Our Most Popular Solar Products

- LFNH Series
  - Fuse Holder
  - Fuse Terminal Cover

- SPNH Series
  - Solar Fuse

- SPD2 PV Series
  - Surge Protection Device

- LFPXV Series
  - Touch-Safe Fuse Holder

- SPXV Series
  - Solar Fuse

- SPXI Series
  - In-Line Solar Fuse

- SE-601 Series
  - DC Ground-Fault Monitor
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## 1000 V RATED PRODUCTS

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## 600 V RATED PRODUCTS

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</table>

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<td>25</td>
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<td>26</td>
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</table>

## SURGE PROTECTION DEVICE PRODUCTS

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<thead>
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<tbody>
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<td>SPD2 PV Series Surge Protection Device</td>
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<tbody>
<tr>
<td>Solar Products by Application</td>
<td>29</td>
</tr>
</tbody>
</table>
SPXV SERIES STRING SOLAR FUSE

Description

The Littelfuse SPXV solar string fuse is designed specifically for 1–32 A 1500 V dc applications.

Features/Benefits

- 10 x 85 mm package size
- UL 248-19 Listed
- Meets IEC 60269-6 electrical performance requirements
- Up to 50,000 A interrupting rating

Applications

- Inverters
- Combiner boxes

Web Resources

Download technical resources at: Littelfuse.com/spxv
For silver plated version: Littelfuse.com/spxvs

Specifications

Voltage Rating

1500 V dc

Amperage Rating

1, 2, 2.25, 2.5, 3, 3.5, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30, 32 A

Interrupting Rating

50 kA (UL 248-19) SPXV-M 25 A–32 A
30 kA (UL 248-19) SPXV 1 A–30 A
50 kA (Self-Certified) SPXV 1 A–20 A

Time Constant

≤ 1 ms

Material

Body: Melamine
Caps: Copper alloy (nickel plated)

Approvals

UL 248-19 Listed (File: E339112)

Environmental

RoHS Compliant
REACH

Country of Origin

Mexico

Part Numbering System

SPXV xxx T – Options

<table>
<thead>
<tr>
<th>SERIES</th>
<th>AMPERAGE</th>
<th>PACKAGE QUANTITY</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPXV</td>
<td>6</td>
<td>10</td>
<td>SPXV006</td>
<td>SPXV006.T</td>
</tr>
<tr>
<td>SPXV</td>
<td>20</td>
<td>50</td>
<td>SPXV020</td>
<td>SPXV020.L</td>
</tr>
<tr>
<td>SPXV</td>
<td>32</td>
<td>10</td>
<td>SPXV032-M</td>
<td>SPXV032.TXM</td>
</tr>
</tbody>
</table>

Options

Blank = 1–20 A 10 x 85 mm
25–30 A 14 x 85 mm
XM = 25–32 A 10 x 85 mm

Package Quantity

T = 10
L = 50

SPXV Dimensions mm (in)

1 – 20 A

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>84.65</td>
<td>(3.333)</td>
</tr>
<tr>
<td>10.31</td>
<td>(.406)</td>
</tr>
</tbody>
</table>

25 – 30 A

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>84.65</td>
<td>(3.333)</td>
</tr>
<tr>
<td>13.72</td>
<td>(.540)</td>
</tr>
<tr>
<td>10.00</td>
<td>(.394)</td>
</tr>
</tbody>
</table>

SPXV-M Dimensions mm (in)

25 – 32 A

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>84.65</td>
<td>(3.333)</td>
</tr>
<tr>
<td>10.31</td>
<td>(.406)</td>
</tr>
</tbody>
</table>
Description

The Littelfuse SPXI solar fuse is designed to integrate into an in-line assembly within a wire harness. The fuse provides photovoltaic (PV) protection that meets UL 248-19 for photovoltaic applications. The SPXI can be electrically insulated by either overmolding or using heat-shrink.

Features/Benefits

- UL 248-19 Recognized
- Meets IEC 60269-6 electrical performance requirements
- 50,000 A interrupting rating
- No fuse holder required

Applications

- Photovoltaic wire harness

Recommended Crimping Tool

SPXI and SPXI-M: T&B Sta-Kon ERG4002
SPXI-B and SPXI-BM: T&B Sta-Kon ERG4

Specifications

<table>
<thead>
<tr>
<th>Voltage Rating</th>
<th>1500 V dc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amperage Rating</td>
<td>2.5, 3.5, 4, 4.5, 5, 6, 8, 10, 12, 15, 20, 25, 30, 32 A</td>
</tr>
<tr>
<td>Interrupting Ratings</td>
<td>SPXI and SPXI-B: 30 kA</td>
</tr>
<tr>
<td></td>
<td>SPXI-M and SPXI-BM: 50 kA</td>
</tr>
<tr>
<td>Time Constant</td>
<td>≤ 1 ms</td>
</tr>
<tr>
<td>Material</td>
<td>Body: Melamine</td>
</tr>
<tr>
<td></td>
<td>Caps: copper alloy (nickel plated)</td>
</tr>
<tr>
<td>Approvals</td>
<td>SPXI and SPXI-B: UL 248-19 Recognized</td>
</tr>
<tr>
<td></td>
<td>SPXI-M and SPXI-BM: UL Pending (File: E339112)</td>
</tr>
<tr>
<td>Environmental</td>
<td>RoHS Compliant</td>
</tr>
<tr>
<td></td>
<td>REACH</td>
</tr>
<tr>
<td>Country of Origin</td>
<td>Mexico</td>
</tr>
<tr>
<td>US Patent</td>
<td>9,564,281</td>
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</tbody>
</table>

Part Numbering System

<table>
<thead>
<tr>
<th>Series</th>
<th>SPXI xxx T XB Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amp Code</td>
<td>Refer to Amp Code Column in Ordering Information Table</td>
</tr>
<tr>
<td>T = 10</td>
<td>Blank = 10–12 AWG</td>
</tr>
<tr>
<td></td>
<td>XB = 8 AWG (2.5–20A)</td>
</tr>
<tr>
<td></td>
<td>XM = 10–12 AWG (25–32 A)</td>
</tr>
<tr>
<td></td>
<td>XBM = 8 AWG (25–32 A)</td>
</tr>
<tr>
<td>L = 50</td>
<td></td>
</tr>
</tbody>
</table>

Web Resources

Download additional technical information and view the complete solar portfolio: littelfuse.com/spxi

SPXI Dimensions mm (in)

<table>
<thead>
<tr>
<th>Amp Range</th>
<th>Diameter</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5–4 A</td>
<td>3.56 (0.140)</td>
<td>81.41 (3.205)</td>
</tr>
<tr>
<td>4.5–20 A</td>
<td>3.56 (0.140)</td>
<td>110.06 (4.333)</td>
</tr>
<tr>
<td>25–30 A</td>
<td>3.56 (0.140)</td>
<td>13.72 (0.540)</td>
</tr>
</tbody>
</table>
**SPXI SERIES IN-LINE SOLAR FUSES**

**SPXI-M Dimensions mm (in)**

- 25–32 A

**SPXI-B Dimensions mm (in)**

- 22.5–4 A

- 41.5–20 A

**SPXI-BM Dimensions mm (in)**

- 25–32 A
**SPNH SERIES SOLAR FUSE**

**1500 V dc • 50-400 A • NH Style**

### Description

The SPNH series has been designed to meet the emerging circuit protection needs for 1500 volt photovoltaic (PV) systems. These fuses provide full range protection for all potential overcurrent conditions that exist in PV applications. Suitable for PV inverter protection and array combiner applications.

### Features/Benefits

- Meets UL and IEC photovoltaic standards
- Compact NH XL Sizes
- Low watt Loss Design
- 1500 V dc rating for emerging market needs
- Designed to protect against a full range of overcurrents

### Applications

- Inverters
- Re-combiner boxes
- Array/re-combiner application
- PV inverter dc input protection

### Web Resources

Download technical documents: [Littelfuse.com/spnh](http://www.Littelfuse.com/spnh)

---

**Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Rating</td>
<td>1500 V dc</td>
</tr>
<tr>
<td>Amperage Rating</td>
<td>50, 63, 80, 100, 125, 160, 200, 250, 315, 350, 400</td>
</tr>
<tr>
<td>Interrupting Rating</td>
<td>30 kA</td>
</tr>
<tr>
<td>Time Constant</td>
<td>≤ 2 ms</td>
</tr>
<tr>
<td>Material</td>
<td>Body: Ceramic End Bells: Copper Alloy</td>
</tr>
<tr>
<td>Approvals</td>
<td>UL 248-19 Listed (File: E339112, Vol. 4) IEC 60269-6</td>
</tr>
<tr>
<td>Environmental</td>
<td>RoHS Compliant</td>
</tr>
</tbody>
</table>

**Part Numbering System**

- **Series**: SPNH
- **Amp Code**: Refer to Amp Code Column in Electrical Specifications Table
- **Package Quantity**: X = 1
- **Termination**: Blank = Solid Blade DL = S Blade DE = U blade DLMS = S Blade w/ Microswitch tab DEMS = U Blade w/ Microswitch tab
- **Case Size**: X = 1XL size 2XL = 2XL size 3L = 3L size

<table>
<thead>
<tr>
<th>SERIES</th>
<th>AMPERAGE</th>
<th>PACKAGE QUANTITY</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPNH</td>
<td>50</td>
<td>1</td>
<td>SPNH050</td>
<td>SPNH050.X</td>
</tr>
<tr>
<td>SPNH</td>
<td>200</td>
<td>1</td>
<td>SPNH200</td>
<td>SPNH200.X</td>
</tr>
<tr>
<td>SPNH</td>
<td>400</td>
<td>1</td>
<td>SPNH400</td>
<td>SPNH400.XDLMS</td>
</tr>
</tbody>
</table>

*Solid blade option for 1XL case size does not require a case or termination designator for the part number.

**Recommended Accessories**

**1XL Case Size**
- **Fuse Holder**: LFNH152001CST
- **Fuse Terminal Covers**: LFNH15200FBC

**2XL Case Size**
- **Fuse Holder**: LFNH154001CST
- **Fuse Terminal Covers**: LFNH15400FBC

**3L Case Size**
- **Fuse Holder**: LFNH156301CST
- **Fuse Terminal Covers**: LFNH15630FBC

**Microswitch**
- MSSPNH1500X
Dimensions Millimeters (in)

Size: 1 XL

Microswitch
MSSPNH1500X

Dimensions Millimeters (in)
LFPXV TOUCH-SAFE FUSE HOLDERS
1500 V • 32 A

Description
The Littelfuse LFPXV fuse holder is designed to hold 1500 V 10x85 mm fuses.

Features/Benefits
• Finger-safe design offers personnel protection
• No fuse pullers or tools required for fuse removal
• 35 mm DIN-rail mountable
• Evaluated for use with copper alloy busbars
• Compact design

Recommended Fuses
Littelfuse SPXV/SPXV-S Fuses

Web Resources
Download the complete datasheet and other technical documents: Littelfuse.com/LFPXV

Ordering Information

<table>
<thead>
<tr>
<th>SERIES</th>
<th>VOLTAGE (V dc)</th>
<th>POLES</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
<th>PACK QTY</th>
<th>TERMINAL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1500</td>
<td>1</td>
<td>LFPXV001</td>
<td>LFPXV001Z</td>
<td>20</td>
<td>Box Lug</td>
</tr>
</tbody>
</table>

Specifications

- **Voltage Ratings**: 1500 V dc
- **Amperage Rating**: 32 A
- **SCCR Rating**: 50 kA
- **Power Dissipation**: 8W maximum
- **Fuse Type**: 10 x 85 mm
- **Material**: Thermoplastic
- **Fuse Clip**: Silver-plated copper alloy
- **Screws**: Zinc-plated steel
- **Operating Temperature**: -55 °C to +125 °C
- **Flammability Rating**: UL94 V-0
- **Temperature Stability**: Body: 130 °C, Carrier: 140 °C
- **Approvals**: UL 4248-19 Listed (File: E345481), IEC 60269-6
- **Environmental**: RoHS compliant, Lead (Pb) free, REACH
- **Recommended DIN Rail**: TH 35-7,5 per IEC 60715

**Material and Temp Rating**

<table>
<thead>
<tr>
<th>TEMP RATING</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 °C or 90 °C</td>
<td>UL Class B and Class C wire</td>
</tr>
<tr>
<td>90 °C</td>
<td>AlphaWire PV Series Photovoltaic Wire</td>
</tr>
<tr>
<td>Copper Only</td>
<td>IEC Class 5 Flexible Wire</td>
</tr>
</tbody>
</table>

**Busbar Specifications**

<table>
<thead>
<tr>
<th>TERMINAL</th>
<th>THICKNESS</th>
<th>WIDTH</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum</td>
<td>0.188 in (4.78 mm)</td>
<td>0.290 in (7.37 mm)</td>
<td>24-28 lb-in (2.71-3.16 N-m)</td>
</tr>
<tr>
<td>Minimum</td>
<td>0.125 in (3.18 mm)</td>
<td>0.200 in (5.08 mm)</td>
<td></td>
</tr>
</tbody>
</table>

**Terminal Information**

<table>
<thead>
<tr>
<th>TERMINAL</th>
<th>NUMBER OF WIRES</th>
<th>WIRE SIZE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4-14 AWG (25-2.5 mm²)</td>
<td>24-28 lb-in (2.71-3.16 N-m)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>16-18 AWG (1.5-0.75 mm²)</td>
<td>18-22 lb-in (2.03-2.49 N-m)</td>
<td></td>
</tr>
<tr>
<td>2*</td>
<td>6-14 AWG (16-2.5 mm²)</td>
<td>26-30 lb-in (2.94-3.69 N-m)</td>
<td></td>
</tr>
<tr>
<td>2*</td>
<td>16-18 AWG (1.5-0.75 mm²)</td>
<td>20-24 lb-in (2.26-2.71 N-m)</td>
<td></td>
</tr>
</tbody>
</table>

*Must be the same cross-sectioned size
LFPXV TOUCH-SAFE FUSE HOLDERS

Dimensions Millimeters (in)

Side View

Top View

Front View

87.17 REF. [3.432]

22.10 REF. [0.87]

138.00 REF. [5.433]
**Specifications**

- **Voltage Rating**: 1500 V dc
- **Ampere Rating**: 200, 400, 630 A
- **Interrupt Rating**: 30 kA
- **Termination Type**: Stud Mount
- **Base Temp Rating**: UL4248-1
- **Approvals**: UL4248-19
- **FILE**: E345481 Vol. 2
- **Environmental**: RoHS Compliant
- **Material**: Fuse Clip: Silver-Plated Copper
  Spring: Zinc-Plated Steel
  Mounting Plate: Zinc-Plated Steel
  Insulator: Ceramic

**Recommended Fuses**

- **SPNH Series**

**Web Resources**

For sample requests, downloadable CAD drawings, dimensions and other technical information:

[Littelfuse.com/LFNH](http://Littelfuse.com/LFNH)

For a comprehensive overview of solar market solutions, visit:

[Littelfuse.com/solar](http://Littelfuse.com/solar)

**Ordering Information**

<table>
<thead>
<tr>
<th>AMPERAGE</th>
<th>ORDERING NUMBER</th>
<th>FUSE SIZE</th>
<th>RECOMMENDED TORQUE</th>
<th>TERMINAL COVER ORDERING NUMBER*</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>LFNH1520001CST</td>
<td>NH1XL</td>
<td>283 in-lb (32 N-m)</td>
<td>132 in-lb (15 N-m)</td>
</tr>
<tr>
<td>400</td>
<td>LFNH1540001CST</td>
<td>NH2XL</td>
<td>283 in-lb (32 N-m)</td>
<td>132 in-lb (15 N-m)</td>
</tr>
<tr>
<td>630</td>
<td>LFNH1563001CST</td>
<td>NH3XL</td>
<td>283 in-lb (32 N-m)</td>
<td>132 in-lb (15 N-m)</td>
</tr>
</tbody>
</table>

*Terminal covers sold separately**
**Specifications**

**Voltage Rating:** 1500 V  
**Ampere Rating:** 200 amperes  
**Flammability Rating:** UL 94 V-0  
**Material:** V0-rated Nylon  
**Packaging:** Sold in pairs
LFNH SERIES FUSE BLOCK

Dimensions Millimeters (in)

Fuse Block
LFNH154001CST

Fuse Terminal Cover
LFNH15400FBC

Specifications
Voltage Rating: 1500 V
Ampere Rating: 400 amperes
Flammability Rating: UL 94 V-0
Material: V0-rated Nylon
Packaging: Sold in pairs
Dimensions Millimeters (in)

Fuse Block
LFNH156301CST

Fuse Terminal Cover
LFNH15630FBC

Specifications

Voltage Rating: 1500 V
Ampere Rating: 630 amperes
Flammability Rating: UL 94 V-0
Material: V0-rated Nylon
Packaging: Sold in pairs
Description
The SPFJ series is the smallest 1000 V dc 70-450 A dc Full Range fuse available in the market. The SPFJ series is manufactured in Class J case sizes are suitable for photovoltaic, DC cable protection, EV off-board charging and other dc applications. that allows for both fuse holder and busbar mounting configuration. The SPFJ meets both UL and IEC requirements.

Features/Benefits
- Meets UL and IEC photovoltaic standards
- Small footprint reduces panel size
- Flexibility of fuse holder or busbar mounting
- Higher amperage solar fuses in standard sizes
- UL Listed branch and feeder circuit rated
- Class J case sizes for the 125-450 A ratings

Applications
- Inverters
- Re-combiner boxes
- Dc Cable Protection
- EV Off-board (dc Fast) chargers

Recommended Fuse Holder
LFJ1000 Solar Series

Web Resources
Download technical documents: Littelfuse.com/spfj

Specifications
- Voltage Rating: 1000 V dc
- Amperage Rating:
  - 70, 80, 90, 100, 125, 160, 200, 250, 300, 350, 400, 450
- Interrupting Rating:
  - Ac: 200 kAIC (125-450 A)
  - Dc: 70-200 A: 20 kAIC
  - 250-400 A: 10 kAIC
  - 450 A: 20 kAIC
- Time Constant: ≤ 1 ms
- Material:
  - Body: Melamine
  - End Bells: Copper Alloy
- Approvals:
  - UL 248-19 Listed (File: E339112)
  - UL 248-8, Class J (125-450 A)
  - cULus (125-450 A)
  - IEC 60269-6 (125-450 A)
- Environmental:
  - RoHS Compliant
- Country of Origin:
  - Mexico

Part Numbering System
- SPFJ xxx X —
- Blank = Std. Class J Dimensions
- XL = 8.5mm Slot (125 - 200A Only)

Series
- SPFJ

Amp Code
- Refer to Amp Code Column in Electrical Specifications Table

Package Quantity
- X = 1

SERIES | AMPERAGE | PACKAGE QUANTITY | CATALOG NUMBER | ORDERING NUMBER
--- | --- | --- | --- | ---
SPFJ | 70 | 1 | SPFJ070 | SPFJ070.X
SPFJ | 200 | 1 | SPFJ200 | SPFJ200.XXL

Dimensions Inches (mm)

<table>
<thead>
<tr>
<th>AMPERAGE</th>
<th>DIMENSIONS IN INCHES (MM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>70-100</td>
<td>3.02 (76.5)</td>
</tr>
<tr>
<td>125-200</td>
<td>3.02 (76.5)</td>
</tr>
<tr>
<td>250-400</td>
<td>3.37 (85.7)</td>
</tr>
<tr>
<td>450</td>
<td>3.75 (95.3)</td>
</tr>
</tbody>
</table>

* SPFJ-L option = 8.5 mm [UL 248-19 approval only]
**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 14 ampere ratings to match specific requirements in a variety of applications.

**Features/Benefits**
- Meets UL and IEC photovoltaic standards
- UL 248-19 Listed 1000 V dc maximum
- 1-30 A ratings available
- 20,000 A Interrupting Rating - 1 A - 20 A
- 50,000 A Interrupting Rating - 25 A - 30 A
- Both PCB mount and dead-front holder options available

**Applications**
- Inverters
- Combiner boxes
- Battery charge controllers

**Recommended Accessories**

Fuse Holder: LPHV 1000 V dc POWR-Safe Series
Fuse Clips: 125004/125005

**Web Resources**

Download technical documents: littelfuse.com/spf

---

**Specifications**

- **Voltage Rating**: 1000 V dc
- **Amperage Rating**: 1, 2, 3, 3.5, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30
- **Max. Interrupting Rating**: 20 kA - 1 A - 20 A
- **50 kA - 25 A - 30 A**
- **Time Constant**: ≤ 2 ms
- **Material**: Body: Melamine
- **Caps: Copper Alloy**
- **Approvals**: UL 248-19 Listed (File: E339112)
  - IEC 60269-6 (1-30 A)
  - CSA Certified (File: 029862_0_000)
  - RoHS Compliant
- **Country of Origin**: Mexico

**Part Numbering System**

**Series**: SPF

**Amp Code**: Refer to datasheet for amp code

**Mounting Options**
- Blank = Ferrule
- XR = PCB

**Package Quantity**
- T = 10
- H = 100

**Dimensions Inches (mm)**

- **Ferrule Version**
- **PCB Version**

**Web Resources**

Download technical documents: littelfuse.com/spf
Solar Products
1000 V DC Rated Products

SPFI SERIES IN-LINE SOLAR FUSE

1000 V dc • 2-30 A

Specifications
Voltage Rating 1000 V dc
Amperage Rating 2, 2.5, 3, 3.5, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 A
Interrupting Rating 20 kA
Time Constant ≤ 1 ms
Material
Body: Melamine
Caps: Copper Alloy (Nickel Plated)
Approvals
UL 2579 Recognized (File: E339112)
Environmental
RoHS Compliant
REACH
Country of Origin Mexico
US Patent 9,564,281

Part Numbering System

<table>
<thead>
<tr>
<th>SERIES</th>
<th>AMPERAGE</th>
<th>PACKAGE QUANTITY</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPFI</td>
<td>2</td>
<td>10</td>
<td>SPF1002</td>
<td>SPF1002.T</td>
</tr>
<tr>
<td>SPFI</td>
<td>3.5</td>
<td>10</td>
<td>SPF103.5</td>
<td>SPF103.5T</td>
</tr>
<tr>
<td>SPFI</td>
<td>20</td>
<td>50</td>
<td>SPF1020</td>
<td>SPF1020.L</td>
</tr>
</tbody>
</table>

Description
The Littelfuse SPFI solar fuse is designed to integrate into an in-line assembly within a wire harness. The fuse provides photovoltaic (PV) protection that meets UL 248-19 for photovoltaic applications. The SPFI can be electrically insulated by either overmolding or using approved heat-shrink.

Features/Benefits
- UL 248-19 Recognized
- Meets IEC 60269-6 electrical performance requirements
- 20,000 A Interrupting Rating
- No fuse holder required

Applications
- Photovoltaic wire harness

Dimensions mm (in)

Web Resources
Downloadable CAD drawings and other technical information:
littelfuse.com/spfi

Recommended Crimping Tool
T&B Sta-Kon ERG4002
**Description**

The LFJ1000 series fuse block is specifically designed for the Littelfuse SPFJ 1000 V Solar Fuse. It meets UL electrical requirements, is available in multiple amperages, and comes in a variety of fuse mounting and termination configuration: fuse clip to box lug, fuse stud to wire stud and fuse clip to wire stud.

**Features/Benefits**

- Narrow width increases space savings
- Range of amperages to match all SPFJ fuse options
- Box lug termination style accommodates a wide range of cable sizes
- Stud-mounted option increases convenience
- Approval for use with copper or aluminum lugs allowing for design flexibility

**Specifications**

- **Voltage Ratings**: 1000 V dc
- **Ampere Ratings**: 200, 400, 450 A
- **Materials**:
  - **Base**: Thermoplastic
  - **Fuse Clip**: Tin plated copper alloy
  - **Box Lug**: Aluminum
  - **Fuse Studs**: Zinc plated steel
  - **Connector Studs**: Zinc plated steel
- **Flammability Rating**: UL 94 V-0
- **Termination Type**: Box Lug or Stud Mount
- **Base Temp Rating**: 130 °C
- **Approvals**: UL 4248-18 Listed
  - File: E345481 Vol. 1
- **Environmental**: RoHS Compliant

**Recommended Fuses**

SPFJ Solar Series

**Web Resources**

Sample requests, downloadable CAD drawings, dimensions and other technical information: Littelfuse.com/LFJ1000

For a comprehensive overview of solar market solutions visit: Littelfuse.com/solar

**Ordering Information**

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

<table>
<thead>
<tr>
<th>AMPERAGE</th>
<th>ORDERING NUMBER</th>
<th>INTERRUPT RATING</th>
<th>RECOMMENDED TORQUE FUSE TERMINAL</th>
<th>MAX. BUSBAR THICKNESS</th>
<th>RECOMMENDED BASE TORQUE BOLT SIZE</th>
<th>RECOMMENDED BASE TORQUE TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>LFJ102001STST</td>
<td>20 kA</td>
<td>65 in-lb (7.3 N-m) 200 in-lb (22.6 N-m)</td>
<td>.774” (19.66 mm)</td>
<td>1/4” 5/16”</td>
<td>30-40 in-lb</td>
</tr>
<tr>
<td>400</td>
<td>LFJ104001STST</td>
<td>10 kA</td>
<td>170 in-lb (19.2 N-m) 200 in-lb (22.6 N-m)</td>
<td>.555” (14.10 mm)</td>
<td>1/4” 5/16”</td>
<td>40-50 in-lb</td>
</tr>
<tr>
<td>450</td>
<td>LFJ104501STST</td>
<td>20 kA</td>
<td>300 in-lb (33.9 N-m) 300 in-lb (33.9 N-m)</td>
<td>.570” (14.18 mm)</td>
<td>1/4” 5/16”</td>
<td>40-50 in-lb</td>
</tr>
</tbody>
</table>

Littelfuse.com/solar 16 © 2019 Littelfuse, Inc.
LPHV POWR-SAFE FUSE HOLDERS

Solar Products
1000 V DC Rated Products

1000 V dc

Description
The Littelfuse LPHV fuse holder is designed to house 1000 V fuses. It is not designed for load break but is ideal for isolating photovoltaic module strings for maintenance and meets UL requirements for 1000 V solar fuse protection.

Features/Benefits
- Touch-safe design offers protection when replacing fuses
- Compact design
- 35 mm DIN Rail Mountable
- Available in 1-, 2-, 3- and 4-pole configurations
- No fuse pullers or tools required for fuse removal

Multi-Pole Assembly Kit
Kits are used to create multi-pole holders from 1-pole LPHV fuse holders.

Multi Pole Assembly Kit Ordering No. CYHP0001Z-KIT
(Kit contains 20 connector pincers & 10 handle pins).

Specifications
- Voltage Rating: 1000 V dc/600 V ac
- Amperage Rating: 30 A
- SCCR Rating: 20 kA
- Power Dissipation: 4 W Maximum
- Fuse Type: 10 X 38 mm up to 1000 V ac
- Housing Material: Thermoplastic
- Terminal Screws: Zinc Plated Steel, Phillips/Slotted Head
- Pressure Plate: Nickel Plated Steel
- Fuse Clip Material: Silver Plated Copper Alloy
- Operating Temperature: -55 °C to +125 °C
- Flammability Rating: UL94 V-0
- Approval: Self-certified 1000 V dc, IEC 60269-2, -4, -6, uR & CSA 600 V ac/dc
- Environmental: RoHS compliant, Lead (Pb) Free

Web Resources
Sample requests, downloadable CAD drawings and other technical information: Littelfuse.com/lphv

More information about solar applications: Littelfuse.com/solar

Recommended Fuses
10x38 mm 1000 V dc Fuses
SPF 1000 V Series
FLU 1000 V Series

Ordering Information

<table>
<thead>
<tr>
<th>SERIES</th>
<th>POLES</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
<th>TERMINAL TYPE</th>
<th>WIRE TYPE</th>
<th>WIRE RANGE</th>
<th>TERMINAL TORQUE</th>
<th>ROHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPHV</td>
<td>1</td>
<td>LPHV001</td>
<td>LPHV0001Z</td>
<td>Pressure Plate</td>
<td>75°C or 90°C C</td>
<td>Stranded / [Solid]</td>
<td>#8-14 AWG (2-10 mm²) / [#10-14 AWG (2-6 mm²)]</td>
<td>17.7 in-lbs (2 N-m)</td>
</tr>
<tr>
<td>LPHV</td>
<td>2</td>
<td>LPHV002</td>
<td>LPHV0002Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPHV</td>
<td>3</td>
<td>LPHV003</td>
<td>LPHV0003Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPHV</td>
<td>4</td>
<td>LPHV004</td>
<td>LPHV0004Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dimensions

Front View

Side View

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BUS BAR SYSTEM

POWR-BAR Distribution

Description
A key objective for panel designers is safe distribution of power to multiple fuse holders in a compact design. The Littelfuse UL 508 Listed bus bar system eliminates most wire terminations in a timesaving package. A power distribution block and associated conductors are no longer needed to feed multiple POWR-safe fuse holders.

Features/Benefits
- Touch-safe design offers protection when replacing fuses
- Compact design
- 35mm DIN-rail mountable
- Available in one and three phase configurations
- Can be cut down to optimal size

Recommended Fuse Holders
Littelfuse LFPSM / LFPSC / LPSM / LPSC (600 V)
Littelfuse LPHV (1000 V)

Web Resources
Download technical documents: Littelfuse.com/busbar

Specifications
Voltage Ratings
- 600 V ac/dc
- 1000 V dc*

Current Ratings
<table>
<thead>
<tr>
<th>CROSS SECTION (mm²)</th>
<th>18 mm²</th>
<th>25 mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>END FED</td>
<td>80 A</td>
<td>100 A</td>
</tr>
<tr>
<td>CENTER FED</td>
<td>160 A</td>
<td>200 A</td>
</tr>
</tbody>
</table>

SCCR: 10 kA, 100 kA
Conductor: Copper
Pitch: 17.8 mm
Approvals: UL 508 Listed (File E328654)
Environmental: RoHS Compliant
Lead (Pb) free

*1 Phase 18 mm² rated 1000 V dc up to 160 A when center fed
1 Phase 25 mm² rated 1000 V dc up to 200 A when center fed
When protected directly upstream by Class J 175 amperes max (18 mm² bus bar) and Class J 200 amperes max (25 mm² bus bar).

Ordering Information

<table>
<thead>
<tr>
<th>1 PHASE, 18 mm²</th>
<th>LENGTH (mm)</th>
<th>1 PHASE, 25 mm²</th>
<th>LENGTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDERING NUMBER</td>
<td>POLES</td>
<td>END FED</td>
<td>18 mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>270</td>
</tr>
<tr>
<td>ORDERING NUMBER</td>
<td>POLES</td>
<td>CENTER FED</td>
<td>25 mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>79</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>270</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3 PHASE, 18 mm²</th>
<th>LENGTH (mm)</th>
<th>3 PHASE, 25 mm²</th>
<th>LENGTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDERING NUMBER</td>
<td>POLES</td>
<td>END FED</td>
<td>18 mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>266</td>
</tr>
<tr>
<td>ORDERING NUMBER</td>
<td>POLES</td>
<td>CENTER FED</td>
<td>25 mm²</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>266</td>
</tr>
</tbody>
</table>

Endcaps are standard with all 3 phase configurations except 57-pole.
Endcaps are not needed for the 1 phase configurations from the factory or if the copper bus is trimmed per the supplied instructions.
Power feed lugs and protective covers are extra.

Accessories
Power Feed Lug

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>AMPERAGE RATING</th>
<th>VOLTAGE (ac/dc)</th>
<th>WIRE RANGE</th>
<th>WIRE TYPE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BB17</td>
<td>115</td>
<td>1000</td>
<td>#10 - 1/0 AWG</td>
<td>CU</td>
<td>50 lb-in</td>
</tr>
<tr>
<td>BB18</td>
<td>115</td>
<td>1000</td>
<td>#10 - 1/0 AWG</td>
<td>CU</td>
<td>50 lb-in</td>
</tr>
<tr>
<td>BB19</td>
<td>115</td>
<td>1000</td>
<td>#10 - 1/0 AWG</td>
<td>CU</td>
<td>50 lb-in</td>
</tr>
<tr>
<td>BB20</td>
<td>115</td>
<td>1000</td>
<td>#10 - 1/0 AWG</td>
<td>CU</td>
<td>50 lb-in</td>
</tr>
</tbody>
</table>

Endcaps

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>PHASE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDCP42</td>
<td>Single</td>
<td>50</td>
</tr>
<tr>
<td>EDCP7</td>
<td>Three</td>
<td>50</td>
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</tbody>
</table>

Pole Protective Covers

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTPT5</td>
<td>5</td>
</tr>
</tbody>
</table>
Features/Benefits
- Indicating and non-indicating options available
- 1-, 2-, 3- and 4-pole configurations
- Easy installation and fuse removal with no additional pullers or tools required
- 35 mm DIN-rail mountable
- Ventilated design for cooler operation

Specifications
- Voltage Rating: 600 V ac/dc
- Ampere Rating: 30 A
- Interrupting Rating: 200 kA (Class CC) 100 kA (Midget)
- Terminal Type: Pressure plate
- Suggested Torque: 17.7 in-lbs
- Wire Range: #8–#14 CU
- Housing: Thermoplastic
- Fuse Clip: Silver plated copper
- Zinc Plated Steel: Zinc plated steel
- Terminal Screws: Nickel plated steel
- Operating Temperature: -50 °C to +125 °C
- Flammability Rating: UL 94 V-0
- Approvals: UL Listed (LPSC File: E14721) UL Recognized (LPSM File: E14721) CSA Certified (LPSC/LPSM File: LR7316)
- Environmental: RoHS Compliant, Lead (Pb) Free

Ordering Information

<table>
<thead>
<tr>
<th>INDICATING</th>
<th>NON-INDICATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>CATALOG NUMBER</td>
<td>ORDERING NUMBER</td>
</tr>
<tr>
<td>LPSC001ID</td>
<td>LPSC0001ZID</td>
</tr>
<tr>
<td>LPSC002ID</td>
<td>LPSC0002ZID</td>
</tr>
<tr>
<td>LPSC003ID</td>
<td>LPSC0003ZID</td>
</tr>
<tr>
<td>LPSC004ID</td>
<td>LPSC0004ZID</td>
</tr>
<tr>
<td>LPSM001ID</td>
<td>LPSM0001ZID</td>
</tr>
<tr>
<td>LPSM002ID</td>
<td>LPSM0002ZID</td>
</tr>
<tr>
<td>LPSM003ID</td>
<td>LPSM0003ZID</td>
</tr>
<tr>
<td>LPSM004ID</td>
<td>LPSM0004ZID</td>
</tr>
</tbody>
</table>

Multi Pole Assembly Kit
Ordering No. CYHP0001Z-KIT
(Kit contains 20 connector pincers & 10 handle pins)

Web Resources
Download CAD drawings and other technical information:
littelfuse.com/lpsc
littelfuse.com/lpsm

Recommended Fuses
Class CC
Midget-style (10 x 38 mm)
KLKD SERIES 10 X 38 FUSES

600 V ac/V dc • 1/10-30 A • Fast Acting

Description
The KLKD fuse series is fast-acting with 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.

In addition, the KLKD series has been designed to meet both the UL and IEC photovoltaic (PV) fuse standards.

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

Features/Benefits
- Designed to UL and IEC photovoltaic specifications
- 1/10 - 30 A ratings available
- 50,000 A Interrupting Rating
- Available in ferrule or PCB mount options
- 1-5 A meets UL 1741 GFDI requirements

Applications
- Combiner boxes and inverters
- Power supplies
- Desktop meters

Dimensions Inches (mm)

Ferrule Version

PCB 1-Tab

Part Numbering System

SERIES
KLKD

AMP RATING
1/8, 1/10, 2/10, 3/4, 1, 11/2, 2, 21/2, 3, 31/2, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25, 30

MOUNTING OPTIONS

T = 10

H = 100

Recommended Fuse Holders
Littelfuse LPSM and LFPSM dead-front series
Littelfuse L60030M open-face series

Web Resources
Download CAD drawings and other technical information: littelfuse.com/klkd

Specifications

Voltage Rating
600 V ac/V dc

Amperage Rating
1/10, 1/8, 2/10, 3/4, 1, 11/2, 2, 21/2, 3, 31/2, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25, 30

Interrupting Ratings
- AC: 100 kA
- DC: 100 kA Littelfuse self-certified
- 1/10-30: 10 kA (UL 2579)
- 1/10-10: 50 kA (UL 248-14)
- Body: Melamine / Caps: Copper Alloy

Material

Operating Temperature

Approvals

UL 2579 Listed (File: E339112)
IEC 60269-6 (2-25 A)
VDE Certified (No. 40033094)
UL 248-14 Listed (File: E10480)
CSA Certified Ferrule only (File: LR29862)
RoHS Compliant

Country of Origin
Mexico

Environmental

Mexico

RoHS Compliant
Connectors
Box lug connectors are designed for use with a single or multiple, solid or class B or C stranded conductor. For UL approved use of more than one conductor per connector opening, contact Littelfuse Technical Service. Manufacturers of cable terminations can furnish crimp-on sleeves for fine stranded conductors which permit these conductors to be used with box lugs.

Ampere Ratings
The ampere rating per pole for power distribution blocks is based on the line ampacity of 75 °C insulated conductors per NEC* Table 310.16. If 60 °C insulated conductors are used, load must not exceed the ampacity of 60 °C conductors. Use of conductors rated in excess of 75 °C is permitted (for example 90 °C), however, load must not exceed the ampacity of 75 °C conductors.

Specifications
Voltage Rating 600 V
Current Rating Based on NEC Table 310.16, using 75 °C copper wire
SCCR Consult factory
Material Phenolic rated at 150 °C and Thermoplastic rated at 125 °C (LD1400 and LS1300 series only)
Connector Aluminum: Highly conductive aluminum, tin plated
Copper: Highly conductive copper, tin plated
Flammability Rating UL 94 V-0
Approvals UL Recognized - 0LD/0LS Series (File: E171395)
LFD/LFS Series (File: E309688)
CSA Certified - 0LD/0LS Series (File: LR700111)
LFD/LFS Series (File: 007316_0_000)
UL Listed - 0LD57xxxx (File: E482231)
Environmental RoHS compliant, Lead (Pb) free

Web Resources
For dimension, CAD and 3-D drawings, visit: littelfuse.com/powrbloks

*NEC is a trademark of its respective owner
Specifications

Voltage Rating
600 / 1200 V
S Package: 75, 100, 150, 200
D Package: 100, 150, 200, 300, 400
WB Package: 225, 300, 450, 600

Amperage Rating
Half-Bridge

Circuit Type
Approvals
UL Listed (File: E71639)
RoHS Compliant

Part Numbering System

Product Type
M: Power Module

Module Type
G: IGBT

Voltage Rating
06: 600 V
12: 1200 V

Current Rating

Ordering Information

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>VOLT</th>
<th>AMPERAGE</th>
<th>PACKAGE TYPE</th>
<th>MOUNTING METHOD</th>
<th>M.O.Q.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MG1250S-BA1MM</td>
<td>1200</td>
<td>50</td>
<td>S</td>
<td>SCREW</td>
<td>100</td>
</tr>
<tr>
<td>MG12100S-8N2MM</td>
<td>1200</td>
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<td>MG126400D-8A1MM</td>
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<td>D</td>
<td>SCREW</td>
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<td>MG121200D-8A1MM</td>
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<td>MG06600W-BN4MM</td>
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<td>MG12225WB-BN2MM</td>
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<td>MG121200WB-BN2MM</td>
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<td>MG121450WB-BN2MM</td>
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<td>450</td>
<td>WB</td>
<td>PRESS FIT</td>
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</table>

Description

Half-Bridge Circuit IGBT Modules offer the high efficiency and fast switching speeds of modern IGBT technology in a robust and flexible format. Used for power control applications, Littelfuse offers IGBT modules for flexible and efficient motor control and inverter applications.

Features

• Ultra low loss
• High ruggedness
• High short-circuit capability
• Positive temperature coefficient
• With fast free-wheeling diodes

Benefits

• High efficiency and switching speed
• High reliability in demanding applications
• Reduced protection needs
• Easily paralleled
• Integrated solution in compact module package

Applications

• AC motor control
• Inverter
• Motion/servo control
• Power supplies
• Photovoltaic/fuel cell

Web Resources

Download the complete datasheet and other technical information: littelfuse.com

Dimensions Inches (mm)

S Package Type

D Package Type

WB Package Type
TVS (TRANSIENT VOLTAGE SUPPRESSION) DIODES

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.

Transient Voltage Suppression 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 200 W to 30 kW, and reverse standoff voltages from 5 V to 512 V. For more information visit Littelfuse.com/solar

TVS and Solar Inverter Protection

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. Solar power inverters are vulnerable to transient voltage effects and its direct connection to other system components allows transient voltage transfer. For example:

- Lightning-induced transient events may pass through the solar array and outdoor cabling to the inverter
- Transients originating from the outside utility power grid may pass through the main circuit panel and cabling to the inverter
- Startup of motorized equipment enables vulnerabilities produced by repeated load changes
- Electrostatic discharge events generated internally and externally to the system may pass between the inverter and sensitive electronic control equipment

It is important to build surge protection in the inverter and at other locations before damaging transients may reach sensitive equipment.
OVERVOLTAGE SUPPRESSION VARISTORS

Protection Application and Needs

Description:
Microprocessor-controlled inverter with the ac output synchronized to the ac grid stores energy in utility company and maximizes photovoltaic (PV) array energy output.

Threats:
- Power surges on ac or dc input and ac output
- ESD threats through the communication network

Solutions:
1. Ac Input: Fuse / MOV / GDT
2. Dc Input: Dc-rated fuse / Unidirectional TVS / MOV
3. Ac Output: Fuse / TVS / MOV
4. Local Ethernet: MLV / SPA
5. Outside Ethernet: SEP series SIDACtor® device

Example: Hybrid Solar Inverter Configuration

Varistor Products

Varistors possess characteristics that divert transient currents away from sensitive components. Littelfuse offers two types: Miniature surface mount Multi-Layer Varistors (MLVs) for small electronics applications and Metal Oxide Varistors (MOVs) for higher energy applications. For more information visit Littelfuse.com/varistor

<table>
<thead>
<tr>
<th>SERIES NAME</th>
<th>PHOTO</th>
<th>OPERATING V AC RANGE</th>
<th>OPERATING V DC RANGE</th>
<th>PEAK CURRENT RANGE (A)</th>
<th>PEAK ENERGY RANGE (J)</th>
<th>OPERATING TEMPERATURE</th>
<th>MOUNT/ FORM FACTOR</th>
<th>DISC SIZE</th>
<th>AGENCY APPROVALS</th>
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</thead>
<tbody>
<tr>
<td>SURFACE MOUNT MLV / MOV</td>
<td></td>
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<tr>
<td>ML</td>
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<td>2.7-107</td>
<td>5.5-120</td>
<td>4-500</td>
<td>0.02-2.5</td>
<td>-55 to +125 °C</td>
<td>Surface Mount</td>
<td>Not Applicable</td>
<td>7, 10, 14, 20 mm</td>
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<td>CH</td>
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<td>14-275</td>
<td>18-369</td>
<td>100-400</td>
<td>1.0-8.0</td>
<td>-55 to +125 °C</td>
<td>Surface Mount</td>
<td>Not Applicable</td>
<td>10, 14, 20 mm</td>
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<td>SM7</td>
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<td>115-510</td>
<td>369-675</td>
<td>1200</td>
<td>10-40</td>
<td>-55 to +65 °C</td>
<td>Surface Mount</td>
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<td>10, 14, 20 mm</td>
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<td>20-320</td>
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<td>RADIAL LEADED MOV</td>
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<td>THERMALLY PROTECTED MOV</td>
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</tbody>
</table>
SE-601 SERIES (PGR-2601)

Dc Ground-Fault Monitor

**Description**
The SE-601 is a microprocessor-based ground-fault relay for ungrounded dc systems. It provides sensitive ground-fault protection without the problems associated with nuisance tripping. Ground-fault current is sensed using an SE-GRM Series Ground-Reference Module—a resistor network that limits ground-fault current to 25 mA. The SE-601 is used on ungrounded dc systems ranging from industrial 24 V dc control circuits to 1000 V dc solar and transportation systems.

**Features & Benefits**

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable pickup (1-20 mA)</td>
<td>Ten settings provide a wide range of low-level protection</td>
</tr>
<tr>
<td>Adjustable time delay (50 ms - 2.5 s)</td>
<td>Adjustable trip delay allows quick protection or delayed response</td>
</tr>
<tr>
<td>Output contacts</td>
<td>Form A and Form B output contacts for operation of separate annunciation and trip circuits</td>
</tr>
<tr>
<td>Analog output (0-5 V)</td>
<td>Provides means for connecting to a meter (PGA-0500) or a control system</td>
</tr>
<tr>
<td>Non-volatile trip memory</td>
<td>Retains trip state when de-energized to simplify troubleshooting</td>
</tr>
<tr>
<td>Selectable contact operating mode</td>
<td>Selectable fail-safe or non-fail-safe operating modes allow connection to shunt or undervoltage breaker coil</td>
</tr>
<tr>
<td>Microprocessor-based</td>
<td>No calibration required saves on maintenance cost</td>
</tr>
</tbody>
</table>

**Accessories**

**SE-GRM Series Ground-Reference Module** Required accessory, used to connect the SE-601 dc Ground-Fault Monitor to the dc bus.

**PGA-0500 Analog % Current Meter** Optional panel-mounted analog meter displays ground-fault current as a percentage of 22 mA.

**Specifications**

<table>
<thead>
<tr>
<th>IEEE Device Numbers</th>
<th>Dc Overcurrent Relay (76G)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>See ordering information</td>
</tr>
<tr>
<td>Dimensions</td>
<td>H 75 mm (3.0”); W 55 mm (2.2”); D 115 mm (4.5”)</td>
</tr>
<tr>
<td>Trip Level Settings</td>
<td>1-20 mA</td>
</tr>
<tr>
<td>Trip Time Settings</td>
<td>0.05 - 2.5 s</td>
</tr>
<tr>
<td>Output Contacts</td>
<td>Isolated Form A and Form B</td>
</tr>
<tr>
<td>Contact Operating Mode</td>
<td>Selectable fail-safe or non-fail-safe</td>
</tr>
<tr>
<td>Test Button</td>
<td>Local</td>
</tr>
<tr>
<td>Reset Button</td>
<td>Local and remote</td>
</tr>
<tr>
<td>Analog Output</td>
<td>0-5 V</td>
</tr>
<tr>
<td>Conformally Coated</td>
<td>Consult factory</td>
</tr>
<tr>
<td>Approvals</td>
<td>CSA certified, UL Listed (E340889), CE (European Union), C-Tick (Australian)</td>
</tr>
<tr>
<td>Warranty</td>
<td>5 years</td>
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<tr>
<td>Mounting</td>
<td>DIN, surface (standard)</td>
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**Ordering Information**

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>CONTROL POWER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE-601-OU</td>
<td>120/240 V ac/V dc</td>
</tr>
<tr>
<td>SE-601-OD</td>
<td>12/24 V dc</td>
</tr>
<tr>
<td>SE-601-OT</td>
<td>48 V dc</td>
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</table>

<table>
<thead>
<tr>
<th>ACCESSORIES</th>
<th>REQUIREMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE-GRM SERIES</td>
<td>Required</td>
</tr>
<tr>
<td>PGA-0500</td>
<td>Optional</td>
</tr>
<tr>
<td>PMA-55</td>
<td>Optional</td>
</tr>
<tr>
<td>PMA-60</td>
<td>Optional</td>
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</tbody>
</table>

Note: For optional conformal coating please consult factory.
EL731 SERIES
Ac/Dc Sensitive Earth-Leakage Relay

Description
The EL731 is a microprocessor-based ac/dc Sensitive Earth-Leakage Relay that offers complete coverage for all frequencies from 0 to 6,000 Hz. Two CTs are required for the entire frequency range, or one CT can be used for only low- or high-frequency detection. An RTD/PTC sensor input allows over-temperature protection for a motor or drive. The EL731 offers metering, password-protected alarm and trip settings and optional network communications. It is primarily used to add low-level ground-fault protection to variable-speed drives, and to dc circuits.

Simplified Circuit Diagram

Ordering Information

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>CONTROL POWER</th>
<th>COMMUNICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL731-00-X0</td>
<td>120/240 V ac/V dc</td>
<td>None</td>
</tr>
<tr>
<td>EL731-01-X0</td>
<td>120/240 V ac/V dc</td>
<td>DeviceNet*</td>
</tr>
<tr>
<td>EL731-02-X0</td>
<td>120/240 V ac/V dc</td>
<td>Profibus*</td>
</tr>
<tr>
<td>EL731-03-X0</td>
<td>120/240 V ac/V dc</td>
<td>EtherNet/IP*</td>
</tr>
<tr>
<td>EL731-04-X0</td>
<td>120/240 V ac/V dc</td>
<td>Modbus* TCP</td>
</tr>
<tr>
<td>EL731-05-X0</td>
<td>48 V dc &amp; 24 V ac</td>
<td>None</td>
</tr>
<tr>
<td>EL731-06-X0</td>
<td>48 V dc &amp; 24 V ac</td>
<td>DeviceNet</td>
</tr>
<tr>
<td>EL731-07-X0</td>
<td>48 V dc &amp; 24 V ac</td>
<td>Profibus</td>
</tr>
<tr>
<td>EL731-08-X0</td>
<td>48 V dc &amp; 24 V ac</td>
<td>EtherNet/IP</td>
</tr>
<tr>
<td>EL731-09-X0</td>
<td>48 V dc &amp; 24 V ac</td>
<td>Modbus TCP</td>
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<td>EL731-11-X0</td>
<td>24 V dc</td>
<td>DeviceNet</td>
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<td>EL731-12-X0</td>
<td>24 V dc</td>
<td>Profibus</td>
</tr>
<tr>
<td>EL731-13-X0</td>
<td>24 V dc</td>
<td>EtherNet/IP</td>
</tr>
<tr>
<td>EL731-14-X0</td>
<td>24 V dc</td>
<td>Modbus TCP</td>
</tr>
</tbody>
</table>

Note: When building a part number, replace the “X” with “1” for AS/NZS 2081:2011 Compliant product, “0” otherwise.

*DeviceNet, Profibus, EtherNet/IP and Modbus TCP are trademarks of their respective owners.

Accessories

- **EFCT Series Earth-Fault Current Transformer**
  Required zero-sequence current transformer specifically designed for low-level detection.

- **AC700-CUA Series Communication Adapter**
  Optional network-interface and firmware-upgrade communications adapters field-install in EL731.

- **AC700-SMK DIN-rail & Surface-mount Adapter**
  EL731 plugs into adapter for back-plane mounting.
SPD2 PV SERIES
Type 2/Type 1CA Pluggable Multi-Pole for PV Systems

Description
Surge protection devices (SPDs) provide equipment protection from transient overvoltage events lasting micro-seconds. By limiting the overvoltage to the equipment during these events, costly damage and downtime can be mitigated.

The surge protection devices for solar string box and inverter applications are available in 1100 and 1500 V dc in the 3+0 configuration.

Features & Benefits

<table>
<thead>
<tr>
<th>FEATURES</th>
<th>BENEFITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capability to clamp and withstand high-energy transients</td>
<td>Ensures low-residual voltage during high-energy surge events and higher nominal discharge current to prevent disruption, downtime, and degradation or damage to equipment</td>
</tr>
<tr>
<td>No additional overcurrent protection devices required in UL applications</td>
<td>Reduces the number of components and costs required for protection</td>
</tr>
<tr>
<td>Compact footprint</td>
<td>Increases panel design flexibility</td>
</tr>
<tr>
<td>Visual life indicator</td>
<td>Quick visual determines module replacement status to avoid loss of protection</td>
</tr>
<tr>
<td>Pluggable modules</td>
<td>Fast and simple to replace, minimizing maintenance and downtime. No tools required</td>
</tr>
<tr>
<td>Thermal protection</td>
<td>Eliminates catastrophic failure</td>
</tr>
<tr>
<td>IP20 protection rating</td>
<td>Finger-safe design increases worker protection</td>
</tr>
</tbody>
</table>

Internal Configuration

Legend
- Protective Earth
- RC Optional Remote Contact
- TD Thermal Disconnection

Module & Base Ordering Information

<table>
<thead>
<tr>
<th>Ordering Number</th>
<th>IEC Electrical</th>
<th>UL Electrical</th>
<th>Single Unit Weight</th>
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<tbody>
<tr>
<td></td>
<td>Maximum Continuous Operating DC Voltage (U&lt;sub&gt;cpv&lt;/sub&gt;)</td>
<td>Nominal Discharge Current (8/20 µs) (I&lt;sub&gt;n&lt;/sub&gt;)</td>
<td>Maximum Discharge Current (8/20 µs) (I&lt;sub&gt;lin&lt;/sub&gt;)</td>
</tr>
<tr>
<td>SPD2-PV11-3P0-R</td>
<td>1100 V</td>
<td>20 kA</td>
<td>40 kA</td>
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<tr>
<td>SPD2-PV15-3P0-R</td>
<td>1500 V</td>
<td>15 kA</td>
<td>40 kA</td>
</tr>
</tbody>
</table>
SPD2 PV SERIES

Module & Base Part Numbering System

SPD2 PV VV XPZ R

Optional Remote Contact
Neutral (1=yes or 0=no)
Number of Poles

Series Photovoltaic
Maximum Continuous Operating DC Voltage in Hundreds

Module Only Part Numbering System

SPD2 PV VV M

Module Only DC Voltage

Series Photovoltaic

Replacement Module Ordering Information

<table>
<thead>
<tr>
<th>Ordering Number</th>
<th>IEC Electrical</th>
<th>UL Electrical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Maximum Continuous Operating DC Voltage (U_{CPV})</td>
<td>Nominal Discharge Current (8/20 µs) (I_n)</td>
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<td>SP02-PV550-M</td>
<td>1100 V</td>
<td>20 kA</td>
</tr>
<tr>
<td>SP02-PV750-M</td>
<td>1500 V</td>
<td>15 kA</td>
</tr>
</tbody>
</table>

Specifications

Mode of Protection
Nominal Discharge Current (8/20 µs) (I_n) 20 kA
Maximum Discharge Current (8/20 µs) (I_{max}) Up to 40 kA
Protective Elements High Energy MOV
Response Time (t_R) < 25 ns
Number of Ports 1

Mechanical & Environmental
Operating Temperature Range (T_J) -40 °C to +80 °C (-40 °F to +185 °F)
Permissible Operating Humidity (RH) 5% to 95%
Altitude (max) 4,000 m (13,123 ft)
Terminal Screw Torque (M_{max}) 4.5 Nm (39.9 lbf-in)
Conductor Cross Section (max) 35 mm² (2 AWG) (Solid, Stranded)/ 25 mm² (4 AWG) (Flexible)
Mounting 35 mm DIN Rail, EN60715
Degree of Protection IP20 (built-in)
Housing Material Thermoplastic: Extinguishing Degree UL 94 V-0
Thermal Protection Yes

Operating State/Fault Indication
Green Flag/No Green Flag
Remote Contact Switching Capacity
AC: 250 V/1 A, 125 V/1 A; DC: 48 V/0.5 A, 24 V/0.5 A, 12 V/0.5 A
Remote Contact Conductor Cross Section (max) 1.5 mm² (16 AWG) (Solid)
Standards Passed
UL 1449 4th Edition; E320116

Product Dimensions
3TE Module and Base
H 90.7 mm (3.57”); W 53.8 mm (2.11”); D 66.1 mm (2.60”)
1TE Replacement Module
H 45.0 mm (1.77”); W 18.0 mm (0.71”); D 57.2 mm (2.25”)

Package Dimensions
3TE Module and Base
H 102.0 mm (4.01”); W 64.0 mm (2.52”); D 110.0 mm (4.33”)
1TE Replacement Module
H 102.0 mm (4.01”); W 28.0 mm (1.10”); D 110.0 mm (4.33”)

With over 25 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 standard photovoltaic installations.
Local Resources for a **GLOBAL** Market

Sales and Technical Support

- **United States and Mexico**
  - Phone: +1 800 TEC FUSE
  - Phone: +1 800 832 3873
  - Fax: +1 800 522 7697

- **Brazil**
  - Phone: +55 11 4427 6261

- **Canada**
  - Phone: +1 306 373 5505

- **China**
  - Hong Kong
    - Phone: +852 2810 5099
  - Shanghai
    - Phone: +86 21 2327 6000
  - Shenzhen
    - Phone: +86 755 8207 0760
  - Taiwan
    - Phone: +886 2 8751 1234

- **Europe**
  - Phone: +49 4244 819149

- **India**
  - Phone: +65 6885 9185

- **Japan**
  - Phone: +81 45 478 1088

- **Singapore**
  - Phone: +65 6885 9188

- **South Korea**
  - Phone: +82 2 6000 8600

- **United Arab Emirates (UAE)**
  - Phone: +971 4341 3660

**Protection Relays & Controls Catalog (PF130N)**
The comprehensive line of electronic and microprocessor-based protection relays, timers, and flashers safeguard equipment and personnel to prevent expensive damage, downtime or injury due to electrical faults.

**Fuses & Fuse Holders Catalog (PF101N)**
Littelfuse offers a complete circuit protection portfolio of industrial power fuses, including time-saving indication products for an instant visual blown-fuse identification.

**Surge Protection Devices Catalog (PF612)**
These surge protection devices safeguard components from transient overvoltage or surges.

Visit Technical Resources at Littelfuse.com
Technical information is only a click away. The Littelfuse Technical Resources section contains datasheets, product manuals, white papers, application guides, demos, on-line design tools, and more.