



Expertise Applied | Answers Delivered



CIRCUIT  
PROTECTION  
SOLUTIONS FOR  
AUTOMOTIVE  
APPLICATIONS



# Automotive

**Passenger Car Solutions**



**Our offering of automotive circuit protection solutions encompasses a wide range of applications:**

- Powertrain**
  - Engine Management
  - Transmission Control
  - Cooling Fan
  - Water Pump
- Safety**
  - ABS
  - EPAS
  - Air Bag
  - Chassis Control
- Comfort**
  - Window Lift
  - Sun Roof
  - Door Lock
  - Power Seat
  - HVAC
- Infotainment**
  - Dashboard
  - Navigation
  - In-Car Entertainment
- Fuse Box**
- Power Supply**
- Lighting**
  - Wire Harness
  - Generator
  - HID Headlight
  - Headlight Leveling
  - Directional Lighting



# portfolio of Littelfuse automotive technologies, products & services

Passenger Automobiles | Aftermarket

## SERVICES

### Product Technologies Plus Application Design Evaluation Services

Littelfuse is the world leader in circuit protection. We offer an extensive selection of circuit protection technologies for Automotive applications. Littelfuse circuit protection expert staff can assist you in designing circuit protection for your most demanding applications. Solutions for over-current applications as well as over-voltage applications are available from Littelfuse.



## CIRCUIT PROTECTION TECHNOLOGIES (1-8)

### 1. Fuses/Footprint Reduction

MICRO2™, MICRO3™ fuses

### 2. Medium Current Cartridge Fuses

MCASE™ cartridge fuses; considerably smaller than JCASE® and Low Profile JCASE® fuses

### 3. Discrete High Current Fuses

High Current Bolt Down fuses and fuse arrays

### 4. ZCase Masterfuse

Smallest high current distribution product in the industry

### 5. Masterfuse

High current distribution array

### 6. ZCase Single MEGA

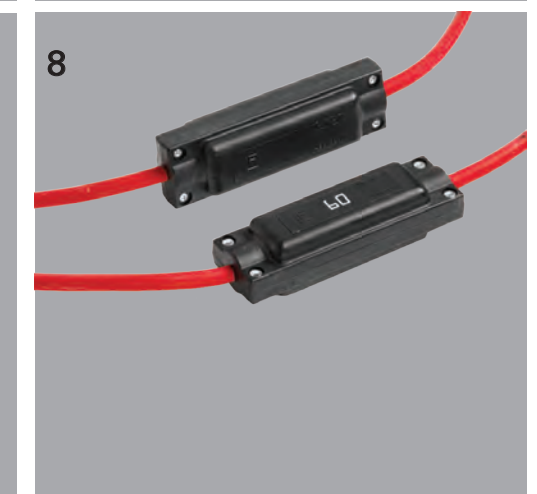
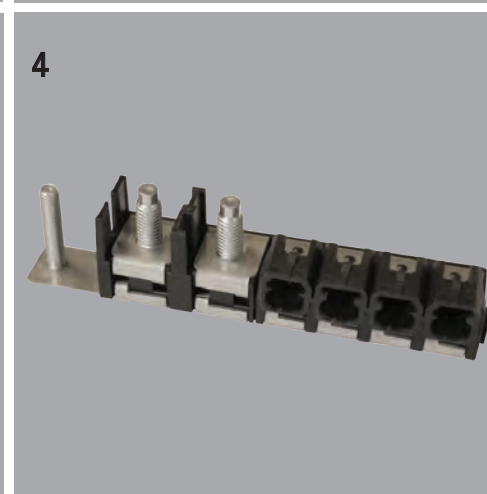
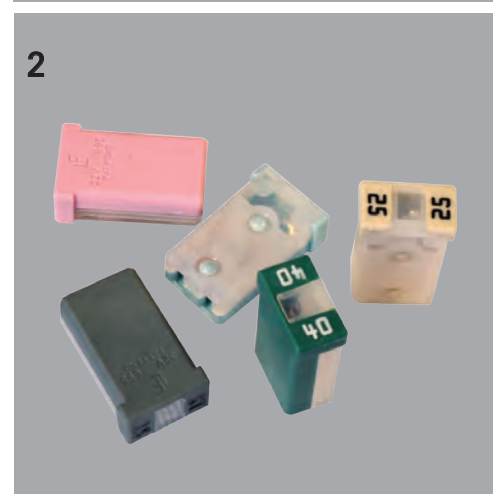
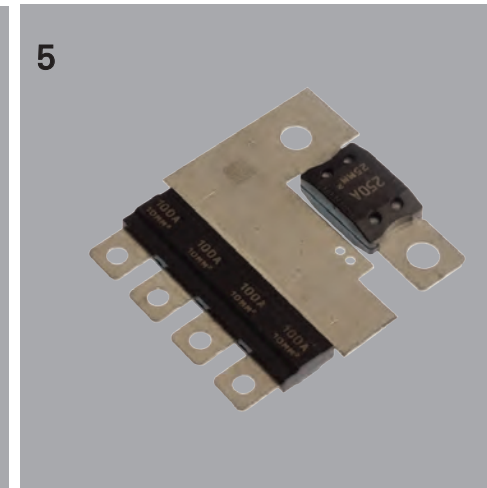
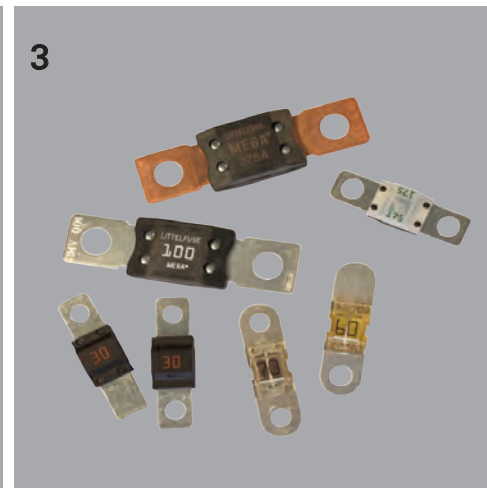
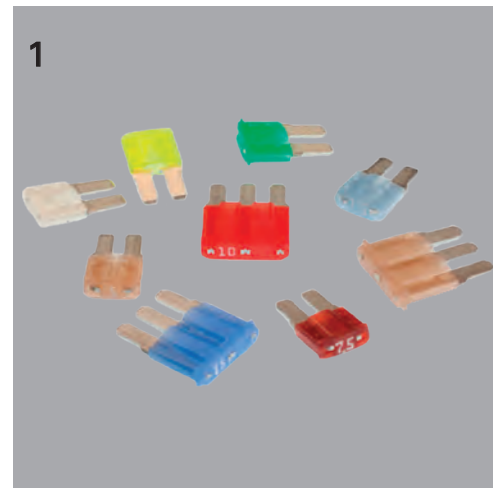
Minimal Footprint Bolt Down fuse

### 7. High Voltage Fuses

Low-current fuses for Electric and Hybrid Electric Vehicles

### 8. Battery Cable Protection

CABLE PRO® protectors for mounting directly inline as part of a high power cable assembly





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## Blade Fuses



|  |           |
|--|-----------|
| <b>MICRO2™ Blade Fuse 32V</b>            | <b>2</b>  |
| <b>MICRO3™ Blade Fuse 32V</b>            | <b>4</b>  |
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# MICRO2™ BLADE FUSE 32V

**RoHS**



Black amperage stamps are used on the 20A & 25A / Light colored housings to improve contrast for vision system inspection.



Also available:  
**MICRO2 Sn Fuse**  
(tin plated)

## Specifications

|                              |                      |
|------------------------------|----------------------|
| Voltage Rating:              | 32 VDC               |
| Interrupting Ratings:        | 1000A @ 32 VDC       |
| Operating Temperature Range: | -40°C to +125°C      |
| Terminals:                   | Ag plated zinc alloy |
| Housing Material:            | PA66                 |

## Ordering Information

| Part Number           | Package Size |
|-----------------------|--------------|
| 0327xxx.YX2S          | 4000         |
| 0327xxx.UXS           | 500          |
| 0327xxx.LXS           | 50           |
| <b>MICRO2 Sn Fuse</b> |              |
| 0327xxx.YX2T          | 4000         |

## Description

The MICRO2™ Fuse is the new standard for vehicle circuit protection. Its sub-miniature design meets the need for more circuits to be protected while utilizing less space and its ability to cope with high temperatures in adverse environments makes the MICRO2™ Fuse of recommended choice for protection.

## Time-Current Characteristics

| % of Rating | Opening Time Min / Max |
|-------------|------------------------|
| 110         | 100 h / -              |
| 135         | 0.75 sec / 120 sec     |
| 160         | 0.30 sec / 50 sec      |
| 200         | 0.15 sec / 5 sec       |
| 350         | 0.04 sec / 0.50 sec    |
| 600         | 0.02 sec / 0.100 sec   |

## Ratings

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 0327005_    | 5                  |                        | 116                    | 17.4                 | 17                                  |
| 032707.5_   | 7.5                |                        | 106                    | 10.8                 | 47                                  |
| 0327010_    | 10                 |                        | 102                    | 7.7                  | 89                                  |
| 0327015_    | 15                 |                        | 94                     | 4.9                  | 189                                 |
| 0327020_    | 20                 |                        | 91                     | 3.5                  | 397                                 |
| 0327025_    | 25                 |                        | 90                     | 2.6                  | 585                                 |
| 0327030_    | 30                 |                        | 88                     | 2.1                  | 1028                                |

## Dimensions

Dimensions in mm



# MICRO2™ BLADE FUSE 32V

RoHS

## Time-Current Characteristic Curves



## Temperature Derating Curve



# MICRO3™ BLADE FUSE 32V

RoHS



## Description

The MICRO3™ Fuse has 3 terminals and 2 fuse elements with a common center terminal. Its sub-miniature design meets the need for more circuits to be protected while utilizing less space and its ability to cope with high temperatures in adverse environments makes the MICRO3™ Fuse of recommended choice for protection.

## Time-Current Characteristics

| % of Rating | Opening Time (Min / Max) |
|-------------|--------------------------|
| 110         | 100 h / -                |
| 135         | 0.75 sec / 120 sec       |
| 160         | 0.30 sec / 50 sec        |
| 200         | 0.15 sec / 5 sec         |
| 350         | 0.04 sec / 0.50 sec      |
| 600         | 0.02 sec / 0.100 sec     |

## Ratings

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 0337005_    | 5                  | Gold                   | 116                    | 17.4                 | 17                                  |
| 033707.5_   | 7.5                | Brown                  | 106                    | 10.8                 | 47                                  |
| 0337010_    | 10                 | Red                    | 102                    | 7.8                  | 89                                  |
| 0337015_    | 15                 | Blue                   | 94                     | 4.9                  | 189                                 |

## Specifications

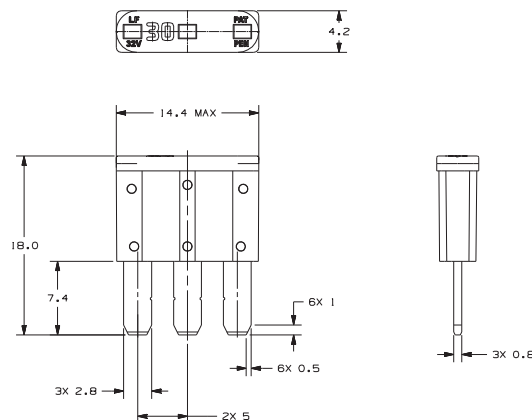
|                              |                      |
|------------------------------|----------------------|
| Voltage Rating:              | 32 VDC               |
| Interrupting Ratings:        | 1000A @ 32 VDC       |
| Operating Temperature Range: | -40°C to +125°C      |
| Terminals:                   | Ag plated zinc alloy |
| Housing Material:            | PA66                 |

## Ordering Information

| Part Number  | Package Size |
|--------------|--------------|
| 0337xxx.PX2S | 2000         |
| 0337xxx.LXS  | 50           |

## Dimensions

Dimensions in mm





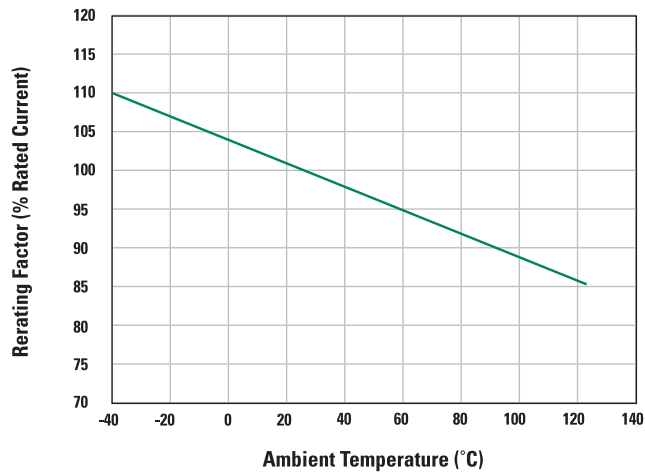
# MICRO3™ BLADE FUSE 32V

RoHS

## Time-Current Characteristic Curves



## Temperature Derating Curve



**LOW PROFILE MINI® 10.0MM FUSES RATED 58V**

**RoHS**



**Also available:  
Low Profile MINI® 10.9mm**



**Specifications**

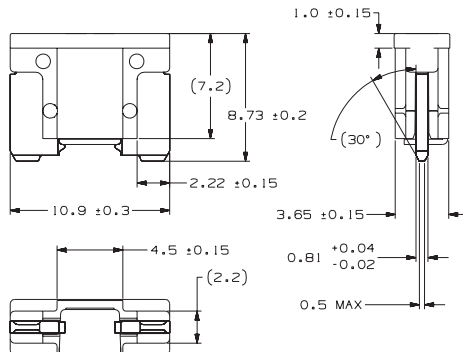
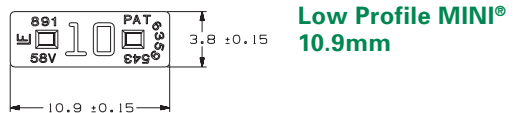
|                              |                 |
|------------------------------|-----------------|
| Voltage Rating:              | 58 VDC          |
| Interrupting Rating:         | 1000A @ 58 VDC  |
| Operating Temperature Range: | -40°C to +125°C |
| Terminals:                   | Ag plated zinc  |
| Housing Material:            | PA66            |

**Ordering Information**

| Part Number                     | Package Size | Plating |
|---------------------------------|--------------|---------|
| <b>Low Profile MINI® 10.0mm</b> |              |         |
| 0891xxx.NXS                     | 5000         | Ag      |
| 0891xxx.U                       | 500          | Ag      |
| 0891xxx.H                       | 100          | Ag      |
| <b>Low Profile MINI® 10.9mm</b> |              |         |
| 0891xxx.NXWS                    | 5000         | Ag      |

**Dimensions**

Dimensions in mm



**Description**

The Low Profile MINI® fuse has similar performance characteristics as the standard MINI® fuse. The lower overall height allows for more space and weight savings. The Low Profile MINI® fuse is designed to mate with tuning-fork terminals, which provides additional weight and material savings in fuse box designs by eliminating the need for female box terminals.

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 110         | 360,000 s / -              |
| 135         | 0.750 s / 120 s            |
| 200         | 0.150 s / 5 s              |
| 350         | 0.080 s / 0.250 s          |
| 600         | 0.030 s / 0.100 s          |

# LOW PROFILE MINI® 10.0MM FUSES RATED 58V

RoHS

## Ratings

| Part Number | Current Rating (A) | Housing Material Color  | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|---|----------------------|-------------------------------------|
| 0891005_    | 5                  |  | 17.21                | 22                                  |
| 089107.5_   | 7.5                |  | 10.65                | 53                                  |
| 0891010_    | 10                 |  | 7.59                 | 102                                 |
| 0891015_    | 15                 |  | 4.70                 | 198                                 |
| 0891020_    | 20                 |  | 3.35                 | 420                                 |
| 0891025_    | 25                 |  | 2.56                 | 613                                 |
| 0891030_    | 30                 |  | 2.06                 | 1110                                |

## Time-Current Characteristic Curves



## Temperature Derating Curve



# MINI<sup>®</sup> BLADE FUSE RATED 32V



**Also available:  
MINI<sup>®</sup> Sn Fuse  
(tin plated)**



## Specifications

|                              |  |
|------------------------------|--|
| Interrupting Rating:         | 1000A @ 32 VDC   |
| Voltage Rating:              | 32 VDC   |
| Operating Temperature Range: | -40°C to +125°C (Sn=-40°C to +105°C)   |
| Terminals:                   | Ag plated zinc alloy   |
| Housing Material:            | PA66   |
| Complies with:               | Meets SAE J2077<br>ISO 8820-3<br>UL 248 Special Purpose Fuses<br>(Sn Fuse not UL recognized) |

## Ordering Information

| Part Number                     | Package Size |
|---------------------------------|--------------|
| 0297xxx.WXNV                    | 3000         |
| 0297xxx.U                       | 500          |
| 0297xxx.H                       | 100          |
| 0297xxx.L                       | 50           |
| <b>MINI<sup>®</sup> Sn Fuse</b> |              |
| 0297xxx.WXT                     | 3000         |

## Dimensions

Dimensions in mm



## Description

The MINI<sup>®</sup> Fuse is the standard for vehicle circuit protection. Its miniature design meets the need for more circuits to be protected while utilizing less space, and its ability to cope with high temperatures in adverse environments makes the MINI<sup>®</sup> Fuse of recommended choice for protection.

## Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 110         | 360,000 s / -              |
| 135         | 0.75 s / 600 s             |
| 200         | 0.15 s / 5 s               |
| 350         | 0.080 s / 0.500 s          |
| 600         | 0.030 s / 0.100 s          |

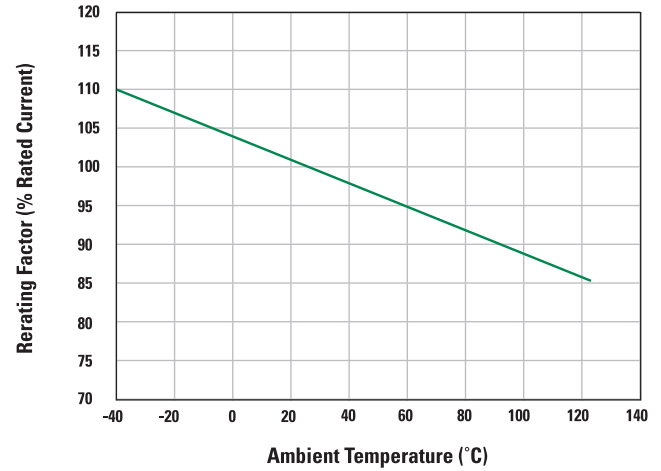
# MINI<sup>®</sup> BLADE FUSE RATED 32V



## Time-Current Characteristic Curves



## Temperature Derating Curve



## Ratings

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 0297002_    | 2                  | Grey                   | 171                    | 55.60                | 2.8                                 |
| 0297003_    | 3                  | Purple                 | 153                    | 33.75                | 9.4                                 |
| 0297004_    | 4                  | Pink                   | 121                    | 23.48                | 17                                  |
| 0297005_    | 5                  | Brown                  | 129                    | 17.75                | 25                                  |
| 029707.5_   | 7.5                | Dark Brown             | 135                    | 10.85                | 68                                  |
| 0297010_    | 10                 | Red                    | 108                    | 7.42                 | 93                                  |
| 0297015_    | 15                 | Blue                   | 98                     | 4.58                 | 270                                 |
| 0297020_    | 20                 | Yellow                 | 96                     | 3.21                 | 380                                 |
| 0297025_    | 25                 | White                  | 86                     | 2.36                 | 625                                 |
| 0297030_    | 30                 | Green                  | 87                     | 1.85                 | 1130                                |



**MINI® BLADE FUSE RATED 58V**



**Specifications**

|                              |   |
|------------------------------|---|
| Interrupting Rating:         | 1000A @ 58 VDC  |
| Voltage Rating:              | 58 VDC  |
| Operating Temperature Range: | -40°C to +125°C   |
| Terminals:                   | Ag plated zinc alloy  |
| Housing Materials:           | PA66  |
| Complies with:               | Meets SAE J2077<br>ISO 8820<br>UL 248 Special Purpose Fuses |

**Ordering Information**

| Part Number | Package Size |
|-------------|--------------|
| 0997xxx.WXN | 3000         |

**Description**

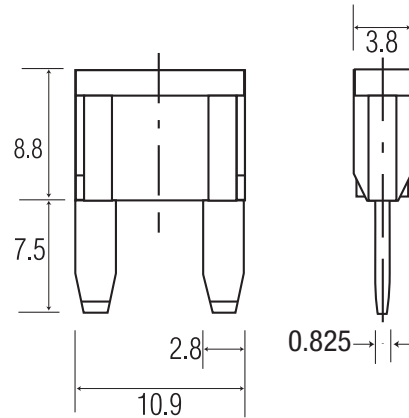
MINI® style fuse for use in 42V Systems. Same Time-Current characteristic as the 32V MINI® fuse. Fits into standard MINI® fuse sockets. Has a rejection feature to prevent fuses with lower voltage rating from being wrongfully inserted into the circuit. Current rating 2A - 30A @58 VDC max.

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 110         | 360,000 s / -              |
| 135         | 0.75 s / 600 s             |
| 200         | 0.15 s / 5 s               |
| 350         | 0.080 s / 0.500 s          |
| 600         | 0.030 s / 0.100 s          |

**Dimensions**

Dimensions in mm



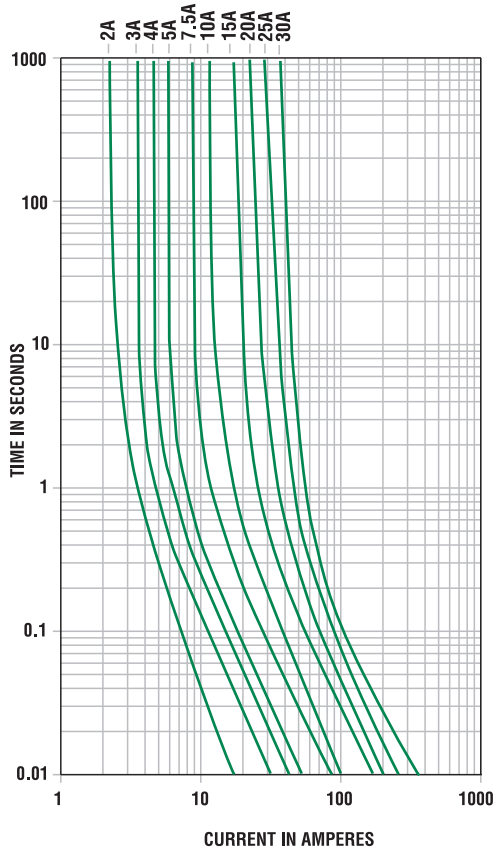
**Ratings**

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 0997002_    | 2                  | Grey                   | 171                    | 55.60                | 2.8                                 |
| 0997003_    | 3                  | Purple                 | 153                    | 33.75                | 9.4                                 |
| 0997004_    | 4                  | Pink                   | 121                    | 23.48                | 17                                  |
| 0997005_    | 5                  | Brown                  | 129                    | 17.75                | 25                                  |
| 099707.5_   | 7.5                | Dark Brown             | 135                    | 10.85                | 68                                  |
| 0997010_    | 10                 | Red                    | 108                    | 7.42                 | 93                                  |
| 0997015_    | 15                 | Blue                   | 98                     | 4.58                 | 270                                 |
| 0997020_    | 20                 | Yellow                 | 96                     | 3.21                 | 380                                 |
| 0997025_    | 25                 | White                  | 86                     | 2.36                 | 625                                 |
| 0997030_    | 30                 | Green                  | 87                     | 1.85                 | 1130                                |

# MINI<sup>®</sup> BLADE FUSE RATED 58V



## Time-Current Characteristic Curves



## Temperature Derating Curve



# ATOF® BLADE FUSE RATED 32V



**Also available:**  
**ATO® Ag Fuse**  
(silver plated)



## Specifications

|                              |                                      |
|------------------------------|--------------------------------------|
| Voltage Rating:              | 32 VDC                               |
| Interrupting Rating:         | 1000A @ 32 VDC                       |
| Operating Temperature Range: | -40°C to +105°C (Ag=-40°C to +125°C) |
| Terminals:                   | Sn plated zinc alloy                 |
| Housing Material:            | PA66                                 |
| Complies with:               | ISO 8820-3                           |
| UL Listed:                   | File AU1410                          |
| CSA Certified:               | File No. 29862                       |

## Ordering Information

| Part Number         | Package Size |
|---------------------|--------------|
| 0287xxx.PXCN        | 2000         |
| 0287xxx.U           | 500          |
| 0287xxx.H           | 100          |
| 0287xxx.L           | 50           |
| <b>ATO® Ag Fuse</b> |              |
| 0287xxx.PXS         | 2000         |

## Description

Developed by Littelfuse for the automotive industry, the ATOF® fuse has become the original equipment circuit protection standard for foreign and domestic automobiles and trucks. Readily identifiable and easily replaced, this fuse can be specified for a variety of low voltage electronic applications.

## Ratings

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 0287001_    | 1                  | Black                  | 176                    | 123                  | 0.4                                 |
| 0287002_    | 2                  | Grey                   | 141                    | 53.5                 | 1.4                                 |
| 0287003_    | 3                  | Purple                 | 137                    | 31.1                 | 7.4                                 |
| 0287004_    | 4                  | Pink                   | 136                    | 22.8                 | 14                                  |
| 0287005_    | 5                  | Brown                  | 128                    | 17.85                | 26                                  |
| 028707.5_   | 7.5                | Dark Brown             | 116                    | 10.91                | 60                                  |
| 0287010_    | 10                 | Red                    | 109                    | 7.70                 | 115                                 |
| 0287015_    | 15                 | Blue                   | 102                    | 4.80                 | 340                                 |
| 0287020_    | 20                 | Yellow                 | 98                     | 3.38                 | 520                                 |
| 0287025_    | 25                 | White                  | 92                     | 2.52                 | 1080                                |
| 0287030_    | 30                 | Light Green            | 84                     | 1.97                 | 1510                                |
| 0287035_    | 35                 | Dark Green             | 87                     | 1.61                 | 2280                                |
| 0287040_    | 40                 | Orange                 | 96                     | 1.44                 | 3310                                |

Corresponding holder see Section "Fuse Holders."

# ATOF® BLADE FUSE RATED 32V



## Dimensions

Dimensions in mm



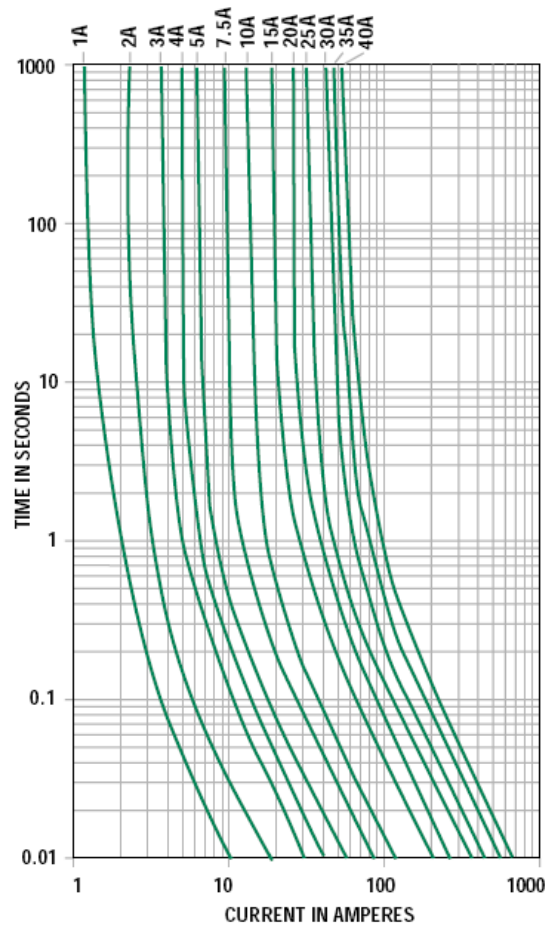
## Temperature Rerating Curve



## Time-Current Characteristics

| % of Rating | Current Rating      | Opening Time Min / Max (s)        |
|-------------|---------------------|-----------------------------------|
| 100         | 35A & 40A           | 360,000 s / -                     |
| 110         | 1A-30A              | 360,000 s / -                     |
| 135         | 1A & 2A<br>3A-40A   | 350 ms / 600 s<br>0.750 s / 600 s |
| 160         | 1A-40A              | 250 ms / 50 s                     |
| 200         | 1A & 2A<br>3A-40A   | 100 ms / 5.0 s<br>0.150 s / 5.0 s |
| 350         | 1A & 2A<br>3A-40A   | 20 ms / 500 ms<br>80 ms / 500 ms  |
| 600         | 1A-30A<br>35A & 40A | - / 100 ms<br>- / 150 ms          |

## Time-Current Characteristic Curves



**MAXI® BLADE FUSE RATED 32V**



**Also available:  
MAXI Sn Fuse  
(tin plated)**



**Specifications**

|                              |   |
|------------------------------|---|
| Voltage Rating:              | 32 VDC  |
| Interrupting Ratings:        | 1000A @ 32 VDC  |
| Operating Temperature Range: | -40°C to +125°C (Sn=-40°C to +105°C)                            |
| Terminals:                   | Ag plated zinc alloy  |
| Housing Material:            | PA66  |
| Complies with:               | SAE J 1888<br>ISO 8820-3:2002(E)<br>(Sn Fuse not UL recognized) |

**Ordering Information**

| Part Number         | Package Size |
|---------------------|--------------|
| 0299xxx.ZXNV        | 1200         |
| 0299xxx.L           | 50           |
| 0299xxx.TXN         | 10           |
| <b>MAXI Sn Fuse</b> |              |
| 0299xxx.ZXT         | 1200         |

**Description**

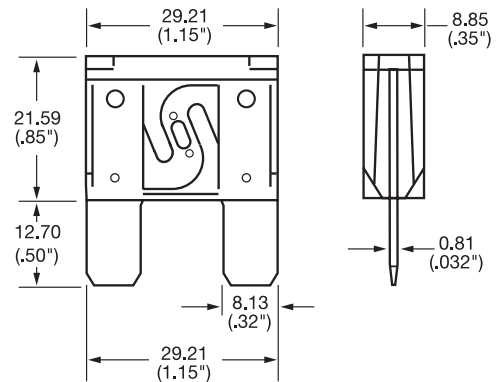
The MAXI® fuse uses "Diffusion Pill Technology" to provide predictable time delay characteristics and low heat dissipation.

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 100         | 360,000 s / -              |
| 135         | 60 s / 1,800 s             |
| 200         | 2 s / 60 s                 |
| 350         | 0.20 s / 7 s               |
| 600         | 0.040 s / 1 s              |

**Dimensions**

Dimensions in mm



Corresponding holder see Section "Fuse Holders."



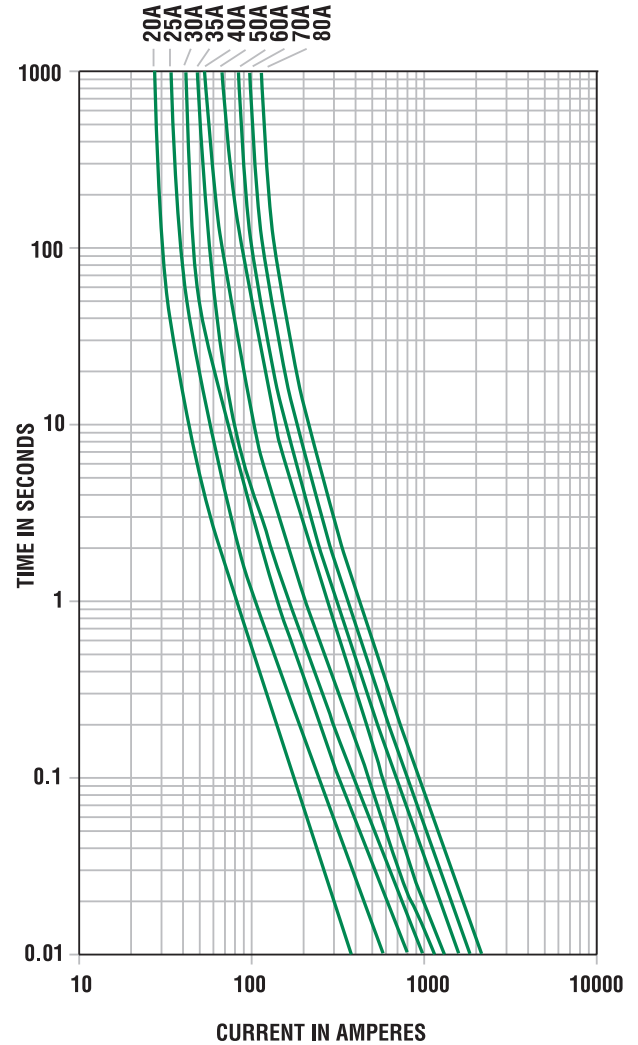
# MAXI<sup>®</sup> BLADE FUSE RATED 32V

RoHS

## Temperature Derating Curve



## Time-Current Characteristic Curves



## Ratings

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 0299020_    | 20                 | Yellow                 | 76                     | 3.10                 | 1100                                |
| 0299025_    | 25                 | Grey                   | 75                     | 2.39                 | 2087                                |
| 0299030_    | 30                 | Green                  | 77                     | 1.95                 | 4070                                |
| 0299035_    | 35                 | Brown                  | 75                     | 1.71                 | 6032                                |
| 0299040_    | 40                 | Orange                 | 75                     | 1.42                 | 8450                                |
| 0299050_    | 50                 | Red                    | 73                     | 1.10                 | 11300                               |
| 0299060_    | 60                 | Blue                   | 77                     | 0.89                 | 15300                               |
| 0299070_    | 70                 | Tan                    | 61                     | 0.64                 | 21200                               |
| 0299080_    | 80                 | White                  | 62                     | 0.54                 | 43600                               |

**MAXI® BLADE FUSE RATED 58V**

**RoHS**



**Description**

The MAXI® style fuse for use in 42V Systems. Same Time-Current characteristic as the 32V MAXI fuse using "Diffusion Pill Technology" to provide predictable time delay characteristics and low heat dissipation. Fits into standard MAXI® fuse sockets. Has a rejection feature to prevent fuses with lower voltage rating from being wrongfully inserted into the circuit. Current rating 20A - 80A @58 VDC max.

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 100         | 360,000 s / -              |
| 135         | 60 s / 1,800 s             |
| 200         | 2 s / 60 s                 |
| 350         | 0.20 s / 7 s               |
| 600         | 0.040 s / 1 s              |

**Ratings**

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 0999020_    | 20                 |                        | 76                     | 3.10                 | 1100                                |
| 0999025_    | 25                 |                        | 75                     | 2.39                 | 2087                                |
| 0999030_    | 30                 |                        | 77                     | 1.95                 | 4070                                |
| 0999035_    | 35                 |                        | 75                     | 1.71                 | 6032                                |
| 0999040_    | 40                 |                        | 75                     | 1.42                 | 8450                                |
| 0999050_    | 50                 |                        | 73                     | 1.10                 | 11300                               |
| 0999060_    | 60                 |                        | 77                     | 0.89                 | 15300                               |
| 0999070_    | 70                 |                        | 61                     | 0.64                 | 21200                               |
| 0999080_    | 80                 |                        | 62                     | 0.54                 | 43600                               |

Corresponding holder see Section "Fuse Holders."

**Specifications**

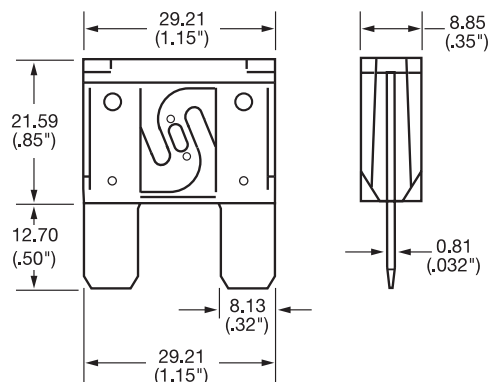
|                              |                                  |
|------------------------------|----------------------------------|
| Voltage Rating:              | 58 VDC                           |
| Interrupting Ratings:        | 1000A @ 58 VDC                   |
| Operating Temperature Range: | -40°C to +125°C                  |
| Terminals:                   | Ag plated zinc alloy             |
| Housing Material:            | PA66                             |
| Complies with:               | SAE J 1888<br>ISO 8820-3:2002(E) |

**Ordering Information**

| Part Number | Package Size |
|-------------|--------------|
| 0999xxx.ZXN | 1200         |

**Dimensions**

Dimensions in mm



MAXI<sup>®</sup> BLADE FUSE RATED 58V

RoHS

Temperature Derating Curve



Time-Current Characteristic Curves



**COPPER BLADE FUSES**



**FK1 32V**

FK1 32V MINI® style Fast-Acting Automotive Copper Blade Fuse

Amps (A): 1- 2, 3, 4, 5, 7.5, 10, 15, 20, 25, 30



**FUN**

MINI® 125V Automotive Copper Blade Fuse

Amps (A): 3, 4, 5, 7.5, 10, 15



**FP1**

MINI® 32V Fast - Acting Automotive Blade Fuse for P.C. Mounting

Amps (A): 1-2, 3, 4, 5, 7.5, 10, 15, 20, 25, 30



**FKS**

AT0® 32V Fast-Acting Automotive Copper Blade Fuse

Amps (A): 1-4, 5, 7.5, 10, 15, 20, 25, 30, 35, 40



**TAC**

AT0® 58V Fast-Acting Automotive Copper Blade Fuse

Amps (A): 1-3, 4, 5, 7.5, 10, 15, 20, 25, 30, 40



**FKS 80V**

AT0® 80V Automotive Copper Blade Fuse

Amps (A): 3, 4, 5, 7.5, 10, 15, 20, 25, 30



**TF**

AT0® 90V Automotive Copper Blade Fuse

Amps (A): 4, 8, 10, 15



**FK3**

MAXI® Slo-Blo® 32V Automotive Copper Blade Fuse

Amps (A): 15, 20, 25, 30, 35, 40, 50, 60, 70, 80



**TOE**

MAXI® style 58V Slo-Blo® Automotive Copper Blade Fuse

Amps (A): 20, 30, 40, 50, 60, 70



**FK3 80V**

MAXI™ 80V Automotive Copper Blade Fuse

Amps (A): 20, 30, 40, 50

## HELPING TO MAKE THE WORLD A CLEANER PLACE TO LIVE

### Littelfuse and the Environment

As members of the global community, we at Littelfuse have always strived to understand the impact of what we do, and of what we create, on the world around us. Because of this, our concern for the environment has always been an integral and fundamental part of our business. We continually work to balance our business objectives with the need to protect and improve the local and global environment.

### Our Strategy for the Design of Eco-friendly Products

Littelfuse has established a focused program committed to developing high-performance eco-friendly products along with a comprehensive set of processing/reliability data and technical process expertise. This includes processes for eliminating, detecting and documenting the presence of hazardous materials such as

- Lead
- Cadmium
- Hexavalent Chromium
- Mercury
- Brominated flame-retardants (PBBs and PBDEs)

The Littelfuse strategy for eco-friendly products is specifically designed to help support our worldwide customers in their transition to Lead-Free processing.



All products considered to be lead-free are marked with this symbol.

Littelfuse defines lead-free as products which contain less than 1000ppm (0.1%) Lead, measured by weight of the entire product.



All RoHS compliant products are marked with this symbol.

Littelfuse follows the requirement set by the European Union for all RoHS compliant products. The European Union Directive 2002/95/EC RoHS restricts the use of Lead, Mercury, Hexavalent Chromium, Cadmium and Brominated flame-retardants (PBBs and PBDEs)

Visit [www.littelfuse.com/lead-free](http://www.littelfuse.com/lead-free) for further information.



## Cartridge Fuses



|  |           |
|--|-----------|
| <b>MCASE™ Cartridge Fuses Rated 32V</b>  | <b>20</b> |
| <b>MCASE+ Cartridge Fuses Rated 32V</b>  | <b>22</b> |
| <b>Low Profile JCASE® Fuse Rated 58V</b> | <b>24</b> |
| <b>JCASE® Fuse Rated 32V</b>             | <b>26</b> |

**MCASE™ CARTRIDGE FUSES RATED 32V**

**RoHS**



**Specifications**

|                              |  |
|------------------------------|--|
| Voltage Rating:              | 32 VDC                                 |
| Interrupting Ratings:        | 1000A @ 32 VDC                         |
| Operating Temperature Range: | -40°C to +125°C                        |
| Insertion Force:             | 44.1N Max. (9.9 lb.) Single Terminal   |
| Extraction Force:            | 4N Min. (0.9 lb), 124.5N Max. (5.5 lb) |

**Ordering Information**

| Part Number | Package Size |
|-------------|--------------|
| 0695xxx.PX4 | 2000         |
| 0695xxx.L   | 50           |

**Description**

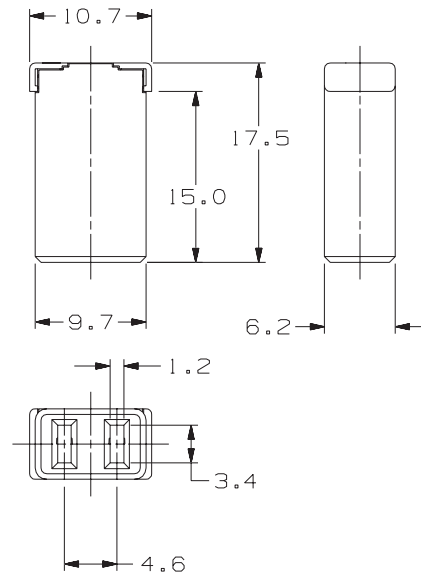
The MCASE™ is a cartridge style fuse with female terminals for 2.8 mm male terminals. It has a miniaturized footprint for optimal usage of space. It is a time delayed fuse and can handle inrush currents.

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 110         | 100 hrs / -                |
| 135         | 60 s / 1800 s              |
| 200         | 2 s / 60 s                 |
| 350         | 0.2 s / 7 s                |
| 600         | 0.04 s / 1 s               |

**Dimensions**

Dimensions in mm



**Ratings**

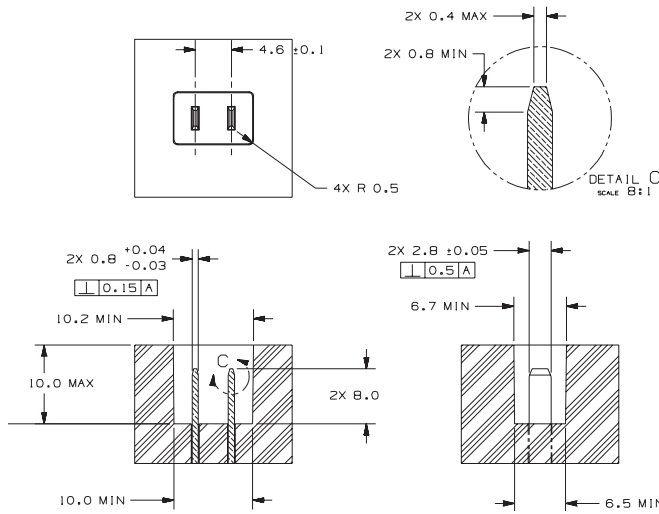
| Part Number | Current Rating (A) | Housing Material Color | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------------------|-------------------------------------|
| 0695015_    | 15                 | Grey                   | 160                                 |
| 0695020_    | 20                 | Blue                   | 530                                 |
| 0695025_    | 25                 | White                  | 1140                                |
| 0695030_    | 30                 | Pink                   | 970                                 |
| 0695040_    | 40                 | Green                  | 2950                                |

## MCASE™ CARTRIDGE FUSES RATED 32V

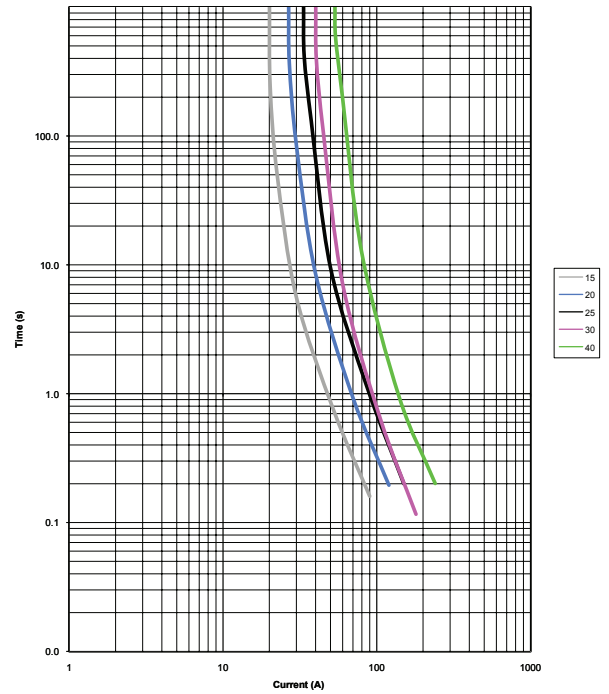
RoHS

### Dimensions

Dimensions in mm



### Time-Current Characteristics Curve



### Temperature Derating Curve



# MCASE+™ CARTRIDGE FUSES RATED 32V

RoHS



## Specifications

|                              |                                       |
|------------------------------|---------------------------------------|
| Voltage Rating:              | 32 VDC                                |
| Interrupting Ratings:        | 1000A @ 32 VDC                        |
| Operating Temperature Range: | -40°C to +125°C                       |
| Fuse Insertion Force:        | 50N (11.2lbf) Typical                 |
| Extraction Force:            | 4N Min. (0.9 lb). 24.5N Max. (5.5 lb) |

## Ordering Information

| Part Number              | Package Size |
|--------------------------|--------------|
| 0695xxx.PXPS<br>Slotted  | 2000         |
| 0695xxx.PXP<br>Unslotted | 2000         |

## Description

The Unslotted MCASE+™ Fuse is a cartridge style fuse up to 40A with female terminals for 2.8 mm male terminals. The Slotted MCASE+™ Fuse is available in amperages up to 60A and can mate with larger male terminals (e.g., 6.3mm) or even mount directly onto a busbar. It has a miniaturized footprint for optimal usage of space. It is a time delayed fuse and can handle inrush currents.

## Time-Current Characteristics

| % of Rating | Opening Time Min / Max |
|-------------|------------------------|
| 110         | 100hrs / -             |
| 135         | 60s / 1800s            |
| 200         | 2s / 60s               |
| 350         | 0.2s / 7s              |
| 600         | 0.04s / 1s             |

## Ratings

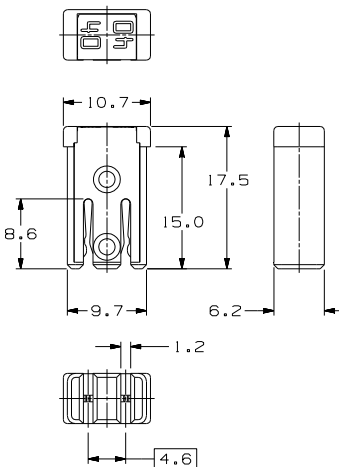
| Part Number  | Type      | Current Rating* (A) | Housing Material Color | I²t (A²s) |
|--------------|-----------|---------------------|------------------------|-----------|
| 0695015.PXP  | Unslotted | 15                  | Grey                   | 310       |
| 0695020.PXP  | Unslotted | 20                  | Blue                   | 750       |
| 0695025.PXP  | Unslotted | 25                  | White                  | 1300      |
| 0695030.PXP  | Unslotted | 30                  | Pink                   | 970       |
| 0695040.PXP  | Unslotted | 40                  | Green                  | 1550      |
| 0695015.PXPS | Slotted   | 15                  | Grey                   | 310       |
| 0695020.PXPS | Slotted   | 20                  | Blue                   | 750       |
| 0695025.PXPS | Slotted   | 25                  | White                  | 1300      |
| 0695030.PXPS | Slotted   | 30                  | Pink                   | 970       |
| 0695040.PXPS | Slotted   | 40                  | Green                  | 1550      |
| 0695050.PXPS | Slotted   | 50                  | Red                    | 4000      |
| 0695060.PXPS | Slotted   | 60                  | Yellow                 | 8500      |

\* The performance of the male terminal is critical to ensuring the fuse will function as designed. The current-carrying capability of the mating terminal must be verified to ensure proper system operation.

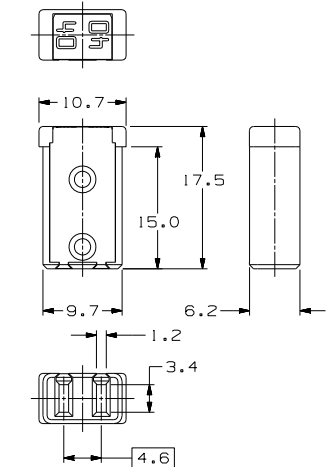
## Dimensions

Dimensions in mm

### Slotted



### Unslotted



# MCASE+™ CARTRIDGE FUSES RATED 32V

RoHS

## Recommended Cavities

Dimensions in mm

### Unslotted



### Slotted



## Time-Current Characteristics Curve



## Temperature Derating Curve



**LOW PROFILE JCASE® FUSES RATED 58V**

**RoHS**



**Description**

The Low Profile JCASE® fuse has similar performance characteristics as the standard JCASE® fuse. The lower overall height reduction allows for more space and weight savings and also allows for a shorter male blade terminal, saving additional weight and material savings in fuse box designs.

**Specifications**

|                              |                   |
|------------------------------|-------------------|
| Voltage Rating:              | 58 VDC            |
| Interrupting Rating:         | 1000A @ 58 VDC    |
| Operating Temperature Range: | -40°C to + 125°C  |
| Insertion Force:             | 53N Max. (12 lb.) |
| Extraction Force:            | 9N Min (2 lb.)    |

**Ordering Information**

| Part Number | Package Size |
|-------------|--------------|
| 0895xxx.Z   | 2000         |
| 0895xxx.U   | 500          |
| 0895xxx.T   | 10           |

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 100         | 360,000 s / –              |
| 135         | 60 s / 1800 s              |
| 200         | 4 s / 60 s                 |
| 350         | 0.200 s / 7 s              |
| 600         | 0.040 s / 1 s              |

**Ratings**

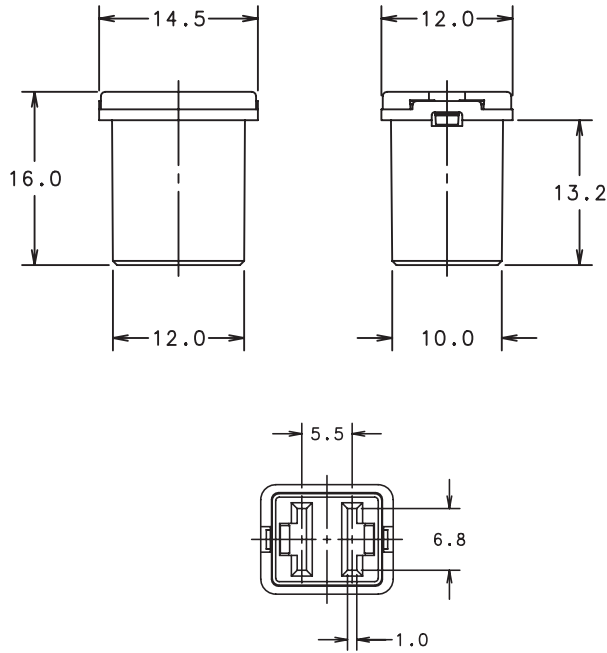
| Part Number | Current Rating (A) | Housing Material Color | Cold Resistance (mΩ) | I²t (A²s) |
|-------------|--------------------|------------------------|----------------------|-----------|
| 0895020_    | 20                 | Blue                   | 4.48                 | 400       |
| 0895025_    | 25                 | White                  | 3.39                 | 680       |
| 0895030_    | 30                 | Pink                   | 2.68                 | 1780      |
| 0895040_    | 40                 | Green                  | 1.89                 | 5470      |
| 0895050_    | 50                 | Red                    | 1.08                 | 4880      |
| 0895060_    | 60                 | Yellow                 | 0.83                 | 9600      |

Corresponding holder see Section “Fuse Holders.”

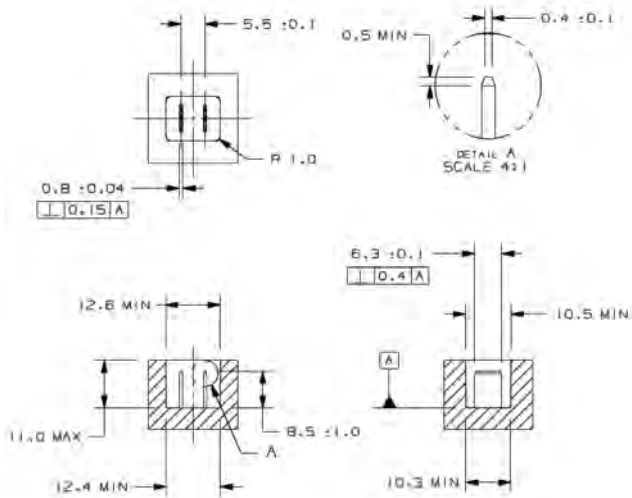
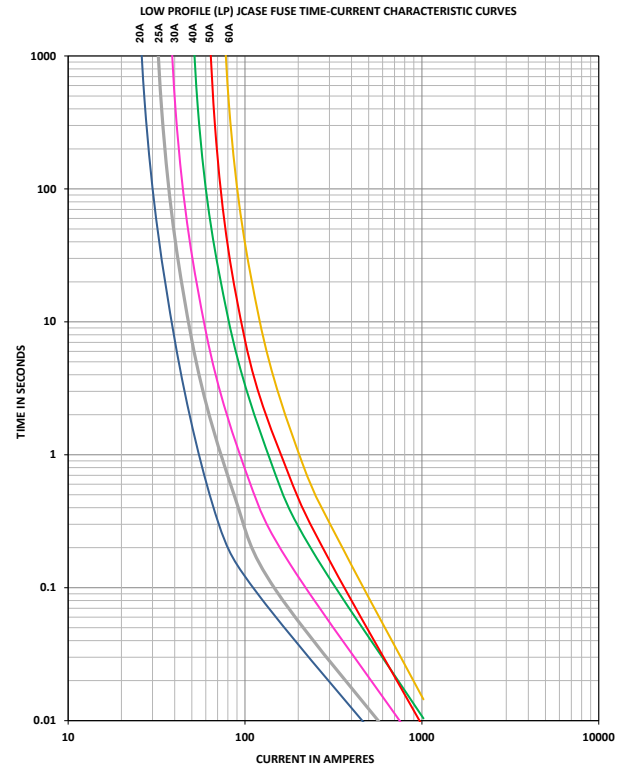
## LOW PROFILE JCASE® FUSES RATED 58V

### Dimensions

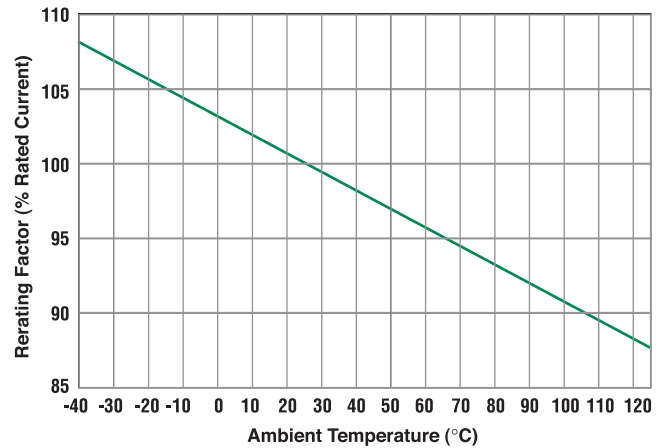
Dimensions in mm



### Time-Current Characteristics Curve



### Temperature Derating Curve





**JCASE® CARTRIDGE FUSE RATED 32V**



**Specifications**

|                              |                   |
|------------------------------|-------------------|
| Voltage Rating:              | 32 VDC            |
| Interrupting Rating:         | 1000A @ 32 VDC    |
| Operating Temperature Range: | -40°C to + 125°C  |
| Insertion Force:             | 53N max. (12 lb.) |
| Extraction Force:            | 9N min. (2 lb.)   |

**Ordering Information**

| Part Number | Package Size |
|-------------|--------------|
| 0495xxx.TXA | 10           |
| 0495xxx.UXA | 500          |
| 0495xxx.ZXA | 2200         |

**Dimensions**

Dimensions in mm



**Description**

The JCASE® is a cartridge style fuse with female terminal design. JCASE® provides both increased time delay and low voltage drop to protect high current circuits. JCASE® has the ability to handle inrush currents.

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 110         | 360,000 s / -              |
| 135         | 60 s / 1800 s              |
| 200         | 4 s / 60 s                 |
| 350         | 0.200 s / 7 s              |
| 600         | 0.040 s / 1 s              |

**Ratings**

| Part Number | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I²t (A²s) |
|-------------|--------------------|------------------------|------------------------|----------------------|-----------|
| 0495020_    | 20                 |                        | 106                    | 4.29                 | 1750      |
| 0495025_    | 25                 |                        | 101                    | 3.28                 | 3220      |
| 0495030_    | 30                 |                        | 91                     | 2.12                 | 1480      |
| 0495040_    | 40                 |                        | 87                     | 1.30                 | 3650      |
| 0495050_    | 50                 |                        | 88                     | 0.99                 | 8750      |
| 0495060_    | 60                 |                        | 87                     | 0.76                 | 19500     |

Corresponding holder see Section "Fuse Holders."

# JCASE® CARTRIDGE FUSE RATED 32V

## Temperature Derating Curve



## Time-Current Characteristic Curves



## Dimensions

Dimensions in mm



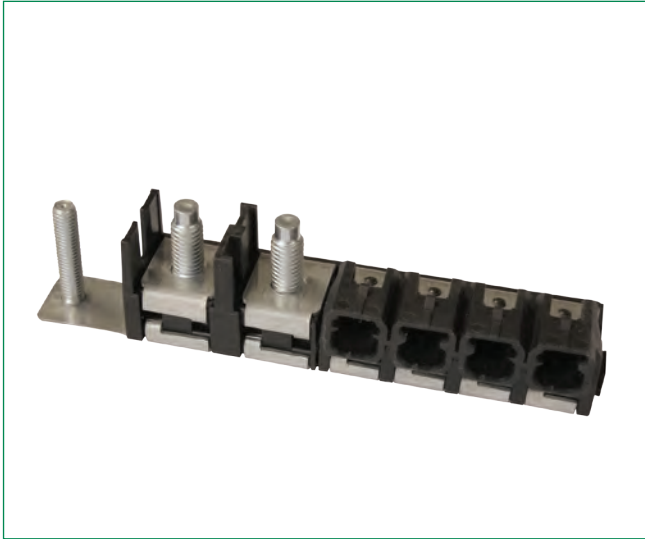
## High Current Fuses



|   |           |
|---|-----------|
| <b>ZCase Masterfuse</b>                     | <b>29</b> |
| <b>Masterfuse</b>                           | <b>30</b> |
| <b>ZCase Single Starter</b>                 | <b>31</b> |
| <b>MEGA® Fuse Rated 32V</b>                 | <b>33</b> |
| <b>MEGA® Low Temperature Fuse Rated 32V</b> | <b>35</b> |
| <b>UL Recognized Mega® Fuse Rated 32V</b>   | <b>37</b> |
| <b>MIDI® Style Bolt-down Fuse Rated 32V</b> | <b>39</b> |
| <b>BF1 Fuse Rated 32V</b>                   | <b>41</b> |
| <b>BF1 Fuse Rated 58V</b>                   | <b>43</b> |
| <b>BF2 Fuse Rated 32V</b>                   | <b>45</b> |
| <b>BF2 Fuse Rated 58V</b>                   | <b>46</b> |
| <b>CF Fuse Rated 58V</b>                    | <b>47</b> |
| <b>Fuse Strips</b>                          | <b>48</b> |

## ZCASE MASTERFUSE

RoHS



### Description

The ZCase Masterfuse product is the smallest high current distribution product in the industry. It utilizes the Z-Axis effectively to create a compact design which takes one third the footprint of a traditional solution. This package allows the user to replace multiple discrete fuses in a power distribution box with a single component, thus eliminating additional bolts, bus bars and interconnects. The output bolt is integrated into the fuse creating a reliable interface to the mating terminal due to its high torque withstandability. Keying features are available on each bolt position to ensure the correct mating ring terminal is used during assembly. The solution can also be connectorized to mate to high current terminals. This compact design enables the integration of the high current distribution into the main junction box due to its small footprint. This eliminates the need for a separate fuse box for high current distribution. By reducing the number of components required, overall system costs are reduced.

The ZCase Masterfuse product is available as a standard design with customized fuse ratings. The modular manufacturing approach enables a wide range of configurations within a product family. In addition, the form factor can be fully customized for specific applications to further optimize the system. Contact Littelfuse to review your application needs.

### Specifications

|                              |  |
|------------------------------|--|
| Mating Terminal Options:     | M10, M8, M6, M5 bolt-down connections or female terminals  |
| Operating Temperature Range: | -40°C to 125°C   |
| Fuse Ratings Available:      | 30-500A  |
| Voltage Rating:              | 32Vdc  |
| Materials:                   | Copper terminals (silver or tin plating options available) |
| Complies with:               | ISO 8820-5   |

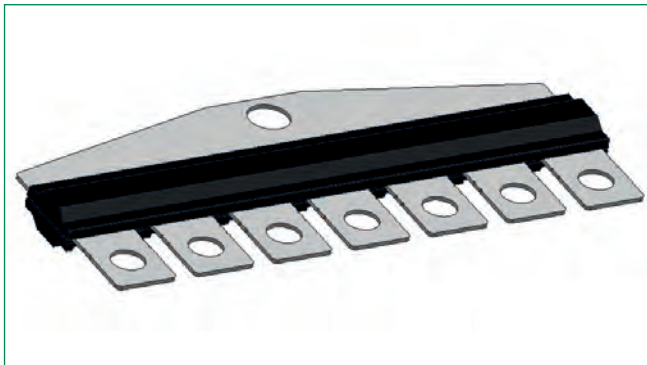
### Features and Benefits

|                  |   |
|------------------|---|
| Miniaturization: | Compact design enables a 2/3 footprint reduction when compared to a traditional solution              |
| Integration:     | Enables the integration of the prefuse function into the main junction box due to its small footprint |



## MASTERFUSE

RoHS



### Description

The Masterfuse product is a configurable fuse solution combining several different fuse types (i.e. MEGA and MIDI) and ratings in one compact package. This fuse package allows the user to replace multiple discrete fuses in a power distribution box with a single component, thus eliminating additional bolts, bus bars, and interconnects that are currently used. By reducing the number of connections required, overall system reliability is increased while cost is decreased.

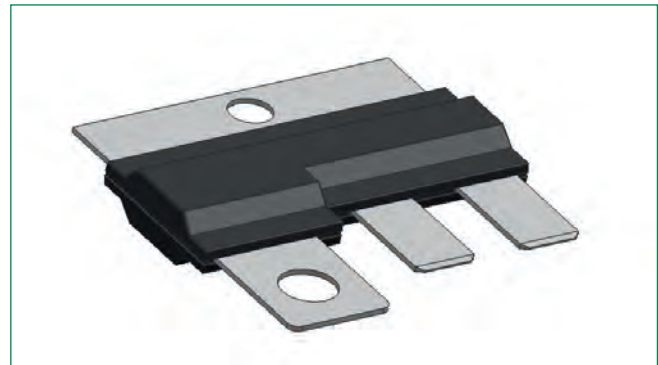
Each Masterfuse is customized to the user's application creating an optimized circuit protection package. Contact Littelfuse to review your application needs.

### Specifications

|                              |  |
|------------------------------|--|
| Mating Terminal Options:     | M10, M8, M6, M5 bolt-down connections or female terminals              |
| Operating Temperature Range: | -40°C to 125°C   |
| Fuse Ratings Available:      | 30A-250A Full Range<br>300A-600A Short Circuit                         |
| Voltage Rating:              | 32Vdc  |
| Materials:                   | Copper terminals (silver or tin plating options available)             |
| Complies with:               | ISO 8820-5   |
|                              | Note: Short circuit protected fuses have a limited continuous current. |

### Features and Benefits

|                           |   |
|---------------------------|---|
| Increased Reliability:    | due to reduced number of terminal interfaces  |
| System Cost Savings:      | Material savings due to reduced number of components required. Assembly cost savings due to reduced number of operations required for installation. |
| Fuse Array Customization: | Ability to mix different fuse types (i.e. MEGA, MIDI, etc.) in one compact package  |
| Termination Options:      | Ability to mate to female terminals to enable "bolt-less" design  |
| Marking:                  | Custom marking options available  |



## ZCASE SINGLE MEGA/STARTER



### Description

The Single Zcase is a Minimal Footprint Bolt Down Fuse with a wide rating range up to 600A in the same packaging size. The Time Current characteristic is similar to the well known Mega Design and can be used as full wire protection until 250A. Higher ratings are mostly used for typically Starter Fuse application as a protector fuse. The fuse design is optimized for a one bolt connection M6 (40A - 250A) or M8 (300A - 600A) and can be used directly on a battery post or busbar connection. Littelfuse is offering a complete solution for the necessary stud and different busbar connections including some battery clamps.

### Specifications

|                        |                   |
|------------------------|-------------------|
| Cover/Base Material:   | PPA (33% GF)      |
| Insulating Tube:       | Out of ceramic    |
| Terminal:              | Tin plated Copper |
| Voltage Rating:        | 32V DC            |
| Interrupting Rating:   | 2000A @ 32V VDC   |
| Operating temperature: | -40 to 125°C      |
| Mounting Torque M6:    | 9.8Nm±1.4Nm       |
| Mounting Torque M8:    | 14Nm±2Nm          |

### Ordering Information

| Part Number   | Package Size |
|---------------|--------------|
| 3298XXX.ZXSTA | 480          |
| 3298XXX.Z     | 480          |

### Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |                           |
|-------------|----------------------------|---------------------------|
|             | 40A - 250A                 | 300A - 600A               |
| 50          | - / -                      | 14,400 / -                |
| 100         | 14,400 / -                 | - / -                     |
| 135         | 120 / 1800                 | - / -                     |
| 200         | 1 / 15                     | 1 / 40                    |
| 350         | 0.300 / 5                  | 0.300 / 5                 |
| 500         | - / -                      | 0.100 / 1 (only for 500A) |
| 600         | 0.100 / 1                  | 0.100 / 1 (except 600A)   |

### Ratings

| Part number   | Current Rating (A) | Wire size (mm <sup>2</sup> ) | Max. Voltage Drop (mV) | Average Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|---------------|--------------------|------------------------------|------------------------|------------------------------|-------------------------------------|
| 3298040.Z     | 40                 | 4                            | 110                    | 1.53                         | 5000                                |
| 3298060.Z     | 60                 | 6                            | 110                    | 0.98                         | 18000                               |
| 3298080.Z     | 80                 | 10                           | 110                    | 0.715                        | 15500                               |
| 3298100.Z     | 100                | 16                           | 110                    | 0.57                         | 31000                               |
| 3298125.Z     | 125                | 16                           | 110                    | 0.39                         | 45000                               |
| 3298150.Z     | 150                | 25                           | 110                    | 0.32                         | 75000                               |
| 3298175.Z     | 175                | 25                           | 110                    | 0.26                         | 140000                              |
| 3298200.Z     | 200                | 35                           | 110                    | 0.231                        | 235000                              |
| 3298225.Z     | 225                | 35                           | 110                    | 0.175                        | 95000                               |
| 3298250.Z     | 250                | 50                           | 110                    | 0.167                        | 160000                              |
| 3298300.ZXSTA | 300                | 35                           | 70                     | 0.128                        | 310000                              |
| 3298350.ZXSTA | 350                | 35                           | 70                     | 0.103                        | 570000                              |
| 3298400.ZXSTA | 400                | 50                           | 70                     | 0.084                        | 870000                              |
| 3298500.ZXSTA | 500                | 50                           | 70                     | 0.065                        | 1550000                             |
| 3298600.ZXSTA | 600                | 50                           | 70                     | 0.049                        | 3000000                             |
| 3298900.Z     | SHUNT              | 50                           | -                      | -                            | -                                   |



**ZCASE SINGLE MEGA/STARTER**

**Dimensions**

Dimensions in mm

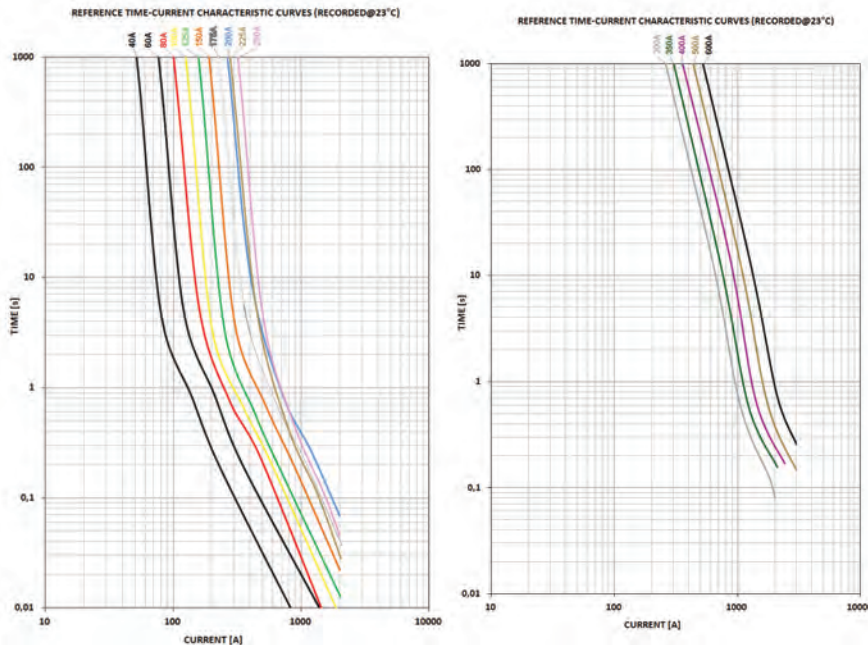


**Examples of Single ZCASE Applications**



Please contact your Littelfuse representative for application support and information on mating hardware.

**Time-Current Characteristic Curves**



All ZCase Starters T/C curves were performed on the left or right side of the metal bar as shown in pictures above. A 50mm<sup>2</sup> Cu wire was mounted at the mid hole (M8) of the metal bar as current feed.



## MEGA® FUSE RATED 32V

RoHS



Also available:  
MEGA Clear Top Housing Fuse



Clear Housing Material:  
Polyethersulfone (top)  
PPA (33%/35% GF) (bottom)

### Description

The MEGA® Fuse is designed for high current circuit protection up to 500A with “Diffusion Pill Technology.” The MEGA® Fuse also provides time delay characteristics. Designed and patented by Littelfuse, the MEGA® Fuse is ideal for battery and alternator protection application and other heavy gauge cables requiring ultra-high current protection.

### Temperature Derating Curve



### Specifications

|                              |   |
|------------------------------|---|
| Interrupting Rating:         | 2000A @ 32 VDC  |
| Voltage Rating:              | 32 VDC  |
| Operating Temperature Range: | -40°C to + 125°C  |
| Housing Material:            | PPA (33%/35% GF)  |
| Terminals:                   | Copper (Silver plated copper available)<br>M6 or M8 bolts available |
| Mounting Torque:             | 8-14 Nm M6<br>12-18 Nm M8   |
| Ref. To:                     | ISO 8820-5  |

### Ordering Information

| Part Number  | Package Size | Plating | Bolt Size | Rating    |
|--------------|--------------|---------|-----------|-----------|
| 0298xxx.ZXH  | 500          | none    | M8        | 300 - 500 |
| 0298xxx.ZXEH | 500          | none    | M8        | 80 - 250  |
| 0298xxx.ZXB  | 500          | Ag      | M8        | 40 - 250  |
| 0298xxx.ZXA  | 500          | none    | M6        | 80 - 500  |

### MEGA Clear Top Housing Material Fuse

|             |     |      |    |          |
|-------------|-----|------|----|----------|
| 0298xxx.UXT | 500 | none | M8 | 40 - 250 |
|-------------|-----|------|----|----------|

### Time-Current Characteristics

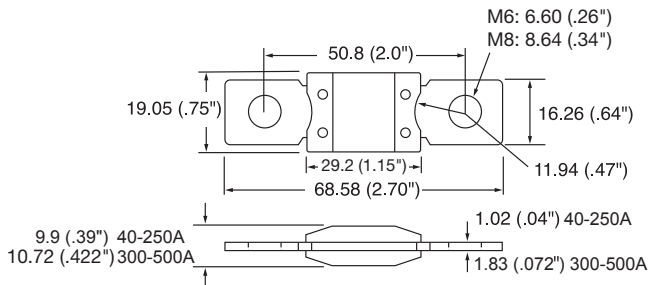
| % of Rating | Opening Time Min / Max (s) |               |
|-------------|----------------------------|---------------|
|             | 40-250                     | 300-500       |
| 75          | - / -                      | 14,400 s / -  |
| 100         | 14,400 s / -               | - / -         |
| 135         | 120 s / 1800 s             | - / -         |
| 200         | 1 s / 15 s                 | 1 s / 15 s    |
| 350         | 0.300 s / 5 s              | 0.500 s / 5 s |
| 600         | 0.100 s / 1 s              | 0.100 s / 1 s |

## MEGA® FUSE RATED 32V

RoHS

### Dimensions

Dimensions in mm



### Time-Current Characteristic Curves



### Ratings

| Part Number | Current Rating (A) | Font Color* | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|-------------|------------------------|----------------------|-------------------------------------|
| 0298040._1  | 40                 | —           | 132                    | 2.510                | 8700                                |
| 0298060._1  | 60                 | —           | 119                    | 1.504                | 21000                               |
| 0298080._   | 80                 | Red         | 87                     | 0.720                | 21500                               |
| 0298100._   | 100                | Yellow      | 87                     | 0.562                | 31100                               |
| 0298125._   | 125                | Green       | 80                     | 0.423                | 57800                               |
| 0298150._   | 150                | Orange      | 92                     | 0.352                | 100000                              |
| 0298175._   | 175                | White       | 86                     | 0.294                | 168000                              |
| 0298200._   | 200                | Blue        | 83                     | 0.257                | 204000                              |
| 0298225._   | 225                | Brown       | 82                     | 0.222                | 257000                              |
| 0298250._   | 250                | Pink        | 82                     | 0.201                | 389000                              |
| 0298300._2  | 300                | Grey        | 74 **                  | 0.167                | 315000                              |
| 0298350._2  | 350                | Dark Green  | 68 **                  | 0.138                | 500000                              |
| 0298400._2  | 400                | Purple      | 64 **                  | 0.126                | 610000                              |
| 0298450._2  | 450                | Gold        | 60 **                  | 0.112                | 1050000                             |
| 0298500._2  | 500                | Brown       | 58 **                  | 0.092                | 2050000                             |

Note 1: Not mentioned in ISO standards Note 2: Short Circuit Protector only

\* 0298xxx.ZXB has white font color on all ratings.

\*\* Voltage Drop measurements for short circuit protectors taken at 75% of rated current.

## MEGA® LOW TEMPERATURE FUSE RATED 32V

RoHS



### Specifications

|                              |   |
|------------------------------|---|
| Interrupting Rating:         | 2000A @ 32 VDC                                      |
| Voltage Rating:              | 32 VDC  |
| Operating Temperature Range: | -40°C to + 125°C                                    |
| Housing Material:            | PPA (33%/35% GF)                                    |
| Terminals:                   | Copper (Silver plated copper available)<br>M8 bolts |
| Mounting Torque:             | 12-18 Nm M8   |

### Ordering Information

| Part Number     | Package Size | Plating | Rating    |
|-----------------|--------------|---------|-----------|
| 0298125.ZXBLT   | 500          | Ag      | 125       |
| 0298xxx.ZXEH-LT | 500          | none    | 150 - 275 |

### Description

The MEGA® Fuse is designed for high current circuit protection up to 275A with “Diffusion Pill Technology.” The MEGA® Fuse also provides time delay characteristics. Designed and patented by Littelfuse, the MEGA® Fuse is ideal for battery and alternator protection application and other heavy gauge cables requiring ultra-high current protection.

### Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |                |
|-------------|----------------------------|----------------|
|             | 125                        | 150-275        |
| 100         | 4 hrs / –                  | 4 hrs / –      |
| 135         | 120 s / 1800 s             | 120 s / 1800 s |
| 200         | 1 s / 50 s                 | 1 s / 150 s    |
| 350         | 0.300 s / 5 s              | 0.300 s / 5 s  |
| 600         | 0.100 s / 1 s              | 0.100 s / 1 s  |

### Ratings

| Part Number     | Current Rating (A) | Font Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-----------------|--------------------|------------|------------------------|----------------------|-------------------------------------|
| 0298125.ZXBLT   | 125                | □          | 67                     | 0.330                | 57000 A                             |
| 0298150.ZXEH-LT | 150                | □          | 62                     | 0.258                | 59000 A                             |
| 0298175.ZXEH-LT | 175                | □          | 65                     | 0.232                | 123000 A                            |
| 0298200.ZXEH-LT | 200                | □          | 61                     | 0.214                | 140000 A                            |
| 0298225.ZXEH-LT | 225                | □          | 57                     | 0.177                | 317000 A                            |
| 0298250.ZXEH-LT | 250                | □          | 54                     | 0.144                | 637000 A                            |
| 0298275.ZXEH-LT | 275                | □          | 53                     | 0.122                | 800000 A                            |

Last figure of article no. = packaging code  
Corresponding holder see Section “Fuse Holders.”

**MEGA® LOW TEMPERATURE FUSE RATED 32V**

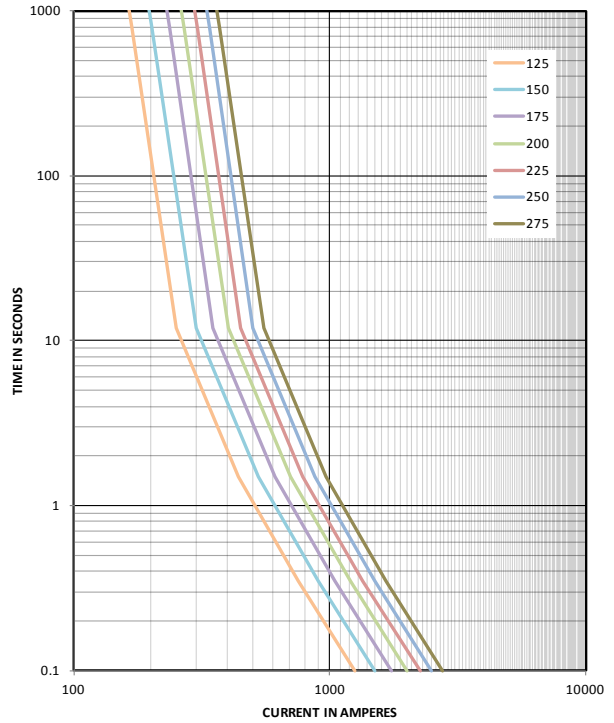
RoHS

**Dimensions**

Dimensions in mm



**Time-Current Characteristic Curves**



**Temperature Rerating Curve**



## UL RECOGNIZED MEGA® FUSE RATED 32V



### Specifications

|                              |                              |
|------------------------------|------------------------------|
| Interrupting Rating:         | 2000A @ 32 VDC               |
| Voltage Rating:              | 32 VDC                       |
| Operating Temperature Range: | -40°C to + 125°C             |
| Housing Material:            | PA66                         |
| Terminals:                   | Copper                       |
|                              | M8 bolts holes               |
| Mounting Torque:             | 12-18 Nm M8                  |
| Complies with:               | ISO 8820-5                   |
|                              | UL 248 Special Purpose Fuses |

### Description

The MEGA® Fuse is designed for high current circuit protection with "Diffusion Pill Technology." The MEGA® Fuse also provides time delay characteristics. Designed and patented by Littelfuse, the MEGA® Fuse is ideal for battery and alternator protection application and other heavy gauge cables requiring ultra-high current protection.

### Ordering Information

| Part Number     | Package Size |
|-----------------|--------------|
| 0298xxx.ZXEH-UL | 500          |

### Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
|             | 80A-175A                   |
| 75          | - / -                      |
| 100         | 14,400 s / -               |
| 135         | 120 s / 1800 s             |
| 200         | 1 s / 15 s                 |
| 350         | 0.300 s / 5 s              |
| 500         | - / -                      |
| 600         | 0.100 s / 1 s              |

### Ratings

| Part Number     | Current Rating (A) | Font Color | Typ. Voltage Drop (mV) | I <sup>2</sup> t (A <sup>2</sup> s) |
|-----------------|--------------------|------------|------------------------|-------------------------------------|
| 0298080.ZXEH-UL | 80                 | Red        | 87                     | 21500                               |
| 0298100.ZXEH-UL | 100                | Yellow     | 87                     | 31100                               |
| 0298125.ZXEH-UL | 125                | Green      | 80                     | 57800                               |
| 0298150.ZXEH-UL | 150                | Orange     | 92                     | 100000                              |
| 0298175.ZXEH-UL | 175                | White      | 62                     | 168000                              |

**UL RECOGNIZED MEGA® FUSE RATED 32V**



**Dimensions**

Dimensions in mm

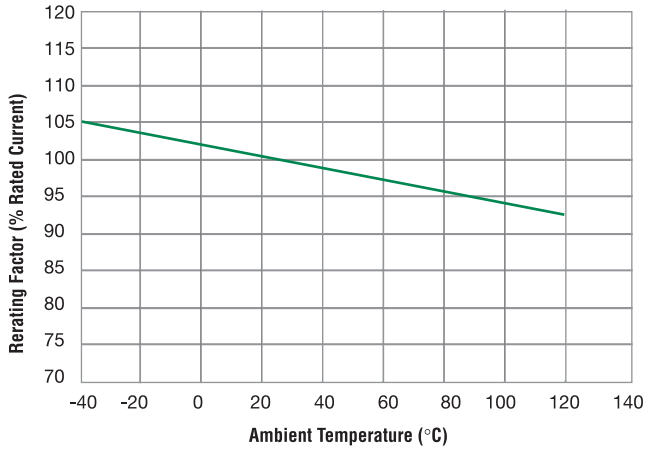


**Time-Current Characteristic Curves**



**Temperature Rerating Curve**

MEGA Fuse Series Temperature Rerating Curve



## MIDI® STYLE BOLT-DOWN FUSE RATED 32V



Also available:  
Clear MIDI® version &  
MIDI® one hole version



(transparent nylon composite cover / \*not UL recognized)



### Specifications

|                              |  |
|------------------------------|--|
| Interrupting Rating:         | 1000A @ 32 VDC                             |
| Voltage Rating:              | 32 VDC                                     |
| Operating Temperature Range: | -40°C to + 125°C                           |
| Housing Material:            | Heat Resistant 94-V0 Thermoplastic         |
| Terminal:                    | Tin plated Copper                          |
| Mounting Torque M5:          | 4.5 Nm +/- 1Nm                             |
| Mounting Torque M6:          | 5.5-6.5 Nm +/- 1Nm                         |
| Complies with:               | ISO 8820-5<br>UL 248 Special Purpose Fuses |

### Ordering Information













| Part Number                | Package Size | Mfg Location  |
|----------------------------|--------------|---------------|
| <b>M5 Version</b>          |              |               |
| 0498xxx.H                  | 100          | North America |
| 0498xxx.M*                 | 1000         | North America |
| 0498.xxx.M-CN*             | 1000         | Asia          |
| <b>M6 Version</b>          |              |               |
| 0498xxx.MXM6*              | 1000         | North America |
| 0498.xxx.MXM6-CN*          | 1000         | Asia          |
| <b>Clear MIDI® Version</b> |              |               |
| 0498xxx.SXT                | 20           | North America |
| 0498xxx.MXT                | 1000         | North America |
| <b>One Hole Version</b>    |              |               |
| 0498xxx.MX1M5*             | 1000         | North America |
| 0498xxx.MX1M5-CN*          | 1000         | Asia          |

\* Materials manufactured in Asia are produced to the same specifications as materials manufactured in North America, and meets the same test requirements. Multiple production locations are for capacity expansion only.

### Description

This MIDI® style fuse offers a bolt-on space saving fuse for high current wiring protection and provides time delay characteristics with “Diffusion Pill Technology”. The MIDI® was designed and patented by Littelfuse.

### Ratings

| Part Number              | Current Rating (A) | Housing Material Color  | Typ. Voltage Drop Littelfuse max. (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|--------------------------|--------------------|---|--|----------------------|-------------------------------------|
| 0498023._ <sup>2</sup>   | 23                 |  | 90                                     | 3.43                 | 1,800                               |
| 0498030._ <sup>2</sup>   | 30                 |  | 65                                     | 2.06                 | 4,200                               |
| 0498040._                | 40                 |  | 65                                     | 1.398                | 10,000                              |
| 0498050._                | 50                 |  | 65                                     | 1.025                | 13,000                              |
| 0498060._                | 60                 |  | 68                                     | 0.865                | 21,700                              |
| 0498070._                | 70                 |  | 70                                     | 0.72                 | 24,000                              |
| 0498080._                | 80                 |  | 58                                     | 0.541                | 24,600                              |
| 0498100._                | 100                |  | 60                                     | 0.457                | 51,300                              |
| 0498125._ <sup>2</sup>   | 125                |  | 71                                     | 0.394                | 73,200                              |
| 0498150._ <sup>1,2</sup> | 150                |  | 77                                     | 0.323                | 81,900                              |
| 0498175._ <sup>1,2</sup> | 175                |  | 77                                     | 0.285                | 100,000                             |
| 0498200._ <sup>1,2</sup> | 200                |  | 77                                     | 0.261                | 125,000                             |

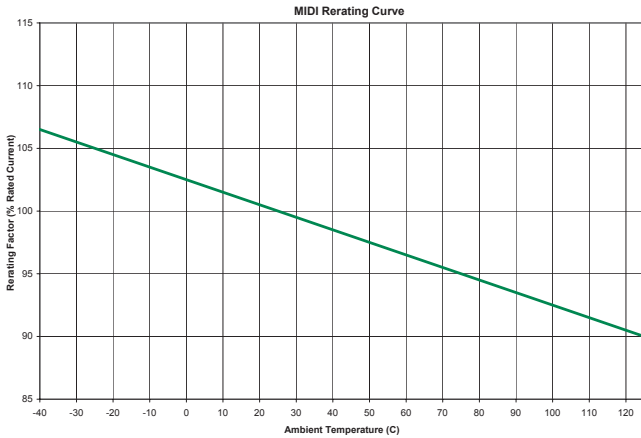
Note 1: Short circuit protector only Note 2: not UL recognized



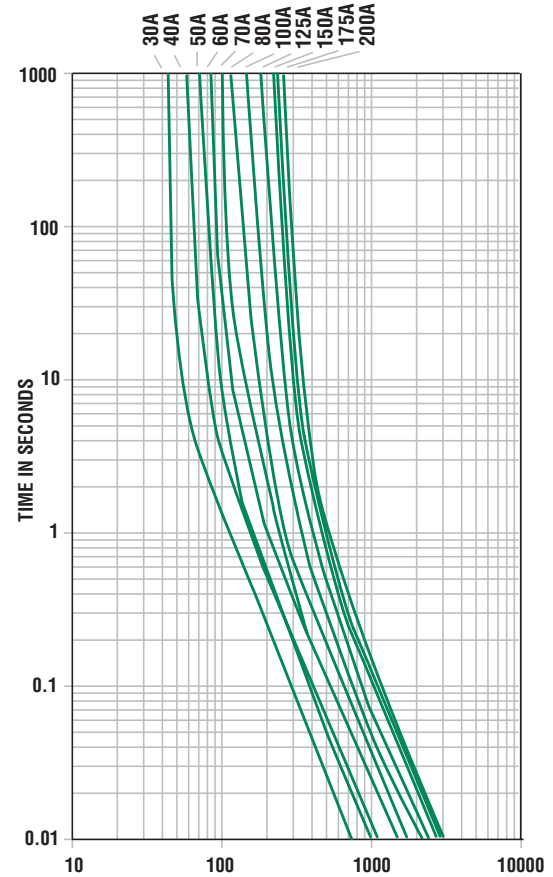
**MIDI® STYLE BOLT-DOWN FUSE RATED 32V**



**Temperature Derating Curve**



**Time-Current Characteristic Curves**



**Dimensions**

Dimensions in mm

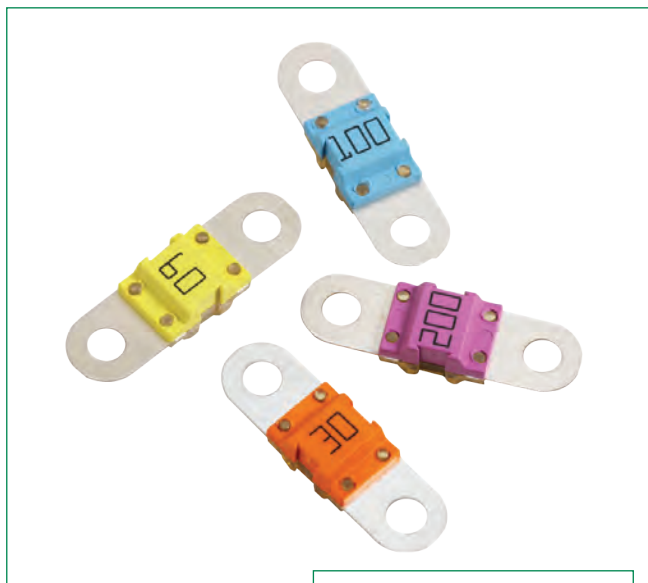


| Part Number | "A"<br>mm (inch) | "B"<br>mm (inch) | "C"<br>mm (inch) |
|-------------|------------------|------------------|------------------|
| 0498030_    | 0.41 (0.016)     | 4.0 (0.157)      | 8.0 (0.315)      |
| 0498040_    | 0.41 (0.016)     | 4.0 (0.157)      | 8.0 (0.315)      |
| 0498050_    | 0.41 (0.016)     | 4.0 (0.157)      | 8.0 (0.315)      |
| 0498060_    | 0.41 (0.016)     | 4.0 (0.157)      | 8.0 (0.315)      |
| 0498070_    | 0.41 (0.016)     | 4.0 (0.157)      | 8.0 (0.315)      |
| 0498080_    | 0.41 (0.016)     | 4.0 (0.157)      | 8.0 (0.315)      |
| 0498100_    | 0.63 (0.025)     | 4.3 (0.169)      | 8.3 (0.327)      |
| 0498125_    | 0.63 (0.025)     | 4.3 (0.169)      | 8.3 (0.327)      |
| 0498150_    | 0.63 (0.025)     | 4.3 (0.169)      | 8.3 (0.327)      |
| 0498175_    | 0.63 (0.025)     | 4.3 (0.169)      | 8.3 (0.327)      |
| 0498200_    | 0.63 (0.025)     | 4.3 (0.169)      | 8.3 (0.327)      |

**Time-Current Characteristics**

| % of Rating | Opening Time Min / Max (s) |               |
|-------------|----------------------------|---------------|
|             | 30-125A                    | 150-200A      |
| 75          | - / -                      | 360,000 s / - |
| 100         | 360,000 s / -              | - / -         |
| 110         | 14,400 s / -               | - / -         |
| 150         | 90 s / 3,600 s             | - / -         |
| 200         | 3 s / 100 s                | 1 s / 15 s    |
| 300         | 0.3 s / 3 s                | - / -         |
| 350         | - / -                      | 0.3 s / 5 s   |
| 500         | 0.1 s / 1 s                | 0.1 s / 1 s   |

## BF1 FUSE RATED 32V



**Also available:  
BF1 one hole version  
60A-125A**



### Description

This BF1 fuse is rated at 32V and offers a bolt-on fuse for high current wiring protection. Current rating 23A - 200A; with transparent housing material for easy detection of blown fuses.

### Specifications

|                        |  |
|------------------------|--|
| Housing Material:      | Heat Resistant 94-V0 Thermoplastic<br>Visible melting element                |
| Terminals:             | Copper alloy, gal. Sn<br>2 x M5 or M6 bolts, distance 30 mm                  |
| Mounting Torque M5:    | 4.5 Nm +/- 1Nm   |
| Mounting Torque M6:    | 6.0 Nm +/- 1Nm   |
| Interrupting Rating:   | 23A & 30A: 1000A @32 VDC<br>40A - 150A: 2000A @32 VDC<br>200A: 1500A @32 VDC |
| Complies with:         | ISO 8820-5<br>UL 248 Special Purpose Fuses                                   |
| Operating Temperature: | -40 to 125 degrees C   |

### Ordering Information

| Mounting Torque | Part Number   | Package Size |
|-----------------|---------------|--------------|
| M5              | 153.5631.xxx2 | 1000         |
| M5              | 153.5631.xxx1 | 10           |
| M6              | 153.7010.xxx2 | 1000         |
| M6              | 153.7000.xxx2 | 500          |

#### BF1 one hole version

|    |               |      |
|----|---------------|------|
| M6 | 153.0010.xxx2 | 1000 |
|----|---------------|------|

### Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |                                   |
|-------------|----------------------------|-----------------------------------|
|             | 23-150A Fuses              | 150-200A Short Circuit Protectors |
| 75          | - / -                      | 360,000 s / -                     |
| 100         | 360,000 s / -              | - / -                             |
| 110         | 14,400 s / -               | - / -                             |
| 150         | 90 s / 3,600 s             | - / -                             |
| 200         | 3 s / 100 s                | 1 s / 15 s                        |
| 300         | 0.300 s / 3 s              | - / -                             |
| 350         | - / -                      | 0.300 s / 5 s                     |
| 500         | 0.100 s / 1 s              | - / -                             |
| 600         | - / -                      | 0.100 s / 1 s                     |

## BF1 FUSE RATED 32V



### Ratings

| Part Number      |                | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|------------------|----------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| M5               | M6             |                    |                        |                        |                      |                                     |
| 153.5631.523_1,2 | -              | 23                 |                        | 105                    | 3.50                 | 1,400                               |
| 153.5631.530_    | 153.7010.530_  | 30                 |                        | 105                    | 2.70                 | 5,100                               |
| 153.5631.540_    | 153.7010.540_  | 40                 |                        | 90                     | 1.56                 | 6,800                               |
| 153.5631.550_    | 153.7010.550_  | 50                 |                        | 80                     | 1.03                 | 6,900                               |
| 153.5631.560_    | 153.7010.560_  | 60                 |                        | 75                     | 0.75                 | 16,200                              |
| 153.5631.570_    | 153.7010.570_  | 70                 |                        | 70                     | 0.64                 | 22,000                              |
| 153.5631.580_    | 153.7010.580_  | 80                 |                        | 70                     | 0.55                 | 25,600                              |
| 153.5631.610_    | 153.7010.610_  | 100                |                        | 70                     | 0.44                 | 42,500                              |
| 153.5631.612_    | 153.7010.612_  | 125                |                        | 70                     | 0.34                 | 62,500                              |
| 153.5631.615_1   | 153.7010.615_1 | 150                |                        | 70                     | 0.29                 | 83,400                              |
| -                | 153.7000.615_3 | 150                |                        | 70                     | 0.33                 | 98,000                              |
| 153.5631.620_3   | 153.7000.620_3 | 200                |                        | 70                     | 0.24                 | 126,000                             |

Corresponding holder see Section "Fuse Holders."

Note 1: not mentioned in ISO standard Note 2: Not UL rated Note 3: Short Circuit Protector only

### Dimensions

Dimensions in mm



### Pre-Arcing Time-Limits



### Derating

Individual derating curves by rating can be ordered through your Littelfuse contact person.

23 A - 150 A: FI = 1.25 (max. operating current:  $0.8 \times I_{rat}$  at 23°C)

200 A: FI = 2.00 (max. operating current:  $0.5 \times I_{rat}$  at 23°C)

## BF1 FUSE RATED 58V



### Description

This BF1 fuse is rated at 58V and offers a bolt-on fuse for high current wiring protection. Current rating 30A - 200A; with transparent housing material for easy detection of blown fuses.

### Specifications

|                        |   |
|------------------------|---|
| Housing Material:      | Heat Resistant 94-V0 Thermoplastic<br>Visible melting element |
| Terminals:             | Copper alloy, gal. Sn<br>2 x M5 or M6 bolts, distance 30 mm   |
| Mounting Torque M5:    | 4.5 Nm +/- 1Nm  |
| Mounting Torque M6:    | 6.0 Nm +/- 1Nm  |
| Interrupting Rating:   | 1000A @ 58 VDC  |
| Complies with:         | ISO 8820-5<br>UL 248 Special Purpose Fuses                    |
| Operating temperature: | -40 to 125 degrees C  |

### Ordering Information

| Part Number   | Package Size |
|---------------|--------------|
| 142.5631.xxx2 | 500          |

### Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |                               |
|-------------|----------------------------|-------------------------------|
|             | 30-150A Fuses              | 200A Short Circuit Protectors |
| 75          | - / -                      | 360,000 s / -                 |
| 100         | 360,000 s / -              | - / -                         |
| 110         | 14,400 s / -               | - / -                         |
| 150         | 90 s / 3,600 s             | - / -                         |
| 200         | 3 s / 100 s                | 1 s / 15 s                    |
| 300         | 0.300 s / 3 s              | - / -                         |
| 350         | - / -                      | 0.300 s / 5 s                 |
| 500         | 0.100 s / 1 s              | - / -                         |
| 600         | - / -                      | 0.100 s / 1 s                 |

### Ratings

| Part Number M5             | Part Number M6             | Current Rating (A) | Housing Material Color | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|----------------------------|----------------------------|--------------------|------------------------|------------------------|----------------------|-------------------------------------|
| 142.5631.5302 <sup>1</sup> | 142.7010.5302 <sup>1</sup> | 30                 | Orange                 | 105                    | 2.70                 | 5,100                               |
| 142.5631.5402              | 142.7010.5402              | 40                 | Green                  | 90                     | 1.56                 | 6,800                               |
| 142.5631.5502              | 142.7010.5502              | 50                 | Red                    | 80                     | 1.03                 | 6,900                               |
| 142.5631.5602              | 142.7010.5602              | 60                 | Yellow                 | 75                     | 0.75                 | 16,200                              |
| 142.5631.5702              | 142.7010.5702              | 70                 | Brown                  | 70                     | 0.64                 | 22,000                              |
| 142.5631.5802              | 142.7010.5802              | 80                 | White                  | 70                     | 0.55                 | 25,600                              |
| 142.5631.6102              | 142.7010.6102              | 100                | Blue                   | 70                     | 0.44                 | 42,500                              |
| 142.5631.6122              | 142.7010.6122              | 125                | Pink                   | 70                     | 0.34                 | 62,500                              |
| 142.5631.6152              | 142.7010.6152              | 150                | Grey                   | 70                     | 0.29                 | 83,400                              |
| 142.5631.6202 <sup>2</sup> | 142.7010.6202 <sup>2</sup> | 200                | Purple                 | 70                     | 0.24                 | 126,000                             |

Corresponding holder see Section "Fuse Holders."  
Note 1: Not UL rated Note 2: Short Circuit Protector only

## BF1 FUSE RATED 58V

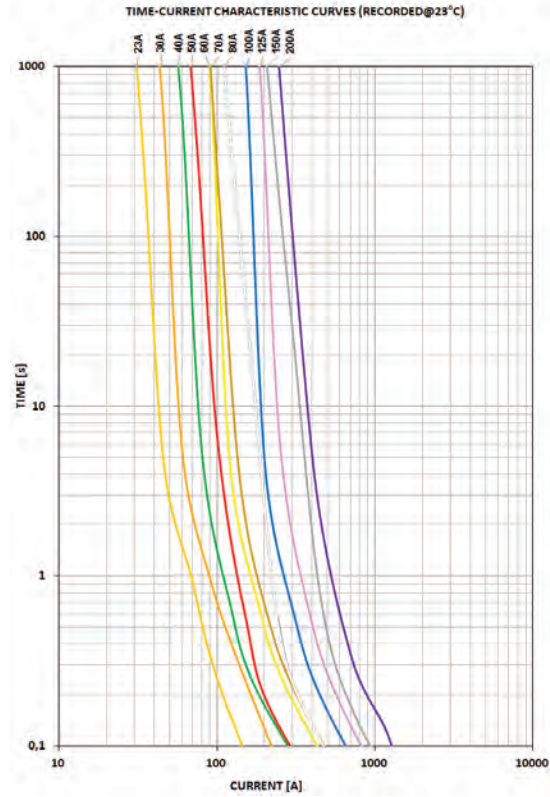


### Dimensions

Dimensions in mm



### Pre-Arcing Time-Limits



30 A - 150 A: FI = 1.25 (max. operating current:  $0.8 \times I_{rat}$  at 23°C)  
 200 A: FI = 2.00 (max. operating current:  $0.5 \times I_{rat}$  at 23°C)

### Derating

Individual derating curves by rating can be ordered through your Littelfuse contact person.

## BF2 FUSE RATED 32V



### Description

This BF2 fuse is rated at 32V and offers a bolt-on fuse for high current wiring protection. Current rating 100A - 500A; with transparent housing material for easy detection of blown fuses.

### Specifications

|                    |  |
|--------------------|--|
| Housing Material:  | Heat Resistant 94-V0 Thermoplastic<br>Visible melting element      |
| Terminal:          | Copper alloy, gal. Sn<br>2 x M8 bolts, Distance 51 mm              |
| Mounting Torque:   | 12.0 Nm +/- 1Nm  |
| Breaking Capacity: | 100 A - 300 A: 2.000 A, 32V, DC<br>400 A - 500 A: 1.500 A, 32V, DC |
| Complies with:     | ISO 8820-5<br>UL 248 Special Purpose Fuses                         |

### Ordering Information

| Part Number   | Package Size |
|---------------|--------------|
| 153.5395.xxxx | 200          |

### Time-Current Characteristic Curves



100A-300A:  $F_L=1,25$  (max. operating current:  $0,8 \times I_{rat}$  at 23°C)  
400A-500A:  $F_L=2,00$  (max. operating current:  $0,5 \times I_{rat}$  at 23°C)

## BF2 FUSE RATED 58V



### Description

This BF2 fuse is rated at 58V and offers a bolt-on fuse for high current wiring protection. Current rating 100A - 300A; with transparent housing material for easy detection of blown fuses.

### Specifications

|                    |   |
|--------------------|---|
| Housing Material:  | Heat Resistant 94-V0 Thermoplastic<br>Visible melting element |
| Terminal:          | Copper alloy, gal. Sn<br>2 x M8 bolts, Distance 51 mm         |
| Mounting Torque:   | 12.0 Nm +/- 1Nm   |
| Breaking Capacity: | 1000A, 58V DC   |
| Complies with:     | ISO 8820-5<br>UL 248 Special Purpose Fuses                    |

### Ordering Information

| Part Number   | Package Size |
|---------------|--------------|
| 142.5395.xxx2 | 200          |

### Time-Current Characteristic Curves



100A-300A:  $F_t=1,25$  (max. operating current:  $0,8 \times I_{rat}$  at 23°C)  
400A-500A:  $F_t=2,00$  (max. operating current:  $0,5 \times I_{rat}$  at 23°C)



## CF FUSE RATED 58V



### Description

Main Fuse for mounting with battery clamp on the battery pole. Voltage rating 58 VDC, Current rating 50A - 300A. With transparent cover material for visual inspection of melting element.

### Dimensions

Dimensions in mm



### Ratings

| Part Number   | Current Rating (A) | Typ. Voltage Drop (mV) | Cold Resistance (mΩ) | I <sup>2</sup> t (A <sup>2</sup> s) |
|---------------|--------------------|------------------------|----------------------|-------------------------------------|
| 155.0892.5501 | 50                 | 100                    | 1.20                 | 1,900                               |
| 155.0892.5751 | 75                 | 90                     | 0.60                 | 12,000                              |
| 155.0892.6101 | 100                | 80                     | 0.60                 | 14,000                              |
| 155.0892.6121 | 125                | 75                     | 0.45                 | 51,000                              |
| 155.0892.6151 | 150                | 70                     | 0.35                 | 63,800                              |
| 155.0892.6171 | 175                | 70                     | 0.25                 | 120,000                             |
| 155.0892.6201 | 200                | 65                     | 0.25                 | 172,800                             |
| 155.0892.6251 | 250                | 70                     | 0.20                 | 330,000                             |
| 155.0892.6301 | 300                | 70                     | 0.15                 | 372,000                             |

Insert CF8-Fuse links only in conjunction with the insulating nuts, see Section "Fuse Holders." Corresponding battery clamp see Section "Fuse Holders."

### Specifications

|                           |   |
|---------------------------|---|
| Insulating Body Material: | Out of ceramic  |
| Cover Material:           | Out of thermoplast (UL 94-V0, heat resistant)             |
| Visible melting-element   |   |
| Interrupting Rating:      | 2,000A @58 VDC  |
| Complies with:            | ISO 8820-6<br>DIN 72581-5<br>UL 248 Special Purpose Fuses |
| cULus Recognized:         | File No. E211637  |

### Ordering Information

| Part Number   | Package Size |
|---------------|--------------|
| 155.0892.xxx1 | 100          |

### Pre-Arcing Time-Limits



FI = 1.25 (max. operating current: 0.8 x I<sub>rat</sub> at 23°C)

### Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 100         | 360,000 s / -              |
| 135         | - / 3,600 s                |
| 150         | 1 s / 600 s                |
| 200         | 0.200 s / 60 s             |
| 300         | 0.050 s / 1.5 s            |
| 400         | 0.020 s / 0.50 s           |
| 600         | - / 0.20 s                 |

**FUSE STRIPS**

**RoHS**



**Fuse Strips**

Fuse Strips for Diesel Vehicles  
 Rated 36V

Amps (A): 25, 30, 40, 50, 60-70, 80,  
 100, 120-125, 150, 250



**Fuse Strips with Housing**

Fuse Strips with Housing Rated 80V

Amps (A): 30, 40, 50, 60, 70, 80,  
 100, 120, 125, 150



**Fuse Strips for BPV**

Fuse Strips for Battery-Powered  
 Vehicles Rated 80V

Amps (A): 35-50, 63, 80, 100, 125,  
 130, 135, 150, 160, 175-500



**157.5701**

Fuse strips with housing for battery-  
 powered vehicles rated 80V

Amps (A): 35-50, 63, 80, 100, 125,  
 130, 135, 150, 160, 175-500



**HSB**

HSB Fuse Rated 32V

Amps (A): 30, 40, 50, 60, 80, 110,  
 150, 175

## PAL & Cable Fuses



|   |           |
|---|-----------|
| <b>Auto Link PAL Fuses</b>                                  | <b>50</b> |
| <b>CABLEPRO<sup>®</sup> Cable Protector Fuses Rated 32V</b> | <b>51</b> |
| <b>BF-Inline Fuses Rated 32V</b>                            | <b>51</b> |

# AUTO LINK PAL FUSES



**293 Series**

Auto Link PAL 293 Series Fuse  
Amps (A): 20, 30, 40, 50, 60, 70, 80, 100



**2935 Series**

Auto Link PAL 2935 Series Fuse  
Amps (A): 25, 30, 45, 65, 75



**2938 Series**

Auto Link PAL 2938 Series Fuse  
Amps (A): 20, 30, 40, 50, 60, 70, 80



**294 Series**

Auto Link PAL 294 Series Fuse  
Amps (A): 30, 40, 50, 60, 70, 80, 100, 120



**294C Series**

Auto Link PAL 294C Series Fuse  
Amps (A): 20, 30, 40, 50, 60, 70, 80, 100, 120



**295 Series**

Auto Link PAL 295 Series Fuse  
Amps (A): 20, 30, 40, 50, 60, 70, 80, 100, 120, 140



**283B Series**

Auto Link PAL 283B Series Fuse  
Amps (A): 20, 30, 40, 50, 60, 70, 80, 100, 120, 140



**283 Series**

Auto Link PAL 283 Series Fuse  
Amps (A): 20, 30, 40, 50, 60, 70, 80, 100, 120, 140

## CABLEPRO® CABLE PROTECTOR FUSES RATED 32V

Available in AWG and metric cables

RoHS



### Specifications

|                              |  |
|------------------------------|--|
| Voltage Rating:              | 32V  |
| Interrupting rating:         | 2000A @ 32 VDC   |
| Operating Temperature Range: | -40°C to +125°C  |
| Cable Types Available:       | SAE J1127 SXT, SAE J1128 TXL, ISO 6722: Type FL2G          |
| Operating Temperature Range: | -40°C to +150°C - Optional for 150A, 175A and 200A ratings |
| Cable Type:                  | Thin wall irradiated XLPE (SAE 4GA)                        |

Available with UL recognized in 60, 100, 150 & 200 at 32V  
(UL not available with the thin wall irradiated XLPE SAE 4GA cable)

### Description

The CABLEPRO® fuse is designed to replace conventional wire fusible links in high current automotive applications. The slim package of the CABLEPRO® and the predictable and reliable performance characteristics (similar to MEGA® fuse) make this far superior over wire fusible links. Interrupting rating 2000A @ 32 VDC. CablePro is not a sealed product. To seal it a shrink tube should be used.

## BF-INLINE FUSE RATED 32V



### Specifications

|                      |                              |
|----------------------|------------------------------|
| Voltage Rating:      | 32 VDC                       |
| Housing Material:    | Heat Resistant Thermoplastic |
| Terminals:           | Crimp, Copper alloy, tinned  |
| Interrupting Rating: | 2000A @32VDC                 |

### Description

Inline fuse to protect specific cable cross-sections and insulations; Cross-section 10mm<sup>2</sup> to 35mm<sup>2</sup>. For rated voltage up to 32 VDC.

Assembly notes: The wire integrated fuse has to be insulated by using a self-adhesive shrinking tube. The wire has to be fixed on both sides of the fuse to minimize the wire forces. Recommended shrinking tube: DERAY(R)-IAKT 4:1, 24mm

## High Voltage Fuses



|                                 |           |
|---------------------------------|-----------|
| <b>LC High Voltage Fuse</b>     | <b>53</b> |
| <b>LC High Voltage 50A Fuse</b> | <b>55</b> |

## LOW CURRENT HEV FUSE

RoHS



### Description

The LC HEV fuse is designed for protection of high-voltage accessory circuits in electric and hybrid electric vehicles.

### Specifications

|  |                 |
|--|-----------------|
| Voltage Rating (10A, 15A, 20A, 30A):       | 450 VDC         |
| Voltage Rating (40A):                      | 425 VDC         |
| Note: The OHEV040.ZXBD is rated at 450 VDC |                 |
| Interrupting Rating (10A, 15A, 20A, 30A):  | 10kA @ 450 VDC  |
| Interrupting Rating (40A):                 | 10kA @ 425 VDC  |
| Operating Temperature Range:               | -40°C to +125°C |

### Ordering Information

| Part Number    | Termination       | Package Size |
|----------------|-------------------|--------------|
| OHEVxxx.ZXC    | Cartridge         | 240          |
| OHEVxxx.ZXISO  | Bolt Down (ISO)   | 240          |
| OHEVxxx.ZXPY   | Blade             | 240          |
| OHEVxxx.ZXBD   | Bolt Down (Axial) | 240          |
| OHEVxxx.ZXPCB  | PCB Mount         | 240          |
| OHEVxxx.ZXPCBL | PCB Mount (Long)  | 240          |

### Time-Current Characteristics

| % of Rating | Opening Time<br>Min / Max (s)<br>10A | Opening Time<br>Min / Max (s)<br>15A, 20A, 30A | Opening Time<br>Min / Max (s)<br>40A |
|-------------|--------------------------------------|--|--------------------------------------|
| 100         | 100 hrs / -                          | 100 hrs / -                                    | 100 hrs / -                          |
| 110         | 4 hrs / -                            | 4 hrs / -                                      | -                                    |
| 135         | 100 / 3600                           | 150 / 3600                                     | 150 / 3600                           |
| 150         | 10 / 1000                            | 10 / 1000                                      | 10 / 1000                            |
| 200         | 0.5 / 100                            | 0.5 / 100                                      | 0.5 / 100                            |
| 300         | 0.1 / 15                             | 0.1 / 15                                       | 0.1 / 15                             |
| 500         | 0.05 / 1                             | 0.05 / 1                                       | 0.05 / 1                             |

### Time-Current Characteristic Curves



### Ratings

| Part Number | Current Rating (A) | Color Code | Typical Voltage Drop at 70% I <sub>R</sub> (mV) | Maximum Voltage Drop Spec at 100% I <sub>R</sub> (mV) | Typical Cold Resistance (mΩ) | Minimum Melting I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|------------|---|---|------------------------------|---|
| OHEV010.xxx | 10                 | Red        | 114   | 300   | 12.8                         | 255   |
| OHEV015.xxx | 15                 | Blue       | 96  | 200   | 7.9                          | 133   |
| OHEV020.xxx | 20                 | Yellow     | 79  | 200   | 5.0                          | 268   |
| OHEV030.xxx | 30                 | Green      | 67  | 200   | 2.7                          | 993   |
| OHEV040.xxx | 40                 | Orange     | 69  | 200   | 2.0                          | 1495  |

(Average Initial Measurements)



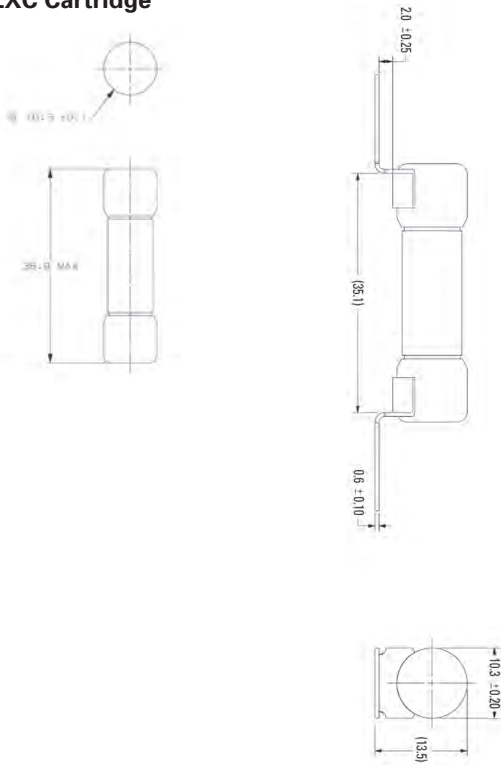
LOW CURRENT HEV FUSE

RoHS

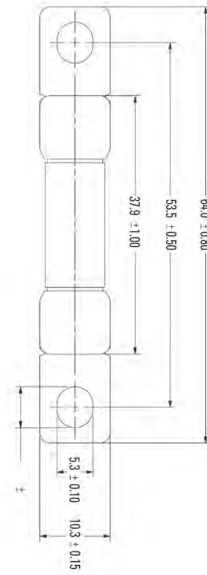
**Dimensions**

Dimensions in mm

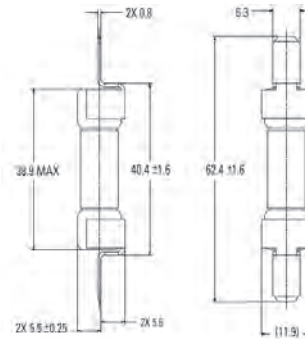
**ZXC Cartridge**



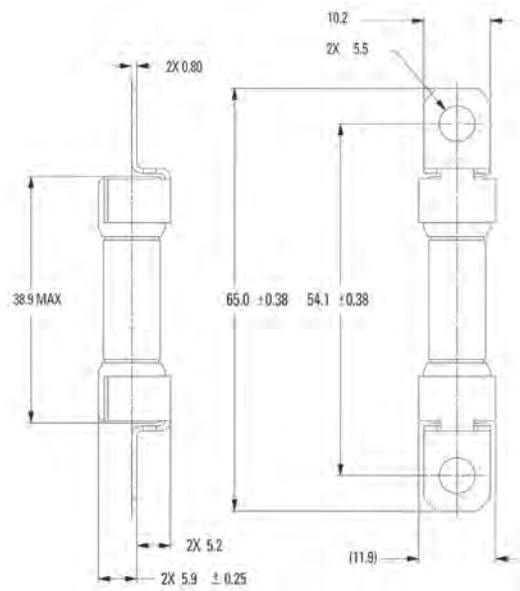
**ZXISO Bolt Down (ISO)**



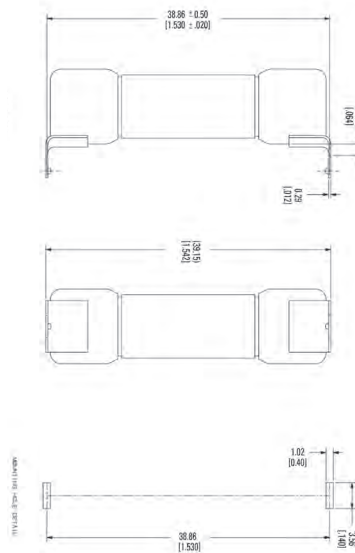
**ZXPY Blade**



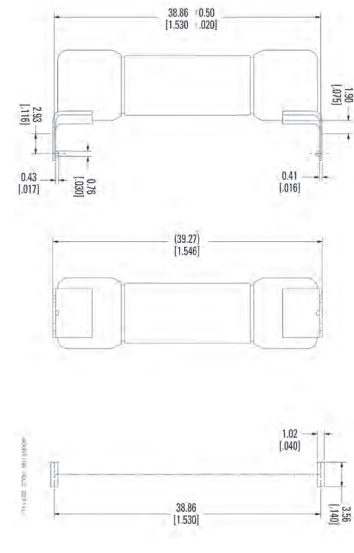
**ZXBD Bolt Down (Axial)**



**ZXPCB PCB Mount**



**ZXPCBL PCB Mount (Long)**



## LC HIGH VOLTAGE 50A FUSE

RoHS



### Specifications

Voltage Rating (50A): 275 VAC  
 Interrupting Rating (50A): 10,000A @ 275 VAC  
 Operating Temperature Range: -40°C to +125°C

### Ordering Information

| Part Number     | Termination       | Package Size |
|-----------------|-------------------|--------------|
| 0HEVxxx.ZXISO2  | Bolt Down (ISO)   | 240          |
| 0HEVxxx.ZXP2Y   | Blade             | 240          |
| 0HEVxxx.ZXPCB2  | PCB Mount         | 240          |
| 0HEVxxx.ZXPCBL2 | PCB Mount (Long)  | 240          |
| 0HEVxxx.ZXBD2   | Bolt Down (Axial) | 240          |

### Description

The LC HEV fuse is designed for protection of high-voltage accessory circuits in electric and hybrid electric vehicles.

### Time-Current Characteristics

| % of Rating | Opening Time Min / Max (s) |
|-------------|----------------------------|
| 100         | 100 hrs / -                |
| 110         | 4 hrs / -                  |
| 135         | -                          |
| 150         | -                          |
| 200         | 0.5 / 100                  |
| 300         | 0.1 / 15                   |
| 500         | 0.05 / 1                   |

### Time-Current Characteristic Curves



### Ratings

| Part Number | Current Rating (A) | Voltage Rating (VAC) | Color Code | Typical Voltage Drop at 70% I <sub>R</sub> (mV) | Maximum Voltage Drop Spec at 100% I <sub>R</sub> (mV) | Typical Cold Resistance (mΩ) | Minimum Melting I <sup>2</sup> t (A <sup>2</sup> s) |
|-------------|--------------------|----------------------|------------|---|---|------------------------------|---|
| 0HEV050.XXX | 50A                | 275                  | □          | 57  | 200   | 1.2                          | 1495  |

(Average Initial Measurements)

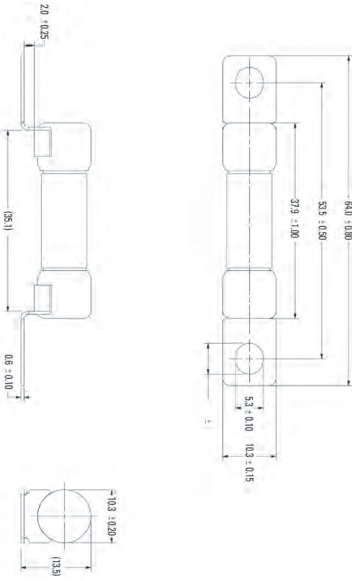
LC HIGH VOLTAGE 50A FUSE

RoHS

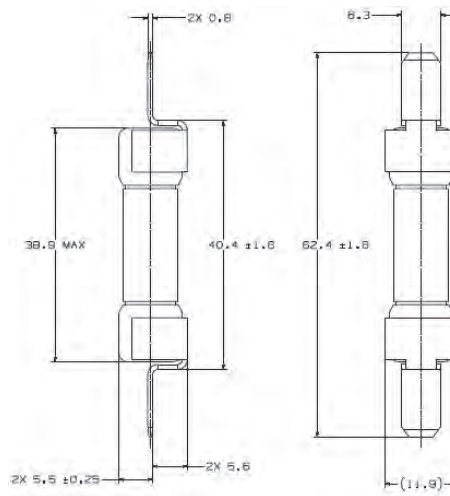
**Dimensions**

Dimensions in mm

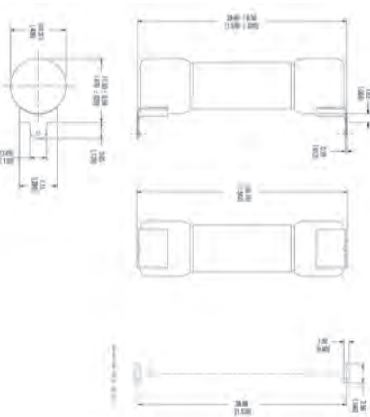
**ZXISO2 Bolt Down (ISO)**



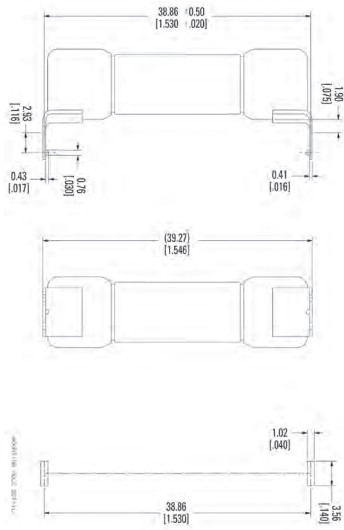
**ZXP2Y Blade**



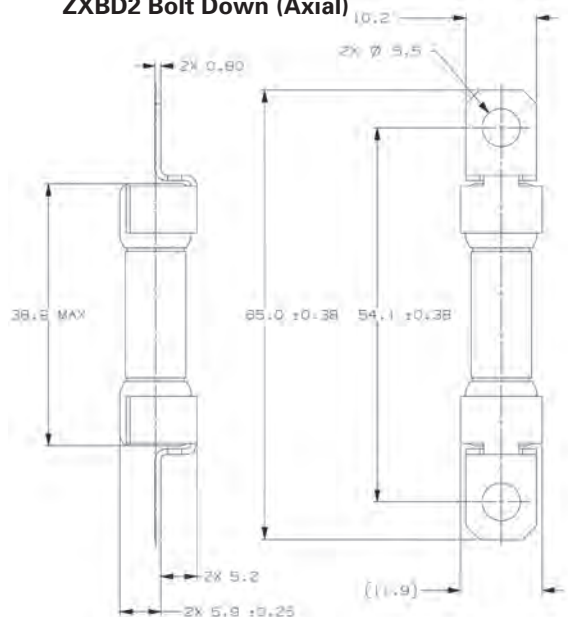
**ZXPCB2 PCB Mount**



**ZXPCBL PCB Mount (Long)**



**ZXBD2 Bolt Down (Axial)**



## Specialty Products



|                    |           |
|--------------------|-----------|
| <b>Shunts</b>      | <b>58</b> |
| <b>Fuseholders</b> | <b>60</b> |

## SHUNTS

### ATO® Shunt



Operating Temp.: -40°C to +125°C  
 Maximum Continuous Load Rating: 35A\*  
 Housing Material: Thermoplastic (UL 94V0 Rated)  
 Terminal Material: Brass Tin Plated

### MINI® Shunt



Operating Temp.: -40°C to +125°C  
 Maximum Continuous Load Rating: 20A\*  
 Housing Material: Thermoplastic (UL 94V0 Rated)  
 Terminal Material: Zinc Silver Plated

### MICRO2® Shunt



Operating Temp.: -40°C to +125°C  
 Maximum Continuous Load Rating: 20A\*  
 Housing Material: PA66  
 Terminal Material: Ag plated zinc alloy

### JCASE® Shunt



Operating Temp.: -40°C to +125°C  
 Maximum Continuous Load Rating: 50A\*  
 Housing Material: PA66  
 Terminal Material: Copper

### MCASE+® Shunt



Operating Temp.: -40°C to +125°C  
 Maximum Continuous Load Rating Unslotted: 30A\*  
 Maximum Continuous Load Rating Slotted: 50A\*  
 Housing Material: PPA (33% / 35% GF)  
 Terminal Material: Copper

| Part Number  | Type             | Max Continuous Load Rating* (A) | Housing Material        | Terminal Material  | Part Quantity     |
|--------------|------------------|---------------------------------|-------------------------|--------------------|-------------------|
| 02400094P    | ATO              | 35                              | Thermoplastic (UL 94V0) | Brass Tin Plated   | 2000              |
| 0297900.WXNV | MINI             | 20                              | Thermoplastic (UL 94V0) | Zinc Silver Plated | 3000              |
| 0327900.YX2S | MICRO2           | 20                              | PA66                    | Zinc Silver Plated | 4000              |
| 0495900_     | JCASE            | 50                              | PA66                    | Copper             | Z=2200 pcs/X=1 pc |
| 0695900.PXP  | MCASE+ Unslotted | 30                              | PPA (33%/35% GF)        | Copper             | 2000              |
| 0695900.PXPS | MCASE+ Slotted   | 50                              | PPA (33%/35% GF)        | Copper             | 2000              |

**\*Rating varies based on mating terminal performance**

INLINE AND PCB FUSE HOLDERS



**FHM**  
Splashproof Inline Fuseholder for MINI® Style  
Amps (A): 20, 30



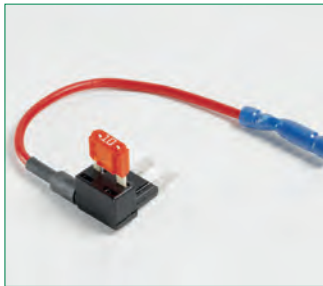
**FHA**  
Inline Fuseholder for ATO® Style  
Amps (A): 20, 30, 3, 4, 5, 10, 25, 7.5



**FHAC**  
Splashproof Inline Fuseholder for ATO® Style  
Amps (A): 20, 30



**OFHA0200**  
ATO® Add-A-Circuit®  
Amps (A): 10.4



**OFHM0200**  
MINI® Add-A-Circuit®  
Amps (A): 10.4



**FHJ**  
Inline Fuseholder for JCASE® Style  
Amps (A): 40, 60



**MAH**  
Inline Fuseholder for MAXI® Style



**0152**  
Fuseholder for MAXI® Style



**FHMaS**  
Splashproof Fuseholder MAXI® Style



**153**  
PCB Mount Fuseholder for MINI® Style Blade Fuse  
Amps (A): 15, 20



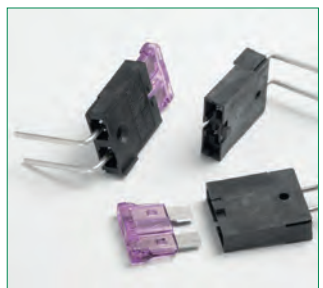
**178**  
PCB Mount Fuseholder for MINI® Style Blade Series 125V



**178 FLR**  
FLR PCB Mount Fuseholder for ATO® Style Blade Fuse 80V



**178 FLR**  
FLR PCB Mount Fuseholder for ATO® Style Blade Fuse 58V



**FKH Fuseholder 80V with 90° connection**  
FKH Fuseholder with 90° Connection for ATO® Style Blade Fuse Rated 80V



# STACKABLE AND PANEL MOUNT FUSE HOLDERS



**Stackable Panel Mount ATO**

Stackable Panel Mount fuse Holder with Wire Leads for ATO Style

Amps (A): 20, 3, 4, 5, 10, 15, 7.5, 25, 30



**ATO Panel Mount Holder Components**



**SNAP Mount Fuse Holder**



**Stackable Panel Mount Fuse Holder**



**868**

Panel-Mount Stackable Components



**FH2 Stackable Block Fuse Holder**

ATO® style 80V Fuseholder



**FH2 Stackable Block Fuse Holder**

ATO® style 58V Fuseholder



**FKH Stackable Fuse Holder**

ATO® style 58V Fuseholder



**FKH Stackable Fuse Holder**

ATO® style 80V Fuseholder



**Low Profile JCASE Holder**

Panel Mount Fuseholder for Low Profile JCASE® Series

Amps (A): 40



**BOLT-DOWN FUSE HOLDERS & ASSEMBLIES**



**498**  
Fuseholder for MIDI/BF1 Style



**MIDI BF1 Fuseholder**  
MIDI/BF1 2 & 3-Way Fuesholder



**498**  
Inline Fuseholder for MIDI® Style  
Amps (A): 200



**Bolt Down Mega**  
Bolt Down Fuseholder for MEGA  
Style



**298**  
Splashproof Fuseholder for MEGA®  
Style Bolt-Down Fuse  
Amps (A): 250



**MEGA-Flex Holder**  
MEGA™-Flex Holder for MEGA®  
Fuses  
Amps (A): 500



**Strips 80V**  
Fuse Base for Fuse Strips 80V for  
Single



**Double Strips 80V**  
Fuse Base for Fuse Strips 80V for  
Double

## I. Introduction

The purpose of this Fuseology section is to promote a better understanding of fuses and some of the more common application details. The fuses to be considered are current-sensitive devices which are designed as the intentional weak link in the electrical circuit. The function of a fuse is to provide discrete component or complete circuit protection by reliably melting under overcurrent conditions and thus safely interrupting the flow of current.

## II. Types of Overcurrents

An overcurrent is any current which exceeds the ampere rating of wiring, equipment or devices under conditions of use. The term “overcurrent” includes both overloads and short circuits.

### A. Overloads

An overload is an overcurrent which is confined to normal current paths. An overload occurs when the current exceeds the value for which the wires or equipment are rated. This can happen when too many devices are connected to the circuit, or when a device connected to the circuit malfunctions in a way that causes it to draw higher than normal current, usually in the range of one to six times normal current. Sustained overloads eventually overheat circuit components. Therefore, fuses must open circuits experiencing sustained overloads before damage occurs.

### B. Short Circuits

A short circuit is current out of its normal path. It occurs when accident or malfunction creates an unintended path for the electricity to flow from the battery or alternator to ground. This shorter, more direct path to ground bypasses the resistance normally offered by the wiring and devices connected to the circuit. With virtually no resistance left to impede current flow, the voltage forces higher and higher current to flow through the wires to the point of the short. Under such a condition, the current will quickly build to such a high level that the heat generated can cause insulation to burn and equipment to be damaged unless the circuit is opened through the use of a fuse.

## III. Fuse Selection Parameters

Since overcurrent protection is crucial to reliable electrical system operation and safety, fuse selection and application should be carefully considered. When selecting fuses, the following parameters should be evaluated:

### A. Voltage Rating

The voltage rating, as marked on a fuse, indicates the maximum voltage of the circuit for which the fuse is designed to operate safely in the event of an overcurrent. Therefore, the fuse’s voltage rating must equal or exceed the available circuit voltage where the fuse will be installed. System voltage exceeding the fuse’s rated voltage may result in fuse damage. The voltage rating is 32 volts DC for the MINI®, MAXI®, ATO®, MIDI®, MEGA®, and CABLEPRO® Fuses.

### B. Interrupting Rating

The interrupting rating (also known as breaking capacity or short circuit rating) is the maximum current, as stated by the manufacturer, which the fuse can safely interrupt at rated voltage. During a fault or short circuit condition, a fuse may receive an instantaneous current many times greater than its normal operating current. Safe operation requires that the fuse remain intact (no body rupture) and clear the circuit. The interrupting rating is 1000A @ 32 volts DC for the MINI®, MAXI®, ATO®, JCASE®, and MIDI® Fuses, and 2000A @ 32 volts DC for the MEGA® and CABLEPRO® Fuses.

### C. Time-Current Characteristics

A fuse’s time-current characteristics determine how fast it responds to different overcurrents. All fuses have inverse time-current characteristics, so opening time decreases as overcurrents increase. Time-current characteristics are presented graphically on standardized “log-log” paper. Figure 1 is a sample time-current curve for the MAXI Fuse series for fuses rated 20-60A. Current values increase from left to right, and time increases from bottom to top. The average melting time for any current can be determined from the curve. For example, from Figure 1 it can be determined that a 20A MAXI Fuse experiencing an overload of 100A will open in about 0.5 seconds. At 40A, the same 20A MAXI Fuse would open in about 9 seconds.

Time-current curves are also used to compare fuses of the same series but of different current ratings. Suppose it was desired to compare the opening times of 20A and 60A MAXI Fuses at an overload of 100A. From the curve in Figure 1, one can see that the 20A fuse opens in about 0.5 seconds at 100 amps, whereas the 60A fuse does not open until about 50 seconds.



Figure 1: Average Melting-Current Curve for the MAXI Fuse Series (20-60A)

It is important to note that time-current curves give only average melting times and are presented as a design aid but are not considered as part of the fuse specifications.

The term used in fuse design that describes how rapidly a fuse responds to various overcurrents is the fuse's "characteristics." Automotive fuse characteristics are determined by the fuse's degree of time delay. Initial or start-up pulses are normal for many automotive applications and require fuses to have a time delay designed in to enable them to survive these pulses and still provide protection against prolonged overloads. Fuses such as the MINI® Fuse and ATO® Fuse have a moderate degree of time delay, whereas fuses like the MAXI® Fuse and MEGA® Fuse have a high degree of time delay which enables them to handle high inrush currents like those caused by motor start-ups. Figure 2 compares sample time-current curves of a 30A MINI Fuse to a 30A MAXI Fuse. To see that the MAXI Fuse has more time delay than the MINI Fuse, compare their opening times at an overload of 100A. Despite the fact that the fuses are the same rating, the MINI Fuse opens in about 0.1 seconds while the MAXI Fuse opens in about 2.2 seconds.

When selecting a fuse, the start-up pulse should be defined and then compared to the time-current curve for the fuse.

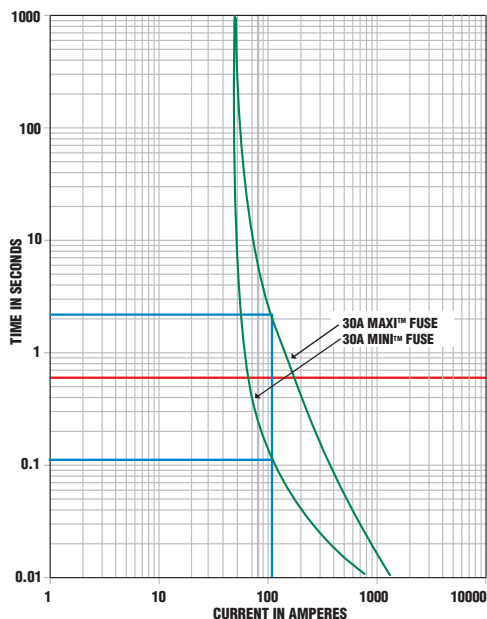


Figure 2: Average Melting-Current Curve Comparing 30A MINI Fuse to 30A MAXI Fuse

## D. Current Rating

The current rating is the maximum current which the fuse can continuously carry under specified conditions.

### 1. Normal Operating Current

The current rating of a fuse is typically derated 25% for operation at 25°C to avoid nuisance blowing. For example, a fuse with a current rating of 10A is not

usually recommended for operation at more than 7.5A in a 25°C ambient.

## 2. Derating for Ambient Temperature

The current carrying capacity tests of fuses are performed at 25°C & will be affected by changes in ambient temperature.

At higher ambient temperatures, a fuse will respond faster to a given overload. Conversely, at lower ambient temperatures, a fuse will respond slower to a given overload. In addition, the temperature of the fuse increases as the normal operating current approaches or exceeds the rating of the fuse.

A MINI Fuse operating at 25°C and 110% of rated current has a minimum life of 100 hours. However, if that same fuse were operated at a very high ambient temperature, derating would be necessary. Figure 3 is a sample temperature derating curve for the MINI Fuse. The following example shows how to use such a curve.

Suppose there is a normal operating current of 15 amperes in a particular circuit, and the ambient temperature will be 105°C instead of 25°C. Which MINI Fuse rating should be used? From Figure 3, the percent of rated current to be used at an ambient temperature of 105°C is 88%, so:

$$\begin{aligned} \text{Ideal fuse rating} &= \frac{\text{Normal operating current}}{\text{Temp derating factor} \times 0.75} \\ &= \frac{15\text{A}}{0.88 \times 0.75} \\ &= 22.73\text{A} \end{aligned}$$

Therefore, a 25A or larger MINI Fuse should be used.

## E. Transient Overcurrent Considerations



Figure 3: MINI Auto Fuse 297 Series Temperature Derating Curve

Transient pulses of inrush current are commonplace in vehicle electrical systems. The transient overcurrent pulses affect the life of automotive fuses.

## 1. I<sup>2</sup>t

I<sup>2</sup>t is an expression of the available thermal energy resulting from current flow. With regard to fuses, the term is usually expressed as melting, arcing, and total clearing I<sup>2</sup>t. The units for I<sup>2</sup>t are expressed in ampere-squared-seconds [A<sup>2</sup>s].

**Melting I<sup>2</sup>t:** the thermal energy required to melt a specific fuse element.

**Arcing I<sup>2</sup>t:** the thermal energy passed by a fuse during the arcing time. The magnitude of arcing I<sup>2</sup>t is a function of the available voltage and stored energy in the circuit.

**Total Clearing I<sup>2</sup>t:** the thermal energy through the fuse from overcurrent inception until current is completely interrupted. Total clearing I<sup>2</sup>t = (melting I<sup>2</sup>t) + (arcing I<sup>2</sup>t).

I<sup>2</sup>t has two important applications to fuse selection. The first is pulse cycle withstand capability and the second is selective coordination.

## 2. Pulse Cycle Withstand Capability

Electrical pulses produce thermal cycling and possible mechanical fatigue that could affect the life of the fuse.

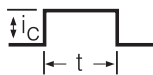
For this reason, it is important to know the pulse cycle withstand capability of the fuse, which is defined as the number of pulses of a given I<sup>2</sup>t value that can be withstood by the fuse without opening, assuming that there is sufficient cool down time between pulses.

Figure 4 shows how I<sup>2</sup>t of the pulse can be calculated from the graph of the pulse current as a function of time.

Figure 5 is a graph of the pulse cycle withstand capability of blade fuses. Because electrical pulse conditions can vary considerably from one application to another, application testing is recommended to establish the ability of the fuse design to withstand the pulse condition.

### WAVESHAPE FUNCTION AND VALUE

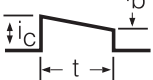
#### Square



$$i = i_c$$

$$I^2t = i_c^2t$$

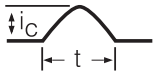
#### Trapezoidal



$$i = i_c \pm kt$$

$$I^2t = (1/3)(i_c^2 + i_b i_c + i_b^2)t$$

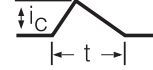
#### Sine



$$i = i_c \sin t$$

$$I^2t = (1/2)i_c^2t$$

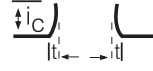
#### Triangular



$$i = \pm kt$$

$$I^2t = (1/3)i_c^2t$$

#### Second order power



$$i = kt^2$$

$$I^2t = (1/5)i_c^2t$$

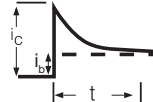
#### Natural decay to zero



$$i = i_c e^{-t/\tau}$$

$$I^2t = (1/2)i_c^2\tau$$

#### Natural decay to non-zero value



$$I^2t = i_b^2t - 2\tau i_b(i_c - i_b)(e^{-t/\tau} - 1) - \tau^2/2(i_c - i_b)^2(e^{-2t/\tau} - 1)$$

Figure 4: Evaluating the I<sup>2</sup>t of a Variety of Current Wave Shapes

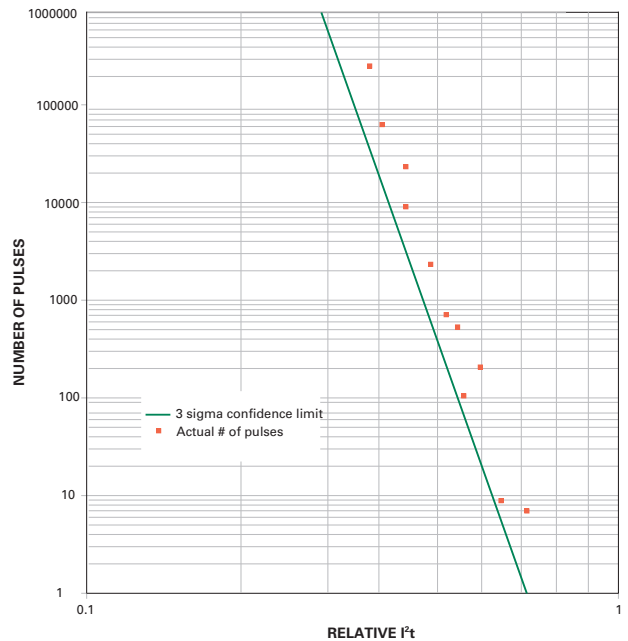


Figure 5: Pulse Cycle Withstand Capability for Blade Fuses

## 3. Selective Coordination

In a selectively coordinated system, only the fuse immediately on the line side of an overcurrent opens. Upstream fuses remain closed and undamaged. All other equipment remains in service, which simplifies locating overloaded equipment or short circuits. In Figure 6, if a short circuit arises behind fuse #1, fuse #1 should open and fuse #2 should stay closed and undamaged. The condition necessary to assure this result is that the minimum melting I<sup>2</sup>t of the supply side fuse (fuse #2) must be greater than the total clearing I<sup>2</sup>t of the load side fuse (fuse #1). This condition results in the load side fuse opening before the supply side fuse begins to melt. Minimum melting and total clearing I<sup>2</sup>t data are given in this catalog.

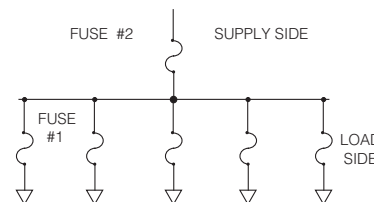


Figure 6: Selective Coordination for Fuses in Series

### IV. Voltage Drop Across Terminals

A fuse is only as good as the system in which it is used. One aspect of the electrical system that has considerable effects on the performance of the fuse is the quality of the connection between the fuse and the cable it protects. High voltage drop across the fuse/terminal interface creates additional thermal loading, which in turn causes shifts in the time-current characteristics of the fuse. Table 1 below gives the maximum recommended voltage drop per terminal for automotive fuses. Figure 7 indicates the measurement locations used to determine the voltage drop across the terminal. The voltage drop across the left terminal would be  $V_{2-4}$  and the voltage drop across the right terminal would be  $V_{1-3}$ .

| Type       | Maximum Recommended Voltage Drop Per Terminal [mV] (between points 1-3 or 2-4) |
|------------|--|
| ATO® FUSE  | 30   |
| MINI® FUSE | 30   |
| MAXI® FUSE | 30   |
| MEGA® FUSE | 15   |

Table 1: Maximum Recommended Voltage Drop per Terminal

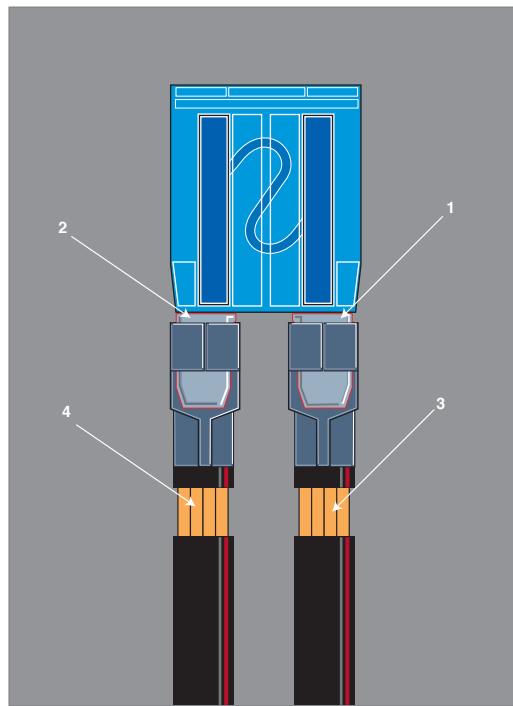


Figure 7: Measurement Locations along the Fuse/Terminal/Cable System Used to Determine the Voltage Drop across the Terminal

### V. Diffusion

Diffusion Pill Technology is a mixing of molecules, atoms or crystals in the solid, liquid or gaseous state. Diffusion Pill Technology is often used in the design of fuses for automotive, electronic and industrial fuse applications.

“M-effect” is the method of diffusing one metal into another to form a new alloy with a lower melting point. Littelfuse uses the “M-effect” to produce three very desirable characteristics in fuse designs: lower melting temperature, time delay, and lower voltage drop.

By affixing a diffusion pill tin to the element, the melting temperature is decreased. This decrease in melting temperature reduces the fuse rating. In order to reestablish its original rating the fuse elements’ cross section needs to increase. An increase in cross section increases the blow time at higher overload condition. A higher degree of time delay enables a fuse to withstand higher current inrush pulses. This increase in cross section reduces the overall fuse resistance and voltage drop.

### VI. Match Wire Gauge to Fuse

In order to protect wiring under all overload and short circuit conditions, it is necessary to standardize the fuse and wire selection process.

Fuses have controlled opening characteristics, and each wire gauge has its respective current carrying capacity. Fuses need to be selected to always protect the wire insulation from damage.

In the selection of wire gauge at various ambient temperatures, it is important to consider the worst case or highest ambient temperature for the application. Wires derate to a much higher degree than fuses, because wire insulation temperature capability is affected much more severely.

#### Maximum Recommended Continuous Current

| Wire Size       |          | Max Continuous Current (A) |         |         |         |         |
|-----------------|----------|----------------------------|---------|---------|---------|---------|
|                 |          | At 25°C                    |         | At 80°C |         |         |
| mm <sup>2</sup> | Gage No. | GXL (1)                    | GPT (2) | GXL (1) | GPT (2) | GXL (1) |
| 0.3             |          | 15                         | 10      | 11      | 4       | 9       |
| 0.5             | 20       | 21                         | 15      | 16      | 6       | 13      |
| 0.75            |          | 27                         | 21      | 20      | 7       | 17      |
| 0.8             | 18       | 31                         | 22      | 23      | 7       | 19      |
| 1               | 16       | 33                         | 23      | 25      | 9       | 20      |
| 1.5             |          | 43                         | 30      | 33      | 12      | 27      |
| 2               | 14       | 50                         | 36      | 37      | 14      | 32      |
| 2.5             |          | 60                         | 42      | 45      | 15      | 38      |
| 3               | 12       | 68                         | 47      | 51      | 18      | 42      |
| 4               |          | 80                         | 56      | 61      | 22      | 50      |
| 5               | 10       | 90                         | 65      | 68      | 23      | 58      |
| 6               |          | 103                        | 73      | 78      | 28      | 64      |
| 8               | 8        | 125                        | 87      | 96      | 30      | 79      |
| 10              |          | 146                        | 103     | 111     | 40      | 90      |
| 13              | 6        | 170                        | 120     | 129     | 47      | 105     |
| 19              | 4        | 221                        | 156     | 166     | 61      | 137     |

(1) = General purpose cross link polyethylene insulation wire with a maximum insulation temperature of 155°C.

(2) = General purpose thermoplastic insulation wire with a maximum insulation temperature of 90°C.













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