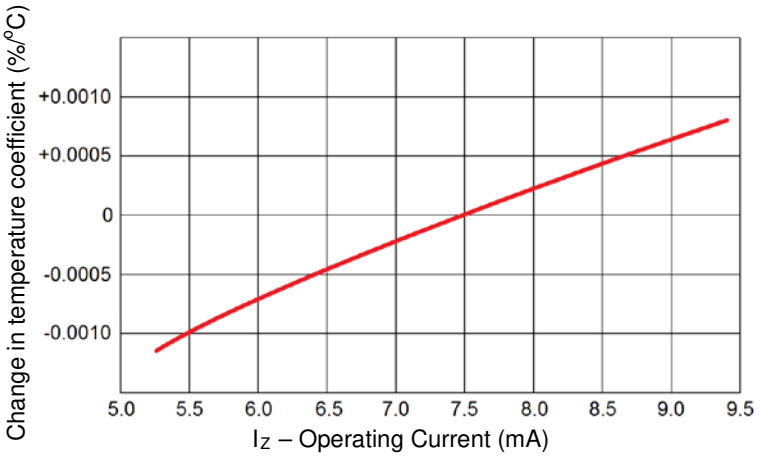


FIGURE 2
TYPICAL CHANGE OF TEMPERATURE COEFFICIENT
WITH CHANGE IN OPERATING CURRENT

The curve shown in Figure 2 is typical of the diode series and greatly simplifies the estimation of the Temperature Coefficient (TC) when the diode is operated at currents other than 7.5 mA.
EXAMPLE: A diode in this series is operated at a current of 7.5 mA and has specified Temperature Coefficient (TC) limits of +/-0.005 %/°C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 6.0mA, the new TC limits (%/°C) can be estimated using the graph in Figure 2. At a test current of 6.0mA the change in Temperature Coefficient (TC) is approximately –0.0006 %/°C. The algebraic sum of +/-0.005 %/°C and –0.0006 %/°C gives the new estimated limits of +0.0044 %/°C and -0.0056 %/°C.

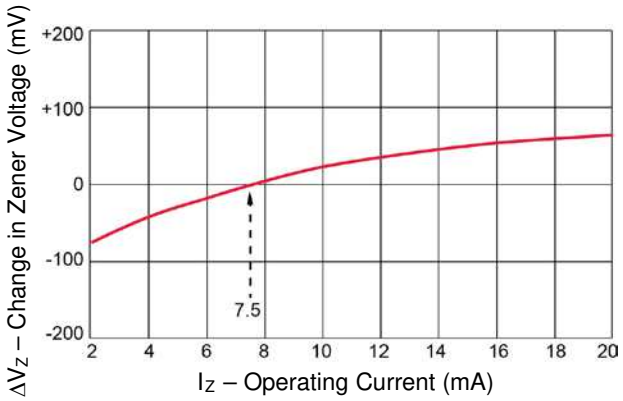
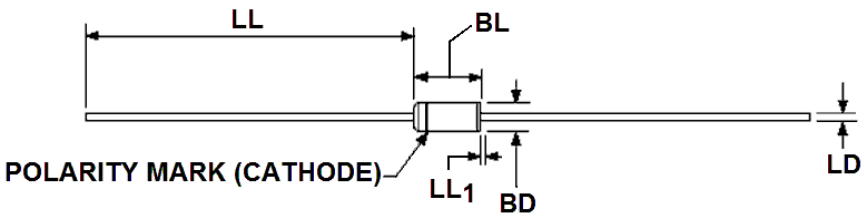


FIGURE 3
TYPICAL CHANGE OF ZENER VOLTAGE
WITH CHANGE IN OPERATING CURRENT

This curve in Figure 3 illustrates the change of diode voltage arising from the effect of impedance. It is in effect an exploded view of the Zener operating region of the I-V characteristic.

In conjunction with Figure 2, this curve can be used to estimate total voltage regulation under conditions of both varying temperature and current.

PACKAGE DIMENSIONS



Ltr	Dimensions				Notes
	Inch		Millimeters		
	Min	Max	Min	Max	
BD	0.055	0.090	1.40	2.29	3
BL	0.120	0.200	3.05	5.08	3
LD	0.018	0.022	0.46	0.56	
LL	1.000	1.500	25.40	38.10	
LL_1		0.050		1.27	4

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for 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 Φx symbology.