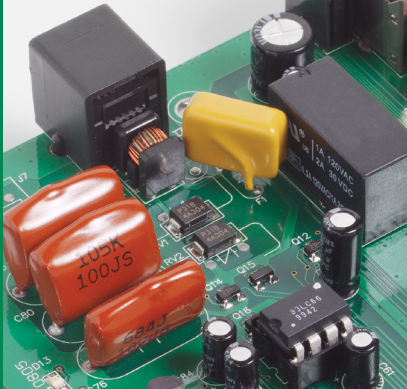
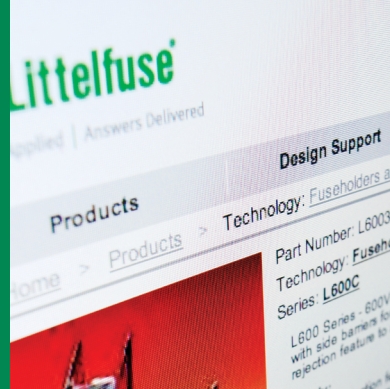




Expertise Applied | Answers Delivered



## CIRCUIT PROTECTION SOLUTIONS



## Electronics Circuit Protection Product Selection Guide

A guide to selecting Littelfuse circuit protection components for electronic applications.

# Broadest and Deepest Portfolio of Product Backed by Unparalleled Circuit Protection Expertise

## ABOUT THIS GUIDE

This guide provides a summary of key circuit protection consideration factors, descriptions of the technologies Littelfuse offers, and product selection tables. It is designed to help you quickly find a protection solution appropriate to your application.

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| Littelfuse Circuit Protection Technologies               | 2–3   |
| <b>Overcurrent Protection Technologies</b>               |       |
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## WHY CHOOSE CIRCUIT PROTECTION

Circuit protection devices interrupt overcurrent events and divert overvoltage transients. They increase safety and enable end products to survive harsh electrical conditions.

Most electrical and electronic equipment require circuit protection devices. In many cases they must be installed to comply with safety and performance standards before the end products can be sold or used.

Beyond this, strategically-selected protection devices will:

- Improve end-product uptime, sustainability and reliability
- Assure low warranty return, repair and replacement costs
- Minimize fire and shock risks and larger damage potential
- Minimize operating dangers and potential liabilities

## WHY CHOOSE LITTELFUSE

Littelfuse is the global leader in circuit protection solutions. We are the only company to offer all of the pertinent circuit protection technologies, with products that can be used in virtually everything that uses electrical energy.

Complementing our wide portfolio of circuit protection products is a global network of design and technical support expertise.

We offer decades of design experience to help you address application challenges and achieve regulatory compliance.

### Your Single Source

Littelfuse offers an extensive circuit protection product line. We design forward-thinking, application-specific solutions to provide assurance that your most demanding requirements will be met. Our goal is to provide the most complete range of options so that you will not have to make compromises.

### Testing Support

Littelfuse can help assure that your products will withstand most common threats repeatedly and will fail safely under extreme circumstances. We can serve as an independent source to provide assistance as you design by offering lab testing capabilities for customer applications. This testing includes industry specific required power fault and ESD/EFT/lightning surge conditions.

### Application Knowledge

For over 85 years, Littelfuse has maintained a focus on circuit protection, and we will continue to adapt as technologies evolve. Engineers and circuit designers around the world have come to rely on Littelfuse products and application knowledge to support their designs.

### Global Support

Littelfuse products, application knowledge and technical support are available around the globe. We offer a network of regional customer support offices and hundreds of independent authorized distributor contacts to assist you. Visit [www.littelfuse.com/contact-us](http://www.littelfuse.com/contact-us) to find local support near you.

### Standards Compliance Expertise

Most Littelfuse products comply with a wide range of applicable industry and government guidelines, as well as our own rigorous quality and reliability criteria. We continually look forward and adapt to changing requirements, so that our products will comply with industry specific, national and international standards such as CCC, CSA, IEC, IEEE, ISO, ITU, Meti, RoHs, Telcordia, TIA and many more.

## FOR FURTHER GUIDANCE

Littelfuse product representatives will work with you to find circuit protection technologies that will meet your requirements.

To address your requirements or questions in detail, please contact a representative near you ([Littelfuse.com/contact-us](http://Littelfuse.com/contact-us)).

For reference diagrams, technical articles, and other application guidance materials to assist in your design processes, please visit [Littelfuse.com/designsupport](http://Littelfuse.com/designsupport)

For detailed selection of Littelfuse circuit protection technologies and their common applications, please visit [Littelfuse.com/products](http://Littelfuse.com/products)

For a library of detailed application guides, please visit [Littelfuse.com/technical-resources/application-designs](http://Littelfuse.com/technical-resources/application-designs)

To download the most current edition of this brochure and our product catalogs, please visit [Littelfuse.com/catalogs](http://Littelfuse.com/catalogs)

# Littelfuse

## Circuit Protection Technologies

| Technology                                      | Key Features and Protection Characteristics                                                                | When / Where Typically Used                                                                 | Surge Energy Rating Range | Typical Voltage Clamping Speeds | Typical Capacitance/ Insertion Loss | Mounting/ Size/Packaging Options                       |
|-------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------|---------------------------------|-------------------------------------|--------------------------------------------------------|
| <b>Overcurrent Protection Technologies:</b>     |                                                                                                            |                                                                                             |                           |                                 |                                     |                                                        |
| <a href="#">Fuses</a>                           | Completely stop current flow, which helps to identify faults; Wide range of options                        | Ultimate protection for sensitive/ expensive/critical components                            | Low thru Very High        | Not applicable                  | Series impedance measured in nH     | Very Extensive Range of Options                        |
| <a href="#">PTCs</a>                            | Resettable; No device replacement after most common overcurrent events                                     | Where overcurrent events may occur often, and continuous uptime desired                     | Low thru High             | Not applicable                  | Series resistance measured in ohms  | Surface Mount, Radial Leaded, Axial Strap              |
| <b>Overvoltage Suppression Technologies:</b>    |                                                                                                            |                                                                                             |                           |                                 |                                     |                                                        |
| <a href="#">Multi-Layer Varistors (MLVs)</a>    | Compact and capable of handling significant surges for their size                                          | ESD and EFT suppression in smaller and portable electronics                                 | Low thru Medium           | Moderate                        | High                                | Miniature Surface Mount                                |
| <b>Metal-Oxide Varistor (MOVs)</b>              | Capable of withstanding very high energy transients; Wide range of options                                 | Appliance, industrial and very high energy suppression applications                         | Medium thru Very High     | Moderate                        | High                                | Radial Leaded, Industrial Terminal                     |
| <a href="#">GDTs</a>                            | Switches that turn to on state and shunt overvoltage to ground using a contained inert gas as an insulator | Protection of telecom equipment from lightning surges                                       | Medium thru High          | Fast                            | Low                                 | Surface Mount, Axial Leaded, 2/3 Lead Radial           |
| <a href="#">PulseGuard® ESD Suppressors</a>     | Extremely low capacitance; Fast response time; Compact size                                                | ESD suppression; Ultra fast reaction; Low signal distortion                                 | Low                       | Moderate                        | Low                                 | Miniature Surface Mount                                |
| <a href="#">PLED LED Protectors</a>             | Shunt function bypasses open LEDs; ESD and reverse power protection                                        | High brightness outdoor LED lighting applications                                           | Low                       | Very Fast                       | Medium                              | Miniature Surface Mount                                |
| <a href="#">TVS Diode Array SPA® Diodes</a>     | Low capacitance / low clamping voltage; Compact size                                                       | ESD suppression; Low distortion; Ideal for I/O interfaces and digital & analog signal lines | Low thru Medium           | Very Fast                       | Low                                 | Extensive range of surface mount options               |
| <a href="#">TVS Diodes</a>                      | Fast response to fast transients; Wide range of options                                                    | Semiconductor protection; telecom I/O interfaces, electronics, industrial equipment         | Medium thru High          | Fast                            | High                                | Axial Leaded, Radial Leaded, Surface Mount             |
| <a href="#">SIDACTor® Protection Thyristors</a> | Specifically designed to serve stringent telecom/ networking standards                                     | Telecom / Datacom and networking applications                                               | Medium thru High          | Very Fast                       | Low                                 | Extensive range of surface mount and thru-hole options |
| <b>Switching Technologies:</b>                  |                                                                                                            |                                                                                             |                           |                                 |                                     |                                                        |
| <a href="#">Power Thyristors</a>                | Solid state switches that switch to low "on" state and control the flow of current                         | Home appliances, power tools, outdoor equipment                                             | Not applicable            | Not applicable                  | Not applicable                      | Extensive range of surface mount and thru-hole options |

## 1. Fuses and Holders —

**Fuses**— Full range including surface mount, axial, glass or ceramic, thin-film or Nano<sup>2</sup>® style, fast-acting or Slo-Blo<sup>®</sup> fuse.

**Clips**— Used in applications that require a fuse to be easily mounted to a PCB, but real-estate is scarce. Clips are also ideal for high-current applications, allowing for better heat management of the fuse. They are the most economical solution.

**Blocks**— An alternative solution to Clips but with easier placement on the PC board during manufacturing. In some instances, Blocks may provide insulation to the side ears of the clips. In addition to being through-hole, Blocks can also be screwed or riveted in place.

**Holders**— The ideal solutions for those applications that require the cartridge fuse to be protected, providing a shock-safe environment. Panel-

mount holders allow for easy replacement of the fuse from outside of the appliance, perfect for applications that require replacing the fuse without opening the appliance enclosure. (Pages 4-6).

## 2. Positive Temperature Coefficient Devices (PTCs) —

Provide resettable overcurrent protection for a wide range of applications (Page 7).

**3. Varistors** — Multiple forms, from Metal Oxide Varistors (MOVs) and Thermally Protected MOV (TMOV<sup>®</sup> varistors) that suppress lightning transient voltages to Multi-Layer Varistors (MLVs) designed for applications requiring protection from various ESD/EFT transients in computers and handheld devices as well as industrial and automotive applications (Page 8).

## 4. Gas Discharge Tubes

(GDTs) — Available in small footprint leaded and surface

mount configurations, Littelfuse GDTs respond fast to transient overvoltage events, reducing the risk of equipment damage (Page 9).

## 5. PulseGuard<sup>®</sup> ESD

**Suppressors** — Available in various surface mount form factors to protect high-speed digital lines without causing signal distortion (Page 9).

**6. TVS Diodes** — Suppress overvoltage transients such as Electrical Fast Transients (EFT), inductive load switching and lightning in a wide variety of applications in the computer, industrial, telecom and automotive markets (Pages 10-11).

## 7. TVS Diode Array —

**SPA<sup>®</sup> Diodes** — Designed specifically to protect analog and digital signal lines from electrostatic discharge (ESD) and other overvoltage transients such as EFT and Lightning (Page 12).

## 8. PLED Bypass Protectors —

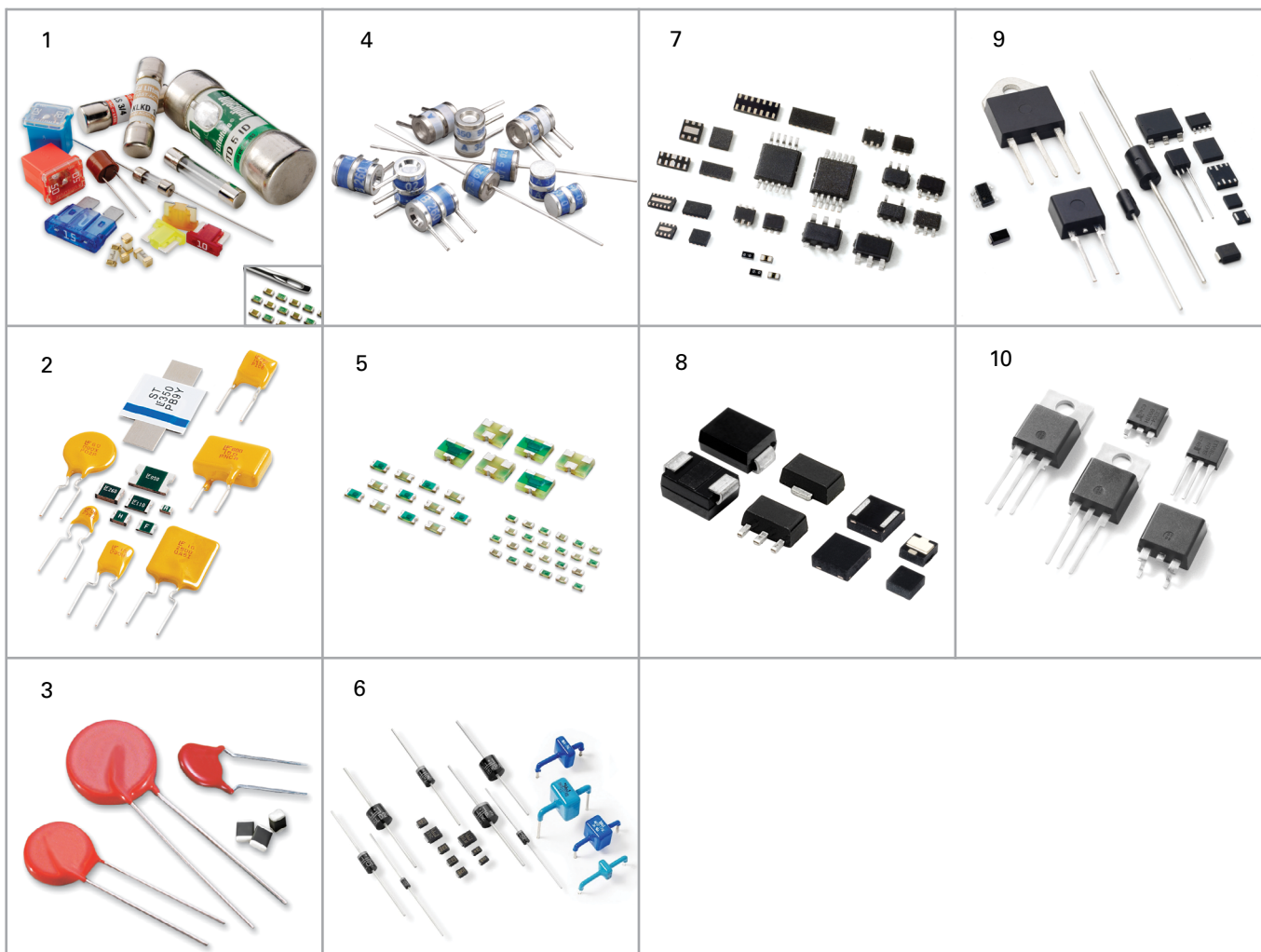
Specialty silicon devices that enable LED lighting strings to continue to function if any single LED fails as an open circuit, and also offer ESD and reverse power protection (Page 13).

## 9. SIDACTor<sup>®</sup> Protection

**Thyristors** — Complete line of protection thyristor products specifically designed to suppress overvoltage transients in a broad range of telecom and datacom applications (Pages 14-15).

## 10. Switching Thyristors —

Solid-state switches used to control the flow of electrical current in applications, capable of withstanding rated blocking/off-state voltage until triggered to the on-state (Pages 16-17).



# Product Specifications and Selection Guide

## FUSE PRODUCTS

Fuses provide protection by completely stopping the flow of energy to sensitive circuits. If current exceeds the fuse's operating range, the metal wire or strip melts safely within an enclosure. Littelfuse offers the most extensive range of fuses available, and for easy replacement of cartridge fuses Littelfuse offers a wide selection of fuseholders including panel mount, in-line, and surface and thru-hole circuit board mount devices.

See page 6 for fuseholder selection.

|                          | Series Name <sup>1</sup>                                                            | View Datasheet | Order Samples                  | Size <sup>2</sup> | Time Lag | Fast Acting | Very Fast Acting | Device Range <sup>3</sup><br>(Operating Current Options in Amps) | Max. Voltage Rating <sup>3</sup><br>(Volts) | Interrupting Rating at Max. Voltage Rating <sup>3</sup><br>(Amps) | Operating Temperature Range | Agency Approvals <sup>3</sup> |    |     |     |     | Halogen Free | RoHS Compliant | Lead Free |
|--------------------------|-------------------------------------------------------------------------------------|----------------|--------------------------------|-------------------|----------|-------------|------------------|------------------------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------|-----------------------------|-------------------------------|----|-----|-----|-----|--------------|----------------|-----------|
|                          |                                                                                     |                |                                |                   |          |             |                  |                                                                  |                                             |                                                                   |                             | UL                            | UR | CSA | PSE | UMF |              |                |           |
| Ceramic Chip             |    | 437            | <a href="#">View Datasheet</a> | 1206              |          | •           |                  | 0.25 - 8                                                         | 125 / 63 / 32                               | 50                                                                | -55°C to +150°C             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 438            | <a href="#">View Datasheet</a> | 0603              |          | •           |                  | 0.25 - 6                                                         | 32 / 24                                     | 50                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 440            | <a href="#">View Datasheet</a> | 1206              |          | •           |                  | 1.75 - 8                                                         | 32                                          | 50                                                                |                             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 441            | <a href="#">View Datasheet</a> | 0603              |          | •           |                  | 2 - 6                                                            | 32                                          | 50                                                                |                             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 469            | <a href="#">View Datasheet</a> | 1206              | •        |             |                  | 1 - 8                                                            | 24 / 32                                     | 24 - 63                                                           |                             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 501            | <a href="#">View Datasheet</a> | 1206              |          | •           |                  | 10, 12, 15, 20                                                   | 32                                          | 150                                                               |                             | •                             |    |     |     |     | •            | •              | •         |
| Thin Film                |  | 466            | <a href="#">View Datasheet</a> | 1206              |          | •           |                  | 0.125 - 5                                                        | 125 / 63 / 32                               | 50                                                                | -55°C to +90°C              | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 429            | <a href="#">View Datasheet</a> | 1206              |          | •           |                  | 7                                                                | 24                                          | 35                                                                |                             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 468            | <a href="#">View Datasheet</a> | 1206              | •        |             |                  | 0.5 - 3                                                          | 63 / 32                                     | 35 - 50                                                           |                             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 467            | <a href="#">View Datasheet</a> | 0603              |          | •           |                  | 0.25 - 5                                                         | 32                                          | 35 - 50                                                           |                             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 494            | <a href="#">View Datasheet</a> | 0603              | •        |             |                  | 0.25 - 5                                                         | 32                                          | 35 - 50                                                           |                             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 435            | <a href="#">View Datasheet</a> | 0402              |          | •           |                  | 0.25 - 5                                                         | 32                                          | 35                                                                |                             | •                             | •  |     |     |     | •            | •              | •         |
| Nano <sup>2</sup> ® Fuse |  | 448            | <a href="#">View Datasheet</a> | 2410              |          | •           |                  | 0.062 - 15                                                       | 125 / 65                                    | 35 - 50                                                           | -55°C to +125°C             | •                             | •  | •   |     |     | •            | •              | •         |
|                          |                                                                                     | 449            | <a href="#">View Datasheet</a> | 2410              | •        |             |                  | 0.375 - 5                                                        | 125                                         | 50                                                                |                             | •                             | •  | •   |     |     | •            | •              | •         |
|                          |                                                                                     | 451 / 453      | <a href="#">View Datasheet</a> | 2410              |          | •           |                  | 0.062 - 15                                                       | 125 / 65                                    | 35 - 50                                                           |                             | •                             | •  | •   |     |     | •            | •              | •         |
|                          |                                                                                     | 452 / 454      | <a href="#">View Datasheet</a> | 2410              | •        |             |                  | 0.375 - 12                                                       | 125 / 72                                    | 50                                                                |                             | •                             | •  | •   |     |     | •            | •              | •         |
|                          |                                                                                     | 456            | <a href="#">View Datasheet</a> | 4012              |          | •           |                  | 20, 25, 30, 40                                                   | 125                                         | 100                                                               |                             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 458            | <a href="#">View Datasheet</a> | 1206              |          | •           |                  | 1.0 - 10                                                         | 75 / 63                                     | 50                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 443            | <a href="#">View Datasheet</a> | 4012              | •        |             |                  | 0.5 - 5                                                          | 250                                         | 50                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 464            | <a href="#">View Datasheet</a> | 4818              |          | •           |                  | 0.5 - 6.3                                                        | 250                                         | 100                                                               |                             |                               |    |     | •   | •   | •            | •              | •         |
|                          |                                                                                     | 465            | <a href="#">View Datasheet</a> | 4818              | •        |             |                  | 1 - 6.3                                                          | 250                                         | 100                                                               |                             |                               |    |     | •   | •   | •            | •              | •         |
|                          |                                                                                     | 462            | <a href="#">View Datasheet</a> | 4118              | •        |             |                  | 0.500 - 5                                                        | 350                                         | 100                                                               |                             | •                             |    |     |     | •   | •            | •              | •         |
| Telelink® Fuse           |  | 485            | <a href="#">View Datasheet</a> | 4818              |          | •           |                  | 0.500 - 3.15                                                     | 600                                         | 100                                                               | -55°C to +125°C             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 461            | <a href="#">View Datasheet</a> | 4012              |          |             |                  | 0.5 - 2.0                                                        | 600                                         | 60                                                                | -55°C to +125°C             | •                             | •  |     |     |     | •            | •              | •         |
|                          |                                                                                     | 461E           | <a href="#">View Datasheet</a> | 4012              |          |             |                  | 1.25                                                             | 600                                         | 60                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
| OMNI-BLOK® Fuseholder    |  | 154            | <a href="#">View Datasheet</a> | *                 |          | •           |                  | 0.062 - 10.0                                                     | 125                                         | 35 - 50                                                           | -55°C to +125°C             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 154T           | <a href="#">View Datasheet</a> | *                 | •        |             |                  | 0.375 - 5                                                        | 125                                         | 50                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
| Fuse and Clip Assemblies |  | 157            | <a href="#">View Datasheet</a> | *                 |          | •           |                  | 0.062 - 10                                                       | 125                                         | 35 - 50                                                           | -55°C to +125°C             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 157T           | <a href="#">View Datasheet</a> | *                 | •        |             |                  | 0.375 - 5                                                        | 125                                         | 50                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 159            | <a href="#">View Datasheet</a> | *                 |          |             |                  | 0.5 - 2                                                          | 600                                         | 60                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
|                          |                                                                                     | 160            | <a href="#">View Datasheet</a> | *                 | •        |             |                  | 0.5 - 5                                                          | 250                                         | 50                                                                |                             | •                             |    |     |     |     | •            | •              | •         |
| PICO® SMF Fuse           |  | 459            | <a href="#">View Datasheet</a> | *                 |          | •           |                  | 0.062 - 5                                                        | 125                                         | 50 - 300                                                          | -55°C to +125°C             | •                             | •  |     |     |     |              |                |           |
|                          |                                                                                     | 460            | <a href="#">View Datasheet</a> | *                 | •        |             |                  | 0.5 - 5                                                          | 125                                         | 50                                                                |                             | •                             | •  |     |     |     |              |                |           |
| Flat Pak                 |  | 202            | <a href="#">View Datasheet</a> | *                 |          | •           |                  | 0.062 - 5                                                        | 250                                         | 50                                                                | -55°C to +125°C             | •                             | •  |     |     |     |              |                |           |
|                          |                                                                                     | 203            | <a href="#">View Datasheet</a> | *                 | •        |             |                  | 0.25 - 5                                                         | 250                                         | 50                                                                |                             | •                             | •  |     |     |     |              |                |           |
| EBF                      |  | 446            | <a href="#">View Datasheet</a> | *                 |          | •           |                  | 2.0 - 10.0                                                       | 350                                         | 100                                                               | -40°C to +125°C             | •                             | •  |     |     |     |              |                |           |
|                          |                                                                                     | 447            | <a href="#">View Datasheet</a> | *                 |          | •           |                  | 2.0 - 10.0                                                       | 350                                         | 100                                                               |                             | •                             | •  |     |     |     |              |                |           |

(1) Detailed information about most product series listed here can be found on our web site.

(2) Size for these surface mount items refers to common industry length and width dimensions of the device surface area. Example: 0402 = .04" x .02"

(3) In some cases for these categories the ratings, agency approvals and specifications vary by part number and are presented here as ranges representing the whole series.

Please refer to product data on [www.littelfuse.com](http://www.littelfuse.com) and in our data sheets for detailed information by part number.

\* Please refer to data sheet for detailed specifications.

|  | Series Name <sup>1</sup> | View Datasheet | Order Samples | Time Lag | Medium Acting | Fast Acting | Very Fast Acting | Device Range <sup>3</sup><br>(Operating Current Options in Amps) | Max. Voltage Rating <sup>2</sup><br>(Volts) | Interrupting Rating at Max Voltage Rating <sup>3</sup><br>(Amps) | Operating Temperature Range | Agency Approvals <sup>3</sup> |    |     |     |     |        |     |     |     |       |      |   | RoHS Compliant | Lead Free |
|--|--------------------------|----------------|---------------|----------|---------------|-------------|------------------|------------------------------------------------------------------|---------------------------------------------|------------------------------------------------------------------|-----------------------------|-------------------------------|----|-----|-----|-----|--------|-----|-----|-----|-------|------|---|----------------|-----------|
|  |                          |                |               |          |               |             |                  |                                                                  |                                             |                                                                  |                             | Americas                      |    |     |     |     | Europe |     |     |     |       | Asia |   |                |           |
|  |                          |                |               |          |               |             |                  |                                                                  |                                             |                                                                  |                             | UL                            | UR | CSA | QPL | UMF | CE     | VDE | TUV | BSI | Semko | PSE  | K |                |           |

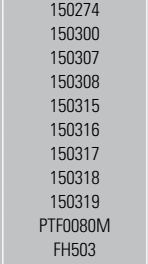
## Radial Leaded / Socket:

|                        |                                                                                   |         |                                |                               |   |   |   |            |     |          |                 |   |   |   |   |   |   |   |  |  |   |   |  |   |   |   |
|------------------------|-----------------------------------------------------------------------------------|---------|--------------------------------|-------------------------------|---|---|---|------------|-----|----------|-----------------|---|---|---|---|---|---|---|--|--|---|---|--|---|---|---|
| Micro™ Fuse / TR3 Fuse |  | 262/268 | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | 0.002 - 5  | 125 | 10,000   | -55°C to +125°C | • | • |   |   |   | • |   |  |  |   |   |  |   |   |   |
|                        |                                                                                   | 269     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | 0.002 - 5  | 125 | 10,000   | -55°C to +125°C | • | • | • |   |   | • |   |  |  |   |   |  |   |   |   |
|                        |                                                                                   | 272/278 | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | 0.002 - 5  | 125 | 10,000   | -55°C to +125°C | • | • |   |   |   | • |   |  |  |   |   |  |   |   |   |
|                        |                                                                                   | 273/279 | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | 0.002 - 5  | 125 | 10,000   | -55°C to +85°C  | • | • |   |   |   | • |   |  |  |   |   |  |   |   |   |
|                        |                                                                                   | 274     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | 0.002 - 5  | 125 | 10,000   | -55°C to +85°C  |   |   |   | • |   | • |   |  |  |   |   |  |   |   |   |
| TR5® Fuse              |  | 303     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | 0.5 - 5    | 125 | 50       | -55°C to +70°C  | • |   | • |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 370     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | 0.4 - 6.3  | 250 | 35 - 50  | -40°C to +85°C  |   | • |   |   |   | • |   |  |  | • | • |  | • | • | • |
|                        |                                                                                   | 372     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.4 - 6.3  | 250 | 35 - 50  |                 |   | • |   |   |   | • | • |  |  | • | • |  | • | • | • |
|                        |                                                                                   | 373     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • |   | 0.5 - 10   | 250 | 50       |                 | • |   | • |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 374     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.5 - 10   | 250 | 50       |                 | • |   | • |   |   | • |   |  |  |   |   |  |   |   | • |
| TE5                    |  | 382     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 1 - 10     | 250 | 100      | -40°C to +85°C  |   | • |   |   |   | • |   |  |  | • | • |  | • | • | • |
|                        |                                                                                   | 383     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 1 - 10     | 300 | 50 - 100 |                 |   | • |   |   |   | • | • |  |  | • | • |  | • | • | • |
|                        |                                                                                   | 369     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 1 - 6.3    | 300 | 50       |                 |   | • |   |   |   | • |   |  |  | • |   |  |   |   | • |
|                        |                                                                                   | 385     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.35 - 1.5 | 125 | 50       |                 |   | • |   |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 391     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • |   | 0.125 - 4  | 65  | 50       |                 |   | • |   |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 392     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.8 - 6.3  | 250 | 25 - 63  |                 |   | • |   |   |   | • |   |  |  | • | • |  | • | • | • |
|                        |                                                                                   | 395     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • |   | 0.05 - 6.3 | 125 | 100      |                 | • |   |   |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 396     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.05 - 6.3 | 125 | 100      |                 | • |   |   |   |   | • |   |  |  | • |   |  |   |   | • |
|                        |                                                                                   | 397     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.35 - 1.5 | 125 | 50       |                 | • |   |   |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 398     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • |   | 0.125 - 4  | 65  | 50       |                 |   | • |   |   |   | • |   |  |  |   |   |  |   |   | • |
| TE7                    |  | 399     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.125 - 4  | 65  | 50       | -40°C to +85°C  |   | • |   |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 400     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.5 - 6.3  | 250 | 130      |                 |   | • |   |   |   | • | • |  |  | • |   |  |   |   | • |
|                        |                                                                                   | 804     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.8 - 6.3  | 250 | 150      |                 |   | • |   |   | • | • |   |  |  | • | • |  | • | • | • |
|                        |                                                                                   | 808     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • |   | 2 - 5      | 250 | 100      |                 | • | • |   |   |   | • |   |  |  |   |   |  |   |   | • |
|                        |                                                                                   | 807     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   | 0.8 - 6.3  | 300 | 100      |                 | • | • | • |   |   | • |   |  |  | • | • |  |   |   | • |

## Axial Leaded / Cartridge:

|                                  |                                                                                     |                               |                                |                               |                                |              |      |            |                 |                 |                 |   |   |   |   |   |   |   |   |  |   |   |   |   |   |   |   |   |
|----------------------------------|-------------------------------------------------------------------------------------|-------------------------------|--------------------------------|-------------------------------|--------------------------------|--------------|------|------------|-----------------|-----------------|-----------------|---|---|---|---|---|---|---|---|--|---|---|---|---|---|---|---|---|
| PICO® Fuse / PICO® II Fuse Axial |   | 251                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.062 - 15 | 125             | 300DC / 50AC    | -55°C to +125°C |   | • | • |   |   | • | • |   |  | • |   |   |   |   | • |   |   |
|                                  |                                                                                     | 253                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.062 - 15 | 125             | 300DC / 50AC    |                 |   | • | • | • |   | • | • |   |  | • |   |   |   |   | • |   |   |
|                                  |                                                                                     | 275                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 20 - 30    | 32              | 300DC / 50AC    |                 |   | • | • |   |   |   |   |   |  |   |   |   |   |   | • |   |   |
|                                  |                                                                                     | 263                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.062 - 5  | 250             | 50              |                 |   | • | • |   |   | • |   |   |  | • |   |   |   |   | • |   |   |
|                                  |                                                                                     | 471                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.5 - 5    | 125             | 50              |                 |   | • | • |   |   | • |   |   |  | • |   |   |   |   | • |   |   |
|                                  |                                                                                     | 472                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.5 - 5    | 125             | 50              |                 |   | • | • |   |   | • |   |   |  |   |   |   |   |   | • |   |   |
|                                  |                                                                                     | 473                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.375 - 7  | 125             | 50              |                 |   | • | • |   |   | • |   |   |  | • |   |   |   |   | • |   |   |
|                                  |                                                                                     | 265/266/267                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.062 - 15 | 125             | 300DC / 50AC    |                 |   | • | • | • |   | • |   |   |  |   |   |   |   |   | • |   |   |
| 3.6x10 mm                        |  | 874                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.1 - 10   | 250             | 50              | -55°C to +125°C | • |   |   |   |   | • |   |   |  |   |   |   |   | • | • |   |   |
|                                  |                                                                                     | 875                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.1 - 10   | 250             | 50              |                 | • |   |   |   |   | • |   |   |  |   |   |   |   |   | • | • |   |
|                                  |                                                                                     | 876                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.125 - 5  | 250             | 35 - 50         |                 |   | • |   |   |   |   | • | • |  |   |   |   |   |   | • | • |   |
|                                  |                                                                                     | 877                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 2 - 6.3    | 250             | 35 - 63         |                 |   | • |   |   |   | • | • |   |  |   |   |   |   |   | • | • |   |
| 4.5x14.5 mm (2AG)                |  | 208                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.125 - 10 | 350             | 100             | -55°C to +125°C |   | • |   | • |   | • |   |   |  | • |   |   |   |   | • | • |   |
|                                  |                                                                                     | 209                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.25 - 7   | 350             | 100             |                 |   | • | • |   | • |   |   |   |  | • |   |   |   |   | • | • |   |
|                                  |                                                                                     | 220                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                | Special Fuse |      | 0.3 - 7    | 250 / 300 / 350 | 35 - 100        |                 | • | • | • |   |   | • |   |   |  | • |   |   |   |   | • | • |   |
|                                  |                                                                                     | 2205                          | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.25 - 2.5 | 250             | 35              |                 |   | • | • |   |   | • |   |   |  |   |   |   |   |   | • | • |   |
|                                  |                                                                                     | 224/225                       | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.375 - 10 | 250 / 125       | 35 - 500        |                 | • | • | • |   |   | • |   |   |  | • |   |   |   |   | • | • |   |
| 5x20 mm                          |  | 229/230                       | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.25 - 7   | 250 / 125       | 35 - 400        | -55°C to +125°C | • | • | • |   |   | • |   |   |  | • |   |   |   |   | • | • |   |
|                                  |                                                                                     | 217                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.032 - 15 | 250             | 35 - 150        |                 |   |   | • | • |   |   | • | • |  | • | • | • | • | • |   | • | • |
|                                  |                                                                                     | 218                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.032 - 16 | 250             | 35 - 100        |                 |   |   | • | • |   |   | • | • |  | • | • | • | • | • |   | • | • |
|                                  |                                                                                     | 213                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              |      | 0.2 - 6.3  | 250             | 35 - 63         |                 |   |   | • | • |   |   | • | • |  | • | • | • | • | • |   | • | • |
|                                  |                                                                                     | 219XA                         | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.04 - 6.3 | 250             | 150             |                 |   |   | • | • |   |   | • | • |  | • | • | • | • | • |   | • | • |
|                                  |                                                                                     | 216                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.05 - 16  | 250             | 750 - 1500      |                 |   |   | • | • |   |   | • | • |  | • | • | • | • | • |   | • | • |
|                                  |                                                                                     | 215                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.125 - 20 | 250             | 400 / 1500      |                 |   |   | • | • |   |   | • | • |  | • | • | • | • | • |   | • | • |
|                                  |                                                                                     | 232                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 1 - 10     | 250 / 125       | 300 / 10,000    |                 |   |   |   |   |   |   | • |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 235                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.1 - 7    | 250 / 125       | 35 - 10,000     |                 | • |   | • |   |   | • |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 233                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 1 - 10     | 125             | 10,000          |                 |   | • | • |   |   | • |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 234                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 1 - 10     | 250             | 100 - 200       |                 |   | • | • |   |   | • |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 239                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.08 - 7   | 250 / 125       | 35 - 10,000     |                 |   | • | • |   |   | • |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 285                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.125 - 20 | 250             | 400 - 1500      |                 |   |   |   |   |   |   |   |   |  |   | • |   |   |   |   | • | • |
| 6.3x32 mm (3AG/3AB)              |  | 477                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.5 - 16   | 400DC / 500AC   | 100 - 1500      | -55°C to +125°C |   | • | • |   |   |   |   |   |  | • |   |   |   |   | • | • |   |
|                                  |                                                                                     | 977                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.5 - 16   | 450DC / 500AC   | 200 / 100       |                 |   |   |   |   |   |   |   |   |  | • | • |   |   |   |   | • | • |
|                                  |                                                                                     | 312/318                       | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.062 - 35 | 250 / 32        | 35 - 300        |                 | • | • | • |   |   | • |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 313/315                       | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.01 - 30  | 250 / 125 / 32  | 35 - 300        |                 | • | • | • |   |   | • |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 314/324                       | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 0.375 - 40 | 250             | 35 - 1000       |                 | • | • | • |   |   |   |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 322                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 12 - 30    | 65              | 200 - 1000      |                 |   |   | • |   |   | • |   |   |  |   |   | • |   |   |   | • | • |
|                                  |                                                                                     | 332                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 1 - 10     | 250             | 100 / 200       |                 |   |   | • |   |   | • |   |   |  |   |   |   |   |   | • | • |   |
|                                  |                                                                                     | 325/326                       | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •                              |              |      | 0.01 - 30  | 250             | 100 - 600       |                 | • | • | • |   |   | • |   |   |  |   | • | • |   |   |   | • | • |
|                                  |                                                                                     | 505                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 10 - 30    | 450 / 500       | 20,000 - 50,000 |                 |   |   | • |   |   | • |   |   |  |   |   |   |   |   |   | • | • |
|                                  |                                                                                     | 506                           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                                |              | •    | 15 - 20    | 600DC           | 10,000          |                 |   |   | • |   |   | • |   |   |  |   |   |   |   |   |   | • | • |
| 508                              | <a href="#">View Datasheet</a>                                                      | <a href="#">Order Samples</a> |                                |                               | 1000VAC / DC High Voltage Fuse | 0.315 - 1    | 1000 | 10,000     |                 |                 | •               | • |   |   | • |   |   |   |   |  |   |   |   |   | • | • |   |   |

## FUSEHOLDER SELECTION GUIDE

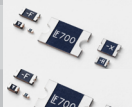
| Circuit Connection Method |                                                                                                                                             | Wire                                                                                | Wire Connector Terminals                                                          | TH= Thru-Hole SM= Surface Mount CT= Wire Connector Terminal QC= Quick Connect     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Fuseholder Type           |                                                                                                                                             | <a href="#">In-Line Fuseholders</a>                                                 | <a href="#">Panel Mount Fuse Enclosures</a>                                       | <a href="#">Circuit Board Mount Fuse Enclosures</a>                               | <a href="#">Fuse Blocks</a>                                                         |                                                                                     | <a href="#">Fuse Clips</a>                                                          |                                                                                     |                                                                                     |
| Fuse Type                 | Fuse Series                                                                                                                                 |    |  |  |  |                                                                                     |  |                                                                                     |                                                                                     |
| 4.5x14.5 mm (2AG)         | 208 / 209<br>225 / 229                                                                                                                      |    | 3452 series Int. Shocksafe                                                        |  |  |  |  |  |  |
|                           |                                                                                                                                             |                                                                                     | 345 series Int. Shocksafe ( old )                                                 |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | 245001 Solder QC                                                                  |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | 245002 Nema QC                                                                    |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | 286377 Flip Top                                                                   |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| 5x20 mm                   | 213 / 215<br>216 / 217<br>218 / 219XA<br>232 / 233<br>234 / 235<br>239 / 285<br>377 / 477<br>617 / 618                                      |    | 345 Shocksafe                                                                     | TH                                                                                | 345121 Shocksafe                                                                    | TH                                                                                  | 354252                                                                              | TH                                                                                  | 100 / 111 Series                                                                    |
|                           |                                                                                                                                             |                                                                                     | 3455 Int. Shocksafe                                                               | TH                                                                                | 4450718 / 595 / 596                                                                 | TH                                                                                  | 445073                                                                              | TH                                                                                  | 04450001 / 00300210                                                                 |
|                           |                                                                                                                                             |                                                                                     | 286677 Flip Top                                                                   | TH                                                                                | 598 / 652                                                                           | TH                                                                                  | 520 002, 520 101                                                                    | TH                                                                                  | 5200001                                                                             |
|                           |                                                                                                                                             |                                                                                     | 800 / 801 / 802 / 821 Series                                                      | TH                                                                                | 810 / 811 / 813 / 814                                                               | QC                                                                                  | 520 003, 520 005                                                                    | TH                                                                                  | 52000001009                                                                         |
|                           |                                                                                                                                             |                                                                                     | 823 Series Snap-in                                                                | TH                                                                                | 830 / 831 / 834                                                                     | CT                                                                                  | 520 004                                                                             | TH                                                                                  | 52100001009                                                                         |
|                           |                                                                                                                                             |                                                                                     | 824 / 824 - 20 / 850 / 851 / 860 series                                           | TH                                                                                | 852 / 853 / 862                                                                     | TH                                                                                  | 646 / 649 / 656                                                                     | TH                                                                                  | 51900001009                                                                         |
|                           |                                                                                                                                             |                                                                                     | 870 Series Medical Grade                                                          | TH                                                                                | PTF045 / PTF050                                                                     | CT                                                                                  | 647                                                                                 | TH                                                                                  | 51800001009                                                                         |
|                           |                                                                                                                                             |                                                                                     | 820/ 820-20 Series Mini Shocksafe                                                 |                                                                                   |                                                                                     | SM                                                                                  | 658                                                                                 | TH                                                                                  | 523 Series                                                                          |
|                           |                                                                                                                                             |                                                                                     | 601                                                                               |                                                                                   |                                                                                     | CT                                                                                  | PTF010 / PTF020                                                                     | TH                                                                                  | 445 Series                                                                          |
|                           |                                                                                                                                             |                                                                                     | 445                                                                               |                                                                                   |                                                                                     | TH                                                                                  | PTF015 / PTF065                                                                     | TH                                                                                  | NY61AP                                                                              |
|                           |                                                                                                                                             |                                                                                     | PTF030 / PTF035 / PTF040                                                          |                                                                                   |                                                                                     | TH                                                                                  | PTF075 / PTF077                                                                     | TH                                                                                  | OCT136                                                                              |
|                           |                                                                                                                                             |                                                                                     | PTF055 / PTF070                                                                   |                                                                                   |                                                                                     | TH                                                                                  | PTF078                                                                              |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | FH02A                                                                             |                                                                                   |                                                                                     |                                                                                     | FB55 / FB58                                                                         |                                                                                     |                                                                                     |
| 6.3x32 mm (3AB/3AG)       | 312<br>313<br>314<br>322<br>326<br>332<br>373<br>505<br>506<br>508<br>605                                                                   |  | 3453 Series Int. Shocksafe                                                        | TH                                                                                | 345101 Shocksafe                                                                    | CT                                                                                  | 354 Series                                                                          | CT                                                                                  | 101001 / 101002                                                                     |
|                           |                                                                                                                                             |                                                                                     | 345 Series Int. Shocksafe (old)                                                   | TH                                                                                | 810 Series                                                                          | QC                                                                                  | 35406                                                                               | CT                                                                                  | 101003 / 102064                                                                     |
|                           |                                                                                                                                             |                                                                                     | 342 Series Traditional                                                            | TH                                                                                | 811 Series                                                                          | QC                                                                                  | 35408                                                                               | CT                                                                                  | 121001 / 121002                                                                     |
|                           |                                                                                                                                             |                                                                                     | 342006 Watertight                                                                 | TH                                                                                | 813 Series                                                                          | QC                                                                                  | 35409                                                                               | CT                                                                                  | 121003 / 121004                                                                     |
|                           |                                                                                                                                             |                                                                                     | 344 Series Snap / Panel Mount                                                     | TH                                                                                | 814 Series                                                                          | CT                                                                                  | 356 Series                                                                          | TH                                                                                  | 102071                                                                              |
|                           |                                                                                                                                             |                                                                                     | 348 Series Snap Mount                                                             |                                                                                   |                                                                                     | CT                                                                                  | 359 Series                                                                          | TH                                                                                  | 102076 / 102078                                                                     |
|                           |                                                                                                                                             |                                                                                     | 340 Series RF Shielded / Watertight                                               |                                                                                   |                                                                                     | QC                                                                                  | OMN002                                                                              | TH                                                                                  | 102079 / 102080                                                                     |
|                           |                                                                                                                                             |                                                                                     | 346877 Flip Top                                                                   |                                                                                   |                                                                                     | QC                                                                                  | OMN004                                                                              | TH                                                                                  | 122083 / 122087                                                                     |
|                           |                                                                                                                                             |                                                                                     | 342021 (FHN26W) Water Tight                                                       |                                                                                   |                                                                                     | QC                                                                                  | OMN006                                                                              | TH                                                                                  | 122088 / 122093                                                                     |
|                           |                                                                                                                                             |                                                                                     | 342024 (FHN26G2) Drip Proof                                                       |                                                                                   |                                                                                     | QC                                                                                  | FB65 / FB66                                                                         | TH                                                                                  | 122090 / 100058                                                                     |
|                           |                                                                                                                                             |                                                                                     | 342025 (FHN20G) Drip Proof                                                        |                                                                                   |                                                                                     |                                                                                     |                                                                                     | TH                                                                                  | 51800001009                                                                         |
|                           |                                                                                                                                             |                                                                                     | 800 Series Shocksafe                                                              |                                                                                   |                                                                                     |                                                                                     |                                                                                     | CT                                                                                  | 101010                                                                              |
|                           |                                                                                                                                             |                                                                                     | 801 / 802 / 803-01 Series                                                         |                                                                                   |                                                                                     |                                                                                     |                                                                                     | TH                                                                                  | 102074                                                                              |
|                           |                                                                                                                                             |                                                                                     | 860 Series                                                                        |                                                                                   |                                                                                     |                                                                                     |                                                                                     | TH                                                                                  | 10207101009                                                                         |
| TE5 / TR5® Fuse           | 303 / 369<br>370 / 372<br>373 / 374<br>382 / 383<br>385 / 392<br>395 / 396<br>397 / 398<br>400 / 662<br>663 / 664<br>665 / 804<br>807 / 808 |  | 570 Series                                                                        | TH                                                                                | 571 0000 000                                                                        |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     |                                                                                   | TH                                                                                | 559 / 560 / 562 Series                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     |                                                                                   | SM                                                                                | 564 Series                                                                          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     |                                                                                   | TH                                                                                | 576 Series                                                                          |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     |                                                                                   | TH                                                                                | 556 / 557                                                                           |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
| Micro™ Fuse / TR3         | 262 / 268<br>269 / 272<br>273 / 274<br>278 / 279                                                                                            |  | 282001 Front mt. Neoprene                                                         | TH                                                                                | 281005 Vertical Silver                                                              |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | 282007 Front mt. Conductive                                                       | TH                                                                                | 281007 Horizontal Silver                                                            |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | 282002 Rear mt. Neoprene                                                          | TH                                                                                | 281008 Vertical Tin                                                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | 282008 Rear mt. Conductive                                                        | TH                                                                                | 281010 Horizontal Tin                                                               |                                                                                     |                                                                                     |                                                                                     |                                                                                     |
|                           |                                                                                                                                             |                                                                                     | 280004 32V indicating                                                             |                                                                                   |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |

## PTC PRODUCTS

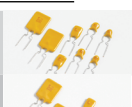
PTCs (positive temperature coefficient) increase resistance as temperature increases. They are designed to prevent unsafe levels of current while allowing constant safe current levels, and their resistance will “reset” automatically when the current and temperature returns to a safe level. PTCs are typically used in applications where automatic reset is desired.

| Series Name <sup>1</sup> | View Datasheet | Order Samples | Size <sup>2</sup> | Hold Current ( $I_{HOLD}$ ) | Max Voltage ( $V_{MAX}$ ) | Max Fault current ( $I_{MAX}$ ) | Operating Temperature Range | Agency Approvals |    |     | Halogen Free | RoHS | Lead Free |
|--------------------------|----------------|---------------|-------------------|-----------------------------|---------------------------|---------------------------------|-----------------------------|------------------|----|-----|--------------|------|-----------|
|                          |                |               |                   |                             |                           |                                 |                             | cUR              | UR | TUV |              |      |           |

### Surface Mount:

|                               |                                                                                    |                                                                                    |                |               |          |                 |               |   |   |   |   |   |   |
|-------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------|---------------|----------|-----------------|---------------|---|---|---|---|---|---|
| LoRho PTC<br>(Low Resistance) |   |   | 0402           | 0.1 - 0.5A    | 6 / 12 V | 50 A            | -40°C to 85°C | • | • | • | • | • | • |
|                               |                                                                                    |                                                                                    | 0603           | 0.5 - 2.0A    |          |                 |               |   |   |   |   |   |   |
|                               |                                                                                    |                                                                                    | 0805           | 0.75 - 3.0A   |          |                 |               |   |   |   |   |   |   |
|                               |                                                                                    |                                                                                    | 1206           | 0.75 - 4.5A   |          |                 |               |   |   |   |   |   |   |
|                               |                                                                                    |                                                                                    | 1812           | 1.9 - 3.7A    |          |                 |               |   |   |   |   |   |   |
|                               |                                                                                    |                                                                                    | 2920           | 7.0A          |          |                 |               |   |   |   |   |   |   |
| 0603L                         |   |   | 0603<br>(1608) | 0.04 - 0.5A   | 6 - 15 V | 40 A            | -40°C to 85°C | • | • | • | • | • | • |
| 0805L                         |                                                                                    |                                                                                    | 0805<br>(2012) | 0.10 - 1.10 A | 6 - 15 V | 100 / 40 A      |               | • | • | • | • | • | • |
| 1206L                         |                                                                                    |                                                                                    | 1206<br>(3216) | 0.10 - 2.0A   | 6 - 30 V | 100 A           |               | • | • | • | • | • | • |
| 1210L                         |                                                                                    |                                                                                    | 1210<br>(3225) | 0.05 - 2.0A   | 6 - 30 V | 10 / 100 A      |               | • | • | • | • | • | • |
| 1812L                         |                                                                                    |                                                                                    | 1812<br>(4532) | 0.1 - 3.0A    | 6 - 60 V | 10 / 20 / 100 A |               | • | • | • | • | • | • |
| 2016L                         |                                                                                    |                                                                                    | 2016<br>(5041) | 0.30 - 2.00 A | 6 - 60 V | 20 / 40 A       |               | • | • | • | • | • | • |
| 2920L                         |  |  | 2920<br>(7351) | 0.30 - 3.00 A | 6 - 60 V | 10 / 40 A       | -40°C to 85°C | • | • | • | • | • | • |
| 250S                          |                                                                                    |                                                                                    | see data sheet | 0.13 A        | 60 V     | 3 A             |               |   |   | • | • | • | • |

### Radial Leaded:

|      |                                                                                     |                                                                                     |                |                |          |          |               |   |   |   |  |   |   |
|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------|----------------|----------|----------|---------------|---|---|---|--|---|---|
| USBR |  |  | see data sheet | 0.75 - 2.50 A  | 6 / 16 V | 40 A     | -40°C to 85°C | • | • | • |  | • | • |
| 16R  |                                                                                     |                                                                                     |                | 2.50 - 14.00 A | 16 V     | 100 A    |               | • | • | • |  | • | • |
| 30R  |                                                                                     |                                                                                     |                | 0.90 - 9.00 A  | 30 V     | 40 A     |               | • | • | • |  | • | • |
| 60R  |                                                                                     |                                                                                     |                | 0.10 - 3.75 A  | 60 V     | 40 A     |               | • | • | • |  | • | • |
| 72R  |                                                                                     |                                                                                     |                | 0.20 - 3.75 A  | 72 V     | 40 A     |               | • | • | • |  | • | • |
| 250R |                                                                                     |                                                                                     |                | 0.08 - 0.18 A  | 250 V    | 3 / 10 A |               | • | • | • |  | • | • |
| 600R |                                                                                     |                                                                                     |                | 0.15 - 0.16 A  | 600 V    | 3 A      |               | • | • | • |  | • | • |

### Battery Strap:

|                        |                                                                                     |                                                                                     |                |             |     |      |               |   |   |   |   |   |   |
|------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------|-------------|-----|------|---------------|---|---|---|---|---|---|
| SL<br>(Low Resistance) |  |  | see data sheet | 1.9 - 3.7 A | 6 V | 50 A | -40°C to 85°C | • | • | • | • | • | • |
|------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------|-------------|-----|------|---------------|---|---|---|---|---|---|

(1) Detailed information about most product series listed here can be found on our web site.

(2) Size for these surface mount items refers to common industry length and width dimensions of the device surface area. Example: 0402 = .04" x .02"

## VARISTOR PRODUCTS

Shorthand for “Variable Resistors,” 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 (MOV) for higher energy applications.

| Series Name <sup>1</sup> |  | View Datasheet | Order Samples | Technology Type | Operating AC Voltage Range | Operating DC Voltage Range | Peak Current Range <sup>2</sup> (A) | Peak Energy Range (J) | Operating Temperature Range | Lines Protected | Mount/Form Factor | Disc Size | Agency Approvals |     |     |      |     |      | Lead Free | Halogen Free |
|--------------------------|--|----------------|---------------|-----------------|----------------------------|----------------------------|-------------------------------------|-----------------------|-----------------------------|-----------------|-------------------|-----------|------------------|-----|-----|------|-----|------|-----------|--------------|
|                          |  |                |               |                 |                            |                            |                                     |                       |                             |                 |                   |           | UR               | CSA | VDE | CECC | QPL | RoHS |           |              |

### Surface Mount MLV / MOV:

|      |                                                                                   |                                                                                   |                                                                                   |                              |           |           |           |             |               |   |               |                |   |  |  |  |  |  |   |   |
|------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------|-----------|-----------|-----------|-------------|---------------|---|---------------|----------------|---|--|--|--|--|--|---|---|
| MHS  |  |  |  | Multi-Layer Zinc Oxide (MLV) | 9 - 42    | 30 - 135  | 300       |             | -55 to +125°C | 1 | Surface Mount | Not Applicable |   |  |  |  |  |  | • |   |
| MLE  |                                                                                   |  |  |                              | 18        | 18        | 22 - 28   |             |               |   |               |                |   |  |  |  |  |  | • |   |
| ML   |                                                                                   |  |  |                              | 2.7 - 107 | 5.5 - 120 | 4 - 500   | 0.02 - 2.5  |               |   |               |                |   |  |  |  |  |  | • |   |
| AUML |                                                                                   |  |  |                              |           | 18        |           |             |               |   |               |                |   |  |  |  |  |  | • |   |
| MLN  |  |  |  | Zinc Oxide (MOV)             | 18        | 5.5 - 18  | 30        | 0.05 - 0.10 | -55 to +85°C  | 4 | Surface Mount | Not Applicable |   |  |  |  |  |  | • |   |
| CH   |                                                                                   |  |  |                              | 14 - 275  | 18 - 369  | 100 - 250 | 1.0 - 8.0   |               |   |               |                | • |  |  |  |  |  | • |   |
| SM7  |                                                                                   |  |  |                              | 115 - 510 | 369 - 675 | 1200      | 23 - 40     |               |   |               |                | • |  |  |  |  |  | • | • |
| SM20 |                                                                                   |  |  |                              | 20 - 320  | 26        | 6500      | 165         |               |   |               |                | • |  |  |  |  |  | • | • |

### Radial Leaded MOV:

|                        |                                                                                   |                                                                                   |                                                                                   |            |            |            |              |            |              |   |               |                    |   |   |   |   |  |  |   |   |
|------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------|------------|------------|--------------|------------|--------------|---|---------------|--------------------|---|---|---|---|--|--|---|---|
| UltraMOV™ Varistor     |  |  |  | Zinc Oxide | 130 - 625  | 170 - 825  | 1750 - 10000 | 12.5 - 720 | -55 to +85°C | 1 | Radial Leaded | 7, 10, 14, 20mm    | • | • | • | • |  |  | • | • |
| UltraMOV™ 25S Varistor |                                                                                   |  |  |            | 115 - 750  | 150 - 970  | 22000        | 230 - 890  |              |   |               | 25mm               | • | • | • | • |  |  | • | • |
| C-III                  |                                                                                   |  |  |            | 130 - 660  |            | 3500 - 9000  | 40 - 530   |              |   |               | 10, 14, 20mm       | • | • | • | • |  |  | • | • |
| LA                     |                                                                                   |  |  |            | 130 - 1000 | 175 - 1200 | 1200 - 6500  | 11 - 360   |              |   |               | 7, 10, 14, 20mm    | • | • | • | • |  |  | • | • |
| ZA                     |                                                                                   |  |  |            | 4 - 460    | 5.5 - 615  | 50 - 6500    | 0.1 - 52   |              |   |               | 5, 7, 10, 14, 20mm | • |   | • | • |  |  | • | • |

### Industrial High Energy Terminal MOV:

|                  |                                                                                     |                                                                                     |                                                                                     |            |            |            |                |             |              |   |                                  |          |   |   |  |  |  |  |   |   |
|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------|------------|------------|----------------|-------------|--------------|---|----------------------------------|----------|---|---|--|--|--|--|---|---|
| BA/BB            |  |  |  | Zinc Oxide | 130 - 2800 | 175 - 3500 | 50000<br>70000 | 450 - 10000 | -55 to +85°C | 1 | Screw / Clip Terminals           | 60mm     | • |   |  |  |  |  | • |   |
| DA/DB            |                                                                                     |  |  |            | 130 - 750  | 175 - 970  | 40000          | 270 - 1050  |              |   |                                  | 40mm     | • |   |  |  |  |  | • | • |
| HA               |                                                                                     |  |  |            | 130 - 750  | 175 - 970  | 25000<br>40000 | 200 - 1050  |              |   | Industrial Packaged Radial Leads | 32, 40mm | • | • |  |  |  |  | • | • |
| HB34, HG34, HF34 |                                                                                     |  |  |            | 130 - 750  | 175 - 970  | 40000          | 270 - 1050  |              |   |                                  | 34mm     | • | • |  |  |  |  | • | • |
| DHB34            |                                                                                     |  |  |            | 250 - 2800 | 330 - 3500 | 20000<br>70000 | 330 - 10000 |              |   |                                  | 34mm     | • | • |  |  |  |  | • | • |
| CA               |                                                                                     |  |  |            | 250 - 2800 | 330 - 3500 | 20000<br>70000 | 330 - 10000 |              |   | Bare Disc                        | 60mm     |   |   |  |  |  |  | • |   |

### Specialty Application MOV:

|                  |                                                                                     |                                                                                     |                                                                                     |            |           |           |            |            |               |   |                     |                |   |   |  |  |   |  |   |   |
|------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------|-----------|-----------|------------|------------|---------------|---|---------------------|----------------|---|---|--|--|---|--|---|---|
| MA               |  |  |  | Zinc Oxide | 9 - 264   | 13 - 365  | 40 - 100   | 0.06 - 1.7 | -55 to +85°C  | 1 | Axial Leaded        | Not Applicable |   |   |  |  |   |  | • | • |
| RA               |                                                                                     |  |  |            | 4 - 275   | 5.5 - 369 | 100 - 6500 | 0.4 - 160  | -55 to +125°C |   | Inline Radial Leads | Not Applicable | • | • |  |  |   |  | • | • |
| High Reliability |                                                                                     |  |  |            | 130 - 510 | 4 - 675   | 100 - 6500 | 0.4 - 190  | -55 to +85°C  |   | (Varies)            | (Varies)       |   |   |  |  | • |  |   |   |

### Thermally Protected MOV:

|                                  |                                                                                     |                                                                                     |                                                                                     |            |           |           |              |            |              |   |                                  |          |   |   |   |   |  |  |   |   |
|----------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------|-----------|-----------|--------------|------------|--------------|---|----------------------------------|----------|---|---|---|---|--|--|---|---|
| SMOV™ 25S Varistor               |  |  |  | Zinc Oxide | 115 - 750 | 150 - 970 | 20000        | 170 - 670  | -45 to +75°C | 1 | Industrial Packaged Radial Leads | 25mm     | • |   |   |   |  |  | • | • |
| SMOV™ 34S Varistor               |                                                                                     |  |  |            | 115 - 750 | 150 - 970 | 40000        | 280 - 1200 | -45 to +75°C |   | Industrial Packaged Radial Leads | 34mm     | • |   |   |   |  |  | • | • |
| TMOV® 25S Varistor               |                                                                                     |  |  |            | 115 - 750 | 150 - 970 | 20000        | 170 - 670  | -55 to +85°C |   | Radial Leaded                    | 25mm     | • |   | • | • |  |  | • | • |
| TMOV® 34S Varistor               |                                                                                     |  |  |            | 115 - 750 | 150 - 970 | 40000        | 235 - 1050 | -55 to +85°C |   | Industrial Packaged Radial Leads | 34mm     | • |   | • | • |  |  | • | • |
| TMOV® Varistor / iTMOV® Varistor |                                                                                     |  |  |            | 115 - 750 | 150 - 970 | 6000 - 10000 | 35 - 480   | -55 to +85°C |   | Radial Leaded                    | 14, 20mm | • | • | • | • |  |  | • | • |

(1) Detailed information about most product series listed here can be found on our web.

(2) Not an applicable parameter for Crowbar devices

## GDT PRODUCTS

GDTs (gas discharge tube) dissipate voltage transients through a contained plasma gas. They have high insulation resistance plus low capacitance and leakage to ensure minimal effect on normal operation of equipment. Littelfuse devices offer a small footprint and are available in leaded and surface mount configurations, with high surge handling capability. Their fast response to transient over-voltage events, and ability to dissipate large amounts of energy, translates into reduced risk of equipment damage. The amount of energy they can dissipate makes them a good choice for lightning surge protection, particularly for telecom equipment located in outdoor structures.

| Series Name <sup>1</sup> | View Datasheet | Order Samples | DC Breakover Voltage Range (Nom $V_{BO}$ ) | Max AC Surge Rating | Peak Pulse Current (8/20 $\mu$ s) | Max Capacitance | Operating Temperature Range | Mounting Options |           |         |            |             |                |
|--------------------------|----------------|---------------|--------------------------------------------|---------------------|-----------------------------------|-----------------|-----------------------------|------------------|-----------|---------|------------|-------------|----------------|
|                          |                |               |                                            |                     |                                   |                 |                             | # Terminals      | Mini Tube | Surface | Axial Lead | Radial Lead | Cartridge Clip |

### High Voltage GDTs:

|     |                                                                                   |                                                                                   |                                                                                   |             |    |       |       |                |   |  |  |   |  |   |
|-----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------|----|-------|-------|----------------|---|--|--|---|--|---|
| AC  |  |  |  | 285 - 600   | NA | 5000A | 1.5pF | -40°C to +90°C | 2 |  |  | • |  | • |
| CG3 |  |  |  | 1000 - 7500 |    | 5000A | 1.5pF |                | 2 |  |  | • |  | • |

### Low to Medium Surge GDTs:

|         |                                                                                   |                                                                                   |                                                                                   |          |      |         |       |                |   |   |   |   |   |  |   |   |
|---------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------|------|---------|-------|----------------|---|---|---|---|---|--|---|---|
| CG5     |  |  |  | 90 - 600 | 5A   | 5000A   | 1.5pF | -40°C to +90°C | 2 | • | • | • |   |  | • |   |
| SL0902A |  |  |  | 90 - 600 | 5A   | 5000A   | 1.5pF |                | 2 | • | • |   |   |  | • | • |
| SL1002A |  |  |  | 75 - 600 | 5A   | 5000A   | 1.2pF |                | 2 | • | • |   |   |  | • | • |
| SL1003A |  |  |  | 90 - 500 | 10A* | 10,000A | 1.2pF |                | 3 | • | • |   | • |  | • | • |
| SL1011A |  |  |  | 75 - 600 | 5A   | 5000A   | 1.5pF |                | 2 |   | • | • |   |  | • | • |

### Medium to High Surge GDTs:

|                |                                                                                     |                                                                                     |                                                                                     |           |           |         |           |                |   |   |   |   |   |  |   |   |
|----------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------|-----------|---------|-----------|----------------|---|---|---|---|---|--|---|---|
| SG (1812 Size) |    |    |    | 75 - 420  | 500 - 750 |         | 1.0pF     | -40°C to +90°C |   |   | • |   |   |  | • | • |
| SL1122A        |    |    |    | 90 - 260  | 10A*      | 10000A* | 100-270pF |                | 3 |   |   |   | • |  | • |   |
| SL1021A        |   |    |    | 90 - 600  | 10A*      | 10000A* | 1.5pF     |                | 3 |   | • |   | • |  | • | • |
| SL1024A        |  |  |  | 90 - 600  | 10A*      | 10000A* | 1.5pF     |                | 3 |   | • |   | • |  | • | • |
| PMT8           |  |  |  | 90 - 400  | 10A*      | 20000A* | 1.5pF     |                | 3 |   | • |   | • |  | • | • |
| SL1011B        |  |  |  | 75 - 350  | 10A       | 10000A  | 1.5pF     |                | 2 |   | • | • |   |  | • | • |
| SL1411A        |  |  |  | 75 - 600  | 10A       | 10000A  | 1.5pF     |                | 2 |   | • | • |   |  | • | • |
| PMT3           |  |  |  | 90 - 500  | 20A*      | 20000A* | 1.5pF     |                | 3 |   | • |   | • |  | • |   |
| CG/CG2         |  |  |  | 75 - 1000 | 20A       | 20000A  | 1.5pF     |                | 2 | • | • | • |   |  | • |   |

### Very High Surge GDTs:

|         |                                                                                     |                                                                                     |                                                                                     |           |      |         |       |                |   |  |   |  |   |   |   |   |
|---------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------|------|---------|-------|----------------|---|--|---|--|---|---|---|---|
| SL1021B |  |  |  | 90 - 600  | 10A* | 20000A* | 1.5pF | -40°C to +90°C | 3 |  | • |  | • |   | • | • |
| SL1024B |  |  |  | 90 - 600  | 10A* | 20000A* | 1.5pF |                | 3 |  | • |  | • |   | • | • |
| SL1026  |  |  |  | 275 - 700 | 10A* | 20000A* |       |                | 2 |  |   |  |   | • | • | • |

(1) Detailed information about most product series listed here can be found on our web site.

\* Total current through center (ground) terminal

## PULSEGUARD® ESD SUPPRESSORS

| Series Name | View Datasheet | Order Samples | Surface Mount Through-Hole | Technology Type | Working Voltage | Array Package (No. of Lines) | Single Line Package | Typical Device Capacitance | Leakage Current | Rated Immunity to IEC 61000-4-2 level 4 | Also Rated for EFT or Lightning | Bidirectional (transients of either polarity) | Performs Low Pass Filtering |
|-------------|----------------|---------------|----------------------------|-----------------|-----------------|------------------------------|---------------------|----------------------------|-----------------|-----------------------------------------|---------------------------------|-----------------------------------------------|-----------------------------|
|-------------|----------------|---------------|----------------------------|-----------------|-----------------|------------------------------|---------------------|----------------------------|-----------------|-----------------------------------------|---------------------------------|-----------------------------------------------|-----------------------------|

### PulseGuard® ESD Suppressors:

|      |                                                                                     |                                                                                     |                                                                                     |   |                           |         |           |            |             |      |   |  |   |
|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---|---------------------------|---------|-----------|------------|-------------|------|---|--|---|
| PGB1 |  |  |  | • | Voltage Variable Material | 0-24VDC | SOT23 (2) | 0402, 0603 | 0.04-0.12pF | <1nA | • |  | • |
| PGB2 |  |  |  | • | Voltage Variable Material | 0-12VDC | NA        | 0402, 0201 | 0.07pF      | <1nA | • |  | • |

## 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 200W to 30kW, and reverse standoff voltages from 5V to 512V.

| Series Name | Photo | View Datasheet<br>Order Samples | Package Type | Reverse Standoff Voltage<br>(V <sub>R</sub> ) | Peak Pulse Power<br>Range <sup>†</sup><br>(P <sub>PP</sub> ) | Peak Pulse<br>Current<br>(I <sub>PP</sub> 8/20µs) | Operating<br>Temperature | Halogen-Free | RoHS Compliant | UR Recognized |
|-------------|-------|---------------------------------|--------------|-----------------------------------------------|--------------------------------------------------------------|---------------------------------------------------|--------------------------|--------------|----------------|---------------|
|-------------|-------|---------------------------------|--------------|-----------------------------------------------|--------------------------------------------------------------|---------------------------------------------------|--------------------------|--------------|----------------|---------------|

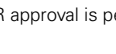
### Surface Mount-Standard Application (200–5000W):

|         |                                                                                     |                                                                 |          |           |       |  |                                      |   |   |   |
|---------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|----------|-----------|-------|--|--------------------------------------|---|---|---|
| SMF     |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | SOD-123  | 5.0 - 54  | 200W  |  | -85° to +302° F<br>(-65° to +150° C) | • | • | * |
| SMAJ    |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AC | 5.0 - 440 | 400W  |  |                                      | • | • | • |
| P4SMA   |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AC | 5.8 - 495 | 400W  |  |                                      | • | • | • |
| SMA6J   |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AC | 5.0 - 12  | 600W  |  |                                      | • | • | • |
| SMA6L   |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-221AC | 5.0 - 85  | 600W  |  |                                      | • | • | * |
| SACB    |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AA | 5.0 - 50  | 500W  |  |                                      | • | • | • |
| SMBJ    |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AA | 5.0 - 440 | 600W  |  |                                      | • | • | • |
| P6SMB   |    | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AA | 5.8 - 495 | 600W  |  |                                      | • | • | • |
| 1KSMB   |   | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AA | 5.8 - 136 | 1000W |  |                                      | • | • | • |
| SMCJ    |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AB | 5.0 - 440 | 1500W |  |                                      | • | • | • |
| 1.5SMC  |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AB | 5.8 - 495 | 1500W |  |                                      | • | • | • |
| SMDJ    |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AB | 5.0 - 170 | 3000W |  |                                      | • | • | • |
| 5.0SMDJ |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-214AB | 12 - 170  | 5000W |  |                                      | • | • | • |

### Axial Leaded-Standard Application (400–5000W):

|       |                                                                                     |                                                                 |        |           |       |  |                                      |   |   |   |
|-------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|--------|-----------|-------|--|--------------------------------------|---|---|---|
| P4KE  |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-41  | 5.8 - 495 | 400W  |  | -85° to +302° F<br>(-65° to +150° C) | • | • | • |
| SA    |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-15  | 5.0 - 180 | 500W  |  |                                      | • | • | • |
| SAC   |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-15  | 5.0 - 50  | 500W  |  |                                      | • | • | • |
| P6KE  |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-15  | 5.8 - 512 | 600W  |  |                                      | • | • | • |
| 1.5KE |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-201 | 5.8 - 512 | 1500W |  |                                      | • | • | • |
| LCE   |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | DO-201 | 6.5 - 90  | 1500W |  |                                      | • | • | • |
| 3KP   |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | P600   | 5.0 - 220 | 3000W |  |                                      | • | • | • |
| 5KP   |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | P600   | 5.0 - 250 | 5000W |  |                                      | • | • | • |

### Axial Leaded-High Power:

|       |                                                                                     |                                                                 |             |          |        |        |                                      |   |   |   |
|-------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------|----------|--------|--------|--------------------------------------|---|---|---|
| 15KPA |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | P600        | 17 - 280 | 15000W |        | -85° to +302° F<br>(-65° to +150° C) | • | • | • |
| 20KPA |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | P600        | 20 - 300 | 20000W |        |                                      | • | • | • |
| 30KPA |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | P600        | 28 - 288 | 30000W |        |                                      | • | • | • |
| AK1   |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | Radial Lead | 76       |        | 1000A  | -67° to +347° F<br>(-55° to +150° C) | • | • | • |
| AK3   |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | Radial Lead | 15 - 430 |        | 3000A  |                                      | • | • | • |
| AK6   |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | Radial Lead | 30 - 430 |        | 6000A  |                                      | • | • | • |
| AK10  |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | Radial Lead | 30 - 430 |        | 10000A |                                      | • | • | • |
| AK15  |  | <a href="#">View Datasheet</a><br><a href="#">Order Samples</a> | Radial Lead | 58 - 76  |        | 15000A | -67° to +257° F<br>(-55° to +125° C) | • | • | • |

Remark: \*\*\* UR approval is pending.

## TVS DIODES (continued)

| Series Name | Photo | View Datasheet<br>Order Samples | Package Type | Reverse Standoff Voltage<br>( $V_R$ ) | Peak Pulse Power<br>Range <sup>1</sup><br>( $P_{PP}$ ) | Peak Pulse<br>Current<br>( $I_{PP}$ 8/20 $\mu$ s) | Operating<br>Temperature | Halogen-Free | RoHS Compliant | UR Recognized | AEC-Q101<br>Compliant |
|-------------|-------|---------------------------------|--------------|---------------------------------------|--------------------------------------------------------|---------------------------------------------------|--------------------------|--------------|----------------|---------------|-----------------------|
|-------------|-------|---------------------------------|--------------|---------------------------------------|--------------------------------------------------------|---------------------------------------------------|--------------------------|--------------|----------------|---------------|-----------------------|

### Automotive Application:

|         |                                                                                   |                                                                                   |          |         |      |  |                                      |   |   |   |   |
|---------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------|---------|------|--|--------------------------------------|---|---|---|---|
| TPSMA6L |  |  | DO-221AC | 10 - 60 | 600W |  | -85° to +302° F<br>(-65° to +150° C) | • | • | * | • |
|---------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------|---------|------|--|--------------------------------------|---|---|---|---|

Remark: "\*" UR approval is pending.

## LED LIGHTING DESIGN



Explore the latest LED lighting industry standards, product information, circuit diagrams and links to application notes and videos using this NEW e-book.

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LED Lighting  
Design Guide.



## ETHERNET PROTECTION



A guide for protecting Ethernet circuits and equipment from electrostatic discharge (ESD), lightning, power faults and other electrical transient threats.

Scan this code  
to view our  
Ethernet  
Design Guide.



## ESD PROTECTION

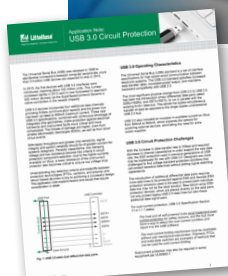


A guide for protecting electronic circuits and interfaces from electrostatic discharge (ESD) using TVS Diode Arrays.

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Protection  
Design Guide.



## USB 3.0 CIRCUIT PROTECTION



Learn about the key selection criteria and tradeoffs among protection technologies for USB 3.0 devices. Recently updated!

Scan this code to  
view our USB 3.0  
Circuit Protection  
Application Note.



## TVS DIODE ARRAY – SPA® DIODES

TVS Diode Arrays are designed to protect analog and digital signal lines from electrostatic discharge (ESD), Electrical Fast Transients (EFT), and lightning-induced surge currents. Offering low dynamic resistance for improved clamping performance, TVS Diode Arrays are offered in a wide range of industry standard discrete and multi-channel SMD packages. Features of this portfolio include capacitance as low as 0.4 pF and enhanced ESD capability up to ±30kV (contact discharge).

| Series Name | Photo | View<br>Datasheet | Order<br>Samples | Package Type | Working<br>Voltage | Capacitance | Number of<br>Channels | ESD Rating<br>(Contact<br>Discharge,<br>IEC61000-4-2) | Clamping Voltage<br>( $t_r=8/20\mu s$ ) | Maximum<br>Surge<br>Rating<br>( $t_r=8/20\mu s$ ) | Lead Free/<br>Green | RoHS<br>Compliant |
|-------------|-------|-------------------|------------------|--------------|--------------------|-------------|-----------------------|-------------------------------------------------------|-----------------------------------------|---------------------------------------------------|---------------------|-------------------|
|-------------|-------|-------------------|------------------|--------------|--------------------|-------------|-----------------------|-------------------------------------------------------|-----------------------------------------|---------------------------------------------------|---------------------|-------------------|

### General Purpose ESD Protection (SCR Diode Array):

|       |                                                                                   |                                |                               |              |       |     |    |     |         |     |   |   |
|-------|-----------------------------------------------------------------------------------|--------------------------------|-------------------------------|--------------|-------|-----|----|-----|---------|-----|---|---|
| SP720 |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | PDIP<br>SOIC | 2-30V | 3pF | 14 | 4kV | 2V @ 1A | 3A  | • | • |
| SP721 |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |              | 2-30V | 3pF | 6  | 4kV | 2V @ 1A | 3A  | • | • |
| SP723 |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |              | 2-30V | 5pF | 6  | 8kV | 2V @ 2A | 7A  | • | • |
| SP724 |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT23        | 2-20V | 3pF | 4  | 8kV | 2V @ 1A | 3A  | • | • |
| SP725 |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOIC         | 2-30V | 5pF | 4  | 8kV | 2V @ 2A | 14A | • | • |

### General Purpose ESD Protection (TVS Discretes and Arrays):

|        |                                                                                    |                                |                               |                                    |      |       |                   |      |            |      |   |   |
|--------|------------------------------------------------------------------------------------|--------------------------------|-------------------------------|------------------------------------|------|-------|-------------------|------|------------|------|---|---|
| SP05   |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SC70<br>SOT23<br>SOT143<br>MSOP    | 5.5V | 30pF  | 2 / 3 / 4 / 5 / 6 | 30kV | N/A        | N/A  | • | • |
| SP1001 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SC70<br>SOT553<br>SOT563<br>SOT963 | 5.5V | 8pF   | 2 / 4 / 5         | 15kV | 8.0V @ 1A  | 2A   | • | • |
| SP1002 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SC70                               | 6.0V | 5pF   | 1 / 2             | 8kV  | 9.2V @ 1A  | 2A   | • | • |
| SP1003 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0402 (SOD723)<br>0402 (SOD882)     | 5.0V | 30pF  | 1                 | 30kV | 12.0V @ 7A | 7A   | • | • |
| SP1004 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT953                             | 6.0V | 5pF   | 4                 | 8kV  | 10V @ 1A   | 1A   | • | • |
| SP1005 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0201 (Flipchip)<br>0402 (SOD882)   | 6.0V | 30pF  | 1                 | 30kV | 9.3V @ 1A  | 10A  | • | • |
| SP1006 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0201 ( $\mu$ DFN-2)                | 6.0V | 25pF  | 1                 | 30kV | 8.3V @ 1A  | 5A   | • | • |
| SP1007 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0201 (Flipchip)<br>0402 (SOD882)   | 6.0V | 3.5pF | 1                 | 8kV  | 11.2V @ 1A | 2A   | • | • |
| SP1008 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0201 (Flipchip)                    | 6.0V | 6pF   | 1                 | 15kV | 10.7V @ 1A | 2.5A | • | • |
| SP1011 |                                                                                    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-6                        | 6.0V | 7pF   | 4                 | 15kV | 8.7V @ 1A  | 2A   | • | • |

### Low Capacitance ESD Protection:

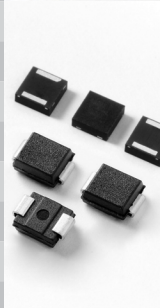
|         |                                                                                     |                                |                               |                                         |      |        |           |      |            |      |   |   |
|---------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------------------------------|------|--------|-----------|------|------------|------|---|---|
| SP3001  |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SC70                                    | 6.0V | 0.65pF | 4         | 8kV  | 9.5V @ 1A  | 2.5A | • | • |
| SP3002  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SC70<br>SOT23<br>$\mu$ DFN-6            | 6.0V | 0.85pF | 4         | 12kV | 9.5V @ 1A  | 4.5A | • | • |
| SP0504S |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT23                                   |      |        |           |      |            |      |   |   |
| SP3003  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-6<br>SC70<br>SOT5x3<br>MSOP10 | 6.0V | 0.65pF | 2 / 4 / 8 | 8kV  | 10.0V @ 1A | 2.5A | • | • |
| SP3004  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT563                                  | 6.0V | 0.85pF | 4         | 12kV | 10.0V @ 1A | 4A   | • | • |
| SP3010  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-10                            | 6.0V | 0.45pF | 4         | 8kV  | 10.8V @ 1A | 3A   | • | • |
| SP3011  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-14                            | 6.0V | 0.40pF | 6         | 8kV  | 11.0V @ 1A | 3A   | • | • |
| SP3012  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-10<br>$\mu$ DFN-14            | 5.0V | 0.50pF | 4 / 6     | 12kV | 6.6V @ 1A  | 4A   | • | • |
| SP3021  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0402 (SOD882)                           | 5.0V | 0.50pF | 1         | 8kV  | 13.1V @ 1A | 2A   | • | • |
| SP3030  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0402 (SOD882)                           | 5.0V | 0.50pF | 1         | 20kV | 9.2V @ 1A  | 3A   | • | • |
| SP3031  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 0402 (SOD882)                           | 5.0V | 0.80pF | 1         | 10kV | 6.9V @ 1A  | 5A   | • | • |
| SP0524P |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-10                            | 5.0V | 0.50pF | 4         | 12kV | 6.6V @ 1A  | 4A   | • | • |

### Lightning Surge Protection:

|           |                                                                                     |                                |                               |              |      |       |   |      |             |      |   |   |
|-----------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|--------------|------|-------|---|------|-------------|------|---|---|
| SRV05-4   |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT23        | 6.0V | 2.4pF | 4 | 20kV | 11.5V @ 5A  | 10A  | • | • |
| SP03-3.3  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOIC         | 3.3V | 16pF  | 2 | 30kV | 15V @ 100A  | 150A | • | • |
| SP03-6    |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOIC         | 6.0V | 16pF  | 2 | 30kV | 20V @ 100A  | 150A | • | • |
| LC03-3.3  |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOIC         | 3.3V | 9.0pF | 2 | 30kV | 17V @ 100A  | 150A | • | • |
| SP2502L   |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOIC         | 3.3V | 5.0pF | 2 | 30kV | 20V @ 75A   | 75A  | • | • |
| SLVU2.8   |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT23        | 2.8V | 2.0pF | 1 | 30kV | 13.9V @ 24A | 40A  | • | • |
| SLVU2.8-4 |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOIC         | 2.8V | 2.0pF | 4 | 30kV | 13.9V @ 24A | 40A  | • | • |
| SR70      |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT143       | 70V  | 2.0pF | 2 | 30kV | 12V @ 30A   | 40A  | • | • |
| SP4060    |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MSOP         | 2.5V | 4.4pF | 8 | 30kV | 8.0V @ 10A  | 20A  | • | • |
| SP2504N   |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-10 | 2.5V | 3.5pF | 4 | 30kV | 6.3V @ 5A   | 20A  | • | • |
| SP3304N   |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | $\mu$ DFN-10 | 3.3V | 3.5pF | 4 | 30kV | 7V @ 5A     | 20A  | • | • |

PLED LIGHT-EMITTING DIODE (LED) PROTECTORS

Littelfuse PLED devices provide added reliability to LED lighting strings. Designed to minimize the impact of losing an entire LED string due to a single LED failure, PLED devices provide a switching function that will bypass LEDs that go open circuit, and allow current to flow to the remaining LEDs in the string. PLED devices also offer LED protection against electrostatic discharge (ESD) and accidental reverse power connection (PLED5 devices only). Designed to serve the needs of high brightness outdoor LED lighting applications (advertising and traffic signs, roadway/pathway/runway lighting, aircraft and emergency lighting, etc), PLED devices help assure reliability and lower maintenance costs.

| Part Number | Photo                                                                             | View Datasheet                 | Order Samples                 | Powermite | QFN 3x3 | DO-214 | V <sub>BR</sub> breakdown |     | I <sub>H</sub> | I <sub>S</sub> | I <sub>T</sub> @V <sub>T</sub> | V <sub>T</sub> and I <sub>T</sub> | Critical rate of rise dV/dt |
|-------------|-----------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------|---------|--------|---------------------------|-----|----------------|----------------|--------------------------------|-----------------------------------|-----------------------------|
|             |                                                                                   |                                |                               |           |         |        | Volts                     |     |                |                |                                |                                   |                             |
|             |                                                                                   |                                |                               |           |         |        | Min                       | Max |                | Max            | Max                            | Max                               | Max                         |
| PLED6M      |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •         |         |        | 5.5                       | 7.5 | 12             | 70             | 0.35                           | 1.2                               | N/A                         |
| PLED6Q12    |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           | •       |        | 6                         | 16  | 5              | 100            | 1.0                            | 1.2                               | 250V/μs                     |
| PLED6S      |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           |         | •      |                           |     |                |                |                                |                                   |                             |
| PLED9Q12    |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           | •       |        | 9                         | 18  |                |                |                                |                                   |                             |
| PLED9S      |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           |         | •      |                           |     |                |                |                                |                                   |                             |
| PLED13Q12   |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           | •       |        | 13                        | 26  |                |                |                                |                                   |                             |
| PLED13S     |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           |         | •      |                           |     |                |                |                                |                                   |                             |
| PLED18Q12   |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           | •       |        | 18                        | 33  |                |                |                                |                                   |                             |
| PLED18S     |                                                                                   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |           |         | •      |                           |     |                |                |                                |                                   |                             |

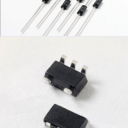
| Part Number | Photo                                                                               | View Datasheet                 | Order Samples                 | QFN 2x2 | SOT 89 | V <sub>AK</sub><br>Input Voltage | V <sub>TO</sub><br>Turn-On Voltage |     | I <sub>S</sub><br>Switching Current | V <sub>OS</sub><br>On-State Voltage | V <sub>OSR</sub><br>Reverse On-State Voltage | I <sub>S</sub><br>On-State Current | I <sub>OSR</sub><br>Reverse On-State Current | V <sub>ESD</sub><br>ESD Withstand Voltage (IEC61000-4-2) |         |     |
|-------------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|---------|--------|----------------------------------|------------------------------------|-----|-------------------------------------|-------------------------------------|----------------------------------------------|------------------------------------|----------------------------------------------|----------------------------------------------------------|---------|-----|
|             |                                                                                     |                                |                               |         |        | Volts                            | Volts                              |     | mAmps                               | Volts                               | Volts                                        | mAmps                              | mAmps                                        | kV                                                       |         |     |
|             |                                                                                     |                                |                               |         |        | Max                              | Min                                | Typ | Max                                 | Max                                 | Min                                          | Max                                | Max                                          | Max                                                      | Contact | Air |
| PLED5Q12    |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | •       |        | 40                               |                                    |     |                                     | 1.3@<br>I <sub>AK</sub> =350mA      | 1.4@<br>I <sub>AK</sub> =350mA               | 500                                | 500                                          | ±8                                                       | ±15     |     |
| PLED5HT     |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |         | •      | 38                               | 4.65                               | 4.9 | 5.15                                | 20                                  | 1.8@<br>I <sub>AK</sub> =700mA               | 1.8@<br>I <sub>AK</sub> =700mA     | 700                                          | 700                                                      | ±8      | ±15 |

## SIDACtor® PROTECTION THYRISTORS

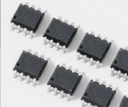
SIDACtor® Protection Thyristors are designed to suppress overvoltage transients in telecom and datacom equipment, and are able to divert currents as high as 5000A to ground within nanoseconds of reaching their breakover voltage. Littelfuse offers a wide range of configurations including DO-214AA, DO214AC, COMPAK (3-Pin DO-214), SOT23-5, QFN, MS-012 and modified MS-013 surface mount, TO-92, TO-218, DO-15, modified TO-220, and TO-220 through-hole package options designed to handle medium to high energy transients.

| Series Name | Photo | View<br>Datasheet | Order<br>Samples | Package Type | Type | Standoff<br>(working)<br>Voltage ( $V_{DRM}$ ) | Switching Voltage<br>( $V_S$ ) | Peak Pulse Rating: |                 |              | RoHS<br>Compliant | UR<br>Recognized |
|-------------|-------|-------------------|------------------|--------------|------|------------------------------------------------|--------------------------------|--------------------|-----------------|--------------|-------------------|------------------|
|             |       |                   |                  |              |      |                                                |                                | 2/10 $\mu$ s       | 10/1000 $\mu$ s | 8/20 $\mu$ s |                   |                  |

### Broadband Optimized Protection:

|                      |                                                                                     |                                |                               |                 |   |                            |                            |      |      |      |   |   |
|----------------------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------|---|----------------------------|----------------------------|------|------|------|---|---|
| MC Series            |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-214AA        | A | 6 - 25                     | 25 - 40                    | 150A | 45A  | 150A |   |   |
|                      |                                                                                     |                                |                               |                 | C | 6 - 320                    | 25 - 400                   | 500A | 100A | 400A |   |   |
|                      |                                                                                     |                                |                               | TO-92           | C | 6 - 320                    | 25 - 400                   | 500A | 100A | 400A | • | • |
| Modified TO-220      |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Modified TO-220 | A | Pin 1-2, 3-2: 6-275        | Pin 1-2, 3-2: 25-350       | 150A | 45A  | 150A |   |   |
|                      |                                                                                     |                                |                               |                 | C | Pin 1-3: 12-550            | Pin 1-3: 50-700            | 500A | 100A | 500A |   |   |
| Balanced MC Series   |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Modified TO-220 | C | Pin 1-2, 3-2, 1-3: 130-420 | Pin 1-2, 3-2, 1-3: 180-600 | 500A | 100A | 400A | • | • |
| Q2L Series           |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 3x3 QFN         | A | 6 - 320                    | 25 - 400                   | 150A | 45A  | 150A |   |   |
|                      |                                                                                     |                                |                               |                 | B |                            |                            | 250A | 80A  | 250A |   |   |
|                      |                                                                                     |                                |                               | 3.3x3.3 QFN     | C |                            |                            | 500A | 100A | 400A | • | • |
| MC Multiport Series  |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MS-013          | C | 6 - 320                    | 25 - 400                   | 500A | 100A | 400A | • | • |
| TwinChip™ Protectors |   | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-214AA        | A | 220 - 640                  | 300 - 800                  | 150A | 45A  | 150A |   |   |
|                      |                                                                                     |                                |                               |                 | B |                            |                            | 250A | 80A  | 250A |   |   |
|                      |                                                                                     |                                |                               | DO-15           | A | 220 - 320                  | 300 - 400                  |      | 50A  |      | • | • |
|                      |                                                                                     |                                |                               |                 | B |                            |                            |      | 80A  |      |   |   |
| SDP Series           |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 3x3 QFN         | F | 8 - 24                     | 15 - 35                    |      |      | 50A  | • | • |
| SDP Biased Series    |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | SOT23 - 5       | B | 58 - 320                   | 77 - 400                   | 250A | 80A  | 250A | • | • |
| SEP Biased Series    |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 5x6 QFN         | C | 6 - 320                    | 25 - 400                   | 500A | 100A | 400A | • | • |
| P0080T023G5          |                                                                                     | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | 5x6 QFN         | C | 6 - 75                     | 25 - 98                    | 500A | 100A | 400A | • | • |
|                      |                                                                                     |                                |                               | SOT 23 - 5      | G | 8                          | 15                         | 45A  | 18A  | 50A  | • | • |

### Subscriber Line Interface Circuit (SLIC) Protection:

|                                                   |                                                                                     |                                |                               |                   |   |                                                                                                                                                                     |          |      |      |      |   |   |
|---------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------|------|------|---|---|
| Fixed Voltage Series                              |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-214AA          | A | 58 - 160                                                                                                                                                            | 77 - 200 | 150A | 45A  | 150A | • | • |
|                                                   |                                                                                     |                                |                               |                   | C |                                                                                                                                                                     |          | 500A | 100A | 400A |   |   |
| Fixed Voltage Twin SLIC Series                    |                                                                                     |                                |                               | Modified DO-214AA | A | 58 - 160                                                                                                                                                            | 77 - 200 | 150A | 45A  | 150A | • | • |
| Fixed Voltage Q2L Series                          |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | QFN 3.3x3.3       | C | 58 - 160                                                                                                                                                            | 77 - 200 | 500A | 100A | 400A | • | • |
| Fixed Voltage Single Port Series                  |                                                                                     |                                |                               | MS-012            | F | 58 - 95                                                                                                                                                             | 77 - 130 | 120A | 30A  | 100A | • | • |
| Fixed Voltage Enhanced Single Series              |                                                                                     |                                |                               | MS-012            | F | 58 - 160                                                                                                                                                            | 77 - 200 | 120A | 30A  | 100A | • | • |
| Fixed Voltage Multiport Series                    |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MS-013            | A | 58 - 160                                                                                                                                                            | 77 - 200 | 150A | 45A  | 150A | • | • |
|                                                   |                                                                                     |                                |                               |                   | C |                                                                                                                                                                     |          | 500A | 100A | 400A |   |   |
| Battrax® Protectors Positive/Negative             |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Modified DO-214AA | A | These devices track their reference voltages. Please refer to data sheets in SIDACtor® Protection Thyristor catalog or www.littelfuse.com for detailed information. |          | 150A | 45A  | 150A | • | • |
|                                                   |                                                                                     |                                |                               |                   | C |                                                                                                                                                                     |          | 500A | 100A | 400A |   |   |
| Battrax® Protectors Single Port Negative          |                                                                                     |                                |                               | MS-013            | C |                                                                                                                                                                     |          | 500A | 100A | 400A | • | • |
| Battrax® Protectors Single Port Positive/Negative |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MS-013            | C |                                                                                                                                                                     |          | 500A | 100A | 400A | • | • |
| Battrax® Protectors Dual Port Negative            |                                                                                     |                                |                               | MS-013            | C |                                                                                                                                                                     |          | 500A | 100A | 400A | • | • |

## SIDACtor® PROTECTION THYRISTORS (continued)

| Series Name | Photo | View<br>Datasheet | Order<br>Samples | Package Type | Type | Standoff<br>(working)<br>Voltage ( $V_{DRM}$ ) | Switching<br>Voltage ( $V_S$ ) | Peak Pulse Rating: |                 |              | RoHS<br>Compliant | UR<br>Recognized |
|-------------|-------|-------------------|------------------|--------------|------|------------------------------------------------|--------------------------------|--------------------|-----------------|--------------|-------------------|------------------|
|             |       |                   |                  |              |      |                                                |                                | 2/10 $\mu$ s       | 10/1000 $\mu$ s | 8/20 $\mu$ s |                   |                  |

### Line Circuit Access Switch (LCAS) Protection:

|                                  |                                                                                   |                                |                               |          |   |                                                                  |           |      |      |      |   |   |
|----------------------------------|-----------------------------------------------------------------------------------|--------------------------------|-------------------------------|----------|---|------------------------------------------------------------------|-----------|------|------|------|---|---|
| Asymmetrical<br>Multiport Series |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MS-013   | A | These products have asymmetric trigger voltages. See data sheet. |           | 150A | 45A  | 150A | • | • |
|                                  |                                                                                   |                                |                               |          | C |                                                                  |           | 500A | 100A | 400A |   |   |
| Custom LCAS<br>Discrete Series   |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-214AA | A | 100 - 230                                                        | 130 - 290 | 150A | 45A  | 150A | • | • |
|                                  |                                                                                   |                                |                               |          | B |                                                                  |           | 250A | 80A  | 250A |   |   |
|                                  |                                                                                   |                                |                               |          | C |                                                                  |           | 500A | 100A | 400A |   |   |

### Baseband Protection (Voice-DS1):

|                                                                                         |                                                                                     |                                |                               |                 |                                             |                                                        |                                                         |      |      |      |   |   |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------|---------------------------------------------|--------------------------------------------------------|---------------------------------------------------------|------|------|------|---|---|
| SIDAct <sup>or</sup> <sup>®</sup><br>Protection Thyristors                              |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-214AA        | A                                           | 6 - 320                                                | 25 - 400                                                | 150A | 45A  | 150A | • | • |
|                                                                                         |                                                                                     |                                |                               |                 | B                                           |                                                        |                                                         | 250A | 80A  | 250A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | C                                           |                                                        |                                                         | 500A | 100A | 400A |   |   |
|                                                                                         |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-214AC (SMA)  | A                                           | 6 - 320                                                | 25 - 400                                                | 150A | 50A  | 150A | • | • |
|                                                                                         |                                                                                     |                                |                               |                 | B                                           |                                                        |                                                         | 250A | 80A  | 250A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | C                                           |                                                        |                                                         | 500A | 100A | 400A |   |   |
|                                                                                         |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | TO-92           | A                                           | 6 - 320                                                | 25 - 400                                                | 150A | 45A  | 150A | • | • |
|                                                                                         |                                                                                     |                                |                               |                 | B                                           |                                                        |                                                         | 250A | 80A  | 250A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | C                                           |                                                        |                                                         | 500A | 100A | 400A |   |   |
|                                                                                         |    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-15           | A                                           | 90 - 320                                               | 130 - 400                                               |      | 45A  |      | • | • |
| B                                                                                       |                                                                                     |                                |                               |                 | 80A                                         |                                                        |                                                         |      |      |      |   |   |
|                                                                                         |                                                                                     |                                |                               |                 |                                             |                                                        |                                                         |      |      |      |   |   |
|       | <a href="#">View Datasheet</a>                                                      | <a href="#">Order Samples</a>  | Modified TO-220               | A               | Pins 1-2,3-2:<br>25-275<br>Pins 1-3: 50-550 | Pins 1-2,3-2:<br>40-350<br>Pins 1-3: 80-700            | 150A                                                    | 45A  | 150A | •    | • |   |
|                                                                                         |                                                                                     |                                |                               | B               |                                             |                                                        | 250A                                                    | 80A  | 250A |      |   |   |
|                                                                                         |                                                                                     |                                |                               | C               |                                             |                                                        | 400A                                                    | 100A | 400A |      |   |   |
| SIDAct <sup>or</sup> <sup>®</sup> Protection<br>Thyristors Multiport<br>Series          |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MS-013          | A                                           | Pins 1-2,3-2,4-5,6-5:<br>6-320<br>Pins 1-3,4-6: 12-640 | Pins 1-2,3-2,4-5,6-5:<br>25-400<br>Pins 1-3,4-6: 50-800 | 150A | 45A  | 150A | • | • |
|                                                                                         |                                                                                     |                                |                               |                 | C                                           |                                                        |                                                         | 500A | 100A | 400A |   |   |
| SIDAct <sup>or</sup> <sup>®</sup> Protection<br>Thyristors Balanced<br>Series           |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MS-013          | C                                           | 130 - 420                                              | 180 - 600                                               | 500A | 100A | 400A | • | • |
|                                                                                         |                                                                                     |                                |                               |                 |                                             |                                                        |                                                         |      |      |      |   |   |
|                                                                                         |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Modified TO-220 | A                                           | Pins 1-2, 3-2:<br>130-420<br>Pins 1-3: 130-420         | Pins 1-2, 3-2:<br>180-600<br>Pins 1-3: 180-600          | 150A | 45A  | 150A | • | • |
|                                                                                         |                                                                                     |                                |                               |                 | B                                           |                                                        |                                                         | 250A | 80A  | 250A |   |   |
| SIDAct <sup>or</sup> <sup>®</sup> Protection<br>Thyristors Balanced<br>Multiport Series |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | MS-013          | C                                           | 130 - 420                                              | 180 - 600                                               | 400A | 100A | 400A | • | • |
|                                                                                         |                                                                                     |                                |                               |                 | A                                           |                                                        |                                                         | 150A | 45A  | 150A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | B                                           |                                                        |                                                         | 250A | 80A  | 250A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | C                                           |                                                        |                                                         | 500A | 100A | 400A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | Asym. A6                                    |                                                        |                                                         | 150A | 45A  | 150A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | Asym. B6                                    |                                                        |                                                         | 250A | 80A  | 250A |   |   |
|                                                                                         |                                                                                     |                                |                               |                 | Asym. C6                                    |                                                        |                                                         | 500A | 100A | 400A |   |   |
| T10A Series                                                                             |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-15           | A                                           | 50 - 245                                               | 84 - 370                                                |      | 50A  | 100A | • | • |
| T10B Series                                                                             |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-201          | B                                           | 80 - 275                                               | 120 - 360                                               |      | 100A | 250A | • | • |

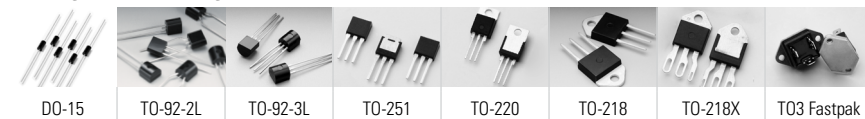
### High Exposure Surge Protection:

|                                       |                                                                                     |                                |                               |                 |   |                                                |                                                |       |      |       |   |   |
|---------------------------------------|-------------------------------------------------------------------------------------|--------------------------------|-------------------------------|-----------------|---|------------------------------------------------|------------------------------------------------|-------|------|-------|---|---|
| Primary Protection<br>Series          |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Modified TO-220 | C | Pins 1-2,3-2:<br>25-275<br>Pins 1-3: 50-550    | Pins 1-2,3-2:<br>40-350<br>Pins 1-3: 80-700    | 500A  | 100A | 400A  | • | • |
| Primary Protection<br>Balanced Series |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Modified TO-220 | C | Pins 1-2, 3-2:<br>130-420<br>Pins 1-3: 130-420 | Pins 1-2, 3-2:<br>180-600<br>Pins 1-3: 180-600 | 500A  | 100A | 400A  | • | • |
| 5kA Series                            |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | TO-218          | E | 140 - 180                                      | 180 - 260                                      |       |      | 5000A | • | • |
| High Surge Current Series             |  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-214AA        | D | 6 - 320                                        | 25 - 400                                       | 1000A | 200A | 800A  | • | • |

## SWITCHING THYRISTORS

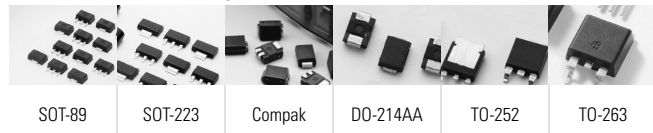
Switching Thyristors are solid state switches that are normally open circuits (very high impedance), capable of withstanding rated blocking/off-state voltage until triggered to on state. Used for circuit control applications, Littelfuse offers Triac, QUADRAC® Semiconductors, SCRs, Rectifiers plus Alternistor Triacs for best commutating and noise immunity. Offered in various and other configurations for a wide range of currents blocking/off-state voltages, packages, and triggering.

### Through-Hole Packages:



**Other:**

### Surface Mount Packages:



| I <sub>TRMS</sub> | V <sub>DRM</sub> /V <sub>RRM</sub> | I <sub>GT (Q1)</sub> | Series    |                |               |          |                |               | Through-Hole |                |               |       |        |             | Surface Mount   |             |              |      |        |         |        |        |
|-------------------|------------------------------------|----------------------|-----------|----------------|---------------|----------|----------------|---------------|--------------|----------------|---------------|-------|--------|-------------|-----------------|-------------|--------------|------|--------|---------|--------|--------|
|                   |                                    |                      | Sensitive | View Datasheet | Order Samples | Standard | View Datasheet | Order Samples | Alternistor  | View Datasheet | Order Samples | TO-92 | TO-251 | TO-220 (sl) | TO-220 Non-(sl) | TO-218 (sl) | TO-218X (sl) | TO-3 | Compak | SO1-223 | TO-252 | TO-263 |

### Triac:

|           |           |          |                |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |  |                                                                                       |                                                                                       |  |
|-----------|-----------|----------|----------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--|
| 0.8A      | 400-600V  | 3-25mA   | LxX8Ex<br>LxXx |   |   | QxX8Ex<br>QxXx                                                                        |   |   |                                                                                       |                                                                                       |                                                                                       |   |                                                                                       |                                                                                       |                                                                                       |                                                                                       |   |  |                                                                                       |                                                                                       |  |
| 0.8A      |           | 3-5mA    | LX8            |  |  |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |  |                                                                                       |                                                                                       |                                                                                       |                                                                                       |  |  |                                                                                       |                                                                                       |  |
| 1.0A      |           | 3-25mA   | Lx01Ex,LxNx    |  |  | Qx01Ex,QxNx                                                                           |  |  |                                                                                       |                                                                                       |                                                                                       |                                                                                       |  |                                                                                       |                                                                                       |                                                                                       |                                                                                       |  |                                                                                       |                                                                                       |  |
| 1.0A      | 400-800V  | 3-10mA   | L01            |  |  |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |                                                                                       |  |                                                                                       |                                                                                       |                                                                                       |                                                                                       |  |  |                                                                                       |                                                                                       |  |
| 4A        | 400-1000V | 3-25mA   | Lxx04xx        |  |  | Qxx04xx                                                                               |  |  |                                                                                       |                                                                                       |                                                                                       |  |  |  |                                                                                       |                                                                                       |                                                                                       |  |  |                                                                                       |  |
| 6A        |           | 5-50mA   | Lxx06xx        |  |  | Qxx06xx                                                                               |  |  | Qxx06xHx                                                                              |  |  |  |  |  |                                                                                       |                                                                                       |                                                                                       |  |  |  |  |
| 8A        |           | 5-50mA   | Lxx08xx        |  |  | Qxx08xx                                                                               |  |  | Qxx08xHx                                                                              |  |  |  |  |  |                                                                                       |                                                                                       |                                                                                       |  |  |  |  |
| 10A       |           | 25-50mA  |                |                                                                                     |                                                                                     | Qxx10xx                                                                               |  |  | Qxx10xHx                                                                              |  |  |                                                                                       |  |  |                                                                                       |                                                                                       |                                                                                       |  |  |                                                                                       |  |
| 12A       |           | 10-50mA  |                |                                                                                     |                                                                                     |                                                                                       |                                                                                       |                                                                                       | Qxx12xHx                                                                              |  |  |                                                                                       |  |  |                                                                                       |                                                                                       |                                                                                       |  |                                                                                       |  |  |
| 15A & 16A |           | 10-80mA  |                |                                                                                     |                                                                                     | Qxx15xx                                                                               |  |  | Qxx16xHx                                                                              |  |  |                                                                                       |  |  |                                                                                       |                                                                                       |                                                                                       |  |                                                                                       |  |  |
| 25A       |           | 50-80mA  |                |                                                                                     |                                                                                     | Qxx25xx                                                                               |  |  | Qxx25xHx                                                                              |  |  |                                                                                       |  |  |  |  |  |  |                                                                                       |  |  |
| 25A       | 600V      | 50mA     |                |                                                                                     |                                                                                     |                                                                                       |                                                                                       | H06025xH5                                                                             |  |  |                                                                                       |  |  |  |                                                                                       |                                                                                       |                                                                                       |  |  |                                                                                       |  |
| 30A & 35A | 400-800V  | 50mA     |                |                                                                                     | Qxx35xx                                                                             |  |  | Qxx35xHx                                                                              |  |  |                                                                                       |  |  |                                                                                       |  |                                                                                       |                                                                                       |  |  |                                                                                       |  |
| 40A       | 400-1000V | 50-100mA |                |                                                                                     |                                                                                     |                                                                                       |                                                                                       | Qxx40xx                                                                               |  |  |                                                                                       |                                                                                       |                                                                                       |  |  |                                                                                       |                                                                                       |  |                                                                                       |                                                                                       |  |

## QUADRAC® Semiconductors:

[illegible]

## SWITCHING THYRISTORS (continued)

| $I_{T(RMS)}$ | $V_{DRM}/V_{RRM}$ | $I_{GT}(Q1)$ | Series    |                |               |          |                |               | Through-Hole |        |            |                |              |                  |             |                 | Surface Mount |        |         |        |        |
|--------------|-------------------|--------------|-----------|----------------|---------------|----------|----------------|---------------|--------------|--------|------------|----------------|--------------|------------------|-------------|-----------------|---------------|--------|---------|--------|--------|
|              |                   |              | Sensitive | View Datasheet | Order Samples | Standard | View Datasheet | Order Samples | TO-92        | TO-251 | TO-220 IsI | TO-220 Non-IsI | TO-218AC IsI | TO-218AC Non-IsI | TO-218X IsI | TO-218X Non-IsI | Compak        | SOT-89 | SOT-223 | TO-252 | TO-263 |

### SCR:

|           |           |            |                 |                                |                               |                  |                                |                               |   |   |   |   |   |   |   |   |   |   |   |   |   |
|-----------|-----------|------------|-----------------|--------------------------------|-------------------------------|------------------|--------------------------------|-------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.8A      | 400-600V  | 12 - 500μA | EC103xx<br>SxSx | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                  |                                |                               | • |   |   |   |   |   |   |   | • |   |   |   |   |
| 0.8A      | 400-800V  | 5 - 200μA  | SxX8xSx         | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                  |                                |                               | • |   |   |   |   |   |   |   |   | • | • |   |   |
| 1A        | 400-600V  | 10mA       |                 |                                |                               | Sx01E<br>SxN1    | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | • |   |   |   |   |   |   |   | • |   |   |   |   |
| 1.5A      |           | 200μA      | TCR22-x         | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                  |                                |                               | • |   |   |   |   |   |   |   |   |   |   |   |   |
| 1.5A      |           | 200μA      | Sx02xS          | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                  |                                |                               | • |   |   |   |   |   |   |   |   |   | • |   |   |
| 4A        |           | 50 - 500μA | Sxx04xSx        | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |                  |                                |                               |   | • |   |   |   |   |   |   |   |   |   | • |   |
| 6A        |           | 0.2-15mA   | Sxx06xSx        | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Sxx06x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • | • | • |   |   |   |   |   |   |   | • |   |
| 8A        |           | 0.2-15mA   | Sxx08xSx        | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Sxx08x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • | • | • |   |   |   |   |   |   |   | • |   |
| 10A       |           | 0.2-15mA   | Sxx10xSx        | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | Sxx10x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • | • | • |   |   |   |   |   |   |   | • |   |
| 12A       |           | 20mA       |                 |                                |                               | Sxx12x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   | • |   | • |   |   |   |   |   |   |   | • |   |
| 15A & 16A |           | 30mA       |                 |                                |                               | Sxx15x<br>Sxx16x | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | • |   |   |   |   |   |   |   |   | • |
| 20A & 25A |           | 30-35mA    |                 |                                |                               | Sxx20x<br>Sxx25x | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   | • | • |   |   |   |   |   |   |   |   | • |
| 35A       | 400-1000V | 40mA       |                 |                                |                               | Sxx35x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   |   |   | • |   | • |   |   |   |   |   |   |
| 40A       |           | 40mA       |                 |                                |                               | Sxx40x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   |   | • |   |   |   |   |   |   |   |   | • |
| 55A       |           | 40mA       |                 |                                |                               | Sxx55x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   |   | • |   | • |   | • |   |   |   |   | • |
| 65A       |           | 50mA       |                 |                                |                               | Sxx65x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   |   |   | • |   | • |   |   |   |   |   |   |
| 70A       |           | 50mA       |                 |                                |                               | Sxx70x           | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |   |   |   |   |   |   |   | • |   |   |   |   |   |

| Series   |                |               |             |                |               |            |                |               | Through Hole | Surface Mount | Switching $V_{BO}$ | $I_H$ | $I_{TSM}$ | static dv/dt | di/dt | $T_J$ |
|----------|----------------|---------------|-------------|----------------|---------------|------------|----------------|---------------|--------------|---------------|--------------------|-------|-----------|--------------|-------|-------|
| Standard | View Datasheet | Order Samples | High Energy | View Datasheet | Order Samples | Multipulse | View Datasheet | Order Samples |              |               |                    |       |           |              |       |       |

### SIDAC:

|       |                                |                               |          |                                |                               |        |                                |                               |              |          |          |       |     |          |         |                |
|-------|--------------------------------|-------------------------------|----------|--------------------------------|-------------------------------|--------|--------------------------------|-------------------------------|--------------|----------|----------|-------|-----|----------|---------|----------------|
| Kxxzy | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |          |                                |                               |        |                                |                               | DO-15, TO-92 | DO-214AA | 79-330V  | 150mA | 20A | 1500V/μs | 150A/μs | -40 to +125 °C |
|       |                                |                               | Kxxx0yH  | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |        |                                |                               | DO-15, TO-92 | DO-214AA | 190-280V | 150mA | 20A |          | 150A/μs | -40 to +125 °C |
|       |                                |                               | K2xx0GHU | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> |        |                                |                               | DO-15        |          | 190-260V | 60mA  |     |          | 220A/μs | -40 to +125 °C |
|       |                                |                               |          |                                |                               | Kxxx1G | <a href="#">View Datasheet</a> | <a href="#">Order Samples</a> | DO-15        |          | 200-380V | 120mA |     |          | 150A/μs | -40 to +125 °C |

| Series | View Datasheet | Order Samples | Through Hole | $I_{T(RMS)}$<br>RMS forward current | $I_{T(AV)}$<br>Average forward current | $I_{TSM}$<br>Peak non-repetitive surge current | $I^2t$<br>$I^2t$ Value for fusing | $T_{stg}$<br>Storage temperature range | $T_J$ |
|--------|----------------|---------------|--------------|-------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|----------------------------------------|-------|
|--------|----------------|---------------|--------------|-------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|----------------------------------------|-------|

### Rectifiers:

|        |                                |   |             |          |              |                                                                      |                                                                      |                            |                |                |
|--------|--------------------------------|---|-------------|----------|--------------|----------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------|----------------|----------------|
| Dxx15L | <a href="#">View Datasheet</a> | • | TO-220 Isl. | 15 - 25A | 9.5 to 15.9A | single half cycle; f = 50Hz;<br>$T_J$ (initial) = 25°C<br>188 - 300A | single half cycle; f = 60Hz;<br>$T_J$ (initial) = 25°C<br>225 - 350A | 210 - 508 A <sup>2</sup> s | -40 to +150 °C | -40 to +125 °C |
| Dxx20L | <a href="#">View Datasheet</a> |   |             |          |              |                                                                      |                                                                      |                            |                |                |
| Dxx25L | <a href="#">View Datasheet</a> |   |             |          |              |                                                                      |                                                                      |                            |                |                |

# Common Circuit Threats and Protection Solutions

| Threat or Circuit Action<br>What is the threat or circuit action that may damage sensitive electronics? | Typical Applications<br>What are the typical end products that require protection from this damage? | Principal Protection Criteria<br>What are the characteristics required of the circuit protection technology? | Littelfuse Protection Technologies<br>Which circuit protection technologies best serve these types of situations? |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Overcurrent / Ground Faults                                                                             | Systems that are grounded and/or in near proximity to AC power lines                                | Proper interrupting rating, current carrying capability and voltage rating                                   | Fuses and/or PTCs                                                                                                 |
| Lightning                                                                                               | Any electronic or electrical equipment with connections to the outside environment                  | Fast response, proper switching threshold, surge current rating                                              | SIDACTor® Protection Thyristors, Varistors (MOVs), TVS Diodes, Gas Discharge Tubes (GDTs)                         |
| Electrostatic Discharge (ESD)                                                                           | Any electronic equipment with a human interface                                                     | Fast response, high peak voltage rating                                                                      | PulseGuard® ESD Suppressors, TVS Diode Array – SPA® Diodes, Multi-Layer Varistors (MLVs), PLED Bypass Protectors  |
| Electrical Fast Transients (EFT)                                                                        | Any system that has inductive loads                                                                 | Fast rise time and recovery for repetitive pulses                                                            | TVS Diodes, Varistors (MLVs and MOVs), TVS Diode Array – SPA® Diodes                                              |
| Inductive Load Switching and Commutative Spikes                                                         | Large motors, pumps, compressors, relays and AC distribution                                        | High energy rating                                                                                           | Varistors (MOVs and MLVs), GDTs, TVS Diodes                                                                       |
| Data and Communication Line Voltage Transients                                                          | Ethernet, xDSL, data bus, telecom, etc.                                                             | Fast response, low load capacitance                                                                          | TVS Diode Array – SPA® Diodes, SIDACTor® Protection Thyristors                                                    |
| Current Switching / Diversion                                                                           | Wide range of electrical and electronic circuits                                                    | Proper blocking voltage and current carrying capacity                                                        | Switching Thyristors, PLED Bypass Protectors                                                                      |

## OVERCURRENT EVENTS

Excessive current events can lead to catastrophic failures in electronic circuits. These failures can result in safety hazards such as fire, shock, or explosion. Common types of overcurrent threats include:



### Overload

Overloads occur when more current is allowed to flow through a circuit path than it was designed to carry. This excess current can generate and accumulate heat and result in complete circuit destruction and possible fire, electrocution or explosion. Sources of overload can include:

- Construction hazards cutting across power mains
- Equipment failure in the power grid
- Environmental hazards on the power grid
- Short spikes of energy within the circuit as a result of turning equipment on or off



### Short Circuit

Short circuits occur when one conducting path comes in contact with another conducting path or with ground, such as may occur due to a loose wire, insulation breakdown, or contact with water. These conditions can increase the likelihood of arcs, shock, or fire hazards.

The principal forms of protection against overcurrent conditions include fuses and resettable positive temperature coefficient (PTC) thermistors.

Their function is to limit current to acceptable levels and prevent catastrophic events, and during acceptable conditions act dormant with a minimal amount of resistance to the circuit.

Fuses will completely stop the flow of current when opened, which may be desired with sensitive, expensive or critical applications.

PTCs offer the ability to re-set for withstanding most minor, common and recurring overcurrent events. They will allow safe levels of current to pass continuously, and during major overcurrent events, increase in resistance as they heat, to restrict the flow of current. When the overcurrent event ends, the device resets to its normal operating state.



### Electrostatic Discharge (ESD)

Damage from ESD is generally caused by the transfer of static electrical charge from a body to an electronic circuit. It may result in faulty circuit operation, latent defects, and even catastrophic failure of sensitive components. ESD suppressors must have very fast response times and handle high peak voltages and currents for short durations. Littelfuse offers a range of PulseGuard® ESD suppressors, Multi-Layer Varistors (MLVs) and TVS Diode Array – SPA® Diodes that are designed to suppress these types of events.



### Inductive Load Switching

Switching of inductive loads, such as those that occur with transformers, generators, motors, and relays, can create transients up to hundreds of volts and amps, and can last as long as 400 milliseconds, affecting both AC and DC circuits. For these applications, commonly used suppressor devices include Metal Oxide Varistors (MOVs), Gas Discharge Tubes (GDTs), and Transient Voltage Suppression (TVS) Diodes.



### Lightning Induced Transient

Most transients induced by nearby lightning strikes result in an electromagnetic disturbance on electrical and communication lines connected to electronic equipment. Devices that protect against these transients must have a fast response time and must be able to dissipate a large amount of energy. Littelfuse Metal Oxide Varistor (MOV), TVS Diodes and GDT products are typically used to protect against these events. Look to Littelfuse SIDACTor® Protection Thyristors and TVS Diode Array – SPA® Diode products for Telecom/Datacom requirements (see page 22).



### Automotive Load Dump

Load dump refers to what happens to the supply voltage in a vehicle when a load is removed. If a load is removed rapidly (such as when the battery is disconnected while the engine is running), the voltage may spike before stabilizing and damage electronic components. In a typical 12V circuit, load dump can rise as high as 120V and take 400 ms to decay—more than enough to cause serious damage. Littelfuse offers a wide range of TVS Diode and Multi-Layer Varistor (MLV) products designed to protect against these types of events.

# Application Solutions by Circuit Type and Related Threat



## CONSUMER ELECTRONIC PRODUCT APPLICATIONS

**Computers**—Server, Notebook, Ultrabook, Desktop

**Handheld Portables**—Smart Phone, Tablet, eReader, PND/GPS, MP3/PMP, Digital Camera/Camcorder

**Consumer A/V Equipment**—LCD/LED TV, set top box, DVD player

**Peripherals**—Scanner, Printer, Monitor, Disk Drive

| Circuit Type                                                                                                | Function or Threat | Standards                     | Littelfuse Product Series       |                                                                                              |
|-------------------------------------------------------------------------------------------------------------|--------------------|-------------------------------|---------------------------------|----------------------------------------------------------------------------------------------|
| <b>Medium/Low-Speed Data Interfaces:</b><br>USB 1.1, Ethernet, RS-232, RS-485, Keypads, Audio, Analog Video | ESD, EMI, EFT      | IEC61000-4-2<br>IEC61000-4-4  | TVS Diode Array<br>SPA® Diodes  | SP05x, SP10xx, SP40xx, LC03, SP72x, SP03-xx, SLVU2.8, SLVU2.8-4                              |
|                                                                                                             |                    |                               | Varistor (MLV)                  | MLA, MLE, MLN, MHS                                                                           |
|                                                                                                             |                    |                               | SIDACTor® Protection Thyristors | PxxxxSA/SB/SC, PxxxxQ12/Q22                                                                  |
|                                                                                                             |                    |                               | TVS Diodes                      | SMF, SMAJ, SMA6L, SMBJ, SMCJ, SMDJ                                                           |
|                                                                                                             | Overcurrent        |                               | PTCs                            | 0603L, 0805L, 1206L, 1210L, 1812L, 2920L                                                     |
| <b>High-Speed Data Interfaces:</b><br>USB 2.0/3.0, HDMI, eSATA, DisplayPort, DVI, IEEE 1394, RF Antenna     | ESD, EMI, EFT      | IEC61000-4-2,<br>IEC61000-4-4 | PulseGuard® ESD Suppressor      | PGB1, PGB2 - 0201, 0402, 0603                                                                |
|                                                                                                             |                    |                               | TVS Diode Array<br>SPA® Diodes  | SP30xx, SP40xx, SP0524P, SP0504S                                                             |
|                                                                                                             | Overcurrent        |                               | LoRho PTCs                      | SL SMT Series 0402L, 0603L, 0805L, 1206L, 1210L, 1812L                                       |
| <b>Power Inputs:</b><br>120/240 VAC                                                                         | Lightning          | IEC61000-4-5                  | TVS Diode                       | SMF, SMAJ, SMA6L, SMBJ, SMCJ, SMDJ, P4KE, P6KE, 1.5KE                                        |
|                                                                                                             | Overcurrent        |                               | Varistor (MOV)                  | LA, UltraMOV™, C-III, TMOV® varistors                                                        |
| <b>Power Inputs:</b><br>Blade DC input, Low voltage DC, Li-ion Battery                                      | Lightning / ESD    | IEC61000-4-2,<br>IEC61000-4-5 | TVS Diode                       | SMF, SMAJ, SMA6L, SMBJ, SMCJ, SMDJ, P4KE, P6KE, 1.5KE                                        |
|                                                                                                             |                    |                               | Varistor (MLV)                  | ML, MLE                                                                                      |
|                                                                                                             |                    |                               | Varistor (MOV)                  | ZA                                                                                           |
|                                                                                                             | Overcurrent        |                               | Fuse                            | SMD - Thin Film, Ceramic, Chip, Nano <sup>20</sup> , (1206 size), 501 (20A), 456 (40A) fuses |
|                                                                                                             |                    |                               | LoRho PTC                       | SL SMT Series 0402L, 0603L, 0805L, 1206L, 1210L, 1812L                                       |



## POWER MAINS / AC LINE PROTECTION\*

| Circuit Type                                                                                                                                                                                                                                                 | Function or Threat                                   | Littelfuse Product Series |                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|---------------------------|------------------------------------------------------------------------------------------------------|
| Type 1 (Power before the panel)                                                                                                                                                                                                                              |                                                      |                           |                                                                                                      |
| <b>Surge Protective Devices (SPD)</b><br>(Primary building entrance, electric meters)                                                                                                                                                                        | Lightning                                            | Varistor (MOV)            | SMOV™, TMOV®, UltraMOV™, LA, C-III, HA, HB34, HF34, HG34 varistors                                   |
| Type 2 (Permanently connected devices after the panel)                                                                                                                                                                                                       |                                                      |                           |                                                                                                      |
| <b>Uninterruptible Power Supply</b><br>(commercial/industrial)<br><b>Surge Protective Devices (SPD)</b><br>(building level equipment, load-center panels, datacenters)<br><b>Power Inverters</b>                                                             | Lightning, Switching Transients                      | Varistor (MOV)            | SMOV™, TMOV®, UltraMOV™, LA, C-III, HA, HB34, HF34, HG34 varistors                                   |
|                                                                                                                                                                                                                                                              |                                                      | TVS Diode                 | 5KP, 15KPA, 20KPA, 30KPA, AK1, AK3, AK6, AK10, AK15                                                  |
|                                                                                                                                                                                                                                                              |                                                      | GDT                       | AC120, AC240                                                                                         |
|                                                                                                                                                                                                                                                              | Power Fault / Short Circuit and other thermal events | Fuse                      | POWR-GARD® Midget fuses<br>LVSP series (MOV protection)                                              |
| Type 3 (Plug-in equipment after the panel)                                                                                                                                                                                                                   |                                                      |                           |                                                                                                      |
| <b>Uninterruptible Power Supply</b><br>(consumer/residential)<br><b>External Power Supplies</b><br>(chargers, peripheral devices, etc)<br><b>Consumer Electronics</b><br><b>AC Appliances</b><br><b>AC Power Strips</b><br><b>Switch Mode Power Supplies</b> | Lightning, Switching Transients                      | Varistor (MOV)            | TMOV®, UltraMOV™, LA, C-III, HA, HB34, HF34, HG34 varistors                                          |
|                                                                                                                                                                                                                                                              |                                                      | TVS Diode                 | 5KP, 15KPA, 20KPA, 30KPA, AK1, AK3, AK6, AK10, AK15                                                  |
|                                                                                                                                                                                                                                                              |                                                      | GDT                       | CG3 4.0                                                                                              |
|                                                                                                                                                                                                                                                              | Power Fault / Short Circuit and other thermal events | Fuse                      | Thru Hole: TR5® / TE5, 2AG, 3AG, 5x20, 3.6x10, PICO® fuses<br>Surface Mount: Nano2®, PICO® SMD fuses |



## LIGHTING SYSTEMS

| Circuit Type                                    | Function or Threat                                   | Littelfuse Product Series |                                                                                                                                                                                  |
|-------------------------------------------------|------------------------------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LED Lighting Systems</b>                     | Improved LED String Reliability                      | PLED devices              | PLEDxx                                                                                                                                                                           |
|                                                 | Power Supply (Lightning, Inductive Load Switching)   | Varistor (MOV)            | TMOV®, UltraMOV™, CH, LA, C-III varistors                                                                                                                                        |
|                                                 |                                                      | TVS Diode                 | SMBJ, P4KE, P6KE, 1.5KE, 5KP, 15KPA, 30KPA, AK1, AK3, AK6, AK10, AK15                                                                                                            |
|                                                 | Power Fault / Short Circuit and other thermal events | Fuse                      | Thru Hole: TR5® / TE5, 2AG, 3AG, 5x20, 3.6x10, PICO® fuses<br>Surface Mount: Ceramic Chip, Nano2®, PICO® SMD (High Voltage) 477 series, 505 series, 808 series, 485 series fuses |
| <b>Light Dimmers</b>                            | Phase Control                                        | Thyristor                 | Triacs / Alternistor Triacs: Q6010Lx, Q6016Lx, Q6025Lx<br>QUADRAC® semiconductors: Q6010LT, Q6015LT                                                                              |
|                                                 | Overcurrent (Europe)                                 | Fuse                      | 3.6x10                                                                                                                                                                           |
| <b>Electronic Fluorescent Lighting Ballasts</b> | Lightning                                            | Varistor (MOV)            | LA                                                                                                                                                                               |
|                                                 | Overcurrent                                          | Fuse                      | 383 TR series / 369 TR5® series, 446 / 447 EBF fuse                                                                                                                              |
| <b>Compact Fluorescent Lamps (CFL)</b>          | Overcurrent                                          | Fuse                      | 3.6x10                                                                                                                                                                           |
| <b>Metal Halide Lighting</b>                    | Lamp Ignition                                        | Thyristor                 | Multipulse Sidac: K2401G                                                                                                                                                         |
| <b>High Pressure Sodium Lighting</b>            | Lamp Ignition                                        | Thyristor                 | Sidac: K1200G                                                                                                                                                                    |



## ELECTRIC MOTORS\*

| Circuit Type                                       | Function or Threat               | Littelfuse Product Series |                                                     |
|----------------------------------------------------|----------------------------------|---------------------------|-----------------------------------------------------|
| <b>Universal / DC Motors</b><br>(intermittant use) | Speed Control                    | Thyristor                 | Triac: Q6016LH4<br>SCR: S6025L<br>Rectifier: D6025L |
| <b>AC Induction Motors</b><br>(continuous use)     | Speed Control                    | Thyristor                 | Triac: Q6012LH4                                     |
|                                                    | Thyristor Overvoltage Protection | Varistor (MOV)            | LA, SM20                                            |
|                                                    |                                  | TVS Diode                 | SMBJ, P4KE, P6KE, 1.5KE                             |

\* Littelfuse offers protection solutions to serve a wide range of electric motors, controllers and power systems. Please consult with your Littelfuse products representative for detailed discussion about your requirements. For higher power and industrial applications, please refer to our POWR-GARD® division product catalogs ([www.littelfuse.com/catalogs](http://www.littelfuse.com/catalogs)).



## TELECOM/DATACOM

| Circuit                                                                                                     | Threat             | Standards                                                                                              | Littelfuse Product Series       |                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Medium/Low-Speed Data Interfaces:<br>USB 1.1, RS-232, RS-485, Keypads, Audio, Analog Video                  | ESD, EMI, EFT      | IEC61000-4-2, IEC61000-4-4                                                                             | TVS Diode Array SPA® Diodes     | SP05x, SP10xx, SP40xx, SP72x, SP03-xx, SLVU2.8, SLVU2.8-4                                                                                                         |
|                                                                                                             |                    |                                                                                                        | Varistor (MLV)                  | ML, MLE, MLN, MHS                                                                                                                                                 |
|                                                                                                             | Overcurrent        |                                                                                                        | TVS Diodes                      | SMF, SMAJ, SMA6L, SMBJ, SMCJ, SMDJ                                                                                                                                |
| High-Speed Data Interfaces:<br>USB 2.0/3.0, HDMI, eSATA, DisplayPort, DVI, IEEE 1394, RF Antenna            | ESD, EMI, EFT      | IEC61000-4-2, IEC61000-4-4                                                                             | PulseGuard® ESD Suppressor      | PGB1, PGB2 - 0201, 0402, 0603                                                                                                                                     |
|                                                                                                             |                    |                                                                                                        | TVS Diode Array SPA® Diodes     | SP30xx, SP40xx, SP0524P, SP0504S                                                                                                                                  |
|                                                                                                             | Overcurrent        |                                                                                                        | PTCs                            | 0805L, 1206L, 1210L, 1812L                                                                                                                                        |
|                                                                                                             | Overvoltage        | IEC61000-4-5, GR-1089, ITU-7 K.12                                                                      | GDTs                            | SG, SL0902A                                                                                                                                                       |
| SLICs (Subscriber Line Interface Circuits):<br>CO sites, Remote Cabinets/Terminals, VoIP systems, FXS ports | Lightning          | GR-1089, TIA-968-A/B, ITU K.20/.21/.45, UL/EN/IEC 60950-1, UL 497B, IEC 61000-4-5, YD/T-993            | SIDACtor® Protection Thyristors | Pxxx1 Fixed Voltage SLIC Protectors<br>Bxxxx Battrax® Programmable SLIC Protectors                                                                                |
|                                                                                                             | Power Fault        |                                                                                                        | Fuses                           | TeleLink® 461                                                                                                                                                     |
|                                                                                                             |                    |                                                                                                        |                                 | PTCs                                                                                                                                                              |
| Low-Speed Circuits:<br>Voice, Fax, Modem, FXO / DAA                                                         | Lightning          | GR-1089, TIA-968-A/B, ITU K.20/.21/.45, UL/EN/IEC 60950-1, UL 497B, IEC 61000-4-5, YD/T-993            | SIDACtor® Protection Thyristors | Pxxxx SIDACtor® Protectors<br>SDP series low profile SIDACtor® Protectors                                                                                         |
|                                                                                                             |                    |                                                                                                        | GDTs                            | SL0902A, SL1002A, SL1003A, SL1011A, SL1024A                                                                                                                       |
|                                                                                                             | Power Fault        |                                                                                                        | Fuses                           | TeleLink® 461 fuse                                                                                                                                                |
|                                                                                                             |                    |                                                                                                        | PTCs                            | 600R150                                                                                                                                                           |
| Medium-Speed Circuits:<br>T1/E1/J1/DS1, T3/E3/DS3                                                           | Lightning          | GR-1089, TIA-968-A/B, ITU K.20/.21/.45, UL/EN/IEC 60950-1, UL 497B, IEC 61000-4-5, YD/T-993            | SIDACtor® Protection Thyristors | PxxxxxMCL SIDACtor® Protectors<br>Pxxx2xxMCL TwinChip™ Protectors<br>PxxxxQxx QFN SIDACtor® Protectors, SDP, SEP series low profile SIDACtor® Protectors, SDP023T |
|                                                                                                             |                    |                                                                                                        | TVS Diode Array SPA® Diodes     | SRV05-4, SP4060, SP2504N, SP3304N, SP2502L, LC03, SP03-xx                                                                                                         |
|                                                                                                             |                    |                                                                                                        | GDTs                            | SL0902A, SL1002A, SL1003A, SL1011A, SL1024A                                                                                                                       |
|                                                                                                             | Power Fault        |                                                                                                        | Fuses                           | TeleLink® 461 / 461E fuses                                                                                                                                        |
|                                                                                                             |                    |                                                                                                        | PTCs                            | 600R150, 250S, 250R                                                                                                                                               |
| Ethernet:<br>10/100/1000BaseT                                                                               | Lightning          | GR-1089, TIA-968-A/B, ITU K.20/.21/.45, UL/EN/IEC 60950-1, UL 497B, YD/T-993, IEEE 802.3, IEC61000-4-5 | SIDACtor® Protection Thyristors | SDP, SEP series low profile SIDACtor® Protectors                                                                                                                  |
|                                                                                                             |                    |                                                                                                        | GDTs                            | SL0902A, SL1002A, SL1003A, SL1011A, SL1024A                                                                                                                       |
|                                                                                                             | Power Fault        |                                                                                                        | TVS Diode Array SPA® Diodes     | SP30xx, SP40xx, LC03, SLVU2.8, SLVU2.8-4, SRV05-4, SP2504N, SP3304N, SP2502L, SP03A-3.3                                                                           |
|                                                                                                             |                    |                                                                                                        | Fuses                           | TeleLink® 461 fuse                                                                                                                                                |
|                                                                                                             |                    |                                                                                                        | PTCs                            | 600R150, 250S, 250R                                                                                                                                               |
| xDSL:<br>ADSL, ADSL2, HDSL, VDSL, VDSL2                                                                     | Lightning          | GR-1089, TIA-968-A/B, ITU K.20/.21/.45, IEC 61000-4-5, YD/T-993, IEEE 802.3                            | SIDACtor® Protection Thyristors | SDP SIDACtor® Protectors, SDP023T                                                                                                                                 |
|                                                                                                             |                    |                                                                                                        | TVS Diode Array SPA® Diodes     | SR70                                                                                                                                                              |
|                                                                                                             | Primary Protection |                                                                                                        | Lightning and Power Fault       | UL497<br>GR-974<br>UL/EN/IEC 60950-1                                                                                                                              |
| Power Inputs:<br>120/240 VAC, up to 120 VDC, ATCA                                                           | Lightning          |                                                                                                        | TVS Diode                       | P4KE, P6KE, 1.5KE, AK1, AK3, AK6, AK10, AK15                                                                                                                      |
|                                                                                                             |                    |                                                                                                        | Varistor (MOV)                  | CH, ZA, UltraMOV™ varistors                                                                                                                                       |
|                                                                                                             |                    | Fault Current                                                                                          |                                 | Fuse                                                                                                                                                              |



## AUTOMOTIVE ELECTRONICS\*

**Engine/Body/Chassis Controllers** — Anti-lock brake / steering / air bag / seat belt / collision control and other safety systems and sensors, lighting / signalling controls, instrument cluster, engine / emission controllers, window / wipers controls, door lock / security controls, seating sensors and controllers

**Multimedia/Information Systems** — In-dash stereo / GPS / climate control electronics, portable GPS, portable CD/DVD/media players, audio / video / data / power docks and inputs

| Circuit Type                                        | Function or Threat                | Standards                                           | Littelfuse Product Series   |                                                                                                     |
|-----------------------------------------------------|-----------------------------------|-----------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------|
| <b>High-Speed Interfaces:</b><br>USB 2.0, IEEE 1394 | ESD                               | IEC61000-4-2                                        | PulseGuard® ESD Suppressor  | PGB1, PGB2 - 0201, 0402, 0603                                                                       |
|                                                     |                                   |                                                     | TVS Diode Array SPA® Diodes | SP30xx, SP0524P, SP0504S                                                                            |
| <b>Medium/Low-Speed Interfaces:</b><br>USB 1.1, CAN | ESD, EMI                          | IEC61000-4-2                                        | TVS Diode Array SPA® Diodes | SP05x, SP72x, SP10xx                                                                                |
|                                                     |                                   |                                                     | Varistor (MLV)              | ML, MLE, MLN, MHS                                                                                   |
| <b>Power Inputs:</b><br>Up to 42 VDC                | Fault Currents                    | RoHS; ISO 7637; GM 9105; Various UL, CSA, IEC, MITI | Fuse                        | Blade / Terminal Fuse Series:<br>257, 297, 298, 299, 495, 498<br>(see automotive products catalogs) |
|                                                     | Load Dump and Inductive Switching | —                                                   | Varistor (MLV)              | AUML, MLA, MLE, MHS                                                                                 |
|                                                     |                                   |                                                     | TVS Diode (AEC-Q101)        | TPSMA6L                                                                                             |
|                                                     |                                   |                                                     | Varistor (MOV)              | CH, ZA                                                                                              |

\* Littelfuse offers a wide range of solutions designed to serve the requirements of automotive, truck, and off-road vehicle applications. Please refer to our automotive products catalogs ([www.littelfuse.com/catalogs](http://www.littelfuse.com/catalogs)) and your Littelfuse products representative for detailed discussion about your requirements.



## WHITE GOODS / APPLIANCES

| Circuit Type                    | Function or Threat       | Littelfuse Product Series     |                                                                            |
|---------------------------------|--------------------------|-------------------------------|----------------------------------------------------------------------------|
| <b>AC Induction Motor</b>       | On / Off / Speed Control | Switching Thyristor           | Alternistor Triac                                                          |
| <b>AC Shaded Pole Motor Fan</b> | On / Off / Speed Control | Switching Thyristor           | EV Series Triac                                                            |
| <b>AC Solenoid Valve / Lock</b> | On / Off                 | Switching Thyristor           | EV Series Triac                                                            |
|                                 | Spike Suppression        | Varistor (MOV)                | LA                                                                         |
| <b>Brushless DC Motor Drive</b> | DC Supply Protection     | TVS Diode                     | 1.5KE / 1.5SMC                                                             |
| <b>Display / Touchscreen</b>    | ESD Protection           | Varistor (MLV)                | ML                                                                         |
| <b>Gas Ignitor</b>              | Free-Running Oscillator  | Switching Thyristor           | K2xxxH Series SIDAC                                                        |
|                                 | Micro-controller Fired   | Switching Thyristor           | EC Series SCR                                                              |
| <b>Heating Element</b>          | On / Off / Variable      | Switching Thyristor           | HQ Series High Temp Triac                                                  |
| <b>Incandescent Bulb</b>        | On / Off / Dim           | Switching Thyristor           | L-Series Triac                                                             |
| <b>LED Indicator / Light</b>    | ESD Protection           | Varistor (MLV)                | ML                                                                         |
| <b>MicroController I/O</b>      | ESD Protection           | Varistor (MLV)                | ML                                                                         |
| <b>Sensor</b>                   | ESD Protection           | Varistor (MLV)                | ML                                                                         |
| <b>Switch-Mode Power Supply</b> | AC Input Overcurrent     | Fuse                          | Cartridge 215, 218, 877, PICO® II, TR / TE 392, 382 fuses                  |
|                                 | Input Overvoltage        | Varistor (MOV)                | LA                                                                         |
|                                 | Output Overcurrent       | Fuse                          | 477, 977, 505 HV DC Cartridge, TE 808 HV DC, 485 Nano <sup>2</sup> ® fuses |
|                                 | Output Overvoltage       | TVS Diode                     | 1.5KE / 1.5SMC                                                             |
| <b>Touch Keypad</b>             | ESD Protection           | Varistor (MLV)                | ML                                                                         |
|                                 |                          | TVS Diode Array – SPA® Diodes | SP10xx                                                                     |
| <b>Triac Control</b>            | Overvoltage Protection   | TVS Diode                     | 1.5KE / 1.5SMC                                                             |
|                                 |                          | Varistor (MOV)                | LA                                                                         |
| <b>Wax Motor Latch / Lock</b>   | On / Off                 | Switching Thyristor           | EV Series Triac                                                            |



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