C O N N E C T A N D P R O T E C T

FUSE & CIRCUIT PROTECTION

FUSIBLE ET PROTECTION DE CIRCUIT

PROTECCIÓN DE FUSIBLE Y CIRCUITO

Grote®

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Contents

Your safety is paramount. It is also vital that the equipment you are working on and with be protected from damage. Using the right fuse for the right application will ensure optimum performance and safety. Always consult your owner's manual or a professional, trained technician to ensure proper installation and application when replacing a fuse. Listed below are some helpful hints and tips to ensure your safety and making sure the right fuse type is being utilized.

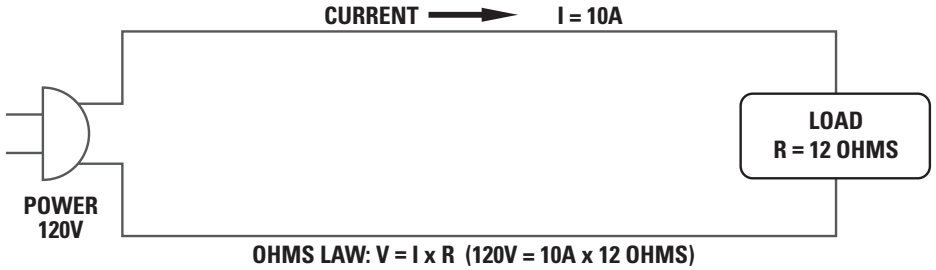
Although care is taken to properly design electrical and electronic circuits; overcurrents in the form of short-circuits and overloads can occur. The sole purpose of fuses and circuit breakers is to protect personnel and/or equipment from serious harm when an overcurrent condition arises. This guide is intended to help create a better understanding the various parameters of overcurrent protection and the proper application of circuit protective devices. This guide creates a basic understanding of overcurrent principles and applications but is not intended to supplant sound engineering principles or replace specific application testing.

Overcurrents

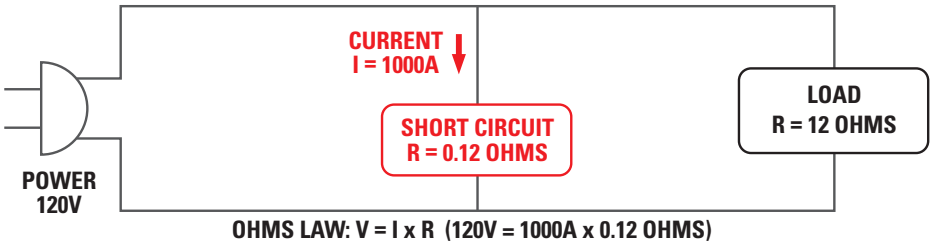
An overcurrent is a condition which exists in an electrical circuit when the normal load current is exceeded. The two basic forms of an overcurrent are overloads and short circuits. Fuses and circuits breakers primary role in a circuit is to protect personnel and equipment when dangerous overcurrents do happen.

Short Circuit

A short-circuit is an overcurrent condition where an abnormal, low-resistance, circuit path is introduced into the circuit. This low-resistance path bypasses the normal load and can create extremely high currents (up to 1000x the normal current under some conditions). Under normal conditions a typical circuit may be described by Ohm's Law as follows:

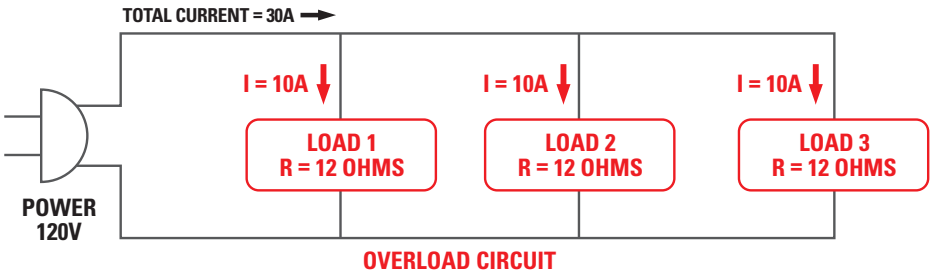


When a short circuit occurs, a low-resistive, abnormal path is created which will cause the circuit current to increase as the circuit resistance is decreased. The current when a short circuit is introduced, can exceed 1000 times the normal current of the circuit. The circuit diagram of a short circuit is shown below:



Overload

An overload is an overcurrent condition where the current exceeds the normal full load-capacity of the circuit but where no fault condition (short-circuit) is present. A momentary overload condition (also known as “in-rush” currents) may also occur when a circuit is first initialized due to capacitor charging and/or motor-startup. An over load circuit diagram is shown below:



In order to select the proper protective device, the following parameters and criteria need to be considered:

1. What is the normal operating current of the circuit?
2. What is the operating voltage?
3. Is the circuit AC or DC?
4. What is the operating ambient temperature?
5. Is the device being used for short-circuit protection, over-load protection, or both?
6. What are the physical size limitations?
7. Does the fuse need to be "field-replaceable"?
8. Is resettability an issue?
9. How will I mount the device?
10. What are the cost considerations?

1. What is the normal operating current of the circuit?

In order to select the right amperage of the fuse, you first need to know the full-load steady-state current of the circuit at an ambient temperature of 20°C (68°F). Once the current value is determined, then a fuse rating should be selected as to be 135% of this value (taken to the next standard value).

For example, if the normal steady-state current is calculated to be 10 amps, then a 15A fuse rating should be selected [10 amps x 135% = 13.5 amps, the next larger standard size is 15A].

It is important to note that if the fuse is intended to be used in an environment with possibly very high or low ambient temperatures, then the nominal fuse current would need to be sized significantly higher or lower (see ambient temperature below).

2. What is the operating voltage?

The basic rule of thumb is that the voltage rating of the fuse must always higher than the voltage rating of the circuit that it is protecting. For example, if the circuit voltage is 24V, then the fuse voltage rating must be higher than 24V (yes… it can be 250V… just so long as it's higher than the circuit voltage).

3. Is the circuit AC or DC?

There exist two distinct types of circuits AC (alternating current) and DC (direct current). AC power is what you will typically find in your home from the electrical utility. AC power is created primarily by moving machines such as generators and delivered through the electric grid. DC power is typically used in electronic and automotive applications. DC power generally is created via a chemical reaction (as batteries and solar alternator cells) or converted AC power through the use of AC to DC power supplies. With AC power, the current and voltage oscillate back and forth. This oscillation helps the fuse to clear quickly. DC power on the other hand doesn't oscillate so the fuse must find other means to clear itself when opening.

Because of these differences, some fuses are designed specifically to be used in DC applications (such as automotive fuses). Some AC rated fuses may be used in DC applications, however there may be a voltage de-rating in these cases.

4. What is the operating ambient temperature?

Ambient temperature is a fancy way of saying the “outside air” surrounding the fuse. Normally, the fuses are tested in "laboratory conditions" by the safety agencies such as UL and CSA. The lab conditions are almost always set at 20°C or 77°F. Unfortunately, most real world conditions are not those found in a laboratory.

Fuses are heat sensitive devices meaning that it takes heat (via the overcurrent) in order to melt the fuse element inside the fuse. The more heat… the faster it takes to melt the fuse element… the less heat… the longer it takes to melt the fuse element.

If a fuse will be subjected to a higher temperature than 20°C, then the fuse amperage will need to be increased as to compensate for the higher temperature (to avoid "nuisance tripping"). Likewise, if the fuse will be used at a lower temperature, then the fuse amperage needs to be lowered (or else it might never open).

The rule of thumb is that for every 20°C higher or lower in temperature, the fuse should be re-rated higher or lower 10-15%.

An example of a fuse re-rating when higher ambient temperatures are present:
Normal full-load current: 1 Amp
Normal fuse sizing: 1.5 Amps (135% of full load current taken to the next higher standard rating)
Ambient Temperature: 65°C
Re-rating: 2 Amps (130% of normal fuse rating)

Conversely, when a fuse is intended to be used in extreme low temperature conditions, the fuse must have a lower rating than that in normal conditions. An example of the fuse re-rating when lower ambient temperatures are present:
Normal full-load current: 1 Amp
Normal fuse sizing: 1.5 Amps (135% of full load current taken to the next higher standard rating)
Ambient Temperature: -15°C
Re-rating: 1.2 Amps (70% of normal fuse rating taken to the next higher standard fuse rating)

5. Is the protective device being used for short-circuit protection, overload protection, or both?
If the device is to be used as short-circuit protection, the fuse or circuit breaker must interrupt the fault quickly (generally less than 4 milliseconds) in order to give the maximum protection to equipment and personnel.

If the fuse or circuit breaker is intended for overload protection only, then it can be much slower in reacting to the overcurrent – seconds or even minutes as compared to milliseconds...

All fuses offer some form of both short-circuit protection as well as over-load protection whereas many circuit breakers however are over-load protection ONLY and have no capabilities to protect against dangerous short-circuits.

6. What are the physical size limitations?
Many times the fuse or circuit breaker needs to be mounted into a place with physical size limitations. It is this reason that fuse and circuit breaker manufacturers have created a wide selection of components with varying physical sizes. Typically however, there are a trade-offs that the engineer must consider.

Generally speaking, the smaller the fuse, the less current and/or capabilities that the fuse or circuit breaker may have. For example, a subminiature fuse maybe limited to 15A whereas the larger 1/4" x 1 1/4" glass tube fuse can accommodate up to 40A.

Additionally, although the fuse can be smaller, the corresponding fuse holder maybe substantially bigger adding to the consideration.

7. Does the fuse need to be "field-replaceable"?
Fuses are intended to open a circuit when an overcurrent occurs; whether it be a short-circuit or an over-load. A decision by the engineer needs to be made as to whether or not the fuse should be field replaceable.

The primary reason for making the fuse replaceable is simply convenience for the end-user in getting their equipment back up and running. The reasons for choosing not to have the fuse field replaceable are two-fold:

1. There can be a significantly greater cost to the manufacturer to include a fuseholder as opposed to directly soldering the fuse into or onto the PCB.

2. The manufacturer may not want the end-customer to access the interior of the equipment to replace the fuse for liability issues. This is especially true when a short-circuit was the cause of the problem in the first place.

3. The manufacturer may have some "planned obsolesce" of their parts and may want to replace the entire circuit board rather than have someone replace just the fuse.

8. Is resettability an issue?

There are one-time use fuses and resettable type fuses available to the engineer. Both types of fuses provide overload protection. Resettable fuses are limited to circuit applications provide 14 amps (at 12V) and even less current at higher voltages. Circuit breakers can also provide resettability and can range from 1A to 300A.

One-time fuses are just as their name implies. Once they are called upon to act, the interior link melts and the fuse must be replaced. Just because the fuse is replaced, there can still be a short-circuit or over-load still present in the circuit which can cause the newly replaced fuse to open as well. Care should be taken to correct whatever problem that may have occurred when the fuse opened in the first place… before replacing the open fuse with a new fuse.

9. How will the fuse be mounted?

One of the most careful considerations that need to be made is the mounting of the fuse in the circuit. There are several options at hand:

1. Direct Solder: In this method, the fuse is directly soldered into or onto the printed circuit board (PCB). The drawback to this design is the lack of field replaceable parts as discussed in great detail in the above section but cost can be significantly reduced with this mounting method.

2. Fuse Clips: Fuse clips are relatively inexpensive and allow for field replaceability. Fuseclips are typically mounted on a PCB so any attempt at replacing the fuse will require opening of the piece of equipment by the end-user. Additionally, removing a fuse from a fuse clip without disconnecting the power source could lead to an electrical shock when touching the fuse. Fuse clips are available for all "tube" fuses as well as microfuses. Typically fuseclips are limited to 20A of normal current (also available in 30A). Fuse clips are generally not listed or recognized by any safety agencies.

3. Panel Mounted Fuseholders: Panel mounted fuseholders allow for easy access for the end-user to replace the fuse in the field. The panel mount fuseholder is shock-safe meaning that the fuse is removed safely when the cap of the fuseholder is removed preventing the possibility of electrical shocks. Fuseholders are typically tested and approved by safety agencies such as UL and CSA. Fuseholders are typically available up to 30A.

4. Fuse Blocks: Fuse blocks are like fuse clips however they do not need to be mounted on the PCB. Fuses mounted in fuse blocks are typically only accessible by opening the piece of equipment which could lead to electrical shocks if the equipment is not disconnected from the power source. Fuse blocks are one of the few methods to mount fuses of large amperage.

5. Inline Fuse Holders: Inline fuse holders are typically used as a part of a wire harness assembly or where no surface is available to secure another type of fuse mount. Inline fuse holders are generally available up to 100A in lower voltage applications and up to 30A in higher voltage applications.

10. What are the cost considerations?

The costs considerations can vary by several degrees depending on the size, performance, and mounting of the fuse. Generally speaking, the larger a fuse is; the most it will cost (due to higher material costs to build the fuse). The performance characteristics of a particular fuse are also a large cost consideration. A low voltage automotive fuse might a fraction of the cost as compared with a 500V super high-speed, ceramic tube fuse both rated at 10A. Safety agency approvals will also add to the overall cost of the fuse. One of the largest costs of a fuse is the fuse holder. A typical panel-mount fuse holder may cost many times than that of the fuse itself.

MINI®/ATM Blade Fuses

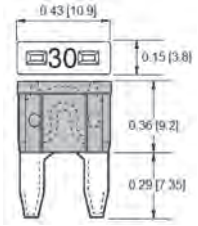
Fast Acting/Blade Mounting
A cost-effective standard automotive fuse for use in automotive, battery and general DC applications.

Body Material: Nylon PA 66

Electrical Specifications: 2A-30A, 32VDC

Design Standards: ISO 8820 Standard Specifications

SPECIFICATIONS
- Voltage: 32VDC
- Amperage: 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A
- Terminals: Zinc alloy
- Designed to meet SAE and ISO Standards
- Interrupt Rating – 1000A @ 32 VDC



Inches [mm]


82-ANM-5A


82-ANM-10A


82-ANM-15A


82-2208


82-ANM-20A


82-ANM-25A

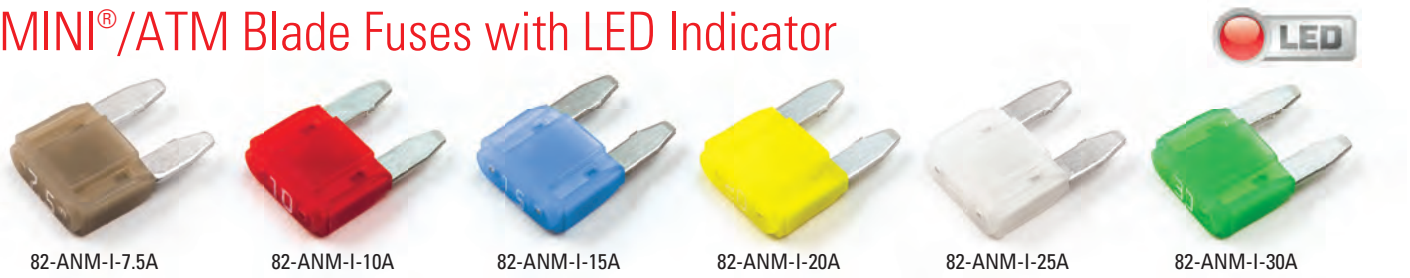

82-ANM-30A


82-2213

Part No.	Current Rating	Color	Pack	Description
82-ANM-2A	2A	GRAY	5	MINI® Fuse
82-ANM-3A	3A	VIOLET	5	MINI® Fuse
82-ANM-5A	5A	TAN	5	MINI® Fuse
82-ANM-7.5A	7.5A	BROWN	5	MINI® Fuse
82-ANM-10A	10A	RED	5	MINI® Fuse
82-ANM-15A	15A	BLUE	5	MINI® Fuse
82-ANM-20A	20A	YELLOW	5	MINI® Fuse
82-ANM-25A	25A	CLEAR	5	MINI® Fuse
82-ANM-30A	30A	GREEN	5	MINI® Fuse
82-ANM-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		7	MINI® Fuse Assortment
82-ANM-8P	(2A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		9	MINI® Fuse Assortment & Puller
82-ANM-8T	(2A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		9	MINI® Fuse Assortment & Tester
82-ASST-43	(5A, 10A, 15A, 20A, 25A, 30A)		43	MINI® Fuse Assortment & Tester
82-ASST-64	(2A, 3A, 4A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A) + (30A, 40A, 50A)		64	MINI® & MAXI Fuse Assortment & Tester
82-ASST-80M	(3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		80	MINI®/ATM Fuse Assortment
82-ASST-180			180	Low Profile MINI®, MINI®/ATM, & ATO®/ATC® Fuse Ast.
FUSE HOLDER				
82-2208	20A (14GA)	RED	1	MINI® Fuse Holder, 7" with Protective Cap
82-2213	25A Primary Circuit, 15A Auxiliary Circuit *(Total not to exceed 30A combined)*	RED	1	"Add A Fuse" MINI®/ATM Fuse Holder; 16GA

Warning: Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame. Avoid contact of device with chemical solvent. Prolonged contact will damage the device performance.

MINI®/ATM Blade Fuses with LED Indicator



82-ANM-I-7.5A | 82-ANM-I-10A | 82-ANM-I-15A | 82-ANM-I-20A | 82-ANM-I-25A | 82-ANM-I-30A

Part No.	Current Rating	Color	Pack	Description
82-ANM-I-3A	3A	VIOLET	2	MINI® Fuse with LED Indicator
82-ANM-I-5A	5A	TAN	2	MINI® Fuse with LED Indicator
82-ANM-I-7.5A	7.5A	BROWN	2	MINI® Fuse with LED Indicator
82-ANM-I-10A	10A	RED	2	MINI® Fuse with LED Indicator
82-ANM-I-15A	15A	BLUE	2	MINI® Fuse with LED Indicator
82-ANM-I-20A	20A	YELLOW	2	MINI® Fuse with LED Indicator
82-ANM-I-25A	25A	CLEAR	2	MINI® Fuse with LED Indicator
82-ANM-I-30A	30A	GREEN	2	MINI® Fuse with LED Indicator
82-ANM-I-5	(10A, 15A, 20A, 25A, 30A)		5	MINI® Fuse with LED Indicator Assortment

Low Profile MINI®/ATM Blade Fuses

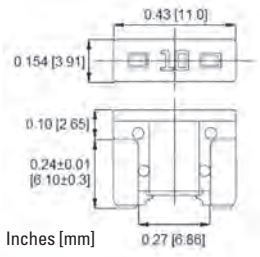
Fast Acting/Blade Mounting
Low Profile version of the Miniature Automotive Blade fuse

Body Material: Nylon PA 66

Electrical Specifications: 3A-30A, 32VDC

Design Standards: ISO 8820 Standard Specifications

SPECIFICATIONS
- Voltage: 32V DC
- Amperage: 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A
- Terminals: Zinc alloy
- Designed to meet SAE, ISO Standards
- Interrupt Rating – 1000A @ 32 VDC



82-ANS-7.5A | 82-ANS-10A | 82-ANS-15A | 82-ANS-20A | 82-ANS-25A | 82-ANS-30A

Part No.	Current Rating	Color	Pack	Description
82-ANS-3A	3A	VIOLET	5	Low Profile MINI® Fuse
82-ANS-5A	5A	TAN	5	Low Profile MINI® Fuse
82-ANS-7.5A	7.5A	BROWN	5	Low Profile MINI® Fuse
82-ANS-10A	10A	RED	5	Low Profile MINI® Fuse
82-ANS-15A	15A	BLUE	5	Low Profile MINI® Fuse
82-ANS-20A	20A	YELLOW	5	Low Profile MINI® Fuse
82-ANS-25A	25A	CLEAR	5	Low Profile MINI® Fuse
82-ANS-30A	30A	GREEN	5	Low Profile MINI® Fuse
82-ANS-I-5	(10A, 15A, 20A, 25A, 30A)		5	Low Profile MINI® Fuse LED Assortment
82-ANS-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		7	Low Profile MINI® Assortment
82-ANS-7P	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		8	Low Profile MINI® Assortment & Puller
82-ANS-7T	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		8	Low Profile MINI® Assortment & Tester
82-ASST-180			180	Low Profile MINI®, MINI®/ATM, & ATO®/ATC® Fuse Assortment

ATO®/ATC® Blade Fuses with LED Indicator

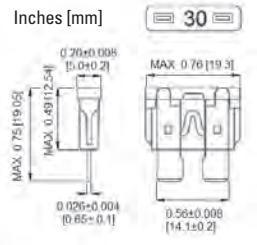
Fast Acting/Blade Mounting
A cost-effective standard automotive fuse for use in automotive, battery and general DC applications.

Body Material: Nylon PA 66

Electrical Specifications: 3A-30A, 32VDC

Design Standards: ISO 8820 Standard Specifications

SPECIFICATIONS
- Voltage: 32VDC
- Amperage: 2A, 3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A,
- Terminals: Zinc alloy
- Designed to meet SAE and ISO Standards
- Interrupt Rating – 1000A @ 32 VDC



82-ANR-I-10A | 82-ANR-I-15A | 82-ANR-I-20A | 82-ANR-I-25A | 82-ANR-I-30A

Part No.	Current Rating	Color	Pack	Description
82-ANR-I-3A	3A	**VIOLET**	2	ATO® Fuse with LED Indicator
82-ANR-I-5A	5A	**TAN**	2	ATO® Fuse with LED Indicator
82-ANR-I-7.5A	7.5A	**BROWN**	2	ATO® Fuse with LED Indicator
82-ANR-I-10A	10A	**RED**	2	ATO® Fuse with LED Indicator
82-ANR-I-15A	15A	**BLUE**	2	ATO® Fuse with LED Indicator
82-ANR-I-20A	20A	**YELLOW**	2	ATO® Fuse with LED Indicator
82-ANR-I-25A	25A	**CLEAR**	2	ATO® Fuse with LED Indicator
82-ANR-I-30A	30A	**GREEN**	2	ATO® Fuse with LED Indicator
82-ANR-I-5	(10A, 15A, 20A, 25A, 30A)		5	ATO® Fuse with LED Indicator Assortment

ATO®/ATC® Fuse Holders

82-2209 | 82-2207 | 82-2166 | 82-2165 | 82-2164 | 84-2903 | 82-2212

Part No.	Current Rating	Color	Pack	Description
82-2209	20A (14GA)	**RED**	1	ATO®/ATC® with Protective Cap + 20A Fuse, 7"
82-2207	20A (16GA)	**RED**	1	ATO®/ATC® with Protective Cap, 7"
82-2166	30A (12GA)	**ORANGE**	1	ATO®/ATC® w/Protective Cap & Mounting Tab, 10"
82-2165	30A (12GA)	**ORANGE**	1	ATO®/ATC®, Continuous Loop, 8"
82-2164	20A (14GA)	**BLACK**	1	ATO®/ATC®, Blunt Cut, 7"
84-2903	20A (14-18GA)		1	Self Stripping ATO®/ATC® Fuse Holder
82-2212	25A Primary Circuit, 15A Auxiliary Circuit, *(Total not to exceed 30A combined)*	**RED**	1	"Add-A-Fuse" ATO®/ATC® Fuse Holder; 16GA

ATO®/ATC® Blade Fuses


82-ANR-3A


82-ANR-5A


82-ANR-7.5A


82-ANR-10A


82-ANR-15A


82-ANR-20A


82-ANR-25A


82-ANR-30A

Part No.	Current Rating	Color	Pack	Description
82-ANR-2A	2A	GRAY	5	ATO® Fuse
82-ANR-3A	3A	VIOLET	5	ATO® Fuse
82-ANR-5A	5A	TAN	5	ATO® Fuse
82-ANR-7.5A	7.5A	BROWN	5	ATO® Fuse
82-ANR-10A	10A	RED	5	ATO® Fuse
82-ANR-15A	15A	BLUE	5	ATO® Fuse
82-ANR-20A	20A	YELLOW	5	ATO® Fuse
82-ANR-25A	25A	CLEAR	5	ATO® Fuse
82-ANR-30A	30A	GREEN	5	ATO® Fuse
82-ANR-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		7	ATO® Fuse Assortment
82-ANR-7P	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		8	ATO® Fuse Assortment & Puller
82-ANR-6T	(5A, 10A, 15A, 20A, 25A, 30A)		7	ATO® Fuse Assortment & Tester
82-ASST-44	(5A, 10A, 15A, 20A, 25A, 30A)		43	ATO® Fuse Assortment & Tester
82-ASST-53	(10A, 15A, 20A, 30A) + (30A, 40A, 50A)		45	ATO® & MAXI Fuse Assortment & Tester
82-ASST-80R	(3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		80	ATO®/ATC® Fuse Assortment
82-ASST-180			180	Low Profile MINI®, MINI®/ATM, & ATO®/ATC® Fuse Assortment

Warning: Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame. Avoid contact of device with chemical solvent. Prolonged contact will damage the device performance.

MAXI/MAX Blade Fuses

Fast Acting/Blade Mounting
A cost-effective automotive fuse for use in automotive, battery and general DC applications.

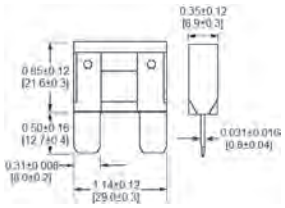
Body Material: Nylon PA 66

Electrical Specifications: 20A-80A, 32VDC

Design Standards: ISO 8820 Standard Specifications

SPECIFICATIONS

- Voltage: 32VDC
- Amperage: 20A, 30A, 40A, 50A, 60A, 70A, 80A
- Terminals: Zinc alloy
- Designed to meet SAE and ISO Standards
- Interrupt Rating – 1000A @ 32 VDC



Inches [mm]

82-ANX-20A

82-ANX-30A

82-ANX-50A

82-ANX-60A

82-ANX-70A

82-2211

Part No.	Current Rating	Color	Pack	Description
82-ANX-20A	20A	YELLOW	1	MAXI Fuse
82-ANX-30A	30A	GREEN	1	MAXI Fuse
82-ANX-40A	40A	ORANGE	1	MAXI Fuse
82-ANX-50A	50A	RED	1	MAXI Fuse
82-ANX-60A	60A	BLUE	1	MAXI Fuse
82-ANX-70A	70A	TAN	1	MAXI Fuse
82-ANX-80A	80A	CLEAR	1	MAXI Fuse
82-ASST-53	(10A, 15A, 20A, 30A) + (30A, 40A, 50A)		45	ATO® & MAXI Fuse Assortment & Tester
82-ASST-64	(2A, 3A, 4A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A) + (30A, 40A, 50A)		64	MINI® & MAXI Fuse Assortment & Tester
FUSE HOLDER				
82-2211	60A (8GA)		1	Fuse holder for MAXI Style Fuses, 12"

Warning: Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame. Avoid contact of device with chemical solvent. Prolonged contact will damage the device performance.

Assortment Kits

Grote's assortment packs contain a variety of popular fuses that will provide you with replacement fuses for circuit protection as you need them! The Grote assortment pack is perfect for the shop at home or at work! Choose from a variety of assortment packs that best suit your needs and applications.

82-ASST-44

82-ANR-6T

82-ANM-8P

82-FSO-7-G

82-ASST-80M


82-ASST-180

Part No.	Current Rating	Pack	Description
MINI®/ATM BLADE FUSES WITH LED INDICATOR			
82-ANM-I-5	(10A, 15A, 20A, 25A, 30A)	5	MINI® Fuse with LED Indicator Assortment
MINI®/ATM BLADE FUSES			
82-ANM-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	7	MINI® Fuse Assortment
82-ANM-8P	(2A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	9	MINI® Fuse Assortment & Puller
82-ANM-8T	(2A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	9	MINI® Fuse Assortment & Tester
82-ASST-43	(5A, 10A, 15A, 20A, 25A, 30A)	43	MINI® Fuse Assortment & Tester
82-ASST-64	(2A, 3A, 4A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A) + (30A, 40A, 50A)	64	MINI® & MAXI Fuse Assortment & Tester
82-ASST-80M	(3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	80	MINI®/ATM Fuse Assortment
82-ASST-180		180	Low Profile MINI®, MINI®/ATM, & ATO®/ATC® Fuse Asst.
LOW PROFILE MINI®/ATM BLADE FUSES			
82-ANS-I-5	(10A, 15A, 20A, 25A, 30A)	5	Low Profile MINI® Fuse LED Assortment
82-ANS-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	7	Low Profile MINI® Assortment
82-ANS-7P	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	8	Low Profile MINI® Assortment & Puller
82-ANS-7T	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	8	Low Profile MINI® Assortment & Tester
ATO®/ATC® BLADE FUSES WITH LED INDICATOR			
82-ANR-I-5	(10A, 15A, 20A, 25A, 30A)	5	ATO® Fuse with LED Indicator Assortment
ATO®/ATC® BLADE FUSES			
82-ANR-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	7	ATO® Fuse Assortment
82-ANR-7P	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	8	ATO® Fuse Assortment & Puller
82-ANR-6T	(5A, 10A, 15A, 20A, 25A, 30A)	7	ATO® Fuse Assortment & Tester
82-ASST-44	(5A, 10A, 15A, 20A, 25A, 30A)	43	ATO® Fuse Assortment & Tester
82-ASST-53	(10A, 15A, 20A, 30A) + (30A, 40A, 50A)	45	ATO® & MAXI Fuse Assortment & Tester
82-ASST-80R	(3A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	80	ATO®/ATC® Fuse Assortment
82-ASST-180		180	Low Profile MINI®, MINI®/ATM, & ATO®/ATC® Fuse Asst.
MAXI/MAX BLADE FUSES			
82-ASST-53	(10A, 15A, 20A, 30A) + (30A, 40A, 50A)	45	ATO® & MAXI Fuse Assortment & Tester
82-ASST-64	(2A, 3A, 4A, 5A, 7.5A, 10A, 15A, 20A, 25A, 30A) + (30A, 40A, 50A)	64	MINI® & MAXI Fuse Assortment & Tester
MICRO2® BLADE FUSES			
82-ANT-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	7	MICRO2® Fuse Assortment
82-ANT-7P	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)	8	MICRO2® Assortment & Puller
GLASS TUBE FUSES			
82-FSA-9-G	(1A, 2A, 3A, 5A, 10A, 15A, 20A, 25A, 30A)	9	AGC, Glass Fuse Assortment
82-FSO-7-G	(4A, 6A, 7.5A, 9A, 14A, 20A, 30A)	7	SFE, Glass Fuse Assortment

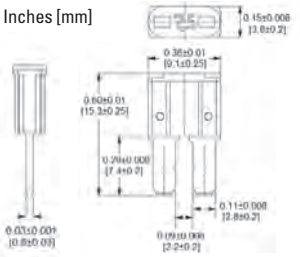
Micro2® Blade Fuses with LED Indicator

Fast Acting/Blade Mounting
- New standard for vehicle circuit protection
- Sub-miniature design
- Space saving – smaller than the MINI® fuse

Body Material: Nylon PA 66

Electrical Specifications: 5A-30A, 32VDC

SPECIFICATIONS
- Voltage: 32V DC
- Amperage: 5A, 7.5A, 10A, 15A, 20A, 25A, 30A
- Terminals: Zinc Alloy
- Interrupting Rating: 1000A @ 32 VDC



82-ANT-I-5A | 82-ANT-I-7.5A | 82-ANT-I-10A | 82-ANT-I-15A | 82-ANT-I-20A | 82-ANT-I-25A | 82-ANT-I-30A

Part No.	Current Rating	Color	Pack	Description
82-ANT-I-5A	5A	TAN	2	MICRO2® Fuse with LED Indicator
82-ANT-I-7.5A	7.5A	BROWN	2	MICRO2® Fuse with LED Indicator
82-ANT-I-10A	10A	RED	2	MICRO2® Fuse with LED Indicator
82-ANT-I-15A	15A	BLUE	2	MICRO2® Fuse with LED Indicator
82-ANT-I-20A	20A	YELLOW	2	MICRO2® Fuse with LED Indicator
82-ANT-I-25A	25A	CLEAR	2	MICRO2® Fuse with LED Indicator
82-ANT-I-30A	30A	GREEN	2	MICRO2® Fuse with LED Indicator

Micro2® Blade Fuses

82-ANT-5A | 82-ANT-7.5A

82-ANT-10A | 82-ANT-15A | 82-ANT-20A | 82-ANT-25A | 82-ANT-30A

Part No.	Current Rating	Color	Pack	Description
82-ANT-5A	5A	TAN	5	MICRO2® Fuse
82-ANT-7.5A	7.5A	BROWN	5	MICRO2® Fuse
82-ANT-10A	10A	RED	5	MICRO2® Fuse
82-ANT-15A	15A	BLUE	5	MICRO2® Fuse
82-ANT-20A	20A	YELLOW	5	MICRO2® Fuse
82-ANT-25A	25A	CLEAR	5	MICRO2® Fuse
82-ANT-30A	30A	GREEN	5	MICRO2® Fuse
82-ANT-7	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		7	MICRO2® Fuse Assortment
82-ANT-7P	(5A, 7.5A, 10A, 15A, 20A, 25A, 30A)		8	MICRO2® Fuse Assortment & Puller

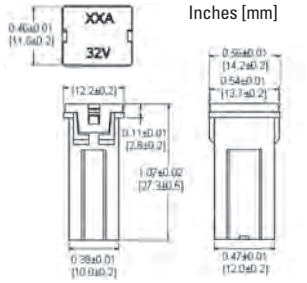
JCASE® Fuses

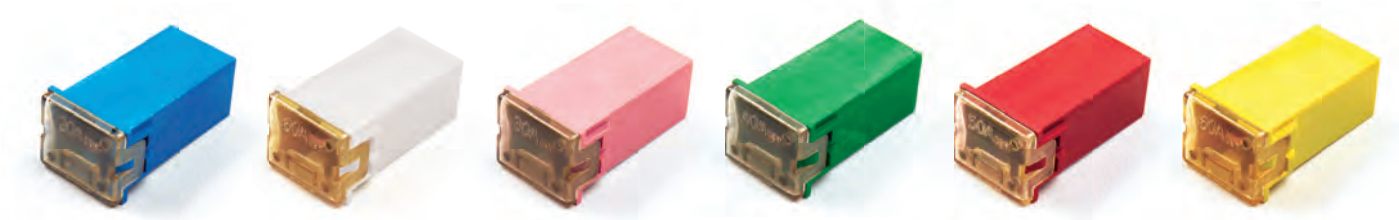
Fast Acting/Blade Mounting
A cost-effective high-current automotive fuses for use in automotive, battery and general DC application.

Electrical Specifications: 20A-60A, 32VDC

SPECIFICATIONS
- Voltage: 32VDC
- Amperage: 20A, 25A, 30A, 40A, 50A, 60A
- Interrupt Rating – 1,500A @32VDC

Inches [mm]

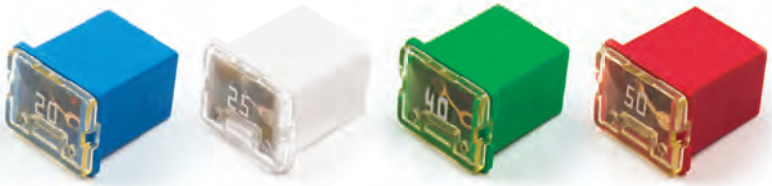




82-FMX-20A | 82-FMX-25A | 82-FMX-30A | 82-FMX-40A | 82-FMX-50A | 82-FMX-60A

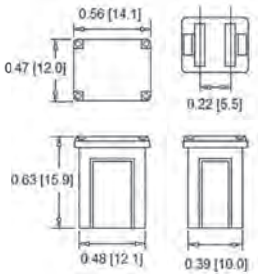
Part No.	Current Rating	Color	Pack	Description
82-FMX-20A	20A	**BLUE**	1	JCASE®, Female Fuse
82-FMX-25A	25A	**CLEAR**	1	JCASE®, Female Fuse
82-FMX-30A	30A	**PINK**	1	JCASE®, Female Fuse
82-FMX-40A	40A	**GREEN**	1	JCASE®, Female Fuse
82-FMX-50A	50A	**RED**	1	JCASE®, Female Fuse
82-FMX-60A	60A	**YELLOW**	1	JCASE®, Female Fuse

Low Profile JCASE® Fuses



82-FMX-LP-20A | 82-FMX-LP-25A | 82-FMX-LP-40A | 82-FMX-LP-50A

Inches [mm]



Part No.	Current Rating	Color	Pack	Description
82-FMX-LP-20A	20A	**BLUE**	1	JCASE®, Low Profile, Female Fuse
82-FMX-LP-25A	25A	**CLEAR**	1	JCASE®, Low Profile, Female Fuse
82-FMX-LP-30A	30A	**PINK**	1	JCASE®, Low Profile, Female Fuse
82-FMX-LP-40A	40A	**GREEN**	1	JCASE®, Low Profile, Female Fuse
82-FMX-LP-50A	50A	**RED**	1	JCASE®, Low Profile, Female Fuse
82-FMX-LP-60A	60A	**YELLOW**	1	JCASE®, Low Profile, Female Fuse

Warning: Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame. Avoid contact of device with chemical solvent. Prolonged contact will damage the device performance.

MEGA® Fuses – Bolt On

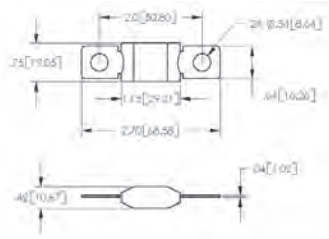
Fast Acting Automotive MEGA® Limiter Fuse
MEGA® type fuses are used in circuit where high current are present and are typically found in select late model cars and trucks. MEGA® type fuses are ideal for battery and/or alternator applications.

Electrical Specifications: 100A-250A, 32VDC

Operating Temperature: -40°C to +125°C (-40°F to +257°C)

Body Material: Polypropylene

SPECIFICATIONS
- Voltage: 32V DC
- Amperage: 100A, 125A, 150A, 175A, 200A, 225A, 250A
- Interrupting Rating: 1000A @ 32 VDC



Inches [mm]

82-MGGA-175A

82-BLC-08-GTA

Part No.	Current Rating	Color	Pack	Description
82-MGGA-100A	100A	YELLOW	1	MEGA® FUSE – BOLT ON
82-MGGA-125A	125A	GREEN	1	MEGA® FUSE – BOLT ON
82-MGGA-150A	150A	ORANGE	1	MEGA® FUSE – BOLT ON
82-MGGA-175A	175A	CLEAR	1	MEGA® FUSE – BOLT ON
82-MGGA-200A	200A	BLUE	1	MEGA® FUSE – BOLT ON
82-MGGA-225A	225A	TAN	1	MEGA® FUSE – BOLT ON
82-MGGA-250A	250A	PINK	1	MEGA® FUSE – BOLT ON
82-BLC-08-GTA			1	FUSE BLOCK – MEGA®

82-PUL-07

Fuse Tester/Puller

- For Regular Auto Blade Fuses
- Use to remove or insert or test fuses
- Can test fuses in or out of a fuse block
- Has a green indicator light on the end of the tester. Indicator light will remain on if fuse is broken. If fuse is good, the LED light will not be lighted.

Part No.	Pack	Description
82-PUL-07	2	Fuse Tester & Puller

82-PUL-01

Fuse Puller

- For Automotive MINI® Blade Fuses
- Material: ABS

Part No.	Pack	Description
82-PUL-01	1	Fuse Puller

82-BLR-I-310

LED ATO®/ATC® Fuse Panels

- Max Current Rating: 30A per Circuit – 100A Max Input
- Fuse Type: Regular Auto Blade
- Base: Black Thermoplastic (UL-Flame 94-V0)
- Cover: Opaque Lexan (UL-Flame 94-V2)
- Terminals: Steel, Tin plated 0.250" Quick Connect Terminals
- Indicating LED – Red

Part No.	Description
82-BLR-I-304	LED Fuse Panel ATO®/ATC® w/cover (4 Position)
82-BLR-I-306	LED Fuse Panel ATO®/ATC® w/cover (6 Position)
82-BLR-I-310	LED Fuse Panel ATO®/ATC® w/cover (10 Position)

82-BLM-I-306

LED MINI®/ATM Fuse Panels

- Max Current Rating: 30A per Circuit – 100A Max Input
- Fuse Type: Miniature Auto Blade
- Base: Black Thermoplastic (UL-Flame 94-V0)
- Cover: Opaque Lexan (UL-Flame 94-V2)
- Terminals: Tin Plated Brass – 0.250" Quick Connect Terminals
- Indicating LED – Red

Part No.	Description
82-BLM-I-304	LED Fuse Panel MINI®/ATM w/cover (4 Position)
82-BLM-I-306	LED Fuse Panel MINI®/ATM w/cover (6 Position)
82-BLM-I-310	LED Fuse Panel MINI®/ATM w/cover (10 Position)


82-2304

ATO®/ATC® Fuse Panels

- Compact, lightweight and rugged construction
- Will accept ATO®/ATC® Blade Fuses or Plug-In Blade Circuit Breakers
- 25A per circuit; 150A Max
- 100A @ 12V DC maximum rating for all circuits
- Base: Black Thermoplastic (UL-Flame 94-V0)
- Cover: Opaque Lexan (UL-Flame 94-V2)
- Recessed mounting holes, 0.218" x 4, for #10 screws
- Stud: #10-32 steel and nickel-plated

Part No.	Description
82-2303	Fuse Panel – ATO®/ATC® (6 Position)
82-2304	Fuse Panel – ATO®/ATC® (8 Position)
82-2305	Fuse Panel – ATO®/ATC® (10 Position)


84-2916


84-2917

Fuse Taps - Uninsulated

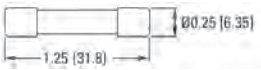
Part No.	Description	Size	Pack
84-2916	Fuse Taps – Uninsulated	.250"	25
84-2917	Fuse Taps – Uninsulated	.250"	8
84-2918	Fuse Taps – Uninsulated	.187"	25
84-2919	Fuse Taps – Uninsulated	.187"	8

FSA (AGC, Glass Fuses)

Agency Standards and Listings:
UL Listed 100mA~10A
UR Recognized 12A~30A
CSA Certified 100mA~30A

Interrupt Ratings:
10,000 amperes at 125V AC (100mA~10A)
35 amperes at 250V AC (100mA~1A)
100 amperes at 250V AC (1.2A~3.5A)
200 amperes at 250V AC (4A~10A)
300 amperes at 32V AC (12A~30A)

Operating Temperature:
-55°C to +125°C (-67°F to +257°F)



Physical Specifications:
Materials: Glass Body/Nickel Plated Brass Contacts
Lead Wire: Tin Plated Copper,
Dia. 0.8mm 12A and less
Dia. 1mm 13A~19A
Dia. 1.2mm above 20A

Electrical Characteristics
Rated Current: 100%
@ 100% – 4 hours min
@ 135% – 1 hour max
@ 200% – 120 sec max

FSO (SFE, Glass Fuses)

Fast Acting / Glass Construction
For automotive circuits.

Electrical Specifications
4A–30A, 32VAC

General Info:
For Automotive Circuits
Visual indication glass body
SAE specifications
Size varies with rating to prevent over-fusing
For use with In-Line holders and ¼" clips.

Avoid contact of Glass Tube device with chemical solvent. Prolonged contact will damage the device.

Part No.	Current Rating	Pack	Description
82-FSA-1A-G	1A	5	AGC, Glass Fuse
82-FSA-2A-G	2A	5	AGC, Glass Fuse
82-FSA-3A-G	3A	5	AGC, Glass Fuse
82-FSA-5A-G	5A	5	AGC, Glass Fuse
82-FSA-10A-G	10A	5	AGC, Glass Fuse
82-FSA-15A-G	15A	5	AGC, Glass Fuse
82-FSA-20A-G	20A	5	AGC, Glass Fuse
82-FSA-25A-G	25A	5	AGC, Glass Fuse
82-FSA-30A-G	30A	5	AGC, Glass Fuse
82-FSA-9-G	(1A, 2A, 3A, 5A, 10A, 15A, 20A, 25A, 30A)	9	AGC, Glass Fuse Assortment
82-FSO-7-G	(4A, 6A, 7.5A, 9A, 14A, 20A, 30A)	7	SFE, Glass Fuse Assortment

Warning: Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame. Glass Tube device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated. Avoid contact of Glass Tube device with chemical solvent. Prolonged contact will damage the device performance.


82-2160


82-2162


82-2161


82-2163

In-Line Fuse Holders

- Nylon fuse holders for glass tube fuses
- Protects electrical equipment
- Includes glass fuse
- GPT wire

Part No.	Current Rating	Description
82-2160	20A (18GA)	7" In-Line Fuse Holder (Black)
82-2162	10A (18GA)	7" In-Line Fuse Holder (White)
82-2161	15A (16GA)	7" In-Line Fuse Holder (Red)
82-2163	30A (14GA)	7" In-Line Fuse Holder (Black)

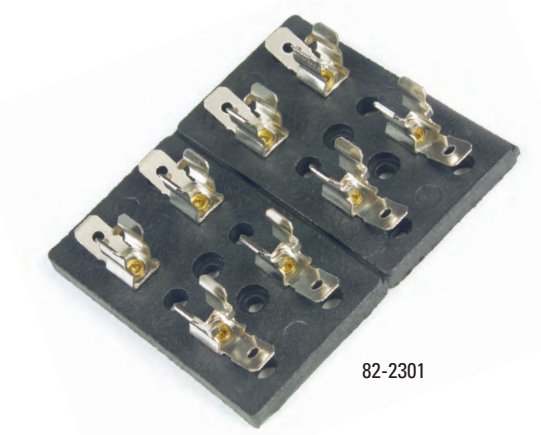

82-2167


82-2169

Bayonet Style Fuse Holder

- Provides full protection of electrical equipment
- GPT wire

Part No.	Current Rating	Description
82-2167	30A (12GA)	7" Bayonet Fuse Holder (Black)
82-2168	20A (14GA)	7" Bayonet Fuse Holder (Black)
82-2169	20A (14GA)	12" Bayonet Fuse Holder (Black)


82-2301

Fuseblock – Glass Fuses

- For use with glass fuses
- Quick disconnect take off, .250"

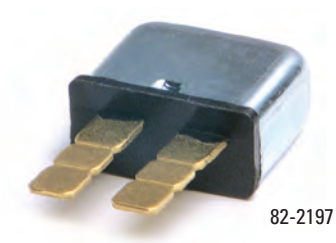
Part No.	Description	Size
82-2301	Glass Fuses Fuse Block – 4 Fuse	3" x 2.5"
82-2302	Glass Fuses Fuse Block – 6 Fuse	4.5" x 2.5"

82-2215

Panel Mount Fuse

- Provides circuit protection for electrical systems
- 15A, .250" quick disconnect contacts, glass fuse
- Round fuseholder mounts easily into any dashboard

Part No.	Current Rating	Description
82-2215	15A	.250" Panel Mount Fuse



82-2197

Universal Circuit Breaker – Plug-In Style

- 12V DC, Type 1
- Continuous self-resetting
- Replacement for ATO®/ATC® blade type fuses
- Dimensions: .840" x .4000" (10.2mm) x 1.500" (38.1mm)
- Meets SAE J553 Standards

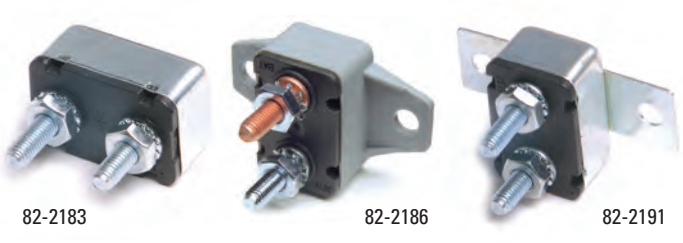
Part No.	Current Rating	Description
82-2195	10A	Universal Circuit Breaker (Plug-In)
82-2196	15A	Universal Circuit Breaker (Plug-In)
82-2197	20A	Universal Circuit Breaker (Plug-In)
82-2199	25A	Universal Circuit Breaker (Plug-In)
82-2198	30A	Universal Circuit Breaker (Plug-In)
82-2200	35A	Universal Circuit Breaker (Plug-In)
82-2201	40A	Universal Circuit Breaker (Plug-In)

82-2176

High Amperage Thermal Circuit Breakers

- Can be used in auxiliary and accessory circuits – trucks, buses, R.V. and marine applications
- Also used as battery chargers and DC audio systems
- Thermoplastic; UL Rated 94V-0 housing
- Surface Mount, Type III; Single Pole, Manual Reset
- Complies with SAE J1625 and J1171 standards
- Operating Temperature -40°C (-40°F) to 85°C (185°F)
- Stud insulators provided; 1/4"-28 thread studs
- North American

Part No.	Current Rating	Description
82-2216	60A	Single Rate Thermal Circuit Breaker
82-2177	80A	Single Rate Thermal Circuit Breaker
82-2178	100A	Single Rate Thermal Circuit Breaker
82-2176	150A	Single Rate Thermal Circuit Breaker
82-2217	200A	Single Rate Thermal Circuit Breaker



82-2183 82-2186 82-2191

Universal Circuit Breaker

- 12V DC, Type 1
- Continuous self-resetting
- 2, #10-32 stud terminals (hex nuts and washers included)
- Meets SAE J553 Standards

W/O Mounting Bracket	Current Rating	With Right Angle Bracket	Current Rating
82-2179	10A	**82-2189**	10A
82-2180	15A	**82-2190**	15A
82-2181	20A	**82-2191**	20A
82-2182	25A	**82-2192**	25A
82-2183	30A	**82-2193**	30A
82-2184	35A	**82-2187**	35A
82-2210	40A	**82-2186**	40A*
82-2194	40A		
82-2185	50A	**82-2188**	50A

** molded bracket*

82-2171

Universal Circuit Breaker – Snap-In Style

- 12V DC automatic reset
- Opens automatically on overload
- Replaces round glass-style fuses
- Fits 1 1/4" Long x 1/4" fuse clips

Part No.	Current Rating	Description
82-2170	10A	Universal Circuit Breaker (Snap-In)
82-2171	15A	Universal Circuit Breaker (Snap-In)
82-2172	20A	Universal Circuit Breaker (Snap-In)
82-2173	30A	Universal Circuit Breaker (Snap-In)
82-2174	40A	Universal Circuit Breaker (Snap-In)

Product Interchange

PART NO.	CURRENT RATING	LITTELFUSE	BUSSMANN	PICO	TECHSPAN	MERITHIAN	TECTRAN
82-2160	FUSEHOLDER, 20A, 18 GA, BLACK				664083		
82-2161	FUSEHOLDER, 14A, 18 GA, RED			906-BP	664082		5020
82-2162	FUSEHOLDER, 10A, 18 GA, WHITE						
82-2163	FUSEHOLDER, 30A, 14 GA. WHITE	FNY1BP					
82-2164	ATO® FUSE HOLDER, 14 GA, 20A	FHA1BP		977-BP	664130	64131	5030-20
82-2165	ATO® FUSE HOLDER, 12 GA, 30A	FHA2BP	BP/HHD-RP	978-BP	664125	64126	
82-2166	ATO® FUSE HOLDER, 12 GA, 30A, W CAP & MOUNTING TAB	FHAC2BP	BP/HHR-RP	951-BP	664132		
82-2167	BAYONET STYLE HOLDER, 7" 12 GA		BP/HHN-RP	904-BP	664084		
82-2168	BAYONET STYLE HOLDER, 7" 14 GA		BP/HHK-RP				
82-2169	BAYONET STYLE HOLDER, 12" 14 GA	FHP1		905-BP			
82-2170	CIRCUIT BREAKER, 10A, SNAP IN	0CB010.XPA	CBF-10				663-10
82-2171	CIRCUIT BREAKER, 15A, SNAP IN	0CB015.XPA	CBF-15				663-15
82-2172	CIRCUIT BREAKER, 20A, SNAP IN	0CB020.XPA	CBF-20				663-20
82-2173	CIRCUIT BREAKER, 30A, SNAP IN	0CB030.XPA	CBF-30				663-30
82-2174	CIRCUIT BREAKER, 40A, SNAP IN	0CB040.XPA	CBF-40				663-40
82-2176	CIRCUIT BREAKER, SWITCHABLE, 150A	0185150.VPA	BP/CB185-150	3404-31			559-150MS
82-2177	CIRCUIT BREAKER, THERMAL, 100A	185080	CB185-150	3400-31			559-80
82-2178	CIRCUIT BREAKER, THERMAL, 80A	0185100.XPA	BP/CB185-100	3401-31			559-100
82-2179	CIRCUIT BREAKER, 10A, NO BRACKET	812010ST	CBC-10				660-10
82-2180	CIRCUIT BREAKER, 15A, NO BRACKET	812015ST	CBC-15	3770-BP	766030	66013	660-15
82-2181	CIRCUIT BREAKER, 20A, NO BRACKET	812020ST	CBC-20	3771-BP	766031	66014	660-20
82-2182	CIRCUIT BREAKER, 25A, NO BRACKET	812025ST	CBC-25		766032	66015	660-25
82-2183	CIRCUIT BREAKER, 30A, NO BRACKET	812030ST	CBC-30	3773-BP	766033	66016	660-30
82-2184	CIRCUIT BREAKER, 35A, NO BRACKET	812035ST	CBC-35				
82-2185	CIRCUIT BREAKER, 50A, NO BRACKET	812050ST	CBC-50				660-50
82-2186	CIRCUIT BREAKER, 40A, W/BRACKET (MOLDED)						
82-2187	CIRCUIT BREAKER, 35A, W/BRACKET	813035ST					
82-2188	CIRCUIT BREAKER, 50A, W/BRACKET	813050ST	CBP-50BA				
82-2189	CIRCUIT BREAKER, 10A, W/BRACKET	813010ST		3790-11			
82-2190	CIRCUIT BREAKER, 15A, W/BRACKET	813015ST		3791-11	766013		
82-2191	CIRCUIT BREAKER, 20A, W/BRACKET	813020ST	CBP-20BA	3792-11	766014		
82-2192	CIRCUIT BREAKER, 25A, W/BRACKET	813025ST	CBP-25BA	3793-11	766015		
82-2193	CIRCUIT BREAKER, 30A, W/BRACKET	813030ST	CBP-30BA	3794-11	766016		
82-2194	CIRCUIT BREAKER, 40A, W/BRACKET	813040ST	CBP-40BA	3795-11			
82-2195	CIRCUIT BREAKER UNIV., PLUG-IN, 10A	UCB10BP	BP/UCB-10-RP	3785-11	766070	66070	664-10
82-2196	CIRCUIT BREAKER UNIV., PLUG-IN, 15A	UCB15BP	BP/UCB-15-RP	3786-BP	766071	66071	664-15
82-2197	CIRCUIT BREAKER UNIV., PLUG-IN, 20A	UCB20BP	BP/UCB-20-RP	3787-BP	766072	66072	664-20
82-2198	CIRCUIT BREAKER UNIV., PLUG-IN, 30A	UCB30BP	BP/UCB-30-RP	3788-BP	766073	66073	664-30
82-2199	CIRCUIT BREAKER UNIV., PLUG-IN, 25A	UCB25BP	BP/UCB-25-RP	3789-11	766067		664-25
82-2200	CIRCUIT BREAKER UNIV., PLUG-IN, 35A						
82-2201	CIRCUIT BREAKER UNIV., PLUG-IN, 40A			3795-11	766068		
82-2207	ATO®/ATC® FUSEHOLDER, 20A, 16 GA W CAP	FHAC1BP	BP-HHF-RP	987-BP	66260		
82-2208	MINI® ATO® FUSEHOLDER, 20A, 14 GA W CAP	FHM1BP	BP/HHL-RP	131-11		66257	
82-2209	ATO®/ATC® FUSEHOLDER, 20A, 14 GA w/CAP & 20A ATO® FUSE			952-11			
82-2210	CIRCUIT BREAKER, 40A, NO BRACKET	812040ST	CBC-40				660-40
82-2211	MAXI FUSEHOLDER, 60A, 8 GA, PK 1	MAH1	HHX	206-31	666261	66255	
82-2212	ATO®, FUSE ADD ON, PK 1		BP-HHA-RP	982-11			
82-2213	ATM/MINI®, FUSE ADD ON, PK 1		BP/HHH-RP	981-11			
82-2215	FUSE HOLDER, PANEL MOUNT, PK 1			995-11		66042	
82-2216	THERMAL BREAKER, 60A	185060	CB185-60		766042		558-60
82-2217	THERMAL BREAKER 200A, PK1						
82-2301	FUSE BLOCK, 4 FUSE			941-11			
82-2302	FUSE BLOCK, 6 FUSE						
82-2303	CIRCUIT BREAKER PANEL, 6 POSITION		15600-06-20	3410-31	766043	66043	
82-2304	CIRCUIT BREAKER PANEL, 8 POSITION		15600-08-20		766044	66044	
82-2305	CIRCUIT BREAKER PANEL, 10 POSITION		15600-10-20		766045	66045	
82-ACBP4-PM-10A	CIRCUIT BREAKER – MINI®, TYPE I, 10A, 1 PK	211010BP	CB211-10	9624-11			
82-ACBP4-PM-15A	CIRCUIT BREAKER – MINI®, TYPE I, 15A, 1 PK	211015BP	CB211-15	9625-11			
82-ACBP4-PM-20A	CIRCUIT BREAKER – MINI®, TYPE I, 20A, 1 PK	211020BP	CB211-20	9626-11			
82-ACBP4-PM-25A	CIRCUIT BREAKER – MINI®, TYPE I, 25A, 1 PK	211025BP	CB211-25	9627-11			
82-ACBP4-PM-30A	CIRCUIT BREAKER – MINI®, TYPE I, 30A, 1 PK	211030BP	CB211-30	9628-11			

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PART NO.	CURRENT RATING	LITTELFUSE	BUSSMANN	PICO	TECHSPAN	MERITHIAN	TECTRAN
82-ANM-10A	MINI® FUSE, 10A, 5 PK	0MIN010.VPA	BP/ATM-10-RP	110-BP	766245	66245	88-0035
82-ANM-15A	MINI® FUSE, 15A, 5 PK	0MIN015.VPA	BP/ATM-15-RP	115-BP	766246	66246	88-0036
82-ANM-20A	MINI® FUSE, 20A, 5 PK	0MIN020.VPA	BP/ATM-20-RP	120-BP	766247	66247	88-0037
82-ANM-25A	MINI® FUSE, 25A, 5 PK	0MIN025.VPA	BP/ATM-25-RP	125-BP	766248	66248	88-0038
82-ANM-2A	MINI®FUSE, 2A, 5 PK	0MIN002.VPA	BP/ATM-2-RP	102-14	766240	66240	88-0030
82-ANM-30A	MINI® FUSE, 30A, 5 PK	0MIN030.VPA	BP/ATM-30-RP	130-BP	766249	66249	88-0039
82-ANM-3A	MINI® FUSE, 3A, 5 PK	0MIN003.VPA	BP/ATM-3-RP	103-BP	766241	66241	88-0031
82-ANM-5A	MINI® FUSE, 5A, 5 PK	0MIN005.VPA	BP/ATM-5-RP	105-BP	766243	66243	88-0033
82-ANM-7	MINI® FUSE ASSORTMENT, 7 PK	00940362ZPA	BP/ATM-A8-RP	N/A	766009		
82-ANM-7.5A	MINI® FUSE, 7.5A, 5 PK	0MIN07.5VPA	BP/ATM-7 1/2-RP	107-BP	766244	66244	88-0034
82-ANM-8P	MINI® FUSE ASSORTMENT & PULLER, 9 PK	00940363ZPA	KM-9				
82-ANM-8T	MINI® FUSE ASSORTMENT & TESTER, 9 PK	00940461ZPA	DIA-2				
82-ANM-I-10A	MINI® FUSE W/LED, 10A, 2 PK	0MIN010.VPGLOA	BP/ATM-10IM	9910-14			
82-ANM-I-15A	MINI® FUSE W/LED, 15A, 2 PK	0MIN015.VPGLOA	BP/ATM-15IM	9915-14			
82-ANM-I-20A	MINI® FUSE W/LED, 20A, 2 PK	0MIN020.VPGLOA	BP/ATM-20IM	9920-14			
82-ANM-I-25A	MINI® FUSE W/LED, 25A, 2 PK	0MIN025.VPGLOA	BP/ATM-25IM	9925-14			
82-ANM-I-30A	MINI® FUSE W/LED, 30A, 2 PK	0MIN030.VPGLOA	BP/ATM-30IM	9930-14			
82-ANM-I-3A	MINI® FUSE W/LED, 3A, 2 PK	0MIN003.VPGLOA	BP/ATM-3IM				
82-ANM-I-5	MINI® FUSE LED ASSORTMENT, 5 PK	00940362ZPGLOA	BP/ATM-FP-AID				
82-ANM-I-5A	MINI® FUSE W/LED, 5A, 2 PK	0MIN005.VPGLOA	BP/ATM-5IM	9905-14			
82-ANM-I-7.5A	MINI® FUSE W/LED, 7.5A, 2 PK	0MIN07.5VPGLOA	BP/ATM-7 1/2IM	9907-14			
82-ANR-10A	ATO® FUSE, 10A, 5 PK	0ATO010.VPA	BP/ATC-10-RP	964-BP	766214	66214	88-0025
82-ANR-15A	ATO® FUSE, 15A, 5 PK	0ATO015.VPA	BP/ATC-15-RP	965-BP	766215	66215	88-0026
82-ANR-20A	ATO® FUSE, 20A, 5 PK	0ATO020.VPA	BP/ATC-20-RP	966-BP	766216	66216	88-0027
82-ANR-25A	ATO® FUSE, 25A, 5 PK	0ATO025.VPA	BP/ATC-25-RP	967-BP	766217	66217	88-0028
82-ANR-2A	ATO® FUSE, 2A, 5 PK	0ATO002.VPA	BP/ATC-2-RP	938-14	766209	66209	
82-ANR-30A	ATO® FUSE, 30A, 5 PK	0ATO030.VPA	BP/ATC-30-RP	968-BP	766218	66218	88-0029
82-ANR-3A	ATO® FUSE, 3A, 5 PK	0ATO003.VPA	BP/ATC-3-RP	960-BP	766210	66210	88-0021
82-ANR-5A	ATO® FUSE, 5A, 5 PK	0ATO005.VPA	BP/ATC-5-RP	962-BP	766212	66212	88-0023
82-ANR-6T	ATO® FUSE ASSORTMENT & TESTER, 7 PK	00940418ZPA	DIA-1				
82-ANR-7	ATO® FUSE ASSORTMENT, 7 PK	00940202ZPA			766006		
82-ANR-7.5A	ATO® FUSE, 7.5A, 5 PK	0ATO07.5VPA	BP/ATC-7 1/2-RP	963-BP	766213	66213	88-0024
82-ANR-7P	ATO® FUSE ASSORTMENT & PULLER, 8 PK	00940370ZPA	AT-7				
82-ANR-I-10A	ATO® FUSE W/LED, 10A, 2 PK	0ATO010.VPGLOA	BP/ATC-10IM	9964-14			
82-ANR-I-15A	ATO® FUSE W/LED, 15A, 2 PK	0ATO015.VPGLOA	BP/ATC-15IM	9965-14			
82-ANR-I-20A	ATO® FUSE W/LED, 20A, 2 PK	0ATO020.VPGLOA	BP/ATC-20IM	9966-14			
82-ANR-I-25A	ATO® FUSE W/LED, 25A, 2 PK	0ATO025.VPGLOA	BP/ATC-25IM	9967-14			
82-ANR-I-30A	ATO® FUSE W/LED, 30A, 2 PK	0ATO030.VPGLOA	BP/ATC-30IM	9968-14			
82-ANR-I-3A	ATO® FUSE W/LED, 3A, 2 PK	0ATO003.VPGLOA	BP/ATC-3IM	9960-14			
82-ANR-I-5	ATO® FUSE LED ASSORTMENT, 5 PK	00940202ZPGLOA	BP/ATC-FP-AID				
82-ANR-I-5A	ATO® FUSE W/LED, 5A, 2 PK	0ATO005.VPGLOA	BP/ATC-5IM	9962-14			
82-ANR-I-7.5A	ATO® FUSE W/LED, 7.5A, 2 PK	0ATO07.5VPGLOA	BP/ATC-7 1/2IM	9963-14			
82-ANS-10A	LOW PROFILE MINI® FUSE, 10A, 5 PK	LMIN010.VPA	BP/ATM-10LP-RP	9945-14			
82-ANS-15A	LOW PROFILE MINI® FUSE, 15A, 5 PK	LMIN015.VPA	BP/ATM-15LP-RP	9946-14			
82-ANS-20A	LOW PROFILE MINI® FUSE, 20A, 5 PK	LMIN020.VPA	BP/ATM-20LP-RP	9947-14			
82-ANS-25A	LOW PROFILE MINI® FUSE, 25A, 5 PK	LMIN025.VPA	BP/ATM-25LP-RP	9948-14			
82-ANS-30A	LOW PROFILE MINI® FUSE, 30A, 5 PK	LMIN030.VPA	BP/ATM-30LP-RP	9949-14			
82-ANS-3A	LOW PROFILE MINI® FUSE, 3A, 5 PK	LMIN003.VPA	BP/ATM-3LP-RP	9941-14			
82-ANS-5A	LOW PROFILE MINI® FUSE, 5A, 5 PK	LMIN005.VPA	BP/ATM-5LP-RP	9943-14			
82-ANS-7	LOW PROFILE MINI® ASSORTMENT, 7 PK	00940506ZPA	BP/ATM-A6LP-RP				
82-ANS-7.5A	LOW PROFILE MINI® FUSE, 7.5A, 5 PK	LMIN07.5VPA	BP/ATM-7 1/2LP-RP	9944-14			
82-ANS-7P	LOW PROFILE MINI® ASSORTMENT & PULLER, 8 PK						
82-ANS-7T	LOW PROFILE MINI® ASSORTMENT & TESTER, 8 PK		DIA-3				
82-ANS-I-5	LOW PROFILE MINI® FUSE LED ASSORTMENT, 5 PK						
82-ANT-10A	MICRO2® FUSE, 10A, 5 PK	MIC2010.VP	BP/ATR-10LP-RP				
82-ANT-15A	MICRO2® FUSE, 15A, 5 PK	MIC2015.VP	BP/ATR-15LP-RP				
82-ANT-20A	MICRO2® FUSE, 20A, 5 PK	MIC2020.VP	BP/ATR-20LP-RP				
82-ANT-25A	MICRO2® FUSE, 25A, 5 PK	MIC2025.VP	BP/ATR-25LP-RP				
82-ANT-30A	MICRO2® FUSE, 30A, 5 PK	MIC2030.VP	BP/ATR-30LP-RP				
82-ANT-5A	MICRO2® FUSE, 5A, 5 PK	MIC2005.VP	BP/ATR-5LP-RP				
82-ANT-7	MICRO2® ASSORTMENT, 7 PK	00940558ZPA					
82-ANT-7.5A	MICRO2® FUSE, 7.5A, 5 PK	MIC207.5VP	BP/ATR-7 1/2LP-RP				
82-ANT-7P	MICRO2® ASSORTMENT & PULLER, 8 PK		BP/ATR-A7-RPP				
82-ANT-I-10A	MICRO2® FUSE W/LED, 10A, 2 PK						
82-ANT-I-15A	MICRO2® FUSE W/LED, 15A, 2 PK						
82-ANT-I-20A	MICRO2® FUSE W/LED, 20A, 2 PK						
82-ANT-I-25A	MICRO2® FUSE W/LED, 25A, 2 PK						
82-ANT-I-30A	MICRO2® FUSE W/LED, 30A, 2 PK						

PART NO.	CURRENT RATING	LITTELFUSE	BUSSMANN	PICO	TECHSPAN	MERITHIAN	TECTRAN
82-ANT-I-5A	MICRO2® FUSE W/LED, 5A, 2 PK						
82-ANT-I-7.5A	MICRO2® FUSE W/LED, 7.5A, 2 PK						
82-ANX-20A	MAXI FUSE, 20A, 1 PK	0MAX020.XPA	BP/MAX-20-RP	220-11	766250	66250	88-0040
82-ANX-30A	MAXI FUSE, 30A, 1 PK	0MAX030.XPA	BP/MAX-30-RP	230-11	766251	66251	88-0041
82-ANX-40A	MAXI FUSE, 40A, 1 PK	0MAX040.XPA	BP/MAX-40-RP	240-11	766252	66252	88-0042
82-ANX-50A	MAXI FUSE, 50A, 1 PK	0MAX050.XPA	BP/MAX-50-RP	250-11	766253	66253	88-0043
82-ANX-60A	MAXI FUSE, 60A, 1 PK	0MAX060.XPA	BP/MAX-60-RP	260-11	766254	66254	88-0044
82-ANX-70A	MAXI FUSE, 70A, 1 PK	0MAX070.XPA	BP/MAX-70-RP	270-11			88-0045
82-ANX-80A	MAXI FUSE, 80A, 1 PK	0MAX080.XPA	BP/MAX-80-RP	280-11			88-0046
82-ASST-180	MINI®, ATO® & MAXI FUSE ASSORTMENT, 180 PK						
82-ASST-43	MINI® FUSE ASSORTMENT, 43 PK	00940462ZXA	NO. 43	6MF-E			
82-ASST-44	ATO® FUSE ASSORTMENT, 43 PK	00940400ZXA	NO. 44	6SF-E			
82-ASST-53	ATO® & MAXI FUSE ASSORTMENT, 45 PK		NO. 53	N/A			
82-ASST-64	MINI® & MAXI FUSE ASSORTMENT, 64 PK		NO. 64	31802-91			
82-ASST-80M	MINI® FUSE ASSORTMENT, 80 PK	00970551Z	CDY10TRY-ATM	6MF-E		66000	
82-ASST-80R	ATO® FUSE ASSORTMENT, 80 PK	00940409Z	CDY10TRY-ATC	6SF-E	766001	66001	
82-BLC-08-GTA	FUSE BLOCK – MEGA®	02980900TXN	HMEG	9711-31			
82-BLM-I-304	LED FUSE PANEL, MINI®/ATM, 4 SLOT & COVER						
82-BLM-I-306	LED FUSE PANEL, MINI®/ATM, 6 SLOT & COVER						
82-BLM-I-310	LED FUSE PANEL, MINI®/ATM, 10 SLOT & COVER						
82-BLR-I-304	LED FUSE PANEL, ATO®/ATC®, 4 SLOT & COVER						
82-BLR-I-306	LED FUSE PANEL, ATO®/ATC®, 6 SLOT & COVER						
82-BLR-I-310	LED FUSE PANEL, ATO®/ATC®, 10 SLOT & COVER						
82-FMX-20A	JCASE®, FEMALE FUSE, 20A, 1 PK	JCAS020.XPA	BP/FMX-20-RP	9590-11			
82-FMX-25A	JCASE®, FEMALE FUSE, 25A, 1 PK	JCAS025.XPA	BP/FMX-25-RP				
82-FMX-30A	JCASE®, FEMALE FUSE, 30A, 1 PK	JCAS030.XPA	BP/FMX-30-RP	9591-11			
82-FMX-40A	JCASE®, FEMALE FUSE, 40A, 1 PK	JCAS040.XPA	BP/FMX-40-RP	9592-11			
82-FMX-50A	JCASE®, FEMALE FUSE, 50A, 1 PK	JCAS050.XPA	BP/FMX-50-RP	9593-11			
82-FMX-60A	JCASE®, FEMALE FUSE, 60A, 1 PK	JCAS060.XPA	BP/FMX-60-RP	9594-11			
82-FMX-LP-20A	JCASE®, LOW PROFILE, FEMALE FUSE, 20A, 1 PK	LJCAS020LP.XPA	BP/FMX-20-RP				
82-FMX-LP-25A	JCASE®, LOW PROFILE, FEMALE FUSE, 25A, 1 PK		BP/FMX-25-RP				
82-FMX-LP-30A	JCASE®, LOW PROFILE, FEMALE FUSE, 30A, 1 PK	LJCAS030LP.XPA	BP/FMX-30-RP				
82-FMX-LP-40A	JCASE®, LOW PROFILE, FEMALE FUSE, 40A, 1 PK	LJCAS040LP.XPA	BP/FMX-40-RP				
82-FMX-LP-50A	JCASE®, LOW PROFILE, FEMALE FUSE, 50A, 1 PK	LJCAS050LP.XPA	BP/FMX-50-RP				
82-FMX-LP-60A	JCASE®, LOW PROFILE, FEMALE FUSE, 60A, 1 PK	LJCAS060LP.XPA	BP/FMX-60-RP				
82-FSA-10A-G	AGC, GLASS FUSE, 10A, 5 PK	0AGC010.VPA	BP/AGC-10	9661-14	766130		81-0006
82-FSA-15A-G	AGC, GLASS FUSE, 15A, 5 PK	0AGC015.VPA	BP/AGC-15	9662-14	766131		81-0007
82-FSA-1A-G	AGC, GLASS FUSE, 1A, 5 PK	0AGC001.VPA	BP/AGC-1	9651-14	766120		88-0001
82-FSA-20A-G	AGC, GLASS FUSE, 20A, 5 PK	0AGC020.VPA	BP/AGC-20	9663-14	766132		81-0008
82-FSA-25A-G	AGC, GLASS FUSE, 25A, 5 PK	0AGC025.VPA	BP/AGC-25	9664-14	766133		81-0009
82-FSA-2A-G	AGC, GLASS FUSE, 2A, 5 PK	0AGC002.VPA	BP/AGC-2	9653-14	766122		81-0002
82-FSA-30A-G	AGC, GLASS FUSE, 30A, 5 PK	0AGC030.VPA	BP/AGC-30	9665-14	766134		81-0010
82-FSA-3A-G	AGC, GLASS FUSE, 3A, 5 PK	0AGC003.VPA	BP/AGC-3	9655-14	766124		81-0003
82-FSA-5A-G	AGC, GLASS FUSE, 5A, 5 PK	0AGC005.VPA	BP/AGC-5	9657-14	766126		81-0005
82-FSA-9-G	AGC, GLASS FUSE ASSORTMENT, 9 PK	0AGC0001ZPA		9600-91			
82-FSO-7-G	SFE, GLASS FUSE ASSORTMENT, 7 PK	0SFE0001ZPA					
82-MGGA-100A	MEGA® FUSE – BOLT ON, 100A, 1 PK	MEG100BP	AMG-100	9701-11			
82-MGGA-125A	MEGA® FUSE – BOLT ON, 125A, 1 PK	MEG125BP	AMG-125	9702-11			
82-MGGA-150A	MEGA® FUSE – BOLT ON, 150A, 1 PK	MEG150BP	AMG-150	97033-11			
82-MGGA-175A	MEGA® FUSE – BOLT ON, 175A, 1 PK	MEG175BP	AMG-175	9704-11			
82-MGGA-200A	MEGA® FUSE – BOLT ON, 200A, 1 PK	MEG200BP	AMG-200	9705-11			
82-MGGA-225A	MEGA® FUSE – BOLT ON, 225A, 1 PK	MEG225BP	AMG-225	9706-11			
82-MGGA-250	MEGA® FUSE – BOLT ON, 250A, 1 PK	MEG250BP	AMG-250	9707-11			
82-MOCBP4-PM-10A	CIRCUIT BREAKER – MINI®, TYPE II, 10A, 1 PK	MIB10	CB212-10	9634-11			
82-MOCBP4-PM-15A	CIRCUIT BREAKER – MINI®, TYPE II, 15A, 1 PK	MIB15	CB212-15	9635-11			
82-MOCBP4-PM-20A	CIRCUIT BREAKER – MINI®, TYPE II, 20A, 1 PK	MIB20	CB212-20	9636-11			
82-MOCBP4-PM-25A	CIRCUIT BREAKER – MINI®, TYPE II, 25A, 1 PK	MIB25	CB212-25	9637-11			
82-MOCBP4-PM-30A	CIRCUIT BREAKER – MINI®, TYPE II, 30A, 1 PK	MIB30	CB212-30	9638-11			
82-PUL-01	FUSE PULLER	00970023XPA	BP/FP-A3-RP		764207		
82-PUL-07	FUSE TESTER & PULLER	00970035XPA	BP/FT-3-RP	101-11			
84-2903	SELF STRIPPING FUSEHOLDER, 18-14 GA, PK 3		BP/HHS-RP	979-BP	764103	64103	
84-2916	FUSE TAP, GM, 1/4", PK 25			969-15			
84-2917	FUSE TAP, MINI®, GM, 3/16", PK 25			959-15			
84-2918	FUSE TAP, GM, 1/4", PK 8		BP/ATC-TAP-RP	969-BP			
84-2919	FUSE TAP, MINI®, GM, 3/16", PK 7		BP/ATM-TAP-RP	959-BP			

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