

eFuses in Factory Automation: All-in-one System Power Protection



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“All-in-one” sounds so nice, doesn’t it? Nothing encompasses the idea of all-in-one more than the Swiss Army knife, which was first introduced to the world back in 1891 and has become something of a legend given its versatility, small size and low cost. This one tool can help solve a variety of daily challenges and is small enough to fit in your pocket. What more could you ask for?

Now picture a factory floor environment. In this setting, a number of things could go wrong, such as short-circuit events, power interruptions and miswiring events. To avoid these situations, you need to protect your system in order to keep it up and running and prevent factory downtime. Some of the protection functions you may find your programmable logic controller (PLC) or motor drive system needing could include:

- Field miswiring.
- Short-circuit protection.
- Overvoltage protection.
- Surge immunity.
- Reverse current blocking.
- In-rush current control.

Just like the Swiss Army knife, what if there was an ultra-flexible, all-in-one semiconductor device that could provide all of the protection features listed above in a small, affordable design for your 24-V factory automation system?

eFuses from Texas Instruments (TI) are 60-V integrated circuits that provide complete system power protection with just one small component. With a wide operating voltage range (4.5 V to 60 V) suitable for industrial automation applications and high configurability, eFuses are an all-in-one solution for power protection. User-adjustable protection functions on these devices make it easy for you to tweak your design with one small change in resistor or capacitor value – for instance, a current limit or an in-rush current level.

In the past, you may have relied on discrete solutions to protect your system. Discrete solutions can sometimes lead to a bulky and inefficient design, eating into your board space and power dissipation budget. eFuses enable both a small solution size and a lower power dissipation solution. [Figure 1](#) compares a discrete protection circuit and an integrated eFuse circuit for a 24-V/0.8-A input power protection design. The discrete solution and eFuse provide the same functionality, but the eFuse is 81% smaller and 37% more efficient.

Size advantage

How eFuses add features & decrease solution size

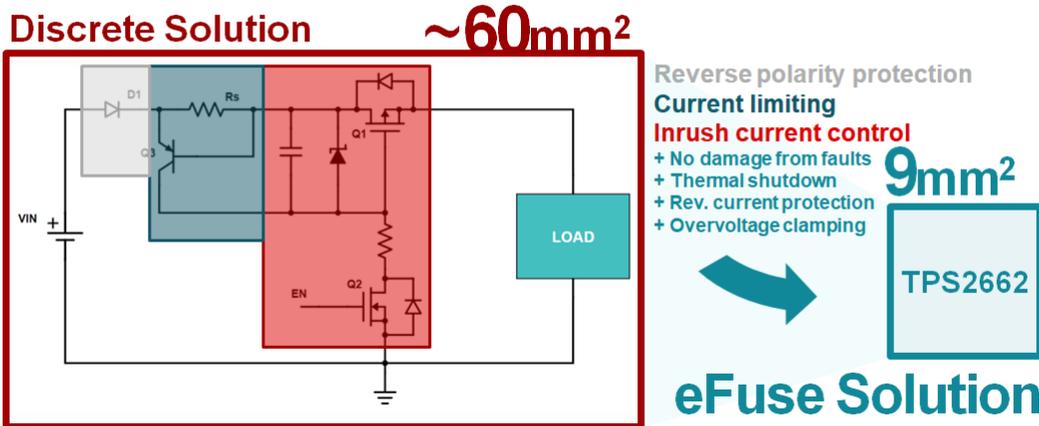


Figure 1. Discrete vs. integrated eFuse size comparison

Not only are eFuses highly integrated with a slew of protection features, but they are also affordable – which means that you can use them in any of your designs to reduce your assembly and overall bill-of-materials costs.

Additionally, TI eFuses provide an extensive product life-cycle for your long-life factory automation designs, eliminating the need for constant board revisions to change out components because of end-of-life scenarios with discrete components.

In summary, eFuses offer a compact, ultra-flexible solution to protect your 24-V input from a variety of faults that could occur in a PLC or motor drive system. Robust protection enables your systems to remain operational to reduce factory downtime and increase your operating efficiency.

Additional resources

- These data sheets describe protection features provided with the use of 60-V eFuses:
 - [“4.5-V to 60-V, 478mΩ, 0.025-0.88A eFuse with integrated input and output reverse polarity protection.”](#)
 - [“4.2-V to 60-V, 150mΩ, 0.1-2.23A eFuse with integrated input reverse polarity protection.”](#)
 - [“4.5-V to 60-V, 31mΩ, 0.6-6A eFuse with output power limiting and surge protection.”](#)
- These application reports describe the use of eFuses in factory automation systems:
 - [“Basics of eFuses.”](#)
 - [“Backplane Power Protection in PLC Systems.”](#)
 - [“Output Power Port Protection in PLC Systems.”](#)
 - [“Single Point Failure Protection for Motor Drive Control Power Supply.”](#)

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