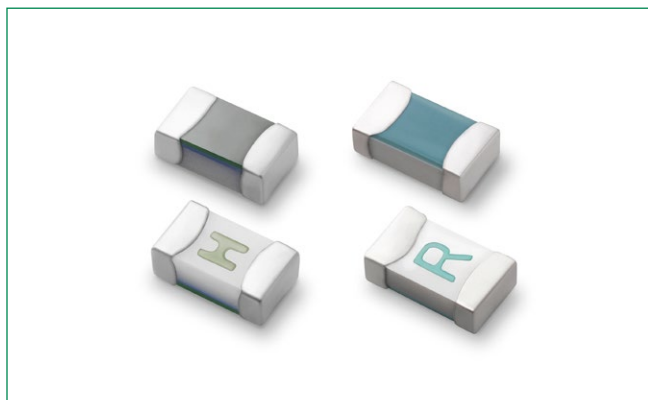


### 438A Series – 0603 Fast-Acting Fuse



#### Agency Approvals

| Agency                                                                            | Agency File Number | Ampere Range |
|-----------------------------------------------------------------------------------|--------------------|--------------|
|  | E10480             | 0.25A – 6A   |
|  | 29862              | 0.25A – 6A   |

#### Electrical Characteristics for Series

| % of Ampere Rating | Ampere Rating | Opening Time at 25°C |
|--------------------|---------------|----------------------|
| 100%               | 0.250A – 6A   | 4 Hours, Minimum     |
| 250%               | 0.250A – 6A   | 5 Seconds, Maximum   |

#### Description

The 438A series AECQ-compliant fuses are specifically tested to cater secondary circuit protection needs of compact auto electronics application.

The general design ensures excellent temperature stability and performance reliability.

The high I<sup>2</sup>t values which is typical in the Littelfuse ceramic fuse family ensure high inrush current withstand capability.

#### Features

- Operating Temperature from -55°C to +150°C
- Meets Littelfuse's Automotive qualifications\*
- 100% Lead-free, RoHS compliant and Halogen-free
- Recognized to UL/CSA/NMX 248-1 and UL/CSA/NMX 248-14
- Suitable for both leaded and lead-free reflow/wave soldering

\* Largely based on Littelfuse internal AECQ-200 test plan.

#### Applications

- Li-ion Battery
- TFT Display
- LED Head-Lights
- Battery Management System (BMS)
- Automotive Navigation System
- Clusters

#### Additional Information



Datasheet



Resources



Samples

#### Electrical Specifications by Item

| Ampere Rating (A) | Amp Code | Max. Voltage Rating (V) | Interrupting Rating (AC/DC) <sup>1</sup> | Nominal Resistance (Ohms) <sup>2</sup> | Nominal Melting I <sup>2</sup> t (A <sup>2</sup> Sec.) <sup>3</sup> | Nominal Voltage Drop At Rated Current (V) <sup>4</sup> | Nominal Power Dissipation At Rated Current (W) | Agency Approvals                                                                      |                                                                                       |
|-------------------|----------|-------------------------|------------------------------------------|----------------------------------------|---------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                   |          |                         |                                          |                                        |                                                                     |                                                        |                                                |  |  |
| 0.25              | .250     | 63VDC                   | 50A @ 63VDC<br>50A @ 32VAC               | 2.218                                  | 0.0017                                                              | 0.550                                                  | 0.138                                          | x                                                                                     | x                                                                                     |
| 0.375             | .375     | 63VDC                   |                                          | 1.247                                  | 0.0041                                                              | 0.488                                                  | 0.183                                          | x                                                                                     | x                                                                                     |
| 0.5               | .500     | 63VDC                   |                                          | 0.829                                  | 0.0100                                                              | 0.486                                                  | 0.243                                          | x                                                                                     | x                                                                                     |
| 0.75              | .750     | 63VDC                   |                                          | 0.466                                  | 0.0281                                                              | 0.378                                                  | 0.284                                          | x                                                                                     | x                                                                                     |
| 1                 | 001.     | 63VDC                   |                                          | 0.310                                  | 0.0593                                                              | 0.351                                                  | 0.351                                          | x                                                                                     | x                                                                                     |
| 1.25              | 1.25     | 63VDC                   |                                          | 0.200                                  | 0.0510                                                              | 0.365                                                  | 0.456                                          | x                                                                                     | x                                                                                     |
| 1.75              | 1.75     | 32VDC                   | 50A@32VAC/32VDC                          | 0.1405                                 | 0.1440                                                              | 0.360                                                  | 0.540                                          | x                                                                                     | x                                                                                     |
| 2                 | 002.     | 32                      | 50A @ 32VDC/12VAC                        | 0.0490                                 | 0.181                                                               | 0.107                                                  | 0.214                                          | x                                                                                     | x                                                                                     |
| 2.5               | 02.5     | 32                      |                                          | 0.0364                                 | 0.240                                                               | 0.095                                                  | 0.238                                          | x                                                                                     | x                                                                                     |
| 3                 | 003.     | 32                      |                                          | 0.0264                                 | 0.439                                                               | 0.093                                                  | 0.279                                          | x                                                                                     | x                                                                                     |
| 3.5               | 03.5     | 32                      |                                          | 0.0210                                 | 0.647                                                               | 0.082                                                  | 0.287                                          | x                                                                                     | x                                                                                     |
| 4                 | 004.     | 32                      |                                          | 0.0177                                 | 0.730                                                               | 0.079                                                  | 0.316                                          | x                                                                                     | x                                                                                     |
| 5                 | 005.     | 32                      |                                          | 0.0127                                 | 0.747                                                               | 0.074                                                  | 0.370                                          | x                                                                                     | x                                                                                     |
| 6                 | 006.     | 24                      | 50A @ 24VDC/12VAC                        | 0.0086                                 | 1.444                                                               | 0.072                                                  | 0.432                                          | x                                                                                     | x                                                                                     |

#### Notes:

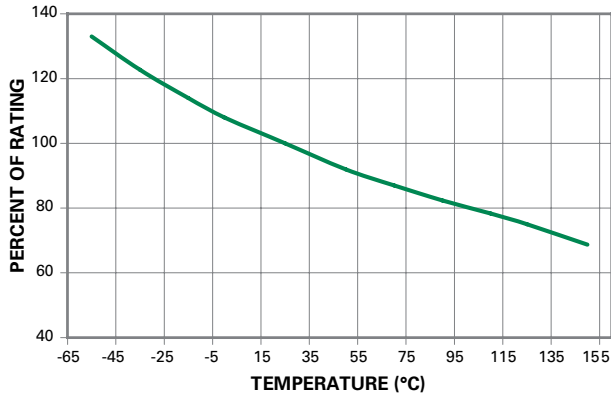
- AC Interrupting Rating tested at rated voltage with unity power factor. DC Interrupting Rating tested at rated voltage with time constant < 0.8 msec.
- Nominal Resistance measured with < 10% rated current.
- Nominal Melting I<sup>2</sup>t measured at 1 msec. opening time.

#### 4. Nominal Voltage Drop measured at rated current after temperature has stabilized.

Devices designed to carry rated current for 4 hours minimum. It is recommended that devices be operated continuously at no more than 80% rated current. See "Temperature Re-rating Curve" for additional re-rating information.

Devices designed to be mounted with marking code facing up.

### Temperature Re-rating Curve



**Note:**

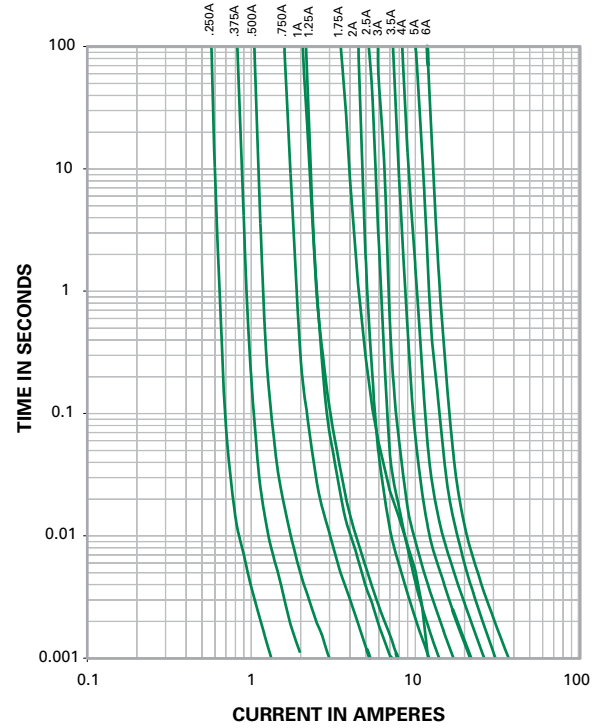
1. Re-rating depicted in this curve is in addition to the standard re-rating of 20% for continuous operation.

**Example:**

For continuous operation at 75 degrees celsius, the fuse should be rerated as follows:

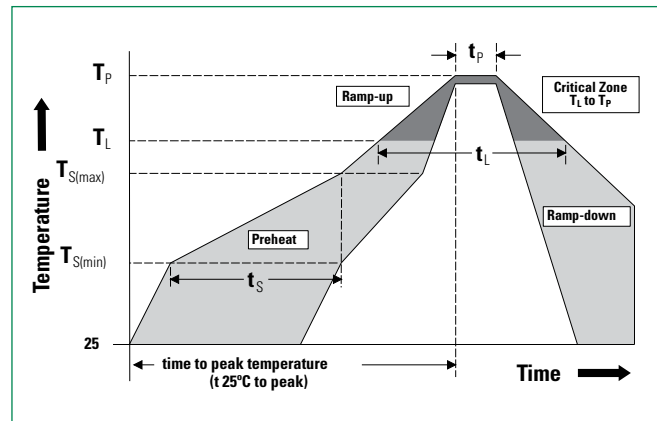
$$I = (0.80)(0.85)_{RAT} = (0.68)_{RAT}$$

### Average Time Current Curves



### Soldering Parameters

|                                                                        |                                    |                         |
|------------------------------------------------------------------------|------------------------------------|-------------------------|
| <b>Reflow Condition</b>                                                |                                    | Pb – free assembly      |
| <b>Pre Heat</b>                                                        | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                                        | - Time (Min to Max) ( $t_s$ )      | 60 – 180 seconds        |
| <b>Average Ramp-up Rate (Liquidus Temp (<math>T_L</math>) to peak)</b> |                                    | 3°C/second max.         |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 5°C/second max.         |
| <b>Reflow</b>                                                          | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|                                                                        | - Temperature ( $t_L$ )            | 60 – 150 seconds        |
| <b>Peak Temperature (<math>T_P</math>)</b>                             |                                    | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>   |                                    | 10 – 30 seconds         |
| <b>Ramp-down Rate</b>                                                  |                                    | 6°C/second max.         |
| <b>Time 25°C to peak Temperature (<math>T_P</math>)</b>                |                                    | 8 minutes max.          |
| <b>Do not exceed</b>                                                   |                                    | 260°C                   |
| <b>Wave Soldering</b>                                                  |                                    | 260°C, 10 seconds max.  |



### Product Characteristics

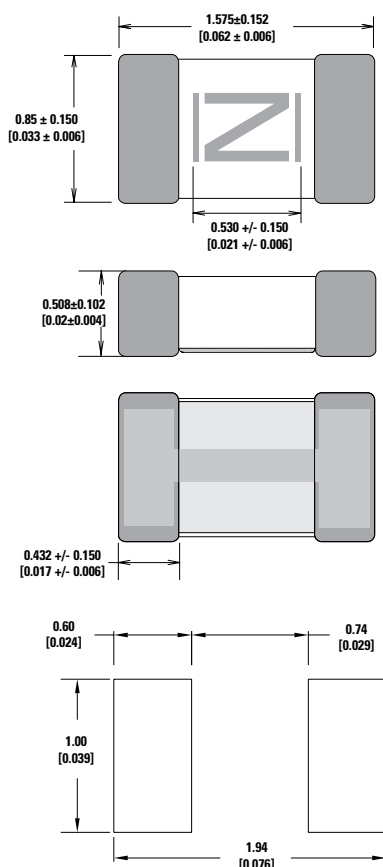
|                                   |                                                                                                                                  |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| <b>Materials</b>                  | <b>Body:</b> Advanced Ceramic<br><b>Terminations:</b> Ag/Ni/Sn (100% Lead-free)<br><b>Element Cover Coating:</b> Lead-free Glass |
| <b>Moisture Sensitivity Level</b> | IPC/JEDEC J-STD-020, Level 1                                                                                                     |
| <b>Solderability</b>              | IPC/EIC/JEDEC J-STD-002, Condition C                                                                                             |
| <b>Humidity Test</b>              | MIL-STD-202, Method 103, Conditions D                                                                                            |
| <b>Resistance to Solder Heat</b>  | MIL-STD-202, Method 210, Condition B                                                                                             |
| <b>Moisture Resistance</b>        | MIL-STD-202, Method 106                                                                                                          |

|                                     |                                      |
|-------------------------------------|--------------------------------------|
| <b>Thermal Shock</b>                | MIL-STD-202, Method 107, Condition B |
| <b>Mechanical Shock</b>             | MIL-STD-202, Method 213, Condition A |
| <b>Vibration</b>                    | MIL-STD-202, Method 201              |
| <b>Vibration, High Frequency</b>    | MIL-STD-202, Method 204, Condition D |
| <b>Dissolution of Metallization</b> | IPC/EIC/JEDEC J-STD-002, Condition D |
| <b>Terminal Strength</b>            | IEC 60127-4                          |

|                                 |                                                                           |
|---------------------------------|---------------------------------------------------------------------------|
| <b>High Temperature Storage</b> | MIL-STD-202 Method 108 with exemptions                                    |
| <b>Thermal Shock Test</b>       | JESD22 Method JA-104, Test Conditions B and N                             |
| <b>Biased Humidity</b>          | MIL-STD-202 Method 103, 85°C/85% RH with 10% operating power for 1000 hrs |
| <b>Operational Life</b>         | MIL-STD-202 Method 108, Test Condition D                                  |
| <b>Resistance To Solvents</b>   | MIL-STD-202 Method 215                                                    |
| <b>Mechanical Shock</b>         | MIL-STD-202 Method 213, Test Condition C                                  |

|                                     |                                           |
|-------------------------------------|-------------------------------------------|
| <b>High Frequency Vibration</b>     | MIL-STD-202, Method 204                   |
| <b>Resistance To Soldering Heat</b> | MIL-STD-202 Method 210, Test Condition B  |
| <b>Solderability</b>                | JESD22-B102E Method 1                     |
| <b>Terminal Strength For SMD</b>    | AEC Q200-006                              |
| <b>Board Flex</b>                   | AEC Q200-005                              |
| <b>Electrical Characterization</b>  | 3 Temperature Electrical Characterization |

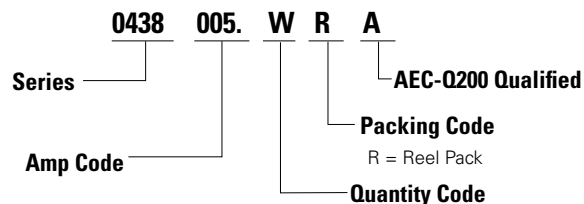
### Dimensions



### Part Marking System

| Amp Code | Marking Code |
|----------|--------------|
| .250     | D            |
| .375     | E            |
| .500     | F            |
| .750     | G            |
| 001.     | H            |
| 1.25     | J            |
| 1.75     | L            |
| 002.     | N            |
| 02.5     | Q            |
| 003.     | P            |
| 03.5     | R            |
| 004.     | S            |
| 005.     | T            |
| 006.     | U            |

### Part Numbering System



### Packaging

| Packaging Option  | Packaging Specification    | Quantity | Quantity & Packaging Code |
|-------------------|----------------------------|----------|---------------------------|
| 8mm Tape and Reel | EIA-481, IEC 60286, Part 3 | 3000     | WR                        |

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