



Expertise Applied | Answers Delivered

# AEC-Q200 Specification for Automotive Applications

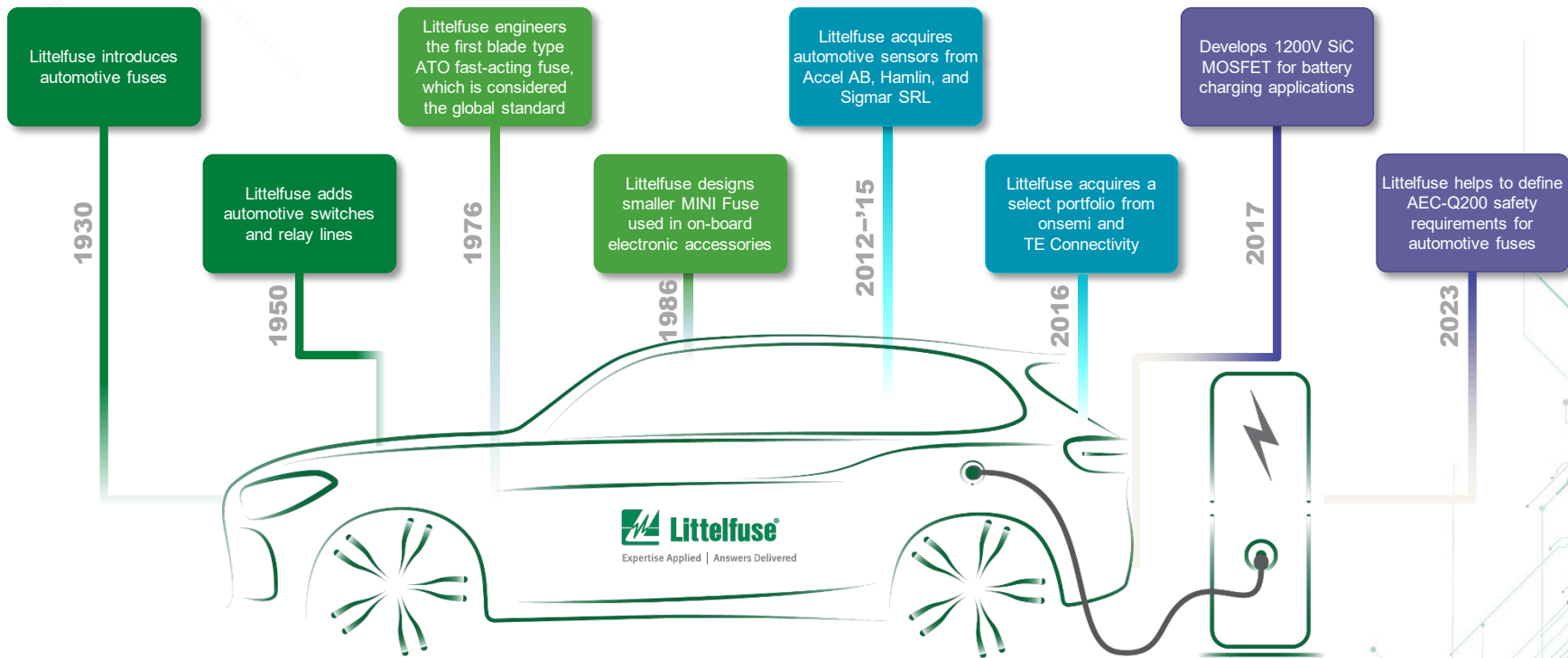
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Automotive

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# Littelfuse has a long history of defining safety needs and developing components for automobiles



Littelfuse has contributed to the development of the **AEC-Q200 Rev E Standard** released in March 2023

# Advanced electronics are driving innovation in multiple automotive applications

## Infotainment & communication

- Smart infotainment
- Navigation
- Multipurpose camera
- Telematics box



## Network systems & body electronics

- CAN, LIN
- USB, Wireless
- Keyless entry
- Lighting control



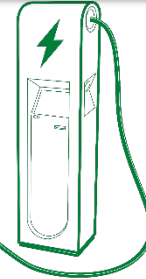
## Advanced Driver Assistance System

- V2X Communication
- Radar
- eCall
- Sensor fusion



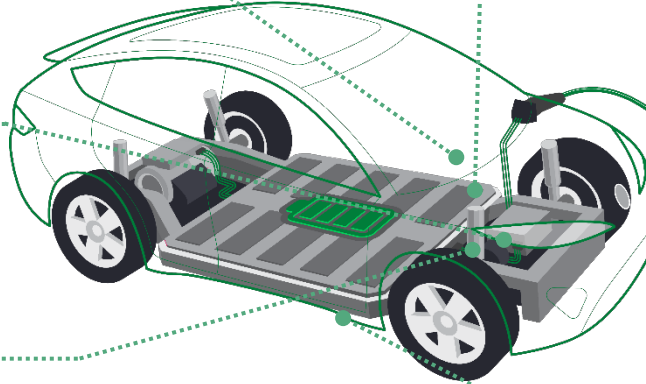
## Power train

- Battery management system
- On-board charger
- Traction motor inverter
- DC-DC converter



## Chassis and safety system

- Seatbelt safety
- Tire pressure monitoring
- Battery disconnect
- Fuel level detection



We satisfy the need for reliable, high-quality circuit protection products for safety and reliability



# Introduction to Automotive Electronics Council (AEC)

*Body for establishing standards for reliable, high quality electronic components*

## Key highlights

The Automotive Electronics Council (AEC) was originally established in the 1990s by Chrysler, Ford, and GM to establish common part-qualification and quality-system standards.

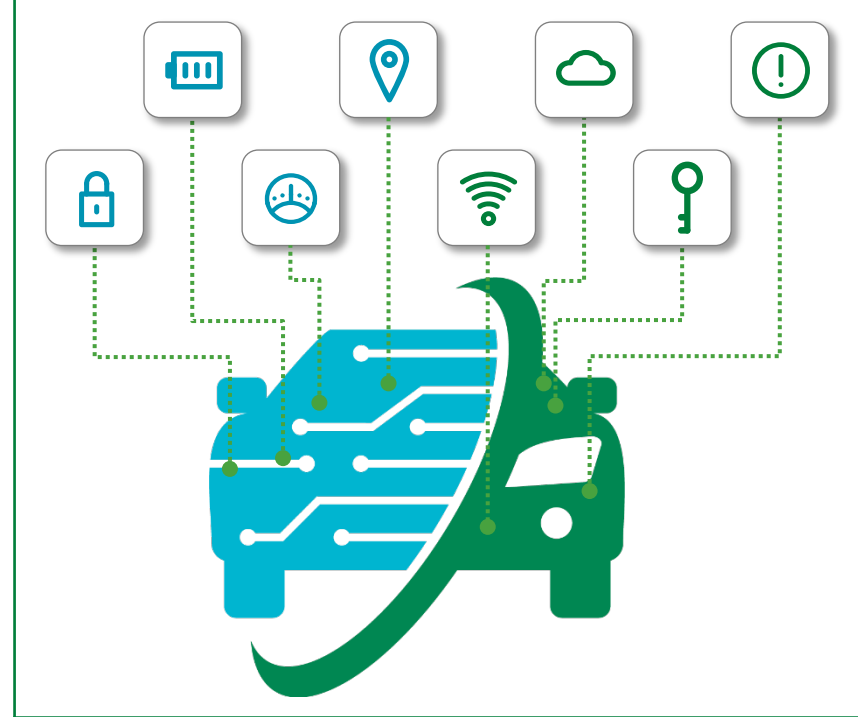
From its inception, the AEC has consisted of two committees: the Quality Systems Committee and the Component Technical Committee.

Components meeting the specifications listed by the Component Technical Committee are suitable for harsh automotive environments.

### Different AEC-Q Standards:

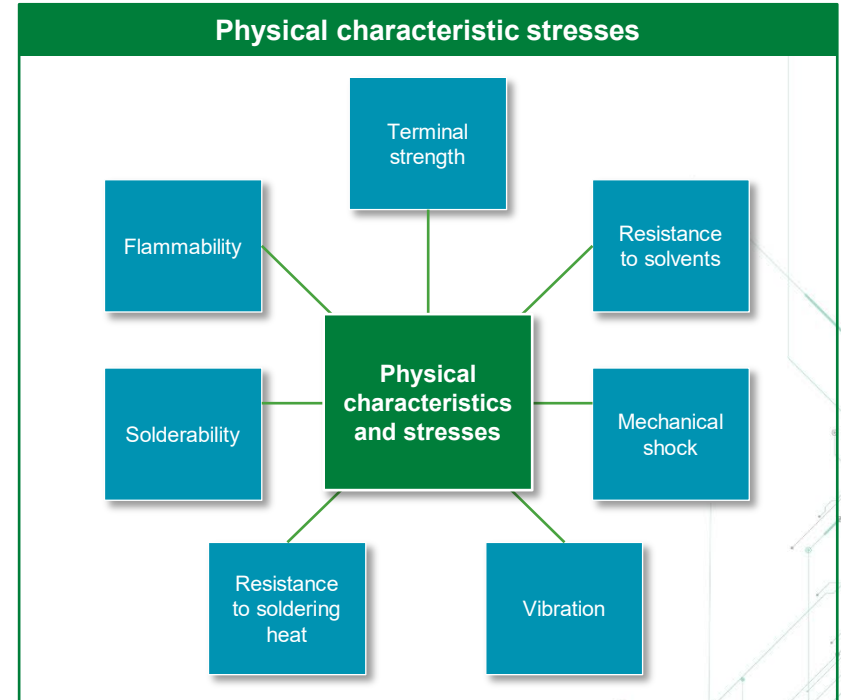
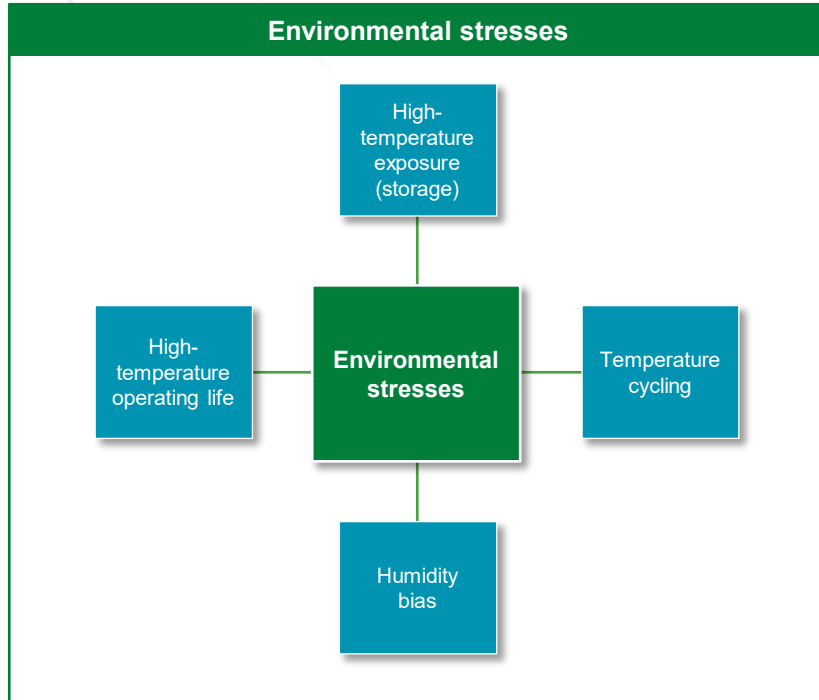
- **AEC-Q100**–Failure Mechanism-Based Stress Test Qualification for Integrated Circuits
- **AEC-Q101**–Failure Mechanism-Based Stress Test Qualification for Discrete Semiconductors
- **AEC - Q102**–Failure Mechanism-Based Stress Test Qualification for Discrete Optoelectronic Semiconductors in Automotive Applications
- **AEC - Q103**–Failure Mechanism-Based Stress Test Qualification for Sensors in Automotive Applications
- **AEC - Q104**–Failure Mechanism-Based Stress Test Qualification for Multichip Modules (MCM) In Automotive Applications
- **AEC-Q200**–**Stress Test Qualification for Passive Components**

## Proliferation of electronics in today's vehicles



# AEC-Q200 Rev D: Stress test qualification for passives

*Resistor, capacitor, inductor, transformer, resonator, crystal, PTC, NTC, thermistor, and varistor*



Two main tests: Environment stresses and physical characteristics stresses

# New AEC-Q200 Rev E (released on March 20, 2023) adds reliability qualifications for fuses

## Key highlights

The AEC-Q200 Rev E expands its scope to provide a single standard that manufacturers can use to design and test fuses for the automotive market.

Fuses provide necessary overcurrent protection for all the circuits in a vehicle, and fuses should meet the rigorous standards for use in automotive equipment that other passive components must meet.

**Littelfuse has contributed to the development of Revision E and the framework for defining the test requirements for fuses.**

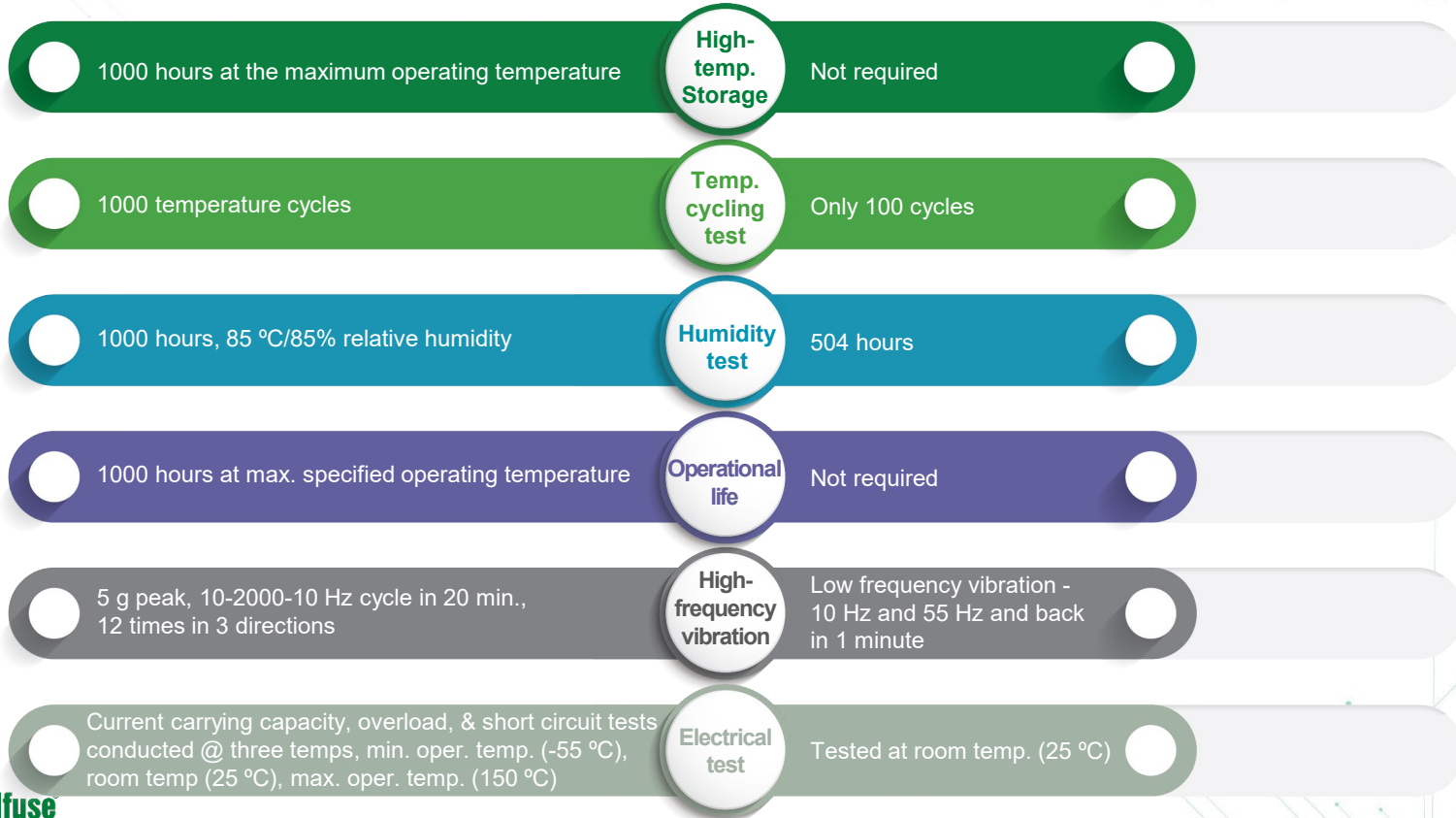
Design engineers developing systems for automotive vehicles will be able to select AEC-Q200 Qualified fuses that have been subjected to an extensive set of tests to ensure a rugged and reliable product.

## AEC-Q200 E qualification fuse stress tests

Stress	No.	Reference
Pre- and post-stress electrical test	1	UL 248, IEC 60127, or User Specification
High-temperature exposure (storage)	3	MIL-STD-202, Method 108
Temperature cycling	4	JESD22-A104
Humidity bias	7	MIL-STD-202, Method 103
High-temperature operating life	8	MIL-STD-202, Method 108
External visual	9	MIL-STD-883, Method 2009
Physical dimensions	10	JESD22-B100
Terminal strength (for axial and radial THT components)	11	MIL-STD-202, Method 211
Resistance to solvents	12	MIL-STD-202, Method 215
Mechanical shock	13	MIL-STD-202, Method 213
Vibration	14	MIL-STD-202, Method 204
Resistance to soldering heat	15	MIL-STD-202, Method 210
Solderability	18	J-STD-002
Electrical characterization	19	UL 248, IEC 60127, or User Specification
Flammability	20	UL 94 or IEC 60695-11-5
Board Flex (SMD)	21	AEC-Q200-005
Terminal strength (SMD)	22	AEC-Q200-006

# AEC-Q200 test plan vs. typical validation test plan

AEC-Q200



Typical

# Littelfuse internal qualification tests were already aligned with the AEC-Q200 Rev. E

## Internal test results in the datasheet

<b>Materials</b>	Body: Epoxy Resin Terminations: Cu/Ni/Sn (100% Pb-free)
<b>Product Marking</b>	Body: Current Rating
<b>Operating Temperature</b>	-55 °C to +125 °C
<b>Solderability</b>	MIL-STD-202
<b>Thermal Shock</b>	MIL-STD-202, Method 107, Test Condition B, 5 cycles, -65 °C to 125 °C, 15 minutes @ each extreme
<b>Mechanical Shock</b>	MIL-STD-202, Method 213B, Test Condition I: De-energized. 100 Gs peak amplitude, sawtooth wave 6 ms duration, 3 cycles XYZ+xyz = 18 shocks
<b>Vibration</b>	MIL-STD-202, Method 201: 0.03" amplitude, 10–55 Hz in 1 min. 2 hrs. each XYZ = 6 hrs (10–55 Hz)
<b>Moisture Resistance</b>	MIL-STD-202, Method 106, 10 cycles Condition A
<b>Salt Spray</b>	MIL-STD-202, Method 101, Test Condition B (48 hrs)
<b>Resistance to Soldering Heat</b>	Method 210, Test Condition B (10 sec at 260 °C)

## 483A Series Datasheet

### Product Characteristics

<b>Materials</b>	Body: Epoxy Resin Terminations: Cu/Ni/Sn (100% Pb-free)
<b>Product Marking</b>	Body: Current Rating
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<b>Solderability</b>	MIL-STD-202
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<b>Resistance to Soldering Heat</b>	Method 210, Test Condition B (10 sec at 260 °C)



# Littelfuse is one of the first suppliers of AEC-Q200 Qualified fuses

Littelfuse invents the FIRST automotive fuse in 1930



Member of the AEC Technical Committee



First to market with AEC-Q200 Qualified fuses



Global manufacturing facilities certified ISO 9001, ISO 14001, and IATF 16949



Contributed to the development of Revision E



Internal qualification aligned with the new AEC-Q200 requirement



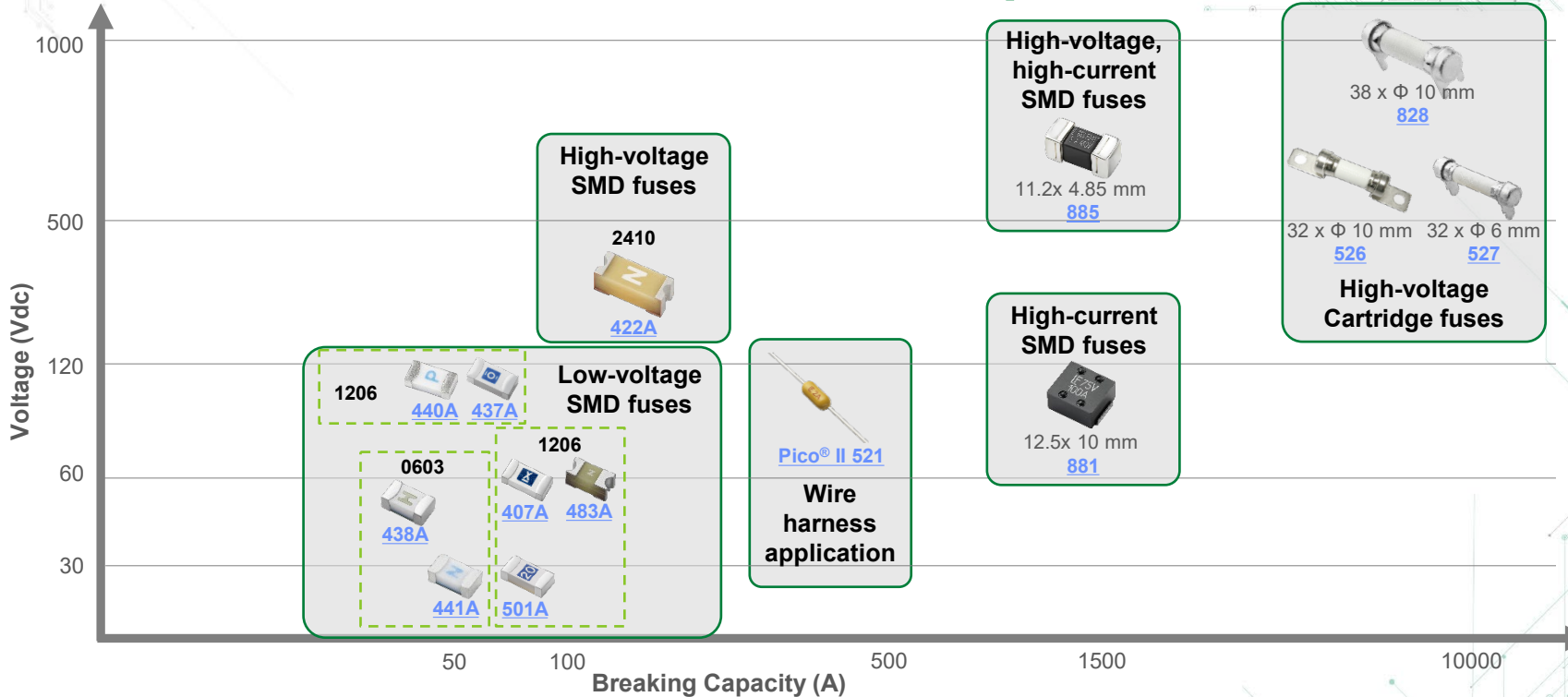
Wide array of AEC-Q100, AEC-Q101, and AEC-Q200 components to choose from



Application expertise

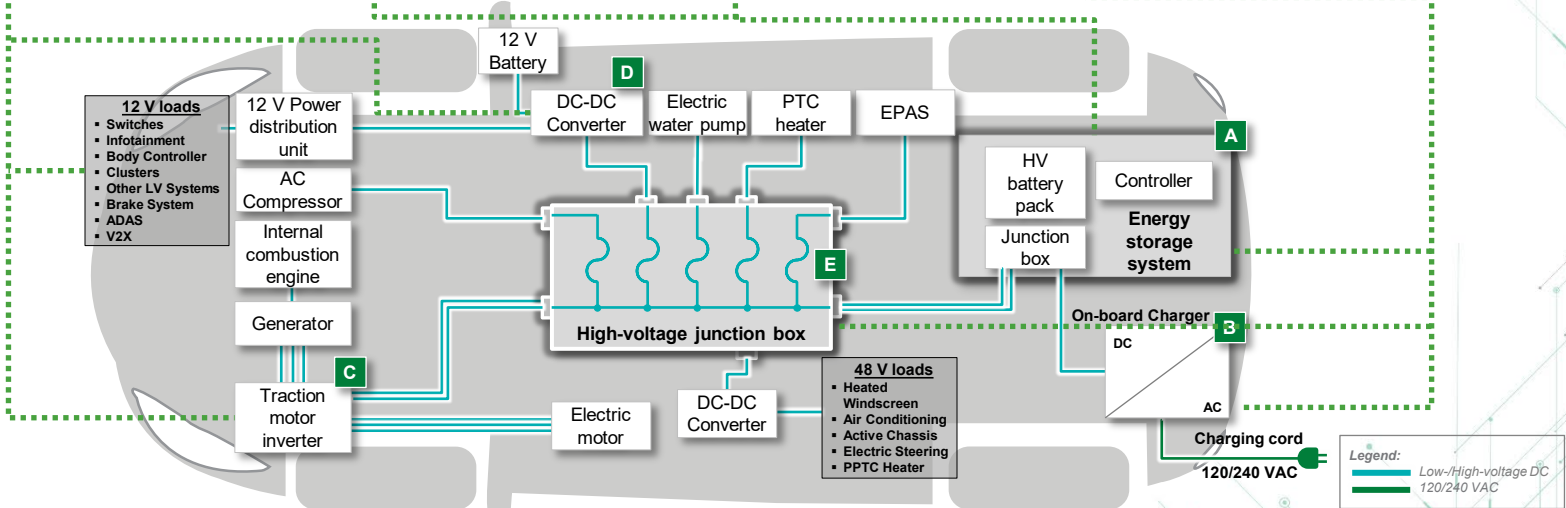


# Littelfuse AEC-Q200 Qualified fuse portfolio



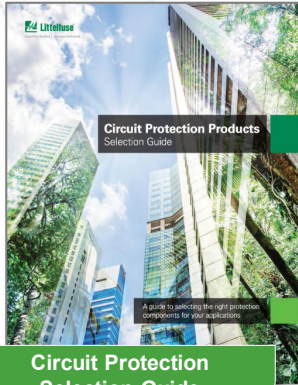
To learn more about Littelfuse's AEC-Q200 Qualified fuses portfolio, click [here](#)

# AEC-Q200 Qualified fuses in automotive applications

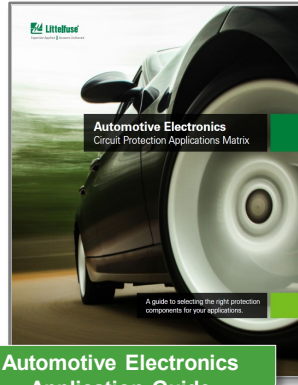


# Additional information can be found on [Littelfuse.com](https://www.littelfuse.com)

Explore the world of Littelfuse with the electronics eCatalogs ([ecatalogs.littelfuse.com](https://ecatalogs.littelfuse.com))



**Circuit Protection Selection Guide**



**Automotive Electronics Application Guide**

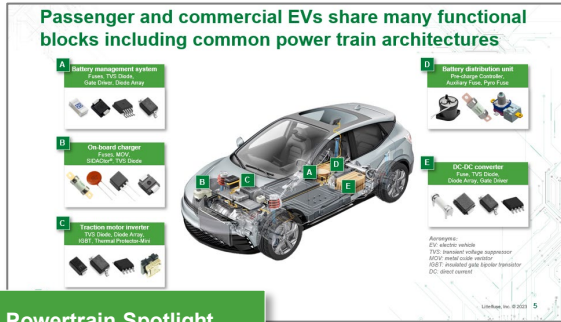


**Fuseology Selection Guide**

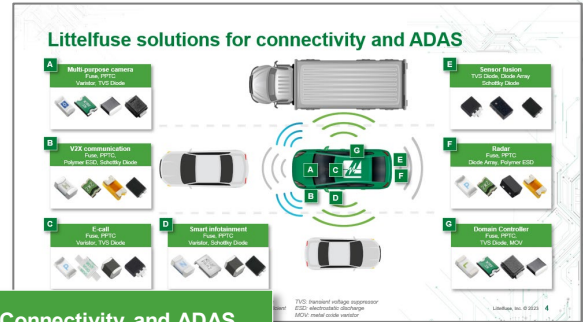


**ESD Protection Selection Guide**

Click on images for more information



**Powertrain Spotlight**



**Connectivity and ADAS**

# Local resources supporting our global customers



## Legend

- Sales
- R&D
- Manufacturing

# Your partner for tomorrow's electronic systems

## Broad product portfolio

We are an industrial technology manufacturing company empowering a sustainable, connected, and safer world

## Application expertise

Our engineers partner directly with customers to help speed up product design and meet unique needs

## Global customer service

Our global customer service team will work with you to anticipate your needs and ensure a seamless experience

## Compliance & regulatory expertise

We help customers in the design process to account for requirements set by global regulatory authorities

## Testing capabilities

We help customers get products to market faster and offer certification testing to global regulatory standards

## Global manufacturing

We offer high-quality manufacturing that is committed to the highest quality standards





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Supplementary slides



# AEC-Q200 Qualified cartridge fuse portfolio

Parameter	<a href="#">828</a>	<a href="#">526</a>	<a href="#">527</a>
Product Photo			
Footprint/Height	38 x $\phi$ 10 mm	32 x $\phi$ 10 mm	32 x $\phi$ 6 mm
Voltage Rating	1000 VDC	500 VAC/VDC	500 VAC
Interrupting Rating	10 kA @ 1000 VDC	10 kA @ 500 VAC/VDC	10 kA @ 500 VAC
Amperage Rating	15 A ~ 30 A	30–60 A	30–50 A
Operating Temperature	-55 °C to +125 °C	-55 °C to +125 °C	-55 °C to 125 °C

## Key highlights

- AEC-Q200 Qualified
- Rated from 500 VDC/VAC–1000 VDC with an interrupting rating of 10 kA and 15–60 A nominal current rating in a small package
- Compact body size (6 x 32 mm, 10 x 32 mm, 10 x 38 mm)

# AEC-Q200 Qualified high-current surface mount fuses

Parameter	<a href="#">885</a>	<a href="#">881</a>
Product Photo		
Footprint/Height	10.86 mm x 4.78 mm	12.5 mm x 10 mm
Voltage Rating	500 VDC	100 VDC
Interrupting Rating	1500 A @ 350 VDC	1500A @ 75VDC
Amperage Rating	1 A–5 A	60A ~ 100A
Operating Temperature	-55 °C to 105 °C	-55 °C to 100 °C

## Key highlights

- AEC-Q200 Qualified
- High DC voltage up to 500 VDC and interrupting current rating up to 1500 A
- Compact body size (10.86 x 4.78mm)

# AEC-Q200 Qualified surface mount thin film chip fuses

Parameter	441A	501A	407A	483A	440A	483A	437A	422A
Product photo								
Footprint/ height	0603	1206	1206	0603	1206	1206	1206	2410
Voltage rating	32 VDC	32 VDC	24–63 VDC	24–63 VDC	50–125 VDC	75 VAC/VDC	32–125 VDC	125–250 VAC/VDC
Interrupting rating at rated voltage	50 A	150 A	50 A	50 A	50 A	50 A	50 A	50–100 A
Amperage rating	2–6 A	10–20 A	1–8 A	0.25–6 A	0.25–8 A	0.75–2 A	0.25–8 A	0.75–5 A
Operating temperature	-55 °C to 150 °C	-55 °C to 150 °C	-55 °C to 150 °C	-55 °C to 150 °C	-55 °C to 150 °C	-55 °C to 125 °C	-55 °C to 150 °C	-55 °C to 125 °C

## Key highlights

- AEC-Q200 Qualified
- Wide range of fuse selections (24–250 VAC/VDC) and amperage ratings (0.25–20 A)
- Compact body size (0603, 1206, and 2410)

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