



Expertise Applied | Answers Delivered



## SOLAR PRODUCTS CATALOG



**1500 VDC PRODUCTS**

**IN-LINE FUSES**

**PROTECTION RELAYS**

**OVERVOLTAGE PROTECTION**

---

# ***NEW Solar Fuses & Holders***



SPNH Series  
Solar Fuse



LFNH Series  
Fuse Holder

LFNH Series  
Fuse Terminal Covers



LFPXV Series  
Touch-Safe Fuse Holders

# TABLE OF CONTENTS


## 1 1500 Vdc RATED PRODUCTS

SPXV String Fuses.....		2
SPXI In-Line Fuses.....		3
SPNH Fuses .....		4
LFPXV Fuse Holders.....		6
LPXV Fuse Holders .....		8


## 2 1000 Vdc RATED PRODUCTS

SPFJ High Amperage Fuses .....		9
SPF String Fuses.....		10
SPFI In-Line Fuses .....		11
LFJ1000 Open-Face Fuse Blocks.....		12
SPFR Class R Fuses .....		13
SPFRHV Open-Face Fuse Blocks .....		13
LPHV Touch-Safe Fuse Holders.....		14



## 3 600 Vdc RATED PRODUCTS

POWR-Bar Bus Bar.....		15
LPSC / LPSM Dead-Front fuse holders .....		16
KLKD 10x38mm (Midget) Fuses .....		17
POWR-BLOKS Distribution Blocks .....		18

## 4 OVERVOLTAGE AND SWITCHING ELECTRONIC PRODUCTS

IGBT Power Modules .....		19
Transient Voltage Suppression (TVS) Diodes .....		20
Overvoltage Suppression Varistors (MOV) .....		21

## 5 PROTECTION RELAY PRODUCTS

SE-601 Ground-Fault Monitor.....		22
EL731 Sensitive Earth-Leakage Relay.....		23

## APPENDIX

Solar Products by Application.....		24
------------------------------------	--	----



# SPXV SERIES SOLAR FUSE

1500 Vdc • 6 – 30 A



1



## 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 2579 Listed
- Meets IEC 60269-6 electrical performance requirements
- 30,000 A interrupting rating

## Applications

- Inverters
- Combiner boxes

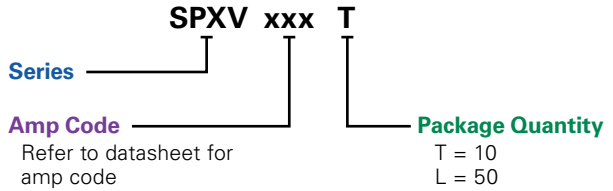
## Web Resources

Download technical resources at:  
[littelfuse.com/spxv](http://littelfuse.com/spxv)

## Specifications

<b>Voltage Rating</b>	1500 Vdc
<b>Amperage Rating</b>	6, 8, 10, 12, 15, 20, 25, 30 A
<b>Interrupting Rating</b>	15 kA (UL 2579) 30 kA (Self-Certified)
<b>Time Constant</b>	≤ 1ms
<b>Material</b>	Body: Melamine Caps: Copper Alloy (Nickel Plated)
<b>Approvals</b>	UL 2579 Listed (File: E339112)
<b>Environmental</b>	RoHS Compliant REACH
<b>Country of Origin</b>	Mexico

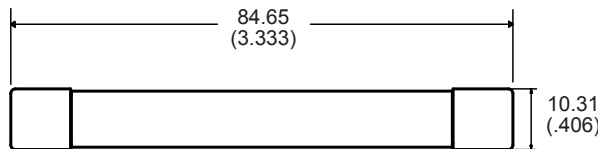
## Part Numbering System



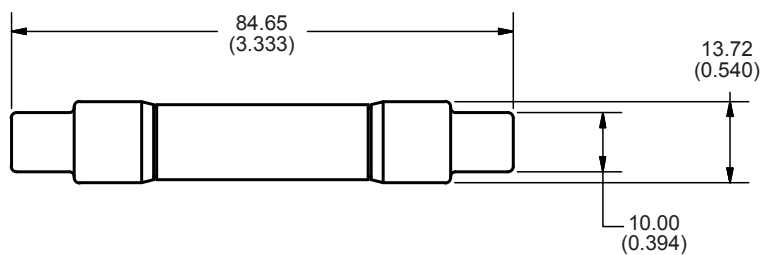
SERIES	AMP	PACKAGE QUANTITY	CATALOG NUMBER	ORDERING NUMBER
SPXV	6	10	SPXV006	SPXV006.T
SPXV	20	50	SPXV020	SPXV020.L

## Dimensions mm (inches)

6 – 20 A



25 – 30 A



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

## Features/Benefits

- UL 2579 Recognized
- Meets IEC 60269-6 electrical performance requirements
- 30,000 A interrupting rating
- No fuse holder required

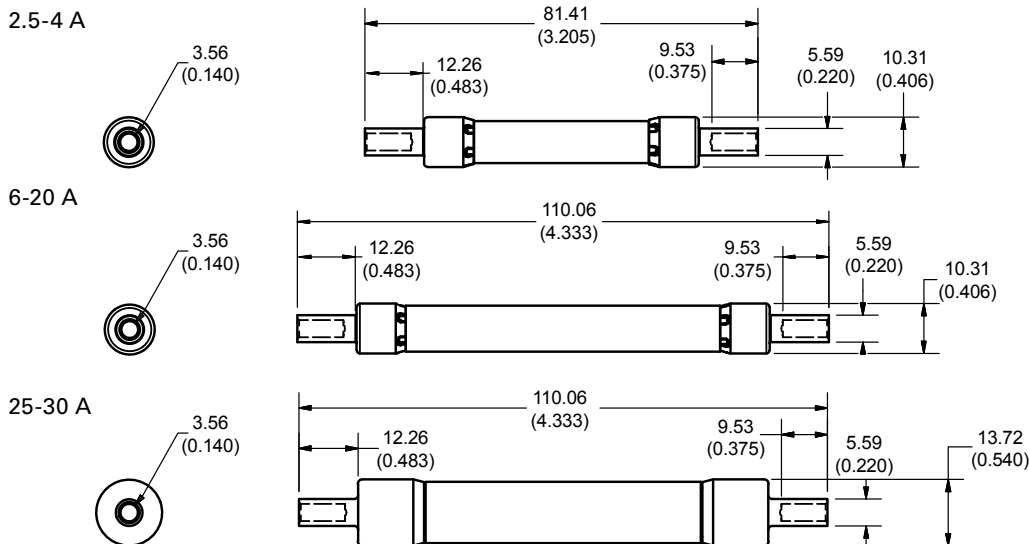
## Applications

- Photovoltaic wire harness

## Recommended Crimping Tool

T&B Sta-Kon ERG4002

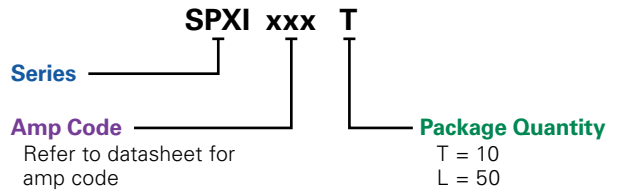
## Dimensions mm (in)



## Specifications

<b>Voltage Rating:</b>	1500 Vdc
<b>Amperage Rating:</b>	2.5, 3.5, 4, 6, 8, 10, 12, 15, 20, 25, 30 A
<b>Interrupting Ratings:</b>	15 kA (UL 2579) 30 kA (Self-Certified)
<b>Time Constant</b>	≤ 1ms
<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

## Part Numbering System



SERIES	AMP	PACKAGE QUANTITY	CATALOG NUMBER	ORDERING NUMBER
SPXI	3.5	10	SPXI03.5	SPXI03.5T
SPXI	4	10	SPXI004	SPXI004.T
SPXI	20	50	SPXI020	SPXI020.L

## Web Resources

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

# SPNH SERIES SOLAR FUSE

1500 Vdc • 50-400 A • NH Style



1



## 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

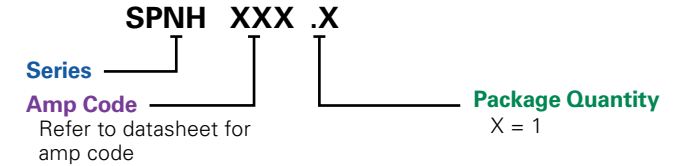
## Web Resources

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

## Specifications

<b>Voltage Rating</b>	1500 Vdc
<b>Amperage Rating</b>	50, 63, 80, 100, 125, 160, 200 250 - 400: Consult Factory
<b>Interrupting Rating</b>	15kA (50-200A)
<b>Time Constant</b>	≤ 2ms
<b>Material</b>	Body: Ceramic End Bells: Copper Alloy
<b>Approvals</b>	UL 248-19 Listed (File: E339112, Vol. 4) (50-200A) IEC 60269-6
<b>Environmental</b>	RoHS Compliant

## Part Numbering System



SERIES	AMP	PACKAGE QUANTITY	CATALOG NUMBER	ORDERING NUMBER
SPNH	50	1	SPNH050	SPNH050.X
SPNH	200	1	SPNH200	SPNH200.X

## Recommended Accessories

**Fuse Holder:** LFNH152001CST  
**Fuse Terminal Covers:** LFNH15200FBC

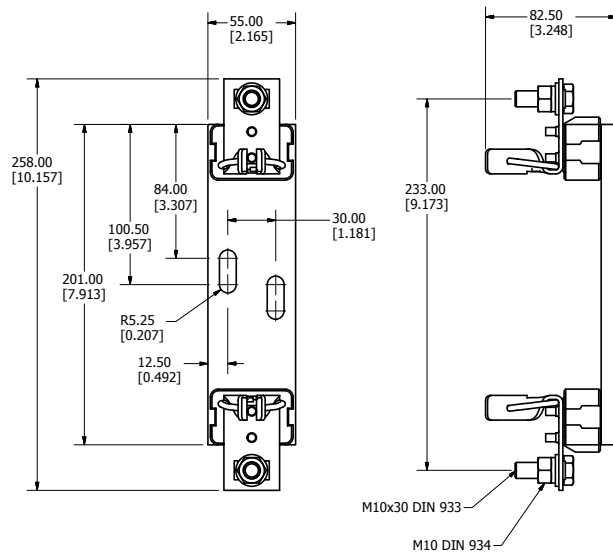
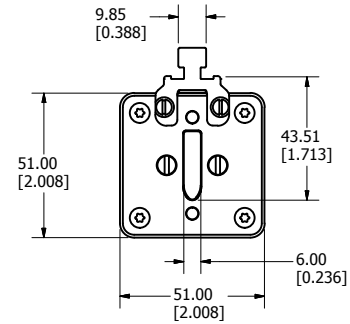
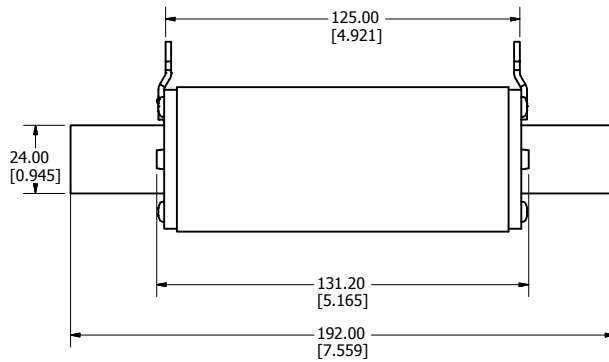


Look for this logo to indicate products that are used in solar applications. Visit our website [Littelfuse.com/solar](http://Littelfuse.com/solar) for the latest updates on approvals, certifications, and new products.

# SPNH SERIES SOLAR FUSE AND FUSE HOLDER

## Dimensions Millimeters (in)

Size: 1 XL

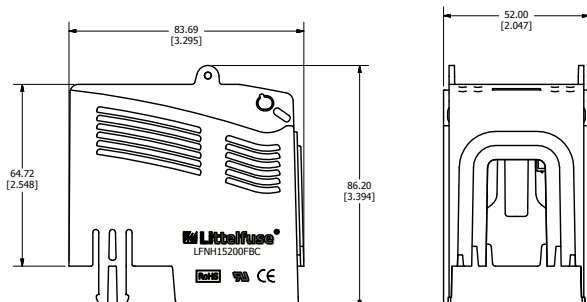


### Fuseholder

#### LFNH152001CST

### Specifications

<b>Voltage Rating:</b>	1500V
<b>Ampere Rating:</b>	200A
<b>Approvals:</b>	UL Recognized (E345481, Vol 2)
<b>Recommended Torque:</b>	Mounting Plate: 15 N-m Terminal: 32N-m
<b>Material:</b>	Fuse Clip: Silver Plated Copper Spring: Zinc Plated Steel Mounting Plate: Zinc Plated Steel Insulator: Ceramic



### Fuse Terminal Cover

#### LFNH15200FBC

### Specifications

<b>Voltage Rating:</b>	1500V
<b>Ampere Rating:</b>	200A
<b>Flammability Rating:</b>	UL94 V-0
<b>Material:</b>	V0 rated Nylon
<b>Packaging:</b>	Sold in pairs



# LFPXV TOUCH-SAFE FUSE HOLDERS

1500 V • 30 A



1



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

## Ordering Information

SERIES	VOLTAGE (Vdc)	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 Vdc
<b>Amperage Rating</b>	30 A
<b>SCCR Rating</b>	50 kA
<b>Power Dissipation:</b>	8W Maximum
<b>Fuse Type</b>	10x85mm
<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

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)	

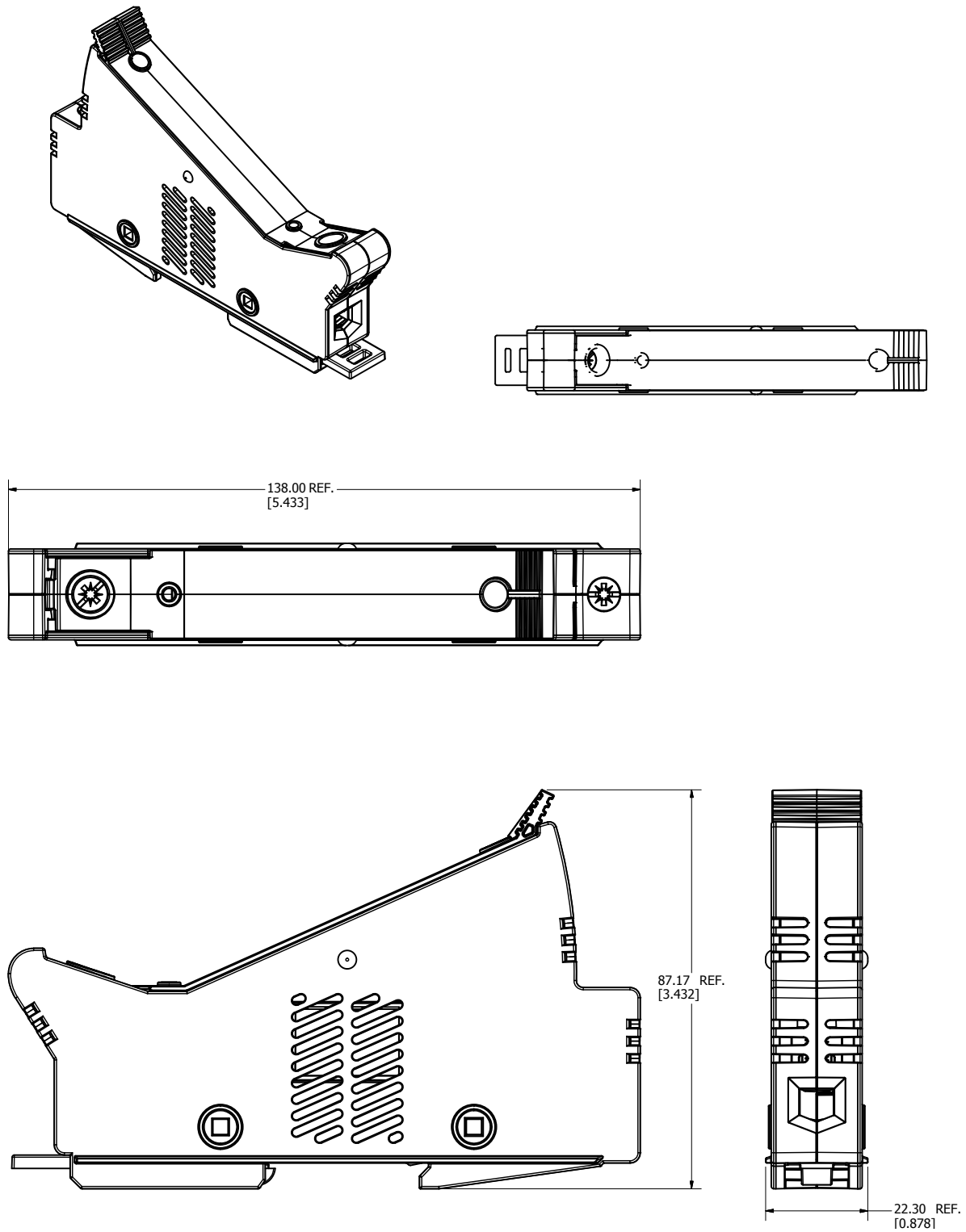


Look for this logo to indicate products that are used in solar applications. Visit our website [littelfuse.com/solar](http://littelfuse.com/solar) for the latest updates on approvals, certifications, and new products.



# LFPXV TOUCH-SAFE FUSE HOLDERS

## Dimensions Millimeters (in)



1



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

# LPXV TOUCH-SAFE FUSE HOLDERS

1500 V • 30 A



1



## 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

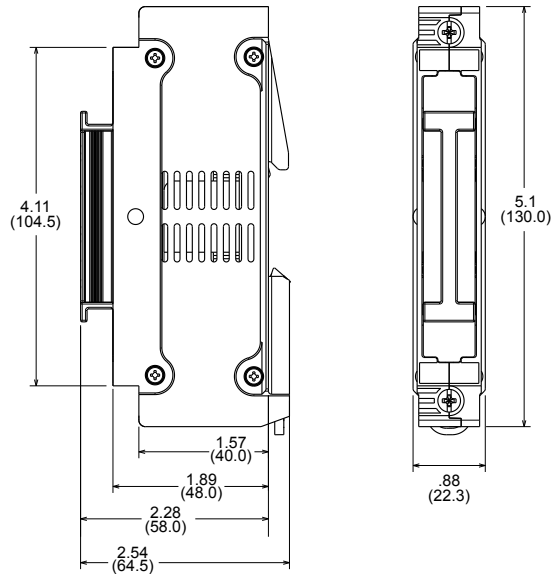
## Web Resources

Download the complete datasheet and other technical documents: [Littelfuse.com/lpxv](http://Littelfuse.com/lpxv)

## Specifications

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

## Dimensions Inches (mm)



## Ordering Information

SERIES	VOLTAGE (Vdc)	POLES	CATALOG NUMBER	ORDERING NUMBER	PACK QTY	TERMINAL INFORMATION				
						TERMINAL TYPE	WIRE TYPE	NUMBER OF WIRES	WIRE SIZE	TORQUE
LPXV	1500	1	LPXV001	LPXV0001Z	5	Box Lug	90° Max CU Only Stranded	1	6-4 AWG (16-25 mm <sup>2</sup> )	22-26 lb-in (2.5-3 N-m)
								1	18-8 AWG (.75-10 mm <sup>2</sup> )	18-22 lb-in (2-2.5 N-m)
								2*	18-6 AWG (.75-16 mm <sup>2</sup> )	18-22 lb-in (2-2.5 N-m)

\*Must be the same cross-sectioned size



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

# SPFJ SERIES SOLAR FUSE

1000 Vdc • 70-450 A



## 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
- VDE certified specifications
- 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

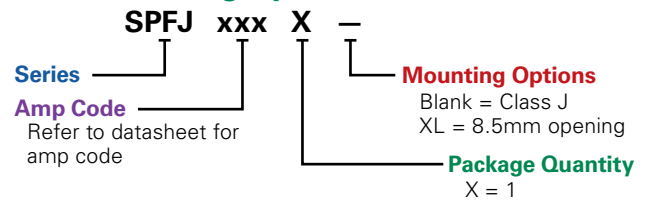
## Web Resources

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

## Specifications

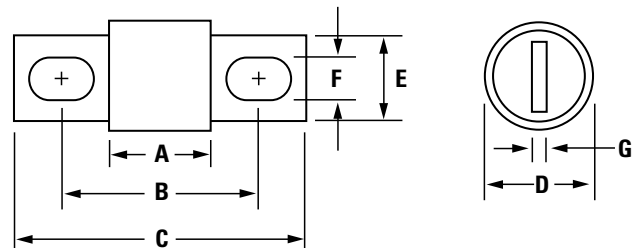
<b>Voltage Rating</b>	1000 Vdc 600 Vac (125-450 A)
<b>Amperage Rating</b>	70, 80, 90, 100, 125, 160, 200, 250, 300, 350, 400, 450
<b>Interrupting Rating</b>	AC: 200 kAIC (125-450 A) DC: 70-200 A: 20 kAIC 250-400 A: 10 kAIC 450 A: 20 kAIC
<b>Time Constant</b>	≤ 1ms
<b>Material</b>	Body: Melamine End Bells: Copper Alloy
<b>Approvals</b>	UL 2579 Listed (File: E339112) UL 248-8, Class J (125-450 A) cULus (125-450 A) IEC 60269-6 (125-450 A) VDE Certified (125-450 A) (No. 40033659, 40033660, 40033661)
<b>Environmental</b>	RoHS Compliant
<b>Country of Origin</b>	Mexico

## Part Numbering System



SERIES	AMP	PACKAGE QUANTITY	MOUNTING METHOD	CATALOG NUMBER	ORDERING NUMBER
SPFJ	70	1	CLASS J	SPFJ070	SPFJ070.X
SPFJ	200	1	LARGE	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 2579 approval only)



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

# SPF SERIES SOLAR FUSES

1000 Vdc • 1-30 A



## Specifications

<b>Voltage Rating</b>	1000 VDC
<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
<b>Time Constant</b>	≤ 2ms
<b>Material</b>	Body: Melamine Caps: Copper Alloy
<b>Approvals</b>	UL 2579 Listed (File: E339112) IEC 60269-6 (1-25 A) VDE Certified (No. 40033098)* CSA Certified (File: 029862_0_000)
<b>Environmental</b>	RoHS Compliant
<b>Country of Origin</b>	Mexico

2



## 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, IEC and VDE photovoltaic standards
- UL 2579 Listed 1000 Vdc maximum
- 1-30 A ratings available
- 20,000 A Interrupting Rating
- Both PCB mount and dead-front holder options available

## Applications

- Inverters
- Combiner boxes
- Battery charge controllers

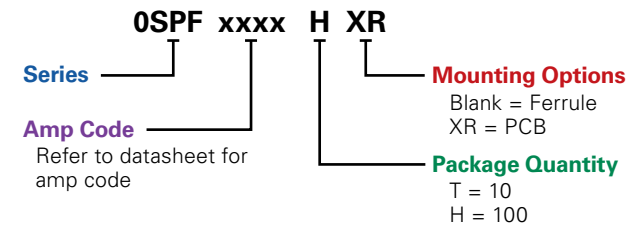
## Recommended Fuse Holders

LPHV 1000 Vdc POWR-Safe Holder

## Web Resources

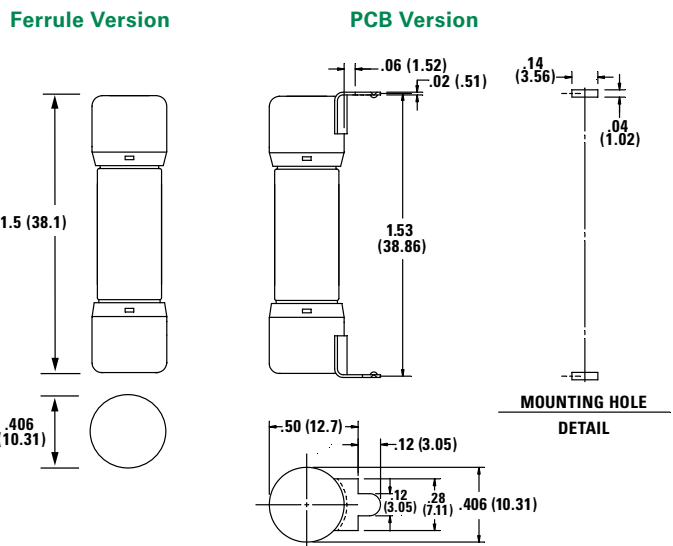
Download technical documents: [littelfuse.com/spf](http://littelfuse.com/spf)

## Part Numbering System



SERIES	AMP	PACKAGE QUANTITY	MOUNTING METHOD	CATALOG NUMBER	ORDERING NUMBER
SPF	2	10	FERRULE	SPF002	OSPF002.T
SPF	3.5	10	FERRULE	SPF03.5	OSPF03.5T
SPF	30	100	PCB TABS	SPF030R	OSPF030.HXR

## Dimensions Inches (mm)



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

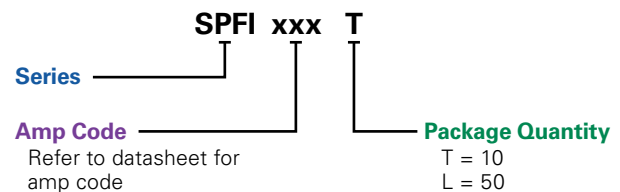
## Applications

- Photovoltaic wire harness

## Specifications

<b>Voltage Rating</b>	1000 Vdc
<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>	≤ 1ms
<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

## Part Numbering System



SERIES	AMP	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

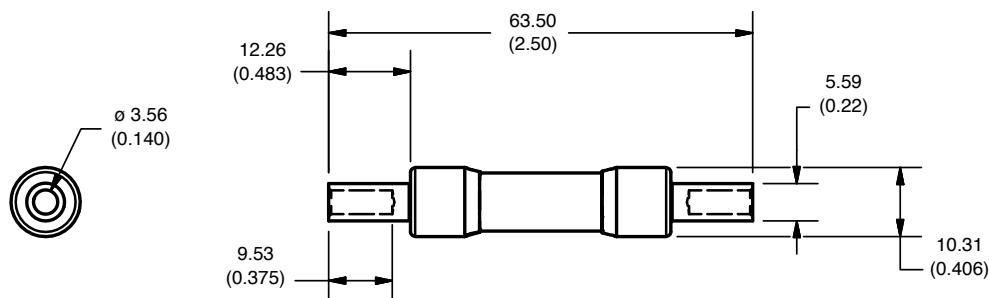
## Web Resources

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



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 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)

AMPERAGE	ORDERING NUMBER	INTERRUPT RATING	WIRE RANGE STANDARD (METRIC)	WIRE TYPE		RECOMMENDED TORQUE
200	LFJ102001C	20 kA	250 kcmil - #6 (127mm <sup>2</sup> - 16mm <sup>2</sup> )	Cu/Al	Solid/ Stranded	275 in-lb (31.1 N-m)
400	LFJ104001C	10 kA	350 kcmil - 1/0 (177mm <sup>2</sup> - 55mm <sup>2</sup> )			275 in-lb (31.1 N-m)
450	LFJ104501C	20 kA	500 kcmil - #4 (253mm <sup>2</sup> - 25mm <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 Ratings</b>	1000 VDC
<b>Ampere Ratings</b>	200, 400, 450 A
<b>Flammability Rating</b>	UL94 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)

# 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

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

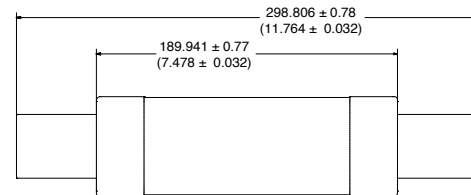
### Ordering Information

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

### Web Resources

Downloadable CAD drawings and other technical information:  
[Littelfuse.com/spfr](http://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

<b>Voltage Rating:</b>	1000 VDC
<b>Ampere Rating:</b>	250 - 400 A
<b>Approvals:</b>	UL 4248 Recognized (File: E14721) CSA (File: 29862)
<b>Environmental:</b>	RoHS Compliant

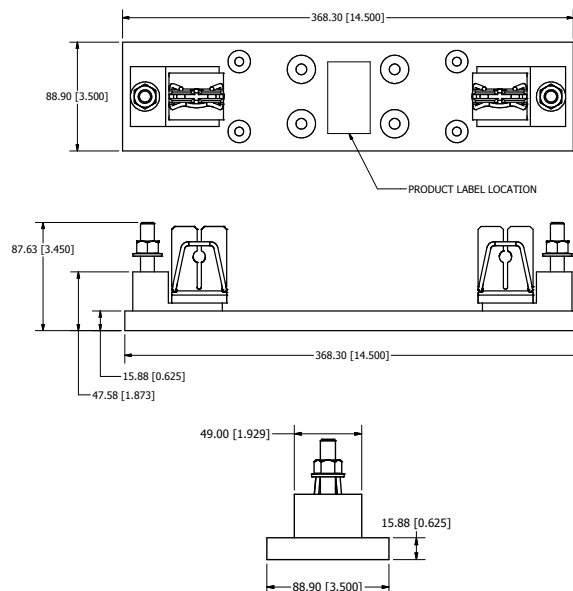
### Ordering Information

ORDERING NUMBER	AMPERAGE
SPFRHV4001ST	250 - 400

### Web Resources

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

### Dimensions mm (inches)





# LPHV POWR-SAFE FUSE HOLDERS

1000 VDC



2



## 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

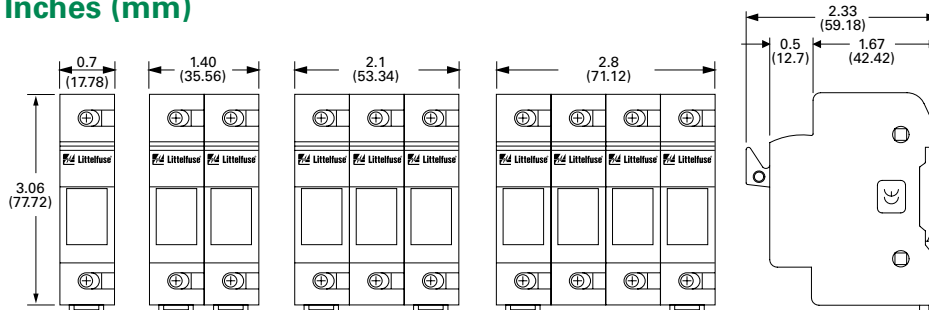
## Features/Benefits

- 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

## 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]	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 VDC
<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 VDC
<b>Material</b>	Thermoplastic
<b>Flammability Rating</b>	UL94 V-0
<b>Approval</b>	Self-certified 1000 VDC 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

10x38 mm 1000 VDC 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 Vac/dc  
1000 Vdc\*

#### 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 Vdc up to 160 A when center fed  
 1 Phase 25 mm<sup>2</sup> rated 1000 Vdc 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>			1 PHASE, 25 mm <sup>2</sup>		
ORDERING NUMBER	POLES	LENGTH (mm)	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

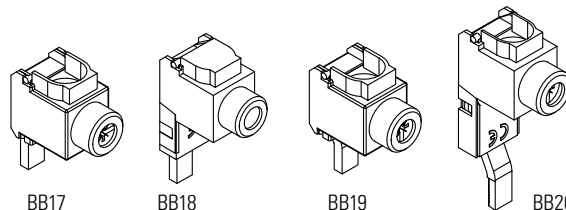
3 PHASE, 18 mm <sup>2</sup>			3 PHASE, 25 mm <sup>2</sup>		
ORDERING NUMBER	POLES	LENGTH (mm)	ORDERING NUMBER	POLES	LENGTH (mm)
3PH6P18mm	6	104	3PH6P25mm	6	104
3PH9P18mm	6	158	3PH9P25mm	9	158
3PH12P18mm	12	214	3PH12P25mm	12	214
3PH15P18mm	15	266	3PH15P25mm	15	266
3PH57P18mm	57	1009	3PH57P25mm	57	1009

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

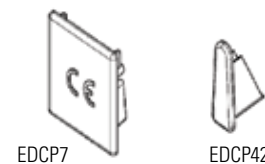
#### Power Feed Lug

PART NUMBER	AMP 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

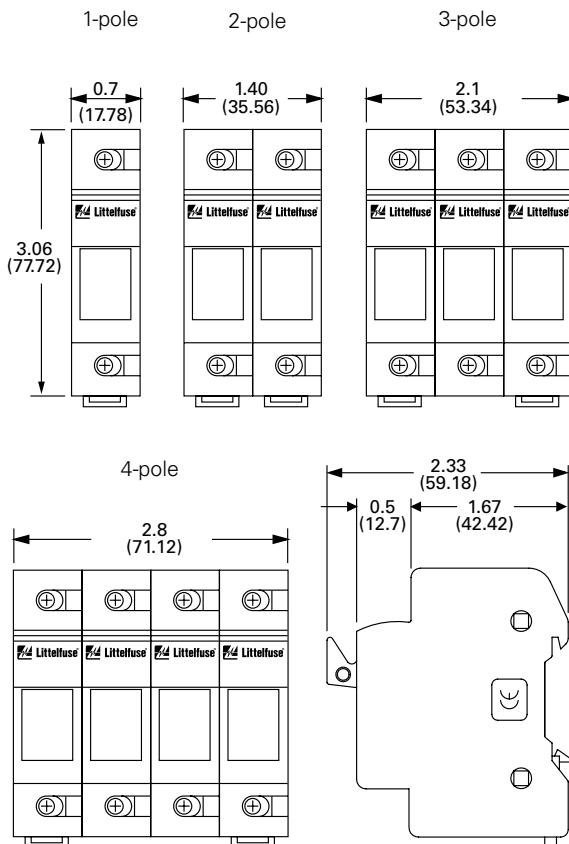
<b>Voltage Rating</b>	600 Vac/dc
<b>Ampere Rating</b>	30 A
<b>Interrupting Rating</b>	200 kA (Class CC) 100 kA (Midget)
<b>Terminal Type</b>	Pressure plate
<b>Suggested Torque</b>	17.7 in-lbs
<b>Wire Range</b>	#8-#14 CU
<b>Material</b>	Thermoplastic
<b>Flammability Rating</b>	UL94 V-0
<b>Approvals</b>	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

**2-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 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

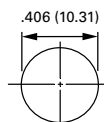
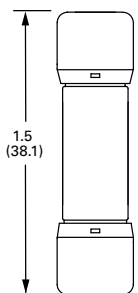
- Designed to UL and IEC photovoltaic specifications
- 1/10 - 30 A ratings available
- 50,000 A Interrupting Rating
- Available in ferrule or PCB mount options
- 1-5 A meets UL1741 GFDI requirements

## Applications

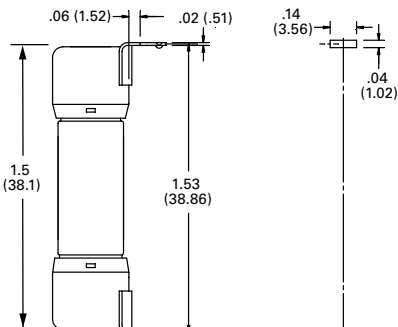
- Combiner boxes and Inverters
- Power supplies
- Desktop meters

## Dimensions Inches (mm)

### Ferrule Version



### PCB 1-Tab

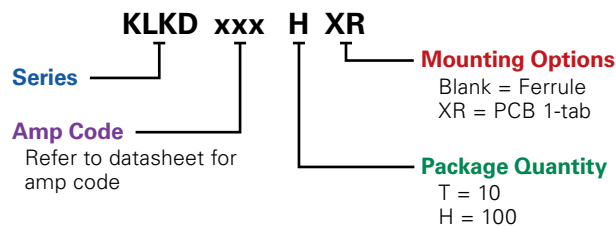


MOUNTING HOLE DETAIL

## Specifications

<b>Voltage Rating:</b>	600 Vac/Vdc
<b>Ampere Rating:</b>	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
<b>Interrupting Ratings:</b>	AC: 100 kA 200 kA Littelfuse self-certified
<b>Material:</b>	Body: Melamine / Caps: Copper Alloy
<b>Operating Temperature:</b>	See Rerating Curve
<b>Approvals:</b>	DC: 1/10-30: 10 kA (UL 2579) 1/10-30: 50 kA (UL 248-14) 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)
<b>Environmental:</b>	RoHS Compliant
<b>Country of Origin:</b>	Mexico

## Part Numbering System



SERIES	AMP	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. 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.

## Hinged Plastic Covers



## 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

<b>Voltage Rating</b>	600 V
<b>Current Rating</b>	Based on 2014 NEC Table 310.16 (or NEC Table 310.15(B)(16) effective with 2017 NEC), using 75°C copper wire
<b>Material</b>	Phenolic rated at 150°C and Thermoplastic rated at 125°C (LD1400 and LS1300 series only)
<b>Connector</b>	Standard: Highly conductive aluminum, tin plated Copper: Highly conductive copper, tin plated
<b>Flammability Rating</b>	UL94 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 - OLD57xxxx (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)

## Clear Plastic Covers





# 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 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

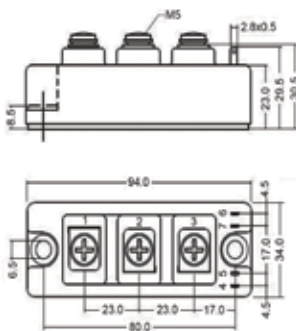
- AC Motor Control
- Inverter
- Motion / Servo Control
- Power Supplies
- Photovoltaic / Fuel Cell

## Web Resources

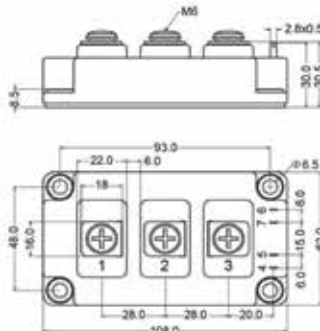
Download the complete datasheet and other technical information: [littelfuse.com](http://littelfuse.com)

## Dimensions Inches (mm)

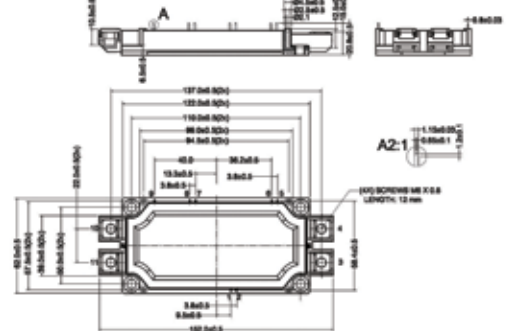
S Package Type



D Package Type



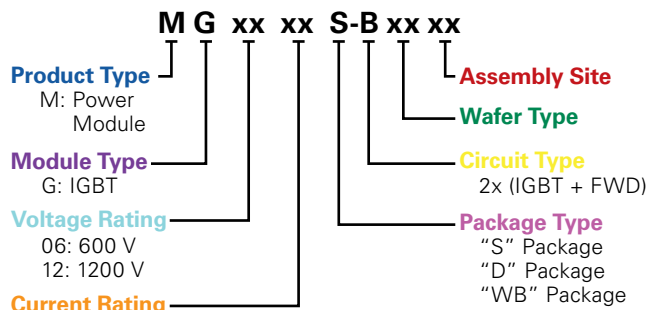
WB Package Type



## Specifications

<b>Voltage Rating</b>	600 / 1200 V
<b>Amperage Rating</b>	S Package: 75, 100, 150, 200 D Package: 100, 150, 200, 300, 400 WB Package: 225, 300, 450, 600
<b>Circuit Type</b>	Half-Bridge
<b>Approvals</b>	UL Listed (File: E71639)
<b>Environmental</b>	RoHS Compliant

## Part Numbering System



## Ordering Information

ORDERING NUMBER	VOLT	AMPS	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 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 withstand ability in the inverter and at locations before damaging transients may reach sensitive equipment.

## Transient Voltage Suppression (TVS) Diodes

TVS Diodes are used to protect semiconductor components from high-voltage transients. Their p-n junctions have a larger cross-sectional area than those of a normal diode, allowing them to conduct large currents to ground without sustaining damage. Littelfuse supplies TVS Diodes with peak power ratings from 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° to +302° F (-55° 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° to +347° F (-55° to +175° C)	•	•	
SA		DO-15	5.0-180	500 W	–		•	•	
SAC		DO-15	5.0-50	500 W	–		•	•	
P6KE		DO-15	5.8-512	600 W	–		•	•	
1.5KE		DO-201	5.8-512	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° to +347° F (-55° to +175° C)	•	•	
20KPA		P600	20-300	20000 W	–		•	•	
30KPA		P600	28-288	30000 W	–		•	•	
AK1		Radial Lead	76	–	1000 A		-67° to +302° F (-55° to +150° C)	•	•
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:

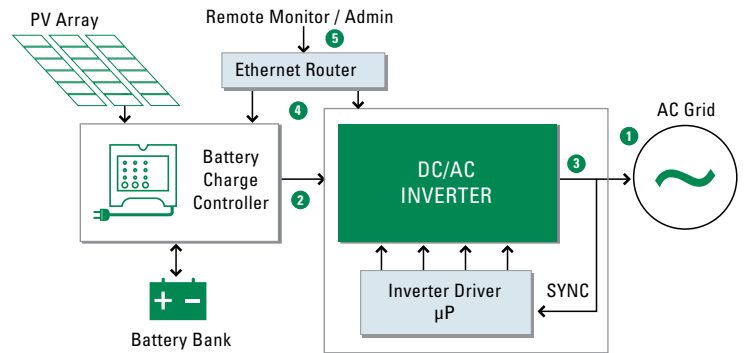
Microprocessor-controlled inverter with the AC output synchronized to the AC grid stores energy in utility company and maximizes PV array energy output.

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

SERIES NAME	PHOTO	OPERATING Vac RANGE	OPERATING Vdc 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		
<b>SURFACE MOUNT MLV / MOV</b>																
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	•					•	•	
<b>RADIAL LEADED MOV</b>																
UltraMOV™		130-625	170-825	1750-10000	12.5-720	-55 to +85°C	Radial Leaded	7, 10, 14, 20 mm	•	•	•	•	•	•	•	
UltraMOV™ 25S		115-750	150-970	22000	230-890			25 mm	•	•	•	•	•	•	•	•
C-III		130-660	–	3500-9000	40-530			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	•	•	•	•	•	•	•	•
<b>THERMALLY PROTECTED MOV</b>																
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	-55 to +85°C	Radial Leaded	25 mm	•	•	•	•	•	•		
TMOV® 34S		115-750	150-970	40000	235-1050			34 mm	•	•	•	•	•	•	•	
TMOV®/iTMOV®		115-750	150-970	6000-10000	35-480			14, 20 mm	•	•	•	•	•	•	•	

# SE-601 SERIES (PGR-2601)

## DC Ground-Fault Monitor



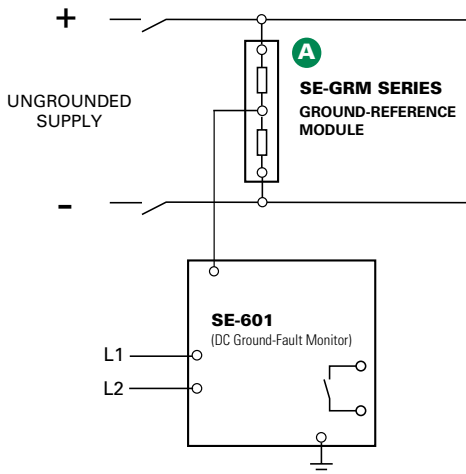
### Description

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-Vdc control circuits to 1000-Vdc 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

### Simplified Circuit Diagram



### 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.

### Ordering Information

ORDERING NUMBER	CONTROL POWER
SE-601-OU	120/240 Vac/Vdc
SE-601-OD	12/24 Vdc
SE-601-OT	48 Vdc

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)

www.littelfuse.com/se-601

# EL731 SERIES

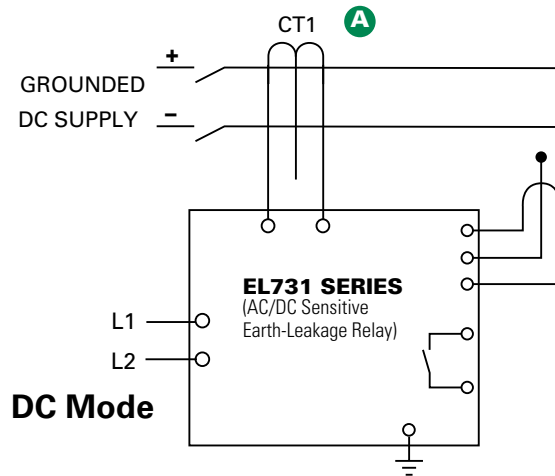
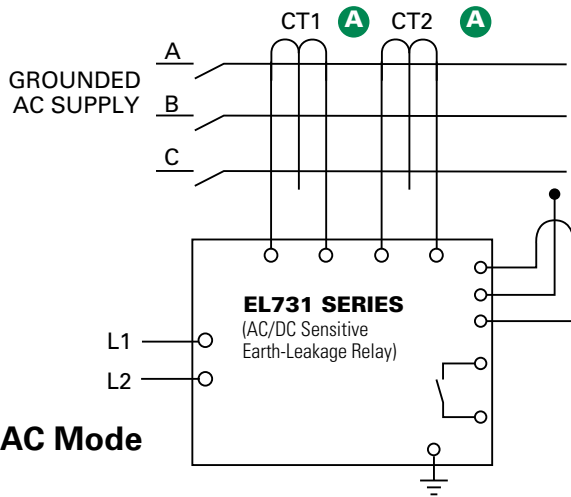
## AC/DC Sensitive Earth-Leakage Relay



### 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



For detailed wiring diagram, see adjacent page.

### Ordering Information

ORDERING NUMBER	CONTROL POWER	COMMUNICATIONS
EL731-00-X0	120/240 Vac/Vdc	None
EL731-01-X0	120/240 Vac/Vdc	DeviceNet™
EL731-02-X0	120/240 Vac/Vdc	Profibus®
EL731-03-X0	120/240 Vac/Vdc	EtherNet/IP™
EL731-04-X0	120/240 Vac/Vdc	Modbus® TCP
EL731-10-X0	48 Vdc & 24 Vac	None
EL731-11-X0	48 Vdc & 24 Vac	DeviceNet™
EL731-12-X0	48 Vdc & 24 Vac	Profibus®
EL731-13-X0	48 Vdc & 24 Vac	EtherNet/IP™
EL731-14-X0	48 Vdc & 24 Vac	Modbus® TCP
EL731-20-X0	24 Vdc	None
EL731-21-X0	24 Vdc	DeviceNet™
EL731-22-X0	24 Vdc	Profibus®
EL731-23-X0	24 Vdc	EtherNet/IP™
EL731-24-X0	24 Vdc	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.

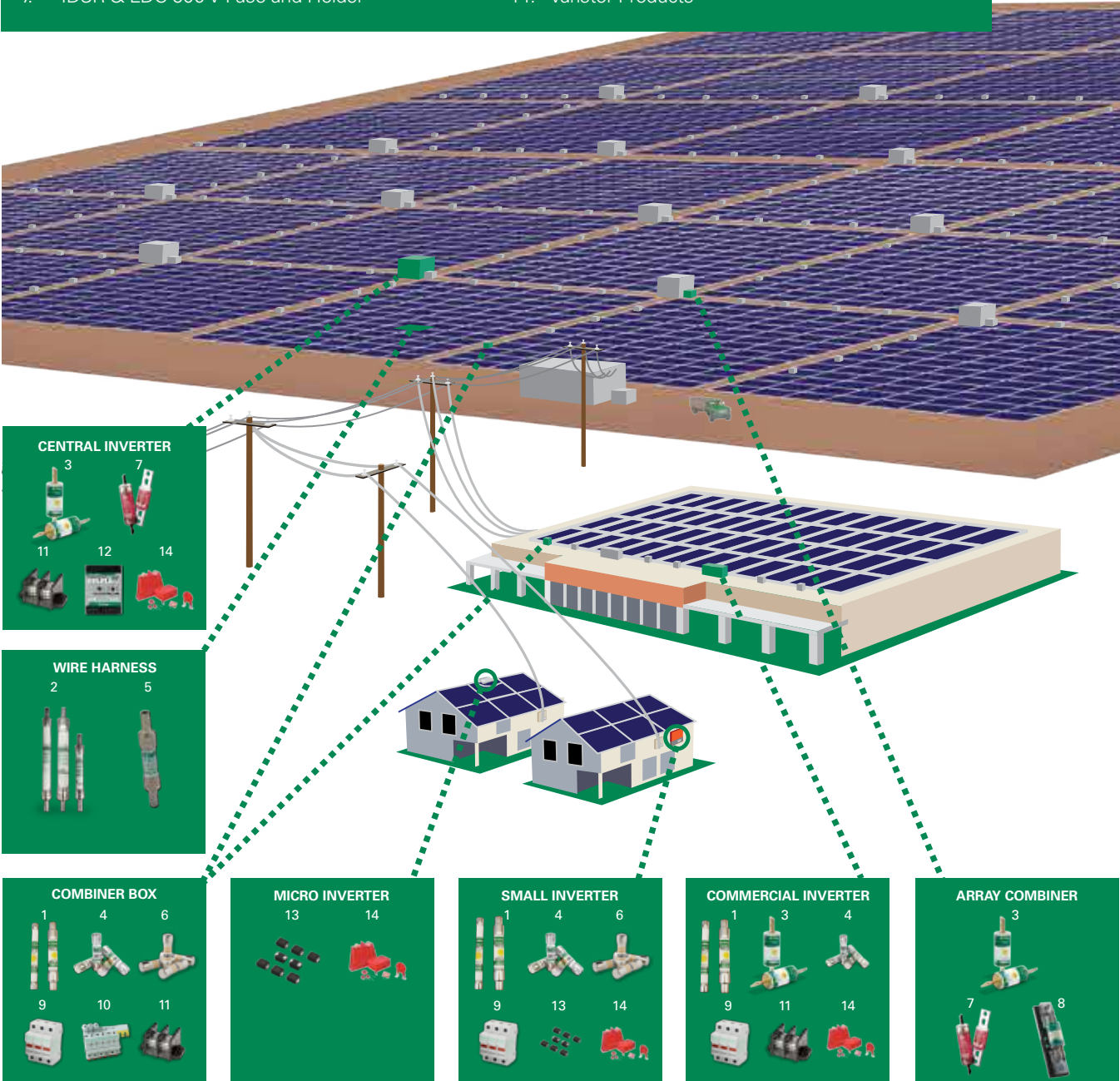
ACCESSORIES	REQUIREMENT
EFCT Series CT	One Required
AC700-CUA Series Com. Unit	Optional
AC700-SMK Surface-Mount Kit	Optional
AC700-CVR-00 Watertight Cover (IP66) for Panel-Mount Applications	Optional
PGA-0520 Analog Meter	Optional

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

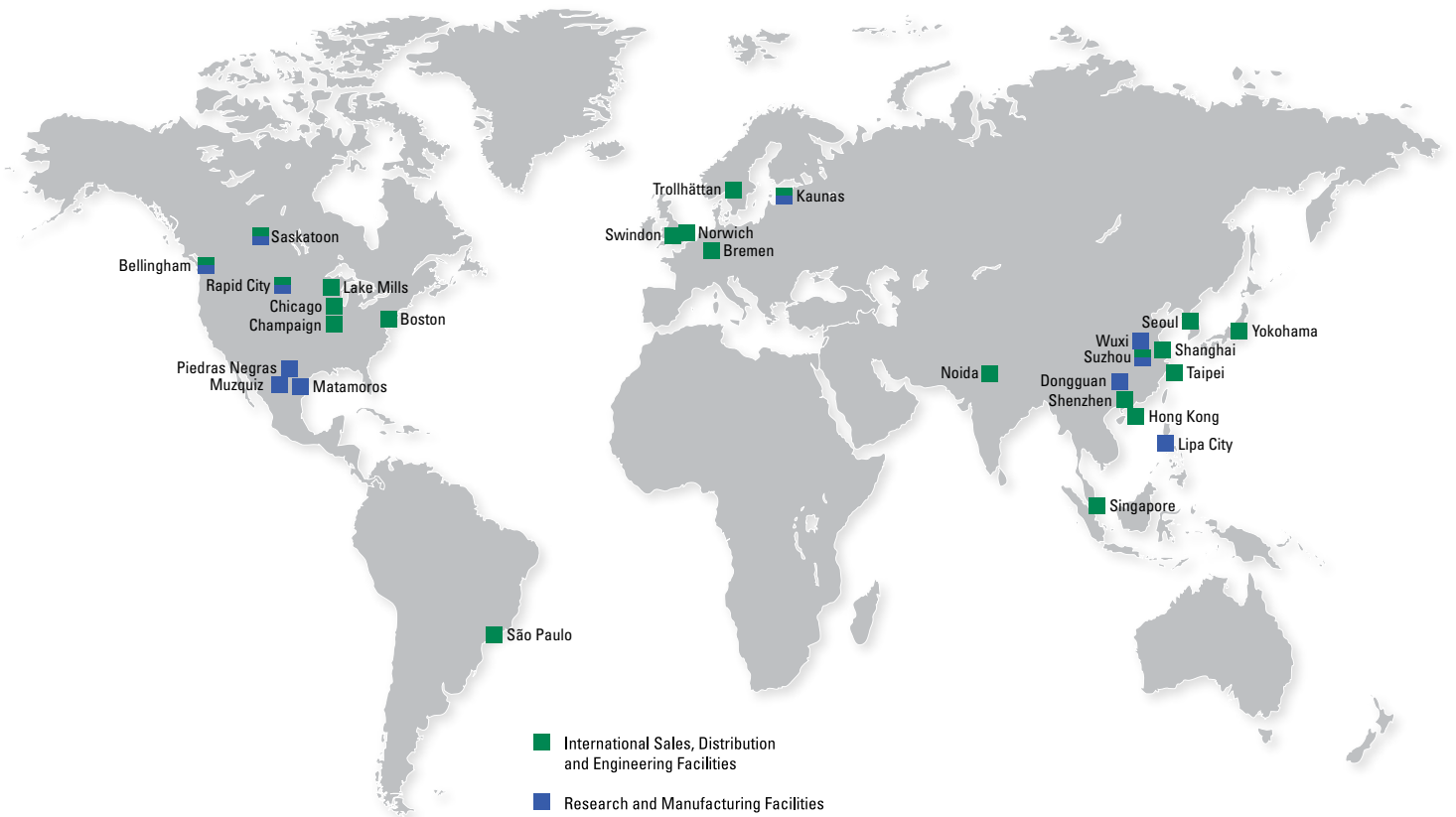


**SOLAR PRODUCTS BY APPLICATION**

1. SPXV 1500 V – 6-30 A Fuse
2. SPXI 1500 V – 2.5-30 A In-Line Fuse
3. SPFJ 1000 V – 70-450 A Fuse
4. SPF 1000 V – 1-30 A Fuse
5. SPFI 1000 V – 2-30 A In-Line Fuse
6. KLKD 600 V – 1/10-30 A Fuse
7. IDSR & LDC 600 V Fuse and Holder
8. LFJ1000 Fuse Block for SPFJ Fuse
9. LFPXV, LPHV & LPSM Series Fuse Holder
10. Busbar for Touch-Safe Fuse Holders
11. Power Distribution Block
12. SE-601 DC Ground-Fault Relay
13. TVS Diodes / SCRs
14. Varistor Products



# Local Resources for a **GLOBAL** Market



## 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

### Canada

Phone 306 373 5505

### Hong Kong, China

Phone +852 2810 5099

### Shanghai, China

Phone +86 21 2327 6000

### Shenzhen, China

Phone +86 755 8207 0760

### Dubai

Phone +971 4341 3660

### 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

### Taiwan

Phone +886 2 8751 1234



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

Technical information is only a click away. The Littelfuse Technical Resources contains datasheets, product manuals, whitepapers, application guides, demos, on-line design tools, and more.





**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](mailto:techline@littelfuse.com)  
**Customer Service:**  
 Tel: +1-800-227-0029  
 E-mail: [PG\\_CSG@littelfuse.com](mailto: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: [techline@littelfuse.com](mailto:techline@littelfuse.com)  
**Customer Service:**  
 Tel: +1-800-227-0029  
 E-mail: [PG\\_CSG@littelfuse.com](mailto:PG_CSG@littelfuse.com)  
 Fax: +1-605-348-5685

**Littelfuse Startco**  
 3714 Kinnear Place  
 Saskatoon, SK S7P 0A6  
 Canada  
 Tel: +1-306-373-5505  
 Fax: +1-306-374-2245  
 E-mail: [techline@littelfuse.com](mailto: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.

Specifications, descriptions and illustrative material in this literature are as accurate as known at the time of publication, but are subject to changes without notice. Visit [Littelfuse.com](http://Littelfuse.com) for the most up-to-date technical information.