

RIVO MULTITRADE OPTICAL SYSTEMS

Gigabit optical modules and FPGAs



Overview

AV02-3383EN WP Altera-FPGA 21Mar2012.indd Altera Corporation and Avago Technologies Inc. have jointly developed a solution that combines an FPGA and optic.

Key Takeaways

Gigabit optical modules enable high-speed data transfer between FPGAs and fiber optic networks, supporting multi-gigabit rates and long-distance communication. Overview of Optical Modules

Optical modules are optoelectronic devices that convert electrical signals from FPGAs into optical signals for transmission over fiber, and vice versa. Common types include SFP, SFP+, SFP28, QSFP, and QSFP28, each offering different speeds, transmission distances, and power requirements. Choosing the right module is critical for network stability and efficiency, and installation requires careful attention to interface type (LC, SC, ST, FC), fiber type, and proper alignment to avoid damage .

FPGA Integration

FPGAs are ideal for high-speed I/O applications due to their configurable logic, SERDES transceivers, and DSP blocks. Modern FPGAs, such as Xilinx Ultrascale or Altera Stratix V, integrate multi-gigabit transceivers (MGTs) capable of 1-28 Gbps per channel, allowing direct connection to optical modules . The FPGA handles signal processing, protocol implementation (Ethernet, InfiniBand, Fibre Channel, Aurora), and error correction, while the optical module handles the physical transmission over fiber .

Development Modules

- Samtec 25/28 Gbps FireFly FMC+: VITA 57.4-compliant, supports up to 16 channels and distances up to 100 meters, suitable for FPGA-to-FPGA or data center applications .
- Samtec 14 Gbps FireFly FMC: VITA 57.1-compliant, supports 10 channels and up to 100 meters, ideal for high-performance computing and evaluation boards . These modules provide adjustable optical power and full-duplex bandwidth, enabling flexible testing and deployment.

Practical Considerations

- Signal Integrity: High-speed traces from FPGA pins to optical modules must be carefully routed to minimize loss and reflections .
- Configuration: FPGA transceivers (GTH, GTY) require proper PLL and line rate settings, often configured via IP cores like Xillyp2p for reliable data transfer .
- Maintenance: Regular testing of connectivity and careful handling of fibers and modules ensures long-term reliability .

Applications

Gigabit optical modules with FPGAs are widely used in data centers, high-performance computing, network switches, and FPGA-to-FPGA communication, providing scalable, high-bandwidth, and low-latency links that surpass copper interconnects in distance and efficiency . By combining configurable FPGA logic with high-speed optical modules, designers can implement flexible, high-performance communication systems capable of supporting modern multi-gigabit protocols.

Article Content

AV02-3383EN WP Altera-FPGA 21Mar2012 dd

Altera Corporation and Avago Technologies Inc. have jointly developed a solution that combines an FPGA and optical transmitter

25/28 Gbps FireFly™ FMC+™ Development Kit

The FireFly™ optical engines provide adjustable power levels to support cable lengths up to 100 m. The Samtec 25/28 Gbps

Design Approach for a FPGA based Ethernet Bridge for Optical Fiber ...

The main aim of this paper is to present an approach to establish optical fiber communication by employing the

14 Gbps FireFly™ FMC™ Development Kit

As a VITA™ 57.1 FMC™, the Samtec 14 Gbps FireFly™ FMC™ Module can be used for optical data communication on any FPGA

Optical fiber link with Kintex-7 GTX and Xillyp2p

This guide shows how to set up a Multi-Gigabit Transceiver (MGT) on an AMD (formerly Xilinx) Kintex-7 FPGA, and how to connect it

Optical fiber link with Ultrascale GTH and Xillyp2p

This guide has presented a complete example of setting up a Multi-Gigabit Transceiver (GTH) on an AMD (formerly Xilinx) UltraScale

JTAG-based Remote Configuration of FPGAs over Optical Fibers

ABSTRACT: In this paper, a remote FPGA-configuration method based on JTAG extension over optical fibers is presented. The

Gigabit Ethernet with Xilinx FPGA and TEMAC IP | EasyFPGA

1000BASE-X: Utilizes SFP modules and fiber optics, making it more suitable for data centers and industrial networks,

Development of Optical Communication Framework with Xilinx Gigabit ...

The optical digital link will be established between two FPGA boards which are Spartan 6 Series SP605 boards which can be

List of protocols for communication between FPGAs with Multi-Gigabit ...

Gigabit Ethernet Even though Gigabit Ethernet is intended for communication between computers, it's possible to use this simple

Paper Title (use style: paper title)

Its transmission principle is to first convert the modulated electrical signal into an optical signal through photoelectric conversion

25/28 Gbps FireFly™ FMC+™ Development Kit

The Samtec 25/28 Gbps FireFly™ FMC+™ Module supports Data Center, High Performance Computing, and FPGA-to-FPGA

FPGAs positioned for 100G OTN, Ethernet designs

The kit, which sells for about \$25,000 without optical modules, includes a Virtex-6 HXT FPGA development board with

Fingertip-Size Optical Module, "Optical I/O Core ...

Optical I/O core based on silicon photonics technology and optical/electrical assembly was developed as a fingertip

Optical Transport Networks for 100G Implementation in FPGAs

Altera® Stratix® IV GT FPGAs solve the problem for both 100G transport and 100G Ethernet by providing integrated 11.3-Gbps

Everything You Need to Know About Optical Modules

Optical modules are electronic devices used in communication systems to transmit optical signals. These modules

25/28 GBPS FIREFLY FMC+ DEVELOPMENT KIT

As a VITA 57.4 FMC+ solution, the Samtec 25/28 Gbps FireFly™ FMC+ Module can be used for optical data communication on any

Small Form-factor Pluggable

A 10 Gigabit Ethernet XFP transceiver, top, and a SFP+ transceiver, bottom The SFP+ (enhanced small form-factor pluggable) is an

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