



# Ultimate Circuit Protection Resources Guide: Automotive Electronics

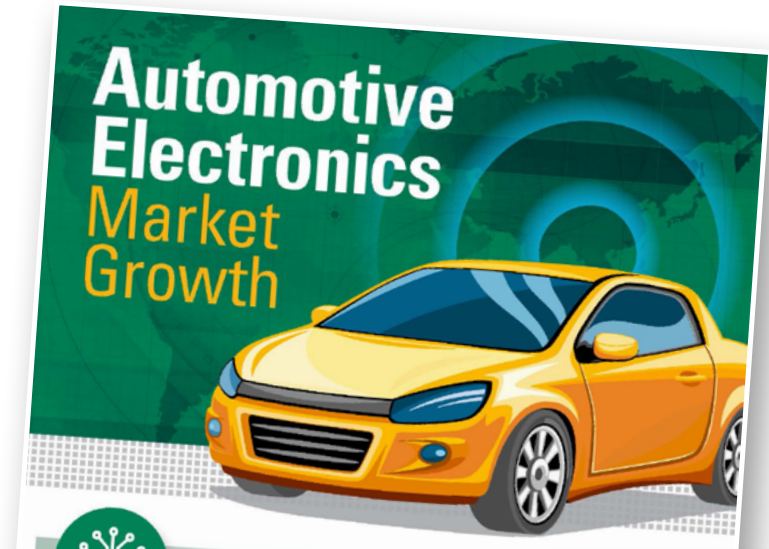
## Discover Four Automotive Electronics Segments Driving Market Growth

As cars become more advanced, the demand for innovative automotive electronics systems will increase. How much is each segment of the automotive electronics market expected to grow? Littelfuse, the global leader in circuit protection, has compiled the latest data to reveal the growth projections for processors, infotainment systems, connected vehicles, and safety features.

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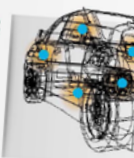
**Q:** What's the difference between automotive transient protection and electrostatic-discharge (ESD) transient protection?



### Processors

Today's automobile designs have nearly 100 microprocessors; the number of processors is expected to double in 5 years.

Source: Clarkson University—International Center for Automotive Research



### Infotainment

By 2018, worldwide automotive infotainment **\$8.54**

[Applications Matrix](#)

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12.26% CAGR

# New! Automotive Circuit Protection Applications Matrix

Confused about which circuit protection device to pick for your next automotive electronics project? Littelfuse has the answers all wrapped up in this convenient Automotive Electronics Circuit Protection Applications Matrix. It covers a broad range of AEC-Q101- and AEC-Q200-qualified components to protect the growing variety of electronic devices in today's vehicles.

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**AEC-Q101-Qualified TVS DIODES & DIODE ARRAYS**  
Examples of automotive applications and approved TVS Diodes & Diode Arrays

- Advanced Driver Assistance Systems**
  - Truck Driver Assistance
  - Adaptive Cruise Control
  - Blind Spot Detection
  - Collision Avoidance
  - Forward Collision Warning
  - Lane Departure Warning
  - Pre-Crash
  - Side Impact Assist
  - Stability Control
  - Traffic Jam Assist
  - Vehicle-to-Infrastructure (V2I) Communication
  - Vehicle-to-Vehicle (V2V) Communication
  - Wireless Safety
- Network Systems & Body**
  - CAN BUS
  - FlexRay
  - MOST
  - Bluetooth
  - Radio
  - Power Audio
  - GPS Module
  - Satellite Navigation
  - Portable Navigator
  - Navigation System
  - Telematics Box
  - Car Multimedia
- Chassis & Safety Systems**
  - ABS
  - ESC
  - Power Windows
  - Power Locks
  - Power Mirrors
  - Power Seats
  - Power Steering
  - Power Windows
  - Power Mirrors
  - Power Seats
  - Power Steering
- Powertrain Systems**
  - Automatic Cruise Control (ACC)
  - Electronics Control Unit (ECU)
  - Turbo Charger
  - Injection
  - GDI
  - Transmission Control Unit (TCU)
  - Battery Charging
- New Energy Car**
  - Gas Electric
  - Fuel Cell Electric
  - Diesel Electric
  - Lithium and NiMH Battery Electric
  - Ultracapacitors
  - Battery Management System (BMS)

## AEC-Q101-Qualified TVS Diodes & Diode Arrays

Examples of automotive applications and approved TVS diodes and diode arrays.

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**AEC-Q200-Qualified VARISTOR SELECTION GUIDE**  
Examples of automotive applications and qualified varistors

- Automotive Applications in Modern Vehicles**
  - Wiper
  - Dashboard
  - Climate Control
  - Keyless Entry
  - Seat Control
  - Power Windows
  - Power Mirrors
  - Power Seats
  - Power Steering
  - Power Windows
  - Power Mirrors
  - Power Seats
  - Power Steering
- Network Systems & Body**
  - CAN BUS
  - FlexRay
  - MOST
  - Bluetooth
  - Radio
  - Power Audio
  - GPS Module
  - Satellite Navigation
  - Portable Navigator
  - Navigation System
  - Telematics Box
  - Car Multimedia
- Safety Electronics**
  - ABS
  - ESC
  - Power Windows
  - Power Locks
  - Power Mirrors
  - Power Seats
  - Power Steering
  - Power Windows
  - Power Mirrors
  - Power Seats
  - Power Steering
- Powertrain Systems**
  - Automatic Cruise Control (ACC)
  - Electronics Control Unit (ECU)
  - Turbo Charger
  - Injection
  - GDI
  - Transmission Control Unit (TCU)
  - Battery Charging
- Hybrid & Electric Vehicle Products**
  - Gas Electric
  - Fuel Cell Electric
  - Diesel Electric
  - Lithium and NiMH Battery Electric
  - Ultracapacitors
  - Battery Management System (BMS)

## AEC-Q200-Qualified Varistor Selection Guide

Examples of automotive applications and qualified varistors.

[Download Now](#)

**Q:** What are the top industry standards for automotive transient protection?

**Automotive Applications in Modern Vehicles**  
Littelfuse portfolio of AEC-Q101 (TVS Diodes and Diode Arrays) and AEC-Q200 (Varistors, Multi Layer Varistors and PPTCs) qualified components help to protect the growing number of electronic applications in modern vehicles.

From ultra low capacitance Diode Arrays for ESD protection of high speed signal lines including CAN bus, USB 2.0 and BroadR Reach, to our high surge formulation AUMOV Varistors, Littelfuse has the solutions and expertise to match your technical and application challenges.

- Communication & Infotainment Systems**
  - Radio
  - Power Audio
  - GPS Module
  - Satellite Navigation
  - Portable Navigator
  - Navigation System
  - Telematics Box
  - Car Multimedia
- Network Systems & Body**
  - CAN BUS
  - LIN BUS
  - FlexRay
  - MOST
  - Bluetooth
  - Safe-By-Wire
  - Central Body Module
  - Lighting Power Window
  - Retracting Mirror
  - Wiper
  - Dashboard
  - Climate Control
  - Keyless Entry
  - Seat Control
  - Park Assistance
- Powertrain Systems**
  - Automatic Cruise Control (ACC)
  - Electronics Control Unit (ECU)
  - Turbo Charger
  - Injection
  - GDI
  - Transmission Control Unit (TCU)
  - Battery Charging
- New Energy Car**
  - Gas Electric
  - Fuel Cell Electric
  - Diesel Electric
  - Lithium and NiMH Battery Electric
  - Ultracapacitors
  - Battery Management System (BMS)
- Advanced Driver Assistance Systems**
  - Night Vision
  - Pedestrian Avoidance
  - Lane Departure Sensing
  - Adaptive Cruise Control
  - Vehicle to Vehicle (V2V) Communication
  - Interior Camera - Driver Monitoring
  - Exterior Camera - Front View
  - Exterior Camera - Rear View
  - Blind Spot Detection
  - Side Impact Assist
  - Automated Head Light Control
  - Seat Belt Pretension
  - Pre-crash
  - Battery Disconnect
  - Antilocker
  - Stability Control
  - Brake Control
  - DC Power Supply
  - Air Bag
  - ABS
  - Radar

**SLD TVS Diode**  
Protects auto electronics against load dump

**SM24CANA Diode Arrays**  
Safeguards Auto CAN bus from ESD damage

**TPSMD TVS Diode**  
Defends electrical systems from transient voltages

**SP3012 Diode Arrays**  
Up to 80% better protection for USB 2.0 and 3.0

**AUML & Auto MLA Varistor**  
Designed to suppress destructive transient voltages and ESD

**AUMOV Varistor**  
Ensures maximum reliability for auto electronics

**Surface Mount PPTCs**  
Resettable overcurrent protection

\* The marks FlexRay, MOST, Bluetooth, Safe-By-Wire and SafeSpeed are the trademarks of their respective owners. Littelfuse.com

Market Growth

Applications Matrix

Protection

Innovations

Selecting

# Protecting Automotive Electronics under the Hood and in the Cabin



## Automotive Circuit Protection using TVS Diodes Application Note

Designing automotive electronics presents numerous technical challenges, including

the need to protect against electrical hazards that can harm the vehicle's electronics. The Automotive CP Application Note helps designers of automotive electronics eliminate transient surges using transient voltage suppression (TVS) diode technology, enhancing the overall safety of the vehicles.

[Download Now](#)



## Updated! ESD Suppression Design Guide

Choosing the most appropriate ESD suppression technology requires a balance between equipment

protection needs and operating requirements. This comprehensive 18-page guide summarizes some of the solutions available and helps designers choose the most appropriate solution for their end applications and numerous interfaces (USB 3.0, HDMI, Ethernet, CAN Bus, etc.).

[Download Now](#)



## Updated! Varistor Design Guide for DC & Automotive Applications

When designing electronics for lower-DC-voltage automotive applications, it's vital to protect against the damaging effects

of high-voltage transients. Need advice on transient suppression techniques? Want help choosing a reliable varistor for your next design? Download this design guide to learn about varistor technology and how to select the ideal varistor for your application.

[Download Now](#)

**Q:** What is a TVS Diode?

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# Automotive Electronics Circuit Protection Innovations



## AEC-Q200-Compliant Varistor: 50% Higher Surge Rating

The AUMOV® Series Varistor is the ideal circuit protection solution for lower-DC-voltage automotive applications. With 50% greater surge withstanding capability than comparable technologies, it protects sensitive vehicle systems from voltage transients induced by load dump and jump starts. In compliance with the AEC-Q200 standard, it can be used in the passenger compartment or under the hood.

[LEARN MORE](#)



## More Load Dump Protection, Smaller Footprint

The AEC-Q101-qualified SLD Series Automotive TVS Diode protects sensitive electronic equipment from voltage transients, especially those induced by load dump and other transient voltage events. It offers a 5,000-W (10/1,000 $\mu$ s) or 2,200-W (load dump) peak pulse power dissipation rating in a standard P600 package. Meets ISO7637-2 5a/5b and ISO16750.

[LEARN MORE](#)



## Compact 3,000-W TVS Diode for High Reliability Applications

The TPSMD TVS Diode protects sensitive automotive electronics from voltage transients. AEC-Q101-qualified, it offers a peak pulse power dissipation rating of 3,000 W in a standard DO-214AB package (TPSMC 1,500-W series also available). Both series are automotive-grade products complying with IEC 61000-4-2 and IEC 610000-4-4 standards and are well suited for high-reliability applications.

[LEARN MORE](#)



## Robust TVS Diodes: Superior Protection & Clamping

The SD and SD-C Discrete Unidirectional and Bidirectional 450-W TVS Diodes protect against ESD and lightning-induced surge currents. AEC-Q101-qualified for use in automotive electronics. Safely absorb repetitive ESD strikes at  $\pm 30$  kV and dissipate up to 30 A of surge current. Low dynamic resistance provides a 50% reduction in clamping voltage.

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