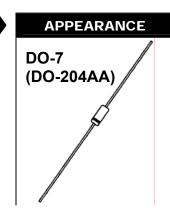


# 8.4 Volt Temperature Compensated Zener Reference Diodes

# **DESCRIPTION**

The popular 1N3154 thru 1N3157A series of Zero-TC Reference Diodes provides a selection of 8.4 V nominal voltages and temperature coefficients to as low as 0.001 %/°C for minimal voltage change with temperature when operated at 10.0 mA. These glass axial-leaded DO-7 reference diodes are also available in JAN, JANTX, and JANTXV military qualifications. As a further option for commercial product, they are available as RoHS Compliant with an e3 suffix added to the part number. Microsemi also offers numerous other Zener Reference Diode products for a variety of other voltages from 6.2 V to 200 V.



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

#### **FEATURES**

- JEDEC registered 1N3154 thru 1N3157A series
- Standard reference voltage of 8.4V +/- 5% with tighter tolerances available
- 1N3154, 3155, 3156, and 3157 also have military qualification to MIL-PRF-19500/158 up to the JANTXV level by adding JAN, JANTX, or JANTXV prefixes to part numbers as well as "-1" suffix, e.g. JANTX1N3157-1, etc.
- Internal metallurgical bonds
- JANS Equivalent available via SCD
- Radiation Hardened devices available by changing 1N prefix to RH, e.g. RH3156, RH3157, RH3157A, etc. Also consult factory for "RH" data sheet brochure
- RoHS Compliant devices available by adding an "e3" suffix (not applicable to military)

# **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
- Tight reference voltage tolerances at the 8.4 V nominal is available by adding tolerance 1%, 2%, 3%, etc. after the part number for identification e.g. 1N3156-2%, 1N3157A-1%, 1N3157-1-1%, etc.
- · Flexible axial-lead mounting terminals
- Nonsensitive to ESD per MIL-STD-750 Method 1020

#### **MAXIMUM RATINGS**

- Operating & StorageTemperature: -65°C to +175°C
- DC Power Dissipation: 500 mW @ T<sub>L</sub> = 25°C and maximum current I<sub>ZM</sub> of 55 mA. NOTE: For optimum voltage-temperature stability, I<sub>Z</sub> = 10.0 mA (less than 90 mW in dissipated power)
- Solder temperatures: 260 °C for 10 s (maximum)

#### **MECHANICAL AND PACKAGING**

- CASE: Hermetically sealed glass case with DO-7 (DO-204AA) package
- TERMINALS: Tin-Lead (military) or RoHS Compliant annealed matte-Tin plating solderable per MIL-STD-750, Method 2026
- MARKING: Part number and cathode band
- 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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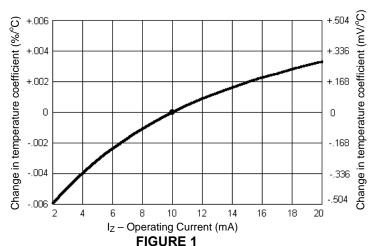
*ELECTRICAL CHARACTERISTICS @ 25°C, unless otherwise specified							
JEDEC TYPE NUMBERS (Notes 1, 5 & 6)	ZENER VOLTAGE V <sub>z</sub> @ I <sub>zT</sub> (Note 1)	ZENER TEST CURRENT I <sub>ZT</sub>	MAXIMUM ZENER IMPEDANCE (Note 2) Z <sub>ZT</sub>	MAXIMUM REVERSE CURRENT I <sub>R</sub> @ 5.5 V	VOLTAGE TEMPERATURE STABILITY (Note 3 & 4) ΔV <sub>ZT</sub> MAXIMUM	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α <sub>VZ</sub>
	VOLTS	mA	OHMS	μΑ	mV	°C	%/°C
1N3154	8.00-8.80	10	15	10	130	-55 to +100	0.01
1N3154A	8.00-8.80	10	15	10	172	-55 to +150	0.01
1N3155	8.00-8.80	10	15	10	65	-55 to +100	0.005
1N3155A	8.00-8.80	10	15	10	86	-55 to +150	0.005
1N3156	8.00-8.80	10	15	10	26	-55 to +100	0.002
1N3156A	8.00-8.80	10	15	10	34	-55 to +150	0.002
1N3157	8.00-8.80	10	15	10	13	-55 to +100	0.001
1N3157A	8.00-8.80	10	15	10	17	-55 to +150	0.001

\*JEDEC Registered Data.

#### NOTES:

- When ordering devices with tighter tolerance than specified, add a hyphenated suffix to the part number for desired tolerance, e.g. 1N3156-2%, 1N3157A-1%, 1N3157-1-1%, etc.
- Measured by superimposing 1.0 mA ac rms on 10 mA dc @ 25°C. 2.
- The maximum allowable change observed over the entire temperature range i.e., the diode voltage will not exceed the 3. specified mV change at any discrete temperature between the established limits.
- Voltage measurements to be performed 15 seconds after application of dc current. 4.
- The 1N3154, 1N3155, 1N3156, and 1N3157 also have military qualification to MIL-PRF-19500/158 up to the JANTXV level by adding JAN, JANTX, or JANTXV prefix to part numbers as well as "-1" suffix, e.g. JANTX1N3156-1, JANTXV1N3157-1, etc. Designate Radiation Hardened devices with "RH" prefix instead of "IN", i.e. RH3157A instead of 1N3157A.

## **GRAPHS**



TYPICAL CHANGE OF TEMPERATURE COEFFICIENT WITH CHANGE IN OPERATING CURRENT.

The curve shown in Figure 1 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 10mA.

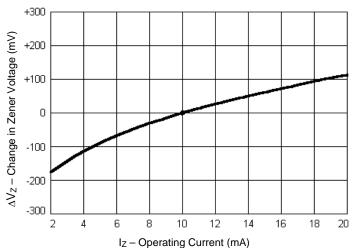
EXAMPLE: A diode in this series is operated at a current of 10mA and has specified Temperature Coefficient (TC) limits of +/-0.005%/°C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 7.5mA, the new TC limits (%/°C) can be estimated using the graph in FIGURE 1.

At a test current of 7.5mA the change in Temperature Coefficient (TC) is approximately -0.0012%.°C. The algebraic sum of +/-0.005%°C and -0.0012%/°C gives the new estimated limits of +0.0038%/oC and -0.0062%/oC.



# 1N3154 thru 1N3157, A, -1, e3

# 8.4 Volt Temperature Compensated Zener Reference Diodes



This curve in Figure 2 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 1, this curve can be used to estimate total voltage regulation under conditions of both varying temperature and current.

# FIGURE 2 TYPICAL CHANGE OF ZENER VOLTAGE WITH CHANGE IN OPERATING CURRENT.

# **DIMENSIONS**

