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SCOTTSDALE DIVISION

# 1N821 thru 1N829A-1 DO-35

## 6.2 & 6.55 Volt Temperature Compensated Zener Reference Diodes

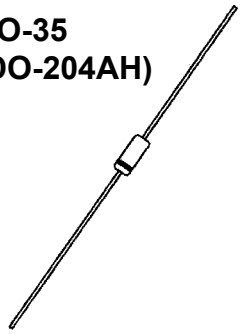
ALSO AVAILABLE IN SURFACE MOUNT

## DESCRIPTION

The popular 1N821 thru 1N829A series of Zero-TC Reference Diodes provides a selection of both 6.2 V and 6.55 V nominal voltages and temperature coefficients to as low as 0.0005%/°C for minimal voltage change with temperature when operated at 7.5 mA. These glass axial-leaded DO-35 reference diodes are optionally available with an internal-metallurgical-bond by adding a "-1" suffix. This type of bonded Zener package construction is also available in JAN, JANTX, and JANTXV military qualifications. Microsemi also offers numerous other Zener Reference Diode products for a variety of other voltages up to 200 V.

## APPEARANCE

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



**IMPORTANT:** For the most current data, consult *MICROSEMI's* website: http://www.microsemi.com

## FEATURES

- JEDEC registered 1N821 thru 1N829 series
- Internal metallurgical bond option available by adding a "-1" suffix
- Reference voltage selection of 6.2 V & 6.55 V +/-5% with further tight tolerance options at lower voltage
- 1N821, 823, 825, 827 and 829 also have qualification to MIL-PRF-19500/159 by adding the JAN, JANTX, or JANTXV prefixes to part numbers a well as the "-1" suffix; e.g. JANTX1N829-1, etc.
- Military surface mount equivalents also available in DO-213AA by adding UR-1 suffix and the JAN, JANTX, and JANTXV prefix, e.g. JANTX1N829UR-1 (see separate data sheet)
- Also available in DO-7 package including military qualifications up to JANS (see separate data sheet)
- JANS equivalent available in DO-35 via SCD

## 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 available with center nominal value of 6.15 V by adding designated tolerance such as 1%, 2%, 3%, etc. after the part number for identification
  e.g. 1N827-2%, 1N829A-1-1%, 1N829-1-1%, etc.
- Flexible axial-lead mounting terminals
- Nonsensitive to ESD per MIL-STD-750 Method 1020
- Typical low capacitance of 100 pF or less

## MAXIMUM RATINGS

- Operating Temperatures: -65°C to +175°C
- Storage Temperatures: -65°C to +175°C
- DC Power Dissipation: 500 mW @ $T_L$ = 25°C and maximum current $I_{ZM}$ of 70 mA. NOTE: For optimum voltage-temperature stability, $I_Z$ = 7.5 mA (less than 50 mW in dissipated power)
- Solder Temperatures: 260°C for 10 s (max)

## MECHANICAL AND PACKAGING

- CASE: Hermetically sealed glass case. DO-35 (DO-204AH) package
- TERMINALS: Leads, tin-lead plated solderable per MIL-STD-750, Method 2026
- MARKING: Part number and cathode band (except double anode 1N822 and 1N824)
- 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)
- WEIGHT: 0.2 grams.
- See package dimensions on last page



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# 1N821 thru 1N829A-1 DO-35

## 6.2 & 6.55 Volt Temperature Compensated Zener Reference Diodes

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

| JEDEC TYPE NUMBER (Note 1 & 5) | ZENER VOLTAGE (Note 1 and 4) $V_Z$ @ $I_{ZT}$ | ZENER TEST CURRENT $I_{ZT}$ | MAXIMUM ZENER IMPEDANCE (Note 2) $Z_{ZT}$ @ $I_{ZT}$ | MAXIMUM REVERSE CURRENT $I_R$ @ 3 V | VOLTAGE TEMPERATURE STABILITY ($\Delta V_{ZT}$ MAX) -55°C to +100°C (Note 3 and 4) | EFFECTIVE TEMPERATURE COEFFICIENT $\alpha_{VZ}$ |
|---|---|---|---|---|---|---|
| | VOLTS | mA | OHMS | µA | mV | %/°C |
| 1N821 | 5.9 – 6.5 | 7.5 | 15 | 2.0 | 96 | 0.01 |
| 1N821A | 5.9 – 6.5 | 7.5 | 10 | 2.0 | 96 | 0.01 |
| 1N822† | 5.9 – 6.5 | 7.5 | 15 | 2.0 | 96 | 0.01 |
| 1N823 | 5.9 – 6.5 | 7.5 | 15 | 2.0 | 48 | 0.005 |
| 1N823A | 5.9 – 6.5 | 7.5 | 10 | 2.0 | 48 | 0.005 |
| 1N824† | 5.9 – 6.5 | 7.5 | 15 | 2.0 | 48 | 0.005 |
| 1N825 | 5.9 – 6.5 | 7.5 | 15 | 2.0 | 19 | 0.002 |
| 1N825A | 5.9 – 6.5 | 7.5 | 10 | 2.0 | 19 | 0.002 |
| 1N826 | 6.2 – 6.9 | 7.5 | 15 | 2.0 | 20 | 0.002 |
| 1N827 | 5.9 – 6.5 | 7.5 | 15 | 2.0 | 9 | 0.001 |
| 1N827A | 5.9 – 6.5 | 7.5 | 10 | 2.0 | 9 | 0.001 |
| 1N828 | 6.2 – 6.9 | 7.5 | 15 | 2.0 | 10 | 0.001 |
| 1N829 | 5.9 – 6.5 | 7.5 | 15 | 2.0 | 5 | 0.0005 |
| 1N829A | 5.9 – 6.5 | 7.5 | 10 | 2.0 | 5 | 0.0005 |

*JEDEC Registered Data.

†Double Anode; electrical specifications apply under both bias polarities.

**NOTES:**

1. Add a "-1" suffix for internal metallurgical bond. When ordering devices with tighter tolerances than specified for the $V_Z$ voltage nominal of 6.15 V, add a hyphened suffix to the part number for desired tolerance, e.g. 1N827-1-2%, 1N829-1-1%, 1N829A-1%, 1N829A-1-1%, etc.
2. Zener impedance is measured by superimposing 0.75 mA ac rms on 7.5 mA dc @ 25°C.
3. 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.
4. Voltage measurements to be performed 15 seconds after application of dc current.
5. 1N821, 1N823, 1N825, 1N827, and 1N829 also have qualification to MIL-PRF-19500/159 by adding the JAN, JANTX, or JANTXV prefix to part numbers as well as the "-1" suffix; e.g. JANTX1N827-1, JANTXV1N829-1, etc.



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## GRAPHS

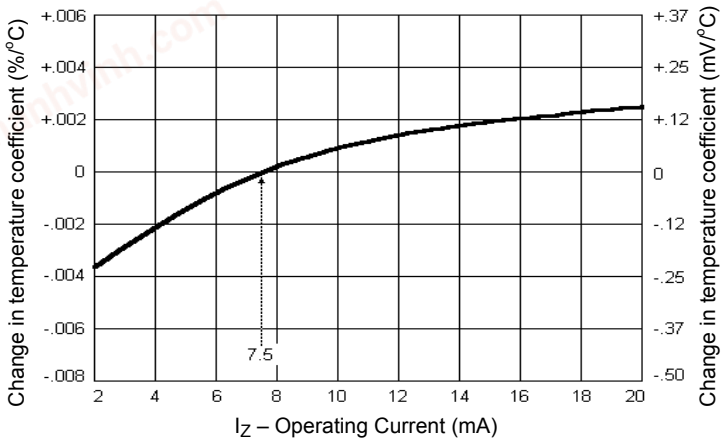



**FIGURE 2**
TYPICAL CHANGE OF TEMPERATURE COEFFICIENT WITH CHANGE IN OPERATING CURRENT.

*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 7.5mA.*

*EXAMPLE: A diode in this series is operated at a current of 7.5mA 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%/oC and -0.0056%/oC.*

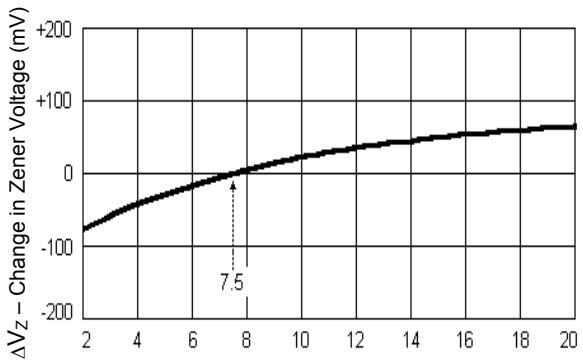
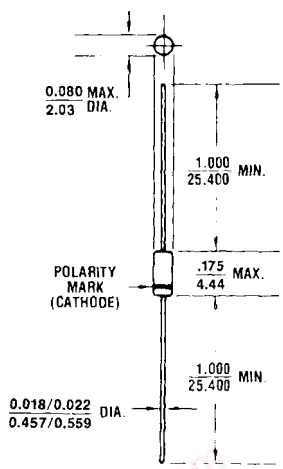



**FIGURE 3**
TYPICAL CHANGE OF ZENER VOLTAGE WITH CHANGE IN OPERATING CURRENT

*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.*

## DIMENSIONS




All dimensions in INCH
mm



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