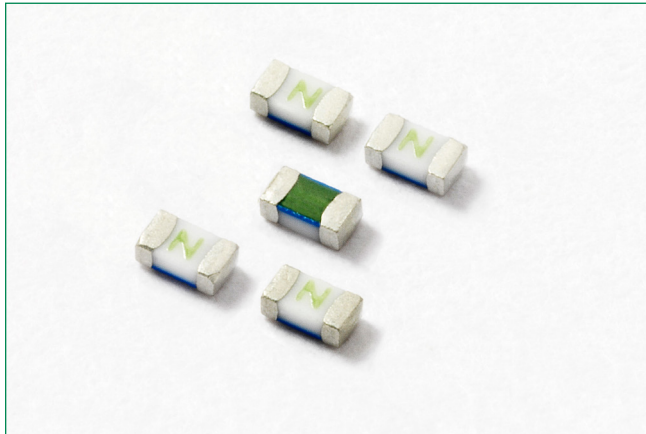


# 438 Series

## 0603 Fast-Acting Fuse



### Description

The 438 Series is a 100% Lead-free, RoHS compliant and Halogen-free fuse series designed specifically to provide over-current protection to circuits that operate under high working ambient temperature up to 150°C.

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 & Benefits

- Operating Temperature from -55°C to +150°C
- 100% Lead-free, RoHS compliant and Halogen-free
- Suitable for both leaded and lead-free reflow / wave soldering
- Recognized to UL/CSA/NMX 248-1 and UL/CSA/NMX 248-14
- Conforms to EN 60127-1 and EN 60127-7
- CE Mark indicates suitability for the European Market
- UKCA Mark indicates suitability for the UK Market

### Applications

- Handheld Electronics
- LCD Displays
- Battery Packs
- Hard Disk Drives
- SD Memory Cards

### Additional Information



Resources



Accessories



Samples

### Agency Approvals

| Agency | Agency File Number | Ampere Range |
|--------|--------------------|--------------|
|        | E10480             | 0.250A – 6A  |
|        | 29862              | 0.250A – 6A  |
|        | J50489122          | 0.250A - 6A  |
|        | N/A                | 0.250A - 6A  |
|        | N/A                | 0.250A - 6A  |

### Electrical Characteristics for Series

| % of Ampere Rating | Ampere Rating | Opening Time at 25°C |
|--------------------|---------------|----------------------|
| 100%               | 0.25A – 6A    | 4 Hours, Minimum     |
| 250%               | 0.25A – 6A    | 5 Seconds, Maximum   |

### Electrical Specifications by Item

| Ampere Rating (A) | Amp Code | Max. Voltage Rating (V) | Interrupting Rating        | 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 |   |   |   |   |
|-------------------|----------|-------------------------|----------------------------|--|---|--|--|------------------|---|---|---|---|
|                   |          |                         |                            |  |   |  |  |                  |   |   |   |   |
| 0.250             | .250     | 63VDC                   | 50A @ 63VDC<br>50A @ 32VAC | 2.218                                  | 0.0017  | 0.550  | 0.138  | x                | x | x | x | x |
| 0.375             | .375     | 63VDC                   |                            | 1.247                                  | 0.0041  | 0.488  | 0.183  | x                | x | x | x | x |
| 0.500             | .500     | 63VDC                   |                            | 0.829                                  | 0.0100  | 0.486  | 0.243  | x                | x | x | x | x |
| 0.750             | .750     | 63VDC                   |                            | 0.466                                  | 0.0281  | 0.378  | 0.284  | x                | x | x | x | x |
| 1.00              | 001.     | 63VDC                   |                            | 0.310                                  | 0.0593  | 0.351  | 0.351  | x                | x | x | x | x |
| 1.25              | 1.25     | 63VDC                   |                            | 0.200                                  | 0.0510  | 0.365  | 0.456  | x                | x | x | x | x |
| 1.50              | 01.5     | 63VDC                   |                            | 0.174                                  | 0.0902  | 0.368  | 0.552  | x                | x | x | x | x |
| 1.75              | 1.75     | 63VDC                   |                            | 0.1405                                 | 0.1440  | 0.360  | 0.540  | x                | x | x | x | x |
| 2.00              | 002.     | 32                      |                            | 0.051                                  | 0.1490  | 0.107  | 0.214  | x                | x | x | x | x |
| 2.50              | 02.5     | 32                      |                            | 0.0324                                 | 0.1977  | 0.095  | 0.238  | x                | x | x | x | x |
| 3.00              | 003.     | 32                      | 50A @ 32VDC/12VAC          | 0.0255                                 | 0.2922  | 0.093  | 0.279  | x                | x | x | x | x |
| 3.50              | 03.5     | 32                      |                            | 0.0205                                 | 0.4752  | 0.082  | 0.287  | x                | x | x | x | x |
| 4.00              | 004.     | 32                      |                            | 0.0170                                 | 0.6920  | 0.079  | 0.316  | x                | x | x | x | x |
| 5.00              | 005.     | 32                      |                            | 0.0115                                 | 0.7398  | 0.074  | 0.370  | x                | x | x | x | x |
| 6.00              | 006.     | 24                      | 50A @ 24VDC/12VAC          | 0.0085                                 | 1.3838  | 0.072  | 0.432  | x                | x | x | x | x |

**Notes:**

1. AC Interrupting Rating tested at rated voltage with unity power factor. DC Interrupting Rating tested at rated voltage with time constant < 0.8 msec.
2. Nominal Resistance measured with < 10% rated current.
3. 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.

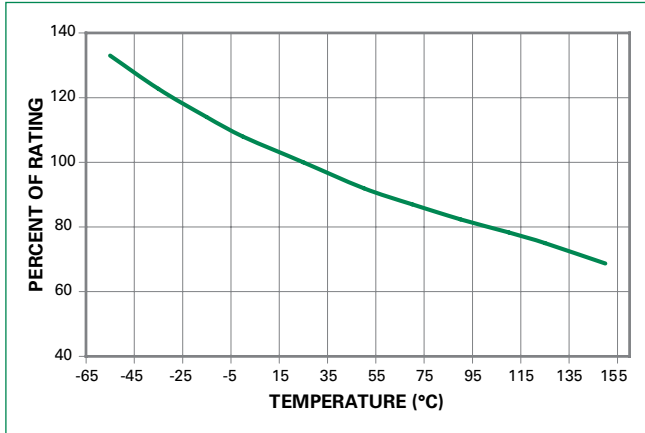
Devices designed to carry rated current for 4 hours minimum. It is recommended that devices be operated continuously at no more than 80% rated current. See "Temperature Re-rating Curve" for additional re-rating information.

Devices designed to be mounted with marking code facing up.

# 438 Series

## 0603 Fast-Acting Fuse

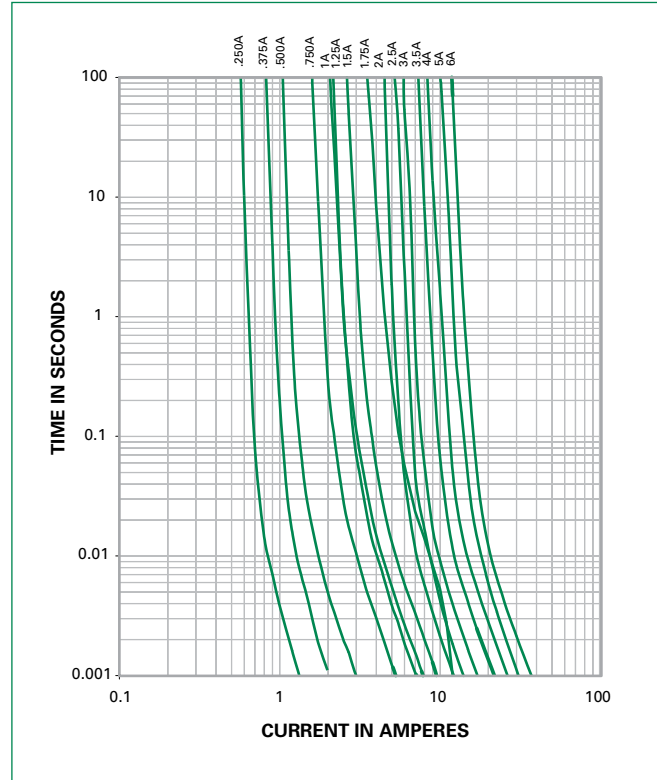
Temperature Re-rating Curve



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

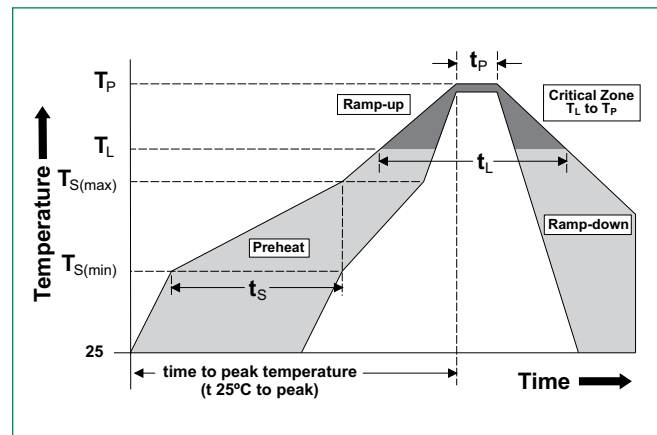
**Example:**  
 For continuous operation at 75 degrees celsius, the fuse should be rerated as follows:  
 $I = (0.80)(0.85)_{\text{RAT}} = (0.68)_{\text{RAT}}$

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) ( $t_p$ )       | 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 ( $t_t$ )             | 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.              |                         |



# 438 Series

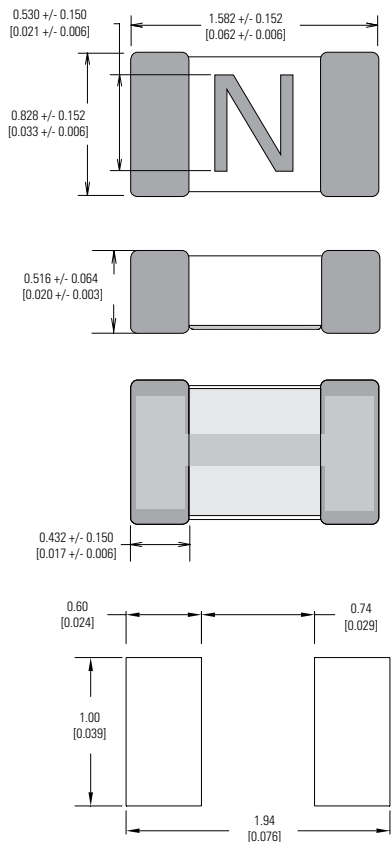
## 0603 Fast-Acting Fuse

### 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 B   |
| <b>Humidity</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-3 |
| <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                            |

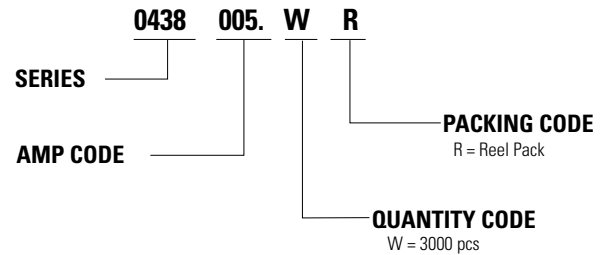
### Dimensions mm [in]



### Part Marking System

| Amp Code | Marking Code | Amp Code | Marking Code |
|----------|--------------|----------|--------------|
| .250     | <b>D</b>     | 002.     | <b>N</b>     |
| .375     | <b>E</b>     | 02.5     | <b>O</b>     |
| .500     | <b>F</b>     | 003.     | <b>P</b>     |
| .750     | <b>G</b>     | 03.5     | <b>R</b>     |
| 001.     | <b>H</b>     | 004.     | <b>S</b>     |
| 1.25     | <b>J</b>     | 005.     | <b>T</b>     |
| 01.5     | <b>K</b>     | 006.     | <b>U</b>     |
| 1.75     | <b>L</b>     |          |              |

### Part Numbering System



### Packaging

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

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