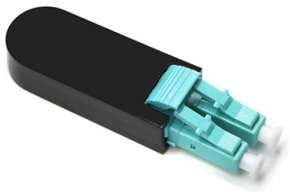
Optocoupler Amplifier Circuit



Overview

Designing Linear Amplifiers Using the IL300 OptocouplerThis application note presents isolation amplifier circuit designs useful in industrial, instrumenta.

Key Takeaways

An optocoupler amplifier circuit uses an LED-photodiode pair to provide galvanic isolation while amplifying analog signals with high linearity and stability.

Overview

An optocoupler amplifier transfers electrical signals between two isolated circuits using light, typically from an LED to a photodiode or phototransistor, ensuring galvanic isolation and protection from high voltages or noise. These circuits are widely used in industrial sensors, medical instrumentation, and switch-mode power supply feedback loops where accurate signal transmission is required without direct electrical connection. Key ComponentsLED (Emitter): Converts the input electrical signal into light.

High-efficiency AlGaAs LEDs are commonly used for linearity and stability. Photodiodes (Receiver): Detect the LED light and convert it back into a current. Precision designs often use dual photodiodes, one for feedback (servo) and one for output, to maintain linearity.

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Feedback Network: A servo photodiode monitors LED output and adjusts current to linearize the response, compensating for temperature and LED aging. Amplifier Circuit: Converts the photodiode current into a voltage output, often using operational amplifiers to achieve desired gain and bandwidth. Example CircuitsIL300-Based Isolation AmplifierThe IL300 optocoupler contains an LED and two PIN photodiodes.

The servo photodiode provides feedback to the LED, ensuring linear output. The output photodiode produces a current proportional to the input signal, maintaining high linearity and ±0. 01% accuracy.

Typical applications include DC and AC signal isolation in instrumentation and switch-mode power supplies, with bandwidths up to 200 kHz. HCNR201-Based Precision AmplifierThe HCNR201 uses a high-performance LED and two closely matched photodiodes. The input photodiode stabilizes LED output, virtually eliminating nonlinearity and drift.

The output photodiode generates a photocurrent linearly related to the input, suitable for unipolar/bipolar, AC/DC, inverting/non-inverting configurations. This design is cost-effective and flexible for analog isolation applications.

Design Considerations

Linearity: Use a feedback photodiode to correct LED nonlinearity. Bandwidth: Choose optocouplers with sufficient speed for your application (e.g., IL300: 200 kHz, HCNR201: high linearity up to several hundred kHz). Gain Stability: Ensure temperature compensation and matched photodiodes to maintain consistent gain.

Isolation Voltage: Verify the optocoupler's isolation rating meets safety requirements for your system. Circuit Topology: Can be single-ended or differential, depending on noise rejection and signal requirements.

Applications

Isolated analog signal transmission from thermocouples, strain gauges, or pressure sensors. Feedback loops in switch-mode power supplies. Protection of microcontrollers or low-voltage circuits from high-voltage AC lines.

Replacement for transformers or relays in analog interfacing. By carefully selecting the optocoupler type and designing the feedback network, an optocoupler amplifier circuit can achieve high linearity, stable gain, and reliable isolation for sensitive analog applications.

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Article Content

Designing Linear Amplifiers Using the IL300 Optocoupler

INTRODUCTION This application note presents isolation amplifier circuit designs useful in industrial, instrumentation, medical, and communication systems. It covers the IL300''s coupling specifications,

Using Opto Couplers

In this example a PC817 optocoupler is shown isolating a circuit using HCT logic via a 7414 Schmitt inverter gate.

Designing Linear Amplifiers Using the IL300 Optocoupler

It covers the IL300''s coupling specifications, and circuit topologies for photovoltaic and photoconductive amplifier design. Specific designs include unipolar and bipolar responding amplifiers. Both single

Optocoupler Tutorial and Optocoupler Application

This type of optocoupler configuration forms the basis of a very simple Solid State Relay application. It can be used to control any AC mains

Precision Analog Isolation Amplifier Using HCNR201 Optocoupler

Applications of the isolation amplifier: The HCNR201 (HCNR200) optocoupler can be used to build a low cost precision isolation amplifier. Circuit diagram is shown below. Note that there

Optocoupler Circuits, Working, Characteristics, Interfacing

The figure above shows a basic optocoupler circuit. The amount of current that may pass through the phototransistor is determined by the applied forward bias current of the IR LED or the I

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

LOC Series Linear Optocouplers

This application note describes isolation amplifier design principles for the LOC Series linear optocoupler devices. It describes the circuit operation in photoconductive and photovoltaic modes and provides

10 MBd High-Speed Optocoupler Design Guide

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In fact, all “high-speed” optocouplers are more sophisticated versions of this simple photodiode detector circuit, in conjunction with a transimpedance amplifier and an accompanying complementary output

Optocoupler Circuits | Nuts & Volts Magazine

Simply described, an optocoupler device is a sealed, self-contained unit that houses independently-powered optical (light) Tx and Rx units, that can be coupled together optically.

Using Opto Couplers

There are many different applications for optocoupler circuits, so there are many different design requirements, but a basic design for an optocoupler providing isolation for example between two

SIMPLE CIRCUIT MODIFICATIONS ENHANCE OPTOCOUPLER

This circuit can be used to help ensure that the varia-tions in optocoupler parameters from lot-to-lot will have less impact on the power supply closed loop performance.

Activity: Optocouplers. [Analog Devices Wiki]

Activity: Optocouplers. Objective: In this activity you will construct an optocoupler from an infra-red LED and an NPN photo transistor. You will investigate the operation of an optocoupler based analog

Precision Analog Isolation Amplifier Using HCNR201 Optocoupler

Design of precision analog isolation amplifier using HCNR201/200 dual photodiode optocoupler, input signal is isolated from output signal.

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Introduction This application note describes isolation amplifier design principles for the LOC Series linear optocoupler devices. It describes the circuit operation in photoconductive and photovoltaic modes

Optoelectronic Feedback Control Techniques for Linear and Switch

INTRODUCTION The power supply designer is continually being pressured to provide units which have higher efficiency, better regulation, less EMI and RFI, and smaller size and weight, all at a lower cost.

Activity: Optocouplers: [Analog Devices Wiki]

Compare your distortion measurements for this circuit to what you measured for the previous circuit. How much have the harmonics improved? For Further Reading: Designing Linear Amplifiers Using

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Optocouplers Desig

pplications. At Avago, for example, Type 1 AlGaAs LEDs are mainly used in optocoupler product families that include digital optocouplers, isolation amplifiers, gate drivers and

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

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