



Scalable Photonic Integration for Secure High-Speed Data Networks

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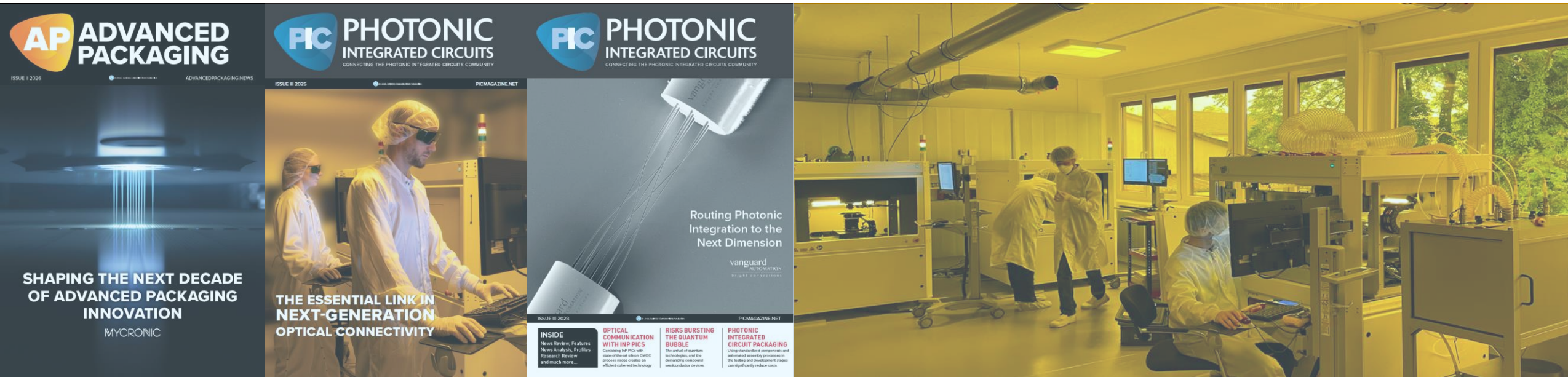
PRODUCT FOCUS



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AUTOMATION
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Vanguard Automation on a Page

Unique IP and Fully Automated Tool Chain for Photonic Interconnects



2018

Joint Venture between
KIT Spin-Off and ELAS
Technologies GmbH –
headquartered in
Karlsruhe, Germany

2024

Joined Mycronic AB (publ)
Swedish high-tech group

MYCRONIC

Unique IP

Growing patent
families in the field of
3D lithography and
photonic packaging

Products

Process technology incl.
Systems, Software,
Consumables, related
Support and Services

50+

Employees (18
nationalities)

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Today's Packaging and Assembly Challenges

Different Mode Field Sizes and Heterogenous Material Platforms

Mode field matching



High-precision assembly alignment



Fast and reproducible packaging

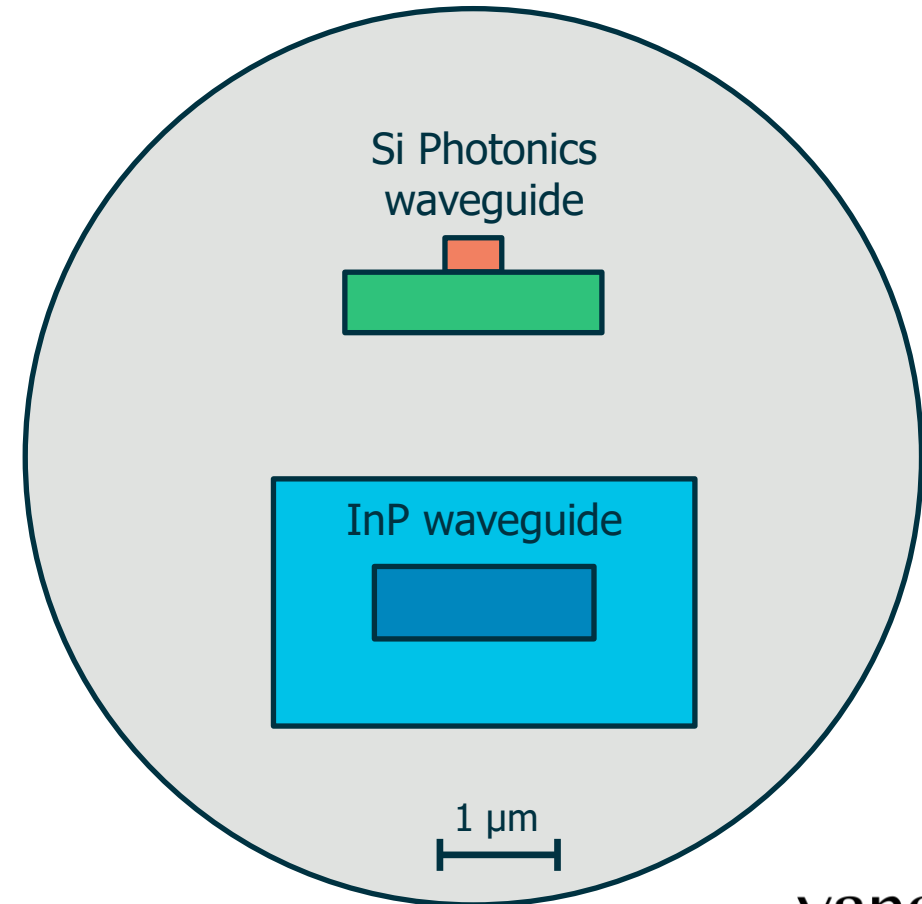


Reliable under various conditions



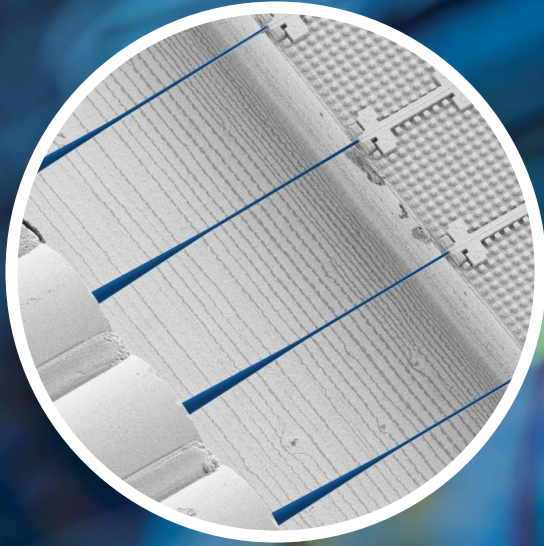
Over 80% of the cost of photonic integrated systems are generated by the packaging process

Single-Mode Fiber Core



Enabling Next Generation **Photonic Integration and Packaging** Solutions with **3D Laser Lithography Solutions**

Photonic Wire Bonding (PWB)

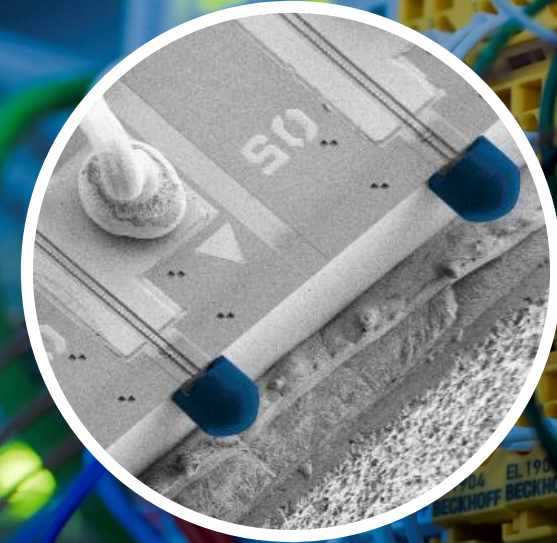


Low loss connections to arbitrary mode fields

Automated, reproducible and **fast**

Reliable connections under various conditions

Facet-Attached Micro-Lenses (FAML)



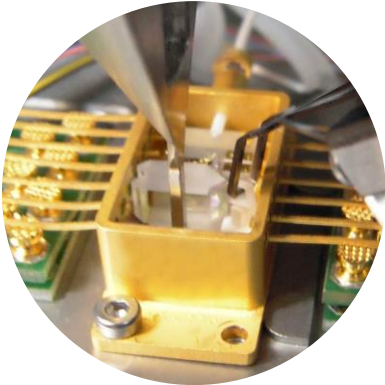
High interconnect density (compact modules)

High degree of **design flexibility** for hybrid multi-chip integration

Compensate for process misalignments and **relax tolerances**

Unique Solution to Photonic Packaging and Integration

Industry-Grade 3D Nano-Printed Photonic Interconnects (PWBs, FaMLs)



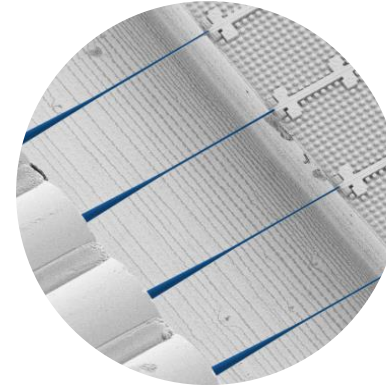
Lens Active Alignment

Current devices are built with active alignment. **Limited scalability and miniaturization.**



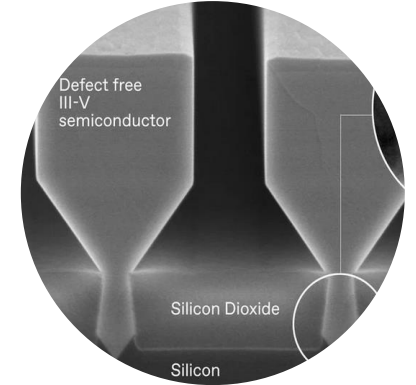
GT-PI Micro-Optical Lenses

3D in-situ nano-printed lenses allow parallel optical connections in a much smaller form factor. **Improves coupling efficiency, increases yield, enables passive alignment.**



GT-PI Photonic Wire Bonds

Fast, low loss connections between known-good components. **No alignment, no lenses, smaller packages, enabling new designs.**



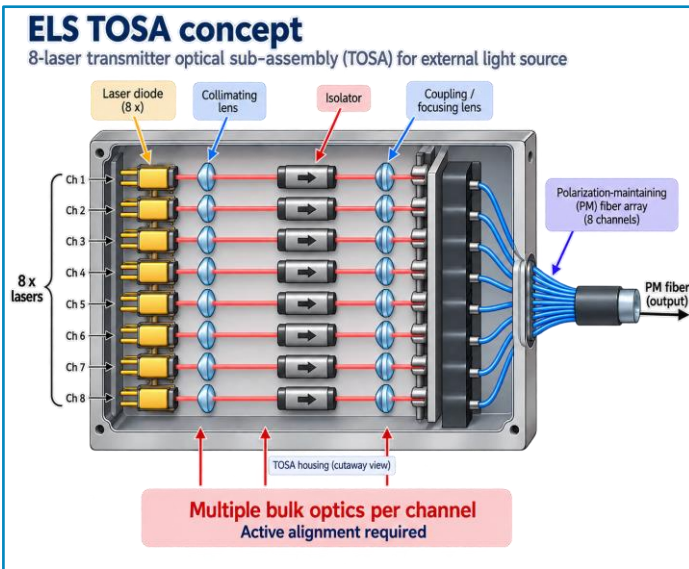
Heterogenous Integration

Direct laser integration on silicon SOI wafer. **Locked into specific components, longer development times, lower yields.**

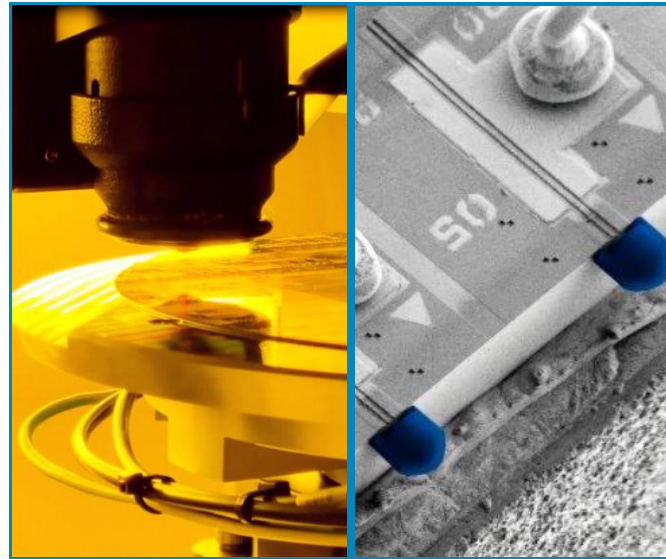
Enabling Scalable Laser Integration for ELSFP

Wafer-level processing and passive alignment: Improved economics and scalability

Incumbent approach: Actively aligned bulk optics



3D Lithography: Wafer-level process and passive alignment



Improved scalability and economics

- ▶ **Increased throughput and yields:** Removes multiple alignment and epoxy curing steps
- ▶ **Reduced Cogs:** Eliminates need for discrete bulk optics.
- ▶ **Supply chain flexibility:** Allows for faster integration of alternative, or next generation laser sources.
- ▶ **Cost reduction:** Up to **5× lower cost** today per Photonic Interconnect, with a path to **another 5× improvement**.

*Photonic Interconnect (PI) – effectively two 3D nano-printed lenses

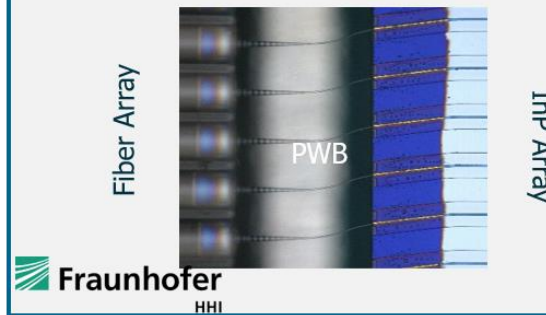
Compatibility and Performance with any Material Platforms

Average losses 1-2 dB with sub-dB losses for focused process optimization

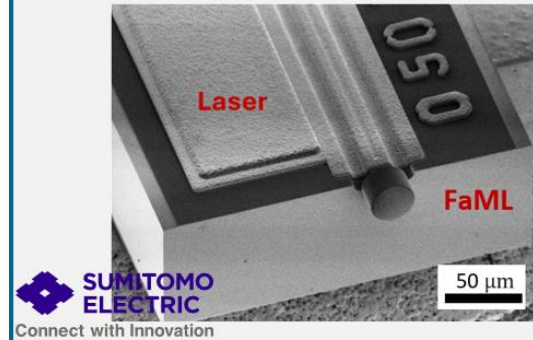
Silicon (**AMF**, Singapore)



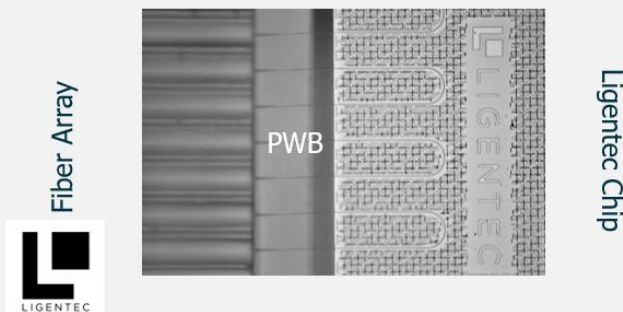
Indium Phosphide (**HHI**, Germany)



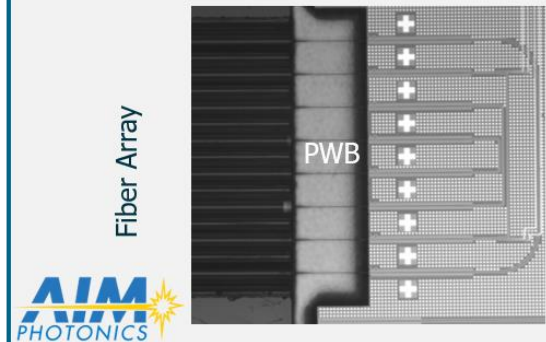
Indium Phosphide (**Sumitomo**, JP)



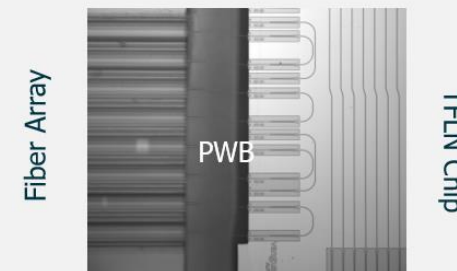
Silicon Nitride (**Ligentec**, Switzerland)



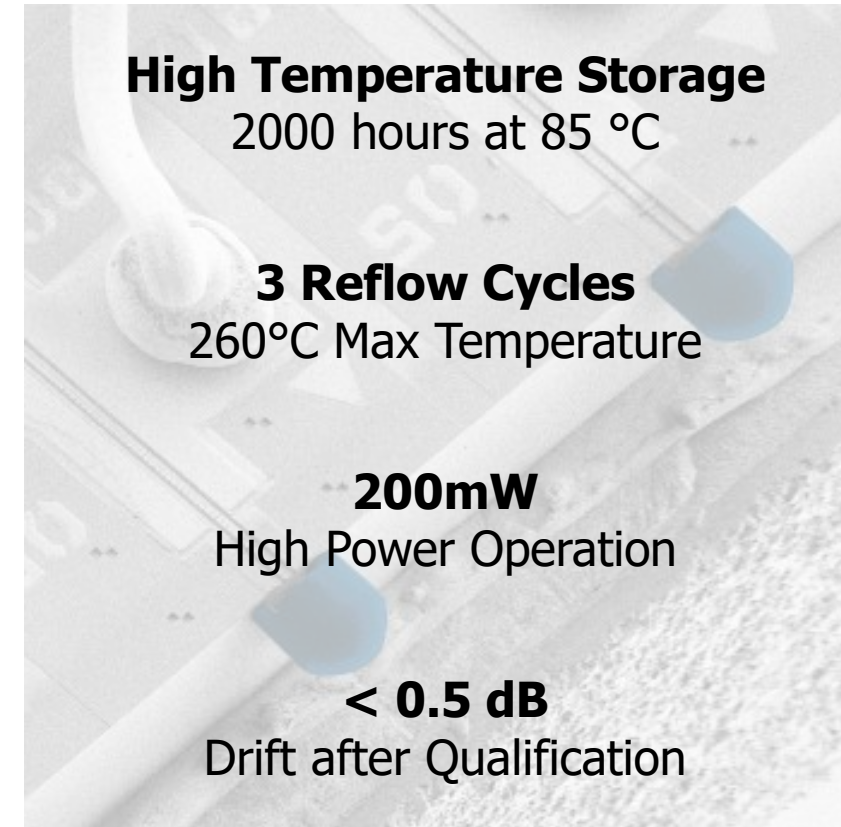
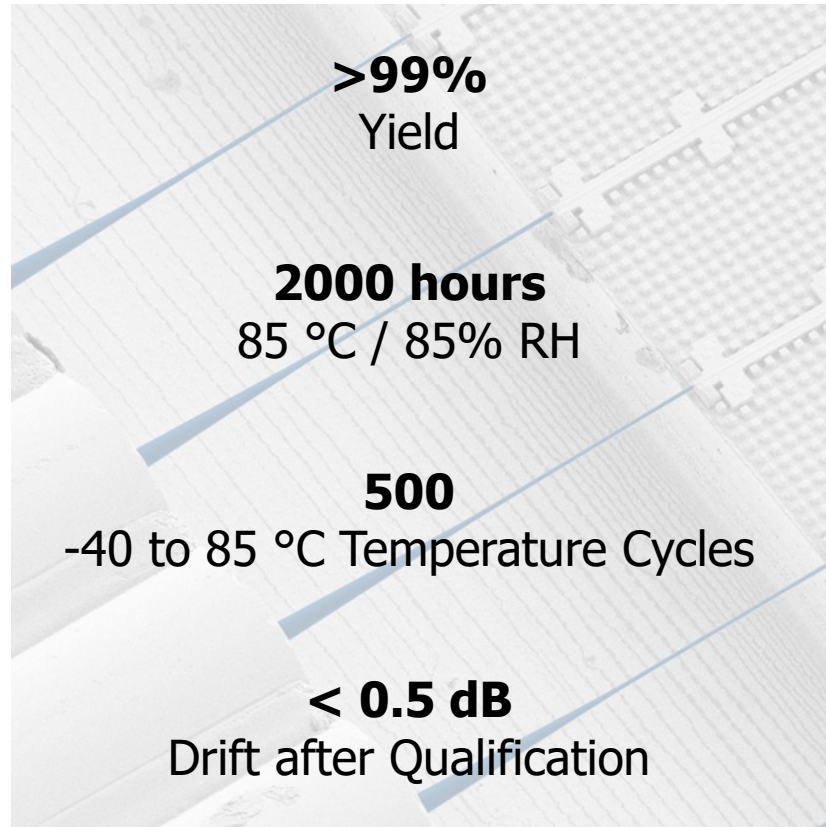
Silicon Nitride (**AIM**, USA)



TFLN (**CSEM**, Switzerland)

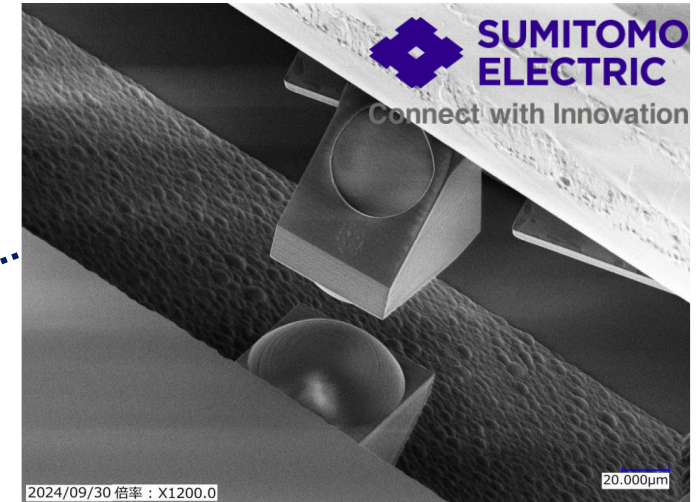
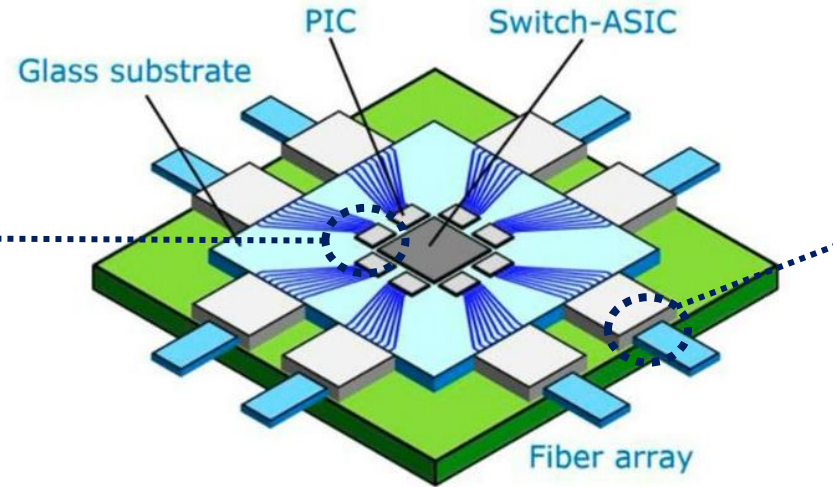
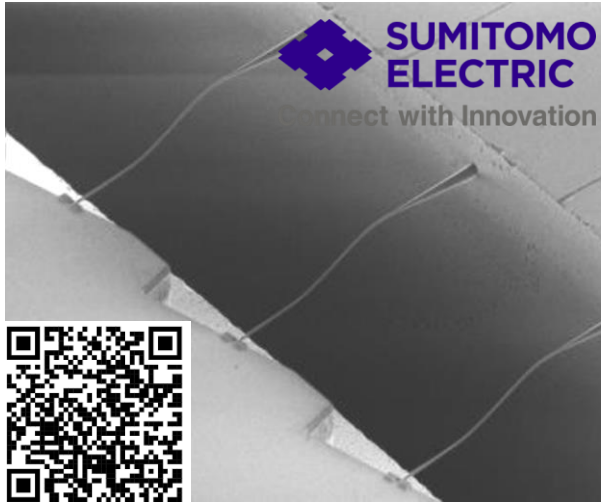


Yield & Reliability – Proven at scale across hundreds of devices



Stable optical performance maintained after extensive qualification testing

Use Cases – Co-Packaged Optics (CPO)



„A surface-mount photonic package with a photonic-wire-bonded glass interposer as a hybrid integration platform for co-packaged optics”

Glass interposer to PIC optical integration

Edge to edge coupling with **Photonic Wire Bonds**

Coupling efficiency -1dB per interface

“Flip-chip photonic-electronic integration platform for co-packaged optics using a glass substrate with vertically coupled beam expanding lens”

PIC to fiber array unit integration

Vertical coupling with **facet-attached micro-lenses**

Coupling efficiency -1.2dB

Use Cases – Optical Engines

Collaboration to incorporate 3D-lithography technology into POET's Optical Interposer™ platform.

Increased Efficiency

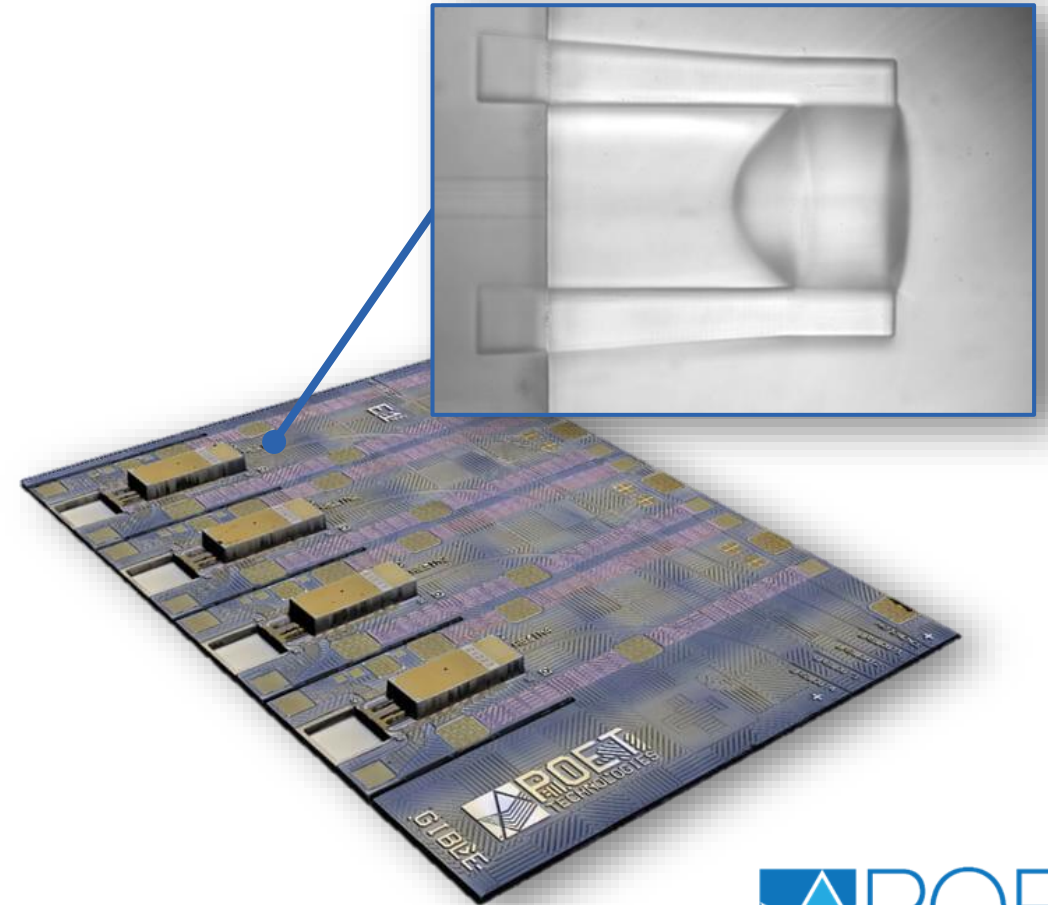
Reduction of coupling efficiency and reduced power consumption.

Cost Reduction

Reduction of cost per optical interconnect through increased throughput and reduced material cost.

Wafer-level scaling

Micro-lenses shall be fabricated onto POET's LightBar™ product to validate the power efficiency improvements and the viability of chip-scale wafer-level manufacturing.



Vanguard **SYMPHONY 1000**

Unique IP and Fully Automated Tool Chain for Photonic Interconnects

Machines

SONATA 1000



Automated 3D Lithography-based
Nano Printing

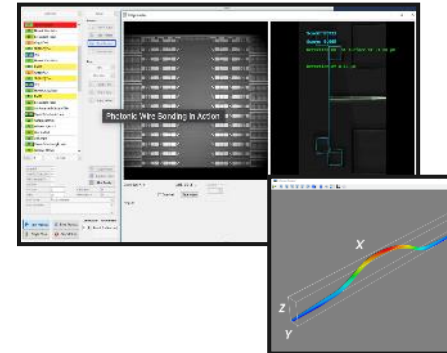
REPRISE 1000



Automated Pre- and Post-Processing:
Development and Encapsulation

Software

Composer and BrightWire3D



Software for Machine Control, Process
Development and Management

Materials and Services

VanCore Resist Series



Materials for the
production of PWBs
and Micro Optical
Lenses

Professional Services



- Training
- Process Development
- Feasibility Studies
- Development Support
- Maintenance Services

COMPLETE INDUSTRY READY SOLUTION

#1139



Bringing tomorrow's electronics to life

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