



Expertise Applied | Answers Delivered



## SOLAR PRODUCTS CATALOG



**1500 V DC PRODUCTS**

**OVERVOLTAGE PROTECTION**

**IN-LINE FUSES**

**PROTECTION RELAYS**

**SURGE PROTECTION**

# Our Most Popular Solar Products



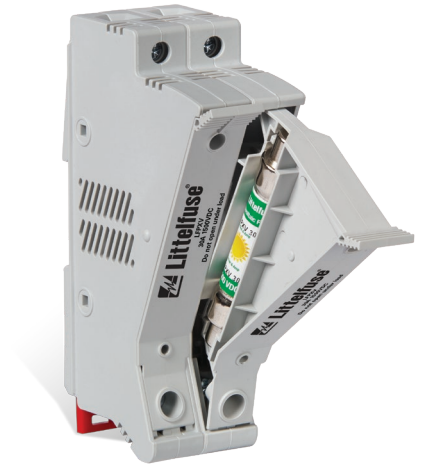
LFNH Series  
Fuse Holder

LFNH Series  
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

# TABLE OF CONTENTS

<b>1</b>	<b>1500 V RATED PRODUCTS</b>		
	SPXV String Fuses.....		2
	SPXI In-Line Fuses.....		3
	SPNH Fuses .....		4
	LFPXV Touch-Safe Fuse Holders.....		6
	LFNH Fuse Block.....		8
<b>2</b>	<b>1000 V RATED PRODUCTS</b>		
	SPFJ High Amperage Fuses.....		12
	SPF String Fuses.....		13
	SPFI In-Line Fuses .....		14
	LFJ1000 Open-Face Fuse Blocks.....		15
	LPHV POWR-Safe Fuse Holders.....		16
	Bus Bar System.....		17
<b>3</b>	<b>600 V RATED PRODUCTS</b>		
	Bus Bar System.....		17
	LPSC/LPSM POWR-Safe Dead-Front Fuse Holders.....		18
	KLKD 10 x 38 mm (Midget) Fuses.....		19
	POWR-BLOKS Distribution Blocks and Covers .....		20
<b>4</b>	<b>OVERVOLTAGE &amp; SWITCHING ELECTRONIC PRODUCTS</b>		
	IGBT Power Modules .....		21
	Transient Voltage Suppression (TVS) Diodes.....		22
	Overvoltage Suppression Varistors (MOV).....		23
<b>5</b>	<b>PROTECTION RELAY PRODUCTS</b>		
	SE-601 Ground-Fault Monitor.....		24
	EL731 Sensitive Earth-Leakage Relay.....		25
<b>6</b>	<b>SURGE PROTECTION DEVICE PRODUCTS</b>		
	SPD2 PV Series Surge Protection Device .....		26
	<b>APPENDIX</b>		
	Solar Products by Application.....		28



# SPXV SERIES STRING SOLAR FUSE

1500 V dc • 1 – 30 A



1



## Description

The Littelfuse SPXV solar string fuse is designed specifically for 1-30 A 1500 V dc 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

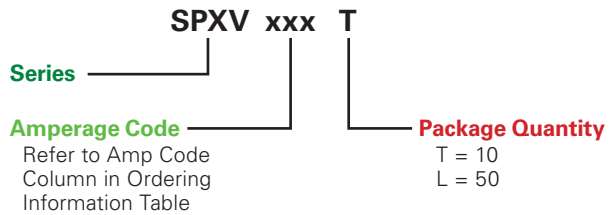
## Web Resources

Download technical resources at: [littelfuse.com/spxv](http://littelfuse.com/spxv)  
For silver plated version: [littelfuse.com/spxvs](http://littelfuse.com/spxvs)

## Specifications

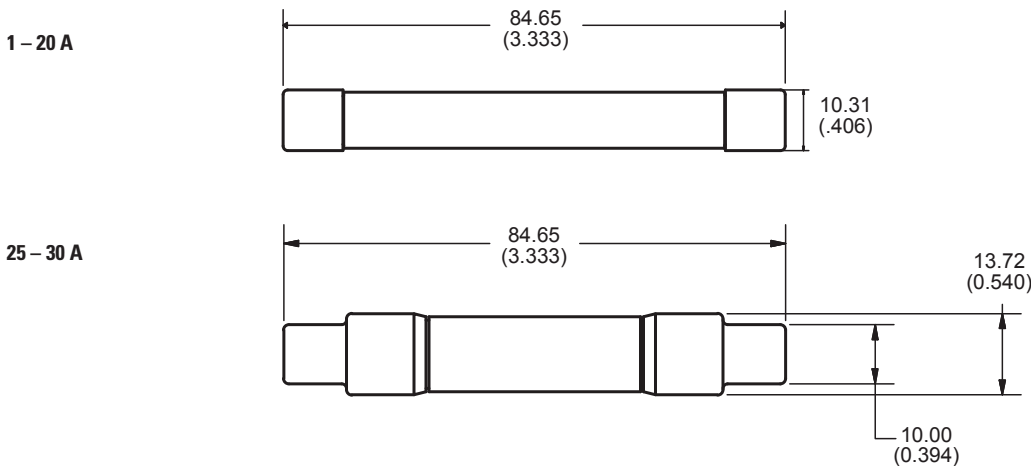
<b>Voltage Rating</b>	1500 V dc
<b>Amperage Rating</b>	1, 2, 2.25, 2.5, 3, 3.5, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30 A
<b>Interrupting Rating</b>	15 kA (UL 248-19) 50 kA (Self-Certified) 1A – 20A 30 kA (Self-Certified) 25A – 30A
<b>Time Constant</b>	≤ 1 ms
<b>Material</b>	Body: Melamine Caps: Copper Alloy (Nickel Plated)
<b>Approvals</b>	UL 248-19 Listed (File: E339112)
<b>Environmental</b>	RoHS Compliant REACH
<b>Country of Origin</b>	Mexico

## Part Numbering System



SERIES	AMP	PACKAGE QUANTITY	CATALOG NUMBER	ORDERING NUMBER
SPXV	6	10	SPXV006	SPXV006.T
SPXV	20	50	SPXV020	SPXV020.L

## Dimensions mm (inches)



# SPXI SERIES IN-LINE SOLAR FUSES

1500 V dc • 2.5-30 A



## Description

The Littelfuse SPXI solar fuse is designed to integrate into an in-line assembly within a wire harness. The fuse series 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

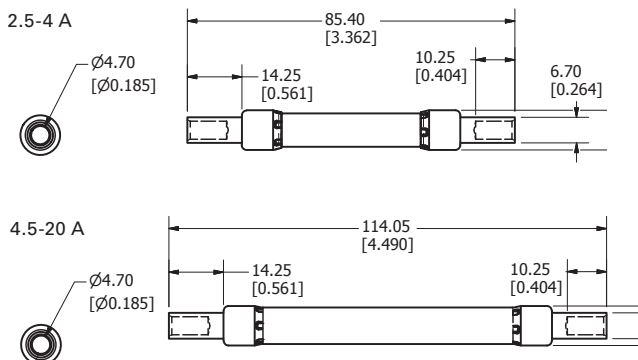
## Applications

- Photovoltaic wire harness

## Recommended Crimping Tool

T&B Sta-Kon ERG4002

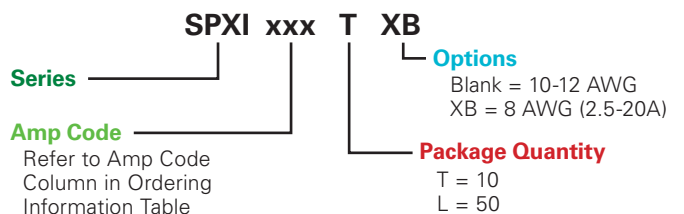
## SPXI-B Dimensions mm (in)



## Specifications

<b>Voltage Rating</b>	1500 V dc
<b>Ampere Rating</b>	2.5, 3.5, 4, 4.5, 6, 8, 10, 12, 15, 20, 25, 30 A
<b>Interrupting Ratings</b>	15 kA (UL 248-19) 30 kA (Self-Certified)
<b>Time Constant</b>	≤ 1 ms
<b>Material</b>	Body: Melamine Caps: Copper Alloy (Nickel Plated)
<b>Approvals</b>	UL 248-19 Recognized (File: E339112)
<b>Environmental</b>	RoHS Compliant REACH
<b>Country of Origin</b>	Mexico
<b>US Patent</b>	9,564,281

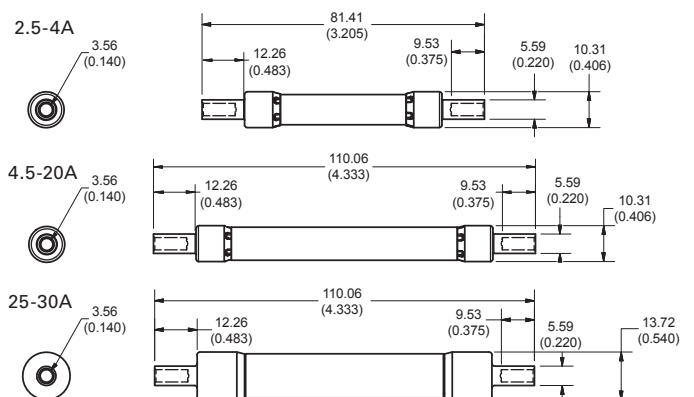
## Part Numbering System



## Web Resources

Download additional technical information and view the complete solar portfolio: [littelfuse.com/spxi](http://littelfuse.com/spxi)

## SPXI Dimensions mm (in)



# SPNH SERIES SOLAR FUSE

1500 V dc • 50-400 A • NH Style



1



## 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

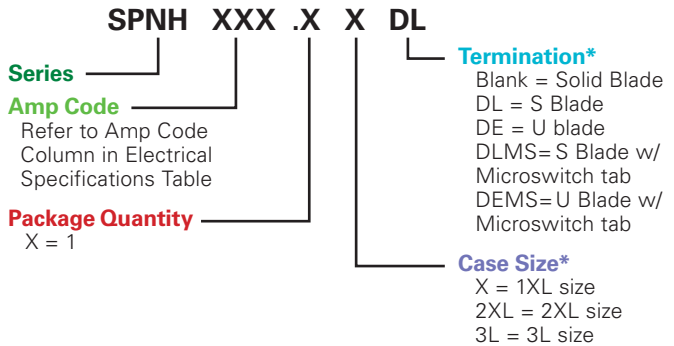
## Web Resources

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

## Specifications

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

## Part Numbering System



SERIES	AMPERAGE	PACKAGE QUANTITY	CATALOG NUMBER	ORDERING NUMBER
SPNH	50	1	SPNH050	SPNH050.X
SPNH	200	1	SPNH200	SPNH200.X
SPNH	400	1	SPNH400	SPNH400.XXDLMS

\*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

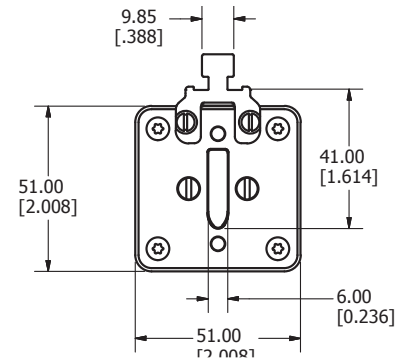
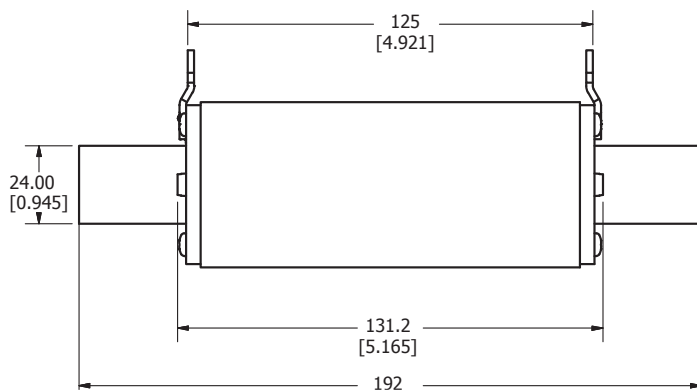


# SPNH SERIES SOLAR FUSE

1

## Dimensions Millimeters (in)

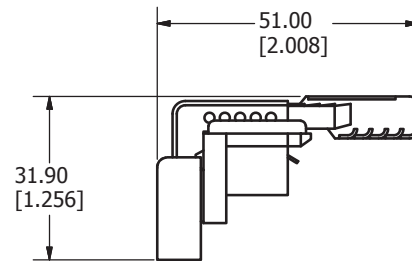
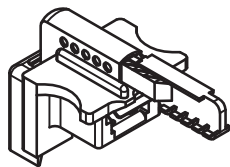
Size: 1 XL



## Microswitch

MSSPNH1500X

## Dimensions Millimeters (in)



# LFPXV TOUCH-SAFE FUSE HOLDERS

1500 V • 30 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](http://Littelfuse.com/LFPXV)

## Ordering Information

SERIES	VOLTAGE (V dc)	POLES	CATALOG NUMBER	ORDERING NUMBER	PACK QTY	TERMINAL INFORMATION			
						TERMINAL TYPE	NUMBER OF WIRES	WIRE SIZE	TORQUE
LFPXV	1500	1	LFPXV001	LFPXV0001Z	20	Box Lug	1	4-14 AWG (25-2.5 mm <sup>2</sup> )	24-28 lb-in (2.71-3.16 N-m)
							1	16-18 AWG (1.5-0.75 mm <sup>2</sup> )	18-22 lb-in (2.03-2.49 N-m)
							2*	6-14 AWG (16-2.5 mm <sup>2</sup> )	26-30 lb-in (2.94-3.69 N-m)
							2*	16-18 AWG (1.5-0.75 mm <sup>2</sup> )	20-24 lb-in (2.26-2.71 N-m)

\*Must be the same cross-sectioned size

## Specifications

<b>Voltage Ratings</b>	1500 V dc
<b>Amperage Rating</b>	30 A UL, 32 A Littelfuse self-certified
<b>SCCR Rating</b>	50 kA
<b>Power Dissipation</b>	8W maximum
<b>Fuse Type</b>	10 x 85 mm
<b>Material</b>	Thermoplastic
	Fuse Clip: Silver-plated copper alloy
	Screws: Zinc-plated steel
<b>Operating Temperature</b>	-55 °C to +125 °C
<b>Flammability Rating</b>	UL94 V-0
<b>Temperature Stability</b>	Body: 130 °C Carrier: 140 °C
<b>Approvals</b>	UL 4248-19 Listed (File: E345481) IEC 60269-6
<b>Environmental</b>	RoHS compliant, Lead (Pb) free, REACH
<b>Recommended DIN Rail</b>	TH 35-7,5 per IEC 60715

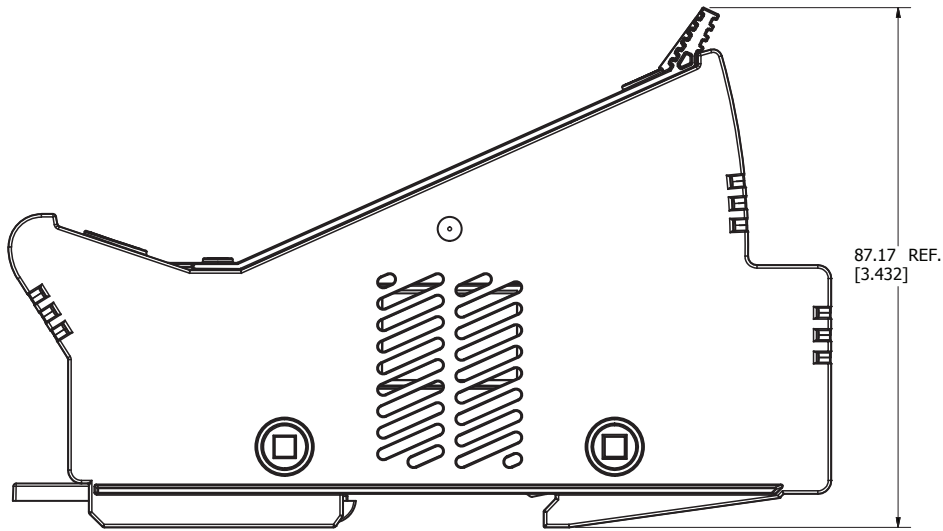
MATERIAL AND TEMP RATING	WIRE TYPE
75 °C or 90 °C CU Only Stranded	UL Class B and Class C wire
	AlphaWire PV Series Photovoltaic Wire
	IEC Class 5 Flexible Wire

BUSBAR SPECIFICATIONS			
TERMINAL	THICKNESS	WIDTH	TORQUE
Maximum	0.188 in (4.78 mm)	0.290 in (7.37 mm)	24-28 lb-in (2.71-3.16 N-m)
Minimum	0.125 in (3.18 mm)	0.200 in (5.08 mm)	

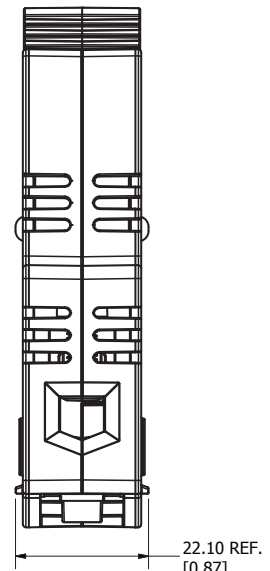


# LFPXV TOUCH-SAFE FUSE HOLDERS

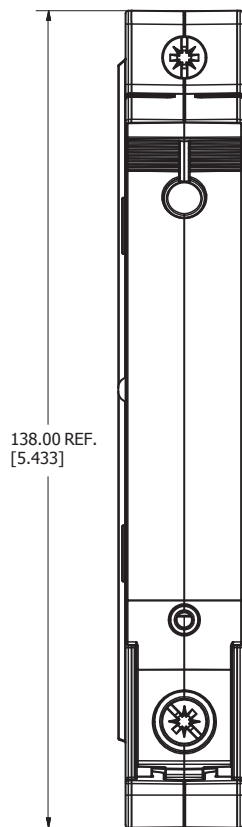
## Dimensions Millimeters (in)



Side View



Top View

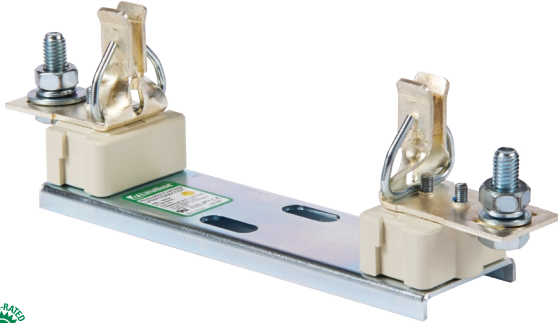


Front View

# LFNH SERIES FUSE BLOCK



1



## Description

The LFNH series fuse block is specifically designed for the Littelfuse SPNH 1500 V solar fuse. It meets UL electrical requirements, is available in multiple case sizes and has an optional cover to enclose the lugs.

## Features/Benefits

- Narrow width increases space savings
- Range of amperages to match all SPNH fuse options

## Specifications

<b>Voltage Rating</b>	1500 V dc
<b>Ampere Rating</b>	200, 400, 630 A
<b>Interrupt Rating</b>	30 kA
<b>Termination Type</b>	Stud Mount
<b>Base Temp Rating</b>	
<b>Approvals</b>	UL4248-1 UL4248-19 FILE: E345481 Vol. 2 RoHS Compliant
<b>Environmental Material</b>	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)**

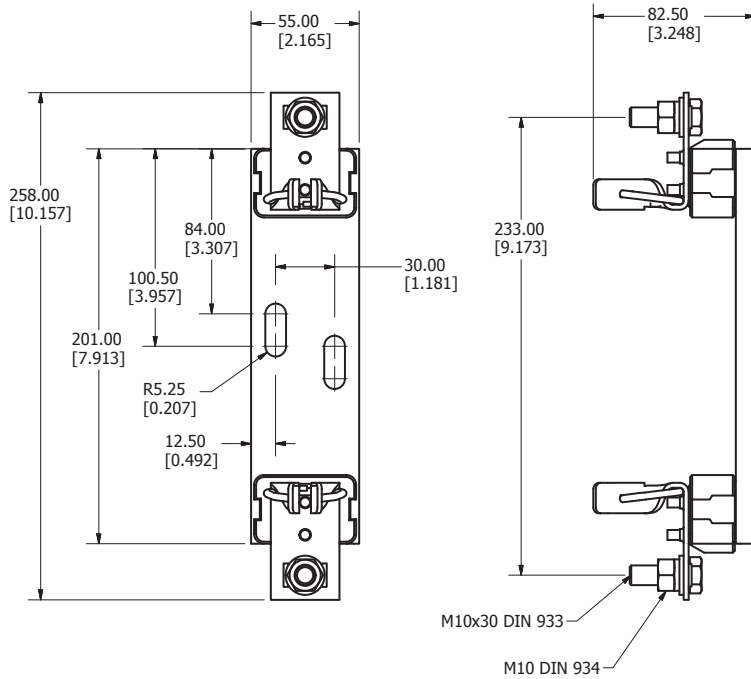
## Ordering Information

AMPERAGE	ORDERING NUMBER	FUSE SIZE	RECOMMENDED TORQUE		TERMINAL COVER ORDERING NUMBER*
			TERMINAL	BASE	
200	LFNH152001CST	NH1XL	283 in-lb (32 N-m)	132 in-lb (15 N-m)	LFNH15200FBC
400	LFNH154001CST	NH2XL	283 in-lb (32 N-m)	132 in-lb (15 N-m)	LFNH15400FBC
630	LFNH156301CST	NH3L	283 in-lb (32 N-m)	132 in-lb (15 N-m)	LFNH15630FBC

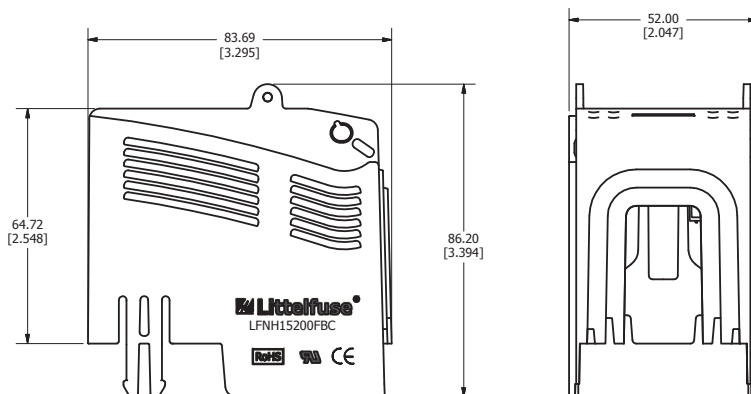
\*Terminal covers sold separately

# LFNH SERIES FUSE BLOCK

## Dimensions Millimeters (in)



**Fuse Block**  
**LFNH152001CST**



**Fuse Terminal Cover**  
**LFNH15200FBC**

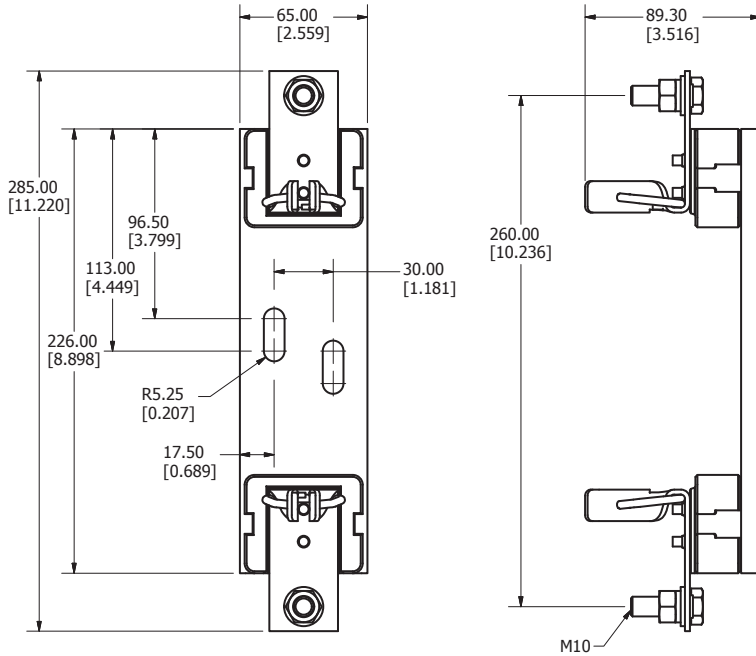
## Specifications

<b>Voltage Rating:</b>	1500 V
<b>Ampere Rating:</b>	200 amperes
<b>Flammability Rating:</b>	UL 94 V-0
<b>Material:</b>	V0-rated Nylon
<b>Packaging:</b>	Sold in pairs

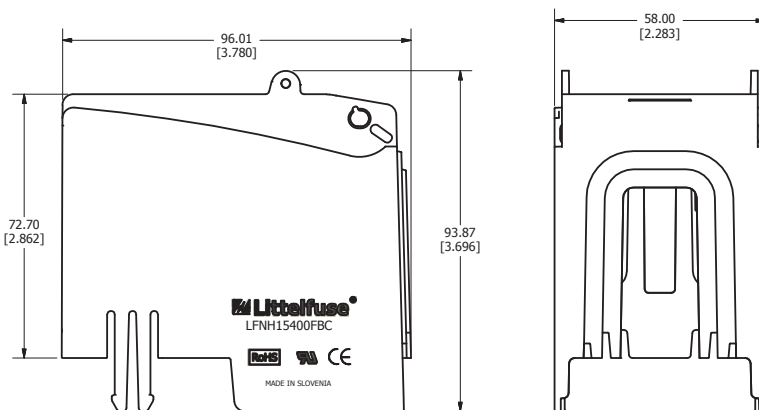
# LFNH SERIES FUSE BLOCK

## Dimensions Millimeters (in)

1



**Fuse Block**  
**LFNH154001CST**



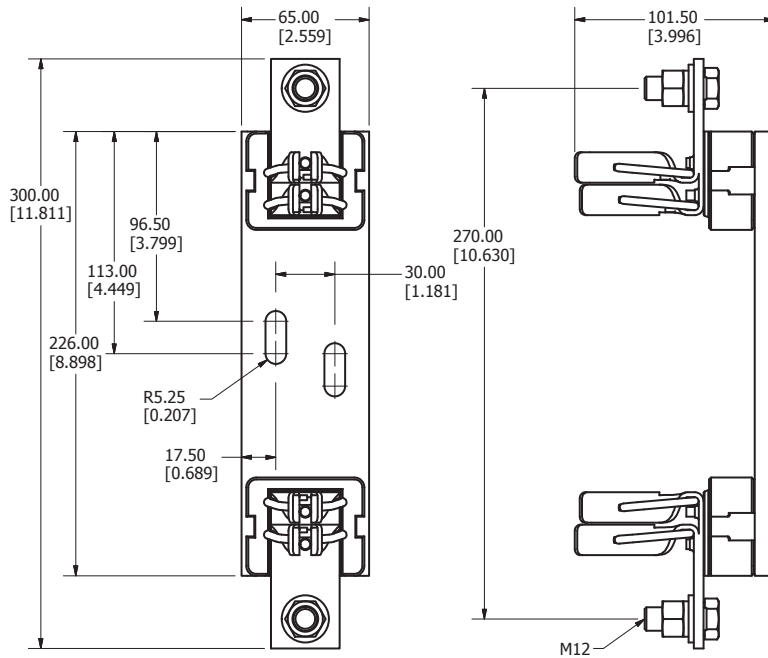
**Fuse Terminal Cover**  
**LFNH15400FBC**

### Specifications

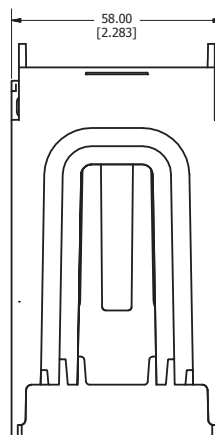
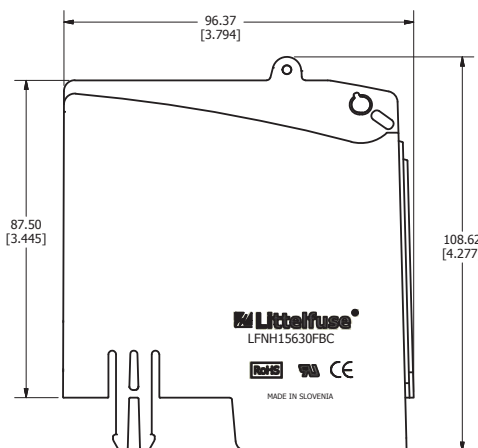
<b>Voltage Rating:</b>	1500 V
<b>Ampere Rating:</b>	400 amperes
<b>Flammability Rating:</b>	UL 94 V-0
<b>Material:</b>	V0-rated Nylon
<b>Packaging:</b>	Sold in pairs

# LFNH SERIES FUSE BLOCK

## Dimensions Millimeters (in)



**Fuse Block**  
**LFNH156301CST**



**Fuse Terminal Cover**  
**LFNH15630FBC**

## Specifications

<b>Voltage Rating:</b>	1500 V
<b>Ampere Rating:</b>	630 amperes
<b>Flammability Rating:</b>	UL 94 V-0
<b>Material:</b>	V0-rated Nylon
<b>Packaging:</b>	Sold in pairs

# SPFJ SERIES SOLAR FUSE

1000 V dc • 70-450 A



## Description

The SPFJ series is the smallest 1000 V dc 70-450 A photovoltaic (PV) 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

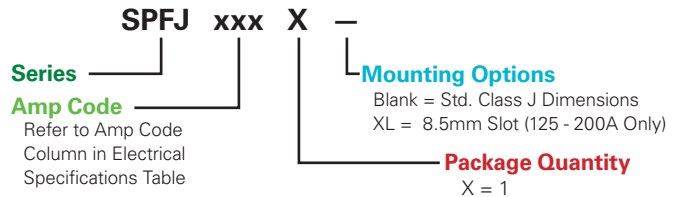
## Web Resources

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

## Specifications

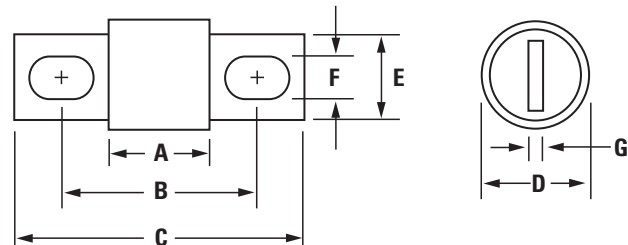
<b>Voltage Rating</b>	1000 V dc 600 V ac (125-450 A)
<b>Amperage Rating</b>	70, 80, 90, 100, 125, 160, 200, 250, 300, 350, 400, 450
<b>Interrupting Rating</b>	Ac: 200 kAIC (125-450 A) Dc: 70-200 A: 20 kAIC 250-400 A: 10 kAIC 450 A: 20 kAIC
<b>Time Constant</b>	≤ 1 ms
<b>Material</b>	Body: Melamine End Bells: Copper Alloy
<b>Approvals</b>	UL 248-19 Listed (File: E339112) UL 248-8, Class J (125-450 A) cULus (125-450 A) IEC 60269-6 (125-450 A)
<b>Environmental</b>	RoHS Compliant
<b>Country of Origin</b>	Mexico

## Part Numbering System



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

## Dimensions Inches (mm)



AMPERAGE	DIMENSIONS IN INCHES (MM)						
	A	B	C	D	E	F	G
70-100	3.02 (76.5)	4.38 (111.3)	5.75 (146.1)	1.5 (38.1)	1.125 (28.3)	.335 (8.5)	.189 (4.8)
125-200	3.02 (76.5)	4.38 (111.3)	5.75 (146.1)	1.5 (38.1)	1.125 (28.3)	.281 (7.1)*	.189 (4.8)
250-400	3.37 (85.7)	5.25 (133.4)	7.125 (181.0)	2.0 (50.8)	1.63 (41.3)	.406 (10.3)	.252 (6.4)
450	3.75 (95.3)	5.98 (152.0)	8.0 (203.2)	2.5 (63.5)	2.0 (50.8)	.531 (13.5)	.374 (9.5)

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

# SPF SERIES SOLAR FUSES

1000 V dc • 1-30 A



## 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

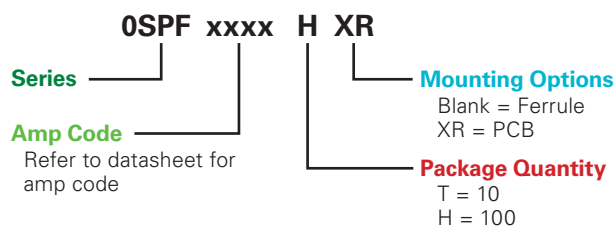
## Web Resources

Download technical documents: [littelfuse.com/spf](http://littelfuse.com/spf)

## Specifications

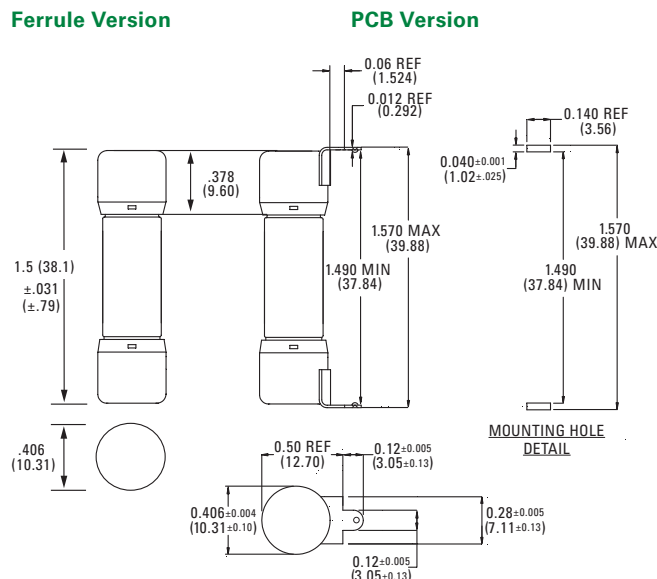
<b>Voltage Rating</b>	1000 V dc
<b>Amperage Rating</b>	1, 2, 3, 3.5, 4, 5, 6, 8, 10, 12, 15, 20, 25, 30
<b>Max. Interrupting Rating</b>	20 kA - 1 A - 20 A 50 kA - 25A - 30 A
<b>Time Constant</b>	≤ 2 ms
<b>Material</b>	Body: Melamine Caps: Copper Alloy
<b>Approvals</b>	UL 248-19 Listed (File: E339112)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

## Part Numbering System



SERIES	AMPERAGE	PACKAGE QUANTITY	MOUNTING METHOD	CATALOG NUMBER	ORDERING NUMBER
SPF	2	10	FERRULE	SPF002	0SPF002.T
SPF	3.5	10	FERRULE	SPF03.5	0SPF03.5T
SPF	30	100	PCB TABS	SPF030R	0SPF030.HXR

## Dimensions Inches (mm)



# SPFI SERIES IN-LINE SOLAR FUSE

1000 V dc • 2-30 A



## 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

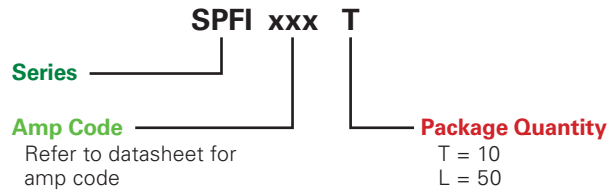
## Applications

- Photovoltaic wire harness

## Specifications

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

## Part Numbering System



SERIES	AMPERAGE	PACKAGE QUANTITY	CATALOG NUMBER	ORDERING NUMBER
SPFI	2	10	SPFI002	SPFI002.T
SPFI	3.5	10	SPFI03.5	SPFI03.5T
SPFI	20	50	SPFI020	SPFI020.L

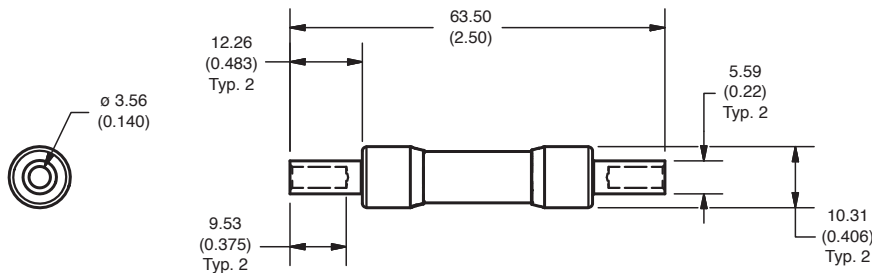
## Web Resources

Downloadable CAD drawings and other technical information:  
[littelfuse.com/spfi](http://littelfuse.com/spfi)

## Recommended Crimping Tool

T&B Sta-Kon ERG4002

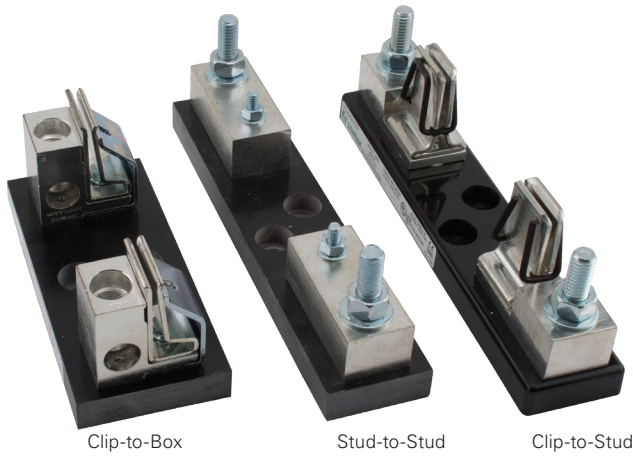
## Dimensions mm (in)





# LFJ1000 SERIES SOLAR FUSE BLOCK

1000 V dc • Clip-to-Box • Stud-to-Stud • Clip-to-Stud



## 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

## Ordering Information

### (Clip-to-Box Lug 1000 V)

AMPERAGE	ORDERING NUMBER	INTERRUPT RATING	WIRE RANGE STANDARD (METRIC)	WIRE TYPE		RECOMMENDED TORQUE
200	LFJ102001C	20 kA	250 kcmil - #6 (127 mm <sup>2</sup> - 16 mm <sup>2</sup> )	Cu/Al	Solid/ Stranded	275 in-lb (31.1 N-m)
400	LFJ104001C	10 kA	350 kcmil - 1/0 (177 mm <sup>2</sup> - 55 mm <sup>2</sup> )			275 in-lb (31.1 N-m)
450	LFJ104501C	20 kA	500 kcmil - #4 (253 mm <sup>2</sup> - 25 mm <sup>2</sup> )			375 in-lb (42.4 N-m)

### (Stud-to-Stud 1000 V)

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

### (Clip-to-Stud 1000 V)

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

## Specifications

<b>Voltage Rating</b>	1000 V dc
<b>Ampere Rating</b>	200, 400, 450 A
<b>Flammability Rating</b>	UL 94 V-0
<b>Termination Type</b>	Box Lug or Stud Mount
<b>Base Temp Rating</b>	130 °C
<b>Approvals</b>	UL 4248-18 Listed File: E345481 Vol. 1 RoHS Compliant
<b>Environmental</b>	

## Recommended Fuses

SPFJ Solar Series

## Web Resources

Sample requests, downloadable CAD drawings, dimensions and other technical information:

[Littelfuse.com/LFJ1000](http://Littelfuse.com/LFJ1000)

For a comprehensive overview of solar market solutions visit:

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

# LPHV POWR-SAFE FUSE HOLDERS

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 (PV) module strings for maintenance and meets UL requirements for 1000 V solar fuse protection.

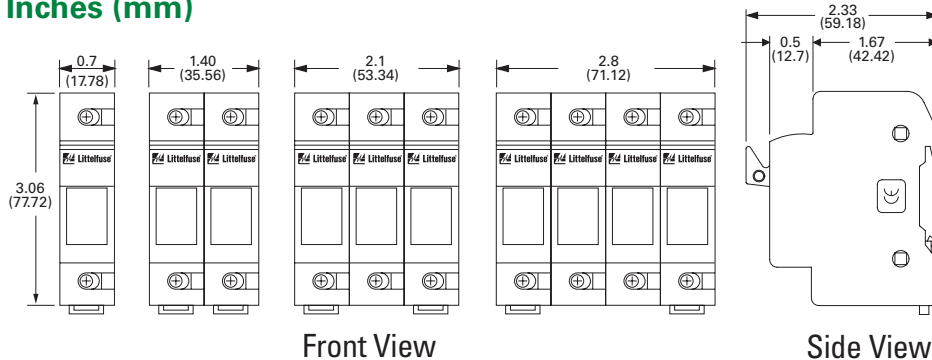
## Features/Benefits

- 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

## Ordering Information

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

## Dimensions Inches (mm)



## Specifications

<b>Voltage Rating</b>	1000 V dc
<b>Amperage Rating</b>	30 A
<b>SCCR Rating</b>	20 kA
<b>Power Dissipation</b>	4 W Maximum
<b>Fuse Type</b>	10 X 38 mm up to 1000 V dc
<b>Material</b>	Thermoplastic
<b>Flammability Rating</b>	UL 94 V-0
<b>Approval</b>	Self-certified 1000 V dc IEC 60269-2, -4, -6
<b>Environmental</b>	RoHS compliant, Lead (Pb) Free

## Multi-Pole Assembly Kit

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

ORDERING NUMBER	DESCRIPTION
CYHP001	20 Connector Pincers & 10 Handle Pins
CYHP002	Connector Pincer Only
CYHP003	Handle Pin Only

## Web Resources

Sample requests, downloadable CAD drawings and other technical information: [Littelfuse.com/lphv](http://Littelfuse.com/lphv)

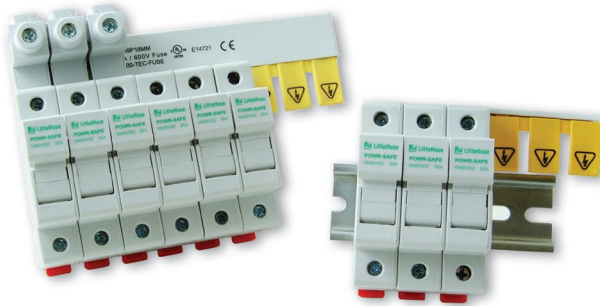
More information about solar applications: [Littelfuse.com/solar](http://Littelfuse.com/solar)

## Recommended Fuses

10 x 38 mm 1000 V dc Fuses  
SPF 1000 V Series  
FLU 1000 V Series

# 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](http://Littelfuse.com/busbar)

### Specifications

**Voltage Ratings** 600 V ac/dc  
1000 V dc\*

#### Current Ratings

CROSS SECTION (mm <sup>2</sup> )	18 mm <sup>2</sup>	25 mm <sup>2</sup>
END FED	80 A	100 A
CENTER FED	160 A	200 A

**SCCR** 10 kA, 100 kA<sup>†</sup>  
**Conductor** Copper  
**Pitch** 17.8 mm  
**Approvals** UL 508 Listed (File E328654)  
**Environmental** RoHS Compliant  
Lead (Pb) free

\*1 Phase 18 mm<sup>2</sup> rated 1000 V dc up to 160 A when center fed  
 1 Phase 25 mm<sup>2</sup> rated 1000 V dc up to 200 A when center fed  
<sup>†</sup>When protected directly upstream by Class J 175 amperes max (18 mm<sup>2</sup> bus bar) and Class J 200 amperes max (25 mm<sup>2</sup> bus bar).

### Ordering Information

1 PHASE, 18 mm <sup>2</sup>			LENGTH (mm)	1 PHASE, 25 mm <sup>2</sup>		
ORDERING NUMBER	POLES	ORDERING NUMBER		POLES	LENGTH (mm)	
1PH3P18mm	3	50	1PH3P25mm	3	50	
1PH4P18mm	4	79	1PH4P25mm	4	79	
1PH6P18mm	6	104	1PH6P25mm	6	104	
1PH9P18mm	9	155	1PH9P25mm	9	155	
1PH12P18mm	12	208	1PH12P25mm	12	208	
1PH15P18mm	15	270	1PH15P25mm	15	270	
1PH57P18mm	57	1009	1PH57P25mm	57	1009	

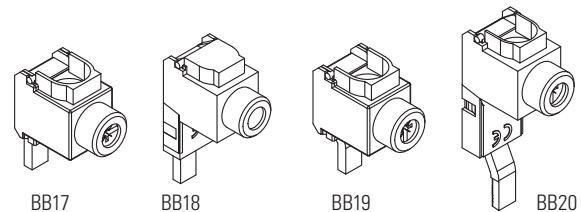
3 PHASE, 18 mm <sup>2</sup>			LENGTH (mm)	3 PHASE, 25 mm <sup>2</sup>		
ORDERING NUMBER	POLES	ORDERING NUMBER		POLES	LENGTH (mm)	
3PH6P18 mm	6	104	3PH6P25 mm	6	104	
3PH9P18 mm	6	158	3PH9P25 mm	9	158	
3PH12P18 mm	12	214	3PH12P25 mm	12	214	
3PH15P18 mm	15	266	3PH15P25 mm	15	266	
3PH57P18 mm	57	1009	3PH57P25 mm	57	1009	

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

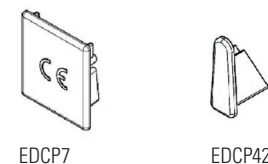
#### Power Feed Lug

PART NUMBER	AMPERAGE RATING	VOLTAGE (ac/ dc)	WIRE RANGE	WIRE TYPE	TORQUE
BB17	115	1000	#10 - 1/0 AWG	CU	50 lb-in
BB18	115	1000	#10 - 1/0 AWG	CU	50 lb-in
BB19	115	1000	#10 - 1/0 AWG	CU	50 lb-in
BB20	115	1000	#10 - 1/0 AWG	CU	50 lb-in



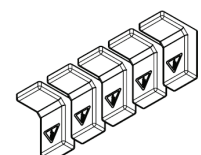
#### Endcaps

PART NUMBER	PHASE	QUANTITY
EDCP42	Single	50
EDCP7	Three	50



#### Pole Protective Covers

PART NUMBER	QUANTITY
CTPT5	5



2  
3

# LPSC / LPSM POWR-SAFE FUSE HOLDERS

600 V



## 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

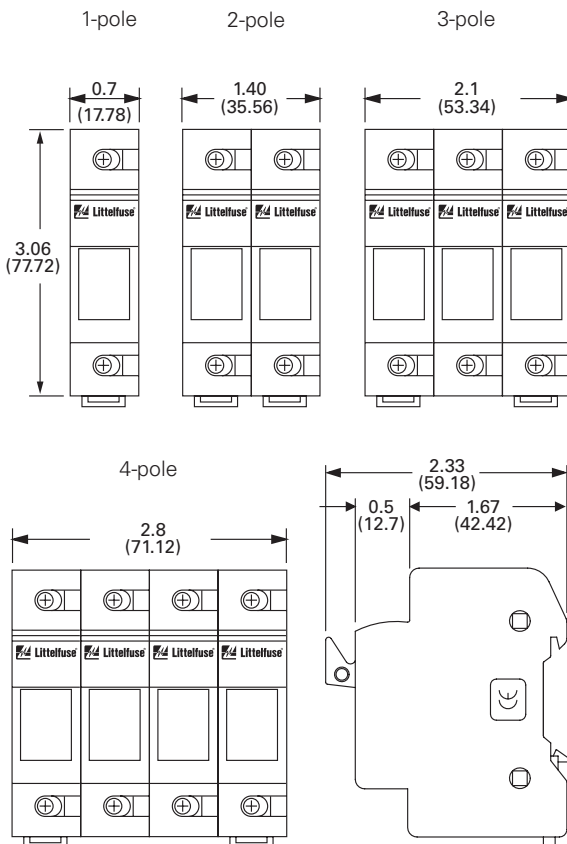
<b>Voltage Rating</b>	600 V ac/dc
<b>Ampere Rating</b>	30 A
<b>Interrupting Rating</b>	200 kA (Class CC) 100 kA (midget)
<b>Terminal Type</b>	Pressure plate
<b>Suggested Torque</b>	17.7 in-lbs
<b>Wire Range</b>	#8-#14 CU
<b>Material</b>	Thermoplastic
<b>Flammability Rating</b>	UL 94 V-0
<b>Approvals</b>	UL Listed (LPSC File: E14721) UL Recognized (LPSM File: E14721) CSA Certified (LPSC/LPSM File: LR7316)
<b>Environmental</b>	RoHS compliant, Lead (Pb) Free



## Description

Littelfuse POWR-Safe dead front holders provide optimum protection to personnel for Class CC and midget-style fuses.

## Dimensions Inches (mm)



## Ordering Information

INDICATING		NON-INDICATING		FUSE TYPE	POLES
CATALOG NUMBER	ORDERING NUMBER	CATALOG NUMBER	ORDERING NUMBER		
LPSC001ID	LPSC0001ZXID	LPSC001	LPSC0001Z	Class CC	1
LPSC002ID	LPSC0002ZXID	LPSC002	LPSC0002Z	Class CC	2
LPSC003ID	LPSC0003ZXID	LPSC003	LPSC0003Z	Class CC	3
LPSC004ID	LPSC0004ZXID	LPSC004	LPSC0004Z	Class CC	4
LPSM001ID	LPSM0001ZXID	LPSM001	LPSM0001Z	Midget	1
LPSM002ID	LPSM0002ZXID	LPSM002	LPSM0002Z	Midget	2
LPSM003ID	LPSM0003ZXID	LPSM003	LPSM0003Z	Midget	3
LPSM004ID	LPSM0004ZXID	LPSM004	LPSM0004Z	Midget	4

**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](http://littelfuse.com/lpsc)  
[littelfuse.com/lpsm](http://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

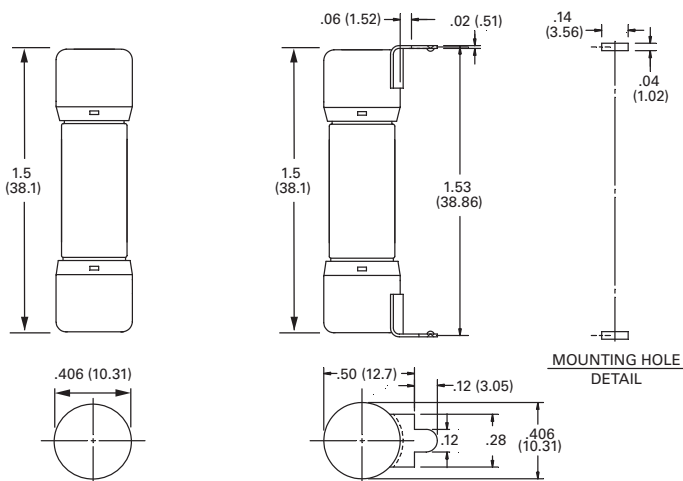
## Applications

- Combiner boxes and inverters
- Power supplies
- Desktop meters

## Dimensions Inches (mm)

Ferrule Version

PCB 1-Tab



## Specifications

**Voltage Rating**  
**Amperage Rating**

600 V ac/V dc  
1/10, 1/8, 2/10, 1/4, 3/10, 1/2, 3/4, 1, 1 1/2, 2, 2 1/2, 3, 3 1/2, 4, 5, 6, 7, 8, 9, 10, 12, 15, 20, 25, 30

**Interrupting Ratings**

AC: 100 kA  
200 kA Littelfuse self-certified  
DC: 1/10-30: 10 kA (UL 2579)  
1/10-30: 50 kA (UL 248-14)

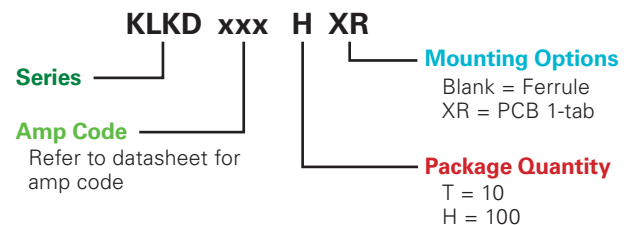
**Material**  
**Operating Temperature**  
**Approvals**

Body: Melamine / Caps: Copper Alloy  
See rerating curve  
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)

**Environmental**  
**Country of Origin**

RoHS Compliant  
Mexico

## Part Numbering System



SERIES	AMPERAGE	PACKAGE QUANTITY	MOUNTING METHOD	CATALOG NUMBER	ORDERING NUMBER
KLKD	1/8	10	FERRULE	KLKD.125	KLKD.125T
KLKD	5	100	FERRULE	KLKD005	KLKD005.H
KLKD	15	10	PCB 1-TAB	KLKD015R	KLKD015.TXR

## 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](http://littelfuse.com/klkd)

# POWR-BLOKS

Distribution Blocks • Splicer Blocks • Covers



3

## 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.

## 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.

## Hinged Plastic Covers



**Clear Plastic Covers**

## 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

<b>Voltage Rating</b>	600 V
<b>Current Rating</b>	Based on NEC Table 310.16, using 75 °C copper wire
<b>SCCR</b>	Consult factory
<b>Material</b>	Phenolic rated at 150 °C and Thermoplastic rated at 125 °C (LD1400 and LS1300 series only)
<b>Connector</b>	Aluminum: Highly conductive aluminum, tin plated Copper: Highly conductive copper, tin plated
<b>Flammability Rating</b>	UL 94 V-0
<b>Approvals</b>	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)
<b>Environmental</b>	RoHS compliant, Lead (Pb) free

## Web Resources

For dimension, CAD and 3-D drawings, visit:  
[littelfuse.com/powrbloks](http://littelfuse.com/powrbloks)

\*NEC is a trademark of its respective owner

# IGBT MODULE, HALF-BRIDGE

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



## 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

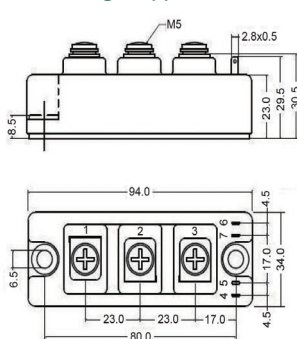
- AC motor control
- Inverter
- Motion/servo control
- Power supplies
- Photovoltaic/fuel cell

## Web Resources

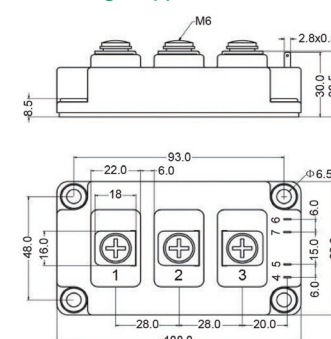
Download the complete datasheet and other technical information: [littelfuse.com](http://littelfuse.com)

## Dimensions Inches (mm)

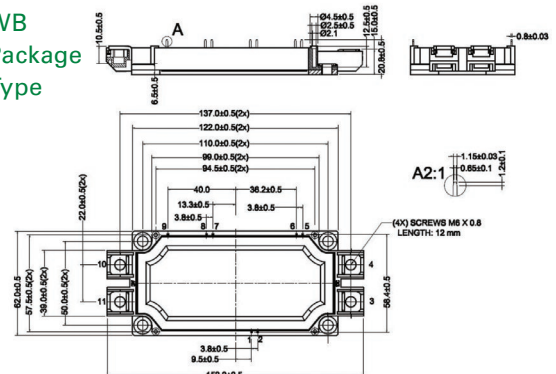
### S Package Type



### D Package Type



### WB Package Type



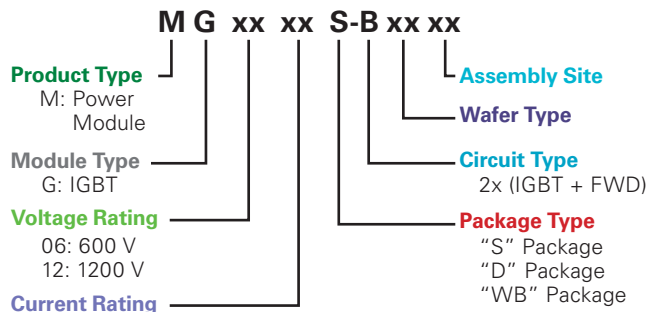
## Specifications

**Voltage Rating**  
**Amperage Rating**

600 / 1200 V  
S Package: 75, 100, 150, 200  
D Package: 100, 150, 200, 300, 400  
WB Package: 225, 300, 450, 600  
Half-Bridge  
UL Listed (File: E71639)  
RoHS Compliant

**Circuit Type**  
**Approvals**  
**Environmental**

## Part Numbering System



## Ordering Information

ORDERING NUMBER	VOLT	AMPERAGE	PACKAGE TYPE	MOUNTING METHOD	M.O.Q.
MG1250S-BA1MM	1200	50	S	SCREW	100
MG12100S-BN2MM	1200	100	S	SCREW	100
MG12150S-BN2MM	1200	150	S	SCREW	100
MG1275S-BA1MM	1200	75	S	SCREW	100
MG06100S-BN4MM	600	100	S	SCREW	100
MG06150S-BN4MM	600	150	S	SCREW	100
MG06300D-BN4MM	600	300	D	SCREW	60
MG06400D-BN4MM	600	400	D	SCREW	60
MG12200D-BA1MM	1200	200	D	SCREW	60
MG12300D-BA1MM	1200	300	D	SCREW	60
MG12300D-BN3MM	1200	300	D	SCREW	60
MG12400D-BN2MM	1200	400	D	SCREW	60
MG06600WB-BN4MM	600	600	WB	PRESS FIT	60
MG12225WB-BN2MM	1200	225	WB	PRESS FIT	60
MG12300WB-BN2MM	1200	300	WB	PRESS FIT	60
MG12450WB-BN2MM	1200	450	WB	PRESS FIT	60

# 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.

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

## 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.

## 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/tvsdiodes](http://Littelfuse.com/tvsdiodes)

SERIES NAME	PHOTO	PACKAGE TYPE	REVERSE STANDOFF VOLTAGE (V <sub>R</sub> )	PEAK PULSE POWER RANGE (P <sub>PP</sub> 10/1000 $\mu$ s)	PEAK PULSE CURRENT (I <sub>PP</sub> 8/20 $\mu$ s)	OPERATING TEMPERATURE	HF	ROHS	
<b>SURFACE MOUNT - STANDARD APPLICATION (200-5000 W)</b>									
SMF		SOD-123	5.0-85	200 W	–	-67 °F to +302 °F (-55 °C to +150 °C)	•	•	
SMAJ		DO-214AC	5.0-440	400 W	–		•	•	
P4SMA		DO-214AC	5.8-468	400 W	–		•	•	
SMA6J		DO-214AC	5.0-12	600 W	–		•	•	
SMA6L		DO-221AC	5.0-85	600 W	–		•	•	
SACB		DO-214AA	5.0-50	500 W	–		•	•	
SMBJ		DO-214AA	5.0-440	600 W	–		•	•	
P6SMB		DO-214AA	5.8-468	600 W	–		•	•	
1KSMB		DO-214AA	5.8-153	1000 W	–		•	•	
SMCJ		DO-214AB	5.0-440	1500 W	–		•	•	
1.5SMC		DO-214AB	5.8-468	1500 W	–		•	•	
4.0SDJ		DO-214AB	24.0	4000W	–		•	•	
SMDJ		DO-214AB	5.0-220	3000 W	–		•	•	
5.0SMDJ		DO-214AB	12-170	5000 W	–		•	•	
<b>AXIAL LEADED - STANDARD APPLICATION (400-5000 W)</b>									
P4KE		DO-41	5.8-468	400 W	–	-67 °F to +347 °F (-55 °C to +175 °C)	•	•	
SA		DO-15	5.0-180	500 W	–		•	•	
SAC		DO-15	5.0-50	500 W	–		•	•	
P6KE		DO-15	5.8-512	600 W	–		•	•	
1.5KE		DO-201	5.8-512	1500 W	–		•	•	
LCE		DO-201	6.5-90	1500 W	–		•	•	
3KP		P600	5.0-220	3000 W	–		•	•	
5KP		P600	5.0-250	5000 W	–		•	•	
<b>AXIAL LEADED - HIGH POWER (15000-30000 W; 1-15 kA)</b>									
15KPA		P600	17-280	15000 W	–	-67 °F to +347 °F (-55 °C to +175 °C)	•	•	
20KPA		P600	20-300	20000 W	–		•	•	
30KPA		P600	28-288	30000 W	–		•	•	
AK1		Radial Lead	76.0	–	1000 A		–	•	•
AK3		Radial Lead	15-430	–	3000 A		–	•	•
AK6		Radial Lead	30-430	–	6000 A		–	•	•
AK10		Radial Lead	15-530	–	10000 A		–	•	•
AK15		Radial Lead	58-76	–	15000 A		–	•	•



# OVERVOLTAGE SUPPRESSION VARISTORS



## Protection Application and Needs

### Description:

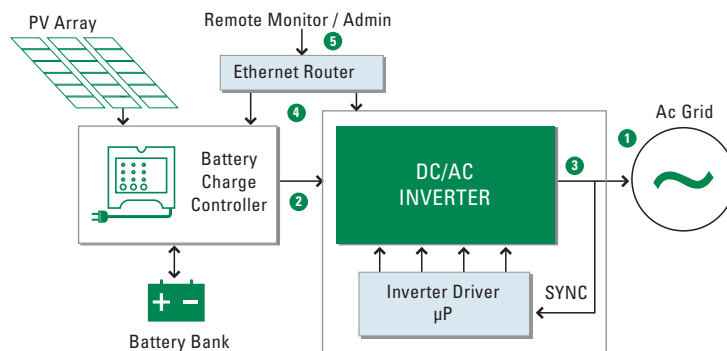
Microprocessor-controlled inverter with the ac output synchronized to the ac grid stores energy in utility company and maximizes photovoltaic (PV) array energy output.

### 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

4

## 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](http://Littelfuse.com/varistor)

SERIES NAME	PHOTO	OPERATING V AC RANGE	OPERATING V DC RANGE	PEAK CURRENT RANGE <sup>2</sup> (A)	PEAK ENERGY RANGE (J)	OPERATING TEMPERATURE	MOUNT/FORM FACTOR	DISC SIZE	AGENCY APPROVALS							
									UR	CSA	VDE	CECC	ROHS	HF		
SURFACE MOUNT MLV / MOV																
ML		2.7-107	5.5-120	4-500	0.02-2.5	-55 to +125 °C	Surface Mount	Not Applicable					•	•		
CH		14-275	18-369	100-400	1.0-8.0	-55 to +125 °C	Surface Mount	Not Applicable	•				•			
SM7		115-510	369-675	1200	10-40	-55 to +85 °C	Surface Mount	Not Applicable	•				•	•		
SM20		20-320	26	2000-6500	20-150		Surface Mount	Not Applicable	•				•	•		
RADIAL LEADED MOV																
UltraMOV™		130-625	170-825	1750-10000	12.5-720			7, 10, 14, 20 mm	•	•	•	•	•	•		
UltraMOV™ 25S		115-750	150-970	22000	230-890			25 mm	•	•	•	•	•	•		
C-III		130-660	—	3500-9000	40-530	-55 to +85 °C	Radial Leaded	10, 14, 20 mm	•	•	•		•	•		
LA		130-1000	175-1200	1200-6500	11-360			7, 10, 14, 20 mm	•	•	•	•	•	•		
ZA		4-460	5.5-615	50-6500	0.1-52			5, 7, 10, 14, 20 mm	•		•	•	•	•		
THERMALLY PROTECTED MOV																
SMOV™ 25S		115-750	150-970	20000	170-670	-45 to +75 °C	Industrial Packaged Radial Leads	25 mm	•				•			
SMOV™ 34S		115-750	150-970	40000	280-1200	-45 to +75 °C	Industrial Packaged Radial Leads	34 mm	•				•			
TMOV® 25S		115-750	150-970	20000	170-670			25 mm	•		•	•	•			
TMOV® 34S		115-750	150-970	40000	235-1050	-55 to +85 °C	Radial Leaded	34 mm	•		•	•	•			
TMOV®/iTMOV®		115-750	150-970	6000-10000	35-480			14, 20 mm	•		•	•	•			

# 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

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

### Accessories

**A**

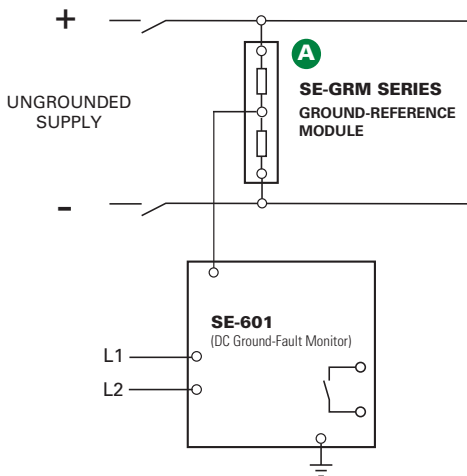


**SE-GRM Series Ground-Reference Module**  
Required accessory, used to connect the SE-601 dc Ground-Fault Monitor to the dc bus.



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

### Simplified Circuit Diagram



### Ordering Information

ORDERING NUMBER	CONTROL POWER
SE-601-OU	120/240 V ac/V dc
SE-601-OD	12/24 V dc
SE-601-OT	48 V dc
ACCESSORIES	REQUIREMENT
SE-GRM SERIES	Required
PGA-0500	Optional
PMA-55	Optional
PMA-60	Optional

Note: For optional conformal coating please consult factory.

### Specifications

<b>IEEE Device Numbers</b>	Dc Overcurrent Relay (76G)
<b>Input Voltage</b>	See ordering information
<b>Dimensions</b>	<b>H</b> 75 mm (3.0"); <b>W</b> 55 mm (2.2"); <b>D</b> 115 mm (4.5")
<b>Trip Level Settings</b>	1-20 mA
<b>Trip Time Settings</b>	0.05 -2.5 s
<b>Output Contacts</b>	Isolated Form A and Form B
<b>Contact Operating Mode</b>	Selectable fail-safe or non-fail-safe
<b>Test Button</b>	Local
<b>Reset Button</b>	Local and remote
<b>Analog Output</b>	0-5 V
<b>Conformally Coated</b>	Consult factory
<b>Approvals</b>	CSA certified, UL Listed (E340889), CE (European Union), C-Tick (Australian)
<b>Warranty</b>	5 years
<b>Mounting</b>	DIN, surface (standard) Panel (with PMA-55 or PMA-60 adapter)

# EL731 SERIES

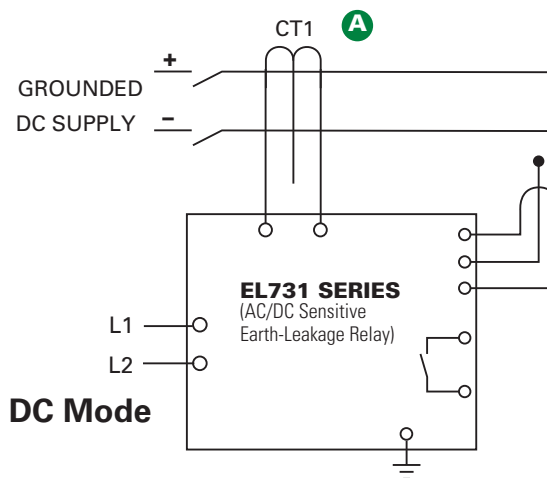
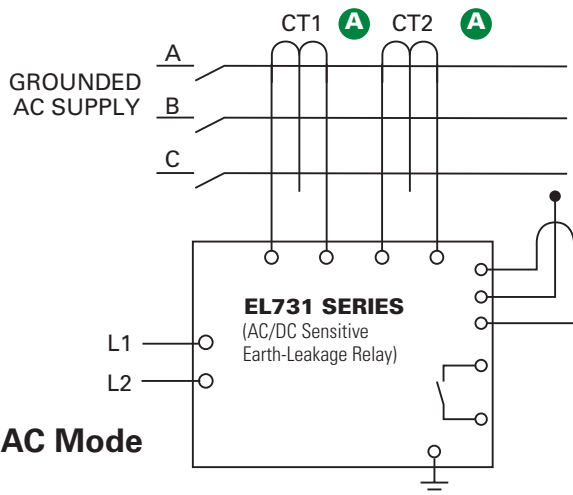
## Ac/Dc Sensitive Earth-Leakage Relay



### 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

ORDERING NUMBER	CONTROL POWER	COMMUNICATIONS
EL731-00-X0	120/240 V ac/V dc	None
EL731-01-X0	120/240 V ac/V dc	DeviceNet*
EL731-02-X0	120/240 V ac/V dc	Profibus*
EL731-03-X0	120/240 V ac/V dc	EtherNet/IP*
EL731-04-X0	120/240 V ac/V dc	Modbus* TCP
EL731-10-X0	48 V dc & 24 V ac	None
EL731-11-X0	48 V dc & 24 V ac	DeviceNet
EL731-12-X0	48 V dc & 24 V ac	Profibus
EL731-13-X0	48 V dc & 24 V ac	EtherNet/IP
EL731-14-X0	48 V dc & 24 V ac	Modbus TCP
EL731-20-X0	24 V dc	None
EL731-21-X0	24 V dc	DeviceNet
EL731-22-X0	24 V dc	Profibus
EL731-23-X0	24 V dc	EtherNet/IP
EL731-24-X0	24 V dc	Modbus TCP

### Accessories

**A** **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.

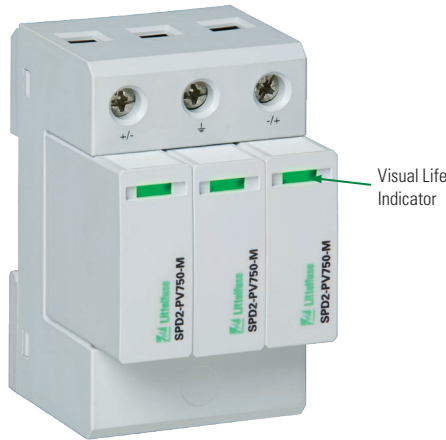
ACCESSORIES	REQUIREMENT
EFCT Series CT	One Required
AC700-CUA Series Com. Unit	Optional
AC700-SMK Surface-Mount Kit	Optional
AC700-CVR-00 Watertight Cover (IP66) for Panel-Mount Applications	Optional
PGA-0520 Analog Meter	Optional

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.

# SPD2 PV SERIES

## Type 2/Type 1CA Pluggable Multi-Pole for PV Systems



### Description

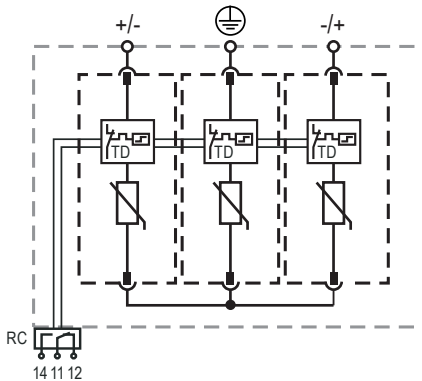
Surge protection devices (SPDs) provide equipment protection from transient overvoltage events lasting micro-seconds. By limiting the overvoltage to the equipment during these events, costly damage and downtime can be mitigated.

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

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

### Internal Configuration



### Legend

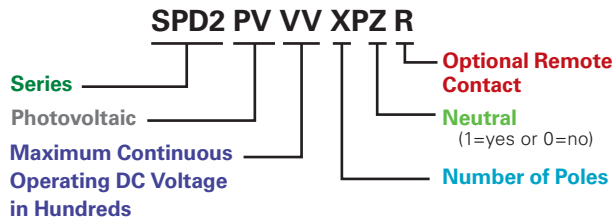
- $\oplus$  Protective Earth
- RC Optional Remote Contact
- TD Thermal Disconnection

### Module & Base Ordering Information

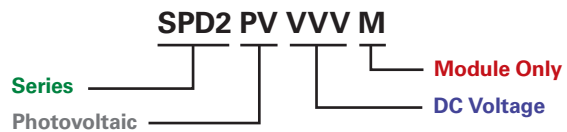
Ordering Number	IEC Electrical						UL Electrical				Single Unit Weight
	Maximum Continuous Operating DC Voltage ( $U_{CPV}$ )	Nominal Discharge Current (8/20 $\mu$ s) ( $I_n$ )	Maximum Discharge Current (8/20 $\mu$ s) ( $I_{max}$ )	Total Discharge Current ( $I_{Total}$ )	Voltage Protection Level ( $U_p$ )	Short-Circuit Current Rating ( $I_{SCPV}$ )	Maximum Permitted DC Voltage ( $U_{pVdc}$ )	Voltage Protection Rating (VPR)	Nominal Discharge Current (8/20 $\mu$ s) ( $I_n$ )	Short-Circuit Current Rating (SCCR)	
SPD2-PV11-3P0-R	1100 V	20 kA	40 kA	50 kA	4200 V	9 kA	1100 V	3000 V	20 kA	50 kA	333 g (0.734 lb)
SPD2-PV15-3P0-R	1500 V	15 kA	40 kA	40 kA	4800 V	9 kA	1500 V	4000 V	20 kA	65 kA	363 g (0.800 lb)

# SPD2 PV SERIES

## Module & Base Part Numbering System



## Module Only Part Numbering System



## Replacement Module Ordering Information

Ordering Number	IEC Electrical						UL Electrical				Single Unit Weight
	Maximum Continuous Operating DC Voltage ( $U_{CPV}$ )	Nominal Discharge Current (8/20 $\mu$ s) ( $I_n$ )	Maximum Discharge Current (8/20 $\mu$ s) ( $I_{max}$ )	Total Discharge Current ( $I_{Total}$ )	Voltage Protection Level ( $U_p$ )	Short-Circuit Current Rating ( $I_{SCP}$ )	Maximum Permitted DC Voltage ( $U_{pVDC}$ )	Voltage Protection Rating (VPR)	Nominal Discharge Current (8/20 $\mu$ s) ( $I_n$ )	Short-Circuit Current Rating (SCCR)	
SPD2-PV550-M	1100 V	20 kA	40 kA	50 kA	4200 V	9 kA	1100 V	3000 V	20 kA	50 kA	61 g (0.134 lb)
SPD2-PV750-M	1500 V	15 kA	40 kA	40 kA	4800 V	9 kA	1500 V	4000 V	20 kA	65 kA	71 g (0.157 lb)

## Specifications

<b>Mode of Protection</b>	(+) - PE, (-) - PE, (+) - (-)
<b>Nominal Discharge Current (8/20 <math>\mu</math>s) (<math>I_n</math>)</b>	20 kA
<b>Maximum Discharge Current (8/20 <math>\mu</math>s) (<math>I_{max}</math>)</b>	Up to 40 kA
<b>Protective Elements</b>	High Energy MOV
<b>Response Time (<math>t_A</math>)</b>	< 25 ns
<b>Number of Ports</b>	1
<b>Mechanical &amp; Environmental</b>	
<b>Operating Temperature Range (<math>T_a</math>)</b>	-40 °C to +80 °C (-40 °F to +185 °F)
<b>Permissible Operating Humidity (RH)</b>	5% to 95%
<b>Altitude (max)</b>	4,000 m (13,123 ft)
<b>Terminal Screw Torque (<math>M_{max}</math>)</b>	4.5 Nm (39.9 lbf-in)
<b>Conductor Cross Section (max)</b>	35 mm <sup>2</sup> (2 AWG) (Solid, Stranded)/ 25 mm <sup>2</sup> (4 AWG) (Flexible)
<b>Mounting</b>	35 mm DIN Rail, EN60715
<b>Degree of Protection</b>	IP20 (built-in)
<b>Housing Material</b>	Thermoplastic: Extinguishing Degree UL 94 V-0
<b>Thermal Protection</b>	Yes

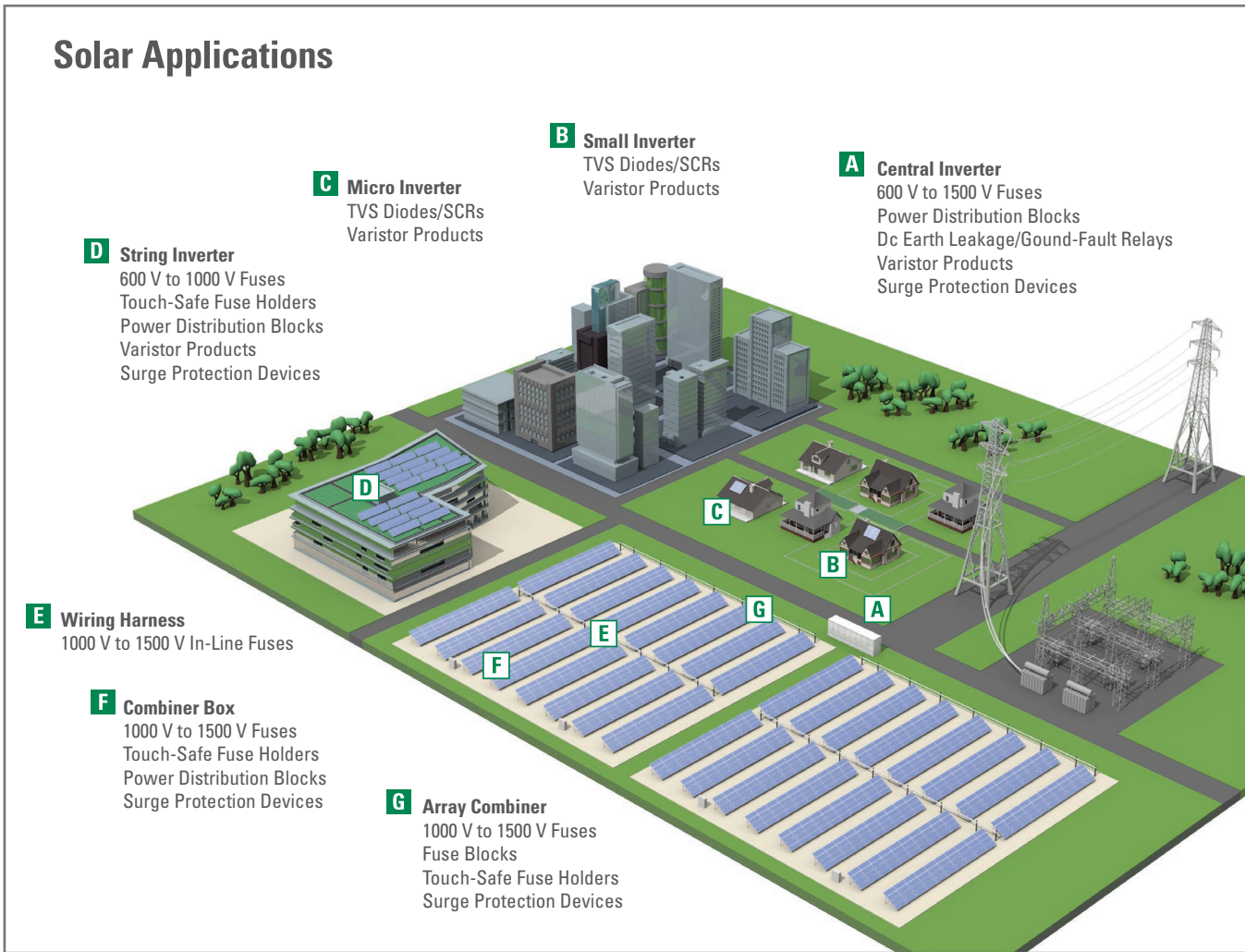
<b>Operating State/Fault Indication</b>	Green Flag/No Green Flag
<b>Remote Contact Switching Capacity</b>	AC: 250 V/1 A, 125 V/1 A; DC: 48 V/0.5 A, 24 V/0.5 A, 12 V/0.5 A
<b>Remote Contact Conductor Cross Section (max)</b>	1.5 mm <sup>2</sup> (16 AWG) (Solid)
<b>Standards Passed</b>	EN 50539-11:2013+A1:2014 UL 1449 4th Edition; E320116

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

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

Warranty – Visit [www.littelfuse.com/warranty](http://www.littelfuse.com/warranty) for details.

# SOLAR-RATED PRODUCTS BY APPLICATION

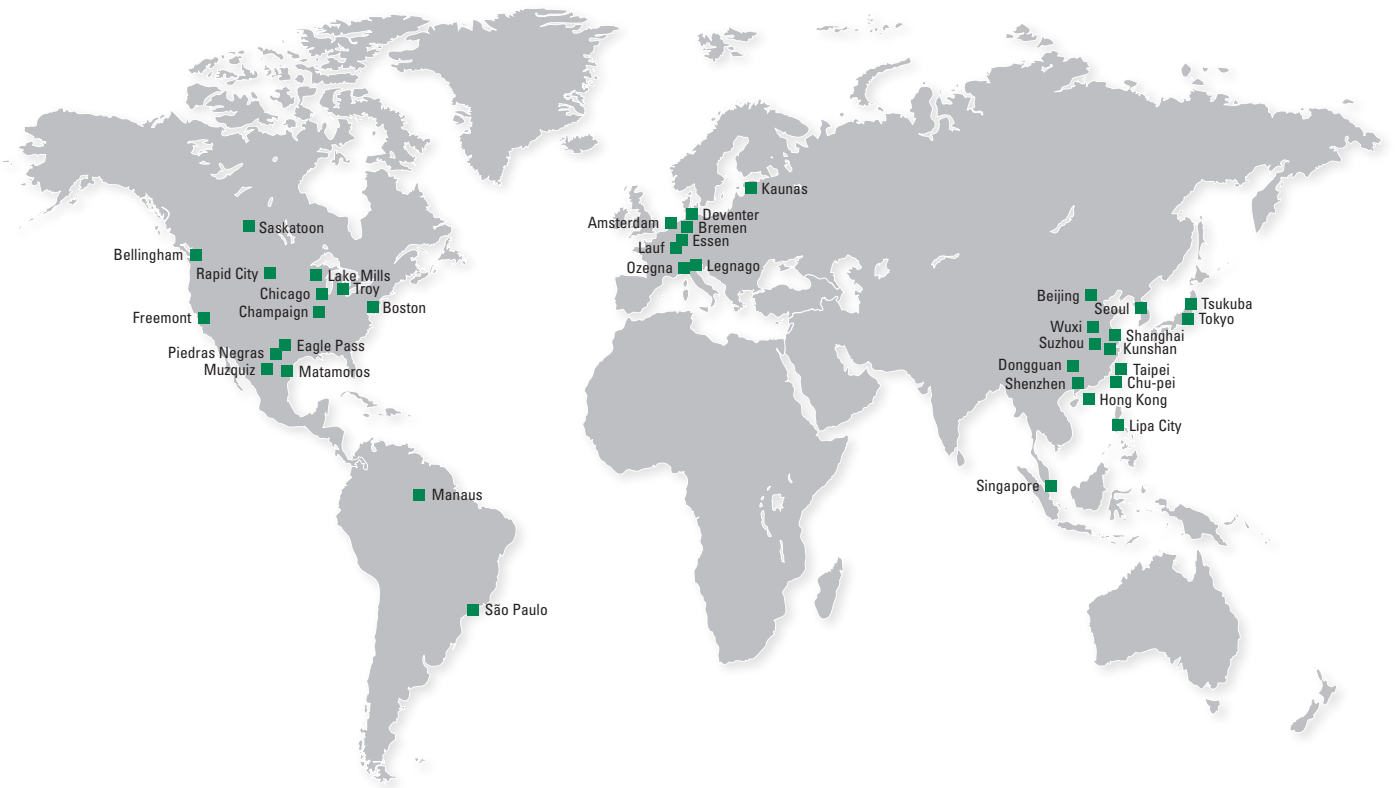


With over 25 million devices installed in photovoltaic power systems, Littelfuse understands the global challenges of the solar market. Littelfuse offers numerous circuit-protection products that are uniquely suited to protect the equipment and systems subject to the harsh environments of standard photovoltaic installations.



Look for this logo to indicate products that are used in solar applications. Visit our website [Littelfuse.com/Solar](https://www.littelfuse.com/Solar) for the latest updates on approvals, certifications, and new products.

# Local Resources for a **GLOBAL** Market



## Sales and Technical Support



### ■ United States and Mexico

Phone +1 800 TEC FUSE  
+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](http://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.



Expertise Applied | Answers Delivered



**Littelfuse World Headquarters**

8755 West Higgins Road, Suite 500  
Chicago, IL 60631, USA

**Technical Support:**

Tel: +1-800-TEC-FUSE  
E-mail: techline@littelfuse.com

**Customer Service:**

Tel: +1-800-227-0029  
E-mail: PG\_CSG@littelfuse.com  
Fax: +1-847-787-5190

**Littelfuse SymCom**

222 Disk Drive  
Rapid City, SD 57701, USA

**Technical Support:**

Tel: +1-800-832-3873  
E-mail: relays@littelfuse.com

**Littelfuse Startco**

Canada  
Tel: +1-306-373-5505  
Fax: +1-306-374-2245  
E-mail: techline@littelfuse.com



Littelfuse products are certified to many standards around the world. To check certifications on specific product please refer to the product datasheet on Littelfuse.com.

**Disclaimer Notice** – Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/product-disclaimer](http://www.littelfuse.com/product-disclaimer).