Principle of Optocoupler Light Detection



Overview

The device''s principle of operation is simple: an electrical-to-optical conversion takes place in the emitter, as the IR-LED emits infrared radiation (i.e.

Key Takeaways

An optocoupler detects light emitted by an internal LED to transfer electrical signals between isolated circuits, using a photodetector to convert light back into an electrical signal.

Basic Working Principle

An optocoupler, also called an opto-isolator, is designed to transfer electrical signals between two circuits while keeping them electrically isolated. It achieves this by using light as the medium. The device typically contains two main components: a Light-Emitting Diode (LED) on the input side and a photodetector (commonly a phototransistor) on the output side.

When an input electrical signal energizes the LED, it emits infrared light proportional to the signal. This light travels across an optical barrier inside the optocoupler and strikes the photodetector. The photodetector responds to the light by changing its electrical conductivity, effectively reproducing the input signal on the output side without any direct electrical connection.

Phototransistor Light Detection

In phototransistor optocouplers, the phototransistor acts like a switch controlled by light.

© 2026 FD SOLUCIONES OPTICAL SYSTEMS - All rights reserved

When the LE

D emits light, photons strike the base region of the phototransistor, generating electron-hole pairs that allow current to flow from collector to emitter. This current flow represents the output signal.

When the LE

D is off, no light reaches the phototransistor, and it remains non-conductive, preventing current flow. The current-transfer ratio (CTR), which is the ratio of output current to input LED current, is a key parameter that determines the efficiency of light detection and signal transfer. Factors such as temperature, DC bias, and parasitic capacitance can affect the phototransistor's response and switching speed.

Applications

Optocouplers are widely used in isolated power supplies, microcontroller interfaces, sensor circuits, and communication systems. They protect sensitive components from high voltages, voltage spikes, and electrical noise while allowing accurate signal transmission. In summary, the principle of optocoupler light detection relies on converting an electrical signal into light via an LED, transmitting it across an optical barrier, and reconverting it into an electrical signal using a photodetector, ensuring electrical isolation and safe signal transfer between circuits.

Article Content

ANO007 | Understanding Phototransistor Optocouplers

The device''s principle of operation is simple: an electrical-to-optical conversion takes place in the emitter, as the IR-LED emits infrared radiation (i.e. photons) with an intensity proportional to the

Everything You Need to Know About Optocouplers in

When the LED is energised by an input signal, it emits light that is detected by the photodetector, which then produces an output signal. This

Optocoupler Tutorial and Optocoupler Application

An optocoupler transfers a signal across an isolation barrier using light: input current drives an LED that emits infrared photons, photons cross a transparent dielectric gap, a

Optocoupler Tutorial for Beginners

An optocoupler uses light to transfer signals from one circuit over to another. This guide shows you how they work and how to use them.

© 2026 FD SOLUCIONES OPTICAL SYSTEMS - All rights reserved

Optocouplers 101: A Comprehensive Guide for PCB

Simply put, optocouplers (or opto-isolators) are electronic components that transfer electrical signals between two isolated circuits using

Optocoupler Circuits, Working, Characteristics, Interfacing

Optocoupler exhibit one very useful characteristic and that is its light coupling efficiency termed as current transfer ratio, or the CTR. This ratio is

What are Optocouplers? Definition, construction and working of ...

Optocouplers are common component by which electrical isolation can be supplied between the input and output source. It is a 6 pin device and can have any number of photodetectors. Here, a beam of

Understanding Optocouplers: Principles, Types and Applications

An optocoupler is mainly composed of two essential elements: an infrared LED and a light-sensitive device that detects the infrared light emitted by the LED. The light-sensitive device can

Opto-isolator

This configuration refers to optocouplers that contain a source that emits light and a sensor that only detects light when it has reflected off an object. The reflective pair configuration is suitable for the

Optocoupler | Working Principle | Types & Applications

Working Principle: Input Signal Applied A small input voltage is applied to the LED, which is forward-biased. Light Emission The LED emits infrared light in response to the input signal. Optical

Optocoupler Working Principle: Types, CTR Formula and Industrial ...

Electronics · Optocoupler · Photocoupler · Electrical Isolation · Signal Coupling Optocoupler Working Principle: How It Provides Electrical Isolation, Types, CTR and Industrial

Automatic street light control using LDR. | PDF

The document is a project report submitted by Md. Fazlur Rahman to Eastern University of Bangladesh that details an automatic street light control system using a light dependent resistor. The system

Optocouplers Working Principle

© 2026 FD SOLUCIONES OPTICAL SYSTEMS - All rights reserved

What is optocoupler? An optocoupler is an optical link and it connects two circuits via this link. The optical link is contained within a chip. A Light Emitting Diode inside the chip shines on a

What is Optocoupler and How it works?

They use light to pass signals between circuits. What is Optocoupler and How It Works As we have already learnt about transistors, an ideal transistor will not allow any current to pass through

What are Optocouplers? Definition, construction and working of ...

Definition: An optocoupler or optoelectronic coupler is an electronic component that basically acts as an interface between the two separate circuits with different voltage levels. Optocouplers are common

How optocouplers work in circuits

This article will discuss how optocouplers work in circuits and their applications. Working Principle Optocouplers operate on the principle of optical coupling. When an electric current is

Optocoupler Tutorial and Optocoupler Application

Then an optocoupler or opto-isolator consists of a light emitter, the LED, and a photosensitive receiver which can be a single photo-diode, photo-transistor, photo-resistor, photo

Optocouplers: Working Principles, Applications, and Advantages

Working Principles The operation of an optocoupler is based on the principle of optical coupling, where the input and output circuits are electrically isolated but optically connected. When an electrical

Related Video Reference

This video was associated with the source search result. Verify technical details against current product documentation and project requirements.

© 2026 FD SOLUCIONES OPTICAL SYSTEMS - All rights reserved

Contact Us

Continue your research online:

Website: https://fdsoluciones.es
Technical inquiry: https://fdsoluciones.es/project-enquiry.html

This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

© 2026 FD SOLUCIONES OPTICAL SYSTEMS - All rights reserved