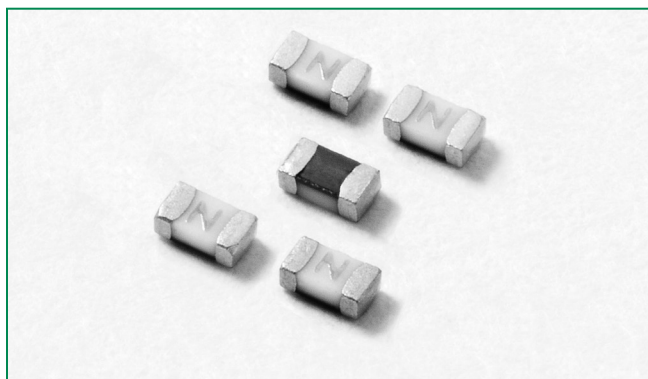


### RoHS HF 438 Series – 0603 Fast-Acting Fuse





#### 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.

#### Agency Approvals

| AGENCY  | AGENCY FILE NUMBER | AMPERE RANGE |
|---|--------------------|--------------|
|  | E10480             | 0.250A – 6A  |
|  | LR29862            | 0.250A – 6A  |

#### Features

- 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



#### 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   |

#### Applications

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

#### 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  |   |   |
|-------------------|----------|-------------------------|----------------------------|--|---|--|--|---|---|---|
|                   |          |                         |                            |  |   |  |  |  |  |   |
| 0.25              | .250     | 63                      | 50A @ 63VDC<br>50A @ 32VAC | 2.024                                  | 0.0017  | 0.550  | 0.138  | x   | x   |   |
| 0.375             | .375     | 63                      |                            | 1.247                                  | 0.0041  | 0.488  | 0.183  | x   | x   |   |
| 0.5               | .500     | 63                      |                            | 0.829                                  | 0.0100  | 0.486  | 0.243  | x   | x   |   |
| 0.75              | .750     | 63                      |                            | 0.466                                  | 0.0281  | 0.378  | 0.284  | x   | x   |   |
| 1                 | 001.     | 63                      |                            | 0.310                                  | 0.0593  | 0.351  | 0.351  | x   | x   |   |
| 1.25              | 1.25     | 63                      |                            | 0.200                                  | 0.0510  | 0.365  | 0.456  | x   | x   |   |
| 1.5               | 01.5     | 63                      |                            | 0.174                                  | 0.0902  | 0.368  | 0.552  | x   | x   |   |
| 1.75              | 1.75     | 63                      |                            | 0.125                                  | 0.1440  | 0.360  | 0.540  | x   | x   |   |
| 2                 | 002.     | 32                      | 50A @ 32VDC/12VAC          | 0.051                                  | 0.1490  | 0.107  | 0.214  | x   | x   |   |
| 2.5               | 02.5     | 32                      |                            | 0.0324                                 | 0.1977  | 0.095  | 0.238  | x   | x   |   |
| 3                 | 003.     | 32                      |                            | 0.0252                                 | 0.2922  | 0.093  | 0.279  | x   | x   |   |
| 3.5               | 03.5     | 32                      |                            | 0.0203                                 | 0.4752  | 0.082  | 0.287  | x   | x   |   |
| 4                 | 004.     | 32                      |                            | 0.0169                                 | 0.6920  | 0.079  | 0.316  | x   | x   |   |
| 5                 | 005.     | 32                      |                            | 0.0113                                 | 0.7398  | 0.074  | 0.370  | x   | x   |   |
| 6                 | 006.     | 24                      |                            | 50A @ 24VDC/12VAC                      | 0.0087  | 1.3838   | 0.072  | 0.432   | x   | x |

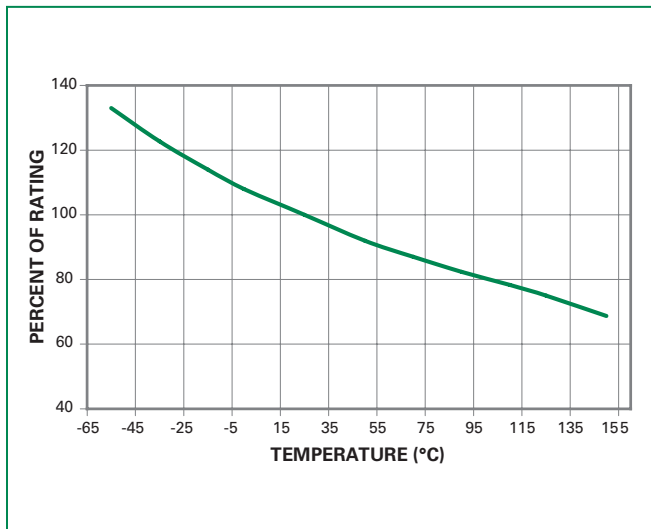
Notes:

- 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.
- 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 Derating Curve" for additional derating information.

Devices designed to be mounted with marking code facing up.

### Temperature Derating Curve



Note:

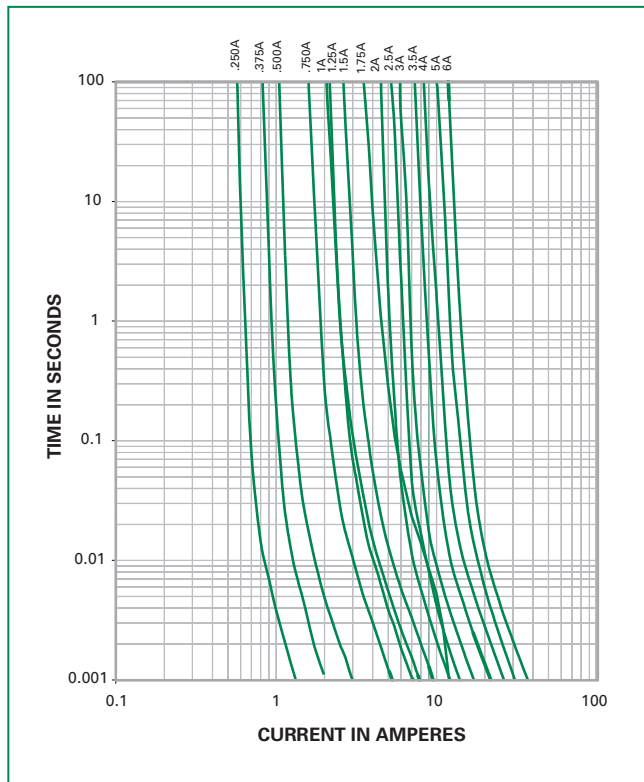
1. Derating depicted in this curve is in addition to the standard derating of 20% for continuous operation.

Example:

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

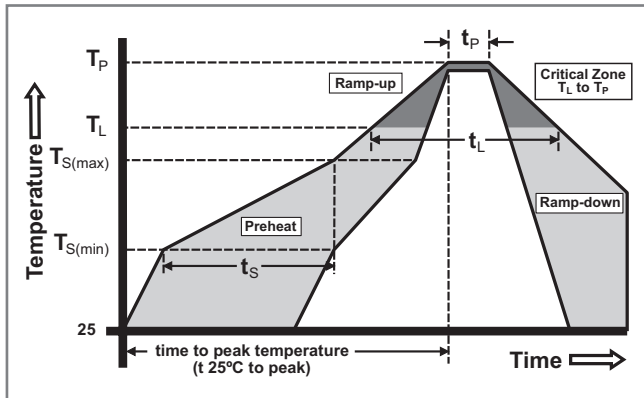
$$I = (0.80)(0.85)I_{RAT} = (0.68)I_{RAT}$$

### Average Time Current Curves



### Soldering Parameters

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



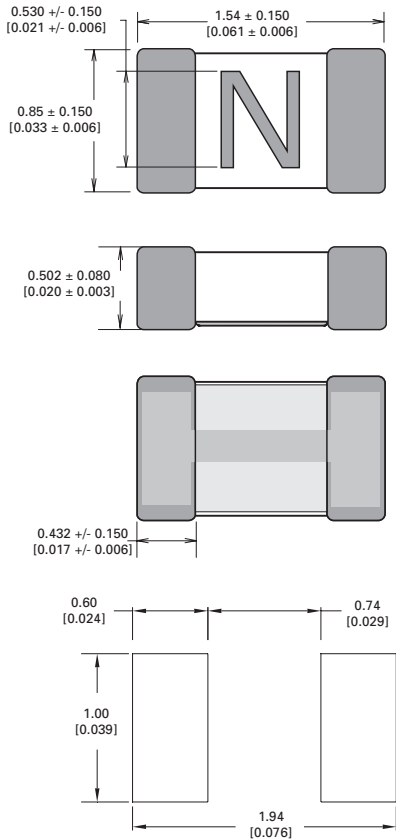
|                |                        |
|----------------|------------------------|
| Wave Soldering | 260°C, 10 seconds max. |
|----------------|------------------------|

### 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-020C, Level 1  |
| <b>Solderability</b>              | IPC/EIC/JEDEC J-STD-002B, Condition B  |
| <b>Humidity</b>                   | MIL-STD-202, Method 103B, Conditions D   |
| <b>Resistance to Solder Heat</b>  | MIL-STD-202, Method 210F, Condition B  |

|                                     |   |
|-------------------------------------|---|
| <b>Moisture Resistance</b>          | MIL-STD-202, Method 106G                |
| <b>Thermal Shock</b>                | MIL-STD-202, Method 107G, Condition B-3 |
| <b>Mechanical Shock</b>             | MIL-STD-202, Method 213B, Condition A   |
| <b>Vibration</b>                    | MIL-STD-202, Method 201A                |
| <b>Vibration, High Frequency</b>    | MIL-STD-202, Method 204D, Condition D   |
| <b>Dissolution of Metallization</b> | IPC/EIC/JEDEC J-STD-002B, Condition D   |
| <b>Terminal Strength</b>            | IEC 60127-4                             |

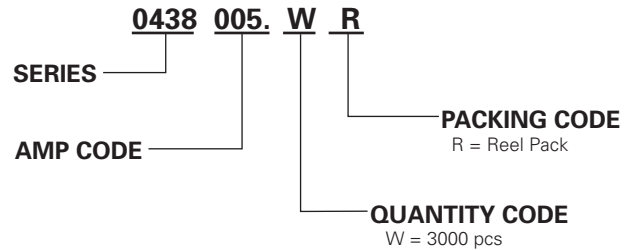
### Dimensions



### Part Marking System

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

### Part Numbering System



### Packaging

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