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Multi-port Remote JTAG over Optical Fibers under Radiation Environment

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The JTAG protocol is still the most popular method to program the FPGA where a more intelligent technology is not applicable. These days, FPGA is often used in the environment where radiation level is high and space is limited. The original JTAG protocol is based on four lines of single-ended DC-coupled signals, and it is not designed for a long distance connection under such an environment. We designed a circuit made of a small number of discrete devices to receive a custom encoded JTAG protocol (optjtag) from an AC-coupled connection, which is suitable for an optical fiber transport over a long distance. The circuit requires no programmable devices, and uses only a small area on the remote FPGA board. The optjtag protocol can be easily implemented at the local end on an inexpensive FPGA using no high speed transceivers. The protocol uses a 10-bit LVDS serializer and deserializer, operated at a data rate around 400–660 Mbps, and a local clock source on the FPGA board at the remote end. The FPGA at the local end runs on an independent clock source, and can easily handle multiple optjtag ports in applications where many remote FPGA boards have to be programmed. The discrete devices are chosen to be at least more radiation tolerant that a typical optical transceiver module. We developed a test board to demonstrate the function, and present a couple of future applications.

Minioral

Yes

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No

Are you a student?

No

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