

“Nanometer Scaled CMOS IC’s for Short-Distance High-Density Optical Interconnects”

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▪ MOTIVATION

An efficient way to enhance the capacity of a short-distance link system is to use inexpensive optical technology. Such an optical link consists of a low-cost vertical-cavity surface-emitting laser (VCSEL) on the transmitter side, a multimode waveguide as transmission medium, and a photo diode on the receiver side. Key electrical circuit blocks of the physical layer of an optical link are the laser driver on the transmitter side and the transimpedance amplifier, DC-offset compensation, limiting amplifiers, and clock-and-data recovery (CDR) on the receiver side.

- Optical technology offers a superior bandwidth-length product and a higher integration density compared to electrical links.
- Hundreds of links can be connected to a single chip to achieve an aggregate bandwidth in the Tb/s range.
- Low power consumption of the electrical circuits in the order of mW/Gb/s.

▪ OBJECTIVES AND CHALLENGES

- With a 4x10 Gb/s optical transceiver design, it is demonstrated that it is possible to achieve the required data throughput for future high-density links systems, while still meeting power consumption restrictions according to the international technology roadmap for semiconductors (ITRS).
- A 40 Gb/s optical receiver in CMOS explores the possibilities in terms of high speed and low power consumption of today’s CMOS technology
- A clock-and-data recovery circuit presents a high data rate of 25 Gb/s and a novel topology suited for high-density, pseudo-synchronous electrical and optical interconnects.
- IBM’s standard CU-08 CMOS process with a nominal transistor gate length of 80-nm was available for the experiments. The advantages of CMOS are low power consumption and high integration, which are key for the target application

▪ APPLICATION AREA / TARGETED TECHNOLOGY

- High throughput communication systems
- Chip-to-chip or system-to-system interconnects for Internet and telecommunication routers
- Memory bus in Computers

▪ APPLYING INDUSTRY / RESEARCH

- Semiconductors
- Laser optics
- System Integration, Packaging

▪ CONTACT

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