

# 2 Greentube™ Gas Plasma Arresters

Gas Plasma Arresters

This section presents complete electrical specifications for Littelfuse's *Greentube*™ Gas Plasma Arresters—improved gas discharge tubes (GDTs).

- Super Fast Response, Ultra Low Clamping Alpha Range
  - SL1122A Series Three-terminal Hybrid Gas Plasma Arrester . . . . . 2-2
- Fast Response, Low Clamping Beta Range
  - SL0902A Series *Broadband Optimized*™ Two-terminal Mini Gas Plasma Arrester 2-4
  - SL1002A Series *Broadband Optimized*™ Two-terminal Mini Gas Plasma Arrester 2-6
  - SL1003A Series Three-terminal Mini Gas Plasma Arrester . . . . . 2-8
  - SL1011A Series Two-terminal Medium-duty Gas Plasma Arrester . . . . . 2-10
  - SL1011B Series Two-terminal Heavy-duty Gas Plasma Arrester . . . . . 2-12
  - SL1021A Series Three-terminal Medium-duty 8 mm Gas Plasma Arrester . . . . . 2-14
  - SL1021B Series Three-terminal Heavy-duty 8 mm Gas Plasma Arrester . . . . . 2-17
- High Energy Delta Range
  - SL1411A Series Two-terminal Gas Plasma Arrester . . . . . 2-20
- Omega Range
  - SL1024A Series Three-terminal Medium-duty 8 mm Gas Plasma Arrester . . . . . 2-22
  - SL1024B Series Three-terminal Heavy-duty 8 mm Gas Plasma Arrester . . . . . 2-25



## SL1122A Series Three-terminal Hybrid Gas Plasma Arrester

RoHS

 Littelfuse®



The *Greentube™* SL1122A (Alpha) Series Hybrid Gas Plasma Arrester (improved gas discharge tube (GDT)) features a high-performance gas plasma arrester in conjunction with a high-speed Silicon Avalanche Diode (SAD). These devices are matched so that high speed pulses are initially clamped by the SAD; then, as the current rises, the transient energy is switched through the gas tube.

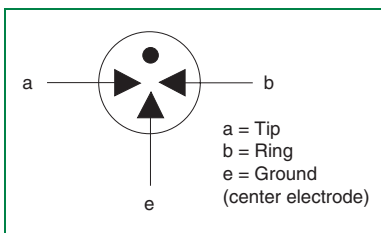
The Hybrid offers high levels of performance on fast-rising transients in the domain of 100 V/ $\mu$ s to 10 kV/ $\mu$ s, eliminating the dv/dt switching delay normally exhibited by standard GDTs.

Extremely robust, these devices can divert a 10,000 A pulse without destruction and are ideal for central office (telephone exchange) protection.

The SL1122A series is used for MDF protection and in alarm panels and general telecom equipment.

Other features include:

- RoHS compliant
- High performance Alpha range
- Totally non-radioactive
- Flat response up to 10 kV/ $\mu$ s
- 10 kA surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- SAD ensures short circuit failure mode in the event of severe transient overload
- Thermal failsafe



Three-terminal Arrester

Electrical Parameters

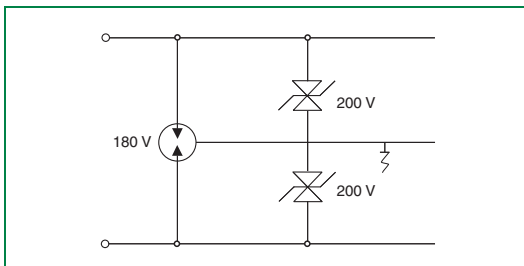
Part Number *	DC Breakover Voltage @ 100 V/s <sup>1,2</sup> Volts		MAX Dynamic Breakover Voltage @ 1 kV/ $\mu$ s Volts	AC Discharge Current <sup>2,3</sup> Amps	MAX Repetitive Impulse Current		MAX Leakage Current <sup>6</sup> nAmps	Holdover Voltage <sup>7</sup> Volts	Nominal On-state Voltage @ 1 A Volts
	MIN	MAX			Notes 2,4 kAmps	Notes 4,5 kAmps			
SL1122A090	70	120	150	5	5	10	50	50	20
SL1122A200	140	250	250	5	5	10	120	120	20
SL1122A230	184	276	350	5	5	10	150	135	20
SL1122A250	200	300	400	5	5	10	150	135	20
SL1122A260	210	350	400	5	5	10	175	135	20
SL1122A350	280	420	600	5	5	10	285	135	20
SL1122A450	420	600	700	5	5	10	350	135	20

Gas Plasma Arresters

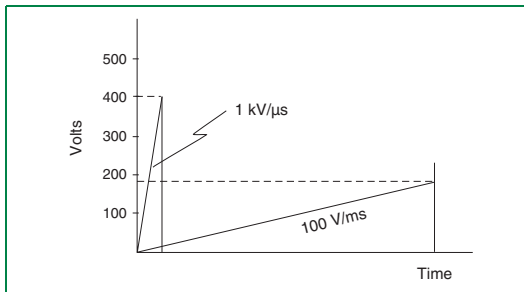
\* Max capacitance is 100 pF, measured at 1 MHz, except for SL1122A090 which is 200 pF.

Notes:

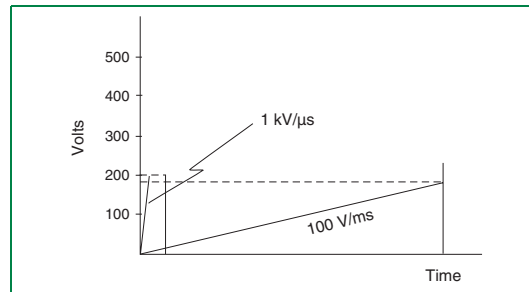
1. In ionized mode
2. Either end (Line) electrode to center (Ground) electrode
3. 10 shots, AC 60 Hz, 1  $\mu$ s duration
4. 10 shots, 8/20  $\mu$ s waveform
5. Total current through center (Ground) electrode, both line electrodes subject to simultaneous pulses
6. Measured at 100 V, except 90 V dc devices which are measured at 50 V
7. Tested according to ITU-T Rec. K.12



Circuit Diagram



Gas Plasma Arrester Only



Hybrid Gas Plasma Arrester

## SL0902A Series *Broadband Optimized*™ Two-terminal Mini Gas Plasma Arrester



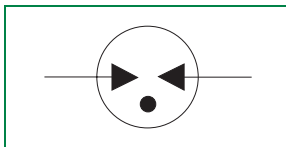
The *Greentube*™ *Broadband Optimized* SL0902A (Beta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) is designed to offer high surge ratings in a miniature package. Unique design features offer high levels of performance on fast-rising transients in the domain of 100 V/ $\mu$ s to 1 kV/ $\mu$ s (those most likely from induced lightning disturbances).

These devices are extremely robust and able to divert a 2,500 A pulse without destruction.

The SL0902A series can be used in MDF modules, ADSL, xDSL (including ADSL2, VDSL, VDSL2), CATV and satellite equipment, and other telecom applications.

Other features include:

- Lead-free and RoHS compliant
- High performance Beta range
- Totally non-radioactive
- Surface mount
- 2.5 kA surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- Can be used to meet Telcordia GR1089 [Littelfuse recommends using the SL0902A in conjunction with a fuse or PTC for this application.]
- 10/700 6 kV capability, as per ITU-T K.21, enhanced test level
- 2,000 A 2/10  $\mu$ s surge rating
- Meets TIA-968-A 10/160  $\mu$ s waveform, 200 A test and 10/560  $\mu$ s waveform, 100 A test



Two-terminal Arrester

**Electrical Parameters**

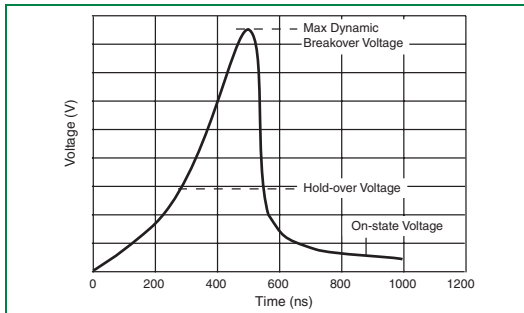
Part Number	DC Breakover Voltage @ 100 V/s <sup>1,2</sup> Volts		MAX Dynamic Breakover Voltage <sup>3</sup>		AC Discharge Current <sup>4</sup> Amps	MAX Repetitive Impulse Current <sup>5</sup> kAmps	MAX Leakage Current <sup>6</sup> nAmps	Holdover Voltage <sup>7</sup> Volts	Nominal On-state Voltage @ 1 A Volts
	MIN	MAX	100 V/μs Volts	1 kV/μs Volts					
SL0902A090	72	108	300	550	2.5	2.5	50	50	20
SL0902A230	184	276	400	500	2.5	2.5	100	135	20
SL0902A350	280	420	550	650	2.5	2.5	100	135	20
SL0902A420	350	504	675	800	2.5	2.5	100	135	20

Gas Plasma Arresters

\* Max capacitance is 1.0 pF.

**Notes:**

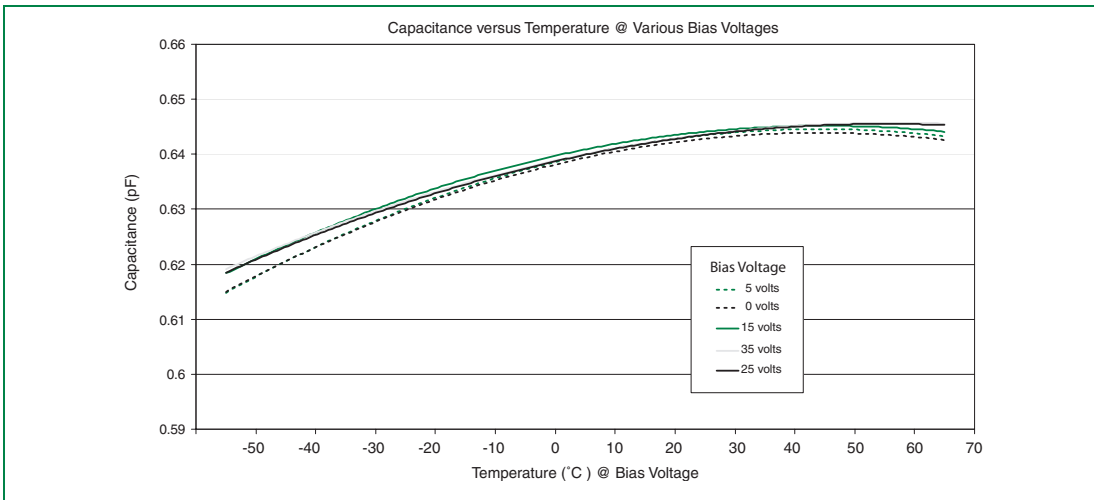
1. At delivery AQL 0.65 level 2, DIN ISO 2859
2. In ionized mode
3. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
4. 10 shots, AC 60 Hz, 1 μs duration
5. 10 shots, 8/20 μs waveform per IEC 61000-4-5
6. Measured at 100 V, except 90 V dc devices which are measured at 50 V
7. Tested according to ITU-T Rec. K.12



Voltage versus Time Characteristics

**Typical Insertion Loss**

- @ 1 GHz = 0.01 dB
- @ 1.4 GHz = 0.1 dB
- @ 1.8 GHz = 0.53 dB
- @ 2.1 GHz = 0.81 dB
- @ 2.45 GHz = 1 dB
- @ 2.8 GHz = 1.2 dB
- @ 3.1 GHz = 1.5 dB
- @ 3.5 GHz = 2.1 dB



SL0902A Typical Capacitance (pF) versus Temperature at Various Bias Voltages

## SL1002A Series *Broadband Optimized*™ Two-terminal Mini Gas Plasma Arrester



The *Greentube*™ *Broadband Optimized* SL1002A (Beta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) is developed for use in broadband equipment. Unique design features offer high levels of performance on fast-rising transients in the domain of 100 V/μs to 1 kV/μs (those most likely from induced lightning disturbances).

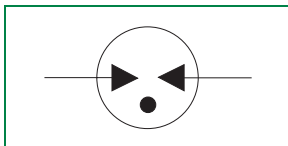
These devices feature ultra low capacitance (typically 1.2 pF or less) and present insignificant signal losses up to 1.5 GHz. They are extremely robust and able to divert a 5,000 A pulse without destruction.

For AC power fault of long duration, overcurrent protection is recommended.

The SL1002A series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, and general telecom equipment.

Other features include:

- Lead-free and RoHS compliant
- High performance Beta range
- Totally non-radioactive
- Surface mount
- 5 kA surge capability tested with 8/20 μs pulse as defined by IEC 61000-4-5
- GHz bandwidth compatible
- Can be used to meet Telcordia GR1089 without series resistance
- 10/700 6 kV capability, as per ITU-T K.21, enhanced test level
- 2,000 A 2/10 μs surge rating
- Meets TIA-968-A 10/160 μs waveform, 200 A test and 10/560 μs waveform, 100 A test



Two-terminal Arrester

**Electrical Parameters**

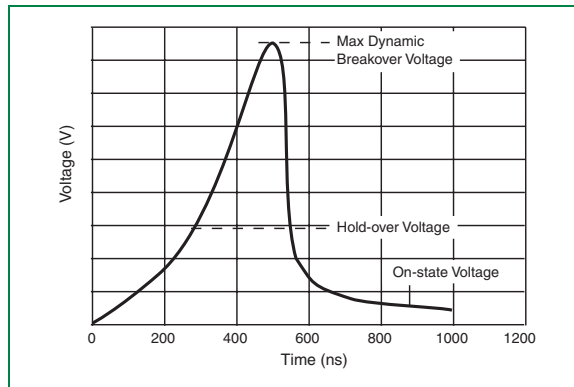
Part Number *	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage <sup>1</sup>		AC Discharge Current <sup>2</sup> Amps	MAX Repetitive Impulse Current <sup>3</sup> kAmps	MAX Single Impulse Current		MAX Leakage Current <sup>4</sup> nAmps	Holdover Voltage <sup>5</sup> Volts	Nominal On-state Voltage @ 1 A Volts
	MIN	MAX	100 V/ $\mu$ s Volts	1 kV/ $\mu$ s Volts			2/10 $\mu$ s kAmps	10/350 $\mu$ s kAmps			
SL1002A090	70	120	360	700	5	5	2	2	100	50	20
SL1002A230	184	276	400	500	5	5	2	2	100	135	20
SL1002A250	200	300	400	500	5	5	2	2	100	135	20
SL1002A260	210	310	400	500	5	5	2	2	100	135	20
SL1002A350	280	420	500	600	5	5	2	2	100	135	20
SL1002A600	480	720	800	900	5	5	2	2	100	135	20

Gas Plasma Arresters

\* Max capacitance is 1.2 pF, measured at 1 MHz, zero volt bias.

Notes:

1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
2. 10 shots, AC 60 Hz, 1  $\mu$ s duration
3. 10 shots, 8/20  $\mu$ s waveform per IEC 61000-4-5
4. Measured at 100 V, except 90 V dc devices which are measured at 50 V
5. Tested according to ITU-T Rec. K.12



Voltage versus Time Characteristic

**Typical Insertion Loss**

- @ 1 GHz = 0.01 dB
- @ 1.4 GHz = 0.1 dB
- @ 1.8 GHz = 0.53 dB
- @ 2.1 GHz = 0.81 dB
- @ 2.45 GHz = 1 dB
- @ 2.8 GHz = 1.2 dB
- @ 3.1 GHz = 1.5 dB
- @ 3.5 GHz = 2.1 dB

## SL1003A Series Three-terminal Mini Gas Plasma Arrester



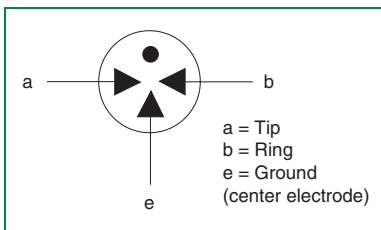
The *Greentube™* SL1003A (Beta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) is developed for use in broadband equipment. Unique design features offer high levels of performance on fast-rising transients in the domain of 100 V/ $\mu$ s to 1 kV/ $\mu$ s (those most likely from induced lightning disturbances).

These devices feature ultra low capacitance (typically 1.2 pF or less) and present insignificant signal losses up to 1.5 GHz. They are extremely robust and able to divert a 5,000 A pulse without destruction.

For AC power fault of long duration, overcurrent protection is recommended.

The SL1003A series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, and general telecom equipment. Other features include:

- Lead-free and RoHS compliant
- High performance Beta range
- Totally non-radioactive
- Surface mount
- 5 kA surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- GHz bandwidth compatible
- Can be used to meet Telcordia GR1089 without series resistance
- 10/700 6 kV capability, as per ITU-T K.21, enhanced test level
- 2,000 A 2/10  $\mu$ s surge rating



Three-terminal Arrester

**Electrical Parameters**

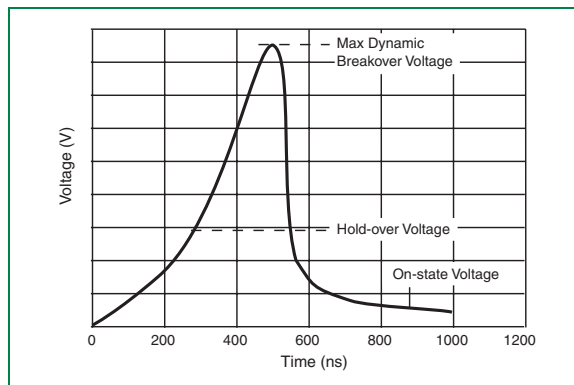
Part Number *	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage <sup>1</sup>		AC Discharge Current <sup>2</sup> Amps	MAX Repetitive Impulse Current <sup>3</sup> kAmps	MAX Leakage Current <sup>4</sup> nAmps	Holdover Voltage <sup>5</sup> Volts	Nominal On-state Voltage @ 1 A Volts
	MIN	MAX	100 V/μs Volts	1 kV/μs Volts					
SL1003A090	70	120	600	700	5	5	50	50	20
SL1003A230	184	276	350	500	5	5	100	135	20
SL1003A250	200	300	400	600	5	5	100	135	20
SL1003A260	210	310	420	600	5	5	100	135	20
SL1003A300	240	360	450	650	5	5	100	135	20
SL1003A350	280	420	500	700	5	5	100	135	20
SL1003A400	320	480	550	800	5	5	100	135	20
SL1003A450	360	540	650	800	5	5	100	135	20

Gas Plasma Arresters

\* Max capacitance is 1.2 pF, measured at 1 MHz, zero volt bias.

Notes:

1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
2. 10 shots, AC 60 Hz, 1 μs duration
3. 10 shots, 8/20 μs waveform per IEC 61000-4-5
4. Measured at 100 V, except 90 V dc which is measured at 50 V
5. Tested according to ITU-T Rec. K 12



Voltage versus Time Characteristic

**Typical Insertion Loss**

@ 1 GHz = 0.01 dB

@ 1.4 GHz = 0.1 dB

@ 1.8 GHz = 0.53 dB

@ 2.1 GHz = 0.81 dB

@ 2.45 GHz = 1 dB

@ 2.8 GHz = 1.2 dB

@ 3.1 GHz = 1.5 dB

@ 3.5 GHz = 2.1 dB

## SL1011A Series Two-terminal Medium-duty Gas Plasma Arrester



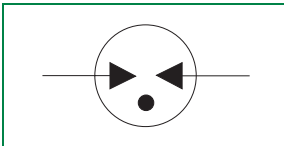
The *Greentube*™ SL1011A (Beta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) offers high levels of performance on fast-rising transients in the domain of 100 V/μs to 1 kV/μs (those most likely from induced lightning disturbances).

These devices feature ultra low capacitance (typically 1 pF or less), making them ideal for the protection of high-speed transmission equipment. They are extremely robust and able to divert a 5,000 A pulse without destruction.

The SL1011A series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, and general telecom equipment.

Other features include:

- Lead-free and RoHS compliant
- High performance Beta range
- Totally non-radioactive
- Low insertion loss
- 5 kA surge capability tested with 8/20 μs pulse as defined by IEC 61000-4-5
- 20,000 A single shot surge capability tested with 8/20 μs pulse as defined by IEC 61000-4-5



Two-terminal Arrester

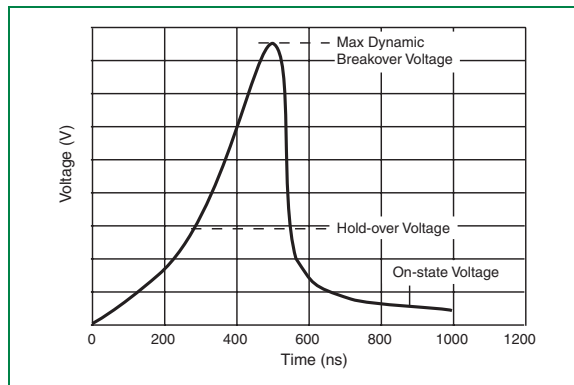
**Electrical Parameters**

Part Number	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage @ 100 V/ $\mu$ s <sup>1</sup> Volts	AC Discharge Current <sup>2</sup> Amps	MAX Repetitive Impulse Current <sup>3</sup> kAmps	MAX Single Impulse Current		MAX Leakage Current <sup>4</sup> nAmps	Holdover Voltage <sup>5</sup> Volts
	MIN	MAX				8/20 $\mu$ s kAmps	10/350 $\mu$ s kAmps		
SL1011A075	60	90	500	5	5	20	2.5	50	50
SL1011A090	70	120	500	5	5	20	2.5	50	50
SL1011A145	116	174	500	5	5	20	2.5	50	50
SL1011A150	120	180	500	5	5	20	2.5	50	50
SL1011A230	184	276	375	5	5	20	2.5	100	135
SL1011A250	200	300	400	5	5	20	2.5	100	135
SL1011A260	210	310	420	5	5	20	2.5	100	135
SL1011A350	280	420	500	5	5	20	2.5	100	135
SL1011A400	320	480	600	5	5	20	2.5	100	135
SL1011A470	376	564	650	5	5	20	2.5	100	135
SL1011A500	400	500	700	5	5	20	2.5	100	135
SL1011A600	480	720	800	5	5	20	2.5	100	135

Gas Plasma Arresters

Notes:

1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
2. 10 shots, AC 60 Hz, 1  $\mu$ s duration
3. 10 shots, 8/20  $\mu$ s waveform
4. Measured at 100 V, except for devices  $\leq$ 150 V dc which is measured at 50 V
5. Tested according to ITU-T Rec. K 12



Voltage versus Time Characteristic

## SL1011B Series Two-terminal Heavy-duty Gas Plasma Arrester



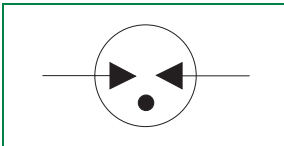
The *Greentube*™ SL1011B (Beta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) offers high levels of performance on fast-rising transients in the domain of 100 V/ $\mu$ s to 1 kV/ $\mu$ s (those most likely from induced lightning disturbances).

These devices feature ultra low capacitance (typically 1 pF or less), making them ideal for the protection of high-speed transmission equipment. They are extremely robust and able to divert a 10,000 A pulse without destruction.

The SL1011B series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, and general telecom equipment.

Other features include:

- Lead-free and RoHS compliant
- High performance Beta range
- Totally non-radioactive
- Low insertion loss
- 10 kA surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- 10,000 A single shot surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5



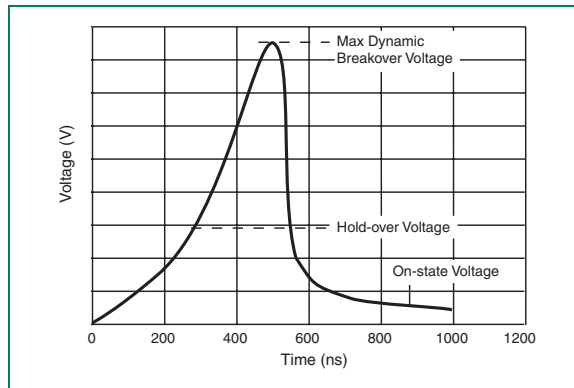
Two-terminal Arrester

**Electrical Parameters**

Part Number	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage @ 100 V/ $\mu$ s <sup>1</sup>	AC Discharge Current <sup>2</sup> Amps	MAX Repetitive Impulse Current <sup>3</sup> kAmps	MAX Single Impulse Current		MAX Leakage Current <sup>4</sup> nAmps	Holdover Voltage <sup>5</sup> Volts
	MIN	MAX				8/20 $\mu$ s kAmps	10/350 $\mu$ s kAmps		
SL1011B075	60	90	500	10	10	20	2.5	50	50
SL1011B090	70	120	500	10	10	20	2.5	50	50
SL1011B145	116	174	500	10	10	20	2.5	50	50
SL1011B150	120	180	500	10	10	20	2.5	50	50
SL1011B230	184	276	375	10	10	20	2.5	100	135
SL1011B250	200	300	400	10	10	20	2.5	100	135
SL1011B260	210	310	420	10	10	20	2.5	100	135
SL1011B350	280	420	500	10	10	20	2.5	100	135

Gas Plasma Arresters

- Notes:
1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
  2. 10 shots, AC 60 Hz, 1  $\mu$ s duration
  3. 10 shots, 8/20  $\mu$ s waveform
  4. Measured at 100 V, except for devices  $\leq 150$  V dc which are measured at 50 V
  5. Tested according to ITU-T Rec. K 12



Voltage versus Time Characteristic

## SL1021A Series Three-terminal Medium-duty 8 mm Gas Plasma Arrester



The *Greentube™* SL1021A (Beta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) offers high levels of performance on fast-rising transients in the domain of 100 V/ $\mu$ s to 1 kV/ $\mu$ s (those most likely from induced lightning disturbances).

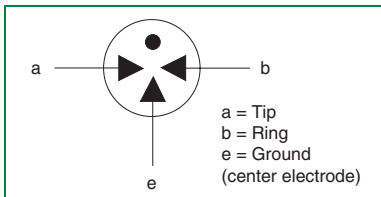
These devices feature ultra low capacitance (typically 1 pF or less) and optimized internal geometry to provide low insertion loss at high frequencies, making them ideal for the protection of broadband equipment. They are extremely robust and able to divert a 10,000 A pulse without destruction.

The failsafe is a heat sensitive device for preventing over-temperature situations. In normal operation or when conducting short duration transients (spikes), the gas plasma arrester does not generate any significant or detectable heat. Under conditions of conducting mains electricity (AC power) for extended periods (power fault), any arrester will generate excessive thermal energy, even to the point where its electrodes glow 'cherry red.' If an arrester is to be used in areas where connection with AC mains is a possibility, then a failsafe can be fitted. These devices are spring-loaded switches held in the open position. When the arrester temperature rises, the device activates to create a short circuit between the arrester center (ground) and line terminals (Tip or Ring). This short circuit is of low resistance and will conduct the fault current without generating any significant heat. The RG failsafe can be used in flow or re-flow solder processes without activating in response to the heat of the process. It is lead-free and can withstand long-term exposure to temperatures up to 100 °C.

The SL1021A series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, and general telecom equipment.

Other features include:

- Lead-free and RoHS compliant
- High performance Beta range
- Totally non-radioactive
- 10 kA surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- 20,000 A single shot surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- Available with thermal failsafe option ("F" suffix added to part number)



Three-terminal Arrester

Electrical Parameters

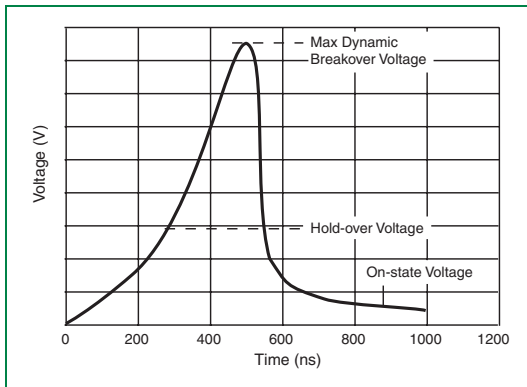
Part Number *	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage <sup>1</sup>		AC Discharge Current		MAX Repetitive Impulse Current		MAX Single Impulse Current <sup>4,6</sup>		MAX Leakage Current <sup>6</sup> nAmps	Holdover Voltage <sup>7</sup> Volts
	MIN	MAX	100 V/ $\mu$ s Volts	1 kV/ $\mu$ s Volts	Notes 2,3 Amps	Notes 2,4 Amps	Notes 3,5 kAmps	Notes 4,5 kAmps	8/20 $\mu$ s kAmps	10/350 $\mu$ s kAmps		
SL1021A200 <sup>8</sup>	150	250	350	450	10	5	10	5	20	2.5	100	135
SL1021A230	184	276	400	500	10	5	10	5	20	2.5	100	135
SL1021A250	200	300	450	550	10	5	10	5	20	2.5	100	135
SL1021A260 <sup>9</sup>	210	310	450	550	10	5	10	5	20	2.5	100	135
SL1021A300	240	360	500	650	10	5	10	5	20	2.5	100	135
SL1021A350	280	420	600	700	10	5	10	5	20	2.5	100	135
SL1021A500	400	500	800	900	10	5	10	5	20	2.5	100	135
SL1021A600	480	720	870	960	10	5	10	5	20	2.5	100	135

Gas Plasma Arresters

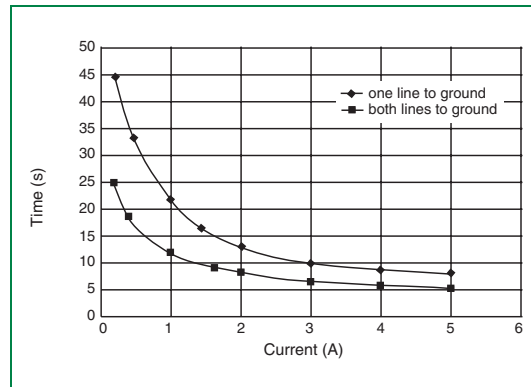
\* Max capacitance is 1.5 pF, measured at 1 MHz  
 Life test rating is 100 shots, 100 A, 10/1000  $\mu$ s pulse; rating does not apply to SL1021A200. (Rating applies to C option devices mounted in a suitable connector with high pressure contacts.)

Notes:

1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
2. 10 shots, AC 60 Hz, 1  $\mu$ s duration
3. Total current through center (Ground) electrode, both line electrodes subject to simultaneous pulses; half value through each respective Line terminal
4. Either end (Line) electrode to center (Ground) electrode
5. 10 shots, 8/20  $\mu$ s waveform
6. Measured at 100 V
7. Tested according to ITU-T Rec. K 12
8. Meets the requirements of BT Type 14A; failsafe option meets the requirements of BT Type 14A/1 ("F" suffix added to part number)
9. Meets the requirements of BT Type 21A



Voltage versus Time Characteristic



Time versus Current for Failsafe

## SL1021B Series Three-terminal Heavy-duty 8 mm Gas Plasma Arrester



The *Greentube*™ SL1021B (Beta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) offers high levels of performance on fast-rising transients in the domain of 100 V/μs to 1 kV/μs (those most likely from induced lightning disturbances).

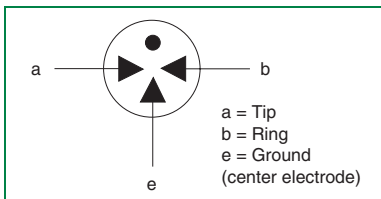
These devices feature ultra low capacitance (typically 1 pF or less) and optimized internal geometry to provide low insertion loss at high frequencies, making them ideal for the protection of broadband equipment. They are extremely robust and able to divert a 20,000 A pulse without destruction.

The failsafe is a heat sensitive device for preventing over-temperature situations. In normal operation or when conducting short duration transients (spikes), the gas plasma arrester does not generate any significant or detectable heat. Under conditions of conducting mains electricity (AC power) for extended periods (power fault), any arrester will generate excessive thermal energy, even to the point where its electrodes glow 'cherry red.' If an arrester is to be used in areas where connection with AC mains is a possibility, then a failsafe can be fitted. These devices are spring-loaded switches held in the open position. When the arrester temperature rises, the device activates to create a short circuit between the arrester center (ground) and line terminals (Tip or Ring). This short circuit is of low resistance and will conduct the fault current without generating any significant heat. The RG failsafe can be used in flow or re-flow solder processes without activating in response to the heat of the process. It is lead-free and can withstand long-term exposure to temperatures up to 100 °C

The SL1021B series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, and general telecom equipment.

Other features include:

- Lead-free and RoHS compliant
- High performance Beta range
- Totally non-radioactive
- 10 kA surge capability tested with 8/20 μs pulse as defined by IEC 61000-4-5
- 20,000 A single shot surge capability tested with 8/20 μs pulse as defined by IEC 61000-4-5
- Available with thermal failsafe option ("F" suffix added to part number)



Three-terminal Arrester

**Electrical Parameters**

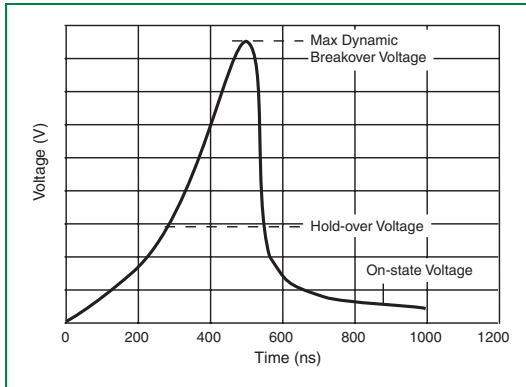
Part Number *	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage <sup>1</sup>		AC Discharge Current <sup>2,3</sup> Amps	MAX Repetitive Impulse Current <sup>3,4</sup> kAmps	MAX Single Impulse Current <sup>3,5</sup>		MAX Leakage Current <sup>6</sup> nAmps	Holdover Voltage <sup>7</sup> Volts
	MIN	MAX	100 V/ $\mu$ s Volts	1 kV/ $\mu$ s Volts			8/20 $\mu$ s kAmps	10/350 $\mu$ s kAmps		
SL1021B200	150	250	350	450	10	10	20	2.5	100	135
SL1021B230	184	276	400	500	10	10	20	2.5	100	135
SL1021B250	200	300	450	550	10	10	20	2.5	100	135
SL1021B260	210	310	450	550	10	10	20	2.5	100	135
SL1021B300	240	360	500	650	10	10	20	2.5	100	135
SL1021B350	280	420	600	700	10	10	20	2.5	100	135
SL1021B500	400	500	800	900	10	10	20	2.5	100	135
SL1021B600	480	720	870	960	10	10	20	2.5	100	135

Gas Plasma Arresters

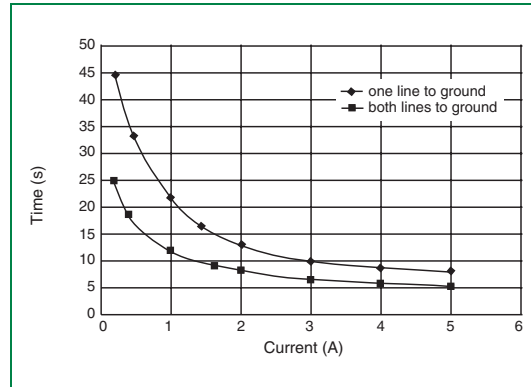
\* Max capacitance is 1.5 pF, measured at 1 MHz.  
Life test rating is 100 shots, 100 A, 10/1000  $\mu$ s pulse

Notes:

1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
2. 10 shots, AC 60 Hz, 1  $\mu$ s duration
3. Either end (Line) electrode to center (Ground) electrode
4. 10 shots, 8/20  $\mu$ s waveform
5. Applies to C option devices mounted in a suitable connector with high pressure contacts
6. Measured at 100 V
7. Tested according to ITU-T Rec. K 12

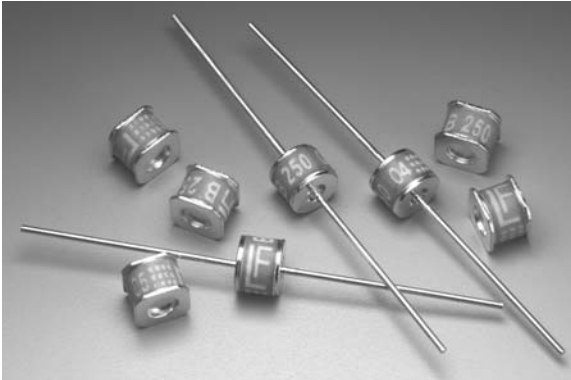


Voltage versus Time Characteristic



Time versus Current for Failsafe

## SL1411A Series Two-terminal Gas Plasma Arrester



The *Greentube*™ SL1411A (Delta) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) features a high-performance transient voltage suppressor designed for heavy-duty protection of telecom and industrial equipment.

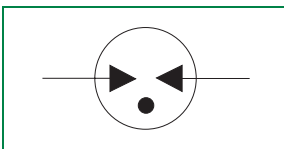
The Delta range offers high levels of performance and durability on fast-rising transients in the domain of 100 V/μS to 1 kV/μS, which are those most likely from induced lightning disturbances. The high surge rating of these devices makes them ideal for arduous service conditions and Outside Plant locations.

The Delta range also features ultra low capacitance (typically 1 pF or less) and optimized internal geometry which provides low insertion loss at high frequencies, so are ideal for the protection of broadband equipment.

The SL1411A series is used for Outside Plant and MDF protector modules, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite, CATV, and general telecom equipment, and cell phone base stations.

Other features include:

- High energy Delta range
- Up to 1.5 GHz working frequency
- 10 kA surge capability tested with 8/20μS pulse as defined by IEC 61000-4-5 (20 kA for 90 V)
- 25,000 A single shot surge capability tested with 8/20μS pulse as defined by IEC 61000-4-5
- Excellent service life characteristics



Two-terminal Arrester

**Electrical Parameters**

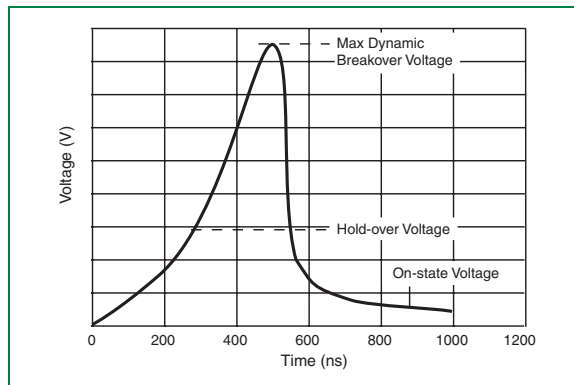
Part Number *	DC Breakover Voltage @ 100 V/s <sup>1,2</sup>		MAX Dynamic Breakover Voltage <sup>3</sup>		AC Discharge Current <sup>4</sup>	MAX Repetitive Impulse Current <sup>5</sup>	MAX Single Impulse Current		MAX Leakage Current <sup>6</sup>	Holdover Voltage <sup>7,8</sup>	Nominal On-state Voltage @ 1 A
	MIN	MAX	100 V/ $\mu$ s	1 kV/ $\mu$ s			8/20 $\mu$ s	10/350 $\mu$ s			
SL1411A075	60	90	450	700	10	10	20	3	50	50	20
SL1411A090	72	108	450	700	10	10	20	3	50	50	20
SL1411A230	184	276	450	650	10	10	20	3	100	135	20
SL1411A250	200	300	475	700	10	10	20	3	100	135	20
SL1411A350	280	420	600	800	10	10	20	3	100	135	20

Gas Plasma Arresters

\* Max capacitance is 1.5 pF, measured at 1 MHz.

Notes:

1. At delivery AQL 0.65 level II, DIN ISO 2859
2. In ionized mode
3. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
4. 10 shots, AC 60 Hz, 1  $\mu$ s duration
5. 10 shots, 8/20  $\mu$ s waveform
6. Measured at 100 V, except for devices 90 V dc which are measured at 50 V
7. With network applied, 52 V for 75 V dc and 90 V dc ratings
8. Tested according to ITU-T Rec. K 12



Voltage versus Time Characteristic

## SL1024A Series Three-terminal Medium-duty 8 mm Gas Plasma Arrester



The *Greentube™* SL1024A (Omega) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) offers high levels of current handling on fast-rising transients created by induced lightning disturbances.

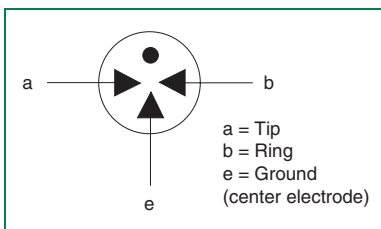
These devices feature ultra low capacitance (typically 1 pF or less), making them ideal for the protection of high-speed transmission equipment. They are extremely robust and able to divert pulses of 10,000 A.

The SL1024A series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, splitters, and general telecom equipment.

The failsafe is a heat sensitive device for preventing over-temperature situations. In normal operation or when conducting short duration transients (spikes), the gas plasma arrester does not generate any significant or detectable heat. Under conditions of conducting mains electricity (AC power) for extended periods (power fault), any arrester will generate excessive thermal energy, even to the point where its electrodes glow 'cherry red.' If an arrester is to be used in areas where connection with AC mains is a possibility, then a failsafe can be fitted. These devices are spring-loaded switches held in the open position. When the arrester temperature rises, the device activates to create a short circuit between the arrester center (ground) and line terminals (Tip or Ring). This short circuit is of low resistance and will conduct the fault current without generating any significant heat. The RG failsafe can be used in flow or re-flow solder processes without activating in response to the heat of the process. It is lead-free and can withstand long-term exposure to temperatures up to 100 °C

Other features include:

- Lead-free and RoHS compliant
- Omega range
- Totally non-radioactive
- Low insertion loss
- 10 kA surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- Available with thermal failsafe option ("F" suffix added to part number)



Three-terminal Arrester

Electrical Parameters

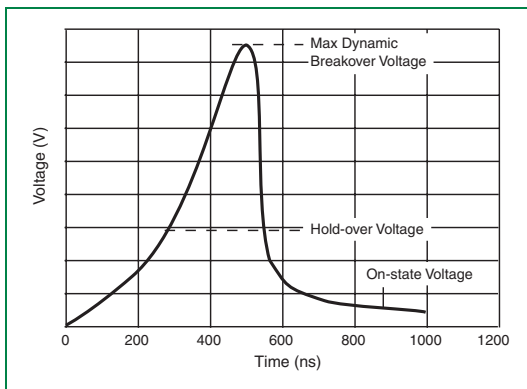
Part Number *	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage @ 100 V/ $\mu$ s <sup>1</sup> Volts	AC Discharge Current <sup>2,3</sup> Amps	MAX Repetitive Impulse Current <sup>4</sup> kAmps	MAX Single Impulse Current <sup>5,6</sup>		MAX Leakage Current <sup>7</sup> nAmps	Holdover Voltage <sup>8</sup> Volts
	MIN	MAX				8/20 $\mu$ s kAmps	10/350 $\mu$ s kAmps		
SL1024A090	70	120	450	10	10	20	2.5	50	50
SL1024A145	116	174	450	10	10	20	2.5	50	50
SL1024A150	120	180	450	10	10	20	2.5	50	50
SL1024A230	184	276	450	10	10	20	2.5	100	135
SL1024A250	200	300	475	10	10	20	2.5	100	135
SL1024A260	210	310	475	10	10	20	2.5	100	135
SL1024A300	240	360	550	10	10	20	2.5	100	135
SL1024A350	280	420	625	10	10	20	2.5	100	135
SL1024A400	320	480	650	10	10	20	2.5	100	135
SL1024A420	345	500	700	10	10	20	2.5	100	135
SL1024A450	360	540	700	10	10	20	2.5	100	135
SL1024A470	376	564	725	10	10	20	2.5	100	135
SL1024A500	400	500	825	10	10	20	2.5	100	135
SL1024A600	480	720	900	10	10	20	2.5	100	135

Gas Plasma Arresters

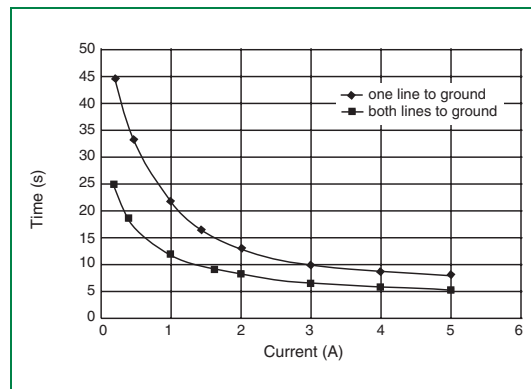
\* Max capacitance is 1.5 pF, measured at 1 MHz.

Notes:

1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
2. Total current through center (Ground) electrode, both line electrodes subject to simultaneous pulses; half value through each respective Line terminal.
3. 10 shots, AC 60 Hz, 1  $\mu$ s duration
4. 10 shots, 8/20  $\mu$ s waveform
5. Either end (Line) electrode to center (Ground) electrode
6. Applies to C option devices mounted in a suitable connector with high pressure contacts.
7. Measured at 100 V, except for devices  $\leq 150$  V dc which are measured at 50 V
8. Tested according to ITU-T Rec. K 12



Voltage versus Time Characteristic



Time versus Current for Failsafe

## SL1024B Series Three-terminal Heavy-duty 8 mm Gas Plasma Arrester



The *Greentube*™ SL1024B (Omega) Series Gas Plasma Arrester (improved gas discharge tube (GDT)) offers high levels of current handling on fast-rising transients created by induced lightning disturbances.

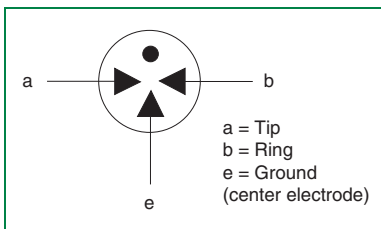
These devices feature ultra low capacitance (typically 1 pF or less), making them ideal for the protection of high-speed transmission equipment. They are extremely robust and able to divert pulses of 20,000 A.

The SL1024B series is used in broadband, ADSL, xDSL (including ADSL2, VDSL, VDSL2), satellite and CATV, splitters, and general telecom equipment.

The failsafe is a heat sensitive device for preventing over-temperature situations. In normal operation or when conducting short duration transients (spikes), the gas plasma arrester does not generate any significant or detectable heat. Under conditions of conducting mains electricity (AC power) for extended periods (power fault), any arrester will generate excessive thermal energy, even to the point where its electrodes glow 'cherry red.' If an arrester is to be used in areas where connection with AC mains is a possibility, then a failsafe can be fitted. These devices are spring-loaded switches held in the open position. When the arrester temperature rises, the device activates to create a short circuit between the arrester center (ground) and line terminals (Tip or Ring). This short circuit is of low resistance and will conduct the fault current without generating any significant heat. The RG failsafe can be used in flow or re-flow solder processes without activating in response to the heat of the process. It is lead-free and can withstand long-term exposure to temperatures up to 100 °C

Other features include:

- Lead-free and RoHS compliant
- Omega range
- Totally non-radioactive
- Low insertion loss
- 20 kA surge capability tested with 8/20  $\mu$ s pulse as defined by IEC 61000-4-5
- Available with thermal failsafe option ('F' suffix added to part number)



Three-terminal Arrester

Electrical Parameters

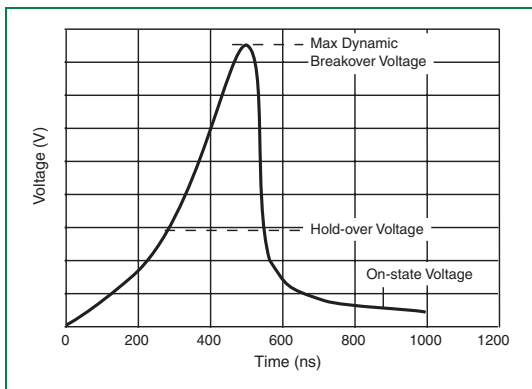
Part Number *	DC Breakover Voltage @ 100 V/s Volts		MAX Dynamic Breakover Voltage @ 100 V/ $\mu$ s <sup>1</sup> Volts	AC Discharge Current <sup>2,3</sup> Amps	MAX Repetitive Impulse Current <sup>4</sup> kAmps	MAX Single Impulse Current <sup>5,6</sup>		MAX Leakage Current <sup>7</sup> nAmps	Holdover Voltage <sup>8</sup> Volts
	MIN	MAX				8/20 $\mu$ s kAmps	10/350 $\mu$ s kAmps		
SL1024B090	70	120	450	10	10	20	2.5	50	50
SL1024B145	116	174	450	10	10	20	2.5	50	50
SL1024B150	120	180	450	10	10	20	2.5	50	50
SL1024B230	184	276	450	10	10	20	2.5	100	135
SL1024B250	200	300	475	10	10	20	2.5	100	135
SL1024B260	210	310	475	10	10	20	2.5	100	135
SL1024B300	240	360	550	10	10	20	2.5	100	135
SL1024B350	280	420	625	10	10	20	2.5	100	135
SL1024B400	320	480	650	10	10	20	2.5	100	135
SL1024B420	345	500	700	10	10	20	2.5	100	135
SL1024B450	360	540	700	10	10	20	2.5	100	135
SL1024A470	376	564	725	10	10	20	2.5	100	135
SL1024B500	400	500	825	10	10	20	2.5	100	135
SL1024B600	480	720	900	10	10	20	2.5	100	135

Gas Plasma Arresters

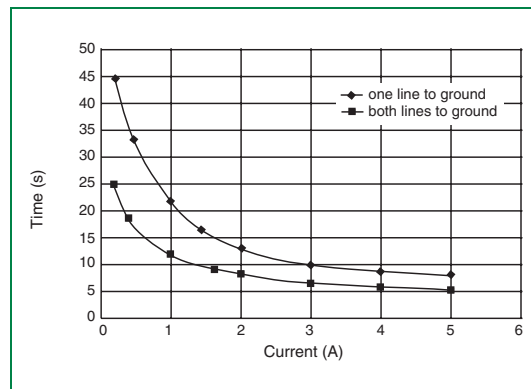
\* Max capacitance is 1.5 pF, measured at 1 MHz.

Notes:

1. Comparable to the silicon measurement Switching Voltage ( $V_s$ )
2. Total current through center (Ground) electrode, both line electrodes subject to simultaneous pulses; half value through each respective Line terminal.
3. 10 shots, AC 60 Hz, 1  $\mu$ s duration
4. 10 shots, 8/20  $\mu$ s waveform
5. Either end (Line) electrode to center (Ground) electrode
6. Applies to C option devices mounted in a suitable connector with high pressure contacts.
7. Measured at 100 V, except for devices  $\leq 150$  V dc which are measured at 50 V
8. Tested according to ITU-T Rec. K 12



Voltage versus Time Characteristic



Time versus Current for Failsafe

## NOTES

---

---