Optocoupler used as a switch



Overview

Photocouplers are mainly used as a switching device to transfer pulse signals and to transfer feedback error signals in analog switching regulators.

Key Takeaways

An optocoupler can function as an electrically isolated switch by driving its input LED to control the output transistor, operating in saturation for ON and cut-off for OFF.

How It Works

An optocoupler, also called an opto-isolator, transfers signals between two electrically isolated circuits using light. The input side contains an LED, and the output side typically has a phototransistor.

When the LE

D is forward-biased, it emits light that activates the phototransistor, allowing current to flow on the output side, effectively acting as a switch. To use an optocoupler as a switch: ON State (Saturation): The LED must be driven with enough forward current to saturate the phototransistor. In saturation, the collector-emitter voltage drops to a minimal level (V_CE(sat)), and the output behaves like a closed switch.

OF

F State (Cut-off): When the LED is off, the phototransistor stops conducting, and the output behaves like an open circuit. The relationship between the input LED current (I_F) and the output collector current (I_C) is defined by the Current Transfer Ratio (CTR). At saturation, the circuit's CTR demand should be less than the device's specified CTR to ensure proper switching.

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Practical Considerations

Voltage Drop: Expect a small voltage drop across the phototransistor when ON, typically up to a few volts depending on the load and device. This is normal and must be accounted for in analog switching applications. Isolation: Optocouplers provide galvanic isolation, protecting sensitive control circuits from high voltages or noisy environments.

Load Driving: For higher currents or voltages, the optocoupler can drive a transistor or triac, which then switches the main load. Component Selection: Choose the optocoupler based on required CTR, maximum collector current, and voltage ratings. Resistors on the input side control LED current and switching sensitivity, while capacitors can filter transients.

Example Application

A simple example is using an 817 optocoupler to control an LED: Upper push button → LED ONLower push button → LED OFFThe optocoupler isolates the control buttons from the LED circuit, allowing safe low-voltage control.

Summary

Using an optocoupler as a switch involves: Driving the input LED with sufficient current to saturate the output transistor. Ensuring the output load current is within the device's CTR capabilities. Accounting for voltage drop across the phototransistor.

Optionally using external transistors or triacs for higher power loads. This approach provides safe, isolated switching for both digital and analog circuits, making optocouplers ideal for microcontroller interfaces, AC/DC load control, and noisy environments.

Article Content

How Photocouplers / Optocouplers Are Used | Renesas

Photocouplers are mainly used as a switching device to transfer pulse signals and to transfer feedback error signals in analog switching regulators.

Optocoupler Tutorial and Optocoupler Application

BenefitsMechanismDesignDefinitionExampleEffectsTypesApplicationsConstructionAdvantagesAn optocoupler or opto-isolator consists of a light emitter, the LED and a light sensitive receiver which can be a single photo-diode, photo-transistor, photo-resistor, photo-SCR, or a photo-TRIAC with the basic operation of an optocoupler being very simple to understand.See more on electronics-tutorials.wsReddit

When using optocoupler as a switch, why do all examples always

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I made a circuit that uses "Option 2" and wasn''t worried about it at first, but I noticed that the switching time of my optocoupler seems way below spec. I use it to drive a grid in a VFD and need fast

Optocoupler Tutorial for Beginners

An optocoupler (or opto-isolator) is a component that transfer signals between circuits using light. In this guide, you''ll learn how they work and how you can use one in your own projects.

ANO007 | Understanding Phototransistor Optocouplers

In some applications like motor control, relays and communication interfaces, the optocoupler is used as an isolated electronic switch, where the phototransistor is driven into conduction and blocking states

Optocoupler as switch

I am trying to use an optocoupler as an ON/OFF switch for an analog circuit. When high/ON voltage is applied at input, the output side should be short circuited. Otherwise it should act

Everything You Need to Know About Optocouplers in

What is the difference between optocoupler relay circuits and direct switching? An optocoupler relay provides double isolation with optical isolation

What is Photocoupler | Optocoupler | Optoisolator

In saturation mode, the optocoupler operates as a switch with two distinct states: ON and OFF. In the ON state, it conducts maximum current, while in the OFF state, it completely blocks

Optocouplers, Optoisolators | Isolators | DigiKey

Optocouplers are essential in feedback loops, signal isolation, and safety-critical applications, particularly in switch-mode power supplies, PLC inputs, and motor

OptoCoupler as a switch (or other options?)

The most foolproof solution would be 3 relays because a regular ''ol electro-mechanical relay* is an electrically operated and electrically-isolated switch. (You need a driver circuit to drive a

optocoupler 6N138 as a switch

hi there! I aim to build an audio switch controled by a pulse out from arduino, and i was wondering if it was possible to use an optocoupler for this porpouse. Since i have some 6N138 this

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optocoupler as a switch #diy #electronic #howtomake

In this quick project, you''ll learn how to use an optocoupler as a switch to control an LED with safe electrical isolation—great for beginners and hobby electronics.

Optocoupler As a Switch

Hello Circuits Community. I am trying to design an AC detection using optocoupler and have been having trouble and thought to reach out for help to the community. I am inputting 120 VAC

Optocouplers Guide: Understanding Types, Applications, and ...

You can use phototransistor optocouplers in applications like microprocessor input/output switching, signal isolation, and power supply regulation. For example, the 4n25 optocoupler is a

What Is Optocoupler and Its Application with Examples

3. How do you use an optocoupler for analog signals? While mostly used for digital switching, linear optocouplers exist. To send audio or analog

How to Use an Optocoupler to Pass Signals Between Controllers at ...

This tutorial makes use of the 4N25 optocoupler chip to allow for communication between controlling devices operating at different voltages. In my examples, I use the Raspberry Pi, which uses 3.3V DC

Anyone using an Optocoupler as a switch? : r/FastLED

I''ve worked with relays and mosfets (as a switch) on other projects before, but I chose to use an optocoupler simply because it was small/cheap. First time using one, so I''m not sure if I chose the

Optocouplers Selection Guide: Types, Features, Applications

Opto-isolated SCR devices use a silicon-controlled rectifier (SCR) as their detector. These optocouplers are typically used as step-up devices, and feature slow to medium switching speeds. Schematic for

How Optocouplers Work

FREE COURSE!! Learn about optocouplers. We''ll look at how they are used to control circuits, how they work and also how to design some simple optocoupler circuits to show the working

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

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