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RoHS
Available on commercial versions

VOIDLESS HERMETICALLY SEALED 500mW GLASS ZENER DIODES

Qualified per MIL-PRF-19500/533

Qualified Levels:
JAN, JANTX, JANTXV and JANS

DESCRIPTION

This Zener voltage regulator series is military qualified and is ideal for high-reliability applications where a failure cannot be tolerated. These industry-recognized 0.5 watt Zener voltage regulators are hermetically sealed with voidless-glass construction using an internal metallurgical bond. It includes Zener selections from 2.4 to 200 volts in standard 5% tolerances as well as 1% and 2% tolerances. They are also available in surface-mount packages. Microsemi also offers numerous other Zener products to meet higher and lower power ratings in both thru-hole and surface mount packages.

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

DO-35 or "D" Package

FEATURES

- JEDEC registered 1N6309 thru 1N6355 series.
- Voltage tolerances of 1%, 2% and 5% are available. (See part nomenclature.)
- Voidless hermetically sealed glass package.
- Internal "*Category I*" metallurgical bonds for 1N6321 thru 1N6355 and "*Category III*" for 1N6309 thru 1N6320.
- JAN, JANTX, JANTXV, and JANS reliability levels are available per MIL-PRF-19500/533.
- RoHS compliant versions available (commercial grade only).

Also available in:

"B" SQ MELF package
(surface mount)
1N6309US – 1N6355DUS

APPLICATIONS / BENEFITS

- Small DO-35 size package (or "D" Package).
- Regulates voltage over a broad operating current and temperature range.
- Extensive selection from 2.4 to 200 volts.
- Standard and tight voltage tolerances available.
- Extremely robust construction.
- Flexible axial-lead mounting terminals.
- Non-sensitive to ESD per MIL-STD-750 method 1020.
- Inherently radiation hard as described in Microsemi "MicroNote 050".

MAXIMUM RATINGS

Parameters/Test Conditions	Symbol	Value	Unit
Junction and Storage Temperature	T_J and T_{STG}	-65 to +175	°C
Thermal Resistance Junction-to-Lead (1) 1N6309 – 1N6320 1N6321 – 1N6355	$R_{\Theta JL}$	 150 95.5	°C/W
Thermal Resistance Junction-to-Ambient (2)	$R_{\Theta JA}$	240	°C/W
Steady-State Power Dissipation @ T_L = 75 °C	P_D	0.5	W
Forward Voltage @ 1.0 A	V_F	1.4	V
Solder Temperature @ 10 s	T_{SP}	260	°C

Notes: 1. At 3/8 inch (10 mm) from body. See Figure 1 and Figure 2 for derating.
2. T_A = +55 °C before derating on printed circuit board (PCB), PCB = FR4 .0625 inch (1.59 mm) 1-layer 1-Oz Cu, horizontal, still air, pads = .092 inch (2.34 mm) diameter, strip = .030 inch (0.76 mm) x 1 inch (25.4 mm) long, axial lead length L ≤ .187 inch (≤ 4.75 mm); $R_{\Theta JA}$ with a defined thermal resistance condition included is measured at I_Z = as defined in the characteristics and ratings table herein.

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MECHANICAL and PACKAGING

- CASE: Hermetically sealed voidless hard glass with tungsten slugs.
- TERMINALS: Axial-leads are tin/lead (Sn/Pb) or RoHS compliant matte/tin (commercial grade only) over copper clad steel.
- MARKING: Body painted and part number.
- POLARITY: Cathode indicated by band.
- TAPE & REEL option: Standard per EIA-296. Consult factory for quantities.
- WEIGHT: 150 milligrams.
- See Package Dimensions on last page.

PART NOMENCLATURE

JAN 1N6309 C (e3)

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

JEDEC type number
(see Electrical Characteristics table)

RoHS Compliance
e3 = RoHS Compliant (available on commercial grade only)
Blank = non-RoHS Compliant

Zener Voltage Tolerance
C = +/- 2%
D = +/- 1%
Blank = +/- 5%

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}).
I_{ZM}	Maximum Regulator (Zener) Current: The maximum rated dc current for the specified power rating.
I_{ZSM}	Maximum Zener Surge Current: The non-repetitive peak value of Zener surge current at a specified wave form.
V_F	Maximum Forward Voltage: The maximum forward voltage the device will exhibit at a specified current.
V_{WM}	Working Peak Voltage: The maximum peak voltage that can be applied over the operating temperature range. This is also referred to as Standoff Voltage.
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

TYPE Note 1	V_{Z2} NOM. +/-5% @ I_{Z2}	V_{Z1} MIN. @ I_{Z1} 250 uA	Test Current I_{Z2}	Dynamic Impedance Z_Z @ I_{Z2}	Dynamic Impedance Z_{ZK} @ 250 µA	Max. Current I_{ZM}	Voltage Reg. $V_{Z(reg)}$ (ΔV_Z) Note 2	Surge Current 8.3 ms quare Wave I_{ZSM}	Reverse Voltage V_R	Max. Reverse Current I_{R1} @ V_R 25 °C	Max. Reverse Current I_{R2} @ V_R 150 °C	Max. Noise Density N_D @ 250 µA 1 to 3 kHz	Max. Temp. Coeff. of Zener Voltage α_{VZ}
	Volts	Volts	mA	ohms	ohms	mA	Volts	Amps	Volts	µA	µA	µV /√Hz	%/°C
1N6309	2.4	1.1	20	30	1,200	177	1.50	2.50	1.0	100	200	1	-.085
1N6310	2.7	1.2	20	30	1,300	157	1.50	2.20	1.0	60	150	1	-.080
1N6311	3.0	1.3	20	29	1,400	141	1.50	2.00	1.0	30	100	1	-.075
1N6312	3.3	1.5	20	27	1,400	128	1.60	1.80	1.0	5	20	1	-.070
1N6313	3.6	1.8	20	25	1,400	117	1.60	1.65	1.0	3	12	1	-.065
1N6314	3.9	2.0	20	23	1,700	108	1.60	1.50	1.0	2	12	1	-.060
1N6315	4.3	2.4	20	20	1,700	99	0.90	1.40	1.0	2	12	1	-.045 +.020
1N6316	4.7	2.8	20	17	1,500	90	0.50	1.27	1.5	5	12	1	-.028 +.032
1N6317	5.1	3.3	20	14	1,300	83	0.40	1.17	2.0	5	12	1	-.020 +.035
1N6318	5.6	4.3	20	8	1,200	76	0.40	1.10	2.5	5	10	2	+.050
1N6319	6.2	5.2	20	3	800	68	0.30	0.97	3.5	5	10	5	+.060
1N6320	6.8	6.0	20	3	400	63	0.35	1.23	4.0	2	50	5	+.062
1N6321	7.5	6.6	20	4	400	57	0.40	1.16	5.0	2	30	5	+.068
1N6322	8.2	7.5	20	5	400	52	0.40	1.07	6.0	1	10	20	+.075
1N6323	9.1	8.4	20	6	500	47	0.50	0.97	7.0	1	10	40	+.076
1N6324	10.0	9.1	20	6	500	43	0.50	0.89	8.0	1	10	80	+.079
1N6325	11.0	10.0	20	7	550	39	0.50	0.83	8.5	1	10	100	+.082
1N6326	12.0	11.0	20	7	550	35	0.55	0.77	9.0	1	10	100	+.083
1N6327	13.0	11.9	9.5	8	550	33	0.55	0.71	9.9	0.05	10	100	+.083
1N6328	15.0	13.8	8.5	10	600	28	0.70	0.62	11.0	0.05	10	100	+.084
1N6329	16.0	14.7	7.8	12	600	27	0.75	0.58	12.0	0.05	10	100	+.084
1N6330	18.0	16.6	7.0	14	600	24	0.85	0.52	14.0	0.05	10	100	+.085
1N6331	20.0	18.5	6.2	18	500	21	0.95	0.47	15.0	0.05	10	100	+.086
1N6332	22.0	20.4	5.6	20	500	19	1.05	0.43	17.0	0.05	10	100	+.087
1N6333	24.0	22.3	5.2	24	500	18	1.15	0.39	18.0	0.05	10	100	+.088
1N6334	27.0	25.2	4.6	27	500	16	1.30	0.35	21.0	0.05	10	100	+.090
1N6335	30.0	28.0	4.2	32	500	14	1.45	0.31	23.0	0.05	10	100	+.091
1N6336	33.0	30.9	3.8	40	600	13	1.60	0.28	25.0	0.05	10	100	+.092
1N6337	36.0	33.7	3.4	50	600	12	1.75	0.260	27.0	0.05	10	100	+.093
1N6338	39.0	36.6	3.2	55	700	11	1.90	0.240	30	0.05	10	100	+.094
1N6339	43.0	40.4	3.0	65	800	9.9	2.10	0.220	33	0.05	10	80	+.095
1N6340	47.0	44.2	2.7	75	900	9.0	2.25	0.200	36	0.05	10	80	+.095
1N6341	51.0	48.0	2.5	85	1,000	8.3	2.50	0.180	39	0.05	10	80	+.096
1N6342	56.0	52.7	2.2	100	1,200	7.6	2.70	0.170	43	0.05	10	80	+.097
1N6343	62.0	58.4	2.0	125	1,300	6.8	2.90	0.150	47	0.05	10	80	+.099
1N6344	68.0	64.1	1.8	155	1,500	6.3	3.20	0.130	52	0.05	10	80	+.101
1N6345	75.0	70.8	1.7	180	1,600	5.7	3.40	0.125	56	0.05	10	80	+.103
1N6346	82.0	77.4	1.5	220	1,800	5.2	3.80	0.115	62	0.05	10	80	+.105
1N6347	91.0	86.0	1.4	270	2,100	4.7	4.20	0.100	69	0.05	10	80	+.108
1N6348	100.0	94.5	1.3	340	2,400	4.3	4.40	0.095	76	0.05	10	80	+.110
1N6349	110.0	104.0	1.1	500	2,800	3.9	4.80	0.085	84	0.05	10	80	+.110
1N6350	120.0	113.0	1.0	600	3,200	3.5	5.20	0.080	91	0.05	10	80	+.110
1N6351	130.0	122	0.95	850	4,100	3.3	5.60	0.070	99	0.05	10	80	+.110
1N6352	150.0	141	0.85	1,000	4,500	2.8	7.00	0.065	114	0.05	10	80	+.110
1N6353	160.0	151	0.80	1,200	5,000	2.7	7.50	0.060	122	0.05	10	80	+.110
1N6354	180.0	170	0.68	1,500	5,600	2.4	9.00	0.050	137	0.05	10	80	+.110
1N6355	200.0	189	0.65	1,800	6,500	2.1	12.00	0.045	152	0.05	10	80	+.110

NOTES:

1. Standard voltage tolerance is 5 percent. Tighter tolerances are available in plus/minus 1 and 2 percent voltage tolerances. (See part nomenclature.)
2. Voltage regulation $V_{Z(reg)}$ is the measured voltage change at thermal equilibrium between the current of 10% and 50% of maximum Zener current I_{ZM} when the lead temperature is maintained at 25 °C =+8 °C, -2 °C.

GRAPHS

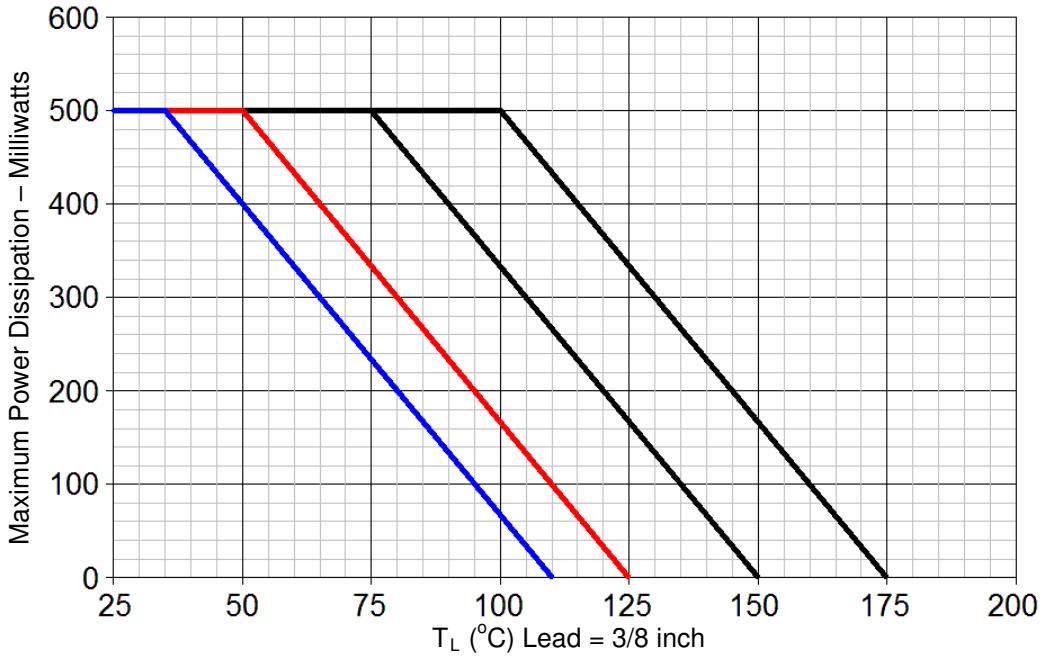


FIGURE 1 - (1N6309 – 1N6320)
T_L Temperature-Power Derating Curve
$R_{\Theta JL}$ 3/8 inch = 150 °C/W (dc operation)

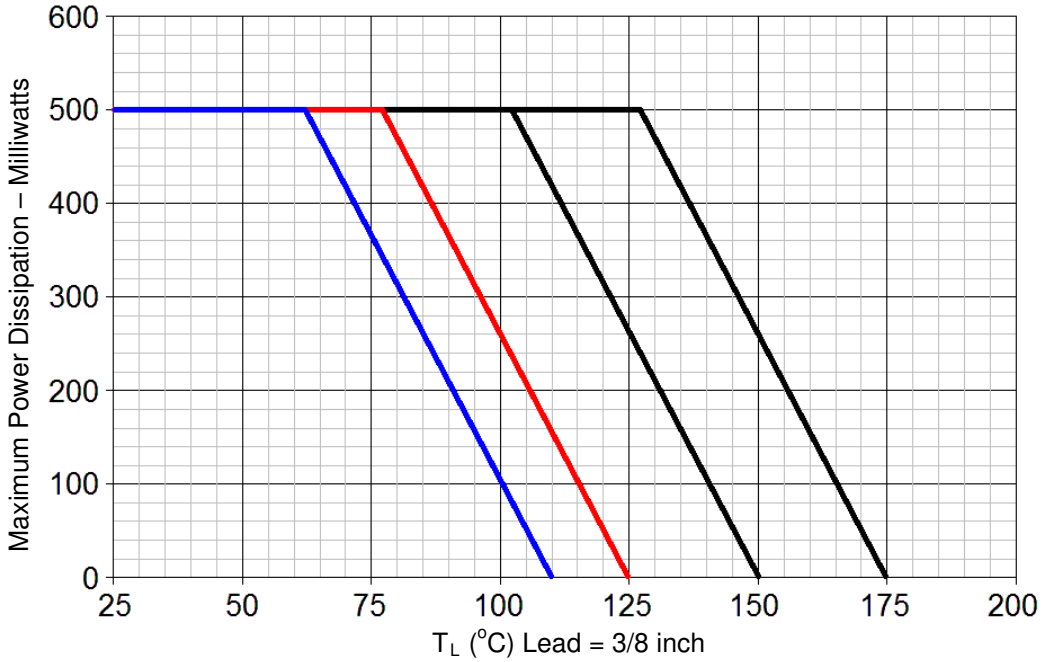


FIGURE 2 - (1N6321 – 1N6355)
T_L Temperature-Power Derating Curve
$R_{\Theta JL}$ 3/8 inch = 95.5 °C/W (dc operation)

GRAPHS (continued)

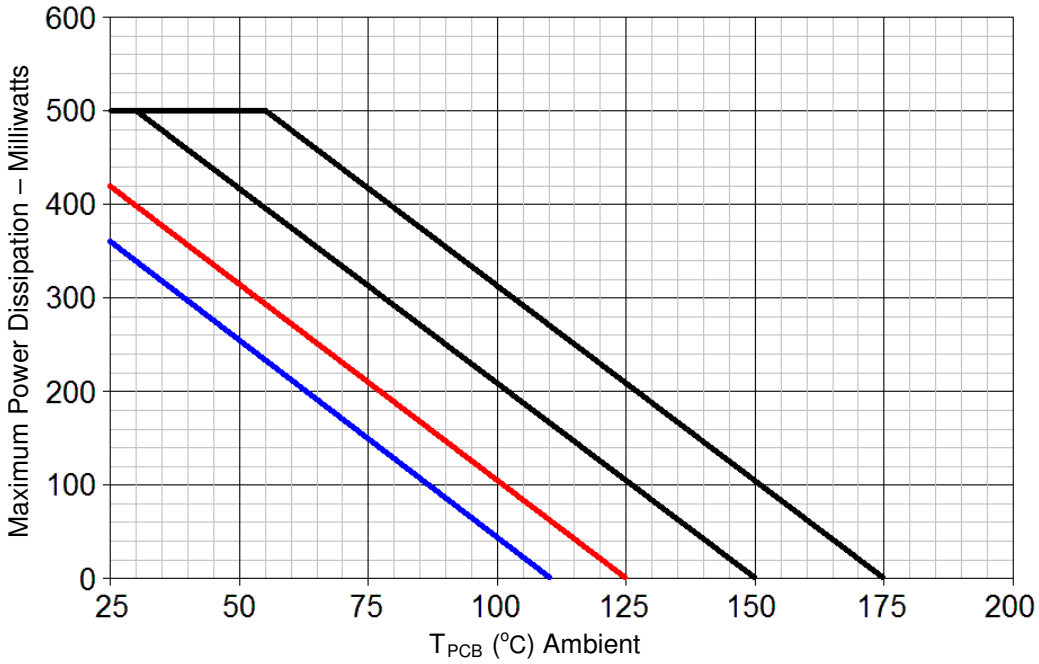
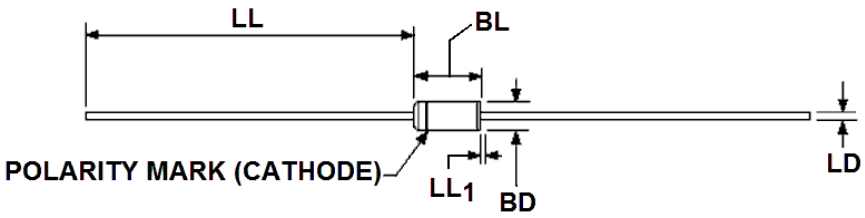


FIGURE 3
Temperature-Power Derating Curve
$R_{\Theta JA}$ = 240 °C/W (dc operation)

PACKAGE DIMENSIONS



NOTE:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Lead diameter not controlled in this zone to allow for flash. Lead finish build-up and minor irregularities other than slugs.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.
5. The BL dimension shall include the entire body including slugs.

Ltr	DIMENSIONS				Notes
	INCH		MILLIMETERS		
	Min	Max	Min	Max	
BD	.060	.090	1.52	2.29	
BL	.120	.200	3.05	5.08	5
LD	.018	.022	0.46	0.56	
LL	1.000	1.500	25.40	38.10	
LL1		.050		1.27	3