

# SiBar Thyristor Surge Protectors TVBxxxNSC-L Series

Raychem Circuit Protection's SiBar thyristor surge protection devices are designed to help protect sensitive telecommunication equipment from the hazards caused by lightning, power contact, and power induction. These devices have a high electrical surge capability to help protect against transient faults and a high off-state impedance, rendering them virtually transparent during normal system operation.

SiBar thyristor surge protectors are designed to assist telecommunication and computer telephony equipment in meeting the applicable requirements and industry specifications.



## Benefits:

- Helps provide protection for sensitive telecom electronic equipment
- Low leakage current
- Low power dissipation
- Fast, reliable operation
- No wear-out mechanisms
- Helps designers meet worldwide telecom standards
- Helps reduce warranty and service costs
- Easy installation
- Helps improve power efficiency of equipment

## Features:

- RoHS compliant
- Bidirectional crowbar transient voltage protection
- Voltage range: 58V – 320V with improved V<sub>drm</sub>/V<sub>bo</sub> range
- High off-state impedance
- Low on-state voltage
- High surge capability
- Short-circuit failure mode
- Surface-mount technology
- DO-214AA SMB package
- 10 x 1000  $\mu$ s 100A surge rating
- Helps equipment comply with TIA-968, Telcordia GR-1089, IEC61000-4-5, ITU K.20/21/45

## Applications:

- Modems
- Fax machines
- Phones, answering machines
- PBX systems
- Set top boxes
- POS systems
- Analog and digital linecards (xDSL, T1/E1...)
- Other customer premise and central office network equipment requiring protection

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**Table SB1 - Electrical Characteristics**

Part Number	V <sub>DM</sub> Max. (V)	V <sub>BO</sub> Max. (V)	I <sub>H</sub> Min. (mA)	V <sub>T</sub> Max. (V)	C1 (Typ) 50V <sub>DC</sub> Bias	C2 (Typ) 2V <sub>DC</sub> Bias	Off-State Current VD2=VDM ( $\mu$ A)
TVB058NSC-L	58	77	150	4	114	222	5
TVB065NSC-L	65	88	150	4	103	198	5
TVB075NSC-L	75	98	150	4	90	176	5
TVB090NSC-L	90	130	150	4	79	154	5
TVB120NSC-L	120	160	150	4	72	140	5
TVB140NSC-L	140	180	150	4	66	130	5
TVB170NSC-L	170	220	150	4	48	99	5
TVB180NSC-L	180	240	150	4	48	97	5
TVB190NSC-L	190	260	150	4	44	90	5
TVB220NSC-L	220	300	150	4	41	81	5
TVB275NSC-L	275	350	150	4	38	76	5
TVB320NSC-L	320	400	150	4	35	71	5

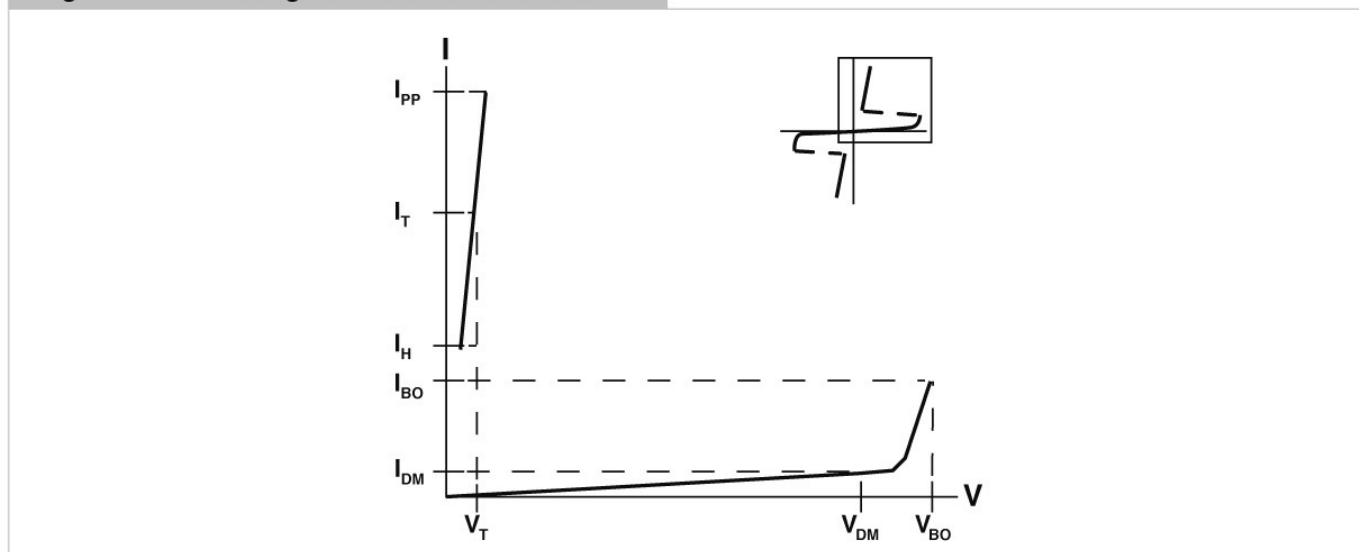
Notes: All electrical characteristics are measured at 25°C.  
V<sub>DM</sub> measured per UL497B pulse requirements: at max. off-state leakage current (IDM) = 5  $\mu$ A.  
V<sub>BO</sub> measured at 100V/ $\mu$ s.  
C1 measured at 1 MHz with a 50 V<sub>DC</sub> bias.  
C2 measured at 1MHz with a 2V<sub>DC</sub> bias.

**Table SB2 – Surge Current Rating**

Part Number	TIA-968			Telcordia GR-1089*		IEC61000-4-5	ITU K.20/21/45*			
	Type A	Type B		I <sub>pp</sub> (A)	I <sub>pp</sub> (A)	I <sub>pp</sub> (A)	I <sub>pp</sub> (A)	I <sub>TSM</sub> Min. (A)	di/dt (A/ $\mu$ s)	dV/dt (V/ $\mu$ s)
	I <sub>pp</sub> (A) 5 x 320 $\mu$ s	I <sub>pp</sub> (A) 10 x 560 $\mu$ s	I <sub>pp</sub> (A) 10 x 160 $\mu$ s	I <sub>pp</sub> (A) 10 x 1000 $\mu$ s	I <sub>pp</sub> (A) 2 x 10 $\mu$ s	I <sub>pp</sub> (A) 8 x 20 $\mu$ s	I <sub>pp</sub> (A) 5 x 310 $\mu$ s (VOC: 10 x 700 $\mu$ s)			
TVBxxxNSC-L	150	150	200	100	500	400	200	60	500	2000

Notes: \*Lightning current wave forms for applicable industry specification.  
I<sub>TSM</sub>, peak on-state surge current is measured at 60 Hz, one cycle.  
di/dt: critical rate-of-rise of on-state current (pulsed power amplifier Vmax = 600V; C = 30 $\mu$ F).  
dV/dt: critical rate-of-rise of off-state voltage (linear wave form, V<sub>0</sub> = rated V<sub>BO</sub>, T<sub>i</sub> = 25°C

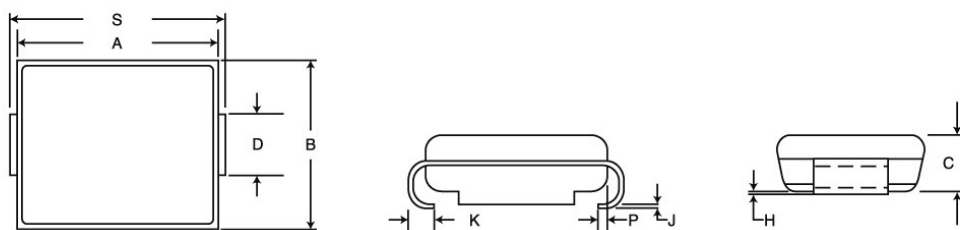
**Figure SB1 - Voltage-Current Characteristics**



The voltage current (V-I) is useful in depicting the electrical characteristics of the SiBar thyristor surge protectors in relation to each other.

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**Figure SB2 - Dimension Figure**



**Table SB3 – Dimensions in Millimeters**

Dimension	A		B		C		D	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
TVBxxxNSC-L	4.06 (0.160)	4.57 (0.180)	3.30 (0.130)	3.94 (0.155)	1.90 (0.075)	2.41 (0.095)	1.95 (0.077)	2.20 (0.087)

Dimension	H		J		K		P	S	
	Min.	Max.	Min.	Max.	Min.	Max.	Ref	Min	Max.
TVBxxxNSC-L	0.051 (0.002)	0.200 (0.008)	0.150 (0.006)	0.31 (0.012)	0.76 (0.030)	1.27 (0.050)	0.51 (0.202)	5.21 (0.205)	5.59 (0.220)

Notes: \*D dimension is measured within dimension P.  
TVB series devices use industry standard SMB package type.  
All devices are bidirectional and may be oriented in either direction for installation

**Table SB4 – Physical Characteristics and Environmental Specifications**

Lead material	Matte tin finish (-L devices)
Encapsulating material	Epoxy, meets UL94V-0 requirements
Solderability	per MIL-STD-750, Method 2026
Solder heat withstand	per MIL-STD-750, Method 2031
Solvent resistance	per MIL-STD-750, Method 1022
Mechanical shock	per MIL-STD-750, Method 2016
Vibration	per MIL-STD-750, Method 2056
Storage temperature (°C)	-55 to 150
Operating temperature (°C)	-40 to 125
Junction temperature (°C)	175
Maximum Lead Temperature for Soldering Purpose; for 10s (°C)	260

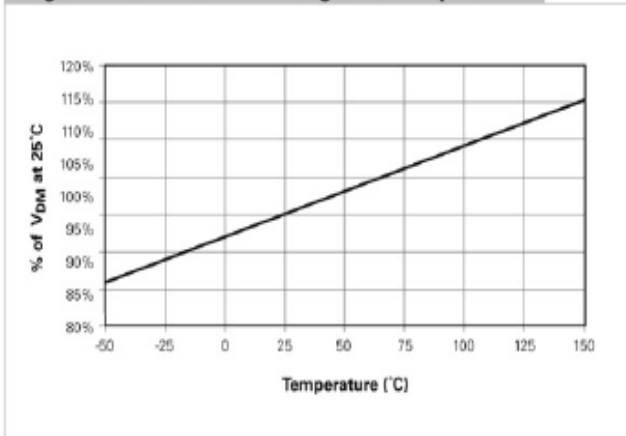
**Table SB5 – Reliability Tests**

Test	Conditions	Duration
High temperature, reverse bias	+100°C, 50VDC bias	1000 hours
High humidity, high temperature, reverse bias	85% RH, +85°C, 50VDC bias	1000 hours
High temperature storage life	+150°C	1000 hours
Temperature cycling	-65°C to +150°C, 15 minute dwell	1000 cycles
Autoclave	100% RH, +121°C, 15 PSI	96 hours

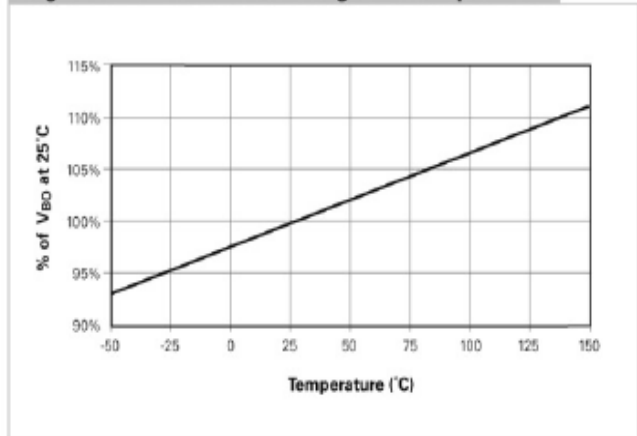
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## Figures SB3-SB6 - Typical Electrical Characteristics vs. Temperature for SiBar Thyristor Surge Protectors

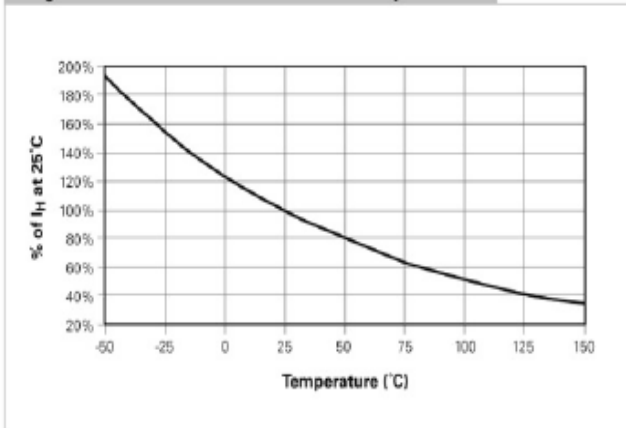
**Figure SB3 - Off-state Voltage vs. Temperature**



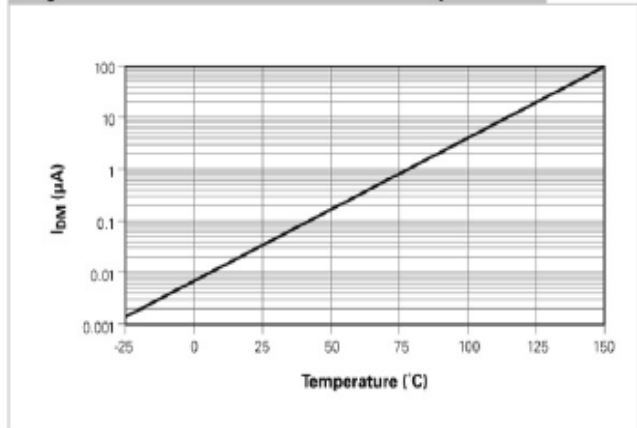
**Figure SB4 - Breakover Voltage vs. Temperature**



**Figure SB5 - Hold Current vs. Temperature**



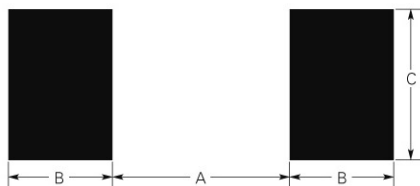
**Figure SB6 - Off-state Current vs. Temperature**



# SiBar Thyristor Surge Protectors

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**Figure SB7 - Recommended Pad Layout**



**Table SB6 – Packaging and Marking Information**

Part Description	Tape and Reel Quantity	Standard Package	Part Marking	Recommended Pad Layout (millimeters/inchs)			Agency Recognition*
				Dimension A (Nom.)	Dimension B (Nom.)	Dimension C (Nom.)	
TVB058NSC-L	2,500	10,000	58NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB065NSC-L	2,500	10,000	65NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB075NSC-L	2,500	10,000	75NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB090NSC-L	2,500	10,000	90NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB120NSC-L	2,500	10,000	12NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB140NSC-L	2,500	10,000	14NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB170NSC-L	2,500	10,000	17NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB180NSC-L	2,500	10,000	18NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB190NSC-L	2,500	10,000	19NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB220NSC-L	2,500	10,000	22NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB275NSC-L	2,500	10,000	27NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL
TVB320NSC-L	2,500	10,000	32NC	2.261 (0.089)	2.159 (0.085)	2.743 (0.108)	UL

\*UL497B, File # E179610