Switching power supply with optocoupler



Overview

Understanding Optocoupler Biasing for Stable Isolated This article explains how to correctly bias optocouplers—covering LED current, current transfer ratio.

Key Takeaways

Optocouplers provide electrical isolation while enabling safe switching of high-voltage or high-current circuits using a low-voltage control signal.

Function and Principle

An optocoupler, also called an opto-isolator, transfers electrical signals between two electrically isolated circuits using light, typically from an LED to a phototransistor. In power switching, the input side (LED) is driven by a low-voltage control signal, while the output side (phototransistor) switches the high-voltage or high-current load. This isolation protects sensitive control electronics, such as microcontrollers, from dangerous voltages.

Switching Operation

When used as a switch, the phototransistor operates in saturation and cut-off, similar to a BJT transistor switch. The forward current through the LED determines the collector current of the phototransistor via the Current Transfer Ratio (CTR), which is the ratio of output current to input LED current. To ensure proper switching, the LED current must be sufficient to saturate the phototransistor, allowing it to fully conduct and minimize the collector-emitter voltage.

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The phototransistor can switch loads connected either to the collector or emitter, with the output polarity inverted depending on the configuration. However, general-purpose optocouplers are limited to tens of milliamperes, so they are typically used to drive intermediate stages like MOSFETs or TRIACs in power circuits.

Applications in Power Electronics

In switch-mode power supplies (SMPS), optocouplers are widely used to provide reinforced isolation between the high-voltage AC input and the low-voltage DC output. They enable feedback control from the output to the primary side while maintaining safety standards such as DIN EN 60747-5-5 (VDE0884),. Proper selection ensures compliance with insulation requirements and long-term reliability.

Design ConsiderationsCTR Selection: Choose an optocoupler with a CTR sufficient to drive the load or the next switching stage.

LE

D Forward Current: Must be high enough to saturate the phototransistor. Load Resistor: Determines the output voltage and current; must match the phototransistor characteristics. Isolation Rating: Reinforced insulation is recommended for line-voltage separation, while basic insulation may suffice for non-touchable low-voltage circuits.

Temperature and Aging: CTR can vary with temperature and LED aging, so design margins are necessary.

Summary

Optocouplers in power switching enable safe, isolated control of high-voltage circuits using low-voltage signals. They operate as switches by saturating the phototransistor, with performance determined by CTR, LED current, and load configuration. They are essential in SMPS, microcontroller interfaces, and other applications requiring electrical isolation and safe switching of power devices.

Article Content

Understanding Optocoupler Biasing for Stable Isolated

This article explains how to correctly bias optocouplers—covering LED current, current transfer ratio (CTR), and phototransistor setup—to keep your

Analysis of the optocoupler circuit of switching power supply

In the monolithic switching power supply, the optocoupler feedback circuit can be constructed by using a linear optical coupler, and the duty ratio is changed by adjusting the current of

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Optocoupler Tutorial and Optocoupler Application

Common applications for opto-couplers include microprocessor input/output switching, DC and AC power control, PC communications, signal

Using Opto Couplers

The main purpose of an optocoupler interface is to completely isolate the input circuit from the output circuit, which normally means there will be two completely

3,4V 2,5A switching supply with optocoupler

The diagram below shows a very simple schematic of a small switching power supply with a single transistor and optocoupler. Switching power supply without optocoupler with the indirect stabilization

ANP113 | Feedback loop compensaion of a current-mode Flyback

Optocouplers provide a mechanically-robust isolation barrier with very high voltage ratings (e.g. 5 kV) in a small package size, helping the power supply to meet stringent safety standards. The optocoupler

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

10-50pcs MOSFET Electronic Switch Controller Module Pulse Trigger

Whether you''re building a smart home device, an industrial automation system, or a high-current motor controller, this module delivers the performance, durability, and safety you need.

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

Wireless Home Automation System Using PIC Microcontroller with

The system also has a power supply that provides stable +3V and +12V outputs for the logic and switching circuits.There are a few ways that the system works. It turns signals into code and back

GVA10158-A1 no secondary power, MIP419MD SMPS fault in JVC

GVA10158-A1 has no voltage on the secondary side in a JVC UX-G48/UX-G49 supply with MIP419MD, could a dried primary capacitor, shorted diode, or start-up fault be the reason?

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LT3804 Datasheet and Product Info | Analog Devices

The LT3804 is high efficiency step-down switching regulator with optocoupler feedback control for regulating multiple outputs in single-secondary winding isolated power supplies.

Reference Design for Isolated Flyback Power Supply

This solution is based on an isolated flyback topology, which does not require an optocoupler or a third winding on the transformer for feedback regulation. Primary-side regulation

4N25, 4N26, 4N27, 4N28

DESCRIPTION The 4N25 family is an industry standard single channel phototransistor coupler. This family includes the 4N25, 4N26, 4N27, 4N28. Each optocoupler consists of gallium arsenide infrared

Teardown of the ECOFLOW DELTA 3 1000 Air Portable Power

EcoFlow''s DELTA 3 1000 Air portable power station packs automotive-grade LiFePO4 chemistry with an automotive CTC architecture into a remarkably compact frame.

IC 555 Latching Circuit for 230V AC Bulb | TikTok

Use the output to drive a transistor or optocoupler that energizes a relay coil, or to drive a triac gate via an appropriate isolating circuit when switching AC. - Mains switching: For a simple, low-cost

ACPL-P314-560E Broadcom Gate Driver Optocoupler

ACPL-P314-560E is a Broadcom 0.6A output-current IGBT gate-driver optocoupler in a 6-SO package. DigiKey lists it as a one-channel optical-coupling gate driver with 3750Vrms isolation and a 10V to

3,4V 2,5A switching supply with optocoupler

Switching power supply without optocoupler with the indirect stabilization would be even more simple, but its output voltage is not stable enough. This switching power supply works as a flyback converter.

Related Video Reference

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

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