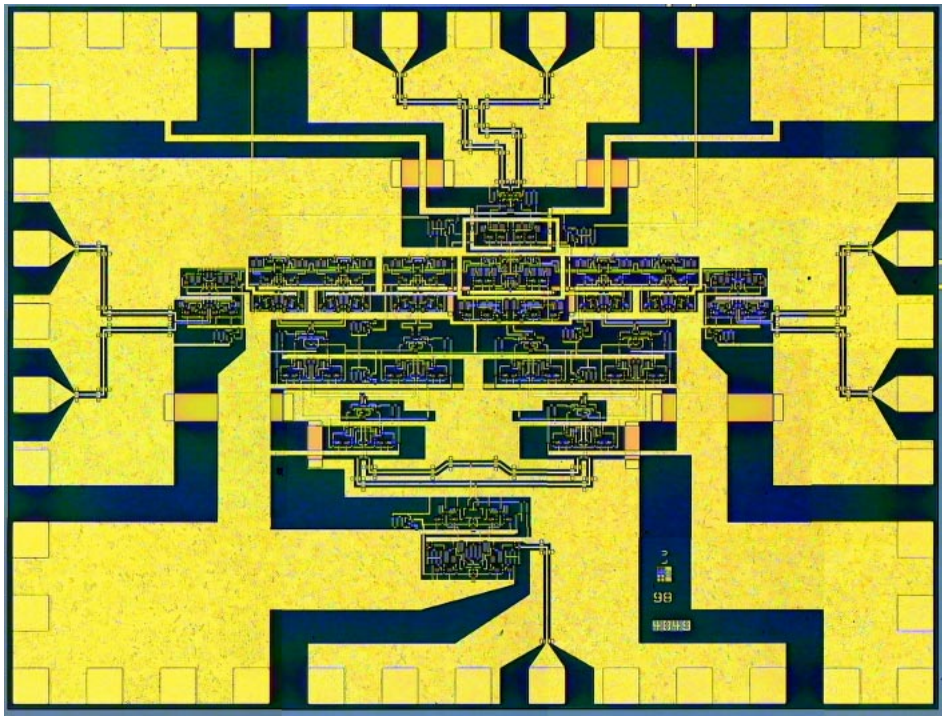
Fraunhofer Institut
Integrierte Schaltungen

High-Speed ASICs for Optical Communications



Chip photograph of a 2:1 Multiplexer for 80 Gb/s

High-speed IC design

High speed ICs are key components for fast and ultrafast optical communication links. Devices like multiplexers and demultiplexers, linear and limiting amplifiers as well as ICs for clock and data recovery in the receiver and laser driver in the transmitter are needed in every communication link.

In this field, we are designing application specific ICs (ASICs) and systems for high and low speed optical communication applications. We do ASIC-design since 1985 and have a lot of experience with designing ICs for commercial and research applications.

We use InP-HBT and HEMT technologies in research projects and commercial silicon bipolar, CMOS/BiCMOS, SiGe-HBT and GaAs-MESFET technologies for industrial designs.

Applications

In optical communications, ASICs are needed for up to 40 Gb/s optical data links as well as for 100 Mb/s to 1 Gb/s short distance communication over polymer optical fibers or in Fiber-to-the-home (FTTH) systems.
We cover each of those applications and are able to design ICs both in CMOS- and in SiGe- or InP-HBT technology.

Project examples

Mostly in cooperation with industrial partners we developped ICs including
- 4 x 10 Gb/s Pseudo Random Bit Sequence Generator (PRBS)
- DEMUX 4x10 Gb/s to 16x2,5 Gb/s
- TIA, limiting amplifier and laser driver for FTTH at 1,25 Gb/s
- Optoelectronic receivers for 100 Mb/s links over polymer optical fiber (POF)

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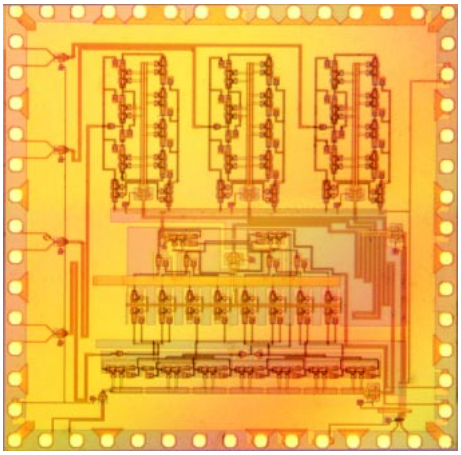
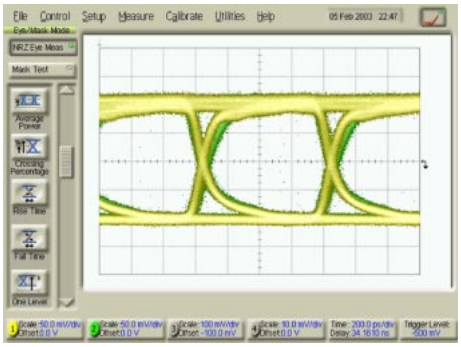


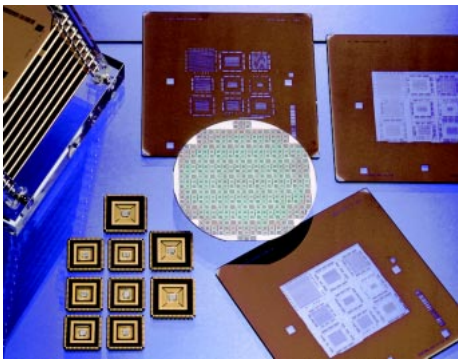
Chip photograph of a 4 x 10 Gb/s PRBS-generator



Eye diagram of a limiting amplifier at 1,25 Gb/s

Small volume production

Together with foundry partners we offer small volume production of ICs in CMOS, BiCMOS and SiGe-HBT technologies. The fastest technology available with this service is a 0,35µm-SiGe-BiCMOS process with a transit frequency of 70 GHz.



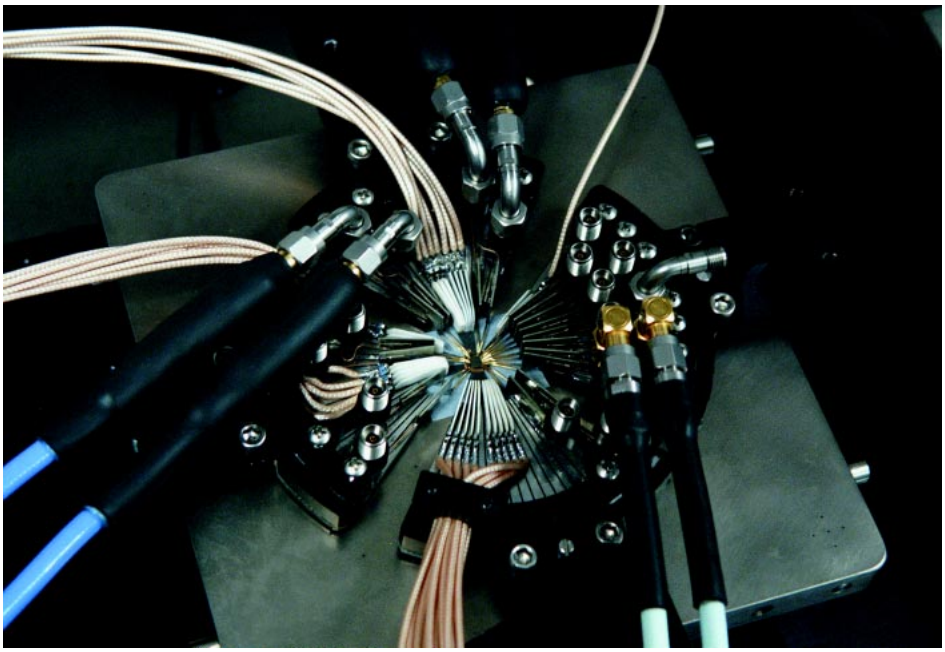
Mask set and chips from small volume production

We offer organization of fabrication, production test and packaging and deliver industrial qualified devices in any quantities. If high volumes are needed production services are performed directly at the foundry.

Evaluation and characterisation

After fabrication of prototypes by our foundry partners usually a characterization of the chips is performed on a wafer prober in our laboratory. We can offer semi-automatic measurements on a probe station.
Our measurement equipment includes:

- Wafer probes up to 67 GHz
- Pattern generator up to 15 Gb/s
- Signal sources up to 60 GHz
- Sampling scope with eye diagram analysis up to 67 GHz
- S-parameter test up to 67 GHz
- Spectrum analyzer up to 40 GHz



Wafer prober measurements of a high-speed ASIC