



RoHS HF 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 | 500mA - 2A |
|  | LR29862 | 500mA - 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 ²⁰ 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.



Features

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

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

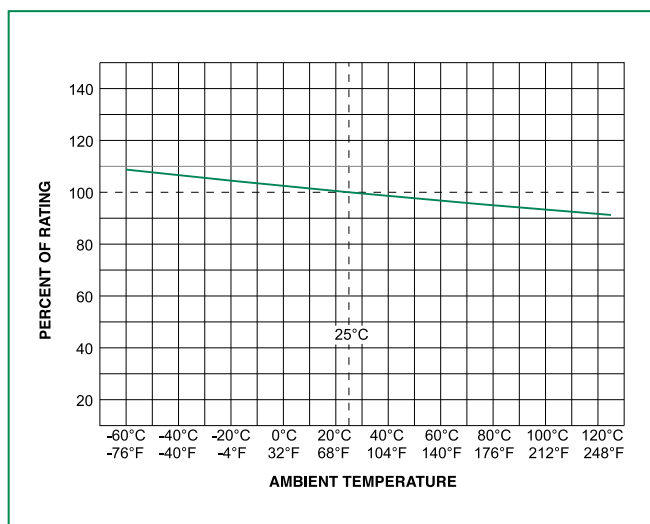
Electrical Specifications by Item

| 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 | 60 A @600 VAC 100 A @80 VDC | 0.560 | 0.840 ¹ | x | x |
| 1.25 | 1.25 | 600 | | 0.110 | 16.5 ¹ | x | x |
| 2.00 | 002. | 600 | | 0.050 | 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).

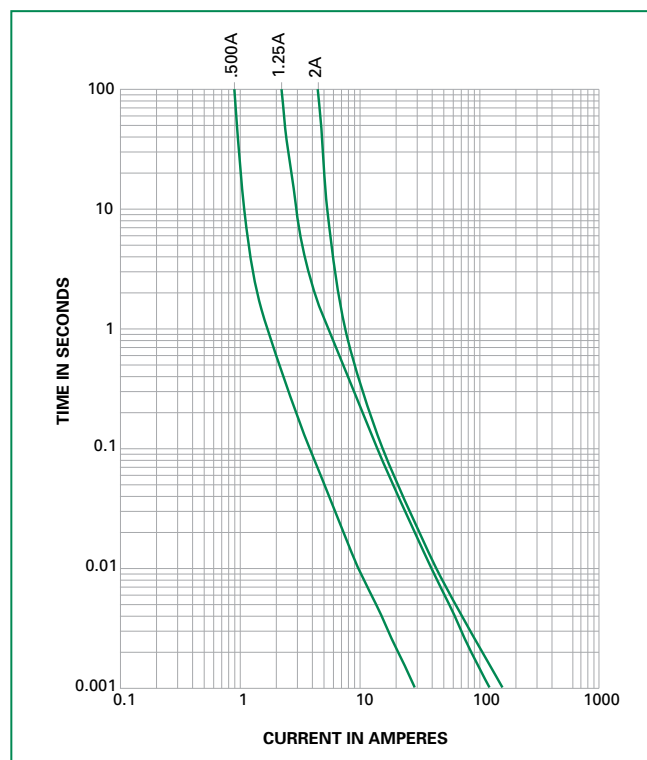
- Typical inductance <40nH up to 500 MHz.
- Resistance changes 0.5% for every °C.
- Resistance is measured at 10% rated current.

Temperature Rerating Curve



Note:
1. Rerating depicted in this curve is in addition to the standard rerating 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 x 560 | 100 | 1 ea. polarity | 1.25 |
| Longitudinal A | 1500 | 10 x 160 | 200 | 1 ea. polarity | 1.25 |
| Metallic B | 1000 | 9 x 720 | 25 | 1 ea. polarity | 1.25 |
| Longitudinal B | 1500 | 9 x 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)

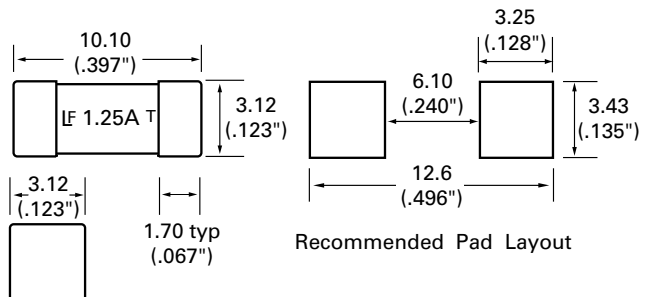
| Test Number | Voltage (V) | Current (A) | Time | Fuse Choices |
|-------------|-------------|-------------|-----------|----------------|
| L1 | 600 | 40 | 1.5 secs. | 0.5, 1.25, 2.0 |
| L2 | 600 | 7 | 5 secs. | 0.5, 1.25, 2.0 |
| L3 | 600 | 2.2 | 30 min. | 0.5, 1.25, 2.0 |
| L4 | 200 | 2.2 | 30 min. | 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

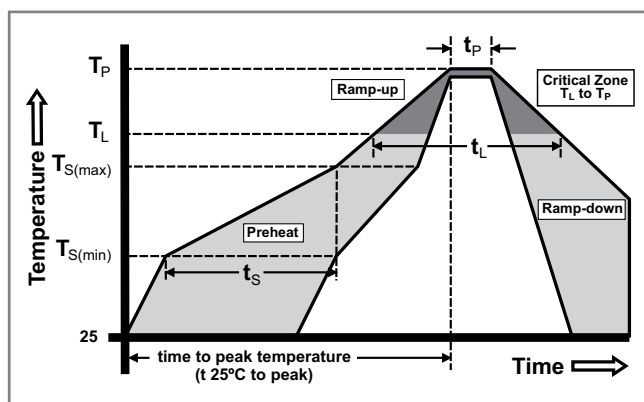


UL60950 (EN 60950) (formerly UL 1950) Impulse Test and Steady-State Electric Strength Test

| Test | Voltage (V) | Current (A) | Waveform | Repetitions | Fuse Choices |
|---------------------|-------------|-------------|------------|------------------------|----------------|
| Impulse | | | | | |
| For handheld units | 2500 | 62.5 | 10 x 700ms | +/- 10 w/60 secs. rest | 0.5, 1.25, 2.0 |
| Non handheld | 1500 | 37.5 | 10 x 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) | | 250 ^{+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 |

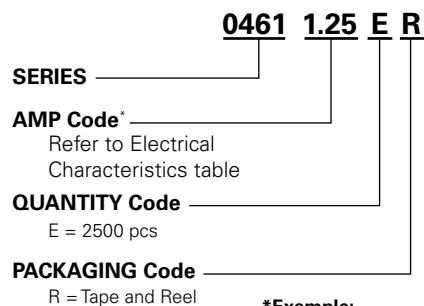


Product Characteristics

| | |
|---|---|
| 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-002A-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 msec. 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



***Example:**
2 amp product is 0461**002**,ER
(1.25 amp product shown above)

Packaging

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