TAK CHEONG

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Components Industries, LLC for
Zener Technology and **Products**.

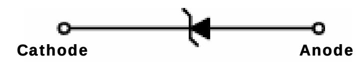
1.3 Watt DO-41 Hermetically Sealed Glass Zener Voltage Regulators

Maximum Ratings

Rating	Symbol	Value	Units
Maximum Steady State Power Dissipation @TL≤50℃, Lead Length = 3/8" Derate Above 50℃	P_D	1.3 8.67	W mW/℃
Operating and Storage Temperature Range	T_J, T_{stg}	-65 to +200	°C

Specification Features:

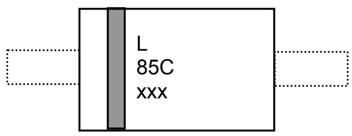
- Zener Voltage Range = 3.3V to 100V
- ESD Rating of Clas 3 (>6 KV) per Human Body Model
- DO-41 Package (DO-204AL)
- Double Slug Type Construction
- Metallurgical Bonded Construction
- Oxide Passivated Die



Specification Features:

Case : Double slug type, hermetically sealed glass
Finish : All external surfaces are corrosion resistant and leads are readily solderable
Polarity : Cathode indicated by polarity band
Mounting: Any

Maximum Lead Temperature for Soldering Purposes
230℃, 1/16" from the case for 10 seconds



L = Logo
85Cxxx = Device Code

Ordering Information

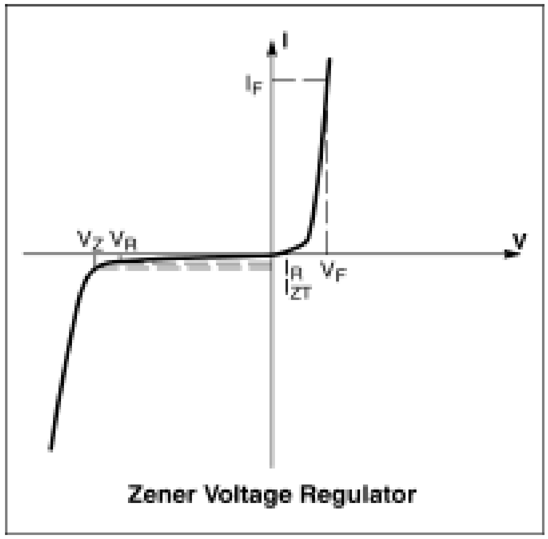
Device	Package	Quantity
BZX85Cxxx	Axial Lead	2000 Units / Box
BZX85CxxxRL	Axial Lead	6000 Units / Tape & Reel
BZX85CxxxRL2*	Axial Lead	6000 Units / Tape & Reel
BZX85CxxxTA	Axial Lead	4000 Units / Tape & Ammo
BZX85CxxxTA2*	Axial Lead	4000 Units / Tape & Ammo

* The "2" suffix refer to 26mm tape spacing.

Devices listed in ***bold italic*** are Tak Cheong **Preferred** devices. **Preferred** devices are recommended choices for future use and best overall value.

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

Symbol	Parameter
V_Z	Reverse Zener Voltage @ I_{ZT}
I_{ZT}	Reverse Zener Current
Z_{ZT}	Maximum Zener Impedance @ I_{ZT}
I_{Zk}	Reverse Zener Current
Z_{Zk}	Maximum Zener Impedance @ I_{Zk}
I_R	Reverse Leakage Current @ V_R
V_R	Reverse Voltage
I_F	Forward Current
V_F	Forward Voltage @ I_F
I_r	Surge Current @ T_A = 25ºC



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

Device (Note 1.)	Device Marking	Zener Voltage (Note 2 & 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)
BZX85C3V3	BZX85C3V3	3.1	3.3	3.5	80	20	400	1	60	1	1380
BZX85C3V6	BZX85C3V6	3.4	3.6	3.8	60	15	500	1	30	1	1260
BZX85C3V9	BZX85C3V9	3.7	3.9	4.1	60	15	500	1	5	1	1190
BZX85C4V3	BZX85C4V3	4	4.3	4.6	50	13	500	1	3	1	1070
BZX85C4V7	BZX85C4V7	4.4	4.7	5	45	13	600	1	3	1.5	970
BZX85C5V1	BZX85C5V1	4.8	5.1	5.4	45	10	500	1	1	2	890
BZX85C5V6	BZX85C5V6	5.2	5.6	6	45	7	400	1	1	2	810
BZX85C6V2	BZX85C6V2	5.8	6.2	6.6	35	4	300	1	1	3	730
BZX85C6V8	BZX85C6V8	6.4	6.8	7.2	35	3.5	300	1	1	4	660
BZX85C7V5	BZX85C7V5	7	7.5	7.9	35	3	200	0.5	1	4.5	605
BZX85C8V2	BZX85C8V2	7.7	8.2	8.7	25	5	200	0.5	1	5	550
BZX85C9V1	BZX85C9V1	8.5	9.1	9.6	25	5	200	0.5	1	6.5	500
BZX85C10	BZX85C10	9.4	10	10.6	25	7	200	0.5	0.5	7	454
BZX85C11	BZX85C11	10.4	11	11.6	20	8	300	0.5	0.5	7.7	414
BZX85C12	BZX85C12	11.4	12	12.7	20	9	350	0.5	0.5	8.4	380

1. TOLERANCE AND TYPE NUMBER DESIGNATION
Tolerance designation – the type numbers listed have zener voltage min/max limits as shown. Device tolerance of ±2% are indicated by a “B” instead of a “C”.

2. SPECIALS AVAILABLE INCLUDE
Nominal zener voltages between the voltages shown and tighter voltage tolerances. For detailed information on price, availability and delivery, contact your nearest Tak Cheong representative.

3. ZENER VOLTAGE (V_Z) MEASUREMENT
VZ is measured after the test current has been applied to 40 ±10msec., while maintaining the lead temperature (T_L) at 30°C ±1°C and 3/8” lead length.

4. ZENER IMPEDANCE (Z_Z) DERIVATION
The zener impedance is derived from the 60 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 ½ square wave or equivalent sine wave pulse of 1/120 second duration superimposed on the test current I_{ZT} per JEDEC registration; however, actual device capability is as described in figure 5 of the General Data DO-41 Glass.

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

Device (Note 6.)	Device Marking	Zener Voltage (Note 7 & 8.) V_Z (Volts) Min	Nom	Max	@ I_{ZT} (mA)	Zener Impedance (Note 9.) Z_{ZT} @ I_{ZT} (Ω)	Z_{ZK} @ I_{ZK} (Ω)	(mA)	Leakage Current I_R @ V_R (µA Max)	(Volts)	I_r (Note 10.) (mA)
BZX85C13	BZX85C13	12.4	13	14.1	20	10	400	0.5	0.5	9.1	344
BZX85C15	BZX85C15	13.8	15	15.6	15	15	500	0.5	0.5	10.5	304
BZX85C16	BZX85C16	15.3	16	17.1	15	15	500	0.5	0.5	11	285
BZX85C18	BZX85C18	16.8	18	19.1	15	20	500	0.5	0.5	12.5	250
BZX85C20	BZX85C20	18.8	20	21.2	10	24	600	0.5	0.5	14	225
BZX85C22	BZX85C22	20.8	22	23.3	10	25	600	0.5	0.5	15.5	205
BZX85C24	BZX85C24	22.8	24	25.6	10	25	600	0.5	0.5	17	190
BZX85C27	BZX85C27	25.1	27	28.9	8	30	750	0.25	0.5	19	170
BZX85C30	BZX85C30	28	30	32	8	30	1000	0.25	0.5	21	150
BZX85C33	BZX85C33	31	33	35	8	35	1000	0.25	0.5	23	135
BZX85C36	BZX85C36	34	36	38	8	40	1000	0.25	0.5	25	125
BZX85C39	BZX85C39	37	39	41	6	45	1000	0.25	0.5	27	115
BZX85C43	BZX85C43	40	43	46	6	50	1000	0.25	0.5	30	110
BZX85C47	BZX85C47	44	47	50	4	90	1500	0.25	0.5	33	95
BZX85C51	BZX85C51	48	51	54	4	115	1500	0.25	0.5	36	90
BZX85C56	BZX85C56	52	56	60	4	120	2000	0.25	0.5	39	80
BZX85C62	BZX85C62	58	62	66	4	125	2000	0.25	0.5	43	70
BZX85C68	BZX85C68	64	68	72	4	130	2000	0.25	0.5	47	65
BZX85C75	BZX85C75	70	75	80	4	150	2000	0.25	0.5	51	60
BZX85C82	BZX85C82	77	82	87	2.7	200	3000	0.25	0.5	56	55
BZX85C91	BZX85C91	85	91	96	2.7	250	3000	0.25	0.5	62	50
BZX85C100	BZX85C100	96	100	106	2.7	350	3000	0.25	0.5	68	45

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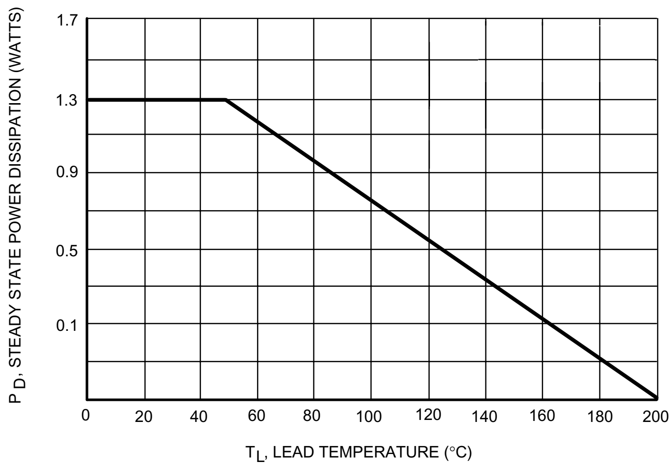


Figure 1. Power Temperature Derating Curve

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

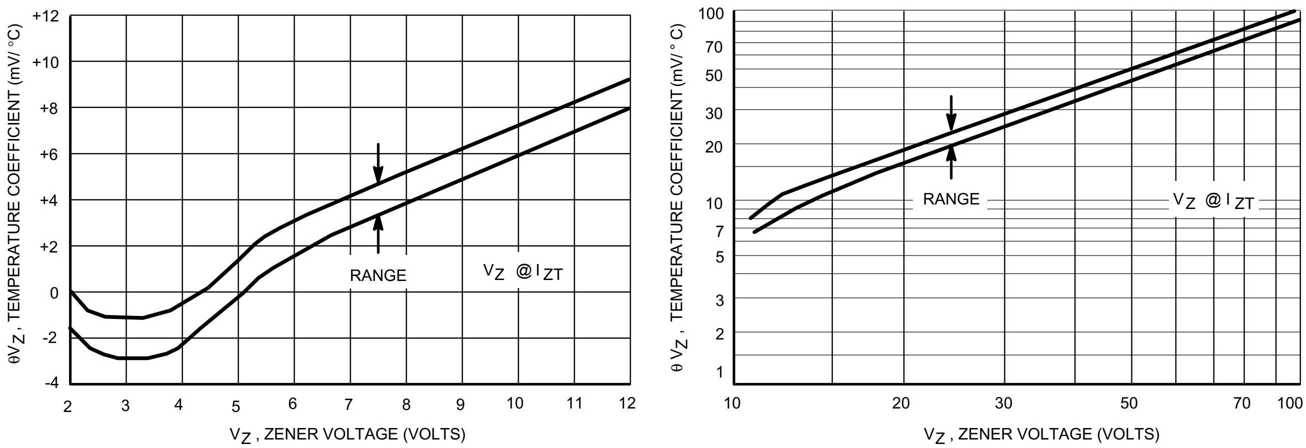


Figure 2. Temperature Coefficients

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

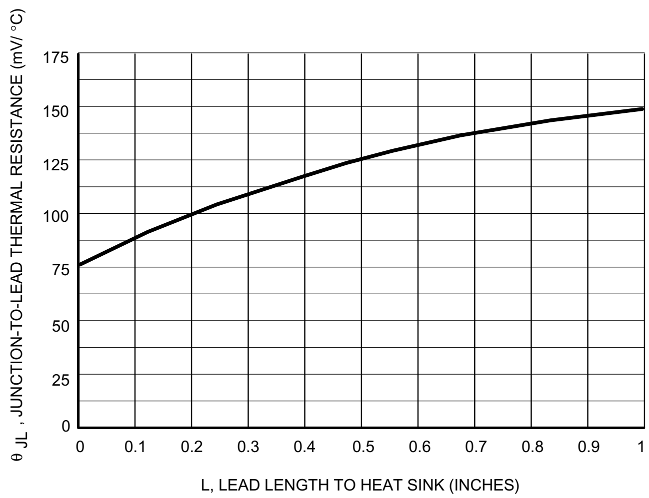


Figure 3. Typical Thermal Resistance versus Lead Length

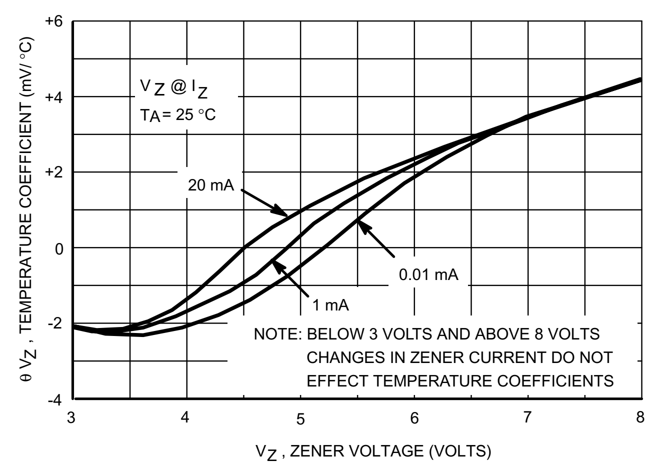
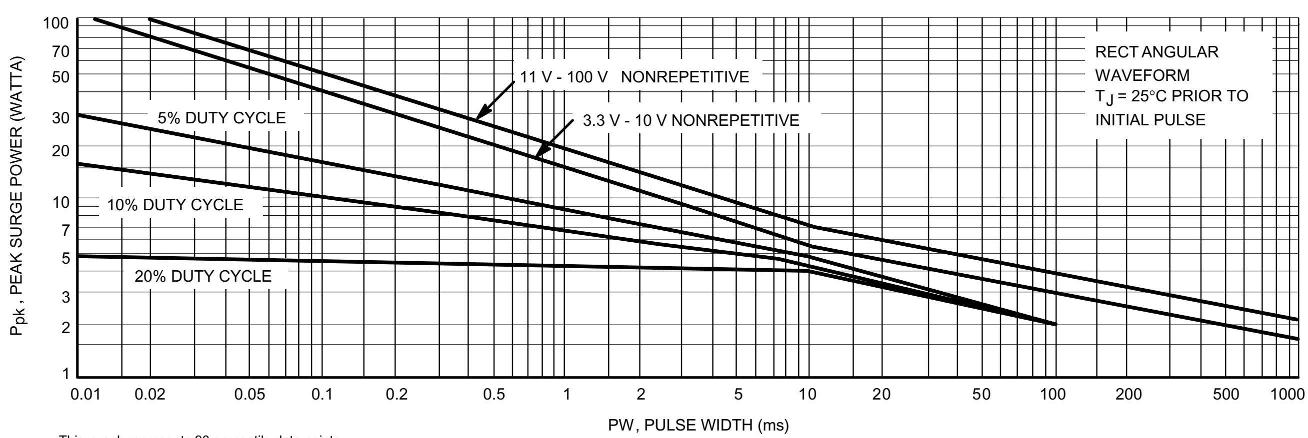


Figure 4. Effect of Zener Current



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

Figure 5. Maximum Surge Power

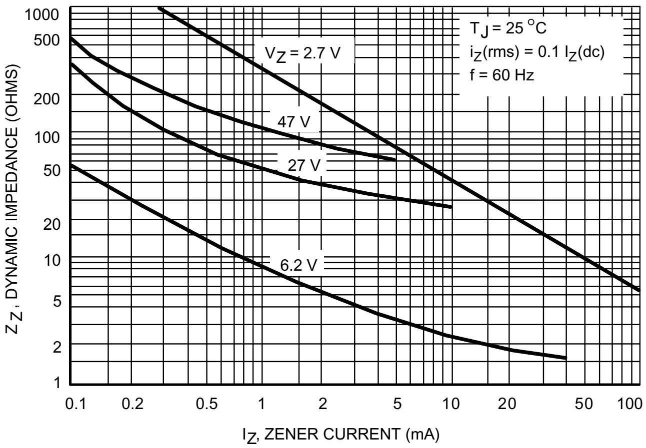


Figure 6. Effect of Zener Current on Zener Impedance

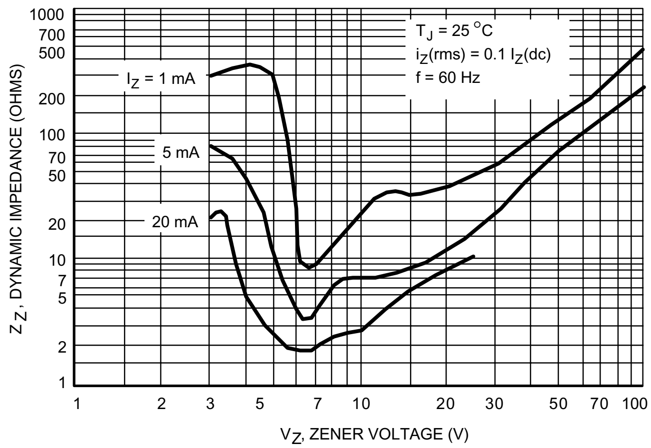


Figure 7. Effect of Zener Voltage on Zener Impedance

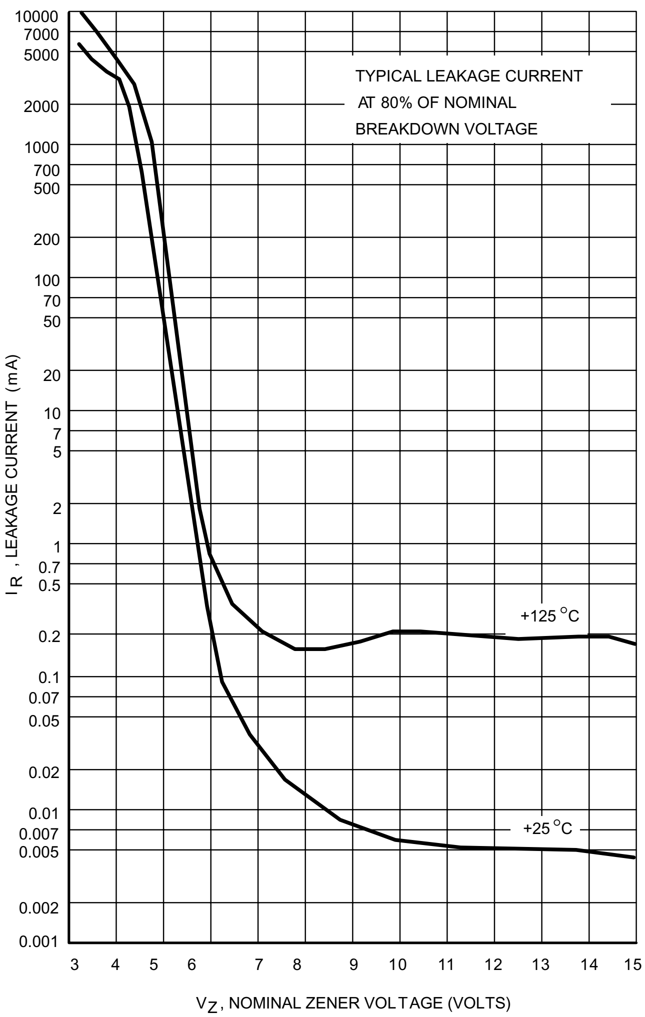


Figure 8. Typical Leakage Current

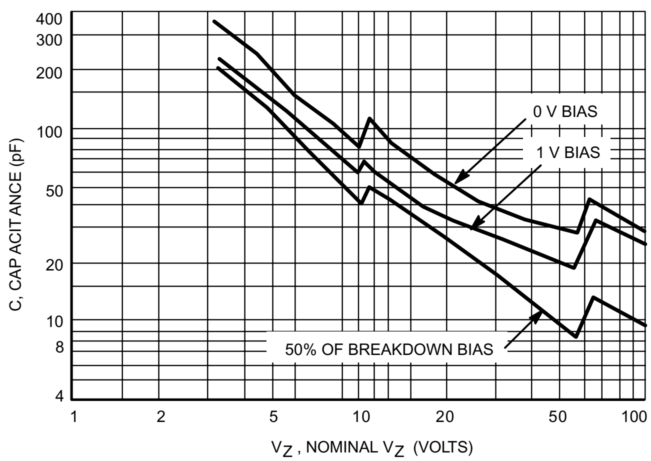


Figure 9. Typical Capacitance versus V_Z

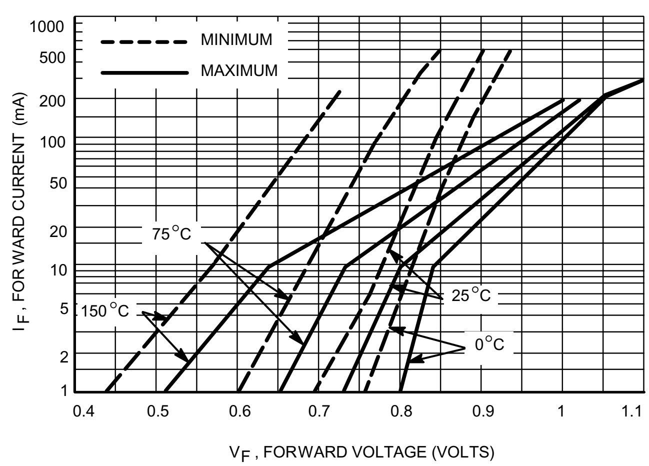


Figure 10. Typical Forward Characteristics

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.