AEC-Q200
Specification for Automotive Applications

Users must independently evaluate the suitability of and test each product selected for their own specific applications. It is the User’s sole responsibility to determine fitness for a particular system or use based on their own performance criteria, conditions, specific application, compatibility with other parts, and environmental conditions. Users must independently provide appropriate design and operating safeguards to minimize any risks associated with their applications and products. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at littelfuse.com/disclaimer-electronics.
Littelfuse has a long history of defining safety needs and developing components for automobiles.

- Littelfuse introduces automotive fuses.
- Littelfuse adds automotive switches and relay lines.
- Littelfuse engineers the first blade type ATO fast-acting fuse, which is considered the global standard.
- Littelfuse designs smaller MINI Fuse used in on-board electronic accessories.
- Littelfuse acquires automotive sensors from Accel AB, Hamlin, and Sigmar SRL.
- Littelfuse acquires a select portfolio from onsemi and TE Connectivity.
- Littelfuse helps to define AEC-Q200 safety requirements for the automotive fuses.
- Develops 1200V SiC MOSFET for battery charging applications.

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

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**Proliferation of electronics in today’s vehicles**

- Battery
- GPS
- Cloud
- Warning light
- Key
- Circuit board
- Chip
- Secure
- WiFi
- Lock

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[Logo and strapline: Littelfuse® Expertise Applied | Answers Delivered]
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**

<table>
<thead>
<tr>
<th>Stress</th>
<th>No.</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre- and post-stress electrical test</td>
<td>1</td>
<td>UL 248, IEC 60127, or User Specification</td>
</tr>
<tr>
<td>High-temperature exposure (storage)</td>
<td>3</td>
<td>MIL-STD-202, Method 108</td>
</tr>
<tr>
<td>Temperature cycling</td>
<td>4</td>
<td>JESD22-A104</td>
</tr>
<tr>
<td>Humidity bias</td>
<td>7</td>
<td>MIL-STD-202, Method 103</td>
</tr>
<tr>
<td>High-temperature operating life</td>
<td>8</td>
<td>MIL-STD-202, Method 108</td>
</tr>
<tr>
<td>External visual</td>
<td>9</td>
<td>MIL-STD-883, Method 2007</td>
</tr>
<tr>
<td>Physical dimensions</td>
<td>10</td>
<td>JESD22-B100</td>
</tr>
<tr>
<td>Terminal strength (for axial and radial THT components)</td>
<td>11</td>
<td>MIL-STD-202, Method 211</td>
</tr>
<tr>
<td>Resistance to solvents</td>
<td>12</td>
<td>MIL-STD-202, Method 215</td>
</tr>
<tr>
<td>Mechanical shock</td>
<td>13</td>
<td>MIL-STD-202, Method 213</td>
</tr>
<tr>
<td>Vibration</td>
<td>14</td>
<td>MIL-STD-202, Method 204</td>
</tr>
<tr>
<td>Resistance to soldering heat</td>
<td>15</td>
<td>MIL-STD-202, Method 210</td>
</tr>
<tr>
<td>Solderability</td>
<td>18</td>
<td>J-STD-002</td>
</tr>
<tr>
<td>Electrical characterization</td>
<td>19</td>
<td>UL 248, IEC 60127, or User Specification</td>
</tr>
<tr>
<td>Flammability</td>
<td>20</td>
<td>UL 94 or IEC 60695-11-5</td>
</tr>
<tr>
<td>Board Flex (SMD)</td>
<td>21</td>
<td>AEC-Q200-005</td>
</tr>
<tr>
<td>Terminal strength (SMD)</td>
<td>22</td>
<td>AEC-Q200-006</td>
</tr>
</tbody>
</table>
# AEC-Q200 Methodology

**General**
- Pre-stress Electrical Test
- **Stress**
- Post-stress Electrical Test

**Fuses**
- Resistance Measurement
- **Stress**
- Resistance Measurement
- Current Carrying Capacity
- Overload
# AEC-Q200 Test Plan vs. Typical Validation Test Plan

<table>
<thead>
<tr>
<th>Test Type</th>
<th>AEC-Q200</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Carrying Capacity</td>
<td>Tested at room temp (25°C)</td>
<td>Not required</td>
</tr>
<tr>
<td>Overload &amp; Short Circuit Tests</td>
<td>At 3 different temps, min.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>oper. temp. (-55°C), room temp</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(25°C), max. oper. temp. (125-150°C)</td>
<td></td>
</tr>
<tr>
<td>1000 Temperature Cycles</td>
<td>Only 100 cycles</td>
<td></td>
</tr>
<tr>
<td>1000 Hours, 85°C/85% Humidity</td>
<td>504 hours</td>
<td></td>
</tr>
<tr>
<td>Operational Life</td>
<td>Not required</td>
<td></td>
</tr>
<tr>
<td>High-Frequency Vibration</td>
<td>Low frequency vibration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>10 Hz and 55 Hz &amp; back in 1 min.</td>
<td></td>
</tr>
<tr>
<td>High-Temperature Storage</td>
<td>Not required</td>
<td></td>
</tr>
<tr>
<td>1000 Hours at Maximum Temp</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Littelfuse internal qualification tests were already aligned with the AEC-Q200 Rev. E

**Internal test results in the datasheet**

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Standard/Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Materials</strong></td>
<td></td>
</tr>
<tr>
<td>Body: Glass-Reinforced Epoxy</td>
<td></td>
</tr>
<tr>
<td><strong>Terminations</strong>: Cu/Ni/Sn (100% Pb-free)</td>
<td></td>
</tr>
<tr>
<td><strong>Moisture sensitivity level</strong></td>
<td>IPC/JEDEC J-STD-020, Level 1</td>
</tr>
<tr>
<td><strong>Thermal shock</strong></td>
<td>JESD22-A104C</td>
</tr>
<tr>
<td><strong>Biased humidity</strong></td>
<td>MIL-STD-202, Method 103, Test Condition D w/ exemptions</td>
</tr>
<tr>
<td><strong>High temperature storage</strong></td>
<td>MIL-STD-202, Method 108, Test Condition D w/ exemptions</td>
</tr>
<tr>
<td><strong>High temperature operational life</strong></td>
<td>MIL-STD-202, Method 108, Test Condition D</td>
</tr>
<tr>
<td><strong>Mechanical shock</strong></td>
<td>MIL-STD-202, Method 213</td>
</tr>
<tr>
<td><strong>High frequency vibration</strong></td>
<td>MIL-STD-202, Method 204</td>
</tr>
<tr>
<td><strong>Resistance to solvents</strong></td>
<td>MIL-STD-202, Method 215</td>
</tr>
<tr>
<td><strong>Resistance to soldering heat</strong></td>
<td>MIL-STD-202, Method 210</td>
</tr>
<tr>
<td><strong>Salt fog</strong></td>
<td>MIL-STD-202, Method 101</td>
</tr>
<tr>
<td><strong>Moisture resistance</strong></td>
<td>MIL-STD-202, Method 106</td>
</tr>
<tr>
<td><strong>Terminal strength</strong></td>
<td>AEC-Q200-006</td>
</tr>
<tr>
<td><strong>Board flex</strong></td>
<td>AEC-Q200-005</td>
</tr>
<tr>
<td><strong>Solderability</strong></td>
<td>JESD22-B102E Method 1</td>
</tr>
<tr>
<td><strong>Pulse testing</strong></td>
<td>Device specification</td>
</tr>
<tr>
<td><strong>Electrical characterization</strong></td>
<td>Conducted at minimum, ambient, and maximum temperatures</td>
</tr>
</tbody>
</table>

**483A Series Datasheet**

**Product Characteristics**

- **Materials**: Glass-Reinforced Epoxy, **Terminations**: Cu/Ni/Sn (100% Pb-free)
- **Moisture Sensitivity Level**: IPC/JEDEC J-STD-020, Level 1
- **Thermal Shock**: JESD22-A104C
- **Biased Humidity**: MIL-STD-202, Method 103, Test Condition D w/ exemptions
- **High Temperature Storage**: MIL-STD-202, Method 108, Test Condition D w/ exemptions
- **High Temperature Operational Life**: MIL-STD-202, Method 108, Test Condition D
- **Mechanical Shock**: MIL-STD-202, Method 213
- **High Frequency Vibration**: MIL-STD-202, Method 204
- **Resistance to Solvents**: MIL-STD-202, Method 215
- **Salt Fog**: MIL-STD-202, Method 101
- **Moisture Resistance**: MIL-STD-202, Method 106
- **Terminal Strength**: AEC-Q200-006
- **Board Flex**: AEC-Q200-005
- **Solderability**: JESD22-B102E Method 1
- **Pulse Testing**: Device specification
- **Electrical Characterization**: Conducted at minimum, ambient, and maximum temperatures
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

- **SMD fuses for 12-48 V applications**
- **100 V SMD fuse used in BMS**
- **Inline fuse for wire harness used in centralized BMS**
- **500 V, SMD or cartridge fuses for BMS, OBC, & PDU**
- **1000 V cartridge fuses for OBC & PDU**

Legend:
- Low-voltage DC
- 120/240 VAC

Diagram showing various components and their connections, including:
- 12 V Battery
- 12 V Power distribution unit
- AC Compressor
- Internal combustion engine
- Generator
- Traction motor inverter
- Electric motor
- DC-DC Converter
- Electric water pump
- PTC heater
- EPAS
- High-voltage junction box
- HV battery pack
- Junction box
- Controller
- Energy storage system
- On-board Charger
- Charging cord 120/240 VAC
AEC-Q200 vs. ISO 8820
AEC-Q200 vs. ISO 8820 test methodology

AEC-Q200 for Fuses

1. Resistance Measurement
2. Stress
3. Resistance Measurement
4. Current Carrying Capacity
5. Overload

ISO 8820 General

1. No pretest
2. Stress
3. Operating Time Rating
AEC-Q200 vs. ISO 8820 test requirements

AEC-Q200

- Physical Dimension
- Verification
  - Electrical Characterization
  - High Temp. Exposure (Storage)
  - Temp. Cycling
- Environmental
  - Flammability
  - Temp./Humidity Cycling
- Mechanical
  - Board Flex
  - Mechanical Shock
  - Vibration
  - Resistance to Soldering Heat
  - Resistance to Solvents
  - Terminal Strength
  - Strength of Terminals

ISO 8820

- Verification
  - Operating Time Rating
  - Current Steps
  - Temp./Humidity Cycling
- Mechanical
  - Breaking Capacity
  - Strength of Terminals
  - Mechanical Load
- Environmental
  - Voltage Drop
  - Operating Current Rating
  - Chemical Loads
  - Resist. against Temp. Shock
AEC-Q200 test requirements

**Verification**
- Electrical Characterization
  - Min. Ambient Temp.
  - Room Ambient Temp.
  - Max. Ambient Temp.
  - AEC requires 30 samples vs. LF requires 30 samples from 3 lots
- Physical Dimension
  - 30 Samples
  - Verify physical dimensions meet applicable component specification
  - Pre/post not required
- Flammability
  - Verify material is V-1, V-0 or 5VA
  - If not V-1, V-0 or 5VA, conduct Needle Flame Test per IEC 60695-11-5
  - Pre/post not required

**Mechanical**
- Terminal Strength (THT)
  - For leaded (THT) fuses only
  - Test Condition A for Pull-test
  - 5 pounds force axis of term. (5-10 secs)
  - Test Condition C for wire-lead bend test
  - 3 cycles of 1 or ½ pound force
- Terminal Strength (SMD)
  - SMD only
  - Force increased to 17.7N
  - Duration 60 sec
- Resistance to Solvents (4 Solvents)
  - By vol., 1 part IUPAC to 3 parts mineral spirits
  - EC-7R (Bioact)
  - By vol., 42:1:1 of H₂O, PGME, MEA
  - IUPAC
- Mechanical Shock
  - THT and SMD: Condition C
  - (100g peak value, 6 msec duration, Half-sine waveform, 12.3 ft/sec velocity, 6 shocks pulses in 3 planes)
- Vibration
  - 5g peak
  - 20 minutes
  - 10 Hz to 2,000 Hz
  - 12 cycles in each 3 directions
  - Mounted per specification
- Resistance to Soldering Heat
  - THT: Cond. B: Solder dip (tinning), Cond. C & D: Wave solder (top/bottom side), 260°C, 20s dwell time, 1 cycle
  - SMD: Cond. K: Infrared/convection reflow, 260°C, 30s dwell time, 3 cycles
- Board Flex (SMD)
  - SMD only
  - Force enough for 2 mm board bend distance
  - Duration 60 sec

**Environmental**
- High Temp. Exposure (Storage)
  - Unpowered
  - Chamber Temperature: max ambient temp. or max storage temp. (whichever is higher)
  - Duration: 1,000 hrs
- Temp. Cycling
  - Unpowered
  - Number of Cycles: 1,000
  - Lower Chamber Temp.: min ambient temp.
  - Upper Chamber Temp.: max ambient temp.
  - Dwell Time: 15 minutes min
  - Transition Time: 1 minute max
- Biased Humidity
  - 10% of In
  - Duration: 1,000 hrs
  - 85 °C, 85% relative humidity
- High Temp. Operating Life
  - At re-rated In
  - Duration: 1,000 hrs.
  - Max operating temp.
ISO 8820 test details

**Verification**
- Voltage Drop
  - Verify energy consumptions of fuse-link which creates temp. rise
  - At 23 ± 5 ºC; rated current
  - Record Voltage Drop (VD) - not exceed values in subsequent ISO 8820 parts

- Transient Current Cycling
  - Ability to withstand transient pulses
  - At 23 ± 5 ºC; pulse given in subsequent ISO 8820 parts; 50,000 cycles
  - Meet operating time rating test

- Operating Time Rating
  - Ability to function during overloads
  - At 23 ± 5 ºC; at loads specified in subsequent ISO 8820 parts
  - Meet operating time within limits of subsequent ISO 8820 parts

- Current Steps
  - Ability to withstand prolonged heating due to low-level overloads
  - At 23 ± 5 ºC; apply fuse current till temp. stabilization; increase by 2.5% current rating till temp. stabilization
  - Fuse-element melts & current is interrupted

- Breaking Capacity
  - Ability to withstand the breaking current
  - At 23 ± 5 ºC; apply fuse-link breaking capacity at rated voltage; after interruption, hold rated voltage for 30s
  - No permanent arcing, no ruptures to fuse surface, fuse-link shall be removable

**Mechanical**
- Dimensions
  - Verify dimensions as required in subsequent ISO 8820 parts

- Chemical Loads
  - Fuse-links resistance to chemicals:
    - Diesel fuel, Bio-diesel fuel, Gasoline, etc.
  - Cotton cloth moistened with each fluid
  - Wipe five times with force of 5N
  - After test, marking shall remain legible, and color remain recognizable

- Strength of Terminals
  - Fuse-links withstand of insertion & removal
  - Force value depends on fuse-link construction
  - Force value found in subsequent ISO 8820 parts

- Mechanical Load
  - Verify fuse-links resistance to chemicals:
    - Diesel fuel, Bio-diesel fuel, Gasoline, etc.
  - Cotton cloth moistened with each fluid
  - Wipe five times with force of 5N
  - After test, marking shall remain legible, and color remain recognizable

**Environmental**
- Temperature/Humidity Cycling
  - Verify fuse-link operates under environmental stresses
  - Number of cycles: 10
  - Duration of a single cycle: 24 hours
  - Cycle consists of:
    - 4 hours at standard conditions
    - 0.5 hour transition maximum
    - 10 hours at 55 ºC/95-99%RH
    - 2.5 hour transition maximum
    - 2 hours at -40 ºC
    - 1.5 hour transition maximum
    - 2 hours at 120 ºC
  - After cycling, fuse-link must meet operating time rating

- Resistance against Temperature Shock
  - Verify fuse-link operates under environmental stresses
  - Number of cycles: 48
  - Duration of a single cycle: 40 minutes
  - Cycle consists of:
    - 20 minutes at -40 ºC
    - 15 seconds maximum transition time
    - 20 minutes at 100 ºC
    - 15 seconds maximum transition time
  - After cycling, fuse-link must meet operating time rating
Fuse selection criteria
## Fuse Selection Parameters

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal operating current</td>
<td>The maximum current that the fuse will experience during normal operation of the application</td>
</tr>
<tr>
<td>2</td>
<td>Application voltage (AC or DC)</td>
<td>The voltage level of the line that the fuse is protecting; this is also the voltage that the fuse will have to safely support after it has opened</td>
</tr>
<tr>
<td>3</td>
<td>Ambient temperature</td>
<td>The temperature in the area surrounding the fuse</td>
</tr>
<tr>
<td>4</td>
<td>Maximum available fault current</td>
<td>The maximum current that the fuse will experience during normal operation of the application</td>
</tr>
<tr>
<td>5</td>
<td>Current Pulses</td>
<td>Surge Currents, Inrush Currents, Start-up Currents, and Circuit Transients</td>
</tr>
<tr>
<td></td>
<td>▪ Shape</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Magnitude</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Duration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>▪ Quantity of the pulses</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Overload current</td>
<td>Amplitude and length of time in which the fuse must open</td>
</tr>
<tr>
<td>7</td>
<td>Other</td>
<td>▪ Mounting requirements – Through hole, SMT, Fuse holder, Physical size limitations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Agency Approvals required, such as UL, CSA, VDE, METI, MITI or Military</td>
</tr>
</tbody>
</table>
Fuse selection process: Summary of steps to select fuse

**Understand the application and circuit parameters** – V, I, Temp, Max fault, Time to damage, Size, Package, Accessories

**Determine minimum current rating of fuse**
(fuse re-rating, thermal de-rating)

\[ I_{\text{f min}} = \frac{I_{\text{f max}}}{FDR \times TDR} \]

**Determine minimum Nominal melting I^2t value of the application**

**Determine Pulse I^2t value of the application**

\[ \text{Pulse } I^2t = I_p^2 \times t \]

**Compare calculated and actual nominal melting I^2t values to ensure fuse will not suffer nuisance opening.** If there are multiple fuses qualified for the application, use secondary characteristics (size, voltage rating, etc.) to determine best solution

**Check T-C curve**

**IMPORTANT!!** Even though care may be used during the fuse selection process, it is recommended that application-level testing be performed to verify coordination of fuses to the circuit conditions
# AEC-Q200 Qualified cartridge fuse portfolio

<table>
<thead>
<tr>
<th>Parameter</th>
<th>828</th>
<th>526</th>
<th>527</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Photo</strong></td>
<td><img src="image1" alt="Product Photo" /></td>
<td><img src="image2" alt="Product Photo" /></td>
<td><img src="image3" alt="Product Photo" /></td>
</tr>
<tr>
<td><strong>Footprint/Height</strong></td>
<td>38 x Φ 10 mm</td>
<td>32 x Φ 10 mm</td>
<td>32 x Φ 6 mm</td>
</tr>
<tr>
<td><strong>Voltage Rating</strong></td>
<td>1000 VDC</td>
<td>500 VAC/VDC</td>
<td>500 VAC</td>
</tr>
<tr>
<td><strong>Interrupting Rating</strong></td>
<td>10 kA @ 1000 VDC</td>
<td>10 kA @ 500 VAC/VDC</td>
<td>10 kA @ 500 VAC</td>
</tr>
<tr>
<td><strong>Amperage Rating</strong></td>
<td>15 A ~ 30 A</td>
<td>30–60 A</td>
<td>30–50 A</td>
</tr>
<tr>
<td><strong>Operating Temperature</strong></td>
<td>-55 °C to +125 °C</td>
<td>-55 °C to +125 °C</td>
<td>-55 °C to 125 °C</td>
</tr>
</tbody>
</table>

## 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 surface mount fuses

<table>
<thead>
<tr>
<th>Parameter</th>
<th>885</th>
<th>881</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product Photo</td>
<td><img src="image1" alt="Product Photo" /></td>
<td><img src="image2" alt="Product Photo" /></td>
</tr>
<tr>
<td>Footprint/Height</td>
<td>10.86 mm x 4.78 mm</td>
<td>12.5 mm x 10 mm</td>
</tr>
<tr>
<td>Voltage Rating</td>
<td>500 VDC</td>
<td>100 VDC</td>
</tr>
<tr>
<td>Interrupting Rating</td>
<td>1500 A @ 350 VDC</td>
<td>1500A @ 75VDC</td>
</tr>
<tr>
<td>Amperage Rating</td>
<td>1 A–5 A</td>
<td>60A ~ 125 A</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55 °C to 105 °C</td>
<td>-55 °C to 100 °C</td>
</tr>
</tbody>
</table>

## 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 4.78 mm)
AEC-Q200 Qualified surface mount thin film chip fuses

<table>
<thead>
<tr>
<th>Parameter</th>
<th>441A</th>
<th>501A</th>
<th>407A</th>
<th>438A</th>
<th>440A</th>
<th>483A</th>
<th>437A</th>
<th>422A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footprint/height</td>
<td>0603</td>
<td>1206</td>
<td>1206</td>
<td>0603</td>
<td>1206</td>
<td>1206</td>
<td>1206</td>
<td>2410</td>
</tr>
<tr>
<td>Voltage rating</td>
<td>32 VDC</td>
<td>32 VDC</td>
<td>24–63 VDC</td>
<td>24–63 VDC</td>
<td>50–125 VDC</td>
<td>75 VAC/VDC</td>
<td>32–125 VDC</td>
<td>125–250 VAC/VDC</td>
</tr>
<tr>
<td>Interrupting rating at rated voltage</td>
<td>50 A</td>
<td>150 A</td>
<td>50 A</td>
<td>50 A</td>
<td>50 A</td>
<td>50 A</td>
<td>50 A</td>
<td>50–100 A</td>
</tr>
<tr>
<td>Amperage rating</td>
<td>2–6 A</td>
<td>10–20 A</td>
<td>1–8 A</td>
<td>0.25–6 A</td>
<td>0.250–8 A</td>
<td>0.75–2 A</td>
<td>0.25–8 A</td>
<td>0.75–5 A</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-55 ºC to 150 ºC</td>
<td>-55 ºC to 150 ºC</td>
<td>-55 ºC to 150 ºC</td>
<td>-55 ºC to 150 ºC</td>
<td>-55 ºC to 150 ºC</td>
<td>-55 ºC to 125 ºC</td>
<td>-55 ºC to 150 ºC</td>
<td>-55 ºC to 125 ºC</td>
</tr>
</tbody>
</table>

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)
Local resources supporting our global customers
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