Littelfuse®

Expertise Applied | Answers Delivered

Circuit Protection Products
Selection Guide

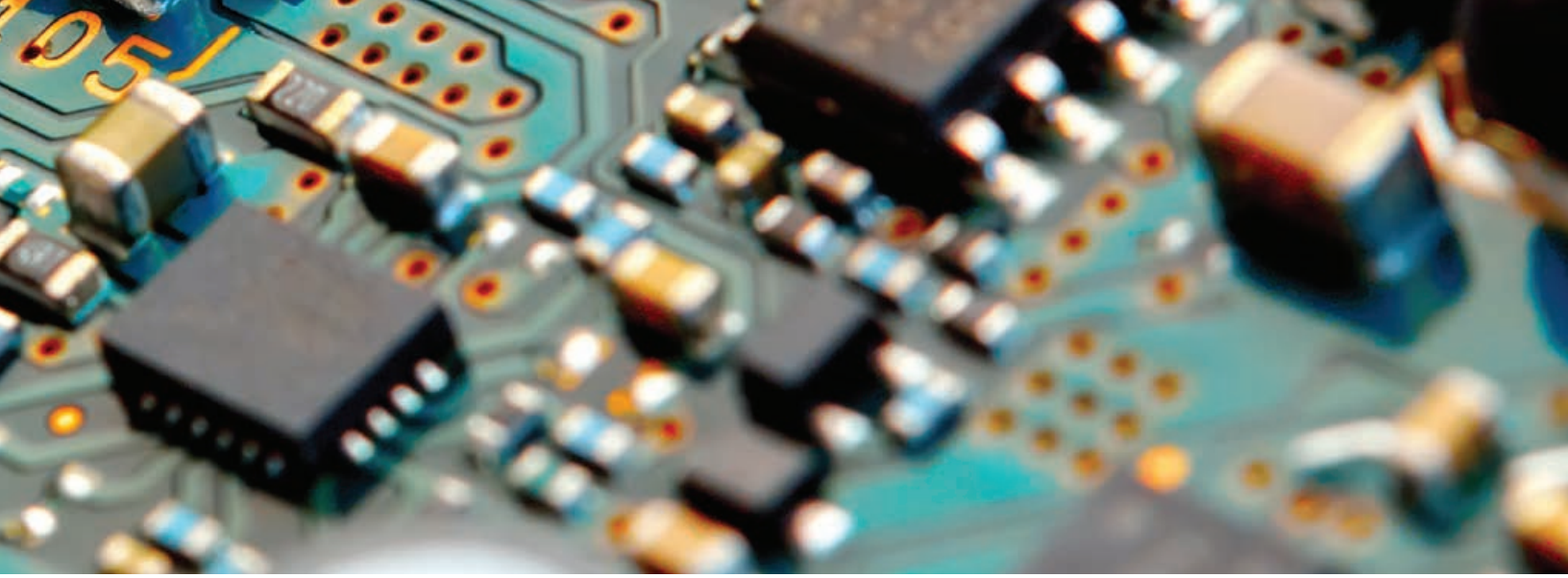
A guide to selecting the right protection components for your applications

Design with Confidence
Supported by our Deep Application Expertise and Extensive Portfolio

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.

Specifications, descriptions, and illustrative material in this literature are as accurate as known at the time of publication, but are subject to changes without notice. Visit **Littelfuse.com** for more information.



Littelfuse: Everywhere, Every Day

Founded in 1927, Littelfuse is a diversified industrial technology manufacturing company empowering a sustainable, connected, and safer world. Across more than 20 countries, and with approximately 18,000 global associates, we partner with customers to design and deliver innovative, reliable solutions.

Littelfuse offers an extensive technology portfolio - fuses, semiconductors, polymers, ceramics, relays, sensors, switches, and more. Serving over 100,000 end customers, our products are found in a variety of industrial, transportation, and electronics end markets—everywhere, every day.

Why Choose Littelfuse

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 compromise.

Testing Support

Littelfuse can help ensure 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. With more than 15 locations worldwide, Littelfuse labs are equipped to provide testing that includes overcurrent, overvoltage, Electrostatic Discharge (ESD), temperature, failure analysis, material analysis, and application performance.

Application Knowledge

For over 95 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 stays close to customers. With manufacturing, lab, and design facilities located around the globe, application knowledge and technical support are locally available. We also offer a network of regional customer support offices and hundreds of independent authorized distributor contacts to assist you. Visit 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 and regulations, such as CCC, CSA, IEC, IEEE, ISO, ITU, METI (Ministry of Economy, Trade and Industry), RoHS (Reduction of Hazardous Substances), Telcordia, TIA, and many more.

Operational Excellence

With our global manufacturing footprint, Littelfuse is firmly committed to manufacturing quality products at a competitive price. We build quality into our products and services, aiming for zero defects in everything we do, thereby reducing cost and increasing your total satisfaction. We strive to exceed your expectations every day.

Quality Assurance

Our global manufacturing facilities abide by strict quality assurance requirements and hold the following quality management system registrations:

- ISO 9001
- ISO 14001
- IATF 16949

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 stops current flow, which helps to identify faults; Wide range of options	Ultimate protection for sensitive/ expensive/critical components	Low through Very High	Not applicable	Series impedance measured in nH	Very extensive range of options
PPTC Devices	Resettable; No device replacement needed after most common overcurrent events	Where overcurrent events may occur often, and continuous uptime desired	Low through High	Not applicable	Series resistance measured in ohms	Surface Mount, Radial Leaded, Axial Strap
Battery Mini-Breakers	Resettable overtemperature and overcurrent protection in high-capacity Lithium-Ion, LiP and prismatic cells	Typically used in overtemperature protection (72°C to 90°C)	Low through High	Not applicable	Not applicable	Axial Strap
Battery Protectors	Non-resettable overcurrent and overcharge protection	Protects the Battery Fuel Gauge IC from overcurrent and overvoltage events	Low through High	Not applicable	Not applicable	Surface Mount
Protection ICs	Significant flexibility by integrating robust circuit protection, sensing, and control in a single chip	Heavy-use consumer electronics, data communications, and industrial applications	Low through Medium	Fast	Series resistance measured in mohms	Surface Mount
Circuit Breakers	Hydraulic-magnetic circuit breakers are considered temperature stable and are not appreciably affected by changes in ambient temperature. Their overcurrent sensing mechanism reacts only to changes of current in the circuit being protected	OE requiring precise overcurrent protection and resettability	Low through High	Not applicable	Series resistance and impedance measured in ohms	Extensive range of options
Overvoltage Suppression Technologies						
Multi-Layer Varistors (MLVs)	Compact and capable of handling significant surges for their size	ESD(1) and EFT(2) suppression in smaller and portable electronics	Low through Medium	Moderate	High	Miniature Surface Mount
Metal-Oxide Varistors (MOVs)	Capable of withstanding very high energy transients; Wide range of options	Appliance, industrial, and very high energy suppression applications	Medium through 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 through 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 Arrays	Low capacitance/ low clamping voltage; Compact size	ESD suppression; Low distortion; Ideal for I/O interfaces and digital and analog signal lines	Low through Medium	Very Fast	Low	Extensive range of surface mount options
TVS Diodes	Fast response to fast transients; Wide range of options: No wear out mechanism	Semiconductor protection; Telecom I/O interfaces, electronics, industrial equipment, and automotive electronics	Medium through High	Fast	Medium	Axial Leaded, Radial Leaded, Surface Mount
SIDACtor® Protection Thyristors	Designed to comply with stringent telecom/datacom networking and industrial AC power surge protection standards; No wear out mechanism, precise trigger voltage, and very low Vt	Telecom/datacom and networking applications, industrial equipment	Medium through High	Very Fast	Medium - Low	Extensive range of surface mount and through-hole options

(1) ESD – Electrostatic Discharge
(2) EFT – Electrical Fast Transient

Fuses and Holders

Fuses – Full range including surface mount, axial, glass or ceramic, thin-film or Nano$^{2®}$ style, fast- acting or Slo-Blo® fuse.

Clips – Used in applications that require a fuse to be easily mounted to a Printed Circuit Board (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.

PolySwitch® PPTC Devices

PolySwitch Polymeric Positive Temperature Coefficient (PPTC) devices help protect against damage caused by harmful overcurrent surges and overtemperature faults. Like traditional fuses, these devices limit the flow of dangerously high current during fault conditions. The PolySwitch PPTC device, however, resets after the fault is cleared and power to the circuit is removed, thereby helping to reduce warranty, service and repair costs. PolySwitch PPTC devices are typically used in consumer electronics, automotive, industrial, home appliance, HVAC, and telecommunications applications.

Circuit Breakers

Hydraulic-magnetic circuit breakers provide highly precise, reliable, and cost-effective solutions to most design challenges. They are considered temperature stable and are not appreciably affected by changes in ambient temperature. Their overcurrent sensing mechanism reacts only to changes in current. Hydraulic-magnetic circuit breakers are available with multiple configuration options, including custom actuator colors and non-standard amperages, and many offer advanced features and cutting-edge designs.

Battery Mini-Breakers

Metal Hybrid PPTC Battery Mini-Breaker with resettable Thermal Cut-Off (TCO). This over-temperature protection device offers a 9VDC rating and a higher current rating than similar products on the market. This device helps circuit designers meet the battery safety requirements of the higher-capacity lithium ion polymer and prismatic battery cells found in the latest portable, battery-powered consumer products. MHP technology connects a bimetal protector in parallel with a Polymeric Positive Temperature Coefficient (PPTC) device, PPTC acts as a heater and helps keep the bimetal latched until the fault is removed.

Battery Protectors (ITV)

Surface mount Li-ion battery protectors designed to guard against overcurrent and overcharging. A fuse element is embedded to cut off the circuit when overcurrent issue happens. A heater is also directly embedded under the fuse element, it will generate heat to blow the fuse once overvoltage detected by IC or FET. Ideal for mobile/portable applications including smart appliances, consumer electronics and power tools.

Protection ICs

The Protection ICs utilize an innovative design that provides a wide range of power input (3.3V to 28V) and integrated protection. In addition to overvoltage protection, these electronic fuses protect against overcurrent, short circuit, inrush current, reverse current, and overtemperature events with real-time diagnostics—all in one chip.

Varistors

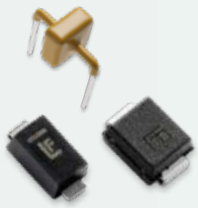
Varistors are available in multiple forms, from Metal Oxide Varistors (MOVs) and Thermally Protected MOV (TMOV® varistors) that suppress lightning transient voltages to Multi-Layer Varistors (MLVs) designed for applications requiring protection from various ESD and EFT transients. They are often used in computers and handheld devices as well as in industrial and automotive applications.

TVS Diodes Arrays

TVS Diode Arrays are designed to protect electronics against transients and overvoltage threats, such as Electrically Fast Transients (EFT) and Electrostatic Discharge (ESD). Because of their lower capacitance and low leakage current, they offer an ideal protection solution for I/O interfaces and digital and analog signal lines, in computer and consumer portable electronics markets.

Gas Discharge Tubes

Gas Discharge Tubes (GDTs) 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. GDT's fast response to transient over-voltage events, and ability to dissipate large amounts of energy, translate into reduced risk of equipment damage. The amount of energy dispersed by GDTs makes them a good choice for lightning surge protection, particularly for telecom equipment located in outdoor structures.



TVS Diodes

The Transient Voltage Suppressor diode (TVS Diode) is a protection diode designed to protect electronic circuits from very fast and often damaging voltage transients, such as lightning and Electrostatic Discharge (ESD). TVS Diodes are silicon avalanche devices typically chosen for their fast response time (low clamping voltage), lower capacitance, and low leakage current. TVS Diodes are ideal for applications in computer, industrial, telecom, and automotive markets.

PulseGuard® ESD Suppressors

PulseGuard suppressors use polymer composite materials to suppress fast-rising ESD transients while adding virtually no capacitance to the circuit. PulseGuard suppressors are best suited for low-voltage, high-speed applications such as protection for high-speed protocols like USB 2.0, IEEE1394, HDMI, and Digital Visual Interface (DVI), where low capacitance is important.

SIDACtor® Protection Thyristors

SIDACtor components use a patented ion implant technology that ensures effective protection within nanoseconds, up to 5000 A surge current ratings. SIDACtors are designed to suppress overvoltage transient surge in the telecom/datacom applications, and they are also used to protect industrial AC/DC powering terminals.

PLED Bypass Protectors

PLED Bypass Protectors are specialty silicon devices that enable LED lighting strings to continue to function if any single LED fails as an open circuit, and they also offer ESD and reverse power protection. PLEDs are often incorporated into the circuit designs of high-power LEDs in applications such as roadway lights and outdoor LED advertising display signs.

Fuses

Fuses have been referred to as “one time” devices, in that the fuse will provide protection from overload by opening only once and then need to be replaced. At the heart of a typical fuse is a length of wire that is heated to its melting point by the excessive current. The circuit current flow decreases to zero as the wire melts open.

Benefits

- It is the most cost-effective form of protection
- Operation of a fuse is simple, and no complexity is involved
- A fuse’s inverse time current characteristic allows it to be used for overload protection

Applications

- Fuses completely stop current in fault condition; this may be more desired if safety or avoidance of downstream circuit equipment is a premium concern
- Fuses are also helpful for diagnostic purposes, aiding equipment designers and users in tracing the origin of the overcurrent faults

Battery Protectors (ITV)

ITV series is a three-terminal surface mountable Li-ion battery protector designed to guard against the damage caused by both overcurrent and overcharging. A fuse element is embedded to cut off the circuit when overcurrent issues happen. A heater is also directly embedded under the fuse element, it will generate heat to blow the fuse once overvoltage is detected by IC or FET.

Benefits

- Protection from both overcurrent and overvoltage
- Low internal resistance
- UL and TUV certification
- Surface mount footprint
- RoHS compliant and halogen free

Applications

Used as a protector in Li-ion battery packs

- Two-way radios
- Vacuum cleaners
- Power tools
- eCall

PolySwitch® PPTC Devices

PolySwitch Polymer Positive Temperature Coefficient (PPTC) devices offer a resettable overcurrent protection alternative, thereby reducing warranty, service, and repair costs. PPTCs increase resistance as temperature increases due to increased flow. The components are designed to limit unsafe currents while allowing constant safe current levels. Resistance will "reset" automatically when the fault is removed and temperature returns to safe levels. The ability of the PPTCs to reset themselves after exposure to a fault current makes them ideal within circuits that are not easily accessible. PPTCs are typically used as circuit protection in applications where sensitive components are at constant risk of damage from overcurrent conditions. The components are also ideal for situations where frequent overcurrent conditions occur or constant uptime is required.

Benefits

- Improved system reliability
- Lower warranty cost and service
- Reduced system downtime
- Lower voltage drop
- Ruggedness prevents breakage during manufacturing and shipment
- Shock & vibration resistance eliminates need for calibration

Applications

- Port protection on personal computers (USB, firewire, keyboard/mouse, and serial ports)
- Peripherals (hard drives, video cards, and hubs)
- Cell phones
- Battery packs
- Industrial controls
- Lighting ballast
- Motor controls

Battery Mini-Breakers

Metal Hybrid PPTC Battery Mini-Breaker with resettable Thermal Cut-Off (TCO). This overtemperature protection device offers a 9VDC rating and a higher current rating than similar products on the market. This device helps circuit designers meet the battery safety requirements of the higher-capacity lithium-ion polymer and prismatic battery cells found in the latest portable, battery-powered consumer products.

Benefits

- Capable of handling the higher voltages and battery discharge rates found in high-capacity lithium polymer and prismatic cell applications
- Helps provide resettable overtemperature protection in high-capacity LiP and prismatic cell applications

Applications

Battery cell protection for high-capacity lithium-ion polymer and Li-ion prismatic cells used in:

- Gaming PCs
- Notebook PCs
- Ultrabooks
- Tablets
- Other battery-powered portable devices

Circuit Breakers

Hydraulic-magnetic circuit breakers provide highly precise, reliable and cost-effective solutions to most design challenges. They are considered temperature stable and are not appreciably affected by changes in ambient temperature. Their overcurrent sensing mechanism reacts only to changes in current.

Benefits

- Available with multiple configuration options
- Many offer advanced features and cutting-edge designs to meet application requirements.
- Custom actuator colors and non-standard amp offerings

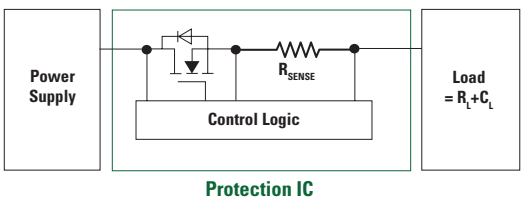
Applications

- Telecom Datacom
- Marine
- Military
- Renewable Energy
- Industrial
- Railway
- Generators
- On/Off Highway
- Medical

Protection ICs

The semiconductor-based Protection IC provides highly integrated functionality in compact-size packages in addition to existing passive overcurrent protection such as fuses and PTCs etc. They offer protection against overcurrent, overvoltage, undervoltage, overtemperature, reverse current as well as inrush protection in Hot-swap and Hot-plug events.

Function Block Diagram



Benefits

Accuracy and Integration
Provides highly accurate current limiting, faster response time, and more integrated protection, sensing and control features than traditional fuses and PTCs

Programmable and Customized Designed to Your Request
Incorporates more flexibility such as adjustable overvoltage threshold, current limiting, and inrush current, along with true reverse current blocking compared to conventional power switches

Speed Up Time to Market
Reduces the design-in phase, PC board space requirements, BOM cost, and time-to-market when versus typical discrete solutions (e.g., hot-swap controller + MOSFET)

Maximize Equipment Uptime
Improved product reliability, increased battery life, lower repair costs, and lengthened overall product lifetime.

Applications

The Protection IC are ideal for Power Line Protection, Hot-swap, and hot-plug protection as well as protecting current limiter and circuit breaker.

Below is a list of the end equipment's examples.

- Type-C Adapter
- Networking/Datacom
- Notebook/PC Desktop
- TV/Monitor
- Set Top Box
- Smart Phone
- Industry
- SSD/HDD
- Enterprise Server
- Programmable Logic Control (PLC)
- Battery System
- Telecom
- Appliance
- Tablets

Features

Overcurrent Protection
Once the load current reaches the current limit ILIMT programmed by ILIMT pin, input current will be automatically reduced to the programmed level to satisfy the limited input power.

Overvoltage Protection
Protects the system from being stressed by excessive high voltage. Once it detects input voltage is higher than the built-in over-voltage threshold, it will immediately turn off and clamp the voltage.

Under Voltage Lockout (UVLO)
UVLO feature disconnects the load from the supply if the input voltage is lower than the threshold to avoid issues caused by an insufficient supply voltage.

Overtemperature Protection
When the device temperature (TJ) exceeds TSHDN, the thermal shutdown circuitry shuts down the internal MOSFET, thereby disconnecting the load from the supply. The Protection IC will remain off during a cooling period until the device temperature falls below TSHDN, after which it will attempt to restart.

Soft Start
Provides the output voltage slew rate control that can limit the inrush current, and an external capacitor can configure the soft start duration.

Reverse Current Blocking
Detects when there is a higher system output voltage than the system input voltage, blocking backward current flow through the system.

SIDACtor® Protection Thyristors

A SIDACtor device is a PNPN device that can be thought of as a thyristor device without a gate. Upon exceeding its peak off-state voltage (VDRM), a SIDACtor device will clamp a transient voltage to within the device's switching voltage (VS) rating. Then, once the current flowing through the SIDACtor device exceeds its switching current, the device will crowbar and simulate a short-circuit condition. When the current flowing through the SIDACtor device is less than the device's holding current (IH), the SIDACtor device will reset and return to its high off-state impedance.

Benefits

Advantages of the SIDACtor device include its fast response time, stable electrical characteristics, long term reliability, and low capacitance. Also, because the SIDACtor device is a crowbar device, it cannot be damaged by voltage.

Restrictions

Because the SIDACtor device is a crowbar device, it cannot be used directly across the AC line; it must be placed behind a load. Failing to do so will result in exceeding the SIDACtor device's maximum on-state current rating, which may cause the device to enter a permanent short-circuit condition.

Applications

Although found in other applications, SIDACtor devices are primarily used as the principle overvoltage protector in telecommunications and data communications circuits.

Gas Discharge Tubes

Gas Discharge Tubes (GDTs) are either glass or ceramic packages filled with an inert gas and capped on each end with an electrode. When a transient voltage exceeds the DC breakdown rating of the device, the voltage differential causes the electrodes of the gas tube to fire, resulting in an arc, which in turn ionizes the gas within the tube and provides a low impedance path for the transient to follow. Once the transient drops below the DC holdover voltage and current, the gas tube returns to its off state.

Benefits

Gas Discharge Tubes have high surge current and low capacitance ratings. Current ratings can be as high as 20 kA, and capacitance ratings can be as low as 1 pF with a zero-volt bias.

Applications

Gas Discharge Tubes are typically used for primary protection due to their high surge rating. However, their low interference for high- frequency components make them a candidate for high-speed data links.

Metal Oxide Varistors

Metal Oxide Varistors (MOVs) are two-leaded, through-hole components typically shaped in the form of discs. Manufactured from sintered oxides and schematically equivalent to two back-to-back PN junctions, MOVs shunt transients by decreasing their resistance as voltage is applied.

Benefits

Since MOVs' surge capabilities are determined by their physical dimensions, high surge current ratings are available. Also, because MOVs are clamping devices, they can be used as transient protectors in secondary AC power line applications.

Applications

Although MOVs' are restricted from use in many telecom applications (other than disposable equipment), they are useful in AC applications where a clamping device is required and tight voltage tolerances are not.

TVS Diodes

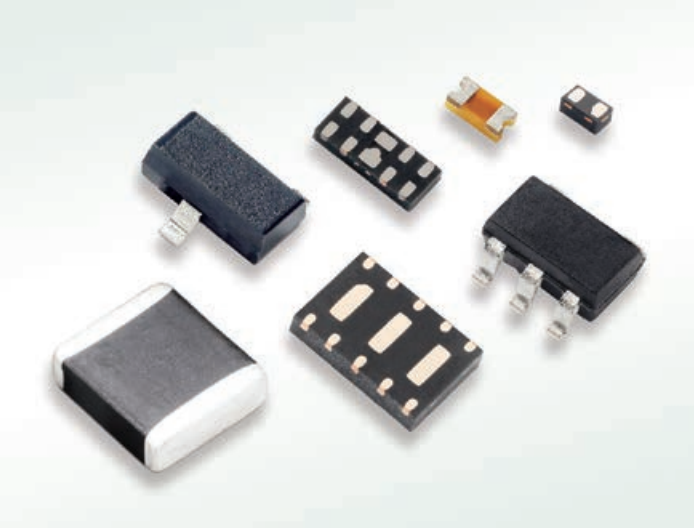
Transient Voltage Suppressor (TVS) diodes are clamping voltage suppressors that are constructed with back-to-back PN junctions. During conduction, TVS diodes create a low impedance path by varying their resistance as voltage is applied across their terminals. Once the voltage is removed, the diode will turn off and return to its high off-state impedance.

Benefits

Because TVS diodes are solid-state devices, they do not fatigue nor do their electrical parameters change as long as they are operated within their specified limits. TVS diodes effectively clamp fast-rising transients and are well suited for low-voltage applications that do not require large amounts of energy to be shunted.

Applications

Due to their low power ratings, TVS diodes are not used as primary interface protectors, but they can be used as secondary protectors that are embedded within a circuit.



TVS Diode Arrays

TVS Diode Arrays are designed to protect electronics from very fast and often damaging voltage transients, such as lightning and electrostatic discharge (ESD). They offer a high level of protection (up to 30kV per IEC 61000-4-2) with very low capacitance, leakage current, and clamp voltage for more robust applications.
Designers choose TVS Diode Arrays when:

- The device being protected requires the lowest possible clamp voltage, low capacitance (0.1pF – 400pF), and low leakage (0.01µA – 10µA)
- Board space is at a premium and space-savings multi-line protection is needed
- Transients other than ESD, such as EFT or lightning, must also be considered

Benefits

- Low capacitance
- Low clamping voltage and leakage current
- Small package size offers space savings and also enables mounting close to input ports for optimal protection

Applications

TVS diode arrays offer an ideal protection solution for I/O interfaces and digital and analog signal lines, such as USB and HDMI, in computer and consumer portable electronics markets. Typical applications include:

- Parallel port (LPT) printer scanners
- Computer inputs and peripheral devices, such as PDA, PMP, cell phone, digital camera, and game controller ports
- Digital video recorders, hard disk drives, video editing systems, scanners, desktops, and laptops

MLV

A Multi-Layer Varistor (MLV) is a voltage suppression device that filters and clamps transients in an electrical circuit. It is a compact, surface-mountable chip that is voltage dependent, nonlinear, and bidirectional. MLVs are chosen when:

- Surge currents or energy beyond Electrostatic Discharge (ESD) is expected in the application—Electrical Fast Transient (EFT), lightning
- Added capacitance is desirable for Electromagnetic Interference (EMI) filtering (3pF – 6000pF)
- Power supply line or low-to-medium speed data and signal lines are to be protected
- The operating voltage is above silicon or PulseGuard® ESD suppressor ratings

Benefits

- Leadless chip makes it compact in size
- Robust construction makes it ideally suitable to endure the thermal stresses encountered during soldering, assembling, and manufacturing
- Low cost

Applications

MLVs are connected near the I/O port to clamp the ESD or surge event with a Surface Mount Device (SMD) package and wide capacitance range to as low as 3pF. MLVs are widely used in audio, control, and dataline communication such as USB2.0.

PulseGuard® ESD Suppressors

PulseGuard® ESD Suppressors offer extremely low capacitance, which makes them ideal for use in high-speed data circuits (IEEE 1394, USB 2.0, HDMI, DVI, etc.). Available in single-line and multi-line packages, they provide ESD protection while ensuring that signal integrity is maintained. Designers choose Pulse-Guard over other ESD solutions when:

- The application tolerates very little added capacitance, (high-speed data lines or RF circuits)
- ESD is the only transient threat
- Protection is required on data, signal, and control lines (not power supply lines)

Benefits

- Ultra-low capacitance
- Low leakage current
- Fast response time
- Withstands multiple ESD strikes

Applications

- HDTV hardware
- Laptop/desktop computers
- Network hardware
- Computer peripherals
- Digital cameras
- External storage
- Set-top boxes
- Antennas

Applications

For more than 95 years, Littelfuse has been the leader in circuit protection, and we continue to develop new solutions as customer applications evolve. We offer a broad portfolio of protection technologies for a wide range of applications.

We offer a broad portfolio of ***protection technologies.***

Overcurrent Protection

Application Matrix

Overcurrent Protection																	
Vertical Markets	**Applications**	**Cartridge Fuses**	**Pico Fuses**	**TR/TE/Micro Fuses**	**Nano Fuses**	**Thin Film Chip Fuses**	**Industrial Fuses**	**Automotive Fuses**	**Radial Leaded Resettable PPTCs**	**Battery Strap Resettable PPTCs**	**Surface Mount Resettable PPTCs**	**Telecom Fuses**	**Battery Mini-Breakers**	**Battery Protectors**	**Protection ICs**	**Circuit Breakers**
Datacenter and Cloud	Servers: Computing	•	-	•	•	•	-	-	•	-	•	•	-	-	•	•
	Switches	-	•	•	•	•	-	-	•	-	•	•	-	-	•	-
	Routers	-	•	•	•	•	-	-	•	-	•	•	-	-	•	•
	Mobile Network: 4G/5G Indoor	-	-	-	-	-	-	-	-	-	-	-	-	-	•	•
	Mobile Network: 4G/5G Outdoor	•	•	•	•	•	-	-	•	-	•	•	-	-	•	•
Consumer Electronics	TVs and Displays	•	•	•	•	•	-	-	•	•	•	-	-	-	•	-
	Speakers & A/V Equipment	•	•	•	•	•	-	-	•	-	•	-	-	-	•	-
	Printers & Scanners	•	•	•	•	•	-	-	•	-	•	-	-	-	•	-
	Desktop Computers	-	•	•	•	•	-	-	•	-	•	-	-	-	•	-
	Power Supplies	•	•	•	•	•	-	-	•	-	•	-	-	-	•	-
Appliances	Major Appliances	•	-	•	•	•	-	-	•	-	•	-	-	-	•	-
	Small Appliances	•	•	•	•	•	-	-	•	-	•	-	-	-	•	-
	Battery Powered	•	-	•	•	•	-	-	•	•	•	-	-	•	•	-
	Robotic Appliances	•	-	•	•	•	-	-	•	•	•	-	•	•	•	-
	Power Tools	•	-	•	•	•	-	•	-	-	•	-	•	•	•	-
Building Technologies	GFCI/AFCI & USB Receptacles	•	•	•	•	•	-	-	•	•	•	-	-	-	•	-
	Environmental & Building Control	-	-	•	•	•	-	-	-		•	-	-	-	•	•
	Security & Access Control	•	•	•	•	•	-	-	•	•	•	-	-	-	•	-
	HVAC & Elevator Drives	•	-	-	•	-	-	-	•	-	-	-	-	-	•	•
	Heat Pumps	•	-	-	-	-	-	•	-	-	-	-	-	-	•	-
	Smart Meters	•	-	•	-	•	-	-	•	•	•	-	-	-	•	-
Industrial	UPS	•	•	•	•	•	•	-	•	-	•	-	-	-	-	•
	Industrial Control	•	•	•	•	•	-	-	•	•	•	-	-	-	•	•
	Robotics	•	•	•	•	•	•	-	•	-	•	-	-	-	•	•
	Motor Control	•	•	•	•	•	•	•	•	•	•	-	-	-	•	-
Renewable Energy	Solar PV	•	-	•	•	•	•	-	•	-	•	-	-	-	•	•
	Central Inverters	•	-	•	•	•	•	-	•	-	•	-	-	-	-	•
	Micro Inverters	•	-	•	•	•	-	-	•	-	•	-	-	-	•	•
	Energy Storage Systems	•	-	•	•	•	•	-	•	-	•	-	-	-	-	•
Transportation/ Automotive	E-Mobility (Onboard Charger, BMS)	•	-	•	•	•	•	•	•	-	•	-	-	-	-	-
	Connectivity & Autonomous Driving	•	-	•	•	•	•	•	•	-	•	-	-	-	-	-
	Engine and Ignition Systems	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	E-Motorcycle (EV 2-3 Wheelers)	•	-	•	•	•	-	-	•	-	•	-	-	-	-	-
Mobile and Wearables	Gaming Controllers	-	-	-	•	•	-	-	-	-	•	-	•	-	•	-
	Smart Watches	-	-	-	•	•	-	-	-	-	•	-	•	•	•	-
	Smartphones	-	-	-	•	•	-	-	-	-	•	-	•	•	•	-
	Chargers	•	•	•	•	•	-	-	•	-	•	-	-	-	•	-
	Notebooks		•	•	•	•	-	-	•	•	•	-	•	•	•	-
EV-Infrastructure	AC Charging	•	-	-	-	-	•	-	-	-	•	-	-	-	-	•
	DC Charging	•	-	-	-	-	•	-	•	-	•	-	-	-	•	•
	Wireless Charging	•	-	-	-	-	•	-	•	-	•	-	-	-	-	-

Overvoltage Protection
Application Matrix

Overvoltage Protection									
Vertical Markets	**Applications**	**MLVs**	**MOVs and TMOVs**	**GDTs**	**ESD Suppressors**	**PLED LED Protectors**	**TVS Diode Arrays**	**TVS Diodes**	**SIDACtors®**
Datacenter & Cloud	Servers -Computing	•	•	•	•	-	•	•	•
	Switches	•	•	•	•	-	•	•	•
	Routers	•	•	•	•	-	•	•	•
	Mobile Network: 4G/5G Indoor	-	-	-	-	-	•	•	•
	Mobile Network: 4G/5G Outdoor	•	•	•	•	-	•	•	•
Consumer Electronics	TVs and Displays	•	•	-	•	-	•	•	•
	Speakers & A/V Equipment	•	•	-	•	-	•	•	-
	Printers & Scanners	•	•	-	•	-	•	•	•
	Desktop Computers	•	•	-	•	-	•	•	•
	Power Supplies	•	•	-	•	-	•	•	•
Appliances	Major Appliances	•	•	-	•	-	•	•	•
	Small Appliances	•	•	-	•	-	•	•	•
	Battery Powered	•	-	-	•	-	•	•	-
	Robotic Appliances	•	•	-	•	-	•	•	•
	Power Tools	-	•	-	•	-	•	•	•
Building Technologies	GFCI/AFCI & USB Receptacles	•	•	•	•	-	•	•	•
	Environmental & Building Control	•	•	-	•	-	•	•	•
	Security & Access Control	•	•	•	•	-	•	•	•
	HVAC & Elevator Drives	-	•	-	-	-	-	•	•
	Heat Pumps	-	•	-	•	-	•	•	-
	Smart Meters	•	•	-	•	-	•	•	•
Industrial	UPS	•	•	•	•	•	-	•	-
	Industrial Control	•	•	•	•	-	•	•	•
	Robotics	•	•	•	•	-	•	•	•
	Motor Control	•	•	•	•	-	•	•	•
Renewable Energy	Solar PV	•	•	•	•	-	•	•	•
	Central Inverters	•	•	•	•	-	•	•	•
	Micro Inverters	•	•	•	•	-	•	•	•
	Energy Storage System	•	•	•	•	-	•	•	
Transportation/ Automotive	E-Mobility (Onboard Charger, BMS)	•	•	•	•	•	•	•	•
	Connectivity & Autonomous Driving	•	•	•	•	•	•	•	•
	Engine and Ignition Systems	-	-	-	-	-	-	•	-
	E-Motorcycle (EV 2-3 Wheelers)	•	•	-	•	•	•	•	-
Mobile and Wearables	Gaming Controllers	•	•	-	-	-	•	•	-
	Smart Watches	•	•	-	-	-	•	•	-
	Smartphones	•	•	-	-	-	•	•	-
	Chargers	•	•	-	-	-	•	•	-
	Notebooks	•	•	-	-	-	•	•	-
EV- Infrastructure	AC Charging	-	•	•	•	-	•	•	-
	DC Charging	-	•	•	•	-	•	•	-
	Wireless Charging	-	•	•	•	-	•	•	-

Design smarter by identifying key ***threats*** *and* ***solutions*** *at the onset of new development.*

Common **Circuit Threats** and Protection Solutions

Type of Electrical Fault or Transient What is the threat or circuit action that may damage sensitive electronics?	**Systems or Modules Affected** What are the typical end products that require protection from this damage?	**Principal Protection Criteria** What are the characteristics required of the circuit protection technology?	**Littelfuse Protection Technologies** 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, PPTCs, Protection ICs
Lightning	Any electronic or electrical equipment with connections to the outside environment	Fast response, proper switching threshold, and surge current rating	SIDACtor® Protection Thyristors, Varistors (MOVs), TVS Diodes, TVS Diode Arrays, Gas Discharge Tubes (GDTs)
Electrostatic Discharge (ESD)	Any electronic equipment with a human interface	Fast response, and high peak voltage rating	PulseGuard® ESD Suppressors, TVS Diode Arrays, 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 Arrays
Inductive Load Switching and Commutative Spikes	Large motors, pumps, compressors, relays, and AC distribution	High energy rating	Varistors (MOVs and MLVs), GDTs, TVS Diodes, TVS Diode Arrays
Data and Communication Line Voltage Transients	Ethernet, xDSL, data bus, telecom, etc.	Fast response and low load capacitance	TVS Diodes, TVS Diode Arrays, 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 possibly fire, electrocution, or explosion. Causes 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 polymeric positive temperature coefficient (PPTC) 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.

PPTCs offer the ability to reset for withstanding most minor, common, and recurring overcurrent events. They will allow safe levels of current to pass continuously, and during major overcurrent events, they 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.

Protection ICs are semiconductor-based devices provide highly integrated functionality in compact-size packages and offer protection against overcurrent, overvoltage, undervoltage, overtemperature, reverse current, as well as inrush protection in hot-swap and hot-plug events.

Voltage Transient Events

Voltage transients are short-duration surges or spikes. Unsuppressed, they may damage circuits and components and result in complete system failure. Below are descriptions of common types of voltage transients, and technologies to reduce their effects:

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 Arrays 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 be able to dissipate a large amount of energy. Metal Oxide Varistors (MOV), TVS Diodes, and GDTs are typically used to protect against these events. Look to Littelfuse SIDACtor® Protection Thyristors and TVS Diode Arrays for telecom/datacom requirements.

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 120 V 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.

Surface Mount Fuses


440


468


458


461


154


304

Surface Mount Type	Series Name[1]	Size[2]	Time Lag	Fast Acting	Very Fast Acting	Device Range[3] (Operating Current Options in Amps)	Max. Voltage Rating[3] (Volts)	Interrupting Rating at Max. Voltage Rating[3] (Amps)	Operating Temperature Range	Agency Approvals[3]					Halogen Free	RoHS Compliant	Lead Free	TUV	VDE	CQC	AECQ
										UL	UR	CSA	PSE	UMF							
Ceramic Chip	407	1206	•	-	-	1 - 8	63/32/24	50/60	-55°C to +150°C	-	•	-	-	-	•	•	•	-	-	-	-
	407A	1206	•	-	-	1 - 8	63/32/24	50/60	-55°C to +150°C	-	•	-	-	-	•	•	•	-	-	-	•
	437	1206	-	•	-	0.25 - 8	125/63/35	50	-55°C to +150°C	-	•	•	-	-	•	•	•	•	-	-	-
	437A	1206	-	•	-	0.250 - 8	125/63/45/32	50/100	-55°C to +150°C	-	•	•	-	-	•	•	•	-	-	-	•
	438	0603	-	•	-	0.25 - 6	32/24/63	50	-55°C to +150°C	-	•	•	-	-	•	•	•	•	-	-	-
	438A	0603	-	•	-	0.250 -6	32/24/63	50	-55°C to +150°C	-	•	•	-	-	•	•	•	•	-	-	•
	440	1206	-	•	-	0.25 - 8	32/125/63/50	50	-55°C to +150°C	-	•	•	-	-	•	•	•	-	-	-	-
	440A	1206	-	•	-	0.5 - 8	63	50	-55°C to +150°C	-	•	•	-	-	•	•	•	-	-	-	•
	441	0603	-	•	-	2 - 6	32	50	-55°C to +150°C	-	•	•	-	-	•	•	•	-	-	-	-
	441A	0603	-	•	-	2 - 6	32	50	-55°C to +150°C	-	•	•	-	-	•	•	•	-	-	-	•
	501	1206	-	•	-	10, 12, 15, 20	32	150	-55°C to +150°C	-	•	•	-	-	•	•	•	-	-	-	-
	501A	1206	-	•	-	10, 12, 15, 20	32	150	-55°C to +150°C	-	•	•	-	-	•	•	•	-	-	-	•
	806	1206	•	-	-	20, 25, 30	24/36	250/200/300	-55°C to +150°C	-	•	-	-	-	•	•	•	-	-	-	-
Thin Film	422	2410	-	•	-	0.750 - 5	32/125/250/86	300/100/50/10,000	-55°C to +125°C	-	•	-	•	-	•	•	•	•	-	-	-
	422A	2410	-	•	-	0.750 - 5	32/125/250/86	300/100/50/10,000	-55°C to +125°C	-	•	-	•	-	•	•	•	•	-	-	•
	435	0402	-	-	•	0.25 - 5	32	50	-55°C to +90°C	-	•	•	-	-	•	•	•	•	-	-	-
	466	1206	-	-	•	0.125 - 5	125/63/32	50	-55°C to +90°C	-	•	•	-	-	•	•	•	•	-	-	-
	467	0603	-	-	•	0.25 - 5	32	35 - 50	-55°C to +90°C	-	•	•	-	-	•	•	•	•	-	-	-
	468	1206	•	-	-	0.5 - 3	63/32	35 - 50	-55°C to +90°C	-	•	•	-	-	•	•	•	•	-	-	-
	470	1206	-	•	-	0.5 -2	125/32	50/300	-55°C to +125°C	•	-	-	-	-	•	•	•	-	-	-	-
	483	1206	-	•	-	0.375 - 15	75/65/32	50	-55°C to +125°C	-	•	-	-	-	•	•	•	-	-	-	-
	483A	1206	-	•	-	0.750 - 2	75	50	-55°C to +125°C	-	•	-	-	-	•	•	•	-	-	-	•
	494	0603	-	•	-	0.25 - 5	32	35 - 50	-55°C to +90°C	-	•	•	-	-	•	•	•	-	-	-	-
Nano[2®] Fuse	443	4012	•	-	-	0.5 - 5	250	50	-55°C to +125°C	-	•	-	•		•	•	-	•	-	-	-
	448	2410	-	-	•	0.062 - 15	125/85	35 - 50	-55°C to +125°C	-	•	•	•	-	•	•	•	-	-	-	-
	449	2410	•	-	-	0.375 - 5	125	50	-55°C to +125°C	-	•	•	•	-	•	•	•	-	-	-	-
	451 / 453	2410	-	-	•	0.062 - 20	125/65	35 - 50	-55°C to +125°C	•	•	•	•	-	•	•	-	•	-	-	-
	452 / 454	2410	•	-	-	0.375 - 12	125/75	50	-55°C to +125°C	-	•	•	•	-	•	•	-	•	-	-	-
	456	4012	-	-	•	20, 25, 30, 40	125/72	100 - 180	-55°C to +125°C	-	•	•	•	-	•	•	-	•	-	-	-
	456SD/E	4818	-	•	-	40, 50, 60	250/80	150A @ 250VAC 600A @ 80VDC	-55°C to +125°C	-	•	•	-	-	•	•	-	-	-	-	-
	458	1206	-	•	-	1.0 - 10	75/63	50	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-
	462	4118	•	-	-	0.500 - 5	250	100 - 150	-40°C to +85°C	•	•	-	•	•	•	•	-	-	•	•	-
	464	4818	-	•	-	0.5 - 6.3	250	100	-55°C to +125°C	-	-	-	•	•	•	•	-	-	-	-	-
	465	4818	•	-	-	1 - 6.3	250	100	-55°C to +125°C	-	-	-	•	•	•	•	-	-	-	-	-
	476	2410	-	•	-	1 - 15	250 VAC up to 5 A 125 VAC for 6.3-15 A	100 @ 250 VAC 100 @ 125 VAC	-55°C to +125°C	-	•	•	•	-	•	•	-	-	-	-	-
	485	4818	-	•	-	1 - 3.15	600	100	-55°C to +125°C	-	•	•	-	-	•	•	-	-	-	-	-
	881	12.5 x 10 mm	-	•	-	60 - 125	75/100	1500 @ 75VDC 1000 @ 100VDC	-55°C to +100°C	-	•	•	-	-	•	•	•	-	-	-	-
	885	10.86 x 4.78 mm	•	-	-	1 - 5	500	100 @ 500 VDC 1500 @ 350 VDC	-40°C to +105°C	-	•	•	-	-	•	•	•	•	-	-	-

(1) Detailed information about product series listed here can be found on our website.
(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 Littelfuse.com and in our data sheets for detailed information by part number.

Surface Mount Fuses (continued)


202


203


446


459

Surface Mount Type	Series Name[1]	Size[2]	Time Lag	Fast Acting	Very Fast Acting	Device Range[3] (Operating Current Options in Amps)	Max. Voltage Rating[3] (Volts)	Interrupting Rating at Max. Voltage Rating[3] (Amps)	Operating Temperature Range	Agency Approvals[3]					Halogen Free	RoHS Compliant	Lead Free	TUV	VDE	CQC	CQC	Ex / IEC / IECEx
										UL	UR	CSA	PSE	UMF								
Telelink® Fuse	461	4012	-	-	-	0.5 - 2.0	600	60	-55°C to +125°C	-	•	•	-	-	•	•	-	•	-	-	-	-
	461E	4012	-	-	-	1.25	600	60	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-	-
OMNI-BLOK® Fuseholder	154	3820	-	-	•	0.062 - 10.0	125	35 - 50	-55°C to +125°C	-	•	-	•	-	•	•	-	-	-	-	-	-
	154T	3820	•	-	-	0.375 - 7	125	50	-55°C to +125°C	-	•	-	•	-	•	•	-	-	-	-	-	-
Fuse and Clip Assemblies	157	2615	-	-	•	0.062 - 10	125	35 - 50	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-	-
	157T	2615	•	-	-	0.375 - 5	125	50	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-	-
	159	4319	-	-	-	0.5 - 2	600	60	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-	-
	160	4319	•	-	-	0.5 - 5	250	50	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-	-
PICO® SMF Fuse	304	13.71 x 6.03 mm	-	-	•	0.05 - 0.75	277	277V / 1500A	*see datsheet	-	•	-	-	-	-	•	-	-	-	-	-	-
	308	5.4 x 3.8 mm	-	•	-	0.25 - 1.5	24VAC / 30VDC	30VDC / 50A	-40°C to +70°C	-	•	-	-	-	-	•	•	-	-	-	-	•
	459	7.24 x 4.32 mm	-	-	•	0.062 - 5	125	50 - 300	-55°C to +125°C	-	•	•	•	-	-	•	-	-	-	-	-	-
	460	7.24 x 4.32 mm	•	-	-	0.375 - 5	125	50	-55°C to +125°C	-	•	•	•	-	•	•	-	-	-	-	-	-
Flat Pak	202	13.00 x 6.35 x 7.62 mm	-	•	-	0.062 - 5	250	50	-55°C to +125°C	-	•	•	-	-	-	-	-	-	-	-	-	-
	203	13.00 x 6.35 x 7.62 mm	•	-	-	0.25 - 5	250	50		-	•	•	-	-	-	-	-	-	-	-	-	-
EBF	446	10.92 x 4.06 x 14.35 mm	-	•	-	2.0 - 10.0	350	100	-40°C to +125°C	-	•	•	-	-	-	-	-	-	-	-	-	-
	447	10.92 x 4.06 x 14.35 mm	-	•	-	2.0 - 10.0	350	100		-	•	•	-	-	-	-	-	-	-	-	-	-

(1) Detailed information about product series listed here can be found on our website.
(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 Littelfuse.com and in our data sheets for detailed information by part number.

How is the Surface Mount Fuse Used Here?

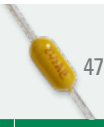
881 Series High-Current SMD Fuse

The 881 provides a single-fuse solution for applications up to 75 Vdc. Current ratings from 60 A to 100 A eliminate the need to parallel multiple lower-rated or over-spec industrial-type fuses. Applications included blade servers, server chassis, backplane boards, and line cards.

The compact 881 Series fuses provide a single fuse solution for this compact application. It protects Cells / Battery Management System (BMS) components from high fault currents due to external shorts and internal short circuits between two battery packs.

Axial Leaded/Cartridge Fuses


251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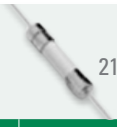
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325

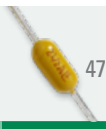

606

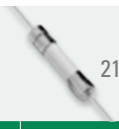
Surface Mount Type	Series Name[1]	Time Lag	Medium Acting	Fast Acting	Very Fast Acting	Device Range[2] (Operating Current Options in Amps)	Max. Voltage Rating[2] (Volts)	Interrupting Rating at Max Voltage Rating[2] (Amps)	Operating Temperature Range	Agency Approvals[2]															RoHS Compliant	Lead Free	Halogen Free	Ex./ IEC / IECEx
										Americas					Europe						Asia							
										UL	UR	CSA	QPL	UMF	CE	VDE	TUV	BSI	Semko	PSE	K	CCC	CQC				
PICO® Fuse / PICO® II Fuse Axial	251	-	-	-	•	0.062 - 15	125	125VDC / 300A 125VAC / 50A	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	•	-	-	-	•	-	•	-
	253	-	-	-	•	0.062 - 15	125	125VDC / 300A 125VAC / 50A	-55°C to +125°C	-	-	-	•	-	•	-	•	-	-	•	-	-	-	•	-	-	-
	259/259UL913	-	-	•	-	0.062 - 5	125	125VAC @ 50A 125VDC @ 300A	-55°C to +125°C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	•	-	-	•
	263	-	-	-	•	0.062 - 5	250	50	-55°C to +125°C	-	•	-	-	-	•	-	-	-	-	•	-	-	-	•	-	•	-
	265/266/267	-	-	-	•	0.062 - 15	125	300DC / 50AC	-55°C to +125°C	-	•	•	•	-	•	-	-	-	-	-	-	-	-	•	-	-	-
	275	-	-	-	•	20 - 30	32	32VDC / 300A 32VAC / 100A	-55°C to +125°C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	•	-	-	-
	305	-	-	•	-	0.05 - 0.75	277	2777V @ 1500A	*see datasheet	-	•	-	-	-	-	-	-	-	-	-	-	-	-	•	-	-	•
	471	•	-	-	-	0.5 - 5	125	50	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	•	-	-	-	•	-	•	-
	472	•	-	-	-	0.5 - 5	125	50	-55°C to +125°C	-	•	-	-	-	•	-	-	-	-	-	-	-	-	•	-	•	-
	473	•	-	-	-	0.375 - 7	125	50	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	•	-	-	-	•	-	•	-
	521	-	-	-	•	2 - 7	75	75VDC / 300A	-55°C to +125°C		•	-	-	-	-	-	-	-	-	-	-	-	-	•	•	•	-
3.6 x 10mm	874	-	-	-	•	0.1 - 10	250	50	-55°C to +125°C	•	-	-	-	-	•	-	-	-	-	-	-	-	-	•	•	-	-
	875	•	-	-	-	0.1 - 10	250	50	-55°C to +125°C	•	-	-	-	-	•	-	-	-	-	-	-	-	-	•	•	-	-
	876	-	-	-	•	0.125 - 5	250	35 - 50	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-	-	-	•	•	-	-
	877	•	-	-	-	0.375 - 10	250	35 - 63	-55°C to +125°C	-	•	-	-	-	•	•	-	-	-	-	-	-	-	•	•	-	-
4.5 x 14.5mm (2AG)	208	-	-	•	-	0.125 - 10	350	100	-55°C to +125°C	-	•	-	•	-	•	-	-	-	-	•	-	-	-	•	•	-	-
	209	•	-	-	-	0.25 - 7	350	100	-55°C to +125°C	-	•	-	•	-	•	-	-	-	-	•	-	-	-	•	•	-	-
	220	Special Fuse				0.3 - 7	250 / 300 / 350	35 - 100	-55°C to +125°C	•	•	•	-	-	•	-	-	-	-	•	-	-	-	•	•	-	-
	2205	•	-	-	-	0.25 - 2.5	250	35	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	-	-	-	-	•	•	-	-
	224/225	-	-	•	-	0.375 - 10	250 / 125	35 - 500	-55°C to +125°C	•	•	•	-	-	•	-	-	-	-	•	-	-	-	•	•	-	-
	229/230	•	-	-	-	0.25 - 7	250 / 125	35 - 400	-55°C to +125°C	•	•	•	-	-	•	-	-	-	-	•	-	-	-	•	•	-	-
5 x 20mm	217	-	-	•	-	0.032 - 15	250	35 - 150	-55°C to +125°C	-	•	•	-	-	•	•	-	•	•	•	•	•	-	•	•	-	-
	218	•	-	-	-	0.032 - 16	250	35 - 100	-55°C to +125°C	-	•	•	-	-	•	•	-	•	•	•	•	•	-	•	•	-	-
	213	•	-	-	-	0.2 - 6.3	250	35 - 63	-55°C to +125°C	-	•	•	-	-	•	•	-	•	•	•	-	•	-	•	•	-	-
	219XA	•	-	-	-	0.04 - 6.3	250	150	-55°C to +125°C	-	•	•	-	-	•	•	-	•	•	•	-	•	-	•	•	-	-
	216	-	-	•	-	0.05 - 16	250	750 - 1500	-55°C to +125°C	-	•	•	-	-	•	•	-	•	•	•	•	•	-	•	•	-	-
	215	•	-	-	-	0.125 - 20	250	400 / 1500	-55°C to +125°C	-	•	•	-	-	•	•	-	•	•	•	•	•	-	•	•	-	-
	232	-	•	-	-	1 - 10	250 / 125	300 / 10,000	-55°C to +125°C	-	-	-	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	235	-	-	•	-	0.1 - 7	250 / 125	35 - 10,000	-55°C to +125°C	•	-	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	233	-	•	-	-	1 - 10	125	10,000	-55°C to +125°C	•	-	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	234	-	•	-	-	1 - 10	250	100 - 200	-55°C to +125°C	•	-	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-

(1) Detailed information about product series listed here can be found on our website.
(2) 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.

Axial Leaded/Cartridge Fuses (continued)


251


473


215


325


606

Surface Mount Type	Series Name[1]	Time Lag	Medium Acting	Fast Acting	Very Fast Acting	Device Range[2] (Operating Current Options in Amps)	Max. Voltage Rating[2] (Volts)	Interrupting Rating at Max Voltage Rating[2] (Amps)	Operating Temperature Range	Agency Approvals[2]															RoHS Compliant	Lead Free	Halogen Free	Ex / IEC / IECEx
										Americas					Europe						Asia								
										UL	UR	CSA	QPL	UMF	CE	VDE	TUV	BSI	Semko	PSE	K	CCC	CQC				
5 x 20mm	239	•	-	-	-	0.08 - 7	250 / 125	35 - 10,000	-55°C to +125°C	•	-	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	285	•	-	-	-	0.125 - 20	250	400 - 1500	-55°C to +125°C	-	-	-	-	-	•	-	-	-	-	•	-	-	-	•	•	-	-
	405	-	-	-	-	25	420VDC / VAC	1,000A @ 250VAC/VDC 300A @ 420VDC 200A @ 420VAC	-55°C to +125°C	-	•	-	-	-	-	-	•	-	-	-	-	-	-	•	•	•	-
	477	•	-	-	-	0.5 - 16	400DC / 500AC	100 - 1500	-55°C to +125°C	-	•	•	-	-	•	-	-	-	•	•	-	-	-	•	•	-	-
	487	-	-	•	-	8 - 20	420	200	-55°C to +125°C	•	-	-	-	-	-	-	•	-	-	-	-	-	-	•	•	-	-
	835	•	-	-	-	5 - 8	250	1500	-55°C to +125°C	•	-	-	-	-	-	-	•	-	-	•	•	•	•	•	•	-	-
	977	•	-	-	-	0.5 - 16	450DC / 500AC	200 / 100	-55°C to +125°C	-	-	-	-	-	•	-	-	-	•	•	-	-	-	•	•	-	-
6 x 25mm	688	-	-	-	-	5 - 40	70	1500 - 2500	-55°C to +125°C	•	-	-	-	-	-	-	•	-	-	-	-	-	-	•	•	-	-
6.3 x 32mm (3AG/3AB)	312/318	-	-	•	-	0.062 - 35	250 / 32	35 - 300	-55°C to +125°C	•	•	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	313/315	•	-	-	-	0.01 - 30	250 / 125 / 32	35 - 300	-55°C to +125°C	•	•	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	314/324	-	-	•	-	0.375 - 40	250	35 - 1000	-55°C to +125°C	•	•	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	322	-	-	-	•	12 - 30	65	200 - 1000	-55°C to +125°C	-	•	-	-	-	•	-	-	-	-	•	-	-	-	•	-	-	-
	328	-	-	-	-	21	100VDC / 300VAC	200 / 200	-55°C to +125°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	332	-	-	-	•	1- 10	250	100 / 200	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	•	-	-	-	•	•	-	-
	325/326	•	-	-	-	0.01 - 30	250	100 - 600	-55°C to +125°C	•	•	•	-	-	•	-	-	-	-	•	•	-	-	•	•	-	-
	504	-	-	-	-	20 - 30	420VDC / 500VAC / 250 VAC	400 / 200 / 1500	-55°C to +125°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	505	-	-	•	-	10 - 30	450 / 500	20,000 - 50,000	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	-	-	-	-	•	•	-	-
	506	-	-	•	-	15 - 20	600DC	10,000	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	-	-	-	-	•	•	-	-
	507	-	-	-	-	1 - 8	650VDC	150	-55°C to +125°C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	508	-	-	-	-	0.315 - 1	1000	10,000	-55°C to +125°C	-	•	•	-	-	•	-	-	-	-	-	-	-	-	•	•	-	-
	513	-	-	-	-	5 - 10	800VDC	400A @ 800VDC	-55°C to +125°C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	•	•	•	-
	514	-	-	•	-	1.6 - 12.5	500	5000	-55°C to +125°C	•	-	-	-	-	•	-	-	-	-	-	-	-	-	•	•	•	-
	527	-	-	-	-	30 - 50	500VAC 305VAC	10KA @ 500VAC 10KA @ 500VDC 10KA @ 305VAC	-55°C to +125°C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	•	•	•	-
10 x 32mm	526	-	-	-	-	30 - 63	500VAC / VDC	10KA @ 500VAC 10KA @ 500VDC 10KA @ 300VAC	-55°C to +125°C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	•	•	•	-
	606	-	-	-	-	40 - 63	500	2000	-55°C to +125°C	•	-	-	-	-	-	-	-	-	-	-	-	-	-	•	•	•	-
	607	-	-	-	-	40 - 63	500VAC / VDC	10KA @ 500VAC 10KA @ 500VDC 10KA @ 300VAC	-55°C to +125°C	-	•	-	-	-	-	-	•	-	-	-	-	-	-	•	•	•	-
10 x 38mm	828	-	-	-	-	15 - 30	1000VDC	10KA @ 1000VDC	-55°C to +125°C	-	•	-	-	-	-	-	-	-	-	-	-	-	-	•	•	•	-

(1) Detailed information about product series listed here can be found on our website.
(2) 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.

Radial Leaded/Socket Fuses


370


303


804

Surface Mount Type	Series Name[1]	Size (mm)	Time Lag	Fast Acting	Very Fast Acting	Device Range[2] (Operating Current Options in Amps)	Max. Voltage Rating[2] (Volts)	Interrupting Rating at Max. Voltage Rating[2] (Amps)	Operating Temperature Range	Agency Approvals[2]					Halogen Free	RoHS Compliant	Lead Free	TUV	VDE	CCC
										UL	UR	CSA	PSE	UMF						
Micro™ Fuse / TR3 Fuse	262/268	6 x 8	-	-	-	0.002 - 5	125	10,000	-55°C to +125°C	-	•	•	-	-	-	-	-	-	-	-
	269		-	-	-	0.002 - 5	125	10,000	-55°C to +125°C	-	•	•	-	-	-	-	-	-	-	-
	272/278		-	-	-	0.002 - 5	125	10,000	-55°C to +125°C	-	•	•	-	-	-	-	-	-	-	-
	273/279		-	-	-	0.002 - 5	125	10,000	-55°C to +85°C	-	•	•	-	-	-	-	-	-	-	-
	274		-	-	-	0.002 - 5	125	10,000	-55°C to +85°C	-	-	-	-	-	-	-	-	-	-	-
	303		-	-	•	0.05 - 5	125	50	-55°C to +70°C	•	-	•	-	-	•	•	•	-	-	-
TR5® Fuse	370	8.5 x 8	-	-	•	0.04 - 6.3	250	35 - 63	-40°C to +85°C	-	•	-	•	-	•	•	•	-	•	•
	372		•	-	-	0.04 - 6.3	250	35 - 50	-40°C to +85°C	-	•	-	•	-	•	•	•	-	•	•
	373		-	-	•	0.05 - 10	250	50	-40°C to +85°C	•	-	•	-	-	•	•	•	-	-	-
	374		•	-	-	0.05 - 10	250	50	-40°C to +85°C	•	-	•	-	-	•	•	•	-	-	-
	382		•	-	-	1 - 10	250	100	-40°C to +85°C	-	•	-	•	-	•	•	•	-	•	•
	383		•	-	-	1 - 10	300	50 - 100	-40°C to +85°C	-	•	-	•	-	•	•	•	-	•	-
TE5	369	8.5 x 8	•	-	-	0.8 - 6.3	300	50	-40°C to +85°C	-	•	-	•	-	•	•	•	-	-	-
	385		•	-	-	0.35 - 1.5	125	50	-40°C to +85°C	-	•	-	-	-	-	•	•	-	-	-
	391		-	-	•	0.125 - 4	65	50	-40°C to +125°C	-	•	-	-	-	-	•	•	-	-	-
	392		•	-	-	0.280 - 6.3	250	25 - 130	-40°C to +125°C	-	•	-	•	-	•	•	•	-	•	•
	395		-	-	•	0.05 - 6.3	125	100	-40°C to +125°C	•	-	-	•	-	•	•	-	-	-	-
	396		•	-	-	0.05 - 6.3	125	100	-40°C to +125°C	•	-	-	•	-	•	•	•	-	-	-
	397		•	-	-	0.35 - 1.5	125	50	-40°C to +125°C	•	-	-	-	-	•	•	•	-	-	-
	398		-	•	-	0.125 - 4	65	50	-40°C to +85°C	-	•	-	-	-	•	•	•	-	-	-
	399		•	-	-	0.125 - 4	65	50	-40°C to +85°C	-	•	-	-	-	•	•	•	-	-	-
	400		•	-	-	0.5 - 6.3	250	130	-40°C to +125°C	-	•	-	•	-	•	•	•	•	-	•
	808	8.9 x 8.9	-	-	•	2 - 5	250	100	-40°C to +85°C	-	•	-	-	-	•	•	•	-	-	-
TE7	804	12.4 x 9.2 x 6.4	•	-	-	0.8 - 6.3	250	150	-40°C to +125°C	-	-	-	•	•	•	•	•	-	•	•
	807	12.4 x 9.2 x 6.4	•	-	-		300	100	-40°C to +125°C	-	•	-	•	-	•	•	•	-	-	-

(1) Detailed information about product series listed here can be found on our website.
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Fuse Holders

Fuseholder Type		In-Line Fuseholders	Panel Mount Fuse Enclosures	Circuit Board Mount Fuse Enclosures		Fuse Blocks		Fuse Clips	
Circuit Connection Method		Wire	Wire Connector Terminals	TH= Through-Hole SM= Surface Mount		CT= Wire Connector Terminal		QC= Quick Connect	
Fuse Type	Fuse Series[1]								
4.5×14.5 mm (2AG)	208 / 209 225 / 229	150274 150300 150307	3452 Series Int. Shocksafe 345 Series Int. Shocksafe (old) 245001 Solder QC 245002 NEMA QC 286377 Flip Top	—		CT TH TH QC	254 011 - 008 254 101, 254 121 254 131 254 201 - 208	TH SM TH TH TH TH TH TH TH TH	111501 111505 111506 111510 111512 52100001009 51900001009 51800001009 523 Series 445 Series
5×20 mm	213 / 215 216 / 217 218 / 219XA 232 / 233 234 / 235 239 / 285 377 / 477 617 / 618	150274 150300 150307 150315 150316 150317 150318 150319 PTF0080M FH503	345 Shocksafe 3455 Int. Shocksafe 286677 Flip Top 800 / 801 / 802 / 821 Series 823 Series Snap-in 824 / 824 - 20 / 850 / 851 / 860 Series 870 Series Medical Grade 820/ 820-20 Series Mini Shocksafe PTF030 / PTF035 / PTF040 PTF055 / PTF070	TH TH TH TH TH	345121 High Voltage Series 810 / 811 / 813 / 814 830 / 831 / 834 852 / 853 / 862 PTF045 / PTF050	TH TH QC CT TH CT SM TH TH TH	445073 520 002, 520 101 520 003, 520 005 520 004 646 / 649 / 656 647 658 PTF015 / PTF065 PTF075 / PTF077 PTF078 FB55 / FB58	TH TH TH TH TH TH	100 / 111 Series 04450001 / 00300210 5200001 52000001009 NY61AP FC51
6.3×32 mm (3AB/3AG)	312 313 314 322 326 332 373 505 506 508 605	155 Series 150312 150322 150603 445004 445005 PTF080 FH602 / FH604 150603	3453 Series Int. Shocksafe 345 High Voltage Series 342 Series Traditional 342006 Watertight 344 Series Snap / Panel Mount 348 Series Snap Mount 340 Series RF Shielded / Watertight 346877 Flip Top 342021 (FHN26W) Watertight 342024 (FHN26G2) Drip Proof 342025 (FHN20G) Drip Proof 800 Series Shocksafe 803-01 Series 860 Series	TH TH TH TH TH TH	345101 High Voltage Series 810 Series 811 Series 813 Series 814 Series 862 Series	CT QC QC QC QC QC CT CT QC QC QC QC	354 Series 35406 Series 35407 Series 35408 Series 35409 Series 354701 Series 356 Series 359 Series OMN002 OMN004 OMN006 FB65 / FB66	CT CT CT CT TH TH TH TH TH TH CT TH TH	101001 / 101002 101003 / 102064 121001 / 121002 121003 / 121004 102071 102076 / 102078 102079 / 102080 122083 / 122087 122088 / 122093 122090 / 100058 51800001009 101010 102074 10207101009
TE5/TR5® Fuse	303 / 369 370 / 372 373 / 374 382 / 383 385 / 392 395 / 396 397 / 398 400 / 662 663 / 664 665 / 804 807 / 808		570 Series	TH TH SM TH TH	571 Series 559 / 560 / 562 Series 564 Series 576 Series 556 / 557 Series				
Micro™ Fuse / TR3	262 / 268 269 / 272 273 / 274 278 / 279		282001 Front Mount Neoprene 282007 Front Mount Conductive 282002 Rear Mount Neoprene 282008 Rear Mount Conductive 280004 32V Indicating	TH TH TH TH	281005 Vertical Silver 281007 Horizontal Silver 281008 Vertical Tin 281010 Horizontal Tin				
Blade Fuse	100		—		—	TH TH TH SM TH	100062 Block ATO Fuse 100063 Block Mini Fuse 100064 Block Mini Fuse 100065 Block Mini Fuse 100066 Block ATO Fuse	TH TH TH TH TH	100059 Clip Mini Fuse 100060 Clip ATO Fuse 100061 Clip ATO Fuse 100067 Clip Mini-ATO Fuse

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

Surface Mount PPTC Devices

PolySwitch®/POLY-FUSE® Standard SMD

FemtoSMD

MicroSMD

1206L

1812L

2920L

Series Name[1]	Size[2]	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			
femtoSMDC	0603	0.05 - 0.35	15	40	-40°C to 85°C	•	•	•	•	•	•
picoSMDC	0805	0.1 - 1.1	15	100	-40°C to 85°C	•	•	•	•	•	•
nanoSMDC	1206	0.1 - 2.0	60	100	-40°C to 85°C	•	•	•	•	•	•
microSMD	1210	0.05 - 2.0	30	100	-40°C to 85°C	•	•	•	•	•	•
miniSMDC	1812	0.1 - 3.0	60	100	-40°C to 85°C	•	•	•	•	•	•
midSMD	2018	0.3 - 2.0	60	40	-40°C to 85°C	•	•	•	•	•	•
SMDC	2920	0.3 - 3.1	60	50	-40°C to 85°C	•	•	•	•	•	•
SMD	2920	0.3 - 3.0	60	50	-40°C to 85°C	•	•	•	•	•	•
SMD2	3425	1.5 - 2.5	33	70	-40°C to 85°C	•	•	•	•	•	•
Low Rho PTC (Low Resistance)	0402	0.1 - 1.0	6	40	-40°C to 85°C	•	•	•	•	•	•
	0603	0.5 - 3.0	6	50	-40°C to 85°C	•	•	•	•	•	•
	0805	0.75 - 4.0	12	50	-40°C to 85°C	•	•	•	•	•	•
	1206	0.75 - 7.0	12	50	-40°C to 85°C	•	•	•	•	•	•
	1210	1.75 - 9.0	12	50	-40°C to 85°C	•	•	•	•	•	•
	1812	1.9 - 3.7	24	50	-40°C to 85°C	•	•	•	•	•	•
	2920	5.0 - 7.0	24	50	-40°C to 85°C	•	•	•	•	•	•
0402L	0402	0.05	9	40	-40°C to 85°C	•	•	•	•	•	•
0603L	0603	0.01 - 0.5	60	40	-40°C to 85°C	•	•	•	•	•	•
0805L	0805	0.05 - 1.1	30	100	-40°C to 85°C	•	•	•	•	•	•
1206L	1206	0.05 - 2.0	60	100	-40°C to 85°C	•	•	•	•	•	•
1210L	1210	0.05 - 2.0	90	100	-40°C to 85°C	•	•	•	•	•	•
1812L	1812	0.1 - 3.0	60	100	-40°C to 85°C	•	•	•	•	•	•
2016L	2016	0.3 - 5.0	60	100	-40°C to 85°C	•	•	•	•	•	•
2920L	2920	0.3 - 7.0	72	50	-40°C to 85°C	•	•	•	•	•	•
250S	3729	0.13	250 / 60	3	-40°C to 85°C	•	•	•	•	•	•
3425L	3425	2.0 - 3.0	60	20	-40°C to 85°C	•	•	•	•	•	•

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

How is the Automotive SMD PPTC Used Here?

picoASMDCH010F-2
Automotive Surface Mount PPTC Devices

Surface mountable PPTCs help prolong the lifespan of LED lighting in automobiles by providing resettable overcurrent and overtemperature protection.

Surface Mount PPTC Devices (continued)

PolySwitch® Automotive SMD

FemtoASMD

PicoASMD


ASMDC

NanoASMDCH

Series Name[1]	Size[2]	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			
femtoASMDC	0603	0.05 - 0.1	15	10	-40°C to 85°C	-	-	-	•	•	•
picoASMDC	0805	0.1 - 0.12	15	20	-40°C to 85°C	-	-	-	•	•	•
picoASMDCH	0805	0.1	16	40	-40°C to 125°C	-	-	-	•	•	•
nanoASMDC	1206	0.1 - 0.5	60	100	-40°C to 85°C	-	-	-	•	•	•
nanoASMDCH	1206	0.16 - 0.5	30	50	-40°C to 125°C	-	-	-	•	•	•
microASMD	1210	0.05 - 0.5	30	40	-40°C to 85°C	-	-	-	•	•	•
miniASMDC	1812	0.1 - 2.6	60	100	-40°C to 85°C	-	-	-	•	•	•
ASMDC	2920	0.3 - 3.0	60	40	-40°C to 85°C	-	-	-	•	•	•
AHS	2018-3425	0.8 - 3.0	16	70	-40°C to 125°C	-	-	-	•	•	•
ASMD	2920-3425	0.23 - 1.97	60	40	-40°C to 85°C	-	-	-	•	•	•

PolySwitch® Oil Resistant SMD

NanoSMDCH

MicroSMDCH


SMDCH

Series Name[1]	Size[2]	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			
NANOSMDCH	1206	0.1 - 0.75	30	10	-40°C to 125°C	-	•	-	•	•	•
MICROSMDCH	1210	0.1 - 0.5	30	10	-40°C to 125°C	-	-	-	•	•	•
SMDCH	2920	0.5 - 2.0	24	20	-40°C to 125°C	-	•	-	•	•	•

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

How is the Radial Leaded PPTC Used Here?

RUEF110S, RUEF135V, AHRF300 & AHEF100 Radial Leaded PPTC Devices

PPTCs provide overcurrent and overtemperature protection. Radial leaded PPTCs protect motors used in automotive power door locks, mirrors, lumbar support, seats, sunroofs, and windows from overheating and burning when a motor stall condition occurs.

Radial Leaded PPTC Devices

PolySwitch®/POLY-FUSE® Standard R-Line


RUEF


RXEF


RUSBF


RGEF

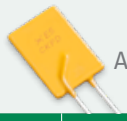

RHEF

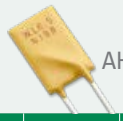
Series Name[1]	Size (mm)	Hold Current (I_{HOLD})	Max Voltage (V_{MAX})	Max Fault Current (I_{MAX})	Operating Temperature Range	Agency Approvals			Halogen Free	RoHS	Lead Free
						cUR	UR	TUV			
RUEF	7.4 x 12.2 to 24.1 x 29.0	0.90 - 9.0	30	100 / 70	-40°C to 85°C	•	•	•	•	•	•
RKEF	7.1 x 11.43 to 24.1 x 29.0	0.50 - 5.0	60	40	-40°C to 85°C	•	•	•	•	•	•
RXEF	8.0 x 8.3 to 27.2 x 31.8	0.05 - 0.17 / 0.20 - 3.75	60 / 72	40	-40°C to 85°C	•	•	•	•	•	•
RUSBF	6.9 x 11.4 to 11.4 x 18.3	0.90 - 2.5 / 0.75 - 1.55	16 / 6	40	-40°C to 85°C	•	•	•	•	•	•
RGEF	7.1 x 11.0 to 23.5 x 27.9	2.5 - 14.0	16	100	-40°C to 85°C	•	•	•	•	•	•
RHEF	6.9 x 10.8 to 23.5 x 28.7	0.50 - 1.0 / 2.0 - 15.0	30 / 16	40 / 100	-40°C to 125°C	•	•	•	•	•	•
16R	7.1 x 11.0 to 23.5 x 27.9	2.50 - 14.00	16	100	-40°C to 85°C	•	•	•	•	•	•
30R	7.4 x 12.2 to 24.1 x 31.6	0.90 - 9.00	30	40	-40°C to 85°C	•	•	•	•	•	•
60R	7.4 x 11.7 to 26.3 x 31.1	0.10 - 3.75	60	40	-40°C to 85°C	•	•	•	•	•	•
72R	7.4 x 11.7 to 26.3 x 31.1	0.20 - 3.75	72	40	-40°C to 85°C	•	•	•	•	•	•

PolySwitch® Automotive R-Line


AGRF


AHEF


AHRF


AHRL

Series Name[1]	Size (mm)	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			
AGRF	8.9 x 14.1 to 23.5 x 28.7	4.0 - 14.0	16	100	-40°C to 85°C	-	-	-	•	•	•
AHRF	6.9 x 10.8 to 23.5 x 28.7	0.5 - 1.0 / 2.0 - 15.0	30 / 16	40 / 100	-40°C to 125°C	-	-	-	•	•	•
AHEF	6.9 x 10.8 to 23.5 x 27.9	0.5 - 10.0	32	100	-40°C to 125°C	-	-	-	•	•	•
AHRL	8.4 x 20 to 18.4 x 34	3.5 - 6.5 / 7.0 - 15.0	16	50 / 100	-40°C to 125°C	-	•	-	•	•	•

PolySwitch® Line Voltage


LVR

Series Name[1]	Size (mm)	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			
LVR	6.9 x 9.9 to 24.9 x 34.8	0.05 - 2.0	240	1 - 20	-20°C to 85°C	•	•	•	-	•	•

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

How is the Line Voltage PPTC Used Here?

LVR040K-2 & LVR025K-2
Radial Leaded Line Voltage PPTC Devices

PPTCs provide overcurrent and overtemperature protection. Line Voltage Rated Radial lead PPTCs protect motors used in home appliances such as coffee machines from overheating and burning when a motor stall condition occurs.

Battery PPTC Devices

PolySwitch® Straps

Series Name[1]	Size (mm)	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			
VLR	23.2 X 3.9 to 23.1 x 5.3	1.70 - 2.30	12	100	-40°C to 85°C	•	•	•	•	•	•
VLP	11.8 x 4.6 to 23.1 x 5.3	1.20 - 2.70	16	60	-40°C to 85°C	•	•	•	•	•	•
VTP	25.6 x 2.9 to 23.1 x 5.3	1.10 - 2.10	16	100	-40°C to 85°C	•	•	•	•	•	•
LR4	22.1 x 5.5 to 66.5 x 10.0	1.90 - 13.0	15/20	100	-40°C to 85°C	•	•	•	•	•	•
LSP	21.5 x 5.5 to 21.5 x 10.5	3.80 - 5.50	16	50	-40°C to 85°C	-	•	•	•	•	•
SRP	22.1 x 5.2 to 32.4 x 13.6	1.20 - 4.20	15/30	100	-40°C to 85°C	•	•	•	•	•	•

POLY-FUSE® Low Rho SMD

1206


1210


2920

Series Name[1]	Size[2]	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			
Low Rho	0402	0.1 - 1.0	6	40	-40°C to 85°C	•	•	•	•	•	•
	0603	0.5 - 3.0	6	50	-40°C to 85°C	•	•	•	•	•	•
	0805	0.75 - 4.0	12	50	-40°C to 85°C	•	•	•	•	•	•
	1206	0.75 - 7.0	12	50	-40°C to 85°C	•	•	•	•	•	•
	1210	1.75 - 9.0	12	50	-40°C to 85°C	•	•	•	•	•	•
	1812	1.9 - 3.7	24	50	-40°C to 85°C	•	•	•	•	•	•
	2920	5.0 - 7.0	24	50	-40°C to 85°C	•	•	•	•	•	•

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

How is the Low Rho SMD PPTC Used Here?

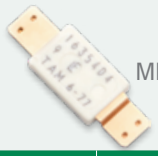
0805L300SLWR & 1206L400SLWR
Low Rho Surface Mount PPTC Devices

The low rho SMD PPTCs protect Li-ion batteries from overcurrent while allowing for longer battery life and faster charging. The compact size makes them an excellent fit for personal healthcare devices such as electric toothbrushes and electric shavers.

Battery Mini-Breakers (Thermal Cutoff Devices)

Battery Mini-Breakers (Thermal Cutoff Devices)


MHP-TAC


MHP-TAM6


MHP-TAT18

Series Name[1]	Size (mm)	Operation Temperature	Reset Temperature	Hold Current @25°C (I_{HOLD})	Contact Rating	Max Breaking Current	Operating Temperature Range	Agency Approvals			Halogen Free	RoHS	Lead Free
								cUR	UR	CB			
MHP-TAM6	5.80 x 3.80 x 1.15$_{MAX}$	72-90°C	≥40°C	6A	DC 9V/12A, 6000 Cycles	DC 5V/40A, 100 Cycles	-30 to 100°C	•	•	•	•	•	•
MHP-TAM15	5.80 x 3.80 x 1.15$_{MAX}$	72-90°C	≥40°C	15A	DC 9V/25A, 6000 Cycles	DC 5V/80A, 100 Cycles	-30 to 100°C	•	•	•	•	•	•
MHP-TAT18	5.80 x 3.80 x 1.15$_{MAX}$	72-90°C	≥40°C	18A	DC 9V/30A, 6000 Cycles	DC 5V/80A, 100 Cycles	-30 to 100°C	•	•	•	•	•	•
MHP-TAC6	4.75 x 2.80 x 0.85$_{MAX}$	72-90°C	≥40°C	6A	DC 12V/12A, 6000 Cycles	DC 5V/40A, 100 Cycles	-30 to 100°C	•	•	•	•	•	•
MHP-TAC15	4.75 x 2.80 x 0.85$_{MAX}$	72-90°C	≥40°C	15A	DC 12V/25A, 6000 Cycles	DC 5V/80A, 100 Cycles	-30 to 100°C	•	•	•	•	•	•

Battery Protectors (ITV Three-Terminal Fuses)

Battery Protectors (ITV Three-Terminal Fuses)


ITV4030


ITV5432


ITV9550

Series Name[1]	Size (mm/in)	Max Voltage (V_{MAX})	Interrupt Current (I_{BREAK})	Current Carrying Capacity @25°C (I_{RATED})	Range of Operation Voltage (V_{OP})	Cells in Series	Operating Temperature Range	Agency Approvals			Halogen Free	RoHS	Lead Free
								cUR	UR	TUV			
ITV4030 12A	4030 / 1612	36V	50A	12A	3.0~19.6V	1~4	-10°C to +65°C	•	•	•	•	•	-
ITV4030 15A	4030 / 1612	36V	50A	15A	3.0~23.5V	1~5	-10°C to +65°C	•	•	•	•	•	-
ITV4030 22A	4030 / 1612	36V	50A	22A	3.5~23.1V	1~5	-10°C to +65°C	•	•	•	•	•	•
ITV5432 30A	5432 / 2213	62V	80A	30A	7.5~62.0V	2~14	-10°C to +65°C	•	•	•	•	•	-
ITV9550 30A	9550 / 3820	85V	80A	30A	8.4~62.0V	3~14	-10°C to +65°C	•	•	•	•	•	-
ITV9550 45A	9550 / 3820	85V	120A	45A	9.8~62.0V	3~14	-10°C to +65°C	•	•	•	•	•	-
ITV9550 60A	9550 / 3820	85V	160A	60A	9.6~62.0V	3~14	-10°C to +65°C	•	•	•	•	•	•

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

How is the Battery Protector Used Here?

ITV9550L2030MR
Surface Mount Battery Protectors

ITVs provide reliable protection from overcurrent and overcharging of Li-ion batteries in a surface mount package for handheld power tools, reducing the risk of thermal runaway.

Telecom PPTC Devices

PolySwitch® Surface Mount & Chips


TCF250


TSV250


TSM250


TS600


TSM600

Series Name[1]	Size (mm)	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			
TCF250	4.9 x 4.9 x 2.3 to 7.1 x 7.1 x 1.6	0.09 - 0.18	250	3	-40°C to 85°C	-	•	-	•	•	•
TSL250	7.9 x 5.3	0.08 - 0.13	250	3	-40°C to 85°C	•	•	•	•	•	•
TS250	9.4 x 7.4	0.13	250	3	-40°C to 85°C	•	•	•	•	•	•
TSM250	8.9 x 8.6	0.13	250	3	-40°C to 85°C	-	•	-	•	•	•
TSV250	6.1 x 6.9	0.13	250	3	-40°C to 85°C	•	•	•	•	•	•
TS600	19.4 x 8.3	0.17 - 0.4	600	3	-40°C to 85°C	•	•	-	•	•	•
TSM600	17.6 x 11.2	0.25 - 0.4	600	3	-40°C to 85°C	•	•	-	•	•	•

PolySwitch® Radial Leaded


TRF250


TRF600

Series Name[1]	Size (mm)	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			
TRF250	4.8 x 9.3 to 9.0 x 12.0	0.055 - 0.184	250	3	-40°C to 85°C	•	•	•	•	•	•
TRF600	9.0 x 12.5 to 16.0 x 12.6	0.15 - 0.4	600	3	-40°C to 85°C	•	•	•	•	•	•
TR600	13.5 x 12.6	0.15	600	3	-40°C to 85°C	-	-	-	•	•	•
250R	5.8 x 9.9 to 9.5 x 12	0.08 - 0.18	250	3 / 10	-40°C to 85°C	•	•	•	•	•	•
600R	9.0 x 12.5 to 16.0 x 12.6	0.15 - 0.16	600	3	-40°C to 85°C	•	•	•	•	•	•

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

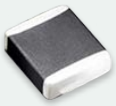
How is the Mini-Breaker Used Here?

MHP-TA Metal Hybrid PPTC Devices

Mini-breakers provide resettable overtemperature and overcurrent protection in high-capacity Li-ion polymer and prismatic cells. They are capable of handling the high battery-discharge currents in notebook PCs, gaming PCs, ultra-books, tablets, smartphones, and other small portable electronic devices.

Varistors

Surface Mount MLV / MOV


MHS

MLA

MLN

CH

SM7

Series Name[1]	Technology Type	Operating AC Voltage Range	Operating DC Voltage Range	Peak Current Range[2] (A)	Peak Energy Range (J)	Operating Temperature Range	Lines Protected	Mount/ Form Factor	Disc Size	Agency Approvals					RoHS	Lead Free	Halogen Free
										UR	cURus	VDE	CECC	QPL			
MHS	Multi-Layer Zinc Oxide (MLV)	-	9 - 42	-	-	-55 to +125°C	1	Surface Mount	Not Applicable	-	-	-	-	-	•	•	•
MLE		-	18	-	-	-55 to +125°C	1			-	-	-	-	-	•	•	•
MLA		2.5 - 300	3.5 - 385	4 - 5000	0.02 - 5.0	-55 to +125°C	1			-	-	-	-	-	•	•	•
MLA AUTO		2.5 - 107	3.5 - 120	4 - 1000	0.02 - 4.5	-55 to +125°C	1			-	-	-	-	-	•	•	•
AUML		-	18 - 68	-	-	-55 to +125°C	1			-	-	-	-	-	•	•	•
MLN		18	5.5 - 18	30	0.05 - 0.10	-55 to +125°C	4			-	-	-	-	-	•	•	•
CH	Metal Oxide Varistor (MOV)	14 - 275	18 - 369	100 - 600	1.0 - 8.0	-40 to +125°C	1			•	-	-	-	-	•	•	•
SM7		115 - 510	369 - 675	1200	23 - 40	-55 to +85°C	1			•	-	-	-	-	•	•	•
SM20		20 - 320	26 - 420	6500	165	-55 to +85°C	1			•	-	-	-	-	•	•	•

Radial Leaded MOV


UltraMOV

UltraMOV25S

C-III

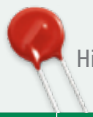
ZA

HMOV

Xtreme

Series Name[1]	Technology Type	Operating AC Voltage Range	Operating DC Voltage Range	Peak Current Range[2] (A)	Peak Energy Range (J)	Operating Temperature Range	Lines Protected	Mount/ Form Factor	Disc Size	Agency Approvals					RoHS	Lead Free	Halogen Free
										UR	cURus	VDE	CECC	QPL			
UltraMOV™ Varistor	Metal Oxide Varistor	130 - 625	170 - 825	1750 -10000	12.5 - 400	-55 to +85°C	1	Radial Leaded	7, 10, 14, 20mm	-	•	•	•	-	•	•	•
UltraMOV™ 25S Varistor		115 - 750	150 - 970	22000	230 - 890	-55 to +85°C	1		25mm	-	•	•	-	-	•	•	•
C-III		130 - 1000	-	3500 - 1000	40 - 530	-55 to +85°C	1		10, 14, 20mm	-	•	•	•	-	•	•	•
LA		130 - 1000	175 - 1200	1200 - 6500	11 - 360	-55 to +85°C	1		7, 10, 14, 20mm	-	•	•	•	-	•	•	•
ZA		4 - 460	5.5 - 615	50 - 6500	0.1 - 52	-55 to +85°C	1		5, 7, 10, 14, 20mm	-	•	•	•	-	•	•	•
LV UltraMOV		11-95	14-125	500-10000	0.8-150	-55 to +85°C epoxy coated ; -55 to +125°C phenolic coated	1		5, 7, 10, 14, 20mm	-	•	-	-	-	•	•	•
AUMOV		14-625	16-825	400-10000	1-490		1		5, 7, 10, 14, 20mm	•	-	-	-	-	•	•	•
HMOV		11-625	14-825	1500-10000	4.2-900	-55 to +125°C	1		10, 14, 20mm	-	•	-	•	-	•	•	•
Xtreme Varistor		130 - 680	170 - 895	1200 - 15000	9.5 - 880	-40 to +125°C	1		5, 7, 10, 11, 14, 20mm	-	•	•	•	-	•	•	•

Specialty Application MOV


RA

High Reliability

Series Name[1]	Technology Type	Operating AC Voltage Range	Operating DC Voltage Range	Peak Current Range[2] (A)	Peak Energy Range (J)	Operating Temperature Range	Lines Protected	Mount/ Form Factor	Disc Size	Agency Approvals					RoHS	Lead Free	Halogen Free
										UR	cURus	VDE	CECC	QPL			
RA	Metal Oxide Varistor	4 - 275	5.5 - 369	150 - 6500	0.4 - 160	-55 to +125°C	1	Inline Radial Leads	Not Applicable	-	•	-	-	-	•	•	-
High Reliability		130 - 510	4 - 675	100 - 6500	0.4 - 190	-55 to +85°C	1	(Varies)	(Varies)	-	-	-	-	•	-	-	-

(1) Detailed information about most product series listed here can be found on our website.
(2) Not an applicable parameter for Crowbar devices

Varistors (Continued)

Industrial High-Energy Terminal MOV


BA/BB


DA/DB


HA


HB34


CA

Series Name[1]	Technology Type	Operating AC Voltage Range	Operating DC Voltage Range	Peak Current Range[2] (A)	Peak Energy Range (J)	Operating Temperature Range	Lines Protected	Mount/ Form Factor	Disc Size	Agency Approvals					RoHS	Lead Free	Halogen Free
										UR	cURus	VDE	CECC	QPL			
BA/BB	Metal Oxide Varistor	130 - 2800	175 - 3500	50000 70000	450 - 10000	-55 to +85°C	1	Screw / Clip Terminals	60mm	•	-	-	-	-	•	-	-
DA/DB		130 - 750	175 - 970	40000	270 - 1050	-55 to +85°C	1		40mm	•	-	-	-	-	•	•	-
HA		110 - 750	148 - 970	25000 40000	160 - 1050	-55 to +85°C	1	Industrial Packaged Radial Leads	32, 40mm	-	•	-	-	-	•	•	•
HB34, HG34, HF34		110 - 750	148 - 970	40000	220 - 1050	-55 to +85°C	1		34mm	-	•	-	-	-	•	•	•
DHB34		110 - 750	148 - 970	40000	220 - 10000	-55 to +85°C	1		34mm	-	•	-	-	-	•	•	•
CA		250 - 2800	330 - 3500	50000 70000	880 - 10000	-55 to +85°C	1	Bare Disc	60mm	-	-	-	-	-	•	-	•

Thermally Protected MOV


LST


TMOV25S


TMOV34S


iTMOV

Series Name[1]	Technology Type	Operating AC Voltage Range	Operating DC Voltage Range	Peak Current Range[2] (A)	Peak Energy Range (J)	Operating Temperature Range	Lines Protected	Mount/ Form Factor	Disc Size	Agency Approvals					RoHS	Lead Free	Halogen Free
										UR	cURus	VDE	CECC	QPL			
LST Varistor	Metal Oxide Varistor	150 - 690	200 - 710	50 - 75	30 - 755	-40 to +85°C	1	Industrial Packaged Radial Leads	34 or 37mm	-	•	-	-	-	•	•	•
TMOV® 25S Varistor		115 - 750	150 - 970	20000	170 - 670	-55 to +85°C	1	Radial Leaded	25mm	-	•	•	•	-	•	•	•
TMOV® 34S Varistor		115 - 750	150 - 970	40000	280 - 1200	-55 to +85°C	1	Industrial Packaged Radial Leads	34mm	-	•	•	•	-	•	•	•
TMOV® Varistor / iTMOV® Varistor		115 - 750	150 - 970	6000 - 10000	35 - 480	-55 to +85°C	1	Radial Leaded	14, 20mm	-	•	•	•	-	•	•	•

(1) Detailed information about product series listed here can be found on our website.
(2) Not an applicable parameter for Crowbar devices

How is the Automotive Varistor used here?

V14H275AUTO, V14H320AUTO, V14H460AUTO, V20H275AUTO, V20H320AUTO AUMOV® Radial Leaded Varistors

The AUMOV® Varistor series provides robust load dump, jump start, and surge voltage transient protection for demanding automotive applications.

Gas Discharge Tubes

High-Voltage GDTs


AC


CG3


CG4

Series Name[1]	DC Sparkover Voltage @ 100V/s ±20% Tolerance (V)	Max AC Surge (A)	Max Impulse Discharge Current 8x20us, 10 hits (KA)	Max Capacitance (pF)	Operation Temperature	Agency Approvals			Halogen Free	RoHS	Lead Free
						cUR	UR	TUV			
CG3/AC	285~7500	NA	5	1.5	-40°C to +90°C	•	•	-	-	•	•
CG4	800~3000	3	3	0.8	-40°C to +90°C	•	•	-	-	•	•
GTCX28-XXXM-R20	75~350	20	20	1.5	-40°C to +90°C	-	•	-	-	•	•

Low- to Medium-Surge GDTs


CG5


SH


SL1002A

Series Name[1]	DC Sparkover Voltage @ 100V/s ±20% Tolerance (V)	Max AC Surge (A)	Max Impulse Discharge Current 8x20us, 10 hits (KA)	Max Capacitance (pF)	Operation Temperature	Agency Approvals			Halogen Free	RoHS	Lead Free
						cUR	UR	TUV			
CG5/SL0902A	90~600	5	5	1.5	-40°C to +90°C	•	•	-	-	•	•
CG6	75~600	3	3	0.3	-40°C to +90°C	•	•	-	-	•	•
CG7	75~470	1	1	0.3	-40°C to +90°C	•	•	-	-	•	•
SH	75~600	5	5	0.7	-40°C to +90°C	•	•	-	-	•	•
SL1002A	75~600	5	5	1.2	-40°C to +90°C	•	•	-	-	•	•
SL1003A	90~500	10	10	1.5	-40°C to +90°C	•	•	-	-	•	•
SL1011A	75~600	5	5	1.5	-40°C to +90°C	•	•	-	-	•	•
SL1010A	75~470	NA	5~10	1.5	-40°C to +90°C	•	•	-	-	•	•
GTCX25-XXXM-R02	75~600	2.5	2.5	1	-40°C to +90°C	-	•	-	-	•	•
GTCX25-XXXM-R05	75~230	5	5	1	-40°C to +90°C	-	•	-	-	•	•
GTCX26-XXXM-R05	75~600	5	5	1	-40°C to +90°C	-	•	-	-	•	•
GTCX28-XXXM-R05	75~600	5	5	1	-40°C to +90°C	-	•	-	-	•	•
GTCX35-XXXM-R05	75~600	5	5	1	-40°C to +90°C	-	•	-	-	•	•
GTCX36-XXXM-R05	75~600	5	5	1	-40°C to +90°C	-	•	-	-	•	•

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

How is the Gas Discharge Tube Used Here?

CG32.0L, CG32.5L and CG33.0L Two Electrode High Voltage Devices

This Gas Discharge Tube (GDT) provides reliable lightning surge protection, particularly for automotive on-board chargers, telecom equipment, AC power ports, etc.

Gas Discharge Tubes (Continued)

Very-High-Surge GDTs


SL1021B


SL1026


GTCA28

Series Name[1]	DC Sparkover Voltage @ 100V/s ±20% Tolerance (V)	Max AC Surge (A)	Max Impulse Discharge Current 8x20us, 10 hits (KA)	Max Capacitance (pF)	Operation Temperature	Agency Approvals			Halogen Free	RoHS	Lead Free
						cUR	UR	TUV			
SL1021B	75~500	10	20	1.5	-40°C to +90°C	•	•	-	-	•	•
SL1026	275~700	10	20	NA	-40°C to +90°C	-	-	-	-	•	•
GTCA28-XXXM-R03	800~4000	5	3 (5 for 800V)	1	-40°C to +90°C	-	•	-	-	•	•

Medium- to High-Surge GDTs


CG/CG2


SG


SE

Series Name[1]	DC Sparkover Voltage @ 100V/s ±20% Tolerance (V)	Max AC Surge (A)	Max Impulse Discharge Current 8x20us, 10 hits (KA)	Max Capacitance (pF)	Operation Temperature	Agency Approvals			Halogen Free	RoHS	Lead Free
						cUR	UR	TUV			
CG/CG2	75~1000	20	20 (10 for 800 & 1000V)	1.5	-40°C to +90°C	•	•	-	-	•	•
SG	75~600	2.5	1~2	1	-40°C to +90°C	•	•	-	-	•	•
SE	75~600	NA	0.5	0.5	-40°C to +90°C	•	•	-	-	•	•
SL1021A	90~600	10	10	1.5	-40°C to +90°C	-	-	-	-	-	-
SL1411A	75~600	10	10	1.5	-40°C to +90°C	•	•	-	-	•	•
SL1122A	90~260	10	5	1	-40°C to +90°C	•	•	-	-	•	•
GTCX23-XXXM-R01	75~400	NA	1	0.5	-40°C to +90°C	•	•	-	-	•	•
GTCX28-XXXM-R10	75~600	10	10	1	-40°C to +90°C	•	•	-	-	•	•
GTCX38-XXXM-R10	75~600	10	10	1	-40°C to +90°C	-	•	-	-	•	•
GTCX36-XXXM-R10	75~600	10	10	1	-40°C to +90°C	-	•	-	-	•	•
GTCX37-XXXM-R10	75~600	10	10	1	-40°C to +90°C	-	•	-	-	•	•

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

How is the ESD Device Used Here?

AXGD10402KR and AXGD10603NR ESD Suppressors

This ESD suppressor provides reliable protection for USB, data communication, HDMI ports, audio interfaces, automotive infotainment, and antennas.

PulseGuard® ESD Suppressors

PulseGuard® ESD Suppressors


PGB1


PGB2


XGD


AXGD

Series Name[1]	Surface Mount	Through Hole	Working Voltage (V)	Array Package (No. of lines)	Single Line Package	Typical Capacitance (pF)	Typical Leakage Current	Rated Immunity to IEC 61000-4-2 level 4	Bidirectional (transients of either polarity)	Halogen Free	RoHS	Lead Free
PGB1	•	-	0~24	SOT23 (2)	0402 0603	0.04-0.12	<1nA	•	•	-	•	•
PGB2	•	-	0~12	NA	0402	0.07	<1nA	•	•	•	•	•
XGD	•	-	0~32	-	0402 0603	0.04-0.09	<1nA	•	•	•	•	•
AXGD	•	-	0~32	-	0402 0603	0.04-0.09	<1nA	•	•	•	•	•

TVS Diode Arrays

General Purpose ESD Protection


SOD323


SOT23-3


uDFN-2


SOD882


SOD523

Series Name[1]	Package Type	Breakdown Voltage (V)	Capacitance (pF)	Channel	ESD Contact (V)	Clamping Voltage (tp = 8/20µs)	Max. Surge Rating (tp = 8/20µs) (A)	RoHS	AEC-Q101 Qualified
SC1006-01LTG	SOD523	7 typ	30	1	±30	10.5V@5A	5	•	-
SC1205-01ETG	SOD882	5.1	7	1	±30	10V@7A	7	•	-
SC1205-01UTG	DFN0603-2L	5.1	7	1	±30	10@7A	7	•	-
SC1210-01ETG	SOD882	5.2	26	1	±30	11@15A	15	•	-
SC1333-01ETG	SOD882	3.5	8	1	±30	7.5V@5A	5	•	-
SC1533-01FTG	SOD323	4.5	25	1	±30	11.5@15A	15	•	-
SC1533-01LTG	SOD523	4.5	25	1	±30	10.5@15A	15	•	-
SD	SOD323	6-40	50-350	1	±30	8.5-52V	5-30	•	•
SD-C	SOD323	6-40	30-200	1	±30	10-50V	5-30	•	•
SM	SOT23-3	6-40	50-400	2	±30	9.8-52V	5-24	•	•
SP1003	SOD723 / SOD882	7	35	1	±30	12.0V	7	•	•
SP1005	SOD882 / 0201 Flipchip	7	35	1	±30	10V	8-10	•	•
SP1006	uDFN-2	7	30	1	±30	8.3V	5	•	•
SP1026	µDFN-2 (0201)	7.8	15	1	±30	12.0V	5.0	•	•
SP1064E-04UTG	DFN2510-10L	62	14	4	±25	102@3.5A	3.5	•	-
SP1103C	uDFN-2	3.8	130	1	±30	9.0V@80A	80.0	•	•
SP11xx	uDFN-2	6.0-26.7	130-630	1	±30	9.8-45V	20-80	•	•
SP1233	SOD882	4.2	35	1	±30	6.1V@1A	20	•	•
SP1305	SOT23-3	7	30	2	±30	8.6V	5	•	-
SP1326	SOD523	7.8	15	1	±30	12V@1A	4	•	•
SP3019	SOT23-6	8.2	0.3	4	+22/-10	10.5V@1A	2.5	•	•
SP712	SOT23-3L	9	75	2	±30	17V	20	•	•
SP720 Lead-Free/Green	SOIC-16 / PDIP-16	-	3	14	±4	-	3	•	-
SP721 Lead-Free/Green	SOIC-8 / PDIP-8	-	3	6	±4	-	3	•	-
SP723 Lead-Free/Green	SOIC-8 / PDIP-8	-	5	6	±8	-	7	•	-
SP724 Lead-Free/Green	SOT23-6	-	3	4	±8	-	3	•	-
SP725	MSOP-10L/ SOIC-8	-	5	-	±8	-	9	•	-
SPHV	SOD882	13.3-40	25-60	1	±15-±30	19-52@1A	2-8.0	•	•
SPHV-C	SOD882	13.3-40	13-30	1	±15-±30	19-52@1A	2-8.0	•	•

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

TVS Diode Arrays (continued)

Ultra-Low Capacitance


0402 DFN


1004 DFN


uDFN-2


SOD882

Series Name[1]	Package Type	Breakdown Voltage (V)	Capacitance (pF)	Channel	ESD Contact (V)	Clamping Voltage (tp = 8/20µs)	Max. Surge Rating (tp = 8/20µs) (A)	RoHS	AEC-Q101 Qualified
Enhanced ESD Discrete TVS	0201 DFN / 0402 DFN	8.8-9.6	0.15-0.3	1	±22	13-14V@2.5A	2.5	•	•
Ultra-Low Capacitance Discrete TVS	0201 DFN / 0402 DFN	9-9.8	0.1-0.2	1	±20	9.2-10V@2.0A	2.0	•	•
Enhanced ESD Diode Arrays	0402 DFN array	8	0.3	2	±22	13V@2.2A	2.2	•	•
Ultra-Low Capacitance Diode Arrays	0402 DFN array / 1004 DFN	9	0.2	2	±20	9.2V@2.0A	2.0	•	•
SC1004U-ULC-04UTG	DFN2510-10L	7.5	0.2 typ@3GHz	4	±12	11V@2A	2.0	•	-
SC3530-01LTG	SOD523	9.2	0.15	1	±22	15.5V@2.5A	2.5	•	-
SC7520-08UTG	DFN3810-9L	6.5	0.32	8	±12	4V@6A	6.0	•	-
SC7538-08UTG	DFN3810-9L	6	0.3	8	±22	10.9V@2A	3.0	•	-
SP00R6-01WTG	0201WLCSP	0.7	0.2	1	±12	2.5V@2A	3.0	•	-
SP33R6-04UTG	DFN2510-10L	0.7	0.2	4	±12	3.3V@2A	3.0	•	-
SP3213	uDFN-2	7.5	0.09	1	±12	12V	2.0	•	•
SP3522	SOD882 / 0201 DFN	9.2	0.15	1	±22	14.5V@2.5A	2.5	•	•
SP3530	SOD882 / 0201 DFN	8.2	0.3	1	±22	11.8V@2.5A	2.5	•	•
SP4337-01WTG	0201WLCSP	7.8 typ	0.18	1	±15	5V@7A	7.0	•	-

Lightning Surge Protection


uDFN-10


SOD323


MSOP-10


uDFN-12


SOT143

Series Name[1]	Package Type	Breakdown Voltage (V)	Capacitance (pF)	Channel	ESD Contact (V)	Clamping Voltage (tp = 8/20µs)	Max. Surge Rating (tp = 8/20µs) (A)	RoHS	AEC-Q101 Qualified
SC1103C-01UTG	DFN1610-2L	3.4	130	1	±30	9V@80A	80	•	-
SC1105-01UTG	DFN1610-2L	6	660	1	±30	11.8V@80A	80	•	-
SC1115-01UTG	DFN1610-2L	16.7	180	1	±30	27.4V@30A	30	•	-
SC1122-01UTG	DFN1610-2L	23	160	1	±30	35.5V@27A	27	•	-
SD22-01FTG	SOD323	23	160	1	±30	35.5V@27A	27	•	-
SP1250-01ETG	SOD882	5.1	120	1	±30	8.7V@50A	50	•	-
SP2525NUTG	uDFN-10L	7	1.7	4	±30	9V@30A	30	•	-
SP2555NUTG	uDFN-10	4	2.5	4	±30	17V@40A	40	•	•
SP3374NUTG	uDFN-10	5.07	3.5	4	±30	5.5A	40	•	•
SP3384NUTG	uDFN-10	6.5	0.5	4	±30	4A	15	•	•
SP3025	SOT23-6L	7	1.7	4	±30	9V@30A	30	•	-
SP4020	SOD323	3.5	2.5	1	±30	6.6V@1A	30	•	•
SP4021	SOD323	6.3	2.5	1	±30	9.3V@1A	25	•	•
SP4022	SOD323	13.3	2	1	±30	19.0V@1A	15	•	•
SP4023	SOD323	16	2	1	±30	23.0V@1A	12	•	•
SP4024	SOD323	26	2	1	±30	34.0V@1A	7	•	•
SP4044	MSOP-10	4.3	1.5	4	±30	5.2V@1A	24	•	•
SP4045	MSOP-10	4.3	1.5	4	±30	6.0V@1A	24	•	•
SP4208	SOD323	9.5	3	1	±30	11.5V@1A	30	•	•
SR70	SOT143-4	0.7	3	2	±30	1.4V@1A	40	•	-

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

TVS Diode Arrays (continued)

Low-Capacitance ESD Protection


SOD882


uDFN-6


uDFN-10


uDFN-14


SOT23-6

Series Name[1]	Package Type	Breakdown Voltage (V)	Capacitance (pF)	Channel	ESD Contact (V)	Clamping Voltage (tp = 8/20µs)	Max. Surge Rating (tp = 8/20µs) (A)	RoHS	AEC-Q101 Qualified
SP1255P	uDFN-6	4.5	0.6	3	30	6.6V@1A	4	•	•
SP3022	SOD882	6	0.5	1	±20	12.0V@1A	3.0	•	•
SP3030	SOD882	6	0.6	1	±20	9.2V@1A	3	•	•
SP3400	uDFN-6	6.5	0.5	2	±25	6.6V@1A	10	•	•
SP3401	uDFN-6	6.5	0.8	2	±18	4V	10	•	•
SP3420	uDFN-10	6.5	0.32	4	±12	2.7V	6	•	•
SP3422	5FC-uDFN	6.7	0.2	4	+20/-10	13.5V@1A	2.0	•	•
SP4010	SOT23-6L	12.5	0.48	2	±30	27.5V	23	•	-
SP8008	uDFN-14	6	0.3	8	+30/-23	12.45V@4A	4.0	•	•
SRV05-04HTG-D	SOT23-6	6	1	4	±30	11.7V	10	•	-

Automotive Qualified


SOD323


SOD523


uDFN-6L


SOT23-3


0201 DFN

Series Name[1]	Package Type	Breakdown Voltage (V)	Capacitance (pF)	Channel	ESD Contact (V)	Clamping Voltage (tp = 8/20µs)	Max. Surge Rating (tp = 8/20µs) (A)	RoHS	AEC-Q101 Qualified
AQxx-01FTG/AQxx-01LTG	SOD323/SOD523	6-40	5-30	1	±30	9.8-34V@1A	7-30	•	•
AQxxC-01FTG/AQxxC-01LTG	SOD323/SOD523	6-40	5-30	1	±30	10.0-36V@1A	7-30	•	•
AQ1003-01ETG/AQ1003-01LTG	SOD882/SOD523	7.8	30	1	±30	11.4V@6A/ 12.0V@7A	7.0	•	•
AQ1005	SOD882	8.5	30	1	±30	9.3V@1A/ 10V@2A/ 15.6V@10A	8.0	•	•
AQ1205-01ETG	SOD882	5.1	7	1	±30	10@7A	7.0	•	•
AQ1205-01FTG	SOD323	5.1	7	1	±30	10@7A	7.0	•	•
AQ1210-01ETG	SOD882	5.2	25	1	±30	11@15A	15.0	•	•
AQ1250-01ETG	SOD882	5.2	118	1	±30	8.7@50A	50.0	•	•
AQ12CANA-02HTG	SOT23-3L	13	28	2	±30	26.5@12A	12	•	•
AQ15CANA-02HTG	SOT23-3L	16.7	21	2	±30	33@9A	9	•	•
AQ22-01FTG	SOD323	23	160	1	±30	35.5@27A	27	•	•
AQ24CANA	SOT23-3L	28	15	2	±27	34V@1A	5.0	•	•
AQ24CANFD	SOT23-3	28	11.5	2	±21	33V@1A	3.0	•	•
AQ2555NUTG	uDFN-10	4	2.5	4	±30	17V@40A	45.0	•	•
AQ3041	SOD882	7.8	0.3	1	±20	9.2V@1A	3.0	•	•
AQ3045	SOD882	7.8	0.35	1	±30	12V@1A	3.0	•	•
AQ3102-02HTG	SOT23-3L	6.5	1	2	±30	9.2V@1A	8.0	•	•
AQ3102-02JTG	SC70-3L	6.5	1	2	±30	9.2V@1A	8.0	•	•
AQ3400	uDFN-6L	7.8	3	2	±30	9.2V@1A	2.0	•	•
AQ3522-01FTG	SOD323	9.2	0.15	1	±22	15.5@2.5A	2.5	•	•
AQ3530-01FTG	SOD323	8.5	0.3	1	±22	12.5@2.5A	2.5	•	•

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

TVS Diode Arrays (continued)

Automotive Qualified (continued)

 SOD323  SOD523  uDFN-6L  SOT23-3  0201 DFN

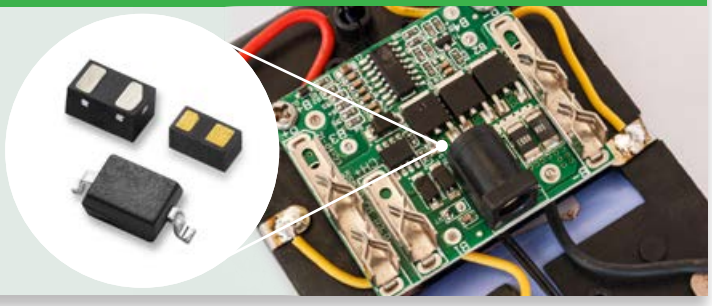
Series Name[1]	Package Type	Breakdown Voltage (V)	Capacitance (pF)	Channel	ESD Contact (V)	Clamping Voltage (tp = 8/20µs)	Max. Surge Rating (tp = 8/20µs) (A)	RoHS	AEC-Q101 Qualified
AQ36CANA-02HTG	SOT23-3L	40	23	2	±30	67@7A	8.0	•	•
AQ4337-01ETG	SOD882	8 typ	0.25	1	±15kV	6.5@7A	7.0	•	•
AQ7520-08UTG	DFN3810-9L	6.5	0.32	8	±12kV	4@6A	6.0	•	•
AQ7538-08UTG	DFN3810-9L	6	0.3	8	±22kV	10.9@2A	3.0	•	•
AQHVxx-01LTG	SOD523	13.3-42.4	25-60	1	±15-±30	16.5-55@1A	3-10.0	•	•
AQHVxx-01LTG-C	SOD523	13.3-43.5	13-30	1	±15-±30	18-58@1A	3-10.0	•	•
AQRV05-4HTG	SOT23-6	6	0.5	4	±30kV	15@12A	12.0	•	•
SM24CANB	SOT23-3	26.7	30	2	±30	34.0V@1A	10.0	•	•
SP3205-01ETG	SOD882	3.6	0.3	1	±30kV	7.5@1A	4	•	•
SP4322-01ETG	SOD882	6	0.4	1	±18kV	4@1A	11	•	•
SESD Ultra-Low Capacitance Discrete TVS	0201 DFN / 0402 DFN	9-9.8	0.1-0.2	1	±20	9.2-10.0V@2A	2.0	-	•
SESD Enhanced ESD Discrete TVS	0201 DFN / 0402 DFN	8.8-9.6	0.15-0.3	1	±22	13-14V@2.5A	2.5	•	•
SESD Ultra-Low Capacitance Diode Arrays	0402 DFN Array / 0802 DFN Array / 1004 DFN Array / 1103 DFN Array	9	0.2	2/4/6	±20	10.0V@2.2A	2.0	-	•
SESD Enhanced ESD Diode Arrays	0402 DFN Array / 1004 DFN Array	8	0.3	2 /4	±22	13V	2.2-2.5	•	•

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

How is the TVS Diode Array Used Here?

AQ1205-01ETG / AQ1205-01FTG / SC1205-01ETG / SC1205-01UTG Diode Arrays

These bidirectional diode arrays protect Battery Management System (BMS) with a low clamping, high ESD level, and robust surge event protection without any performance degradation.



How is the Protection IC Used Here?

LS2406ERQ33 eFuse Protection IC

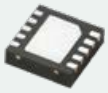
This Protection IC features Reverse Current Blocking, Soft-start Fast Role Swap and is an ideal USB Type-C Power Delivery protection solution.

Protection ICs

eFuse


DNF2x2_8

SOT23-3

DNF1.2x1.6

DNF3x3_10

QFN2.5x3.2_16

DNF2x3_8

Series Name[1]	Package Type	Voltage	Vmax (V)	Continuous Current (A)	Ron (mΩ)	Overcurrent Protection (A)	Overvoltage Protection (V)	Soft Start	Output Discharge	Reverse Blocking
LS0505EVD22	DFN2x2_8	5V	30	5	50	Adj	6.2	•	•	-
LS0504EVT233	SOT23-3		30	4	50	4	6.2	•	•	-
LS0504EDD12	DFN1.2x1.6_4		6	4	26	4.5	6.3	•	•	-
LS05006VPQ33	QFN3x3_20		28	0.6	250	-	6 (CC) 4.5 (SBU)	-	•	-
LS0502SCD33**	DFN3x3_10		18	2	100	Adj	Adj	•	•	•
LS1205EVD33	DFN3x3_10	12V	20	5	25	Adj	3.8/5.7/14.4	• (Adj)	•	-
LS1205EFD33	DFN3x3_10		20	5	25	Adj	14.4	• (Adj)	•	-
LS12052BD33	DFN3x3_10		20	5	25	Adj	14.4	• (Adj)	•	Control Pin
LS2406ERQ23	QFN2.5x3.2_16	24V	28	6	24	Adj	Adj	• (Adj)	•	•
LS2405IDD23	DFN2x3_8		28	5	35	-	-	-	-	•
LS24062RQ23	QFN2.5x3.2_16		28	6	24	Adj	Adj	• (Adj)	•	• Bi-direction

** Product series will be released and avalible in 2023 Q2. Please contact Littelfuse local sales for more details.

TVS Diodes

Surface Mount High Power and Axial Leaded High Power


SMDJ

SMTAK3

LTKAK3

15KPA

AK15

AK1-Y

Series Name[1]	Package Type	Reverse Standoff Voltage (VR)	Peak Pulse Power Range (PPP 10/1000µs)	Peak Pulse Current (IPP 8x20µs)	Operating Temperature	Halogen Free	RoHS Compliant	UL Recognized
8.0SMDJ	DO-214AB	12-110	8000W	293.8A-2613.7A (max)	-65°C - +150°C	•	•	•
LTKAK2	SMTO-218	150-170	-	2kA	-55°C - +125°C	•	•	*
SMTOAK2	SMTO-263	70	-	2kA	-55°C - +150°C	•	•	•
SMTAK3	SMTAK	15-76	-	3kA	-55°C - +125°C	•	•	•
LTKAK3	SMTO-218	66	-	3kA	-55°C - +125°C	•	•	•
LTKAK6	SMTO-218	58-76	-	6kA	-55°C - +125°C	•	•	•
LTKAK10	SMTO-218	58-86	-	10kA	-55°C - +125°C	•	•	•
5KP	P600	5.0-350	5000W	-	-55°C - +175°C	•	•	•
15KPA	P600	17-280	15000W	-	-55°C - +150°C	•	•	•
20KPA	P600	20-300	20000W	-	-55°C - +150°C	•	•	•
30KPA	P600	28-360	30000W	-	-55°C - +150°C	•	•	•
AK1	Axial Lead	76-430	-	1kA	-55°C - +125°C	•	•	•
AK1-Y	Axial Lead	76-430	-	1kA	-55°C - +125°C	•	•	•
AK3	Axial Lead	15-430	-	3kA	-55°C - +125°C	•	•	•
AK3-Y	Axial Lead	15-430	-	3kA	-55°C - +125°C	•	•	•
AK6	Axial Lead	30-430	-	6kA	-55°C - +125°C	•	•	•
AK6-Y	Axial Lead	30-430	-	6kA	-55°C - +125°C	•	•	•
AK10	Axial Lead	15-530	-	10kA	-55°C - +125°C	•	•	•
AK10-Y	Axial Lead	15-530	-	10kA	-55°C - +125°C	•	•	•
AK15	Axial Lead	58-190	-	15kA	-55°C - +125°C	•	•	•
AK15-Y	Axial Lead	58-190	-	15kA	-55°C - +125°C	•	•	•
AK20-Y	Axial Lead	16-76	-	20kA	-55°C - +125°C	•	•	*

*UR approval is pending

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

TVS Diodes (continued)

Surface-Mount Standard Application (200W-5000W)


SMF4L


SMAJ


SMA6L


SMBJ


SMCJ

Series Name[1]	Package Type	Reverse Standoff Voltage (VR)	Peak Pulse Power Range (PPP 10/1000µs)	Peak Pulse Current (IPP 8x20µs)	Operating Temperature	Halogen Free	RoHS Compliant	UL Recognized
SMF3.3	SOD-123FL	3.3	200W	-	-55°C - +150°C	•	•	•
SMF	SOD-123FL	5.0-250	200W	-	-65°C - +150°C	•	•	•
SMF4L	SOD-123FL	5.0-250	400W	-	-55°C - +150°C	•	•	•
SMAJ	DO-214AC	5.0-440	400W	-	-65°C - +150°C	•	•	•
P4SMA	DO-214AC	5.8-468	400W	-	-65°C - +150°C	•	•	•
SMA6J	DO-214AC	5.0-130	600W	-	-65°C - +150°C	•	•	•
SMA6L	DO-221AC	5.0-250	600W	-	-65°C - +150°C	•	•	•
SACB	DO-214AA	5.0-50	500W	-	-65°C - +150°C	•	•	•
SMBJ	DO-214AA	5.0-440	600W	-	-65°C - +150°C	•	•	•
P6SMB	DO-214AA	5.8-512	600W	-	-65°C - +150°C	•	•	•
1KSMB	DO-214AA	5.8-153	1000W	-	-65°C - +150°C	•	•	•
1.5SMB	DO-214AA	17.1-85.5	1500W	-	-65°C - +150°C	•	•	•
SMCJ	DO-214AB	5.0-440	1500W	-	-65°C - +150°C	•	•	•
1.5SMC	DO-214AB	5.8-512	1500W	-	-65°C - +150°C	•	•	•
3.0SMCJ	DO-214AB	5.0-58	3000W	-	-65°C - +150°C	•	•	•
3.0SMC	DO-214AB	20-33	-	365A-570A (max)	-65°C - +150°C	•	•	*
SMDJ	DO-214AB	5.0-440	3000W	21.5A-1630.5A (max)	-65°C - +150°C	•	•	•
4.0SMDJ	DO-214AB	10-24	4000W	650A-1480A (max)	-65°C - +150°C	•	•	•
5.0SMDJ	DO-214AB	12-170	5000W	136.5A-1382.2A (max)	-65°C - +150°C	•	•	•
5.0SMDJxxS	DO-214AB	6.0-60	5000W	258.5A-2669.7A (max)	-65°C - +150°C	•	•	•

*UR approval is pending

Axial-Leaded Standard Application (400W-1500W)


P4KE


P6KE


1.5KE

Series Name[1]	Package Type	Reverse Standoff Voltage (VR)	Peak Pulse Power Range (PPP 10/1000µs)	Peak Pulse Current (IPP 8x20µs)	Operating Temperature	Halogen Free	RoHS Compliant	UL Recognized
P4KE	DO-41	5.8-468	400W	-	-	•	•	•
SA	DO-15	5.0-180	500W	-	-	•	•	•
SAC	DO-15	5.0-150	500W	-	-	•	•	•
P6KE	DO-15	5.8-512	600W	-	-	•	•	•
1.5KE	DO-201	5.8-512	1500W	-	-	•	•	•
LCE	DO-201	6.5-90	1500W	-	-	•	•	•

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

How is the TVS Diode Used Here?

8.0SMDJ
High Power TVS Diode

This TVS Diode increases system robustness and reliability, reducing costly system outages and repairs and providing industrial protection up to 8 kW for high power density in a compact package.

TVS Diodes (continued)

Avionics and High Reliability Axial Lead


15KPA-HR


30KPA-HR

Series Name[1]	Package Type	Reverse Standoff Voltage (VR)	Peak Pulse Power Range (PPP 10/1000µs)	Peak Pulse Current (IPP 8x20µs)	Operating Temperature	Halogen Free	RoHS Compliant	UL Recognized
TLP/TLPA	P600	10-40	5000W	-	-55 to 175°C	•	•	-
5KPA-HR/5KPA-HRA	P600	5.0-220	5000W	-	-55 to 175°C	•	•	-
15KPA-HR/15KPA-HRA	P600	17-280	15000W	-	-55 to 175°C	•	•	•
30KPA-HR/30KPA-HRA	P600	28-345	30000W	-	-55 to 175°C	•	•	•

Avionics and High Reliability Surface Mount


SMBJ-HR


SMCG-HR


SMCJ-HR

Series Name[1]	Package Type	Reverse Standoff Voltage (VR)	Peak Pulse Power Range (PPP 10/1000µs)	Peak Pulse Current (IPP 8x20µs)	Operating Temperature	Halogen Free	RoHS Compliant	UL Recognized
SMAJ-HR/SMAJ-HRA	DO-214AC	6.0-45	400W	-	-65 to 150°C	•	•	•
SMBJ-HR/SMBJ-HRA	DO-214AA	5.0-170	600W	-	-65 to 150°C	•	•	-
SMBLCE-HR/SMBLCE-HRA	DO-214AA	6.5-70	600W	-	-65 to 150°C	•	•	-
SMCG-HR/SMCG-HRA	DO-215AB	5.0-120	1500W	-	-65 to 150°C	•	•	•
SMCJ-HR/SMCJ-HRA	DO-214AB	5.0-170	1500W	-	-65 to 150°C	•	•	•
SMDJ-HR/SMDJ-HRA	DO-214AB	5.0-170	3000W	-	-65 to 150°C	•	•	•
5.0SMDJxxS-HRA	DO-214AB	6.0-60	5000W	-	-65 to 150°C	•	•	•

Protection Semiconductors Wafer and Bare Die



Wafer and Bare Die

Series Name[1]	Description	Direction	Forward Zener Voltage VZ Max. (V)	Reverse Zener Voltage VZ Max. (V)	ESD Protection Contact (kV)	Reverse Stand off Voltage VR (V)	Peak Pulse Power P_{PPM} (W)	Peak Pulse Current Ipp (10/1000µs) (A)
WB07B0606LG	Wire Bond Zener Diode Die	Bi-directional	7.0	6.8	± 8	-	-	-
FC09B1606NL-0 / FC09B1606NS-0	Flip Chip Zener Die	Bi-directional	10.5	10.5	± 8	-	-	-
SZW200 / SZD200	Planar TVS Wafer / Die for Automotive and High Reliability	Bi-directional	-	-	-	24-36	5000	128.30-85.60

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

Littelfuse offers a wide range of TVS and Protection Thyristors products in bare die form with different power levels, voltages, and tolerances. Please contact your local Littelfuse sales for further details.

Automotive TVS Diodes

Automotive Axial Lead


SLD


TP1.5KE


TP6KE

Series Name[1]	Package Type	Reverse Standoff Voltage (VR)	Peak Pulse Power Range (PPP 10/1000µs)	Operating Temperature	Halogen Free	RoHS Compliant	UL Recognized	AEC-Q101 Qualified
TP6KE	DO-204AC	11.10-77.80	600W	-55 to 175°C	•	•	•	•
TP1.5KE	DO-201	10.20-40.20	1500W	-55 to 150°C	•	•	•	•
TP5KP	P600	11-60	5000W	-55 to 150°C	•	•	•	•
SLD	P600	11-60	5000W	-55 to 175°C	•	•	•	•

Automotive Surface Mount


SLD8S


SZ1SMA


TPSMB


TPSMC


TPSMF-4L

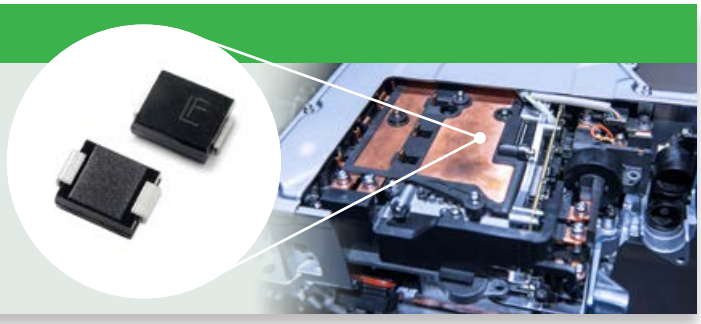
Series Name[1]	Package Type	Reverse Standoff Voltage (VR)	Peak Pulse Power Range (PPP 10/1000µs)	Operating Temperature	Halogen Free	RoHS Compliant	UL Recognized	AEC-Q101 Qualified
SZSMF	SOD–123FL	5-58	200W	-55 to 150°C	•	•	-	•
SZSMF4L	SOD-123FL	5.0-78	400W	-55 to 175°C	•	•	•	•
TPSMF4L	SOD-123FL	5.0-85	400W	-55 to 150°C	•	•	•	•
SZ1SMA	DO-214AC	5.0-170	400W	-65 to 150°C	•	•	•	•
TPSMA6L	DO-221AC	5.0-85	600W	-65 to 150°C	•	•	•	•
SZ1SMB	DO-214AA	5.0-170	600W	-65 to 150°C	•	•	•	•
SZP6SMB	DO-214AA	5.8-171	600W	-65 to 150°C	•	•	•	•
TPSMB	DO-214AA	6.4-553	600W	-65 to 150°C	•	•	•	•
TPSMB Asymmetric	DO-214AA	26/16	600W	-65 to 175°C	•	•	•	•
TPSMB-VR	DO-214AA	6.5-440	600W	-65 to 150°C	•	•	•	•
SZ1.5SMC	DO-214AB	5.8-77.8	1500W	-65 to 150°C	•	•	•	•
SZ1SMC	DO-214AB	5.0-78	1500W	-65 to 150°C	•	•	•	•
TPSMC	DO-214AB	10.20-256	1500W	-65 to 150°C	•	•	•	•
TPSMC-VR	DO-214AB	11.0-200	1500W	-65 to 150°C	•	•	•	•
TPSMD	DO-214AB	10.0-400	1500W	-65 to 150°C	•	•	•	•
SZ5KASMC	DO-214AB	10-36	5000W	-65 to 175°C	•	•	•	•
TP5.0SMDJ	DO-214AB	40-170	5000W	-65 to 150°C	•	•	•	•
SLD5S	SMTO-263	14-40	3600W	-55 to 150°C	•	•	•	•
SLD6S	SMTO-263	14-57	4600W	-55 to 150°C	•	•	•	•
SLD8S	SMTO-263	14-64	7000W	-55 to 175°C	•	•	•	•

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

How is the Automotive TVS Diode Used Here?

TP5.0SMDJ
Automotive Grade TVS Diode

This TVS Diode offers 5 kW surge capability in DO-214AB compact package for robust protection in general automotive electronics.



PLED Bypass Protectors

PLED Bypass Protectors

 PLED

 PLEDxUx

 PLEDxN

 PLED Ultra Low

 PLEDxUSxA

Series Name[1]	QFN3X3	DO-214	SOD-123	VBR breakdown Volts	IH mAmps	IS mAmps Max	IT@VT Amps Max	VT and IT Volts Max
PLED	•	•	-	6 - 18	5	100	1	1.2
PLEDxUx	•	•	-	6 - 35	30	50	1	1.2
PLEDxN	-	-	•	6	12	70	1	1.2
PLED Ultra Low	-	•	-	58 - 430	21	800	1	2
PLEDxUSxA	-	•	-	6 - 9	5	100	1	1.2

Automotive PLED Bypass Protectors

 PLEDxS-A

 PLEDxUx-A

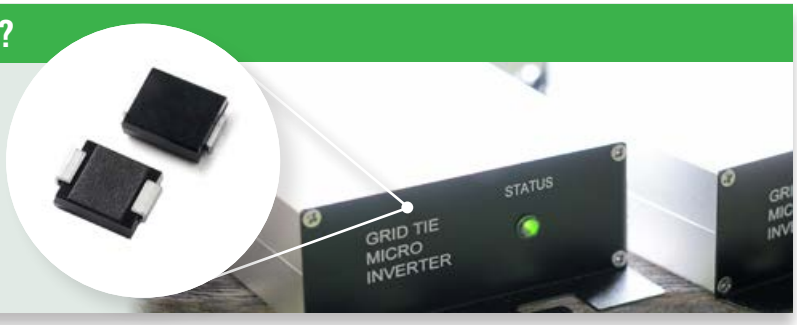
Series Name[1]	QFN3X3	DO-214	SOD-123	VDRM Volts	VS Volts	IH mAmps	IS mAmps Max	IT@VT Amps Max	VT and IT Volts Max
PLEDxS-A	-	•	-	6 - 18	27-55	5	100	1	1.2
PLEDxUx-A	-	•	-	6 - 35	27-83	30	50	1	1.2

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

How is the SIDACtor® Device Used Here?

Pxxx0S3N
High Power SIDACtor® Protection Thyristor

Highly reliable 3 kA surge current capability, unlike alternative technologies with lifetime and reliability limitations.



SIDACtor® Protection Thyristors

High-Exposure Surge Protection

 Modified TO-220

 TO-262M

 TO-218

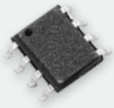
 DO-214AA

Series Name[1]	Package Type	Surge Rating	Standoff (working) Voltage (V_{DRM})	Switching Voltage (V_S)	Peak Pulse Rating			RoHS Compliant	UL Recognized
					2/10µs	10/1000µs	8/20µs		
Pxxx2AC	Modified TO-220	C	50-550	80-700	500	100	400	•	•
Pxxx3AC	Modified TO-220	C	130-420	180-600	500	100	400	•	•
Pxxx0SD	DO-214AA	D	6-320	25-400	1000	200	800	•	•
Pxxx0S3N	DO-214AB	B	6-350	25-430	-	-	2500 (6V-30V) 3000 (58V-350V)	•	•
Pxxx0FN	TO-262M	N	58-350	77-430	-	-	3000	•	•
Pxxx0ME	TO-218	E	140-450	180-600	-	1100	5000	•	•

Subscriber Line Interface Circuit (SLIC) Protection

 Modified DO-214AA

 MS-013

 MS-012

 DO-214AA

 3.3x3.3 QFN

Series Name[1]	Package Type	Surge Rating	Standoff (working) Voltage (V_{DRM})	Switching Voltage (V_S)	Peak Pulse Rating			RoHS Compliant	UL Recognized
					2/10µs	10/1000µs	8/20µs		
Pxxx1Q22C	3.3x3.3 QFN	C	58-160	77-200	500	100	400	•	•
Pxxx1Cx2	Modified DO-214AA	A	58-160	77-200	150	45	150	•	•
		B			250	80	250	•	•
Bxxx0Cx	Modified DO-214AA	A	|-Vref| +|-1.2V|	|-Vref| +|-10V|	150	45	150	•	•
		C			500	100	400	•	•
Pxxx1S	DO-214AA	A	18-160	40-200	150	45	150	•	•
		C	58-160	77-200	500	100	400	•	•
		D	58-160	77-200	1000	200	800	•	-
PxxxxDF	MS-012 (SOP-8)	F	58-160	77-200	120	30	100	•	-
B61089BDR	MS-012 (SOP-8)	-	170	-	180	35	170	•	-
B61089QDR	MS-012 (SOP-8)	-	170	-	180	35	170	•	-
Pxxx1U	MS-013	A	58-160	77-200	150	45	150	•	•
		C			500	100	400	•	•
Bxxx1Ux	MS-013	A	|-Vref| +|-1.2V|	|-Vref| +|-10V|	150	45	150	•	•
		C			500	100	400	•	•
Bxxx1UC4	MS-013	C	|-Vref| +|-1.2V|	|-Vref| +|-10V|	500	100	400	•	•
B3xx4Ux	MS-013	A	|-Vref| +|-1.2V|	|-Vref| +|-10V|	150	45	150	•	•
		C			500	100	400	•	•

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

SIDACtor® Protection Thyristors (continued)

SIDACtor® Devices

 DO-214AA

 SOT23-6

 3x3 QFN

 5x6 QFN

 Modified MS-013

Series Name[1]	Package Type	Surge Rating	Standoff (working) Voltage (V_{DRM})	Switching Voltage (V_S)	Peak Pulse Rating			RoHS Compliant	UL Recognized
					2/10µs	10/1000µs	8/20µs		
PxxxxS4x	SOD-123FL	B	6-15	25-32	200	55	200	•	•
Pxxx0S1x	DO-214AC	A	6-320	25-400	150	50	150	•	•
		B			250	55	250	•	•
Pxxx0Sx	DO-214AA	A	6-320	25-400	150	45	150	•	•
		B	6-400	25-530	250	80	250	•	•
		C			500	100	400	•	•
Pxxx0SAMC	DO-214AA	A	6-25	25-40	150	45	150	•	•
		C	6-400	25-530	500	100	400	•	•
Pxxx2Sx	DO-214AA	A	58-550	77-700	150	45	150	•	•
		B	58-800	77-960	250	80	250	•	•
		C	280-640	360-850	500	100	400	•	•
Pxxx2SxLH	DO-214AA	B	400	570	250	65	250	•	•
		C	400	530	500	100	500	•	•
		D	275-400	380-570	600	130	550	•	•
SDPxxx0T023G5	SOT23-5	G	8-24	15-35	-	-	50	•	•
SDP	SOT23-6	G	19	29	-	-	30	•	•
DSLP	SOT23-6	G	12-24	22-34	-	-	30	•	•
Pxxx0Q12x	3x3 QFN	A	6-320	25-400	150	45	150	•	•
		B			250	80	250	•	•
Pxxx0Q22C	3.3x3.3 QFN	C	6-400	25-530	500	100	400	•	•
Pxxx0Q22xLH	3.3x3.3 QFN	D	400	570	600	130	550	•	•
SDPxxx0Q38C	5x6 QFN	C	6-320	25-400	500	100	400	•	•
SEPxxxxQ38	5x6 QFN	B	6-75	25-98	250	80	250	•	•
		C			500	100	430	•	•
AxxxxUx6	Modified MS-013	A	50-270	80-340	150	45	150	•	•
		B			250	80	250	•	•
		C			500	100	400	•	•
Pxxx3U	Modified MS-013	A	130-420	180-600	150	45	150	•	•
		B			250	80	250	•	•
		C			500	100	400	•	•

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

SIDACtor® Protection Thyristors (continued)

SIDACtor® Devices (continued)

 Modified MS-013

 Modified TO-220

 TO-92

Series Name[1]	Package Type	Surge Rating	Standoff (working) Voltage (V_{DRM})	Switching Voltage (V_S)	Peak Pulse Rating			RoHS Compliant	UL Recognized
					2/10µs	10/1000µs	8/20µs		
Pxxx4Ux	Modified MS-013	A	12-640	50-800	150	45	150	•	•
		C			500	100	400	•	•
Pxxx4UCMC	Modified MS-013	C	12-600	50-800	500	100	400	•	•
Pxxx6U	Modified MS-013	A	130-420	180-600	150	45	150	•	•
		B			250	80	250	•	•
		C			500	100	400	•	•
Pxxx2Ax	Modified TO-220	A	50-550	80-700	150	45	150	•	•
		B			250	80	250	•	•
		C			500	100	400	•	•
Pxxx2ACMC	Modified TO-220	C	25-275	40-350	500	100	400	•	•
Pxxx3Ax	Modified TO-220	A	130-420	180-600	150	45	150	•	•
		B			250	80	250	•	•
		C			500	100	400	•	•
Pxxx3ACMC	Modified TO-220	C	130-420	180-600	500	100	400	•	•
Pxxx0EA	TO-92	A	6-320	25-400	150	45	150	•	•
		B			250	80	250	•	•
		C			500	100	400	•	•
Pxxx0ECMC	TO-92	C	6-320	25-400	500	100	400	•	•

Automotive SIDACtor® Devices

 DO214-AA

Series Name[1]	Package Type	Surge Rating	Standoff (working) Voltage (V_{DRM})	Switching Voltage (V_S)	Peak Pulse Rating			RoHS Compliant	UL Recognized
					2/10µs	10/1000µs	8/20µs		
Pxxx0Sx-A	DO214-AA	A	6-275	25-350	150	45	150	•	•

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

Circuit Breakers

Series[1]	A-Series	B-Series	TB-Series	C-Series
				
Poles	1-6 (handle) 1-3 (rocker/toggle)	1-6	2	1-6 (handle) 1-3 (rocker/toggle)
Actuator Style	sealed metal toggle, handle, rocker, paddle	handle, rocker	handle	sealed metal toggle, handle, rocker
Available Delays	AC, DC, AC/DC: instantaneous, ultrashort, short, medium & long AC, DC: high inrushshort, medium & long	AC, DC, AC/DC: instantaneous, ultra-short, short, medium & long AC, DC: high inrushshort, medium & long	AC: ultrashort, short, medium, long, high inrush	AC, DC, AC/DC: instant, ultrashort, short, medium & long AC, DC: high inrush-short, medium & long
Max Current & Voltage Ratings	0.02-30A@ 277VAC, 80VDC 31.0-50A@125/250VAC, 65VDC	0.02-30A@277VAC, 80VDC 0.02-30A@125/250VAC, 65VDC	.1-20A@120/240VAC	UL Listed: 0.02-250A@80VDC 0.1-100A@125VDC 0.02-70A@120VAC 0.02-20A@240VAC UL Recognized: 0.02-30A@480WYE/277VAC 2 Pole, 1Ø 3 Pole, 3Ø 0.02-50A@277VAC 0.02-100A@250VAC, 80VDC 0.02-100A@120/240VAC, 65VDC
Max Interrupting Capacity	7,500 amps	7,500 amps	10,000 amps; 5,000 amps TUV	10,000 amps
Auxiliary Switch Rating	10.1A@125VAC 0.1A@125VAC (gold contacts) 0.5A@65VDC 0.1A@80VDC	10.1A@125 VAC 0.1A@125 VAC (gold contacts) 0.5A@65 VDC 0.1A@80 VDC	10.1A@125 VAC 0.1A@125 VAC (gold contacts) 0.5A@65 VDC 0.1A@80 VDC	10.1A@250 VAC 0.1A@125 VAC (gold contacts) 0.5A@80 VDC
Available Circuits	series, shunt, relay, switch only, series with remote shutdown, relay & shunt trip dual coil	series, shunt, relay, switch only, series with remote shutdown, relay & shunt trip dual coil, mid-trip with alarm switch	series trip	series, shunt, relay, switch only, series with remote shutdown, relay & shunt trip dual coil, mid-trip with alarm switch
Terminal Options	.250" QC tabs, 8-32 & 10-32 screw (& metric), PCB	.250" QC tabs, 8-32 & 10-32 screw (& metric), PCB	8/32, 10/32, M4, M5 back connection	10-32 stud, 1/4-20 stud, 10-32 screw with saddle clamp, 7/16 clip & push-In
Mounting Method	threaded inserts: front panel snap-in	threaded inserts: front panel snap-in	threaded inserts	threaded inserts
Agency Approvals	UL 489A, UL 1077, UL 1500, UL 508, CSA Accepted, TUV and VDE certified to IEC/EN 60934, CCC	UL 489, UL 489A, UL 1077, UL 1500, UL 508, cULus, CSA Accepted, TUV and VDE certified to IEC/EN 60934, CCC	UL 489, cULus, TUV certified to IEC/EN 60947-2	UL 489, UL 489A, UL 1077, UL 1500, UL 508, CSA Accepted, CSA Certified, TUV and VDE certified to IEC/EN 60934, TUV certified to IEC/EN 60947-2, CCC

(1) Details information about product series listed here, please visit www.carlingtech.com

Manufacturer reserves the right to change product specification without prior notice.

Circuit Breakers (continued)

Series[1]	CX-Series	D-Series	E-Series	F-Series
				
Poles	1-5	1-4 (handle) 1-3 (rocker)	1-6	1-3
Actuator Style	handle, 1 per pole	curved rocker, visirocker (1 per unit), handle (1 per pole/ unit)	handle	handle
Available Delays	DC: instant, ultrashort, short, medium & long	AC, DC, AC/DC: instant, ultra-short, short, medium, long AC, DC: high inrushshort,medium, long	AC, DC, AC/DC: instant, short, medium & long, high inrush-short, medium & long	AC, DC: short, medium & long
Max Current & Voltage Ratings	UL Listed: 0.2-15A @ 250/500VDC 0.2-50A @ 205/410VDC UL Recognized: 0.2-115A @ 600VDC	0.02-50A@277VAC, 65VDC 0.02-30A@480WYE /277VAC 2 Pole 1Ø 3 Pole 3Ø	UL Listed: 0.02-100A@240VAC, 80VDC, 125VDC UL Recognized: 0.02-100A@277VAC, 160VDC, 1 pole 0.02-100A@600VAC, 2 Pole 1Ø, 3 pole 3Ø 0.02-120A@125VDC, 1 pole	UL489 Listed: 50-250A@125VDC 100-250A@120/240VAC 100-250A@277VAC 100-250A@208Y/120, 3ØVAC UL489A Listed: 250-700A@125VDC
Max Interrupting Capacity	10,000 amps	5,000 amps	10,000 amps	50,000 amps
Auxiliary Switch Rating	20A@80 VDC (GO circuit)	n/a	10.1A@250VAC 1.0A@65VDC 0.1A@80VDC	10.1A@250VAC 0.5A@65VDC 0.1A@80VDC
Available Circuits	series trip	series, switch only, series with remote shutdown	series, shunt,relay, switch only, series with remote shutdown	series & switch only with or without metering shunt
Terminal Options	10-32 or M5 screw terminals 1/4-20 or M6 threaded stud	recessed wire-ready, pressure plate type screw terminals	10-32 stud, 1/4-20 stud 0-32 screw, 1/4-20 screw, box wire connector	3/8-16 stud, 3/8-16 screw & box wire connector
Mounting Method	threaded insert: #6-32 UNC-2B, or M3X0.5-6H B ISO (2 per pole)	rear mounted on DIN rail or front panel mounted	rear or front panel	rear or front panel
Agency Approvals	UL 489, UL 489B, UL 1077, cRUus, cULus, and TUV certified to IEC/EN 60947-2, CCC	UL 1077, UL 508, CSA Accepted and VDE certified to IEC/EN 60934	UL 489, UL 1077, UL 1500, CSA Accepted, CSA Certified and VDE certified to IEC/EN 60934, CCC	UL 489, UL 489A, cULus, TUV certified to IEC/EN 60934, CCC

(1) Details information about product series listed here, please visit www.carlingtech.com

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Circuit Breakers (continued)

Series[1]	G-Series	H-Series	J-Series	K-Series
				
Poles	1-3 (UL Listed) 1-4 (UL Recognized)	1-3	1-3	1
Actuator Style	handle	handle, rocker (curved & flat)	curved rocker, flat rocker, push-to-reset guard, handle	handle
Available Delays	AC, DC: instantaneous, ultrashort, short, medium & long AC, DC: high inrush-short, medium & long	AC, DC: instantaneous, ultra-short, short, medium & long	AC: ultrashort, short, medium, long, high inrush	DC: instantaneous, short & medium
Max Current & Voltage Ratings	UL Listed: 1-50A@80VDC 1-50A@125VDC 1-50A@120VAC 1-50A@120/240VAC 1-25A@240VAC UL Recognized: 0.2-80A@80VDC 0.2-63A@240VAC 0.2-63A@480YVAC	1-35A@ 65VDC, 80VDC, 250VAC	1-20A@ 240 VAC	1-30A@65 VDC, 80 VDC, 250 VAC
Max Interrupting Capacity	5,000 amps	3,000 amps	10,000 amps; 5,000 amps TUV	1,000 amps
Auxiliary Switch Rating	3A@125VAC 2A@30VDC	1.0A @ 65VDC/0.5A @ 80VDC, 0.1A @ 125VAC (gold contacts)	n/a	n/a
Available Circuits	series, switch only	series, switch only, relay trip	series trip	series trip
Terminal Options	recessed wire-ready, pressure plate type screw terminals	.250" QC tabs, 8-32 & 10-32 screw (& metric), PCB	8/32, 10/32, M4, M5	PCBA soldering terminal (0.197) push-on 0.250 Tab (Q.C) screw terminal 8-32 (bus type)
Mounting Method	rear mounted on DIN rail	threaded inserts	threaded inserts	threaded insert with and without hook
Agency Approvals	UL 489, UL 1077, cRUus, CSA Accepted, TUV certified to IEC/EN 60934, CCC	UL 1077, CSA Accepted, TUV certified to IEC/EN 60934, CCC	UL 489, cULus, TUV certified to IEC/EN 60947-2, CCC	UL 489A, UL 1077, CSA 22.2 No. 235, TUV IEC/EN 60934, CCC GB17701

(1) Details information about product series listed here, please visit www.carlingtech.com

Manufacturer reserves the right to change product specification without prior notice.

Circuit Breakers (continued)

Series[1]	L-Series	M-Series	MS-Series	N-Series
				
Poles	1-3	1-2	1-3	1-2
Actuator Style	rocker, with or without guard	rocker (curved & flat), visi-rocker, paddle, baton, push-to-reset & push-pull pushbuttons	sealed metal toggle	flush rocker, with or without push-to-reset guard
Available Delays	AC: ultrashort, short, medium, long, short-high inrush, medium-high inrush, long-high inrush	AC/DC: instantaneous, short, medium, hi-inrush	DC: instantaneous, short & medium	AC: ultrashort, short, medium, long, short-high inrush, medium-high inrush, long-high inrush
Max Current & Voltage Ratings	.1-32A@120/240VAC .1-20A@415/240VAC, 3 pole	1 Pole: 0.02-15FLA@32VDC,125VAC 15.1-25GPA@32VDC,125VAC 0.02-12FLA@250VAC 0.02-7.5GPA@50VDC 0.02-30GPA@65VDC, 80VDC 2 Pole: 0.02-15FLA@65VDC, 250VAC 15.1-25GPA@65VDC, 250VAC Parallel Pole: 31-50GPA@80VDC	0.2-30A@ 65VDC 240VAC, 120/240VAC	1-20A@240/277VAC 1-30A@120/240VAC
Max Interrupting Capacity	5,000 amps	1,000 amps; 600 amps TUV; 500 amps VDE	3,000 amps	22,000 amps; 10,000 amps for single pole
Auxiliary Switch Rating	n/a	7A@250VAC 0.1A@125VAC (gold contacts) 7A (res.)@28VDC 4A (ind.)@28VDC 0.25A@80VDC	5A @ 125VAC 3A @ 32VDC .1A @ 125VAC, 32VDC	n/a
Available Circuits	series trip	series and switch only parallel pole	series and switch only	series trip
Terminal Options	10-32, 8-32, M5 & M4 screw	.250" QC tabs, 8-32 screw with upturned lugs, 8-32, 10-32 screw (bus type), push in stud terminals	.250" QC tabs 8-32 screw & solder type	screw terms
Mounting Method	threaded insert: #6-32 UNC-2B, or M3X0.5-6H B ISO (2 per pole)	snap-in front panel threaded bushing	front panel	threaded insert: #6-32 x .195 inches ISO M3x 5mm
Agency Approvals	UL 489, cULus, TUV certified to IEC/EN 60934, CCC	UL 489A, UL 1077, CSA Accepted, TUV & VDE certified to IEC/EN 60934, CCC	UL 1077, cRUus, TUV certified to IEC/EN 60934	UL 489A, TUV certified to IEC/EN 60947-2

(1) Details information about product series listed here, please visit www.carlingtech.com

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- Resettable Positive Temperature Coefficient (PPTC) Devices

Overvoltage Suppression
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- TVS Diode Arrays
- PLED Series Open LED Protectors
- SIDACtor® Protection Thyristors
- PulseGuard® ESD Suppressors
- Switching Thyristors
- TVS Diodes
- Varistors
- Power Control
- TRIAC Thyristors

Power Semiconductors
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- Bare Die Devices
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- Slide Switches
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- Switchlock Switches
- Rotary Switches

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- Wire to Wire connectors
- Harness Solutions

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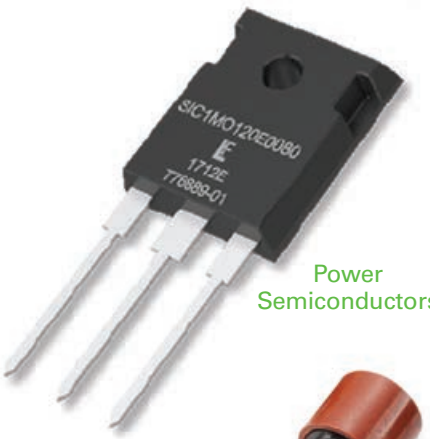
Our industry-leading product portfolio includes reliable circuit protection, power control, and sensing products that are designed for a variety of markets and applications. We have assembled unparalleled expertise and developed a global footprint that puts our facilities close to our customers and target markets. As our global manufacturing and R&D teams objectively recommend the best circuit protection, power control, or sensing solution for each customer application, they form partnerships that will lead to the development of the next generation of advanced products.

Littelfuse provides:
- Application Expertise
- Global Support
- Operational Excellence
- Technology Innovation
- Collaboration
- Customer Focus


Reed Switches


Thermistors


Gas Discharge Tubes



Power Semiconductors


Metal Oxide Varistors


Radial Leaded Fuses


Multi-Layer Varistors

Additional Resources

Sensing Products Selection Guide
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Power Semiconductor Selection Guide
This selection guide offers a comprehensive look at the breadth and depth of the IXYS: A Littelfuse Technology power semiconductor and control IC portfolio.

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Surface Mount Fuses


Fuses


Circuit Breakers

Global Lab Capabilities

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- High- & Low-Temperature Storage
- High-Temperature Loading
- Ingress Protection (IP)
- HTGB
- HTRB
- Temperature & Humidity
- Temperature Cycling
- Thermal Shock
- Salt Fog

Physical-Mechanical Characteristics

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- Leak Detection
- Mechanical Shock
- Resistance to Soldering Heat (Dip, Reflow, Wave)
- Resistance to Solvents
- Solderability
- Terminal Strength (Push, Pull, Bend)
- Vibration
- Wetting Balance
- Wire Pull

Electrical

- BCI
- Capacitance
- EFT
- ESD
- Impedance
- Insulation Resistance
- I-V
- Life
- Lightning Surge
- Overload
- Parametric Tests
- Power-Cross
- Power Cycling
- Ring Wave
- R-T
- S-Parameter Measurements (Insertion Loss, Isolation, Reflection)
- Short Circuit
- Step Current
- Surface Resistivity
- Surge
- TDR (Eye Diagram)
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