OCP SPECIAL FOCUS:
PHOTONICS



VCSEL-based High Density Interconnects

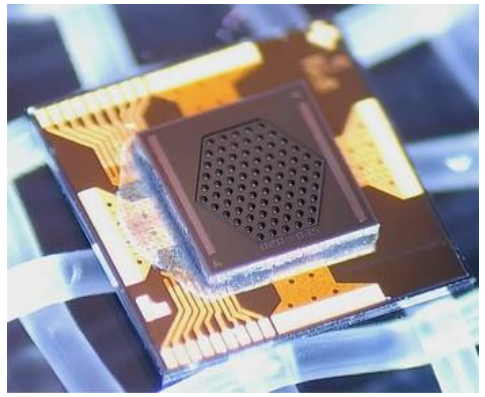
Oleg Shchekin

Lumentum

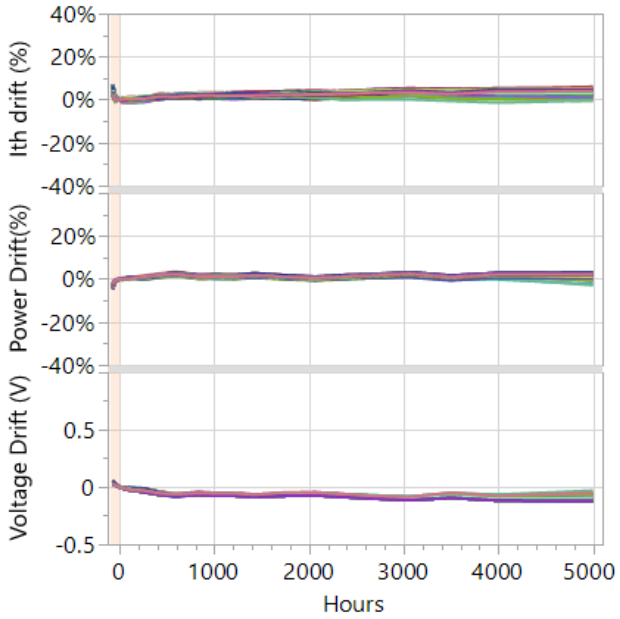


VCSEL-based High Density Interconnects

- Scalable architecture
- High bandwidth density
- High energy efficiency
- Existing assembly methods
- Existing fiber and connector ecosystem
- Reliability
- High-volume manufacturing

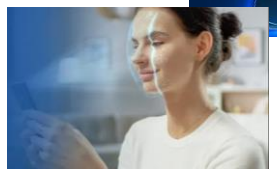


1060nm VCSEL HTOL 5000 h
8mA 115C oven → Tj 181C

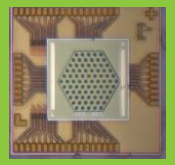
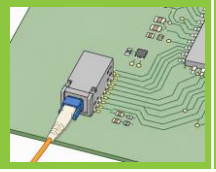
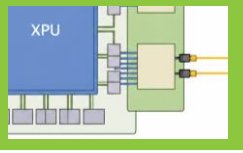
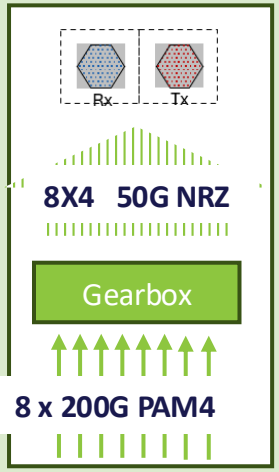
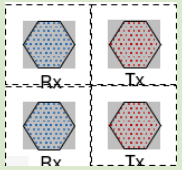
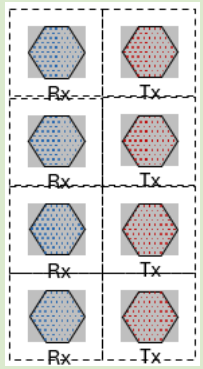
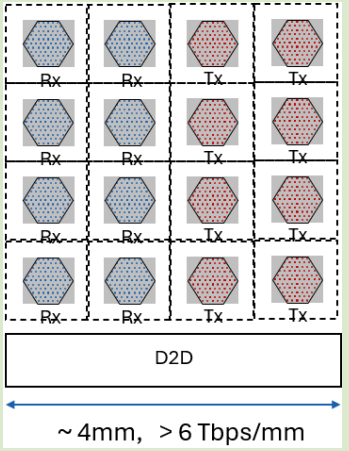


3D Sensing
Supply chain



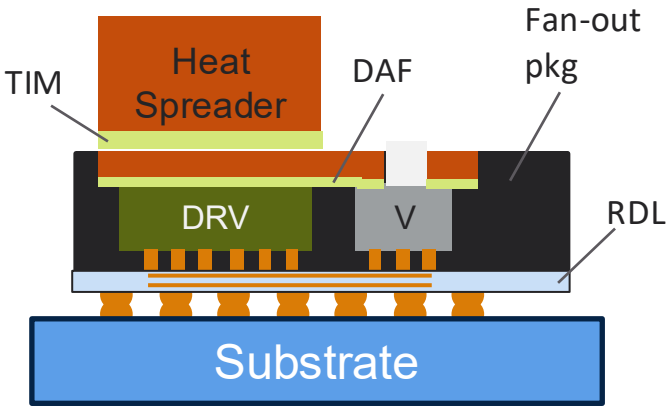


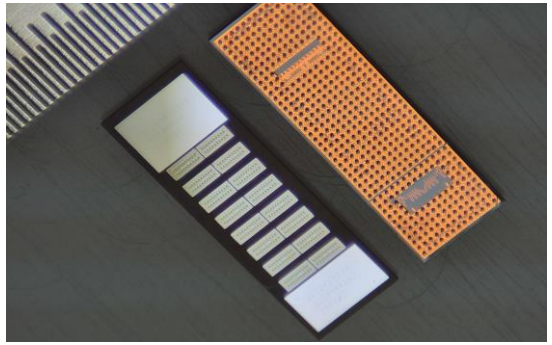
Scalable Architecture

Application		Scale-up, Scale-out			Scale-in
Form Factor		Pluggable  		NPO 	CPO 
	Array	1.6T	3.2T	6.4T	12.8T
Configuration examples	**Channel data rate** / **1.6T: Channels/array for with sparing for FIT < 1** 32 Gbps: 54 50 Gbps: 36 64 Gbps: 30				
Protocol/ Interface		Ethernet, InfiniBand, Ultra Ethernet, PCIe, NVLink, UALink			D2D, UCIe 32G, 64G NRZ

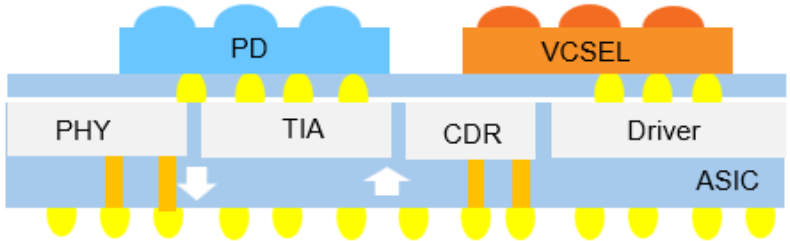
CMOS Integration

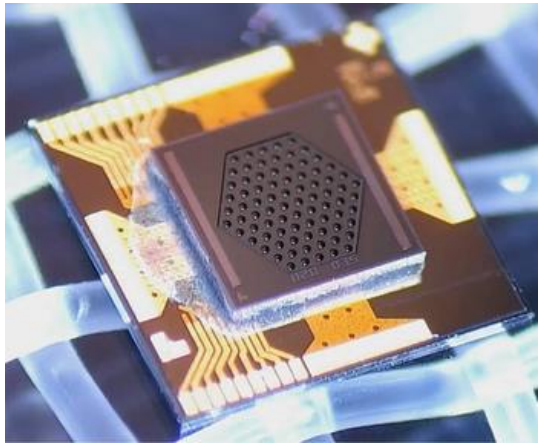
Wafer-level Fan Out Package (WLFOP)





3D stacked

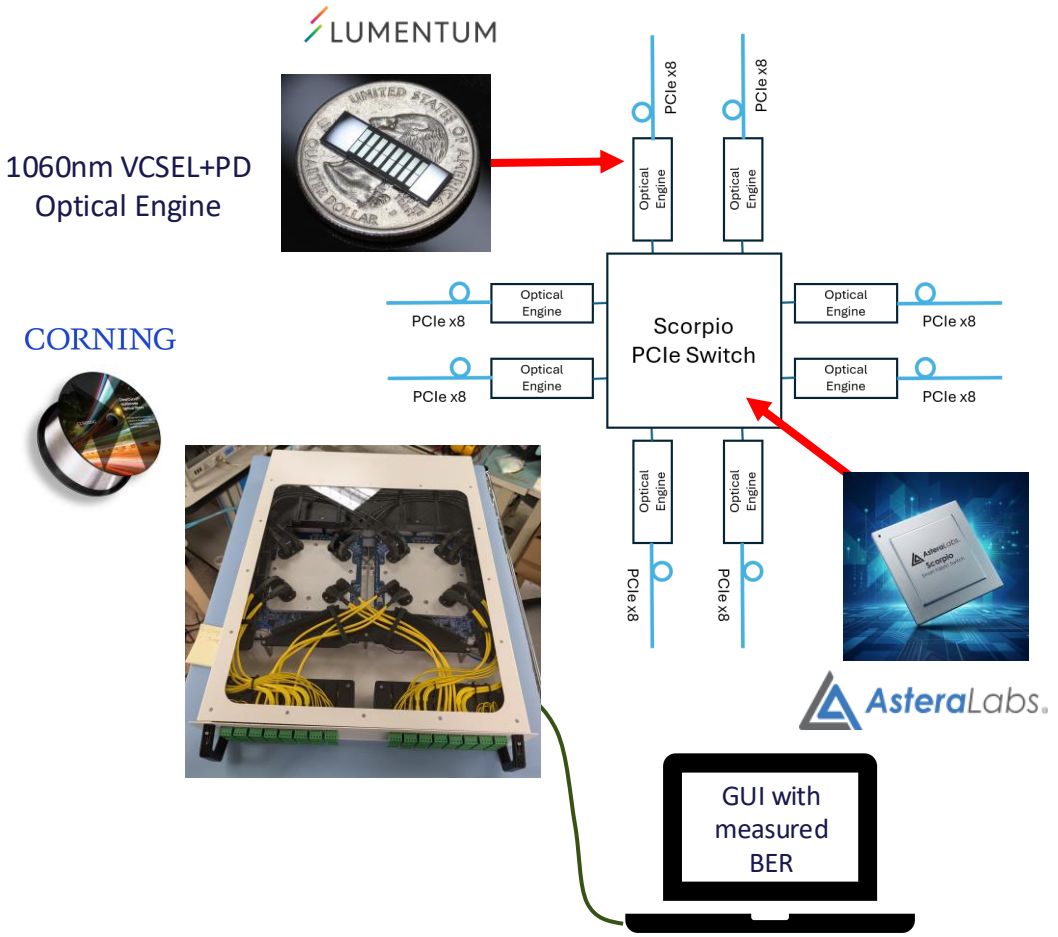




PCIe Optical Connectivity

LUMENTUM AsteraLabs. CORNING

- High-density optical PCIe solution for AI scale-up/in
- Tens-of-meters reach over multimode fiber
- ~1 Tb/s/mm today; line of sight to ~4 Tb/s/mm
- Designed for emerging wide/slow and narrow/fast interfaces
- Proof-of-Concept Rack-level Demo:
  - 1060nm 3D FOWLP VCSEL/PD Tx+Rx optical engines
  - Scorpio PCIe switches in the same NPO / CPO-like rack tray
  - Multiple 32 Gb/s NRZ channels running live
  - Error-free PCIe-5 link over OM3 multimode fiber
  - Optical engine path to <2.5 pJ/bit
- Live Demonstration of Optical PCIe Connectivity: Booth B34



Call to Action

- Continue dialogue on
  - System requirements and key figures of merit
    - Energy efficiency (pJ/bit) — including definition of the system boundary
    - Reach, latency, and cost for key use cases
    - Establish consistent metrics to enable meaningful technology comparisons
  - Ecosystem of electronics, fiber solutions and connectors

Thank You!

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