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INDUSTRY

PhotoMOS® Relays

Building automation, energy management or e-mobility: Panasonic's PhotoMOS® lineup offers the right solution for high-power applications with small dimensions and high operating speed.

Application Note

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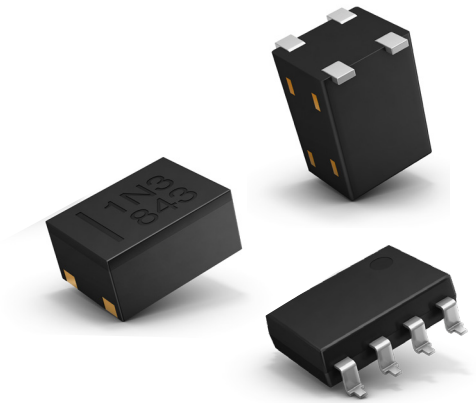

Product

PhotoMOS® relays

Purpose

Reliable, fast switching for future industries with high power consumption.

Features

Low control and leakage current

Stable on-resistance over lifetime

Small size

High switching speed

High vibration and shock resistance

No bouncing and no switching noise

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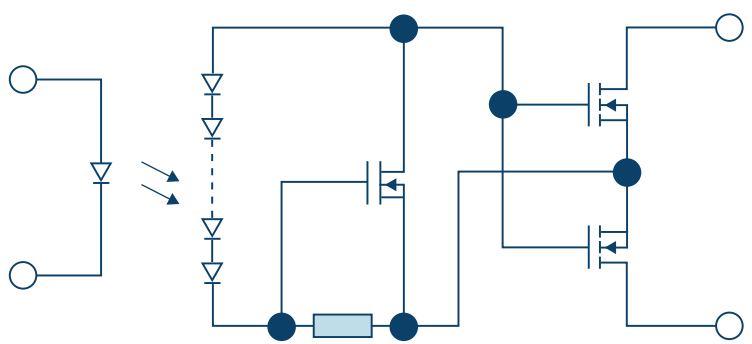
Facts & Figures

Whether in cars, buildings, or automated machines, switching devices have become indispensable for industries and in everyday life. While electromechanical relays (EMRs) are still a popular choice for many applications, PhotoMOS® relays are establishing themselves as an attractive alternative for industries that are concerned about package size, high operating speed, or high power consumption.

PhotoMOS® relays typically consist of several elements. If a current of about 3 mA is applied to the input pins of the relay, a LED diode on the input side emits light to a photo-diode array (PDA), located at least 0.4 mm from the LED. This array of solar cells converts the incoming light into electrical current and voltage, which in turn drive two power MOSFETs on the output side. A resistor and a MOSFET integrated into the PDA serve as a control circuit for switching the power MOSFETs and therefore the load circuit. These DMOS transistors are source-coupled, thus providing bidirectional switching capabilities.

The DMOSFET output transistor used in a PhotoMOS® relay significantly differs from standard MOSFETs found in integrated circuits. It has a vertical channel structure, and source and drain are placed opposite the wafer, giving more space to the source and drain region. As a result, the DMOSFET can sustain high currents. Furthermore, the double-diffused structure of the DMOSFETs enables them to switch AC loads when placed into inverse connection. A single transistor is only capable of switching a DC voltage, since the diode will become forward-biased if the polarity is reversed. But by connecting the two output transistors of an AC relay in parallel, the allowable DC current can be increased up to 5 A.



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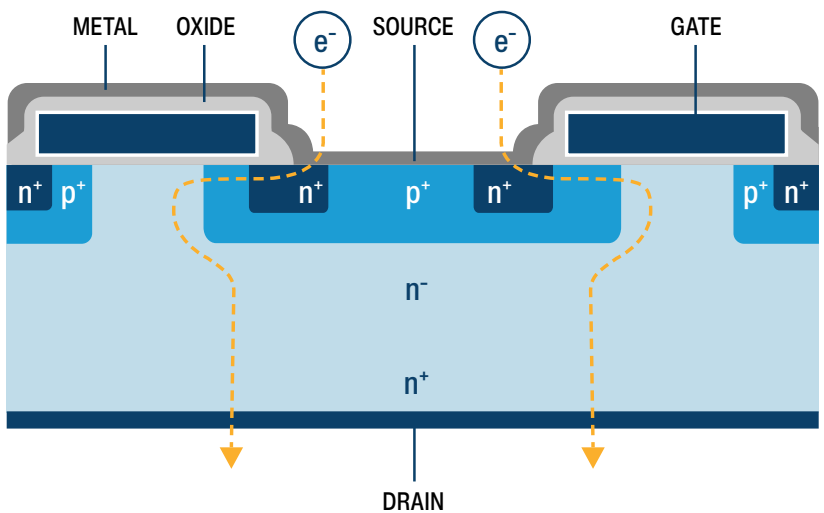
Due to their unique topography, PhotoMOS® relays show a number of characteristics that set them apart from existing switching solutions. In contrast to SSRs with bipolar transistors, they can switch DC and AC up to high frequencies. Furthermore, the static and commutating rate of voltage change over time (dV/dt) effects are not inherent and turn-off is not related to the phase of the AC current. MOSFETs also have a lower on-state offset voltage and much lower off-state leakage currents than bipolar transistors, as well as an infinite static forward current gain.

Compared with EMR, PhotoMOS® relays offer high switching speed and are immune to electromagnetic interference. Because there are no moving parts, they are also particularly reliable over a long period of time and enable bounce-free operation. PhotoMOS® relays additionally offer advantages in terms of energy consumption and package dimensions. Due to the low input current required by the LED, power consumption of around 10 mW are standard but sensitive products with less than 5 mW are also available. And while EMR only come in DIP, PhotoMOS® relays can go down to VSSOP or even TSON packages for low-current devices.

Panasonic Industry offers a wide range of PhotoMOS® relays for different applications and user demands, such as building and industrial automation, automotive settings, energy management, or measurement equipment. With further developments on the horizon, PhotoMOS® relays are sure to become a staple in these future industries.



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Learn
more about
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technology

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here the
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Application Note - How to solve various tasks with PhotoMOS® relays
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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