

Photonic Boards

Date: 09.08.2024

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Photonic Boards to boost future Micro TCA Systems?



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Who we are

- SME based in Heiden, Switzerland
- Spin-off from Varioprint AG (PCB)
- Designer & Manufacturer of photonic boards
- Applications & Markets:
 - Photonic Sensing (Medical, Industrial, Environmental)
 - High-speed on-board communication (Telecom, Aerospace)
 - Photonic chip packaging (Telecom, Sensing,...)





What we do: Photonic Boards / Optical PCBs

vario-optics manufactures optical printed circuit boards (oPCBs)

Design & Development

- Feasibility Studies, Engineering
- Electro-optical Co-Design

Prototype/Pilot Production

- Functional Devices
- Evaluation boards

Manufacturing

- Custom Runs
- Support for packaging & assembly





Core Technology I: Planar Waveguides





	Multimode	Singlemode	
Spectral Range	450 - 1600 nm	850 - 1600 nm	
Propagation Loss	0.05 dB/cm (850nm) - 0.5	dB/cm (1550 nm)	
Power Handling	> 1W	100 mW	
TE			



- Adjustable MFD (4 10 μm)
- On-chip mode conversion
- TE / TM Polarization supported
- Polarization maintaining!

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vario-optics Polymer Photonics Portfolio

> 15 years of Waveguide R&D Know-How



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Core Technology II: PCB Integration & Reliability





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- Max Panel Size (MM): up to 305 – 460 mm²
- Reflow soldering compatible (260°C, 0.5 min)
- Recently successfully passed ESA technology validation

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Environmental Stability:	
Operating Temperature	120°C
Environmental Test	85% rel.h / 85°C for 2000h (Telcordia)
Temperature Cycling	- 50°C to + 100°C



Markets & Applications

enabling technology for many use-cases



Pulse oximetry

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- Absorption spectrometry
- On-chip interferometry

2) On-Board Photonics for Tele-/Datacom



- Electro-optic boards
- Highest data-rates
- Massive power reduction using optical signals

3) PIC packaging



- dense integration of electronic and photonic interfaces
- High-channel counts with small pitch

On-Board Photonics

Ongoing project on a 100G demonstratorboard within Cobo





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Massive assembly cost-reduction

- vario-optics embedded waveguide technology brings photonics to the board level inside the module
- Combination and integration of optical and electrical connections is a key-enabler for optical transceivers, copackaged optics, integrated photonics etc.

Conventional (PCB + glass fibers)









Optical High-Speed on-Board Communication high-performance computing

- 1.4 Tb/s on board communication
- 20 electrical layers 1 multimode optical layer
- 4 mid-board optical engines (Finisar)
- Xilinx Virtex FPGA for simultaneous coding, switching, BER & eye diagram measurements on all 48 optical channels
- Automated assembly (Benchmark)
- Double sided reflow soldering



Embedded



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Benchmark

Chip-packaging example: ICT STREAMS

Substrate for High-Speed optical Chip-Chip Communication, Silicon Photonics







www.ict-streams.eu



High-performance **Electro-optical circuit board** for high-data rate Silicon Photonic transceivers, with ultra-low power consumption

- a) & b) high-frequency RF electrical signal interface
- c) Polymer Singlemode waveguides (@1310 nm)
- d) adiabatic optical-coupling interface (< 1dB loss; assembly tolerance ± 2µm; Broadband spectral operation)
 - 400 Gb/s (8-channel) data-transmission
 - 70% power reduction (compared to electrical communication)
 - 5pJ/bit (50Gbit/s) vs. 16pJ/bit (QPI)*

* T. Lamprecht et al., "EOCB-Platform for Integrated Photonic Chips Direct-on-Board Assembly within Tb/s Applications", IEEE 68th Electronic Components and Technology Conference (ECTC), San Diego, USA, 2018, pp. 854-858



On-board Calvanic Separation

- Separation of any voltage levels the optical length can be adjusted to the needs of the application
- Very high bandwidth the bandwidth of optical signaling is not limited (up to multiple GHz)

Applications:

- **High Voltage Systems with many connections** EV, Rail, Industrial
- Hermetically sealed systems
 Embedded in PCB













Let's keep up inspiring

Globally leading, energy saving high-speed solution provider for optical communication and miniaturized sensors

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