



1 Product Selection Guide

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Greentube™ Gas Plasma Arrester Product Description

Greentube gas plasma arresters are manufactured using totally non-radioactive processes and are designed to perform to the stated characteristics of ITU K.12.

Advantages

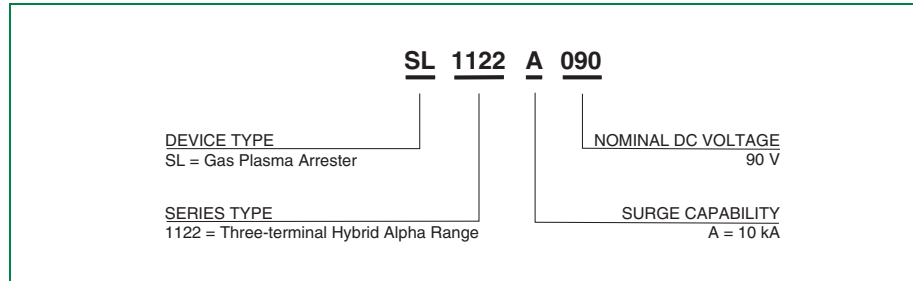
- RoHS compliant
- Low insertion loss
- Excellent response to fast-rising transients
- Ultra low capacitance
- High peak surge current capability

Applications

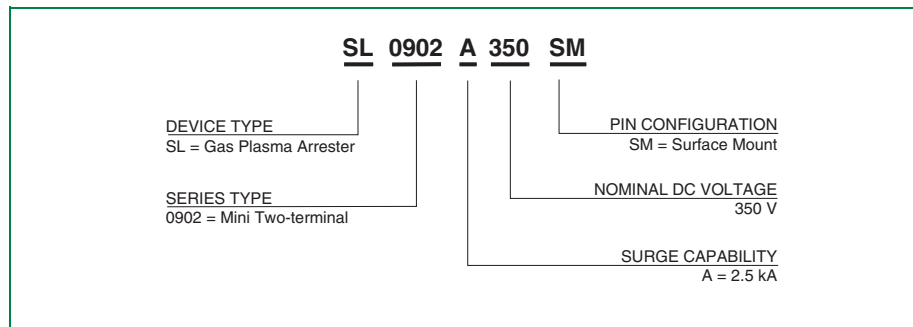
- Broadband equipment
- ADSL equipment
- xDSL equipment
- Satellite and CATV equipment
- General telecom equipment

Greentube™ Gas Plasma Arrester Part Number Description

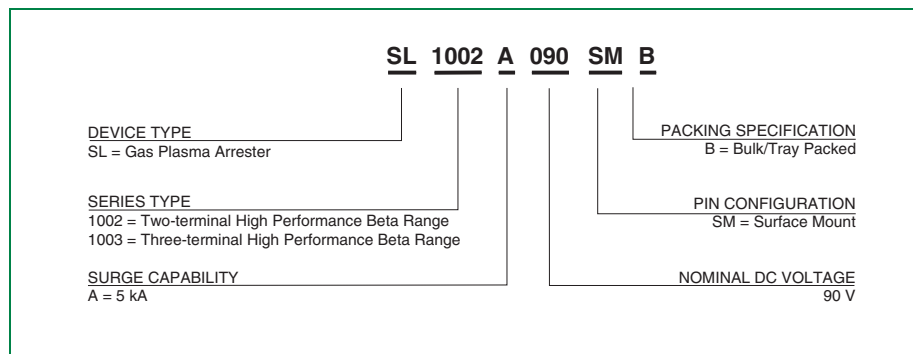
The following illustration shows a description of a sample device part number for the SL1122A series gas plasma arrester.



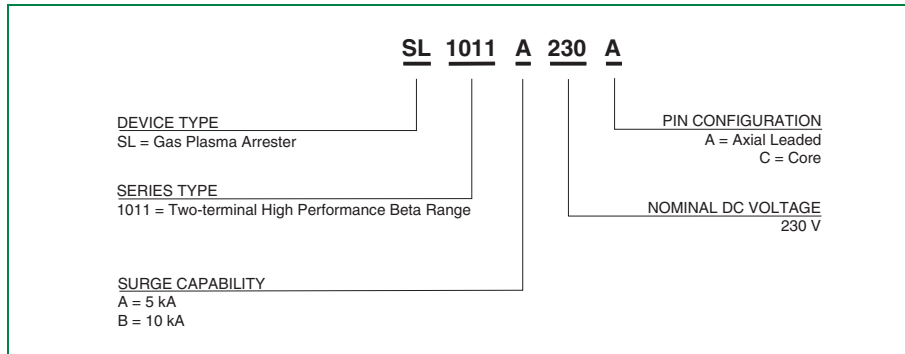
The following illustration shows a description of a sample device part number for the SL0902A series gas plasma arrester.



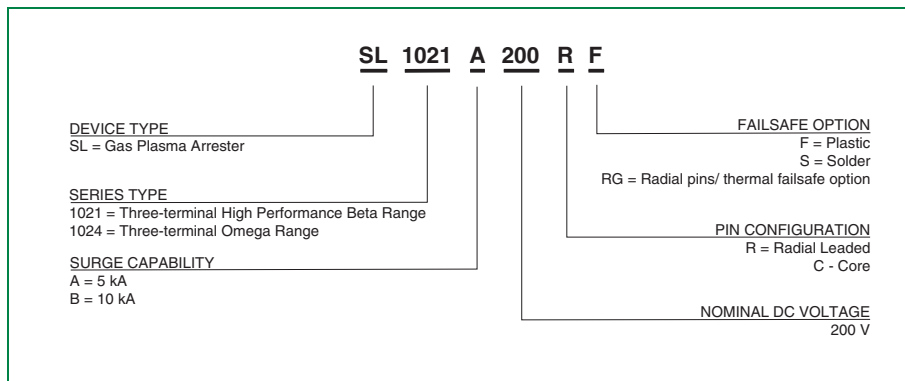
The following illustration shows a description of a sample device part number for the SL1002A and SL1003A series gas plasma arrester.



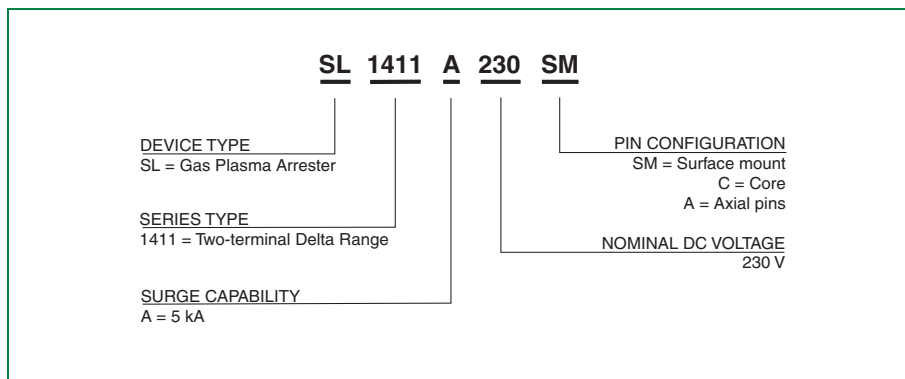
The following illustration shows a description of a sample device part number for the SL1011A and SL1011B series gas plasma arrester.



The following illustration shows a description of a sample device part number for the SL1021A, SL1021B, SL1024A, and SL1024B series gas plasma arrester.



The following illustration shows a description of a sample device part number for the SL1411A series gas plasma arrester.

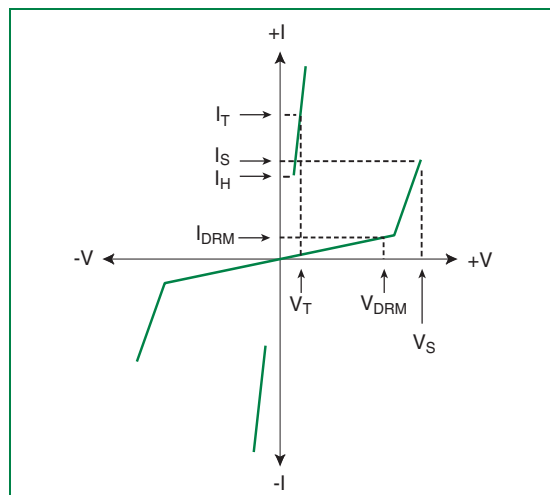


SIDACTor® Product Description

SIDACTor components are solid state crowbar devices designed to protect telecom equipment during hazardous transient conditions. Capitalizing on the latest in thyristor advancements, Littelfuse makes SIDACTor devices with a patented ion implant technology. This technology ensures effective protection within nanoseconds, up to 5000 A surge current ratings, and simple solutions for regulatory requirements such as GR 1089, TIA-968-A (formerly known as FCC Part 68), ITU-T K.20, ITU-T K.21, and UL 60950.

Operation

In the standby mode, SIDACTor devices exhibit a high off-state impedance, eliminating excessive leakage currents and appearing transparent to the circuits they protect. Upon application of a voltage exceeding the switching voltage (V_S), SIDACTor devices crowbar and simulate a short circuit condition until the current flowing through the device is either interrupted or drops below the SIDACTor device's holding current (I_H). Once this occurs, SIDACTor devices reset and return to their high off-state impedance.



V-I Characteristics

Advantages

Compared to surge suppression using other technologies, SIDACTor devices offer absolute surge protection regardless of the surge current available and the rate of applied voltage (dv/dt). SIDACTor devices:

- Cannot be damaged by voltage
- Eliminate hysteresis and heat dissipation typically found with clamping devices
- Eliminate voltage overshoot caused by fast-rising transients
- Are non-degenerative
- Will not fatigue
- Have low capacitance, making them ideal for high-speed transmission equipment

Applications

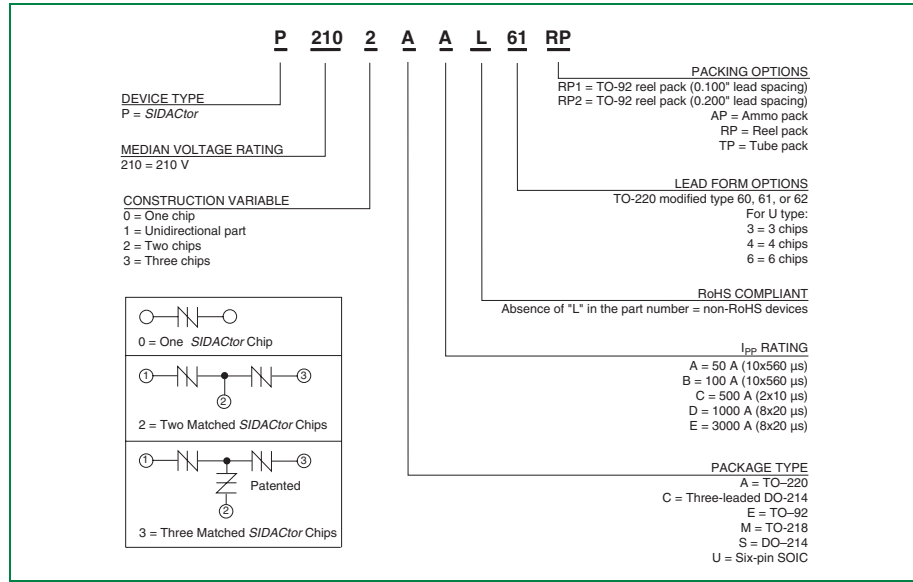
When protecting telecommunication circuits, *SIDACtor* devices are connected across Tip and Ring for metallic protection and across Tip and Ground and Ring and Ground for longitudinal protection. They typically are placed behind some type of current-limiting device, such as the Littelfuse *TeleLink*® lightning tolerant fuse. Common applications include:

- Central office line cards (SLICs)
- T-1/E-1, ISDN, and xDSL transmission equipment
- Customer Premises Equipment (CPE) such as phones, modems, and caller ID adjunct boxes
- PBXs, KSUs, and other switches
- Primary protection including main distribution frames, five-pin modules, building entrance equipment, and station protection modules
- Data lines and security systems
- CATV line amplifiers and power inserters
- Sprinkler systems

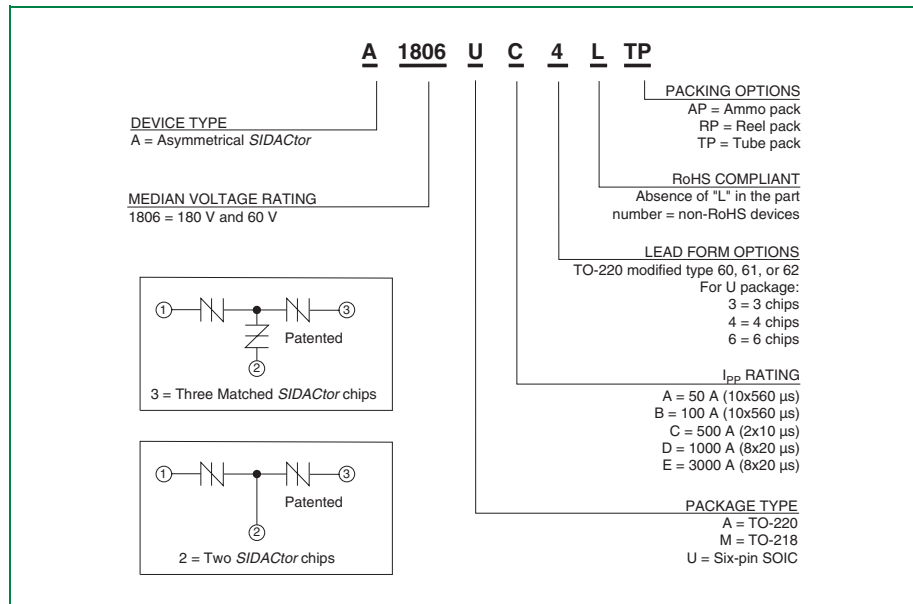
For more information regarding specific applications, design requirements, or surge suppression, please contact Littelfuse directly at +1 972-580-7777 or through our local area representative. Access Littelfuse's web site at <http://www.littelfuse.com>.

SIDACTor® Part Number Description

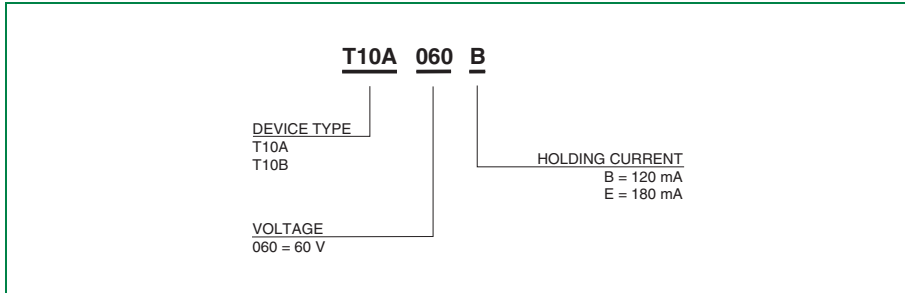
The following illustration shows a description of a sample SIDACTor device part number.



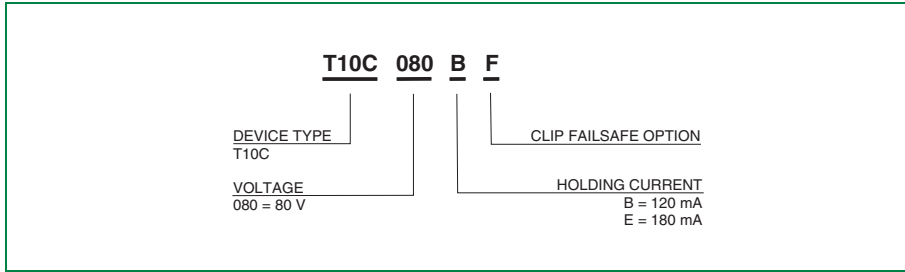
The following illustration shows a description of a sample asymmetrical SIDACTor device part number.



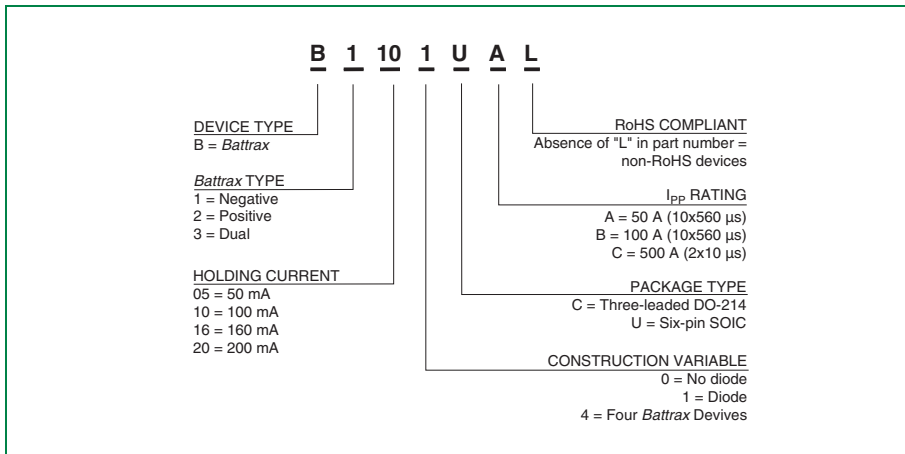
The following illustration shows a description of a sample T10A or T10B device part number.



The following illustration shows a description of a sample T10C device part number.

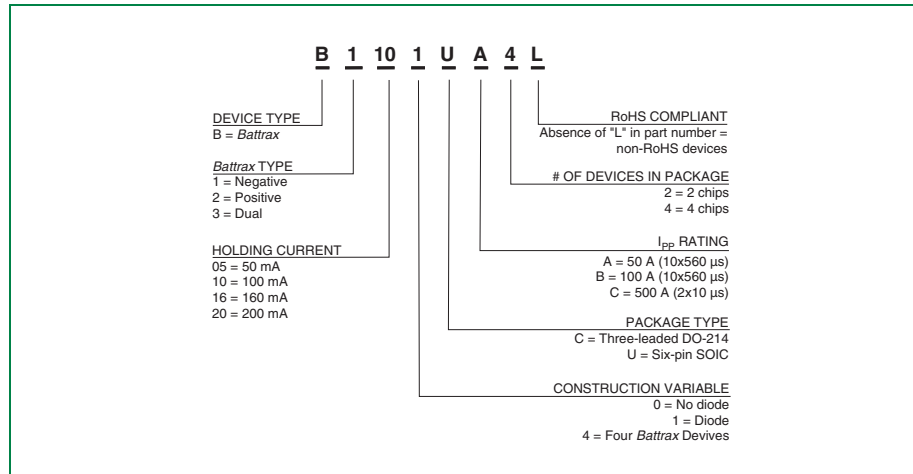


The following illustration shows a description of a sample single port *Battrax* device part number.

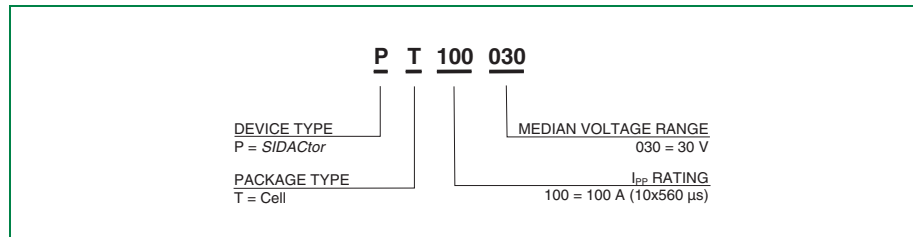


SIDACtor® Part Number Description

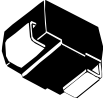

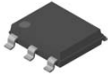

The following illustration shows a description of a sample dual port *Battrax* device part number.



The following illustration shows a description of a sample *SIDACtor* cell device part number.



SIDACtor® Product Packages

	Surface Mount Packages			
	DO-214AA	Modified DO-214AA	Modified MS-013 Six-pin	TO-263 NE (3KA)
				
Balanced <i>SIDACtor</i> Device			✓	
<i>Batrax</i> ® Single Port Negative SLIC Protector			✓	
<i>Batrax</i> Single Port Positive/Negative SLIC Protector			✓	
<i>Batrax</i> Dual Port Negative SLIC Protector			✓	
<i>Batrax</i> SLIC Protector		✓	✓	
High Surge Current Two-pin <i>SIDACtor</i> Device				✓
CATV Line Amplifiers/Power Inserters <i>SIDACtor</i> Device				✓
Fixed Voltage SLIC Protector	✓	✓	✓	
High Surge (D-rated) <i>SIDACtor</i> Device	✓			
LCAS Asymmetrical Device	✓		✓	
MC Balanced <i>SIDACtor</i> Device			✓	
MC <i>SIDACtor</i> Device	✓		✓	
Multiport Balanced <i>SIDACtor</i> Device			✓	
Multiport Quad SLIC Protector			✓	
Multiport <i>SIDACtor</i> Device			✓	
Twin SLIC Protector		✓		

Through-hole Packages					T10A T10B	T10C	SIDACtor Cells	
TO-92	Modified TO-220		TO-220 RE (3KA)	TO-218				
	✓							Balanced SIDACtor Device
								Batrax Single Port Negative SLIC Protector
								Batrax Single Port Positive/Negative SLIC Protector
								Batrax Dual Port Negative SLIC Protector
								Batrax SLIC Protector
		✓		✓				High Surge Current Two-pin SIDACtor Device
		✓	✓	✓				CATV Line Amplifiers/Power Inserters SIDACtor Device
							✓	Fixed Voltage SLIC Protector
		✓						High Surge (D-rated) SIDACtor Device
								LCAS Asymmetrical Device
	✓							MC Balanced SIDACtor Device
✓	✓	✓						MC SIDACtor Device
								Multiport Balanced SIDACtor Device
								Multiport Quad SLIC Protector
								Multiport SIDACtor Device
								Twin SLIC Protector

TeleLink® Fuse Product Description

The Littelfuse *TeleLink*® surface mount (SM) surge-tolerant fuse offers overcurrent protection for telecom applications without requiring a series resistor. When it is used in conjunction with a *SIDACtor*® transient voltage suppressor (TVS) or a *Greentube*™ gas plasma arrester, this combination provides a compliant solution for standards and recommendations such as GR 1089–Core, TIA-968-A, UL/EN/IEC 60950, and ITU K.20 and K.21. The coordination requirement contained in GR 1089–Core, and ITU K.20/21 may require a series impedance device.

Operation

The *TeleLink* is designed to carry 100 percent of its rated current for four hours and 250 percent of its rated current for one second minimum and 120 seconds maximum. For optimal fuse performance, the steady state operating current of the application should be less than or equal to 75 percent of the *TeleLink*'s rated current.

Advantages

The 04611.25 or 04612.00 fuse is designed to meet the 600 V 60 A power fault requirement of the GR 1089–Core standard. The *TeleLink* is available in 0.5 A, 1.25 A, and 2 A ratings. The *TeleLink* devices are designed to meet the specific environmental requirements of the RoHS directive and the higher temperature solder profiles typical of lead-free solders.

Applications

Common applications for the *TeleLink* fuse include the following:

- T1/E1/J1 and HDSL2/4
- SLIC interface portion of Fibre to the Curb (FTTC) and Fibre to the Premises (FTTP)
- Non-Fibre SLIC interface for Central Office (CO) locations and Remote Terminals (RT)
- xDSL applications such as ADSL, ADSL2+, VDSL, and VDSL2+
- Ethernet 10/100/1000BaseT
- POTS applications such as modems, answering machines, telephones, fax machines, and security systems
- ISDN “U” interface
- Baystation T1/E1/J1, T3 (DS3) trunk cards

DC Power Fuse Product Description

Littelfuse telecom power fuses are fast-acting, extremely current-limiting devices designed for short-circuit protection to telecommunications equipment and power distribution circuits. These products use silver-plated elements with unique geometry that provide reliable protection to sensitive equipment and components.

Advantages

The telecom power fuses offer designers flexibility without sacrificing equipment protection. Compact designs in multiple mounting configurations can be used with fuse holders and disconnect switches that use built-in alarm signaling circuits to identify blown fuses.

Other advantages include:

- UL recognized
- Extremely current limiting
- Very fast-acting
- Low I^2t and peak currents
- Low operating temperature

Applications

Telecommunication circuits are very sensitive to surges and spikes. The current-limiting characteristics of Littelfuse telecom power fuses minimize damage to DC power supplies and distribution equipment within telephone networks. Common applications include:

- Central office power panels
- Cellular base stations
- Satellite relay stations
- Microwave transmission stations
- Cable and other component protection

Part Number Index

For explanation of part numbers, see “*Greentube*™ Gas Plasma Arrester Part Number Description” and “*SIDACTor*® Part Number Description” in this Product Selection Guide.

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Electrical Parameters

Greentube™ Gas Plasma Arrester

Gas plasma arrester electrical parameters are based on the following definition of conditions:

V_S	Dynamic Breakover (Impulse Sparkover (GR 1361 term) or voltage-limiting) Voltage —maximum breakover voltage measured on a 100 V/1 kV μ s ramp rate (whichever is specified)
V_{SDC}	DC Breakover (Sparkover) Voltage —nominal breakover voltage measured at a specified ramp rate (typically 100 V/S, but up to 2 kV/s in some specifications)
V_H	Holdover Voltage —specific voltage value below which device voltage falls after a device switches on and stays in the low impedance state due to a transient
V_T	On-state (Arc) Voltage [similar to V_T parameter for solid-state devices]—maximum voltage measured across the protector when in its low impedance (fully switched on) state, sometimes quoted at a given test current
I_{PP}	Maximum Surge (Impulse Discharge) Current [similar to the I_{PP} parameter for solid-state devices]—maximum current a protector can handle without degradation or destruction, usually quoted using industry standard 8/20 μ s double exponential waveform
I_{TSM}	Maximum AC Surge (Alternating Discharge) Current —maximum current a protector can handle without degradation or destruction, usually quoted using a specified number (often 5) of one-second 60 Hz bursts with a three-minute rest period between each burst
I_{DRM}	Insulation Resistance —alternative way of quoting leakage current, the effective resistance of a device at a given voltage (50 V, 100 V, 200 V specified in GR 1361); test voltage divided by leakage current (typical value 1x10 ⁹ Ω)

Use of other general terms related to gas plasma arresters are based on the following definitions:

Failsafe—thermal sensitive switch device which prevents hazards due to thermal run-away by operating at a predetermined temperature and shorting the terminals of the protection device, providing a low resistance path between Ring to Ground and Tip to Ground

Note: Failsafe devices are deployed for power fault conditions.

Crowbar Device—class of suppressors that exhibit a “crowbar” characteristic, usually associated with four-layer NPNP silicon bipolar (*SIDACtor*) or gas plasma arresters

Note: Upon reaching a threshold or breakover voltage, the device transitions to a low impedance state. In essence, the line is either momentarily short-circuited to Ground (for longitudinal events) or the Tip and Ring conductors are momentarily shorted together (for transverse events) throughout the duration of the transient.

Power Fault / Cross—AC power connected accidentally to a communication line or an induced voltage between the AC line and the telecom pair

Capacitance—property of a circuit element that permits it to store an electrical charge

Note: In circuit protection, usually the capacitance is measured between input pins and the common terminal at 1 MHz with a zero-volt bias. Increasing values of capacitance have the effect of limiting high-speed data transmission.

SIDACtor[®] Devices

SIDACtor electrical parameters are based on the following definition of conditions:

- On state (also referred to as the crowbar condition) is the low impedance condition reached during full conduction and simulates a short circuit.
- Off state (also referred to as the blocking condition) is the high impedance condition prior to beginning conduction and simulates an open circuit.

C_O	Off-state Capacitance —capacitance measured in off state @ 2 V bias and 1 MHz
di/dt	Rate of Rise of Current —maximum rated value of the acceptable rate of rise in current over time
dv/dt	Rate of Rise of Voltage —rate of applied voltage over time
I_S	Switching Current —maximum current required to switch to on state
I_{DRM}	Leakage Current —maximum peak off-state current measured at V _{DRM}
I_H	Holding Current —minimum current required to maintain on state
I_{PP}	Peak Pulse Current —maximum rated peak impulse current
I_T	On-state Current —maximum rated current for two seconds
I_{TSM}	Peak One-cycle Surge Current —maximum rated one-cycle AC current
V_S	Switching Voltage —maximum voltage prior to switching to on state
V_{DRM}	Peak Off-state Voltage —maximum voltage that can be applied while maintaining off state
V_F	On-state Forward Voltage —maximum forward voltage measured at rated on-state current
V_T	On-state Voltage —maximum voltage measured at rated on-state current

Commitment to Quality

Littelfuse is committed to meeting customer expectations and providing quality products and services at a competitive price. In support of this commitment, Littelfuse promises to:

Encourage quality awareness and quality performance in all associates at all levels of the Company through management leadership.

Promote the participation of all associates in making individual contributions to the quality improvement process.

Support continuous quality improvement by providing our associates with the necessary training, tools, and information feedback to enable enhancement of the quality of our products and services.

Develop relationships with suppliers who consistently demonstrate their ability to fulfill quality, price and delivery objectives that are mutually beneficial.

Build quality into our products and services, striving for zero defects in everything we do, thereby reducing cost and increasing total customer satisfaction.

Agency Approvals



Littelfuse products are recognized under the Components program of Underwriters Laboratories and certified by CSA. The following table shows agency file numbers for Littelfuse products.

Product	UL File Number	CSA Certificate
Greentube™ Gas Plasma Arresters	E128662	—
SIDACtor® Devices / Batrax® ¹	E133083	—
T10A / T10B / T10C	E128662	—
TeleLink®	E10480 (Littelfuse) E191008 (Teccor®)	LR 29862 (Littelfuse) LR 702828 (Teccor®)
2AG Slo-Blo® Fuse—229 / 230 Series ²	E10480	LR 29862
NANO ² ® Very Fast-Acting Fuse—451 / 453 Series ³	E10480	LR 29862
NANO ² ® Slo-Blo® Fuse—452 / 454 Series	E10480	LR 29862
NANO ² ® 250 V UMF Fuse— 464 Series ⁴	E184655	—
Alarm Indicating Fuse—481 Series ⁵	E71611	LR 29862
Alarm Indicating Fuseholder—482 Series ⁵	E14721	LR 29862
SMF OMNI-BLOK® Fuse Block, Molded Base Type—154 Series ⁵	E14721	LR 07316
L17T Series Telecommunications Power Fuse ⁵	E71611	LR 29862
TLN Series Telecommunications Power Fuse	E71611	—
TLS Series Telecommunications Power Fuse	E71611	—
LTFD Series Telecommunications Disconnect Switch	E122674	—
LTFD 101 Series Telecommunications Disconnect Switch	E122674	—

Notes:

1. Recognized component under 'Conditions of Acceptability'
2. Through 3.5 A listed by UL and certified by CSA; 4 A through 7 A recognized under Components program of UL; 1 A through 7 A approved by METI
3. 1 A through 5 A approved by METI
4. Listed to IEC 60127-4, Universal Modular Fuse-Links (UMF), 250 V; UL Listed; Approved by METI (METI NBK30502-E184655a,b) and CCC. K and VDE approvals pending.
5. Certified under the Components Acceptance Program of CSA



Littelfuse, Inc., manufacturer of Teccor® brand circuit protection devices, is the proprietor of the SIDACtor®, Batrax®, and TeleLink® trademarks. All other brand names may be trademarks of their respective companies. Teccor® brand SIDACtor products are covered by these and other U.S. Patents:

4,685,120
4,827,497
4,905,119
5,479,031
5,516,705

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