

Relay protection active optical module with high temperature resistance

Article Overview

Optically-isolated solid-state relays (SSRs) with PhotoMOS technology provide high-temperature resistance, reliable isolation, and long operational life for relay protection applications.

Overview of Optically-Isolated Relays

Optically-isolated relays, also known as PhotoMOS or SSRs, use a light-emitting diode (LED) input, a photo sensor array, and MOSFET output switches to control load circuits without mechanical contacts. This design eliminates contact bounce, reduces switching noise, and provides high vibration and shock resistance, making them ideal for industrial and high-temperature environments (TTI, Inc.), .

High Temperature Performance

High-temperature operation is achieved through temperature-compensated protective circuits. As temperature rises, the resistance of components increases, which can raise power dissipation. PhotoMOS relays counteract this with a negative temperature coefficient, allowing the relay to respond to lower current levels at elevated temperatures, maintaining reliable operation and preventing thermal overload (TTI, Inc.), .

Key Advantages

- o **Electrical Isolation:** Optically-isolated relays provide dielectric separation between input and output, often rated up to 5 kVRMS reinforced isolation (TI) or high isolation for industrial modules (Vishay, WAGO), .
- o **Reliability:** Without moving parts, SSRs have long mean time to failure (MTTF) and tolerate shock, vibration, and high-frequency switching better than electromechanical relays .
- o **Fast Switching and Low On-Resistance:** These relays offer rapid switching speeds, low leakage current, and stable on-resistance over their lifetime, which is critical for precise relay protection and control .
- o **Compact and Modular Design:** Many industrial relay modules are DIN-rail mountable, with pluggable optocoupler modules for easy maintenance and replacement, suitable for control cabinets and automation systems (WAGO, Weidmuller), .

Applications

- o **Industrial Automation:** Switching actuators, sensors, and control signals in high-temperature environments.
- o **Power Systems:** Relay protection for motors, transformers, and high-voltage circuits.
- o **Railway and Shipbuilding:** Modules designed for niche applications requiring high reliability and thermal tolerance.
- o **Battery Management Systems:** High-voltage SSRs with integrated isolation and fault diagnostics for Li-ion

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or EV battery packs (TI), .

Design Considerations

- o Input Drive: Use a current-limiting resistor to ensure the LED reaches full intensity without overdrive.
- o Thermal Management: Ensure proper heat dissipation and consider the negative temperature coefficient of the protective circuit for high-temperature operation.
- o Isolation Requirements: Select relays with appropriate basic or reinforced isolation ratings based on system voltage and safety standards.
- o Load Type: Verify compatibility with resistive, inductive, or capacitive loads, as SSRs may have different derating factors for high inrush currents. In summary, optically-isolated solid-state relays with PhotoMOS technology are highly suitable for relay protection in high-temperature environments, offering reliable isolation, long life, fast switching, and thermal compensation, making them a preferred choice for industrial, power, and automation applications .

System Description This reference design shows how to achieve a solid state relay solution with overcurrent and overtemperature

Thermal interface resistance of pluggable optical modules (POMs) is affected by design factors under the control of

Solid state relays (optical MOSFET based relays) manufactured by Vishay, a global leader for

In an optical module with high density and small size, it is important to maintain the operating temperature by adequate heat

Solid state relays Vishay's solid-state relays (SSRs) are designed for high reliability, high input-to-output isolation, and low on

Normally, commercial-grade optical modules in the 0-70 °C working environment, the general temperature is not too

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In this paper, you will learn more about the operating principles of optically-isolated relays, how to apply them in different applications

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Investigation and Evaluation of High-Temperature Encapsulation Materials for Power Module Applications
Benjamin

The first requirement is to set a target temperature for the laser module based on the desired output color. The system

IntroductionUsed to source, detect, and control light, optoelectronics are increasingly important in a wide range of automotive,

The solid state relay by Littelfuse has a high-voltage rating and a high-temperature range It replaces electromechanical

AQY212G3HS and AQY232G3HS relays benefit from high operating temperature levels of up to +105 degrees Celsius and +125

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