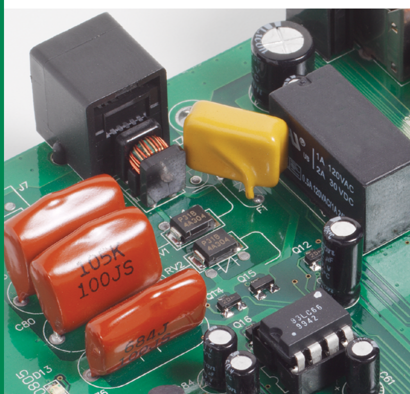
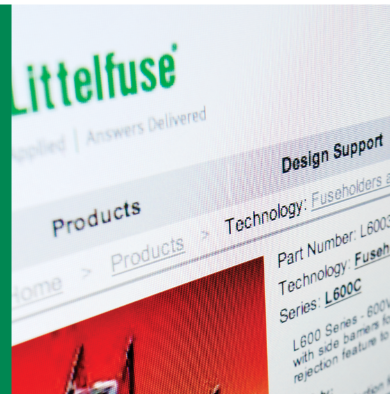
Littelfuse®

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.

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 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).

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

For detailed selection of Littelfuse circuit protection technologies and their common applications, please visit Littelfuse.com/products

For a library of detailed application guides, please visit Littelfuse.com/technical-resources/application-designs

To download the most current edition of this brochure and our product catalogs, please visit 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
Overcurrent Protection Technologies:						
Fuses	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
PTCs	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
Overvoltage Suppression Technologies:						
Multi-Layer Varistors (MLVs)	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
Metal-Oxide Varistor (MOVs)	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
GDTs	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
PulseGuard® ESD Suppressors	Extremely low capacitance; Fast response time; Compact size	ESD suppression; Ultra fast reaction; Low signal distortion	Low	Moderate	Low	Miniature Surface Mount
PLED LED Protectors	Shunt function bypasses open LEDs; ESD and reverse power protection	High brightness outdoor LED lighting applications	Low	Very Fast	Medium	Miniature Surface Mount
TVS Diode Array SPA® Diodes	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
TVS Diodes	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
SIDACtor® Protection Thyristors	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
Switching Technologies:						
Power Thyristors	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 Nano2® style, fast-acting or Slo-Blo® 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® 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® 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® 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).

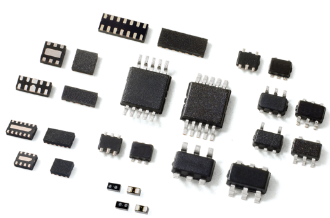
9. SIDACtor® Protection Thyristors — Complete line of protection thyristor products specifically designed to suppress overvoltage transients in a broad range of telecom and datacom applications (Pages 14–15).

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).

1

4

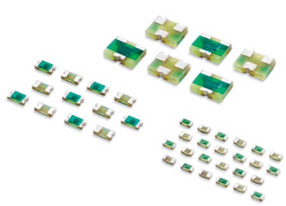
7



9

2

5



8

10

3

6