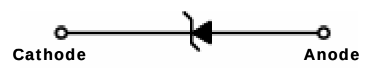
1 Watt DO-41 Hermetically Sealed Glass Zener Voltage Regulators

Maximum Ratings

Rating	Symbol	Value	Units
Maximum Steady State Power Dissipation @TL≤50℃, Lead Length = 3/8" Derate Above 50℃	P_D	1 6.67	W mW/℃
Operating and Storage Temperature Range	T_J, T_{stg}	-65 to +200	°C

Specification Features:

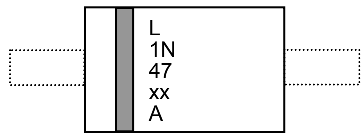
- Zener Voltage Range = 3.3V to 100V
- ESD Rating of Clas 3 (>6 KV) per Human Body Model
- DO-41 Package (DO-204AL)
- Double Slug Type Construction
- Metallurgical Bonded Construction
- Oxide Passivated Die



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
1N47xxA = Device Code

Ordering Information

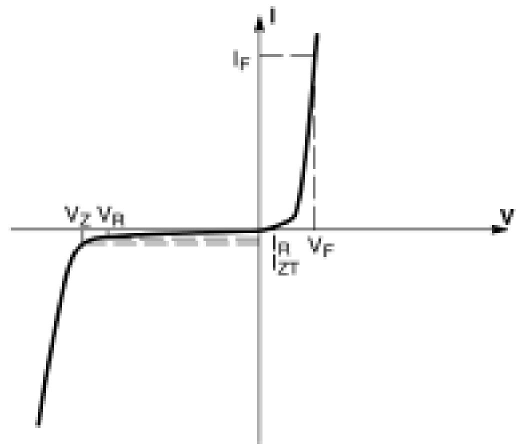
Device	Package	Quantity
1N47xxA	Axial Lead	2000 Units / Box
1N47xxARL	Axial Lead	6000 Units / Tape & Reel
1N47xxARL2*	Axial Lead	6000 Units / Tape & Reel
1N47xxATA	Axial Lead	4000 Units / Tape & Ammo
1N47xxATA2*	Axial Lead	4000 Units / Tape & Ammo

* 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



Zener Voltage Regulator

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

Device (Note 2.)	Device Marking	Zener Voltage (Note 3 & 4.)				Zener Impedance (Note 5.)			Leakage Current		I_r (Note 6.)
		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)
1N4728A	1N4728A	3.135	3.3	3.465	76	10	400	1	100	1	1380
1N4729A	1N4729A	3.42	3.6	3.78	69	10	400	1	100	1	1260
1N4730A	1N4730A	3.705	3.9	4.095	64	9	400	1	50	1	1190
1N4731A	1N4731A	4.085	4.3	4.515	58	9	400	1	10	1	1070
1N4732A	1N4732A	4.465	4.7	4.935	53	8	500	1	10	1	970
1N4733A	***1N4733A***	***4.845***	***5.1***	***5.355***	***49***	***7***	***550***	***1***	***10***	***1***	***890***
1N4734A	***1N4734A***	***5.32***	***5.6***	***5.88***	***45***	***5***	***600***	***1***	***10***	***2***	***810***
1N4735A	***1N4735A***	***5.89***	***6.2***	***6.51***	***41***	***2***	***700***	***1***	***10***	***3***	***730***
1N4736A	***1N4736A***	***6.46***	***6.8***	***7.14***	***37***	***3.5***	***700***	***1***	***10***	***4***	***660***
1N4737A	1N4737A	7.125	7.5	7.875	34	4	700	0.5	10	5	605
1N4738A	1N4738A	7.79	8.2	8.61	31	4.5	700	0.5	10	6	550
1N4739A	1N4739A	8.645	9.1	9.555	28	5	700	0.5	10	7	500
1N4740A	***1N4740A***	***9.5***	***10***	***10.5***	***25***	***7***	***700***	***0.25***	***10***	***7.6***	***454***
1N4741A	***1N4741A***	***10.45***	***11***	***11.55***	***23***	***8***	***700***	***0.25***	***5***	***8.4***	***414***
1N4742A	***1N4742A***	***11.4***	***12***	***12.6***	***21***	***9***	***700***	***0.25***	***5***	***9.1***	***380***

2. TOLERANCE AND TYPE NUMBER DESIGNATION (V_Z)
The type numbers listed have a standard tolerance on the nominal zener voltage of ±5%.

3. 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.

4. ZENER VOLTAGE (V_Z) MEASUREMENT
Nominal zener voltage is measured with the device junction in the thermal equilibrium at the lead temperature (T_L) at 30°C ±1°C and 3/8" lead length.

5. 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}.

6. 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 7.)	Device Marking	Zener Voltage (Note 8 & 9.) V_Z (Volts) Min	Nom	Max	@ I_{ZT} (mA)	Zener Impedance (Note 10.) Z_{ZT} @ I_{ZT} (Ω)	Z_{ZK} @ I_{ZK} (Ω)	(mA)	Leakage Current I_R @ V_R (µA Max)	(Volts)	I_r (Note 11.) (mA)
1N4743A	1N4743A	12.35	13	13.65	19	10	700	0.25	5	9.9	344
1N4744A	***1N4744A***	***14.25***	***15***	***15.75***	***17***	***14***	***700***	***0.25***	***5***	***11.4***	***304***
1N4745A	***1N4745A***	***15.2***	***16***	***16.8***	***15.5***	***16***	***700***	***0.25***	***5***	***12.2***	***285***
1N4746A	***1N4746A***	***17.1***	***18***	***18.9***	***14***	***20***	***750***	***0.25***	***5***	***13.7***	***250***
1N4747A	***1N4747A***	***19***	***20***	***21***	***12.5***	***22***	***750***	***0.25***	***5***	***15.2***	***225***
1N4748A	***1N4748A***	***20.9***	***22***	***23.1***	***11.5***	***23***	***750***	***0.25***	***5***	***16.7***	***205***
1N4749A	***1N4749A***	***22.8***	***24***	***25.2***	***10.5***	***25***	***750***	***0.25***	***5***	***18.2***	***190***
1N4750A	***1N4750A***	***25.65***	***27***	***28.35***	***9.5***	***35***	***750***	***0.25***	***5***	***20.6***	***170***
1N4751A	***1N4751A***	***28.5***	***30***	***31.5***	***8.5***	***40***	***1000***	***0.25***	***5***	***22.8***	***150***
1N4752A	***1N4752A***	***31.35***	***33***	***34.65***	***7.5***	***45***	***1000***	***0.25***	***5***	***25.1***	***135***
1N4753A	1N4753A	34.2	36	37.8	7	50	1000	0.25	5	27.4	125
1N4754A	1N4754A	37.05	39	40.95	6.5	60	1000	0.25	5	29.7	115
1N4755A	1N4755A	40.85	43	45.15	6	70	1500	0.25	5	32.7	110
1N4756A	1N4756A	44.65	47	49.35	5.5	80	1500	0.25	5	35.8	95
1N4757A	1N4757A	48.45	51	53.55	5	95	1500	0.25	5	38.8	90
1N4758A	1N4758A	53.2	56	58.8	4.5	110	2000	0.25	5	42.6	80
1N4759A	1N4759A	58.9	62	65.1	4	125	2000	0.25	5	47.1	70
1N4760A	1N4760A	64.6	68	71.4	3.7	150	2000	0.25	5	51.7	65
1N4761A	1N4761A	71.25	75	78.75	3.3	175	2000	0.25	5	56	60
1N4762A	1N4762A	77.9	82	86.1	3	200	3000	0.25	5	62.2	55
1N4763A	1N4763A	86.45	91	95.55	2.8	250	3000	0.25	5	69.2	50
1N4764A	1N4764A	95	100	105	2.5	350	3000	0.25	5	76	45

7. **TOLERANCE AND TYPE NUMBER DESIGNATION (V_Z)**
   The type numbers listed have a standard tolerance on the nominal zener voltage of ±5%.
8. **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.
9. **ZENER VOLTAGE (V_Z) MEASUREMENT**
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10. **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}.
11. **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.

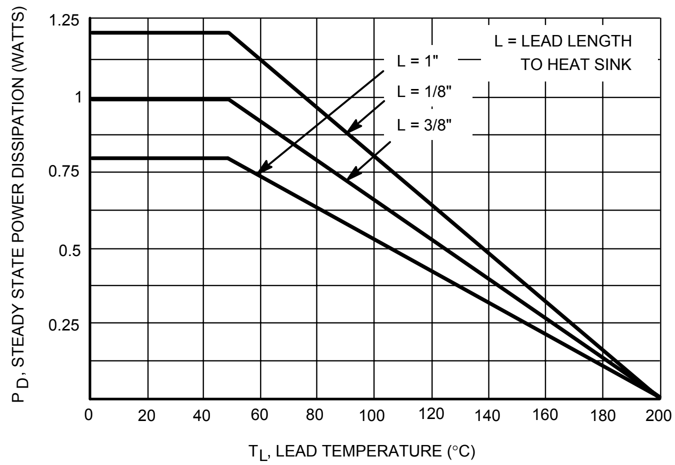
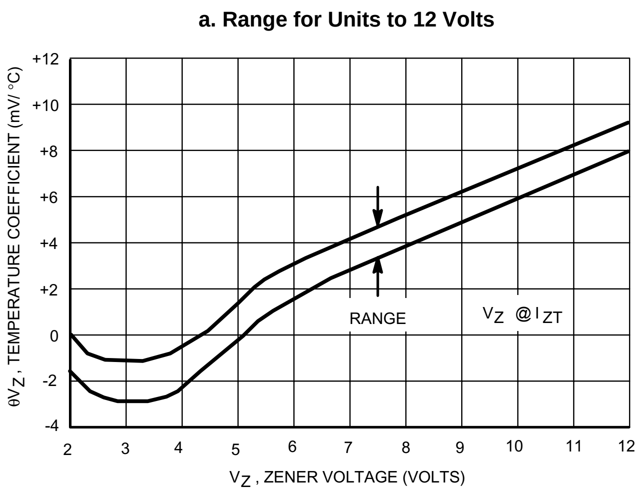


Figure 1. Power Temperature Derating Curve



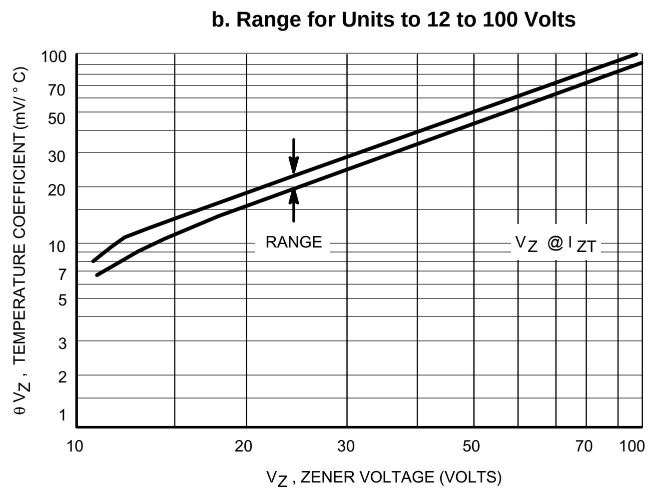


Figure 2. Temperature Coefficients

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

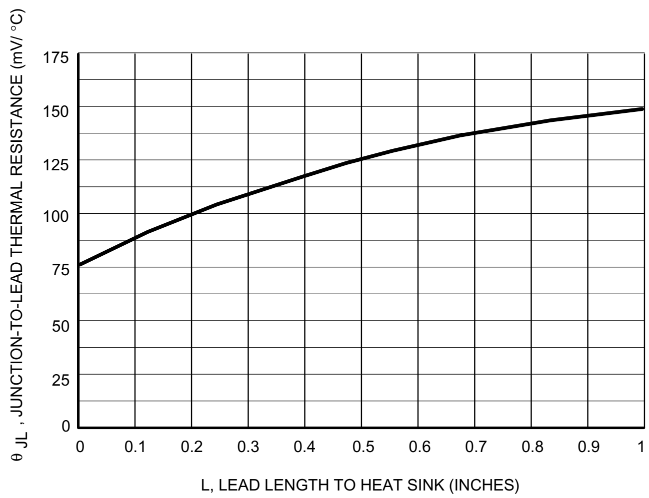


Figure 3. Typical Thermal Resistance versus Lead Length

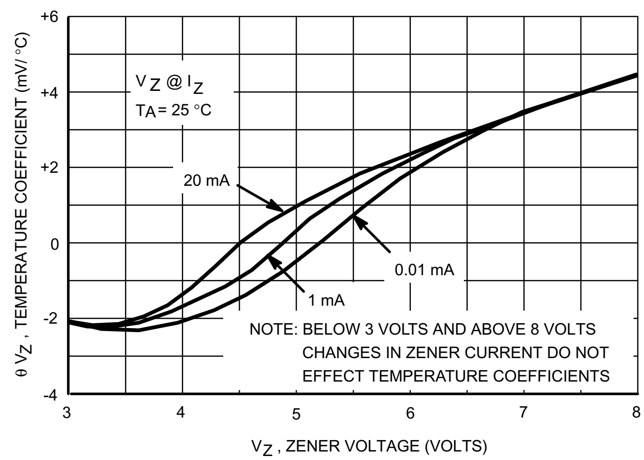
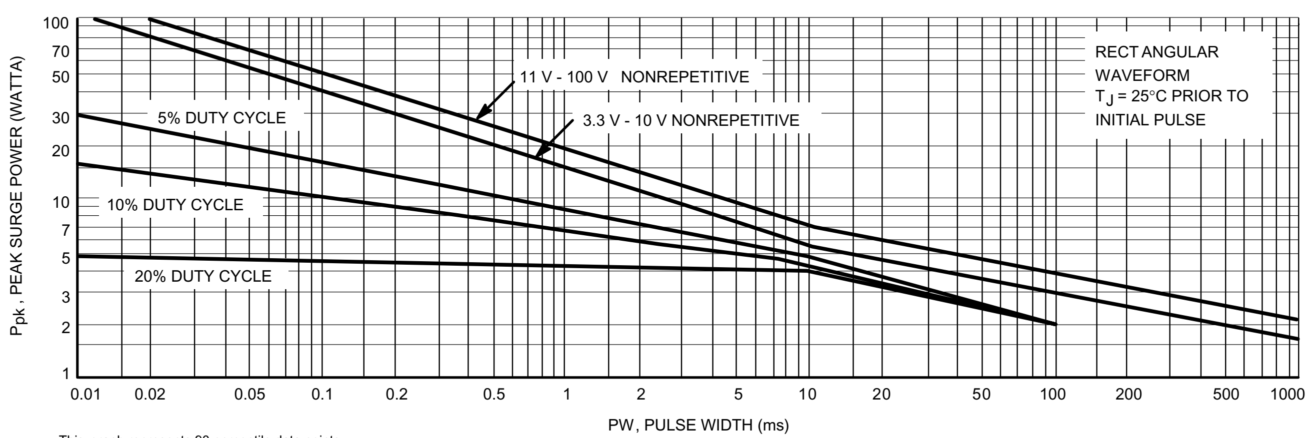


Figure 4. Effect of Zener Current



This graph represents 90 percentile data points.

For worst case design characteristics, multiply surge power by 2/3.

Figure 5. Maximum Surge Power

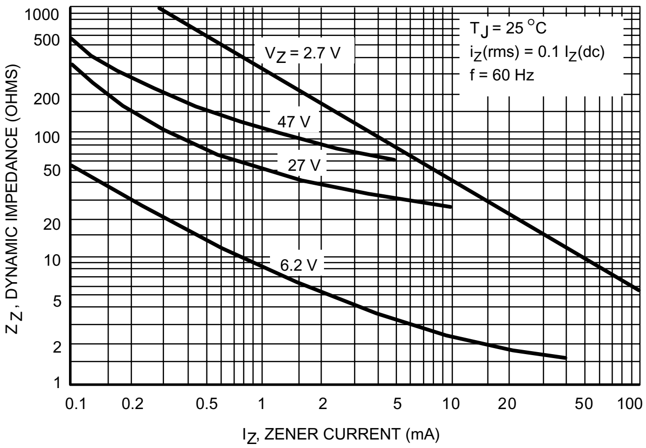


Figure 6. Effect of Zener Current on Zener Impedance

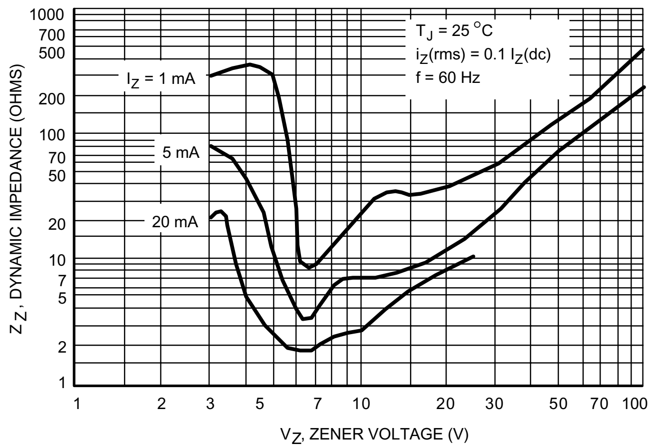


Figure 7. Effect of Zener Voltage on Zener Impedance

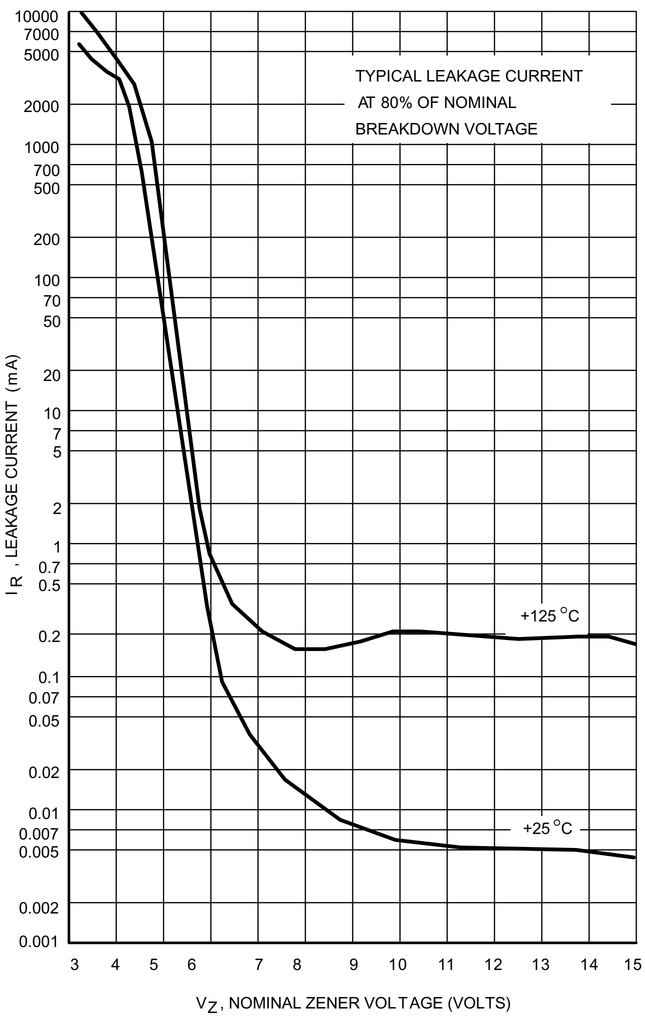


Figure 8. Typical Leakage Current

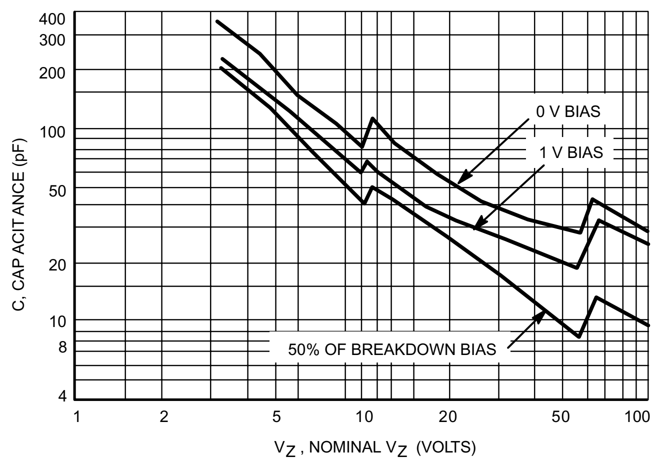


Figure 9. Typical Capacitance versus V_Z

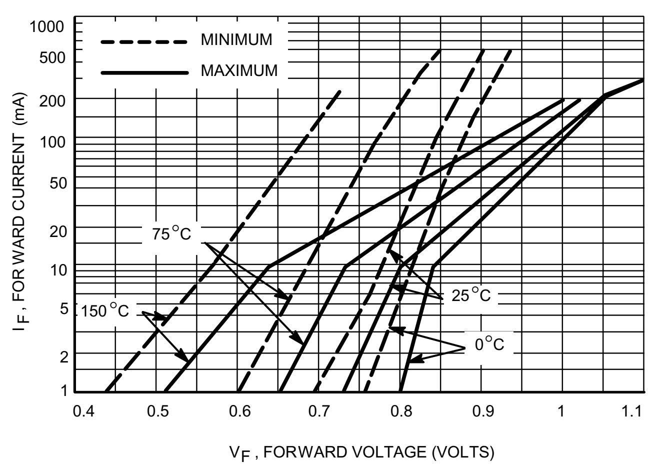


Figure 10. Typical Forward Characteristics

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.