BZX85C3V3RL Series

1 Watt DO-41 Hermetically Sealed Glass Zener Voltage Regulators

This is a complete series of 1 Watt Zener diodes with limits and excellent operating characteristics that reflect the superior capabilities of silicon–oxide passivated junctions. All this in an axial–lead hermetically sealed glass package that offers protection in all common environmental conditions.

Specification Features:

- Zener Voltage Range – 3.3 V to 85 V
- ESD Rating of Class 3 (>16 KV) per Human Body Model
- DO–41 (DO–204AL) Package
- Double Slug Type Construction
- Metallurgical Bonded Construction
- Oxide Passivated Die

Mechanical Characteristics:

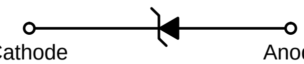
CASE: Double slug type, hermetically sealed glass
FINISH: All external surfaces are corrosion resistant and leads are readily solderable
MAXIMUM LEAD TEMPERATURE FOR SOLDERING PURPOSES: 230°C, 1/16″ from the case for 10 seconds
POLARITY: Cathode indicated by polarity band
MOUNTING POSITION: Any

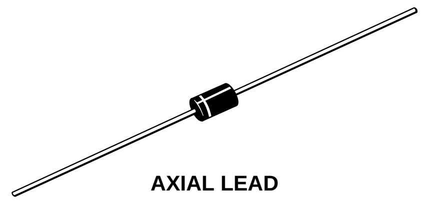
MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Max. Steady State Power Dissipation @ $T_L \le 50°C$, Lead Length = 3/8″	P_D	1	W
Derate above 50°C		6.67	mW/°C
Operating and Storage Temperature Range	T_J, T_{stg}	–65 to +200	°C

ON Semiconductor™

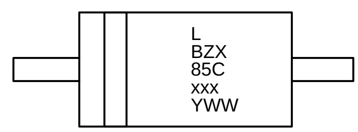
http://onsemi.com


Cathode Anode



AXIAL LEAD
CASE 59
GLASS

MARKING DIAGRAM



L = Assembly Location
BZX85Cxxx = Device Code
(See Table Next Page)
Y = Year
WW = Work Week

ORDERING INFORMATION

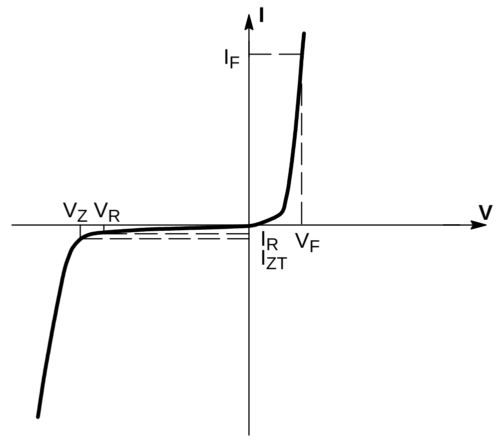
Device	Package	Shipping
BZX85CxxxRL	Axial Lead	6000/Tape & Reel
BZX85CxxxRL2	Axial Lead	6000/Tape & Reel

* The “2” suffix refers to 26 mm tape spacing.

May, 2001 – Rev. 0
Publication Order Number:
BZX85C3V3RL/D

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 1.2 V Max., I_F = 200 mA for all types)

Symbol	Parameter
V_Z	Reverse Zener Voltage @ I_{ZT}
I_{ZT}	Reverse Current
Z_{ZT}	Maximum Zener Impedance @ I_{ZT}
I_{ZK}	Reverse Current
Z_{ZK}	Maximum Zener Impedance @ I_{ZK}
I_R	Reverse Leakage Current @ V_R
V_R	Breakdown Voltage
I_F	Forward Current
V_F	Forward Voltage @ I_F
I_R	Surge Current @ T_A = 25°C



Zener Voltage Regulator

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted, V_F = 1.2 V Max., I_F = 200 mA for all types)

Device (Note 1.)	Device Marking	Zener Voltage (Notes 2. and 3.)				Zener Impedance (Note 4.)			Leakage Current		I_R (Note 5.)
		V_Z (Volts)			@ I_{ZT}	Z_{ZT} @ I_{ZT}	Z_{ZK} @ I_{ZK}		I_R @ V_R		
		Min	Nom	Max	mA	Ω	Ω	mA	μA Max	Volts	mA
BZX85C3V3RL	BZX85C3V3	3.1	3.3	3.5	80	20	400	1	1	60	1380
BZX85C3V6RL	BZX85C3V6	3.4	3.6	3.8	60	15	500	1	1	30	1260
BZX85C3V9RL	BZX85C3V9	3.7	3.9	4.1	60	15	500	1	1	5	1190
BZX85C4V3RL	BZX85C4V3	4.0	4.3	4.6	50	13	500	1	1	3	1070
BZX85C4V7RL	BZX85C4V7	4.4	4.7	5.0	45	13	600	1	1.5	3	970
BZX85C5V1RL	BZX85C5V1	4.8	5.1	5.4	45	10	500	1	2	1	890
BZX85C5V6RL	BZX85C5V6	5.2	5.6	6.0	45	7	400	1	2	1	810
BZX85C6V2RL	BZX85C6V2	5.8	6.2	6.6	35	4	300	1	3	1	730
BZX85C6V8RL	BZX85C6V8	6.4	6.8	7.2	35	3.5	300	1	4	1	660
BZX85C7V5RL	BZX85C7V5	7.0	7.45	7.9	35	3	200	0.5	4.5	1	605
BZX85C8V2RL	BZX85C8V2	7.7	8.2	8.7	25	5	200	0.5	5	1	550
BZX85C9V1RL	BZX85C9V1	8.5	9.05	9.6	25	5	200	0.5	6.5	1	500
BZX85C10RL	BZX85C10	9.4	10	10.6	25	7	200	0.5	7	0.5	454
BZX85C12RL	BZX85C12	11.4	12.05	12.7	20	9	350	0.5	8.4	0.5	380
BZX85C13RL	BZX85C13	12.4	13.25	14.1	20	10	400	0.5	9.1	0.5	344
BZX85C15RL	BZX85C15	13.8	14.7	15.6	15	15	500	0.5	10.5	0.5	304
BZX85C16RL	BZX85C16	15.3	16.2	17.1	15	15	500	0.5	11	0.5	285
BZX85C18RL	BZX85C18	16.8	17.95	19.1	15	20	500	0.5	12.5	0.5	250
BZX85C22RL	BZX85C22	20.8	22.05	23.3	10	25	600	0.5	15.5	0.5	205
BZX85C24RL	BZX85C24	22.8	24.2	25.6	10	25	600	0.5	17	0.5	190
BZX85C27RL	BZX85C27	25.1	27	28.9	8	30	750	0.25	19	0.5	170
BZX85C30RL	BZX85C30	28	30	32	8	30	1000	0.25	21	0.5	150
BZX85C33RL	BZX85C33	31	33	35	8	35	1000	0.25	23	0.5	135
BZX85C36RL	BZX85C36	34	36	38	8	40	1000	0.25	25	0.5	125
BZX85C43RL	BZX85C43	40	43	46	6	50	1000	0.25	30	0.5	110
BZX85C47RL	BZX85C47	44	47	50	4	90	1500	0.25	33	0.5	95
BZX85C62RL	BZX85C62	58	62	66	4	125	2000	0.25	43	0.5	70
BZX85C75RL	BZX85C75	70	75	80	4	150	2000	0.25	51	0.5	60
BZX85C82RL	BZX85C82	77	82	87	2.7	200	3000	0.25	56	0.5	55

1. **TOLERANCE AND TYPE NUMBER DESIGNATION**
   The type numbers listed have zener voltage min/max limits as shown and have a standard tolerance on the nominal zener voltage of ±5%.
2. **AVAILABILITY OF SPECIAL DIODES**
   For detailed information on price, availability and delivery of nominal zener voltages between the voltages shown and tighter voltage tolerances, contact your nearest ON Semiconductor representative.
3. **ZENER VOLTAGE (V_Z) MEASUREMENT**
   V_Z measured after the test current has been applied to 40 ±10 msec, while maintaining the lead temperature (T_L) at 30°C ±1°C, 3/8″ from the diode body.
4. **ZENER IMPEDANCE (Z_Z) DERIVATION**
   The zener impedance is derived from 1 kHz cycle AC voltage, which results when an AC current having an rms value equal to 10% of the DC zener current (I_{ZT} or I_{ZK}) is superimposed on I_{ZT} or I_{ZK}.
5. **SURGE CURRENT (I_R) NON–REPETITIVE**
   The rating listed in the electrical characteristics table is maximum peak, non–repetitive, reverse surge current of 1/2 square wave or eqivalent sine wave pulse of 1/120 second duration superimposed on the test current, I_{ZT}. However, actual device capability is as described in Figure 5 of the General Data – DO–41 Glass.

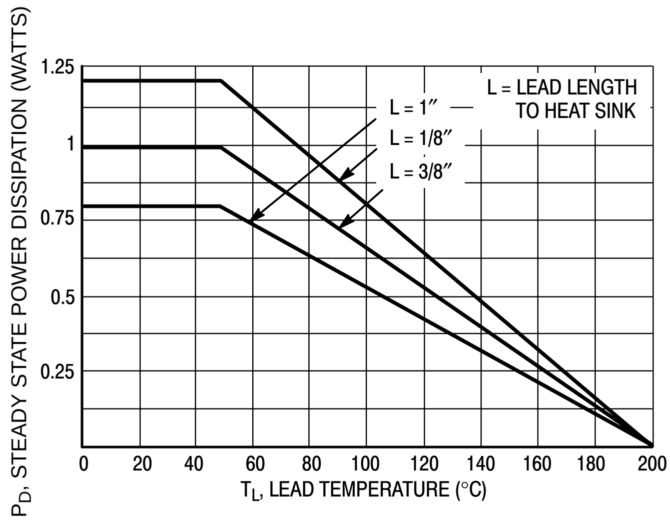


Figure 1. Power Temperature Derating Curve

a. Range for Units to 12 Volts **b. Range for Units to 12 to 100 Volts**

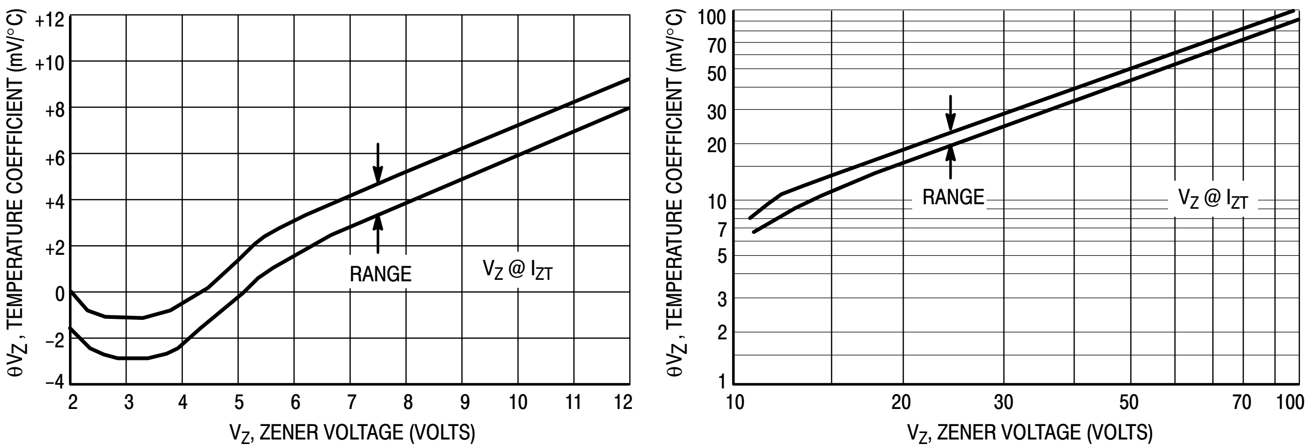


Figure 2. Temperature Coefficients

(–55°C to +150°C temperature range; 90% of the units are in the ranges indicated.)

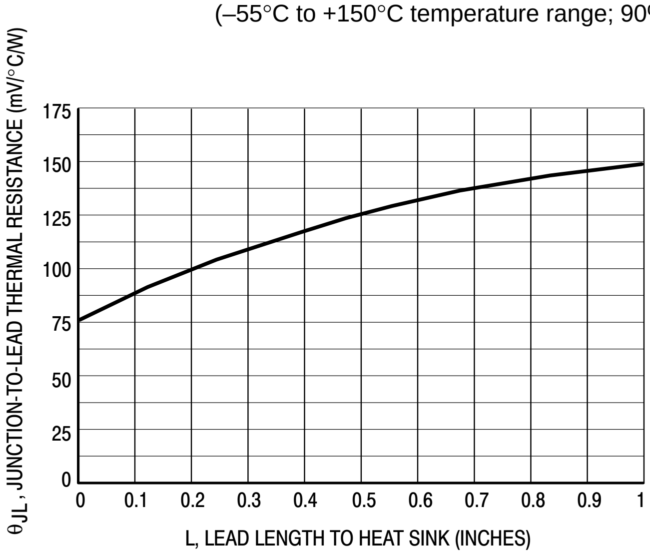


Figure 3. Typical Thermal Resistance versus Lead Length

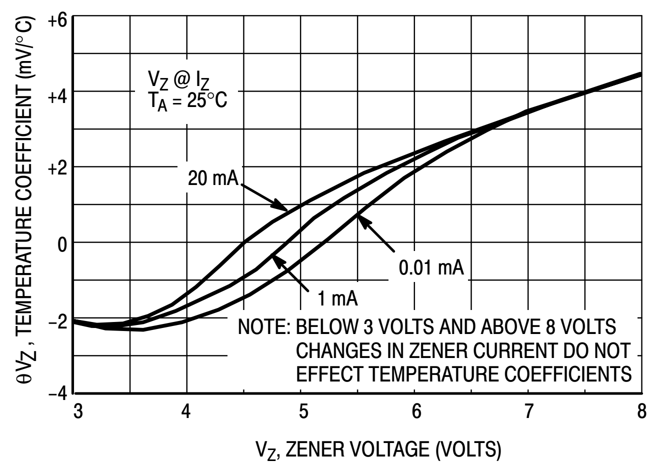
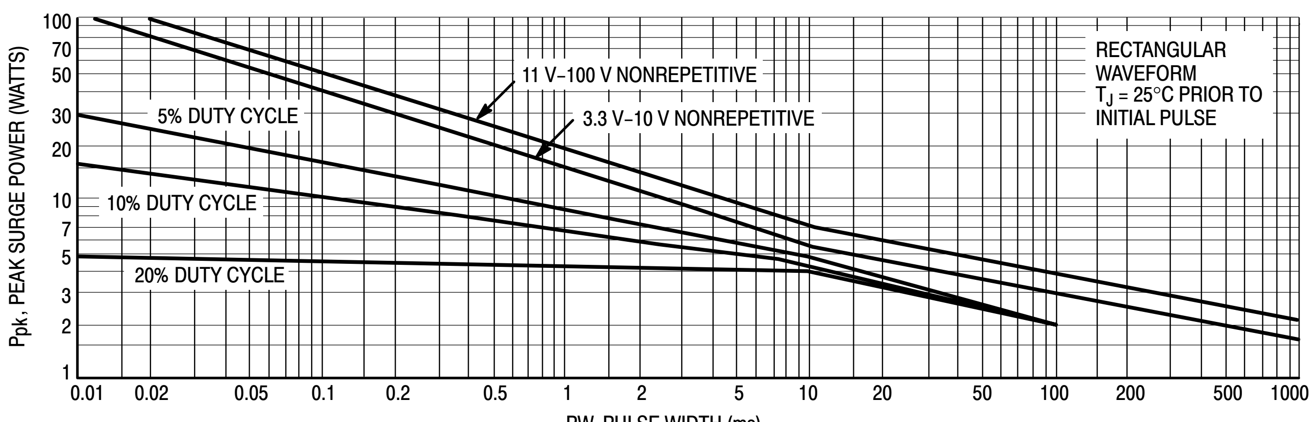


Figure 4. Effect of Zener Current



This graph represents 90 percentile data points.
For worst case design characteristics, multiply surge power by 2/3.

Figure 5. Maximum Surge Power

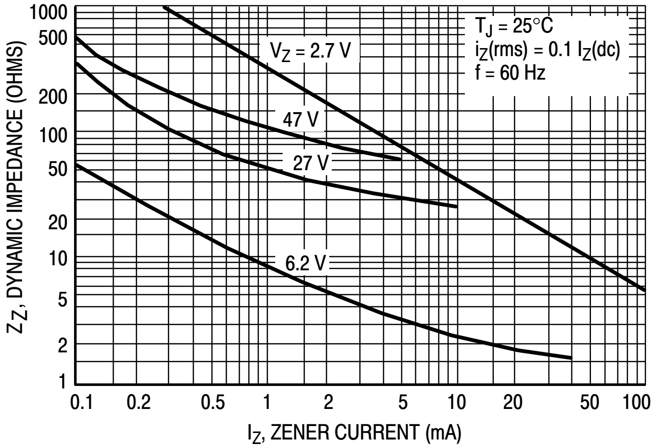


Figure 6. Effect of Zener Current on Zener Impedance

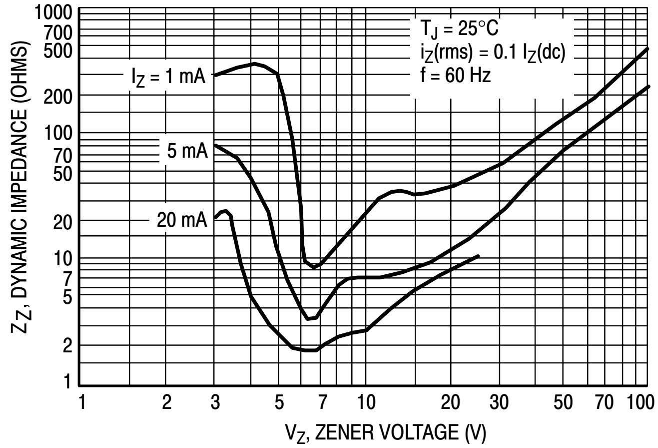


Figure 7. Effect of Zener Voltage on Zener Impedance

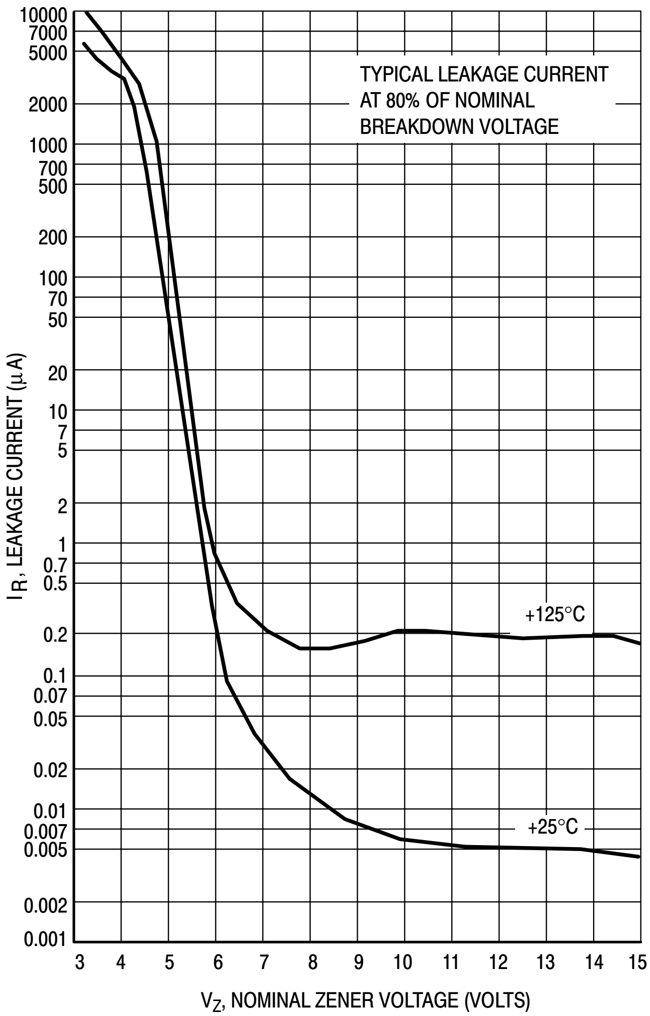


Figure 8. Typical Leakage Current

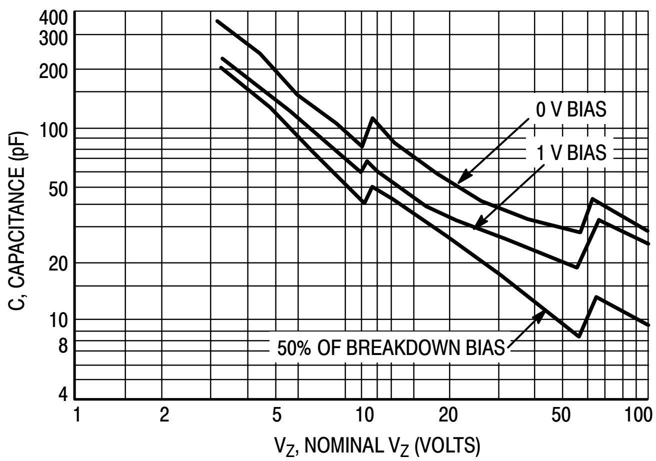


Figure 9. Typical Capacitance versus V_Z

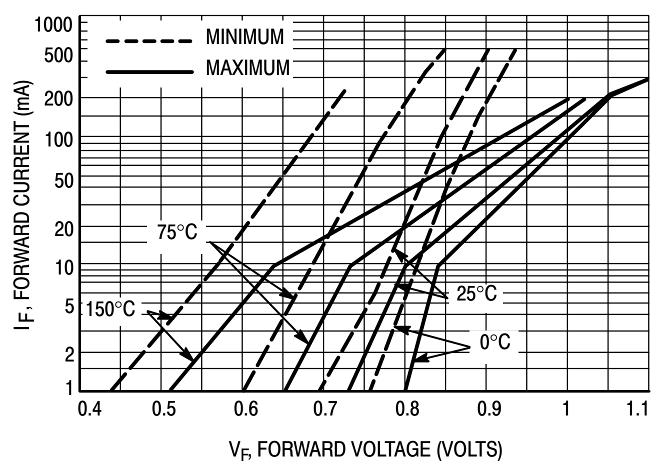


Figure 10. Typical Forward Characteristics

APPLICATION NOTE

Since the actual voltage available from a given zener diode is temperature dependent, it is necessary to determine junction temperature under any set of operating conditions in order to calculate its value. The following procedure is recommended:

Lead Temperature, T_L, should be determined from:

$$T_L = \theta_{LA} P_D + T_A.$$

θ_{LA} is the lead-to-ambient thermal resistance (°C/W) and P_D is the power dissipation. The value for θ_{LA} will vary and depends on the device mounting method. θ_{LA} is generally 30 to 40°C/W for the various clips and tie points in common use and for printed circuit board wiring.

The temperature of the lead can also be measured using a thermocouple placed on the lead as close as possible to the tie point. The thermal mass connected to the tie point is normally large enough so that it will not significantly respond to heat surges generated in the diode as a result of pulsed operation once steady-state conditions are achieved. Using the measured value of T_L, the junction temperature may be determined by:

$$T_J = T_L + \Delta T_{JL}.$$

ΔT_{JL} is the increase in junction temperature above the lead temperature and may be found as follows:

$$\Delta T_{JL} = \theta_{JL} P_D.$$

θ_{JL} may be determined from Figure 3 for dc power conditions. For worst-case design, using expected limits of I_Z, limits of P_D and the extremes of $T_J(\Delta T_J)$ may be estimated. Changes in voltage, V_Z, can then be found from:

$$\Delta V = \theta_{VZ} \Delta T_J.$$

θ_{VZ}, the zener voltage temperature coefficient, is found from Figure 2.

Under high power-pulse operation, the zener voltage will vary with time and may also be affected significantly by the zener resistance. For best regulation, keep current excursions as low as possible.

Surge limitations are given in Figure 5. They are lower than would be expected by considering only junction temperature, as current crowding effects cause temperatures to be extremely high in small spots, resulting in device degradation should the limits of Figure 5 be exceeded.