



Description

The 159 Series product is a metal fuse clip with pre-installed Littelfuse 461 Series TeleLink® fuse. This fuse and clip combination can be automatically installed in PC Boards in one efficient manufacturing operation. It permits quick and easy fuse replacement without exposing the PC Board and other components to risks of rework solder heat as required with direct surface mount fuses.

It meets UL 60950 power cross requirements and is designed to allow compliance with Telcordia GR-1089-CORE and TIA-968-A Surge Specifications. The product provides coordinated protection with Littelfuse SIDACTor® protection thyristors without series resistors.

Agency Approvals

AGENCY	AGENCY FILE NUMBER	AMPERE RANGE
c UL US	E14721	0.5A, 1.25A, 2.0A

Electrical Characteristics for Series

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
250%	1 sec, Minimum 120 secs Maximum


Features

- Offers low profile easily-replaceable fuse alternative compatible with automated PCB surface mount equipment
- Comes supplied with surge resistant Littelfuse 461 series TeleLink® time-lag Slo-Blo® fuse
- Fuse designed to allow compliance with Telcordia GR-1089-CORE and TIA-968-A (formerly FCC Part 68) Surge Specifications.
- Provides coordinated protection with Littelfuse SIDACTor® devices and GDTs, without series resistors.
- Clip fully compatible with RoHS/Pb-Free solder alloys and higher temperature profiles associated with leadfree assembly
- Available in ratings of 0.5-2.0 Amperes

Applications

- Telecom equipment (POTS) applications such as modems, answering machines, telephones, fax machines, and security systems
- Network equipment, such as:
 - 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
 - ISDN "U" interface
 - Baystation T1/E1/J1, T3 (DS3) trunk cards

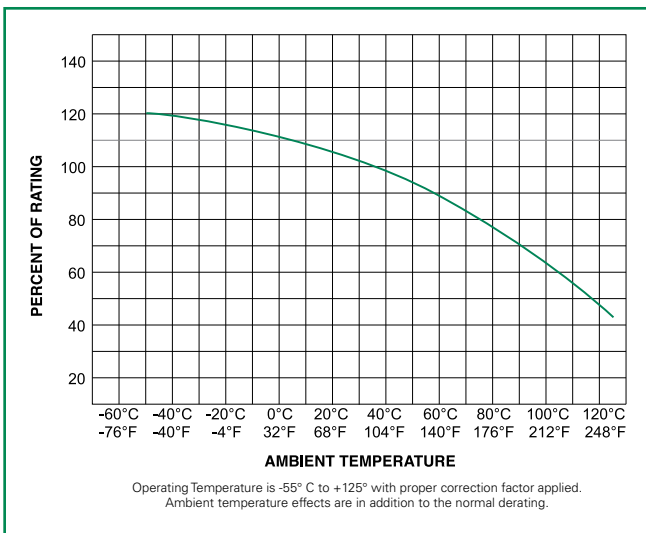
Electrical Specifications by Item

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
						
0.50	.500	600	60 amperes @600 VAC.	0.560	0.840 ¹	x
1.25	1.25	600		0.110	16.5 ¹	x
2.00	002.	600		0.050	17.5 ¹	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 Derating Curve



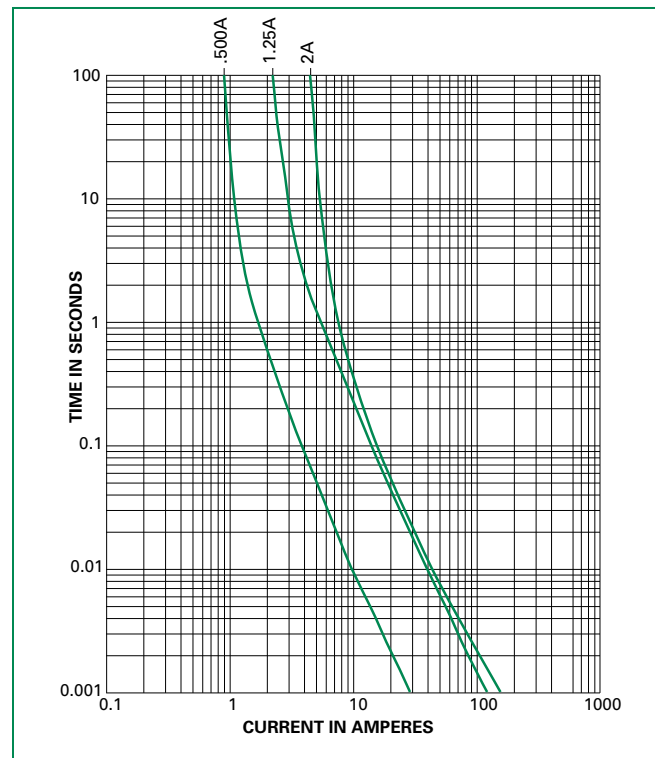
Note:

1. Derating depicted in this curve is in addition to the standard derating of 25% for continuous operation.

Maximum Temperature Rise

Telecom Nano ² Fuse	Opening Time
04611.25	</=82°C (180°F)
046002	</=50°C (122°F)

Average Time Current Curves



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.

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 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	.33	1	15 min.	removed	1.25, 2.0
2	100	.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 sec.	removed	1.25, 2.0
6	600	0.5	1	30 sec	removed	1.25, 2.0
7	440	2.2	5	2 sec.	removed	1.25, 2.0
8	600	3	1	1.1 sec.	removed	1.25, 2.0
9	1000	5	1	0.4 sec.	in place	1.25, 2.0

GR 1089 2nd level lightning surge telecom port

(Equipment under test shall not become a fire, fragmentation, 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 F 2.0 will not open thus providing operational compliance.

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

Test Circuite	Vrms	Short (A)	Duration	Fuse
1	120,277	25	15 min.	0.5, 1.25, 2.0
2	600	60	5 sec.	0.5, 1.25, 2.0
3	600	7	5 sec.	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).

UL60950 Requirements

UL 60950 (EN 60950, formerly UL 1950) Power Cross Test (L=Longitudinal, M=Metallic)

Test Number	Voltage (V)	Current (A)	Time	Fuse Choices
L1	600	40	1.5 sec.	0.5, 1.25, 2.0
L2	600	7	5 sec.	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 sec.	0.5, 1.25, 2.0
M2	600	7	5 sec.	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

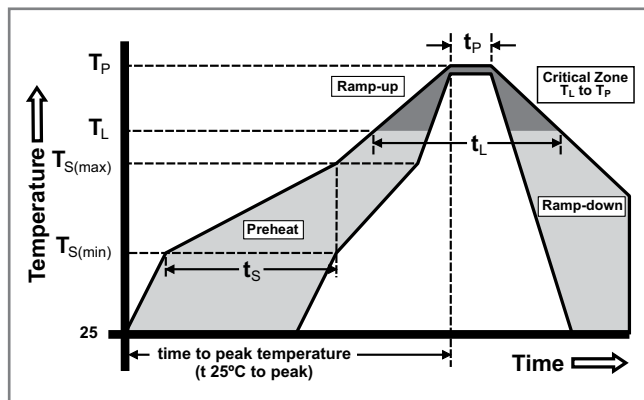
- 26 AWG line cord removes L1/M1 test requirement
 - L5 conducted only if product does not pass section 6.1.2
 - L2,M2,L3,M3,L4,M4 conducted if not in a fire enclosure
- Fuse must open before the wiring simulator fuse (MDL 2.0).

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

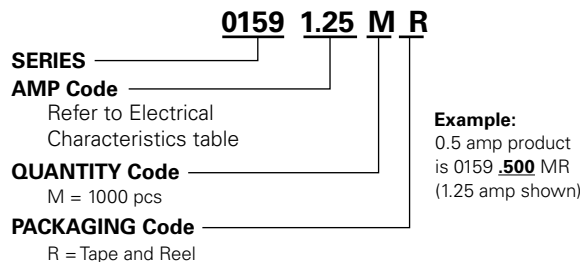
Test	Voltage (V)	Current (A)	Waveform	Repetitions	Fuse Choices
Impulse					
For handheld units	2500	62.5	10 x 700ms	+ 10 w/60 sec. rest	0.5, 1.25, 2.0
Non handheld	1500	37.5	10 x 700ms	+ 10 w/60 sec. rest	0.5, 1.25, 2.0
Steady-State					
For handheld units	1500		60Hz		0.5, 1.25, 2.0
Non handheld	1000		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 secs
Average ramp up rate (Liquidus Temp (T_L) to peak)		3°C/second max.
$T_{s(max)}$ to T_L - Ramp-up Rate		3°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



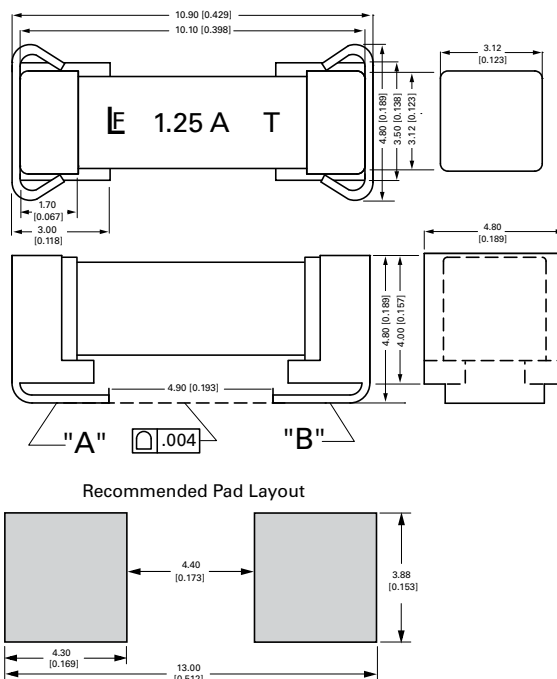
Part Numbering System



Product Characteristics

Materials	Fuse Body: Ceramic Fuse Caps/Terminals: Silver-plated brass Clip Base: Gold plated Clip Terminals: Nickel plated
Product Marking	Brand Logo, Current Rating, 'T'
Insulation Resistance (after opening)	MIL-STD-202, Method 302, Test condition A (10,000 ohms, minimum)
Operating Temperature	-55°C to 125°C with proper derating
Humidity Test	85°C/ 85% RH, 1000 Hours
Solderability	MIL-STD-202, Method 208/IPC EIA J-STD002A, Test Condition A)
Resistance to Solvents	MIL-STD-202, Method 215 (3 solvent types)
Thermal Shock	MIL-STD-202, Method 107G, Test Condition B3 95 cycles -65°C to +125°C)
Mechanical Shock	MIL-STD-202, Method 213, Test Condition I (100G's peak for 6 millisc.)
Vibration	MIL-STD-202, Method 201, (10-55 Hz)
Moisture Resistance	MIL-STD-202, Method 106, High Humidity (90-98% RH), Heat (65°C)
Salt Spray/ Atmosphere	MIL-STD-202F, Method 101, Test Condition B (48 hrs.)
Terminal Attachment	MIL-STD-202, Method 211, Test Condition A, 5 lbs applied to end caps

Dimensions



Packaging

Packaging Option	Packaging Specification	Quantity	Quantity & Packaging Code
24mm Tape and Reel	EIA RS-481-2 (IEC 286, part 3)	1000	MR