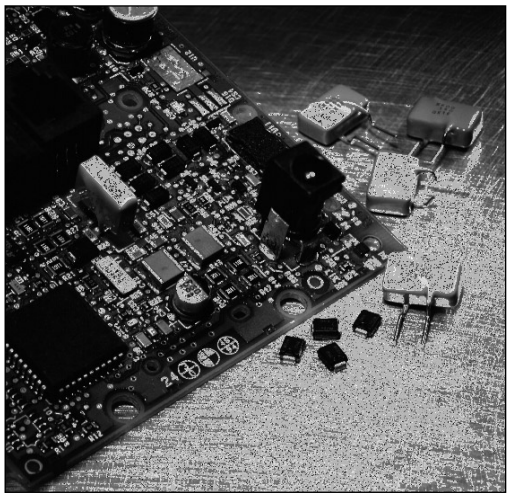
tyco Electronics Raychem CIRCUIT PROTECTION

SiBar Thyristor Surge Protectors

SA and SC series thyristor products for overvoltage protection

SiBar thyristor surge protectors provide transient voltage protection for telecommunications applications.



Tyco Electronics SiBar™ thyristor surge protectors are designed to protect sensitive telecommunications equipment from the hazards caused by lightning, power contact, and power induction. These devices have high surge capability to protect against transient faults and high off-state impedance, rendering them transparent during normal system operation.

Target Applications:

SiBar thyristor surge protectors are designed specifically for telecommunications and computer telephony applications, including:

- Modems
- Fax machines
- PBX systems
- Phones
- POS systems
- Analog and digital linecards
- xDSL modems and splitters
- Other customer premise and network equipment requiring protection

Benefits:

- Effective protection for sensitive telecom electronics
- Low leakage current
- Low power dissipation
- Fast, reliable operation
- No wear-out mechanisms
- Helps designers meet worldwide telecom standards
- Reduced warranty and service costs
- Easy installation; tape and reel per EIA 481 standards

Features:

- Bidirectional transient voltage protection
- High off-state impedance
- Low on-state voltage
- High surge capability
- Glass-passivated junctions
- Short-circuit failure mode
- Surface-mount technology

Fundamentals of SiBar Thyristor Surge Protection Devices

SiBar thyristor surge protectors are bidirectional silicon devices that fold back in the presence of transient overvoltage faults. When the breakover voltage of a SiBar device is exceeded, the device switches from high to low impedance to protect sensitive downstream equipment from harmful voltage surges. The device remains latched in a low-impedance state until the current decreases below the hold current, at which point the device returns to its high-impedance state.

SiBar devices may be used in conjunction with PolySwitch™ resettable fuses in telecommunications applications, including network equipment, customer premise equipment, and primary protectors. Proper selection of both devices can provide reliable and cost-effective resettable overvoltage and overcurrent protection. These devices help designers to meet worldwide telecommunications standards and to lower equipment-service and warranty costs.

Typical applications

Problem/solution

Industry standards and customer specifications require telecommunications equipment designers to protect against the harmful effects of power cross, power induction, and lightning surges. These hazards can travel through the network and local loop, resulting in equipment damage and loss of service.

A SiBar thyristor surge protector, either by itself or properly coordinated with a PolySwitch overcurrent device, will assist in protecting against these faults, minimizing equipment damage and improving customer satisfaction.

Customer premise equipment (CPE)

SiBar devices have been designed to assist customer premise equipment manufacturers meet the stringent requirements of FCC part 68, UL1459/UL1950 3rd Edition, UL497A, and ITU-T Recommendation K.21.

Examples of customer premise equipment include:

- PBX systems
- Key telephone systems
- Modems
- Phone sets
- POS equipment
- Surge strips with communication ports

Network equipment

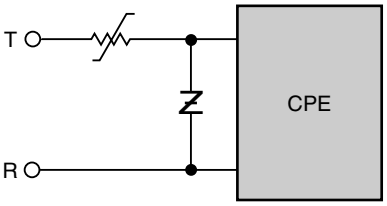
SiBar devices have been designed to assist network equipment manufacturers meet the stringent requirements of Telcordia GR-1089, ITU-T Recommendations K.17, K.20, and K.45.

Examples of network equipment include:

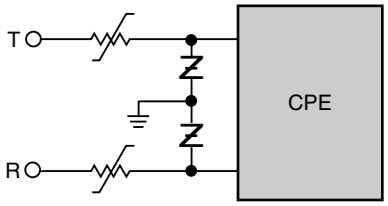
- Analog and digital linecards
- Base stations
- Meter monitoring systems
- Multiplex/pairgain systems
- Remote terminal units
- Repeaters

Customer premise equipment protected with SiBar and PolySwitch devices

Ungrounded



Grounded



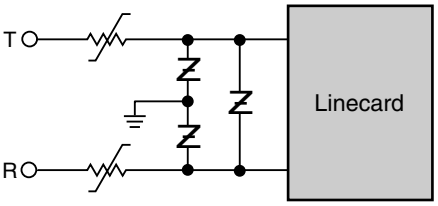
Symbol key:

SiBar thyristor surge protector (transient voltage protector)

PolySwitch resettable fuse (overcurrent protection device)

Network equipment protected with SiBar and PolySwitch devices

Grounded



Note:
T-R SiBar thyristor is optional; refer to SiBar application notes (www.circuitprotection.com)

SiBar thyristor surge protectors and PolySwitch resettable fuses are designed to work together to effectively protect telecommunications equipment from transient overcurrent and overvoltage faults defined by regional agency specifications.

Specifications	SiBar Surge Protector	PolySwitch Resettable Fuse
ITU-T K.20	TVB170SA, TVB200SA, TVB270SA	TR250, TS250, TSV250
ITU-T K.21	TVB170SA, TVB200SA, TVB270SA	TR250, TS250, TSV250
ITU-T K.45	TVB170SA, TVB200SA, TVB270SA	TR250, TS250, TSV250
FCC Part 68	TVB270SA	TR600-150, TS600-170
UL 1459*	TVB270SA	TR600-150, TS600-170
UL 1950	TVB270SA	TR600-150, TS600-170
Telcordia GR1089	TVB170SC, TVB200SC, TVB270SC	TR600-160-RA, TS600-200-RA
Telcordia GR1089 Intrabuilding	TVB170SA, TVB200SA, TVB270SA	TR250, TS250, TSV250

* Superseded by UL 1950, 3rd Edition for new designs.

Note: For more information on PolySwitch resettable fuses for overcurrent protection, please contact your local Raychem representative or visit our Web site (www.circuitprotection.com)

Selection Guide

Follow these steps to select the proper SiBar thyristor surge protectors for your application:

1. Define the operating parameters for the circuit:
   - Maximum ambient operating temperature
   - Maximum system operating current
   - Maximum operating voltage (DC bias + peak ringing voltage)
   - Maximum fault current
   - System voltage damage threshold
2. Select a SiBar device with an off-state voltage rating (V_{DM}) above the maximum operating voltage and a peak pulse current rating above the maximum fault current.
3. Verify that the minimum hold current of the device is above the maximum short-circuit current of the system.
4. Verify that the maximum breakover voltage of the device is below the system damage threshold.
5. Verify that the circuit's ambient operating temperatures are within the SiBar device's operating temperature range.
6. Verify that the SiBar device's dimensions fit the application's space considerations.
7. Independently evaluate and test the suitability and performance of the SiBar device in the application.

Electrical Characteristics (25° C, Unless Otherwise Specified)

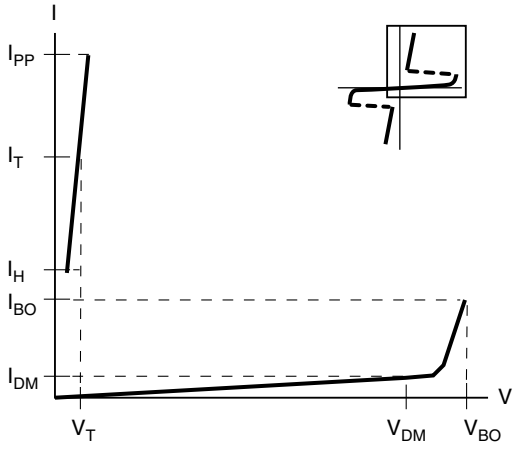
Part number	V_{DM} max. (V)	V_{BO} max. (V)	I_H min. (mA)	V_T max. (V)	C_1 typ. (pF)	I_{TSM} min. (A)	Lightning Current Wave Forms Peak Pulse Current (1pp) FCC Part 68 5x320 µs	FCC Part 68 10x560 µs	FCC Part 68 10x160 µs	Telcordia GR-1089 10x1000 µs	Telcordia GR-1089 2x10 µs	ITU K Series 5x310 µs
TVB270SC	270	370	175	5.0	50	60	100	100	200	100	500	100
TVB200SC	200	320	175	5.0	50	60	100	100	200	100	500	100
TVB170SC	170	265	175	5.0	50	60	100	100	200	100	500	100
TVB270SA	270	370	175	5.0	20	22	90	70	100	50	-	90
TVB200SA	200	320	175	5.0	20	22	90	70	100	50	-	90
TVB170SA	170	265	175	5.0	20	22	90	70	100	50	-	90
Notes	(1)	(2)		(3)	(4)	(5)	(5)	(5)	(5)	(5)	(5)	-

Notes:
1. V_{DM} measured per UL497B pulse requirements; max. off-state leakage current (I_{DM}) = 5 µA.
2. Measured at a typical breakover current (I_{BO}) = 230 mA.
3. C, measured at f = 1 MHz, 50-V_{DC} bias, 1 V_{RMS}
4. Peak on-state surge current (60 Hz, one cycle).
5. Refer to application notes (www.circuitprotection.com) for further details.

Electrical Characteristics (25° C, Unless Otherwise Specified)

Parameter	Symbol	Unit	TVBxxxSA	TVBxxxSC
Peak on-state surge current (60Hz, one cycle)	I_{TSM}	A	22	60
Critical rate-of-rise of on-state current (max. 2 x 10-µs waveform, I_{SC} =120A)	di/dt	A/µs	150	250
Critical rate-of-rise of off-state voltage (linear waveform, V_D = Rated V_{BO}, T_i = 25° C)	dv/dt	V/µs	2000	2000
Storage temperature		°C	–65 to 150	–65 to 150
Operating temperature		°C	–40 to 125	–40 to 125
Junction temperature		°C	175	175

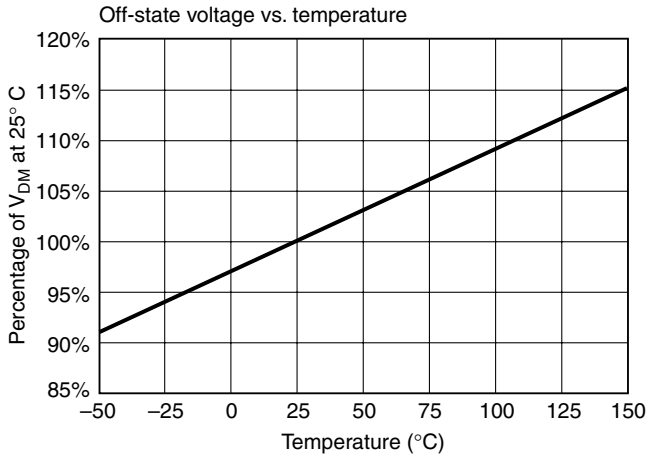
Voltage-Current Characteristics

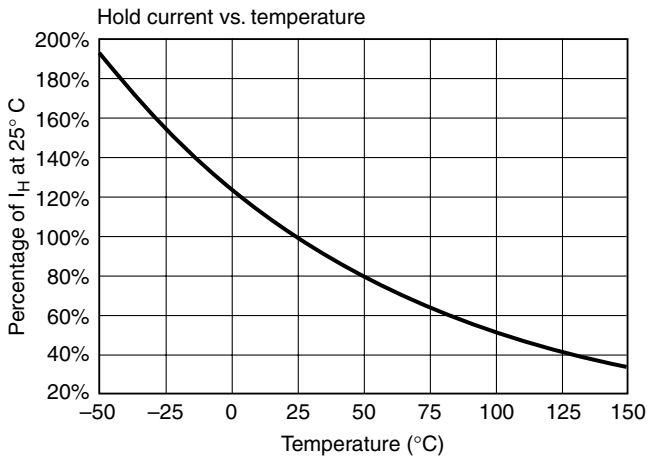


The voltage-current (V-I) is useful in depicting the electrical characteristics of the SiBar thyristor surge protectors in relation to each other.

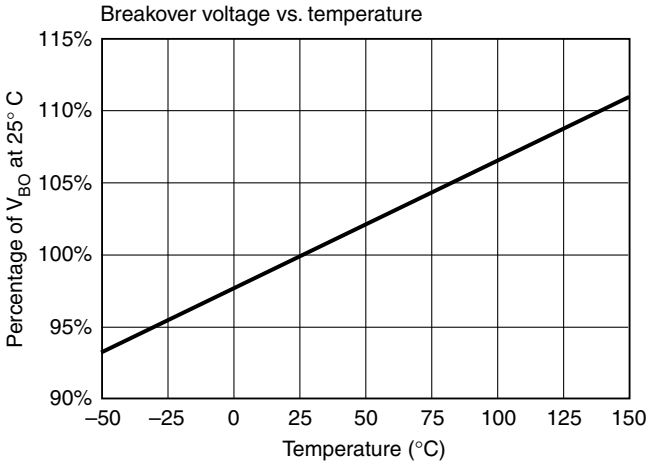
Symbol	Parameter	Definition
V_{BO}	Breakdown voltage	Maximum voltage across the device at breakdown measured under a specified voltage and current rate of rise.
I_{BO}	Breakdown current	Instantaneous current flowing at the breakover voltage (V_{BO}).
I_H	Hold current	Minimum current required to maintain the device in the on-state condition.
I_T	On-state current	Current through the device in the on-state condition.
V_T	On-state voltage	Voltage across the device in the on-state condition at a specified current (I_T).
V_{DM}	Maximum off-state voltage	Maximum DC voltage that can be applied to the device while maintaining it in the off-state condition.
I_{DM}	Off-state current	Maximum DC value of current that results from the application of the maximum off-state voltage.
I_{PP}	Peak pulse current	Rated peak pulse current of specified amplitude and waveshape that may be applied without damage.
di/dt, dv/dt	Critical rate of rise of on-state current and voltage	Maximum current and voltage rate of rise the device can withstand without damage.

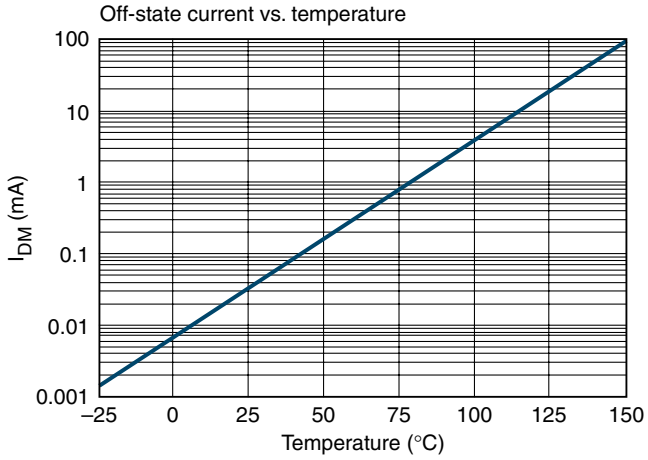
Typical Electrical Characteristics vs. Temperature





Typical Electrical Characteristics vs. Temperature (continued)

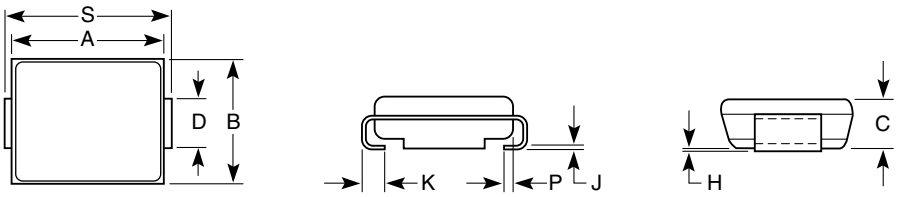




Product Dimensions

SiBar SA and SC devices are offered in industry-standard "SMB" device packages for easy installation.

All devices are bidirectional and may be oriented in either direction during installation.



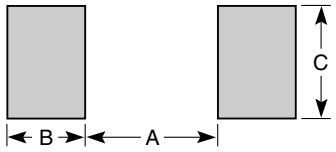
	A		B		C		D *	
	min.	max.	min.	max.	min.	max.	min.	max.
Millimeters	4.06	4.57	3.30	3.81	1.90	2.41	1.96	2.11
Inches	0.160	0.180	0.130	0.150	0.075	0.095	0.077	0.083

	H		J		K		P	S	
	min.	max.	min.	max.	min.	max.	ref.	min.	max.
Millimeters	0.051	0.152	0.15	0.30	0.76	1.27	0.51	5.21	5.59
Inches	0.002	0.006	0.006	0.012	0.030	0.050	0.020	0.205	0.220

* D dimension is measured within dimension P.

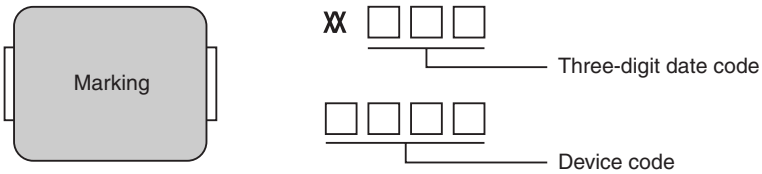
Recommended Pad Layout

The dimensions in the table below provide the recommended pad layout for each SiBar device.



Pad dimensions			
	A	B	C
Millimeters	2.261	2.159	2.743
Inches	0.089	0.085	0.108

Part Marking System



Device code	Part number
REBD	TVB270SC
RDBD	TVB200SC
RCBD	TVB170SC
REBB	TVB270SA
RDBB	TVB200SA
RCBB	TVB170SA

Ordering Information

Product description
TVBXXXSA
TVBXXXSC

Devices per reel*	2500 pieces
Standard box quantity	10,000 pieces
Approximate box weight	3.5 lb

*Supplied in embossed tape and reel format per EIA 481-1 standards.

WARNING!

- Operation beyond maximum ratings or improper use may result in device damage.
- These devices are intended for protection against occasional overvoltage fault conditions and should not be used when repeated fault conditions are anticipated.

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