Local Resources for a **GLOBAL** Market

**NEW Solar Fuses & Holders**

**SPNH Series**
- Solar Fuse

**LFNH Series**
- Fuse Holder
- Fuse Terminal Covers

**LFPXV Series**
- Touch-Safe Fuse Holders

**Sales and Technical Support**

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

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

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**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 and 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.

Visit Technical Resources at Littelfuse.com
Technical information is only a click away. The Littelfuse Technical Resources contains databases, product manuals, whitepapers, application guides, demos, on-line design tools, and more.
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<td>Transient Voltage Suppression (TVS) Diodes</td>
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<th>Page</th>
</tr>
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<tbody>
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<td>SE-601 Ground-Fault Monitor</td>
<td>22</td>
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<td>EL731 Sensitive Earth-Leakage Relay</td>
<td>23</td>
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Description

The Littelfuse SPXV solar string fuse is designed specifically for 6-30 A 1500 Vdc applications.

Features/Benefits

- 10 x 85 mm package size
- UL 248-19 Listed
- Meets IEC 60269-6 electrical performance requirements
- 30,000 A interrupting rating

Applications

- Inverters
- Combiner boxes

Web Resources

Download technical resources at: littelfuse.com/spxv

Specifications

Voltage Rating
1500 Vdc

Amperage Rating
6, 8, 10, 12, 15, 20, 25, 30 A

Interrupting Rating
15 kA (UL 248-19)
30 kA (Self-Certified)

Time Constant
≤ 1ms

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

Series
SPXV

Amp Code
Refer to datasheet for amp code

Package Quantity
T = 10
L = 50

Applications

- Inverters
- Combiner boxes

Dimensions mm (inches)

6 – 20 A

84.65 (3.333)

10.31 (.406)

25 – 30 A

84.65 (3.333)

13.72 (0.540)

10.00 (0.394)
POWR-GARD® 1500 V Solar Rated Products

SPXI SERIES IN-LINE SOLAR FUSES

1500 Vdc • 2.5-30 A (Patent Pending)

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 approved heat-shrink.

Features/Benefits
- UL 248-19 Recognized
- Meets IEC 60269-6 electrical performance requirements
- 30,000 A interrupting rating
- No fuse holder required

Applications
- Photovoltaic wire harness

Recommended Crimping Tool
T&B Sta-Kon ERG4002

Dimensions mm (in)

2.5-4 A
- 3.56 (0.140)

6-20 A
- 3.56 (0.140)

25-30 A
- 3.56 (0.140)

Specifications
- Voltage Rating: 1500 Vdc
- Amperage Rating: 2.5, 3.5, 4, 6, 8, 10, 12, 15, 20, 25, 30 A
- Interrupting Ratings:
  - 15 kA (UL 248-19)
  - 30 kA (Self-Certified)
- Time Constant: ≤ 1 ms
- Material:
  - Body: Melamine
  - Caps: Copper Alloy (Nickel Plated)
- Approvals:
  - UL 248-19 Recognized (File: E339112)
- Environmental:
  - RoHS Compliant
  - REACH
- Country of Origin: Mexico

Part Numbering System
- SPXI xxx T
- Series
- Amp Code
  - Refer to datasheet for amp code
- Package Quantity
  - T = 10
  - L = 50

Web Resources
Download additional technical information and view the complete solar portfolio: littelfuse.com/spxi
SPNH SERIES SOLAR FUSE
1500 Vdc • 50-400 A • NH Style

Description
The SPNH series has been designed to meet the emerging circuit protection needs for 1500 volt photovoltaic 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
- 1500Vdc 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

Specifications
- Voltage Rating: 1500 Vdc
- Amperage Rating: 50, 63, 80, 100, 125, 160, 200, 250, 315, 350, 400
- Interrupting Rating: 15kA
- Time Constant: ≤ 2ms
- Material: Body: Ceramic End Bells: Copper Alloy
- Approvals: UL 248-19 Listed (File: E339112, Vol. 4) (50-200A) 250-400A pending IEC 60269-6

Part Numbering System
- Series: SPNH
- Amp Code: Refer to Amp Code Column in Electrical Specifications Table
- Package Quantity: X = 1
- Case Size*: X = 1XL size 2XL = 2XL size 3L = 3L size
- Termination*: Blank = Solid Blade DL = S Blade DE = U blade

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

*Solid blade option for 1XL case size does not require a case or termination designator for the part number.
SPNH SERIES SOLAR FUSE AND FUSE HOLDER

Dimensions Millimeters (in)

Size: 1 XL

Fuseholder
LFNH152001CST

Specifications
Voltage Rating: 1500V
Ampere Rating: 200A
Approvals: UL Recognized (E345481, Vol 2)
Recommended Torque: Mounting Plate: 12N-m
Terminal: 32N-m
Material:
Fuse Clip: Silver Plated Copper
Spring: Zinc Plated Steel
Mounting Plate: Zinc Plated Steel
Insulator: Ceramic

Fuse Terminal Cover
LFNH15200FBC

Specifications
Voltage Rating: 1500V
Ampere Rating: 200A
Flammability Rating: UL94 V-0
Material: V0 rated Nylon
Packaging: Sold in pairs
**Description**

The Littelfuse LFPXV fuse holder is designed to hold 1500 V 10x85mm 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/lfpvx

**Ordering Information**

<table>
<thead>
<tr>
<th>SERIES</th>
<th>VOLTAGE (Vdc)</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>LFPXV</td>
<td>1500</td>
<td>1</td>
<td>LFPXV001</td>
<td>LFPXV001D</td>
<td>20</td>
<td>Box Lug</td>
</tr>
</tbody>
</table>

**TERMINAL INFORMATION**

<table>
<thead>
<tr>
<th>TERMINAL TYPE</th>
<th>NUMBER OF WIRES</th>
<th>WIRE SIZE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4-14 AWG (25-2.5 mm²)</td>
<td>24-28 lb-in (2.71-3.16 N-m)</td>
</tr>
<tr>
<td></td>
<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>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>6-14 AWG (16-2.5 mm²)</td>
<td>26-30 lb-in (2.94-3.69 N-m)</td>
</tr>
<tr>
<td>2</td>
<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>
</tr>
</tbody>
</table>

*Must be the same cross-sectioned size

**Specifications**

- **Voltage Ratings**: 1500 Vdc
- **Amperage Rating**: 30 A
- **SCCR Rating**: 50 kA
- **Power Dissipation**: 8W Maximum
- **Fuse Type**: 10x85mm
- **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 60929-6
- **Environmental**
  - RoHS compliant, Lead (Pb) free, REACH

**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>

**Busbar Specifications**

- **75°C or 90°C CU Only Stranded**
  - UL Class B and Class C wire
  - AlphaWire PV series Photovoltaic Wire
  - IEC Class 5 Flexible Wire

**Wire Type**

**BUSBAR SPECIFICATIONS**

- **WIRE TYPE**
  - 75°C or 90°C CU Only Stranded
  - UL Class B and Class C wire
  - AlphaWire PV series Photovoltaic Wire
  - IEC Class 5 Flexible Wire

**Environmental**

- RoHS compliant, Lead (Pb) free, REACH

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Look for this logo to indicate products that are used in solar applications. Visit our website littelfuse.com/solar for the latest updates on approvals, certifications, and new products.
LPXV TOUCH-SAFE FUSE HOLDERS

1500 V • 30 A

Description
The Littelfuse LPXV fuse holder is designed to hold 1500 V 10x85mm fuses.

Features/Benefits
- Finger-Safe design offers personnel protection
- No fuse pullers or tools required for fuse removal
- 35 mm DIN Rail Mountable
- Compact design

Recommended Fuses
Littelfuse SPXV 1500 V Fuses

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

Specifications
Voltage Ratings: 1500 V
Amperage Rating: 30 A
SCCR Rating: 15 kA
Fuse Type: 10x85mm
Material: Thermoplastic
Flammability Rating: UL94 V-0
Temperature Stability: Body: 125° C  Carrier: 140° C
Approvals: UL 4248-18 Listed (File: E345481)  IEC 60269-1 & IEC 60269-2
Environmental: RoHS compliant, Lead (Pb) free

Dimensions Inches (mm)

Ordering Information

<table>
<thead>
<tr>
<th>SERIES</th>
<th>VOLTAGE (Vdc)</th>
<th>POLES</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
<th>PACK QTY</th>
<th>TERMINAL TYPE</th>
<th>WIRE TYPE</th>
<th>NUMBER OF WIRES</th>
<th>WIRE SIZE</th>
<th>TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPXV</td>
<td>1500</td>
<td>1</td>
<td>LPXV001</td>
<td>LPXV0001Z</td>
<td>5</td>
<td>Box Lug</td>
<td>1</td>
<td>6-4 AWG (16-25 mm²)</td>
<td>22-26 lb-in (2.9-3 N-m)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>18-8 AWG (.75-10 mm²)</td>
<td>18-22 lb-in (2.5 N-m)</td>
<td></td>
</tr>
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<td></td>
<td></td>
<td>2*</td>
<td>18-6 AWG (.75-16 mm²)</td>
<td>18-22 lb-in (2.5 N-m)</td>
<td></td>
</tr>
</tbody>
</table>

*Must be the same cross-sectioned size

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Description

The SPFJ series is the smallest 1000 Vdc 70-450 A photovoltaic fuse available in the market. The SPFJ series is manufactured in Class J case sizes 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

Recommended Fuse Holder

LFJ1000 Solar Series

Web Resources

Download technical documents: Littelfuse.com/spfj

Specifications

Voltage Rating
1000 Vdc
600 Vac (125-450 A)

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)
RoHS Compliant

Environmental
Country of Origin
Mexico

Part Numbering System

**Series**

**Amp Code**

Refer to datasheet for amp code

**Mounting Options**

Blank = Class J
XL = 8.5 mm opening

**Package Quantity**

X = 1

<table>
<thead>
<tr>
<th>SERIES</th>
<th>AMP</th>
<th>PACKAGE QUANTITY</th>
<th>MOUNTING METHOD</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPFJ</td>
<td>70</td>
<td>1</td>
<td>CLASS J</td>
<td>SPFJ070</td>
<td>SPFJ070.X</td>
</tr>
<tr>
<td>SPFJ</td>
<td>200</td>
<td>1</td>
<td>LARGE</td>
<td>SPFJ200</td>
<td>SPFJ200.XXL</td>
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</tbody>
</table>

Dimensions Inches (mm)

**AMPERAGE**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-100</td>
<td>3.02</td>
<td>4.38</td>
<td>5.75</td>
<td>1.5</td>
<td>1.125</td>
<td>.335</td>
<td>.189</td>
</tr>
<tr>
<td>125-200</td>
<td>3.02</td>
<td>4.38</td>
<td>5.75</td>
<td>1.5</td>
<td>1.125</td>
<td>.335</td>
<td>.281</td>
</tr>
<tr>
<td>250-400</td>
<td>3.37</td>
<td>5.25</td>
<td>7.125</td>
<td>2.0</td>
<td>1.63</td>
<td>.406</td>
<td>.252</td>
</tr>
<tr>
<td>450</td>
<td>3.75</td>
<td>5.98</td>
<td>8.0</td>
<td>2.5</td>
<td>2.0</td>
<td>.531</td>
<td>.374</td>
</tr>
</tbody>
</table>

* SPFJ L option = 8.5 mm (UL 248-19 approval only)

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**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 Vdc maximum
- 1-30 A ratings available
- 20,000 A Interrupting Rating - 1A - 20A
- 50,000 A Interrupting Rating - 25A - 30A
- Both PCB mount and dead-front holder options available

**Applications**

- Inverters
- Combiner boxes
- Battery charge controllers

**Recommended Fuse Holders**

LPHV 1000 Vdc POWR-Safe Series

**Web Resources**

Download technical documents: littelfuse.com/spf

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**Specifications**

**Voltage Rating**

1000 VDC

**Amperage Rating**

1, 2, 3, 3.5, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30

**Max. Interrupting Rating**

20 kA - 1A - 20A
50 kA - 25A - 30A

**Time Constant**

≤ 2ms

**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
Mexico

**Environmental**

Country of Origin: Mexico

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**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

**Catalog Number**

SPFxxxx H XR

**Ordering Number**

0SPF002 T
0SPF03.5 T
0SPF030 HXR

**Dimensions Inches (mm)**

**Ferrule Version**

1.5 (38.1)

**PCB Version**

1.5 (38.1)

0.6 (1.52)
0.5 (1.27)
0.4 (1.02)

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POWR-GARD® 1000 V Solar Rated Products

SPFI SERIES IN-LINE SOLAR FUSE

1000 Vdc • 2-30 A (Patent Pending)

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 2579 for photovoltaic applications. The SPFI can be electrically insulated by either overmolding or using approved heat-shrink.

Features/Benefits
- UL 2579 Recognized
- Meets IEC 60269-6 electrical performance requirements
- 20,000 A Interrupting Rating
- No fuse holder required

Applications
- Photovoltaic wire harness

Specifications
- Voltage Rating: 1000 Vdc
- 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: ≤ 1ms
- Material
  - Body: Melamine
  - Caps: Copper Alloy (Nickel Plated)
- Approvals
  - UL 2579 Recognized (File: E339112)
  - RoHS Compliant
  - REACH
- Country of Origin: Mexico

Part Numbering System

<table>
<thead>
<tr>
<th>SERIES</th>
<th>AMP</th>
<th>PACKAGE QUANTITY</th>
<th>CATALOG NUMBER</th>
<th>ORDERING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPFI 2</td>
<td>10</td>
<td>SPF002</td>
<td>SPF002.T</td>
<td></td>
</tr>
<tr>
<td>SPFI 3.5</td>
<td>10</td>
<td>SPF03.5</td>
<td>SPF03.5T</td>
<td></td>
</tr>
<tr>
<td>SPFI 20</td>
<td>50</td>
<td>SPF020</td>
<td>SPF020.L</td>
<td></td>
</tr>
</tbody>
</table>

Amp Code
Refer to datasheet for amp code

Package Quantity
T = 10
L = 50

Dimensions mm (in)

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

Recommended Crimping Tool
T&B Sta-Kon ERG4002
POWR-GARD® 1000 V Solar Rated Products

POWR-GARD® 1000 V Solar Rated Products

1000 VDC • Clip-to-Box • Stud-to-Stud • Clip-to-Stud

Specifications

Voltage Ratings
1000 VDC

Ampere Ratings
200, 400, 450 A

Flammability Rating
UL94 V-0

Termination Type
Box Lug or Stud Mount

Base Temp Rating
130˚ C

Approvals
UL 4248-18 Listed

File: E345481 Vol. 1 RoHS Compliant

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

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 configurations; 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

Ordering Information

(Clip-to-Box Lug 1000 V)

<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 (127mm² - 16mm²)</td>
<td>Cu/Al</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 (177mm² - 55mm²)</td>
<td>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 (253mm² - 25mm²)</td>
<td>Solid/Stranded</td>
<td>375 in-lb (42.4 N-m)</td>
</tr>
</tbody>
</table>

(Sud-to-Stud 1000 V)

<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 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” 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>5/16” 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></td>
</tr>
</tbody>
</table>

(Clip-to-Stud 1000 V)

<table>
<thead>
<tr>
<th>AMPERAGE</th>
<th>ORDERING NUMBER</th>
<th>INTERRUPT RATING</th>
<th>RECOMMENDED TORQUE TERMINAL</th>
<th>MAX. BUSBAR THICKNESS</th>
<th>RECOMMENDED BASE TORQUE BOLT SIZE TORQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>LFJ102001CST</td>
<td>20 kA</td>
<td>200 in-lb (22.6 N-m)</td>
<td>.774” (19.66 mm)</td>
<td>1/4” 30-40 in-lb</td>
</tr>
<tr>
<td>400</td>
<td>LFJ104001CST</td>
<td>10 kA</td>
<td>200 in-lb (22.6 N-m)</td>
<td>.555” (14.10 mm)</td>
<td>5/16” 40-50 in-lb</td>
</tr>
<tr>
<td>450</td>
<td>LFJ104501CST</td>
<td>20 kA</td>
<td>300 in-lb (33.9 N-m)</td>
<td>.570” (14.18 mm)</td>
<td></td>
</tr>
</tbody>
</table>

Littelfuse.com/solar
POWR-GARD® 1000 V Solar Rated Products

SPFR SERIES AND SPFRHV SERIES

SPFR 1000 VDC Solar Fuse

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

Specifications
- Voltage Rating: 1000 VDC
- Ampere Rating: 250, 300, 350, 400
- Interrupting Rating: 10,000 A; Time Constant less than 1 ms
- Fuse Type: Fast-acting
- Approvals: UL 248 Recognized (File: 71611)
  CSA Certified (File: 29862)

Ordering Information

<table>
<thead>
<tr>
<th>AMPERAGE</th>
<th>PART NUMBER</th>
<th>ORDERING NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>SPFR 250</td>
<td>SPFR250.X</td>
</tr>
<tr>
<td>300</td>
<td>SPFR 300</td>
<td>SPFR300.X</td>
</tr>
<tr>
<td>350</td>
<td>SPFR 350</td>
<td>SPFR350.X</td>
</tr>
<tr>
<td>400</td>
<td>SPFR 400</td>
<td>SPFR400.X</td>
</tr>
</tbody>
</table>

Web Resources
Downloadable CAD drawings and other technical information:
Littelfuse.com/spfr

Dimensions mm (inches)

SPFRHV 1000 VDC Fuse Block

Description
The Littelfuse SPFRHV fuse block is designed to hold Littelfuse high amperage (250-400 A) SPFR fuses.

Specifications
- Voltage Rating: 1000 VDC
- Amperage Rating: 250 - 400 A
- Approvals: UL 4248 Recognized (File: E14721)
  CSA (File: 29862)
- Environmental: RoHS Compliant

Ordering Information

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>AMPERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPFRHV4001ST</td>
<td>250 - 400</td>
</tr>
</tbody>
</table>

Web Resources
Downloadable CAD drawings and other technical information:
Littelfuse.com/spfrhv

Dimensions mm (inches)
POWR-GARD® 1000 V Solar Rated Products

LPHV POWR-SAFE FUSE HOLDERS

1000 VDC

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

Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Rating</td>
<td>1000 VDC</td>
</tr>
<tr>
<td>Amperage Rating</td>
<td>30 A</td>
</tr>
<tr>
<td>SCCR Rating</td>
<td>20 kA</td>
</tr>
<tr>
<td>Power Dissipation</td>
<td>4 W Maximum</td>
</tr>
<tr>
<td>Fuse Type</td>
<td>10 X 38 mm up to 1000 VDC</td>
</tr>
<tr>
<td>Material</td>
<td>Thermoplastic</td>
</tr>
<tr>
<td>Flammability Rating</td>
<td>UL94 V-0</td>
</tr>
<tr>
<td>Approval</td>
<td>Self-certified 1000 VDC</td>
</tr>
<tr>
<td>Environmental</td>
<td>RoHS compliant, Lead (Pb) Free</td>
</tr>
</tbody>
</table>

Multi-Pole Assembly Kit
Kits are used to create multi-pole holders from 1-pole LPHV fuse holders. Please contact factory for more information.

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYHP001</td>
<td>20 Connector Pincers &amp; 10 handle Pins</td>
</tr>
<tr>
<td>CYHP002</td>
<td>Connector Pincer Only</td>
</tr>
<tr>
<td>CYHP003</td>
<td>Handle Pin Only</td>
</tr>
</tbody>
</table>

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 VDC 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>Stranded /</td>
<td>#8-14 AWG (2-10 mm²) /</td>
<td>17.7 in-lbs</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>[Solid]</td>
<td>[#10-14 AWG (2-6 mm²)] /</td>
<td>(2 N-m)</td>
<td></td>
</tr>
<tr>
<td>LPHV</td>
<td>2</td>
<td>LPHV002</td>
<td>LPHV0002Z</td>
<td>75° C or 90° C</td>
<td>CU Only</td>
<td>0.7 (17.7)</td>
<td>1.40 (35.56)</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.1 (53.34)</td>
<td>2.1 (53.34)</td>
<td></td>
</tr>
<tr>
<td>LPHV</td>
<td>3</td>
<td>LPHV003</td>
<td>LPHV0003Z</td>
<td></td>
<td></td>
<td>0.7 (17.7)</td>
<td>1.40 (35.56)</td>
<td>•</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>2.1 (53.34)</td>
<td>2.1 (53.34)</td>
<td></td>
</tr>
<tr>
<td>LPHV</td>
<td>4</td>
<td>LPHV004</td>
<td>LPHV0004Z</td>
<td></td>
<td></td>
<td>0.7 (17.7)</td>
<td>1.40 (35.56)</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.1 (53.34)</td>
<td>2.1 (53.34)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.7 (17.7)</td>
<td>1.40 (35.56)</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2.1 (53.34)</td>
<td>2.1 (53.34)</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions Inches (mm)

Littelfuse.com/solar
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 Vac/dc
1000 Vdc*

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 kA³
Conductor Copper
Pitch 17.8 mm
Approvals UL 508 Listed (File E328654)
Environmental RoHS Compliant
Lead (Pb) free

*1 Phase 18 mm² rated 1000 Vdc up to 160 A when center fed
1 Phase 25 mm² rated 1000 Vdc up to 200 A when center fed
1 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>ORDERING NUMBER</th>
<th>POLES</th>
<th>LENGTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1PH3P18mm</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>1PH4P18mm</td>
<td>4</td>
<td>79</td>
</tr>
<tr>
<td>1PH6P18mm</td>
<td>6</td>
<td>104</td>
</tr>
<tr>
<td>1PH9P18mm</td>
<td>9</td>
<td>155</td>
</tr>
<tr>
<td>1PH12P18mm</td>
<td>12</td>
<td>208</td>
</tr>
<tr>
<td>1PH15P18mm</td>
<td>15</td>
<td>270</td>
</tr>
<tr>
<td>1PH57P18mm</td>
<td>57</td>
<td>1009</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>POLES</th>
<th>LENGTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1PH3P25mm</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>1PH4P25mm</td>
<td>4</td>
<td>79</td>
</tr>
<tr>
<td>1PH6P25mm</td>
<td>6</td>
<td>104</td>
</tr>
<tr>
<td>1PH9P25mm</td>
<td>9</td>
<td>155</td>
</tr>
<tr>
<td>1PH12P25mm</td>
<td>12</td>
<td>208</td>
</tr>
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<td>1PH15P25mm</td>
<td>15</td>
<td>270</td>
</tr>
<tr>
<td>1PH57P25mm</td>
<td>57</td>
<td>1009</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>POLES</th>
<th>LENGTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PH6P18mm</td>
<td>6</td>
<td>104</td>
</tr>
<tr>
<td>3PH9P18mm</td>
<td>6</td>
<td>158</td>
</tr>
<tr>
<td>3PH12P18mm</td>
<td>12</td>
<td>214</td>
</tr>
<tr>
<td>3PH15P18mm</td>
<td>15</td>
<td>266</td>
</tr>
<tr>
<td>3PH57P18mm</td>
<td>57</td>
<td>1009</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>POLES</th>
<th>LENGTH (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PH6P25mm</td>
<td>6</td>
<td>104</td>
</tr>
<tr>
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<td>6</td>
<td>158</td>
</tr>
<tr>
<td>3PH12P25mm</td>
<td>12</td>
<td>214</td>
</tr>
<tr>
<td>3PH15P25mm</td>
<td>15</td>
<td>266</td>
</tr>
<tr>
<td>3PH57P25mm</td>
<td>57</td>
<td>1009</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>AMP 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>
</tr>
</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 Vac/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
- **Material**: Thermoplastic
- **Flammability Rating**: UL94 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>Catalog Number</th>
<th>Ordering Number</th>
<th>Fuse Type</th>
<th>Poles</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPSC0011D</td>
<td>LPSC0001ZXID</td>
<td>Class CC</td>
<td>1</td>
</tr>
<tr>
<td>LPSC0021D</td>
<td>LPSC0002ZXID</td>
<td>Class CC</td>
<td>2</td>
</tr>
<tr>
<td>LPSC0031D</td>
<td>LPSC0003ZXID</td>
<td>Class CC</td>
<td>3</td>
</tr>
<tr>
<td>LPSC0041D</td>
<td>LPSC0004ZXID</td>
<td>Class CC</td>
<td>4</td>
</tr>
<tr>
<td>LPSM0011D</td>
<td>LPSM0001ZXID</td>
<td>Midget</td>
<td>1</td>
</tr>
<tr>
<td>LPSM0021D</td>
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<tr>
<td>LPSM0031D</td>
<td>LPSM0003ZXID</td>
<td>Midget</td>
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</tr>
<tr>
<td>LPSM0041D</td>
<td>LPSM0004ZXID</td>
<td>Midget</td>
<td>4</td>
</tr>
</tbody>
</table>

**Dimensions Inches (mm)**

1-pole  | 2-pole  | 3-pole  | 4-pole  |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7 (17.78)</td>
<td>1.40 (35.56)</td>
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**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)
POWR-GARD® 600 V Solar Rated Products

KLKD SERIES 10X38 FUSES

600 Vac/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 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 UL1741 GFDI requirements

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

Dimensions Inches (mm)

<table>
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<tr>
<th>Ferrule Version</th>
<th>PCB 1-Tab</th>
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Specifications
- Voltage Rating: 600 Vac/Vdc
- Amperage Rating: 1/10, 1/8, 1/4, 3/10, 1/2, 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, 200 kA Littelfuse self-certified
DC: 1/10-30: 10 kA (UL 2579)
DC: 1/10-30: 50 kA (UL 248-14)
- Material: Body: Melamine / Caps: Copper Alloy
- Operating Temperature: See Rating Curve
- Approvals: UL 2579 Listed (File: E339112)
IEC 60269-6 (2-25 A)
VDE Certified (No. 4003094)
UL 248-14 Listed (File: E10480)
CSA Certified Ferrule only (File: LR29862)
- Environmental: RoHS Compliant
Country of Origin: Mexico

Part Numbering System

<table>
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<tr>
<th>Series</th>
<th>Amp Code</th>
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<td>KLKD</td>
<td>xxx</td>
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</table>

Mounting Options
- Blank = Ferrule
- XR = PCB 1-tab

Package Quantity
- 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
POWR-GARD® 600 V Solar Rated Products

POWR-BLOKS™
Distribution Blocks • Splicer Blocks • Covers

Description
POWR-BLOKS™ power distribution blocks offer a safe, convenient way of splicing cables, providing a fixed junction tap-off point or splitting primary power into secondary circuits. Lx2xxx-DIN series offers integral DIN-Rail mount and an optional hinged safety cover.

Optional power distribution block covers provide protection against accidental shorting between poles caused by loose wires, tools, or other conductive material. They also protect personnel from accidentally contacting energized connectors. To order protective covers, match the number of poles for the block to the cover.

Applications
Typical applications include heating, air conditioning and refrigeration systems, elevator systems, material handling equipment, control panels, motor controls, switchgear, and anywhere power needs to be distributed to more than one load.

Connectors
Box lug connectors are designed for use with a single, solid or class B or C stranded conductor. Use of more than one conductor per connector opening or use of extra-flexible, fine-stranded conductors, such as welding cable, voids the UL Listing and may cause overheating. 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 2014 NEC® Table 310.16 (this reference has changed to Table 310.15(B)(16) effective with the 2017 NEC®). 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 2014 NEC Table 310.16 (or NEC Table 310.15(B)(16) effective with 2017 NEC), using 75°C copper wire
Material Phenolic rated at 150°C and Thermoplastic rated at 125°C (LD1400 and LS1300 series only)
Connector Standard: Highly conductive aluminum, tin plated Copper: Highly conductive copper, tin plated
Flammability Rating UL94 V-0
Approvals UL Recognized - OLD/OLS Series (File: E171395) LFD/LFS Series (File: E309688) CSA Certified - OLD/OLS Series (File: LR700111) LFD/LFS Series (File: 007316_0_000) UL Listed - OLD57xxx (File: E482231)
Environmental RoHS compliant, Lead (Pb) free

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

Hinged Plastic Covers

Clear Plastic Covers
POWR-GARD® 600 V Solar Rated Products

IGBT MODULE, HALF-BRIDGE

600 / 1200 V • S Package • D Package • WB Package

Specifications

Voltage Rating

600 / 1200 V

Amperage Rating

S Package: 75, 100, 150, 200
D Package: 100, 150, 200, 300, 400
WB Package: 225, 300, 450, 600

Circuit Type

Half-Bridge

Approvals

UL Listed (File: E71639)

Environmental

RoHS Compliant

Part Numbering System

M G xx xx S-B xx xx

Product Type

M: Power Module

Module Type

G: IGBT

Voltage Rating

06: 600 V
12: 1200 V

Current Rating

Ordering Information

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Dimensions Inches (mm)

S Package Type

D Package Type

WB Package Type

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 its first 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

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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 (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 200 W to 30 kW, and reverse standoff voltages from 5 V to 512 V. For more information visit Littelfuse.com/tvsdiodes

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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 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.

It is important to build surge withstandability in the inverter and at locations before damaging transients may reach sensitive equipment.

Littelfuse.com/solar | 20 | © 2017 Littelfuse Solar Products Catalog
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 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

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<th>PHOTO</th>
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<th>OPERATING Vdc RANGE</th>
<th>PEAK CURRENT RANGE (A)</th>
<th>PEAK ENERGY RANGE (J)</th>
<th>OPERATING TEMPERATURE</th>
<th>MOUNT/FORM FACTOR</th>
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<td>Radial Leaded</td>
<td>5, 7, 10, 14, 20 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THERMALLY PROTECTED MOV</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td>SMOV™ 25S</td>
<td></td>
<td>115-750</td>
<td>150-970</td>
<td>20000</td>
<td>170-670</td>
<td>-45 to +75°C</td>
<td>Industrial Packaged</td>
<td>25 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SMOV™ 34S</td>
<td></td>
<td>115-750</td>
<td>150-970</td>
<td>40000</td>
<td>280-1200</td>
<td>-45 to +75°C</td>
<td>Industrial Packaged</td>
<td>34 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMV® 25S</td>
<td></td>
<td>115-750</td>
<td>150-970</td>
<td>20000</td>
<td>170-670</td>
<td>-45 to +75°C</td>
<td>Radial Leads</td>
<td>25 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMV® 34S</td>
<td></td>
<td>115-750</td>
<td>150-970</td>
<td>40000</td>
<td>235-1050</td>
<td>-55 to +85°C</td>
<td>Radial Leads</td>
<td>34 mm</td>
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<td></td>
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<tr>
<td>TMV®/iTMOV®</td>
<td></td>
<td>115-750</td>
<td>150-970</td>
<td>6000-10000</td>
<td>35-480</td>
<td>-55 to +85°C</td>
<td>Radial Leads</td>
<td>14, 20 mm</td>
<td></td>
<td></td>
</tr>
</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-Vdc control circuits to 1000-Vdc 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 Approvals</td>
<td>Consult factory</td>
</tr>
<tr>
<td>CSA certified</td>
<td>Consult factory</td>
</tr>
<tr>
<td>CE (European Union)</td>
<td>Consult factory</td>
</tr>
<tr>
<td>C-Tick (Australian)</td>
<td>Consult factory</td>
</tr>
<tr>
<td>UL Listed (E340889)</td>
<td>Consult factory</td>
</tr>
<tr>
<td>Warranty</td>
<td>5 years</td>
</tr>
<tr>
<td>Mounting</td>
<td>DIN, Surface (standard)</td>
</tr>
<tr>
<td></td>
<td>Panel (with PMA-55 or PMA-60 adapter)</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>ORDERING NUMBER</th>
<th>CONTROL POWER</th>
<th>ACCESSORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE-601-0U</td>
<td>120/240 Vac/Vdc</td>
<td>Required</td>
</tr>
<tr>
<td>SE-601-0D</td>
<td>12/24 Vdc</td>
<td>Required</td>
</tr>
<tr>
<td>SE-601-0T</td>
<td>48 Vdc</td>
<td>Required</td>
</tr>
<tr>
<td>SE-GRM SERIES</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>PGA-0500</td>
<td>Optional</td>
<td></td>
</tr>
<tr>
<td>PMA-55</td>
<td>Optional</td>
<td></td>
</tr>
<tr>
<td>PMA-60</td>
<td>Optional</td>
<td></td>
</tr>
</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 Vac/Vdc</td>
<td>None</td>
</tr>
<tr>
<td>EL731-01-X0</td>
<td>120/240 Vac/Vdc</td>
<td>DeviceNet™</td>
</tr>
<tr>
<td>EL731-02-X0</td>
<td>120/240 Vac/Vdc</td>
<td>Profinet®</td>
</tr>
<tr>
<td>EL731-03-X0</td>
<td>120/240 Vac/Vdc</td>
<td>EtherNet/IP™</td>
</tr>
<tr>
<td>EL731-04-X0</td>
<td>120/240 Vac/Vdc</td>
<td>Modbus® TCP</td>
</tr>
<tr>
<td>EL731-10-X0</td>
<td>48 Vdc &amp; 24 Vac</td>
<td>None</td>
</tr>
<tr>
<td>EL731-11-X0</td>
<td>48 Vdc &amp; 24 Vac</td>
<td>DeviceNet™</td>
</tr>
<tr>
<td>EL731-12-X0</td>
<td>48 Vdc &amp; 24 Vac</td>
<td>Profinet®</td>
</tr>
<tr>
<td>EL731-13-X0</td>
<td>48 Vdc &amp; 24 Vac</td>
<td>EtherNet/IP™</td>
</tr>
<tr>
<td>EL731-14-X0</td>
<td>48 Vdc &amp; 24 Vac</td>
<td>Modbus® TCP</td>
</tr>
<tr>
<td>EL731-20-X0</td>
<td>24 Vdc</td>
<td>None</td>
</tr>
<tr>
<td>EL731-21-X0</td>
<td>24 Vdc</td>
<td>DeviceNet™</td>
</tr>
<tr>
<td>EL731-22-X0</td>
<td>24 Vdc</td>
<td>Profinet®</td>
</tr>
<tr>
<td>EL731-23-X0</td>
<td>24 Vdc</td>
<td>EtherNet/IP™</td>
</tr>
<tr>
<td>EL731-24-X0</td>
<td>24 Vdc</td>
<td>Modbus® TCP</td>
</tr>
</tbody>
</table>

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.

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

For detailed wiring diagram, see adjacent page.
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