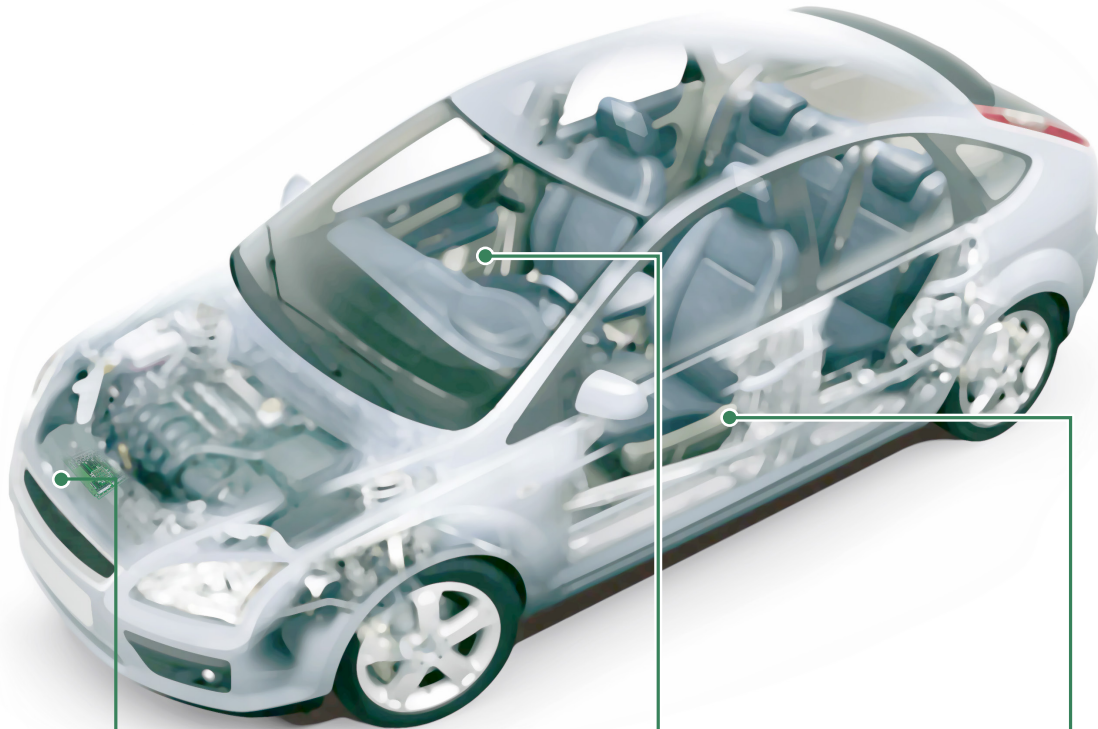


Littelfuse PolySwitch devices for automotive applications offer overcurrent, overvoltage, PCB trace fault, and thermal protection for your vehicle's sensitive electronics.

# Circuit Protection Devices for Automotive



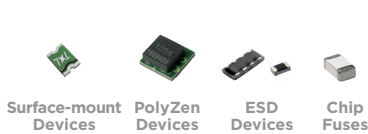
## ELECTRONIC CONTROL MODULES



Surface-mount Devices

Radial-leaded Devices

## INFOTAINMENT



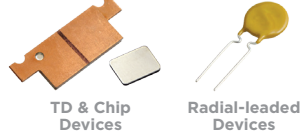
Surface-mount Devices

PolyZen Devices

ESD Devices

Chip Fuses

## SMALL & MEDIUM MOTORS



TD & Chip Devices

Radial-leaded Devices

## Applications

- Motor and motor control including power doorlocks, mirrors, lumbar pumps, seats, sunroofs and windows
- Electronic Control Unit (ECU) I/O
- HVAC Motor and I/O
- Telematics, infotainment and navigations systems
- LCD back-light heater protection and wire downsizing
- Power and cigarette lighter outlets, plugs and adapter/chargers
- Powered networks and busses
- Air-flow detection and overcurrent protection in HVAC and cooling fan systems
- Stall detection in express window and sunroof circuits
- Power distribution, electrical centers and junction box resettable overcurrent protection
- ESD damage, load dump and other transient voltage protection
- Secondary thermal protection for ABS, glow plugs, cooling fans

## Features

- Overcurrent, overvoltage and overtemperature circuit protection devices
- Resettable and single-use overcurrent devices
- Wide range of form factor and termination methods
- Wide range of dedicated automotive surface-mount and through-hole resettable overcurrent devices
- High-performance, transient-voltage

## Benefits

- Expertise from the world's leading resettable overcurrent protection manufacturer
- High quality/reliability products from the world's largest passive component manufacturer
- Worldwide team dedicated to support automotive applications
- Products meet applicable automotive industry standards
- Devices compatible with high-volume electronics assembly

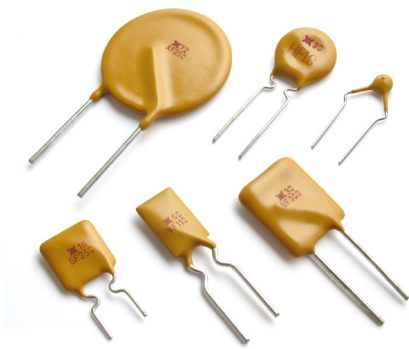
# PolySwitch PPTC Resettable Overcurrent Protection Devices

PolySwitch PPTC (Polymeric Positive Temperature Coefficient) resettable devices help reduce warranty costs and increase end-customer satisfaction. PolySwitch devices offer advantages over competitive technologies:

- PolySwitch devices are in-rush current tolerant. When using PolySwitch devices, lower current values are required, permitting wire size reductions, with resulting harness cost, weight and volume savings
- PolySwitch devices work in coordination with the components they help protect, providing automatic temperature compensation
- PolySwitch devices can be installed permanently inside modules and motors, allowing intermittent-use vehicle systems to be smaller and less costly
- PolySwitch devices typically do not require user access; protection can be put where needed, without the necessity to loop back and forth to a fuse box
- Unlike pluggable fuses, PolySwitch devices installed on a PCB cannot be readily removed to circumvent necessary warning indicators
- Unlike single-use fuses, PolySwitch devices cannot readily be substituted for an incorrect and often unsafe fuse rating
- The PolySwitch device's solid-state construction is more reliable than the mechanical contacts found in bimetal circuit-breakers

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## Wide Range of Devices Available for Automotive Applications That Meet the Latest Industry Standards



### PolySwitch Radial-Leaded Devices

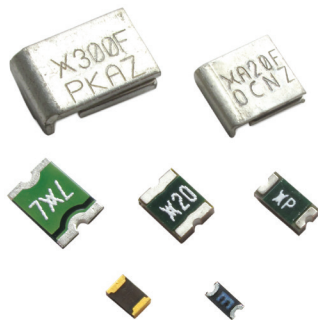
PolySwitch through-hole devices represent a comprehensive and complete range of PPTC overcurrent protection for the car, truck and bus industries. Littelfuse offers a wide range of devices qualified to rigorous automotive standards (following the AECQ200 specification).

#### Features

- Current ratings up to 15A
- Voltage ratings up to 72V<sub>DC</sub>
- Compatible with high-volume, automatic insertion, electronic assembly processes
- Very low electrical resistance
- Broad range of through-hole PPTC devices available with small current increments. Temperature range: -40°C/+85°C or +125°C
- RoHS compliant, lead and halogen free

#### Benefits

- Can be used in applications that require current values up to 15A
- Devices available for both existing and future vehicle electrical systems (12V, 24V, 48V systems)
- Low installation cost
- Low voltage drop
- Many available electrical and physical sizes facilitate the most precise protection design. Can be used for in-cabin and under-the-hood applications



### PolySwitch Surface-Mount Devices

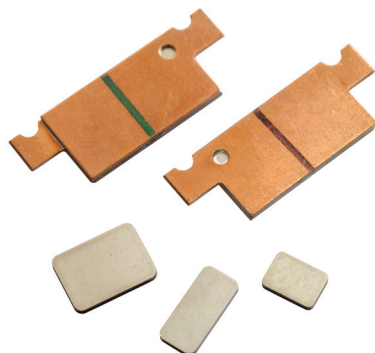
For over 25 years PolySwitch Surface-Mount Devices (SMD) have proven their reliability and capability in helping to protect computer and consumer electronics against temporary overcurrent faults. The PolySwitch SMD product family has been extended to include a range of devices, which are qualified to strict automotive standards (following the AECQ200 specification). As a result, they are suitable for protecting Electronic Control Units (ECUs) against damage from faults that would otherwise require costly, complete module replacement.

#### Features

- Current ratings up to 3A
- Voltage ratings up to 60V<sub>DC</sub>
- A wide range of current ratings available
- Small size down to 1608mm (0603 mils)  
Temperature range -40°C/+85°C or +125°C

#### Benefits

- Suitable for ECU I/O and trace protection
- Devices available for both current and future vehicle electrical systems (12V, 24V, 48V systems)
- Maximum design flexibility
- Minimizes circuit-board space, weight and cost
- Can be designed in cabin or under-the-hood applications



### Customized PolySwitch Devices for DC Motor Protection

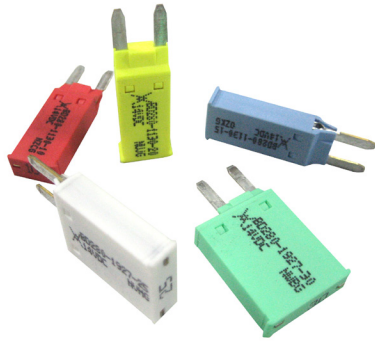
PolySwitch devices have become the de facto standard for helping protect intermittent-use automotive motors. Customized shapes able to accommodate the physical and operational demand for each motor has made these devices ubiquitous in seat, window, sunroof and door-lock applications. Their solid-state construction helps provide reliable operation for the life of the vehicle.

#### Features

- Reacts to both overcurrent and thermal failure mechanisms
- Time to activate can be tailored for each application
- No contacts to arc and erode
- Solid-state construction
- Can be configured to react to changes in air-flow

#### Benefits

- Helps protect motors from stall damage
- Adaptable to normal motor operational cycles
- Very high cycle-life with near zero EMI transmission
- Shock and vibration resistant
- Fast reaction to fan stall in engine cooling and HVAC fan applications



### PolySwitch Bladed Devices

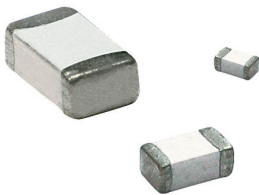
Useful in helping to provide resettable overcurrent protection for passenger vehicle and heavy truck wire harnesses, the PolySwitch bladed contact device features a 2.8mm and 5.4mm form factor to facilitate easy, one-to-one replacement of mini-sized fuses and Type II bimetal circuit protection devices in 12V vehicle systems.

#### Features

- 2.8mm and 5.4mm terminals
- Latches on first trip
- PPTC resistance switching action
- Constant wattage power dissipation when tripped
- Solid-state construction
- Probe points
- Bright color coded housing (based on hold current rating)
- Temperature range: -40°C to 125°C

#### Benefits

- Easy to implement, reliable solid-state resettable overcurrent protection
- Long, safe performance life
- Resilient at minimum and maximum voltage
- Resistance to shock and vibration and loads
- Facilitates fault finding
- Color recognition inspection possible
- Less chance of mis-installation
- Offers resettable overcurrent protection even in under-the-hood applications



### Surface-Mount Chip Fuses

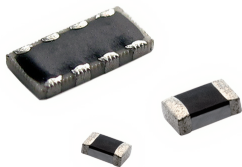
A traditional single-use fuse is often preferred over a resettable device when, for instance, semiconductors fail short-circuit. Littelfuse surface-mount fuses provide high current, small size surface-mount devices in both fast and slow-blow technologies. Clean blow characteristics contain the fusing event physically within the package with low arc effects.

#### Features

- Small sizes down to 1005mm (0402mm)
- Monolithic, multilayer design
- Temperature range -55°C to 150°C
- 0.5A to 30A current rating

#### Benefits

- Helps minimize circuit-board space, weight and cost
- Resistance to shock and vibration
- Very good arc suppression characteristics
- Can be designed in under-the-hood applications
- High current for small size



### PESD Protection Devices

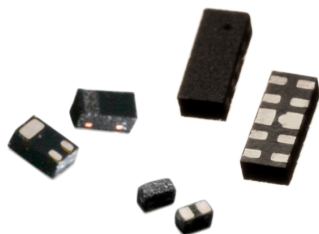
The Littelfuse Polymer (ESD) line of devices helps protect I/O ports on HDMI 1.3, portable video players, digital visual interface (DVI) and antenna switches from electrostatic discharge (ESD). PESD devices shunt ESD away from sensitive circuitry in portable devices.

#### Features

- Low capacitance: 0.25pF (typ)
- Low leakage current
- Low clamping voltage
- Fast response time (<1ns)
- Capable of withstanding numerous ESD strikes
- Bi-directional protection
- Thick film technology

#### Benefits

- ESD protection for high-frequency applications (HDMI 1.3)
- Smaller form factor for board space savings
- Helps protect sensitive electronic circuits against damage caused by ESD events



### SESD Protection Devices

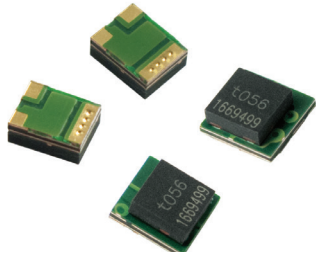
High frequency applications often require a very low capacitance ESD protection solution such as Littelfuse Silicon ESD devices. This is especially true in high speed data transmission applications (e.g. USB3.0, Thunderbolt, GPS, Bluetooth) where the SESD devices help protect the sensitive semiconductor components embedded in various automotive electronics equipment.

#### Features

- Helps protect sensitive electronic circuits against damage caused by ESD events
- Extremely low capacitance - 0.10pF (typ. bi-di)
- Low leakage current - 50nA @5V (typ. single channel)
- Bi-directional clamping
- Low trigger voltage
- Low clamping voltage  
+10.0/-10.0V (typ. bi-di), +9.20/-0.80V (typ. uni-di) @ (tp=8x20Qs, Ipp=2A)
- ESD - 20kV contact/air discharge per IEC61000-4-2
- Small size and low profile XDFN packages
- RoHS compliant, Pb and halogen free  
(refers to: Br ≤ 900ppm, Cl ≤ 900ppm, Br+Cl ≤ 1500ppm)

#### Benefits

- Suitable for high speed data transmission lines and radio frequency data lines (GPS, cell phone, Bluetooth, etc)
- Low leakage results in a lower battery run-down rate.
- Helps protect sensitive electronics against damage from ESD events and transients.
- Helps minimize circuit-board space, weight and cost.
- Resistant to shock and vibration.
- Suitable for high temperature applications.



### PolyZen Devices

PolyZen devices are polymer-enhanced precision Zener diodes. They help protect sensitive electronics from damage caused by inductive voltage spikes, voltage transients, use of incorrect power supplies and reverse bias, and are well-suited for cigarette lighter adaptor chargers, DC power port protection, cell phone charger port and infotainment power applications.

#### Features

- Overvoltage transient suppression
- Hold currents up to 2.6A
- Time delayed, overvoltage trip
- Time delayed, reverse bias trip
- Power handling on the order of 30 Watts
- Integrated device construction
- RoHS compliant and halogen free

#### Benefits

- Helps shield downstream electronics from overvoltage and reverse bias
- Trip events shut out overvoltage and reverse bias sources
- Analog nature of trip events minimizes upstream inductive spikes
- Helps reduce design costs with single component placement and minimal heat sinking requirements

# Automotive Application Solution Guide

APPLICATIONS	Overcurrent Circuit Protection			PESD Devices	Overvoltage Circuit Protection	Hybrid Protection
	PolySwitch Devices	Slow-blow Chip Fuses	Fast-acting Chip Fuses		SESD Devices	PolyZen Devices
<b>AUTOMOTIVE</b> ABS Systems	•	•	•			
Antenna	•			•		
Cigarette Lighter Accessories	•	•	•			•
Displays	•	•	•	•	•	
Electronic Control Units	•	•	•	•	•	•
HVAC and Climate Control	•	•				
Infotainment and Navigation Systems	•	•	•	•	•	•
Motors	•	•				
Wire Harness	•	•				
EV BMS	•	•	•			



# Automotive Application Examples



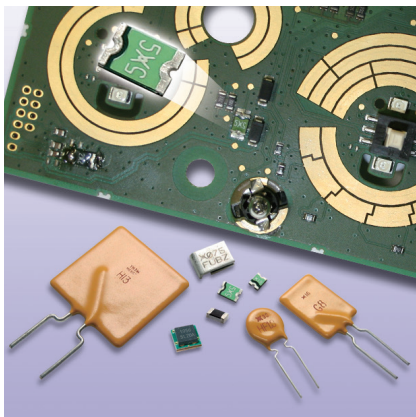
Navigation and Infotainment System



Driver-side Console



Automotive Actuators and DC Motors



Electronic Control Units



Junction Box



DC Cigarette Lighters and Power Plug Adapters



Relay Overcurrent Protection

**Notice:**

Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and shall not be used for, any purpose (including, without limitation, military, aerospace, medical, life-saving, life-sustaining or nuclear facility applications, devices intended for surgical implant into the body, or any other application in which the failure or lack of desired operation of the product may result in personal injury, death, or property damage) other than those expressly set forth in applicable Littelfuse product documentation. Warranties granted by Littelfuse shall be deemed void for products used for any purpose not expressly set forth in applicable Littelfuse documentation. Littelfuse shall not be liable for any claims or damages arising out of products used in applications not expressly intended by Littelfuse as set forth in applicable Littelfuse documentation. The sale and use of Littelfuse products is subject to Littelfuse Terms and Conditions of Sale, unless otherwise agreed by Littelfuse.