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Application Note Connection Methods for PhotoMOS® Relays

With e-mobility and energy management on the rise, PhotoMOS® relays gain popularity as safe and reliable switching devices. They offer flexible solutions for connections to the load, making them easy to integrate into a wide variety of applications.

Flexible connection solutions

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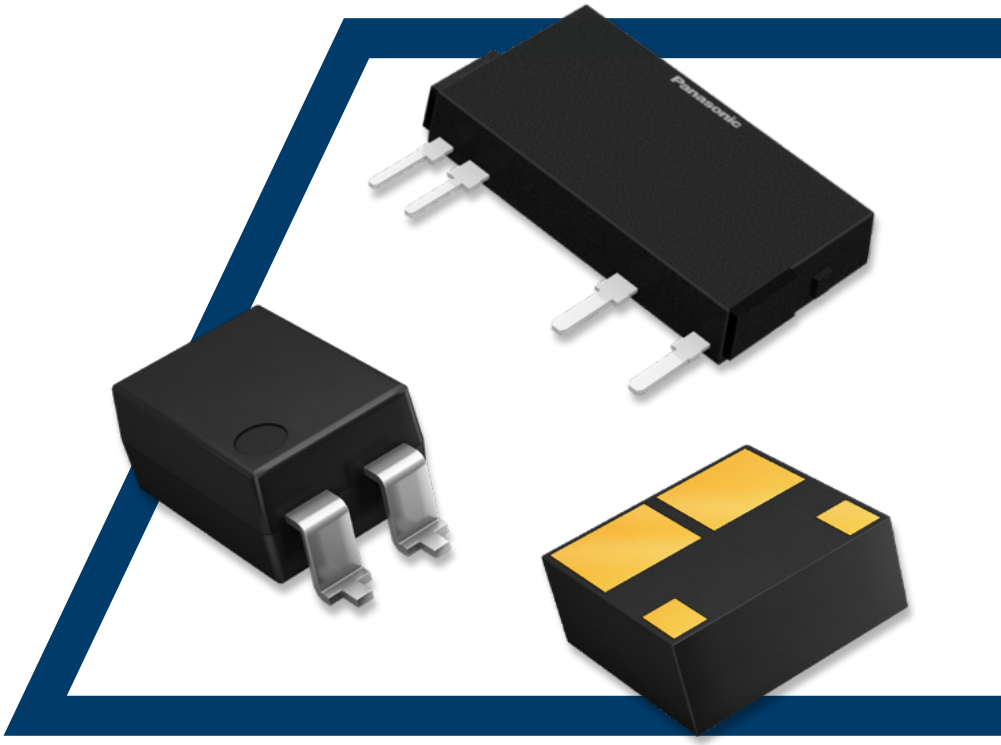
PRODUCT

Connection methods for PhotoMOS® relays

PURPOSE

PhotoMOS® semiconductor relays offer optimal solutions for applications in tele-communication, measurement, security devices and industrial control. Thanks to the flexible connection solutions, they can be connected to the load in various ways.



FEATURES

- Flexible connection solutions
- Low control current
- High switching frequency
- Extremely long lifetime
- Stable on-resistance over lifetime
- High reliability
- Small relay size
- No preferred mounting position
- High vibration and shock resistance
- No switching noise

Flexible connection solutions

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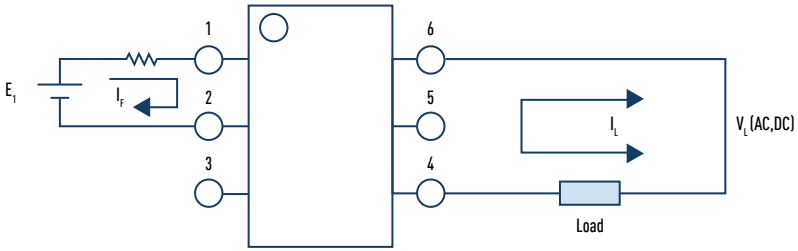
FACTS & FIGURES

In comparison to electromechanical relays, semiconductor relays – due to their design – offer optimal solutions for applications in telecommunication, measurement, security devices and industrial control. Their construction is easily described: Their input pins are connected to a light-emitting diode (LED), which is located on the input side of the relay. A current flowing through it causes the LED to emit infrared light. This light leads to a voltage drop across an array of solar cells which are located at least 0.4 mm from the LED. The voltage drop is used to control the gate of two DMOSFET transistors which are source-coupled. By integrating different output transistors in the PhotoMOS® relay, a whole range of relays can be supplied.

The DMOSFET output transistor has a vertical channel structure, source and drain are placed opposite the wafer. As a result, more space for the source and drain region is available, leading to an increased current rating. Because of the DMOSFET's intrinsic bulk-drain-diode in connection to drain and source, a single transistor is only capable of switching a DC voltage since the diode will become forward-biased if the polarity is reversed. Thus, it is mandatory to use two source-coupled DMOSFETs in the output stage of the PhotoMOS® relay to enable the switching of AC voltages. Connecting the source-coupled node of the PhotoMOS® relay to an external pin opens up various possibilities of connecting the load to the relay.

If the PhotoMOS® relay is used for switching between AC and DC loads, the two DMOSFETs need to be source-coupled due to the fact that the polarity changes for an AC voltage. The connection method looks as follows:



Flexible connection solutions

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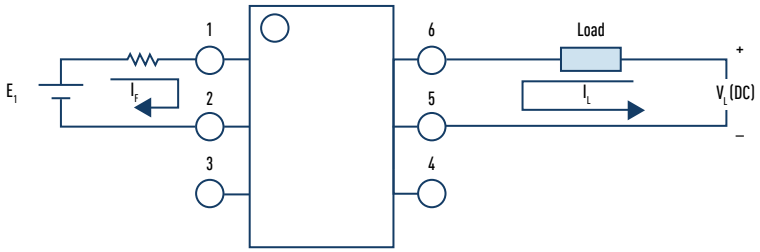
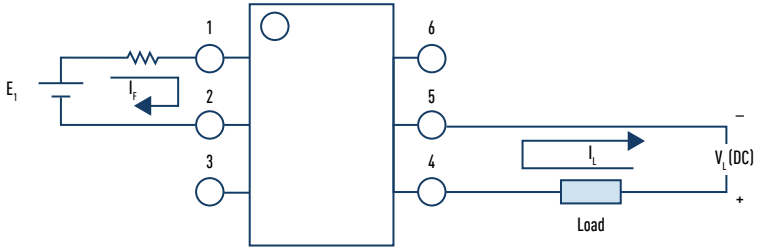
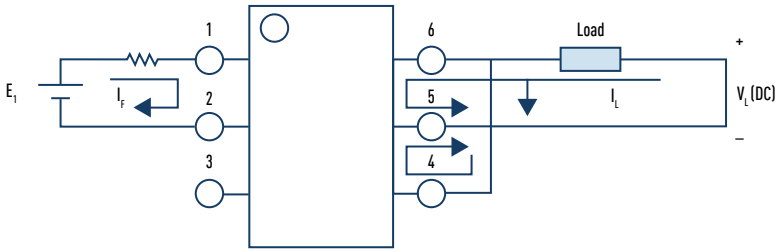
FACTS & FIGURES

If only DC voltages are switched by the PhotoMOS® relay, only one of the two output transistors is used. This connection method produces less heat than the first because only one DMOSFET's on-resistance is responsible for the switch's total on-resistance. The connection method looks as follows:





Both output transistors also can be used in a parallel connection. Again, only DC voltages can be switched, but the total on-resistance of the relay is now halved because of the DMOSFET's parallel connection. As a consequence, the current rating can be further increased. The connection method looks as follows:



When choosing a connection method, it is important to note that the maximum power dissipation of the PhotoMOS® relay, caused by on-resistance of the output transistors and the load current, is limited by the relay's case. The above connection methods demonstrate that PhotoMOS® relays can be connected to the load in various ways, offering flexible solutions in regard to the circuit's load, the total resistance in the circuit and the load current.

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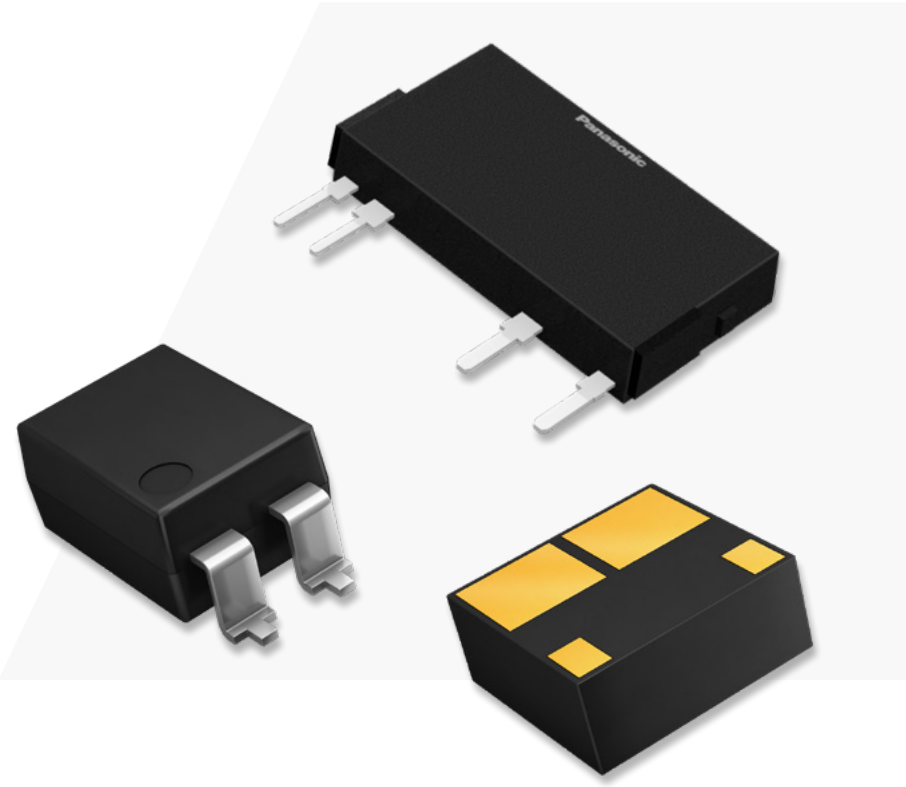

Application Note - How to solve various tasks with Connection Methods for PhotoMOS® Relays

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Notes: Data and descriptions in this document are subject to change without notice.

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