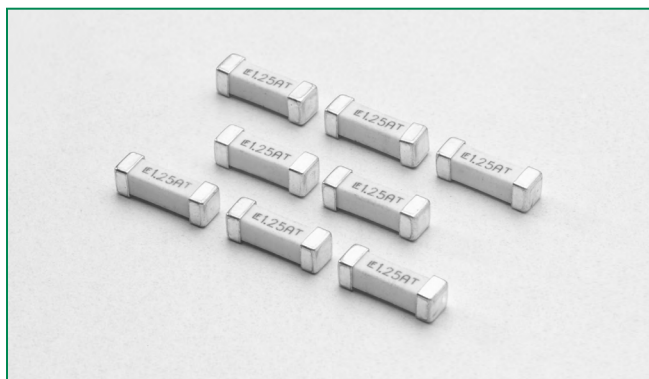


461 Series TeleLink® Fuse



Description

The Littelfuse 461 Series TeleLink® Surface Mount, Surge Resistant Fuse, offers over-current protection for a wide range of telecom applications without requiring a series resistor. When used in conjunction with a Littelfuse SIDACtor® Transient Voltage Suppressor (TVS) or a Greentube™ Gas Plasma Arrestor, 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 of impedance devices.

Agency Approvals

AGENCY	AGENCY FILE NUMBER	AMPERE RANGE
	E10480	.5A - 2A
	29862	.5A - 2A

Electrical Characteristics for Series

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
250%	1 sec., Min.; 120 secs., Max.

Maximum Temperature Rise

Telecom Nano ² ® Fuse	Temperature Reading
04611.25	< 82°C (180°F)
0461002.	< 50°C (122°F)

Higher Currents and PCB layout designs can affect this parameter.
Readings are measured at rated current after temperature stabilizes.

Additional Information



Datasheet



Resources



Samples

Features

- Surface mount surge resistant Slo-Blo® fuse
- Meet UL 60950 3rd Edition power cross requirements standard alone
- Designed to allow compliance with Telcordia GR-1089-CORE and TIA-968-A (formerly FCC Part 68) Surge Specifications
- Provide coordinated protection with Littelfuse SIDACtor® Transient Voltage Suppressor (TVS) or a Greentube™ Gas Plasma Arrestor, without series resistors
- Designed to serve the requirements of a wide range of telecommunication and networking equipment
- 2A rating has improved temperature rise performance under 2.2A surge current testing when compared with 1.25A rating
- Product is Halogen Free and RoHS compliant and compatible with lead-free solder and higher temperature profiles when ordered with Standard Silver Plated Brass Caps
- Standard product is RoHS Compliant and compatible with lead-free solders and higher temperature profiles

Applications

- T1/E1/J1 and HDSL2/4
- SLIC interface portion of Fiber to the Curb (FTTC) and Fiber to the Premises (FTTP)
- Non-Fiber 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

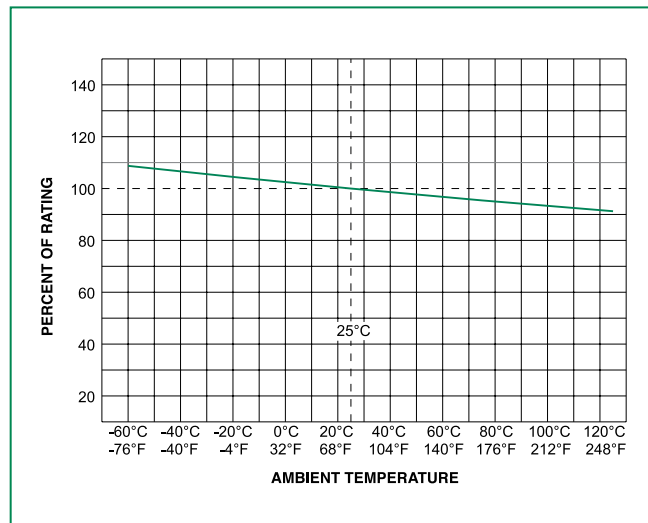
Electrical Specifications by Item

Ampere Rating (A)	Amp Code	Max Voltage Rating (V)	Interrupting Rating	Nominal Cold Resistance (Ohms)	Nominal Melting I ² t (A ² sec)	Agency Approvals	
							
0.500	.500	600	50A @ 250 VAC 60 A @600 VAC 100 A @80 VDC	0.560	0.840 ¹	x	x
1.25	1.25	600		.1040	16.5 ¹	x	x
2.00	002.	600		.0450	17.5 ¹	x	x

¹ I²t is calculated at 10 msec. or less. I²t at 10 times rated current has a typical value of: 24 A²sec (2.0A), 22 A²sec (1.25A), 1.3 A²sec (0.5A).

- Typical inductance <40nH up to 500 MHz.
- Resistance changes 0.5% for every °C.
- Resistance is measured at 10% rated current.

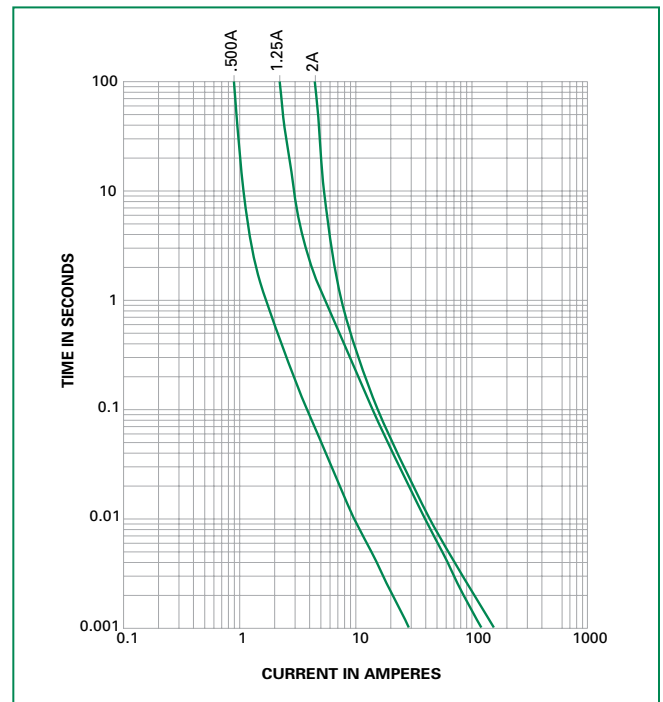
Temperature Re-rating Curve



Note:

1. Re-rating depicted in this curve is in addition to the standard re-rating of 25% for continuous operation.

Average Time Current Curves



GR 1089 Inter-building requirements

GR 1089 1st level lighting surge inter-building
(Equipment under test can not be damaged and must continue to operate properly)

Surge	Minimum Peak Voltage (V)	Minimum Peak Current (A)	Max. Rise/Min. Decay (μs)	Repetitions Each Polarity	Fuse Choices
1	600	100	10/1000	25	1.25, 2.0
2	1000	100	10/360	25	1.25, 2.0
3	1000	100	10/1000	25	1.25, 2.0
4	2500	500	2/10	10	1.25, 2.0
5	1000	25	10/360	5	0.5, 1.25, 2.0

If sufficient series resistance is used, then the 0.5 fuse may be used in test conditions 1-4.

GR 1089 2nd level lightning surge telecom port
(Equipment under test shall not become a fire or electrical safety hazard)

Surge	Minimum Peak Voltage (V)	Minimum Peak Current (A)	Max. Rise/Min. Decay (μs)	Repetitions Each Polarity	Fuse Choices
1	5000	500	2/10	1	0.5, 1.25, 2.0
Alternative	5000	500/8=625	8/10	1	0.5, 1.25, 2.0

The 0.5 fuse will open during these test conditions. The 1.25 & 2.0 will not open thus providing operational compliance.

GR 1089 AC power fault 1st level inter-building (fuse not allowed to open)

Test	Vrms	Short Circuit Current (A)	Hits	Duration	Primary Protector	Fuse Choices
1	50	0.33	1	15 min.	removed	1.25, 2.0
2	100	0.17	1	15 min.	removed	1.25, 2.0
3	200,400, 600	1	60	1 sec.	removed	1.25, 2.0
4	1000	1	60	1 sec.	operative	1.25, 2.0
5	Diagram	Diagram	60	5 secs.	removed	1.25, 2.0
6	600	0.5	1	30 secs.	removed	1.25, 2.0
7	440	2.2	5	2 secs.	removed	1.25, 2.0
8	600	3	1	1.1 secs.	removed	1.25, 2.0
9	1000	5	1	0.4 sec.	in place	1.25, 2.0

GR 1089 AC power fault 2nd level (fuse can open but must open in a safe and controlled manner)

Test Circuit	Vrms	Short Circuit Current (A)	Duration	Fuse
1	120,277	25	15 min.	0.5, 1.25, 2.0
2	600	60	5 secs.	0.5, 1.25, 2.0
3	600	7	5 secs.	0.5, 1.25, 2.0
4	100-600	2.2	15 min..	0.5, 1.25, 2.0
5	Diagram	Diagram	15 min.	0.5, 1.25, 2.0

Fuse must open before wiring simulator fuse (MDL 2.0).

TIA -968-A (formerly FCC Part 68) Surge Waveforms (fuse can not open during type B events)

Surge	Voltage (V)	Waveform (µs)	Current (A)	Repetitions	Recommended Fuse
Metallic A	800	10×560	100	1 ea. polarity	1.25
Longitudinal A	1500	10×160	200	1 ea. polarity	1.25
Metallic B	1000	9×720	25	1 ea. polarity	1.25
Longitudinal B	1500	9×720	37.5	1 ea. polarity	1.25

For the type A events the 0.5 fuse will open, providing non-operational compliance. The 1.25 & 2.0 will not open, providing for operational compliance with TIA-968-A type A surge events.

UL 60950 requirements

UL60950 (EN 60950) (formerly UL 1950) Power Cross (L = longitudinal, M = metallic)

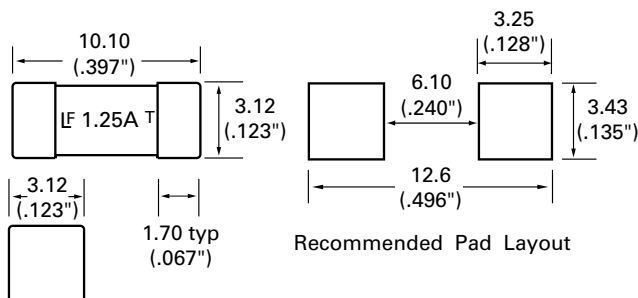
Test Number	Voltage (V)	Current (A)	Time	Fuse Choices
L1	600	40	1.5 secs.	0.5, 1.25, 2.0
L2	600	7	5 secs.	0.5, 1.25, 2.0
L3	600	2.2	30 min.	0.5, 1.25, 2.0
L4	200	2.2	30 min.	0.5, 1.25, 2.0
L5	120	25	30 min.	0.5, 1.25, 2.0
M1	600	40	1.5 secs.	0.5, 1.25, 2.0
M2	600	7	5 secs.	0.5, 1.25, 2.0
M3	600	2.2	30 min.	0.5, 1.25, 2.0
M4	600	2.2	30 min.	0.5, 1.25, 2.0

Selection of test number depends on current limiting F fire enclosure/spacing of end product

- 26 AWG line cord removes L1/M1 test requirement
- L5 conducted only if product does not pass section 6.1.2
- L2,M2,L3,M3,L4,M4 conducted if not in a fire enclosure

Fuse must open before the wiring simulator fuse (MDL 2.0).

Dimensions

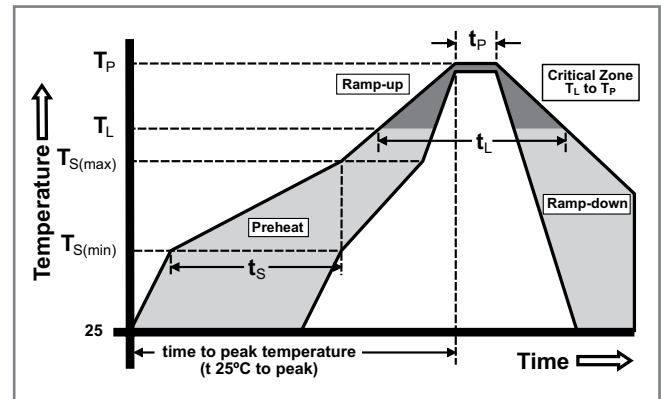


UL60950 (EN 60950) (formerly UL 1950) Impulse Test and Steady-State Electric Strength Test

Test	Voltage (V)	Current (A)	Waveform	Repetitions	Fuse Choices
Impulse					
For handheld units	2500	62.5	10×700ms	+/- 10 w/60 secs. rest	0.5, 1.25, 2.0
Non handheld	1500	37.5	10×700ms	+/- 10 w/60 secs. rest	0.5, 1.25, 2.0
Steady-State					
For handheld units	1500		60Hz		0.5, 1.25, 2.0
Non handheld	1000		60Hz		0.5, 1.25, 2.0

Soldering Parameters

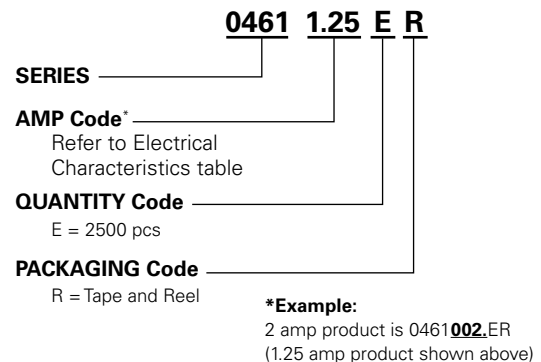
Reflow Condition		Pb – free assembly
Pre Heat	- Temperature Min ($T_{s(min)}$)	150°C
	- Temperature Max ($T_{s(max)}$)	200°C
	- Time (Min to Max) (t_s)	60 – 120 seconds
Average Ramp-up Rate (Liquidus Temp (T_L) to peak)		5°C/second max.
$T_{s(max)}$ to T_L - Ramp-up Rate		5°C/second max.
Reflow	- Temperature (T_L) (Liquidus)	217°C
	- Temperature (t_L)	60 – 90 seconds
Peak Temperature (T_p)		260 $^{+0/-5}$ °C
Time within 5°C of actual peak Temperature (t_p)		20 – 40 seconds
Ramp-down Rate		6°C/second max.
Time 25°C to peak Temperature (T_p)		8 minutes max.
Do not exceed		260°C



Product Characteristics

Materials	Body: Ceramic Terminations: Silver-plated Caps
Product Marking	Brand Logo, Ampere Rating, T
Operating Temperature	-55°C to 125°C
Moisture Sensitivity Level	Level 1, J-STD-020C
Solderability	IEC-60127-4 (215°C immersion, 3 seconds)
Resistance to Dissolution of Metallization	IPC / EIA J-STD-002-Test D 260°C for 120 seconds
Thermal Shock	MIL-STD-202, Method 107, Test Condition B, -55°C to +125°C, 30 minutes @ each extreme
Mechanical Shock	MIL-STD-202, Method 213, Test Condition A - Half Sine, 50 G's, 11 msecs. duration
High Frequency Vibration	MIL-STD-202, Method 204, Test Condition D
Moisture Resistance	MIL-STD-202, Method 106, 50 cycles
Terminal Strength	Board deflection per EIA / IS-722, 1mm deflection for 1 minute
Terminal Attachment	MIL-STD-202, Method 211, Test Condition A, 5 lbs applied to end caps

Part Numbering System



Packaging

Packaging Option	Packaging Specification	Quantity	Quantity & Packaging Code
24mm Tape and Reel	EIA RS-481-2 (IEC 286, part 3)	2500	ER