Littelfuse®

Expertise Applied | Answers Delivered

SOLAR
PRODUCTS
CATALOG


SOLAR-RATED

# SOLAR PRODUCTS

**1000 VDC Protection • Full-Range Protection • Remote Notification • Overvoltage Protection**

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# Technical Expertise and Manufacturing Excellence

With over 14 million devices installed in photovoltaic power systems, Littelfuse understands the global challenges of the solar market. Littelfuse offers numerous circuit-protection products that are uniquely suited to protect the equipment and systems subject to the harsh environments of photovoltaic installations. Items listed within this catalog, and even newer products and information available online, represent over 80 years of Littelfuse technical expertise and manufacturing excellence.

The high power research lab in Champaign, Illinois, USA, provides design and test capabilities for up to 1500VDC. Littelfuse design engineers and technicians, who participate in the global standards committees, understand the applications and environments of photovoltaic systems. Littelfuse products are manufactured in one of six facilities around the world, supported by a strong network of suppliers and a knowledgeable sales channel. This allows Littelfuse to provide the best products for photovoltaic applications - delivered where and when needed.

# Circuit-Protection Products for Photovoltaic Applications

FUSES
FUSEHOLDERS
PROTECTION RELAYS
VARISTORS
TVS DIODES
POWER DISTRIBUTION

As a global leader in circuit-protection, Littelfuse provides a wide selection of fuses, fuseholders, protection relays, TVS diodes and varistors to improve system uptime, sustainability and reliability of photovoltaic power systems. Littelfuse circuit-protection products meet the unique requirements of photovoltaic applications – where issues such as heat, efficiency, longevity and global standards impact the choices in selecting protection options.

In addition to a wide portfolio of circuit-protection products, Littelfuse offers decades of design experience to help address application challenges and achieve regulatory compliance.

Visit our website **www.littelfuse.com/solar** for additional technical specifications, reference materials and the latest updates on new products currently being developed.

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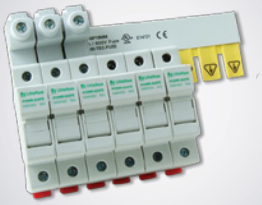

# SOLAR-RATED PRODUCTS

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**1. SPFJ 1000VDC Solar Fuse and Fuseblock—(Page 2 & 3)**
- 125A - 450A
- UL Class J size

**2. SPF 1000VDC Solar Fuse—(Page 4)**
- Up to 30A
- 10x38mm

**3. KLKD 600VDC Solar Fuse—(Page 5)**
- Up to 30A
- 10x38mm

**4. LPHV 1000VDC and LPSM 600VDC Fuseholders—(Page 6)**
- Accepts 10x38mm fuses up to 30A
- DIN-Rail Mountable

**5. Up-LINK™ 600VDC Remote Indication Fuseholder—(Page 7)**
- Accepts 10x38mm fuses up to 30A
- DIN-Rail Mountable

**6. SPFR 1000VDC Solar Fuse and Fuseblock—(Page 8 & 9)**
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- Up to 3,500VDC
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- Multiple-Wire Rated Terminals
- Connectors available in Cu and Al

# SPFJ SERIES 1000 VDC SOLAR FUSE


## Description

The SPFJ series is the smallest 1000VDC 125-450A photovoltaic fuse available in the market. The SPFJ series is manufactured in Class J case sizes that allows for both fuseholder and busbar mounting configuration. The SPFJ meets both UL and IEC requirements.

## Features/Benefits

- Meets both UL and IEC photovoltaic standards
- Small footprint reduces panel size
- Full-range PV time-current characteristic
- Flexibility of fuseholder or busbar mounting
- Higher amperage solar fuses in standard sizes
- UL listed Class J branch and feeder circuit rated

## Applications

- Inverters
- Re-combiner boxes

## Specifications

**Voltage Ratings:** 1000 VDC
**Interrupting Rating:** AC: 200 kAIC;
DC: 125 A-200 A: 20 kAIC
250 A-400 A: 10 kAIC
450 A: 20 kAIC
**Amperage:** 125, 160, 200, 250, 300, 350, 400, 450
**Approvals:** UL 248-8, Class J
UL 2579 Listed
C UL (Approval on Class J fuse–no PV standard)
VDE certifications to IEC 60269-6 in progress
**Material:** Body-Melamine
End Bells-Copper Alloy
**Environmental:** RoHS Compliant
**Country of Origin:** Mexico

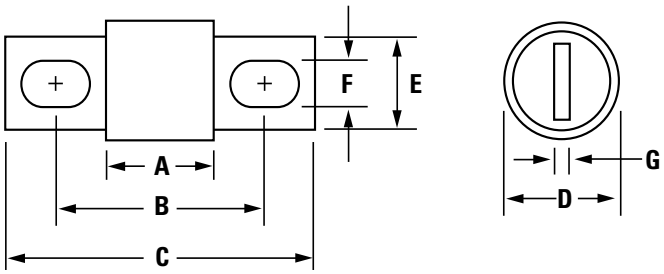
## Recommended Fuseholder

LFJ 1000VDC ..... .....pg. 3

## Ordering Information

| AMPERAGE | PART NUMBER | ORDERING NUMBER |
|---|---|---|
| 125 | SPFJ125 | SPFJ125.X |
| 160 | SPFJ160 | SPFJ160.X |
| 200 | SPFJ200 | SPFJ200.X |
| 250 | SPFJ250 | SPFJ250.X |
| 300 | SPFJ300 | SPFJ300.X |
| 350 | SPFJ350 | SPFJ350.X |
| 400 | SPFJ400 | SPFJ400.X |
| 450 | SPFJ450 | SPFJ450.X |

## Dimensions in mm (inches)




| AMPERAGE | DIMENSIONS IN INCHES (MM) | | | | | | |
|---|---|---|---|---|---|---|---|
| | A | B | C | D | E | F | G |
| 125-200 | 3 (76.2) | 4 11/32 (110.19) | 5-21/32 (144.02) | 1 1/2 (38.1) | 1 1/8 (28.6) | 9/32 (7.1) | 3/16 (4.8) |
| 225-400 | 3 3/8 (85.7) | 5 1/4 (133.35) | 7 1/8 (181.0) | 2 (50.8) | 1 5/8 (41.3) | 13/32 (10.3) | 1/4 (6.4) |
| 450 | 3 3/4 (95.3) | 5.98 (151.99) | 8 (203.2) | 2 1/2 (63.5) | 2 (50.8) | 17/32 (13.5) | 3/8 (9.5) |

# LF SERIES 1000 VDC SOLAR FUSEBLOCK

## Specifications

| | |
|---|---|
| **Voltage Ratings:** | 1000 VDC |
| **Ampere Ratings:** | 200, 400, 450 |
| **Flammability Rating:** | UL94 V-0 |
| **Termination Type:** | Box Lug |
| **Base Temp Rating:** | 130° C |
| **Approvals:** | UL Listed |
| **Environmental:** | RoHS Compliant |

## Description

The LFJ 1000VDC fuseblock is specifically designed for the Littelfuse SPFJ 1000VDC Solar Fuse. It meets UL electrical characteristic requirements and is available in multiple amperages.

## Features/Benefits

- Narrow width increases space savings
- Box Lug termination style accommodates a wide range of cable sizes
- Range of amperages to match all SPFJ fuse options

## Recommended Fuses

SPFJ.....pg. 2

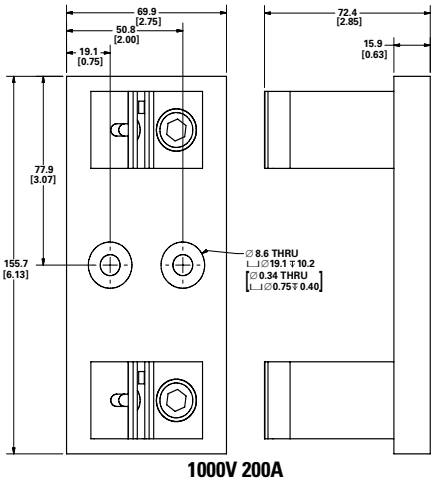
## Web Resources

Sample requests, downloadable CAD drawings and other technical information:
**http://www.littelfuse.com/fuseblocks**

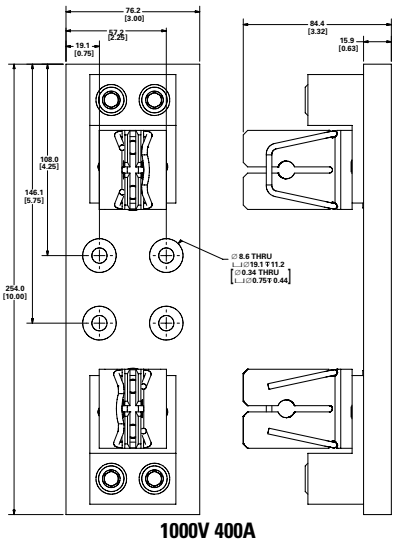
## Ordering Information

| AMPERAGE | ORDERING NUMBER | DC INTERUPT RATING | WIRE RANGE STANDARD (METRIC) | WIRE TYPE | | RECOMMENDED TORQUE |
|---|---|---|---|---|---|---|
| 200 | LFJ102001C | 20 kA | 250 kcmil - #6 (127mm² - 16mm²) | Cu/Al | Solid/Stranded | 31.1 N-m (275 in-lb) |
| 400 | LFJ104001C | 10 kA | 350 kcmil - 1/0 (177mm² - 55mm²) | Cu/Al | Solid/Stranded | 31.1 N-m (275 in-lb) |
| 450 | LFJ104501C | 20 kA | 500 kcmil - #4 (253mm² - 25mm²) | Cu/Al | Solid/Stranded | 42.4 N-m (375 in-lb) |

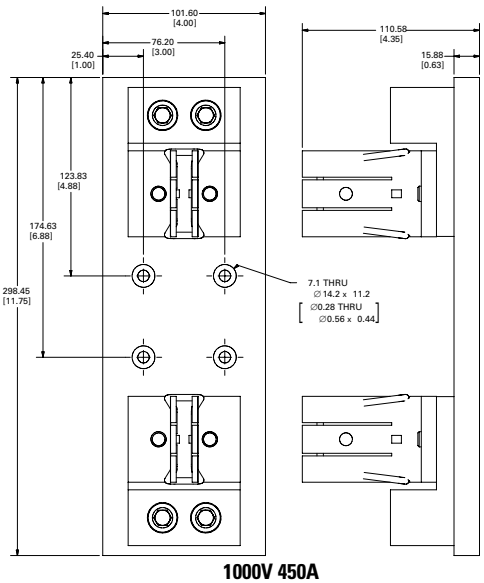
## Dimensions in mm (inches)




1000V 200A




1000V 400A




1000V 450A

# SPF SERIES 1000 VDC SOLAR FUSE

## Description

The SPF Solar Protection Fuse series has been specifically designed for the protection of photovoltaic (PV) systems. This family of Midget style fuses (10 x 38 mm) can safely protect PV modules and conductors from reverse-overcurrent conditions.

As PV systems have grown in size, so have the corresponding voltage requirements. This increase in system voltage has typically been intended to minimize power loss associated with long conductor runs. Standard circuit protection devices are not designed to completely protect photovoltaic panels. However, the SPF series is UL Listed to safely interrupt faulted circuits up to this demanding voltage level.

Littelfuse offers 13 ampere ratings to match specific requirements in a variety of applications.

## Features/Benefits

- Designed to both UL and IEC photovoltaic specifications
- UL 2579 Listed 1000 VDC maximum
- 1-30 A ratings available
- 20,000 A Interrupting Rating
- Both PCB mount and dead-front holder options available

## Applications

- Combiner boxes
- Inverters
- Battery charge controllers

## Recommended Fuseholders

LPHV ..... pg. 6

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/spf**

## Specifications

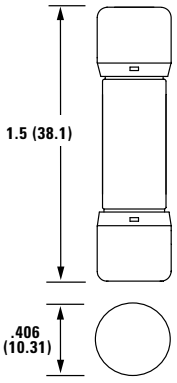
| | |
|---|---|
| **Voltage Rating:** | 1000 VDC |
| **Amperage Rating:** | 1, 2, 3, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 |
| **Max. Interrupting Rating:** | 20 kA; Time Constant less than 2ms |
| **Min. Interrupting Rating:** | 1.35x Current Rating |
| **Material:** | Body: Melamine<br>Caps: Copper Alloy |
| **Operating Temperature:** | See Rerating Curve |
| **Approvals:** | UL 2579 Listed (File No. E339112)<br>IEC 60269-6 |
| **Environmental:** | RoHS Compliant |
| **Country of Origin:** | Mexico |

## Ordering Information

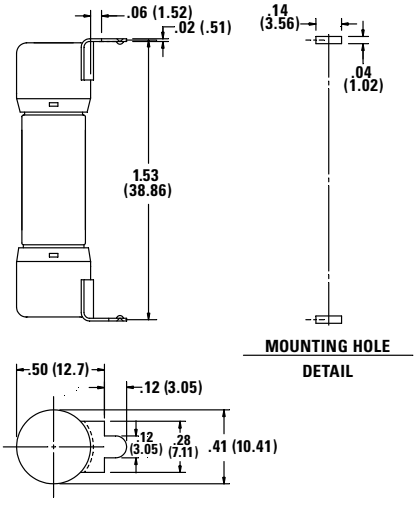
| AMPERAGE | PART NUMBER | ORDERING NUMBER |
|---|---|---|
| 2 | SPF002 | SPF002.T |
| 8 | SPF008 | SPF008.T |
| 30 | SPF030 | SPF030.T |
| 30 (WITH PCB TABS) | SPF030R | SPF030.HXR |

## Dimensions in inches—PCB Version (mm)

**Ferrule Version**




**PCB Version**



# KLKD SERIES 600 VDC / 600 VAC FUSES


## Description

The KLKD fuse series is fast-acting and has a high DC voltage rating. This family of Midget style fuses (10 x 38 mm) is used in solar combiner boxes and in circuits with DC fault currents up to 50,000 amperes. KLKD fuses are available in standard and board-mount configurations.

As PV systems have grown in size, so have the electrical characteristic requirements. The KLKD series has been designed to meet both the UL and IEC photovoltaic fuse standards.

Littelfuse offers a wide range of ampere ratings to match specific requirements in a variety of applications.

## Features/Benefits

- Designed to UL (3/10 A-30 A) and IEC (2 A-25 A) photovoltaic specifications
- 1/10-30 A ratings available
- 50 kA DC Voltage Interrupting Rating (3/10 A-30 A)
- Both standard and board-mount configurations available
- 1-5A meets UL1741 GFDI requirements

## Applications

- Combiner boxes
- Inverters

## Recommended Fuseholders

LPSM.....pg. 6

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/klkd**

## Specifications

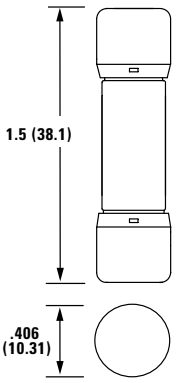
| | |
|---|---|
| **Voltage Rating:** | 600 VAC/VDC |
| **Amperage Rating:** | 1/10, 1/8, 2/10, 1/4, 3/10, 1/2, 3/4, 1, 1 1/2, 2, 2 1/2, 3, 3 1/2, 4, 5, 6, 7, 8, 9,10, 12, 15, 20, 25, 30 |
| **Interrupting Ratings:** | AC: 200 kA rms symmetrical<br>DC: 1/10 A-1/4 A: 10 kA<br>3/10 A-30 A: 50 kA |
| **Material:** | Body: Melamine<br>Caps: Copper Alloy |
| **Operating Temperature:** | See Rerating Curve |
| **Approvals:** | 2A - 30A UL 2579 Listed (File No. E339112)<br>(1/10 A - 1 1/2 A in process)<br>2A - 25A IEC 60269-6<br>UL 248-14 Listed (File No. E10480)<br>CSA Cerified (File No. LR29862)<br>CE Certified<br>QPL - 81706 |
| **Environmental:** | RoHS Compliant |
| **Country of Origin:** | Mexico |

## Ordering Examples

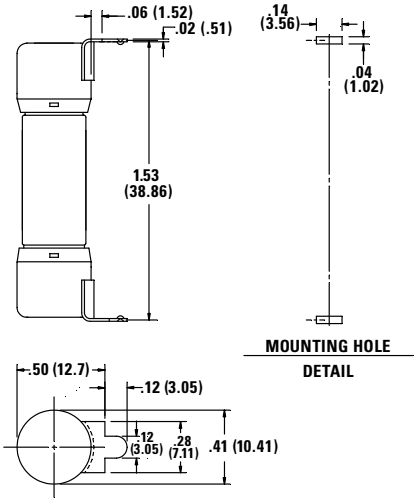
| AMPERAGE | PART NUMBER | ORDERING NUMBER |
|---|---|---|
| 1/8 | KLKD.125 | KLKD.125T |
| 1 | KLKD001 | KLKD001.T |
| 2 | KLKD002 | KLKD002.T |
| 8 | KLKD008 | KLKD008.T |
| 30 (WITH PCB TABS) | KLKD030R | KLKD030.HXR |

## Dimensions in inches(mm)

**Ferrule Version**




**PCB Version**



# LPHV/LPSM SERIES TOUCH-SAFE HOLDERS

## Specifications

| | |
|---|---|
| **Voltage Rating:** | LPHV: 1000 VAC/VDC<br>LPSM: 600 VAC/VDC |
| **Amperage Rating:** | 30 A |
| **SCCR Rating:** | 200,000 Aac; 20,000 Adc |
| **Wire Range:** | #6–#14 CU 75°C |
| **Terminal Type:** | Pressure Plate |
| **Terminal Torque:** | 17.7 in-lbs |
| **Approvals:** | 600 VDC UL Recognized (UL file# E14721)<br>CSA (File No. 7316)<br>LPHV: 1000 VDC Self-certified |
| **Environmental:** | RoHS Compliant |

## Description

The LPHV and LPSM 10 x 38 mm midget fuseholders have a touch-safe design to protect personnel from contact with live parts when installing and removing fuses. The compact fuseholder mounts quickly onto 35 mm DIN-rail, decreasing panel layout and assembly time. The LPHV is self-certified to stringent Littelfuse standards for applications up to 1000 VDC when used with the Littelfuse SPF 10 x 38 mm midget fuse series.

The LPHV and LPSM fuseholders are available in 1, 2, 3 and 4 pole configurations or can be connected together with an assembly kit. Applications include combiner boxes and inverters.

## Features/Benefits

- LPHV is self-certified to 1000 VDC
- LPSM and LPHV are UL Recognized to 600 VDC
- Mountable on 35-mm Din Rail
- Safe and easy installation and removal of fuses
- Indication available on LPSM

## Ordering Information

| LPHV (1000 VDC) | | |
|---|---|---|
| POLES | PART NUMBER (NON-ID) | ORDERINGNUMBER (NON-ID) |
| One | LPHV001 | LPHV001Z |
| Two | LPHV002 | LPHV002Z |
| Three | LPHV003 | LPHV003Z |
| Four | LPHV004 | LPHV004Z |

| LPSM (600 VDC) | | | | |
|---|---|---|---|---|
| POLES | PART # (NON-ID) | PART # (INDICATOR) | ORDERING # (NON-ID) | ORDERING # (INDICATOR) |
| One | LPSM001 | LPSM001ID | LPSM001Z | LPSM001ZXID |
| Two | LPSM002 | LPSM002ID | LPSM002Z | LPSM002ZXID |
| Three | LPSM003 | LPSM003ID | LPSM003Z | LPSM003ZXID |
| Four | LPSM004 | LPSM004ID | LPSM004Z | LPSM004ZXID |

**Multi-pole Assembly Kit:** CYHP001 (Kit allows up to 10 holders to be connected)

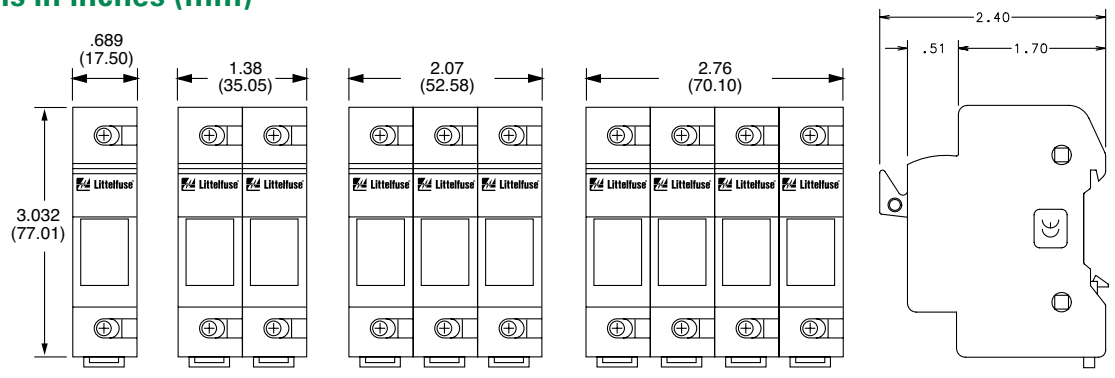
## Recommended Fuses

SPF ..... pg. 4
KLKD ..... pg. 5

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/lpsm**
**www.littelfuse.com/lphv**

## Dimensions in inches (mm)



# UP-LINK CLASS CC AND 10x38mm FUSEHOLDER

## Specifications

| | |
|---|---|
| **Voltage Rating:** | 100–600 VAC/VDC |
| **Amperage Rating:** | 30 A max |
| **SCCR:** | 200,000 Aac; 20,000 Adc |
| **Terminal Type:** | Pressure Plate (torque 17.7 in-lbs) |
| **Wire Range:** | #8–#14 CU Stranded; #10–#14 CU Solid |
| **Approvals:** | Class CC: UL Listed (File No. E14721)<br>Midget: UL Recognized<br>CSA Certified |
| **Environmental:** | RoHS Compliant |

## Remote Indicating Circuit

| | |
|---|---|
| **Output (open fuse):** | Open Collector |
| **Max Current Sink:** | 25 mA (28 VDC Max) |
| **Terminals:** | Push In |
| **Wire Range:** | #16–#24 CU Solid/Stranded |
| **Suggested Insulation Strip Length:** | 8 mm (0.31 in) |

## Description

The Littelfuse Up-LINK solid-state dead-front fuseholder series provides remote fuse status functionality without the need to incorporate proprietary network protocols. It features two separate indication modes, remote indication for immediate notification to maintenance personnel and local LED indication on the front of the holder.

All 1, 2 and 3 pole Up-LINK holders have the same footprint as their corresponding Littelfuse LPSM, LPHV, Midget and LPSC Class CC dead-front fuseholders, making design upgrades easy in existing applications.

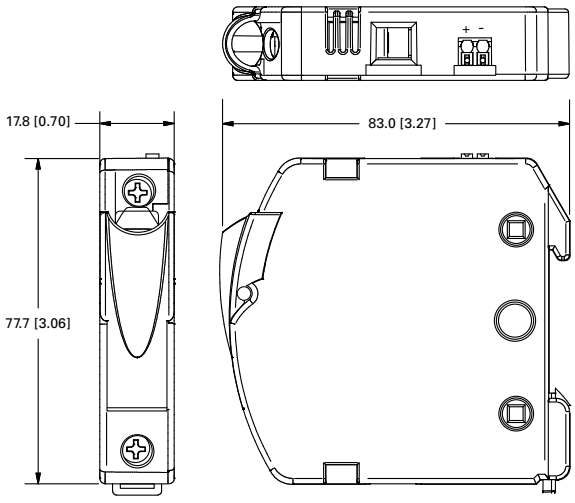
## Product Benefits

- Cost effective solution for remote blown-fuse indication
- Easily integrates with an existing PLC or system
- Utilizes reliable solid state circuitry
- Meets stringent IEC and UL Touch-Safe Standards to improve worker safety

## Ordering Information

| CLASS CC | | |
|---|---|---|
| POLES | PART NUMBER | ORDERING NUMBER |
| One | LINK001C | LINK001C.Z |
| Two | LINK002C | LINK002C.Z |
| Three | LINK003C | LINK003C.Z |
| **10x38 MM** | | |
| POLES | PART NUMBER | ORDERING NUMBER |
| One | LINK001M | LINK001M.Z |
| Two | LINK002M | LINK002M.Z |
| Three | LINK003M | LINK003M.Z |

## Dimensions in mm [inches]




## Accesories

Quick-Link I/O Connectors

## Description

Littelfuse Quick-LINK connectors allow for Up-LINK daisy-chaining. They reduce the number of PLC I/O ports that are required and save installation time and materials. With four different configurations, any number of Up-LINK fuseholders can quickly be connected together.

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/uplink**

FAQ document for integration with UP-LINK Fuseholder:
**www.littelfuse.com/quick-link**

# SPFR SERIES 1000 VDC SOLAR FUSE

## Specifications

| | |
|---|---|
| **Voltage Rating:** | 1000 VDC |
| **Amperage Rating:** | 250, 300, 350 and 400 A |
| **Interrupting Rating:** | 10,000 A; Time Constant less than 1ms |
| **Fuse Type:** | Fast-acting |
| **Approvals:** | UL Recognized 1000 VDC UL 248 (UL File No. 71611)<br>CSA Certified (File No. 29862) |

## Ordering Information

| AMPERAGE | PART NUMBER | ORDERING NUMBER |
|---|---|---|
| 250 | SPFR 250 | SPFR250.X |
| 300 | SPFR 300 | SPFR300.X |
| 350 | SPFR 350 | SPFR350.X |
| 400 | SPFR 400 | SPFR400.X |

## Description

The SPFR series was designed to meet the growing needs of the solar industry with higher amperage and voltage requirements. It was developed specifically for solar applications, ranging from 250 A to 400 A.

## Applications

- Solar Inverters
- High-amperage combiner boxes

## Features/Benefits

- DC Voltage rating meets European system requirements and North American utility scale requirements
- Multiple amperage ratings
- UL Class H Dimensions
- Full Range Protection

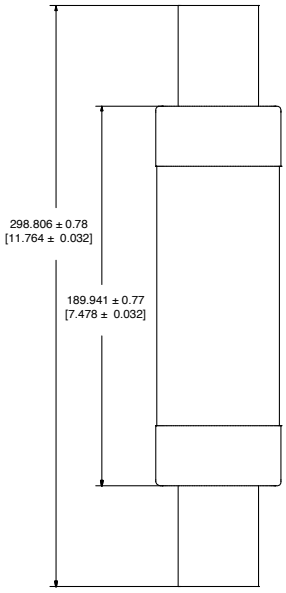
## Recommended Fuseholders

SPFRHV..... pg. 9

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/spfr**

## Dimensions in mm [inches]



# SPFRHV SERIES 1000 VDC SOLAR FUSEBLOCK

## Specifications

**Voltage Rating:** 1000 VDC
**Amperage Rating:** 250 - 400 A
**Approvals:** UL Recognized 1000 VDC UL 4248 (File No. E14721)
CSA (File No. 29862)
**Environmental:** RoHS Compliant

## Ordering Information

| PART/ORDERING NUMBER | AMPERAGE |
|---|---|
| SPFRHV4001ST | 250 – 400 |

*Note: SPFRHV4001ST fits SPFR 250–400 A fuses.*

## Recommended Fuses

SPFR..... pg. 8

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/spfrhv**

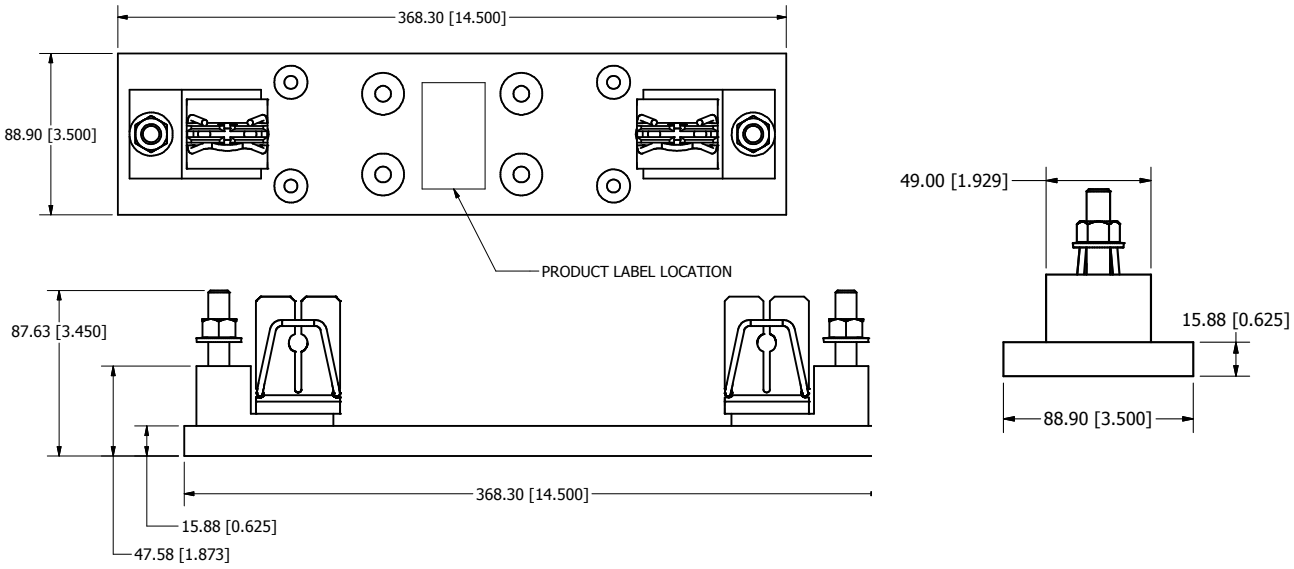
## Description

The Littelfuse SPFRHV fuseblock is designed to house Littelfuse high amperage (250-400 A) SPFR fuses.

## Features/Benefits

- Houses 250 A, 300 A, 350 A, and 400 A fuses offering protection up to 1000 VDC
- Hard plastic body is durable and compact

## Dimensions in mm (inches)



# IDSR AND LDC 600 VDC FUSES

## IDSR Series Class RK5 Indicator® Fuse


### Specifications

**Voltage Ratings:** 600 VAC/VDC
**Amperage Rating:** 1/10 – 600 A
**Interrupting Ratings:** AC: 200,000 A rms symmetrical
300,000 A rms symmetrical
(Littelfuse self-certified)
DC: 20,000 A
**Approvals:** Standard 248–12, Class RK5
UL Listed (File No: E81895)
CSA Certified (File No: LR29862)

| AMPERAGE RATING | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1/10 | 6/10 | 1 8/10 | 4 | 8 | 30 | 80 | 225 |
| 1/8 | 8/10 | 2 | 4 1/2 | 9 | 35 | 90 | 250 |
| 15/100 | 1 | 2 1/4 | 5 | 10 | 40 | 100 | 300 |
| 2/10 | 1 1/8 | 2 1/2 | 5 6/10 | 12 | 45 | 110 | 350 |
| 1/4 | 1 1/4 | 2 8/10 | 6 | 15 | 50 | 125 | 400 |
| 3/10 | 1 4/10 | 3 | 6 1/4 | 17 1/2 | 60 | 150 | 450 |
| 4/10 | 1 1/2 | 3 2/10 | 7 | 20 | 70 | 175 | 500 |
| 1/2 | 1 6/10 | 3 1/2 | 7 1/2 | 25 | 75 | 200 | 600 |

*Note: All fuses rated 1 A and above are Indicator® fuses.*

### Description

The design of the IDSR features a 600 Vac/dc rating, making it ideal for DC applications such as solar photovoltaic systems.

### Recommended Fuseholder

LFR .....pg. 11

### Ordering Example

| AMPERAGE | PART NUMBER | ORDERING NUMBER |
|---|---|---|
| 30 | IDSR030 | IDSR030.T |

### Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/idsr**

## LDC Series Class L


### Specifications

**Voltage Ratings:** 600 VAC/VDC
**Amperage Rating:** 150–2000 A
**Interrupting Ratings:** AC: 200,000 A rms symmetrical
DC: 50,000 A
**Approvals:** Standard 248–10, Class L
UL Listed 601–2000 A (File No: E81895)
UL Recognized 150–600 A (File No: E71611)
CSA Certified 150–2000 A (File No: LR29862)

| AMPERAGE RATING | | | | |
|---|---|---|---|---|
| 150 | 450 | 750 | 1300 | 1900 |
| 200 | 500 | 800 | 1350 | 2000 |
| 250 | 600 | 900 | 1400 | |
| 300 | 601 | 1000 | 1500 | |
| 350 | 650 | 1100 | 1600 | |
| 400 | 700 | 1200 | 1800 | |

### Description

The 600 Vac/dc rating of the LDC series can be used on either the AC or DC side of a photovoltaic system.

### Ordering Example

| AMPERAGE | PART NUMBER | ORDERING NUMBER |
|---|---|---|
| 150 | LDC150 | 0LDC150.X |

### Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/ldc**

# CLASS R FUSEBLOCKS


## Features/Benefits

- Indication offered up to 100A versions
- One hand release from DIN Rail (snap-to-release) for all non-knife blade style fuses.
- Universal mounting holes for easy replacement.
- Clip designs maximize electrical contact and minimize heat rise.
- Standard reinforcing clips on all fuseblocks.

## Specifications

**Voltage Rating:** 600 V
**Ampere Rating:** 0–600 A
**Approvals:** UL Listed (File No. E14721)
CSA Certified (File No. LR73091)
**Environmental:** RoHS Compliant

## Recommended Fuses

IDSR.....pg. 10

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/lfr**

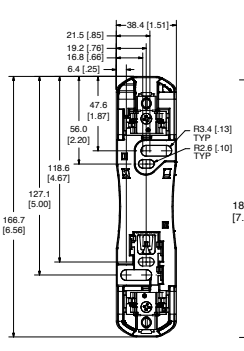
## Ordering Information

| AMP RATING | POLES | PART/ORDERING NUMBER | | | | TORQUE | TERMINAL | WIRE RANGE | WIRE TYPE | | BASE TEMP RATING | SNAP TO RELEASE | INDICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BASE ORDERING NUMBER | SUFFIX | | | | | | | | | | |
| | | | BOX LUG | PRESSURE PLATE | SCREW | | | | | | | | |
| 30 | 1 | LFR600301 | CID | PID | SID | 2.8 N-m (25 in-lbs) | C | 6-14 AWG | CU Only | Solid/ Stranded | 130°C | • | • |
| | 2 | LFR600302 | CID | PID | SID | | P | 10-14 AWG | | | | | |
| | 3 | LFR600303 | CID | PID | SID | | S | 10-22 AWG | | | | | |
| 60 | 1 | LFR600601 | CID | — | — | 5.6 N-m (50 in-lbs) | 2-4 AWG | | CU-AL | Solid/ Stranded | 130°C | • | • |
| | 2 | LFR600602 | CID | — | — | | | | | | | | |
| | 3 | LFR600603 | CID | — | — | 2.8 N-m (25 in-lbs) | 6-14 AWG | | | | | | |
| 100 | 1 | LFR601001 | CID | — | — | 13.6 N-m (120 in-lbs) | 2/0-6 AWG | | CU-AL | Solid/ Stranded | 130°C | — | • |
| | 3 | LFR601003 | CID | — | — | 4.5 N-m (40 in-lbs) | 8 AWG | | | | | | |
| | | | | — | — | 4.0 N-m (35 in-lbs) | 10-14 AWG | | | | | | |
| 200 | 1 | LFR602001 | C | — | — | 31.1 N-m (275 in-lbs) | 250 kcmil-6 | | CU-AL | Solid/ Stranded | 130°C | — | — |
| | 3 | LFR602003 | C | — | — | | | | | | | | |
| 400 | 1 | LFR604001 | C | — | — | 31.1 N-m (275 in-lbs) | (2) 350 kcmil-1/0 | | CU-AL | Solid/ Stranded | 130°C | — | — |
| | 3 | LFR604003 | C | — | — | | | | | | | | |
| 600 | 1 | LFR606001 | C | — | — | 42.4 N-m (375 in-lbs) | (2) 500 kcmil-4 | | CU-AL | Solid/ Stranded | 130°C | — | — |
| | 3 | LFR606003 | C | — | — | | | | | | | | |

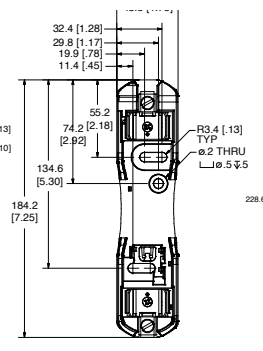
*Note: Reinforcing springs standard on all Class R fuseblocks.*
** 30 A Fuseblocks are also available with screw or pressure plate terminals. To order, replace suffix CR with SR for screw or PR for pressure plate.*

## Dimensions inches [mm]

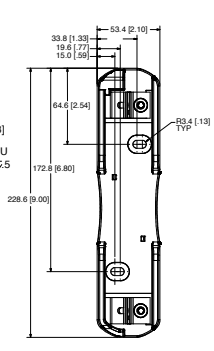
**600 V 30 A**



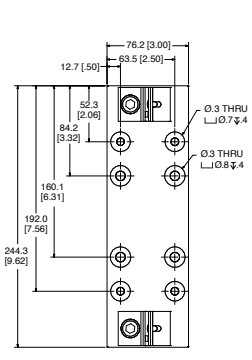

**600 V 60 A**



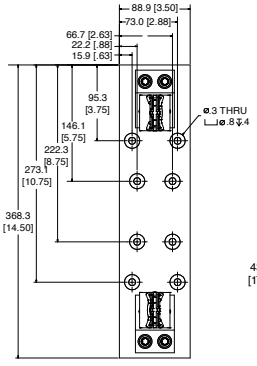

**600 V 100 A**



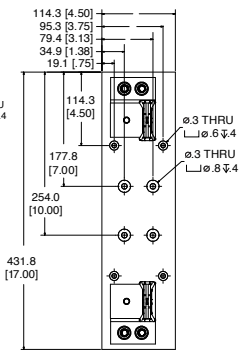

**600 V 200 A**



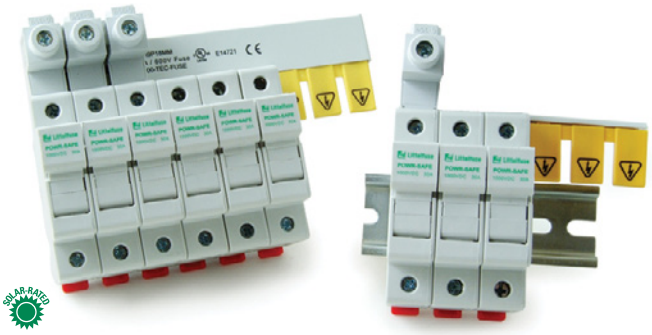

**600 V 400 A**




**600 V 600 A**



# POWR-BAR™ SERIES BUS BAR SYSTEM



## Description

Safe distribution of power to multiple fuseholders in a compact design is a key objective for effective panel design. The Littelfuse UL508 bus bar system eliminates most wire terminations in a time-saving package. A power distribution block and associated conductors are no longer needed to combine multiple POWR-SAFE fuseholders. It can accommodate LPSM, LPSC and LPHV holders.

## Features/Benefits

- Decreases wiring terminations
- Small footprint reduces space requirements
- Reduces assembly time
- Prevents accidental finger exposure
- Quick and safe method of changing fuseholder configurations
- Allows for future expansion
- Improves troubleshooting
- Eliminates low amperage power distribution block
- Can be cut down to optimal size
- RoHS compliant

## Specifications

**Max Current:**

| CROSS SECTION (mm²) | 18 mm² | 25 mm² |
|---|---|---|
| End Fed | 80 A | 100 A |
| Center Fed | 160 A | 200 A |

**Max Operating Voltage:** 600 VAC/VDC
**Conductor:** Copper
**Pitch:** 17.8 mm
**Approvals:** UL Listed 508 (File No: E328654)
**Environmental:** RoHS Compliant

## Web Resources

Dimensions, CAD drawings and other technical information:
**www.littelfuse.com/busbar**

## Customization

This product is simple to integrate into AC and DC applications. It offers multiple pole configurations and amperage ratings to match the design requirements. Instructions are included for bus bar cutting for further customization. Individual power feed allows termination at any point along the bus bar.

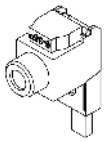
## Ordering Information

| 1-PHASE AC, 18 mm² | | DC, 25 mm² | | POLES | LENGTH* |
|---|---|---|---|---|---|
| PART NUMBER | ORDERING NUMBER | PART NUMBER | ORDERING NUMBER | | |
| 1PH3P18MM | 1PH3P18MM.V | 1PH3P25MM | 1PH3P25MM.V | 3 | 50 |
| 1PH6P18MM | 1PH6P18MM.V | 1PH6P25MM | 1PH6P25MM.V | 6 | 104 |
| 1PH9P18MM | 1PH9P18MM.V | 1PH9P25MM | 1PH9P25MM.V | 9 | 155 |
| 1PH12P18MM | 1PH12P18MM.V | 1PH12P25MM | 1PH12P25MM.V | 12 | 208 |
| 1PH15P18MM | 1PH15P18MM.V | 1PH15P25MM | 1PH15P25MM.V | 15 | 270 |
| 1PH57P18MM | 1PH57P18MM.V | 1PH57P25MM | 1PH57P25MM.V | 57 | 1009 |

*Note: Contact factory for 3-phase part number information.*
** Length is shown in millimeters.*

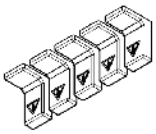
## Required Accessory

**Power Feed Lug**
Part# BB18
Ampere rating: 115 A
Wire: #10–1/0 AWG copper



## Optional Accessories

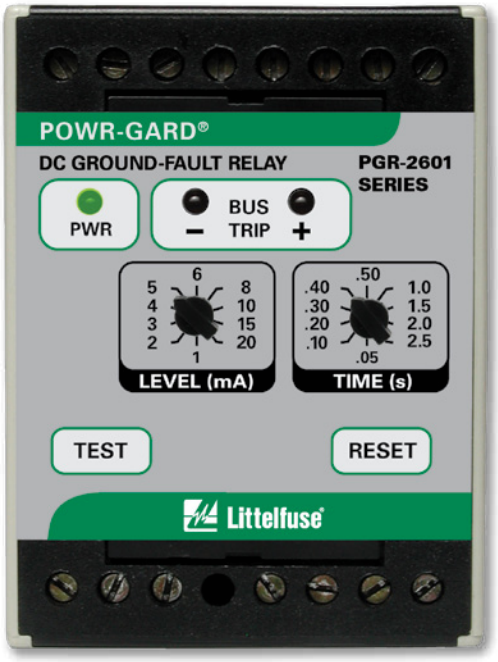
**Pole Protective Covers**
Part# CTPT5
5 covers/bag

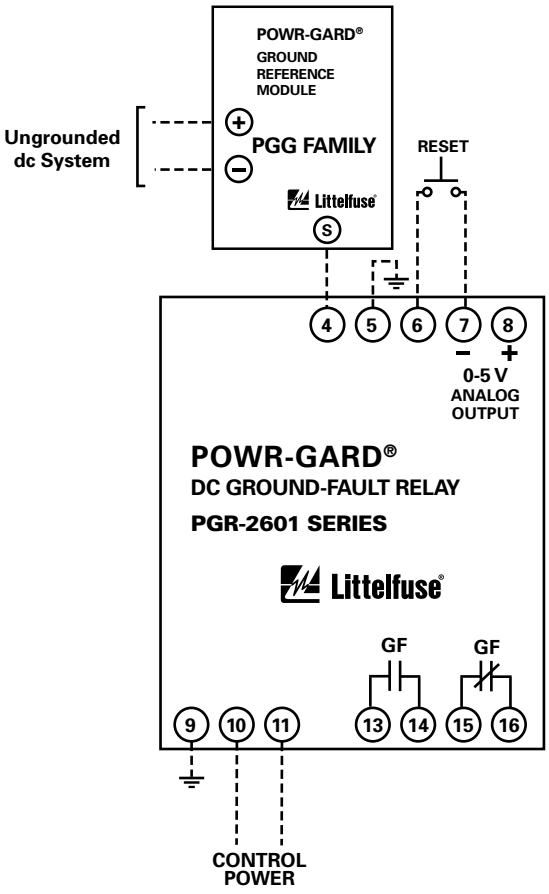


**Endcaps**
Part# EDCP42 for 1-phase
50 piece bag

*Note: End caps are not needed for the DC configurations from the factory or if the copper bus is trimmed per the supplied instructions. Power feed lugs and protective covers should be ordered separately.*

# PGR-2601 SERIES DC GROUND-FAULT RELAY




## Description

The PGR-2601 is used to detect harmful ground faults in ungrounded photovoltaic systems, and limit fault current to 25 mA or less. This relay is typically installed in the controls enclosure of the central inverter. In addition, a PGG series Ground-Reference Module is mounted between the positive and negative DC bus inside of a central inverter.

## Applications

The PGR-2601 is used on ungrounded dc systems ranging from industrial 24-VDC control circuits to 1000-VDC photovoltaic systems.

## Features/Benefits

Sensitive 1-to 20-mA trip setting provides a wide range of low-level protection and 50-ms to 2.5-s trip delay allows coordinated protection.

- Form A and Form B ground-fault trip contacts
- Non-volatile trip memory retains trip state
- Analog output for external metering
- Selectable fail-safe or non-fail-safe operating modes
- No calibration required

## Specifications

| | |
|---|---|
| **IEEE Device Numbers:** | 76 G |
| **Input Voltage:** | See Ordering Information |
| **Dimensions:** | **H** 75 mm (3.0"); **W** 55 mm (2.2"); **D** 115 mm (4.5") |
| **Trip Level Settings:** | 1– 20 m A |
| **Trip Time Settings:** | 0.05 s–2.5 s |
| **Alarm Relay Contacts:** | Isolated N.O. and N.C. |
| **Contact Operating Mode:** | Selectable fail-safe or non-fail-safe |
| **Test Button:** | Standard |
| **Reset Button:** | Standard |
| **Communications:** | Analog Output |
| **Conformally Coated:** | Optional |
| **Warranty:** | 5 Year |
| **Mounting:** | DIN, Surface, Panel (optional) |

## Ordering Information

| PART/ORDERING NUMBER | CONTROL POWER |
|---|---|
| PGR-2601-OD | 9–36 VDC |
| PGR-2601-OT | 32–70 VDC |
| PGR-2601-OU | 75–275 VAC/VDC 50/60 Hz |

*Note: The PGG-1000 Ground Reference Module is a required accessory that connects the PGR-2601 to an ungrounded 1000 V bus.*

## Web Resources

Downloadable manuals and other technical information:
**www.littelfuse.com/pgr-2601**

# TVS (TRANSIENT VOLTAGE SUPPRESSION) DIODES

RoHS HF

## What Are Voltage Transients?

Voltage transients are unwanted short duration surges of electrical energy. They may result from the sudden release of previously stored energy, and can come from internal and external sources. If the voltage magnitude of the transient is large enough, circuit component damage or malfunction of the circuit may result.

Transients can occur either repeatedly or as random impulses. Repeatable transients are frequently caused by the operation of other system components, such as motors, generators or the switching of reactive circuit components. Random transients, are often caused by lightning, electrostatic discharge (ESD), and other outdoor environment events.

| SOURCE | VOLTAGE | CURRENT | RISE-TIME | DURATION |
|---|---|---|---|---|
| Lightning | 25 kV | 20 kA | 10 µs | 50 ms |
| Load Switching | 600 V | 500 A | 50 µs | 500 ms |
| Electromagnetic Pulse (EMP) | 1 kV | 300 kV | 20 ns | 1 ms |
| Electrostatic Discharge (ESD) | 15 kV | 30 A | 1–5 ns | 100 ns |

Integration of Transient Voltage Suppression (TVS) components within solar system designs help to prevent the damaging effects of transient events, and assure compliance to safety and reliability standards.

## TVS and Solar Inverter Protection

A PV solar system component particularly vulnerable to transient voltage effects is the power inverter. Its range of functions and direct connection to other system components enables vulnerability of transient voltage transfer. For example:

- Lightning-induced transient events may pass through the solar array and outdoor cabling to the inverter (and other sensitive electronic equipment in the path).
- Conversely, transients originating from the outside utility power grid may pass through the main circuit panel and cabling to the inverter.
- Startup of motorized equipment (such as power tools, tracking systems, fan motors) enable vulnerabilities produced by repeat load changes.
- Electrostatic discharge events generated internal and external to the system may pass between the inverter and sensitive electronic control equipment.

For these reasons, it is important to build surge withstand ability within the inverter as well at locations before damaging transients may reach sensitive equipment.

## TRANSIENT VOLTAGE SUPPRESSION (TVS) DIODES

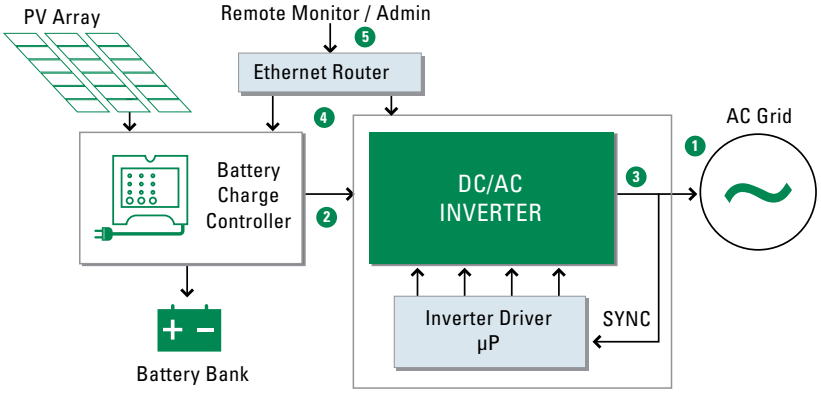
TVS Diodes are used to protect semiconductor components from high-voltage transients. Their p-n junctions have a larger cross-sectional area than those of a normal diode, allowing them to conduct large currents to ground without sustaining damage. Littelfuse supplies TVS Diodes with peak power ratings from 400 W to 15 kW, and reverse standoff voltages from 5 V to 512 V.

**www.littelfuse.com/tvsdiode**

| SERIES NAME[1] | | PACKAGE TYPE | REVERSE STANDOFF VOLTAGE ($V_R$) | PEAK PULSE POWER RANGE[2] ($P_{PP}$) | OPERATING TEMPERATURE | HF | ROHS |
|---|---|---|---|---|---|---|---|
| **SURFACE MOUNT - STANDARD APPLICATIONS (400-5000W):** | | | | | | | |
| SMAJ |  | DO-214AC | 5.0-440 | 400 W | -85° to +302° F (-65° to +150° C) | • | • |
| P4SMA | | | 5.8-495 | 400 W | | • | • |
| SACB | | DO-214AA | 5.0-50 | 500 W | | • | • |
| SMBJ | | | 5.0-440 | 600 W | | • | • |
| P6SMB | | | 5.8-495 | 600 W | | • | • |
| 1KSMB | | | 5.8-136 | 1000 W | | • | • |
| SMCJ | | DO-214AB | 5.0-440 | 1500 W | | • | • |
| 1.5SMC | | | 5.8-495 | 1500 W | | • | • |
| SMDJ | | | 5.0-170 | 3000 W | | • | • |
| 5.0SMDJ | | | 12-170 (uni-directional) 12-45 (bi-directional) | 5000 W | | • | • |
| **AXIAL LEADED - STANDARD APPLICATIONS (400-5000W):** | | | | | | | |
| P4KE |  | DO-41 | 5.8-495 | 400 W | -85° to +302° F (-55° to +175° C) | • | • |
| SA | | DO-15 | 5.0-180 | 500 W | | • | • |
| SAC | | DO-15 | 5.0-50 | 500 W | | • | • |
| P6KE | | DO-15 | 5.8-512 | 600 W | | • | • |
| 1.5KE | | DO-201 | 5.8-495 | 1500 W | | • | • |
| LCE | | DO-201 | 6.5-90 | 1500 W | | • | • |
| 3KP | | P600 | 5.0-220 | 3000 W | | • | • |
| 5KP | | P600 | 5.0-250 | 5000 W | | • | • |
| **AXIAL LEADED - HIGH POWER:** | | | | | | | |
| 15KPA |  | P600 | 17-280 | 15000W | -85° to +302° F (-55° to +175° C) | • | • |
| 20KPA | | P600 | 20.0-300 | 20000W | | • | • |
| 30KPA | | P600 | 28.0-288 | 30000W | | • | • |
| AK6 | | Radial Lead | 58-430 | NA | -67° to +347° F (-55° to +150° C) | • | • |
| AK10 | | Radial Lead | 58-430 | NA | | • | • |

(1) Detailed information about most product series listed here can be found on our web site by entering www.littelfuse.com/series/(Series Name).html
(2) For Maximum Clamping Voltage ($V_C$) please refer to electrical characteristics table within each series data sheet

# VARISTORS




**Example: Grid-Connected Solar Inverter Configuration**

## Protection Application and Needs:

**Description:**
Microprocessor-controlled inverter with the AC output synchronized to the AC grid prevents over-discharging of the battery.

**Threats:**
- Power surges on AC or DC Input and AC Output
- ESD threats through the communication network

**Solutions:**
- **AC Input:** Fuse / MOV
- **DC Input:** DC-rated fuse / Unidirectional TVS.
- **AC Output:** Fuse / TVS
- **Outside Ethernet:** SEP series SIDACtor® device
- **Local Ethernet:** MLV / SPA

**Companion Solution:**
- AC output may use MOV in less exposed environments

## VARISTOR PRODUCTS

Varistors possess characteristics that divert transient currents away from sensitive components. Littelfuse offers a range of options including protection of higher energy applications.

**www.littelfuse.com/varistor**

| SERIES NAME[1] | | OPERATING AC VOLTAGE RANGE | OPERATING DC VOLTAGE RANGE | PEAK CURRENT RANGE[2] (A) | PEAK ENERGY RANGE (J) | OPERATING TEMP. RANGE | MOUNT/ FORM FACTOR | DISC SIZE | AGENCY APPROVALS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | UL | CSA | VDE | CECC | ROHS |
| **RADIAL LEADED MOV:** | | | | | | | | | | | | | |
| TMOV®/ iTMOV® |  | 115-750 | | 6000-10000 | 35-480 | -55 to +85°C | Radial Leaded | 14, 20, 34mm | • | • | • | • | • |
| TMOV® 25S |  | 115-750 | | 20000 | 170-670 | | | 25mm | | | | | • |
| UltraMOV™ |  | 130-625 | 170-825 | 1750-10000 | 12.5-720 | | | 7, 10, 14 20, 25mm | • | • | • | • | • |
| UltraMOV™ 25S |  | 115-750 | 150-970 | 22000 | 230-890 | | | 25mm | • | • | • | • | • |
| C-III |  | 130-660 | | 3500-9000 | 40-530 | | | 10, 14, 20mm | • | • | • | | • |
| LA | | 130-1000 | 175-1200 | 1200-6500 | 11-360 | | | 7, 10, 14 20mm | • | • | • | • | • |
| ZA | | 4-460 | 5.5-615 | 50-6500 | 0.1-52 | | | 5, 7, 10, 14, 20mm | • | | • | • | • |
| **INDUSTRIAL HIGH ENERGY TERMINAL MOV:** | | | | | | | | | | | | | |
| BA/BB |  | 130-2800 | 175-3500 | 50000 70000 | 450-10000 | -55 to +85°C | Screw / Clip Terminals | 60mm | • | | | | • |
| DA/DB |  | 130-750 | 175-970 | 40000 | 270-1050 | | | 40mm | • | | | | • |
| HA |  | 130-750 | 175-970 | 25000 40000 | 200-1050 | | | 32, 40mm | • | • | | | • |
| TMOV34S® |  | 115-750 | | 40000 | 235-1050 | | Industrial Packaged Radial Leads | 34mm | • | | | | • |
| HB34, HG34, HF34 |  | 130-750 | 175-970 | 40000 | 270-1050 | | | 34mm | • | • | | | • |
| DHB34 |  | 250-2800 | 330-3500 | 20000 70000 | 330-10000 | | | 34mm | | | | | • |
| CA |  | 250-2800 | 330-3500 | 20000 70000 | 330-10000 | | Bare Disc | 60mm | | | | | • |

(1) Detailed information about most product series listed here can be found on www.littelfuse.com/series/(Series Name).html
(2) Not an applicable parameter for Crowbar devices

# POWR-BLOKS™

## Description

POWR-BLOKS power distribution blocks offer a safe, convenient way of collecting or distributing power. The LX2xxx-xDIN series offers integral DIN-Rail mount and an optional hinged safety cover.

## Applications

- solar string
- array combiner boxes
- inverters.

## Connectors

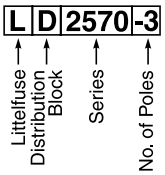
The POWR-BLOKS use box lug connectors that are designed for a single or solid class B or C stranded conductor.

## Specifications

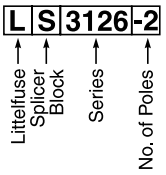
| | |
|---|---|
| **Voltage Rating:** | 600 V |
| **Amperage Rating:** | Based on NEC® Table 310.16, using 75°C copper wire |
| **Material:** | Phenolic rated at 150°C and Thermoplastic rated at 125°C |
| **Connector:** | Standard: Highly conductive aluminum, tin plated<br>Copper: Highly conductive copper, tin plated |
| **Flammability Rating:** | 94 VO |
| **Approvals:** | UL Recognized (File No. E171395)<br>CSA Certified (File No. LR700111) |
| **Environmental:** | RoHS Compliant |

## Ordering Example

**Distribution Block Example Part No.**




**Splicer Block Example Part No.**



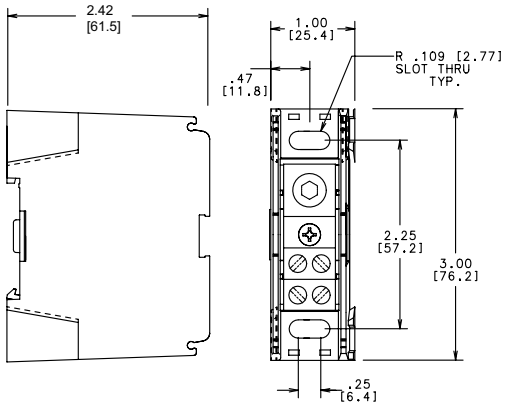

*Note: Aluminum blocks can use copper or aluminum wire; copper blocks can only use copper wire. More configuration options are available online.*

## Web Resources

Downloadable CAD drawings and other technical information:
**www.littelfuse.com/ld**
**www.littelfuse.com/ls**

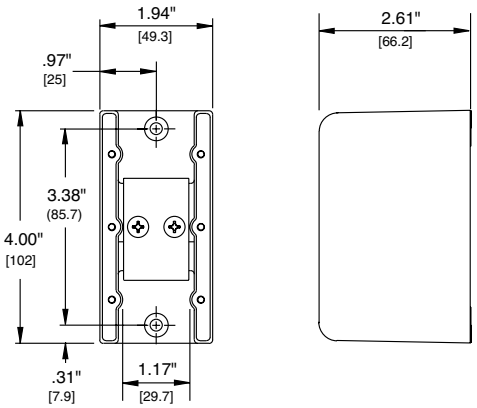
## Dimensions in inches [mm]

**LX2XXX-XDIN**




1 POLE

**LX3XXX**

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## Corporate Headquarters

**Littelfuse, Inc.**
8755 West Higgins Road, Suite 500
Chicago, IL 60631 USA
1 773 628 1000
www.littelfuse.com

## Sales and Technical Support

- **United States, Canada and Mexico**
  Phone: 1 800 TEC FUSE (1 800 832 3873)
  (1 217 531 3120)
  Fax: 1 800 522 7697
- **Brazil**
  Phone: +55 11 4427 6261
  Fax: +55 11 4468 1356
- **Europe**
  Electrical and Electronic Products
  Phone: +49 4244 819149
  Fax: +49 421 20 31080

  Automotive Products
  Phone: +49 4244 819142
  Fax: +49 4244 819139
- **Hong Kong, China**
  Phone: +852 2810 5099
  Fax: +852 2810 5500
- **Beijing, China**
  Phone: +86 10 84549408
  Fax: +86 10 84549405
- **Shanghai, China**
  Phone: +86 21 2327 6000
  Fax: +86 21 5383 7476
- **Shenzhen, China**
  Phone: +86 755 8207 0760
  Fax: +86 755 8207 0759
- **Singapore**
  Phone: +65 6885 9188
  Fax: +65 6885 9196
- **Japan**
  Phone: +81 45 478 1088
  Fax: +81 45 478 1089
- **South Korea**
  Phone: +82 2 6000 8600
  Fax: +82 2 6000 8655
- **Taiwan**
  Phone: +886 2 8751 1234
  Fax: +886 2 8751 1177

Littelfuse's broad portfolio of circuit-protection products and services enhance the productivity and safety of electrical systems and end-user applications. Along with solar-rated products, Littelfuse offers current-limiting fuses to decrease Arc-Flash exposure, protection relays to improve productivity and safeguard equipment, and overvoltage suppression products to protect against transients.

- **Fuses and Fuseholders**
- **Protection Relays**
- **Solar-rated Products**
- **Varistors**
- **TVS Diodes**
- **Remote Indication Products**


## WWW.LITTELFUSE.COM/SOLAR

For over 30 years Littelfuse has helped OEM engineers, consulting engineers and end users select the right products to protect critical electrical equipment — supported by our full line of product catalogs and reference materials.

**Fuses and Fuseholders Catalog** — Littelfuse offers a complete circuit protection portfolio of industrial power fuses, including time-saving indication products for an instant visual blown-fuse identification, even on de-energized systems.

**Protection Relay Catalog** — The comprehensive line of electronic and microprocessor-based protection relays safeguard equipment and personnel to prevent expensive damage, downtime or injury due to electrical faults.

**Up-LINK™ Product Brochure** — Up-LINK™ is a patented remote indication technology, incorporated in a growing number of fuseholders and other products that improve productivity by providing necessary information to monitoring sites.

**Varistor Catalog** — Littelfuse offers industrial Metal Oxide Varistors (MOVs) to protect against transient voltage surges.

**TVS Diodes Catalog** — Littelfuse offers silicon transient voltage suppression (TVS) devices, able to conduct large currents to ground without sustaining damage.


To view all Littelfuse product catalogs, visit our website at **www.littelfuse.com/catalogs**



**FORM NO. PF140-C**