

SOLUTIONS TECH BRIEF

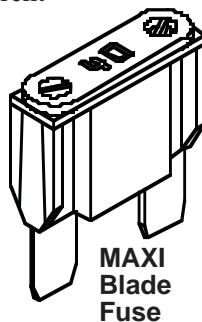
Technical solutions on circuit protection from Littelfuse, Inc.

Brief No. 98-001

Selection Guidelines for Littelfuse MAXI™ Blade Fuses and JCASE® Cartridge Fuses

Advancements in high current automotive circuit protection technology have resulted in two superior fuse designs from Littelfuse, Inc. – the MAXI Blade Fuse and JCASE Cartridge Fuse. Littelfuse is the only circuit protection supplier to offer both cartridge and blade fuses for high current automotive applications.

Both the MAXI Fuse and JCASE Fuse have been developed with patented Littelfuse design processes such as tin diffusion technology for greater time delay and lower voltage drop, and skiving to assure tight resistance control. However, there are important differences between them that affect selection. For optimum fuse performance and proper circuit protection, the design engineer should consider such application requirements as element melting temperature, time delay, voltage drop, power density and other criteria.



MAXI
Blade
Fuse

Following are technical guidelines to consider.

Fuse Block Design – Standard U.S. fuse blocks are designed to accept MAXI and other blade type fuses. JCASE fuses fit cartridge-style fuse blocks. For

MAXI Fuse:

- * Developed in 1986 to meet automotive OE need to replace fusible wire and fusible links in under-the-hood electrical harnesses
- * Installed in over 90% of new U.S. car models
- * Fits standard U.S. fuse block design

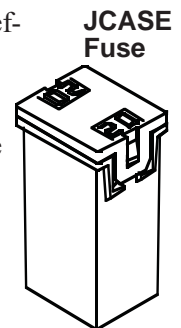
JCASE Fuse:

- * Developed in 1996 as an alternative to the MAXI Fuse that achieves some of the same performance characteristics but in a cartridge style fuse design
- * Currently used on Japanese new car models made by Japanese transplants in the U.S

standard U.S. fuse block designs, use MAXI blade type fuses. Retooling of the fuse block will be required to properly fit cartridge fuses.

Element Melting Temperature – While both the MAXI Fuse and JCASE Fuse utilize tin diffusion technology to minimize fuse melting temperature, the MAXI Fuse runs cooler. The Maxi Fuse's zinc element has a maximum melting temperature of 419°C, compared to a maximum melting temperature of 1083°C for the copper alloy, one piece JCASE fuse element. For temperature-sensitive applications, the MAXI Fuse is a more effective alternative.

Pulse Cycle Withstand Capability – Consider the MAXI Blade Fuse over the JCASE cartridge fuse to protect motor-powered applications (electric fan motors, power seats, power windows). The MAXI Fuse withstands repeated pulsing caused by the high in-rush of current with less chance of nuisance opening or fuse fatigue than cartridge fuses.



JCASE
Fuse

Consistent Opening Times – Littelfuse's patented skiving process assures that both the MAXI Fuse and JCASE Fuse maintain tight tolerances for good resistance control, resulting in consistent fuse opening times.

Power Density – Smaller in size, the JCASE Cartridge Fuse has a higher power density (Watts/cm³) than a comparable MAXI Blade Fuse. Therefore, excess heat can develop by overpacking JCASE Fuses in a compact space. To safely meet the application's power density requirements without overpacking fuses and building up heat, first consider the MAXI Blade Fuse. The JCASE Cartridge Fuse may be used only after careful analysis of the application and its power density requirements.

Low Voltage Drop – The voltage drop measured at

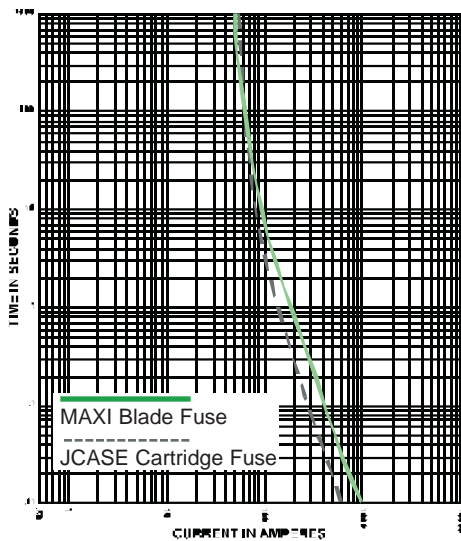


Figure 1: Time-Current Curve

drop. When measured from a system viewpoint, the voltage drop of both the MAXI Fuse and JCASE® Fuse are approximately equal.

Current Ratings – The MAXI Fuse is available in current ratings from 20 to 80 amps. The JCASE Fuse is available in 20 to 60 amp current ratings.

Greater Time Delay – In applications requiring the greatest amount of time delay in a high current fuse, consider the MAXI Blade Fuse. If less time delay is acceptable, the JCASE Cartridge Fuse is an effective alternative.

Time-current curves for a 40 amp MAXI Blade Fuse and a 40 amp JCASE Cartridge Fuse are shown in Figure 1 above. For example, at 200 amps of current, the 40 amp MAXI Fuse will open in approximately 0.9 seconds, while the 40 amp JCASE Fuse will open in approximately 0.3 seconds.

Mating Terminal Design – Design engineers should consider the mating terminal closely when selecting a high current fuse. If you use a MAXI Fuse, the female terminal must be designed to withstand multiple fuse insertions, fatigue and heat over the life of the vehicle. Because the female terminal is integral to the JCASE Fuse, the female terminal is replaced when the fuse is replaced. Consult with a Littelfuse Applications Engineer on the design of the male terminal to use with a JCASE Fuse.

rated current should be as low as possible while still maintaining the required time-current characteristics. This gives the lowest temperature rise, especially important when many fuses are packed close together in the fuse block. The MAXI™ Fuse has a lower component voltage

Compact Size – The Maxi Fuse is designed to meet the OE auto industry's needs for compact size, light weight and high current circuit protection. The JCASE Fuse is slightly smaller and lighter. (NOTE: Due to the fuse's higher power density, more space between JCASE Fuses may be needed than for MAXI Fuses.)

Cost – With its high-tech design, one-piece copper alloy construction, and built-in female terminal, the JCASE Cartridge Fuse is higher in cost than a MAXI Blade Fuse. Retooling to replace a blade-style fuse block with one that accommodates cartridge fuses is another cost factor to consider.

Comparison Recap

MAXI Fuse:

* Recommended for applications requiring cooler running temperatures, minimal voltage drop and a greater amount of time delay. Ideal for motor-powered applications.

JCASE Fuse:

* Recommended for applications requiring a cartridge style fuse, in which the female terminal is an integral part of the fuse design.

For More Information:

Littelfuse is the only circuit protection supplier to offer both cartridge and blade fuses for high current automotive applications. Customers who need additional assistance with their circuit protection application can contact a Littelfuse Engineer at 1-847-824-1188.

MAXI Fuse and JCASE Fuse Comparison Chart		
Specification	MAXI Fuse	JCASE Fuse
Element Melting Temperature*	≤ 419° C	≤ 1083° C
Pulse Cycle Withstand Capability	High	Medium
Power Density	Low	High
Voltage Drop**	75 mV	90 mV
Current Ratings	20 - 80 Amps	20 - 60 Amps
Time Delay	High	Medium
Volume (L x W x H)	5.8 cm ³	3.1 cm ³
Overall Mass	6.1 gm	3.6 gm
Cost Ratio***	1	∪1.25

*Maximum element melting temperatures shown for MAXI Fuse and JCASE Fuse. Depending on overload condition, the actual melting temperature may be significantly lower.
 **MAXI Fuse and JCASE Fuse show approximately equal voltage drop from a system viewpoint.
 *** Reflects fuse cost only. Application costs may vary.



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