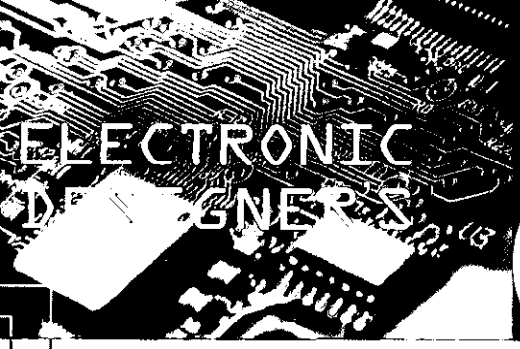
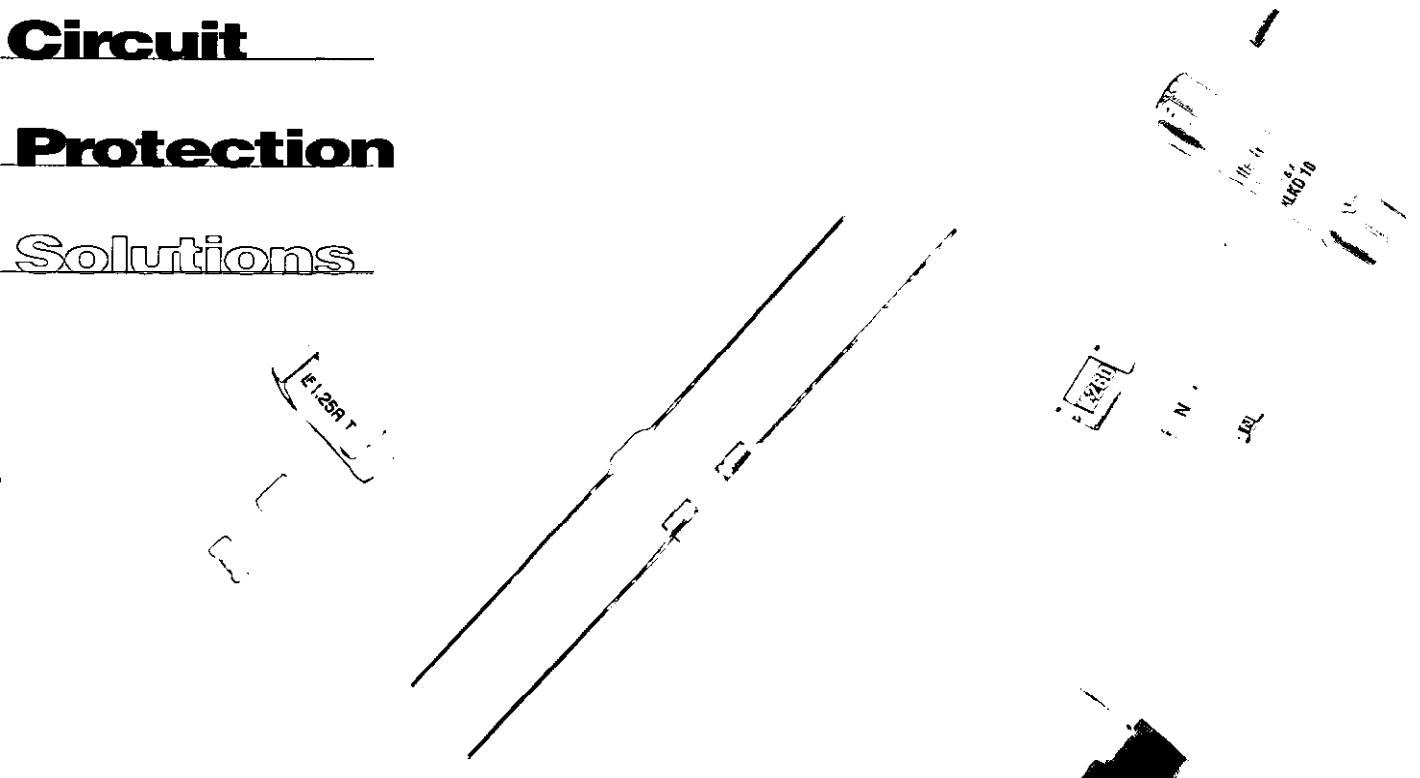
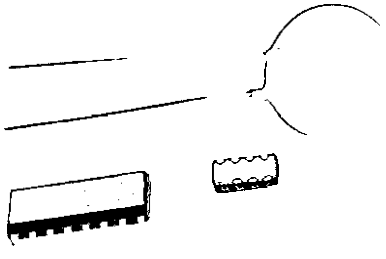


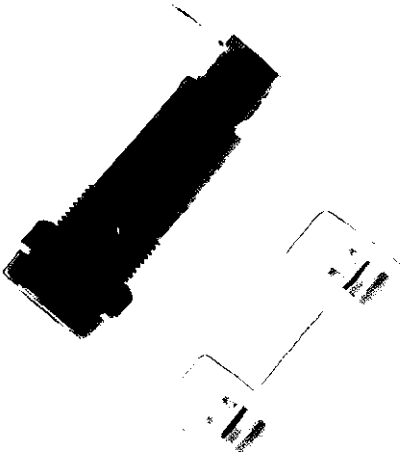
ELECTRONIC DESIGNER'S GUIDE

Circuit Protection Solutions



Harris Suppression
is now Littelfuse





Littelfuse®

WORLDWIDE LEADER IN
CIRCUIT PROTECTION TECHNOLOGIES

LITTELFUSE®
Leading the Way in Circuit Protection Technology

Littelfuse is the leading producer of advanced innovative circuit protection devices directed to the electronic, electrical power, and automotive markets worldwide.

It began with the manufacture of top quality fuses in 1927 when the company's founder, Edward Sundt, developed the first small, fast-acting fuse capable of protecting sensitive test meters.

Today, Littelfuse has expanded its customer base by directing development and manufacturing activities toward the circuit protection market rather than to fuses alone.

Littelfuse possesses the capability of conducting state-of-the-art development work in a new research and development facility located at Des Plaines, Illinois. This advanced R & D facility consists of both office space and a laboratory capable of performing extremely sophisticated analysis using the latest test equipment. These facilities and the commitment to provide outstanding customer service will enhance the ability of Littelfuse to maintain its leadership position in the electronics arena in the 21st century.

Littelfuse was the first U.S. fuse manufacturer to attain ISO 9001 certification. This certification pertains to quality management systems and applies to the Des Plain&, Illinois headquarters location. ISO 9002 certification was awarded to the electrical power fuse manufacturing facility in Arcola, Illinois, in 1992. The electronic fuse manufacturing facility in Centralia, Illinois earned its ISO 9002 certification in 1993. I" addition to these domestic certifications, Littelfuse has bee" awarded ISO certifications for its facilities in England and Switzerland in 1988 and 1990, respectively.

The Littelfuse Quality Policy

Littelfuse is committed to being sensitive to customer expectations and to providing quality products and services *at a competitive price. In support of this commitment, Littelfuse will:*

Encourage quality awareness and quality performance in all associates at all levels of the Company through management leadership;

Promote the participation of all associates in making individual contributions to the quality improvement process;

Support continuous quality improvement by providing **our associates** with the necessary training, tools, and information feedback to enable enhancement of the quality of our products and services;

Develop relationships with suppliers who consistently demonstrate their ability to fulfill quality, price and delivery objectives that are mutually beneficial; and,

Build quality into our products and services, striving for zero defects in everything we do, thereby reducing cost and increasing TOTAL CUSTOMER SATISFACTION.

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Representatives:
Littelfuse has a worldwide network of manufacturers' representatives. If you need direction on contacting your local representative, please call our headquarters location in Des Plaines, Illinois.

Other Littelfuse Literature:
Please contact our Des Plaines, Illinois headquarters to request other Littelfuse literature including the following items.

- *Littelfuse POWR-GARD™ Products Catalog* covering 13/32" x 1½" and larger fuses which meet the National Electrical Code and CSA requirements for main, feeder, and branch circuit protection. (PF101)
- *Littelfuse Automotive OEM Products and Capabilities Brochure* which is a reference guide covering fuses, fuseholders, and other special products directed to the automotive market. (OE101)
- *Littelfuse Application Notes.*

The application guidelines and product data in this guide are intended to provide technical information that will help with application design. Since these are only a few of the contributing parameters, application testing is strongly recommended and should be used to verify performance in the circuit/application. In the absence of special requirements, Littelfuse reserves the right to make appropriate changes in design, process, and manufacturing location without notice.

The purpose of the Fuseology Section is to promote a better understanding of both fuses and common application details. The fuses to be considered are currant sensitive devices which are designed as the intentional weak link in the electrical circuit. The function of the fuse is to provide protection of discrete components, or of complete circuits, by reliably melting under current overload conditions. This fuseology section will cover some important facts about fuses, selection considerations, and standards.

FUSE *FACTS*

The following fuse parameters or application concepts should be well understood in order to properly select a fuse for a given application.

AMBIENT TEMPERATURE: Refers to the temperature of the air immediately surrounding the fuse and is not to be confused with "room temperature." The fuse ambient temperature is appreciably higher in many cases, because it is enclosed (as in a panel mount fuseholder) or mounted near other heat producing components, such as resistors, transformers, etc.

BREAKING CAPACITY: See Interrupting Rating.

CURRENT RATING: The nominal amperage value marked on the fuse. It is established by the manufacturer as a value of current which the fuse can be loaded to, based on a controlled set of test conditions (See RERATING).

Catalog Fuse part numbers include series identification and amperage ratings. Refer to the FUSE SELECTION GUIDE section for guidance on making the proper choice.

RERATING: For 25°C ambient temperatures, it is recommended that fuses be operated at no more than 75% of the nominal current rating established using the controlled test conditions. These test conditions are part of UL/CSA/ANCE (Mexico) 248-14 "Fuses for Supplementary Overcurrent Protection," whose primary objective is to specify common test standards necessary for the continued control of manufactured items intended for protection against fire, etc. Some common variations of these standards include: fully enclosed fuseholders, high contact resistances, air movement, transient spikes, and changes in connecting cable size (diameter and length). Fuses are essentially temperature-sensitive devices. Even small variations from the controlled test conditions can greatly affect the predicted life of a fuse when it is loaded to its nominal value, usually expressed as 100% of rating.

The circuit design engineer should clearly understand that the purpose of these controlled test conditions is to enable fuse manufacturers to maintain unified performance standards for their products, and he must account for the variable conditions of his application. To compensate for these variables, the circuit design engineer who is designing for trouble-free, long-life fuse protection in his equipment generally loads his fuse not more than 75% of the nominal rating listed by the manufacturer, keeping in mind that overload and short circuit protection must be adequately provided for.

The fuses under discussion are temperature-sensitive devices whose ratings have been established in a 25°C ambient. The fuse temperature generated by the current passing through the fuse increases or decreases with ambient temperature change.

The ambient temperature chart in the FUSE SELECTION GUIDE section illustrates the effect that ambient temperature has on the nominal current rating of a fuse. Most traditional Slo-Blo® Fuse designs use lower melting temperature materials and are, therefore, more sensitive to ambient temperature changes.

DIMENSIONS: Unless otherwise specified, dimensions are in inches. The fuses in this catalog range in size from the approx. 0603 chip size (.063"L x .031"W x .018"H) up to the 5 AG, also commonly known as a "MIDGET" fuse (13132" dia. x 1½" length). As new products were developed throughout the years, fuse sizes evolved to fill the various electrical circuit protection needs. The first fuses were simple, open-wire devices, followed in the 1890's by Edison's enclosure of thin wire in a lamp base to make the first plug fuse. By 1904, Underwriters Laboratories had established size and rating specifications to meet safety standards. The renewable type fuses and automotive fuses appeared in 1914, and in 1927 Littelfuse started making very low amperage fuses for the budding electronics industry.

The fuse sizes in the chart below began with the early "Automobile Glass" fuses, thus the term "AG". The numbers were applied chronologically as different manufacturers started making a new size: "3AG," for example, was the third size placed on the market. Other non-glass fuse sizes and constructions were determined by functional requirements, but they still retained the length or diameter dimensions of the glass fuses. Their designation was modified to AB in place of AG, indicating that the outer tube was constructed from Bakelite, fibre, ceramic, or a similar material other than glass. The largest size fuse shown in the chart is the 5AG, or "MIDGET," a name adopted from its use by the electrical industry and the National Electrical Code range which normally recognizes fuses of 9/16" x 2" as the smallest standard fuse in use.

FUSE **SIZES**

SIZE	**DIAMETER (Inches)**		LENGTH (Inches)	
1AG	1/4	.250	5/8	.625
2AG	—	.177	—	.588
3AG	*114*	.250	1¼	*1.25*
4AG	9132	.281	1¼	1.25
5AG	*13132*	.406	1½	*1.50*
7AG	*114*	.250	7/8	.875
8AG	1/4	.250	1	1

TOLERANCES: The dimensions shown in this catalog are nominal. Unless otherwise specified, tolerances are applied as follows:

± ,010" for dimensions to 2 decimal places.
± .005" for dimensions to 3 decimal places.

The factory should be contacted concerning metric system and fractional tolerances. Tolerances do not apply to lead lengths.

FUSE CHARACTERISTICS: The characteristic of a fuse design refers to how rapidly the fuse responds to various current overloads. Fuse characteristics can be classified into three general categories: very fast-acting, fast-acting, or Slo-Blo® Fuse. The distinguishing feature of Slo-Blo® fuses is that these fuses have additional thermal inertia designed to tolerate normal initial or start-up overload pulses.

FUSE CONSTRUCTION: Internal construction may vary depending on ampere rating. Fuse photos in this catalog

show typical construction of a particular ampere rating within the fuse series.

FUSEHOLDERS: In many applications, fuses are installed in fuseholders. These fuses and their associated fuseholders are not intended for operation as a "switch" for turning power "on" and "off".

INTERRUPTING RATING: Also known as breaking capacity or short circuit rating, the interrupting rating is the maximum approved current which the fuse can safely interrupt at rated voltage. During a fault or short circuit condition, a fuse may receive an instantaneous overload current many times greater than its normal operating current. Safe operation requires that the fuse remain intact (no explosion or body rupture) and clear the circuit.

Interrupting ratings may vary with fuse design and range from 35 amperes AC for some 250V metric size (5 x 20mm) fuses up to 200,000 amperes AC for the 600V KLK series. Information on other fuse series can be obtained from the factory.

Fuses listed in accordance with UL/CSA/ANCE 246 are required to have an interrupting rating of 10,000 amperes, with some exceptions (See STANDARDS section) which, in many applications, provides a safety factor far in excess of the short circuit currents available.

NUISANCE OPENING: Nuisance opening is most often caused by an incomplete analysis of the circuit under consideration. Of all the "Selection Factors" listed in the FUSE SELECTION GUIDE, special attention must be given to items 1, 3, and 6, namely, normal operating current, ambient temperature, and pulses. For example, one prevalent cause of nuisance opening in conventional power supplies is the failure to adequately consider the fuse's nominal melting I^2t rating. The fuse cannot be selected solely on the basis of normal operating current and ambient temperature. In this application, the fuse's nominal melting I^2t rating must also meet the inrush current requirements created by the input capacitor of the power supply's smoothing filter. The procedure for converting various waveforms into I^2t circuit demand is given in the FUSE SELECTION GUIDE. For trouble-free, long-life fuse protection, it is good design practice to select a fuse such that the I^2t of the waveform is no more than 20% of the nominal melting I^2t rating of the fuse. Refer to the section on PULSES in the FUSE SELECTION GUIDE.

RESISTANCE: The resistance of a fuse is usually an insignificant part of the total circuit resistance. Since the resistance of fractional amperage fuses can be several ohms, this fact should be considered when using them in low-voltage circuits. Actual values can be obtained from the factory. Most fuses are manufactured from materials which have positive temperature coefficients, and, therefore, it is common to refer to cold resistance and hot resistance (voltage drop at rated current), with actual operation being somewhere in between. Cold resistance is the resistance obtained using a measuring current of no more than 10% of the fuse's nominal rated current. Values shown in this publication for cold resistance are nominal and representative. The factory should be consulted if this parameter is critical to the design analysis. Hot resistance is the resistance calculated from the stabilized voltage drop across the fuse, with current equal to the nominal rated current flowing through it.

Resistance data on all of **our** fuses is available on request. Fuses can be supplied to specified controlled resistance tolerances at additional cost.

SOLDERING RECOMMENDATIONS: Since most fuse constructions incorporate soldered connections, caution should be used when installing those fuses intended to be soldered in place. The application of excessive heat can reflow the solder within the fuse and change its rating. Fuses are heat-sensitive components similar to semi-conductors, and the use of heat sinks during soldering is often recommended.

TEST **SAMPLING PLAN:** Because compliance with certain specifications requires destructive testing, these tests are selected on a statistical basis for each lot manufactured.

TIME-CURRENT CURVE: The graphical presentation of the fusing characteristic, time-current curves are generally average curves which are presented as a design aid but are not generally considered part of the fuse specification. Time-current curves are extremely useful in defining a fuse, since fuses with the same current rating can be represented by considerably different time-current curves. The fuse specification typically will include a life requirement at 100% of rating and maximum opening times at overload points (usually 135% and 200% of rating). A time-current curve represents average data for the design; however, there may be some differences in the values for any one given production lot. Samples should be tested to verify performance, once the fuse has been selected.

UNDERWRITERS LABORATORIES: Reference to "Listed by Underwriters Laboratories" signifies that the fuses meet the requirements of UL/CSA/ANCE 246 "Fuses for Supplementary Overcurrent Protection". Some 32 volt fuses (automotive) in this catalog are listed under UL Standard 275. Reference to '"Recognized under the Component Program of Underwriters Laboratories" signifies that the item is recognized under the component program of Underwriters Laboratories and application approval is required.

VOLTAGE RATING: The voltage rating, as marked on a fuse, indicates that the fuse can be relied upon to safely interrupt its rated short circuit current in a circuit where the voltage is equal to, or less than, its rated voltage. This system of voltage rating is covered by N.E.C. regulations and is a requirement of Underwriters Laboratories as a protection against fire risk. The standard voltage ratings used by fuse manufacturers **for** most small-dime&ion and midget fuses are 32, 63, 125, 250 and 600.

In electronic equipment with relatively low output power supplies, with circuit impedance limiting short circuit currents to values of less than ten times the current rating of the fuse, it is common practice to specify fuses with 125 or 250 volt ratings for secondary circuit protection of 500 volts or higher.

As mentioned previously (See RERATING), fuses are sensitive to changes in current, not voltage, maintaining their "status quo" at any voltage from zero to the maximum rating of the fuse. It is not until the fuse element melts and arcing occurs that the circuit voltage and available power become an issue. The safe interruption of the circuit, as it relates to circuit voltage and available power, is discussed in the section on INTERRUPTING RATING.

FUSE FACTS

To summarize, a fuse may be used at any voltage that is less than its voltage rating without detriment to its fusing characteristics. Please contact the factory for applications at voltages greater than the voltage rating.

DERIVATION OF NOMINAL MELTING I^2t: Laboratory tests are conducted on each fuse design to determine the amount of energy required to melt the fusing element. This energy is described as nominal melting I^2t and is expressed as "Ampere Squared Seconds" (A^2 Sec.). A pulse of current is applied to the fuse, and a time measurement is taken for melting to occur. If melting does not occur within a short duration of about 8 milliseconds (0.008 seconds) or less, the level of pulse current is increased. This test procedure is repeated until melting of the fuse element is confined to within about 6 milliseconds. The purpose of this procedure is to assure that the heat created has insufficient time to thermally conduct away from the fuse element. That is, all of the heat energy (I^2t) is used, to cause melting. Once the measurements of current (I) and time (t) are determined, it is a simple matter to calculate melting I^2t. When the melting phase reaches completion, an electrical arc occurs immediately prior to the "opening" of the fuse element. Clearing I^2t = Melting I^2t + arcing I^2t. The nominal I^2t values given in this publication pertain to the melting phase portion of the "clearing" or "opening".

FUSE SELECTION GUIDE

The application guidelines and product data in this guide are intended to provide technical information that will help with application design. Since these are only a few of the contributing parameters, application testing is strongly recommended and should be used to verify performance in the circuit/application.

Many of the factors involved with fuse selection are listed below:

Selection Factors

1. Normal operating current
2. Application voltage (AC or DC)
3. Ambient temperature
4. Overload current and length of time in which the fuse must open.
5. Maximum available fault current
6. Pulses, Surge Currents, Inrush Currents, Start-up Currents, and Circuit Transients
7. Physical size limitations, such as length, diameter, or height
6. Agency Approvals required, such as UL, GSA, VDE, or Military
9. Considerations: mounting type/form factor, ease of removal, axial leads, visual indication, etc.
10. Fuseholder features: clips, mounting block, panel mount, p.c. board mount. R.F.I. shielded, etc.

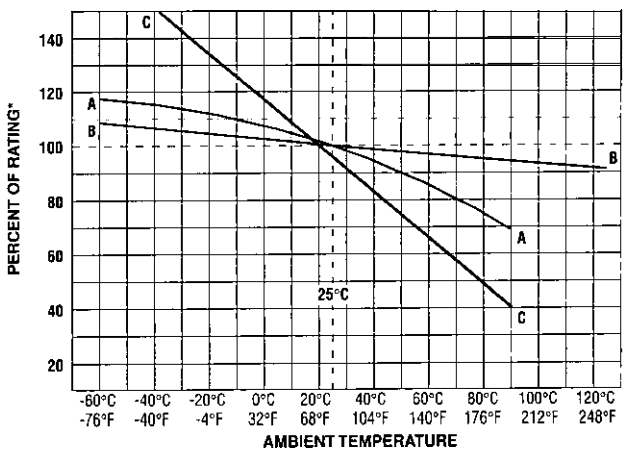
NORMAL OPERATING CURRENT: The current rating of a fuse is typically derated 25% for operation at 25°C to avoid nuisance blowing. For example, a fuse with a current rating of 10A is not usually recommended for operation at more than 7.5A in a 25°C ambient. For additional details, see RERATING in the previous section and AMBIENT TEMPERATURE below.

VOLTAGE: The voltage rating of the fuse must be equal to, or greater than, the available circuit voltage. For exceptions, sea VOLTAGE RATING.

AMBIENT TEMPERATURE: The current carrying capacity tests of fuses are performed at 25°C and will be affected by changes in ambient temperature. The higher the ambient temperature, the hotter the fuse will operate, and the shorter its life will be. Conversely, operating at a lower temperature will prolong fuse life. A fuse also runs hotter as the normal operating current approaches or exceeds the rating of the selected fuse. Practical experience indicates fuses at room temperature should last indefinitely, if operated at no more than 75% of catalog fuse rating.

CHART SHOWING EFFECT OF AMBIENT TEMPERATURE ON CURRENT-CARRYING CAPACITY (TYPICAL)

KEY TO CHART:
Curve A:Thin-Film Fuses and 313 Series (.010 to .150A)
Curve B: Very Fast-Acting, Fast-Acting, and Spiral Wound Slo-Blo® Fuses
Curve C: Resettable PTC's



*Ambient temperature effects are in addition to the normal derating, see example.

Example: Given a normal operating current of 1.5 amperes in an application using a traditional Slo-Blo® fuse at room temperature, then:

$$\text{Catalog Fuse Rating} = \frac{\text{Normal Operating Current}}{0.75}$$

or

$$\frac{1.5 \text{ Amperes}}{0.75} = 2.0 \text{ Amp Fuse (at 25°C)}$$

Similarly, if that same fuse were operated at a very high ambient temperature of 70°C additional derating would be necessary. Curve "A" (Traditional Slo-Blo® Fuse) of the ambient temperature chart shows the maximum operating "Percent of Rating" at 70°C to be 80%, in which case;

$$\text{Catalog Fuse Rating} = \frac{\text{Nominal Operating Current}}{0.75 \times \text{Percent of Rating}}$$

or

$$\frac{1.5 \text{ Amperes}}{0.75 \times 0.80} = 2.5 \text{ Amp Fuse (at 70°C)}$$

OVERLOAD CURRENT CONDITION: The current level for which protection is required. Fault conditions may be specified, either in terms of current or, in terms of both current and maximum time the fault can be tolerated before damage occurs. Time-current curves should be consulted to try to match the fuse characteristic to the circuit needs, while keeping in mind that the curves are based on average data.

MAXIMUM FAULT CURRENT: The Interrupting Rating of a fuse must meet or exceed the Maximum Fault Current of the circuit.

PULSES: The general term "pulses" is used in this context to describe the broad category of wave shapes referred to as "surge currents", "start-up currents", "inrush currents", and "transients". Electrical pulse conditions can vary considerably from one application to another. Different fuse constructions may not all react the same to a given pulse condition. Electrical pulses produce thermal cycling and possible mechanical fatigue that could affect the life of the fuse. Initial or start-up pulses are normal for some applications and require the characteristic of a Slo-Blo® fuse. Slo-Blo® fuses incorporate a thermal delay design to enable them to survive normal start-up pulses and still provide protection against prolonged overloads. The start-up pulse should be defined and then compared to the time-current curve and I^2t rating for the fuse. Application testing is recommended to establish the ability of the fuse design to withstand the pulse conditions.

Nominal melting I^2t is a measure of the energy required to melt the fusing element and is expressed as "Ampere Squared Seconds" (A^2 Sec.). This nominal melting I^2t, and the energy it represents (within a time duration of 8 milliseconds [0.008 second] or less and 1 millisecond [0.001 second] or less for thin film fuses), is a value that is constant for each different fusing element. Because every fuse type and rating, as well as its corresponding part number, has a different fusing element, it is necessary to determine the I^2t for each. This I^2t value is a parameter of the fuse itself and is controlled by the element material and the configuration of the fuse element. In addition to selecting fuses on the basis of "Normal Operating Currents", "Derating", and "Ambient Temperature" as discussed earlier, it is also necessary to apply the I^2t design approach. This nominal melting I^2t is not only a constant value for each fuse element design, but it is also independent of temperature and voltage. Most often, the nominal melting I^2t method of fuse selection is applied to those applications in which the fuse must sustain large current pulses of a short duration. These high-energy currents are common in many applications and are described by a variety of terms, such as "surge current", "start-up current", "inrush current", and other similar circuit "transients" that can be classified in the general category of "pulses." Laboratory tests are conducted on each fuse design to determine its nominal melting I^2t rating. The values for I^2t given in this publication are nominal and representative. The factory should be consulted if this parameter is critical to the design analysis. The following example should assist in providing a better understanding of the application of I^2t.

EXAMPLE: Select a 125V, very fast-acting PICO® fuse that is capable of withstanding 100,000 pulses of current (I) of the pulse waveform shown in Figure 1. The normal operating currant is 0.75 ampere at an ambient temperature of 25°C.

Step 1 — Refer to Chart I (page #6) and select the appropriate pulse waveform, which is waveform (E) in this example. Place the applicable value for peak pulse current (i_p) and time (t) into the corresponding formula for waveshape (E), and calculate the result, as shown:

$$I^2t = \frac{1}{5}(i_p)^2t$$

$$= \frac{1}{5} \times 8^2 \times .004 = 0.0512 \text{ } A^2 \text{ Sec.}$$

This value is referred to as the "Pulse I^2t".

Step 2 — Determine the required value of Nominal Melting I^2t by referring to Chart II (page 6). A figure of 22% is shown in Chart II for 100,000 occurrences of the Pulse I^2t calculated in Step 1. This Pulse I^2t is converted to its required value of Nominal Melting I^2t as follows:

Nom. Melt I^2t = Pulse I^2t/.22

= 0.05121.22 = 0.2327 A" Sec

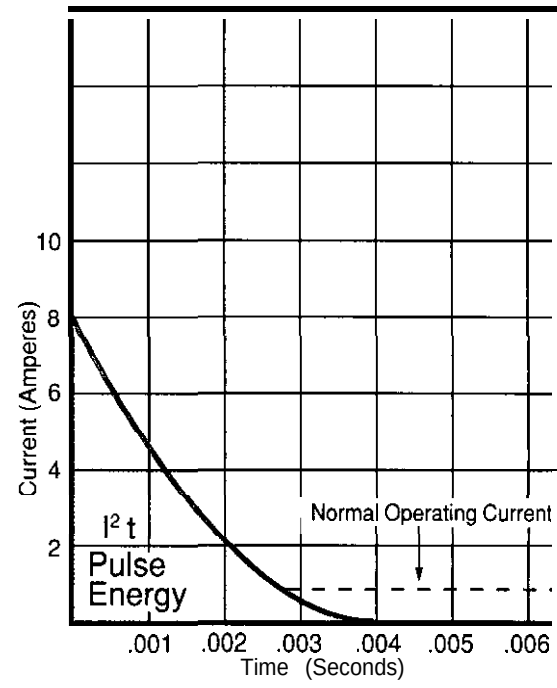
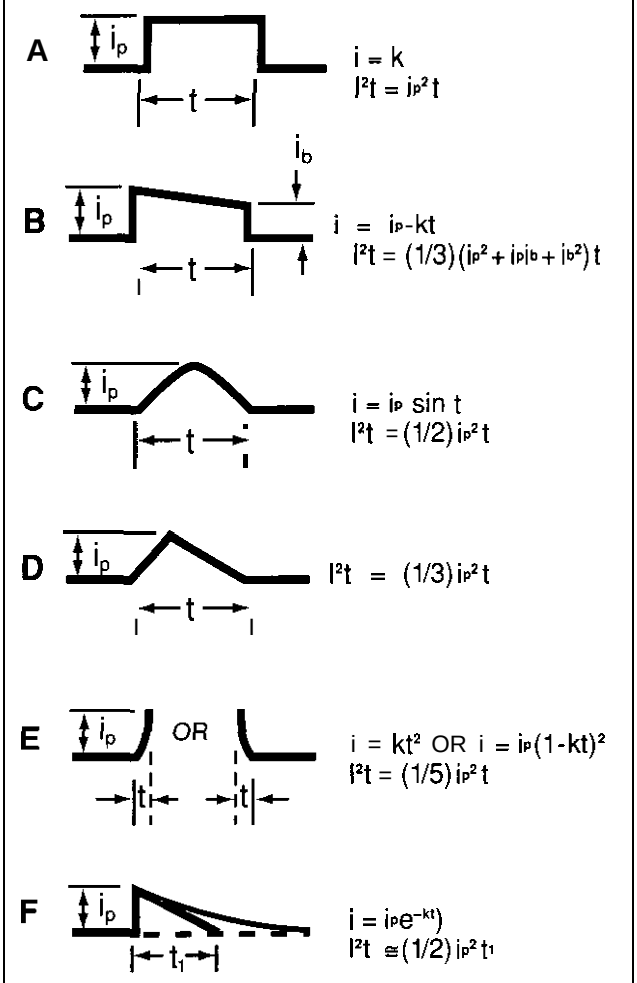


Figure 1

FUSE SELECTION GUIDE

CHART I



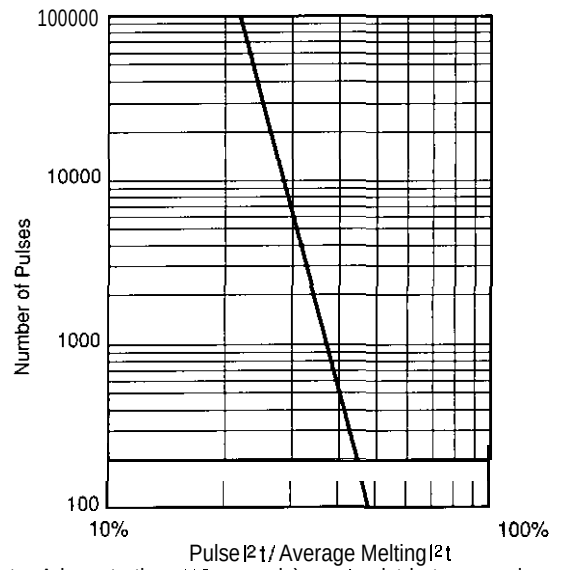
Step 3 — Examine the I^2t rating data for the PICO® II, 125V, very fast-acting fuse. The part number 251001, 1 ampere design is rated at 0.256 A^2 Sec., which is the minimum fuse rating that will accommodate the 0.2327 A^2 Sec. value calculated in Step 2. This 1 ampere fuse will also accommodate the specified 0.75 ampere normal operating current, when a 25% derating factor is applied to the 1 ampere rating, as previously described.

TESTING: The above factors should be considered in selecting a fuse for a given application. The next step is to verify the selection by requesting samples for testing in the actual circuit. Before evaluating the samples, make sure the fuse is properly mounted with good electrical connections, using adequately sized wires or traces. The testing should include life tests under normal conditions and overload tests under fault conditions, to ensure that the fuse will operate properly in the circuit

CHART II

PULSE CYCLE WITHSTAND CAPABILITY

100,000 Pulses	Pulse I^2t = 22% of Nominal Melting I^2t
10,000 Pulses	Pulse I^2t = 29% of Nominal Melting I^2t
1,000 Pulses	Pulse I^2t = 38% of Nominal Melting I^2t
100 Pulses	Pulse I^2t = 48% of Nominal Melting I^2t



Note: Adequate time (10 seconds) must exist between pulse events to allow heat from the previous went to dissipate.

FUSEHOLDER SELECTION GUIDE

RERATING: For 25°C ambient temperatures, it is recommended that fuseholders be operated at no more than 60% of the nominal current rating established using the controlled test conditions specified by Underwriters Laboratories. The primary objective of these UL test conditions is to specify common test standards necessary for the continued control of manufactured items intended for protection against fire, etc. A copper dummy fuse is inserted in the fuseholder by Underwriters Laboratories, and then the current is increased until a certain temperature rise occurs. The majority of the heat is produced by the contact resistance of the fuseholder clips. This value of current is considered to be the rated current of the fuseholder, expressed as 100% of rating. Some of the more common, everyday applications may differ from these UL test conditions as follows: fully enclosed fuseholders, high contact resistance, air movement, transient spikes, and changes in connecting cable size (diameter and length). Even small variations from the controlled test conditions can greatly affect the ratings of the fuseholder. For this reason, it is recommended that fuseholders be derated by 40% (operated at no more than 60% of the nominal current rating established using the Underwriter Laboratories test conditions, as stated above).

Littelfuse is at your service to help solve your electrical protection problems. When contacting Littelfuse safes engineers, please have all the requirements of your applications available. Requests for quotes or assistance in designing or selecting special types of circuit protection components for your particular applications are also welcome.

In the absence of special requirements, Littelfuse reserves the right to make appropriate changes in design, process, and manufacturing location without prior notice.

STANDARDS

Fuse ratings and other performance criteria are evaluated under laboratory conditions **and acceptance criteria, as** defined in one or more of the various fuse standards. It is important to understand these standards so that the fuse can be properly applied to circuit protection applications.

UL/CSA/ANCE (Mexico) 248-14 FUSES FOR SUPPLEMENTARY OVERCURRENT PROTECTION (600 Volts, Maximum) (Previously UL 198G and CSA k22.2, No. 59)

(UL) UL LISTED

A UL Listed fuse meets all the requirements of the UL/CSA 248.14 Standard. Following are some of the requirements.

UL ampere rating tests are conducted at 100%, 135%, and 200% of rated current. The fuse must carry 110% of its ampere rating and must stabilize at a temperature that does not exceed a 75°C rise at 100%.

The fuse must open at 135% of rated current within one hour. It also must open at 200% of rated current within 2 minutes for O-30 ampere ratings and 4 minutes for 35-60 ampere ratings.

The interrupting rating of a UL Listed fuse is 10,000 amperes AC minimum at 125 volts. Fuses rated at 250 volts may be listed as interrupting 10,000 amperes at 125 volts and, at least, the minimum values shown below at *250* volts.

Ampere Rating of Fuse	Interrupting Rating In Amperes	Voltage Rating
0 to 1	35	250 "AC
1.1 to *3.5*	100	*250* VAC
3.6 to 10	*200*	*250* VAC
10.1 to 15	*750*	*250* VAC
15.1 to *30*	1500	*250* VAC

Recognized Under the Component Program of Underwriters Laboratories

The Recognized **Components** Program of UL is different from UL Listing. UL will test a fuse to a specification requested by the manufacturer. The test points can be different from the UL Listed requirements if the fuse has been designed for a specific application. Application approval is required by UL for fuses recognized under the Component Program.

UL 275 AUTOMOTIVE GLASS TUBE FUSES (32 Volts)

UL Listed

UL ampere ratings tests are conducted at 11 0%, 135%. and 200%. Interrupting rating tests are not required.

CSA Certification

CSA Certification in Canada is equivalent to UL Listing in the United States.

@The Component Acceptance Program of CSA is equivalent to the Recognition Program at UL. This CSA Program allows the manufacturer to declare a specification. CSA then verifies the test results.

MITI APPROVAL

MITI® approval in Japan is similar to UL Recognition in the United States.

MITI® has its own design standard and characteristics.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

Publication 60127, Sheet 1, 2, 3, 5, 6 (250 Volts)

The IEC organization is different from UL and CSA, since IEC only writes specifications and does not certify. UL and CSA write the specifications, are responsible for testing, and give certification.

Certification to IEC specifications are given by such **organizations** as SEMKO (Swedish Institute of Testing and Approvals of Electrical Equipment) Ⓢ and BSI (British Standards Institute ▽, as well as UL and CSA.

IEC Publication 60127 defines three breaking capacity levels (interrupting rating). Low breaking capacity fuses must pass a test of 35 amperes or ten times rated current, whichever is greater, while enhanced breaking capacity fuses must pass a test of 150 amperes and finally high breaking capacity fuses must pass a test of 1500 amperes.

Sheet 1 -Type F Quick Acting, High Breaking Capacity

Sheet 2 -Type F Quick Acting, Low Breaking Capacity

Sheet 3 -Type T Time Lag, Low Breaking Capacity

Sheet 5 -Type T Time Lag, High Breaking Capacity

Sheet 6 -Type T Time Lag, Enhanced Breaking Capacity

The letters 'F' and 'T' represent the time-current characteristic of the fast-acting and time delay fuses. One of these letters will be marked on the end cap of the fuse.

ULICSAIANCE (Mexico) 248-14 vs. IEC 80127 FUSE OPENING TIMES (ULICSAIANCE (Mexico) 248-14 Was Previously UL 198G and CSA 22.2, No. 59) vs. MITI®

Percent of Rating	UL & CSA STD 248-14	IEC TYPE F Sheet 1 (*)	IEC Type F Sheet 2 (*)	IEC Type T Sheet 3 & 4 (*)	IEC Type T Sheet 5 (*)	MITI ®
110	4 Hr. Min.	—	—	—	—	
130	—	—	—	—	—	1Hr. Min.
135	60 Minutes Max.	—	—	—	—	
150	—	60 Minutes Min.	60 Minutes Min.	60 Minutes Min.	60 Minutes Min.	
160	—	—	—	—	—	1 Hr. Max.
200	2 Minutes Max.	—	—	—	—	2 Minutes Max.
210	—	30 Minutes Max.	30 Minutes Max.	2 Minutes Max.	30 Minutes Max.	

(*) Note: The IEC Specification is only written up to 6.3A, any components above these ratings are not recognized by the IEC (although the fuses may have those opening characteristics).

IEC also has requirements at 275%, 400% and 1000%; however, the chart is used to show that fuses with the same ampere rating made to different specifications are not interchangeable. According to the IEC 60127 Standard, a one ampere-rated fuse can be operated at one ampere. A one ampere-rated fuse made to UL/CSA/ANCE 248-14 should not be operated at more than .75 ampere (25% derated — See RERATING section of FUSEOLOGY).

MITI® covers only one characteristic i.e. there are no 'delay' definitions on other performance variants.

STANDARDS AND PACKAGING INFORMATION

Publication IEC 60127-4
(Universal Modular Fuse-Links [UMF])

This part of IEC 60127 covers both PCB through-hole and surface mount fuses. This standard covers fuses rated 32, 63, 125, and 250 volts. This standard will be accepted by UUCSA making it the first global fuse standard. This specification uses different fusing gates than IEC 60127-2; the gates used here ***are*** 125%, 200%, and 1000%.

The fuses must not open in less than one hour at 125% of rated current and open within two minutes at 200% of rated current. The 1000% overload is used to determine the fuse characteristic. The time for each rating is listed below.

Type FF: Less than 0.001 sec.
Type F: From 0.001 • 0.01 sec.
Type T: From 0.01 0.1 sec.
Type TT: From 0.1 1 .OO sec.

These characteristics correlate to the terminology used in IEC 60127-l.

Breaking capacity (interrupting rating) varies based on volt age rating. Parts rated at 32 & 63 volts must pass a test of 35 amperes or ten times rated current, whichever is greater.Parts rated et 125 volts must pass a test of 50 amperes or ten times rated current, whichever is greater. Parts rated at 250 volts are further defined as either low, intermediate or high breaking. The low breaking capacity fuses must pass a test of 100 amperes or ten times rated current, while intermediate breaking capacity fuses must pass a test of 500 amperes and, finally, high breaking capacity fuses must pass a test of 1500 amperes.

Packaging Suffixes

A/X = 1 unit per bag
V = 5 units per box
T = 10 units per box
H = 100 units per box
U = 500 units per box
M = 1000 units per box
P = 2000 units per box
W = 3000 units per box
N = 5000 units per box
R = Taped & reeled fuses
Ml = Taped & reeled. Spacing = 4 mm. 1000 pieces per reel
MT1 = Taped & reeled. Spacing = 2.062 inches (52.4 mm) 1000 pieces per reel
MT2 = Taped & reeled. Spacing = 2.50 inches (63.5 mm) 1000 pieces per reel
MT3 = Taped & reeled. Spacing = 2.874 inches (73 mm) 1000 pieces per reel

NT1 = Taped & reeled. Spacing = 2.062 inches (52.4 mm) ***5000*** pieces per reel
NT2 = Taped & reeled. Spacing = 2.50 inches (63.5 mm) ***5000*** pieces per reel
NT3 = Taped & reeled. Spacing = 2.874 inches (73 mm) ***5000*** pieces per reel

Tx = Taped & reeled. Spacing to be determined.

MILITARY/FEDERAL STANDARDS
See Table of Contents for Military Product Section.

Fuses and holders approved to the following Military specifications are on the Qualified Products List (QPL) for that specification.

MIL-PRF-15160 and MIL-PRF-23419

These specifications govern the construction and performance of fuses suitable primarily for military electronic applications.

MIL-PRF-19207

This specification governs the construction and performance of fuseholders suitable for military applications.

DESC Drawing #87108

This drawing governs the construction and performance of .177" x .570" (2AG size) cartridge fuses and axial lead versions suitable for military applications. DESC #87108 designation is included in the fuse end cap marking.

FEDERAL SPECIFICATION W-F-1614

This specification governs the construction and performance of fuses with high interrupting ratings that are approved for federal applications. Fuses approved to these specifications are on the Federal Qualified Products List.

Write to the following agencies for additional information on standards, approvals, or copies of the specifications.

Underwriters Laboratories Inc. (UL)
333 Pfingsten Road
Northbrook, IL 60062
Att: Publications Stock

Canadian Standards Association (CSA)
176 Rexdale Boulevard
Rexdale, Ontario, Canada M9W 1 R3
Att: Standard Sales

International Electrotechnical Commission (IEC)
3, Rue de Varembe
1211 Geneva 20
Switzerland
Att: Sales Department

Naval Publications and Military Standards Form Center (for Military and Federal Standards)
5601 Tabor Avenue
Philadelphia, PA 19120
Att: Commanding Officer

Defense Supply Center Columbus (DSSC)
3990 East Broad Street
Columbus, OH 43216-5000

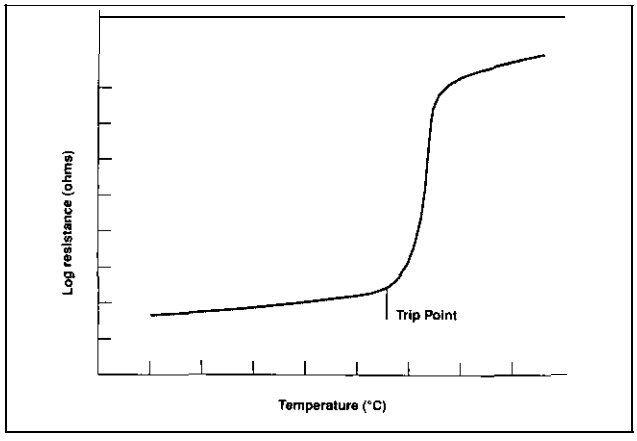
Ministry of International Trade and Industry (MITI)
Kasumigaseki
Chi-Youda-Ku
Tokyo 100, Japan

PTC FACTS

Overcurrent circuit protection can be accomplished with the use of either a traditional fuse or the more recently developed resettable PTC. Both devices function by reacting to the heat generated by the excessive current flow in the circuit. The fuse melts open, interrupting the current flow, and the PTC changes from a low resistance to a high resistance to limit current flow. Understanding the differences in performance between the two types of devices will make the best circuit protection choice easier.

The most obvious difference is that the PTC is *resettable.* The general procedure for resetting after an overload has occurred is to remove power and allow the device to cool down. There are several other operating characteristics that differentiate the two types of products. The terminology used for PTCs is often similar but not the same as for fuses. Two parameters that fall into this category are leakage current and interrupting rating.

LEAKAGE CURRENT: The PTC is said to have "tripped-when it has transitioned from the low resistance state to the high resistance state due to an overload,



Protection is accomplished by limiting the current flow to some *leakage* level. Leakage current can range from less than a hundred milliamps at rated voltage up to a few hundred milliamps at lower voltages. The fuse on the other hand completely interrupts the current flow and this open circuit results in "0" leakage current when subjected to a" overload.

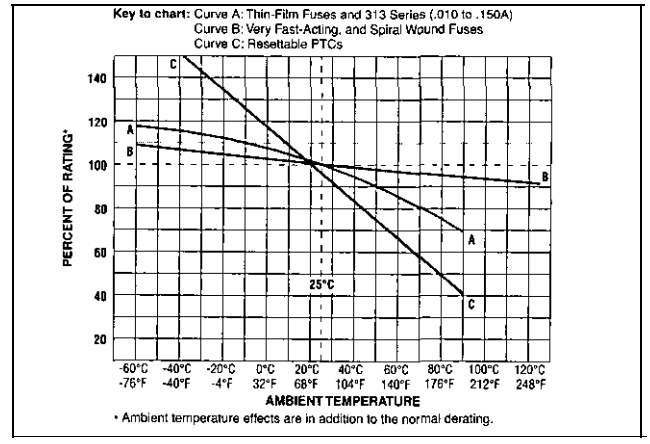
INTERRUPTING RATING: The PTC is rated for a maxi. mum short circuit current at rated voltage. This fault current level is the maximum current that the device can withstand but the PTC will not actually interrupt the current flow (see LEAKAGE CURRENT above). A typical PTC short circuit rating is 40A. Fuses do in fact interrupt the current flow in response to the overload and the range of interrupting ratings goes from hundreds of amperes up to 10,000 amperes at rated voltage.

The circuit parameters may dictate the component choice based on typical device rating differences.

VOLTAGE RATING: General "se PTCs are not rated above 60V while fuses are rated up to 600V.

CURRENT RATING: The operating current rating for PTCs can be up to 1 IA while the maximum level for fuses can exceed 20A.

TEMPERATURE RATING: The useful upper limit for a PTC is generally 85°C while the maximum operating temperature for fuses is 125°C. The following temperature derating curves that compare PTCs to fuses illustrate that more derating is required for a PTC at a given temperature.



Additional operating characteristics can be reviewed by the circuit designer in making the decision to choose a PTC or a fuse for overcurrent protection.

AGENCY APPROVALS: PTCs are Recognized under the Component Program of Underwriters Laboratories to UL Thermistor Standard 1434. The devices have also been certified under the CSA Component Acceptance Program. Approvals for fuses include Recognition under the Component Program of Underwriters Laboratories and the CSA Component Acceptance Program. In addition, many fuses are available with full "Listing" in accordance with the new Supplementary Fuse Standard UL/CSA/ANCE (Mexico) 248-14.

RESISTANCE: Reviewing product specifications indicates that similarly rated PTCs have about twice (sometimes more) the resistance of fuses.

TIME-CURRENT CHARACTERISTIC: Comparing the time-current curves of PTCs to time-current curves of fuses show that the speed of response for a PTC is similar to the time delay of a Slo-Blo® fuse.

SUMMARY: Many of the issues discussed become a matter of preference, but there is an important area of application where the use of wettable PTCs is becoming a requirement. Much of the design work for personal computers and peripheral devices is strongly influenced by *Microsoft and Intel System* Design *Guide* which states that "Using a fuse that must be replaced each time an overcurrent condition occurs is unacceptable." And the *Plug and Play SCSI* (Small Computer Systems Interface) Specification for this large market includes a statement that ". must provide a self-resetting device to limit the maximum amount of current sourced".

The PTC / fuse discussion provides some insight as to when PTCs may be the appropriate choice for providing overcurrent circuit protection. A selection guide worksheet appears on the following page as an aid in choosing the best circuit protection component.

SELECTION GUIDE WORKSHEET

1. Define the circuit operating parameters.

Complete the following form:

Normal operating current in amperes: _____

Normal operating voltage in volts: _____

Maximum interrupt current: (see page 3) _____

Ambient Temperature/Rerating: (see page 4) _____

Typical overload current: _____

Required opening time at specified overload: _____

Transient pulses expected: (see page 5) _____

Resettable or one-time: _____

Agency Approvals: _____

Mounting type/form factor: _____

Typical resistance (in circuit): _____

2. Select the proper circuit protection component.

LITTELFUSE CIRCUIT PROTECTION COMPARISON TABLE:

	Surface Mount PTC (Pg. 22-25)	30V PTC Leaded (Pg. 26-27)	60V PTC Leaded (Pg. 28-29)	'0603' SMF (Pg. 34-35)	'1206' SMF (Pg. 33, 36)
Operating current Range	0.300 2.6A	0.900 - 9A	0.100 - 3.75A	0.250 5A	0.125 7A
Maximum Voltage (*)	60V	30V	60V	32"	125v
Maximum Interrupting Rating (**)	40A	40A	40A	50A	50A
Temperature Range	–40°C to 85°C	–40°C to 85°C	–40°C to 85°C	-55°C to 125°C	-55°C to 125°C
Thermal Rerating	Medium	Medium	Medium	LOW	Low
Opening time at 200% IN (***)	Slow	Slow	Slow	Fast	Fast to Medium
Transient Withstand	LOW	LOW	LOW	LOW	LOW
Resistance	Medium	Low to Medium	Medium	Low	Low
Agency Approvals	UL, CSA, TUV	UL, CSA, TUV	UL CSA, TUV	UL, CSA	UL, CSA
Operational Uses	Multiple	Multiple	Multiple	One Time	One Time
Mounting/Form Factor	Surface Mount	Leaded	Leaded	Surface Mount	Surface Mount

(*) Maximum operating voltage in the series. parts may be used at voltages equal to or less than this value.
(**) Maximum interrupting rating at specified voltage which may be less than maximum operating voltage.
(***) Opening time is in relation to other forms of protection. A fast device will typically operate within three seconds at 200% of rated current.

SELECTION GUIDE WORKSHEET

3. Determine the opening time at fault.

Consult the Time-Current (T-C) Curve to determine if the selected part will operate within the constraints of your application. If the device opens loo soon, the application may experience nuisance operation. If the device does not open soon enough, the overcurrent may damage downstream components.

To determine the opening time for the chosen device, locate the overload current on the X-axis of the appropriate T-C Curve and follow its line up to its intersection with the curve. At this point read the time listed on the Y-axis. This is the average opening time for that device. If your overload current falls to the right of the curve the device will open. If the overload current is to the left of the curve the device will not operate.

4. Verify ambient operating parameters.

Ensure that the application voltage is less than or equal to the device's rated voltage and that the operating temperature limits are within those specified by the device.

5. Verify the device's dimensions.

Using the information from the Designer's Guide page, compare the maximum dimensions of the device to the space available in the application.

LITTELFUSE CIRCUIT PROTECTION COMPARISON TABLE:

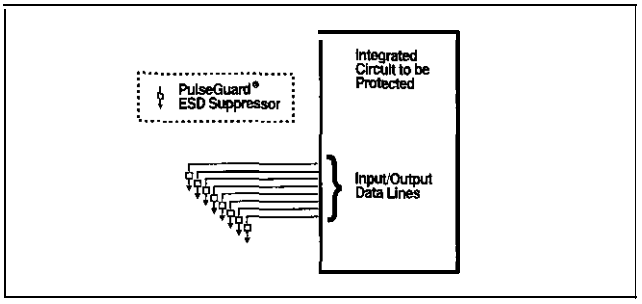
	Nano² SMF Fuse (Pg. 40-41)	PICO² II Fuse (Pg. 48-51)	2AGs (Pg. 55-57)	5x20mm (Pg. 62-70)	3AGs/3ABs (Pg. 58-61,71)	Midgets (Pg 76-84)
Operating Current Range	0.062 - 15A	0.062 - 15A	0.100 - 10A	0.032 - 15A	0.010 - 35A	0.100 30A
Maximum Voltage (*)	125V	250V	250V	250V	250V	600V
Maximum Interrupting Rating (**)	50A	50A	10,000A	10,000A	10,000A	200,000A
Temperature Range	–55°C to 125°C	–55°C to 125°C	–55°C to 125°C	–55°C to 125°C	–55°C to 125°C	–55°C to 125°C
Thermal Rerating	Low	Low	Low	Low	Low	LOW
Opening time at 200% I_N (***)	Fast to Medium	Fast to Medium	Fast to Medium	Fast to Slow	Fast to Slow	Fast to Slow
Transient Withstand	Low to Medium	Low to Medium	Low to High	Low to High	Low to High	Low to High
Resistance	Low	Low	Low	Low	Low	Low
Agency Approvals	UL, CSA, MITI	UL, CSA, MITI	UL, CSA, MITI	CSA, BSI, VDE, MITI, SEMKO, UL	UL, CSA, MITI	UL, CSA
Operational Uses	One Time	One Time	One Time	One Time	One Time	One Time
Mounting/Form Factor	Surface Mount	Leaded	Leaded or Cartridge	Leaded or Cartridge	Leaded or Cartridge	Cartridge

(*) Maximum operating voltage in the series, parts may be used at voltages equal to or less than this value.
(**) Maximum interrupting rating at specified voltage which may be less than maximum operating voltage.
(***) Opening time is in relation to other forms of protection. A fast device will typically operate within three seconds at 200% of rated current.

ESD Suppressor FACTS

Electronic devices that rely on integrated circuitry are becoming more sensitive to the threats of electrostatic discharge (ESD) transient overvoltage events. Using the input/output communication ports as entryways, ESD pulses are able to pass from the outside of the electronic equipment to the I/O pins of the integrated circuit (IC) chips inside. The ESD transients are generated by people and transferred to the equipment during normal operation and maintenance.

IC's are typically manufactured to withstand ESD events up to 2,000 volts; however, ESD events often occur at levels exceeding 15,000 volts. Because of this protection discrepancy, reliability of the electronic equipment is compromised. The solution to this problem is to supplement the on-chip protection against ESD events by installing ESD suppressing components in parallel with the input/output communications lines as shown below.



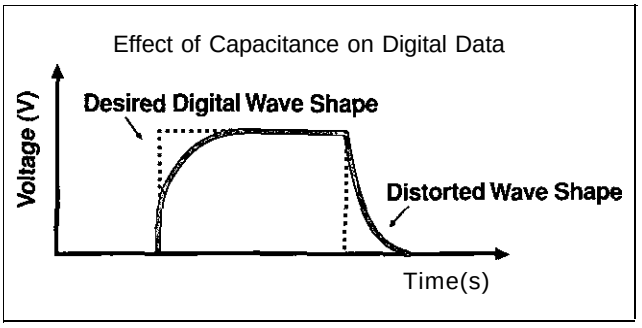
Protection is provided by the PulseGuard suppressor as it transitions from a high resistance state to a low resistance state. In the "'off" state, the high resistance causes the part to be electrically transparent to the circuit. After being triggered, the ESD protector shifts to the "on" state, becomes conductive, and shunts the ESD pulse from the signal line to ground. The amount of voltage that the system experiences due to ESD is thus minimized. After the ESD energy is dissipated, the PulseGuard suppressor "resets" itself to the high resistance "off" state.

A factor that complicates the protection of data communication lines is that signal transmission rates are increasing continuously. The information age has mandated the need for more communication links between electronic systems, causing an associated explosion in the magnitude of data that must be handled. Data transmission rates, by necessity, have increased and will continue to increase.

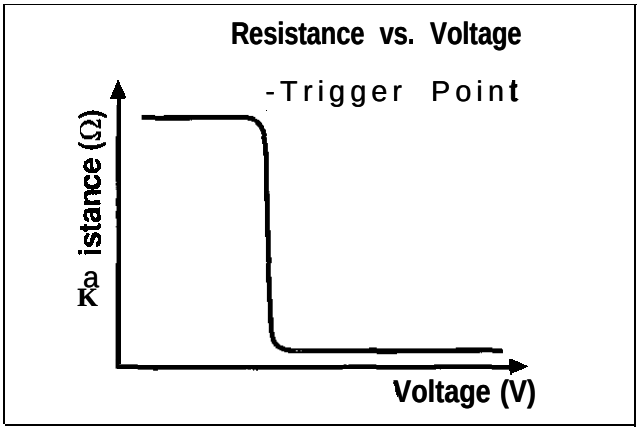
As the transmission rate of data increases, the inherent capacitance of the ESD suppressor becomes an issue. Capacitance will cause degradation to the signals that are passing along the data line. PulseGuard suppressors have less than 1pF of capacitance and will not affect the signals. Typical effects on the data waveshape can be seen below.

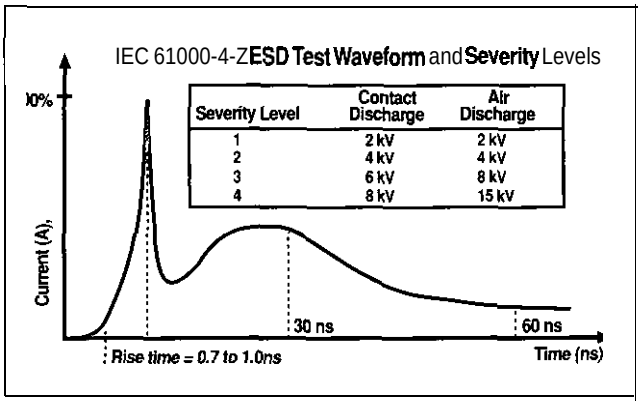
For those applications where the speed of the data streams is approximately 100MHz or less, Littelfuse also offers electroceramic and silicon products for ESD protection. The MultiLayer Varistor (MLV) devices should be used to protect data lines where the speed of the signal is approximately 100MHz or less. The SP series contains the SP720, SP721, SP723, and SP724 devices. Both of these product families also provide protection against Electrical Fast Transients (EFT's) and have limited surge (8x20 μs) capabilities.

As an example, the SP724 would be the ideal solution for USB1.1 data lines, which transmit data up to speeds of 12 Mbps. The new USB2.0 serial bus will be able to transmit data at speeds up to 480 Mbps. For that application, the PulseGuard product would be the ideal solution.



Aside from reliability, the IEC 61000-4-2 test specification is an important design consideration. Created by the International Electrotechnical Commission (IEC), this specification provides the definition of the ESD waveform, severity levels, and the methodologies that are used to test the ability of electronic equipment to survive multiple ESD events. The following chart includes the waveshape and voltage level information relating to this specification.





ESD Suppressor FACTS

Currently, electronic equipment manufacturers are required to certify that their equipment can survive testing to the IEC standard if they are selling that equipment into the European Union. Non-compliance is a prosecutable offense. Compliance is voluntary in the United States. Use of PulseGuard ESD suppressors will help our customers to meet this important specification.

LEAKAGE CURRENT: Until the PulseGuard suppressor transitions to the "on" state, it is electrically transparent to the circuit. Leakage current passing through the device is less than .1 µA.

INTERRUPTING RATING: ESD suppressors are not rated as current-breaking devices; however, PulseGuard suppressors are able to withstand the 45A that are present during worst case ESD discharges.

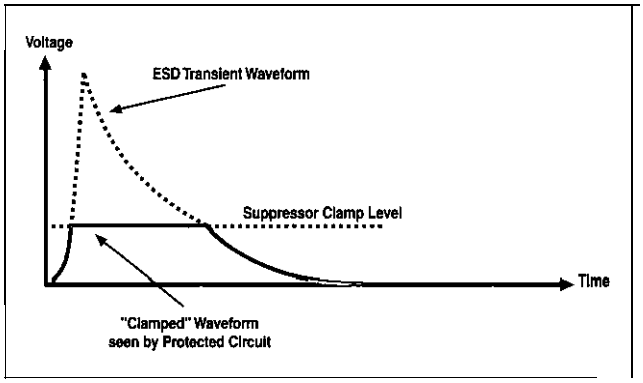
VOLTAGE RATING: PulseGuard suppressors are rated for use in operating environments up to 24 VDC.

TEMPERATURE RATING: The operating temperature range is –65°C to +125°C. These devices do not operate as a result of thermal action; therefore, there is no derating necessary.

AGENCY APPROVALS: At this lime, there are no applicable standards for ESD suppressor components. Nonetheless, PulseGuard suppressors have been subjected to all levels of severity of the IEC 61000-4-2 test specification using both the Contact Discharge and Air Discharge injection methods. In all cases, clamping of the ESD transient is provided.

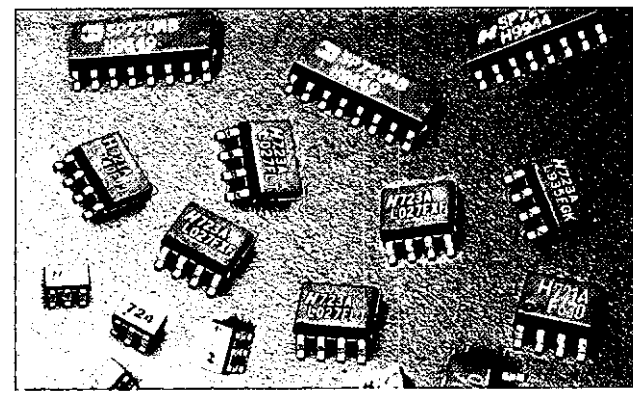
RESISTANCE: While in the "off" state, the suppressors remain electrically transparent to the circuit. The measured resistance of the suppressors is 10 MΩ, or greater.

TIME-VOLTAGE CHARACTERISTIC: Because the magnitude of the voltage and the time duration vary with the individual ESD event, a general form of this curve is shown below.



SUMMARY: The decision to use the surface mount suppressor or the connector array suppressor is left to the individual application. The ideal location is at the connector site, so that the ESD pulse is shunted to ground before the pulse enters the body of the electronic equipment. However, protection against the ESD threat will also be realized if the surface mount PulseGuard suppressors are installed as close as possible to the source of ESD. That is, on the PC board behind the connector so that the suppressor is the first device encountered by the ESD pulse after it passes through the connector.

SCR / Diode Arrays



SP720, SP721, SP723, SP724

- Designed to withstand extreme ESD connections, enabling them to protect other silicon devices on data, signal and control lines.
- High energy ratings (up to 25 kV HBM)
- ESD rated to IEC 61000-4-2 (level 4)

*Very low clamping

- 416114 Line Protection

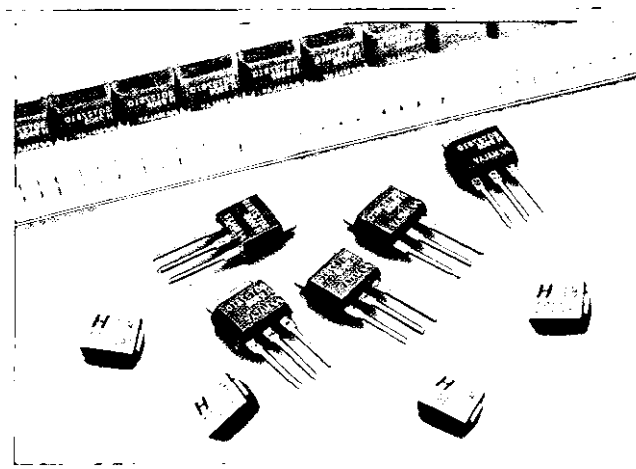
Applications: Line Protection- I/O, Control, Signal, Audio; voltage clamp

Capacitance: 3.0–5.0pf; 1-2pf measured

Leakage Current: 1 .0–2.0nA @ 25" typical

Operating Voltage: 1 .O-30 VDC

Surgectors™



SGT

- Designed to suppress lightning and other transients that are induced on the telecommunication system. These devices can help provide the secondary protection for telecommunication equipment such as telephone, MODEM, line card and other devices subject to damage from transient over voltage.
- Low Profile DO-214AA Package / Modified TO202 Package

. Nano second response time

- Automatic Reset

. I_H = 150mA-270mA

. Bi-directional and unidirectional thyristors

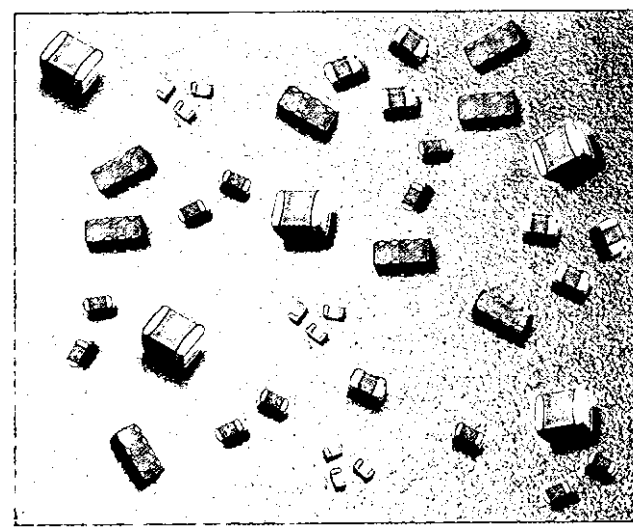
. SMD

. TO202

Applications: Central office and customer premise equipment including modems, phones, office equipment, T1/E1, Data Transfer, etc.

Operating Voltage: 58-300 VDC

Surface Mount Varistors



CH

. Intended for use in a variety of applications from low voltage DC to off-line board-level protection.

ML

- Protects integrated circuits and other components in applications on power supply control and signal lines.

MLE

. Provides filtering and suppression in a single package, MLN: "Surge Array"" series of varistors provides up to 4-line protection in a 1206 package.

AUML

. Specifically designed to meet harsh automotive requirements.

. Bi-directional

- 0402 through 2220 chip size

. 4 Line Protection

. Single and quad array line protection

Capacitance: 60+pf

Operating Voltage: 3.5–120 VDC

'Detailed product information is available in the Harris Suppression Product Guide or by visiting the Littelfuse website at www.littelfuse.com

Radial MOVs

ZA

- Radial-lead varistor designed for use in the protection of low and medium-voltage circuits and systems.

Working Voltage: 5.5–615 VDC / 4–460 VAC
Peak Current: 50–6,500 A
Energy Rating: 0.1-52 J

LA Series

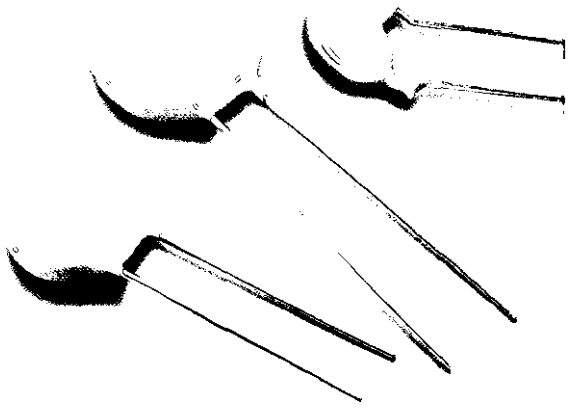
- Radial-lead transient surge suppressors designed to be operated continuously across AC power lines.

Working Voltage: 175-i ,200 VDC / 130-i ,000 VAC
Peak Current: 1,200–6,500 A
Energy Rating: .1 l-360 J

UltraMOV™

- Offers enhanced performance for the same form factor of Standard LA series products. Designed for applications requiring peak surge current ratings and high-energy absorption capability (ex. UPS & TVSS)

Working Voltage: 130-625 VAC
Peak Current: 1,750-l 0,000 A
Energy Voltage: 12.5-720 J



Industrial / Axial / Other MOVs

PA

- Ideal for applications which are subject to vibration.

Working Voltage: 175-850VDC / 130–660VAC
Peak Current: 6,500 A
Energy Rating: 70-250 J

HA, HB34, DA / DB

- Industrial High Energy MOV designed to provide surge protection for motor controls, power supplies and TVSS modules.

Working Voltage: 175-970 VDC / 130–750 VAC
Peak Current: 25,000–40,000 A
Energy Rating: 270-i ,050 J

BA / BB

- High Energy MOV designed to provide surge protection for motor controls and power supplies.

Working Voltage: 175-3,500 VDC / 130–2,800 VAC
Peak Current: 50,000–70,000 A
Energy Rating: 450–10,000 J

NA

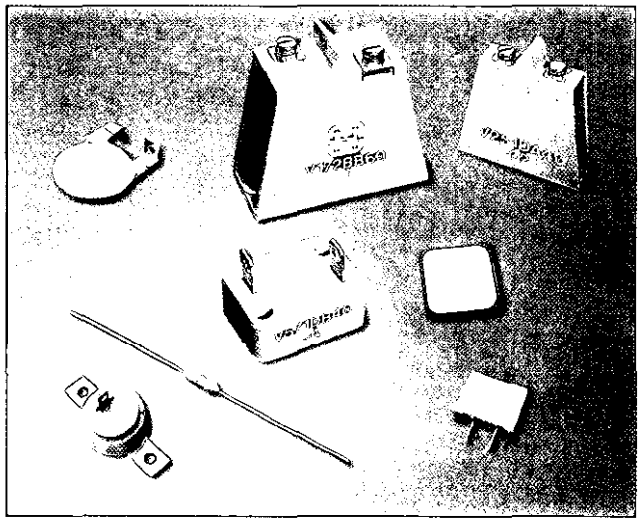
- Intended for specialized industrial high-energy applications requiring unique electrical contact or packaging methods.

Working Voltage: 175–970 VDC / 130-750 VAC
Peak Current: 30,000– 40,000 A
Energy Rating: 270-1050 J

RA

- Increased mechanical stability for secure circuit-board mounting and vibration critical applications.

Working Voltage: 3.5-369 VDC / 4-275 VAC
Peak Current: 100–6,500 A
Energy Rating: 0.4-160 J

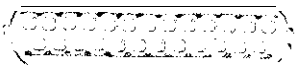


MA

- Protects component and signal/data lines from low energy transients where the small axial lead package is required.

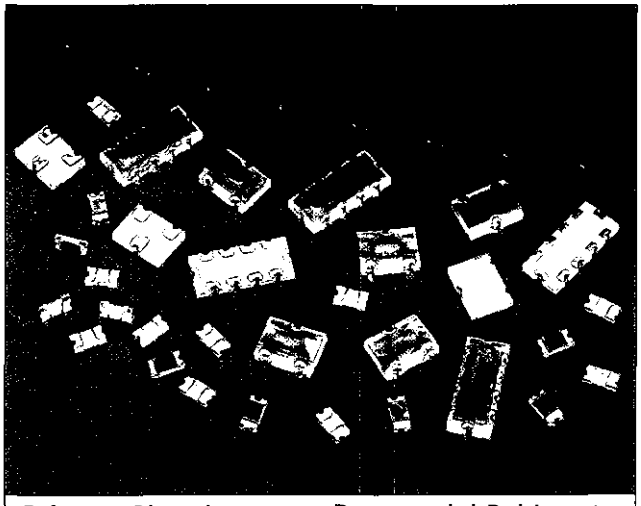
Working Voltage: 13-365 VDC / 9-264 VAC
Peak Current: 40-100 A
Energy Rating: 0.06-i .7 J

PULSEGUARD®
SUPPRESSORS



Surface Mount ESD Suppressor

PulseGuard ESD suppressors provide protection for electronic devices against the threat of electrostatic discharge (ESD). Employing a voltage-variable material to switch between high resistance and low resistance states, PulseGuard suppressors shunt ESD transients away from sensitive circuitry. They are ideal for use on high-speed data and signal communication lines that link the IC or ASIC to the outside of the electronic equipment. PulseGuard suppressors are designed to increase the reliability of electronic equipment as well as allowing compliance with ESD test specifications (IEC 61000-4-2, MIL-STD-883).



ELECTRICAL CHARACTERISTICS:

• Capacitance	<1 pF[1]
• Leakage Current	<0.1 µA[2]
• Off state Resistance	10 MΩ[2], minimum
• Clamping Voltage	1 50V[3], typical
• Operating Voltage	24 VDC, maximum
• Peak Current	45A, at 15 kV
• Bi-directional	
. Product Rated for 10,000 cycles	

PHYSICAL SPECIFICATIONS:

Body Material: Glass Epoxy

Terminations: Tin-Lead

Voltage Variable Material: Littelfuse polymeric foi

Soldering Parameters:

- Wave Solder: 260°C, 10 sec. maximum.
- Reflow Solder: 260°C. 30 sac. maximum.

Packaging: Tape and Reel per EIA-RS481 (IEC 266, part 3);
PGB0010603 1 ,000 (MR) or 5,000 (NR) per 8mm reel.
PGB002ST23 1,500 (DR) per 8mm reel.
PGB008CA10 2,000 (PR) per 12mm reel.

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -65°C to 125°C

Vibration: Withstands 10-55Hz per MIL-STD-202, Method 201 and 10-2000Hz at 20 G's per MIL-STD.202, Method 204, Condition D.

Thermal Shock: MIL-STD-202, Method 107, 200 30-minute cycles of -65°C to 125°C.

Mechanical Shock: MIL-STD-200, Method 213 Test A.

Humidity Aging: 1,000 Hours @ 48 VOC, 85°C, 85% RH in circuit.

Solvent Resistance: MIL-STD-202, Method 215.

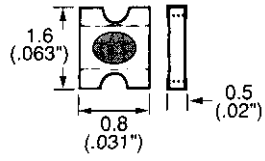
Stressed Voltage Load: 1,000 Hours @ 48 VOC, 65°C.

Solderability: IPC/EIA J-STD.002 (includes steam aging and dissolution of metalization) and per IPC/EIA J-STD.001 (fillets).

[1] Tested at 1 Megahertz
[2] Tested at 5 VDC
[3] Tested at 8 kV, Direct Contact, IEC 61000-4-2 ESD Waveform

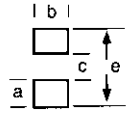
Reference Dimensions:

PGB0010603



Recommended Pad Layout:

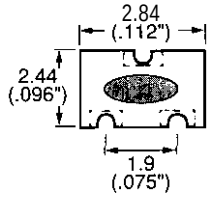
PGB0010603



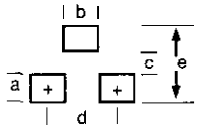
Dimension (in.)

	Reflow	Wave
a	1.27 (.050")	1.27 (.050")
b	0.76 (.030")	0.76 (.030")
c	0.51 (.020")	0.76 (.030")
d	n/a	n/a
e	3.05 (.120")	3.30 (.130")

PGB002ST23



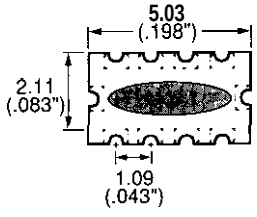
PGB002ST23



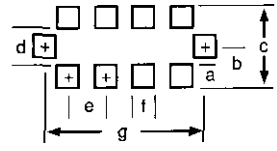
Dimension (in.)

	Reflow	Wave
a	1.12 (.044")	1.27 (.050")
b	0.89 (.035")	0.89 (.035")
c	0.99 (.039")	0.94 (.037")
d	1.91 (.075")	1.91 (.075")
e	3.23 (.127")	3.48 (.137")

PGB008CA10



PGB008CA10

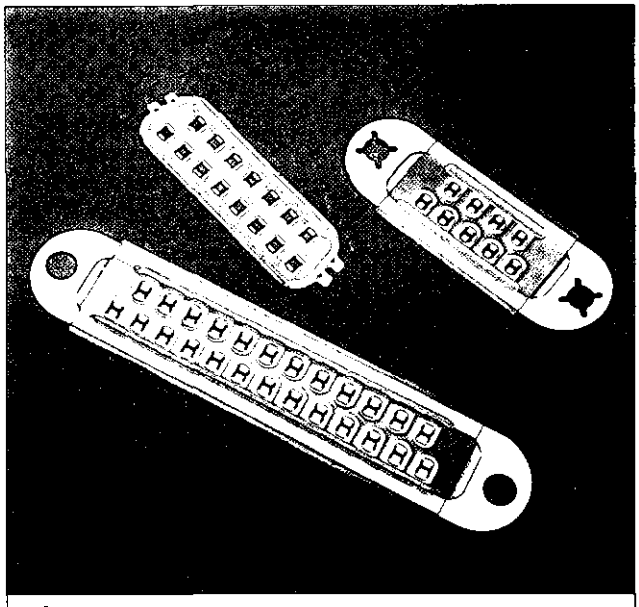


Dimension (in.)

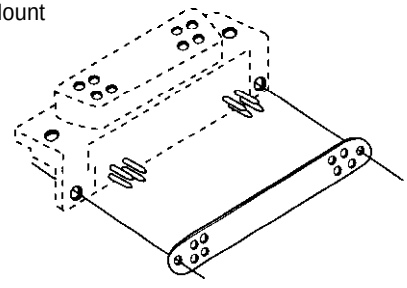
	Reflow	Wave
a	0.64 (.025")	0.91 (.036")
b	1.27 (.050")	1.52 (.060")
c	2.57 (.101")	3.02 (.119")
d	1.30 (.051")	1.19 (.047")
e	1.09 (.043")	1.09 (.043")
f	1.09 (.030")	0.76 (.030")
g	1.09 (.191")	5.03 (.198")

Connector Array ESD Suppressor

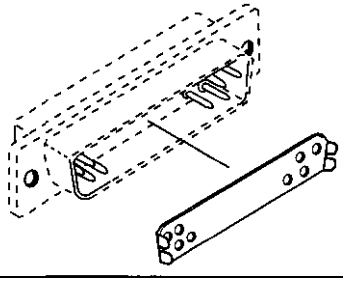
With similar performance features as the surface mount ESD products, the connector array products provide the first line of defense against ESD events. For use in standard D-Subminiatures, these suppressors intercept the ESD pulses before they enter the electronic equipment. The pulses are shunted to the grounded shell of the connector and kept off of the circuit board. The connector configuration takes up zero board space and can also be used as a retrofit solution in cases where the ESD problem was identified after the board design was complete.



90° Angle Mount



Front Mount



ELECTRICAL CHARACTERISTICS:

- Capacitance <2 pF[1]
- Leakage Current <0.1 µA[2]
- Off state Resistance 10 MΩ[2]
- Clamping Voltage 100V[3], typical
- Operating Voltage **24** VDC
- Peak Current 45A, at 15 kV
- Bi-directional
- Product Rated for 10,000 cycles

PHYSICAL SPECIFICATIONS:

Body Material: Polyimide

Terminations: Spring contacts

Voltage Variable Material: Littelfuse polymeric formula.

Soldering Parameters:

- Press-in fitting, soldering not necessary.

Packaging: Bulk, bagged and tagged.

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -65°C to **125°C**

Vibration: Withstands 10-55Hz per MIL-STD-202F, Method 201 A and 10-2000Hz at 20 G's per MIL-STD-202F, Method 204D, Condition D.

Thermal Shock: Withstands 5 cycles of -50°C to 125°C

ORDERING INFORMATION:

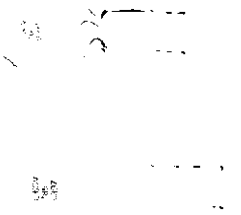
Catalog Number	Mounting Option	Number of Pins	Pin Size (in.)
PGD009S030BSA01	90° Angle	9	0.018 0.028
PGD009S030CSA01	90° Angle	9	0.030 0.040
PGD009S030CSF01	Front	9	0.030 0.040
PGD009S030BSR01	Rear	9	0.018 0.028
PGD015S030BSA01	90° Angle	15	0.018 0.028
PGD015S030CSA01	90° Angle	15	0.030 0.040
PGD015S030CSF01	Front	15	0.030 0.040
PGD015S030BSR01	Rear	15	0.018 0.028
PGD025S030BSA01	90° Angle	25	0.018 0.028
PGD025S030CSA01	90° Angle	25	0.030 0.040
PGD025S030CSF01	Front	25	0.030 0.040
PGD025S030BSR01	Rear	25	0.018 0.028
PGD037S030BSA01	90° Angle	37	0.018 0.028
PGD037S030CSA01	90° Angle	37	0.030 0.040
PGD037S030CSF01	Front	37	0.030 0.040

[1] Tested at 1 Megahertz

[2] Tested at 5 VDC

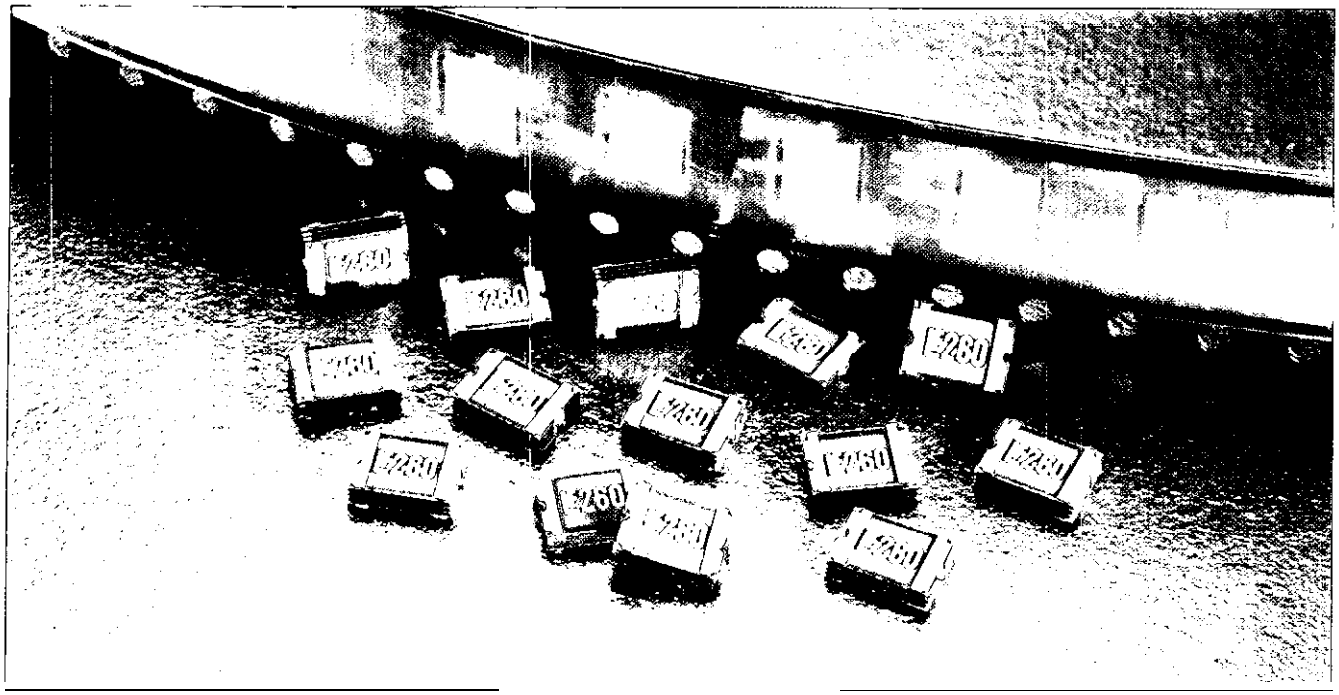
[3] Tested at 8 kV, Direct Contact, IEC 61000-4-2 ESD Waveform

RESETTABLE **PTCs**



SURFACE MOUNT PTC

1812L Series



PHYSICAL SPECIFICATIONS:

Terminal Material: Tin-Lead Plated Copper

Solderability: Meets EIA **specification** RS186-9E **and** IPC/EIA J-STD-002, and IPC/EIA J-STD-001.

Device Labeling: Device is marked with F **and amperage rating.**

Packaging: 12mm tape and reel carrier per EIA 481 Standard.

Standard reel quantity: 2,000 devices on 7" reel (PRT Suffix).
Optional reel quantity: 8,000 devices on 13" reel (ZRT Suffix).

AGENCY APPROVALS: UL, CSA, TUV approved

ENVIRONMENTAL SPECIFICATIONS:

Passive Aging: 85°C, **1000** Hours.

Humidity Aging: 85°C, **85% R.H., 100 hours.**

Thermal Shock: 85°C / –40°C, 20 times.

Vibration: MIL-STD 202, Method 201, MIL-STD-883, Method 2007.

Mechanical Shock: MIL-STD-202, Method 213 test condition I (100 g's, 6 sac.).

Solvent Resistance: MIL-STD-202, Method 215.

Operating/Storage Temperature: -40°C to 85°C

Device should remain in sealed bags prior to use.

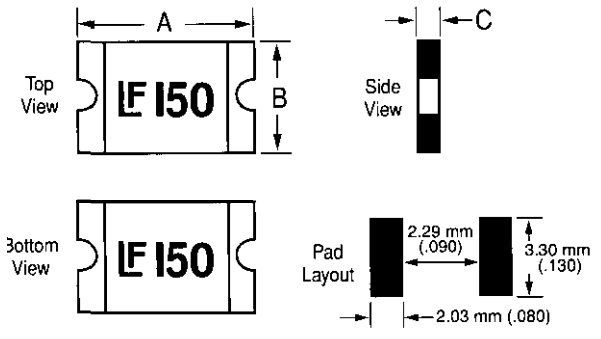
Temperature Rerating:

	Ambient Temperature									
	-40°C	-20°C	0°C	20°C	40°C	50°C	60°C	70°C	80°C	85°C
Part Number	Hold Current (A)									
1812L050	0.65	0.61	0.57	0.50	0.46	0.44	0.41	0.39	0.37	0.35
1812L075	0.98	0.91	0.83	0.75	0.69	0.65	0.62	0.58	0.54	0.53
1812L110	1.44	1.33	1.22	1.10	1.01	0.96	0.90	0.85	0.80	0.77
1812L125	1.63	1.51	1.41	1.25	1.15	1.09	1.03	0.96	0.91	0.88
1812L150	1.96	1.81	1.67	1.50	1.38	1.30	1.23	1.16	1.09	1.05
1812L200	3.02	2.68	2.33	2.00	1.66	1.49	1.32	1.15	0.99	0.82
1812L260	3.92	3.48	3.04	2.60	2.16	1.94	1.72	1.50	1.28	1.06

SURFACE MOUNT PTC

1812L Series

Dimensions (Inches) **Recommended Pad Layout (Inches)**
All dimensions are nominal.



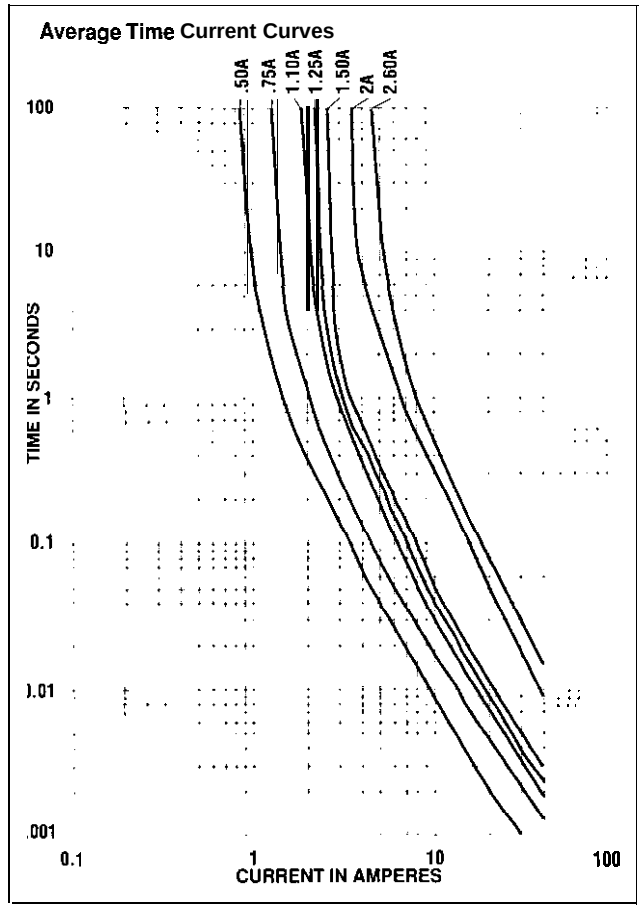
evices can be reflow or wave soldered.

Dimensions:

1812L 050-150	A	B	C
Min. [mm (in.)]	4.32(.170)	3.00(.118)	0.53(.021)
Max. [mm (in.)]	4.62(.182)	3.30(.130)	0.69(.028)

Dimensions:

1812L 200.260	A	B	C
Min. [mm (in.)]	4.32(.170)	3.00(.118)	1.01(.040)
Max. [mm (in.)]	4.62(.182)	3.30(.130)	1.45(.057)



Electrical Characteristics:

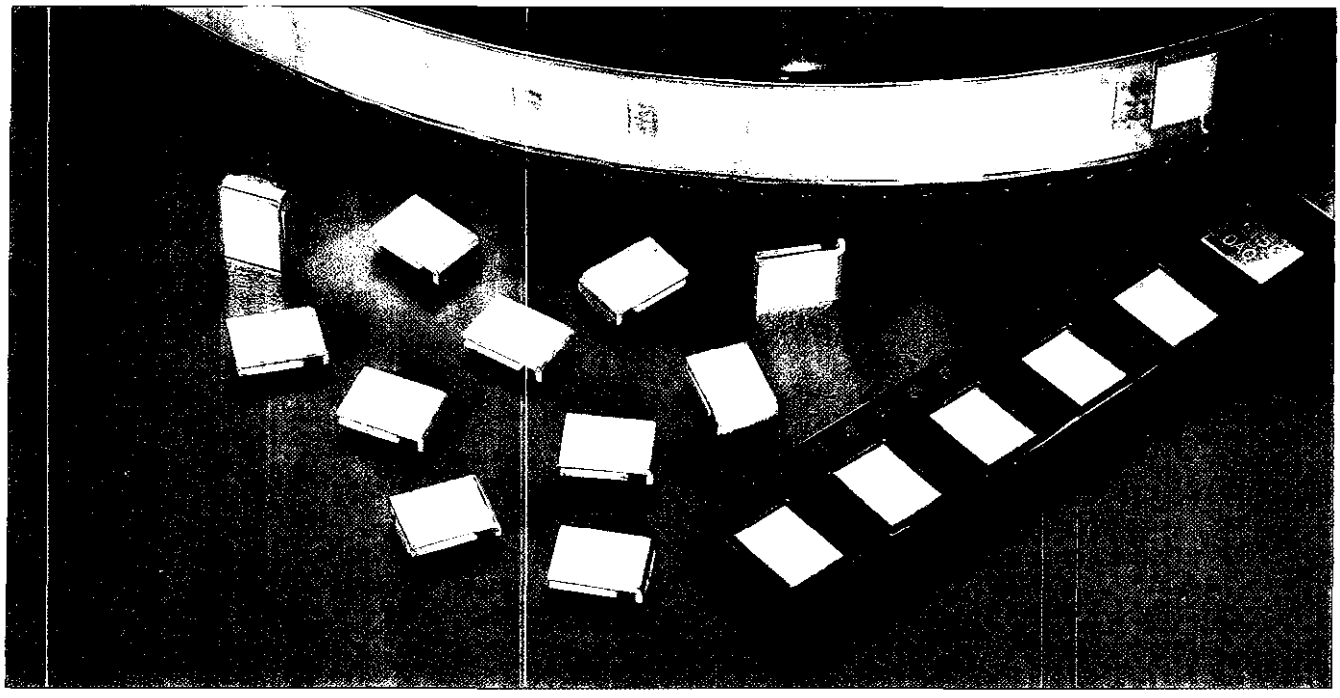
Part Number		I_{trip} (A)	V_{max} (Vdc)	I_{max} (A)	P_d max. (W)	Maximum Time To Trip Current (A)	Maximum Time To Trip Time (Sec)	Resistance R_{1L} (Ω)	Resistance R_{AT} (Ω)
1812L050		1.oo	15.0	40	0.8	8.0	0.15	0.100	1.000
1812L075		1.50	13.2	40	0.8	8.0	0.30	0.075	0.420
1812L110		2.20	6.0	40	0.8	8.0	0.30	0.040	0.226
1812L125		2.50	6.0	40	0.8	8.0	0.25	0.045	0.184
1812L150		3.00	6.0	40	0.8	8.0	0.30	0.040	0.137
NEW 1812L200		4.00	6.0	40	0.8	8.0	2.50	Call for Data	Call for Data
NEW 1812L260		5.20	6.0	40	0.8	8.0	2.50	0.01	0.050

I_{hold} = Hold Current: maximum current device will sustain for 4 hours without tripping in 20°C still air.
I_{trip} = Trip Current: minimum current at which the device will trip in 20°C still air.
V_{max} = Maximum voltage device can withstand without damage at rated current (I,,,)
I_{max} = Maximum fault current device can withstand without damage at rated voltage (V_{max})
P_d = Power dissipated from device when in the tripped state at 20°C still air.
R_{IL} = Minimum resistance of device in initial (w-soldered) state.
R_{AT} = Maximum measured resistance in the non-tripped state 1 hour after reflow with reflow conditions of 260°C for 20 sec.

CAUTION: Operation beyond the specified ratings may result in damage and possible arcing and flame.

SURFACE MOUNT PTC

3425L Series



- The 3425L Series Resettable devices utilize a unique polymer-based, Positive Temperature Coefficient (PTC) material to protect electrical circuits against overcurrent conditions.
- In normal operation, the 3425L Series PTC has many conductive paths and a very low resistance. In an overcurrent condition, the temperature of the polymer material rises. This dramatically reduces the conductive paths resulting in an immediate rise in resistance. In this condition, the device provides circuit protection by significantly limiting the flow of current. However, once the cause of the initial overcurrent condition is eliminated, the 3425L Series FTC cools down and resets to a low resistance value permitting the normal current flow to resume.
- The 3425L Series are surface mountable.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratory and the Component Acceptance Program of CSA. TUV approved.

AGENCY FILE NUMBERS: UL E183209, CSA LR 108832

PHYSICAL SPECIFICATIONS:

Materials: Terminal Material: Tin Plated Brass to MIL-T-107276

Solderability: Meets EIA specification RS186-9E and IPC/EIA J-STD.002, and IPC/EIA J-STD-001.

Device Labeling: Device is marked with the letter 'L', amperage rating and date code.

Packaging: Packaged in tape and reel carrier per EIA 481-2 standard

Standard reef quantities:

Part [illegible]	Reel [illegible]	Packaging [illegible]
3425L Series	1500	DR

ENVIRONMENTAL SPECIFICATIONS:

Passive Aging: 85°C, **1000** Hours.

Humidity Aging: 85°C, **85%** R.H., 100 hours.

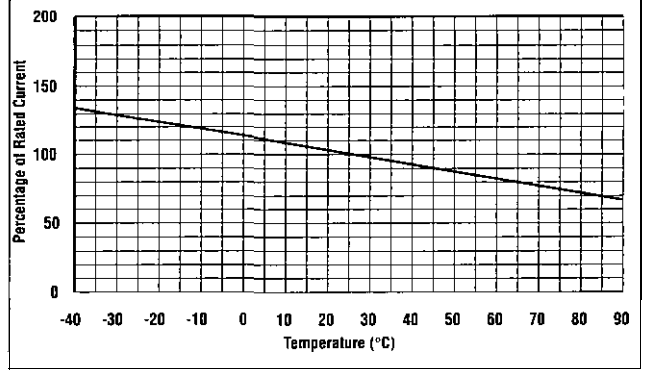
Thermal Shock: 85°C / –40°C, 20 times.
125°C / –55°C, 10 times.

Vibration: MIL-STD 202, Method 201. No resistance change.

Mechanical Shock: MIL-STD-202, Method 213 test condition I (100 g's, 6 sec.).

Operating/Storage Temperature: -40°C to **85°C**
Devices should remain in sealed bags prior to use.

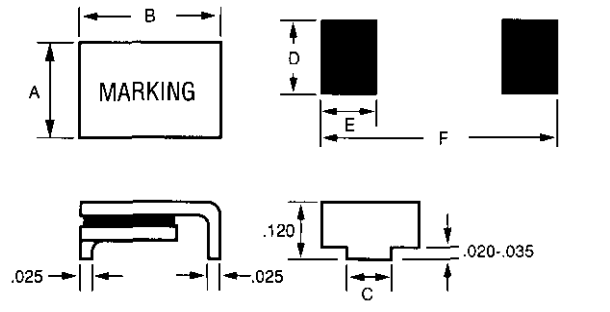
Rerating Curve for 3425L Series



SURFACE MOUNT PTC

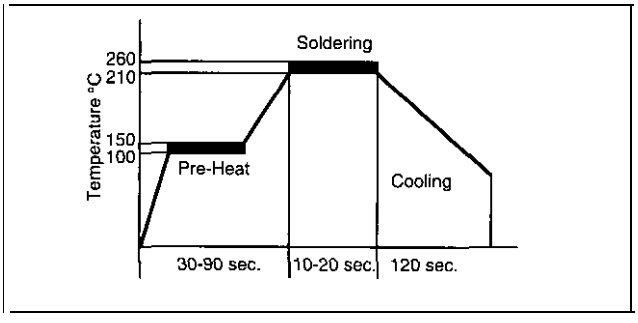
3425L Series

Dimensions (Inches) **Recommended Pad Layout (Inches)**
All dimensions are nominal.

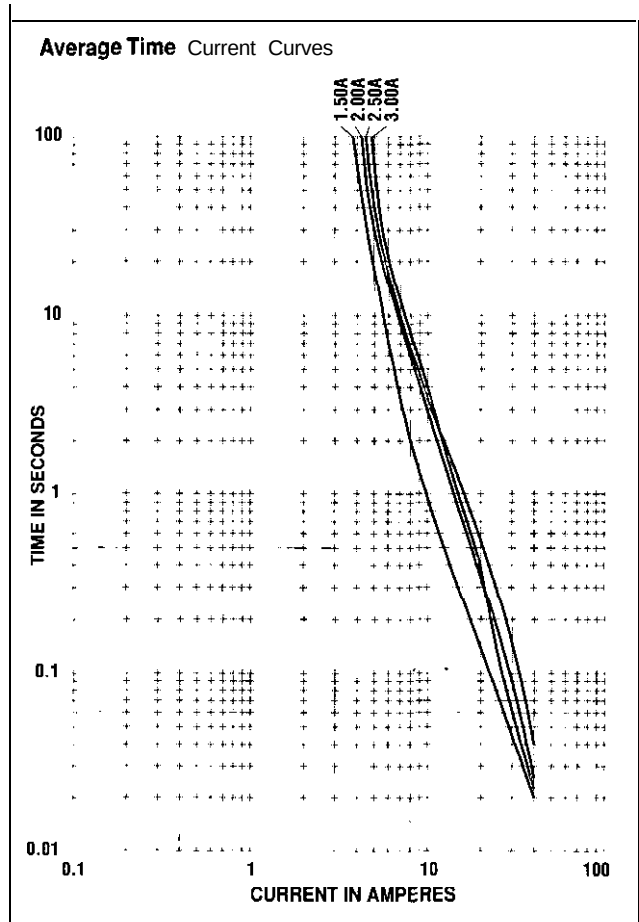


Series	A	B	C	D	E	F
3425L	.264 max.	.374max.	.145	.180	I.090	.420

RECOMMENDED REFLOW CONDITIONS:
(IR, Forced Air Convection, Vapor Phase)
Devices are not designed to be wave soldered



Average Time Current Curves



ORDERING INFORMATION:

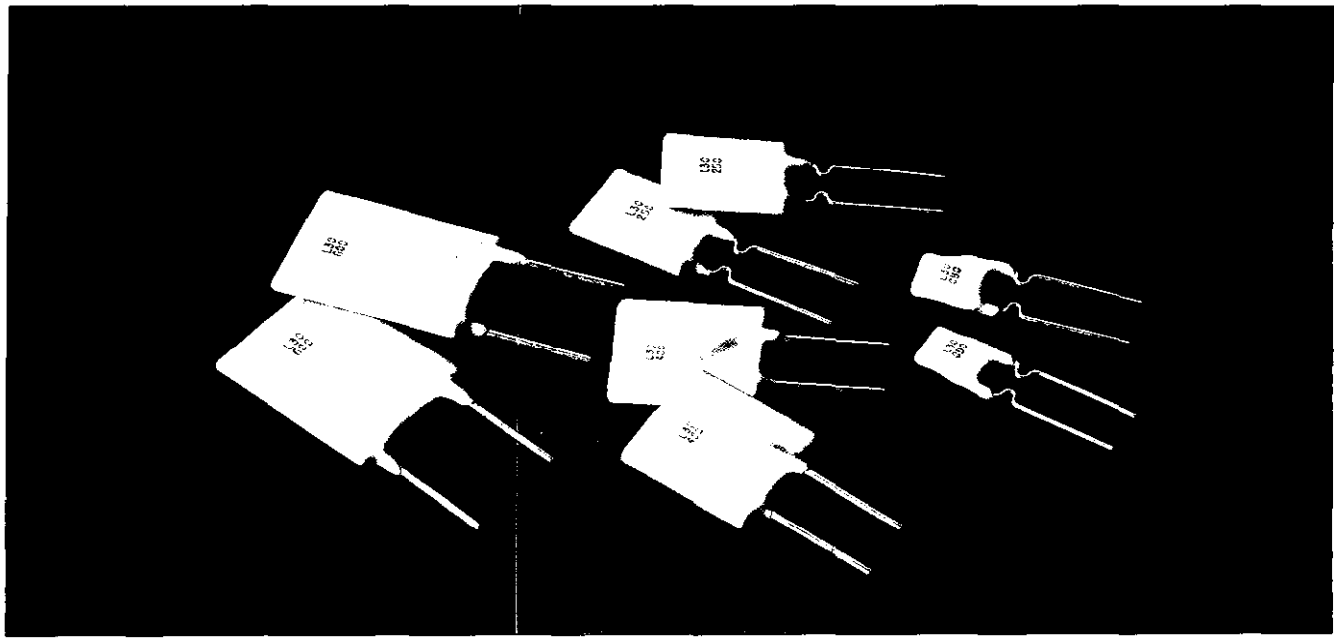
Catalog Number	I_{hold} (A)	I_{trip} (A)	V_{max} (Vdc)	I_{max} (A)	P_d max. (W)	Maximum Time To Trip: Current (A)	Maximum Time To Trip: Time (Sec)	Resistance: R_{IL} (Ω)	Resistance: R_{AT} (Ω)
3425L150	1.50	3.0	15	40	1.9	8.0	5.0	0.060	0.25
3425L200	2.00	4.0	15	40	1.9	8.0	12.0	0.050	0.15
3425L250	2.50	5.0	15	40	1.9	8.0	25.0	0.035	0.10
NEW 3425L300	3.00	6.0	15	40	1.9	8.0	32.0	0.020	0.06

I_{hold} = Hold Current: maximum current device will sustain for 4 hours without tripping in 20°C still air.
I_{trip} = Trip Current: minimum current at which the device will trip in 20°C still air.
V_{max} = Maximum voltage device can withstand without damage at rated current (I_{max})
I_{max} = Maximum fault current device can withstand without damage at rated voltage (V_{max})
P_d = Power dissipated from device when in the tripped state at 20°C still air.
R_{IL} = Minimum resistance of device in initial (un-soldered) state.
R_{AT} = Maximum measured resistance in the non-tripped state 1 hour after reflow with reflow conditions of 260°C for 20 sec.

CAUTION: Operation beyond the specified ratings may result in damage and possible arcing and flame.

RADIAL LEADED PTC

30R Series



. The 30R Series Resettable devices utilize a unique polymer-based, Positive Temperature Coefficient (PTC) material to protect electrical circuits against overcurrent conditions.

• In normal operation, the 30R Series PTC has many conductive paths and a very low resistance. In an overcurrent condition, the temperature of the polymer material rises. This dramatically reduces the conductive paths resulting in an immediate rise in resistance. In this condition, the device provides circuit protection by significantly limiting the flow of current. However, once the cause of the initial overcurrent condition is eliminated, the 30R Series PTC cools down and resets to a low resistance value permitting the normal current flow to resume.

. The 30R Series is a 30V Radial Leaded Device with a 40A Short Circuit Rating.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratory and the Component Acceptance Program of CSA. TUV approved.

AGENCY *FILE* NUMBERS: UL *E183209*, CSA LR **108832**

PHYSICAL SPECIFICATIONS:

Materials: Leads

30R090-250: Tin plated copper-clad steel, 24 AWG (0.020" Dia.)

30R300-900: Tin plated copper, 20 AWG (0.032" Dia.)

Lead Solderability: MIL-STD-202, Method 208E

Coating: Thermoset Coating

Device Labeling: Device is marked with the letter 'C, amperage rating, voltage rating & date code.

Packaging: Standard bulk packaging is 500 pieces per container. Optional tape and reel packaging per EIA 486-B is also available.

Standard reel quantities:

Part Number	Reel Quantity	Part Number	Reel Quantity
R30R090 R30R110 R30R135 R30R160 R30R185 R30R250	3000	R30R300 R30R400	1500
		30R500 30R600 30R700 30R800 30R900	**Bulk Only 500 Per** Container

ENVIRONMENTAL SPECIFICATIONS:

Passive Aging: 85°C, 1000 Hours. ±5% typical resistance change.

Humidity Aging: 85°C, 85% R.H., 1000 hours. ±5% typical **resistance** change.

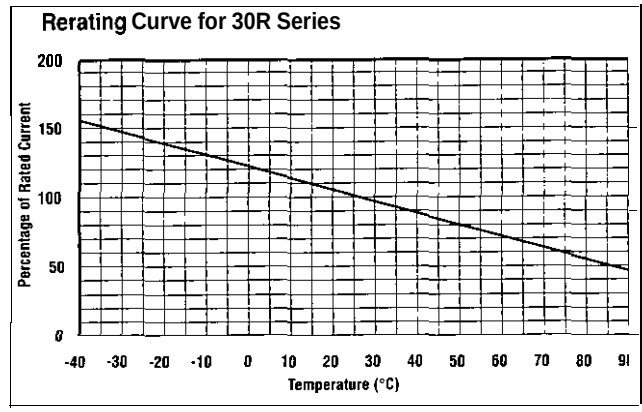
Thermal Shock: 85°C / –40°C, 20 times. ±10% typical resistance change.

Vibration: MIL-STD 202, Method 201. No resistance change.

Mechanical Shock: MIL-STD-202, Method 213 test condition I (100 g's, 6 sec.). No resistance change.

Max. Surface Temperature: 125°C

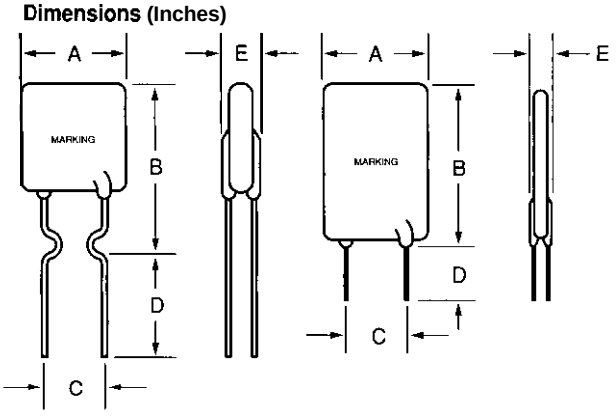
Operating/Storage Temperature: -40°C to 85°C



RADIAL LEADED PTC

30R Series

Dimensions (Inches)

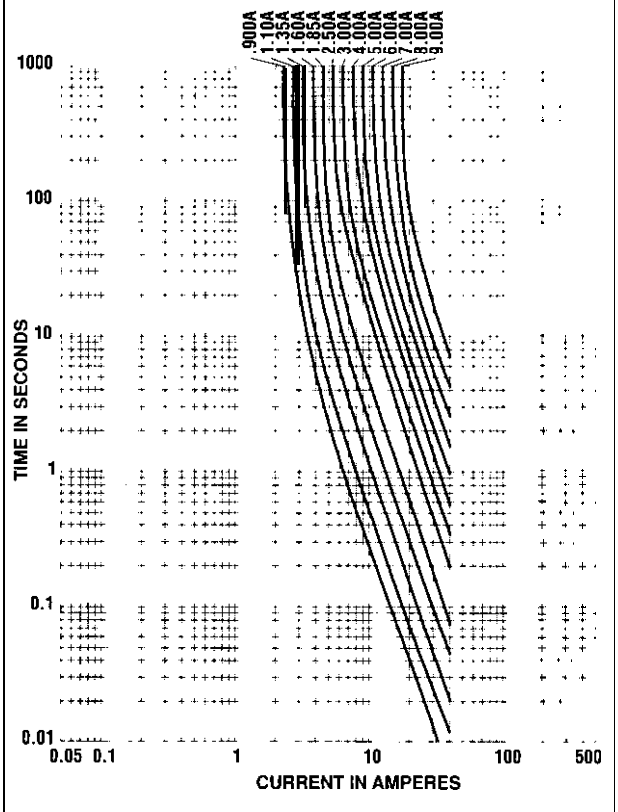


Note: Stand-offs only used for 30R090-30R250

Part Number	'A' (Max.)	'B' (Max.)	'C' (Typ.)
30R090	0.26	0.46	0.20
30R110	0.26	0.56	0.20
30R135	0.35	0.53	0.20
30R160	0.35	0.60	0.20
30R185	0.40	0.62	0.20
30R250	0.45	0.72	0.20
30R300	0.45	0.66	0.20
30R400	0.55	0.79	0.20
30R500	0.55	0.98	0.40
30R600	0.65	0.96	0.40
30R700	0.75	1.05	0.40
30R800	0.65	1.15	0.40
30R900	0.95	1.17	0.40

Dimension 'D' is 30" Minimum
Dimension 'E' is 12" Maximum

Average Time Current Curves



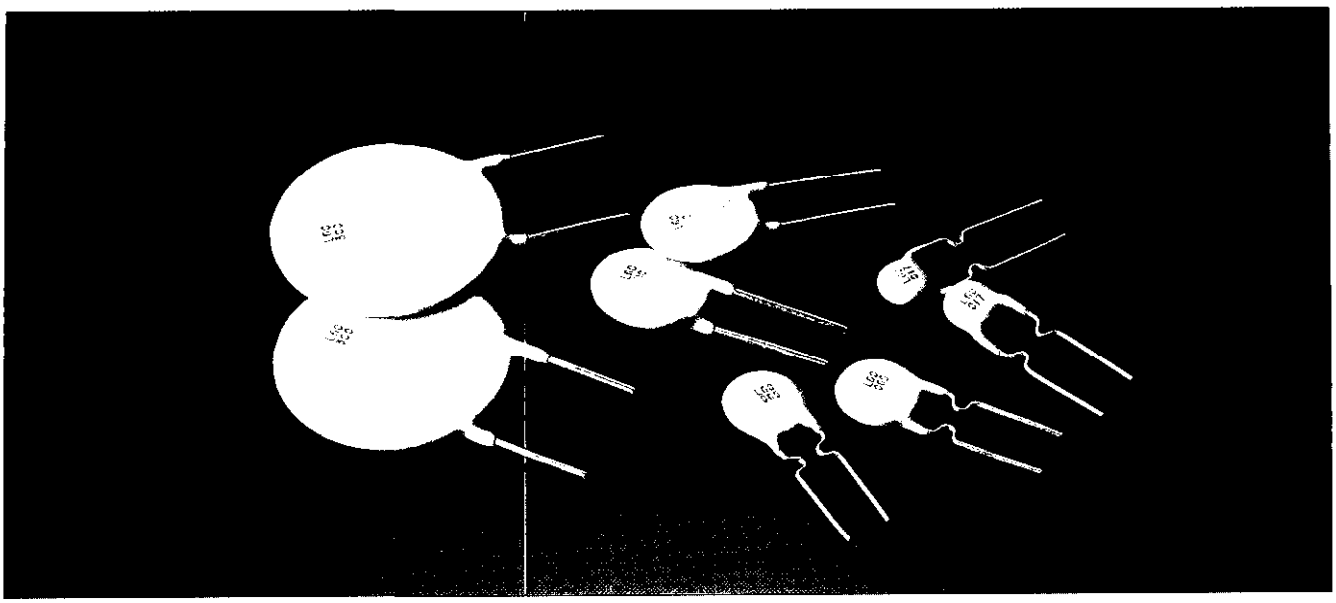
ORDERING INFORMATION:

Part Number	I_{hold} (A)	I_{trip} (A)	V_{max} (Vdc)	(A)	P_d max. (W)	Maxir T *current* (A)	Time ip Time (Sec)	Resi R_{IL} (Ω)	nce *RAT* (Ω)
30R090	0.90	1.80	30	40	0.6	4.50	5.9	0.070	0.22
30R110	1.10	2.20	30	40	0.7	5.50	6.6	0.050	0.17
30R135	1.35	2.70	30	40	0.8	6.75	7.3	0.040	0.13
30R160	1.60	3.20	30	40	0.9	8.00	6.0	0.030	0.11
30R185	1.85	3.70	30	40	1.o	9.25	6.7	0.030	0.09
30R250	2.50	5.00	30	40	1.2	12.5	10.3	0.020	0.07
30R300	3.00	6.00	30	40	2.0	15.0	10.6	0.020	0.06
30R400	4.00	8.00	30	40	2.5	20.0	12.7	0.010	0.05
30R500	5.00	10.00	30	40	3.0	25.0	14.5	0.010	0.05
30R600	6.00	12.00	30	40	3.5	30.0	16.0	0.005	0.04
30R700	7.00	14.00	30	40	3.8	35.0	17.5	0.005	0.03
30R800	8.00	16.00	30	40	4.0	40.0	16.6	0.005	0.02
30R900	9.00	18.00	30	40	4.2	40.0	20.0	0.005	0.02

I_{hold} = Hold Curre maximum current device will sustain for 4 hours wit Jt tripping in 20°C still
I_{trip} = Trip Curren minimum current at which the device will trip in 20°C ll air.
V_{max} = Maximum age device can withstand without damage a, rated current (I_{max})
I_{max} = Maximum t current device can withstand without damage at rated voltage (V_{max})
P_d = Power diss ted from device when in the tripped state at 20°C still air.
R_{IL} = Minimum r stance of device in initial (un-soldered) state.
R_{AT} = Maximum stance of device at 20°C measured one hour after tripping.

CAUTION: Operation beyond the specified ratings may result in damage and possible arcing and flame.

60R Series



- The 60R Series Resettable devices utilize a unique polymer-based, Positive Temperature Coefficient (PTC) material to protect electrical circuits against overcurrent conditions.
- In normal operation, the 60R Series PTC has many conductive paths and a very low resistance. In an overcurrent condition, the temperature of the polymer material rises. This dramatically reduces the conductive paths resulting in an immediate rise in resistance. In this condition, the device provides circuit protection by significantly limiting the flow of current. However, once the cause of the initial overcurrent condition is eliminated, the 60R Series PTC cools down and resets to a low resistance value permitting the normal current flow to resume.
- The 60R Series is a 60V Radial Leaded Device with a 40A Short Circuit Rating.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratory and the Component Acceptance Program of CSA. TUV approved.

AGENCY FILE NUMBERS: UL E183209, CSA LR 108832

PHYSICAL SPECIFICATIONS:

Materials: Leads

60R010: Tin coated constantan, 24 AWG (0.020" Dia.)

60R017-040: Tin plated copper-clad steel, 24 AWG (0.020" Dia.)'

60R050-090: Tin plated copper, 24 AWG (0.020' Dia.)

60R11 O-375: Tin plated copper, 20 AWG (0.032" Dia.)

Lead Solderability: MIL-STD-202, Method 208E

Coating: Thermoset Coating

Device **Labeling:** Device is marked with the letter 'L', amperage rating, voltage rating & date code.

Packaging: Standard bulk packaging is 500 pieces per container. Optional tape and reel packaging per EIA 486-B is also available.

Standard reel quantities:

Part Number	Reel Quantity	Part Number	Reel Quantity
R60R010	3000	R60R017	2500
R60R020		R60R110	1500
R60R025		R60R135	
R60R030		R60R160	
R60R040		R60R185	1000
R60R050		60R250	Bulk Only 500 Per Container
R60R065		60R300	
R60R075		60R375	
R60R090			

ENVIRONMENTAL SPECIFICATIONS:

Passive Aging: 85°C, 1000 Hours. ±5% typical resistance change.

Humidity Aging: 85°C, 85% R.H., 1000 hours. ±5% typical resistance change.

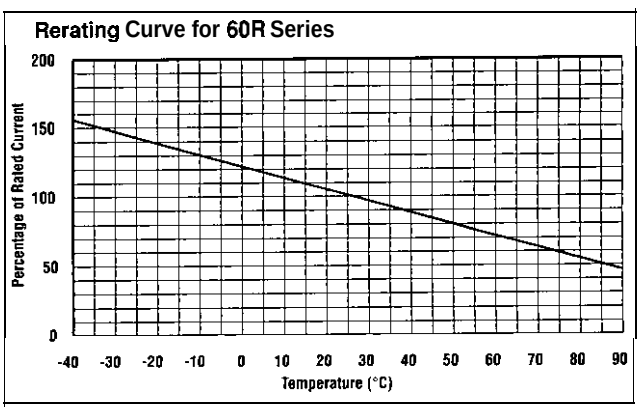
Thermal Shock: 65°C / –40°C, 20 times. ±10% typical resistance change.

Vibration: MIL-STD 202, Method 201. No resistance change.

Mechanical Shock: MIL-STD-202, Method 213 test condition I (100 g's, 6 sec.). No resistance change.

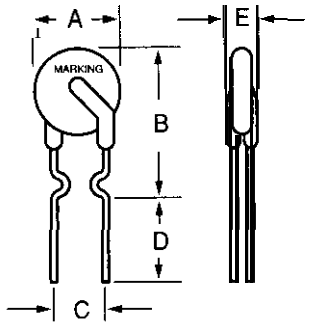
Max. Surface Temperature: 125°C

Operating/Storage Temperature: -40°C to 85°C



60R Series

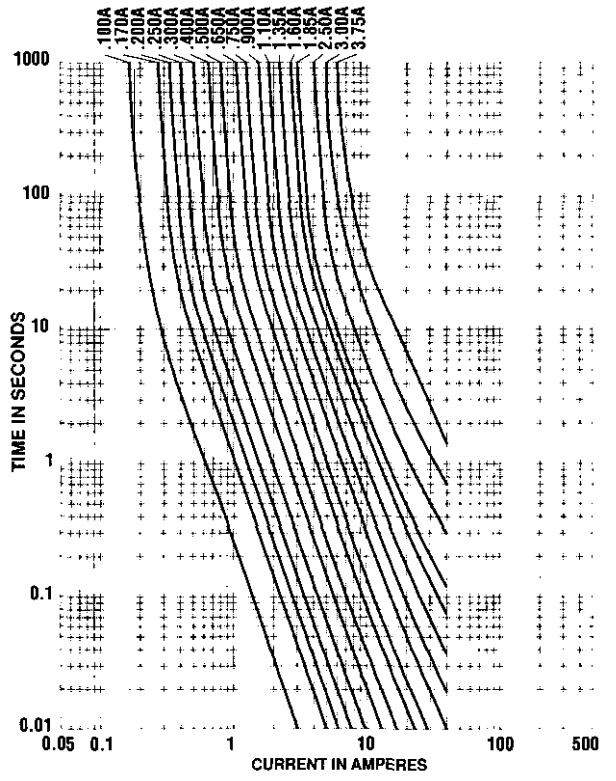
Dimensions (Inches)



Note: Stand-offs only used for 60R010-60R090

Part Number	'A' (Max.)	'B' (Max.)	'C' (Typ.)
60R010	0.29	0.50	
60R017	0.29	0.50	
60R020	0.29	0.46	
60R025	0.29	0.50	
60R030	0.29	0.51	
60R040	0.30	0.53	
60R050	0.30	0.54	
60R065	0.38	0.57	
60R075	0.41	0.60	
60R090	0.46	0.62	
60R110	0.51	0.71	0.20
60R135	0.57	0.77	0.20
60R160	0.64	0.64	0.20
60R185	0.70	0.90	0.20
60R250	0.64	1.04	0.40
60R300	0.98	1.16	0.40
60R375	1.12	1.32	0.40
Dimension 'D' is	30" Minimum		
Dimension 'E' is	12" Maximum		

Average Time Current Curves



ORDERING INFORMATION:

Part Number	I_{hold} (A)	I_{trip} (A)	V_{max} (Vdc)	I_{max} (A)	P_d max. (W)	Maxim To current (a)	Time p Time (Sec)	Resistance R_{IL} (Ω)	Resistance R_{AT} (Ω)
60R010	0.10	0.20	60	40	0.36	0.50	4.0	2.50	7.50
60R017	0.17	0.34	60	40	0.46	0.65	3.0	3.30	8.00
60R020	0.20	0.40	60	40	0.41	1.00	2.2	1.83	4.40
60R025	0.25	0.50	60	40	0.46	1.25	2.5	1.25	3.00
60R030	0.30	0.60	60	40	0.49	1.50	3.0	0.88	2.10
60R040	0.40	0.60	60	40	0.56	2.00	3.6	0.55	1.29
60R050	0.50	1.00	60	40	0.77	2.50	4.0	0.50	1.17
60R065	0.65	1.30	60	40	0.66	3.25	5.3	0.31	0.72
60R075	0.75	1.50	60	40	0.92	3.75	6.3	0.25	0.60
60R090	0.90	1.60	60	40	0.99	4.50	7.2	0.20	0.47
60R110	1.10	2.20	60	40	1.50	5.50	8.2	0.15	0.36
60R135	1.35	2.70	60	40	1.70	6.75	9.6	0.12	0.30
60R160	1.60	3.20	60	40	1.90	9.00	11.4	0.09	0.22
60R185	1.85	3.70	60	40	2.10	9.25	12.6	0.08	0.19
60R250	2.50	5.00	60	40	2.50	12.50	15.6	0.05	0.13
60R300	3.00	6.00	60	40	2.80	15.00	19.6	0.04	0.10
60R375	3.75	7.50	60	40	3.20	16.75	24.0	0.03	0.06

I_{hold} = Hold Current: maximum current device will sustain 4 hours without tripping 20°C still air.
I_{trip} = Trip Current: minimum current at which the device will trip in 20°C still air.
V_{max} = Maximum voltage device can withstand without damage at rated current (I_{max})
I_{max} = Maximum fault current device can withstand without damage at rated voltage (V_{max})
P_d = Power dissipated from device when in the tripped state at 20°C still air.
R_{IL} = Minimum resistance of device in initial (un-soldered) state.
R_{AT} = Maximum resistance of device at 20°C measured one hour after tripping.

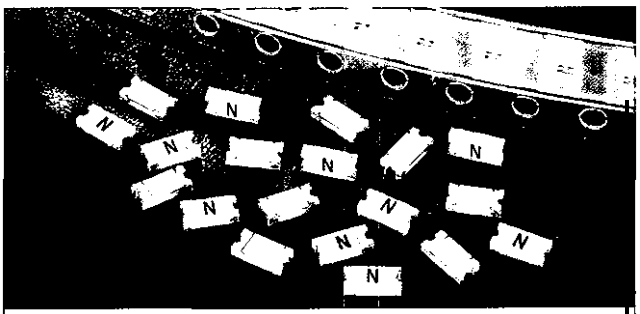
CAUTION: Operation beyond the specified ratings may result in damage and possible arcing and flame.

SURFACE MOUNT FUSES

THIN-FILM SURFACE MOUNT

SlimLine 1206 Very Fast-Acting Thin-Film Type 433 Series

- The SlimLine 1206 is an extremely small, low profile design (1206 chip size) utilizing thin-film technology to achieve precise control of electrical characteristics.
- The lower height profile produces a flat surface for improved performance in pick-and-place operations and an alternate solution for height critical application.
- Mounting pad and electrical specification are identical to the popular 429 Series specifications.



ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	6.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

0.125 – .375A	50 A @ 125 V AC/DC
0.5 -2A	50 A @ 63 V AC/DC
2.5 -3A	50 A @ 32 V AC/DC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 90°C. Consult temperature rerating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Per **MIL-STD-202F.**

Insulation Resistance (After Opening): Greater than 10,000 ohms.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Shelf Life (Solderability): 1 year min.

Thermal Shock: Withstands 5 cycles of -55" to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate
Terminations: Copper/Nickel/Tin-Lead (9515)
Cover Coat: Conformal Coating

Soldering Parameters:
Wave Solder — 260°C, 10 seconds maximum
Infrared Solder — 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481-2 (IEC 286, part 3); 5,000 per reel, add packaging suffix, NR.

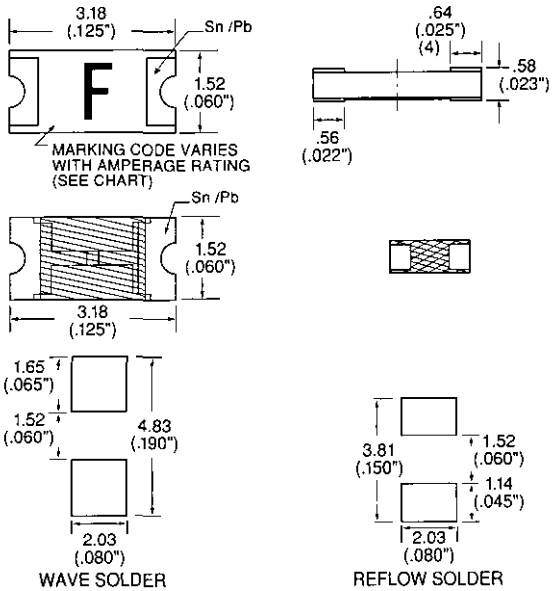
PATENTS: Patent Pending

ORDERING INFORMATION:

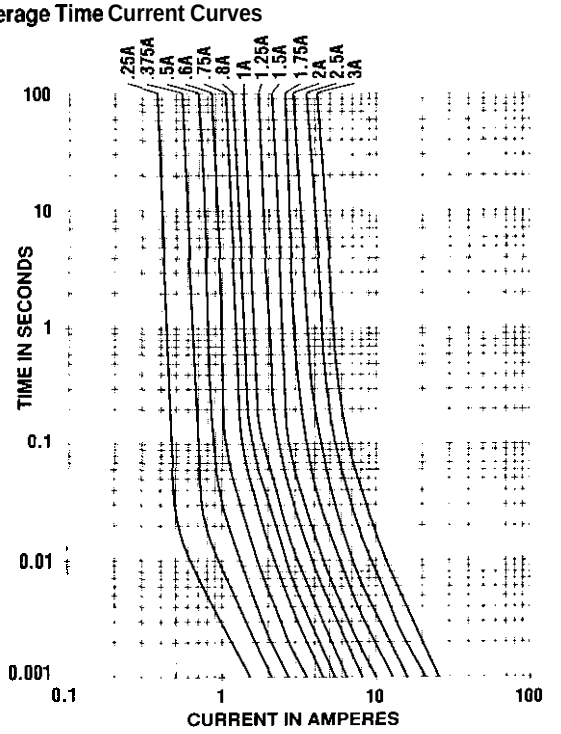
Catalog Number	Ampere Rating	Marking Code	Voltage Rating	Nominal Resistance Cold Ohms[1]	Melting I²t (A² Sec.)
0433.125	125	B	125	3.45	0.00040
0433.200	.200	C	125	0.938	0.00055
0433.250	.250	D	125	0.625	0.0010
0433.375	.375	E	125	0.375	0.0028
M33.500	.50	F	63	0.2405	0.0060
0433.600	.60		63	0.2100	0.0131
0433.750	.75	G	63	0.1370	0.0170
0433.800	.80	.8	63	0.1225	0.0305
0433.001	1.0	H	63	0.09950	0.0350
04331.25	1.25	J	63	0.07475	0.0650
0433 01.5	1.5	K	63	0.06250	0.125
04331.75	1.75	L	63	0.05000	0.150
0433 002.	2.0	N	63	0.03975	0.230
0433 02.5	2.5	0	32	0.03065	0.50
0433 003.	3.0	P	32	0.02625	0.70

[1] Measured a, 10% of rated current, 25%
[2] Measured at rated voltage.

Reference Dimensions:



Average Time Current Curves



THIN-FILM SURFACE MOUNT

1206 Very Fast-Acting Thin-Film Type 429 Series

• For new designs below 4A please consult the 433 Series on page 30.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10460, CSA LR 29662.

INTERRUPTING RATINGS:

0.125 – 3A 50 amperes at rated voltage, VACNDC
4 – 7A 35 amperes at rated voltage, VACNDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 90°C. Consult temperature rerating chart on page 4. For operation above 90°C contact Littelfuse.

Vibration: Withstands 10–55 Hz per MIL-STD-202F, Method 201A and 10.2000 Hz at 20 G's per MIL-STD-202F, Method 204D, Condition D.

Insulation Resistance (After Opening): Greater than 10 KOhm.

Resistance to Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Thermal Shock: Withstands 5 cycles of -55" to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate
Terminations: Copper/Nickel/Tin-Lead (9515)
Cover Coat: Conformal Coating

Soldering Parameters:
Reflow Solder — 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel par EIA-RS481-2 (IEC 286, part 3); 3,000 par reel, add packaging suffix, WR.

PATENTED

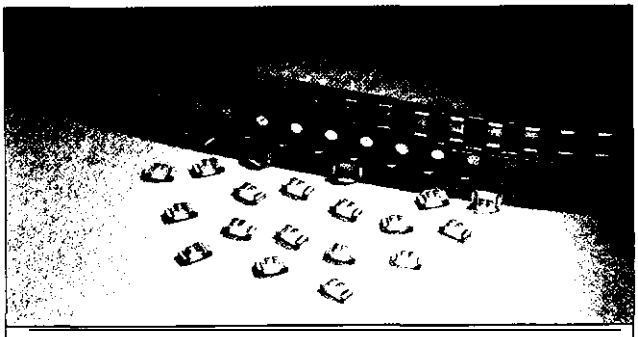
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Marking Code	Nominal Voltage Rating	Nominal Resistance Cold Ohms[1]	Melting I²t (A² Sec.)[2]
429 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

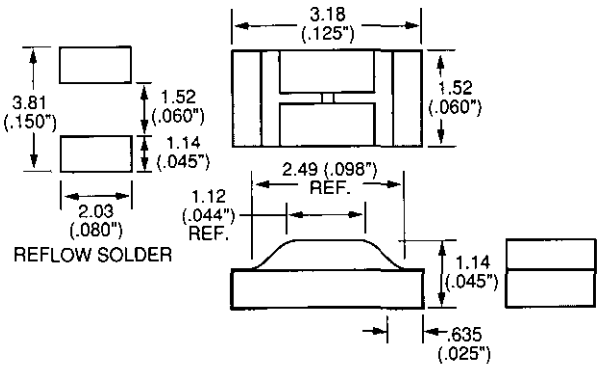
For New Designs Below 4A Use 433 Series.

429 004	4.0	FS	24	0.01926	1.18
429 005	5.0	FT	24	0.01375	2.12
429 007	7.0	FU	24	0.00925	4.90

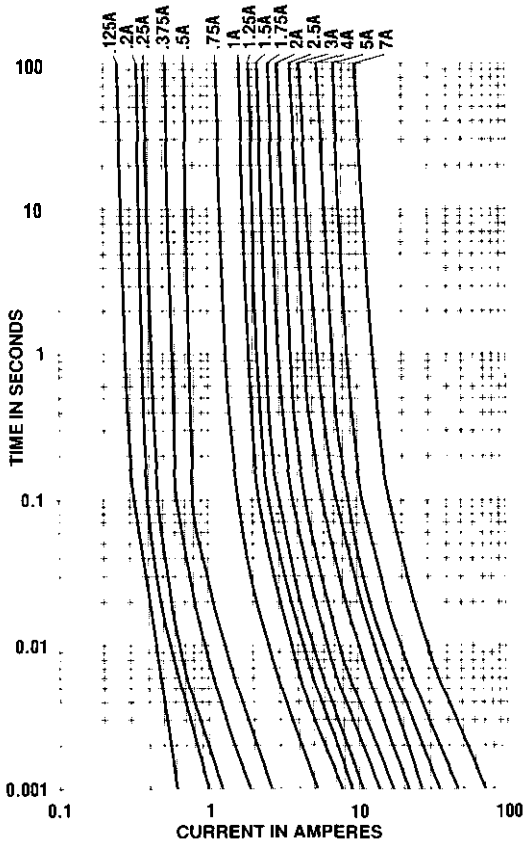
[1]Measured at 10% of rated current, 25°C. [2]Measured at rated voltage.



RECOMMENDED PAD LAYOUTS



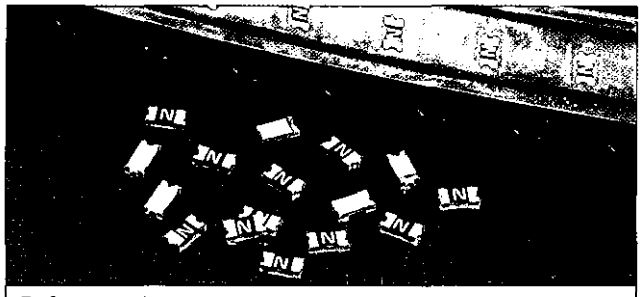
Average Time Current Curves



THIN-FILM SURFACE MOUNT

SlimLine 0603 Very Fast-Acting Thin-Film Type 434 Series

- The SlimLine 0603 is an extremely small, low profile design (0603 chip size) utilizing thin-film technology to achieve precise control of electrical characteristics.
- The lower height profile produces a flat surface for improved performance in pick-and-place operations and an alternate solution for height critical applications.
- Mounting pad and electrical specifiation are identical to the popular 431 Series specifications.



ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Opening Time at 25°C
100%	4 hours. Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

.25–1A 50 A @ 32 V AC/DC
1.25–5A 35 A @ 32 V AC/DC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 90°C. Consult temperature rerating chart on page 4. For operation above 90°C contact Linelfuse.

Vibration: Per **MIL-STD-202F.**

Insulation Resistance (After Opening): Greater than 10,000 ohms.

Resistance To Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.

Shelf Life (Solderability): 1 **year** min.

Thermal Shock: Withstands 5 cycles of -55°C to 125°C.

PHYSICAL SPECIFICATIONS:

Materials: Body: Epoxy Substrate
Terminations: Copper/Nickel/Tin-Lead (9515)
Cover Coat: Conformal Coating

Soldering Parameters:
Wave Solder — 260°C, 10 seconds maximum
Infrared Solder- 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-FiS481 (IEC 286, part 3); 5,000 per reel, add packaging suffix, NR.

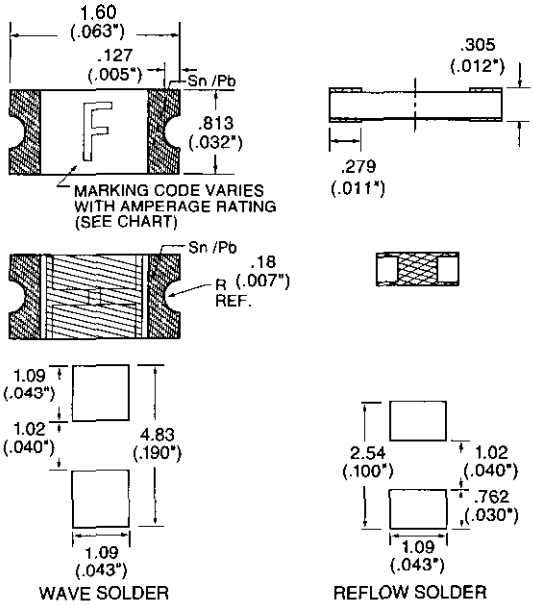
PATENTS: Patent Pending

ORDERING INFORMATION:

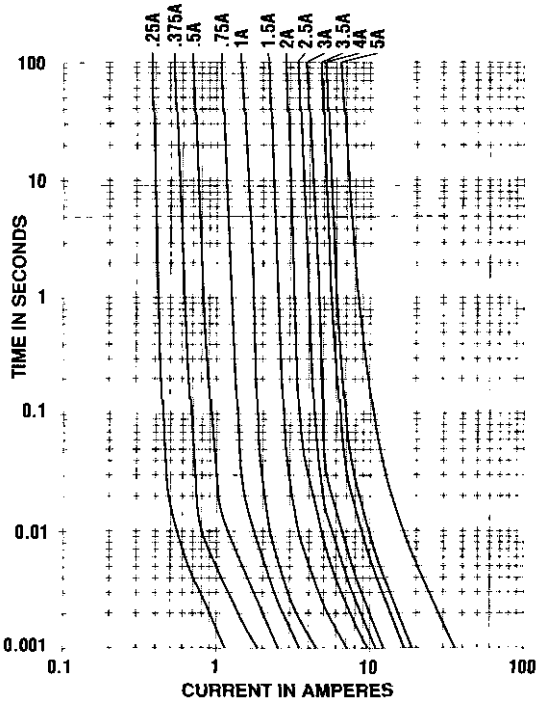
Catalog Number	Ampere Rating	Marking Code	Voltage Rating	Nominal Resistance Cold Ohm[1]	Melting I²t (A² Sec.)
0434.250	.25	D	32	0.375	0.0030
0434.375	.375	E	32	0.265	0.0053
0434.500	.5	F	32	0.193	0.0087
0434.750	.75	G	32	0.114	0.0171
0434 001.	1	H	32	0.072	0.0210
0434 1.25	1.25	J	32	0.054	0.0320
0434 01.5	1.5	K	32	0.048	0.0526
0434 1.75	1.75	L	32	0.039	0.0661
0434 002.	2	N	32	0.036	0.104
0434 02.5	2.5	O	32	0.028	0.175
0434 003.	3	P	32	0.023	0.198
0434 03.5	3.5	R	32	0.019	0.265
0434 004.	4	S	32	0.017	0.352
0434 005.	5	T	32	0.013	1.297

[1]Measured at 10% of rated current, 25°C.
[2]Measured at rated voltage.

Reference Dimensions:



Average Time Current Curves



0603 Very Fast-Acting Thin-Film Type 431 Series

. For new designs please consult the 434 Series on page 32.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:
.25–1A 50 amperes at 32 VAC/VDC
1-5A 35 amperes at 32 VAC/VDC

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 90°C. Consult tempera. ture rerating chart on page 4. For operation above 90°C contact Littelfuse.
Vibration: Withstands 10-55 HZ per MIL-STD-202F, Method 201 A and 1 O-2000 HZ at'20 G's per MIL-STD-202F, Method 204D, Condition D.
insulation Resistance (After Opening): Greater than 500,000 ohms.
Resistance To Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.
Thermal Shock: Withstands 5 cycles of -50°C to 125°C.

PHYSICAL SPECIFICATIONS:
Materials: Body: Epoxy Substrate
Terminations: Copper/Nick&Tin-Lead (95/5)
Cover Coat: Conformal Coating
Soldering Parameters:
Reflow Solder- 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481 (IEC 286, part 3); 5,000 par reel, add packaging suffix, NR.

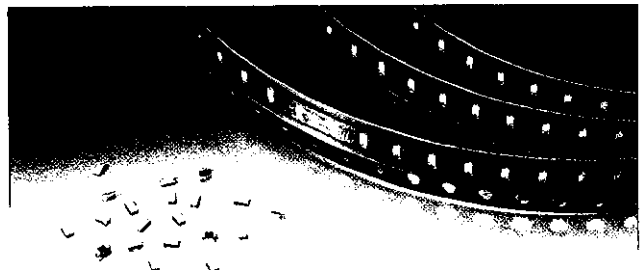
PATENTED

ORDERING INFORMATION:

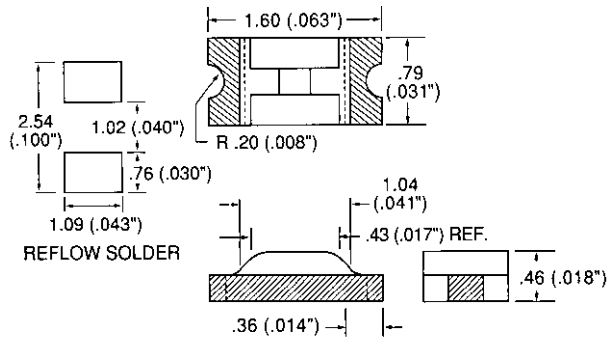
Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohm[1]	Melting I²t (A² Sec.)
431 250	0.25	32	0.375	0.0133
431 375	0.375	32	0.265	0.00344
431 500	0.5	32	0.193	0.00555
431 750	0.75	32	0.114	0.0134
431 001	1	32	0.072	0.0227
431 01.5	1.5	32	0.048	0.0526
431 002	2	32	0.033	0.122
431 02.5	2.5	32	0.028	0.184
431 003	3	32	0.023	0.256
431 03.5	3.5	32	0.019	0.311
431 004	4	32	0.016	0.371
431 005	5	32	0.013	1.31

For New Designs Use 434 Series

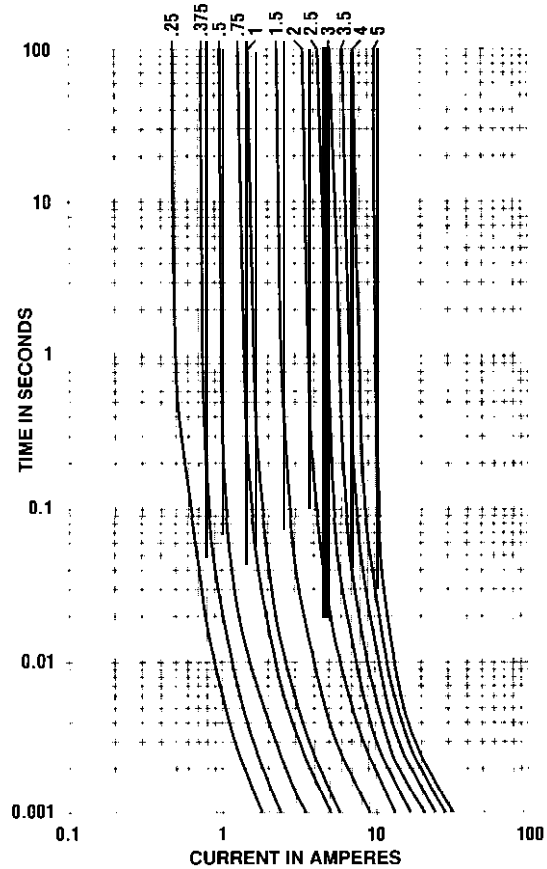
[1]Measured at 10% of rated current, 25°C.



Reference Dimensions:



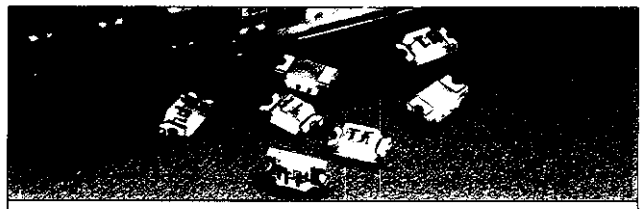
Average Time Current Curves



THIN-FILM SURFACE MOUNT

1206 Slo-Blo® Thin-Film Fuse 430 Series

- Time delay feature withstands high in-rush currents and prevents nuisance openings.
- Package is visually distinct from fast-acting version for easy identification.
- Top side marking allows visual verification of amperage rating.



ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Opening Time @ 25°C
100%	4 hours, Minimum
200%	1 sec., Min.: 120 sec., Max.
300%	0.1 sec., Min.; 3 sec., Max.
600%	0.002 sec., Min.; .05 sec., Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29662.

INTERRUPTING RATINGS:

0.5A - 1.5A	50 amperes at 63 VACNDC
2A	35 amperes at 63 VACNDC
3A	50 amperes at 32 VACNDC

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 90°C. Consult temperature rerating chart on page 4. For operation above 90°C contact Littelfuse.
Vibration:
Withstands IO-55 Hz per MIL-STD-202F, Method 201A and 10-2000 Hz at 20 G's per MIL-STD-202F, Method 204D, Condition D.
Insulation Resistance (after opening):
Greater than 10kΩ.
Resistance to Soldering Heat:
Withstands 60 seconds above 200°C up lo 260°C, maximum.
Thermal Shock:
Withstands 5 cycles of -50°C to +125°C.

PHYSICAL SPECIFICATIONS:
Materials: Body: Epoxy Substrate
Terminations: Copper/Nickel/Tin-Lead (9515)
Cover Coat: Conformal Coating
Soldering Parameters:
Reflow Solder: 260°C, 30 seconds maximum

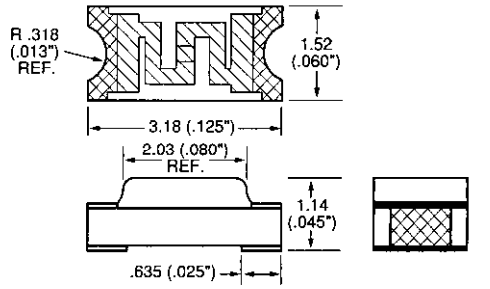
PACKAGING SPECIFICATIONS: 8mm Tape and Reel per EIA-RS481-2 (IEC 266, part 3); 3,000 per reel, add packaging suffix, WR.

PATENTED

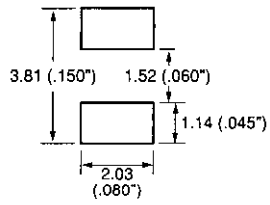
ORDERING INFORMATION:

Catalog Number	Amperage Rating (A)	Marking Code	Voltage Rating (V)	Nom. Cold Resistance (Ω)[1]	Nominal Melting I²t (A²sec)[2]
0430.500	0.5	TF	63	.250	0.0305
0430 001.	1.0	TH	63	.097	0.144
0430 01.5	1.5	TK	63	.056	0.298
0430002.	2.0	TN	63	,039	0.494
0430 003.	3.0	TP	32	.020	1.33

[1] Measured at 10% of rated current.25°C.
[2] Measured at rated voltage.

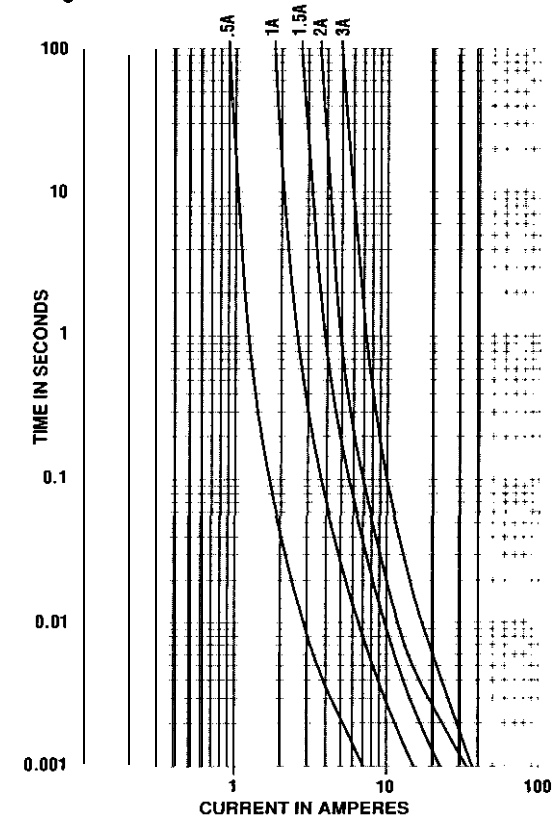


RECOMMENDED MOUNTING PAD DIMENSIONS:



REFLOW SOLDER

Average Time Current Curves



THIN-FILM SURFACE MOUNT

SlimLine 0402 Very Fast-Acting Thin-Film Type 435 Series

- The SlimLine 0402 is the world's smallest fuse available.
- Ideal for space sensitive applications including disc drives and handheld devices including mobile phones, cameras and personal communication devices.
- The low profile flat surface and full-faced termination are designed for superior performance in surface mount assembly processes.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time at 25°C
100%	4 hours, Minimum
200%	5 seconds, Maximum
300%	0.2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:
35 A @ 24 V AC/DC

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 90°C. Consult temperature rerating chart on page 4. For operation above 90°C contact Littelfuse.
Vibration: Per MIL-STD-202F.
Insulation Resistance (After Opening): Greater than 10,000 ohms.
Resistance To Soldering Heat: Withstands 60 seconds above 200°C up to 260°C, maximum.
Shelf Life (Solderability): 1 year min.
Thermal Shock: Withstands 5 cycles of –55°C to 125°C.

PHYSICAL SPECIFICATIONS:
Materials: Body: Epoxy Substrate
Terminations: Copper/Nickel/Tin-Lead
Cover Coat: Conformal Coating
Soldering Parameters:
Reflow Solder- 260°C, 30 seconds maximum

PACKAGING SPECIFICATIONS: 8mm Paper Tape and Reel par EIA-RS481 (IEC 286, part 3): 10,000 per reel, add packaging suffix, KR.

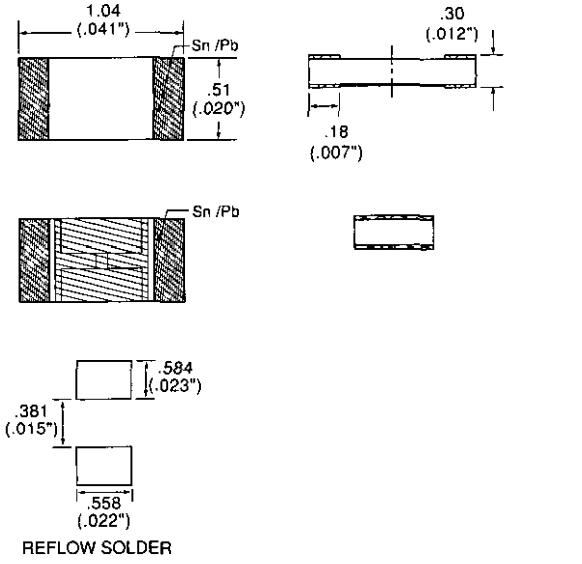
PATENTS: Patent Pending

ORDERING INFORMATION:

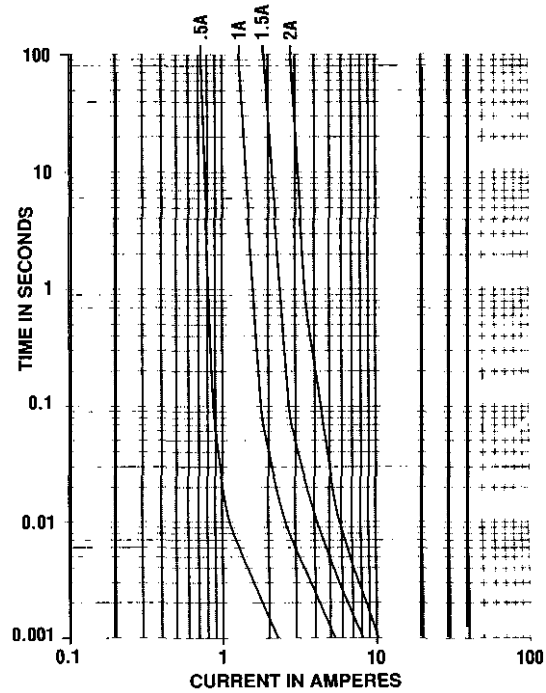
Catalog Number	Ampere Rating	Voltage Rating	Resistance Cold Ohm[1]	Nominal Melting I²t (A² Sec.)
0435.250	.25	24	0.220	0.0025
0435.375	.375	24	0.185	0.0035
0435.500	.5	24	0.150	0.0053
0435.750	.75	24	0.105	0.012
0435001.	1	24	0.072	0.020
0435 1.25	1.25	24	0.060	0.035
0435 01.5	1.5	24	0.047	0.056
0435 1.75	1.75	24	0.038	0.075
0435002.	2	24	0.030	0.100

[1]Measured at 10% of rated current, 25°C.
[2]Measured at rated voltage.

Reference Dimensions:

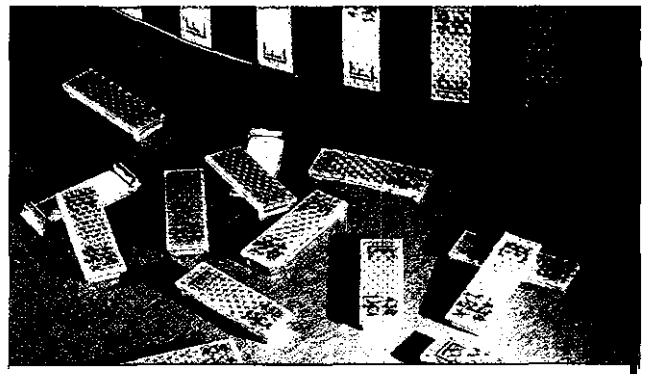


Average Time Current Curves



SMTelecom® Fuse 436 Series

. Surface mount overcurrent protection from lightning and power cross.
• Meets UL 145911950 power cross requirements stand alone.
• Ideal for use in telecommunication equipment including modems, fax machines, desk top phones, answering machines and line cards.
. UL recognized, with a 250 V operating voltage.
• Top side marking allows visual verification of ampere rating.
• Complies with Bellcore GR-1089-CORE and FCC 47 part 68 Surge Specifications.



ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating		Opening Time
100%		4 Hours, Minimum
200%	*	5 Seconds. Min.; 30 Seconds, Max.

Short Circuit Capabilities:
UL 1459 / UL 1950 3rd. Edt.
40 Amperes @ 600 VAC
7 amperes @ 600 VAC
2.2 amperes @ 600 VAC

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:
10,000 amperes @ 125V
100 amperes @ 250V

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature Range: -55°C to +125°C

PHYSICAL SPECIFICATIONS:
Materials: Body: Melamine Substrate
Terminations: Copper/Nickel/Tin-Lead (95/5)
Soldering Parameters:
Reflow Solder — 250°C, 10 sec. maximum.
Wave Solder — Not recommended.

PACKAGING SPECIFICATIONS: 24mm Tape and Reel per EIA-RS481-2 (IEC 286, part 3); 2,000 par reel, add packaging suffix, PR.

PATENTED

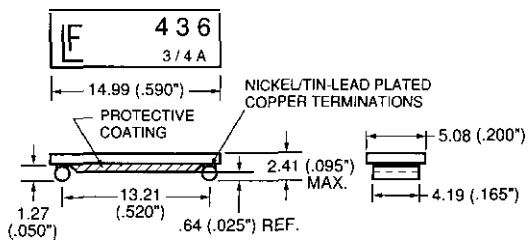
ORDERING INFORMATION:

Catalog Number	Ampere Rating (A)	Voltage Rating (V)	Nominal Cold Resistance (Ω)	Nominal Melting I²t (A² sec.)
0436.750	3/4	250	0.650	1.143
0436 001.	1	250	0.475	2.606
04361.25	1¼	250	0.305	3.656
043601.5	1½	250	0.210	5.921
043601.6	1⅘	250	0.165	13.500

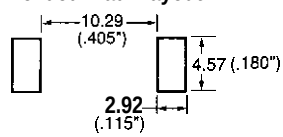
PERFORMANCE CHARACTERISTICS:

Catalog Number	FCC 47Part68 Longitudinal Surge 10x160µSec. (1500 V)		FCC 47Part68 Metallic Surge 10x560µSec. ,800V)		Bellcore GR-1089-CORE First Level Lightning 10x1000µSec. (1000 V)	Bellcore GR-1089-CORE First Level Lightning 2x10µSec. (2500 V)
Repetitions	50	2	50	2	50	20
M36.750	82 A	88 A	29 A	32 A	22 A	225A
0436 001.	102 A	117 A	MA	48 A	37 A	350A
0436 1.25	120 A	135 A	87 A	95 A	56 A	425A
0436 01.5	175 A	200 A	100 A	115 A	80 A	500A
0436 01.6	200A	200 A	134 A	156 A	100 A	500A

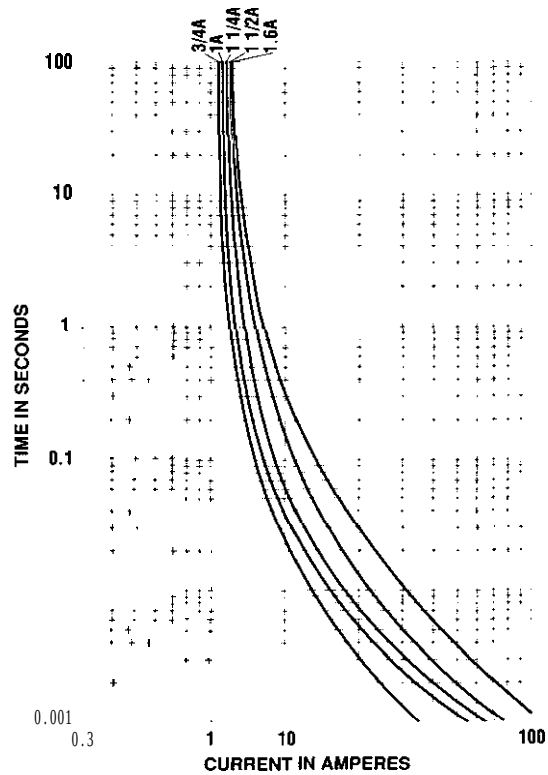
Reference Dimensions



Recommended Pad Layout:



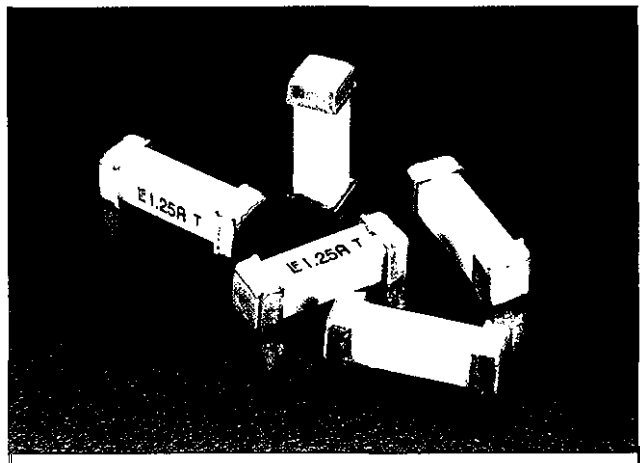
Average Time Current Curves

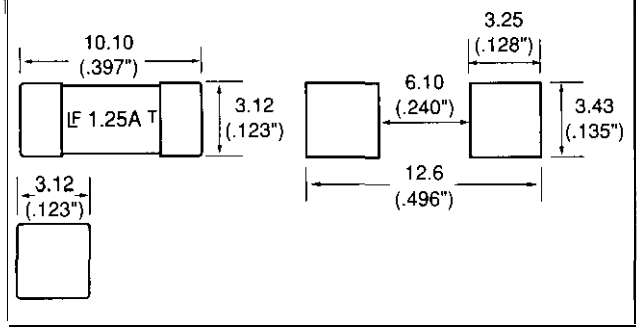


MINIATURE SURFACE MOUNT

Telecom NANO²® Fuse 461 Series

- Surface mount overcurrent protection from power cross and allows compliance with lightning surges.
- Meets UL 1950 3rd Edition (formerly UL 1459) power cross requirements stand alone.
- Designed to allow compliance with Bellcore/Telcordia GR-1089-CORE and FCC 47 part 68 Surge Specifications.
- Provides coordinated protection with Littelfuse Surgector™ suppression devices.
- Ideal for use in telecommunication equipment including line cards, modems, fax machines, phones, answering machines, caller ID devices and other products connected to phone network.





ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
250%	1 Second, Min.; 120 Seconds, Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Product is recognized to meet the following interrupting ratings and Power Fault tests:

50 amperes at 250 VAC.

Overvoltage/AC Power Fault (Power Cross) Requirements:

The most severe tests are listed, Telecom Nano² will pass lower level tests as well.

Standard/ Test	Surge Voltage (VAC)	surge current (A)	Duration	Rating Selection for Compliance Stand Atone'
GR-1089	1000	5	0.5 sec.	1.25A
GR-1089	600	60'	5 sec.	1.25A
UL 1950 3rd Edition	600	40	1.5 sec.	0.5,1.25A
GR-1089 UL 1950 3rd Edition	600	7	5 Sec.	0.5.1.25A
GR-1089 UL 1950 3rd Edition	100-600	2.2	30 Min.'	0.5 1.25A
GR-1089	? 7 7	25	15 Min.	0.5,1.25A
UL 1950 3rd Edition	120	25	30 Min.	0.5 1.25A

'Tested at 0° to 90" closing angle
² See UL 1950 for test procedures for fuses and testing at 135%.

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature Range: -55°C to 125°C.

PHYSICAL SPECIFICATIONS:
Materials: Body: Ceramic.
Terminations: Silver Plated Brass Caps.

Soldering Parameters:
Reflow Solder — 230°C, 30 seconds maximum.
Wave Solder — 260°C, 3 seconds maximum.

PACKAGING SPECIFICATIONS: 24mm Tape and Reel per EIA-RS481, (IEC 286 part 3); 2500 fuses per reel, add suffix, ER.

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
0461.500	0.5	250	Contact Littelfuse	
0461 1.25	1.25	250	.130	11.5⁴

⁴ I²t is calculated at 8 msec. I²t at 10 times rated current has a typical value of 22 A²sec.

Environmental/Lightning Surge Requirements

Standard/ Test	Surge Voltage (Vpk)	Duration/ Wave Form (µSec.)	Surge Current (A)	Repetitions (Each Polarity)	Rating Selection for Compliance Stand Alone'
GR-1089 1st Level	600	10 x 1000	100	25	1.25A
	1000	10 x 360	100	25	1.25A
	1000	10 x 1000	100	25	1.25A
	2500	2x10	500	10	1.25A
	1000	10 x 360	25	5	0.5,1.25A
GR-1089 2" Level	5000	2x.10	500	1	1.25A
FCC 47 Part 68 Type A Metallic	800	10 x 560	100	1	1.25A
FCC 47 Part 68 Type A Longitudinal	1500	10 x 160	200	1	1.25A
FCC 47 Part68 Type B Metallic	1000	voltage 9 x 720 current 5 x 320	25	1	0.5,1.25A
FCC 47 Part 68 Type B Longitudinal	1500	voltage 9 x 720 current 5 x 320	37.5	1	0.5,1.25A

'Additional series resistance used in conjunction with the fuse may allow compliance by fuse ratings not listed.

SUBMINIATURE SURFACE MOUNT

NANO²® Very Fast-Acting Type Fuse

The Nano² SMF Fuse is a very small, square surface mount fuse that is **also available in a surface mount holder.**

ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Ampere Rating	Opening Time
100%	1/16–15	4 hours, Minimum
200%	1/16–10	5 seconds, Maximum
	12-15	20 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Approved by MITI from 1 through 5 amperes.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

1/16 – 8A 50 amperes at 125 VACNDC
300 amperes at 32 VDC

10A 35 amperes at 125 VAC/50 amperes at 125 VDC
300 amperes at 32 VDC

12A – 15A 50 amperes at 65 VACNDC
300 amperes at 24 VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz).

Salt Spray: MIL-STD-202, Method 101, Test Condition B.

Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A, (10,000 ohms minimum).

Resistance to Soldering Heat: MIL-STD-202, Method 210, Test Condition F (20 sec. at 260°C).

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125%).

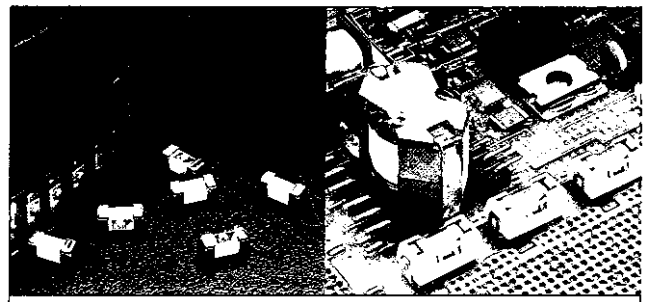
Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90-98 RH), Heat (65-C).

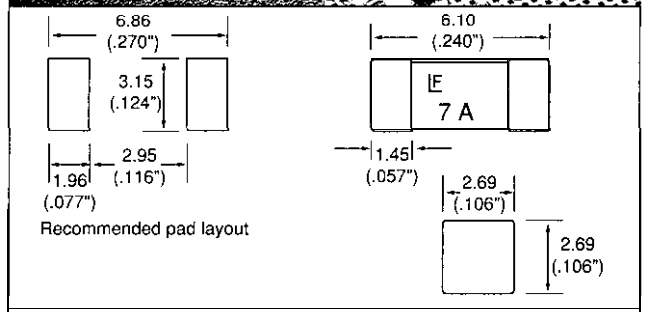
PATENTED

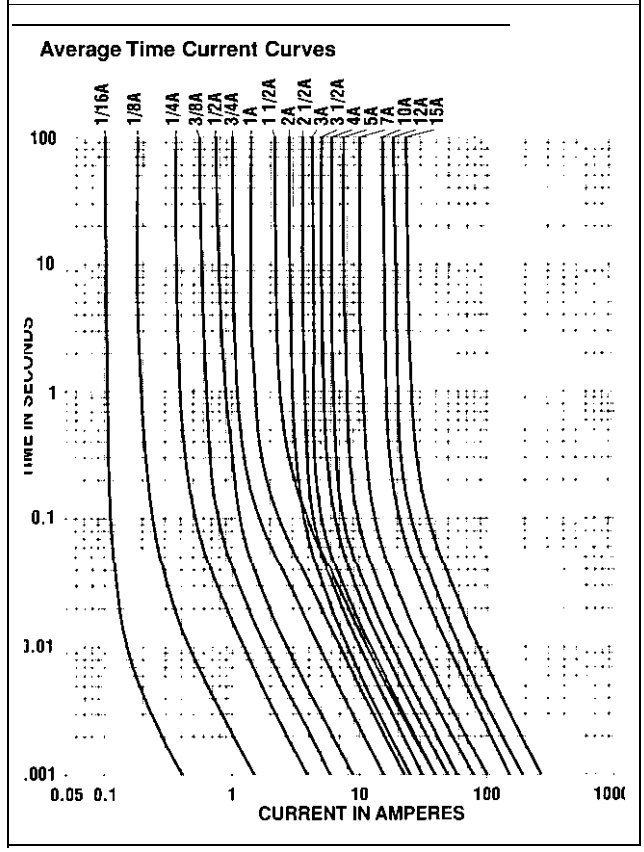
ORDERING INFORMATION:

Tin-Lead Plated Catalog #	Silver Plated Catalog #	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
	R451 .062	0.062	125	5.50	0.00019
	R451 .080	0.080	125	4.05	0.00033
	R451.100	0.100	125	3.10	0.00138
–	R451.125	0.125	125	2.00	0.00286
R451.160	0453.160	0.160	125	1.80	0.00306
R451.200	0453.200	0.200	125	1.40	0.00652
R451.250	0453.250	0.250	125	1.05	0.01126
R451.315	0453.315	0.316	125	0.78	0.0231
R451.375	0453.375	0.375	125	0.560	0.0464
R451.400	0453.400	0.400	125		
R451.500	0453.500	0.500	125	0.420	0.0795
R451.630	0453.630	0.630	125	0.305	0.143
R451.750	0453.750	0.750	125	0.245	0.185
R451.800	0453.600	0.800	125	0.212	0.271
R451 001.	0453001.	1.0	125	0.153	0.459
R451 1.26	0453 1.25	1.25	125	0.0780	0.664
R451 01.5	045301.5	1.5	125	0.0630	0.853
R451 01.6	0453 01.6	1.6	125	0.0580	1.060
R451 002.	0453002.	2.0	125	0.0367	0.530
R451 02.5	0453 02.5	2.5	125	0.0286	1.029
R451 003.	0453003.	3.0	125	0.0227	1.650
R451 3.16	0453 3.15	3.15	125	0.0215	1.920
R451 03.5	0453 03.5	3.5	125	0.0200	2.469
R451 004.	0453004.	4	125	0.0160	3.152
R451 005.	0453005.	5	125	0.0125	5.666
R451 06.3	0453 06.3	6.3	125	0.0096	9.17
R451 007.	0453007.	7	125	0.0090	10.32
R451 008.	0453008.	8	125	0.0077	20.23
R451 010.	0453 010.	10	125	0.0056	26.46
R451 012.	0453 012.	12	65	0.0049	47.97
R451 015.	0453015.	15	65	0.0037	97.82

Refer to pg. 110 for SMF Omni-Blok® Holder, Series 154 000.







PHYSICAL SPECIFICATIONS:

Materials: Body: Ceramic
Terminations: Tin-Lead Alloy or Silver Plated Caps.

Soldering Parameters:
Wave Solder — 260°C, 10 seconds maximum
Reflow Solder — 260°C, 30 seconds maximum

Solderability: MIL-STD-202, Method 208.

PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481 (IEC 286, part 3); 1,000 per reel, add packaging suffix, MR.

SUBMINIATURE SURFACE MOUNT

NANO²® Slo-Blo® Type Fuse

The very small NANO' Fuse with time delay performance characteristics. The unique time delay feature of this fuse design helps solve the problem of nuisance "opening" by accommodating inrush currents that normally cause a fast-acting fuse to open.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Min.; 60 seconds, Max.
300%	0.2 seconds. Min.; 3 seconds. Max.
800%	0.02 seconds, Min.: 0.1 seconds, Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10460, CSA LR 29862.

INTERRUPTING RATINGS:
50 **amperes** at 125 VAC
50 **amperes** at 125 VDC
300 amperes at 32 VDC

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202., Method 213. Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz. .06 in. total excursion).

Salt Spray: MIL-STD-202, Method 101, Test Condition B (46 hrs.).

Insulation Resistance (After Opening): MIL-STD.202, Method 302, Test Condition A, (10,000 ohms minimum).

Resistance to Soldering Heat: MIL-STD-202, Method 210. (3 sec. at 260°C).

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125°C).

Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90-98 RH), Heat (65%).

PHYSICAL SPECIFICATIONS:

Materials: Body: Ceramic
Terminations: Tin-Lead Alloy or Silver Plated **Brass** Caps.

Soldering Parameters:
Wave Solder — 260°C. 3 seconds maximum
Reflow Solder — 230°C, 30 seconds maximum

Solderability: MIL-STD-202, Method 206.

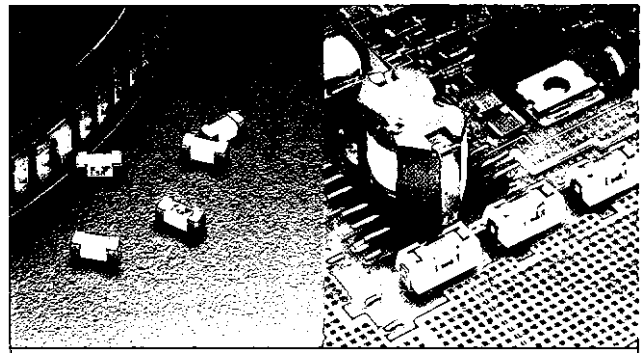
PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481 (IEC 266, part 3); 1,000 per reel.

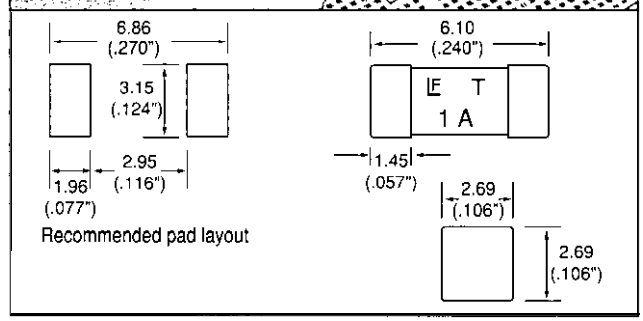
Marking: The 4521454 series Slo-Blo fuse marking includes the letter "T" to designate time delay characteristics.

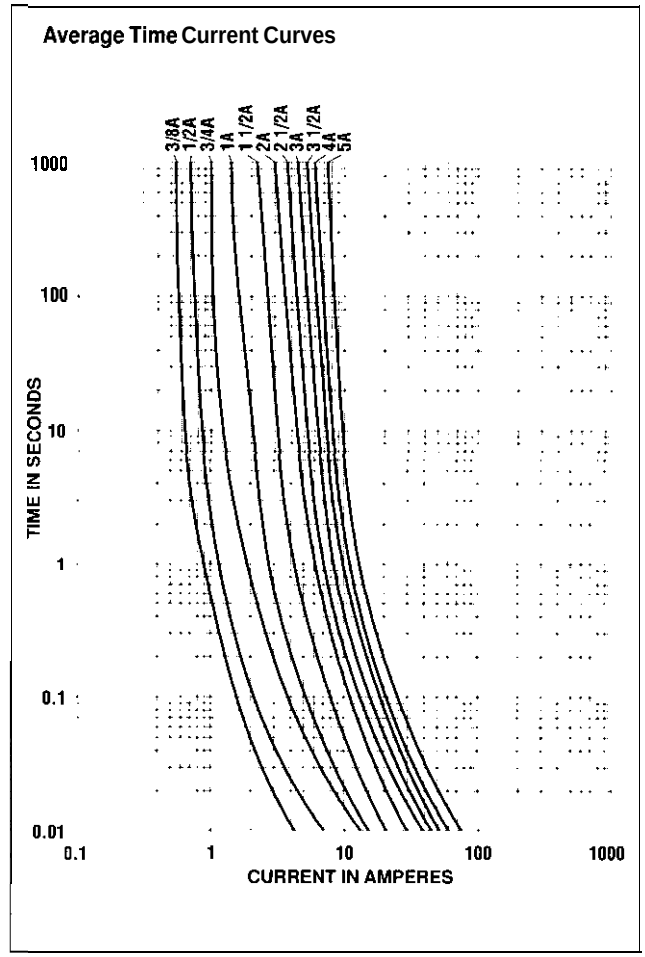
PATENTED

ORDERING INFORMATION:

Tin-Lead Plated Catalog #	Silver Plated Catalog #	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
R452.375	**0454.375**	3/8	125	1.20	0.101
R452.500	0454.500	1/2	125	0.700	0.240
R452.750	0454.750	314	125	0.360	0.904
R452 001.	0454001.	1	125	0.225	1.98
R452 **01.5**	045401.5	1½	125	0.0930	3.65
R452 002.	0454 **002.**	2	125	0.0625	8.20
R452 02.5	0454 **02.5**	2½	125	0.0450	15.0
R452 003.	0454003.	3	125	0.0340	20.16
R452 03.5	0454 03.5	3½	125	0.0224	26.53
R452 004.	0454004.	4	125	0.0186	34.40
R452005.	0454005.	5	125	0.0136	53.72





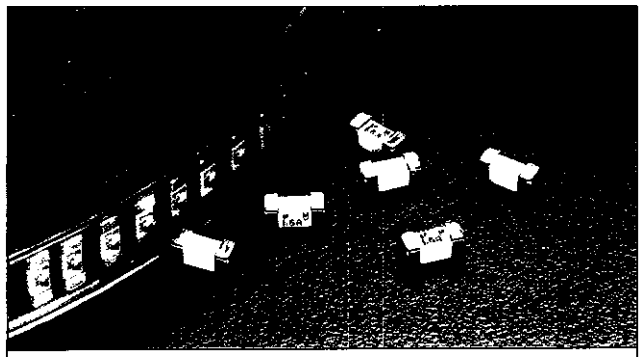


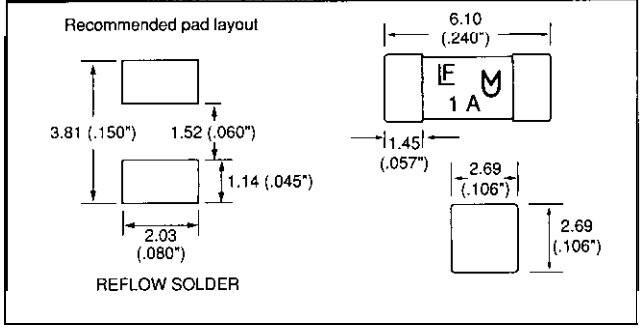
Refer to pg. 110 for SMF Omni-Blok® Holder, Series 154 000T.

SUBMINIATURE SURFACE MOUNT

NANO²® UMF Fast-Acting Type Fuse 455 Series

*The Nano² UMF Fuse is a very small, square surface mount fuse design.
*Designed to International (IEC) Standards for use globally.
• Meets IEC 60127-4 UMF specifications for Fast-Acting Fuses





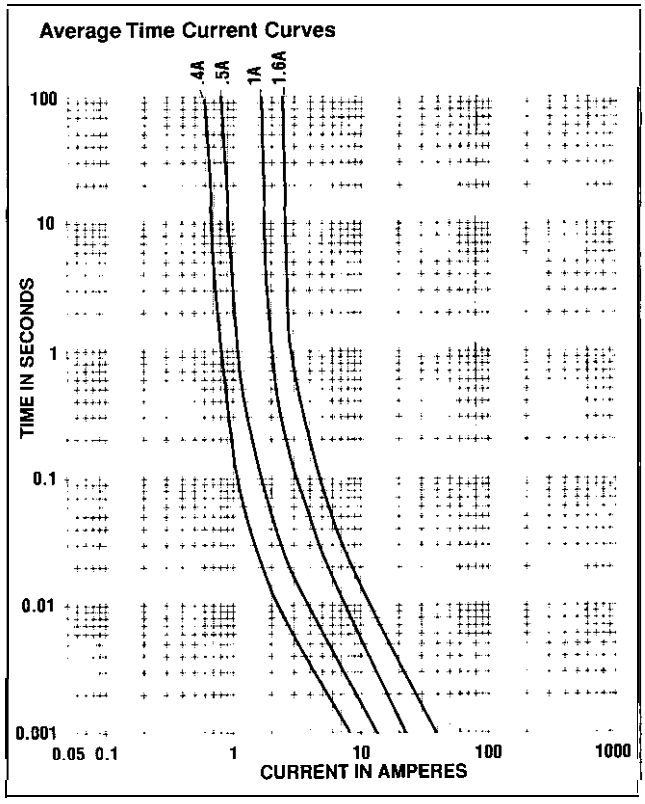
ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
125%	1 hour. Minimum
200%	2 minutes, Maximum
1000%	.001 sec. Min; .01sec Max

AGENCY APPROVALS: Listed to IEC 60127-4. Universal Modular Fuse-Links (UMF), 125V.
AGENCY FILE NUMBERS: UL E184655.
INTERRUPTING RATINGS: 50 amperes at 125 VACNDC
ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 125°C.
Shock: MIL-STD.202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (IO-55 Hz).
Salt Spray: MIL-STD-202, Method 101, Test Condition B.
Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A, (10,000 ohms minimum).
Resistance to Soldering Heat: MIL-STD-202, Method 210, Test Condition F (20 sec. at 260°C).
Thermal Shock: MIL-STD-202, Method 107, Test Condition B (–65 to 125°C).
Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90.98 RH), Heat (65°C).
PHYSICAL SPECIFICATIONS:
Materials: Body: Ceramic
Terminations: Tin-Lead Alloy Plated Caps.
Soldering Parameters:
Wave Solder — 260°C, 10 seconds maximum
Reflow Solder — 260°C, 30 seconds maximum
Solderability: MIL-STD-202, Method 208.
PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481 (IEC 266, part 3); 1,000 per reel, add packaging suffix, MR.
PATENTED
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Nominal Voltage Rating	Cold Resistance (Ohms)	Nominal Melting I²t (A² sec)
0455.400	0.4	125	0.420	0.0795
0455.500	0.5	125	0.305	0.143
0455 001.	1.0	125	0.078	0.645
0455 01.6	1.6	125	0.0532	1.060

[1] Measured at 10% of rated current, 25%



SUBMINIATURE SURFACE MOUNT

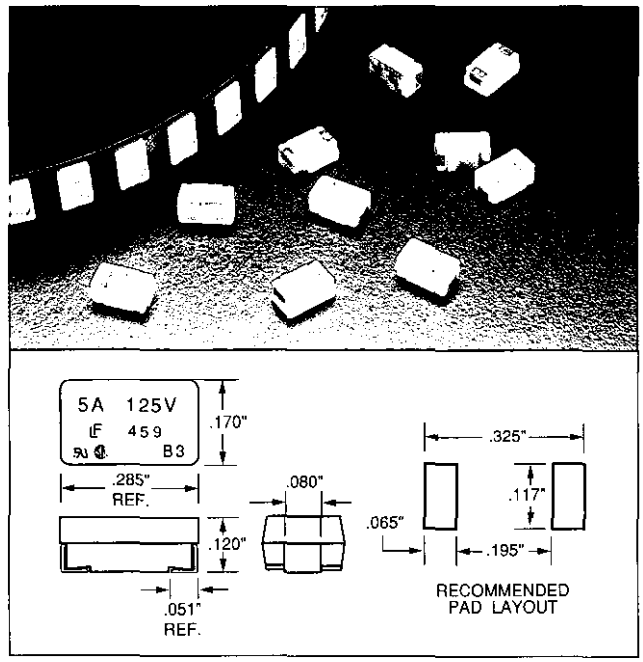
PICO® SMF 459 and 460 Series

• For newer designs the NANO² is recommended.

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 125°C.
Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (10–55 Hz, .06 in. total excursion).
Salt **Spray:** MIL-STD-202, Method 101, Test Condition B (48 hrs.).
Insulation Resistance (After Opening): MIL-STD.202, Method 302, (10,000 ohms minimum at 100 volts).
Resistance to Soldering Heat: MIL-STD.202, Method 210, Test Condition F (IO sec. at 260°C).
Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65 to 125°C).
Moisture Resistance: MIL-STD-202, Method 106, High Humidity (90-98 RH), Heat (65").

PHYSICAL SPECIFICATIONS:
Materials: Body: Molded Thermoplastic
Terminations: Tin-Lead Plated Copper
Soldering Parameters:
Wave Solder — 260°C, 10 seconds maximum
Reflow Solder — 260°C, 30 seconds maximum
Solderability: MIL-STD-202, Method 206.

PACKAGING SPECIFICATIONS: 12mm Tape and Reel per EIA-RS481 (IEC 266, part 3); 500 per reel, add packaging suffix, UR.



PICO® SMF
Very Fast-Acting Type Fuse 459 Series

ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second. Maximum
300%	0.1 second, Maximum

459 SERIES AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29662.

459 SERIES INTERRUPTING RATINGS:
50 amperes at 125 VAC.
300 amperes at 125 VDC.

PATENTED

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
R459.062	1/16	125	7.0	0.000075
R459.125	1/8	125	1.70	0.00163
R459.250	1/4	125	0.665	0.0106
R459.375	3/8	125	0.395	0.0254
R459.500	1/2	125	0.260	0.0546
R459.750	314	125	0.175	0.155
R459 001	1	125	0.126	0.281
R459 01.5	1½	125	0.0600	0.650
R459 002	2	125	0.0466	0.421
R459 02.5	2½	125	0.0350	0.721
R459 003	3	125	0.0290	1.23
R459 03.5	3½	125	0.0240	1.65
R459 004	4	125	0.0200	2.35
R459 005	5	125	0.0155	3.90

PICO® SMF
Slo-Blo® Type Fuse 460 Series

ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Min.; 120 seconds, Max.
306%	2 second, Min.; 8 seconds, Max.
800%	0.02 second, Min.; 0.1 second, Max.

460 SERIES AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Approved by MITI from 1 through 5 amperes.

460 SERIES INTERRUPTING RATINGS:
50 amperes at 125 VAC.
50 amperes at 125 VDC.

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² sec.
R460.500	1/2	125	1.19	0.210
R460.750	314	125	0.497	0.760
R460 001	1	125	0.260	2.0,
R460 01.5	1½	125	0.116	3.94
R460 002	2	125	0.07,	7.60
R460 02.5	3	125	0.052	13.0
R460 003	3½	125	0.038	21 .0
R460 03.5		125	0.024	26.6
R460 004	4	125	0.0194	35.0
R460 005	5	125	0.0133	54.6

SUBMINIATURE SURFACE MOUNT & DIP TYPES

FLAT-PAK® Fast Acting Fuse

Fast-Acting and Slo-Blo® Fuse versions of the Flat-Pak® Fuse designs are available. Both designs are available in either a gull-wing surface mount package or a DIP configuration for through-hole mounting. These fuse designs feature a 250 VAC rating in a low profile, rectangular package.

. ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	2 seconds. Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATING:
50 amperes at 250VAC.

ENVIRONMENTAL SPECIFICATION:
Operating Temperature: -55°C to 125°C.

PHYSICAL SPECIFICATIONS:
Materials: Body: Thermoplastic
Terminations: Tin/Lead Plated Copper
Soldering Parameters:
Wave Solder — 260°C, 3 seconds maximum.
Reflow Solder — 215% 30 seconds maximum.
Solderability: MIL-STD-202, Method 208.
Cleaning: Board washable in most common Solvents.

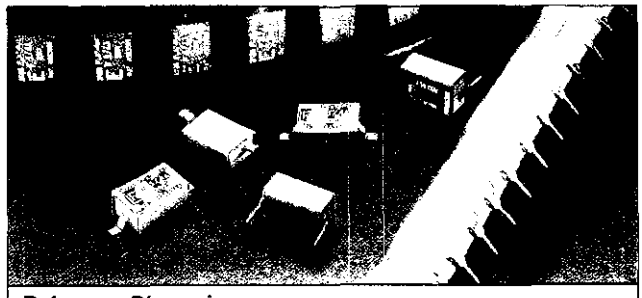
PACKAGING SPECIFICATIONS:
SMF Fuses — 24mm Tape and Reel per EIA-RS481 (IEC 286, part 3); 500 per reel.
DIP Fuses — Antistatic magazine, 100 per magazine.

PATENTED

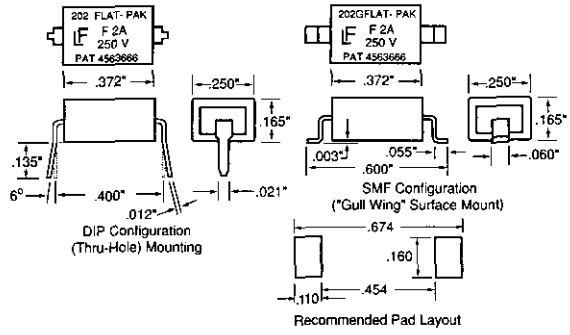
ORDERING INFORMATION

Catalog Number	Catalog[1] Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
202.062	202.062G	1/16	250	7.90	0.000220
202.125	202.125G	1/8	250		
202.250	202.250G	1/4	250	0.880 2.45	0.00180 0.0147
202.500	202.500G	1/2	250	0.298	0.0363
202.750	202.750G	3/4	250	0.166	0.0980
202001	202 001G	1	250	0.119	0.192
202 01.5	202 01.5G	1½	250	0.0701	0.540
202002	202 002G	2	250	0.0469	1.07
202 02.5	202 02.5G	2½	250	0.0455	1.76
202003	202 003G	3	250	0.0327	1.71
202004	202 004G	4	250	0.0244	3.00
202005	202 005G	5	250	0.0174	4.68

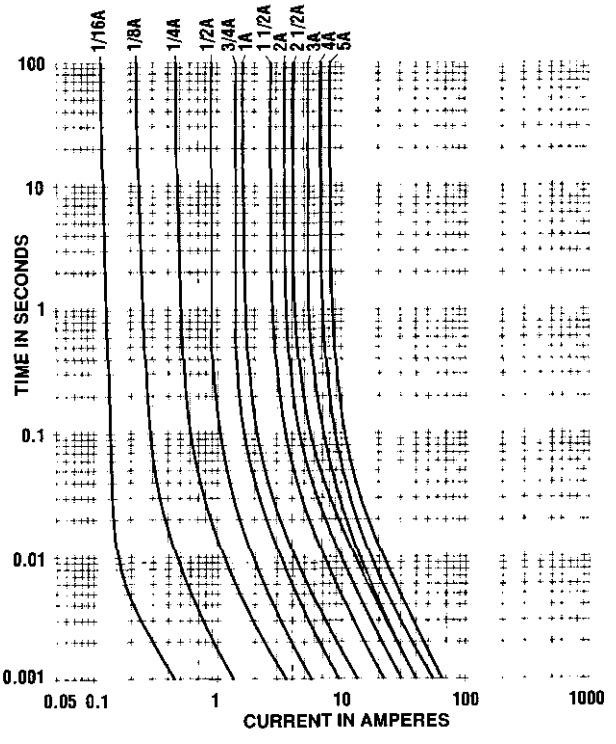
[1] SMF fuse marking includes the letter "G" next to the series number indicating "Gull-Wing".



Reference Dimensions:



Average Time Current Curves



FLAT-PAK® Slo-Blo® Fuse

Fast-Acting and Slo-Blo® Fuse versions of the Flat-Pak Fuse designs are available. Both designs are available in either a gull-wing surface mount package or a DIP configuration for through-hole mounting. These fuse designs feature a 250 VAC rating in a low profile, rectangular package.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Minimum 30 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATING:
50 **amperes** at **250 VAC.**

ENVIRONMENTAL SPECIFICATION:
Operating Temperature: –55°C to **125%.**

PHYSICAL SPECIFICATIONS:
Materials: Body: Thermoplastic
Terminations: Tin/Lead Plated Copper
Soldering Parameters:
Wave Solder — 260°C, 3 seconds maximum.
Reflow Solder — 215°C, 30 seconds maximum.
Solderability: MIL-STD.202. Method 206.
Cleaning: Board washable in most common solvents.

PACKAGING SPECIFICATIONS:
SMF Fuses — 24mm Tape and Reel per EIA-RS481 (IEC 266, part 3); 500 per reel.
DIP Fuses -Antistatic magazine, 100 per magazine.

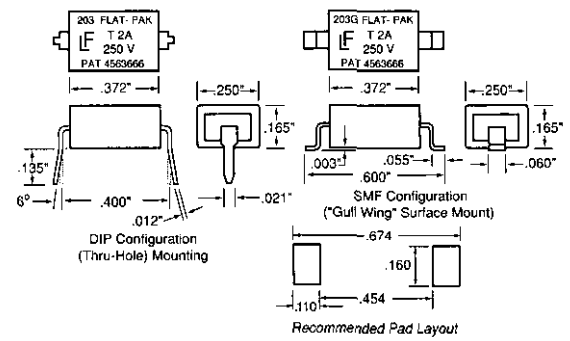
PATENTED

ORDERING INFORMATION

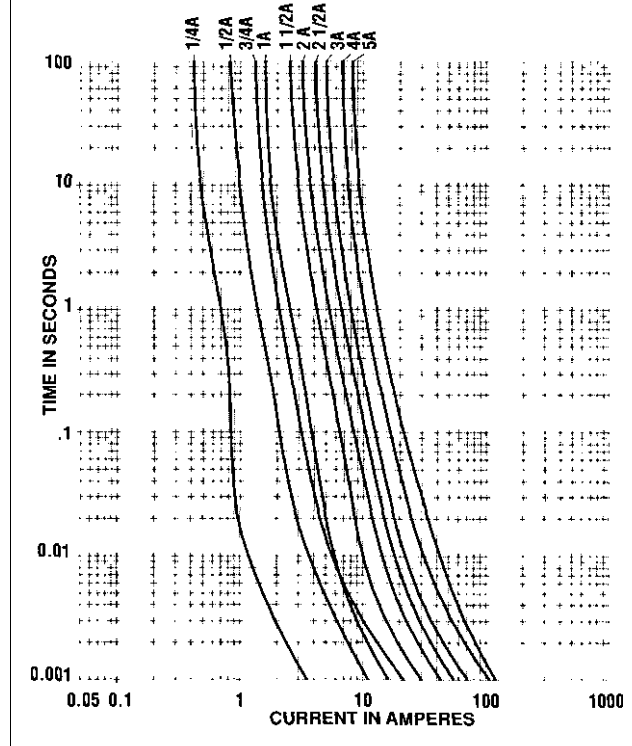
Catalog Number	Catalog[1] Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
203.250	203.250G	1/4	250	1.36	0.0126
203.500	203.500G	1/2	250	0.433	0.112
203.750	203.750G	314	250	0.158	0.327
20300,	203 001G	1	250	0.0755	0.328
20301.5	203 01.5G	1½	250	0.0390	0.850
203002	203 002G	2	250	0.0345	1.70
203 02.5	203 02.5G	2½	250	0.0237	2.87
203003	203003G	3	250	0.0197	4.40
203 004	203 004G	4	250	0.0148	8.75
203005	203005G	5	250	0.0124	14.7

[1] SMF fuse marking includes the letter "G" next to the series number indicating "Gull-Wing".

Reference Dimensions:



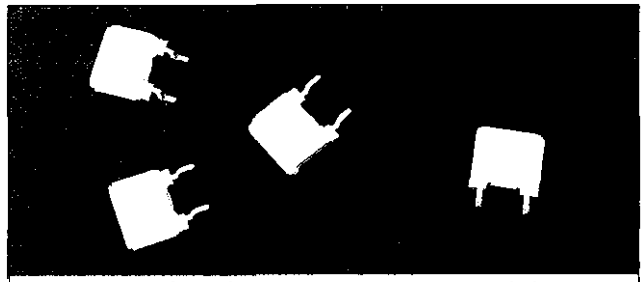
Average Time Current Curves



350 VOLT SURFACE MOUNT FUSE

EBF Fuse Fast-Acting Type 446 Series

- Ideal for use in electronic lighting ballast, power supply and power inverter applications.
- Rated for use in 125, 250, 277 and 350 VAC circuits.
- Based on the proven reliability of the automotive MINI' Fuse; available from 2 through 10 amperes.



ELECTRICAL CHARACTERISTICS:

% of Ampere Rating		Opening Time
100%		4hours, Minimum
260%		0.15 sec. Min., 5 Sec. Max

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and CSA Certified. Approved by MITI to 5 amperes.

AGENCY FILE NUMBERS: UL: E71611, CSA LR 29862.

INTERRUPTING RATINGS:
100 amperes at 350 VAC, 50 amperes at 125 VDC and 450 amperes at 60VDC

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -40°C to +125°C.

PHYSICAL SPECIFICATIONS:
Materials: Body: Plastic Body
Terminations: Tin-Lead (9515) plated Zn, Ni barrier

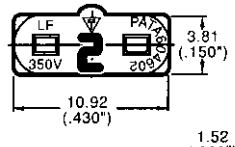
Soldering Parameters:
Reflow Solder — 235°C, 5 seconds maximum.
No-clean process recommended.
Wave Solder — Not recommended.
Non-plated terminal surfaces may not meet MIL-STD-202, Method 208.

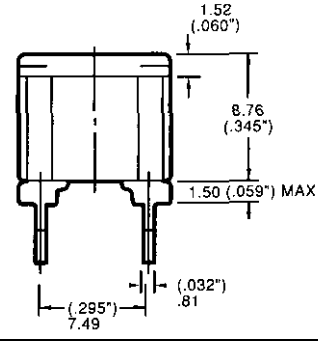
PACKAGING SPECIFICATIONS:
24mm Tape and Reel per EIA-RS481 (Equivalent to IEC 266, part 3); 800 fuses per reel, add packaging suffix, ZR.
Shelf Life: Up to 1 year in Factory sealed packaging.

ORDERING INFORMATION:

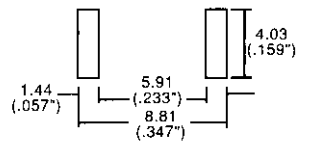
Catalog Number	Ampere Rating (A)	Voltage Rating (VAC)	Nominal Cold Resistance(Ω)	Nominal Melting I²t (A²sec)
0446002.	2	350	0.0560	2.8
0446003.	3	350	0.0340	9.4
0446004.	4	350	0.0240	17
0446005.	5	350	0.0180	25
044607.5	7.5	350	0.0110	68
0446010.	10	350	0.0073	93

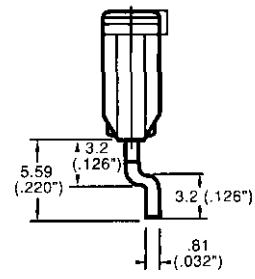
Reference Dimensions (Inches):



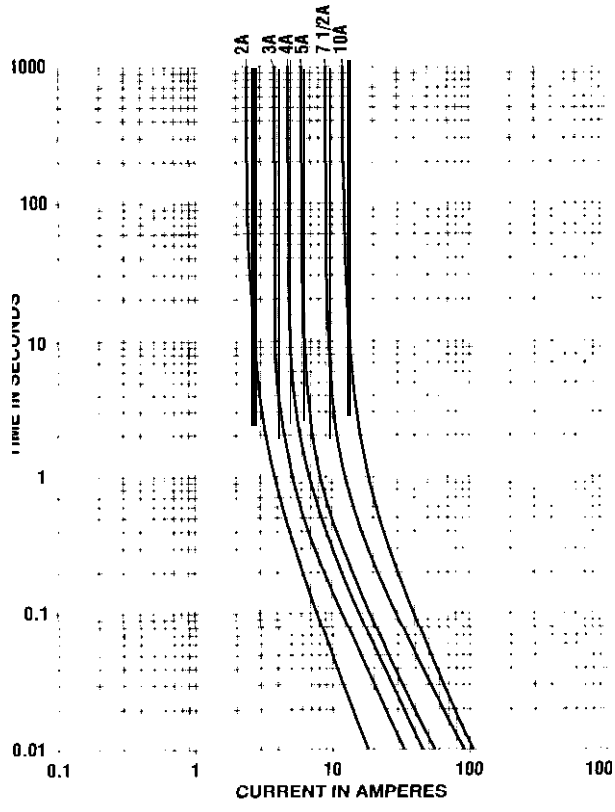


Recommended Pad Layout:

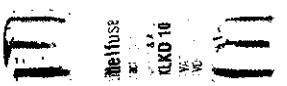




Average Time Current Curves



AXIAL LEAD AND CARTRIDGE FUSES



SUBMINIATURE

PICO® II Very Fast-Acting Type Fuse

The PICO® II very fast-acting fuse is designed to meet an extensive array of performance characteristics in a space-saving subminiature package.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
100%	1/16–15	4 hours, Minimum
	1/16–7	1 second, Maximum
200%	10	3 seconds, Maximum
	12–15	10 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Approved by MITI from 1 through 5 amperes.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

REFERENCE TO MIL SPEC: Available in Military QPL type FM10, conforming to MIL-PRF-23419. To order, change 251 to 253 as shown below.

INTERRUPTING RATINGS:
300 amperes at rated voltage VDC.
50 amperes at rated voltage VAC.

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 125°C.
Shock: MIL-STD-202, Method 213. Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (10–55 Hz): Method 204, Test Condition C (55–2000 Hz at 10 G's Peak).
Moisture Resistance: MIL-STD-202, Method 106.

PHYSICAL SPECIFICATIONS:
Materials: Encapsulated, Epoxy-Coated Body; Solder Coated Copper Wire Leads.
Flammability Rating: UL 94V0
Soldering Parameters:
Wave Solder — 260°C, 10 seconds maximum.
Solderability: MIL-STD-202, Method 208.
Lead Pull Force: MIL-STD.202, Method 211, Test Condition A (will withstand a 7 lb. axial pull test).

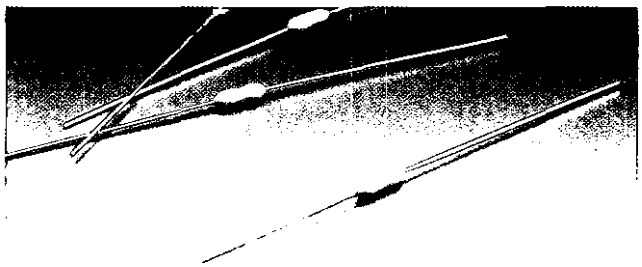
PACKAGING SPECIFICATIONS: Tape and Reel per EIA-296; T1: 2.062" (52.4mm) taped spacing; 5,000 per reel.
Option: Radial Lead Version; 0.4" lead spacing; to order, change 251 to 252.

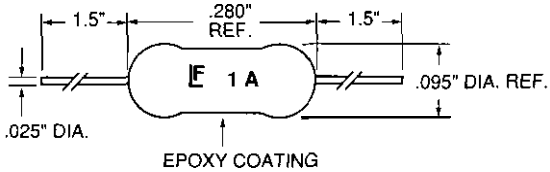
PATENTED

ORDERING INFORMATION:

Std. Type Catalog Number	Mil. Type Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² sec.
R251.125	R253.125	1/8	125	1.00	0.000113
R251.250	R253.250	1/4	125	0.665	0.00174
R251.375	R253.375	3/8	125	0.395	0.0116
R251.500	R253.500	1/2	125	0.280	0.0296
R251.750	R253.750	3/4	125	0.175	0.0598
R251 00,	R253 001	1	125	0.128	0.153
R251 01.5	R253 01.5	1½	125	0.0823	0.256
R251 002	A253002	2	125	0.0473	0.587
R251 02.5		2½	125	0.0360	0.405
R251 003	R253003	3	125	0.0290	0.72,
R251 03.5		3½	125	0.0240	1.19
R251 004	R253004	5	125	0.0204	1.58
R251 005	R253 005	7	125	0.0155	2.45
R251 007	R253007		125	0.0105	4.14
A251010	R253 010	10	125	0.00705	10.4
R251 012		12	32	0.0055	25.5
R251 015	R253 015	15	32	0.00446	45.2

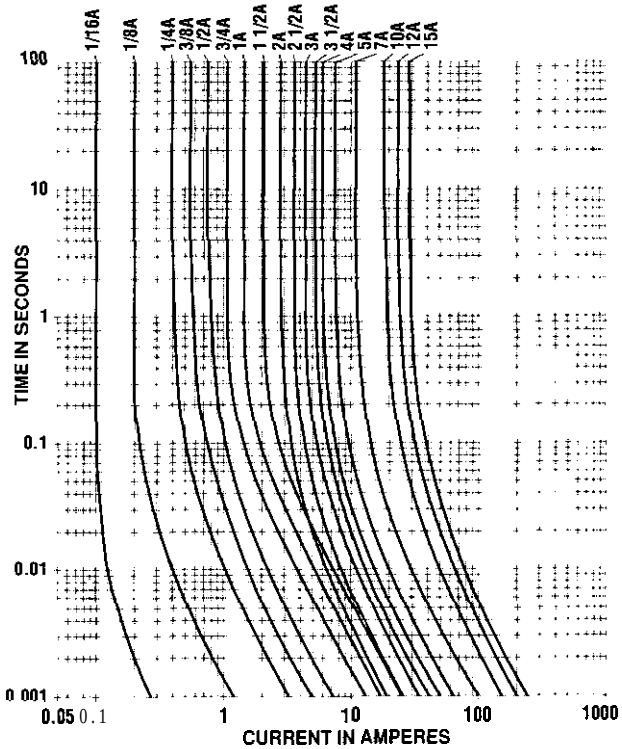
Note: Higher Ampere Ratings Available.
Contact Technical Assistance for Details





NOTE: .025" diameter for 1/16–10A, .032" diameter for 12–15A.

Average Time Current Curves



SUBMINIATURE

PICO® II 250 Volt Very Fast-Acting Type Fuse

The PICO® II 250 Volt Fuse is a specially designed axial leaded fuse that achieves a 250 volt rating in a small package.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second, Maximum
300%	0.1 second, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29662.

INTERRUPTING RATING:
50 **amperes** at **250** VAC.

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to **125°C.**
Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (10–55 Hz); MIL-STD-202, Method 204. Test Condition C (55–2000 Hz at 10 G's Peak).
Salt Spray: MIL-STD-202, Method 101, Test Condition B (48 hrs.).
Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A (10,000 ohms minimum at 100 volts).
Resistance to Soldering Heat: MIL-STD-202, Method 210, Test Condition C (10 sec at 260°C).
Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-55°C to 125°C).
Moisture Resistance: MIL-STD-202, Method 106.

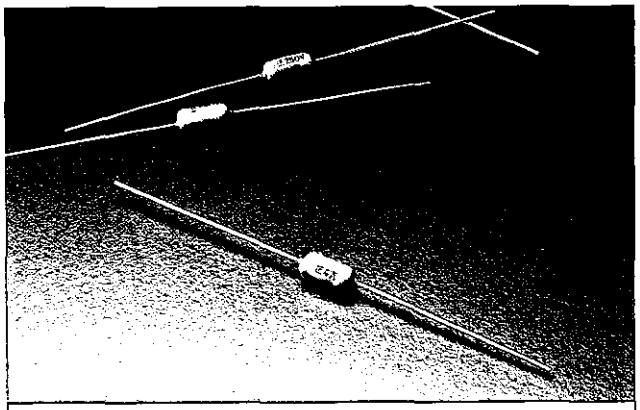
PHYSICAL SPECIFICATIONS:
Materials: Encapsulated, Epoxy-Coated Body; Solder Coated Copper Leads.
Soldering Parameters:
Wave Solder- 260°C, 10 seconds maximum.
Solderability: MIL-STD-202, Method 208.
Lead Pull Force: MIL-STD-202, Method 211, Test Condition A (will withstand 7 lb. axial pull test).

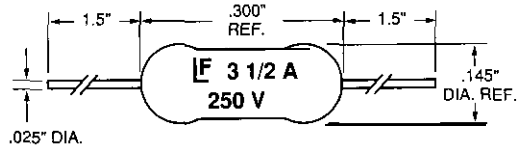
PACKAGING SPECIFICATIONS: Tape and Reel per EIA-296; T1: 2.062" (52.4mm) taped spacing; 4,000 per reel.

PATENTED

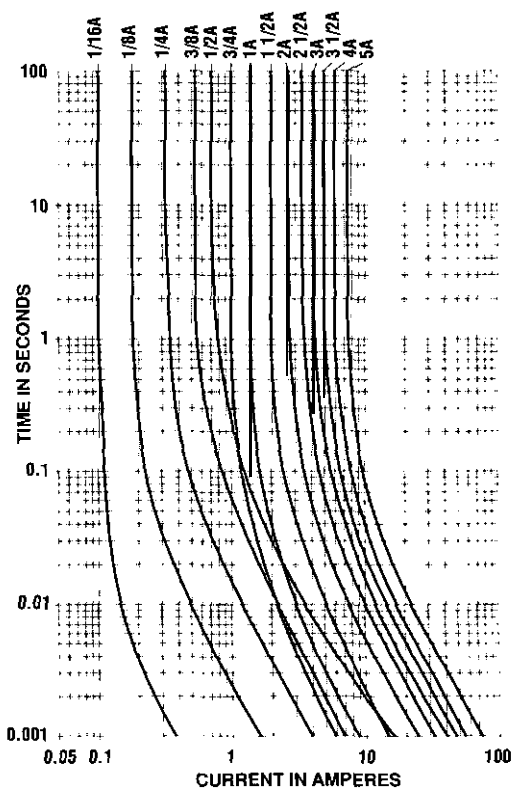
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
263.062	1/16	250	5.50	0.000192
263.125	1/8	250	1.75	0.00251
263.250	1/4	250	1.2	0.0165
263.375	3/8	250	0.630	0.0444
263.500	1/2	250	0.430	0.1125
263.750	3/4	250	0.300	0.0411
263001	1	250	0.210	0.067
26301.5	1½	250	0.0560	0.398
263 002	2	250	0.0420	0.74
263 02.5	2½	250	0.0335	1.197
263003	3	250	0.0280	1.77
263 03.5	3½	250	0.0238	2.33
263004	4	250	0.0210	3.06
263 005	5	250	0.0180	5.55





Average Time Current Curves



SUBMINIATURE

PICO® II Time Lag Type Fuse 471 Series

- The PICO® II time-lag fuse is designed for applications that require moderate inrush withstand.
- For additional inrush withstand, consult the 473 Series.

ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Opening Time
100%	4 h&Minimum
200%	120 seconds, Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Approved by MITI from 1 through 5 amperes.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:
50 amperes at 125 VAC and VDC.

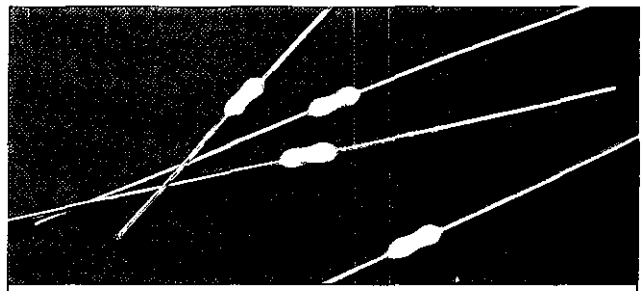
ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to **125°C.**
Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (10–55 Hz); Method 204, Test Condition C (55-2000 Hz at 10 G's Peak).
Moisture Resistance: MIL-STD-202, Method 106.

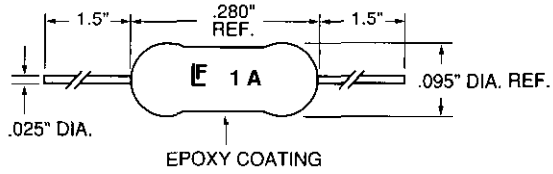
PHYSICAL SPECIFICATIONS:
Materials: Encapsulated, Epoxy-Coated Body; Solder Coated Copper Wire Leads.
Flammability Rating: UL 94V0
Soldering Parameters:
Wave Solder — 260°C, 10 seconds maximum.
Solderability: MIL-STD-202, Method 208.
Lead Pull Force: MIL-STD-202, Method 211, Test Condition A (will withstand a 7 lb. axial pull test).

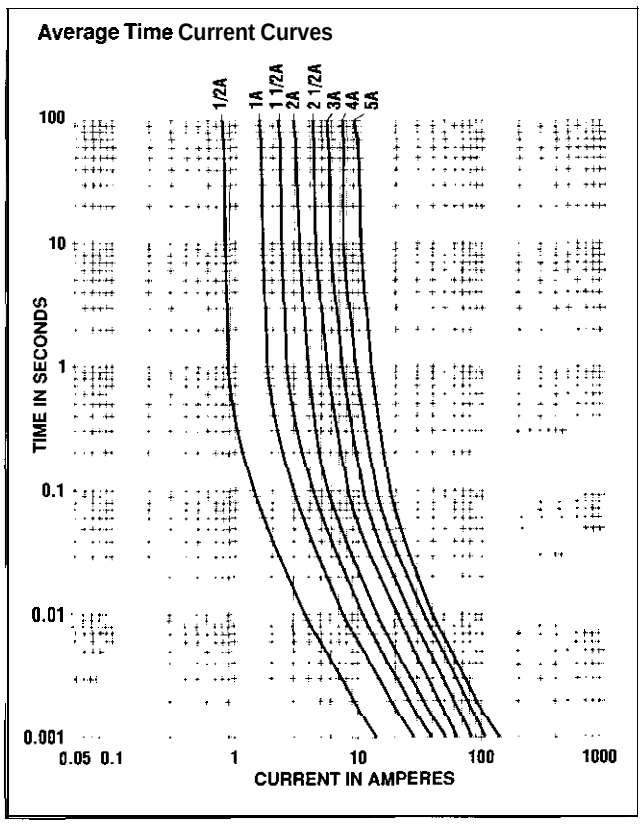
PACKAGING SPECIFICATIONS: Tape and Reel per EIA-296; 5,000 per reel.

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
0471.500	1/2	125	0.189	0.159
0471001.	1	125	0.085	0.722
0471 01.5	1½	125	0.054	1.810
0471002.	2	125	0.039	2.500
0471 02.5	2½	125	0.030	4.390
0471 003.	3	125	0.023	6.960
0471 004.	4	125	0.012	10.600
0471005.	5	125	0.008	15.400







SUBMINIATURE

PICO® II Slo-Blo® Type Fuse

The PICO® II Slo-Blo® fuse combines time delay performance characteristics with the proven reliability of a PICO® fuse.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	1 second. Min.; 60 seconds, Max.
300%	0.2 second. Min.: 3 seconds, Max.
800%	0.02 second, Min.; 0.1 second, Max.

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. Approved by MITI from 1 through 5 amperes.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATING:
50 amperes at 125 VDC/VAC

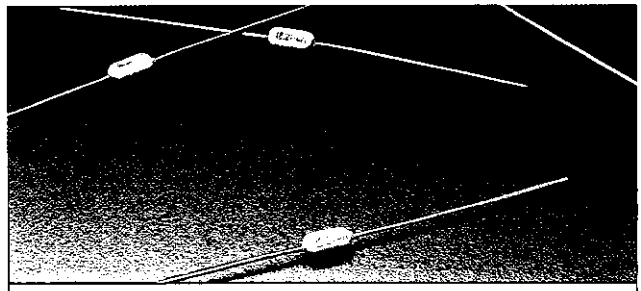
ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 125°C.
Shock: MIL-STD.202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (IO-55 Hz); MIL-STD.202, Method 204, Test Condition C (55-2000 Hz at 10 G's Peak).
Salt Spray: MIL-STD-202, Method 101, Test Condition B.
Insulation Resistance (After Opening): MIL-STD-202, Method 302, (10,000 ohms minimum at 100 volts).
Resistance to Soldering Heat: MIL-STD-202, Method 210, Test Condition C (20 sec at 260°C).
Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65°C to 125°C).
Moisture Resistance: MIL-STD-202, Method 106 (QO-98% RH), Heat (65°C).

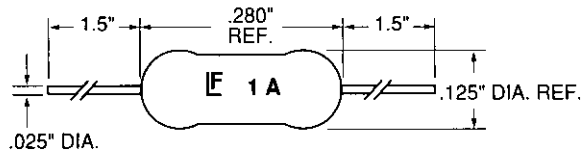
PHYSICAL SPECIFICATIONS:
Materials: Encapsulated, Epoxy-Coated Body; Solder Coated Copper Wire Leads.
Soldering Parameters:
Wave Solder — 260°C, 3 seconds maximum.
Solderability: MIL-STD-202, Method 208.
Lead Pull Force: MIL-STD-202, Method 211, Test Condition A (will withstand a 10 lb. axial pull test).
PACKAGING SPECIFICATIONS: Tape and Reel per EIA-296; T1 : 2.062" (52.4mm) taped spacing; 4,000 per reel.

PATENTED

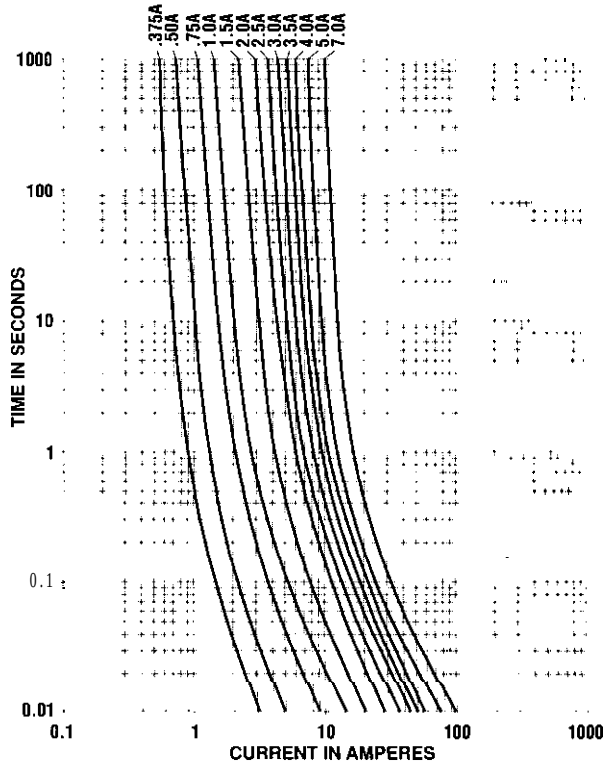
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
473.375	3/8	125	1.74	0.0650
473.500	1/2	125	1.13	0.210
473.750	314	125	0.460	0.760
473001	1	125	0.267	2.01
47301.5	1½	125	0.116	3.94
473002	2	125	0.0712	7.60
473 2.25	2¼	125	0.0630	9.28
473 02.5	2½	125	0.0520	13.0
473003	3	125	0.0360	21.0
473 03.5	3½	125	0.0240	26.6
473004	4	125	0.0194	35.0
473 005	5	125	0.0133	54.8
473 007	7	125	0.0092	105.0





Average Time Current Curves



HIGH-RELIABILITY SUBMINIATURE

PICO® Fuse Very Fast-Acting Type Fuse

QPL

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
100%	1/16–15	4 hours, Minimum
	1/16–7	1 second. Maximum
200%	10	3 seconds. Maximum
	15	10 seconds. Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

FUSES TO MIL SPEC: 265 Series (except 1116 ampere rating) is available in Military QPL Type (FM08A), conforming to MIL-PRF-23419/8. To order, change 265 to 267.

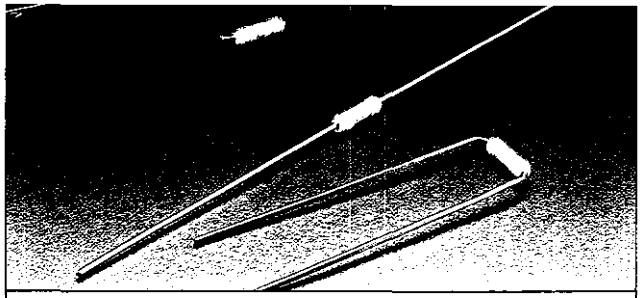
INTERRUPTING RATINGS:
300 amperes at rated voltage VDC
50 amperes at rated voltage VAC

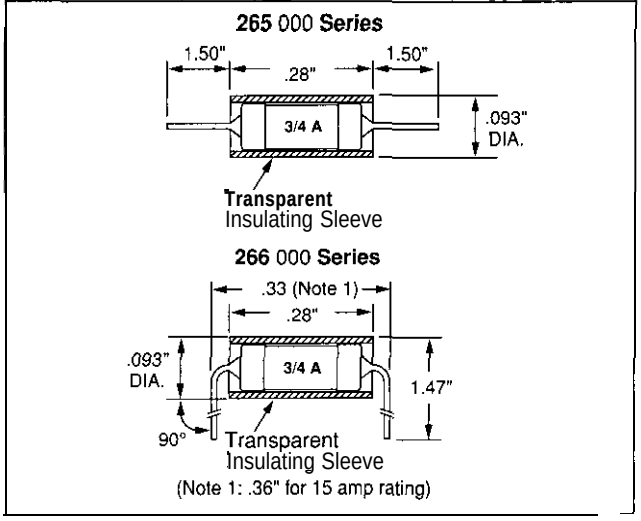
ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 125°C.
Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (10–55 Hz); MIL-STD-202, Method 204, Test Condition C (552000 Hz at 10 G's Peak).
Salt Spray: MIL-STD-202, Method 101, Test Condition B.
Seal Test: MIL-STD-202, Method 112, Test Condition A.
Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A (1/2 Megohm minimum).
Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65°C to 125°C).
Moisture Resistance: MIL-STD-202, Method 106.

PHYSICAL SPECIFICATIONS:
Materials: Gold-Plated Copper Leads, Type II
Weight: .32 Grams
Solderability: MIL-STD-202, Method 208.
Lead Pull Force: MIL-STD-202, Method 211, Test Condition A (will withstand a 5 lb. axial pull test).
AQL (Electrical Characteristics): Certified to 1% AQL.
Sampling: Per MIL-STD-105, Inspection Level II.
Traceability and Identification Records: Controlled by lot number and retained on file for a minimum of three years. Copies of Lot Certification Test data available when requested with order.

OPTIONS: Special screening tests, burn-in, etc. can be supplied on special order to meet specific requirements. For information on higher current ratings, contact Littelfuse.

PATENTED





ORDERING INFORMATION:

Axial Lead Catalog Number	Radial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms
265.062	266.062	1/16	125	7.0
265.125	266.125	1/8	125	2.1
266.250	266.250	1/4	125	0.71
265.375	266.375	3/8	125	0.42
265.500	266.500	1/2	125	0.26
265.750	266.750	314	125	0.17
265001	266001	1	125	0.125
265 01.5	266 01.5	1½	125	0.08
265002	266002	2	125	0.055
265 02.5	266 02.5	2½	125	0.042
265003	266003	3	125	0.03515
265004	266004	4	125	0.023
265005	266005	5	125	0.014
265007	266007	7	125	0.01
265010	266010	10	125	0.00645
265 015	266015	15	32	0.004

Please contact Littelfuse for Average Time Current Curve.

HIGH-RELIABILITY SUBMINIATURE

MICRO'" FUSE Very Fast-Acting Type

QPL

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
100%	1/500–5	4 hours, Minimum
200%	1/500–3/10	5 seconds. Maximum
	4/10–5	2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

FUSES TO MIL SPEC: 262 **Series** is available in Military QPL Type (FM07A), conforming to MIL-PRF-2341917. To order, change 262 to 269.

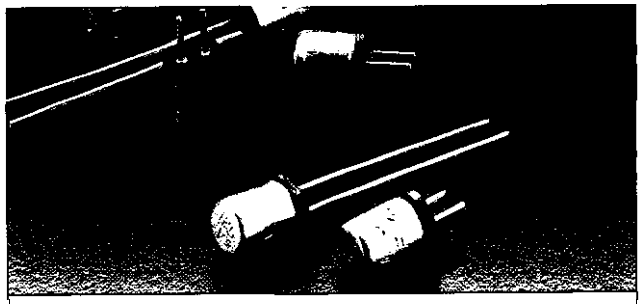
INTERRUPTING RATING:
10,000 amperes at 125 VACNDC

ENVIRONMENTAL SPECIFICATIONS:
Operating Temperature: -55°C to 125°C.
Shock: **(11500):** MIL-STD-202, Method 213, Test Condition A (50 G's peak for 11 milliseconds).
(l/200-5): MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (IO-55 Hz); MIL-STD.202, Method 204, Test Condition C (55-2000 Hz at 10 G's Peak).
Salt Spray: MIL-STD-202, Method 101, Test Condition B.
Seal Test: MIL-STD-202, Method 112, Test Condition A
Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition A (1/2 Megohm minimum).
Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65°C to 125°C).
Moisture Resistance: MIL-STD-202, Method 106

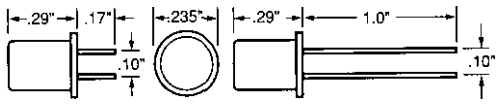
PHYSICAL SPECIFICATIONS:
Materials: Gold-Plated Copper Leads, Type II (Fuse cap is also Gold-Plated).
Weight: 262 and 269 Series .36 **Grams;** 268 Series .48 Grams.
Lead Pull Force: MIL-STD-202, Method 211, Test Condition A (will withstand a 5 lb. axial pull test).
AQL (Electrical Characteristics): Certified to 1% AQL.
Sampling: Per MIL-STD-105, Inspection Level II.
Traceability and Identification Records: Controlled by lot number and retained on file for a minimum of three years. Copies of Lot Certification Test data available when requested with order.

OPTIONS: Special screening tests, burn-in, etc. can be supplied on special order to meet specific requirements.

PATENTED



262 000 Series 266 **000 Series**



ORDERING INFORMATION:

Plug-In Catalog Number	Radial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms
262.002	258.002	1,500	125	2000
262.005	268.005	1,200	125	260
262.010	268.010	1/100	125	94.0
262.015	266.015	1/64	125	44.0
262.031	266.031	1/32	125	16.45
262.050	266.050	1/20	125	3.20
262.062	268.062	1/16	125	2.25
262.100	266.100	1/10	125	1.17
262.125	266.125	1/8	125	1.0
262.200	266.200	2/10	125	2.30
262.250	266.250	1/4	125	1.75
262.300	266.300	3/10	125	1.25
262.400	266.400	4/10	125	0.227
262.500	266.500	1/2	125	0.167
262.600	268.600	6/10	125	0.140
262.700	266.700	7/10	125	0.114
262.750	266.750	3/4	125	0.104
262.600	266.800	8/10	125	0.094
262 001	266 001	1	125	0.100
262 01.5	26601.5	1½	125	0.063
262 002	268 002	2	125	0.046
262 003	268 003	3	125	0.034
262 004	268 004	4	125	0.019
262 005	268 005	5	125	0.018

Please contact Littelfuse for Average Time Current Curve.

SUBMINIATURE

MICRO™ FUSE Very Fast-Acting Type

QPL

Developed originally for the U.S. Space Program, MICRO fuse provides reliability in an extra compact design. The MICRO fuse is available in plug in or radial lead styles and a complete range of ampere ratings from 11500 to 5 amperes to suit a wide variety of design needs.

ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Ampere Rating	Opening Time
100%	1/500–5	4 hours, Minimum
200%	1/500–3/10	5 seconds. Maximum
	4/10–5	2 seconds, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862,

INTERRUPTING RATING:
10,000 amperes at 125 VAC/VDC.

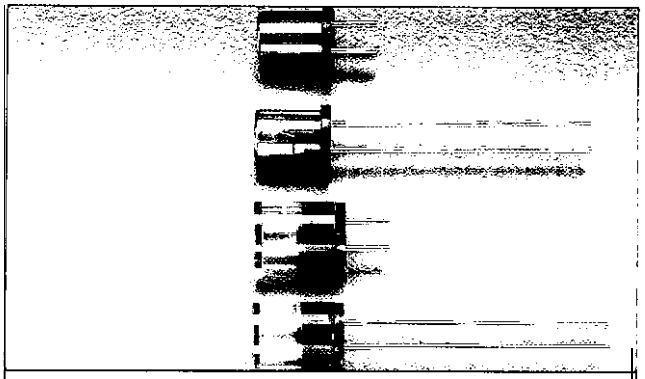
FUSES TO MIL SPEC: 273 Series is available in Military QPL type (FM02). To order, change 273 to 274.

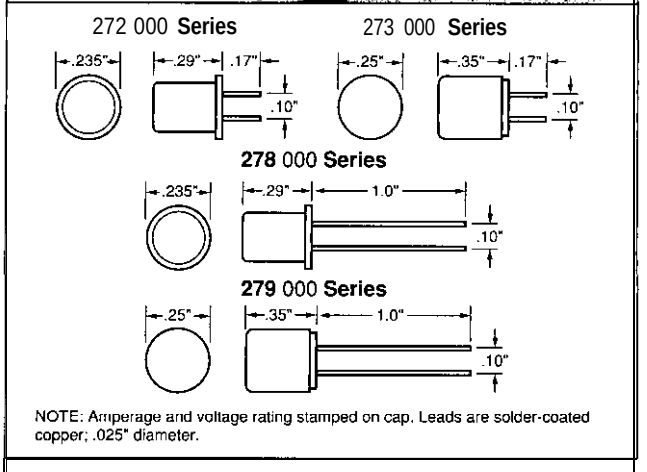
Operating Temperature:
273 and 279: -55°C to 85°C.
272 and 278: -55°C to 125°C

PATENTED

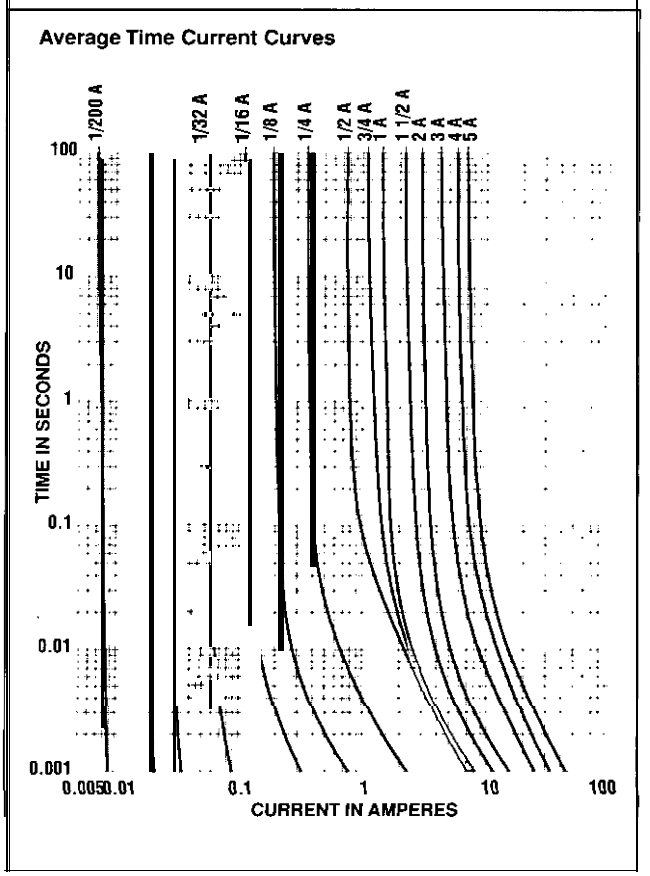
ORDERING INFORMATION:

Plug-In Catalog Number	Plug-In Catalog Number	Radial Lead Catalog Number	Radial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
272.002	273.002	278.002	279.002	1/500	125	2200	0.00000000845
272.005	273.005	278.005	279.005	1/200	125	280	0.0000000810
272.010	273.010	278.010	279.010	1/100	125	80.0	0.000000462
272.015	273.015	278.015	279.015	1/64	125	44.0	0.00000123
272.031	273.031	278.031	279.031	1/32	125	16.0	0.00000810
272.050	273.050	278.050	279.050	1/20	125	3.20	0.0000666
272.062	273.062	278.062	279.062	1/16	125	2.32	0.000115
272.100	273.100	278.100	279.100	1/10	125	1.25	0.000385
272.125	273.125	278.125	279.125	1/8	125	1.0	0.000691
272.200	273.200	278.200	279.200	2/10	125	2.30	0.00409
272.250	273.250	278.250	279.250	1/4	125	1.75	0.00640
272.300	273.300	278.300	279.300	3/10	125	1.25	0.00945
272.400	273.400	278.400	279.400	4/10	125	0.227	0.0251
272.500	273.500	278.500	279.500	1/2	125	0.167	0.0716
272.600	273.600	278.600	279.600	6/10	125	0.430	0.0411
272.700	273.700	278.700	279.700	7/10	125	0.324	0.0710
272.750	273.750	278.750	279.750	3/4	125	0.293	0.0900
272.800	273.800	278.800	279.800	8/10	125	0.271	0.113
272 001	273 001	278 001	279 001	1	125	0.0880	0.0648
272 01.5	273 01.5	278 01.5	279 01.5	1½	125	0.0578	0.160
272 002	273 002	278 002	279 002	2	125	0.0425	0.300
272 003	273 003	278 003	279 003	3	125	0.0275	0.759
272 004	273 004	278 004	279 004	4	125	0.0202	1.38
272 005	273 005	278 005	279 005	5	125	0.0156	2.21





NOTE: Amperage and voltage rating stamped on cap. Leads are solder-coated copper; .025" diameter.



SUBMINIATURE GLASS BODY

2AG Fast-Acting Type

The 2AG Fast-Acting fuses are available in cartridge form or with axial leads. Axial leaded fuses are board washable. ZAG fuses provide the same performance characteristics as their 3AG counterpart, while occupying one-third the space. Sleeved fuses are available.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	4 hours. Minimum
135%	1 hour, Maximum
200%	1 second, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA. 224 Series approved by MITI from 1 through 5 amperes.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29662.

FUSES TO MIL SPEC: 224 and 225 Series 1/8 through 7 amperes are available to DESC Drawing #87108. To order, change 224 to 269 or 225 to 286.

INTERRUPTING RATINGS:

0.1–10A	10,000 amperes at 125 VAC
0.1–1A	35 amperes at 250 VAC
1.5–3.5A	100 amperes at 250 VAC

OPTIONS: 224 **Series** available on tape and reel.

PACKAGING SPECIFICATIONS: Tape and Reel per EIA-296; T1 : 52.4mm (2.062") taped spacing; For 1,500 per reel, 10mm (.40") spacing, add packaging suffix, DRT1. For 2,500 per reel, 5mm (.20") spacing, add packaging suffix, ERT1.

PATENTED

ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
225.100	224.100	1/10	250	6.15	0.000750
225.125	224.125	1/8	250	3.90	0.00286
225.250	224.250	1/4	250	1.15	0.0300
225.375	224.375	3/8	250	0.395	0.171
225.500	224.500	1/2	250	0.265	0.365
225.750	224.750	3/4	250	0.152	1.05
225001	224001	1	250	0.102	2.22
225 01.5	22401.5	1½	250	0.0705	0.800
225002	224002	2	250	0.0490	1.50
22502.5	224 02.5	2½	250	0.0365	2.68
225003	224003	3½	250	0.0310	4.62
225 03.5	224 03.5	4	250	0.0258	6.70
225004	224004	5	125	0.0233	9.40
225005	224005		125	0.0179	17.00
225006	224006	6	125	0.0147	22.1
		7			40.0
225 008	224008	8	125	0.0100	56.0
225010	224010	10	125	0.00675	116.0

2AG Special 350V
Fast-Acting Type

The 220 007 subminiature fuse is intended for fluorescent lighting ballast protection or similar applications up to 350V.

AXIAL LEAD PART NUMBER: 220 007 (ampere rating of 3A)

DIMENSIONS: Same as 224 Series.

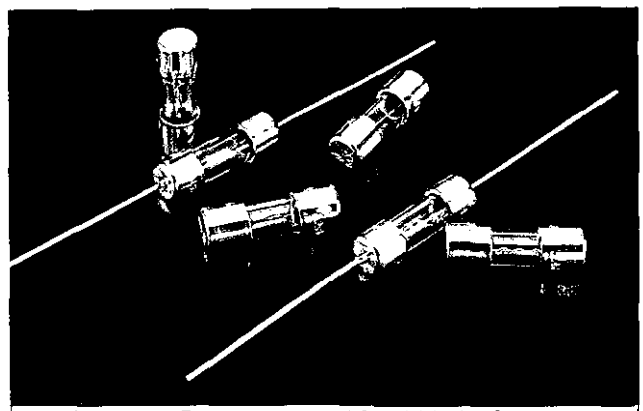
ELECTRICAL CHARACTERISTICS: Same as 224 **Series.**

INTERRUPTING RATING: 100 amperes at 350 VAC.

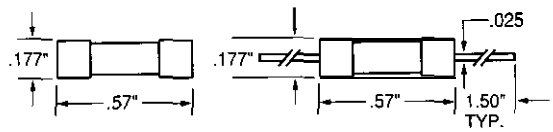
PATENTED

Contact Littelfuse concerning other ampere ratings.

MIL

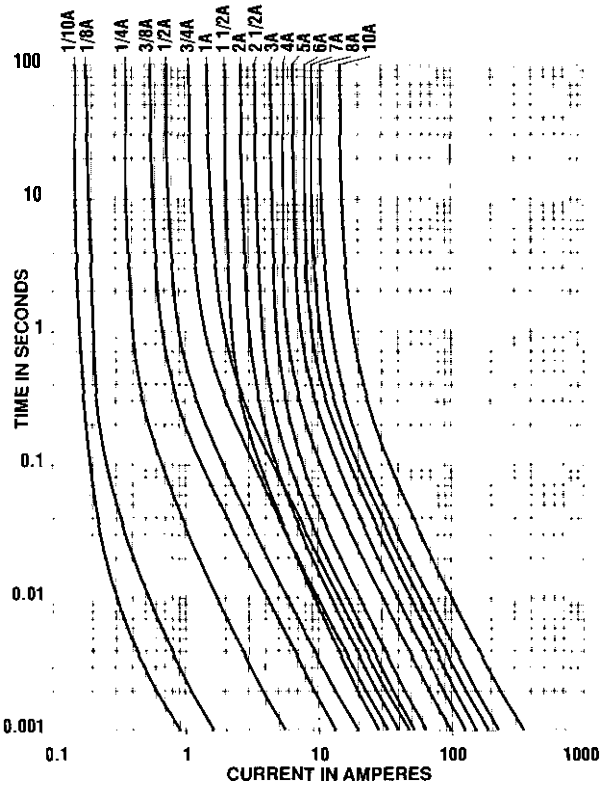


225 000 Series 224 000 Series



Axial Lead Material: Solder coated copper.

Average Time Current Curves



SUBMINIATURE GLASS BODY

2AG Slo-Blo® Type Fuse

Ⓤ Ⓒ MIL

The 2AG Slo-Blo® fuses are available in cartridge form or with axial leads. Axial leaded fuses are board washable. 2AG fuses provide the same performance characteristics as their 3AG counterpart, while occupying one-third the space. Sleeved fuses are available.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	4 hours, Minimum
135%	1 hour, Maximum.
200%	3 seconds, Minimum
	20 seconds, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA through 3.5 amperes. Recognized under the Components Program of Underwriters Laboratories from 4 through 7 amperes. 229 004 and 229 005 approved by MITI. 230 001 through 230 005 approved by MITI.

AGENCY FILE NUMBERS: UL E10480. CSA LR 29862.

FUSES TO MIL SPEC: 229 and 230 Series are available to DESC Drawing #87108. To order, change 229 to 290 or 230 to 291.

INTERRUPTING RATINGS:

0.25–3.5A	10,000 amperes at 125VAC
4–7A	400 amperes at 125VAC
0.25–1A	35 amperes at 250VAC
1.25–3.5A	100 amperes at 250VAC

OPTIONS: 230 Series available on tape and reel.

PACKAGING SPECIFICATIONS: Tape and Reel par EIA-296; T1: 52.4mm (2.062") taped spacing; For 1,500 par reel, 10mm (.40") spacing, add packaging suffix, DRT1. For 2,500 per reel, 5mm (.20") spacing, add packaging suffix, ERT1

ENVIRONMENTAL SPECIFICATIONS:

Operating Temperature: -55°C to 125°C.

Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).

Vibration: MIL-STD-202, Method 201 (10–55 Hz, 0.06 inches total excursion).

Salt Spray: MIL-STD.202 Method 101, Test Condition B (48 hours).

Insulation Resistance (After Opening): MIL-STD-202, Method 302, Test Condition B.

Resistance to Soldering Heat: (Axial Leaded Fuses): MIL-STD-202, Method 210A. Test Condition B (260°C. 3 Seconds).

Thermal Shock: MIL-STD-202, Method 107, Test Condition B (-65°C to 125°C).

Moisture Resistance: MIL-STD-202, Method 106 (90-98% RH, 65°C).

PEAK WITHSTAND CURRENT (Ip): These fuses will withstand 50 repetitions of a double exponential impulse wave having peak currents (Ip) and peak voltages as listed.

PHYSICAL SPECIFICATIONS:

Materials: Glass Body, Nickel-Plated Brass Fuse Caps. (Insulating sleeve option available).

Soldering parameters:

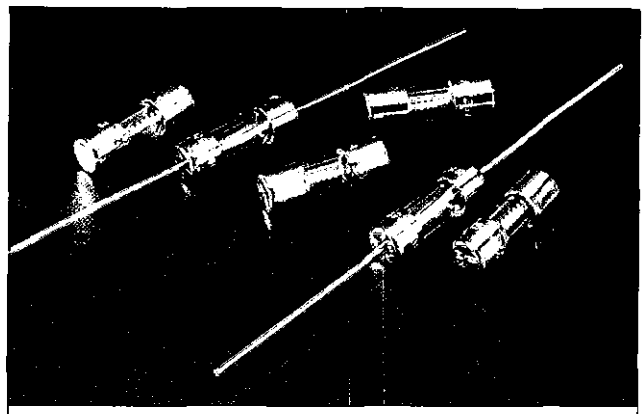
Wave solder — 500°F (260°C), 3 seconds Max.

Reflow solder — Not recommended.

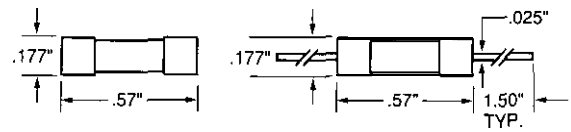
Solderability: (Axial Leaded Fuses): MIL-STD-202, Method 208.

PACKAGING SPECIFICATIONS: Tape and Reel par EIA-296; T1: 52.4mm (2.062") taped spacing; For 1,500 par reel, 10mm (.40") spacing, add packaging suffix, DRT1. For 2,500 par reel, 5mm (.20") spacing, add packaging suffix, ERT1. Insulating sleeve option available.

NOTE: LF logo. series number, amperage rating, voltage rating and UL and CSA logos are stamped on the fuse caps.



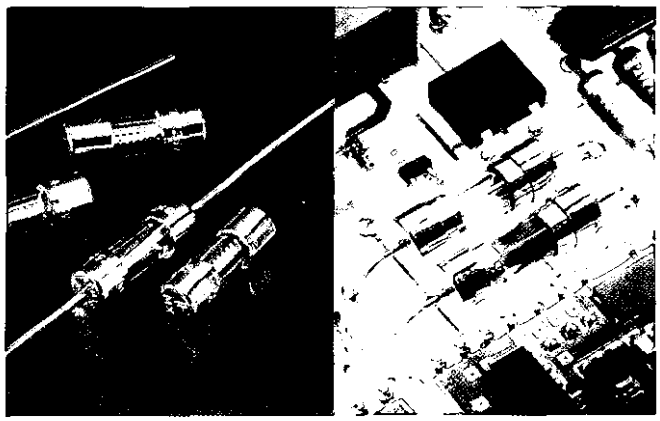
229 000 Series 230 000 **Series**



Axial Lead Material: Solder coated copper.

2AG Indicating Slo-Blo® Type Fuse

The 2AG Indicating Slo-Blo® fuse instantly identifies itself upon opening by showing a discoloration of its glass body. Guesswork and time consuming circuit testing are eliminated. This unique design offers the same quality performance characteristics as the standard 2AG fuse design.



*When ordering the 2AG Indicating Sk-Blo Type Fuse, an 'S is required after the catalog number.

Example:

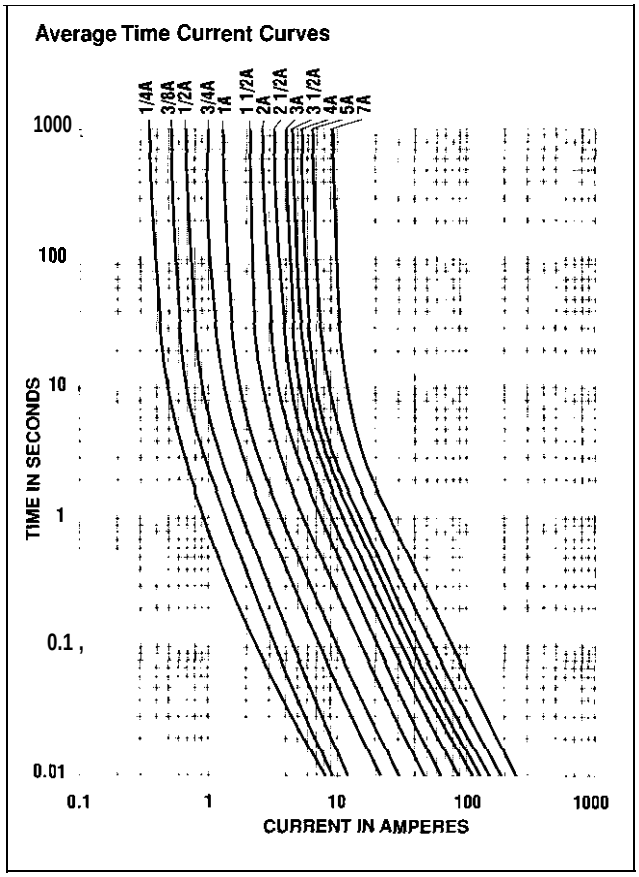
-IA Indicating Slo-Blo® = 230 001S

SUBMINIATURE GLASS BODY

2AG Slo-Blo® Type

PATENTED
ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I^2t A^2 Sec.
229.250	230.250	1/4	250	2.41	0.216
229.350	230.350	.350	250	1.30	0.490
229.375	230.375	3/8	250		0.580
229.500	230.500	1/2	250	0.688	1.16
				0.477	1.75
229.750	230.750	(3/4)	250	0.340	2.95
229.800	230.800	8/10	250	0.304	3.45
229 001	230 001	1	250		5.64
229 1.25	230 1.25	1¼	250	0.145	9.60
229 01.5	230 01.5	1½	250	0.107	15.0
229 002	230002	2	250	0.0692	30.0
229 2.25	230 2.25	2¼	250	0.0562	39.0
229 02.5	230 02.5	2½	250	0.0496	50.0
223 003	230 003	3	250	0.0380	77.0
229 03.5	230 03.5	3½	250	0.0310	110.0
229 004	230 004	5	125	0.0256	148.0
229 005	230 005		125	0.0185	267.0
		6		0.0140	380.0
229 007	230 007	7	125	0.0115	464.0



2AG Surge Withstand Specifications

ZAG Surge Withstand Fuse combines conventional overcurrent protection with the ability to withstand high current, short duration pulses. These fuses comply with the short circuit requirements of UL 1459 for telephone equipment. Insulating Sleeve Option available.

ELECTRICAL CHARACTERISTICS:

Short Circuit Capabilities:

UL 1459 / UL 1950 3rd Edt.: 40A, 600VAC
7A, 600VAC
2.2A, 600VAC

- **Meets UL 497** Specifications

% of Ampere Rating	Opening Time
110%	4 hours, **Minimum**
135%	1 hour, **Maximum**
200%	3 seconds, **Minimum**; 20 seconds, **Maximum**

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

INTERRUPTING RATINGS:

1/4–1¼A 10,000 amperes at 125VAC
1/4–1A 35 **amperes at 250VAC**
1¼A 100 **amperes at 250VAC**

Amperage Rating	10 x 160 microsec. 1500V	10 x 560 microsec. 800V	10x1000 microsec. 1000V
1/4	23.0A	16.6A	12.4A
351100	34.0A	25.8A	19.3A
3/8	40.0A	25.4A	19.0A
1/2	60.0A	37.7A	28.2A
6/10	71.0A	47.2A	35.3A
3/4	91.0A	65.5A	49.0A
8/10	104.0A	68.9A	51.6A
1	130.0A	88.6A	66.3A
1¼	162.0A	118.1A	100.0A

[1] 500A peak, 2500V, 2 x 10 microseconds, 20 repetitions.

2AG Special Surge Withstand Slo-Blo® Type

AXIAL LEAD PART NUMBER: 220 003 (0.35A)
ELECTRICAL CHARACTERISTICS:

Amperes	Opening Time
0.35A	4 hours, Minimum
0.6A	90 seconds, Maximum
2.0A	2 seconds, Maximum
6.0A	0.5 second, Maximum

INTERRUPTING RATINGS: Same as 230 Series.
LIGHTNING SURGE WITHSTAND CAPABILITY: 25 amperes peak, 800V, 10 x 560 microseconds.
PATENTED

GLASS BODY

3AG Fast-Acting Type

Ⓤ Ⓢ QPL

A standard for cost-effective reliability and performance in circuit protection, the 3AG fuse satisfies a broad range of application requirements.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
110%	1/32–35	4 hours, Minimum
135%	1/32–35	1 hour, Maximum
200%	1/32–10	5 sec., Maximum
	12–30	10 sec., Maximum
	35	20 sec., Maximum

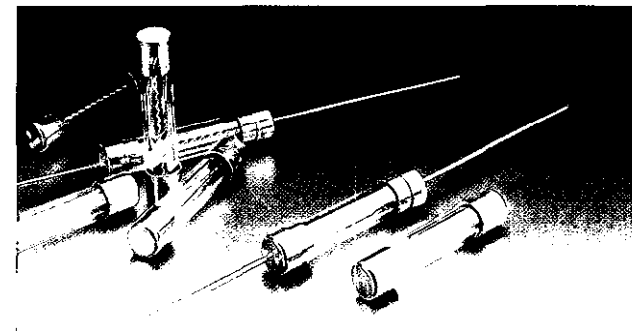
AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA through 30 amperes. 1/100–10 amperes listed to UL 248-14 (UL 198-G) 12-30 amperes listed to UL 275.

AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

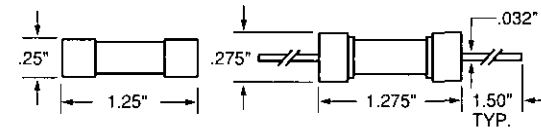
FUSES TO MIL SPEC: See F02A cartridge type in Military Section.

ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² sec.
312.031	316.031	1/32	250	23.3	* 0.0000300
312.062	316.062	1/16	250	24.5	0.000249
312.100	318.100	1/10	250	11.2	0.00102
312.125	318.125	1/8	250	7.10	0.00289
312.150	316.150	151100	250	5.10	0.00550
312.175	316.175	.175	250	3.65	0.00960
312.187	316.187	3/16	250	3.40	0.0128
312.200	316.200	2/10	250	3.00	0.0165
312.250	318.250	1/4	250	2.00	0.0355
312.300	318.300	3110	250	1.40	0.0689
312.375	316.375	3/8	250	0.820	0.165
312.500	316.500	1/2	250	0.495	0.463
312.600	316.600	6/10	250	0.360	0.660
312.750	318.750	3/4	250	0.243	1.84
312 001	316001	1	250	0.189	0.760
312 1.25	316 1.25	1¼	250	0.138	1.45
31201.5	31801.5	1½	250	0.103	2.35
31201.6	31601.6	1⅗	250	0.0930	2.60
312 1.75	318 1.75	1¾	250	0.0650	3.60
312 01.8	318 01.8	1⅘	250	0.0620	3.65
312 002	318 002	2	250	0.0700	5.20
312 2.25	318 2.25	2¼	250	0.0590	7.20
312 02.5	318 02.5	2½	250	0.0510	9.54
312003	316003	3	250	0.0424	14.0
312004	316004	4	250	0.0291	28.5
312005	318005	5	250	0.0223	50.0
312006	316006	6	250	0.0177	61.1
312 007	318 007	7	250	0.0145	118.0
312006	316006	8	250	0.0121	166.0
312010	316010	10	250	0.00925	298.0
312012	—	12	32	0.0071	—
312 015	—	15	32	0.0052	—
312020	—	20	32	0.0034	—
312025	—	25	32	0.0024	—
312030	—	30	32	0.0019	—
312035	—	35	32	0.0013	—

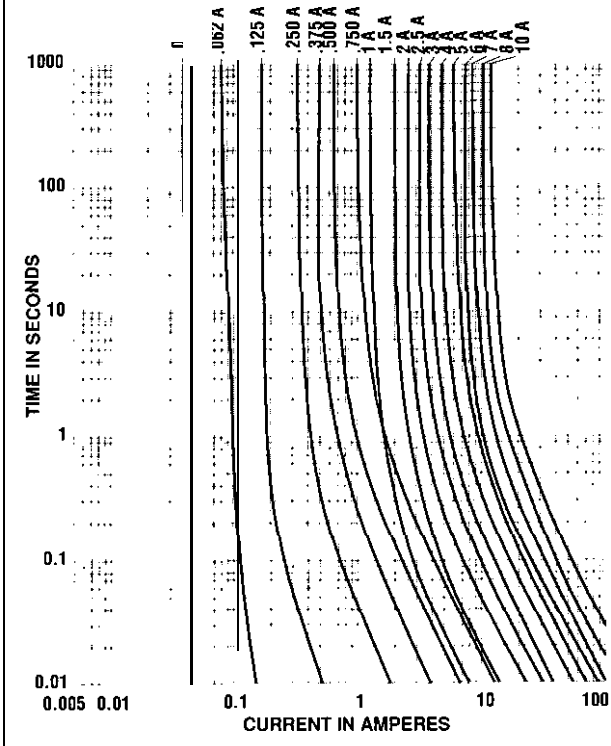


312 000 Series **318 000 Series**



Axial Lead Material: Solder coated copper.

Average Time Current Curves



GLASS BODY

3AG Slo-Blo® Type Fuse

A standard for cost-effective reliability and performance in circuit protection, the 3AG fuse satisfies a broad range Of application requirements.

ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Opening Time
110%	4 hours, Minimum
135%	1 hour. Maximum
200%	5 seconds, Minimum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA through 8 amperes. 313 000 Series approved by MITI from 1 through 5 amperes.

AGENCY FILE NUMBERS: UL E10460, CSA LR 29662.

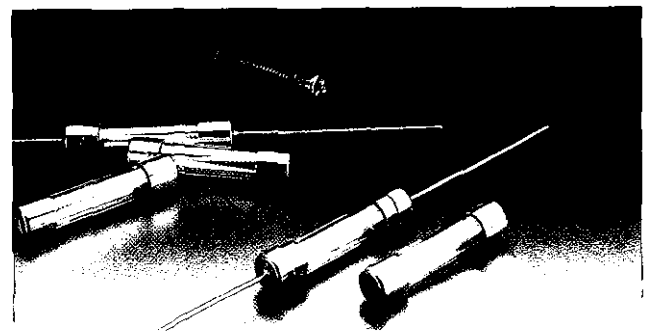
FUSES TO MIL SPEC: See F02B cartridge type in Military Section.

PATENTED

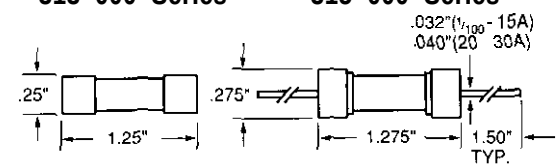
ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
313.010	315.010	1/100	250	3300	0.000121
313.031	315.03,	1132	250	330	0.00303
313.040	315.040	41100	250	220	0.00630
313.062	315.062	1116	250	91.0	0.0210
313.100	315.100	1/10	250	33.3	0.0850
313.125	315.125	118	250	22.3	0.152
313.150	315.150	15/100	250	15.3	0.270
313.175	315.175	,175	250	8.60	0.177
313.167	315.187	3/16	250	7.95	0.230
313.200	315.200	2/10	250	6.54	0.270
313.250	315.250	1/4	250	4.27	0.385
313.300	315.300	3/10	250	3.11	0.730
313.375	315.375	3/8	250	2.06	1.23
313.400	315.400	4/10	250	1.86	1.35
313.500'	315.500	1/2	250	1.25	2.55
313.600	315.600	6110	250	0.914	4.00
313.700	315.700	7110	250	0.695	5.90
313.750	315.750	3/4	250	0.617	7.16
313.600	315.800	8/10	250	0.550	8.00
313001'	315 001	1	2 5 0	0.375	14.0
31301.2	31501.2	1¼	250	0.276	21.5
313 1.25	315 1.25	1¼	250	0.256	24.0
31301.5		1½	250	0.190	38.0
313 01.6	31501.6	1⅝	250	0.170	49.6
313 01.8	315 01.8	1⅞	250	0.140	58.0
313002	315002	2	250	0.116	77.0
313 2.25	315 2.25	2¼	250	0.0960	121.0
313 02.5	315 02.5	2½	250	0.0805	130.0
313 02.8	315 02.8	2⅞	250	0.0670	170.0
313003	315 003	3	250	0.0588	200.0
313 03.2	315 03.2	3⅛	250	0.0525	209.0
313004	315004	4	250	0.0306	76.1
313005	315005	5	250	0.0212	140.0
313 6.25	315 6.25	6¼	250	0.0152	242.0
313 6.30	315 6.30	6.30	250	0.0152	242.0
313007	315007	7	250	0.0127	347.0
313006	315006	8	250	0.0110	445.0
313010	315010	10	32	0.00620	760.0
313012	315012	12	32	0.00640	1200.0
313015	315 015	15	32	0.00500	1670.0
313020	315020	20	32	0.00220	9560.0
313025	315026	25	32	0.00170	16500.0
313030	315030	30	32	0.00120	26900.0

'These ratings available with an indicating option. Add the 'ID designation lo the series number. i.e. 313.500 ID.

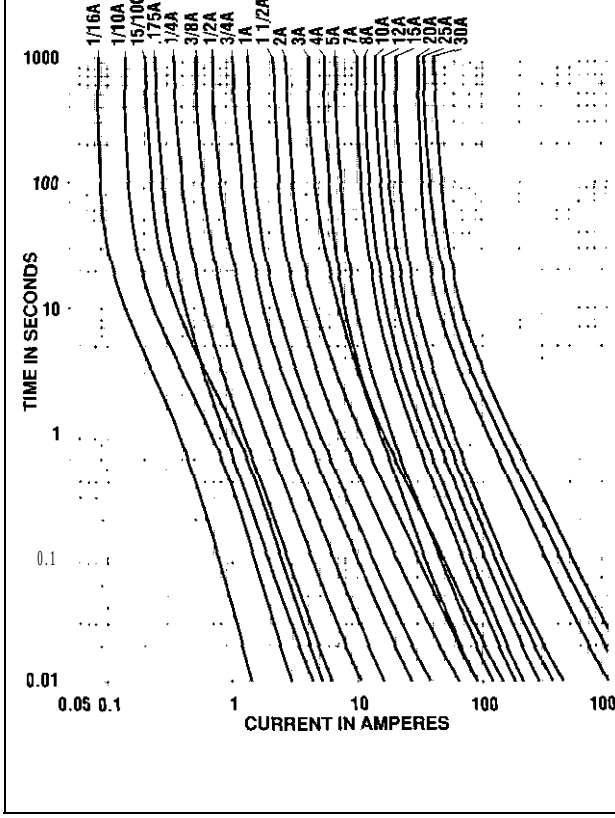


313 000 Series **315 000 Series**



Axial Lead Material: Solder coated copper.

Average Time Current Curves



CERAMIC BODY

3AB Fast-Acting Type

Ceramic body construction permits higher interrupting ratings and voltage ratings. Ideal for applications where high current loads are expected.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
100%	1/8–30	4 hours, Minimum
135%	1/8–30	1 hour, Maximum
200%	1/8–12	15 seconds, Maximum
	15–30	30 seconds. Maximum

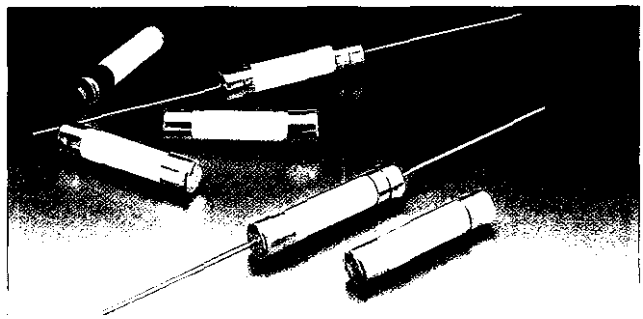
AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA through 15 amperes at 250 VAC/125 VDC. Recognized under the Components Program of Underwriters Laboratories from 20 through 30 amperes, 20 amperes at 250 VAC/125 VDC, 25 through 30 amperes at 125 VAC/VDC. Approved by MITI from 10 through 30 amperes.

AGENCY **FILE** NUMBERS: UL E10480, CSA LR 29862.

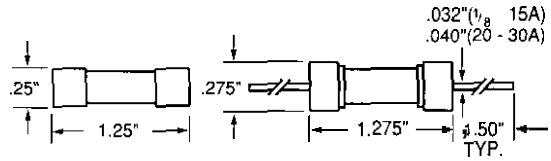
FUSES TO MIL SPEC: See F03A cartridge type in Military Section.

ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I^2t A² Sec.
314.125	324.125	1/8	250	6.20	0.00149
314.250	324.250	1/4	250	1.95	0.0140
314.375	324.375	3/8	250	0.820	0.050
314.500	324.500	1/2	250	0.500	0.115
314.750	324.750	3/4	250	0.250	0.466
314001	324001	2	250	0.189	0.690
314 002	324002	3	250	0.0700	11.0
314003	324003		250	0.0432	14.6
314004	324004	4	250	0.0470	10.4
314005	324005	5	250	0.0300	26.0
314 006	324006	6	250	0.0240	45.0
314007	324007	7	250	0.0187	71.0
314008	324008	8	250	0.0153	105.0
314010	324010	10	250	0.0105	206.0
314012	324012	12	250	0.00760	570.0
314015	324015	15	250	0.00505	292.0
314020	324020	20	250	0.00355	631.0
314025	324025	25	125	0.00235	1450.0
314030	324030	30	125	0.00182	2490.0

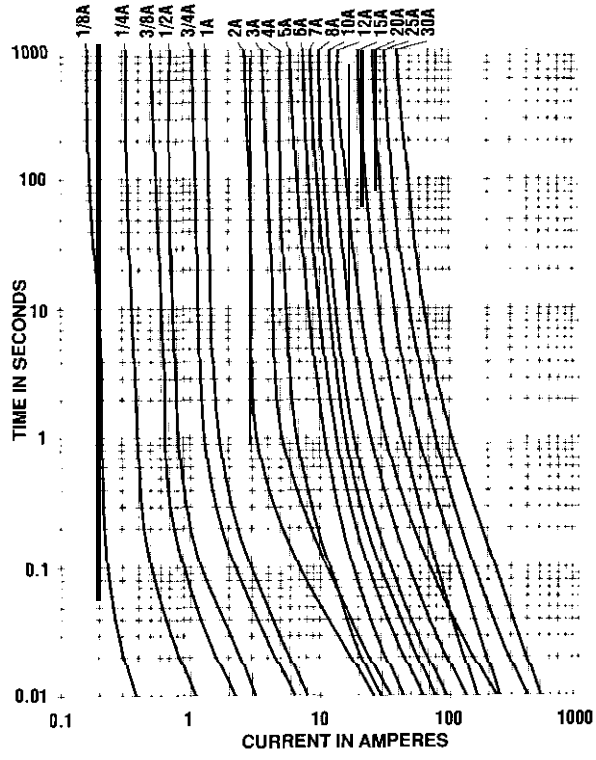


314 000 Series **324 000 Series**



Axial Lead Material: Solder coated copper.

Average Time Current Curves



CERAMIC BODY

3AB Slo-Blo® Type Fuse

QPL

Ceramic body construction permits higher interrupting ratings and voltage ratings. Ideal for applications where high current loads are expected.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
110%	1/100–30	4 hours, Minimum
135%	1/100–30	1 hour, Maximum
200%	1/100–3.2	5 sec., Min.; 30 sec. Max.
	4-30	5 sec., Min.: 60 sec. Max.

AGENCY APPROVALS: Listed by Underwriters Laboratories from 1/4 through 10 amperes. Certified by CSA from 1/4 through 30 amperes.

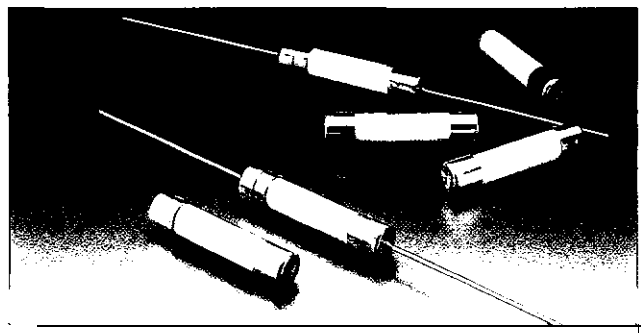
AGENCY FILE NUMBERS: UL E10480, CSA LR 29862.

FUSES TO MIL SPEC: See F03B cartridge type in Military Section.

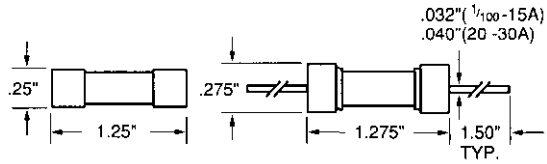
PATENTED

ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
326.010	**325.010**	1/100	**250**	3300	0.00146
326.031	325.031	1/32	250	330	**0.0110**
326.062	325.062	1/16	**250**	91.0	0.0276
326.100	325.100	1/10	250	33.3	0.0670
326.125	325.125	1/8	250	22.3	**0.100**
326.150	325.150	15/100	250	15.3	0.143
326.175	325.175	.175	250	6.64	0.220
326.187	325.167	3/16	250	7.67	0.230
326.200	325.200	2110	250	6.72	0.213
326.250	325.250	1/4	250	4.40	0.432
326.300	325.300	3/10	250	3.20	**0.690**
326.375	325.375	3/8	250	2.14	1.20
326.400	325.400	4/10	250	1.92	1.33
326.500	325.500	1/2	250	1.29	2.50
326.600	325.600	6/10	250	0.940	**3.90**
326.700	325.700	7110	250	0.716	6.42
326.750	325.750	3/4	250	0.636	7.00
326.600	326.600	8/10	250	0.568	**8.20**
326001	325001	1	250	0.386	16.3
326 01.2	326 01.2	1²/₁₀	250	0.284	22.0
326 1.25	325 1.25	1¼	250	0.266	**24.0**
326 01.5	325 01.5	1½	250	0.196	40.1
326 01.6	326 01.6	1⁶/₁₀	250	0.175	45.0
326002	325002	2	250	0.120	**80.0**
326 02.5	325 02.5	2½	250	0.0630	136.0
326 02.6	325 02.6	2%	250	0.0690	170.0
326003	325003	3	250	0.0600	200.0
32603.2	325 03.2	3²/₁₀	250	0.0535	**214.0**
326004	326004	4	250	0.0755	**9.7,**
326005	325005	5	250	0.0516	25.0
326 6.25	325 6.25	6¼	250	0.0343	60.4
326007	325007	7	250	0.0225	47.3
326006	325006	8	250	0.019,	67.1
326010	325010	10	250	0.0131	137.0
326012	325012	12	250	0.0066	129.0
326015	325015	15	250	**0.0049**	245.0
326020	325020	20	250	0.0033	575.0
326025	325025	25	125	0.0024	1030.0
326030	325030	30	125	**0.0019**	**1690.0**

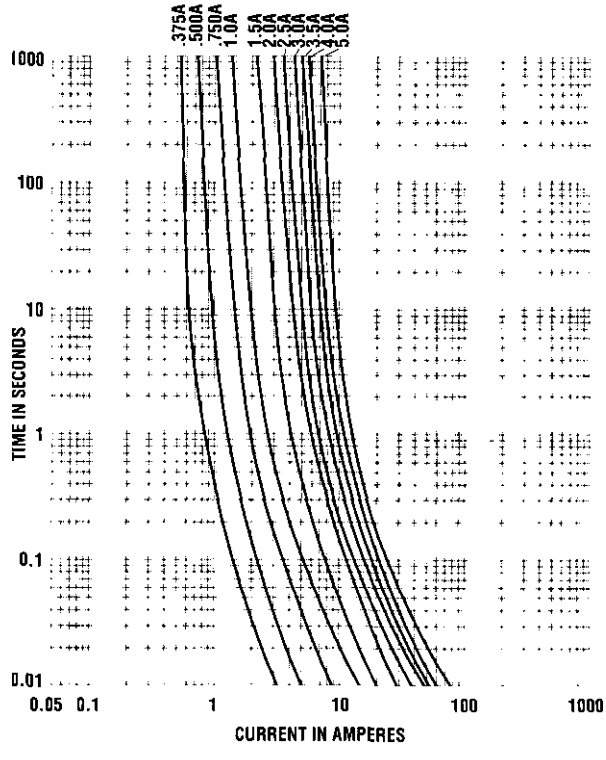


326 000 Series **325 000 Series**



Axial Lead Material: Solder coated copper.

Average Time Current Curves



DESIGNED TO IEC STANDARD

5 x 20 mm Fast-Acting Type

- Designed to International (IEC) Standards for use globally,
- Meets the IEC 60127.2, Sheet 2 specification for Fast-Acting Fuses.
- Available in Cartridge and Axial Lead Form.

-Available in ratings of 0.032 to 10 amperes.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
150%	.032–.100	60 minutes, Minimum
	.125–6.3	60 minutes, Minimum
210%	.032–.100	30 minutes, Maximum
	.125–6.3	30 minutes, Maximum
275%	.032–.100	0.01 sec., Min.; .5 sec. Max.
	.125–6.3	0.06 sec., Min.; 2 sec. Max.
400%	.032–.100	.003 sec., Min.; 0.1 sec. Max.
	.125–6.3	.01 sec., Min.; 0.3 sec. Max.
1000%	.032–.100	.02 second, Maximum
	.125–6.3	.02 second Maximum

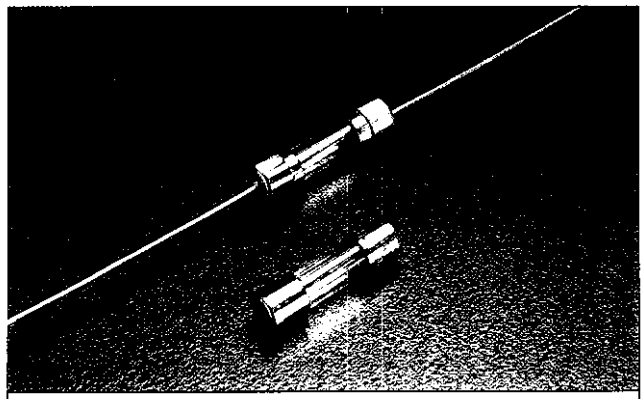
AGENCY APPROVALS: Sheet I IEC 60127.2:' SEMKO, VDE approved thru 6.3 amps. BSI approved 0.4-6.3 amps. Recognized under the Components Program of Underwriters Laboratories and recognized by CSA. UL recognized to 6.3A only.

INTERRUPTING RATING: 35 amperes Or 10 x rated current; whichever is greater.

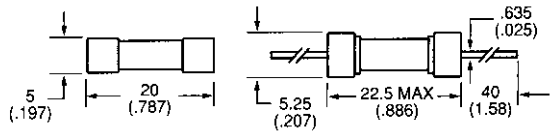
ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A' Sec.
	227.032	.032	250	262.2	0.000046
217.040	227.040	.040	250	183.2	0.000074
217.050	227.050	.050	250	15.20	0.00020
217.063	227.063	.063	250	10.43	0.00057
217.060	227.080	.080	250	7.88	0.00065
217.100	227.100	.100	250	5.10	0.0034
217.125	227.125	.125	250	3.68	0.0049
217.160	227.160	.160	250	2.53	0.011
217.200	227.200	.200	250	1.65	0.025
217.250	227.250	.250	250	1.18	0.043
217.315	227.315	.315	250	0.610	0.110
217.400	227.400	.400	250	0.277	0.130
217.500	227.500	.500	250	0.210	0.225
217.630	227.630	.630	250	0.168	0.420
217.600	227.800	.800	250	0.134	0.870
217 001	227001	1	250	0.096	1.07
217 1.25	227 1.25	1.25	250	0.070	2.29
217 01.6	227 01.6	1.6	250	0.046	4.74
217002	227002	2	250	0.040	5.66
217 02.5	227 02.5	2.5	250	0.033	9.72
217 3.15	227 3.15	3.15	250	0.022	18.2
217004	227004	4	250	0.016	30.0
217005	227005	5	250	0.013	43.9
217 06.3	227 06.3	6.3	250	0.0098	64.2
217008	227006	8	250	0.0066	203.5
217 010	227010	10	250	0.0060	223.5

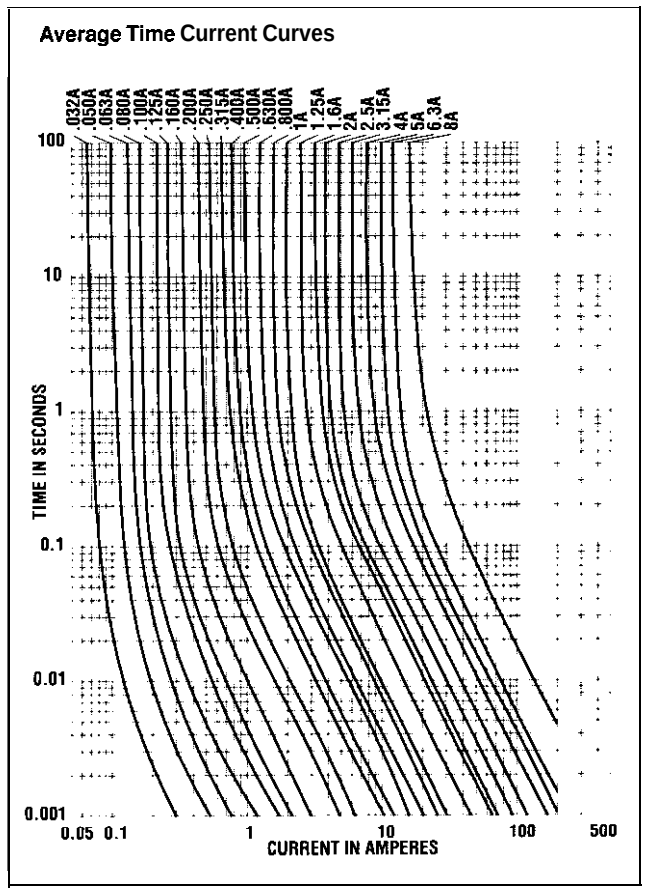
*IEC Standards for 5 x 20mm fuses do not include ratings above 6.3 amperes, but are under consideration.



217 000 Series **217 000 XE**
227 000 Series'



Average Time Current Curves



' 227 Series is used for North American ordering.

DESIGNED TO IEC STANDARD

5 x 20 mm Time Lag Fuse (Slo-Blo® Type Fuse)

- Designed to International (IEC) Standards for use globally.
- Meets the IEC 60127-2, Sheet 3 specification for Time Lag Fuses.
- Available in Cartridge and Axial Lead Form.
- Available in ratings of 0.032 to 10 amperes.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
150%	.032–.100	60 minutes, Minimum
	.125–6.3	60 minutes, Minimum
210%	.032–.100	2 minutes, Maximum
	.125–6.3	2 minutes, Maximum
275%	.032–.100	0.2 sec., Min.; 10 sec. Max.
	.125–6.3	0.6 sec., Min.; 10 sec. Max.
400%	.032–.100	.04 sec., Min.; 3 sec. Max.
	.125–6.3	.15 sec., Min.; 3 sec. Max.
1000%	.032–.100	.01 sec., Min.; 0.3 sec. Max.
	.125–6.3	0.02 sec., Min.; 0.3 sec. Max.

AGENCY APPROVALS: Sheet III IEC 60127-2:* SEMKO, VDE approved thru 6.3 amps. BSI approved 0.08-6.3 amps. Recognized under the Components Program of Underwriters Laboratories and recognized by CSA. 0213 series MITI approved 1-5A.

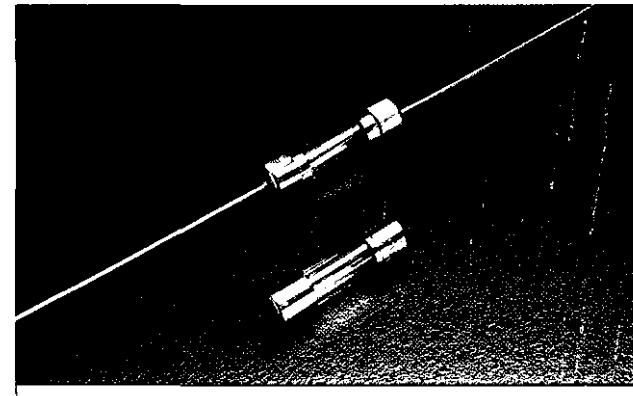
VOLTAGE RATING: 250 VAC

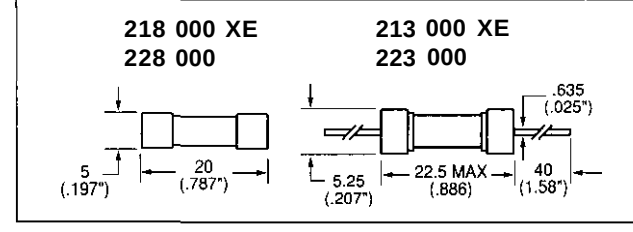
INTERRUPTING RATINGS: 35 amperes or 10 x rated current; whichever is greater.

ORDERING INFORMATION:
For axial leaded change 216 to 228 and 213 to 223.

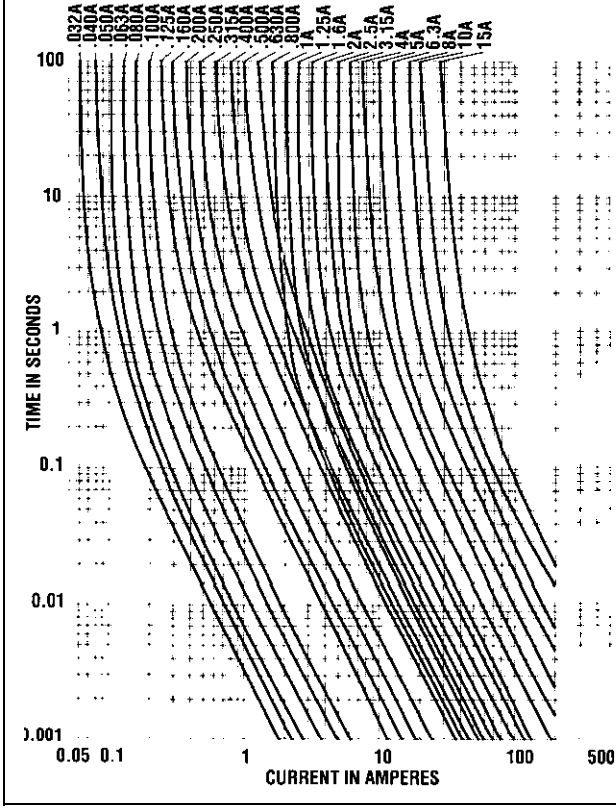
	218/228			213/223 Surge Withstand		
Ampere Rating	Cartridge Catalog Number	Nominal Resistance Cold Ohms	Nominal Melting I²t A²Sec.	Cartridge Catalog Number	Nominal Resistance Cold Ohms	Nominal Melting I²t A²Sec.
.032	218.032	58.45	0.00305	–	–	–
.040	218.040	35.70	0.0055	–	–	–
.050	218.050	23.30	0.0071	–	–	–
.063	218.063	16.1	0.012	–	–	–
.080	218.060	12.6	0.0265		–	–
	218.100	8.95	0.0495		–	–
.125	218.125	4.41	0.150		–	–
.160	218.160	2.44	0.225		–	–
.200	218.200	1.60	0.350	0213.200	1.60	0.350
.250	218.250	1.05	0.555	0213.250	1.05	0.555
.315	218.315	0.848	1.14	0213.315	0.848	1.14
.400	218.400	0.535	1.35	0213.400	0.535	1.35
.500	218.500	0.370	2.90	0213.500	0.370	2.90
.630	218.630	0.275	4.80	0213.630	0.275	4.80
.800	218.600	0.073	1.99	0213.600	0.165	9.42
1	218 001	0.055	3.33	0213001.	0.117	19.20
1.25	218 1.25	0.042	5.80	0213 1.25	0.061	27.15
1.6	21801.6	0.032	10.61	0213 01.6	0.055	44.2
2	218002	0.029	14.80	0213002.	0.044	92.7
2.5	21802.5	0.022	23.85	0213 02.5	0.030	136.0
3.15	2183.15	0.017	39.20	0213 3.15	0.022	226.5
4	218004	0.013	70.95	0213 004.	0.017	202
5	218005	0.010	114.0	0213 005.	0.011	314
6.3	218 06.3	0.0075	204.0	0213 06.3	0.08	600
8	218008	0.0059	350.5			
10	218010	0.0045	583.0			
15	218015	0.0030	1441.0			

. IEC Standards for 5 x 20 fuses do not include ratings above 6.3A, but are under consideration.





Average Time Current Curves for 2181228



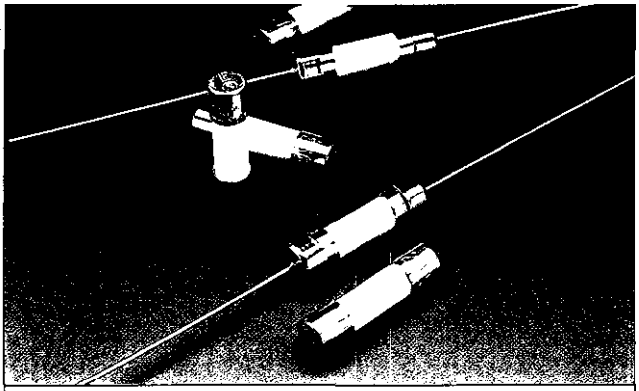
Please contact Littelfuse for Average Time Current Curve for 2131223 surge withstand.

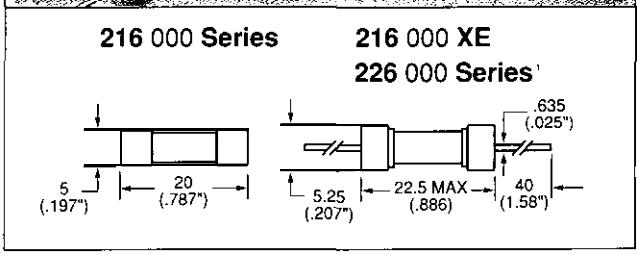
228 and 223 **Series are** used for North American ordering.

DESIGNED TO IEC STANDARD

5 x 20 mm Fast-Acting Type

- Designed to International (IEC) Standards for use globally.
- Meets the IEC 60127-2, Sheet 1 specification for Fast Acting Fuses.
- Available in Cartridge and Axial Lead Form.
- Available in ratings of 0.050 to 10 amperes.
- High breaking capacity.





ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
150%	.05–3.15	60 minutes. Minimum
	4 - 6 . 3	60 minutes, Minimum
210%	.05–3.15	30 minutes, Maximum
	4-6.3	30 minutes, Maximum
275%	.05–3.15	0.01 sec.. Min.; 2 sec. Max.
	4 - 6 . 3	0.01 sec., Min.; 3 sec. Max.
400%	.05–3.15	.003 sec., Min.; 0.3 sec. Max.
	4 - 6 . 3	,003 sec., Min.; 0.3 sec. Max.
1000%	x 3 . 1 5	.02 seconds, Maximum
	4-6.3	.02 seconds, Maximum

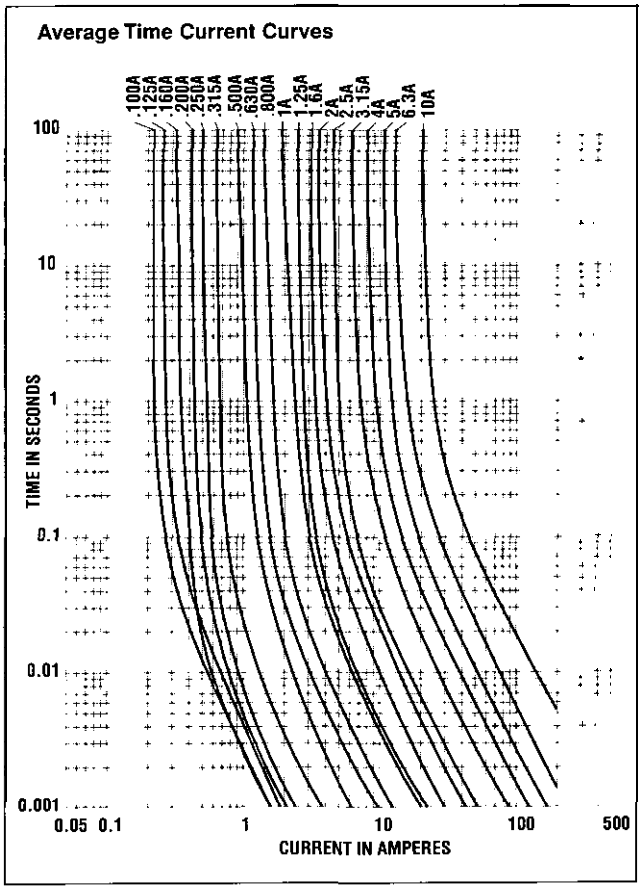
AGENCY APPROVALS: Sheet I IEC 60127.2:' SEMKO approved thru 6.3 amps. Recognized under the Components Program of Underwriters Laboratories and recognized by CSA. BSI approved 1A to 6.3A. VDE approved .05-6.3.

INTERRUPTING RATING: 1500 amperes.

ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Nominal Ampere Rating	Nominal Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A' Sec.
216.050	226.050	.050	-250	15.90	0.00019
216.063	226.063	,063	250	10.45	0.00055
216.080	226.080	,080	250	7.89	0.00086
216.100	226.100	.100	250	5.42	0.0033
216.125	226.125	.125	250	3.66	0.0056
216.160	226.160	.160	250	5.20	0.0018
216.200	226.200	,200	250	3.35	0.0045
216.250	226.250	,250	250	2.35	0.0092
216.315	226.315	.315	250	1.85	0.015
216.400	226.400	,400	250	1.67	0.028
216.500	226.500	,500	250	1.20	0.045
216.630	226.630	.630	250	0.790	0.097
216.600	226.600	.800	250	0.588	0.18
216001	226 001	1	250	0.228	0.19
216 1.25	226 1.25	1.25	250	0.153	0.49
216 01.6	226 01.6	1.6	250	0.108	1.04
216 002	226002	2	250	0.0770	1.92
216 02.5	226 02.5	2.5	250	0.0575	2.77
216 3.15	226 3.15	3.15	250	0.0333	7.65
216 004	226004	4	250	0.0243	15.4
216 005	226 005	5	250	0.0166	28.2
216 06.3	226 06.3	6.3	250	0.0125	57.9
216 009	226006	8	250	0.0120	66.1
216 010	226010	10	250	0.00775	158.5

*IEC Standards for 5 x 20mm fuses do not include ratings above 6.3 amperes, but are under consideration.

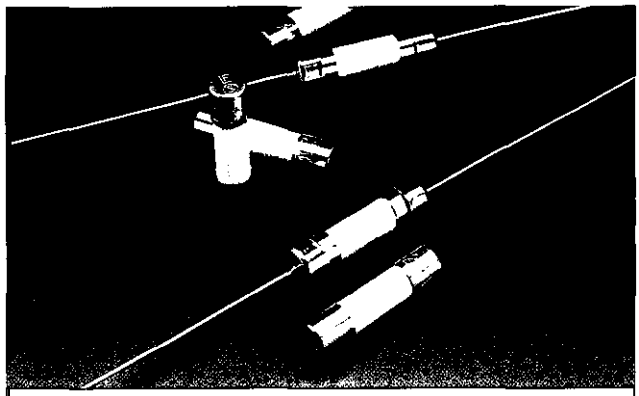


' 226 Series is used for North American ordering.

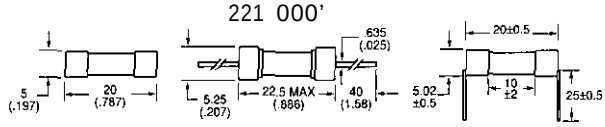
DESIGNED TO IEC STANDARD

5 x 20 mm Time Lag Fuse (Slo-Blo® Type Fuse)

- Designed to International (IEC) Standards for use globally.
- Meets the IEC 60127-2, Sheet 5 specification for Time Lag Fuses.
- Available in Cartridge and Axial Lead Form.
- Available in ratings of .2 to 10 amperes.
- High breaking capacity.



215 000 | 215 000 XE, 221 000' | 215 000 x w



ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
150%	1-315	60 minutes; Minimum
	4-6.3	60 minutes, Minimum
210%	1-3.15	30 minutes, Maximum
	4-6.3	30 minutes, Maximum
275%	1-3.15	1 sec., Min.; 80 sec. Max.
	4-6.3	1 sec., Min.; 80 sec. Max.
400%	1-3.15	.095 sec., Min.: 5 sec. Max.
	4-6.3	.150 sec., Min.: 5 sec. Max.
1000%	.2–.4	.010 sec., Min.; .15 sec., Max.
	.5–3.15	.010 sec., Min.; .1 sec., Max.
	4–6.3	.020 sec., Min.; .1 sec. Max.

AGENCY APPROVALS: Sheet V IEC 60127.2:' SEMKO approved 1 A-6.3A. BSI and VDE approved 1 .O-6.3 amps. MITI approved 1-10A. Recognized under the Components Program of Underwriters Laboratories and recognized by CSA.

INTERRUPTING RATING: 1500 amperes.

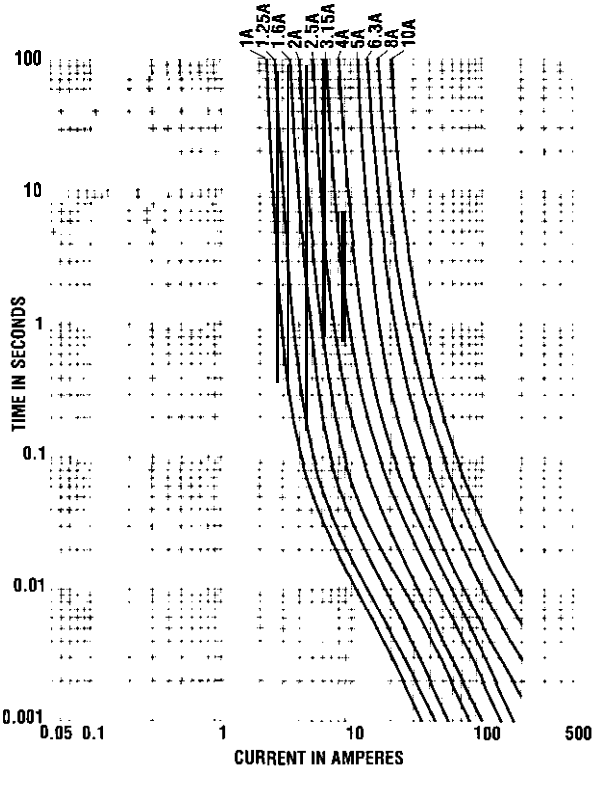
ORDERING INFORMATION:

Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec.
215.200	221.200	.200*	250	1.750	0.37
215.250	221.250	.250	250	1.170	0.56
215.315	221.315	.315	250	0.673	1.08
215.400	221.400	.400	250	0.560	1.45
215.500	221.500	.500	250	1.080	0.34
215.630	221.630	.630	250	0.660	0.56
215.600	221.800	.800	250	0.436	0.954
215 001	221 001	1	250	0.110	1.05
215 1.25	221 1.25	1.25	250	0.085	2.05
21501.6	221 01.6	1.6	250	0.0588	3.90
215002	221 002	2	250	0.043	6.95
215 02.5	22102.5	2.5	250	0.0312	10.65
2153.15	2213.15	3.15	250	0.0220	21.2
215004	221004	4	250	0.0163	38.7
215005	221005	5	250	0.0125	82.85
215 06.3	221 06.3	6.3	250	0.0099	132.5
215 008	221 008	8*	250	0.0078	209.5
215 010	221 010	10*	250	0.0060	360.5

*IEC Standards for 5 x 20mm fuses do not include ratings above 6.3 amperes, but are under consideration.

IEC 60127-2, Sheet 5 does not include ratings below 1 ampere (under consideration by IEC).

Average Time Current Curves

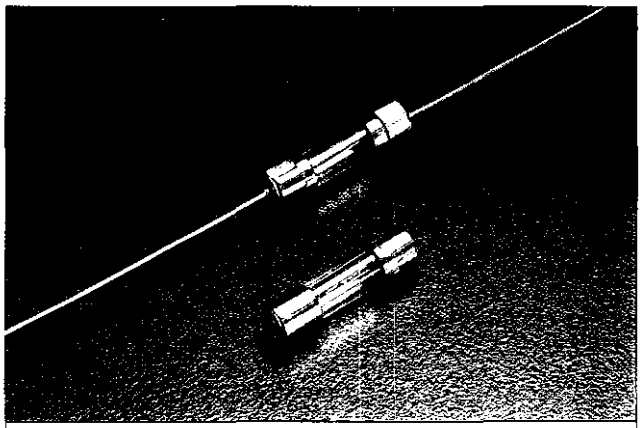


¹ 221 Series is used for North American ordering.

DESIGNED TO IEC STANDARD

5 x 20 mm Time Lag Fuse (Slo-Blo® Type Fuse)

- Designed to International (IEC) Standards for use globally.
- Meets the IEC 60127-2, Sheet 6 specification for Time Lag Fuses.
- Available in Cartridge and Axial Lead Format.
- Available in ratings of 0.125 to 6.3 amperes.
- Enhanced Breaking Capacity



ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
150%	60 minutes, Minimum
210%	2 minutes, Maximum
275%	0.6 sec., Min.; 10 sec. Max
400%	.15 sec., Min.; 3 sec. Max
1000%	0.02 sec., Min.: 0.3 sec. Max.

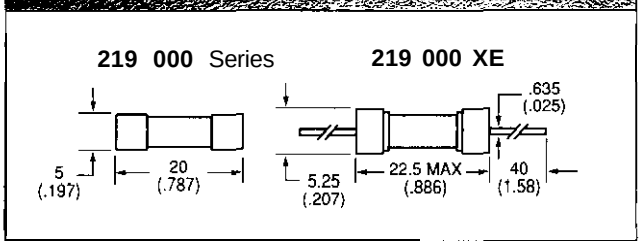
AGENCY APPROVALS: Sheet 6 IEC 60127: SEMKO, BSI and VDE approved. Recognized 1A to 6.3A under the components program of Underwriters Laboratories and recognized by CSA. MITI A 1A to 6.3A.

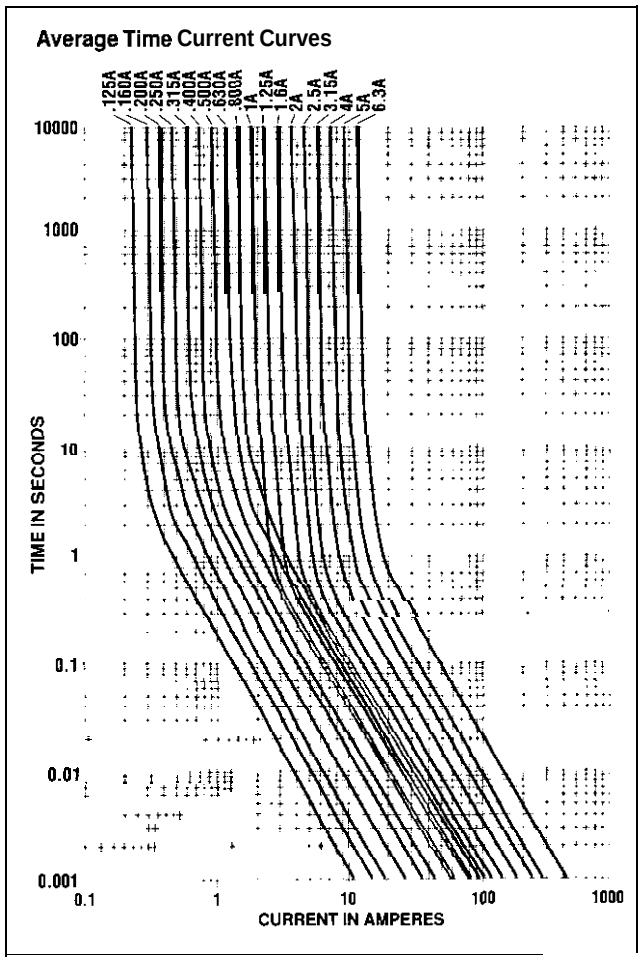
INTERRUPTING RATINGS: 150 amperes

PACKAGING: For Axial Leads add packaging suffix XE.

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Nominal Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec
0219.125	.125	250	4.41	0.150
0219.160	.160	250	2.44	0.225
0219.200	.200	250	1.60	0.350
0219.250	.250	250	1.05	0.555
0219.315	.315	250	0.848	1.14
0219.400	.400	250	0.635	1.35
0219.500	.500	250	0.370	2.90
0219.630	.630	250	0.275	4.80
0219.800	.800	250	0.163	9.42
0219 001.	1	250	0.056	3.33
0219 1.25	1.25	250	0.042	5.80
0219 01.6	1.8	250	0.032	10.81
0219 002.	2	250	0.029	14.80
0219 02.5	2.5	250	0.022	23.85
02193.15	3.15	250	0.017	39.20
0219 004.	5	250	0.013	70.95
0219005.		250	0.010	114.0
0219 06.3	6.3	250	0.0075	204.0





DESIGNED TO MITI STANDARD

5 x 20 mm Medium Acting Fuse

- Designed to Japanese Standard JIS C6575.
- Available in Cartridge, Axial and Radial Lead Format.
- Available in ratings of IA to 10A.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
130%	1 hour, Minimum
160%	1 hour, Maximum
200%	2 minutes. Maximum

AGENCY APPROVALS: MITI B Approval.

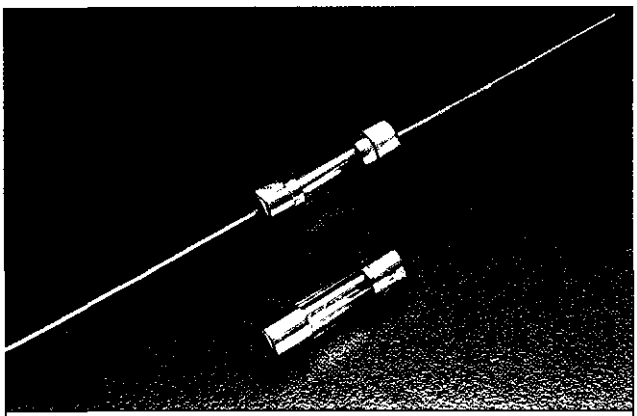
INTERRUPTING RATING:
500 amperes at 125 VAC
100 amperes at 250 VAC

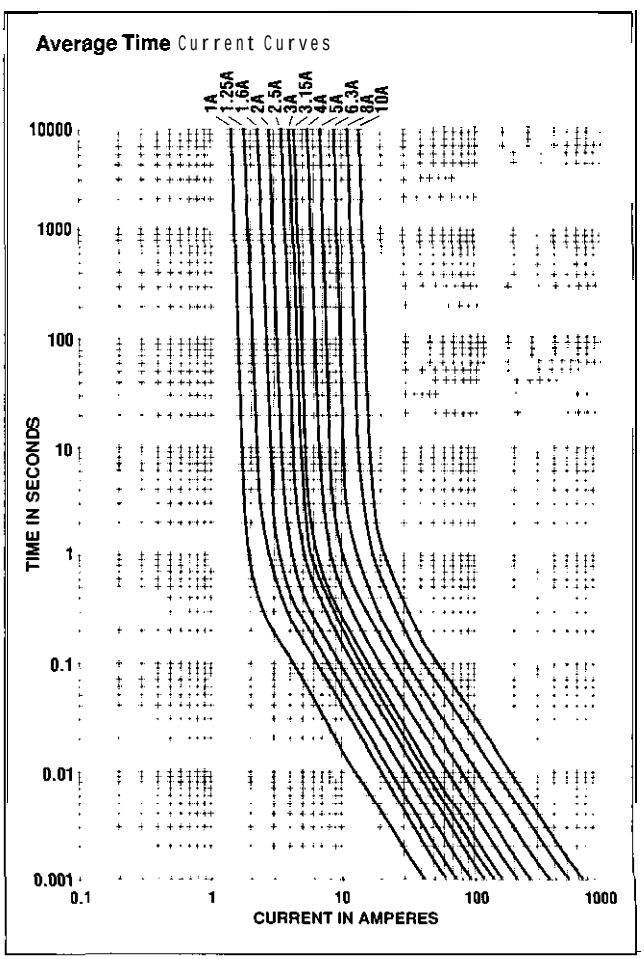
PACKAGING: For Axial Leads add packaging suffix XE. For Radial Leads add packaging suffix XW. For tape and reel options contact Littelfuse.

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating*	Nominal Resistance Cold Ohms	Nominal Melting I^2t A^2 Sec
0232 001.	1	125/250	0.0957	1.41
0232 1.25	1.25	125/250	0.0707	4.22
0232 01.6	1.6	1251250	0.0567	7.14
0232 002.	2	125/250	0.0385	8.47
0232 02.5	2.5	125,250	0.0297	14.25
0232 003.	3	125/250	0.0257	17.65
0232 3.15	3.15	1251250	0.0235	22.55
0232 004.	4	125,250	0.018	36.75
0232 005.	5	125,250	0.0145	58.25
0232 06.3	6.3	1251250	0.0105	92.85
0232 008.	8	125/250	.0076	187.5
0232 010.	10	1251250	.0061	298.5

*Voltage Rating is not marked on fuse.





DESIGNED TO MEET UL/CSA STANDARDS

5 x 20 mm Fast-Acting Type

- Designed to UL/CSA/ANCE 246 Standard.
- Available in Cartridge and Axial Lead Format.
- Available in ratings of 0.100 to 6 amperes.

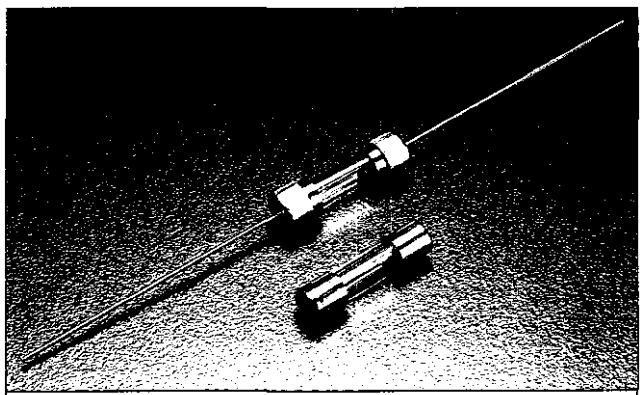
ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	4 hours, Minimum
135%	1 hour. Maximum
200%	1 second, Maximum

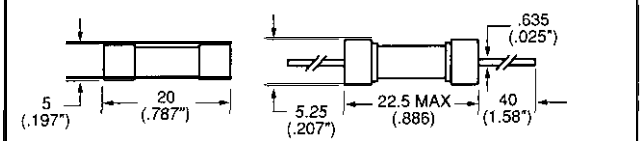
AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA. Approved by MITI from 1 through 5 amperes.

ORDERING INFORMATION:

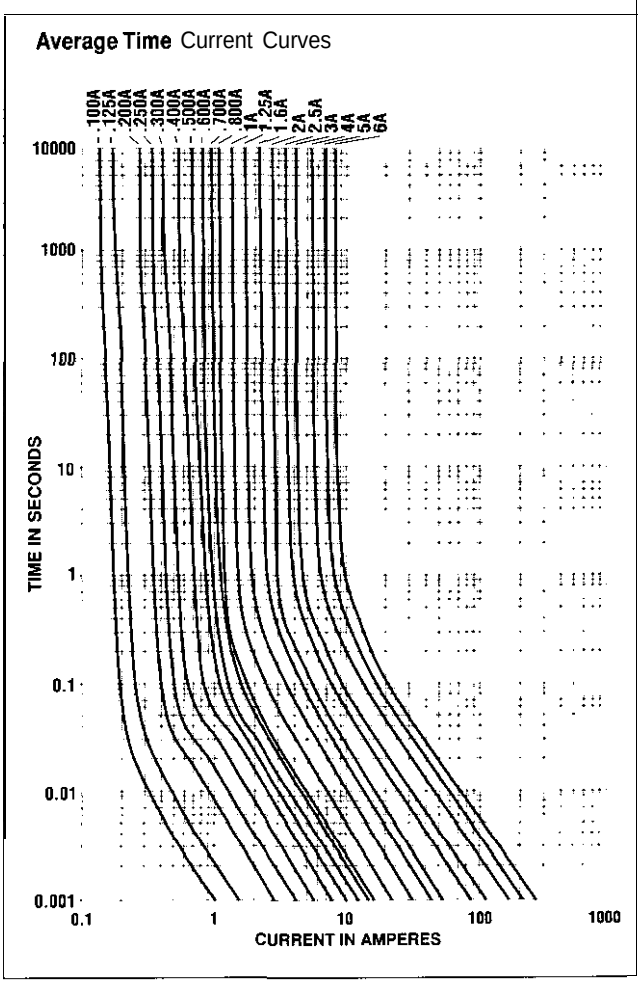
Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A' Sec.
235.100	236.100	.100	250	8.40	0.00160
235.125	236.125	.125	250	5.75	0.00260
235.200	236.200	.200	250	3.15	0.00890
235.250	236.250	.250	250	2.25	0.0170
235.300	236.300	.300	250	1.60	0.0330
235.400	236.400	.400	250	1.08	0.0600
235.500	236.500	.500	250	0.455	0.0710
235.600	236.600	.600	250	0.318	0.115
235.700	236.700	.700	250	0.263	0.160
235.800	236.600	,800	250	0.195	0.260
235 001	236 001	1	250	0.153	0.480
235 1.25	236 1.25	1.25	250	0.106	1.12
235 01.6	236 01.6	1.6	250	0.0775	2.08
2 3 5 0 0 2	2 3 6 0 0 2	2	250	0.0600	2.72
235 02.5	236 02.5	2.5	250	0.0436	5.59
235 003	236 003	3	250	0.0348	8.62
235 004	236 004	4	125	0.0246	17.60
235 005	236 005	5	125	0.0185	28.15
235 006	236 006	6	125	0.0150	48.60



235 000 Series **235 000 XE**
236 000 Series



Average Time Current Curves



DESIGNED TO UL/CSA STANDARD

5 x 20 mm Medium Acting Fuse

- Designed to UL/ CSA/ANCE 248 Standard.
- Available in Cartridge, Axial and Radial Lead Format.
- Available in ratings of IA to 10A.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
110%	1 - 3 . 5	4 hours, Minimum
	4–10	1 hour, Minimum
135%	1–10	1 hour, Maximum
200%	1–10	3 seconds, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA. Approved by MITI.

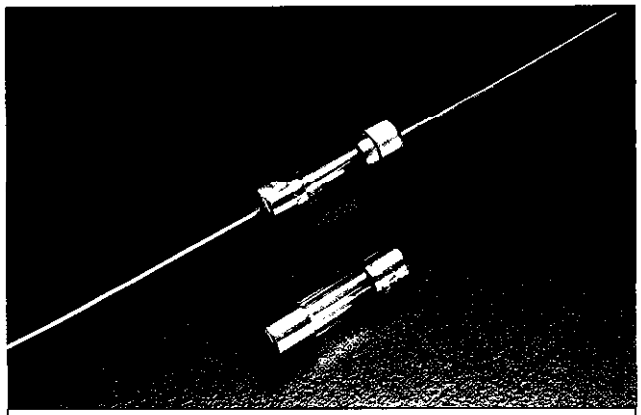
INTERRUPTING RATING:

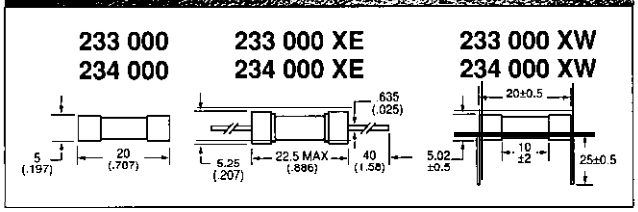
I A	10,000 amperes at 125 VAC 35 amperes at 250 VAC
1.25A-3.5A	10,000 amperes at 125 VAC 100 amperes at 250 VAC
4A-10A	10,000 amperes at 125 VAC 200 amperes at 250 VAC

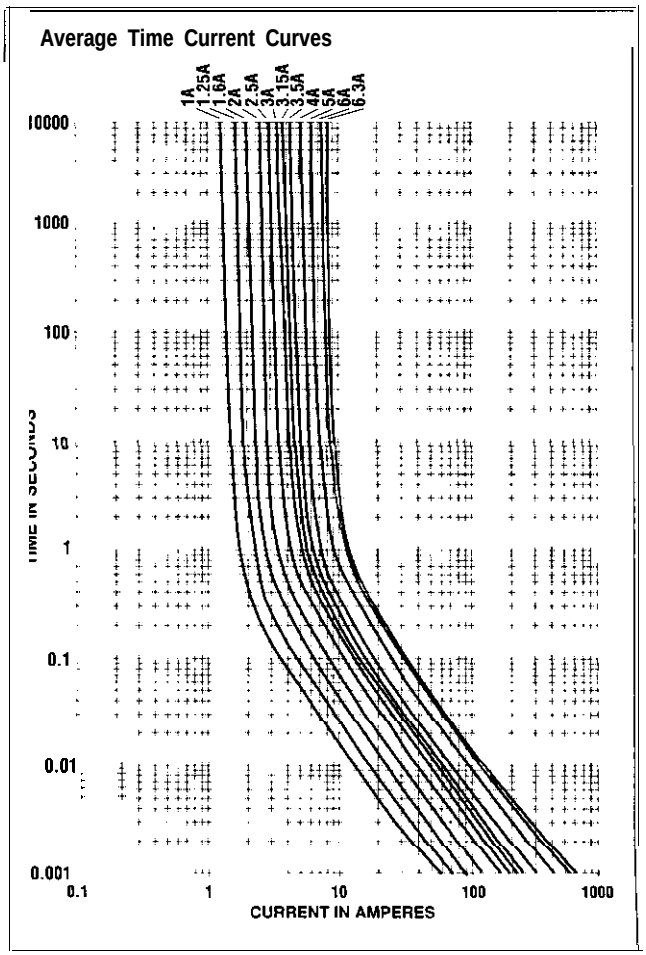
PACKAGING: For Axial Leads add packaging suffix XE. For Radial Leads add packaging suffix XW. For tape and reel options contact Littelfuse.

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A²Sec
0233 001	1	125	0 . 1 8	2.03
0233 1.25	1.25	125	0.13	3.46
0233 01.6	1.6	125	0.088	6.31
0233002.	2	125	0.066	10.2
0233 02.5	2.5	125	0.052	17.5
0233003.	3	125	0.043	27.0
0233 3.15	3.15	125	0.036	30.6
0233 03.5	3.5	125	0.034	37.3
0233004.	4	125	0.032	53.0
0233005.	5	125	0.022	92.4
0233006.	6	125	0.018	135
0233 06.3	6.3	125	0.017	156
0234 001	1	250	0.18	2.03
0234 1.25	1.25	250	0.13	3.46
023401.6	1.6	250	0.066	6.31
0234002.	2	250	0.068	10.2
0234 02.5	2.5	250	0.052	17.5
0234003.	3	250	0.043	27.0
02343.15	3.15	250	0.036	30.6
0234 03.5	3.5	250	0.034	37.3
0234004.	4	250	0.032	53.0
0234005.	5	250	0.022	92.4
0234006.	663	250	0.0'8	135
023406.3		250	0.017	156
0234008.	8	250	0.013	62.9
0234010.	10	250	0.010	133







DESIGNED TO MEET UL/CSA STANDARDS

5 x 20 mm Time Lag Fuse (Slo-Blo® Type Fuse)

- Designed to UL/CSA/ANCE 248 Standard.
- Available in Cartridge and Axial Lead Format.
- Available in ratings of 0.200 to 5 amperes.

ELECTRICAL CHARACTERISTICS:

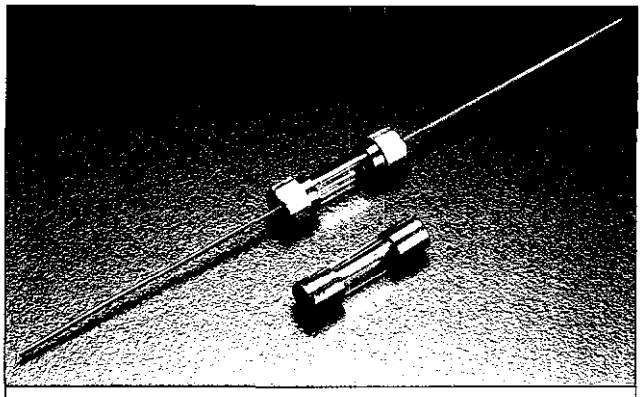
% Of Ampere Rating	Opening Time
110%	4 hours, Minimum
135%	1 hour, Maximum
200%	5 seconds, Minimum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA. Approved by MITI from 1 through 5 amperes.

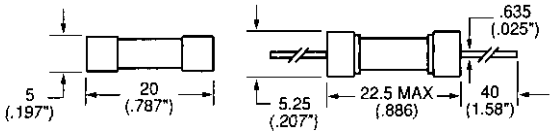
PATENTED

ORDERING INFORMATION:

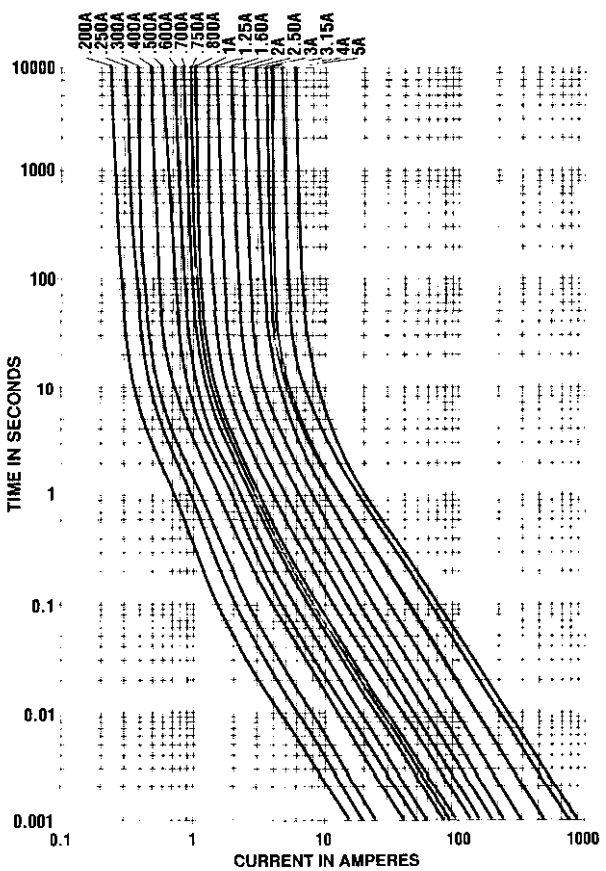
Cartridge Catalog Number	Axial Lead Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A²sec.
239.200	238.200	.200	250	8.40	0.170
239.250	238.250	.250	250	3.00	0.3508
239.300	238.300	.300	250	2.25	0.630
239.400	238.400	.400	250	1.46	1.53
239.500	238.500	.500	250	0.865	2.04
239.600	238.600	.600	250	0.688	2.48
239.700	238.700	.700	250	0.550	4.23
239.750	238.750	.750	250	0.453	5.57
239.800	238.800	.800	250	0.403	7.77
239 001	238 001	1	250	0.313	ii.60
239 1.25	238 1.25	1.25	250	0.200	20.05
239 01.6	238 01.6	1.60	250	0.122	31.25
239 002	238 002	2	250	0.0975	51.95
239 02.5	238 02.5	2.50	250	0.053	81.85
239 003	238 003	3	250	0.0480	133.0
239 3.15	2383.15	3.15	250	0.0425	131.5
239 004	238004	4	125	0.0313	278.0
239005	238005	5	125	0.0208	311.0



239 000 Series 239 000 XE
238 000 Series



Average Time Current Curves



SPECIAL

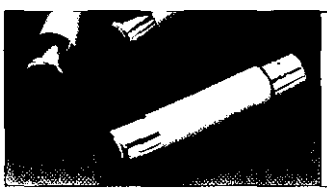
3AB Very Fast-Acting Type

For protection of silicon controlled rectifiers and similar solid-state devices.

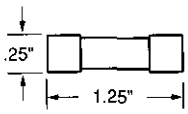
ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Ampere Rating	Opening Time
100%	1–30	4 hours, Minimum
250%	1–10	.2 second, Maximum
	12–30	1 second, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories from 1 through 10 amperes at 250 VAC/65 VDC, 12 through 30 amperes at 65 VAC/VDC.



322 000 Series



ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms
322 001	1	250	0.26
322 1.25	1¼	250	0.175
322002	2	250	0.132
	3	250	0.063
322004	4	250	0.044
322003	5	250	0.035
322006	6	250	0.027
322007	7	250	0.022
322006	8	250	0.019
322009	9	250	0.016
		250	0.0135
322010	10	65	0.0052
322015	15	65	0.0043
322 020	20	65	0.0034
322025	25	65	0.0029
322030	30	65	0.0023

LOW VOLTAGE

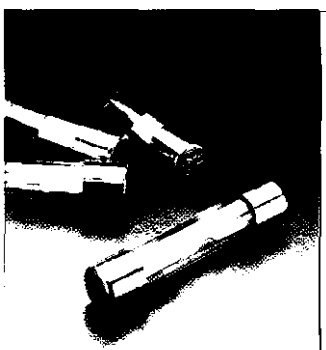
SFE &-Acting Type

ELECTRICAL CHARACTERISTICS:

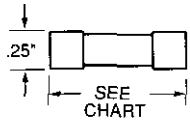
% of Ampere Rating	Opening Time
110%	4 hours, Minimum
135%	1 hour, Maximum
200%	10 seconds, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories.

DESIGN STANDARDS: UL Standard 275. SAE (Society of Automotive Engineers) J554.



307 000 Series



ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Fuse Length
307 004	4	32	0.0220	5/8"
307 006	6	32	0.0144	3/4"
307 07.5	7½	32	0.0113	7/8"
307 009	9	32	0.00945	7/8"
307 014	14	32	0.0055	1 1/16"
307020	20	32	0.0034	1¼"
307030	30	32	0.0021	1 7/16"

SUBMINIATURE

LT-5™ Fast-Acting Fuse 662 Series

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Time
210%	30 minutes, Maximum
275%	.010 sec Min.; 3 sec Max
400%	.003 sec Min.; .030 sec Max
1000%	.020 sec Maximum

AGENCY APPROVALS: IEC 60127-3/1: Semko and VDE approved 50 mA through 3.15 A. Recognized under the Components Program Underwriters Laboratories and recognized by CSA.

INTERRUPTING RATINGS: 35A or 10X rated current; whichever is greater.

PACKAGING:
Please refer to the following suffixes when ordering.
Bulk 100 pieces:

Short Lead (Bulk)	HXSL
Long Lead (Bulk)	HXLL

Tape and Reel 750 pieces:

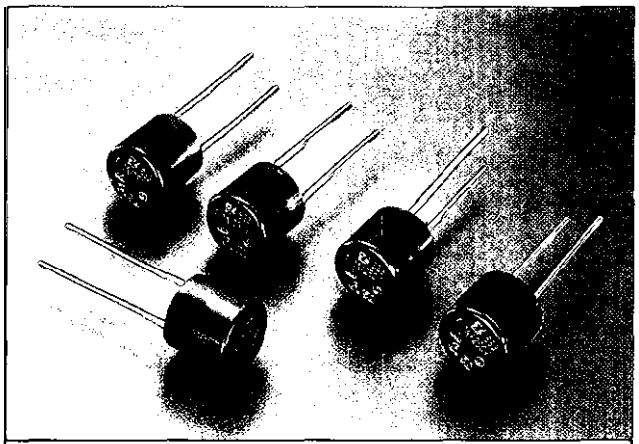
Long Lead (Tape and Reel IEC 286-2)	ZRLL

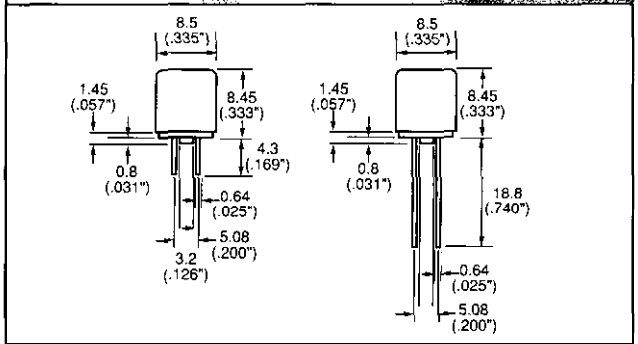
PATENTED

ORDERING INFORMATION:

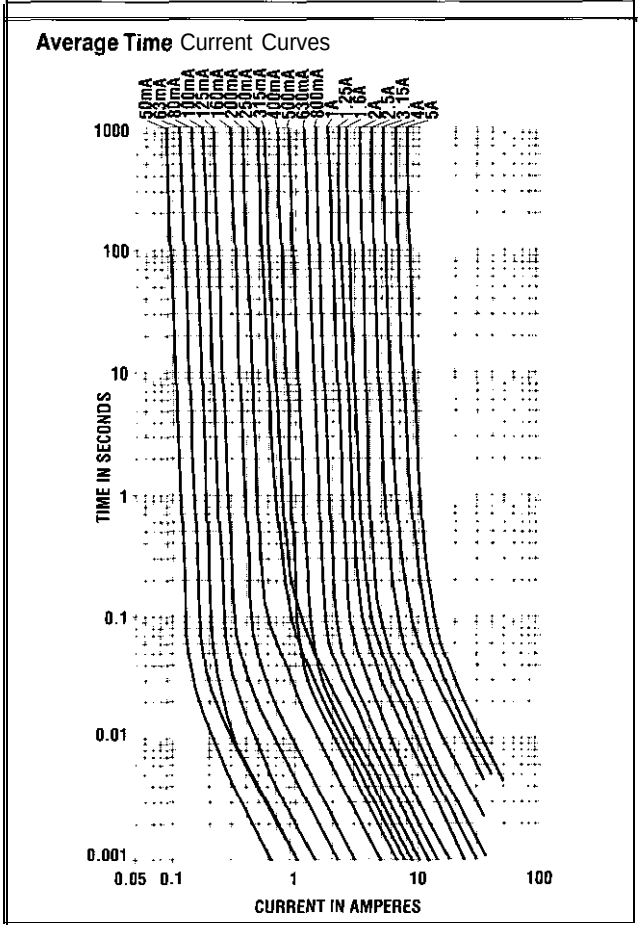
Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec
0662.050	.050	250	4483	0.004
0662.063	.063	250	3865	0.001
0662.080	.080	250	2545	0.001
0662.100	.100	250	2010	0.002
0662.125	.125	250	1345	0.006
0662.160	.160	250	2960	0.014
0662.200	.200	250	2255	0.024
0662.250	.250	250	1460	0.056
0662.315	.315	250	1209	0.104
0662.400	.400	250	180	0.044
0662.500	.500	250	128	0.090
0662.630	.630	250	96	0.150
0662.600	.800	250	78	0.220
0662001.	1.00	250	60	0.330
0662 1.25	1.25	250	45	0.680
0662 01.6	1.60	250	37	0.940
0662002.	2.00	250	29	1.330
0662 02.5	2.50	250	24	1.940
0662 3.15	3.15	250	17	5.400
0662004.	4.00	250	13	7.900
0662005.	5.00	250	10	11.190

Refer to page 96 for LT-5" holder information





Average Time Current Curves



SUBMINIATURE

LT-5™ Time Lag Fuse 663 Series

ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Time
210%	, 2 minutes, Maximum
275%	, .4 sec Min.; 10 seconds Max
400%	.15 sec Min.: 3 seconds Maximum
1000%	.02 sec Min. .15 seconds Maximum

AGENCY APPROVALS: IEC 60127-3/1: Semko and VDE approved through 4 amps. Recognized under the Components Program Underwriters Laboratories and recognized by CSA.

INTERRUPTING RATINGS: 35A or 10X rated current; which ever is greater.

PACKAGING:
Please refer to the following suffixes when ordering.

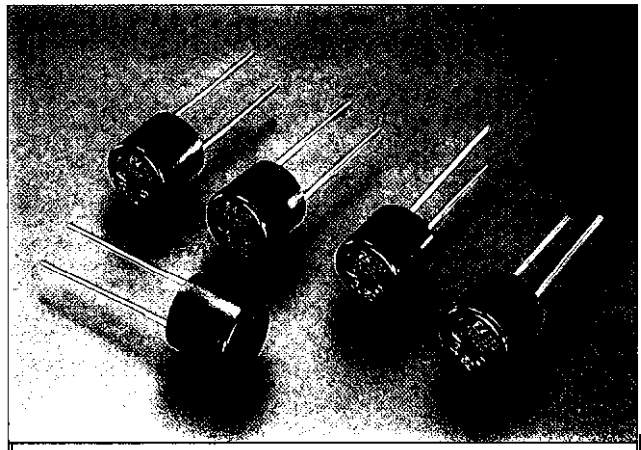
Bulk 100 pieces:	
Short Lead (Bulk)	HXSL
Long Lead (Bulk)	HXLL
Tape and Reel 750 pieces:	
Long Lead (Tape and Reel IEC 286-2)	ZRLL

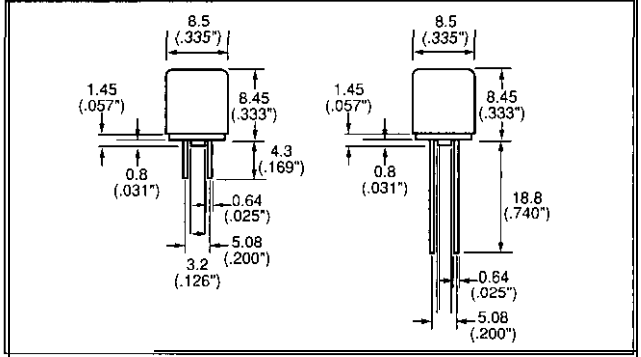
PATENTED

ORDERING INFORMATION:

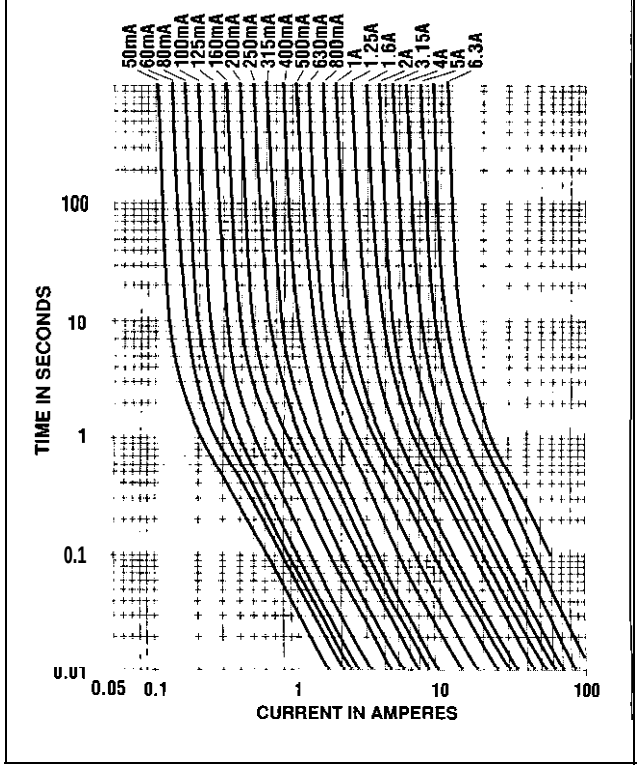
Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec
0663.050	.050	250	7573	0.03
0663.063	.063	250	4490	0.05
0663.060	.080	250	2646	0.07
0663.100	.100	250	1669	0.06
0663.125	.125	250	1241	0.12
0663.160	.160	250	990	0.24
0663.200	.200	250	718	0.35
0663.250	.250	250	475	0.6
0663.315	.315	250	326	0.6
0663.400	.400	250	239	1.1
0663.500	.500	250	167	2.5
0663.630	,630	250	129	4
0663.600	.800	250	67	8
0663 001.	1.00	250	75	12
0663 1.25	1.25	250	50	15
0663 01.6	1.60	250	36	30
0663 002.	2.00	250	27	34
0663 02.5	2.50	250	20	55
06633.15	3.15	250	17	76
0663 004.	4.00	250	12	80
0663 005.	5.00	250	9	230
0663 06.3	6.30	250	7	360

Refer to page 96 for LT-5™ holder information





Average Time Current Curves



SUBMINIATURE

LT-5™ Time Lag Extended Breaking Capacity Fuse 664 Series

- Similar to the 663 fuse, this fuse is designed with a higher breaking capacity.
- Meets IEC 60127-3/4 specifications.
- Available in short and long lead variations.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Time
210%	2 minutes, Maximum
275%	.4 sec Min.: 10 seconds Maximum
400%	.1 sec Min.: 3 seconds Maximum
1000%	.02 sec Min. .15 seconds Maximum

AGENCY APPROVALS: IEC 60127-3/4: Semko and VDE approved through 4A. Recognized under the Components Program Underwriters Laboratories and recognized by CSA.

INTERRUPTING RATINGS: 100A at 250 VAC.

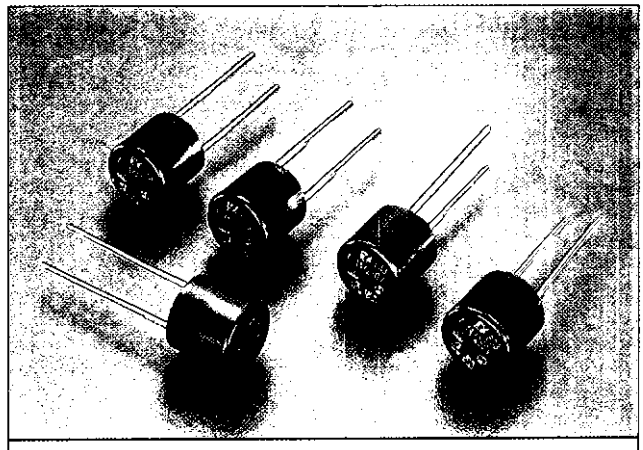
PACKAGING:
Please refer to the following suffixes when ordering.
Bulk 100 pieces:
Short Lead (Bulk) HXSL
Long Lead (Bulk) HXLL
Tape and Reel 750 piece?.:
Long Lead (Tape and Reel IEC 286-2) ZRLL

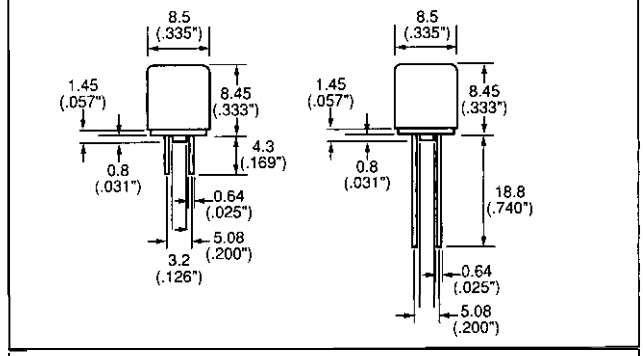
PATENTED

ORDERING INFORMATION:

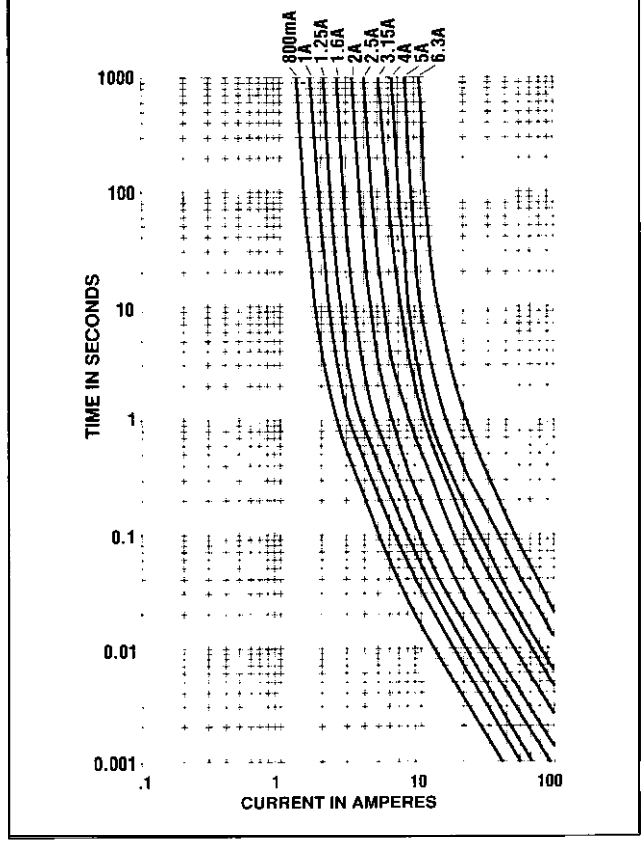
Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms	Nominal Melting I²t A² Sec
0664.800	.800	250	183	2.2
0664 001.	1.00	250	123	4.4
0664 1.25	1.25	250	85	6.3
666401.6	1.60	250	60	10
0664002.	2.00	250	39	16
0664 02.5	2.50	250	30	32
0664 3.15	3.15	250	20	57
0664004.	4.00	250	17	77
0664 005.	5.00	250	12	155
0664 06.3	6.30	250	9	262

Refer to page 96 for LT-5' holder information.





Average Time Current Curves



SUBMINIATURE

LT-5™ Time Lag Fuse 665 Series

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Time
100%	4 hours Min
150%	10 minutes Max
200%	60 sec Max

AGENCY APPROVALS: UL248-14 approved 250 mA through 6.3 A. Listed under the Components Program Underwriters Laboratories and recognized by CSA.

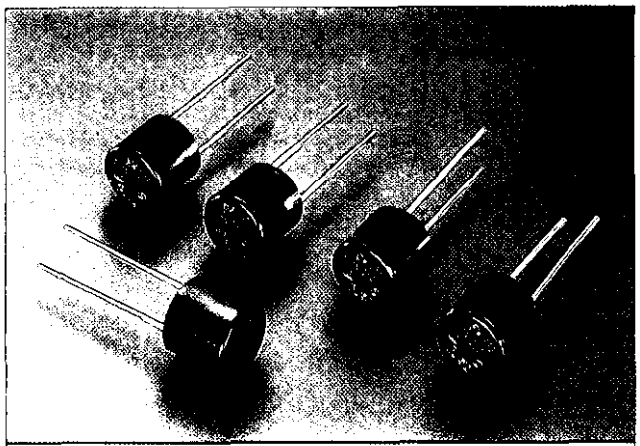
INTERRUPTING RATINGS: 50A at 250 VAC.

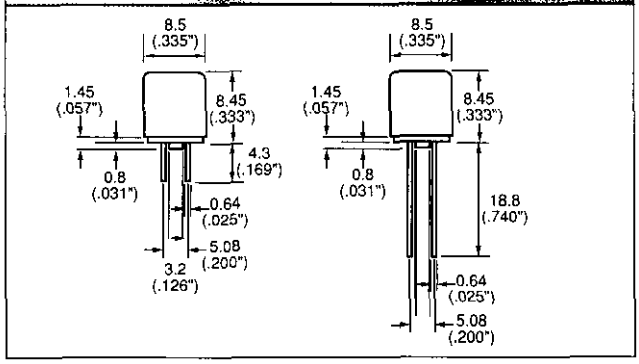
PACKAGING:
Please refer to the following suffixes when ordering.
Bulk 100 pieces:
Short Lead (Bulk) HXSL
Long Lead (Bulk) HXLL
Tape and Reel 750 pieces:
Long Lead (Tape and Reel IEC 286-2) ZRLL

PATENTED

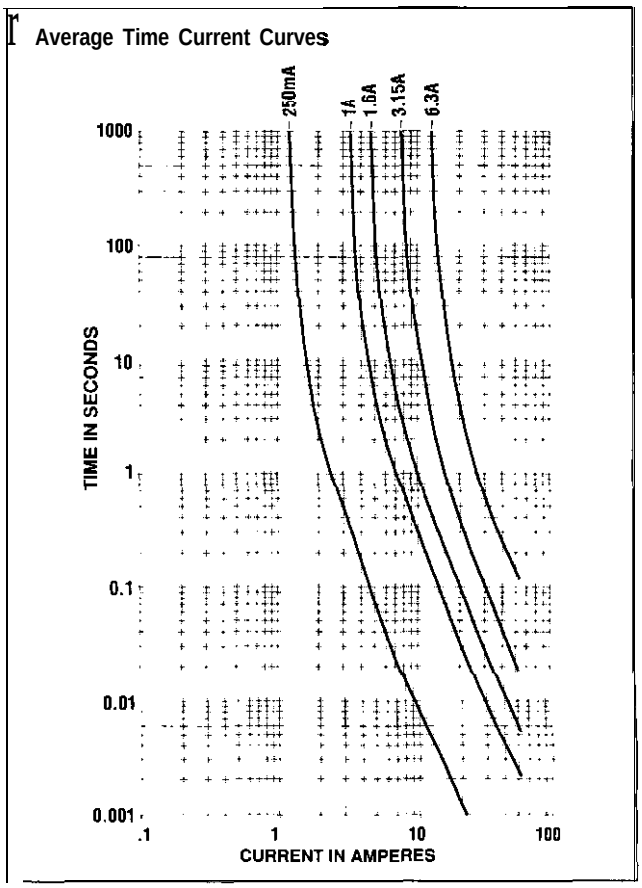
ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating	I²t at 10 x In (A² Sec)
0665.250	.250	250	.26
0665001.	1.00	250	6.65
066601.6	1.60	250	17.5
06663.15	3.15	250	55
066506.3	6.30	250	267





Average Time Current Curves



AC Fast-Acting Type

Fast-acting fuses designed for use in circuits with high AC fault current capacity or where military approval is required.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
110%	1/10–30	4 hours, Minimum
135%	1/10–30	1 hour. Maximum
	1/10–4	2 seconds, Maximum
200%	5–12	15 seconds, Maximum
	15–30	2 minutes, Maximum

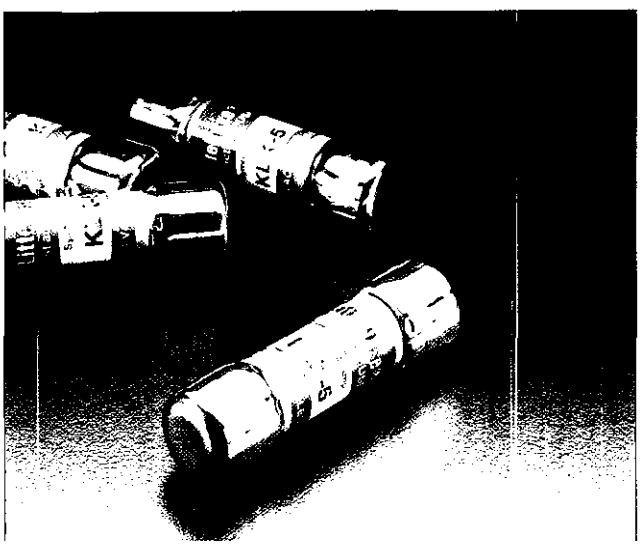
AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA from 3/10 through 30 amperes.

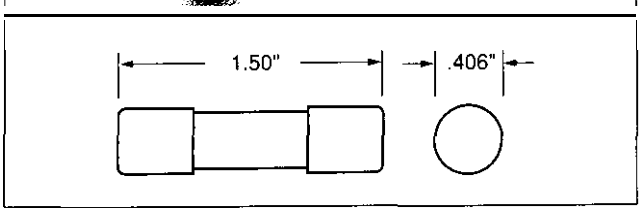
KLK INTERRUPTING RATING:
100,000 amperes (capable of 200,000) at 600VAC.

MILITARY TYPE F60C INTERRUPTING RATINGS:
200,000 amperes at 500VAC
150,000 amperes at 500VDC

FUSES TO MIL SPEC: See F60C type in Military Section.

PATENTED

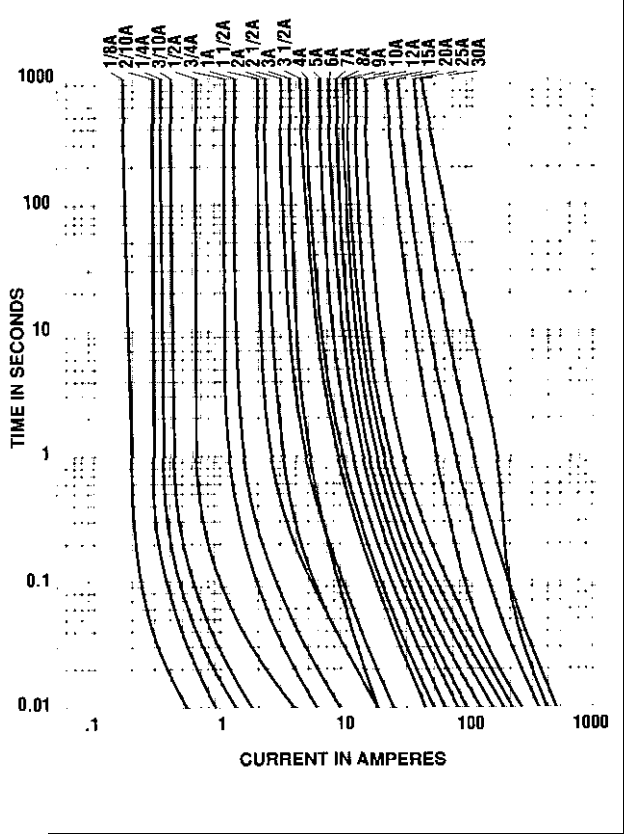




ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	Voltage Rating	Nominal Resistance Cold Ohms
KLK 1/10	,100	600	65.5
KLK 1/8	.125	600	65.0
KLK 2110	,200	600	30.9
KLK 1/4	.250	600	22.0
KLK 3/10	.300	600	16.2
KLK 1/2	.500	600	7.99
KLK 3/4	.750	600	.398
KLK 1	1	600	.249
KLK 1½	1.5	600	.132
KLK 2	2	600	.129
KLK 2½	2.5	600	.0989
KLK 3	3	600	.0773
KLK 3½	3.5	600	.0613
KLK 4		600	.0511
KLK 5		600	.0261
KLK 6	6	600	.0261
KLK 7	7	600	.0205
KLK 8	8	600	.0194
KLK 9	9	600	.0166
KLK 10	10	600	.0128
KLK 12	12	600	.0103
KLK 15	15	600	.0073
KLK 20	20	600	.00421
KLK 25	25	600	.00302
KLK 30	30	600	.002816

Average Time Current Curves



MIDGET

DC Fast-Acting Type

Ⓤ Ⓒ QPL

Fast-acting fuses designed for use in circuits with DC fault currents up to 10,000 amperes. Same AC interrupting ratings as KLK series.

ELECTRICAL CHARACTERISTICS:

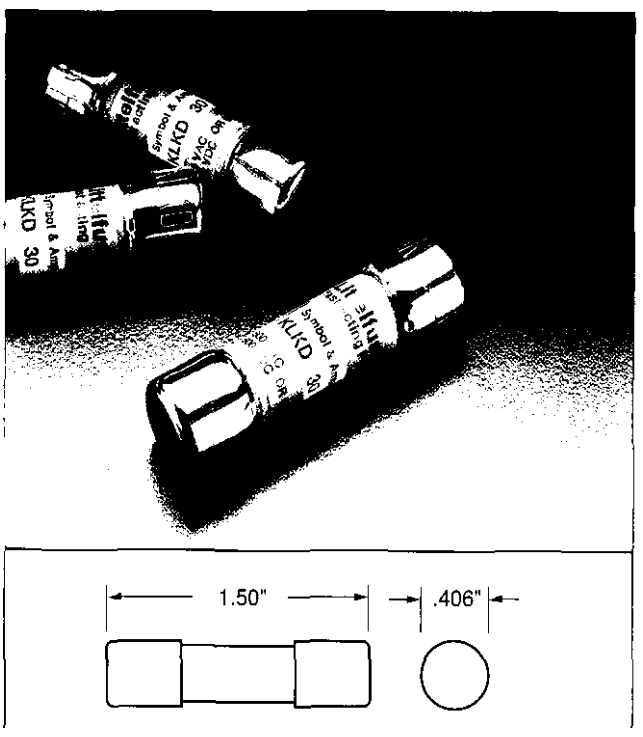
% of Ampere Rating	Ampere Rating	Opening Time
110%	1/10–30	4 hours, Minimum
135%	1/10–30	1 hour, Maximum
	1 1 1 0 - 4	2 seconds, Maximum
200%	5 - 1 2	15 seconds, Maximum
	1 5 - 3 0	2 minutes, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA from 3/10 through 30 **amperes.**

INTERRUPTING RATINGS:
10,000 amperes at 600 VDC.
100,000 amperes (capable of 200,000) at 600VAC.

FUSES TO **MIL SPEC:** See KLK Series for QPL fuses with DC ratings.

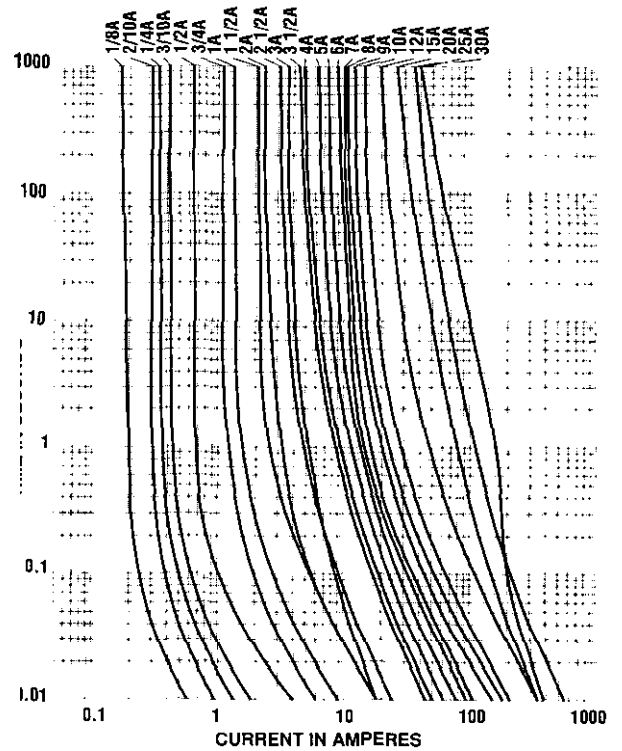
PATENTED



ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	AC Voltage Rating	Nominal Resistance Cold Ohms
KLK D 1/10	.100	600	65.5
KLK D 1/8	.125	600	65.0
KLK D 2/10	.200	600	30.9
KLK D1/4	.250	600	22.0
KLK D 3/10	.300	600	16.2
KLK D1/2	.500	600	6.16
KLK D 314	.750	600	,402
KLK D1		600	,252
KLK D1½	1.5	600	.134
KLK D 2	2	600	,124
KLK D2½	2.5	600	.0989
KLK D 3	3	600	.0773
KLK D3½	3.5	600	.0613
KLKD4	4	600	.0511
KLK D 5	5	600	.0363
KLK D 6	6	600	.0261
KLK D 7	7	600	.0205
KLK D 8	8	600	.0194
KLK D 9	9	600	.0166
KLK D 10	10	600	.0128
KLK D 12	12	600	.0103
KLK D 15	15	600	.0078
KLK D 20	20	600	.0045
KLK D 26	25	600	.00329
KLK D 30	30	600	.002816

Average Time Current **Curves**



MIDGET

250 Volt Slo-Blo® Type Fuse

QPL

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	4 hours, Minimum
135%	1 hour. Maximum
200%	12 seconds, Minimum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA.

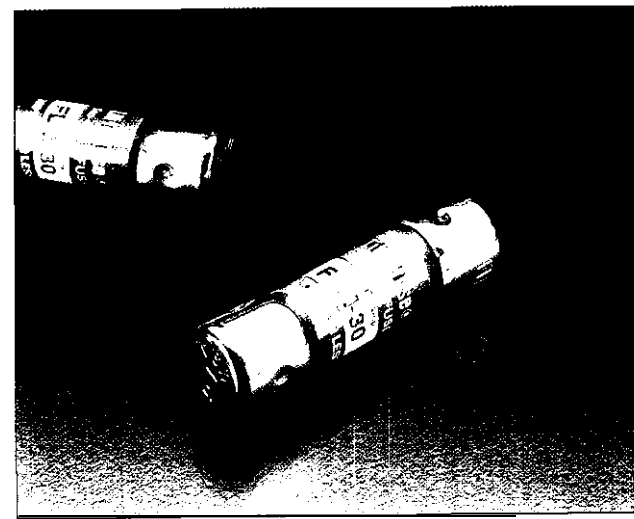
INTERRUPTING RATING:
10,000 amperes at 250 VAC.

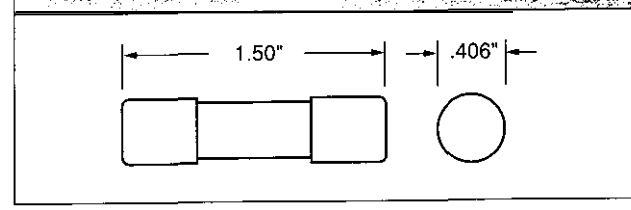
FUSES TO MIL SPEC: See F09B type in Military Section.

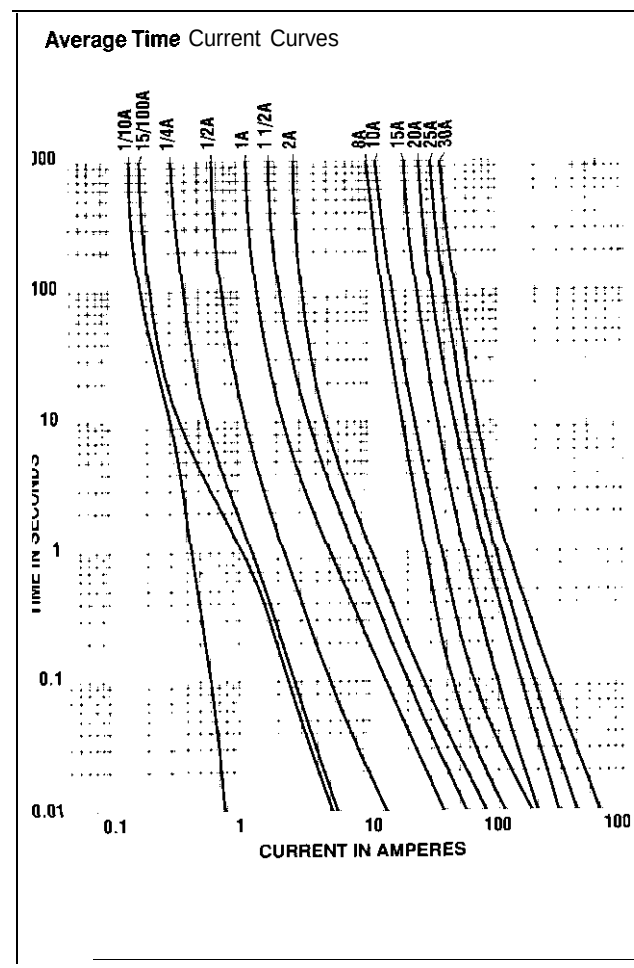
PATENTED

ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	AC Voltage Rating	Nominal Resistance Cold Ohms
FLM 1/10	.100	250	188.0
FLM 15,100	.150	250	87.0
FLM 2/10	.200	250	35.1
FLM 1/4	.250	250	5.40
FLM 3/10	,300	250	3.79
FLM 4/10	,400	250	2.10
FLM 1/2	.500	250	1.54
FLM 6/10	.600	250	1.024
FLM 8/10	.800	250	.623
FLM 1	1	250	,395
FLM 1 1/8	1.125	250	,356
FLM 1 1/4	1.25	250	.286
FLM 1 4/10	1.4	250	.253
FLM 1 1/2	1.5	250	.219
FLM 1 6/10	1.6	250	.184
FLM 1 8/10	1.8	250	.162
FLM 2	2	250	.125
FLM 2 1/4	2.25	250	.102
FLM 2 1/2	2.5	250	.0904
FLM 2 8/10	2.8	250	.0735
FLM 3	3	250	.0700
FLM 3 2/10	3.2	250	.0576
FLM 3 1/2	3.5	250	.0517
FLM 4	4	250	.0426
FLM 4 1/2	4.5	250	.0360
FLM 5	5	250	.0413
FLM 5 6/10	5.6	250	.0326
FLM 6	6	250	.0280
FLM 6 1/4	6.25	250	.0277
FLM 7	7	250	.02133
FLM 8	8	250	.01247
FLM 9	9	250	.01066
FLM 10	10	250	.00903
FLM 12	12	250	.00698
FLM 15	15	250	.00530
FLM 20	20	250	.00385
FLM 25	25	250	.00275
FLM 30	30	250	.00226







MIDGET

500 Volt Slo-Blo® Type Fuse

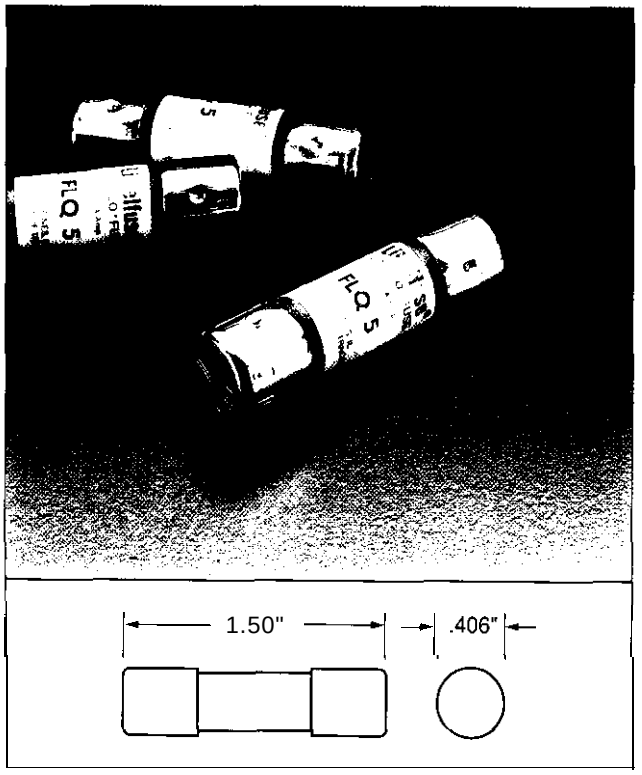
ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	4 hours, **Min**imum
135%	1 hour, **Max**imum
200%	12 seconds, **Min**imum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA.

INTERRUPTING RATING:
10,000 amperes at 500 VAC.

PATENTED



ORDERING INFORMATION:

Cartridge **Catalog** Number	Ampere Rating	AC Voltage Rating	Nominal Resistance Cold Ohms
FLQ 1/10	.100	500	188.0
FLQ 1/8	.125	500	125.9
FLQ 151100	.150	500	87.0
FLQ 3/16	.187	500	45.5
FLQ 2/10	.200	500	35.1
FLQ 1/4	.250	500	9.7
FLQ 3/10	,300	500	7.4
FLQ 4110	,400	500	4.33
FLQ 1/2	,500	500	2.76
FLQ 6/10	.600	500	1.88
FLQ 8/10	.800	500	1.03
FLQ 1	1	500	.7864
FLQ 1 1/8	1.125	500	.652
FLQ 1 1/4	1.25	500	.509
FLQ 1 1/2	1.5	500	.3835
FLQ 1 6/10	1.6	500	.296
FLQ 2	2	500	.2086
FLQ 2 1/4	2.25	500	.1563
FLQ 2 1/2	2.5	500	.1381
FLQ 3	3	500	.0954
FLQ 3 2/10	3.2	500	.0938
FLQ 3 1/2	3.5	500	.0732
FLQ 4	4	500	.0618
FLQ 4 1/2	4.5	500	.0463
FLQ 5	5	500	.0348
FLQ 5 6/10	5.6	500	
FLQ 6	6	500	
FLQ 6 1/4	6.26	500	
FLQ 7	7	500	
FLQ 8	8	500	
FLQ 9	9	500	.01540
FLQ 10	10	500	.01563
FLQ 12	12	500	.01176
FLQ 14	14	500	.00740
FLQ 15	15	500	.00690
FLQ 20	20	500	.004063
FLQ 25	25	500	.002920
FLQ 30	30	500	.002816

SPECIAL MIDGET

1 3/8" Long Fast-Acting Type Fuse

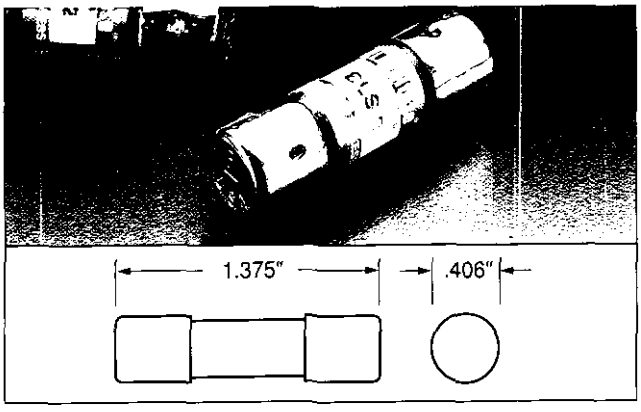
ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Ampere Rating	Opening Time
100%	2/10–10	4 hours, Minimum
135%	2/10–1 0	1 hour, Maximum
200%	2/10–5	5 seconds, Maximum
	6–10	10 seconds, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories from 1/2 through 5 amperes and Certified by CSA from 1/2 through 5 amperes.

INTERRUPTING RATING:
10,000 amperes at rated VAC.

PATENTED



ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	AC Voltage Rating	Nominal Resistance Cold Ohms
BLS 2/10	.200	600	36
BLS 4/10	.400	600	11.5
BLS 1/2	.500	600	1.25
BLS 314	.750	600	.591
BLS 8/10	.800	600	.524
BLS 1	1	600	.944
BLS 1 1/2	1.5	600	.190
BLS 1 6/10	1.6	600	.180
BLS 1 8/10	1.8	600	.143
BLS 2	2	600	.2608
BLS 3	3	600	1 0625
BLS4	4	600	.0464
LS 5	5	600	.0330
BLS 6	6	250	.0182
BLS 7	7	250	.1045
BLS 8	8	250	.012
BLS 10	10	250	.0081

Slo-Blo® indicating Type Fuse

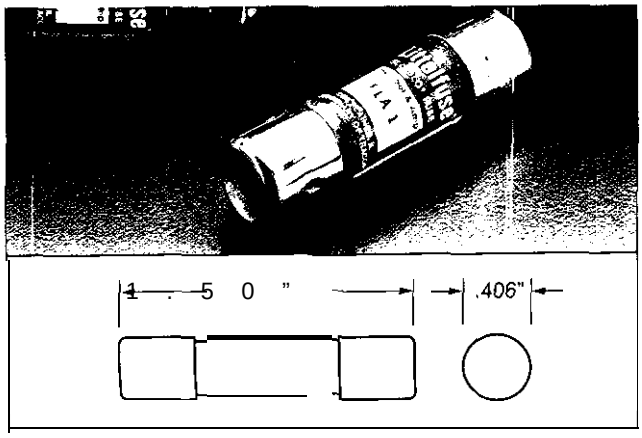
ELECTRICAL CHARACTERISTICS:

% Of Ampere Rating	Opening Time
110%	4 hours. Minimum
135%	1 hour, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories.

INTERRUPTING RATING:
10,000 amperes at rated VAC.

INDICATING PIN: Extends 0.3" when fuse opens.
NOTE: Fuses rated 12–30 amperes have dual tube construction.



ORDERING INFORMATION:

Catalog Number	Ampere Rating	Nominal Resistance Cold Ohms,	Catalog Number	Ampere Rating	Nominal Resistance Cold Ohms,	AC Voltage Rating
FLA 1/10	.100	200.0	FLA 5	556	.06304	125
FLA 15/100	.15	88.90	FLA 5 6/10	6	.05194	125
FLA 2/10	.200	50.00	FLA 6	6.25	.04253	125
FLA 114	.250	32.00	FLA 6 1/4		.03794	125
FLA 3/10	.300	22.20	FLA7	8	.03146	125
FLA 4110	.400	11.39	FLA 8	10	.01890	125
FLA 1/2	.500	8.00	FLA 10		.01387	125
FLA 6110	.600	5.55	FLA 12	12	.00689	125
FLA 8/10	.800	3.65	FLA 15	15	.00530	125
FLA 1	1	1.9504	FLA 20	20	.00385	125
FLA 1 1/8	1.125	1.7004	FLA 25	25	.00275	125
FLA 1 1/4	1.250	1.4004	FLA 30	30	.00226	125
FLA 1 4/10	1.4	1.1204				125
FLA 1 1/2	1.5	.8204				125
FLA 1 6/10	1.6	.7027				125
FLA 1 8/10	1.8	.5637				
FLA 2	2	.4627				
FLA 2 1/4	2.25	.3557				
FLA 2 1/2	2.5	.2599				
FLA 2 8/10	2.8	.2048				
FLA 3	3	.1816				125
FLA 3 2/10	3.2	.1587				125
FLA 3 1/2	3.5	.1195				125
FLA 4	4	.09772				125
FLA 4 1/2	4.5	.07875				125

MIDGET

Laminated Body Fast-Acting Type

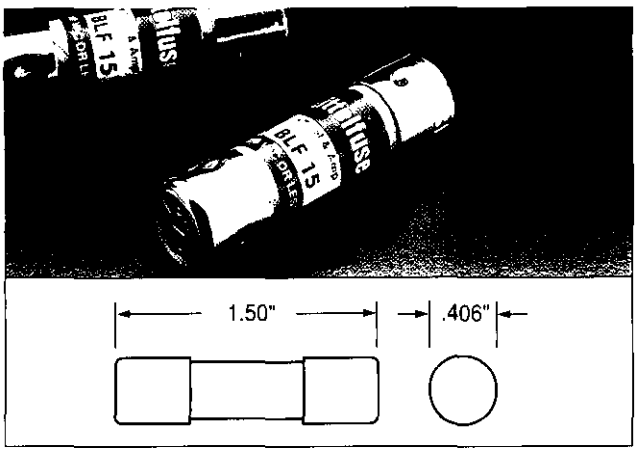
ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	4 hours. Minimum
135%	1 hour, Maximum
200%	30 seconds. Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA.

INTERRUPTING RATING:
10,000 amperes at rated VAC.

NOTE: Not recommended for applications in humid areas.



ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	AC Voltage Rating	Nominal Resistance Cold Ohms
ELF 1/2	.500	250	1.57
BLF 1	1	250	.395
BLF 1 1/2	1.5	250	.2191
BLF 2	2	250	.125
ELF 2 1/2	2.5	250	.0946
BLF 3	3	250	.0696
BLF 4	4	250	.0432
BLF 5	5	250	.0413
BLF 6	6	260	.02842
BLF 6 1/4	6.25	250	.02741
❑ LF 7	7	250	.02282
BLF 8	8	250	.01664
BLF 9	9	250	.01364
BLF 10	10	250	.01097
BLF 12	12	250	.00920
BLF 15	15	250	.00684
BLF 20	20	125	.00528
BLF 25	25	125	.00378
BLF 30	30	125	.00289

Fibre Body Fast-Acting Type

QPL

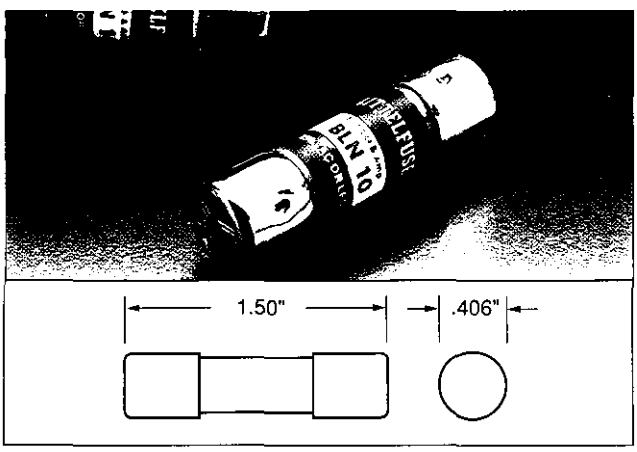
ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	4 hours. Minimum
135%	1 hour. Maximum
200%	30 seconds, Maximum

AGENCY APPROVALS: Listed by Underwriters Laboratories and Certified by CSA.

INTERRUPTING RATING: 10,000 amperes at 250 VAC.

FUSES TO MIL SPEC: See F09A type in Military Section.



ORDERING INFORMATION:

Cartridge Catalog Number	Ampere Rating	AC Voltage Rating	Nominal Resistance Cold Ohms
BLN 1		250	.395
BLN 2	2	250	.222
BLN 3	3	250	.125
BLN 4	4	250	.071
BLN 5	5	250	.0432
BLN 6	6	250	.0413
BLN 8	8	250	.0284
BLN 10	10	250	.0166
BLN 12	12	250	.011
BLN 15	15	250	.00920
BLN 20	20	250	.00684
❑ LN 25	25	250	.00270
BLN 30	30	250	.00230

SPECIAL MIDGET

Class CC* Fast-Acting & Slo-Blo® Type Fuses

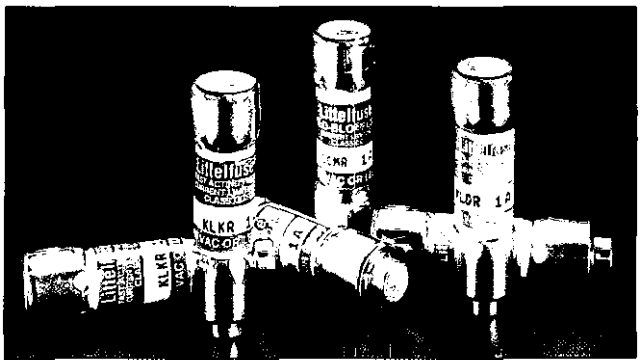
Fast-acting KLKR fuses provide fast-acting protection to equipment containing surge sensitive components. Use KLKR fuses for non-inductive loads not requiring time delay. CCMR fuses (formerly KLMR) are specifically designed to withstand sustained starting currents of small motors. The CCMR fuses provide short-circuit protection for motor branch-circuits. KLDR fuses are specifically designed to with stand the momentary high magnetizing currents of control transformers, solenoids, and similar inductive loads.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
110%	1/10–30	4 hours. Minimum
135%	1/10–30	1 hour, Maximum

AGENCY APPROVALS: KLKR Series: UL listed Fast-Acting Class CC per UL 248 and CSA Certified. KLDR, CCMR Series: UL listed Time-Delay Class CC per UL 248 and CSA Certified.
'CCMR 35-60A UL Listed Time-Delay Class CD.

INTERRUPTING RATING: AC: 200,000 amperes
DC: 20,000 amperes



See page 83 for time current curves.

AGENCY FILE NUMBERS: UL E81895, CSA LR 29862

VOLTAGE RATINGS: AC: 600 Volts
DC: 250 Volts (CCMR 2110 -2A)
(CCMR 4 1/2 – 10A)
(CCMR 35 – 60A)
300 Volts (CCMR 2 1/4 -4A)
300 Volts (KLDR)
300 Volts (KLKR)

ORDERING INFORMATION:

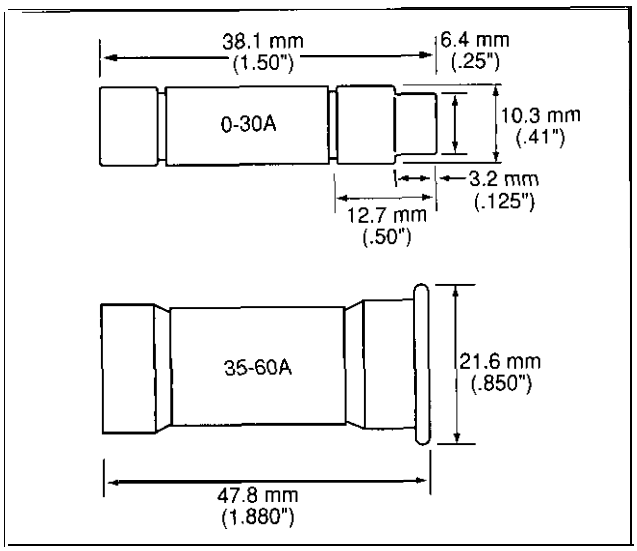
Ampere Rating	Catalog Number	Nominal Resistance Cold Ohms
1/10		
1/8		
15/100		
3/16	–	
2/10	**CCMR**.200	68.4
1/4	**CCMR**.250	43.3
3/10	**CCMR**.300	28.6
4/10	–	
1/2	**CCMR**.500	7.62
6/10	**CCMR**.600	8.2
3/4		
8/10	CCMR.800	4.013
1	CCMR 001.	2.59
1 1/8		
1 1/4	CCMR 1.25	1.687
1 4/10	CCMR 01.4	1.33
1 1/2	CCMR 01.5	1.24
1 6/10	CCMR 01.6	.9894
1 8/10	**CCMR** 01.8	.7783
2	CCMR 002.	.485
2 1/4	CCMR 2.25	.4166
2 1/2	CCMR 02.5	.3375
2 8/10	CCMR 02.8	.2400
3	**CCMR** 003.	.2188
3 2/10	CCMR 03.2	.1855
3 1/2	**CCMR** 03.5	.1346
4	CCMR 004.	.1231
4 1/2	CCMR 04.5	.093
5	CCMR 005.	.0704
5 6/10	CCMR 05.6	.0535
6	CCMR 006.	.0517
6 1/4	CCMR 6.25	.0464
7	CCMR 007.	.0369
7 1/2	CCMR 07.5	.027
8	**CCMR** 008.	.023
9	CCMR 009.	.0193
10	CCMR 010.	.0133
12	CCMR 012.	.0114
15	CCMR 015.	.00708
17 1/2	CCMR 17.5	.00495
20	CCMR 020.	.00360
25	CCMR 025.	.00250
30	CCMR 030.	.00240
35	CCMR 035.	.00426
40	**CCMR** 040.	.00286
45	**CCMR** 045.	.00246
50	CCMR 050.	.00182
60	CCMR 060.	.00118

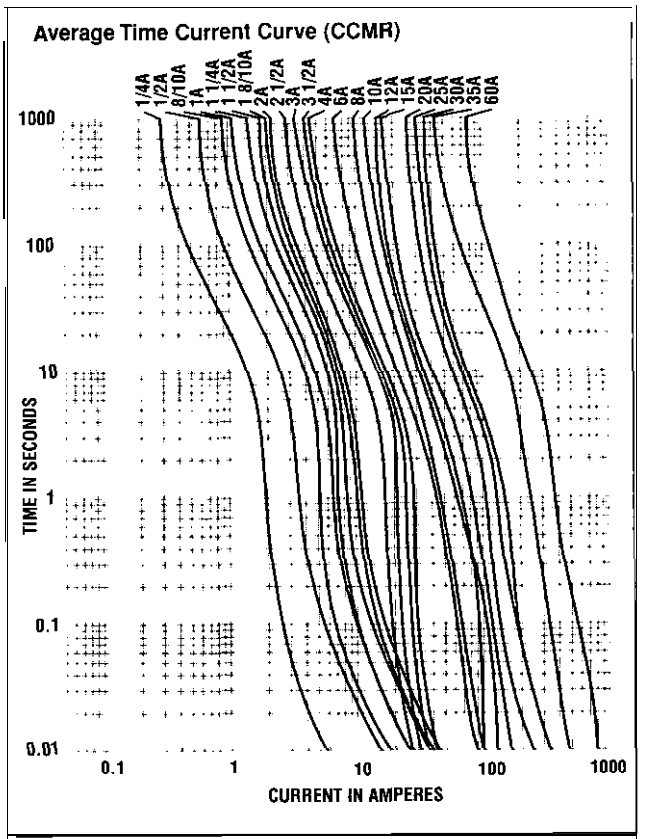
Catalog Number	Nominal Resistance Cold Ohms
KLDR.100	246
KLDR.125	134.9
KLDR.150	96
KLDR.187	66.4
KLDR.200	57.8
KLDR.250	31.61
KLDR.300	25.5
KLDR.400	13.6
KLDR.500	15.9
KLDR.600	9.99
KLDR.750	6.08
KLDR.800	6.2
KLDR 001.	4.0
KLDR 1.12	2.94
KLDR 1.25	2.33
KLDR 01.4	1.5
KLDR 01.5	.898
KLDR 01.6	.625
KLDR 01.8	.486
KLDR 002.	.55
KLDR 2.25	.52
KLDR 02.5	.333
KLDR 02.8	.26
KLDR 003.	.21
KLDR 03.2	.171
KLDR 03.5	.239
KLDR 004.	.118
KLDR 04.5	.082
KLDR 005.	.0399
KLDR 05.6	.0334
KLDR 006.	.0315
KLDR 6.25	.03
KLDR 007.	.0253
KLDR 07.5	.0205
KLDR 008.	.0193
KLDR 009.	.0155
KLDR 010.	.0122
KLDR 012.	.0114
KLDR 015.	.00708
KLDR 17.5	.00495
KLDR 020.	.0036
KLDR 025.	.0025
KLDR 030.	.0024

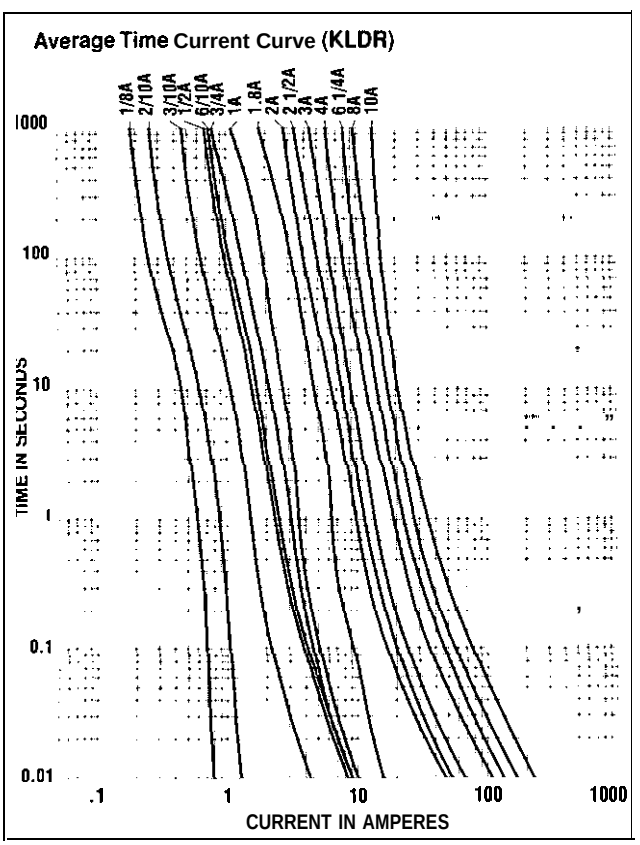
Catalog Number	Nominal Resistance Cold Ohms
KLKR.100	79.33
KLKR.125	56.52
–	
–	
KLKR.200	28.21
KLKR.250	IS.22
KLKR.300	15.10
–	–
KLKR.500	6.95
–	–
KLKR.750	3.581
–	–
KLKR 001.	.2342
	–
	–
	–
KLKR 01.5	.225
	–
	–
KLKR 002.	.135
–	–
KLKR 02.5	.0906
	–
KLKR 003.	.0776
–	–
KLKR 03.5	.0562
KLKR 004.	.0468
	–
KLKR 005.	.0332
–	–
KLKR 006.	.0238
	–
KLKR 007.	.0208
	–
KLKR 008.	.0177
KLKR 009.	.0151
KLKR 010.	.01325
KLKR 012.	.00852
KLKR 015.	.0074
–	–
KLKR 020.	.00511
KLKR 025.	.003775
KLKR 030.	.002954

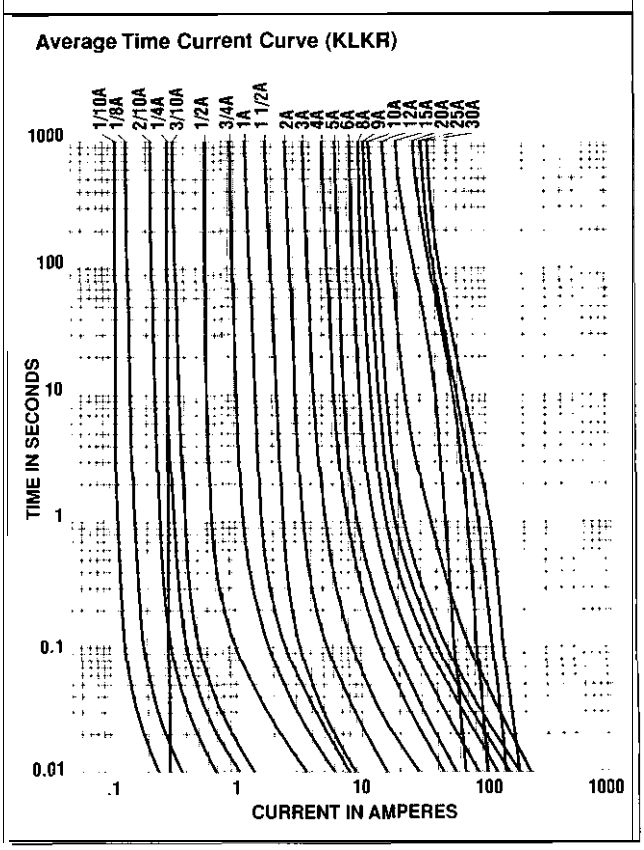
SPECIAL MIDGET

Class CC Fast-Acting & Slo-Blo® Type Fuses









MIDGET

KLQ Series Fuse

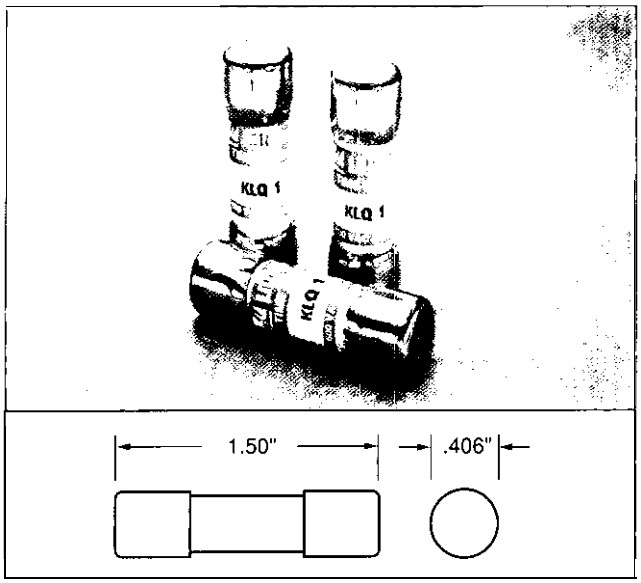
- The Littelfuse KLQ series is designed to protect gaseous vapor fixtures. HID ballasts. and other electronic and lighting circuits.
- The KLQ is the same physical size as the Littelfuse BLS, but has more time delay to handle transient and inrush currents.

VOLTAGE RATING: 600 VAC.

INTERRUPTING **RATING:**
10,000 amperes at rated VAC.

AMPERE RANGE: I-15 amperes.

AGENCY APPROVALS: UL Listed per UL 248.



ORDERING INFORMATION:

Catalog Number	Ampere Rating	AC Voltage Rating
KLQ 001	1	600
KLQ 1 6/10	1.6	600
KLQ 002	2	600
KLQ 003	3	600
KLQ 004	4	600
KLQ 005	5	600
KLQ 006	6	600

FLU Series Fuse

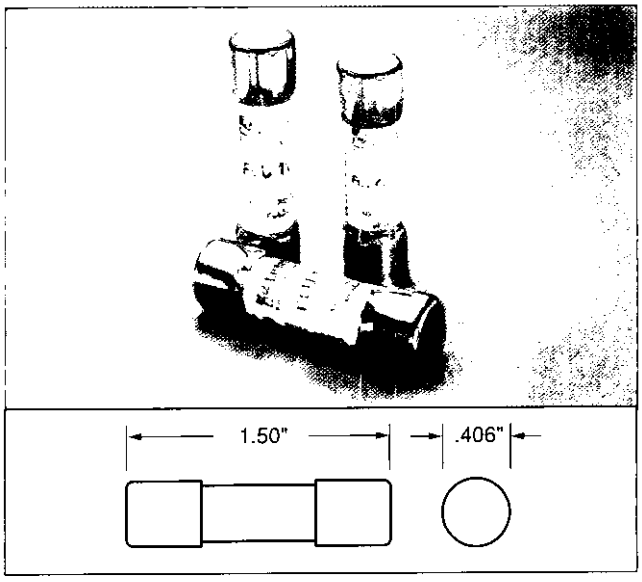
- The Littelfuse FLU series is designed specifically for the protection of multimeters.
- The 1000 VACNDC rating also makes the FLU ideal for a variety of other applications.

VOLTAGE **RATING:** 1000 VACNDC.

INTERRUPTING RATING: 44/100A: 10kA
11A: 20kA.

AMPERE RATINGS: 441100 and 11 amperes.

AGENCY APPROVALS: UL Recognized under the components program.



ORDERING INFORMATION:

Catalog Number	Ampere Rating	AC Voltage Rating
FLU 441100	0.44	1000
FLU 011	11	1000

BLADE TERMINAL AND SPECIAL PURPOSE FUSES

ATO® Fuse Fast-Acting Type

Designed and originated by Littelfuse for the automotive industry, the ATO® 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.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
110%	1–40 Amp	100 Hours Minimum
135%	I-2 Amp	.50 sec., Min.; 600 sec., Max.
	3–40 Amp	.75 sec., Min.: 600 sec., Max.
200%	I-2 Amp	.10 sec., Min.; 5 sec., Max.
	3-40 Amp	.15 sec.. Min.: 5 sec.. Max.
350%	1-2 Amp	.020 sec., Min.; 0.5 sec., Max.
	3-40 Amp	.080 sec.. Min.; 0.5 sec.. Max.

AGENCY APPROVALS: Listed by Underwriters Laboratories (i-40 amperes). Certified by CSA (3-30 amperes).

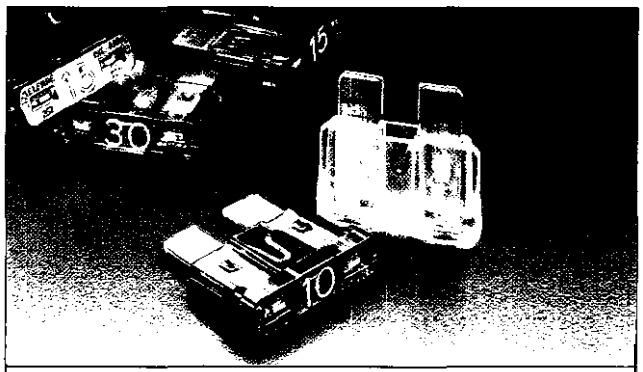
DESIGN STANDARDS: U.L. Standard for Automotive Blade Type Fuses. SAE (Society of Automotive Engineers) J1284.

PATENTED

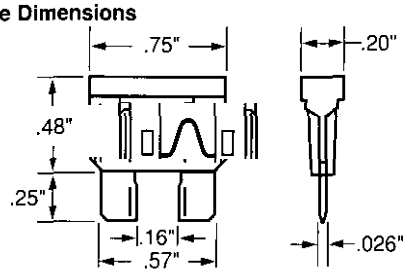
COLOR-CODING: Autofuse® fuses are color-coded for easy amperage identification.

ORDERING INFORMATION:

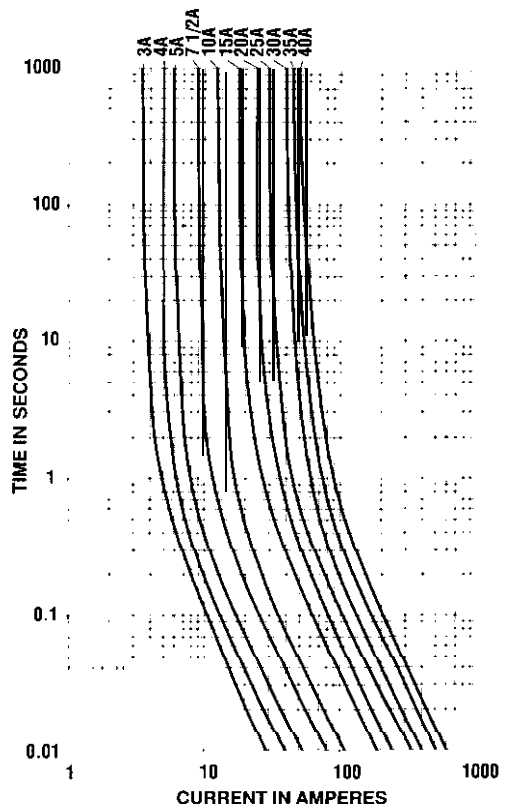
Catalog Number	Ampere Rating (A)	Voltage Rating (VDC)	Body Color Code	Nominal Cold Resistance Ohms	Minimum Melting I²t (A² Sec.)
257 001	1	32	Black	0.123	.4
257002	2	32	Grey	0.050	1.4
257003	3	32	Violet	0.031	7.4
257004	4	32	Pink	0.023	14
257005	5	32	Tan	0.018	26
257 07.5	7½	32	Brown	0.011	60
257 010	10	32	Red	0.0077	115
257015	15	32	Blue	0.0048	340
257020	20		Yellow	0.0033	520
257025	25	32	Natural	0.0025	1080
257030	30	32	Green	0.0019	1510
257035	35	32	Blue Green	0.0016	2280
257040	40	32	orange	0.0014	3310



Reference Dimensions



Average Time Current Curves



Reference pg. 106, ATO® Fuse Clip for PC. Board mounting.

MINI® Fuse Fast-Acting Type

The MINI:" Fuse is smaller than its predecessor, the ATO® Fuse, which permit more fuses in the same amount of space. More fuses in the same space satisfy the requirement that more circuits be individually fused in newer automobiles.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
110%	100 Hours Minimum
135%	.75 sec., Min.: 600 sec. Max.
200%	.15 sec., Min.; 5 sec., Max.
350%	.080 sec., Min.; .250 sec.. Max.
600%	.030 sec.. Min.: .100 sec.. Max.

AGENCY APPROVALS: Listed by Underwriters Laboratories.

DESIGN STANDARD: SAE (Society of Automotive Engineers) J2077.

PHYSICAL SPECIFICATIONS:
Materials: Body: Plastic
Terminations: Silver-Plated

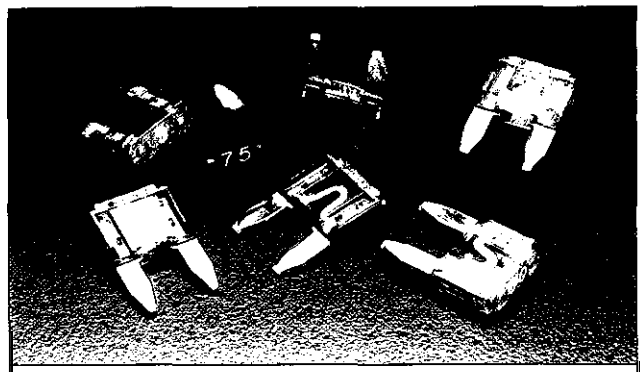
PATENTED

ORDERING INFORMATION:

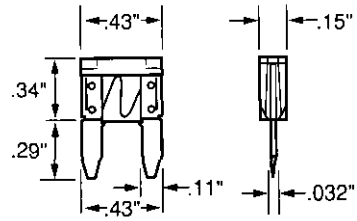
Catalog Number	Ampere Rating (A)	Voltage Rating (VDC)	Body Color Code	Nominal Cold Resistance Ohms	Minimum Melting I²t (A² Sec.)
297 002	2	32	Grey	0.056	2.8
297 003	3	32	Violet	0.034	9.4
297 004	4	32	Pink	0.024	17
297005	5	32	Tan	0.018	25
297 07.5	7½	32	Brown	0.0, 1	68
297 010	15	32	Red	0.0073	93
297 015	20	32	Blue	0.0045	270
297020		32	Yellow	0.0032	380
297025	25	32	Natural	0.0023	625
297030	30	32	Green	0.0018	1130

ATO® Fuse, MINI" Fuse, 3AG Fuse Puller

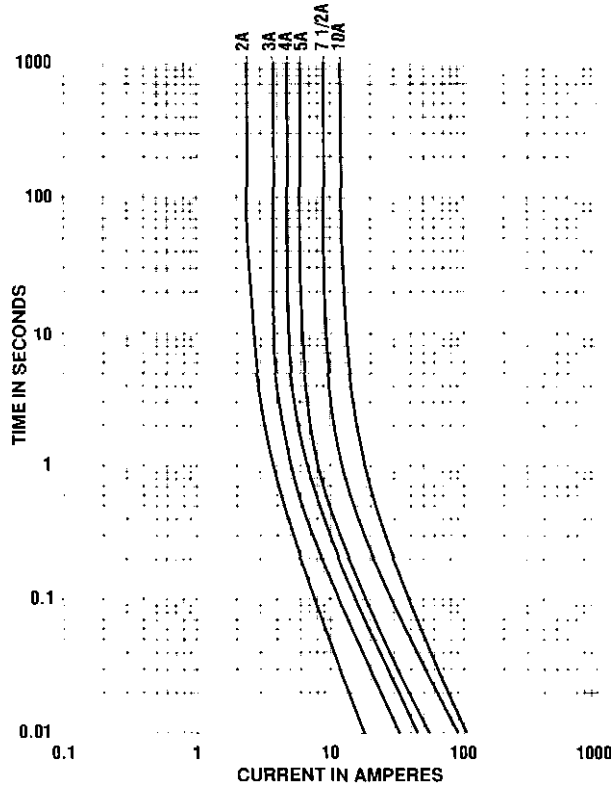
ORDERING INFORMATION:
Catalog Number: 097024



Reference Dimensions



Average Time Current Curves



Reference pg. 106-107 for MINI" Fuse PC. Board fuseholders.

LOW VOLTAGE

MAXI™ Fuse Slo-Blo® Type Fuse

The MAXI™ Fuse is available in a higher range of amperage ratings (20–80 amperes) than the MINI™ Fuse and ATO® Fuse designs and is larger in physical size. A typical MAXI™ Fuse application in today's more sophisticated automobile circuits is protection of the wiring harness by replacing the fusible wire or fusible link, which is often a plain piece of small wire.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Ampere Rating	Opening Time
135%	20–60	60 sec., Min.: 1800 sec., **Max.**
	70–80	60 sec., **Min.**; 3600 sec., Max.
200%	20	4 sec., Min.; 20 sec., Max.
	30	6 sec., Min.; 30 sec.. Max.
	40	8 sec., Min.; 40 sec., Max.
	50	10 sec., Min.; 50 sec., **Max.**
	60	15 sec., **Min.: 60 sec., Max.**
	70–80	4 sec., Min.; 60 sec., Max.
350%	20	.7 sec., Min.: 2 sec., Max.
	30	1 sec., Min.; 4 sec., Max.
	40	1.4 sec., Min.: 5 sec., **Max.**
	50	**1.7 sec., Min.: 6 sec., Max.**
	60	2 sec., Min.; 7 sec., Max.
	70-80	.2 sec.. Min.; 2 sec., Max.
600%	20	.15 sec., Min.; 1 sec., Max.
	30-60	.20 **sec.. Min.: 1 sec., Max.**
	70–80	.04 sec., **Min.**; .15 sec., **Max.**

AGENCY APPROVALS: Recognized under the components program of Underwriters Laboratories (20-60 amperes).

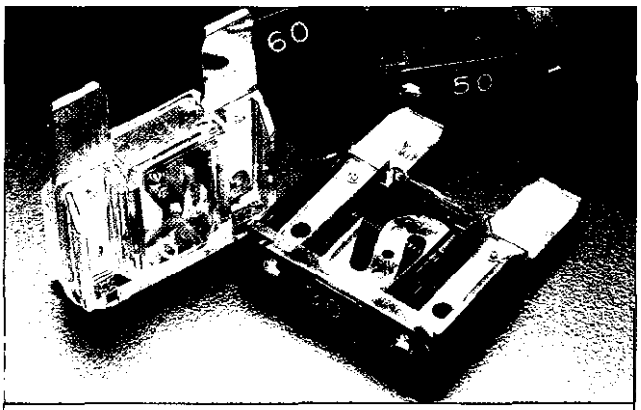
DESIGN STANDARD: SAE (Society of Automotive Engineers) J1888.

PHYSICAL SPECIFICATIONS:
Materials: Body: Plastic
Terminations: Silver-Plated

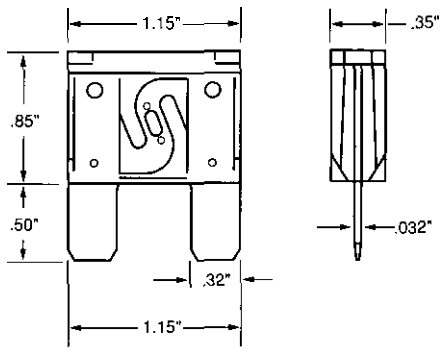
PATENTED

ORDERING INFORMATION:

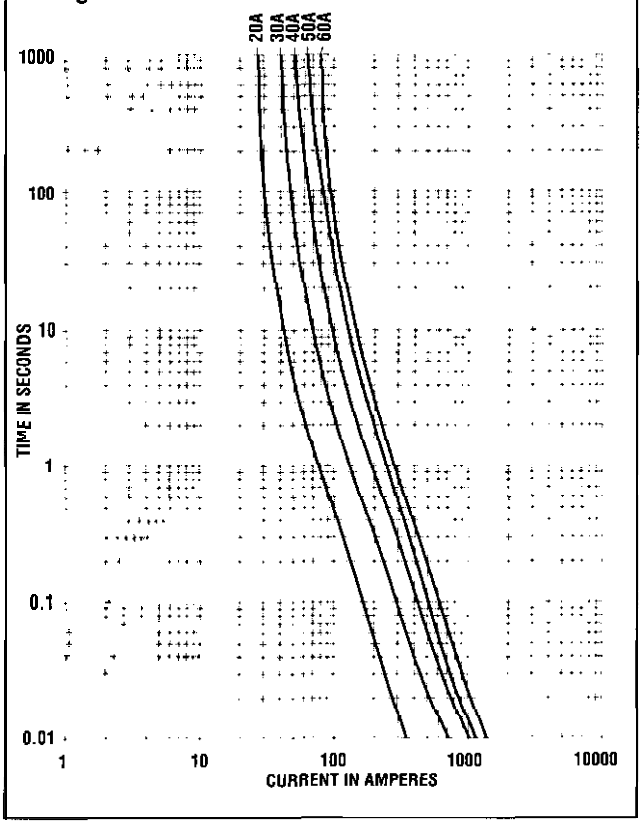
Catalog Number	Ampere Rating (A)	Voltage Rating (VDC)	Body Color Code	Nominal Cold Resistance Ohms	Minimum Melting I^2t (A² Sec.)
299020	20	32	Yellow	0.0031	1100
299025	25	32	Gray	1.71	2087
299030	30	32	Green	0.0020	4070
299035	35	32	Brown	2.39	6032
299040	40	32	mange	0.0014	8450
299 050	50	32	Red	0.0011	11300
299 060	60	32	Blue	0.00089	15300
299070	70	32	Tan	0.00069	6900
299060	80	32	Natural	0.00059	8800



Reference Dimensions



Average Time Current Curves



LOW VOLTAGE

MEGA® Fuse Fast-Acting Type

Designed for high current circuit protection up to 250 amperes. Ideal for battery and UPS systems requiring ultra-high current protection.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 Hours, Minimum
135%	120 sec.. Min.; 1800 sec., Max.
200%	1 sec., Min.; 15 sec., Max.
350%	0.3 sec., Min.; 5 sec., Max.
600%	0.1 sec., Min.; 1 sec., Max.

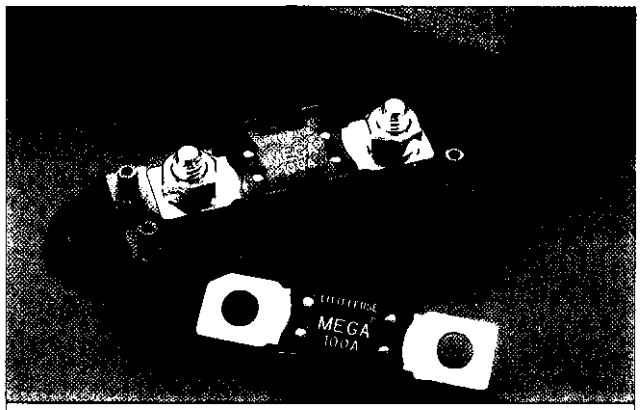
PHYSICAL SPECIFICATIONS:

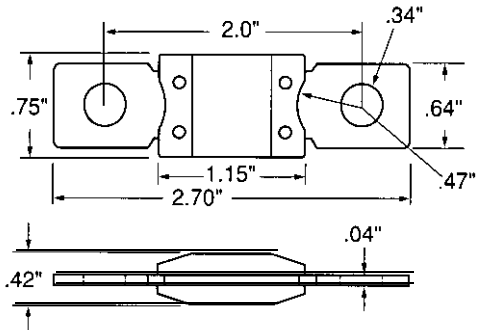
Materials: Body: Plastic
Terminations: Copper

PATENTED

ORDERING INFORMATION:

Catalog Number	Ampere Rating (A)	Voltage Rating (VDC)	Stamp Color Code	Nominal Cold Resistance (milliOhms)	Minimum Melting I^2t (A* Sec.)
298 100	100	32	Yellow	0.55	31100
298 125	125	32	Green	0.43	57800
298 150	150	32	orange	0.35	100000
298 175	175	32	White	0.27	188000
298 200	200	32	Blue	0.26	204000
298 225	225	32	Tan	0.23	257000
298 250	250	32	Pink	0.19	389000

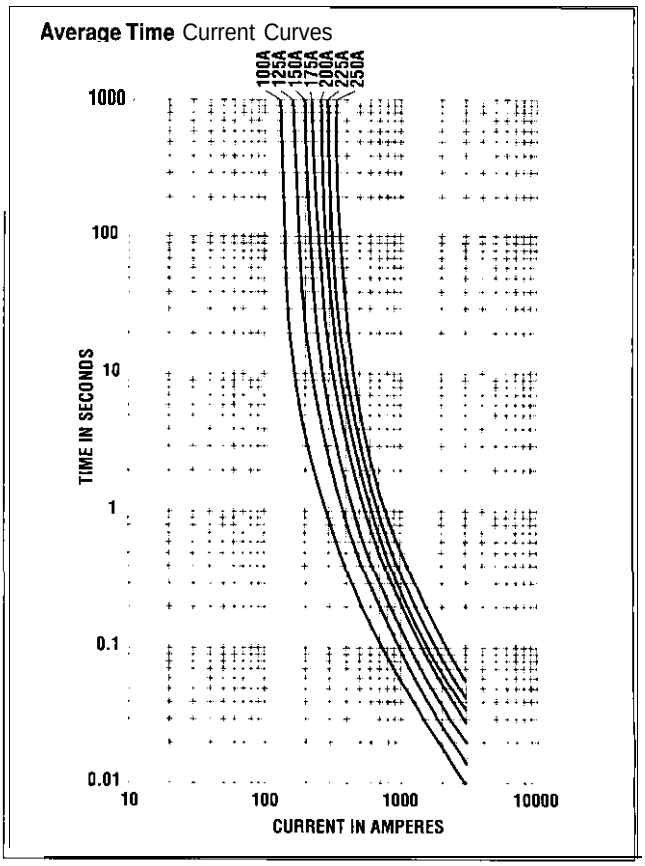




MEGA® Fuse Holder

ORDERING INFORMATION:

Catalog Number	Version
0298 1001	Single Holder Assembly
0298 2001	Dual Holder Assembly



MIDI® FUSE

The MIDI" Fuse offers a bolt-on space saving fuse for high current wiring protection and provides time delay characteristic?. with "Diffusion Pill Technology". The MIDI Fuse was designed and patented by Littelfuse.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	**100 hours.** Minimum
110%	4 hours, Minimum
150%	90 sec.. Min.; 3600 sec., Max.
200%	5 sec., Min.; 100 sec., Max.
300%	.5 sec., Min.; 15 sec., **Max.**

INTERRUPTING RATINGS: 1000 amperes at 32 VDC

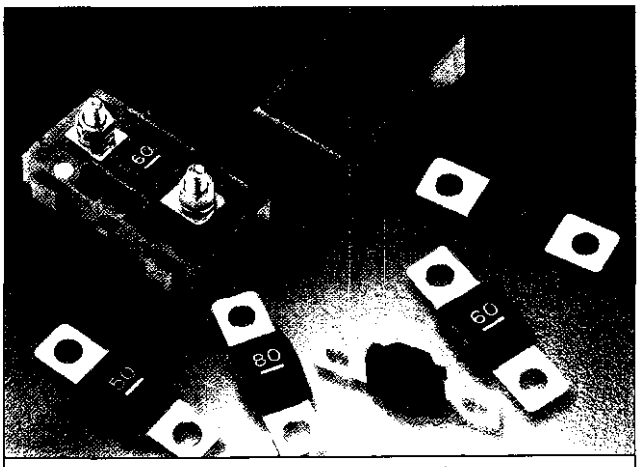
VOLTAGE RATINGS: 32 VDC

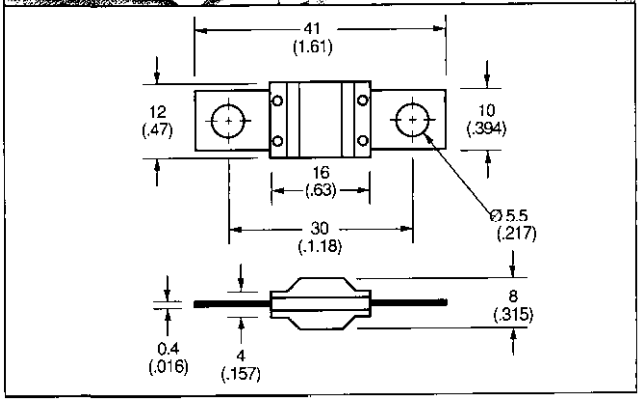
AMBIENTTEMP.: –40°C **to** +125°C

PATENTED:

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Voltage Rating (VDC)	Nominal Cold Resistance (mΩ)
0498 040	40	32	1.3
0498 050	50	32	1.04
0498 060	60	32	0.87
0498 070	70	32	0.72
0498 080	80	32	0.56
0498 100	100	32	0.45
0498 125	125	32	0.40
0499150	150	32	0.33

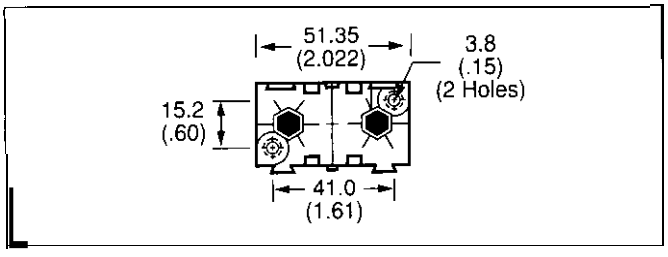


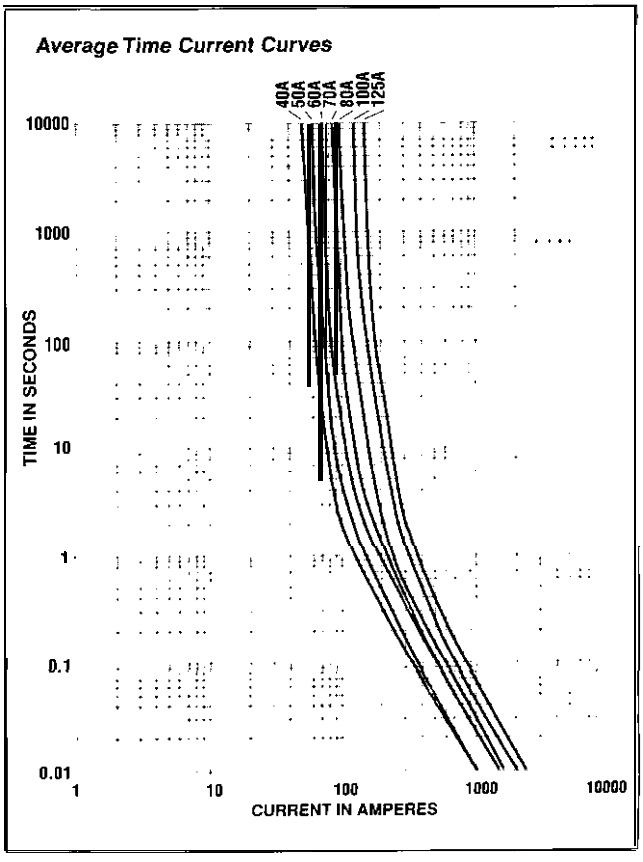


MIDI' FUSE Fuseholders

ORDERING INFORMATION:
Catalog Number 498900.

SPECIFICATIONS:
Electrical: Use with MIDI" Fuses from 40 to 150 amps. (321')
Body: Glass Filled Thermoplastic
Body Color: Black
Cover With Tether: Glass Filled Thermoplastic
Cover Color: Black
Ambient Temp.: –40°C **to** +125°C
Fuse Mounting: M5 Threaded Stud and Hex Nuts
Cable Positions: Optional
Side Stackable Feature





481 Alarm Indicating Type Fuse

- Ideal for telecommunications and control panel Circuits.
- Eliminates down time by immediately pinpointing the blown (open) circuit while triggering LED or audio alarm, while placed in mating holder (482 Series).
- Clear plastic lens option available for additional safety.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	10 minutes. Minimum
150%	5 minutes, Maximum

AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and the Components Acceptance Program of CSA.

AGENCY FILE NUMBERS: UL E71611, CSA LR 29862

INTERRUPTING RATINGS:
450 amperes at 60 VDC
300 amperes at 125 VAC (up to 20 amperes)
300 amperes at 125 VDC (up to 15 amperes)
200 amperes at 125 VDC (up to 20 amperes)

ENVIRONMENTAL SPECIFICATION:
Operating Temperature: -55°C to +125°C

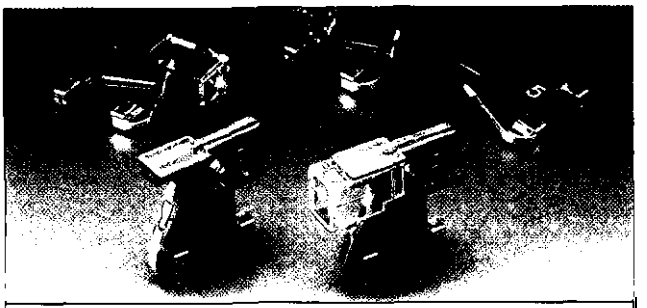
PHYSICAL SPECIFICATIONS:
Construction Materials:
Body: Polyphenylene Sulfide (UL 94VO)
Terminations: Beryllium Copper/Tin Plated
Optional Lens: Nylon

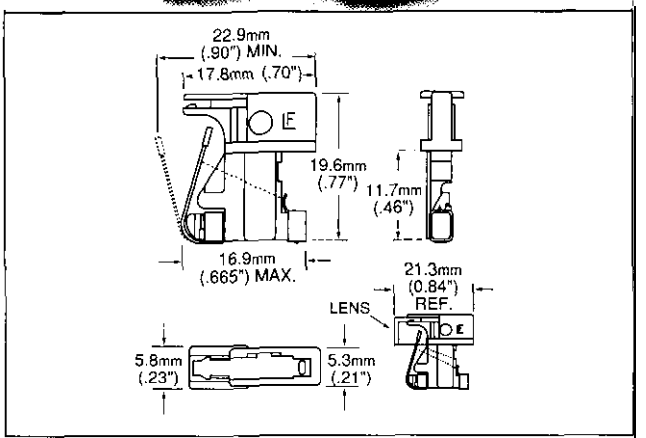
PACKAGING SPECIFICATIONS:
Available in five (5) packs or boxes of one hundred (100). When ordering a Five (5) Pack, please add the letter 'V' after the catalog number. When ordering a one hundred (100) piece box, add a 'H'. To order the part with a Protective Lens, add the letters 'XL' after the package code.

ORDERING INFORMATION:

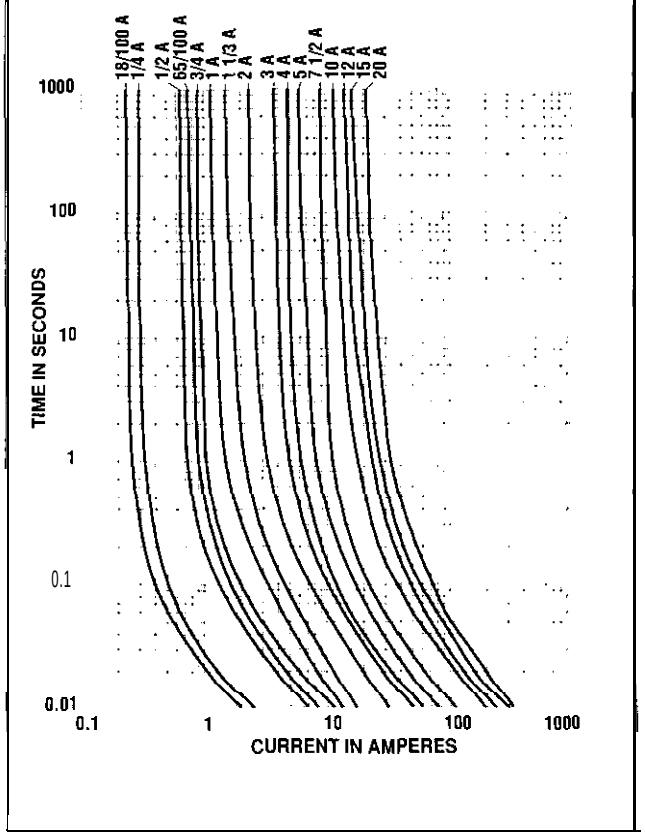
Catalog Number	Ampere Rating (A)	Voltage Rating	Body Color Code	Nominal Cold Resistance Ohms	Minimum Melting I²t (A² Sec.)
0481.180	18/100		Yellow	4.8	0.00808
NEW 0461.200	1/5		Red/Black		
0461.250	1/4		Violet	3.3	0.0356
NEW 6461.375	3/8		Gray/White		
0401.500	1/2		Red	1.52	0.139
NEW 0481.650	65/100		Black	1.25	0.278
0481.750	314		Brown	.980	0.363
0481001.	1		Gray	.665	0.733
04811.33	1⅓	125VAC	White	.480	1.58
048101.5	1½	&	Yellow/White	.385	2.55
0481002.	2	125 VDC	Orange	.120	5.29
NEW 048102.5	2½		Orange/White	.0904	9.46
0481003.	3		Blue	.0670	11.2
048103.5	3½		Blue/White	.0415	10.5
0481004.	4		Brown/White	.0350	15.4
0481005.	5		Green	.0285	26.2
046107.5	7½		Black/White	.0113	42.8
0481010.	10		Red/White	.00840	115.3
0481012.	12		Green/Yellow	.00660	222.5
0481015.	15		Red/Blue	.00580	294.22
NEW 0481020.	2 0		Green/White		
0481000.	Dummy		ø		

'20 A Fuseholder must be used. Fuse is keyed to prevent insertion in lower rated holders. 20 A Fuseholder is designed to accept all ratings up to 20 amperes.





Average Time Current Curves



Refer to pg. 108 for Alarm Indicating Fuseholder.

Barrier Network Fuse 242 Series

- Meets Barrier Network Standards (EN50020) for hazardous applications.
- High interrupting rating. Meets the 1500A minimum.
- Available in both axial lead and surface mount.

ELECTRICAL CHARACTERISTICS:

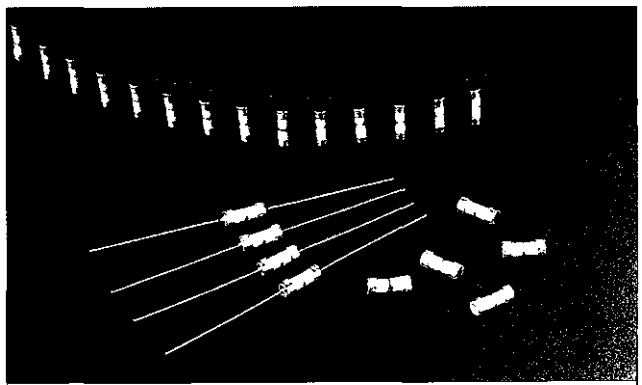
% of Ampere Rating	Opening Time
1 10%	4 hours, Minimum
300%	10 seconds, Maximum
1000%	0.002 seconds, Maximum

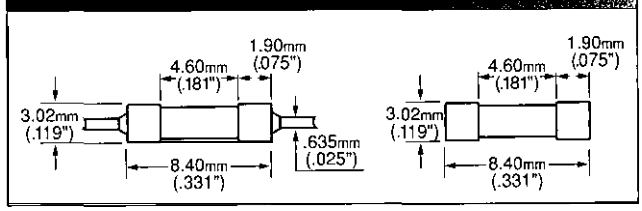
INTERRUPTING RATINGS:
4000 amperes at 250VAC/VDC

PACKAGING: For surface mount version add packaging suffix UR. For Axial Leaded version add packaging suffix UA For Axial Leaded version, taped add packaging suffix UAT1.

ORDERING INFORMATION:

Catalog Number	Ampere Rating	Color Coding	Nominal Resistance Cold Ohms	Nominal Melting I²t A' Sec.
0242.050	.050	Fled	11.34	0.000103
0242.060	.080	Green	6.19	0.000214
0242.100	.100	Blue	3.60	0.000977
0242.160	.160	Violet	3.00	0.00157
0242.200	.200	Brown	2.66	0.0036
0242.250	.250	Black	1.6	0.00579





Safe-T-Plus Fuse 259 Series

- Designed to allow equipment to meet "'Intrinsically Safe" certification for applications in gas plants, petrochemical and processing industries where there is a danger of gas explosion from faulty circuits.
- Hermetically Sealed.

ELECTRICAL CHARACTERISTICS:

% of Ampere Rating	Opening Time
100%	4 hours, Minimum
200%	5 seconds, Maximum

AGENCY APPROVALS: Meets CENELEC EN500014 to 039 and IEC 60079-i 1.

INTERRUPTING RATINGS:
50 amperes at 125 VAC
300 amperes at 125 VDC

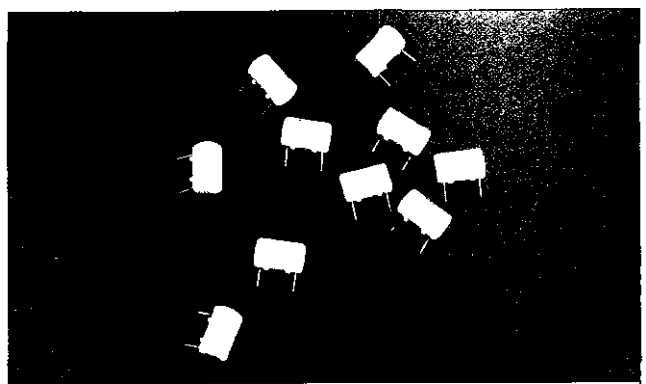
ORDERING INFORMATION:

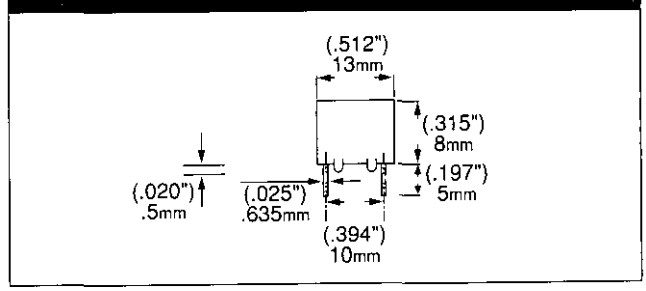
Catalog Number	Ampere Rating	Voltage Drop	Maximum Resistance Cold Ohms	Nominal Melting I²t A' Sec.
0259.062	.062	2.1	8.1	0.00016
0259.125	.125	1.3	2.4	0.0012
0259.250	.250	0.63	0.67	0.0095
0259.375	.375	0.61	0.46	0.025
0259.500	.500	0.78	0.32	0.07
0259.750	,750	0.23	0.19	0.062
0259001.	1	0.24	0.14	0.01

Schedule of limitations.

1) The fuse must be so mounted that creepage and clearance distances meet the requirements of Table 2 of EN50020:1977 or Table 4 of EN50020:1994 (equivalent to IEC 60079-11 4th Edition 1999).

2) When used in intrinsically safe apparatus it will be necessary to determine a surface temperature classification for the fuse.





FUSEHOLDERS

FOR 3AG, 5 x 20mm, OR 2AG FUSES

International Shock-Safe Panel Mount Type

A complete selection of styles and options satisfy a wide variety of fuseholder design needs. Designed to eliminate the possibility of electrical shock, as defined in IEC standards 60065 and 60127. The universal fuseholder body will accept 3AG, 5 x 20mm, and 2AG fuse sizes depending on knob selected. Permits inventory reduction of bodies and provides knob interchange versatility. Anti-tease feature eliminates circuit interruption when knob is accidentally depressed. Five fuseholder types assure design flexibility. Available with two knob styles -screwdriver slot or fingergrip. Drip-proof option is available on screwdriver slot knob style. Available in two terminal styles-dual-purpose for soldering or 3/16" NEMA quick connect; and 1/4" NEMA/DIN quick connect. Quick fuse size identification is provided with letters on fingergrip knob and color-coded screwdriver slot knobs.

APPROVALS:

	3AG	5 x 20mm	2AG
𝕽	20A 250V	10A 250V	1 OA 250V
CSA	20A 250V	10A 2 5 0 V	1 OA 250V
S E M K O	6.3A 250V	6.3A 250V	—
VDE	1 OA 250V	1 OA 250V	—

SPECIFICATIONS:

Electrical: Insulation Resistance: 10,000 megohm minimum at 500 VDC. Contact Resistance: Less than .005 ohm average at currents up to 1 ampere.

Mounting: Threaded styles withstand 15 in.-lb. mounting torque. Low profile and High profile panel thickness: .032" min./.310" max. Quick mount panel thickness: .012" min./.360" max. Rear mount pane thickness: .012" min.l.260" max.

Molded Parts: Body Material: Black glass-filled thermoplastic (UL 94VO). Knob Material: Grey, blue or black glass-filled thermoplastic (UL 94VO) Hex Nut Material: Black glass-filled thermoplastic.

Knob: Finger-Grip, Fuse Extractor type or Screwdriver Slot, Fuse Extractor type with plated copper alloy insert. Plated copper alloy contact clips. Spring loaded, locking mechanism provides an anti-tease feature and will not vibrate loose.

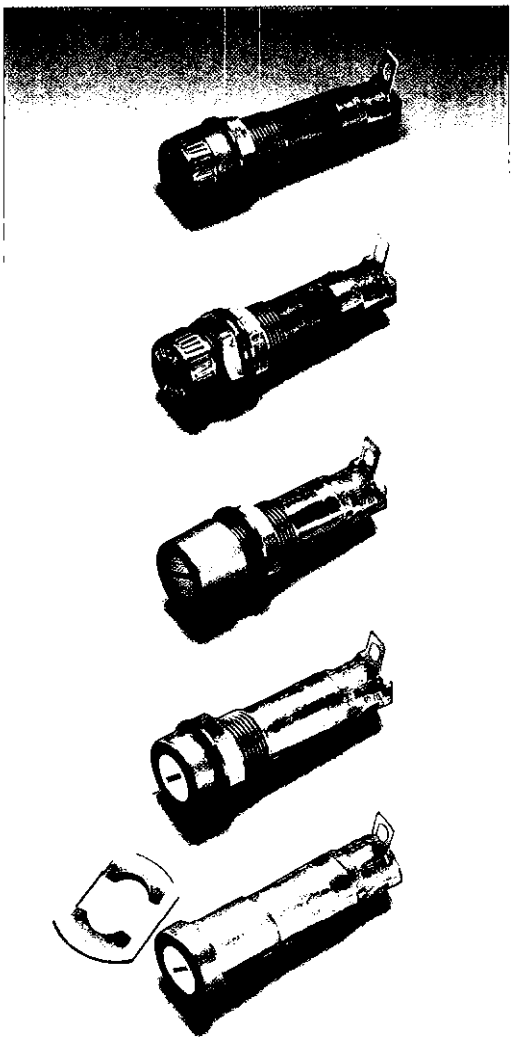
Terminals: Copper alloy. Tin-plated. Three styles available. A .187" dual purpose terminal accepts wire for soldering or a Quick-Connect receptacle. .187" terminal for NEMA Quick-Connect and .250" terminal for NEMA/DIN Quick-Connect available.

Ambient Temperature: -40°C to +85°C.

Hardware: Threaded style fuseholders are supplied with a thermoplastic hex nut unassembled. Quick mount style fuseholders are supplied with a push-on type retaining nut, black oxide finish. unassembled. A synthetic rubber "O" ring will be supplied only with the screwdriver slot knob when the drip-proof version is requested. To order with a metal internal tooth lockwasher (L) and/or neoprene panel washer (N) and/or drip-proof synthetic rubber "O" ring with Neoprene washer (NP) [Screwdriver slot knob only], add the appropriate suffix (L, N, or NP) respectively (or in combination) to the catalog number.

Example: 3453LS7LNP is a holder supplied with a lockwasher, a neoprene panel washer, and a drip-proof "O" ring in addition to the hex nut.

PATENTED



FOR 3AG, 5 x 20mm, or 2AG FUSES

International Shock-Safe Panel Mount Type

ORDERING INFORMATION:

EXAMPLE (**Complete** Assembly with options): **345** 3 **LS** 7 **L** N

Series Number

Fuse Size	Style	Terminals	Options*
2 2AG .177" x .570"	**LF** Low Profile Body Black Fingergrip Knob	**1** 3/16" (Rt. Angle) Dual Purpose Solder/QC	**L** Lockwasher
3 3AG .250" x 1.250"	**RF** Rear Mount Body Black Fingergrip Knob	**2** 3/16" (Straight) Dual Purpose Solder/QC	**N** Neoprene Washer
5 5 x 20mm .197" x .787"	**HS** High Profile Body Screwdriver Slot Knob	**3** 3/16" (Rt. Angle) NEMA QC	**NP** Drip-Proof "O" Ring** with Neoprene Washer
	LS Low Profile Body Screwdriver Slot Knob	**4** 3/16" (Straight) NEMA QC	
	QS Quick Mount Body Screwdriver Slot Knob	**7** 1/4" (Rt. Angle) NEMA/DIN QC	
	Screwdriver Slot Knob 2AG — Blue Knob 3AG — Grey Knob 5 x 20mm — Black Knob	**8** 1/4" (Straight) NEMA/DIN QC	

*Options (L, N, NP) can be ordered individually or in combination.

**Screwdriver slot knob only.

Note: To Order Knob Only:

Fuse Size	Fingergrip Knob Part Number	Screwdriver Slot Knob Part Number
2AG	3452LF1-020	3452LS1-020
3AG	3453LF1-020	3453LS1-020
5 x 20mm	3455LF1-020	3455LS1-020

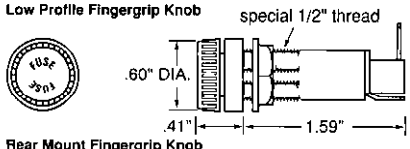
To Order Body Including Nut(s) Only:

Terminal Style	Bottom Terminal	Low Profile Body Part Number***	High Profile Body Part Number	Rear Mount Body Part Number	Quick Mount Body Part Number
3/16" Dual Purpose	(Rt. Angle)	3453LF1-010	3453HS1-010	3453RF1-010	3453QS1-010
3/16" Dual Purpose	(Straight)	3453LF2-010	3453HS2-010	3453RF2-010	3453QS2-010
3/16" NEMA QC	(Rt. Angle)	3453LF3-010	3453HS3-010	3453RF3-010	3453QS3-010
3/16"NEMA QC	(Straight)	3453LF4-010	3453HS4-010	3453RF4-010	3453QS4-010
1/4" NEMA/DIN QC	(Rt. Angle)	3453LF7-010	3453HS7-010	3453RF7-010	3453QS7-010
1/4"NEMA/DIN QC	(Straight)	3453LF8-010	3453HS8-010	3453RF8-010	3453QS8-010

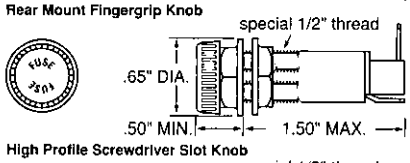
***Low Profile Body will accept either Fingergrip or Screwdriver Slot Knob.

DIMENSION DRAWINGS:

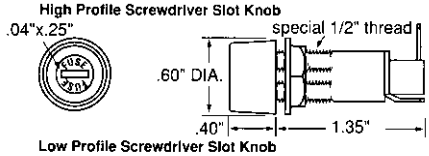
Low Profile Fingergrip Knob



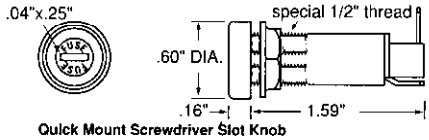
Rear Mount Fingergrip Knob



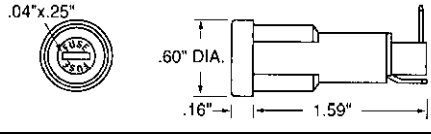
High Profile Screwdriver Slot Knob



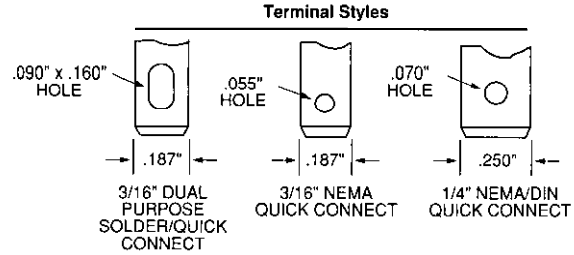
Low Profile Screwdriver Slot Knob



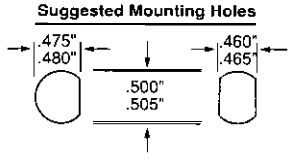
Quick Mount Screwdriver Slot Knob



Terminal Styles

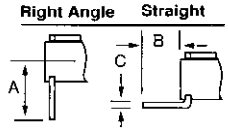


Suggested Mounting Holes



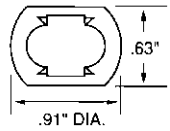
Bottom Terminal

Right Angle Straight

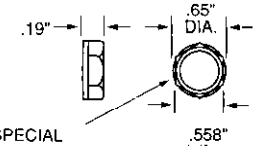


	A	B	C
.187" QC	.53"	.30"	.020"
.250" QC	.59"	.36"	.032"

"Push-On" Type Retaining Nut for Quick Mount Fuseholder



Plastic Hex Nut with Flange



FOR 3AG, 5 x 20mm, OR 2AG FUSES

Flip-Top Shock-Safe Panel Mount Type

Shock-Safe design eliminates any possibility of electrical shock, per IEC Standards 60127 and 60065. Fuse carrier holds spare fuse for fast, easy fuse replacement and convenient servicing. Low profile design complements modern panels.

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: Rating: See TABLE.
Insulation Resistance: 10,000 megohm minimum at 500 VDC.
Contact Resistance: Less than 0.01 ohm.

Mounting: Snap-in mounting. No hardware required. Panel thickness range: .032" through .125".

Molded Parts: Thermoplastic (UL 94VO) black standard (other colors available as special).

Fuse Carrier: Spring-loaded. Unlocks with a press of the finger. Locks into place to prevent accidental circuit interruption. Permanently attached to fuseholder body to prevent loss. Extracts fuse from live terminals. Holds spare fuse.

Terminals: Copper alloy, tin plate. Accepts quick-connect or solder.

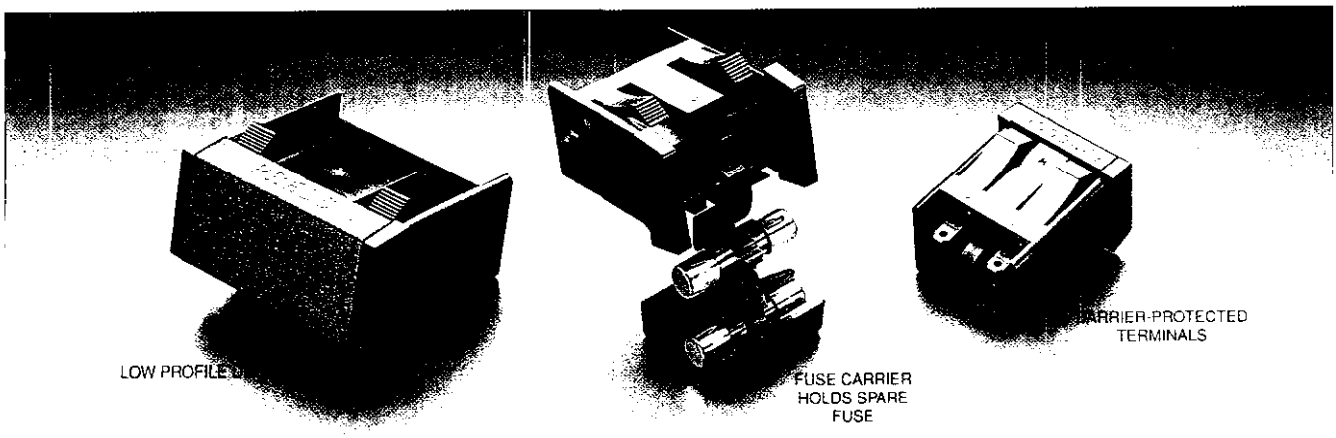
Ambient Temperature: -40°C to +85°C.

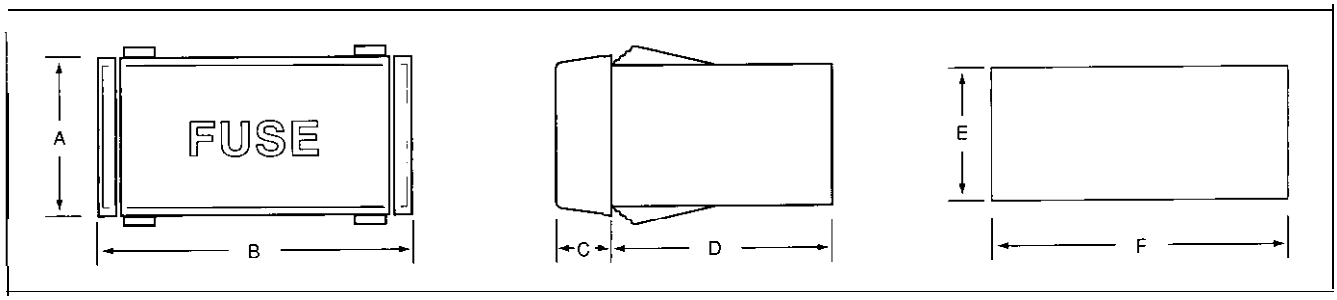
Vibration: 10-55-10 Hz at .06" double amplitude (Method 201, MIL-STD-202).

PATENTED

ORDERING INFORMATION:

Catalog Number	Fuse Size	Q.C. Terminals	Max. Amps At 250V.	A	B	C	D	E +.005"/-.000"	F +.005"/-.000"
346 a77	3AG	.250" x .032" .072" Dia. Hole	15	.75"	1.5'	.27"	1.04'	.688"	1.445"
286 677	5 x 20mm	.187" x .032" .055" Dia. Hole	10	.70"	1.03'	.26"	.94"	.625"	.953"
286 377	2AG	.110" x .020" .048" Dia. Hale	10	.61"	.85"	.20"	.87"	.550"	.775"





FOR 2AG FUSES

Shock-Safe **Panel Mount Type**

Newest and smallest of the 2AG fuseholder family. Popular screwdriver slot knob style provides low profile which complements modern panels. Shock-Safe design eliminates any possibility of electrical shock, per IEC Standards 60127 and 60065.

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: Rated at 10 amperes for any voltage up to 300 volts.
Insulation Resistance: 10,000 megohm minimum at 500 VDC.
Contact Resistance: Less than .005 ohm average at currents up to 1 ampere.

Dielectric Strength: 4000 volts terminal to panel, 3000 volts terminal to terminal.

Mounting: Withstands 10 lb.-in. mounting torque. Maximum panel thickness is .250".

Molded Parts: Body, knob, and hex nut material: Slack, glass reinforced thermoplastic.

Knob: Screwdriver slot, fuse extractor type with nickel-plated, beryllium copper insert. Stainless steel spring.

ORDERING INFORMATION:

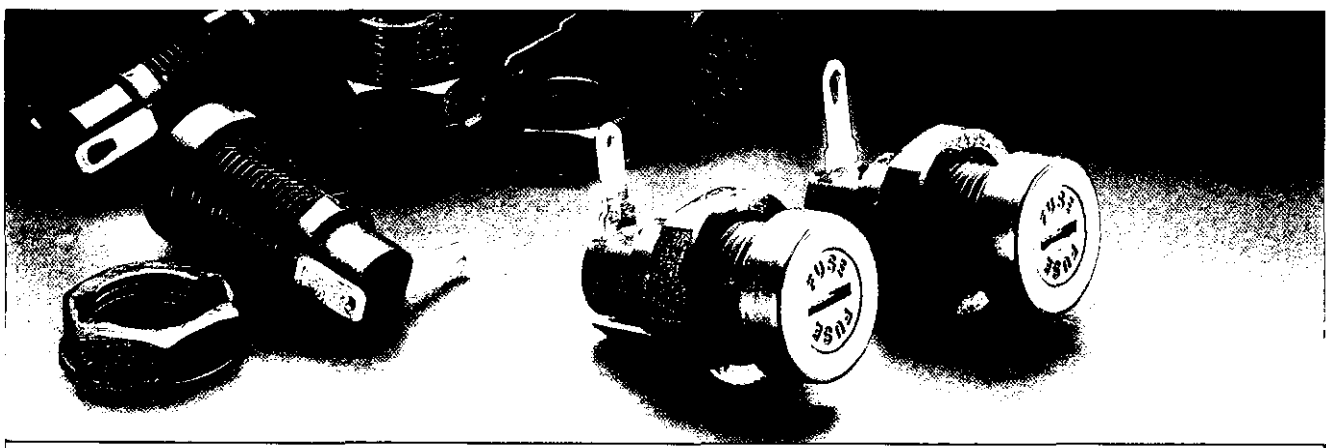
Catalog Number	Type of Terminal
245 001	Solder/Q.C.Terminal
245 002	NEMA Q.C. Terminal

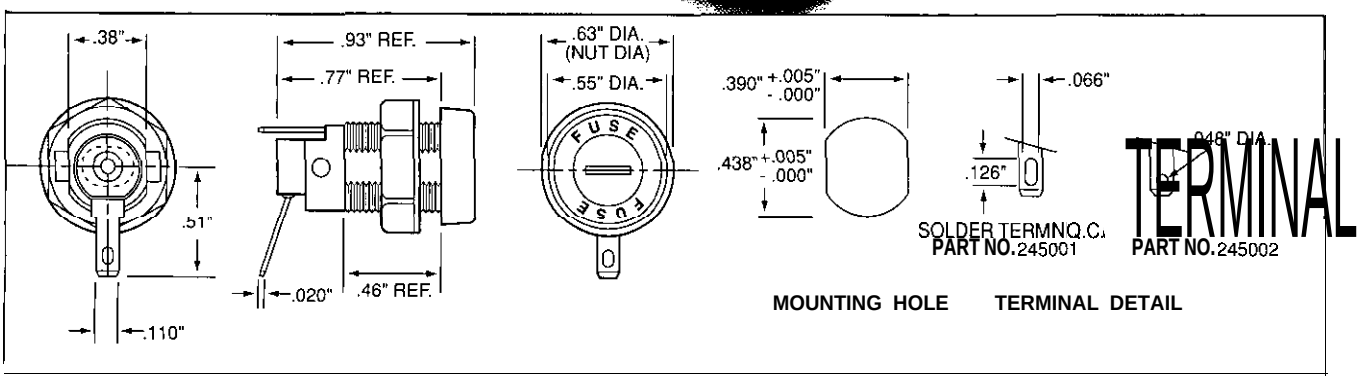
Terminals: Brass. Tin-plated. Solder/Q.C. Terminals accept soldered wire or a .110" quick-connect receptacle. The NEMA-style .110" Q.C. terminal has a .048" hole.

Ambient Temperature: -40°C to +85°C.

Hardware: Standard fuseholders are supplied with a thermoplastic hex nut, unassembled. To order with a lockwasher (L), and/or neoprene panel washer (N), add the appropriate suffix (L. N, or LN) to the catalog number. Example: 245001 LN is a holder with lockwasher and neoprene panel washer in addition to the hex nut.

PATENTS: Patented.





FOR 3AG, 5 x 20mm, OR MIDGET FUSES

Shock-Safe for 3AG or 5x20mm Fuses PC Board Type

Similar to Shock-Safe fuseholders shown on preceding page, but designed for PC. board mounting. Shock-Safe design per IEC Standards 60127 and 60065. Two different knob styles available for use with 3AG (¼" x 1¼") or 5 x 20mm fuses.

APPROVALS: Recognized under the Components Program of Underwriters Laboratories (16A, 250V).
Certified by CSA (15A, 250V).
SEMKO approved (6.3A, 250V).
VDE approved (10A, 250V).

SPECIFICATIONS:

Electrical: Rating: See APPROVALS.

Insulation Resistance: 10,000 megohm minimum at 500 VDC.

Contact Resistance: Less than .005 ohm average at a current of one ampere.

Dielectric Strength: 4000 volts minimum.

Mounting: Intended for soldering to printed circuit boards.

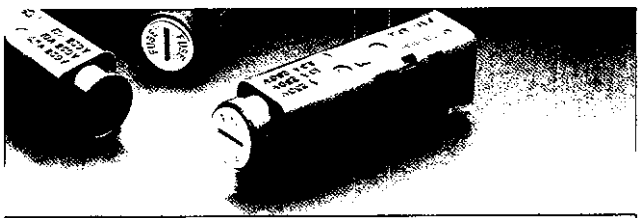
Molded Parts: Body Material: Black glass-filled thermoplastic (UL 94V0).

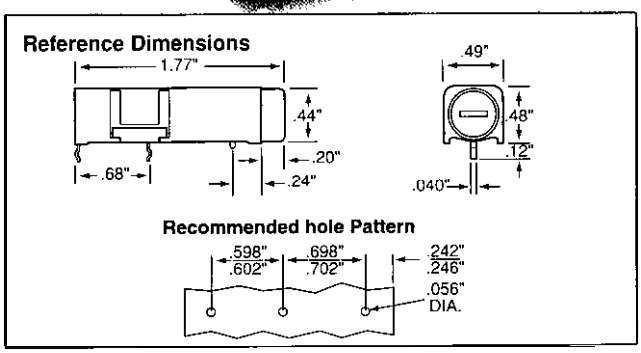
Knob: Screwdriver slot, fuse extractor type with nickel-plated, copper alloy insert. Spring-loaded, bayonet style.

Knob Material: Grey or Black glass-filled thermoplastic (UL 94V0).

Terminals: Brass. Tin-plated.

Ambient Temperature: –40°C to +85°C.





ORDERING INFORMATION:

Catalog Number	Fuse Size
345 101	¼" x 1¼" Fuses
345121	5 x 20mm Fuses

Body only: 345 101-010
Knob only: 345 101-020 (¼" x 1¼") Grey;
345 121-020 (5 x 20mm) Black.

for Midget Fuses Panel Mount Type

Two panel mount fuseholder designs are available for supplementary or Class CC branch circuit protection. Class CC fuses have a rejection feature on one end cap which mates with the rejection feature of Littelfuse Class CC fuse blocks and fuseholders to prevent the installation of fuses with lower voltage ratings or interrupting ratings.

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: Rated at 30 amperes for any voltage up to 600 volts.

Dielectric Strength: 4000 volts minimum.

Mounting: Flange mounting either in front of or behind panel. Watertight version must be front panel mounted. Maximum panel thickness is .75".

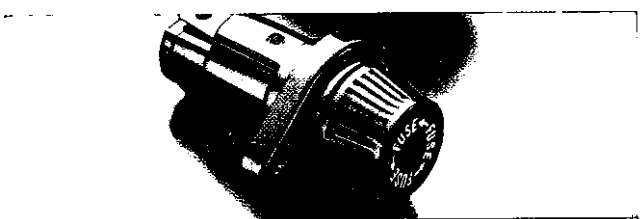
Molded Parts: Black thermoplastic (UL 94VO).

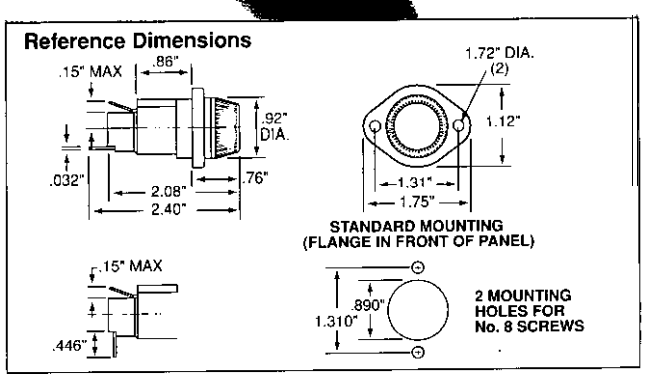
Knob: Screw type, with engraved markings: unfilled characters (571 007, 571 008, 571 007P, 571 008P), light blue characters (571 027, 571 026, 571 027P, 571 028P).

Terminals: Brass. Tin-plated. Combination solder and ¼" Quick-Connect. Side terminal has .125" diameter hole. Bottom terminal has .156" x .124" elongated hole.

Ambient Temperature: -40°C to +85°C.

Hardware: 571 007,571 006,571 027, 571 026,571 OCC, and 571 RCC, none; 571 007P, 571 008P, 571 027P, 571 028P, 571 OCCP, and 571 RCCP, two O-rings for watertight seal per MIL-PRF-19207.





ORDERING INFORMATION:

Catalog Number Standard	Watertight	Bottom Terminal	Fuse Length Range*
571 027 571 028	571 027P 571 028P	Straight Rt. Angle	1 5/16" – 1 3/8"
571 007 571 008	571 007P 571 008P	Straight Rt. Angle	13/32" – ½"
571 OCC 571 RCC	571 OCCP 571 RCCP	Straight Rt. Angle	1½"

*Fuse diameter is 13/32".

FOR 3AG FUSES

LOW Profile Snap Mount Type

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: 348 Series: Rated at 15 amps for any voltage up to 250 volts.
344 **Series:** Rated at 15 amps at lamp voltage shown below.

Dielectric Strength: 1500 volts minimum.
When designing indicating type fuseholders into a circuit consideration should be given to the resistance of fractional amperage fuses and the parallel resistance of the indicator lamp and its resistor.

Mounting: Panel thickness range: .031" through .125"

Molded Parts: Black thermoplastic body (UL 94V0). Thermoplastic bezel, cap and lens (UL94V2). See tables below for colors.

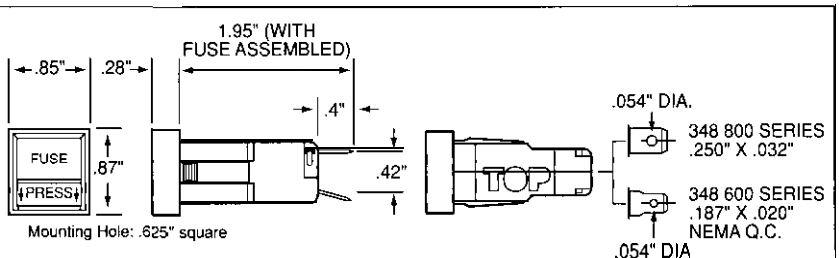
Terminals: Brass. Tin-plated.

Ambient Temperature:
Non-indicating: -40°C to +85°C.
Indicating: -40°C to +60°C.

Fuse Installation: Insert a fuse into the cap and push the assembly into the body until it latches. Press in and down to unlatch for removal.

PATENTED

348 000 Series



ORDERING INFORMATION:

Six-Digit Catalog Numbers Consist of:

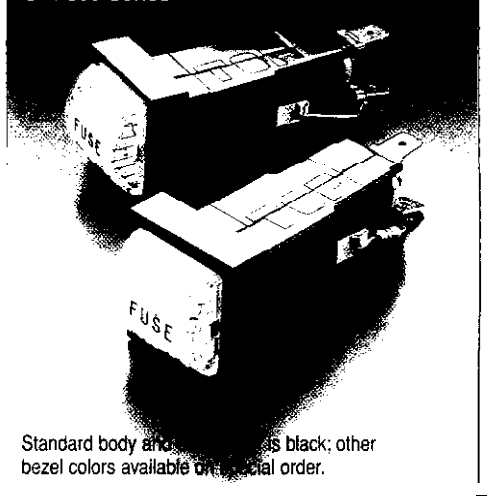
series Number	Terminal Style	Bezel Color	cap Color
348 for 3AG Fuses	8 for 3/16" wide NEMA Q.C. Terminal 8 for 1/4" wide	1 for Red 2 for Green 3 for Yellow 4 for Blue 5 for White 7 for Black 9 for Grey	1 for Red 2 for Green 3 for Yellow 4 for Blue 5 for White 7 for Black 9 for Grey

Example: 3 4 8 6 1 1

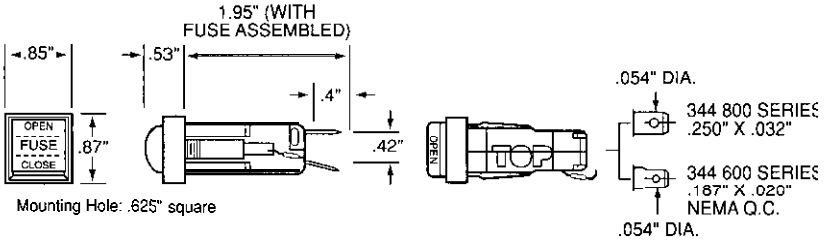
Blown-Fuse Indicating Snap Mount Type

APPROVALS AND SPECIFICATIONS: See above.

344 600 Series
344 800 Series



Standard body and ... is black; other bezel colors available on special order.



ORDERING INFORMATION:

Catalog Number 3/16" Q.C. Terminals	Catalog Number 1/4" Q.C. Terminals	Lamp Type	Lamp Voltage	Lamp current	Resistor	Lens Color
344 601	344 801	Incandescent	6	40 ma	No	Amber
344 602	344 802	Incandescent	14	80 ma	No	Amber
344 603	344 803	Incandescent	28	40 ma	No	Amber
344 604	344 804	Neon	120	1.2 ma	Yes	Clear
344 605	344 805	Neon	240	.3 ma	Yes	Clear

FOR MICRO" FUSE PLUG-IN FUSES

RF-Shielded Front Panel Mount Type/Rear Panel Mount Type

Space Saving. RF-shielded design holds miniature MICRO'" fuse. Screw-on drip-proof knob construction permits use when presence of moisture exists at front of panels.

SPECIFICATIONS:

Electrical: Rated at 5 amperes for any voltage up to 125 volts.

Mounting: Front panel mount, maximum panel thickness: .093". Rear panel mount, maximum panel thickness: .125".

Molded Parts: Black thermoset.

Housing, Knob and Nut: Aluminum, untreated. Chromate finish for RF shielding or anodized finish (non-RF shielding) available on special order.

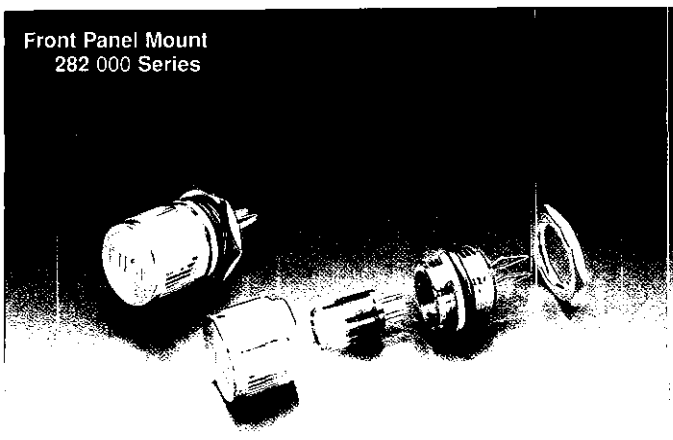
Mounting Gasket: Neoprene or conductive silicone.

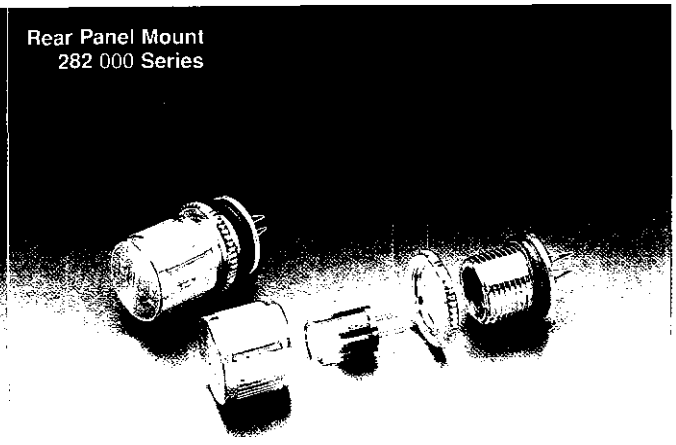
Seal: Buna "N" O-ring inside the knob.

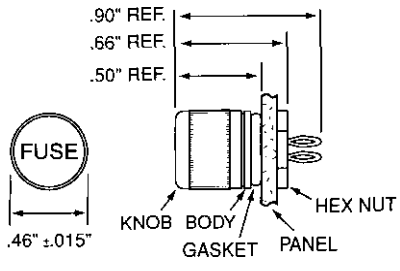
Terminals: Beryllium copper. Silver plated.

Ambient Temperature: -40°C to +125°C.

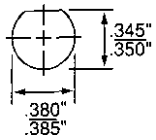
Hardware: Hex nut or knurled nut as shown, unassembled.





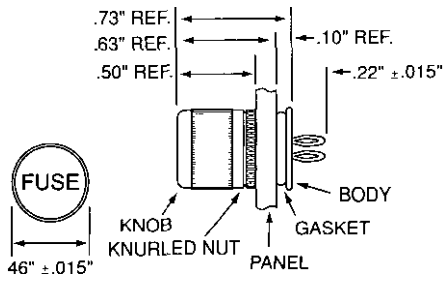


Mounting Hole

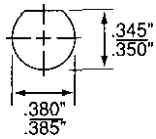


ORDERING INFORMATION:

Catalog Number	Gasket Type
282 001	Neoprene
282 007	Conductive



Mounting Hole



ORDERING INFORMATION:

Catalog Number	Gasket Type
282 002	Neoprene
282 008	Conductive

FOR 3AG FUSES

Traditional Panel Mount Type

QPL

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: Rated at 20 amperes for any voltage up to **250 volts.**

Dielectric Strength: 2400 volts minimum.

Mounting: Withstands 15 lb.-in. mounting torque; maximum panel thickness: .187".

Molded Parts: Black thermoplastic (UL 94V0).

Knob: Bayonet style with lettering.

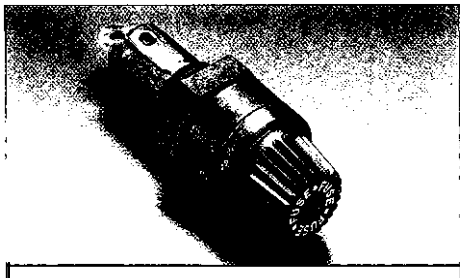
Terminals: Copper & copper alloy. Tin plated, except 1/4" Quick-Connect terminals are nickel plated.

Ambient Temperature: -40°C to +85°C.

Hardware: Standard fuseholders are supplied with a neoprene washer and a metal hex nut unassembled. To order with a lockwasher (L) and/or drip-proof seal (P), add the appropriate suffix (L, P, or PL) to the catalog number. Example: 342 004PL is a holder with lockwasher and drip-proof seal in addition to neoprene washer and hex nut.

FUSEHOLDERS TO MIL SPEC: See Military Section.

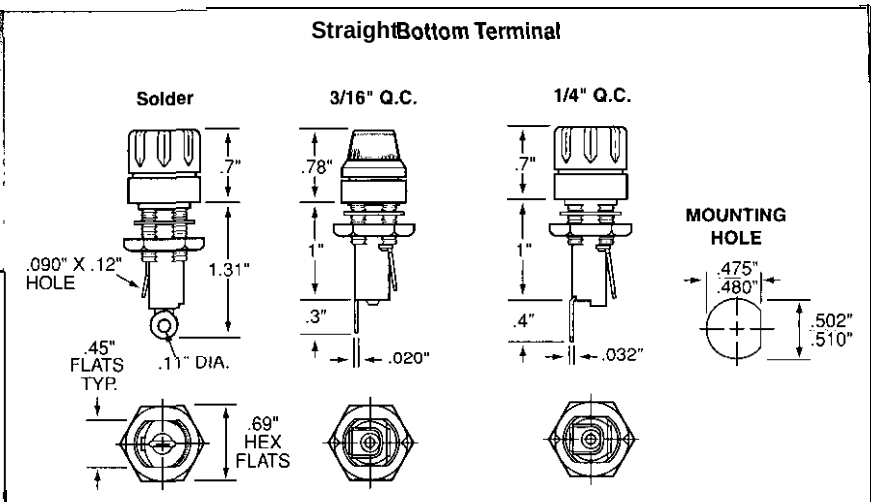
342 000 Series



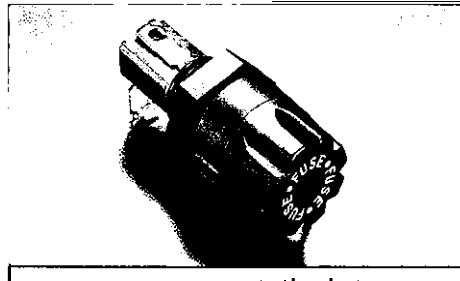
Knurled knob shown. Fluted knob also available. See table below.

ORDERING INFORMATION:

Catalog Number		
Fluted Knob	Knurled Knob	Type of Terminal
342 014	342 012	Solder
342 838	342 858	1/4" Q.C.
342 038	342 058	3/16" Q.C.



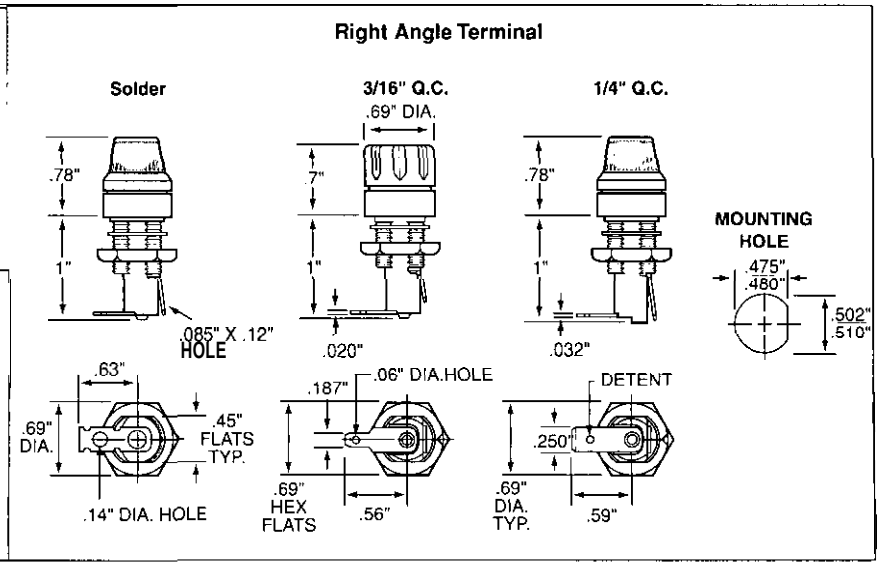
342 000 Series



Fluted knob shown. Knurled knob also available. See table below.

ORDERING INFORMATION:

Catalog Number		
Fluted Knob	Knurled Knob	Type of Terminal
342 004	342 022	Solder
342 028	342 048	3/16" Q.C.
342 828	342 848	1/4" Q.C.



FOR 3AG FUSES

Blown-Fuse Indicating Panel Mount Type

QPL

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: Rated at 20 amperes at lamp voltage shown below. Dielectric withstanding voltage exceeds 1500 volts. All fuseholders are supplied with a resistor. When designing indicating type fuseholders into a circuit, consideration should be given to the resistance of fractional amperage fuses and the parallel resistance of the indicator lamp and its resistor.

Mounting: Withstands 15 lb.-in. mounting torque. Maximum panel thickness is .250".

Molded Parts: Black Thermoplastic (UL 94V0), except lens is thermoplastic (UL 94V2). See Table below for lens color.

Knob: Bayonet style.

Terminals: Copper & copper alloy. Tin plated.

Ambient Temperature: -40°C to +85°C.

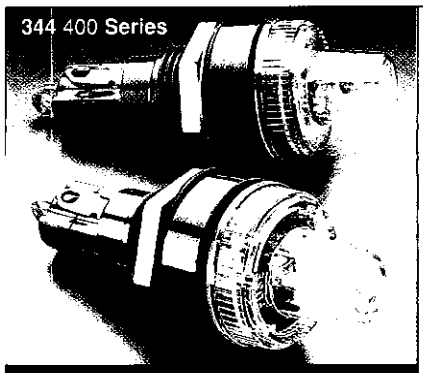
Hardware: Neoprene washer, lockwasher & hex nut unassembled.

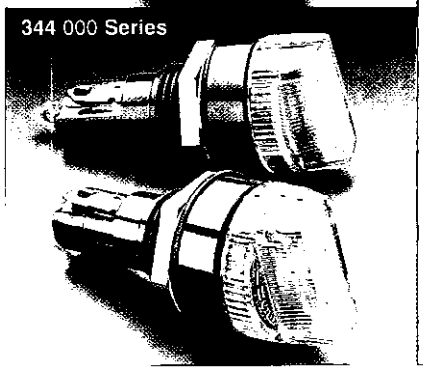
Option: O-ring available assembled to knob for drip-proof seal. Add suffix "P" to part number (example 344 125P).

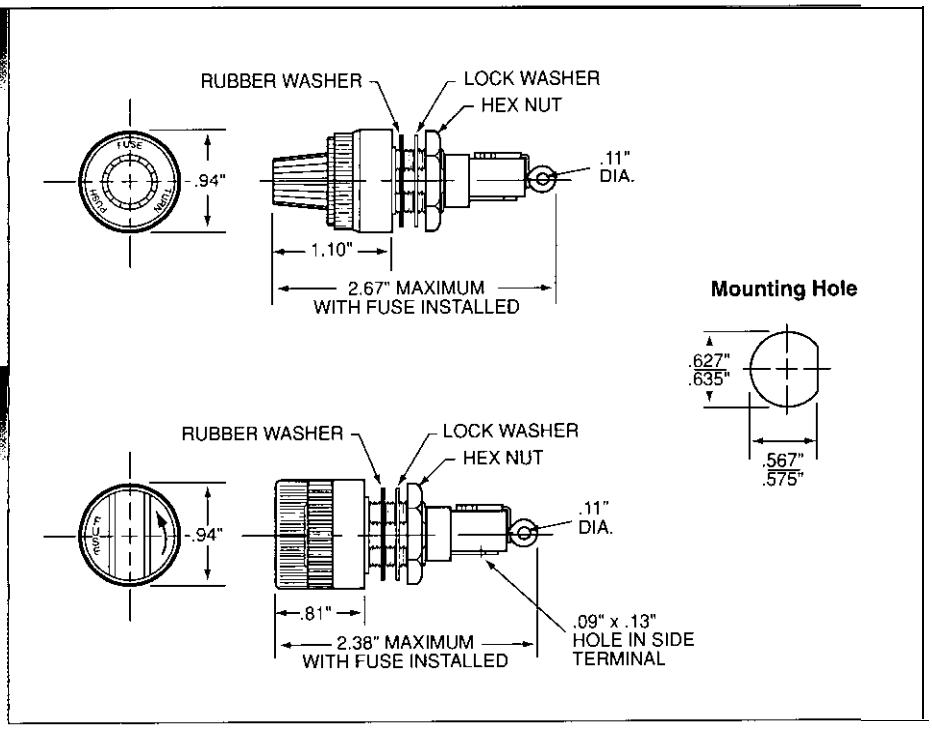
FUSEHOLDERS TO MIL SPEC: See Military Section.

ORDERING INFORMATION:

Catalog Number					
344 000 Series (Bar Knob)	344 400 Series (Round Knob)	Voltage Range	Lamp Type	Lamp current Rating	Lens Color
344006	344401	2.5 to 7	6V Incandescent	.20 amp	Amber
344012	344402	7 to 16	14" Incandescent	.08 amp	Amber
344 024	344403	16 to 32	28V Incandescent	.04 amp	Amber
344125	344404	100 to 125	Neon	.002 amp	Clear
344 250	344405	200 to 250	Neon	.002 amp	Clear



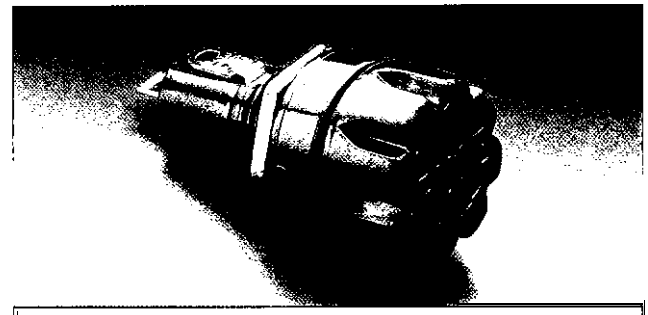


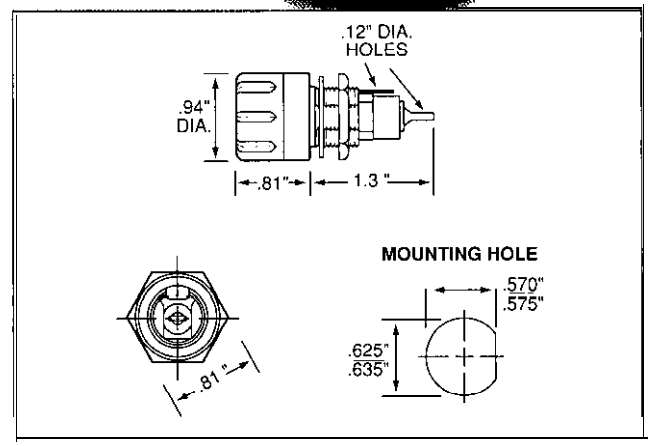


FOR 3AG FUSES

Watertight Panel Mount Type

QPL





APPROVALS: Recognized under the Components Program of Underwriters Laboratories.

SPECIFICATIONS:

Electrical: Rated at 20 amperes for any voltage up to 250 volts.

Dielectric Strength: 1500 volts minimum.

Mounting: Withstands 15 lb.-in. mounting torque; maximum panel thickness is .250".

Molded Parts: Slack thermoset (UL 94VO).

Knob: Screw type.

Seal: O-ring provides a watertight seal on the front side of the panel per MIL-PRF-19207.

Terminals: Copper & copper alloy. Tin plated. Solder type.

Ambient Temperature: -40°C to +85°C.

Hardware: O-rings (2) and hex nut, unassembled.

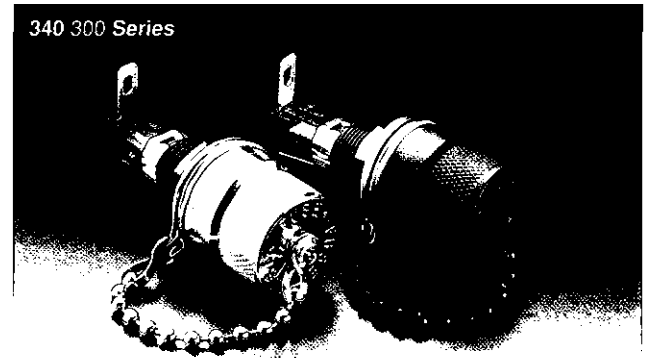
FUSEHOLDERS TO MIL SPEC: See Military Section.

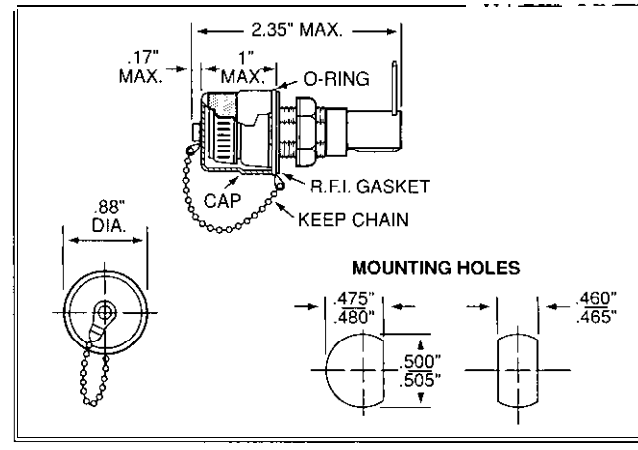
ORDERING INFORMATION:
Catalog Number: 342 006

RF Shielded/ Watertight Panel Mount Type

QPL

Radio frequency shielded fuseholders eliminate possible transmission or reception of RF signals through the hole in the chassis in which the fuseholder is mounted. These fuseholders comply with the watertight construction requirement of MIL-PRF-19207 and the Shock-Safe requirements of IEC 60065 and 60127-6. A rubber O-ring and conductive gasket maintain RF shielding and watertight construction.





SPECIFICATIONS: The basic fuseholder used is the 345 603 Shock-Safe holder.

ORDERING INFORMATION:

Catalog Number	Brass Shielding Cap Finish
340 312	Nickelplated
340 313	Dull Black

FOR MICRO'™ FUSE OR PICO® II FUSES

"Push-On" Retaining Nut Chassis Mount Type

QPL

Fuseholder will accept Littelfuse MICRO'™ fuses and PICO® II fuses (rated to 5 amperes) with ,025" diameter leads.

SPECIFICATIONS:

Electrical: Rated at 5 amperes for any voltage up to 125 volts.

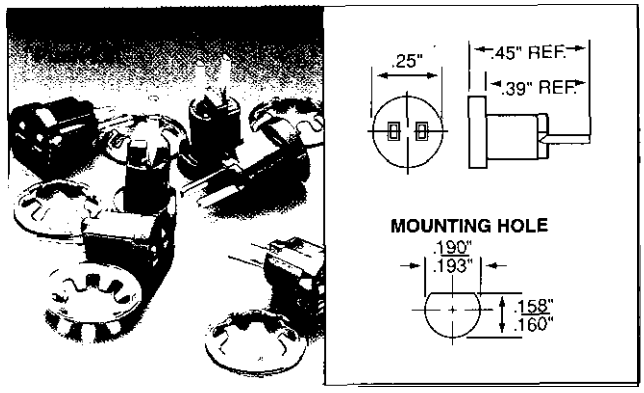
Mounting: Maximum panel thickness is .09".

Molded Parts: Black Thermoset.

Terminals: Beryllium Copper, Silver-plated.

Ambient Temperature: -40°C to +125°C.

Hardware: "Push-On" retaining nut.



FOR MICRO'™ FUSE OR PICO® II FUSES

Vertical/Horizontal

P.C. Board Mount Type

Fuseholder will accept Littelfuse MICRO* fuses and PICO® II fuses (rated to 5 amperes) with .025" diameter leads.

SPECIFICATIONS:

Electrical: Rated at 5 amperes for any voltage up to 125 volts.

Molded Parts: White Thermoplastic.

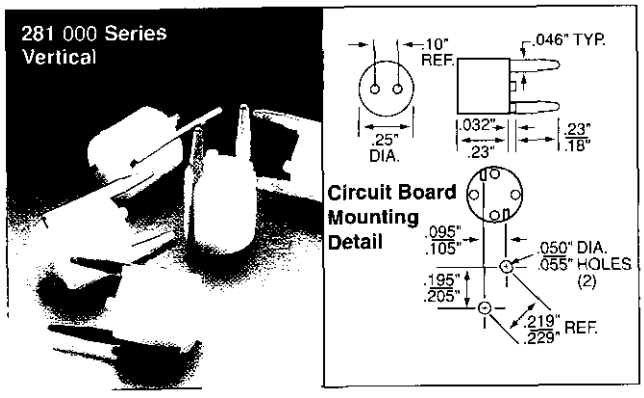
Terminals: Copper Alloy.

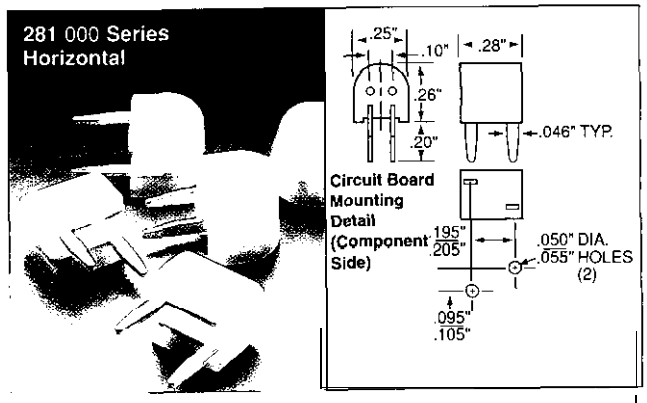
Ambient Temperature: -40°C to +100°C.

ORDERING INFORMATION:

Catalog Number	Terminal Plating	Mounting
281005	Silver'	Vertical
281008	Tin	Vertical
281007	Silver'	Horizontal
281010	Tin	Horizontal

'UL Recognized.





For LT-5™ Fuse

P.C. Board Mount Type

Fuse holder will accept Littelfuse LT-5™ fuses, 662, 663, 664 and 665 Series up to 5 amperes.

SPECIFICATIONS:

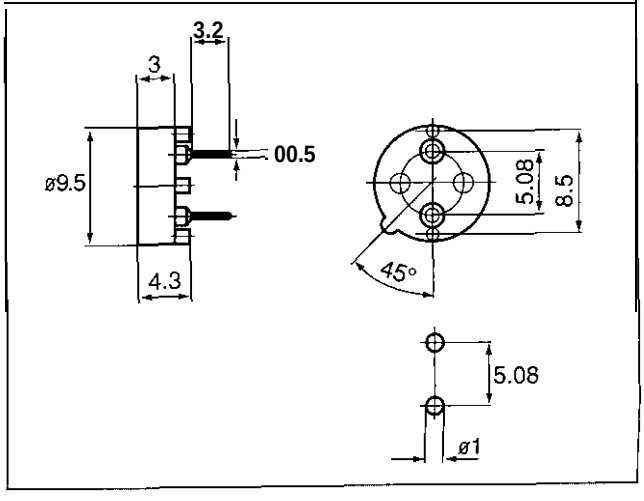
Electrical: Rated at 5 amperes for any voltage up to **250** volts.

Molded Parts: Black Thermoplastic (UL 94VO).

Terminals: Tin-plated brass, gold inside.

ORDERING INFORMATION:

Catalog Number: 02800050



FOR LOW VOLTAGE 3AG OR SFE FUSE APPLICATIONS

Twist-Lock In-Line Type

SPECIFICATIONS:

Electrical: Intended for use at 32 volts or less with fuses rated up to 20 amperes when the proper spring is installed for fuse size.

Molded Parts: Black Thermoplastic (UL 94V2). Body halves have a .14" diameter hole for insulated wire.

Ambient Temperature: -40°C to +75°C.

Contact Rivet: Brass. Tin finish. Designed to accommodate #14 AWG stranded wire.

Assembled: Includes fuse listed and 19" loop of #14 AWG red vinyl insulated wire.

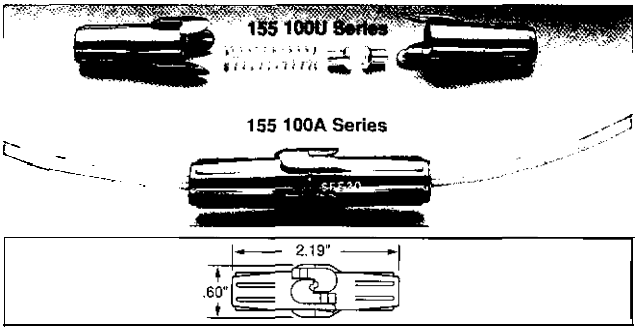
Unassembled: For assembly to #14 AWG wire.

OPTIONS:

150 215 is similar to 155 120A except no fuse is supplied. It is intended for use with 3AG fuses rated up to 20 amperes.

UNIVERSAL IN-LINE FUSEHOLDER 155 100:
Supplied with 8" loop of #14 AWG red vinyl insulated wire and two springs in different lengths to accommodate SFE sized fuses.

PATENTED



ORDERING INFORMATION:

Unassembled		Assembled	
Catalog Number	For Fuse Size	Catalog Number	Fuse Installed
155104U	1/4" x 5/8"	155104A	SFE 4
155 106U	1/4" x 3/4"	155106A	SFE 6
155 17.5"	1/4" x 7/8"	15517.5A	SFE 7½
155109U	1/4" x 7/8"	155109A	SFE 9
155 114U	1/4" x 1 1/16"	**155** 114A	SFE 14
155120U	1/4" x 1 1/4"	155120A	SFE 20

Heavy-Duty Bayonet Knob In-Line Type

SPECIFICATIONS:

Electrical: Intended for use at 32 volts or less with fuses rated up to 20 amperes when the proper spring is installed for full size.

Molded Parts: Body and knob are Black Thermoset (UL 94VO). Both body and knob have a .20" diameter hole for insulated wire.

Knob: Bayonet-lock type metal insert.

Ambient Temperature: -40°C to +125°C.

Contact Rivet: Brass. Tin plated. Designed to accommodate #14 AWG stranded wire.

Assembled: Includes fuse listed and 19" loop of #14 AWG red vinyl insulated wire.

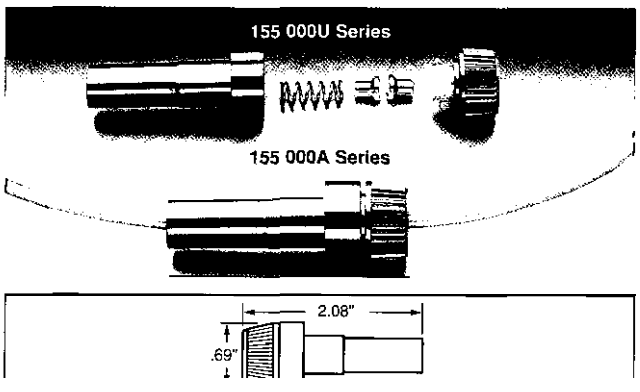
Unassembled: For assembly to #14 AWG wire.

OPTIONS:

150 079 is similar to 155 020A except no fuse is supplied. It is intended for use with 3AG fuses rated up to 20 amperes.

UNIVERSAL IN-LINE FUSEHOLDER 150 145:
Supplied with 15" loop of #14 AWG red vinyl insulated wire and three springs in different lengths to accommodate SFE sized fuses.

Fuseholders with other wire sizes or lengths available on special order.



ORDERING INFORMATION:

Unassembled		Assembled	
Catalog Number	For Fuse Size	Catalog Number	Fuse Installed
155 004U	1/4" x 5/8"	155004A	SFE 4
155006U	1/4" x 3/4"	155 006A	SFE 6
15507.5U	1/4" x 7/8"	15507.5A	SFE 7½
155009U	1/4" x 7/8"	**155** 009A	SFE 9
155 014U	1/4" x 1 1/16"	155014A	SFE 14
155020U	1/4" x 1 1/4"	**155** 020A	SFE 20

SPECIAL TYPES

2AG or 5 x 20mm Inline Fuseholders

SPECIFICATIONS:

Electrical: This fuseholder, part number 150274, is intended for use with 2AG and 5 x 20mm fuses. Maximum current ratings are 5 amperes at 32V for the 2AG size fuses and 10 amperes at 32V for the 5 x 20mm size fuses.

Body: Black Thermoplastic.

Terminals: Brass.

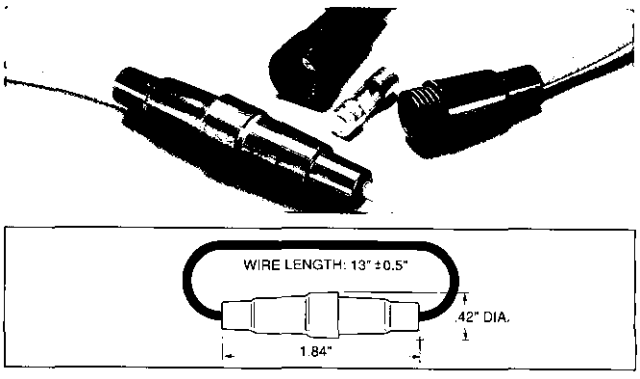
Wire: 16 Awg size; nominal o.d. 0.104"; color red.

Lead Pull Test: Will withstand 10 lb. pull.

Ambient Temperature: -40°C to +80°C.

ORDERING INFORMATION:

Catalog Number: 150 274



SPECIAL TYPES

For ATO® Fuses In-Line Type

SPECIFICATIONS:

Electrical: Intended for use with 32 volts Autofuse® fuses rated to 20 or 30 amperes depending on wire size and terminal combinations.

Mounting: Capable of snap-mounting to panel from rear. Fuseholders interlock for multiple mounting.

Molded Parts: Black Thermoplastic (UL 94V2).

Terminals: Brass. Tin-plated. Snap-lock into body.

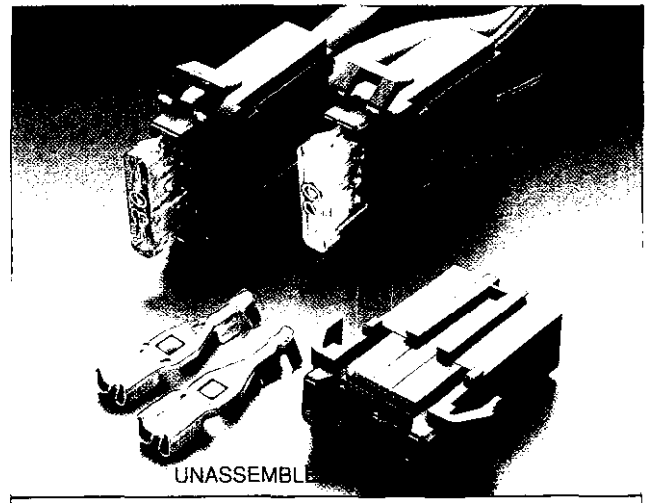
Ambient Temperature: -40°C to +85°C.

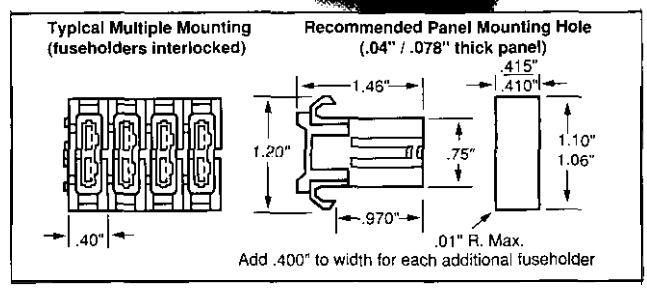
Wire: Stranded with PVC insulation, black #14 AWG for 155 300 Series and orange #10 AWG for 155 400 Series.

PATENTED

ORDERING INFORMATION:

Catalog Number			
Unassembled	Assembled with 8" wire Loop, No Fuse	Assembled with 8" Wire Loop and Fuse	Fuse Amperage Rating
155 320U (Terminals designed for #14 **AWG** stranded wire and marked "14').	155300 (#14 wire/ terminals rated to 20A).	**155** 303A	3
		155304A	4
		155 305A	5
		155 37.5A	7.5
		155 310A	10
		155 315A	15
		155 320A	20
155 430U (Terminals designed for #10 AWG *stranded* wire and marked "'IO').	**155** 400 (#10 wire/ terminals rated to 30A).	**155** 425A	25
		155 430A	30





For ATO® Fuses P.C. Board Mount Type

SPECIFICATIONS:

Electrical: Intended for use with 32 volts ATO® fuses rated to 15 amperes.

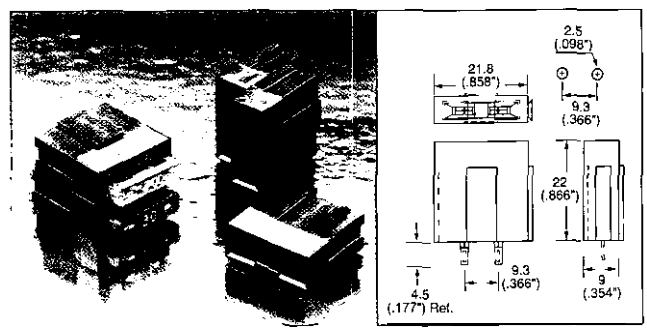
Molded Parts: Black Thermoplastic

Terminals: Copper Alloy, Tin Plated

Ambient Temperature: -40°C to +85°C.

ORDERING INFORMATION:

Catalog Number: 04450715



For MINI® Fuses In-Line Type — Easy Crimp Fuseholder

SPECIFICATIONS:

Terminals: Copper Alloy/Tin plated.

Body: Black Thermoplastic.

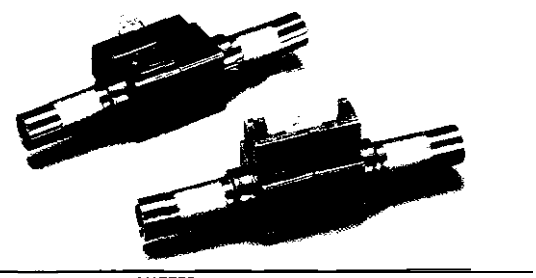
Operating Temperature: -40°C to +105°C.

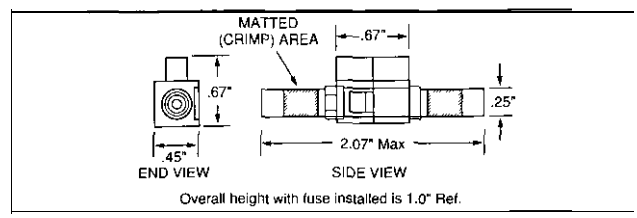
Use standard crimping tool and crimp the malted area to secure wire. (Possible crimp tool - Ideal #30-428 [Toothed Die slot] or equivalent).

ORDERING INFORMATION:

Catalog Number	Description
153 002	20A **Max. Rating - Terminals will accept #16–22 AWG (1.0-.33 mm') stranded wire (use appropriate wire size based on fuse usage). For example — Use #16 AWG wire for 20A fuse.**
153003	30A **Max. Rating-Terminals will accept #10–14 AWG (5.0-2.0 mm²) stranded wire (use appropriate wire size based on fuse usage). For example — Use #10 AWG wire for 30A fuse.**

Tool For Fuse Removal or Replacement; Part No. 097024.





SPECIAL TYPES

For MINI® Fuses P.C. Board Mount Type

The MINI" Fuse P.C. board fuseholders bring the reliability and availability of the plug-in 32V MINI" Fuse to the circuit board. Vertical and horizontal mounting of units is offered to meet a variety of requirement?. in which circuit protection is desired for a low DC voltage PC. board application. The fuseholder body has "stand-offs" to accommodate board washing and incorporates a unique "board lock" anchor to maintain a firm mechanical bond to the PCB during fuse insertion and removal.

APPROVALS: Recognized under the Components Program of Underwriters Laboratories for 15 amperes and Certified by CSA for 10 amperes.

SPECIFICATIONS:

Electrical: Rated 32 VDC.

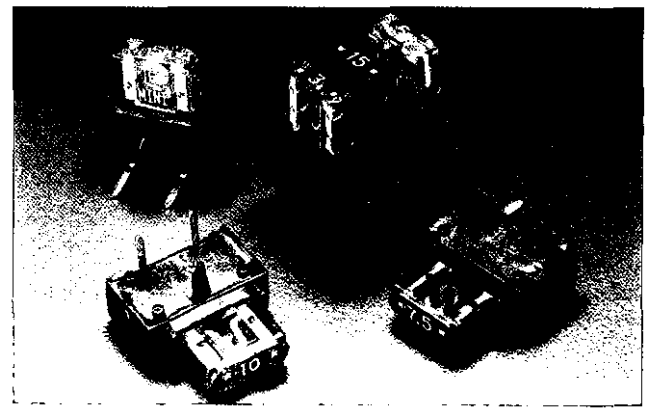
Mounting: Three fuseholders can be mounted side by side (stacked) and operated at rated current. Contact factory for applications involving more than three stacked fuseholders.

Molded Parts: Black Thermoplastic body (UL 94VO).

Terminals: Copper Alloy. Tin Plated.

Ambient Temperature: -40°C to +85°C.

Compatibility: Standard ,062" PCB thickness.

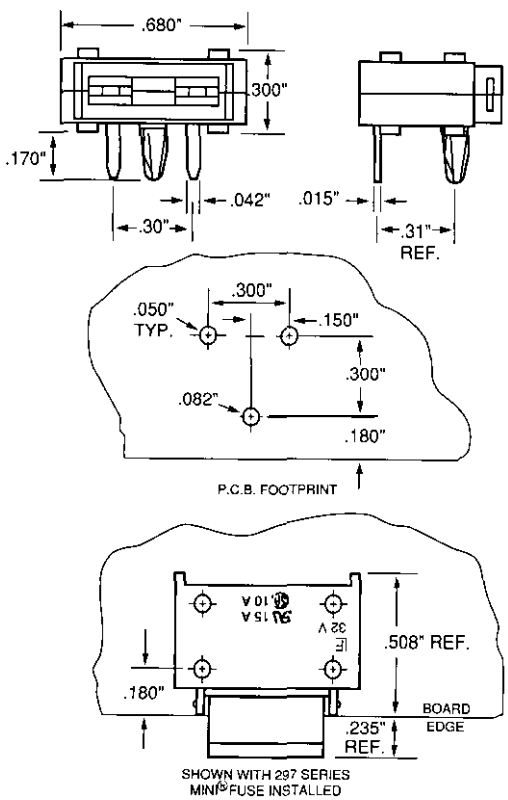


ORDERING INFORMATION:

Catalog Number	Description
153 007	Horizontal Mount P.C.B. Holder
153 008	Single or Stackable (End Unit) Vertical Mount P.C.B. Holder
153 009	Stackable Vertical Mount P.C.B. Holder

Tool For Fuse Removal or Replacement; Part No. 097024.

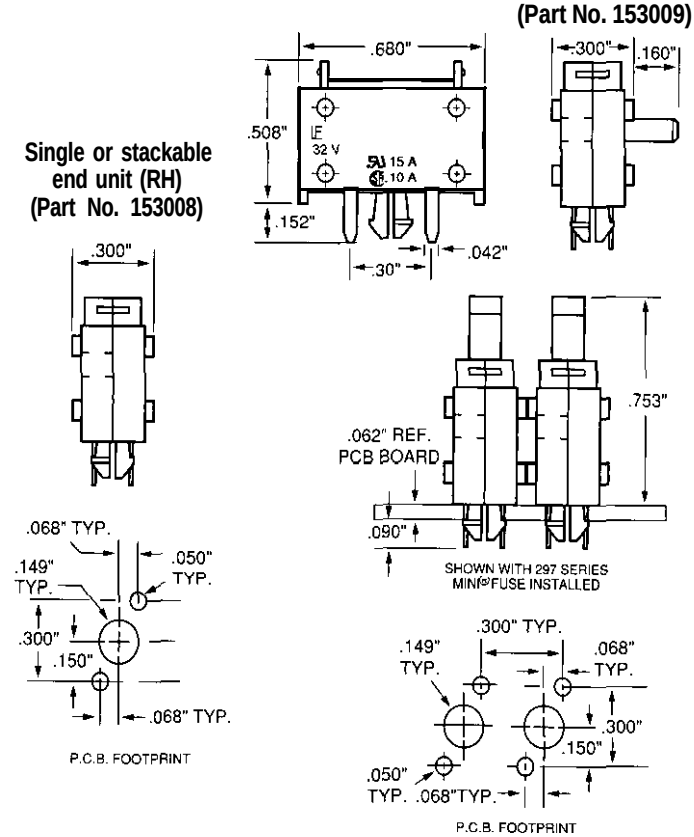
HORIZONTAL MOUNT
(Part No. 153007)



VERTICAL MOUNTS

Stackable unit
(Part No. 153009)

Single or stackable
end unit (RH)
(Part No. 153008)



482 Alarm Indicating Fuseholder

The Alarm Indicating Fuseholder is designed for use with the Littelfuse 481 Alarm Fuse. It is designed to accept other manufacturer's replacement fuses as well.

The fuseholder is available in three versions:

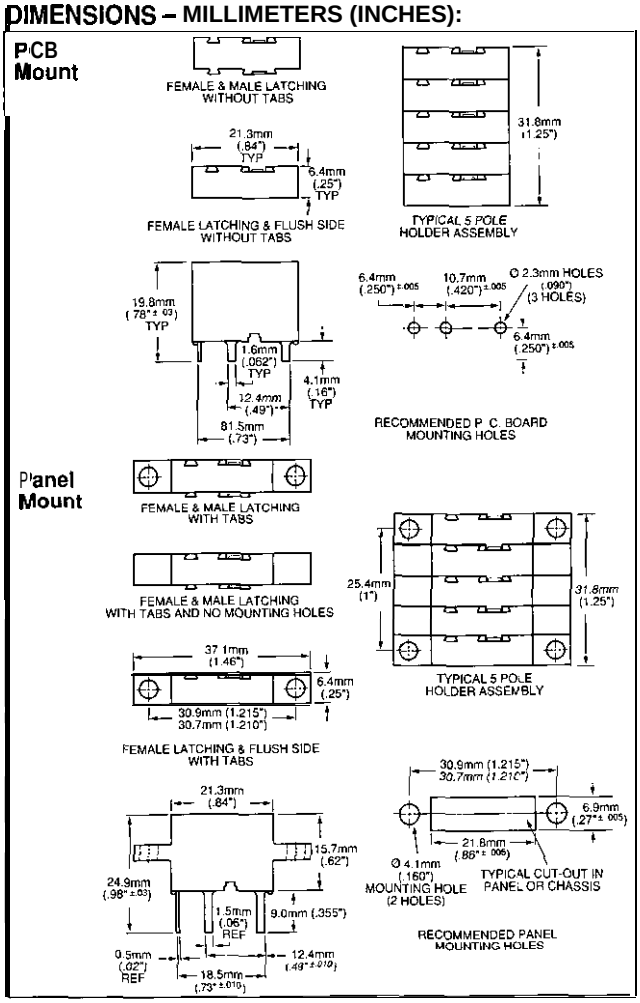
PCB Mount
Can be soldered directly to a printed circuit board. Rated up to 15 amperes. Available in single pole or gangable up to 20 poles. Ganged configurations without mounting grooves on either side are available. Please contact Littelfuse for ordering information. Fuseholder is keyed to prevent insertion of 20 ampere fuse.

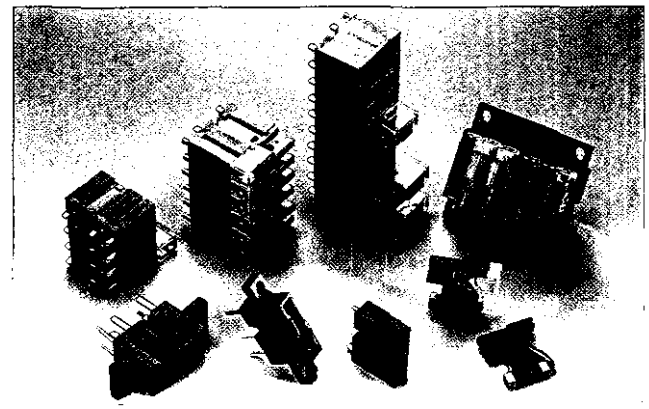
Panel Mount
Available in single pole or gangable configurations rated up to 15 amperes or in a single pole version rated up to **20 amperes.**

Panel Mount-15A: 15 ampere gangable version of fuseholder is keyed to prevent insertion of 20 ampere fuse. Ganged configurations with both sides finished are available. Please contact Littelfuse for ordering information.

Panel Mount—20A: The 20 ampere single pole holder is designed to accept all fuse ratings up to 20 amperes. 20 ampere fuseholders should be spaced 12.7mm (0.50") apart, center to center to insure proper heat dissipation under normal operation. Heatsinking may be required for operation in higher ambient temperatures or alternate configurations.

DIMENSIONS – MILLIMETERS (INCHES):





AGENCY APPROVALS: Recognized under the Components Program of Underwriters Laboratories and the Component Acceptance Program of CSA.

SPECIFICATIONS:
PCB Mount and Panel Mount—15A:
Rated at 15 amperes up to 125 VAC/VDC
Body Material: Thermoplastic
Fuse Terminals: Tin-plated Beryllium Copper
Alarm Terminal: Tin-plated Brass
Operating Temperature: -40" to +85°C

Panel Mount—20A:
Rated at 20 amperes up to 125 VAC/VDC
Body Material: Black Phenolic
Fuse Terminals: Tin-plated Copper Alloy
Alarm Terminal: Tin-plated Copper Alloy
Operating Temperature: -40" to +85°C

ORDERING INFORMATION:
PCB Mount and Panel Mount—15A

Catalog Number PCB MOUNT	Catalog Number Panel Mount	Type
0482 0001ZXB	0482 0001ZXP	1 pole
0482 0002ZXB	0482 0002ZXP	2 pole
0482 0003ZXB	0482 0003ZXP	3 pole
0482 0004ZXB	0482 0004ZXP	4 pole
0482 0005ZXB	0482 0005ZXP	5 pole
0482 0006ZXB	0482 0006ZXP	6 pole
0482 0007ZXB	0482 0007ZXP	7 pole
0482 0008ZXB	0482 0008ZXP	8 pole
0482 0009ZXB	0482 0009ZXP	9 pole
04820010ZXB	04820010ZXP	10 pole
0482 0011ZXB	0482 0011ZXP	11 pole
0482 0012ZXB	0482 0012ZXP	12 pole
0482 0013ZXB	0482 0013ZXP	13 pole
0482 0014ZXB	04820014ZXP	14 pole
0482 0015ZXB	0482 0015ZXP	15 pole
0482 0016ZXB	0482 0016ZXP	16 pole
04820017ZXB	04820017ZXP	17 pole
0482 0018ZXB	0482 0018ZXP	18 pole
04820019ZXB	04820019ZXP	19 pole
0482 0020ZXB	0482 0020ZXP	20 pole

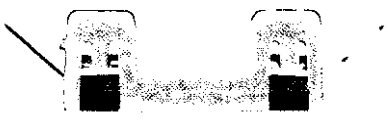
Add-on Poles:

Catalog Number	Type
0482 0AD1 HXB	PCB Mount
0482 HAD1 HXP	Panel Mount with Mounting Holes
0482 0AD1 HXP	Panel Mount without Mounting Holes

Panel Mount—20A:

Catalog Number
0482 2001 ZXPF

FUSE BLOCKS AND CLIPS



FOR NANO® SURFACE MOUNT FUSES

SMF OMNI-BLOK® Fuse Block Molded Base Type

The SMF Omni-Blok® Fuseholder permits quick and easy replacement of Nano® SMF surface mount fuses. The fuse block and pre-installed fuse combination can be placed on the PC board in one efficient manufacturing operation. Fuse replacement is accomplished without exposing the PC board to the detrimental effects of solder heat. Refer to notes 1 and 2, below, for fuse/fuseholder combinations available.

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:
Electrical: 8 Amperes, 125 Volts.
Molded Parts: Thermoplastic (94VO).
Terminals: Tin/Lead Alloy Plated Beryllium Copper.
Ambient Temperature: -55°C to +125°C.
Shock: MIL-STD-202, Method 213, Test Condition I (100 G's peak for 6 milliseconds).
Vibration: MIL-STD-202, Method 201 (10–55 Hz).
Thermal Shock: MIL-STD-202, Method 107, Condition A (200 cycles: 30 minutes at –55°C, 30 minutes at **125°C).**
Soldering Parameters (Fuse Installed):
Reflow — 154 000: 500°F (260°C), **30 sec.**
154 000T: 445°F (230°C), 30 sec.
Solderability: MIL-STD-202, Method 208.
Packaging: 16mm Tape and Reel for use with automatic pick and place equipment per EIA Standard 481; 1500 per reel.

PATENTED

ORDERING INFORMATION:

With Very Fast-Acting Fuse Installed

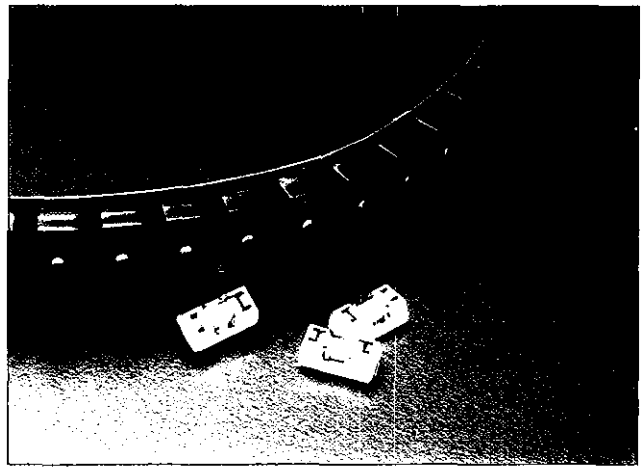
Catalog Number	Ampere Rating	Fuse Furnished[1]
154.062	1/16	0453.062
154.125	1/8	0453.125
154.250	1/4	0453.250
154.375	318	0453.375
154.500	1/2	0453.500
154.750	314	0453.750
154001	1	0453 001.
15401.5	1.5	045301.5
154002	2	0453002.
154 02.5	2.5	0453 02.5
154003	3	0453003.
154 03.5	3.5	0453 03.5
154004	4	0453 004.
154005	5	0453 005.
154007	7	0453 007.
154008	8	0453008.

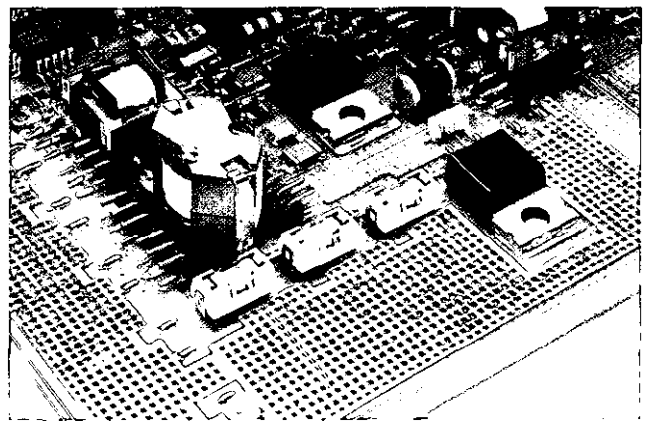
With Slo-Blo® Fuse Installed

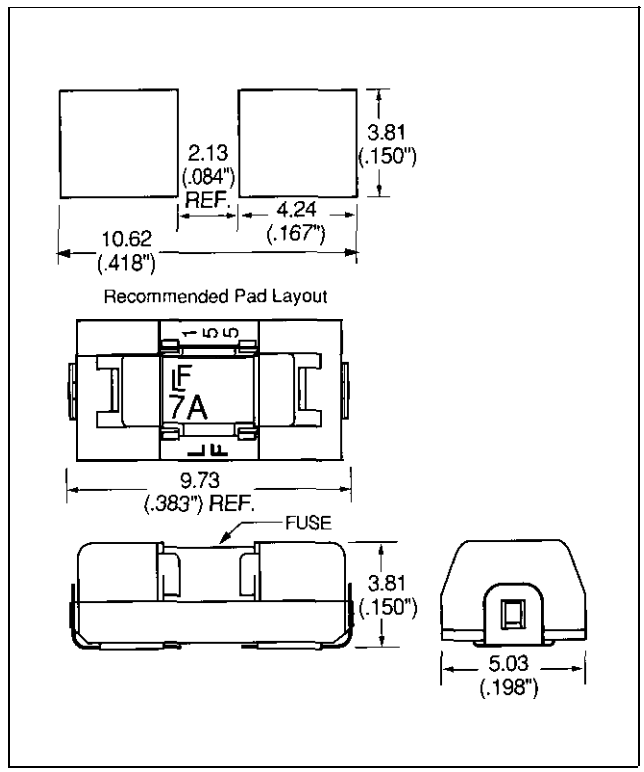
Catalog Number	Ampere Rating	Fuse Furnished[2]
154.375T	318	0454.375
154.500T	1/2	0454.500
154.750T	314	0454.750
154 001T	1	0454 001.
154 01.5T	1½	0454 01.5
154 002T	2	**0454** 002.
154 02.5T	2½	**0454** 02.5
154 003T	3	**0454** 003.
154 03.5T	3½	**0454** 03.5
154 004T	4	**0454** 004.
154 005T	5	**0454** 005.

[1] 453 Series Fuse has silver plated end caps, installed to accommodate solder reflow process. Use either 451 or 453 Series for replacement purposes, page 40.

[2] 454 Series Fuse has silver plated end caps, installed to accommodate solder reflow process. Use either 452 or 454 Series for replacement purposes, page 41.



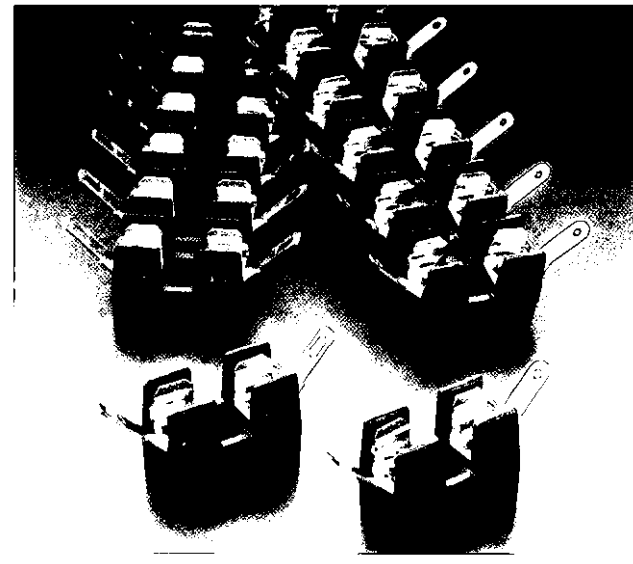




FOR 2AG FUSES

OMNI-BLOK® Fuse Block Molded Base Type

This low profile Omni-Blok® Fuse Block design is available with a choice of solder type terminals, Q.C. terminals or P.C. board mountable terminals. The PCB design is offered with either tin-plated brass terminals for normal applications or tin-plated beryllium copper terminals for use in caustic environments. These fuse blocks feature individual barriers which reinforce the fuse clips while providing greater protection against clip damage and electrical shock. The unique design permits self-alignment of clips to fuse cap. This, plus a one-piece clip/terminal assures low contact resistance. Multiple pole units may be broken apart to obtain desired number of poles.



APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA.

SPECIFICATIONS:

Electrical: Solder Type — 10A, 300V.
Q.C. Type — 10A, 300V.
PCB Type — 10A, 300V.

Dielectric Strength: 1500V., Minimum.

Clip/Terminals: Tin-Plated Spring Brass, except pn 254121 is Tin-Plated Beryllium Copper.

Base: Black Thermoplastic, glass reinforced with UL 94V0 flammability rating.

Ambient Temperature: -40°C to +85°C.

OPTIONS:

1. Other colors available on special order. Contact factory.

2. Two different style clips can be supplied for circuit identity or polarization. Contact factory.

PATENTED

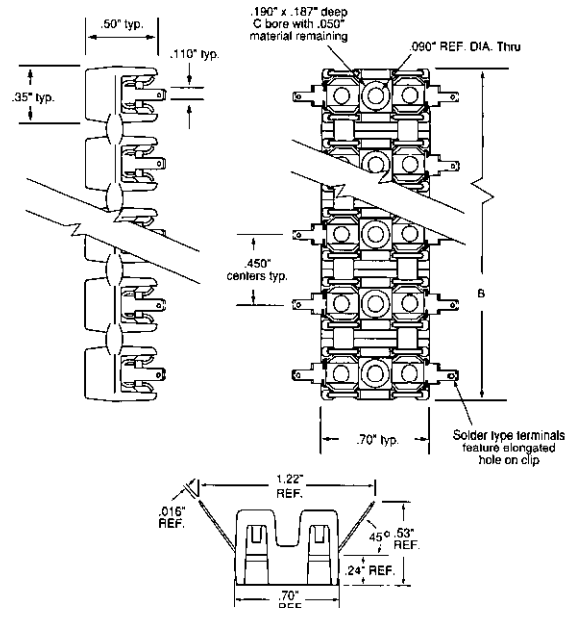
ORDERING INFORMATION:

Catalog Number Solder Type Terminals	Number of Poles	Typical Overall Width (B)	Clip/ Terminals
254 001	1	0.35"	Brass
254 002	2	0.80	Brass
254 003	3	1.25'	Brass
254 004	4	1.70'	Brass
254 005	6	2.15'	Brass
254 006	7	2.60'	Brass
254 007		3.05'	Brass
254 008	8	3.50"	Brass

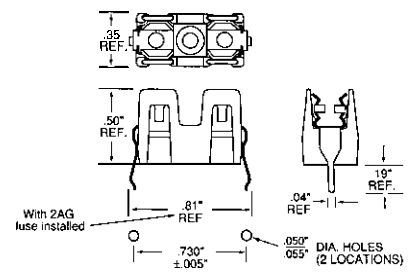
NEMA Style .110" Q.C. Terminals	Number of Poles	Typical Overall Width (B)	Clip/ Terminals
254 201	2	0.35'	Brass
254 202	3	0.80'	Brass
254 203		1.25'	Brass
254 204	5	1.70'	Brass
254 205	6	2.15	Brass
254 206		2.60	Brass
254 207	7	3.05	Brass
254 208	8	3.50"	Brass

P.C. Board Mount	Number of Poles	Typical Overall Width (B)	Clip/ Terminals
254 101	1	0.35'	Brass
254 121	1	0.35'	Beryllium Capper

Solder & Q.C. Types:



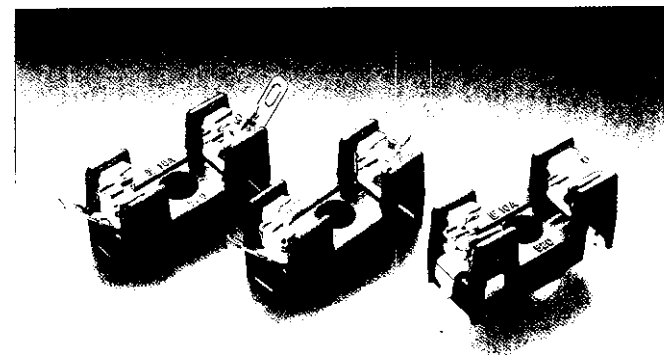
P.C. Board Mount Type:



FOR 5 x 20mm FUSES

Metric OMNI-BLOK® Fuse Block Molded Base Type

The metric Omni-Blok® fuse block, for 5 x 20mm size fuses, is a low profile design that is available with a choice of solder type terminals, NEMA style QC terminals, or PC board mountable terminals. Each of these designs has tin-plated brass terminals. A unique design feature provides self-alignment of the clips to the fuse caps. This feature, plus a one-piece clip/terminal design, assures low contact resistance. An anti-rotation feature is also available on the solder and QC terminal designs.



APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA. VDE and Semko approved.

SPECIFICATIONS:

Electrical:	**UL/CSA**	**VDE/Semko**
Solder Type —	1 OA, 300V.	6.3A, 250V.
Q.C. Type —	1 OA, 300V.	6.3A, 250V.
PCB Type —	1 OA. 300V.	6.3A, 250V.

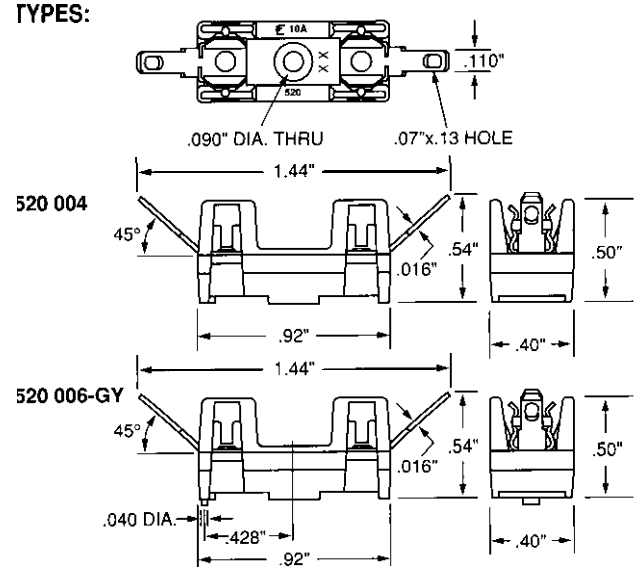
Dielectric Strength: 1500V., Minimum.
Clip/Terminals: Tin-Plated Spring Brass.
Base: Glass reinforced Thermoplastic, UL 94V0 flammability rating. Gray color (GY) for anti-rotational series, black color for all others.
Ambient Temperature: -40°C to +85°C.

PATENTED

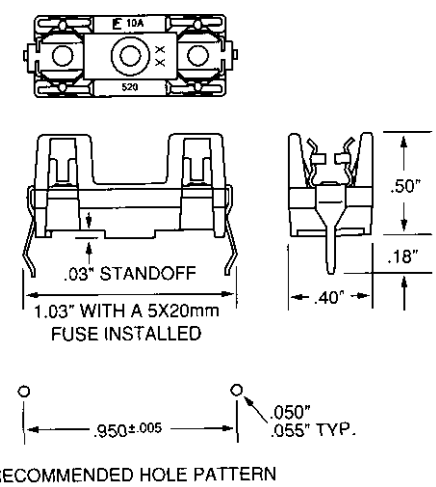
ORDERING INFORMATION:

Catalog Number	Typical Overall Width	Clip/ Terminals	Anti-Rotation Boss
Solder Type Terminals			
520 004	.40"	Brass	NO
520 006-GY	.40"	Brass	Yes
NEMA Style .110" Q.C. Terminals			
520003	.40"	Brass	NO
520 005-GY	.40"	Brass	Yes
PC Board Mount			
520 101	.40	Brass	NO

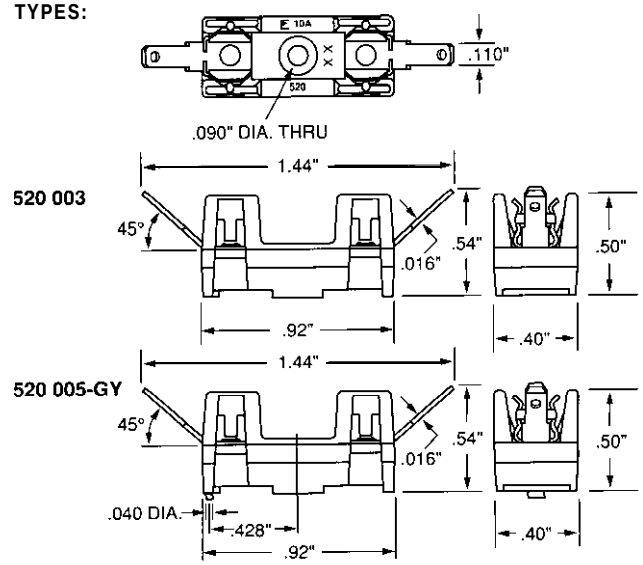
SOLDER TERMINAL TYPES:



P.C. MOUNT TYPE 520101



Q.C. TERMINAL TYPES:



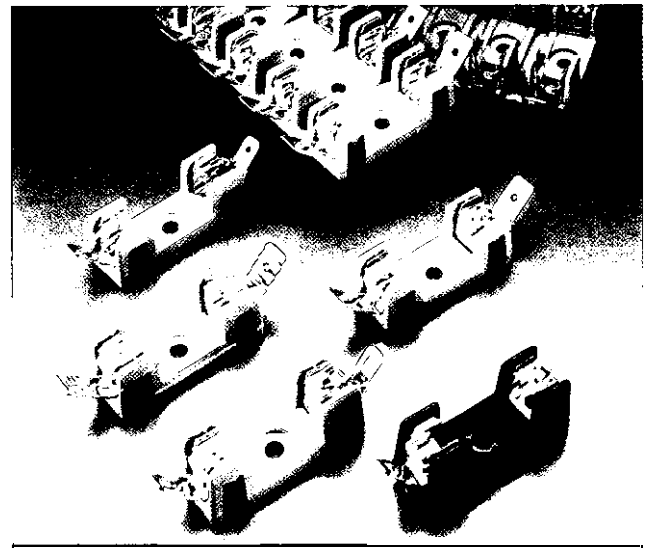
FOR 3AG FUSES

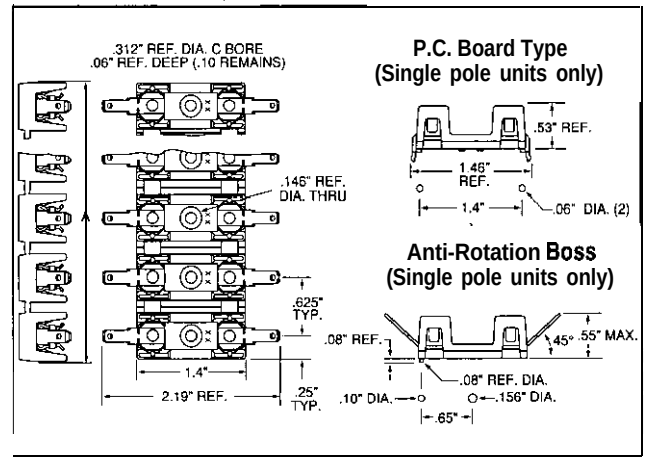
3AG OMNI-BLOK® Molded Base Type Fuse Block

A low profile fuse block featuring individual barriers which reinforce the fuse clips while providing greater protection against clip damage and electrical shock. The unique design permits self-alignment of clips to fuse cap. This, plus a one-piece clip/terminal assures low contact resistance. Higher current ratings have been attained using spring brass clips. With the exception of the two-pole unit, multiple pole units may be broken apart to obtain desired number of poles.

APPROVALS: Recognized under the Components Program of Underwriters Laboratories and Certified by CSA up to 300V and at current ratings shown below.

Series	Current Rating U.L.	CSA
354 000	30A	30A
364 600	20A	20A
354 800	20A	20A
354 900	30A	25A
3 5 4 101-GY	15A	15A





SPECIFICATIONS:

Dielectric Strength: 1500V., Minimum.
Clip/Terminals: Tin-Plated Spring Brass.
Base: Glass reinforced Thermoplastic. (Gray except Anti-Rotation series which is Black). UL 94V0 flammability rating.
Ambient Temperature: -40°C to +85°C.

ELECTRICAL SPECIFICATIONS:

Series or Catalog Number	Terminals	Rating
3 5 4 0 0 0	Solder	30A, 300V
354 600	3/16" Q.C.	20A, 300V
354 800	1/4" Q.C.	20A, 300V
354 900	1/4" QC.	30A, 300V
354 101-GY	P.C. Board	15A, 300V

*30 amp capability is based on temperature rise with #10 AWG wire properly soldered.

OPTION:
Two different style clips can be supplied for circuit identity or polarization. Contact factory.

PATENTED

ORDERING INFORMATION:

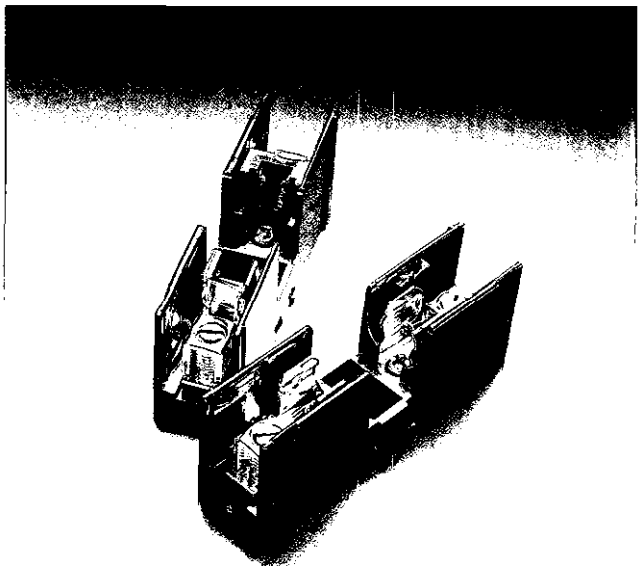
Catalog Number					
Solder Type Terminals	NEMA Style 3/16" Q.C. Terminals	1/4" Q.C. Terminals	NEMA Style 1/4" Q.C. Terminals	Number of Poles	Reference Dimension "A"
354 001-GY	354 601-GY	354 801-GY	354 901-GY	1	.50"
354 002-GY	354 602-GY	354 802-GY	354 902-GY	2	1.12"
354 003-GY	354 603-GY	354 803-GY	354 903-GY	3	1.75"
354 004 GY	354 604-GY	354 804 GY	354 904-GY	4	2.36'
354 005-GY	354 605-GY	354 805-GY	354 905-GY	5	3.00'
354 006-GY	354 606-GY	354 806-GY	354 906-GY	6	3.63'
354 007-GY	354 607-GY	354 807-GY	354 907-GY	7	4.25'
354 008-GY	354 608-GY	354 808-GY	354 908-GY	8	4.88'
354 009-GY	354 609-GY	354 809-GY	354 909-GY	9	5.50"
354 010-GY	354-610-GY	354 810-GY	354 910-GY	10	6.13"
354 011-GY	354 611-GY	354 811-GY	354 911-GY	11	6.75'
354 012-GY	354 612-GY	354 812-GY	354 912-GY	12	7.38'
354 021-BL	354 621-BL*	354 821-BL	354 921-BL	1	.50"
354 101-GY			—	1	.50"

*With Anti-Rotation Boss

For 1½" LONG MIDGET FUSES

600 **Volt** Molded Base Type

Space-saving, 600 volt, molded base fuse blocks with side barriers for isolation. For use with 13132" x 1½" midget fuses. By sliding and locking blocks together, any number of poles can be achieved. Class CC fuses have a rejection feature on one end cap which mates with the rejection feature of Littelfuse Class CC fuse blocks and fuseholders to prevent the installation of fuses with lower voltage ratings or interrupting ratings.

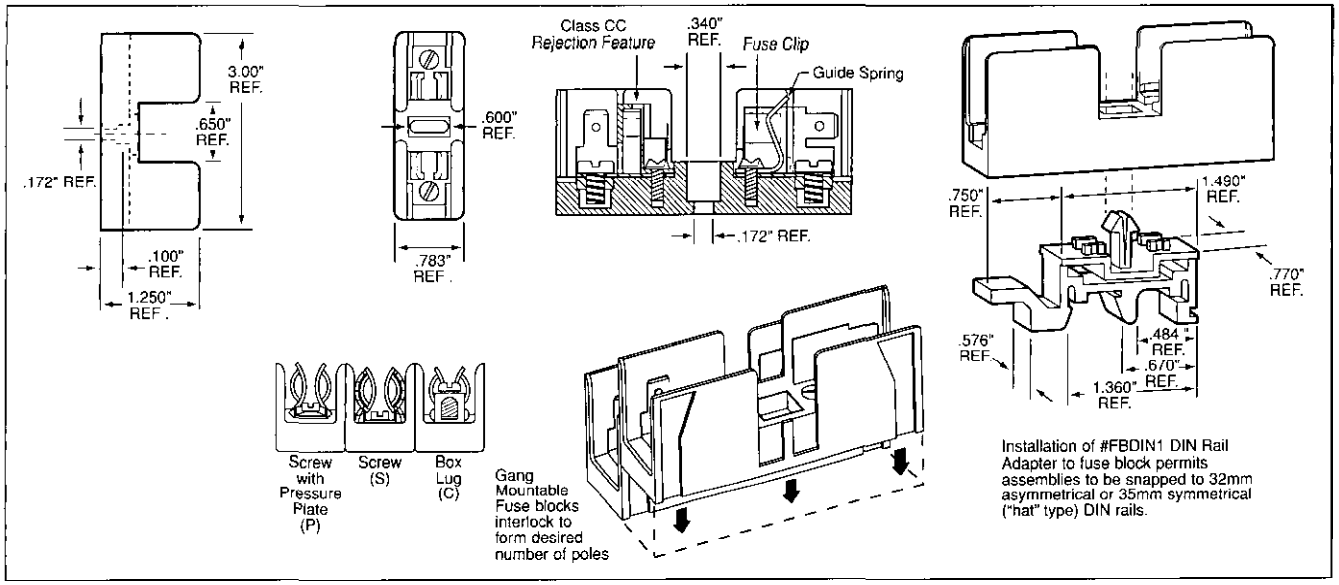


AGENCY APPROVALS:
Midget Blocks: Recognized under the Components Program of Underwriters Laboratories. Certified by CSA. Class CC Blocks: UL Listed. Certified by CSA.

SPECIFICATIONS:
Electrical: Screw terminal, pressure plate terminal, and box lug terminals rated for 30 amperes. Q.C. terminals rated for **20 amperes.**
Dielectric Strength: 12OOV Minimum.
Clip/Terminals: Tin-Plated Copper Alloy.
Box Lug: copper.
Screws and Captive Pressure Plate: Zinc-Plated Steel.
Reinforcing Spring: Stainless Steel. Contact factory for availability.
Base: Thermoplastic. UL 94V0 flammability rating.
Ambient Temperature: 105°C Maximum.

PATENTED

DIMENSIONS:



ORDERING INFORMATION:

Catalog Number		Number of		Maximum
Midget	Class cc	Poles	Connector Type	Wire Size
L60030M-1C	L60030C-1c	1	copper Box Lug	
L60030M-2C	L60030C-2C	2	Copper BOXLug	# 6 CU
L60030M-3C	L60030C-3C	3	copper Box Lug	
L60030M-1SQ	L60030C-1SQ	1	Screw/Q.C.Terminal	
L60030M-2SQ	L60030C-2SQ	2	Screw/Q.C. Terminal	#10 cu
L60030M-3SQ	L60030C-3SQ	3	Screw/Q.C.Terminal	
L60030M-1PQ	L60030C-1PQ	1	Pressure Plate/Q.C. Terminal	
L60030M-2PQ	L60030C-2PQ	2	Pressure Plate/Q.C. Terminal	#10 cu
L60030M-3PQ	L60030C-3PQ	3	Pressure Plate/Q.C. Terminal	

DIN Rail Adapter: Part No. FBDIN1.

3AG Screw Terminal Laminated Base Type

APPROVALS: 356 000 Series (250V) Recognized under the Components Program of Underwriters Laboratories.

SPECIFICATIONS:
Electrical: Rated for currents up to 15 amperes (units with spring brass clips) or up to 30 amperes (beryllium copper clips).
Clips: 356 000 Series: Nickel-plated spring brass.
359 000 Series: Silver-plated beryllium copper.
Terminals: 8-32THD screw type.
Base: Black phenolic laminate.
Mounting Hole: 3AG Block: Reference Dimensions .142"/.147" diameter with .295"/.302" x 82°C.S.

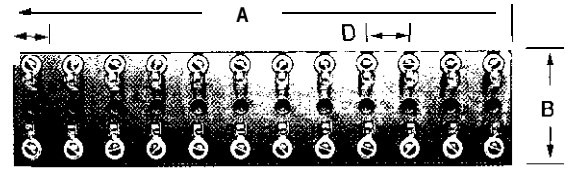
ORDERING INFORMATION:
(Including Reference Dimensions)

No. of Poles	Dimension A"	For 3AG Fuses Catalog Number	
1	.78"	356 001	359 001
2	1.69"	356 002	359 002
3	2.59'	356 003	359 003
4	3.50'	366 004	359 004
5	4.41"	366 005	359 005
6	5.31"	356 006	359 006
7	6.21'	356 007	359 007
8	7.12"	356 008	359 008
9	8.05	356 009	359 009
10	8.94	366 010	359 010
11	9.64	356011	359 011
12	10.75'	356 012	359 012

REFERENCE DIMENSIONS:

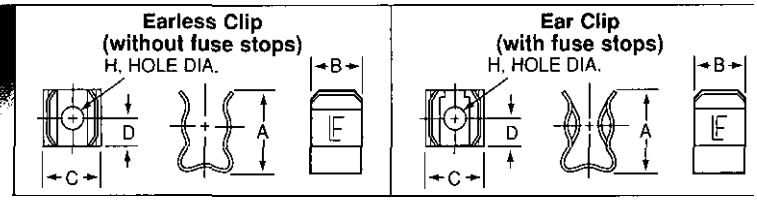
Fuse Type	A	B	C	D	E
3AG	See	2.38"	.25"	.91"	.73"

ONE POLE



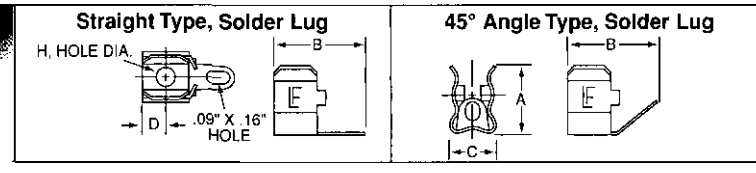
C = Board Thickness E = Overall Height

For 1/4" – 13/16" Diameter Fuses Rivet/Eyelet Mount Type



† See Ordering Information below.

For 1/4" Diameter Fuses Rivet/Eyelet Mount Solder Type



ORDERING INFORMATION:

Style	Fuse Type	Catalog Number Spring Brass Nickel-plated	Beryllium Copper Silver-plated	Fuse Diameter	A	B	C	D	H Diameter
† Ear	3AG	101 001	121 001	1/4	.48	.31"	.30"	.16"	.131"
	Midget	105 001	125 001	13132	.75	.44"	.52"	.22"	.196
	NEC 1–30 amp	107 001	127 001	9/16	.94	.59"	.65"	.25"	.203
	NEC 30–60 amp	109 001**	129 001	13/16"	1.31"	.75"	.87"	.30"	.265"
† Earless	3AG	101 002	121 002	1/4"	.48"	.31"	.30"	.16"	.131"
	Midget	105 002	125 002	13/32"	.75	.44"	.52	.22"	.196"
	NEC 130 amp	107 002	127 002	9/16"	.94	.59	.65	.25	.203"
	NEC 30–60 amp	109002"	129 002	13/16"	1.31"	.75	.87"	.30"	.265"
Solder Lug 45"	3AG	101 003	121 004	1/4"	.47"	.56	.31"	.16"	.131"
Solder Lug Straight	3AG	102 064*	—	1/4"	.47"	.64"	.31"	.16"	.131"

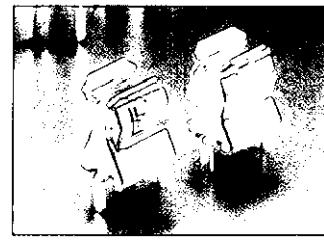
*Tin-plated "Bare Phos. Bronze

FOR 1/4" DIAMETER FUSES

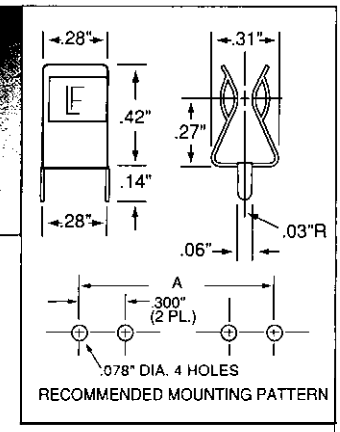
Traditional P.C. Board Type

ORDERING INFORMATION:

Catalog Number	Clip Material*	Finish	Style
102 071	Spring Brass	Tin-plated	Ear
102 074	Spring Brass	Tin-plated	Earless
102 076	Spring Brass	Hot Tin	Ear
122 083	Beryllium Copper	Silver-plated	Ear
122 087	Beryllium Copper	Silver-plated	Earless
122 088	Beryllium Copper	Tin-plated	Ear
122 093	Beryllium Copper	Tin-plated	Earless

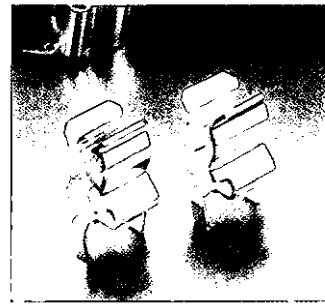


Nominal Fuse Length	Length "A"
5/8	.750
3/4	.875
7/8	1.000
1	1.125
1 1/16	1.187
1 1/4	1.347
1 7/16	1.562

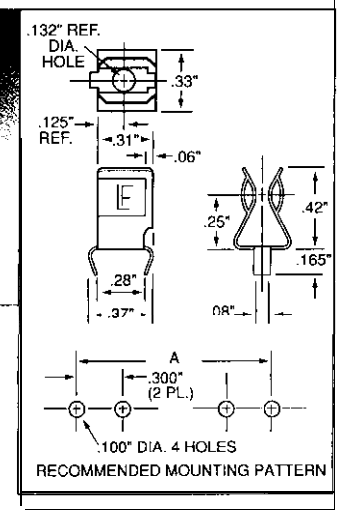


Bowed Tab P.C. Board Type

Catalog Number	Clip Material'	Finish	Style
102078	Spring Brass	Tin-plated	Earless
102 079	Spring Brass	Tin-plated	Ear



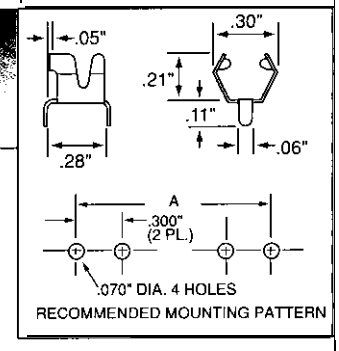
Nominal Fuse Length	Length "A"
5/8	.750
3/4	.875
7/8	1.000
1	1.125
1 1/16	1.187
1 1/4	1.347
1 7/16	1.562



LOW Profile P.C. Board Type

Catalog Number	Clip Material*	Finish	Style
102 080	Spring Brass	Tin-plated	Ear
122 090	Beryllium Copper	Silver-plated	Ear

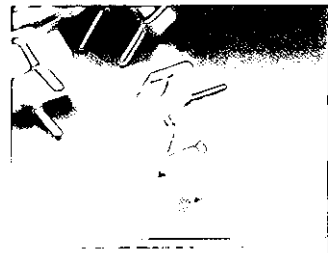
Nominal Fuse Length	Length "A"
5/8	.760
3/4	.880
7/8	1.005
1	1.130
1 1/16	1.195
1 1/4	1.380
1 7/16	1.570



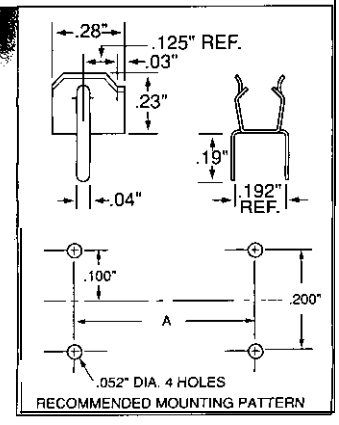
LOW Profile P.C. Board Type

Catalog Number	Clip Material*	Finish	Style
100 058	Spring Brass	Tin-plated	Ear

*NOTE: Spring brass clips are suitable for current levels up to 15 amperes; beryllium copper clips up to 30 amperes.



Nominal Fuse Length	Length "A"
1	0.781
1 1/4	0.035
1 7/16	1.250



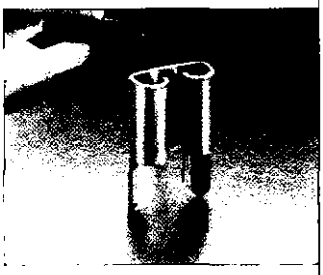
FOR VARIOUS DIAMETER FUSES

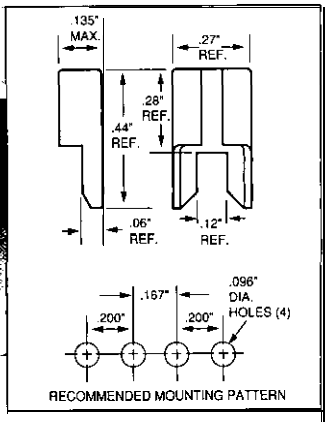
ATO® Fuse Clip P.C. Board Type

ORDERING INFORMATION:

Catalog Number	Clip Material*	Finish
100057	Spring Brass	Tin-plated

NOTE: #100 057 spring brass. tin-plated clips available for printed circuit board mounting. Suitable for current levels up to 15 amperes. First time fuse insertion force may approach 40 lbs.





For 2AG or 5mm Diameter Fuses P.C. Board Type

ORDERING INFORMATION:

Catalog Number	Clip Material	Finish	Style
111501	Spring Brass	Tin-plated	Ear
111506	Beryllium Copper	Tin-plated	Ear
111505	Beryllium Copper	Tin-plated	Surface Mount

NOTE: Suitable for current levels up to 10 amperes.
NOTE: Metric dimensions are shown. Inch dimensions are in parentheses.

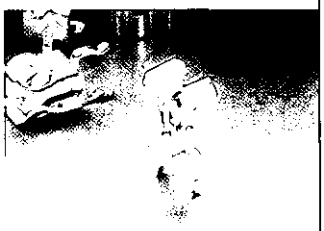
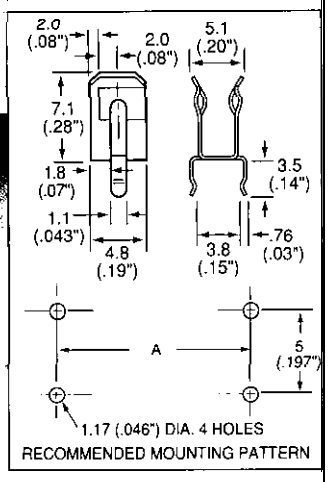


Table 1	A Dim.
2AG	12.7 (.50")
5x20	17.8 (.70")



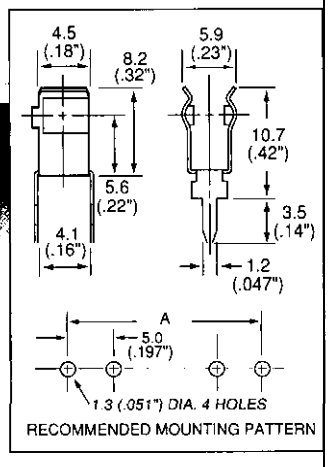
For 5mm Diameter Fuses P.C. Board Type

ORDERING INFORMATION:

Catalog Number	Clip Material	Finish	Style
100054	Spring Bra**	Silver-plated	Ear
100 056	Spring Brass	Tin-plated	Ear

NOTE: Spring brass clips are suitable for current levels up to 10 amperes.
NOTE: Metric dimensions are shown. Inch dimensions are in parentheses.

Fuse Size	A Dim.
5mm x 20mm	20.5 (.807")
5mm x 25mm	25.5 (1.004")
5mm x 30mm	31.0 (1.220")



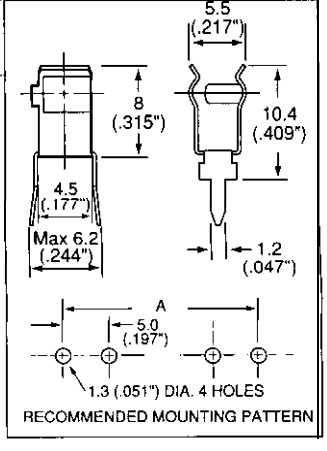
For 5mm Diameter Fuses P.C. Board Type

ORDERING INFORMATION:

Catalog Number	Clip Material	Finish	Style
0445 0001	**Spring Brass**	Tin-plated	Ear
0030 0210	Spring Brass	Nickel-plated	Ear
05200001	Spring Brass	Silver-plated	Ear

NOTE: spring brass clips are suitable for current levels up to 10 amperes.

Fuse Size	A Dim.
5mm x 20mm	20.5 (.807")
5mm x 25mm	25.5 (1.004")
5mm x 30mm	31.0 (1.220")

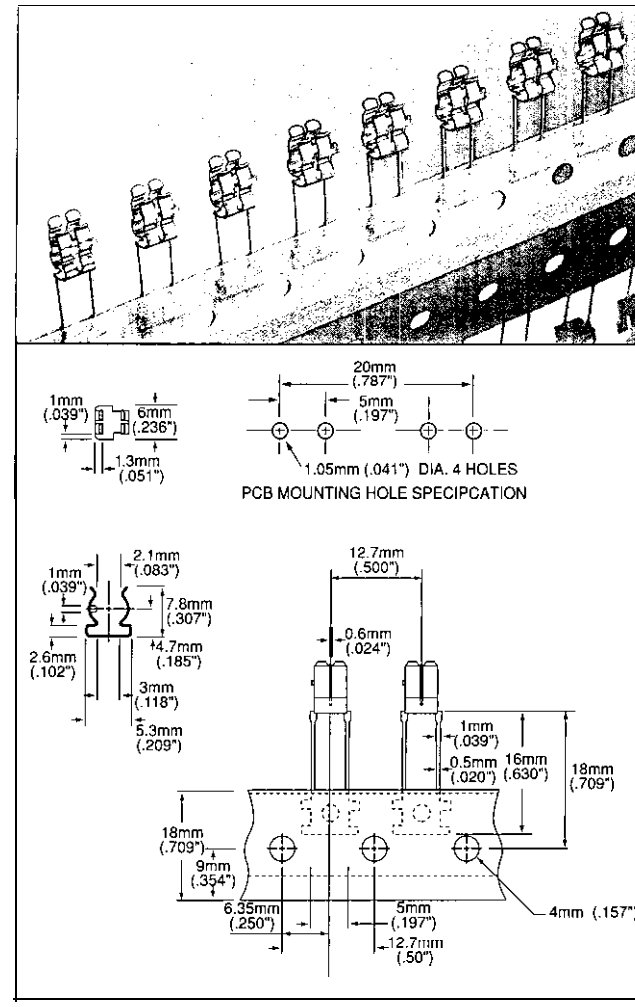


For **5mm** Diameter Fuses **Automatic Insertion Type**

ORDERING INFORMATION:

Catalog Number	Clip Material	Finish	Style
0111 0005MR	Phosphor Bronze	Tin-plated	Ear

Ammo Pack 1000 Pcs.



Approved to MIL-PRF-15160

F01A FUSES — MIL-PRF-15160/1

(Commercial Equivalent — 361 Series)

MIL Type Designation	Nickel-Plated caps	Silver-Plated caps
F01A 250V 1/200A	364.005	366.005
F01A 250V 1/100A	364.010	366.010
F01A 250V 1/32A	364.031	366.031
F01A 250V 1/16A	364.062	366.062
F01A 250V 1/10A	364.100	★
F01A 250" 1/8A	364.125	366.125
F01A 250V 3/16A	★	★
F01A 250V 2/10A	●	★
F01A 250V 1/4A	364.250	366.250
F01 A 250V 3/8A	364.375	366.375
F01A 250V 4/10A	★	★
F01A 250V 1/2A	364.500	366.500
F01A 125V 6/10A	364.600	★
F01A 125V 3/4A	364.750	366.750
F01A 125V 8/10A	★	★
F01A 125V IA	364 001	366 001
F01A 125V 1¼A	★	★
F01A 125V 1½A	364 01.5	366 01.5
F01A 125V 1⁶/₁₀A	★	★
F01A 125V 2A	364 002	366 002
F01A 25V2½A	★	★
F01A 125V 3A	364 003	366 003
F01A 125V 3³/₁₀A	★	●
F01A 125V4A	364 004	★
F01A 125V 5A	364 005	●

F02A FUSES — MIL-PRF-15160/2

(Commercial Equivalent — 311,312 Series)

MIL Type Designation	Nick&Plated caps	Silver-Plated Caps
F02A 250; 1/100A	392.010	397.010
F02A 250V 1/32A	392.031	397.031
F02A 250V 1/16A	392.062	397.062
F02A 250V 1/8A	392.125	397.125
F02A 250V 15/100A	392.150	★
F02A 250V 175/1000A	392.175	★
F02A 250V 3/16A	392.187	397.187
F02A 250V 2/10A	392.200	397.200
F02A 250V 1/4A	392.250	397.250
F02A 250V 3/10A	392.300	397.300
F02A 250V 3/8A	392.375	397.375
F02A 250V 1/2A	392.500	397.500
F02A 250V 6/10A	392.600	397.600
F02A 250V 3/4A	392.750	397.750
F02A 250V 1A	392 001	397 001
F02A 250V 1¼A	392 1.25	★
F02A 250V 1½A	392 01.5	397 01.5
F02A 250V 1⁶/₁₀A	392 01.6	★
F02A 250V 2A	392 002	397 002
F02A 250V 2½A	392 02.5	397 02.5
F02A 250V 3A	392 003	397 003
F02A 250V 4A	392 004	397 004
F02A 250V 5A	392 005	397 005
F02A 250V 6A	392 006	397 006
F02A 125V 8A	392 008	397 008
F02A 125V 10A	392 010	397 010
F02A 32V 15A	392 015	397 015
F02A 32V 20A	392 020	397 020
F02A 32V 25A	392 025	397 025

F02B FUSES — MIL-PRF-15160/2

(Commercial Equivalent — 313 Series)

MIL Type Designation	Nickel-Plated caps	Silver-Plated caps
F02B 250V 1/100A	393.010	398.010
F02B 250V 1/32A	393.031	398.031
F02B 250V 1/25A	393.040	398.040
F02B 250V 1/16A	393.062	398.062
F02B 250V 1/10A	393.100	398.100
F02B 250V 1/8A	393.125	398.125
F02B 250V 15/100A	393.150	398.150
F02B 250V 175/1000A	393.175	398.175
F02B 250V 3/16A	393.187	398.187
F02B 250V 2/10A	393.200	398.200
F02B 250V 1/4A	393.250	398.250
F02B 250V 3/10A	393.300	398.300
F02B 250V 3/8A	393.375	398.375
F02B 250V 4/10A	393.400	398.400
F02B 250V 1/2A	393.500	398.500
F02B 250V 6/10A	393.600	398.600
F02B 250V 7/10A	393.700	398.700
F02B 250V 3/4A	393.750	398.750
F02B 250V 8/10A	393.800	398.800
F02B 250V 1A	393 001	398 001
F02B 250V 1¼A	393 1.25	398 1.25
F02B 250V 1½A	393 01.5	398 01.5
F02B 250V 1⁶/₁₀A	393 01.6	398 01.6
F02B 250V 1⁸/₁₀A	393 01.8	398 01.8
F02B 250V 2A	393 002	398 002
F02B 250V 2¼A	393 2.25	398 2.25
F02B 250V 2½A	393 02.5	398 02.5
F02B 250V 2⁸/₁₀A	393 02.8	398 02.8
F02B 250V 3A	393 003	398 003
F02B 250V 3²/₁₀A	393 03.2	398 03.2

F03A FUSES — MIL-PRF-15160/3

(Commercial Equivalent — 314 Series)

MIL Type Designation	Nickel-Plated caps	Silver-Plated caps
F03A 250V 1/4A	394.250	399.250
F03A 250V 1/2A	394.500	399.500
F03A 250V 1 A	394 001	399 001
F03A 250V 1¼A	★	★
F03A 250V 1½A	394 01.5	399 01.5
F03A 250V 2A	394 002	399 002
F03A 250V 3A	394 003	399 003
F03A 250V 4A	394 004	399 004
F03A 250V 5A	394 005	399 005
F03A 250V 6A	394 006	399 006
F03A 250V 8A	394 008	399 008
F03A 250V 10A	394 010	399 010
F03A 250V 12A	394 012	399 012
F03A 250V 15A	394 015	399 015
F03A 125V 20A	394 020	399 020
F03A 125V 25A	394 025	399 025
F03A 125V 30A	394 030	399 030

NOTES:
1. The suffix letter "S" added to the type designation indicates that silver-plated fuse caps are required. For example: F02A 250V 3/4A S.
2. ★ Contact factory.
3. Boldface numbers indicate series; light type numbers indicate amperage value.

Approved to MIL-PRF-15160

F03B FUSES — MIL-PRF-15160/3

(Commercial Equivalent — 326 Series)

MIL Type Designation	Nickel-Plated caps	Silver-Plated Caps
F03B 250V 1/100A	390.010	395.010
F03B 250V 1/32A	390.031	395.031
F03B 250V 1/16A	390.062	395.062
F03B 250V 1/10A	390.100	395.100
F03B 250V 1/8A	390.125	395.125
F03B 250V 15/100A	390.150	395.150
F03B 250V 175/1000A	390.175	395.175
F03B 250V 3/16A	390.187	395.187
F03B 250V 2/10A	390.200	395.200
F03B 250V 1/4A	390.250	395.250
F03B 250V 3/10A	390.300	395.300
F03B 250V 3/8A	390.375	395.375
F03B 250V 4/10A	390.400	395.400
F03B 250V 1/2A	390.500	395.500
F03B 250V 6/10A	390.800	395.600
F03B 250V 7/10A	390.700	395.700
F03B 250V 3/4A	390.750	395.750
F03B 250V 8/10A	390.800	395.800
F03B 250V 1A	390 001	395 001
F03B 250" 1 2/10A	390 01.2	395 01.2
F03B 250V 1 1/4A	390 1.25	395 1.25
F03B 250V 1 1/2A	390 01.5	395 01.5
F03B 250V 1 6/10A	390 01.6	395 01.6
F03B 250V 2A	390 002	395 002
F03B 250V 2 1/2A	390 02.5	395 02.5
F03B 250V 2 8/10A	390 02.8	395 02.8
F03B 250V 3A	390 003	395 003
F03B 250V 3 2/10A	390 03.2	395 03.2
F03B 125V 4A	390 004	395 004
F03B 125V 5A	390 005	395 005
F03B 125V 6 1/4A	390 6.25	395 6.25
F03B 125V 7A	390 007	395 007
F03B 125V 8A	390 008	395 008
F03B 125V 10A	390 010	395 010
F03B 125" 15A	390 015	395 015
F03B 125V 20A	390 020	395 020
F03B 125V 25A	390 025	395 025

F09A FUSES — MIL-PRF-15160/9

(Commercial Equivalent — BLN Series)

MIL Type Designation	Nickel-Plated Caps	Silver-Plate Caps
F09A 250; 1A	594 001	594 001 s
F09A 250V 2A	594 002	594 002S
F09A 250V 3A	594 003	594 003S
F09A 250V 4A	594 004	594 004S
F09A 250V 5A	594 005	594 005S
F09A 250V 6A	594 006	594 006S
F09A 250V 7A	594 007	594 007s
F09A 250V 8A	594 008	594 008S
F09A 250V 10A	594 010	594 010S
F09A 250V 12A	594 012	594 012S
F09A 250V 15A	594 015	594 015s
F09A 250V 20A	594 020	594 020s
F09A 250V 25A	594 025	594 0255
F09A 250V 30A	594 030	594 030s

F09B FUSES — MIL-PRF-15160/9

(Commercial Equivalent — FLM Series)

MIL Type Designation	Nickel-Plated caps	Silver-Plated caps
F09B 250V 3/10A	593.300	593.300s
F09B 250V 4/10A	593.400	593.400s
F09B 250V 1/2A	593.500	593.500s
F09B 250V 6/10A	593.600	593.6005
F09B 250V 8/10A	593.800	593.8005
F09B 250V 1A	593 001	593 001S
F09B 250V 1 1/8A	593 1.12	593 1.12s
F09B 250V 1 1/4A	593 1.25	593 1.25S
F09B 250V 1 4/10A	593 01.4	593 01.4S
F09B 250V 1 1/2A	593 01.5	593 01.5s
F09B 250V 1 6/10A	593 01.8	593 01.6S
F09B 250V 1 8/10A	593 01.8	593 01.8S
F09B 250V 2A	593 002	593 002s
F09B 250V 2 1/4A	593 2.25	593 2.255
F09B 250V 2 1/2A	593 02.5	593 02.55
F09B 250V 2 8/10A	593 02.8	593 02.8S
F09B 250V 3A	593 003	593 003S
F09B 250V 3 3/10A	593 03.2	593 03.2S
F09B 250V 3 1/2A	593 03.5	593 03.5s
F09B 250V 4A	593 004	593 004s
F09B 250V 4 1/2A	593 04.5	593 04.5s
F09B 250V 5A	593 005	593 005S
F09B 250V 5 6/10A	593 05.6	593 05.6S
F09B 250V 6A	593 006	593 006S
F09B 250V 6 1/4A	593 6.25	593 6.255
F09B 250V 7A	593 007	593 007S
F09B 250V 8A	593 008	593 0085
F09B 250V 9A	593 009	593 009S
F09B 250V 10A	593 010	593 010S
F09B 125V 12A	593 012	593 012S
F09B 125V 15A	593 015	593 015s
F09B 32V 20A	593 020	593 020s
F09B 32V 25A	593 025	593 025S
F09B 32V 30A	593 030	593 030s

F60C FUSES — MIL-PRF-15160/60

(Commercial Equivalent — KLK Series)

MIL Type Designation	Nickel-Plated Caps	Silver-Plated Caps
F60C 500V 1/8A	592.125	592.125S
F60C 500V 2/1 OA	592.200	592.200S
F60C 500V 1/4A	592.250	592.250S
F60C 500V 3/1 OA	592.300	592.300S
F60C 500V 3/8A	592.375	592.375S
F60C 500V IRA	592.500	592.500S
F60C 500V 3/4A	592.750	592.750S
F60C 500V 1A	592 001	592 001S
F60C 500V 1 1/2A	592 01.5	592 01.5S
F60C 500V 2A	592 002	592 002S
F60C 500V 3A	592 003	592 003s
F60C 500V 4A	592 004	592 004s
F60C 500V 5A	592 005	592 005s
F60C 500V 6A	592 006	592 006S
F60C 500V 8A	592 008	592 008S
F60C 500V 10A	592 010	592 010S
F60C 500V 15A	592 015	592 015s
F60C 500V 20A	592 020	592 020S
F60C 500V 25A	592 025	592 025S
F60C 500V 30A	592 030	592 030S

NOTES: 1. The suffix letter "S" added to the type designation indicates that silver-plated fuse caps are required. For example: F02A 250V 3/4A S.

2. Boldface numbers indicate series; light type numbers indicate amperage value.

Approved to MIL-PRF-23419

FM02 FUSES MIL-PRF-23419/2

(Commercial Equivalent — 273 Series MICRO" fuses)

MIL Type Designation	Catalog Number
FMOZA 125V 1/500A	274.002
FMOZA 125V 1/200A	274.005
FM02A 125V 1/100A	274.010
FMOZA 125V 1/64A	274.015
FM02A 125V 1/32A	274.031
FM02A 125V 1/16A	274.062
FM02A 125V 1/10A	274.100
FM02A 125V 1/8A	274.125
FMOZA 125V 2/10A	274.200
FMOZA 125" 1/4A	274.250
FM02A 125V 3/10A	274.300
FM02A 125V 4/10A	274.400
FM02A 125V 1/2A	274.500
FM02A 125V 6/10A	274.600
FM02A 125V 3/4A	274.750
FMOZA 125V 1A	274001
FM02A 125V 1½A	27401.5
FM02A 125V 2A	274002
FM02A 125V 3A	274003
FM02A 125V 4A	274004
FM02A 125V 5A	274005

FM04 FUSES MIL-PRF-23419/4

(Commercial Equivalent — 275 Series PICO® fuses)

Not recommended for new design — use FM 10

MIL Type Designation	Catalog Number
FM04A 125V 1/16A	277.062
FM04A 125V 1/8A	277.125
FM04A 125V 1/4A	277.250
FM04A 125V 3/8A	277.375
FM04A 125V 1/2A	277.500
FM04A 125V 3/4A	277.750
FM04A 125V 1A	277 001
FM04A 125V 1½A	27701.5
FM04A 125V 2A	277002
FM04A 125V 3A	277003
FM04A 125V 4A	277004
FM04A 125V 5A	277005
FM04A 125V 7A	277007
FM04A 125V 10A	277010
FM04A 32V 15A	277015

FM07 FUSES MIL-PRF-23419/7

(Commercial Equivalent — 262 Series MICRO" fuses)

MIL Type Designation	Catalog Number
FM07A 125V 1/500A	269.002
FM07A 125V 1/200A	269.005
FM07A 125V 1/100A	269.010
FM07A 125V 1/64A	269.015
FM07A 125V 1/32A	269.031
FM07A 125V 1/20A	269.050
FM07A 125V 1/16A	269.062
FM07A 125V 1/10A	269.100
FM07A 125V 1/8A	269.125
FM07A 125V 2/10A	269.200
FM07A 125V 1/4A	269.250
FM07A 125V 3/10A	269.300
FM07A 125V 4/10A	269.400
FM07A 125V 1/2A	269.500
FM07A 125V 6/10A	269.600
FM07A 125V 7/10A	269.700
FM07A 125V 3/4A	269.750
FM07A 125V 8/10A	269.600
FM07A 125V 1A	269 001
FM07A 125V 1½A	269 01.5
FM07A 125V 2A	269 002
FM07A 125V 3A	269003
FM07A 125V 4A	269004
FM07A 125V 5A	269 005

FM08 FUSES MIL-PRF-2341918

(Commercial Equivalent — 265 Series PICO® fuses)

MIL Type Designation	Catalog Number
FM08A 125V 1/8A	267.125
FM08A 125V 1/4A	267.250
FM08A 125V 3/8A	267.375
FM08A 125V 1/2A	267.500
FM08A 125V 3/4A	267.750
FM08A 125V 1A	267 001
FM08A 125V 1½A	267 01.5
FM08A 125V 2A	267 002
FM08A 125V 2½A	267 02.5
FM08A 125V 3A	267 003
FM08A 125V 4A	267 004
FM08A 125V 5A	267 005
FM08A 125V 7A	267 007
FM08A 125V 10A	267 010
FM08A 32V 15A	267 015

FM10 FUSES MIL-PRF-23419/10

(Commercial Equivalent — 251 Series PICO® fuses)

MIL Type Designation	Catalog Number
FMIOA 125V 1/16A	253.062
FMIOA 125V 1/8A	253.125
FMIOA 125V 1/4A	253.250
FMIOA 125V 3/8A	253.375
FMIOA 125V 1/2A	253.500
FM, OA 125V 3/4A	253.750
FMIOA 125V ,A	253001
FMIOA 125V 1½A	253 Of.5
FMIOA 125V 2A	253002
FMIOA 125V 3A	253003
FMIOA 125V 4A	253004
FMIOA 125V 5A	253 005
FMIOA 125V 7A	253007
FMIOA 125V 10A	253010
FMIOA 32V 15A	253015

NOTE: Boldface numbers of catalog number indicate series; light type numbers indicate amperage value.

FUSES

Approved to DESC Drawing No. 87108

2AG Cartridge Fuses — Fast-Acting

(Commercial Equivalent — 225 Series)

DESC Part Number	Voltage Rating	Ampere Rating	Catalog Number
87108-001A	250V	1/8	288.125
87108-003A	250V	1/4	288.250
87108-005A	250V	3/8	288.375
87108-007A	250V	1/2	288.500
87108-011A	250V	3/4	288.750
87108-015A	250v	1	288001
87108-019A	250v	1½	288 01.5
87108-021A	250V	2	288002
87108-025A	250v	2½	288 02.5
87108-027A	250v	3	288003
87108-029A	250v	3½	288 03.5
87108-031A	125V	4	288004
87108-033A	125V	5	288005
87108-035A	125V	7	288007

2AG Axial Lead Fuses — Fast-Acting

(Commercial Equivalent — 224 Series)

DESC Part Number	Voltage Rating	Ampere Rating	Catalog Number
87108-002A	250V	1/8	**289.125**
87108-004A	250V	1/4	289.250
87108-006A	250V	318	289.375
87108-008A	250V	1/2	289.500
87108-012A	250V	314	289.750
87108-016A	250V	1	289 001
87108-020A	250V	1½	289 01.5
87108-022A	250v	2	289002
87108-026A	250V	2½	289 02.5
87108-028A	250V	3	289003
87108-030A	250V	3½	289 03.5
87108-032A	125V	4	289004
87108-034A	125V	5	289 005
87108-036A	125V	7	289007

2AG Cartridge Fuses — Slo-Blo® Fuse

(Commercial Equivalent — 229 Series)

DESC Part Number	Voltage Rating	Ampere Rating	Catalog Number
87108-003B	250V	1/4	290.250
87108-005B	250V	318	290.375
87108-007B	250V	1/2	290.500
87108-009B	250V	6/10	290.600
87108-011B	250v	314	290.750
87108-015B	250V	1	290001
87108-017B	250V	1¼	290 1.25
87108-0198	250V	1½	290 01.5
87108-021B	250V	2	290002
87108-023B	250V	2¼	**290** 2.25
87108-025B	250V	2 %	290 02.5
87108-027B	250V	3	290003
87108-029B	250v	3 ½	290 03.5
87108-031B	125V	4	290004
87108-033B	125V	5	290005
87108-035B	125V	7	290007

2AG Axial Lead Fuses — Sto-Blo" Fuse

(Commercial Equivalent — 230 Series)

DESC Part Number	Voltage Rating	Ampere Rating	Catalog Number
87108-004B	250V	114	**291.250**
87108-006B	250V	3/8	**291.375**
87108-008B	250V	1/2	**291.500**
87108-010B	250V	6/10	291.600
87108-012B	250V	314	**291.750**
87108-016B	250V	1	291 001
87108-018B	250V	1¼	291 1.25
87108-0208	250V	1½	291 01.5
87108-022B	250V	2	291002
87108-024B	250V	2¼	**291 2.25**
87108-026B	250V	2½	**291 02.5**
87108-028B	250V	3	**291 003**
87108-030B	250V	3½	**291 03.5**
87108-0328	125V	4	**291 004**
87108-034B	125V	5	**291 005**
87108-036B	125V	7	**291007**

FUSEHOLDERS

Approved to MIL-PRF-19207

MIL Specification	Type Designation	Catalog Number	Specifications: Type	Electrical Rating		For Fuse Type	Commercial Equivalent: Catalog Number	Voltage Range
MIL-PRF19207/11	FHN20G	342025	Drip-Proof	20A	250V Max	3AG, F02, F03	**342** 004P	250" Max
MIL-PRF19207/16	FHN26G2	342024	Drip-Prod	30A	250V Max	3AG, F02, F03	**342** 012P	250" Max
MIL-PRF19207/16	FHN26W	342021	Water-Tight	30A	250V Max	3AG, F02, F03	342006	250V Max
MIL-PRF19207/36	FHN55W	340267	Water-Tight — RFI	3 0 A	250V Max	3AG, F02, F03	—	250" Max

NOTE: Boldface numbers of catalog number indicate series; light type numbers indicate amperage value.

NUMERICAL INDEX OF CATALOG NUMBERS

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