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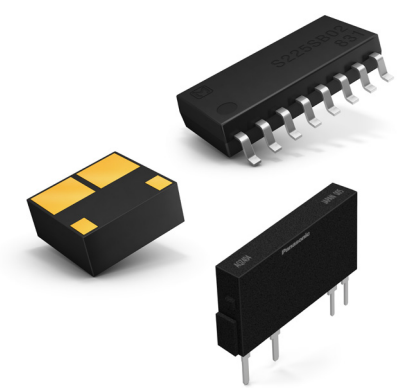
# Protecting PhotoMOS® relays with varistors

Despite their DMOSFET with an above-average current rating, Panasonic Industry PhotoMOS® relays can still be susceptible to voltage spikes caused by lightning or switching inductive loads. Such overvoltage can be prevented by utilizing a metal oxide varistor.

## Application Note



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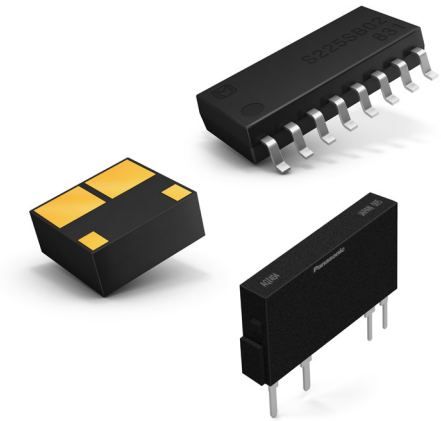
# Reduce voltage peaks

## Product

PhotoMOS® relay with varistors

## Purpose

PhotoMOS® relays switch signal outputs in sensors, control units or on measurement cards. Equipped with a metal oxide varistor acting as a low-resistance shunt, the relay is protected against voltage spikes when switching off inductive loads or as a result from lightning or electrostatic discharge.



## Features

Overvoltage and surge protection

Wide range of voltage classes

One of the top brands of surge absorbers for over 40 years

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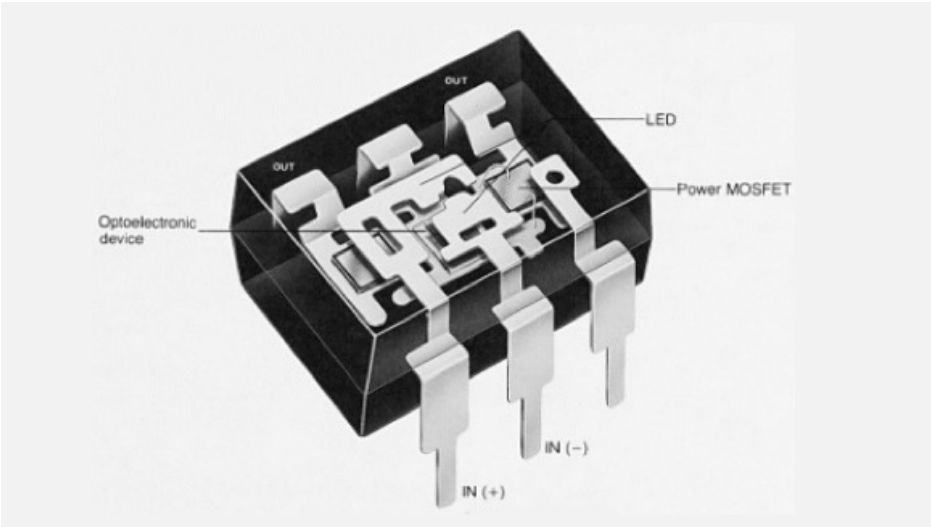
## Facts & Figures

Growing applications like e-mobility, automated machines, or energy management are placing ever higher demands on switching devices. Often, higher loads need to be switched in small and sensitive environments. For these types of applications, PhotoMOS® relays have emerged as the technology of choice. This type of relay typically consists of several elements: An LED diode on the input side emits light to a photodiode array (PDA), which converts the incoming light into electrical current and voltage. These in turn drive two power MOSFETs on the output side. An intermediate control circuit is responsible for the safe and reliable turn-on and turn-off of the output MOSFETs once a certain trigger current is reached.

This setup gives PhotoMOS® relays several characteristics which make them the ideal choice for applications concerned about package size, power consumption, operating speed – or all of the above. Because they don't include any mechanical elements, PhotoMOS® relays guarantee bounce-free operation and switching speeds below 1 ms. No moving parts inside a PhotoMOS® relay also lead to much better shock and vibration resistance and a long, reliable switching life. Furthermore, this type of semiconductor relay allows for unusually high isolation voltage, maximum switching voltage and low energy consumption.

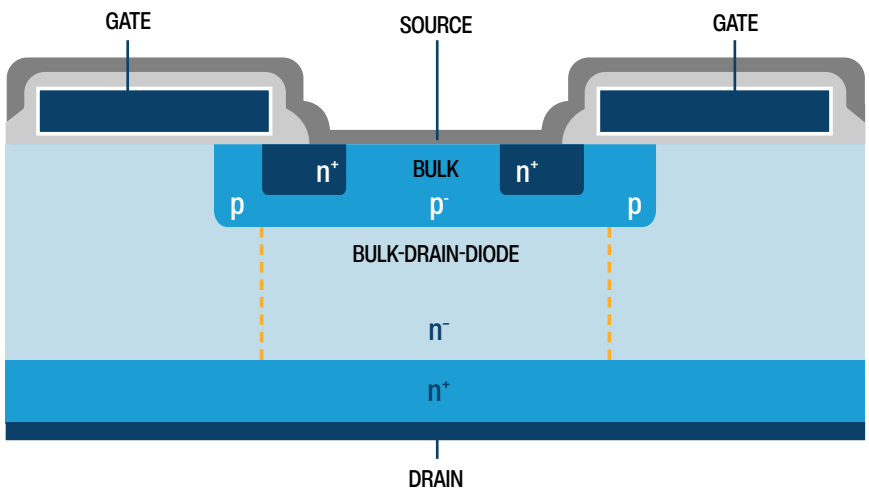



# Reduce voltage peaks

## Facts & Figures

The DMOSFET output transistor differs significantly from standard MOSFETs used in integrated circuits and features a greater current rating. When switching off inductive loads, however, high voltages may be produced that harm the inductor and the switch. Another potential danger are surge voltages that may result from lightning or electrostatic discharge. To protect the PhotoMOS® from such overvoltage, they can be equipped with protective devices such as metal oxide varistors.

Varistors are voltage-dependent resistors with a symmetrical V-I characteristic curve whose resistance decreases with increasing voltage. Connected in parallel with an electronic device or circuit, they form a low-resistance shunt when voltage increases, thereby preventing a further rise of the overvoltage. To reduce voltage peaks during load switching, the maximum energy absorption of the utilized varistor must be higher than the energy from the inductor, and the protection level of the varistor must satisfy the maximum voltage ratings of the switch and of the inductor. A wide range of voltage classes of the varistor is available to find the optimal fit for each given application. The operating voltage of the varistor is also critical for surge voltage protection, where, based on the surge current and the maximum permissible power dissipation (energy of the pulse, duration, and number of repetitions), the optimal varistor can be determined.

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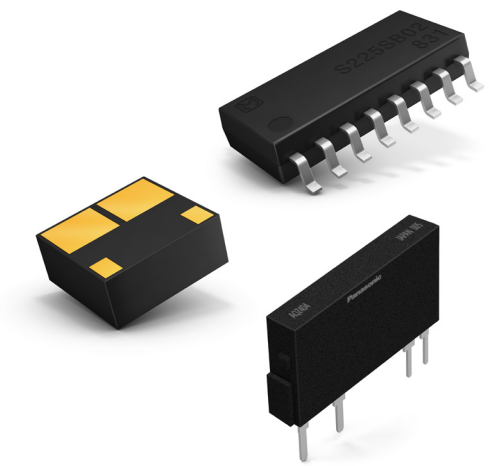

Application Note - How to solve various tasks by protecting PhotoMOS® relays with varistors
Date: April 2024
Contact: Panasonic Industry Europe GmbH, photomos@eu.panasonic.com
Notes: Data and descriptions in this document are subject to change without notice.
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