

Comparison of Low-Temperature Resistance of Optical Isolators and Alternative Solutions



Summary of Content

Optocouplers exhibit varying low-temperature performance depending on package type, semiconductor material, and design, with LTCC-packaged devices showing superior stability compared to conventional epoxy-based optocouplers.

Low-Temperature Behavior of Optocouplers

Optocouplers transfer electrical signals across galvanically isolated circuits using optical coupling, typically via an LED emitter and a phototransistor detector. Key performance parameters affected by temperature include current transfer ratio (CTR), leakage current, propagation delay, rise time, and fall time. At low temperatures, CTR can decrease due to reduced LED emission efficiency, while leakage current generally remains low, and response speed may slightly improve or remain stable depending on the device design .

Package Material Influence

Traditional optocouplers often use epoxy-based packages, which are prone to mechanical stress and parametric variation at extreme temperatures, including low temperatures. In contrast, Low-Temperature Co-Fired Ceramic (LTCC) packaging provides enhanced thermal stability, maintaining functionality across a wide temperature range, including sub-zero conditions. LTCC allows precise cavity formation for optical paths, reducing performance degradation and ensuring consistent CTR and response times at low temperatures .

Article Content

Opto-Emulators Explained: Exploring Optocoupler Alternatives

Optocouplers have long been an option for designers seeking galvanic isolation for system signals. This article

Improve your isolation design's reliability, robustness and performance ...

Optocouplers use an LED to transmit signals across an isolation barrier (often just an air gap). Optocoupler dielectrics are built in an

Isolator vs. Optocoupler Technology

This white paper explains the underlying technologies of digital optocouplers and digital CMOS isolators with side-by-side

How to Replace Optocouplers with Digital Isolators in Standard ...

This article compares common optocoupler circuits to digital isolator circuits used to isolate common digital interfaces and

CMOS Digital Isolators vs. Optocouplers in Industrial Applications

Explore CMOS digital isolators as a replacement for optocouplers in industrial settings. Learn about RF isolation technology,

Optocouplers vs. Digital Isolators: A Comparison of Modern Circuit ...

While traditional light-based components have dominated for decades, newer semiconductor-based solutions now offer alternatives.

Optocouplers vs Digital Isolators Selection Guide

Compare optocouplers vs digital isolators on speed, isolation voltage, power, and EMI to choose the right isolator.

Microsoft Word

This white paper explains the underlying technologies of digital optocouplers and digital CMOS isolators with side-by-side

Isolation Technologies and Comparisons

Optocoupler is the dominant isolation Broadcom Isolation Products currently technology in the industry Optical isolation is preferred

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