Current to Voltage Converter for High-Speed Optical Fiber Communications

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CONTACT

Edward Hsieh
hsiehe5@uci.edu
tel: 949-824-8428.

OTHER INFORMATION

CATEGORIZED AS

- **Communications**
  - Internet
  - Optical
- **Semiconductors**
  - Design and Fabrication

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BRIEF DESCRIPTION

The exponential increase in internet traffic due to the increased availability of internet access as well as high demand activities (such as movie streaming) presents an enormous challenge to infrastructure in handling this increasing amount of data. The UCI researchers have developed an ultra-broadband transimpedance amplifier (TIA), which is a key component for coupling high-speed optical fiber to conventional metal wiring. The silicon-based circuit is capable of 50 Gbps data transfer, representing a 25% increase over other, state of the art devices.

FULL DESCRIPTION

Data transfer using optical fiber networks has become an attractive alternative to conventional electrical transmission. Using light instead of electricity avoids the drawbacks of traditional copper wiring. The skin effect at high frequencies and crosstalk between adjacent channels both cause degradation of data signals that require periodic correction and power boosting for long distance transmission. However, the optical signals must eventually be converted back to electrical signals to interface with everyday electronic devices.

Fiber optics are coupled to traditional electronics in two steps. A photodiode first converts the light into current, which is then converted into a voltage by a device such as a transimpedance amplifier (TIA). The TIA must be able to operate at very high frequencies for high data transfer rates. State of the art TIA's report data transfer speeds of 40 Gbps. The UCI inventors have addressed this problem with the design of a novel circuit for an ultra-broadband transimpedance amplifier (TIA). The low-power TIA is capable of 50 Gbps transfer speeds and offers a broadband frequency response while maintaining signal integrity.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,243,523	03/26/2019	2016-762

STATE OF DEVELOPMENT

A chip prototype has been designed, implemented, fabricated, and successfully measured. The measured results showed improved performance compared to prior work. The future plan is to design other high frequency and high speed building blocks and develop a broadband transceiver.

ADVANTAGES

· A low-power 50 Gbps TIA with a wideband flat transimpedance gain frequency response that maintains signal integrity.

· Relaxes the trade-off between input noise, bandwidth, and transimpedance gain.

· Lower power dissipation (24 mW) compared to the existing technologies.

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5270 California Avenue / Irvine,CA
92697-7700 / Tel: 949.824.2683