



11.7 Volt Temperature Compensated **Zener Reference Diodes**

Qualified per MIL-PRF-19500/157

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

DESCRIPTION

The popular 1N941UR-1 thru 1N945BUR-1 series of zero-TC reference diodes provides a selection of 11.7 V nominal voltages and temperature coefficients to as low as 0.0002 %/°C for minimal voltage change with temperature when operated at 7.5 mA. Some of these glass, DO-213AA reference diodes are also available in JAN, JANTX, JANTXV and JANS military qualifications. Microsemi also offers numerous other Zener reference diode products for a variety of other voltages from 6.2 V to 200 V.



DO-213AA

Package

Also available in:

DO-35 (DO-204AH)

(axial-leaded)

1N941-1 thru1N945B-1

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

FEATURES

- Surface mount equivalent of the JEDEC registered 1N941 thru 1N945 series.
- Standard reference voltage of 11.7 V +/- 5% with tighter reference tolerances of 1%, 2%, and 3% available on commercial level only.
- Internal metallurgical bond.
- JAN, JANTX, JANTXV and JANS qualification per MIL-PRF-19500/157 available on 1N941BUR-1, 1N943BUR-1, 1N944BUR-1, and 1N945BUR-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 %/°C to 0.0005 %/°C.
- Non-sensitive to ESD per MIL-STD-750, method 1020.

MAXIMUM RATINGS

Parameters/Test Conditions	Symbol	Value	Unit
Power Dissipation @ $T_L = 25$ °C and maximum current I_{ZM} of 39 mA. (1, 2)	P _D	500	mW
Junction and Storage Temp	T_J and T_STG	-55 to +175	°C
Maximum Zener Current	I _{ZM}	39	mA
Solder Temperature @ 10 s	T _{SP}	260	°C

Notes: 1. For optimum voltage-temperature stability, Iz = 7.5 mA (less than 95 mW in dissipated power).

2. Derate at 3.33 mW/ $^{\circ}$ C above T_A = +25 $^{\circ}$ C.

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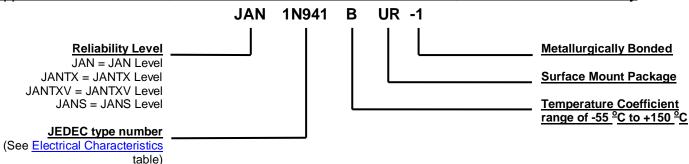


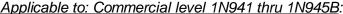
MECHANICAL and PACKAGING

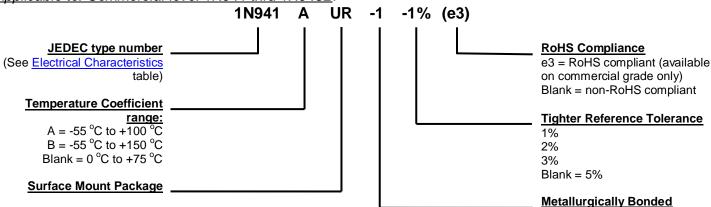
- CASE: Hermetically sealed glass case with surface mount DO-213AA (MELF, SOD-80, LL34) package.
- TERMINALS: Tin-lead plated or RoHS compliant matte-tin plating available (on commercial grade only) and solderable per MIL-STD-750, method 2026.
- MARKING: Cathode band.
- POLARITY: Reference diode to be operated with the banded end positive with respect to the opposite end.
- MOUNTING SURFACE SELECTION: The Axial Coefficient of Expansion (COE) of this device is approximately +6PPM/°C. The COE of the mounting surface system should be selected to provide a suitable match with this device.
- TAPE & REEL option: Standard per EIA-481-B with 12 mm tape. Consult factory for quantities. (Add "TR" suffix to part number.)
- · WEIGHT: 0.2 grams.
- See Package Dimensions on the last page.

PART NOMENCLATURE

Applicable to: JAN, JANTX, JANTXV and JANS level 1N941B, 1N943B, 1N944B, and 1N945B only:









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 (Iz) in its breakdown region.			
V_{ZT}	Zener Voltage Temperature.			
Z _{ZT} or Z _{ZK}	Dynamic Impedance: The small signal impedance of the diode when biased to operate in its breakdown region at a			
ZZT OI ZZK	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 (Notes 4)	ZENER VOLTAGE V _Z @ I _{ZT} (Note 3) Volts	ZENER TEST CURRENT I _{ZT}	MAXIMUM ZENER IMPEDANCE Z _{ZT} @ I _{ZT} (Note 1) Ohms	MAXIMUM REVERSE CURRENT I _R @ 8 V	VOLTAGE TEMPERATURE STABILITY ΔV_{ZT} MAXIMUM (Note 2 & 3) mV	TEMPERATURE RANGE	EFFECTIVE TEMPERATURE COEFFICIENT α _{VZ}
1N941UR-1	11.12 - 12.28	7.5	30	μ Α 15	88	_	0.01
1N941AUR-1	_	_		15		0 to +75	
	11.12 - 12.28	7.5	30	_	181	-55 to +100	0.01
1N941BUR-1	11.12 -12.28	7.5	30	15	239	-55 to +150	0.01
1N942UR-1	11.12 - 12.28	7.5	30	15	44	0 to +75	0.005
1N942AUR-1	11.12 - 12.28	7.5	30	15	90	-55 to +100	0.005
1N942BUR-1	11.12 - 12.28	7.5	30	15	120	-55 to +150	0.005
1N943UR-1	11.12 -12.28	7.5	30	15	18	0 to +75	0.002
1N943AUR-1	11.12 - 12.28	7.5	30	15	36	-55 to +100	0.002
1N943BUR-1	11.12 - 12.28	7.5	30	15	47	-55 to +150	0.002
1N944UR-1	11.12 - 12.28	7.5	30	15	9	0 to +75	0.001
1N944AUR-1	11.12 - 12.28	7.5	30	15	18	-55 to +100	0.001
1N944BUR-1	11.12 - 12.28	7.5	30	15	24	-55 to +150	0.001
1N945UR-1	11.12 - 12.28	7.5	30	15	4	0 to +75	0.0005
1N945AUR-1	11.12 - 12.28	7.5	30	15	9	-55 to +100	0.0005
1N945BUR-1	11.12 - 12.28	7.5	30	15	12	-55 to +150	0.0005

^{*}JEDEC Registered Data.

NOTES:

- 1. 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.
- The 1N941BUR-1, 1N943BUR-1, 1N944BUR-1, and 1N945BUR-1 only are military qualified to MIL-PRF-19500/157 up to the JANS level.



GRAPHS

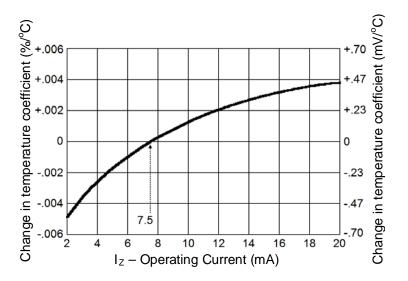


FIGURE 1

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 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 +/-0.002 % C. To obtain the typical Temperature Coefficient limits for this same diode operated at a current of 6.0 mA, the new TC limits (% C) can be estimated using the graph in Figure 1.

At a test current of 6.0mA the change in Temperature Coefficient (TC) is approximately – 0.0009 %°C. The algebraic sum of +/-0.002 %°C and –0.0009 %°C gives the new estimated limits of +0.0011 %°C and -0.0029 %°C.

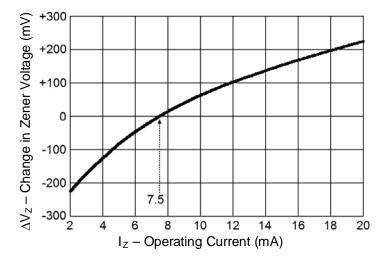


FIGURE 2

TYPICAL CHANGE OF ZENER VOLTAGE
WITH CHANGE IN OPERATING CURRENT

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



GRAPHS

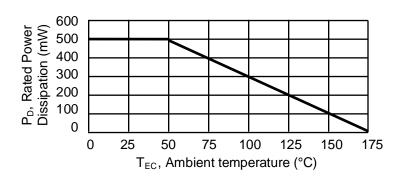


FIGURE 3
POWER DERATING CURVE

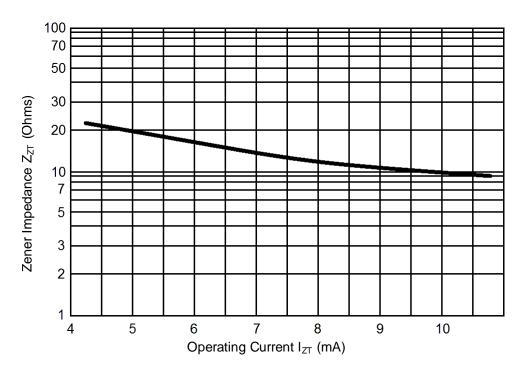
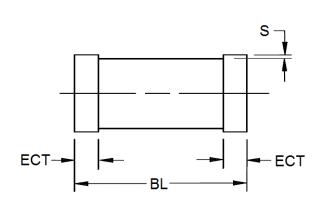


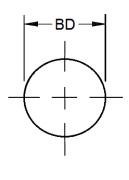
FIGURE 4

TYPICAL ZENER IMPEDANCE VS. OPERATING CURRENT



PACKAGE DIMENSIONS



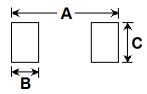


NOTES:

- 1. Dimensions are in inches.
- 2. Millimeters are given for general information only.
- 3. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

	In	ch	Milli	meter
DIM	MIN	MAX	MIN	MAX
BD	0.063	0.067	1.60	1.70
ECT	0.016	0.022	0.41	0.56
BL	0.130	0.146	3.30	3.70
S	0.001 MIN		0.03 MIN	

PAD LAYOUT



DIM	INCH	MILLIMETER	
Α	.200	5.08	
В	.055	1.40	
С	.080	2.03	