

## Small Signal Zener Diodes



### FEATURES

- Very sharp reverse characteristic
- Low reverse current level
- Very high stability
- Low noise
- AEC-Q101 qualified
- Material categorization:  
For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

### APPLICATIONS

- Voltage stabilization

PRIMARY CHARACTERISTICS		
PARAMETER	VALUE	UNIT
V <sub>Z</sub> range nom.	2.4 to 36	V
Test current I <sub>ZT</sub>	2; 5	mA
V <sub>Z</sub> specification	Pulse current	
Int. construction	Single	

ORDERING INFORMATION			
DEVICE NAME	ORDERING CODE	TAPED UNITS PER REEL	MINIMUM ORDER QUANTITY
TZX-series	TZX-series-TAP	10 000 per ammpack (52 mm tape)	30 000/box
TZX-series	TZX-series-TR	10 000 per 14" reel (52 mm tape)	30 000/box

PACKAGE				
PACKAGE NAME	WEIGHT	MOLDING COMPOUND FLAMMABILITY RATING	MOISTURE SENSITIVITY LEVEL	SOLDERING CONDITIONS
DO-35	125 mg	UL 94 V-0	MSL level 1 (according J-STD-020)	260 °C/10 s at terminals

ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)					
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT	
Power dissipation	I = 4 mm, T <sub>L</sub> = 25 °C	P <sub>tot</sub>	500	mW	
Zener current		I <sub>Z</sub>	P <sub>tot</sub> /V <sub>Z</sub>	mA	
Thermal resistance junction to ambient air	I = 4 mm, T <sub>L</sub> = constant	R <sub>thJA</sub>	300	K/W	
Junction temperature		T <sub>j</sub>	175	°C	
Storage temperature range		T <sub>stg</sub>	- 65 to + 175	°C	
Forward voltage (max.)	I <sub>F</sub> = 200 mA	V <sub>F</sub>	1.5	V	



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)								
PART NUMBER	ZENER VOLTAGE RANGE		TEST CURRENT	REVERSE LEAKAGE CURRENT				DYNAMIC RESISTANCE
	$V_Z$ at $I_{ZT1}$		$I_{ZT1}$	$I_R$ at $V_R$		$I_R$ at $V_R^{(1)}$		$Z_Z$ at $I_{ZT1}$
	V		mA	$\mu\text{A}$	V	$\mu\text{A}$	V	$\Omega$
	MIN.	MAX.		MAX.		MAX.		MAX.
TZX2V4A	2.3	2.5	5	5	0.5	50	1	100
TZX2V4B	2.4	2.6	5	5	0.5	50	1	100
TZX2V7A	2.5	2.7	5	5	0.5	10	1	100
TZX2V7B	2.6	2.8	5	5	0.5	10	1	100
TZX2V7C	2.7	2.9	5	5	0.5	10	1	100
TZX3V0A	2.8	3	5	5	0.5	6	1	100
TZX3V0B	2.9	3.1	5	5	0.5	6	1	100
TZX3V0C	3	3.2	5	5	0.5	6	1	100
TZX3V3A	3.1	3.3	5	5	1	2	1	100
TZX3V3B	3.2	3.4	5	5	1	2	1	100
TZX3V3C	3.3	3.5	5	5	1	2	1	100
TZX3V6A	3.4	3.6	5	5	1	2	1	100
TZX3V6B	3.5	3.7	5	5	1	2	1	100
TZX3V6C	3.6	3.8	5	5	1	2	1	100
TZX3V9A	3.7	3.9	5	5	1	2	1	100
TZX3V9B	3.8	4	5	5	1	2	1	100
TZX3V9C	3.9	4.1	5	5	1	2	1	100
TZX4V3A	4	4.2	5	5	1.5	1	1	100
TZX4V3B	4.1	4.3	5	5	1.5	1	1	100
TZX4V3C	4.2	4.4	5	5	1.5	1	1	100
TZX4V3D	4.3	4.5	5	5	1.5	1	1	100
TZX4V7A	4.4	4.6	5	5	2	6	2	100
TZX4V7B	4.5	4.7	5	5	2	5	2	100
TZX4V7C	4.6	4.8	5	5	2	4	2	100
TZX4V7D	4.7	4.9	5	5	2	3	2	100
TZX5V1A	4.8	5	5	5	2	2	2	100
TZX5V1B	4.9	5.1	5	5	2	2	2	100
TZX5V1C	5	5.2	5	5	2	2	2	100
TZX5V1D	5.1	5.3	5	5	2	2	2	100
TZX5V6A	5.2	5.5	5	5	2	1	2	40
TZX5V6B	5.3	5.6	5	5	2	1	2	40
TZX5V6C	5.4	5.7	5	5	2	1	2	40
TZX5V6D	5.5	5.8	5	5	2	1	2	40
TZX5V6E	5.6	5.9	5	5	2	1	2	40
TZX6V2A	5.7	6	5	1	3	3	4	15
TZX6V2B	5.8	6.1	5	1	3	3	4	15
TZX6V2C	6	6.3	5	1	3	3	4	15
TZX6V2D	6.1	6.4	5	1	3	3	4	15
TZX6V2E	6.3	6.6	5	1	3	3	4	15
TZX6V8A	6.4	6.7	5	1	3.5	2	4	15
TZX6V8B	6.6	6.9	5	1	3.5	2	4	15
TZX6V8C	6.7	7	5	1	3.5	2	4	15
TZX6V8D	6.9	7.2	5	1	3.5	2	4	15



ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)								
PART NUMBER	ZENER VOLTAGE RANGE		TEST CURRENT	REVERSE LEAKAGE CURRENT				DYNAMIC RESISTANCE
	V <sub>Z</sub> at I <sub>ZT1</sub>		I <sub>ZT1</sub>	I <sub>R</sub> at V <sub>R</sub>		I <sub>R</sub> at V <sub>R</sub> <sup>(1)</sup>		Z <sub>Z</sub> at I <sub>ZT1</sub>
	V		mA	μA	V	μA	V	Ω
	MIN.	MAX.		MAX.		MAX.		MAX.
TZX7V5A	7	7.3	5	1	5	30	6.65	15
TZX7V5B	7.2	7.6	5	1	5	30	6.84	15
TZX7V5C	7.3	7.7	5	1	5	30	6.94	15
TZX7V5D	7.5	7.9	5	1	5	30	7.13	15
TZX7V5X	7.07	7.45	5	1	5	30	6.72	15
TZX8V2A	7.7	8.1	5	1	6.2	0.1	7.32	20
TZX8V2B	7.9	8.3	5	1	6.2	0.1	7.5	20
TZX8V2C	8.1	8.5	5	1	6.2	0.1	7.7	20
TZX8V2D	8.3	8.7	5	1	6.2	0.1	7.98	20
TZX9V1A	8.5	8.9	5	1	6.8	0.04	8.08	20
TZX9V1B	8.7	9.1	5	1	6.8	0.04	8.27	20
TZX9V1C	8.9	9.3	5	1	6.8	0.04	8.46	20
TZX9V1D	9.1	9.5	5	1	6.8	0.04	8.65	20
TZX9V1E	9.3	9.7	5	1	6.8	0.04	8.84	20
TZX10A	9.5	9.9	5	1	7.5	0.04	9.03	25
TZX10B	9.7	10.1	5	1	7.5	0.04	9.22	25
TZX10C	9.9	10.3	5	1	7.5	0.04	9.41	25
TZX10D	10.2	10.6	5	1	7.5	0.04	9.69	25
TZX11A	10.4	10.8	5	1	8.2	0.04	9.88	25
TZX11B	10.7	11.1	5	1	8.2	0.04	10.2	25
TZX11C	10.9	11.3	5	1	8.2	0.04	10.4	25
TZX11D	11.1	11.6	5	1	8.2	0.04	10.5	25
TZX12A	11.4	11.9	5	1	9.5	0.04	10.8	35
TZX12B	11.6	12.1	5	1	9.5	0.04	11	35
TZX12C	11.9	12.4	5	1	9.5	0.04	11.3	35
TZX12D	12.2	12.7	5	1	9.5	0.04	11.6	35
TZX12X	11.44	12.03	5	1	9.5	0.04	10.9	35
TZX13A	12.4	12.9	5	1	10	0.04	11.8	35
TZX13B	12.6	13.1	5	1	10	0.04	12	35
TZX13C	12.9	13.4	5	1	10	0.04	12.3	35
TZX14A	13.2	13.7	5	1	11	0.04	12.5	35
TZX14B	13.5	14	5	1	11	0.04	12.8	35
TZX14C	13.8	14.3	5	1	11	0.04	13.1	35
TZX15A	14.1	14.7	5	1	11.5	0.04	13.4	40
TZX15B	14.5	15.1	5	1	11.5	0.04	13.8	40
TZX15C	14.9	15.5	5	1	11.5	0.04	14.2	40
TZX15X	14.35	15.09	5	1	11.5	0.04	13.6	40
TZX16A	15.3	15.9	5	1	12	0.04	14.5	45
TZX16B	15.7	16.5	5	1	12	0.04	14.9	45
TZX16C	16.3	17.1	5	1	12	0.04	15.5	45
TZX18A	16.9	17.7	5	1	13	0.04	16.1	55
TZX18B	17.5	18.3	5	1	13	0.04	16.6	55
TZX18C	18.1	19	5	1	13	0.04	17.2	55
TZX20A	18.8	19.7	2	1	15	0.04	17.9	60
TZX20B	19.5	20.4	2	1	15	0.04	18.5	60
TZX20C	20.2	21.2	2	1	15	0.04	19.2	60
TZX22A	20.9	21.9	2	1	17	0.04	19.9	65

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)								
PART NUMBER	ZENER VOLTAGE RANGE		TEST CURRENT	REVERSE LEAKAGE CURRENT				DYNAMIC RESISTANCE
	$V_Z$ at $I_{ZT1}$		$I_{ZT1}$	$I_R$ at $V_R$		$I_R$ at $V_R^{(1)}$		$Z_Z$ at $I_{ZT1}$
	V		mA	$\mu\text{A}$	V	$\mu\text{A}$	V	$\Omega$
	MIN.	MAX.		MAX.		MAX.		MAX.
TZX22B	21.6	22.6	2	1	17	0.04	20.5	65
TZX22C	22.3	23.3	2	1	17	0.04	21.2	65
TZX24A	22.9	24	2	1	19	0.04	21.8	70
TZX24B	23.6	24.7	2	1	19	0.04	22.4	70
TZX24C	24.3	25.5	2	1	19	0.04	23.1	70
TZX24X	22.61	23.77	2	1	19	0.04	21.5	70
TZX27A	25.2	26.6	2	1	21	0.04	23.9	80
TZX27B	26.2	27.6	2	1	21	0.04	24.9	80
TZX27C	27.2	28.6	2	1	21	0.04	25.8	80
TZX27X	26.99	28.39	2	1	21	0.04	25.6	80
TZX30A	28.2	29.6	2	1	23	0.04	26.8	100
TZX30B	29.2	30.6	2	1	23	0.04	27.7	100
TZX30C	30.2	31.6	2	1	23	0.04	28.7	100
TZX30X	29.02	30.51	2	1	23	0.04	27.6	100
TZX33A	31.2	32.6	2	1	25	0.04	29.6	120
TZX33B	32.2	33.6	2	1	25	0.04	30.6	120
TZX33C	33.2	34.5	2	1	25	0.04	31.5	120
TZX36A	34.2	35.7	2	1	27	0.04	32.5	140
TZX36B	35.3	36.8	2	1	27	0.04	33.5	140
TZX36C	36.4	38	2	1	27	0.04	34.6	140
TZX36X	35.36	37.19	2	1	27	0.04	33.6	140

**Notes**

- Additional measurement of voltage group TZX27A to TZX36,  $I_R$  at 95 %  $V_{Zmin}$ ,  $\leq 40\text{ nA}$  at  $T_j = 25\text{ }^{\circ}\text{C}$
- (1) Additional measurement

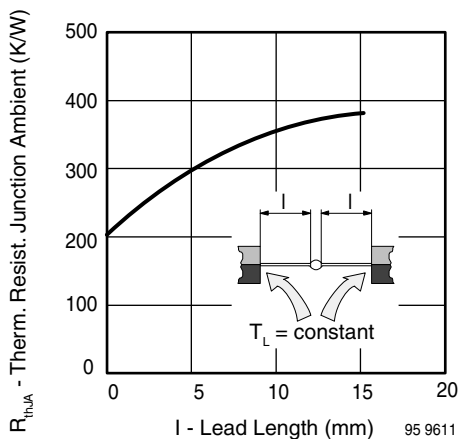
**BASIC CHARACTERISTICS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)


Fig. 1 - Thermal Resistance vs. Lead Length



Fig. 2 - Total Power Dissipation vs. Ambient Temperature



Fig. 3 - Typical Change of Working Voltage under Operating Conditions at  $T_{amb} = 25\text{ }^{\circ}\text{C}$

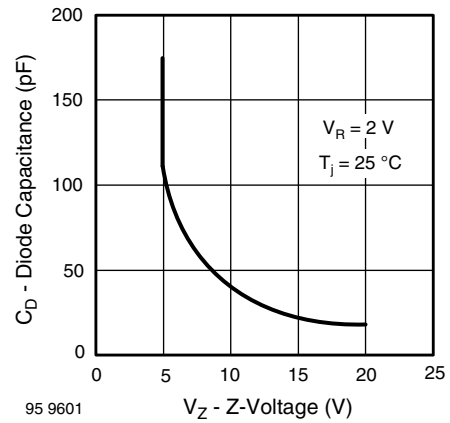


Fig. 6 - Diode Capacitance vs. Z-Voltage

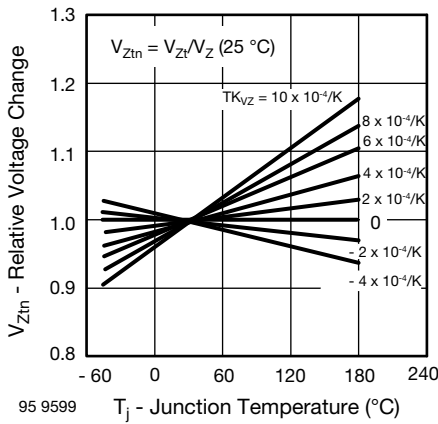


Fig. 4 - Typical Change of Working Voltage vs. Junction Temperature

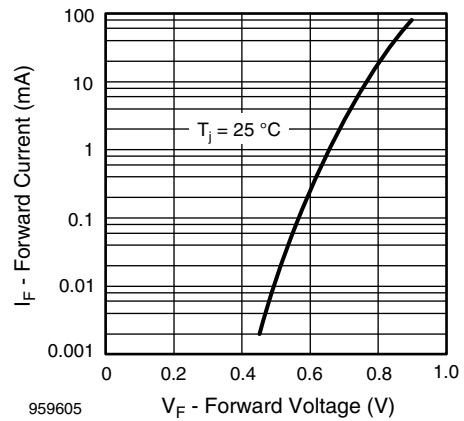


Fig. 7 - Forward Current vs. Forward Voltage



Fig. 5 - Temperature Coefficient of  $V_Z$  vs. Z-Voltage

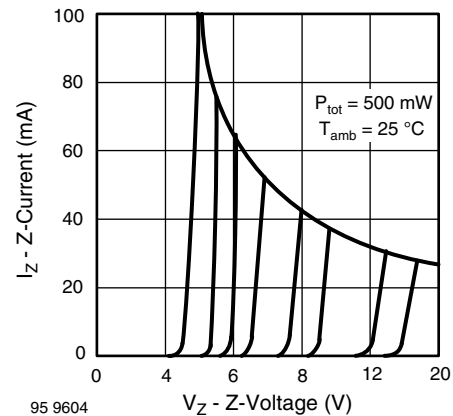


Fig. 8 - Z-Current vs. Z-Voltage



Fig. 9 - Z-Current vs. Z-Voltage



Fig. 10 - Differential Z-Resistance vs. Z-Voltage



Fig. 11 - Thermal Response

**PACKAGE DIMENSIONS** in millimeters (inches): **DO-35**



Rev. 6 - Date: 19. December 2011  
 Document no.: SB-V-3906.04-031(4)  
 94 9366



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**