Ultra-fast CMOS Transceiver Design for Optical Interconnect applications

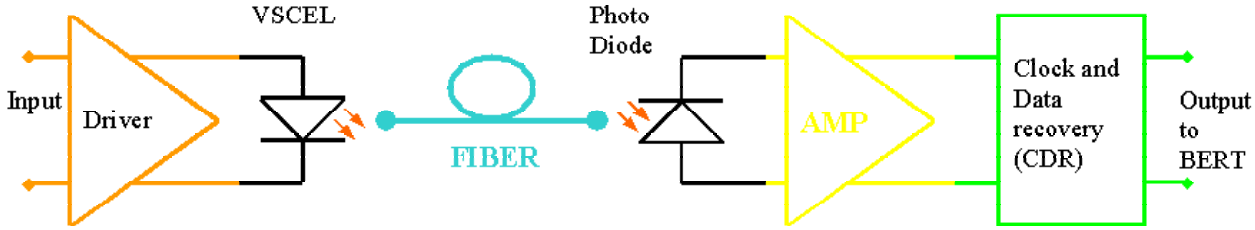

Fig. 1 A complete optical multimode link for short distance, high density applications

As in Fig. 1 depicted a complete optical multimode link consists of an electrical driver, a multimode Vertical-cavity Surface Emitting Laser (VCSEL), a multimode fiber as transmission medium, a photo receiver with a transimpedance amplifier and a clock-and-data recovery circuit.
The focus in this research project is the design of the transmitter and receiver circuits in a state of the art CMOS technology as well as the modeling of the laser VCSEL.

Transmitter

On the transmitter side an electrical amplifier drives the VCSEL by means of a current. The VCSEL converts the current into optical power. Developing and optimizing transmitter driver circuits makes a computational efficient model for the VCSEL mandatory.

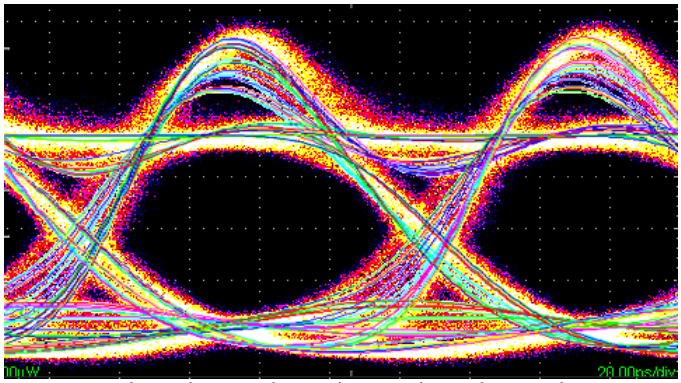

Figure 2 Measured with overlaped simulated eye-diagram@ 10 Gb/s

Receiver

On the receiver side, the photo receiver converts the optical power back into an electrical current. The first electrical stage in the receiver is the Transimpedance Amplifier (TIA), which converts the photo current into a voltage and low-noise amplifies it. Succeeding Limiting Amplifiers regenerate zeros and ones. The clock

and data recovery extracts the clock information from the non-return-to-zero (NRZ) data.

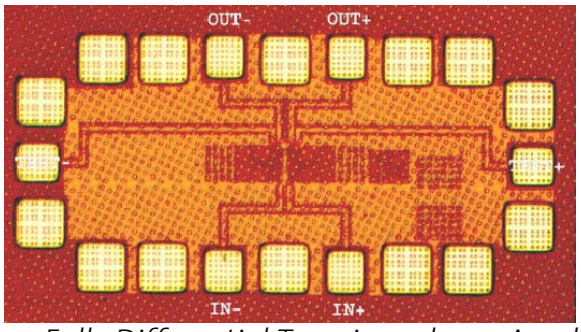

Fig. 3 Fully Differential Transimpedance Amplifier

Contact: Gion Sialm/ sialm@ife.ee.ethz.ch
Christian Kromer/ kromer@ife.ee.ethz.ch

Funding: KTI Nr. 4900.1