



SEMICONDUCTOR

# DATA SHEET

## 1N957B~1N992B

### 500 mW DO-35 Hermetically Sealed Glass Zener Voltage Regulators

#### Maximum Ratings (Note 1)

Rating	Symbol	Value	Unit
Maximum Steady State Power Dissipation @ $T_L \leq 75^\circ\text{C}$ , Lead Length = 3/8"	$P_D$	500	mW
Derate Above 75°C		4.0	mW/°C
Operating and Storage Temperature Range	$T_J, T_{stg}$	-65 to +200	°C

1. Some part number series have lower JEDEC registered ratings.

#### Specification Features

- Zener Voltage Range = 6.8 V to 200 V
- ESD Rating of Class 3 (>16 KV) per Human Body Model
- DO-35 Package (DO-204AH)
- Double Slug Type Construction
- Metallurgical Bonding

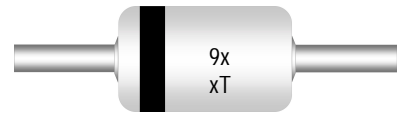
#### Mechanical Characteristics

**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°C, 1/16" from the case for 10 seconds

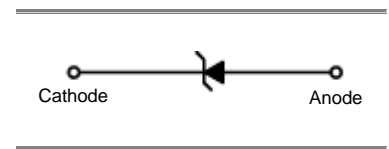


DEVICE MARKING DIAGRAM

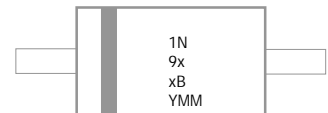


Device Code : 1N9xxT  
 Tolerance (T) : A = 10%  
 B = 5%  
 C = 2%  
 D = 1%

AXIAL LEAD DO35



MARKING DIAGRAM

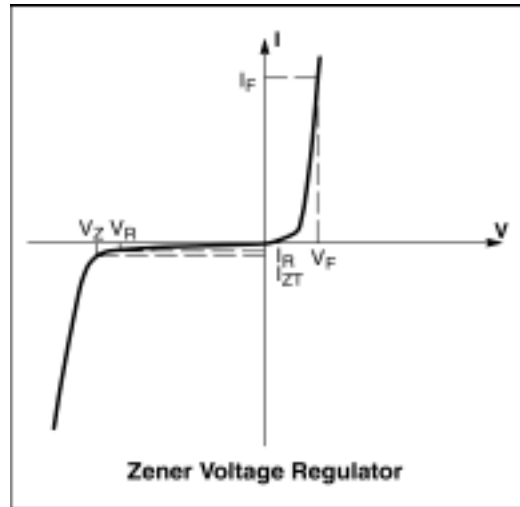


1N9xxB = Device Code  
 Y = Year  
 MM = Month

# 1N957B~1N992B

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 1.5\text{ V Max @ } I_F = 200\text{mA}$  for all types)

Symbol	Parameter
$V_Z$	Reverse Zener Voltage @ $I_{ZT}$
$I_{ZT}$	Reverse Zener Current
$Z_{ZT}$	Maximum Zener Impedance @ $I_{ZT}$
$I_{ZM}$	Maximum DC Zener Current
$I_R$	Reverse Leakage Current @ $V_R$
$V_R$	Reverse Voltage
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$
$I_{ZM}$	Maximum DC Zener Current



**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 1.5\text{ V Max @ } I_F = 200\text{mA}$  for all types)

Device (Note 2.)	Device Marking	Zener Voltage (Note 3.)				Zener Impedance (Note 4.)			Leakage Current		$I_{ZM}$ (Note 5.)
		$V_Z$ (Volts)			@ $I_{ZT}$	$Z_{ZT}$ @ $I_{ZT}$	$Z_{ZK}$ @ $I_{ZK}$		$I_R$ @ $V_R$		
		Min	Nom	Max	(mA)	( $\Omega$ )	( $\Omega$ )	(mA)	( $\mu\text{A}$ )	(Volts)	(mA)
1N957B	1N957B	6.46	6.8	7.14	18.5	4.5	700	1	150	5.2	47
1N958B	1N958B	7.125	7.5	7.875	16.5	5.5	700	0.5	75	5.7	42
1N959B	1N959B	7.79	8.2	8.61	15	6.5	700	0.5	50	6.2	38
1N960B	1N960B	8.645	9.1	9.555	14	7.5	700	0.5	25	6.9	35
1N961B	1N961B	9.5	10	10.5	12.5	8.5	700	0.25	10	7.6	32
1N962B	1N962B	10.45	11	11.55	11.5	9.5	700	0.25	5	8.4	28
1N963B	1N963B	11.4	12	12.6	10.5	11.5	700	0.25	5	9.1	26
1N964B	1N964B	12.35	13	13.65	9.5	13	700	0.25	5	9.9	24
1N965B	1N965B	14.25	15	15.75	8.5	16	700	0.25	5	11.4	21
1N966B	1N966B	15.2	16	16.8	7.8	17	700	0.25	5	12.2	19
1N967B	1N967B	17.1	18	18.9	7	21	750	0.25	5	13.7	17
1N968B	1N968B	19	20	21	6.2	25	750	0.25	5	15.2	15
1N969B	1N969B	20.9	22	23.1	5.6	29	750	0.25	5	16.7	14
1N970B	1N970B	22.8	24	25.2	5.2	33	750	0.25	5	18.2	13
1N971B	1N971B	25.65	27	28.35	4.6	41	750	0.25	5	20.6	11
1N972B	1N972B	28.5	30	31.5	4.2	49	1000	0.25	5	22.8	10
1N973B	1N973B	31.35	33	34.65	3.8	58	1000	0.25	5	25.1	9.2
1N974B	1N974B	34.2	36	37.8	3.4	70	1000	0.25	5	27.4	8.5
1N975B	1N975B	37.05	39	40.95	3.2	80	1000	0.25	5	29.7	7.8
1N976B	1N976B	40.85	43	45.15	3	93	1500	0.25	5	32.7	7

## 2. TOLERANCE AND TYPE NUMBER DESIGNATION ( $V_Z$ )

The type numbers listed have a standard tolerance on the nominal zener voltage of  $\pm 5\%$ .

## 3. 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  $30^\circ\text{C} \pm 1^\circ\text{C}$  and  $3/8"$  lead length.

## 4. ZENER IMPEDANCE ( $Z_Z$ ) DERIVATION

$Z_{ZT}$  and  $Z_{ZK}$  are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for  $I_{Z(AC)} = 0.1 I_{Z(DC)}$  with AC frequency = 60Hz.

## 5. MAXIMUM ZENER CURRENT RATINGS ( $I_{ZM}$ )

Values shown are based on the JEDEC rating of 400mW where the actual zener voltage ( $V_Z$ ) is known at the operating point, the zener current may be increased and is limited by the derating curve.

# 1N957B~1N992B

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted, V<sub>F</sub> = 1.5 V Max @ I<sub>F</sub> = 200mA for all types)

Device (Note 6.)	Device Marking	Zener Voltage (Note 7.)			Zener Impedance (Note 8.)			Leakage Current		I <sub>ZM</sub> (Note 9.)	
		V <sub>Z</sub> (Volts)			@ I <sub>ZT</sub>	Z <sub>ZT</sub> @ I <sub>ZT</sub>	Z <sub>ZK</sub> @ I <sub>ZK</sub>	I <sub>R</sub> @ V <sub>R</sub>			
		Min	Nom	Max	(mA)	(Ω)	(Ω)	(mA)	(μA)	(Volts)	(mA)
1N977B	1N977B	44.65	47	49.35	2.7	105	1500	0.25	5	35.8	6.4
1N978B	1N978B	48.45	51	53.55	2.5	125	1500	0.25	5	38.8	5.9
1N979B	1N979B	53.2	56	58.8	2.2	150	2000	0.25	5	42.6	5.4
1N980B	1N980B	58.9	62	65.1	2	185	2000	0.25	5	47.1	4.9
1N981B	1N981B	64.6	68	71.4	1.8	230	2000	0.25	5	51.7	4.5
1N982B	1N982B	71.25	75	78.75	1.7	270	2000	0.25	5	56	4.1
1N983B	1N983B	77.9	82	86.1	1.5	330	3000	0.25	5	62.2	3.7
1N984B	1N984B	86.45	91	95.55	1.4	400	3000	0.25	5	69.2	3.3
1N985B	1N985B	95	100	105	1.3	500	3000	0.25	5	76	3
1N986B	1N986B	104.5	110	115.5	1.1	750	4000	0.25	5	83.6	2.7
1N987B	1N987B	114	120	126	1	900	4500	0.25	5	91.2	2.5
1N988B	1N988B	123.5	130	136.5	0.95	1100	5000	0.25	5	98.8	2.3
1N989B	1N989B	142.5	150	157.5	0.85	1500	6000	0.25	5	114	2
1N990B	1N990B	152	160	168	0.8	1700	6500	0.25	5	121.6	1.9
1N991B	1N991B	171	180	189	0.68	2200	7100	0.25	5	136.8	1.7
1N992B	1N992B	190	200	210	0.65	2500	8000	0.25	5	152	1.5

### 6. TOLERANCE AND TYPE NUMBER DESIGNATION (V<sub>Z</sub>)

The type numbers listed have a standard tolerance on the nominal zener voltage of ±5%.

### 7. ZENER VOLTAGE (V<sub>Z</sub>) MEASUREMENT

Nominal zener voltage is measured with the device junction in the thermal equilibrium at the lead temperature (T<sub>L</sub>) at 30°C ±1°C and 3/8" lead length.

### 8. ZENER IMPEDANCE (Z<sub>Z</sub>) DERIVATION

Z<sub>ZT</sub> and Z<sub>ZK</sub> are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for I<sub>Z(AC)</sub> = 0.1 I<sub>Z(DC)</sub> with AC frequency = 60Hz.

### 9. MAXIMUM ZENER CURRENT RATINGS (I<sub>ZM</sub>)

Values shown are based on the JEDEC rating of 400mW where the actual zener voltage (V<sub>Z</sub>) is known at the operating point, the zener current may be increased and is limited by the derating curve.

# DEVICE CHARACTERISTICS

## 1N957B~1N992B

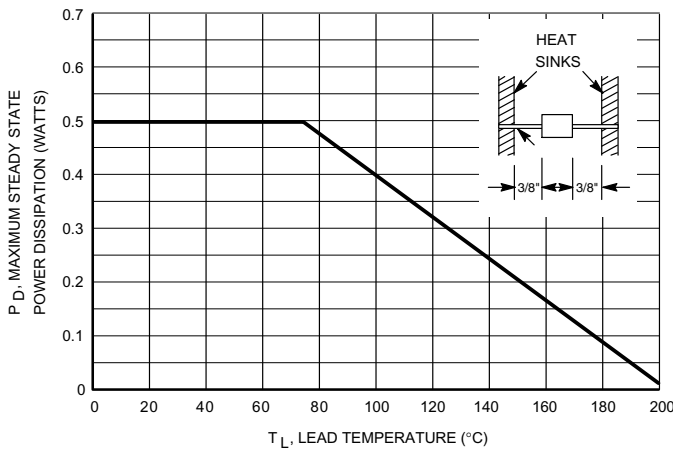


Figure 1. Steady State Power Derating

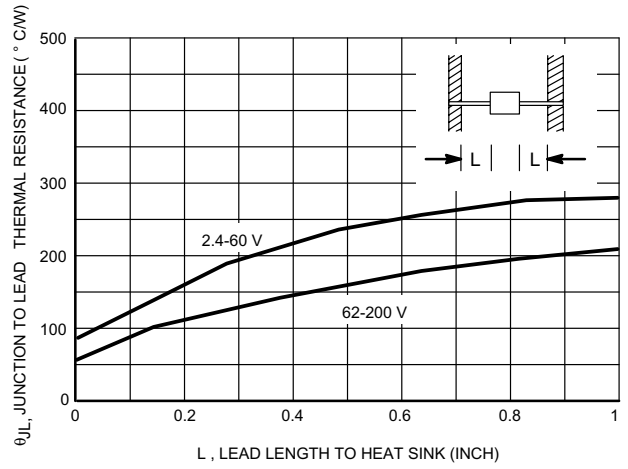


Figure 2. Typical Thermal Resistance

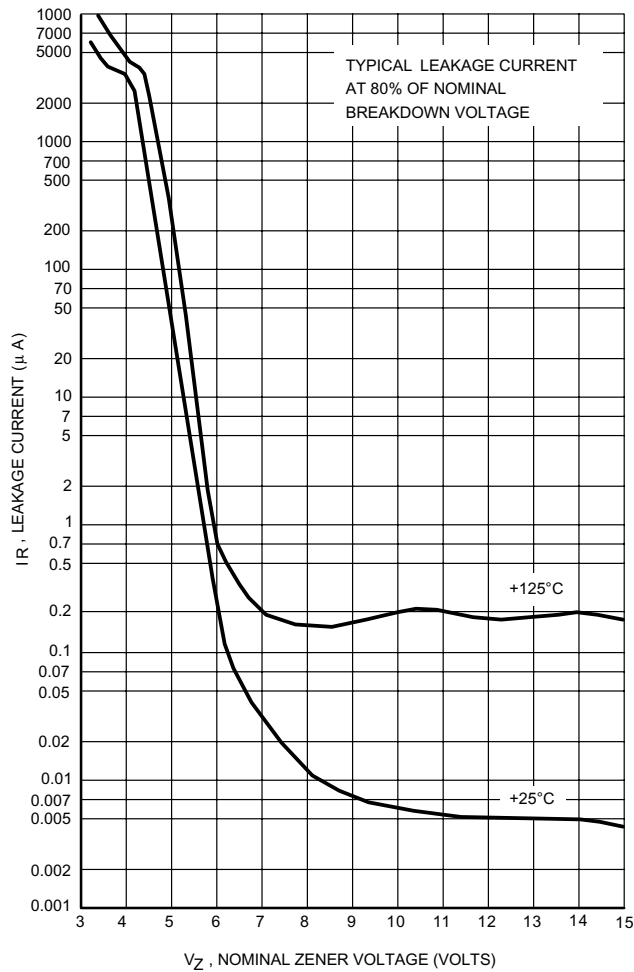


Figure 3. Typical Leakage Current

# DEVICE CHARACTERISTICS

## 1N957B~1N992B

### TEMPERATURE COEFFICIENTS

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

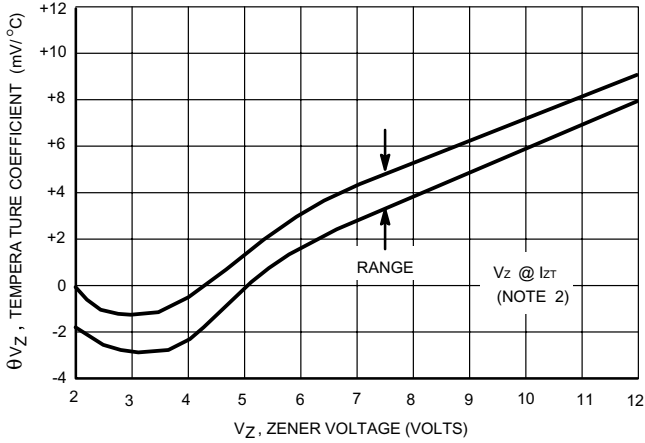


Figure 4a. Range for Units to 12 Volts

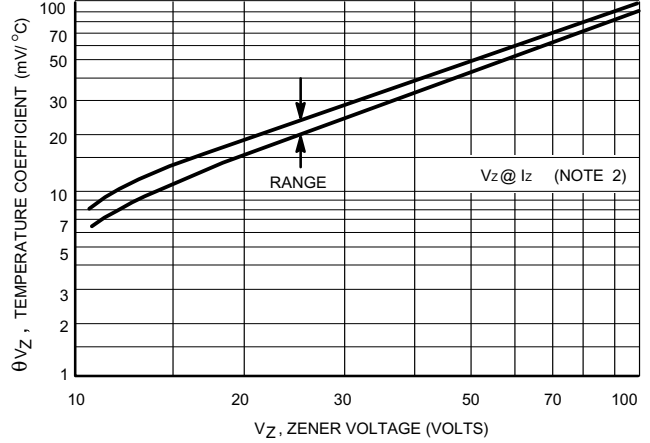


Figure 4b. Range for Units 12 to 100 Volts

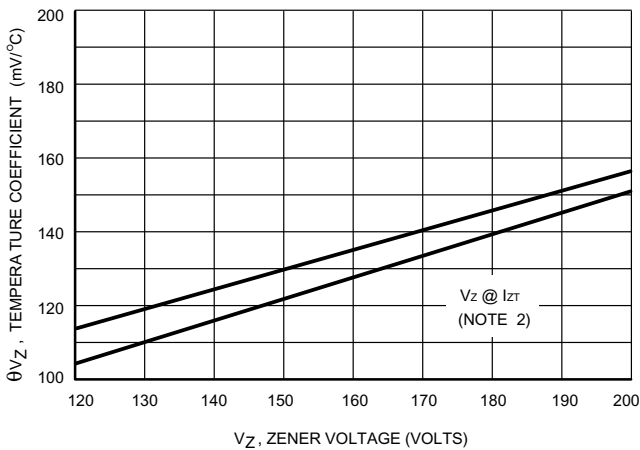


Figure 4c. Range for Units 120 to 200 Volts

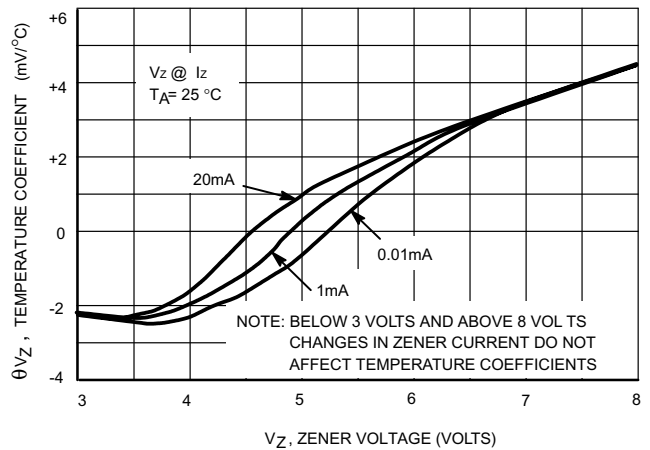


Figure 5. Effect of Zener Current

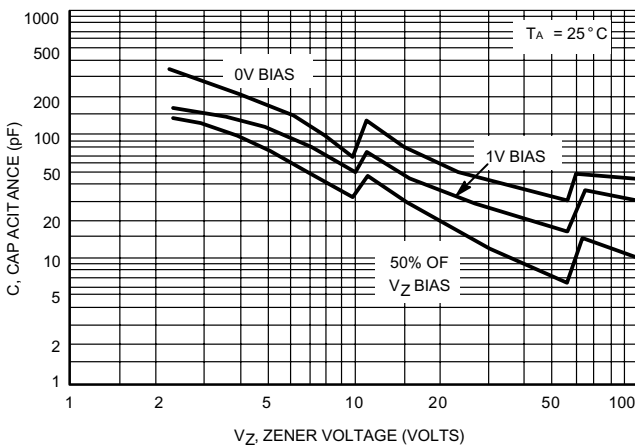


Figure 6a. Typical Capacitance 2.4-100 Volts

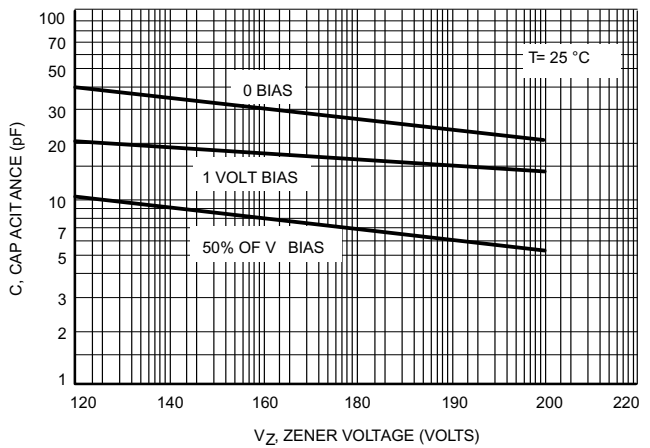


Figure 6b. Typical Capacitance 120-200 Volts

# DEVICE CHARACTERISTICS

## 1N957B~1N992B

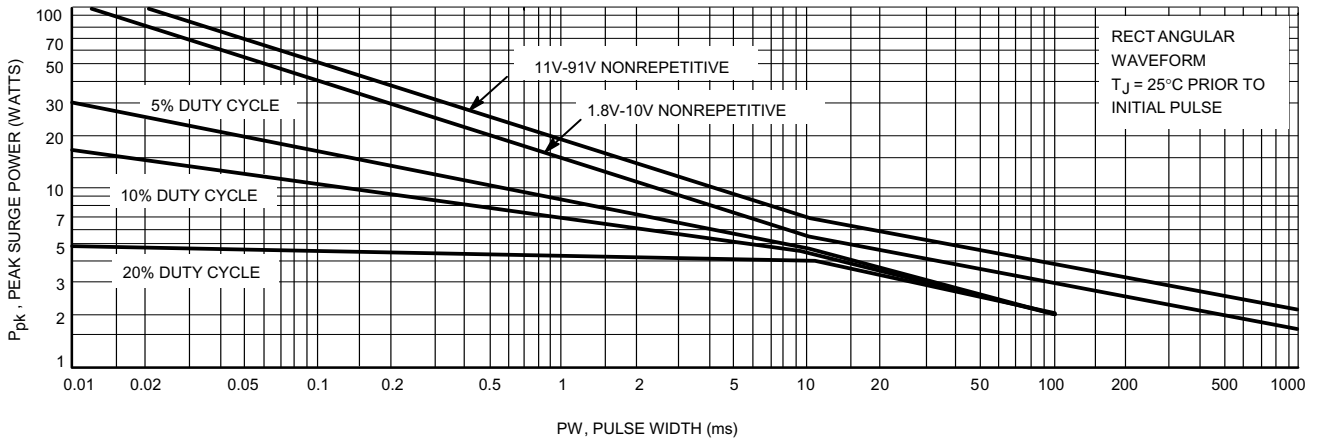


Figure 7a. Maximum Surge Power 1.8-91 Volts

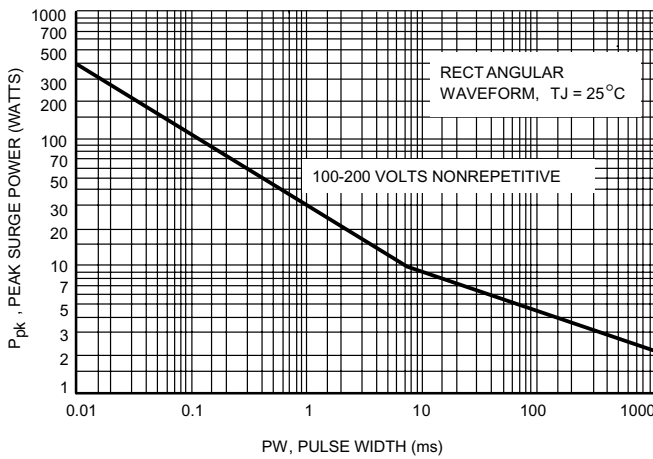


Figure 7b. Maximum Surge Power DO-35 100-200Volts

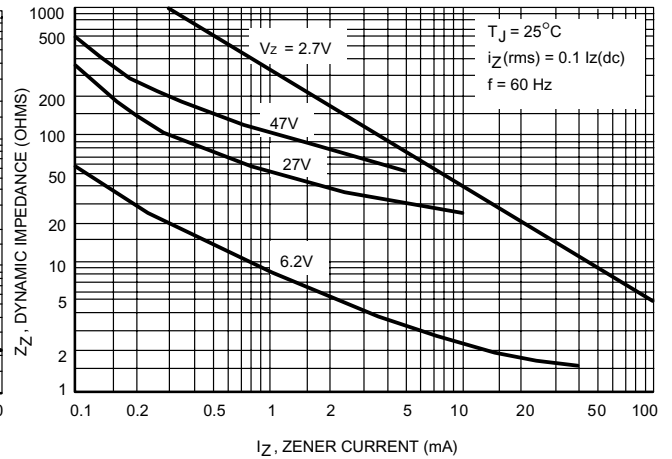


Figure 8. Effect of Zener Current on Zener Impedance

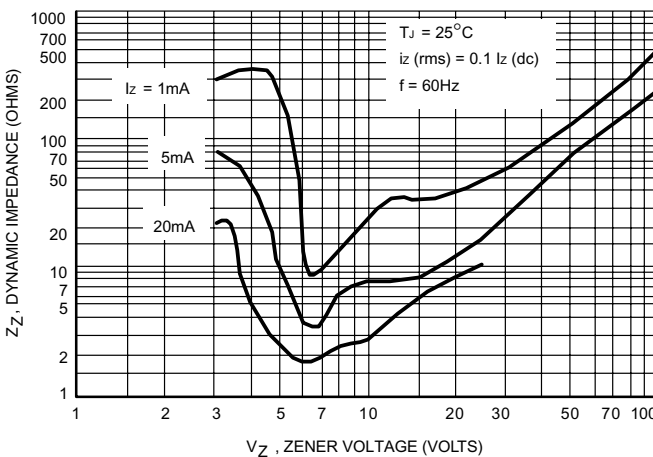


Figure 9. Effect of Zener Voltage on Zener Impedance

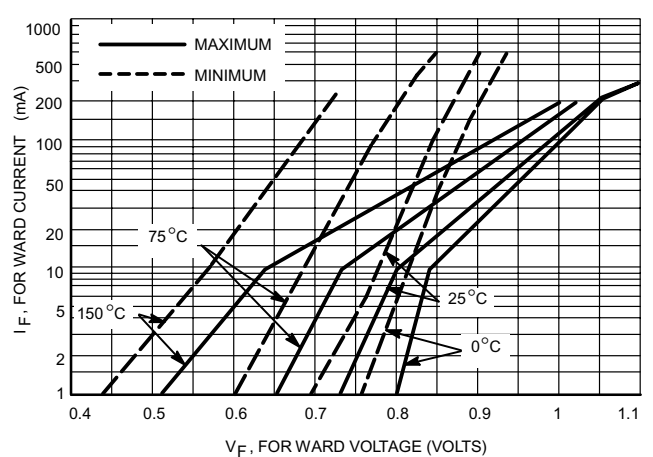


Figure 10. Typical Forward Characteristics

# DEVICE CHARACTERISTICS

## 1N957B~1N992B

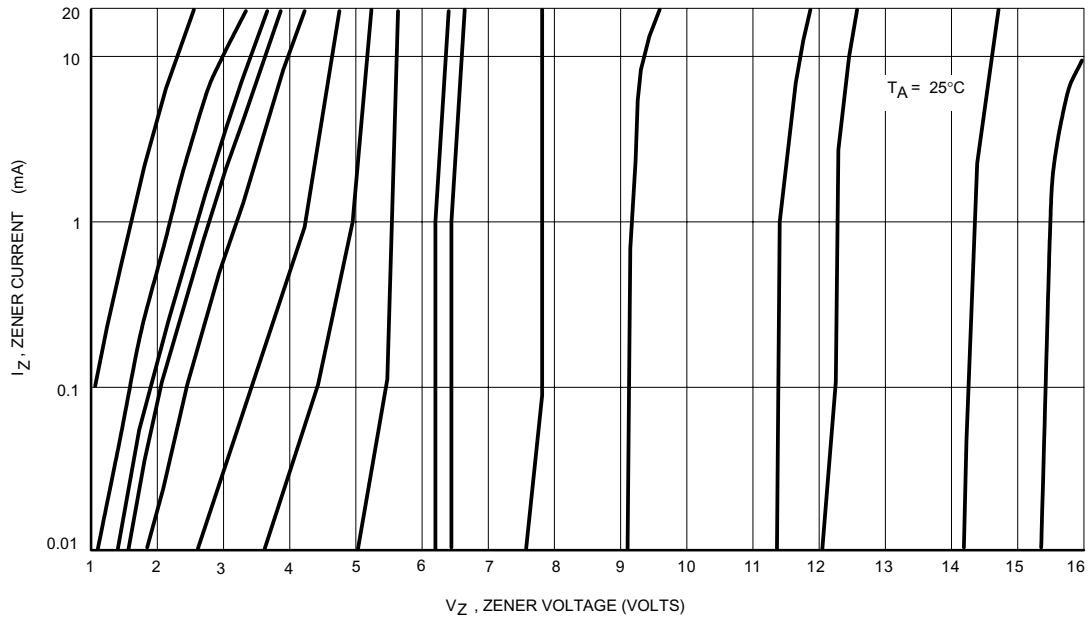


Figure 1 1. Zener Voltage versus Zener Current -  $V_Z = 1$  thru 16 Volts

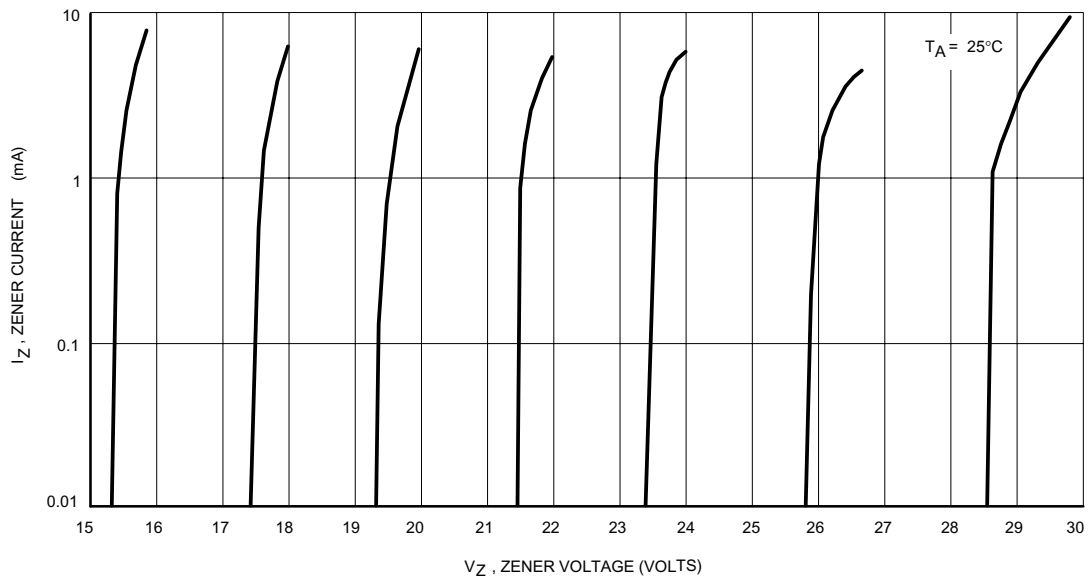


Figure 12. Zener Voltage versus Zener Current -  $V_Z = 15$  thru 30 Volts

# DEVICE CHARACTERISTICS

## 1N957B~1N992B

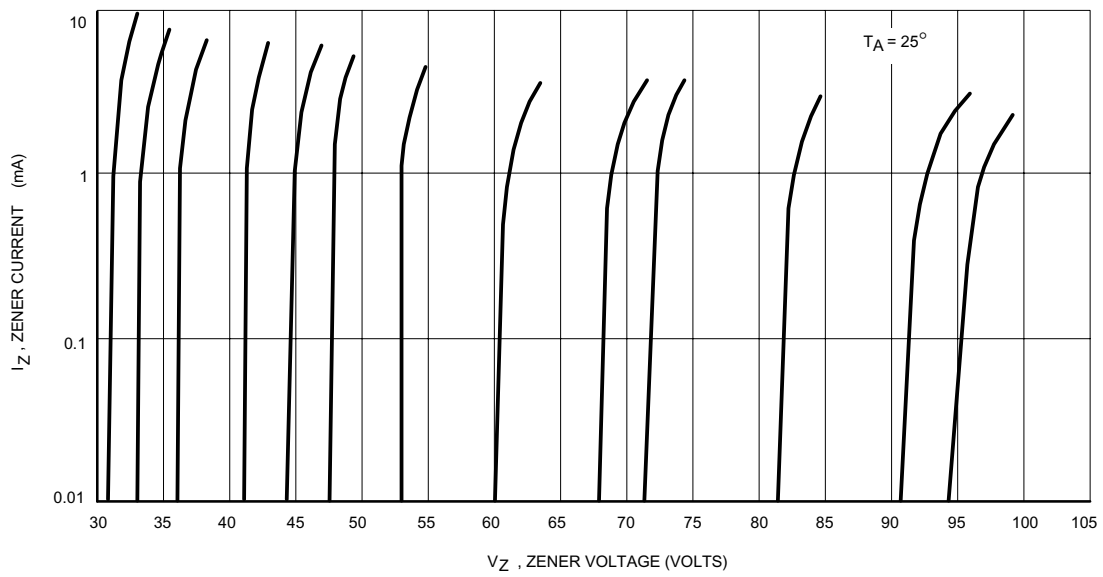


Figure 13. Zener Voltage versus Zener Current -  $V_Z = 30$  thru 105 Volts

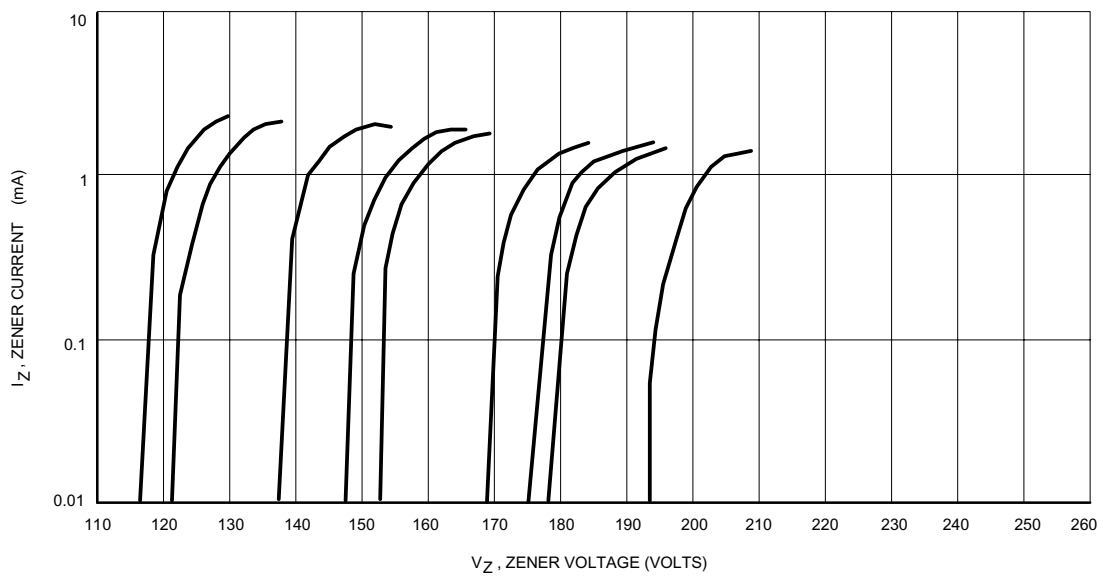


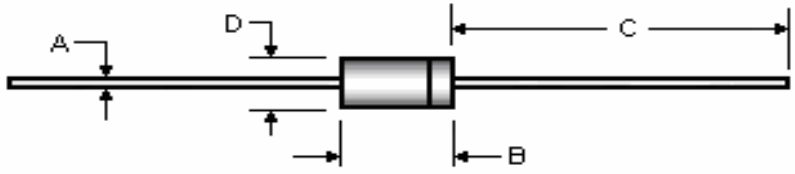
Figure 14. Zener Voltage versus Zener Current -  $V_Z = 110$  thru 220 Volts



# PACKAGE OUTLINE & DIMENSIONS

1N957B~1N992B

## Package Outline

Package	Case Outline				
DO-35					
	DO-35				
	DIM	Millimeters		Inches	
		Min	Max	Min	Max
	<b>A</b>	0.46	0.55	0.018	0.022
<b>B</b>	3.05	5.08	0.120	0.200	
<b>C</b>	25.40	38.10	1.000	1.500	
<b>D</b>	1.53	2.28	0.060	0.090	

**Notes:**

1. All dimensions are within JEDEC standard.
2. DO35 polarity denoted by cathode band.