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A 14 Gbps low power VCSEL driver for high-energy physics experiments

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We present the design and the preliminary test results of a dual-channel VCSEL-driver ASIC, LOClD65 with the aim of introducing it for the upgrade of the front-end readout system of the ATLAS Liquid Argon Calorimeter. LOClD65 is fabricated in a commercial 65-nm CMOS process, and each channel operates up to 14 Gbps. LOClD65 provides a perfect match to lpGBT, which is a single-channel 10 Gbps serializer-deserializer ASIC developed chiefly for HL-LHC upgrades. Each channel of LOClD65 can be turned off individually thus providing a flexible solution on the front-end module design. LOClD65 can also be used for general optical transmission applications in high-energy physics experiments.

The analog core of LOClD65 consists of a continuous-time equalizer, a four-stage limiting amplifier, and a high-current differential driver. The programmable equalizer can effectively mitigate the high-frequency loss due to the traces on the printed circuit board. A shared inductive-peaking technique is adopted to extend the bandwidth and reduce the chip area. A programmable active feedback circuit is used to optimize the gain and bandwidth in different process corners. The two-channel design is fabricated on a 1 mm x 1 mm die area and packaged in a 24-pin QFN package.

We have preliminary eye mask test results for LOClD65. It passed at 10-Gbps and 14-Gbps with an 850-nm 10-Gbps VCSEL. The power dissipation of each channel is 58 mW with a 6-mA modulation current and a 2-mA bias current. We plan to test the radiation effects, including SEE and TID in the future.

Description

14Gbps ASIC

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Yes

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