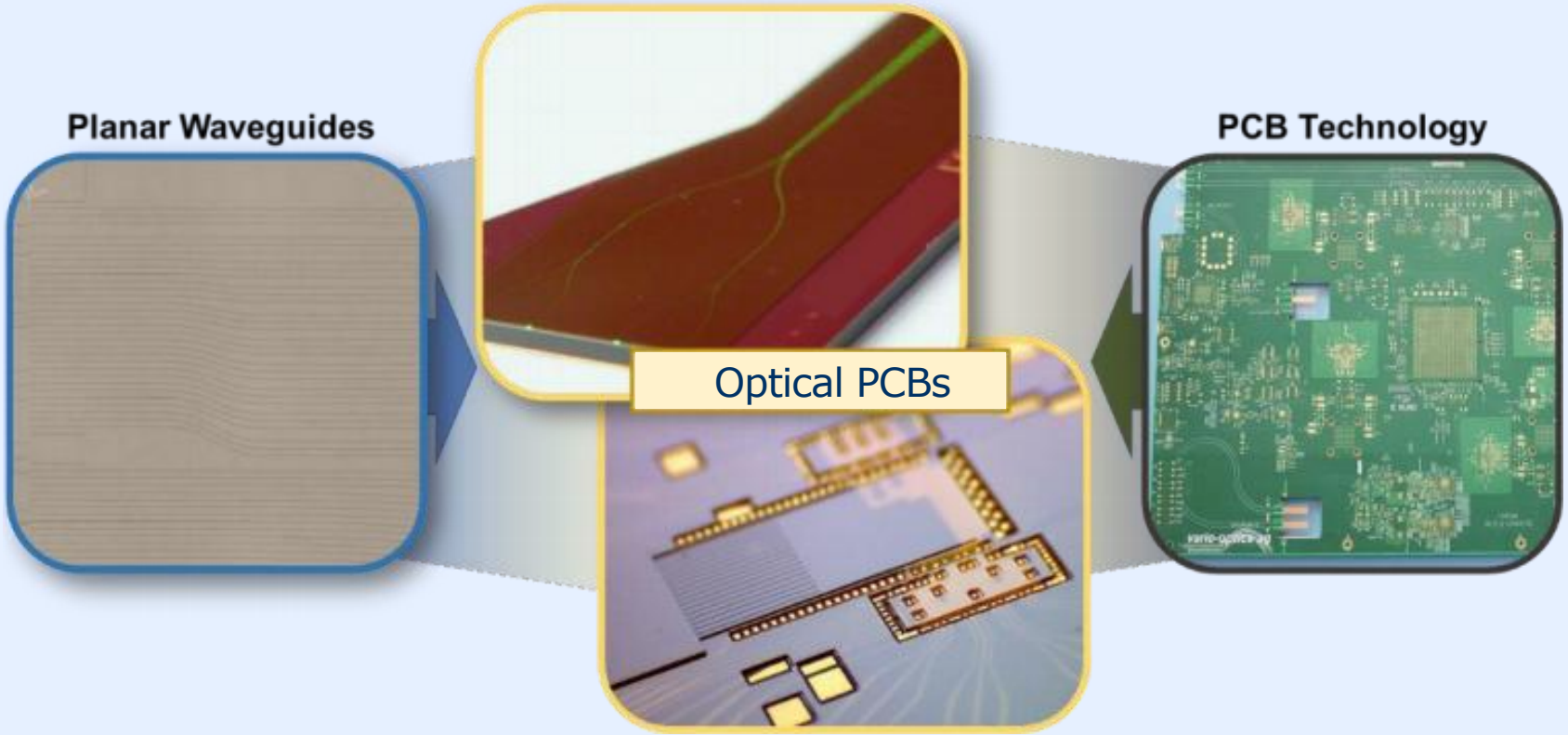
Technical Capability

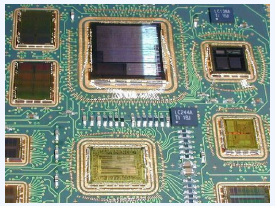


In short, optical PCBs combine optical and electrical signals on the same substrate, enabling smaller, faster, and more efficient electronic devices.

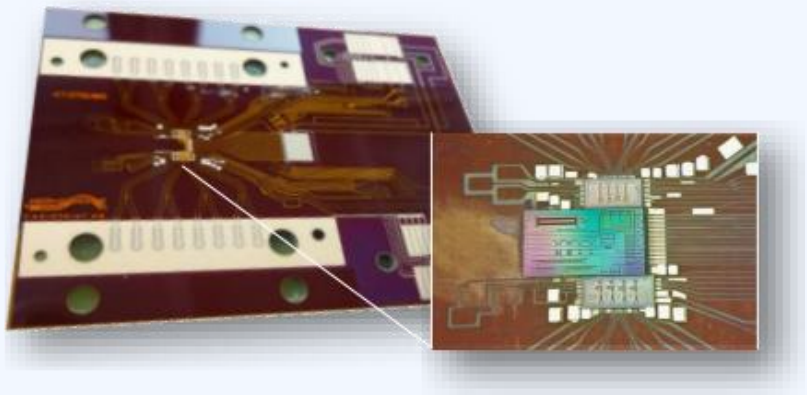
Planar Waveguide Technologies/PICs

Chip level





Board level



PICs / Transceivers

Sensing

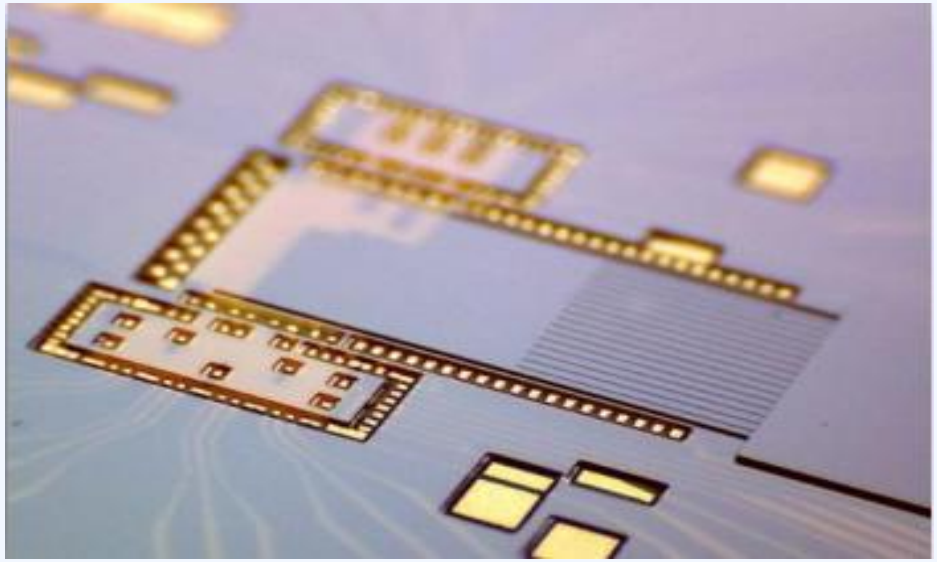
Optical Interconnects

governed by refractive index (contrast)

High ← complexity / confinment → Low

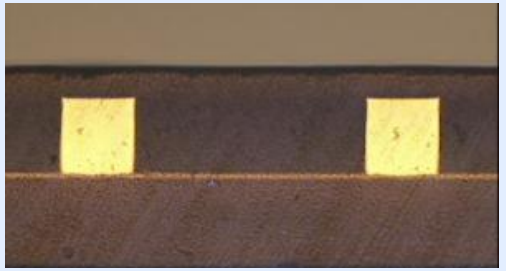
Core Technology —— Planar Waveguides

The **planar waveguide** is a waveguide with a planar geometric structure that guides light in only one dimension. They are typically formed by depositing a thin film of dielectric material (such as glass) on a planar substrate.



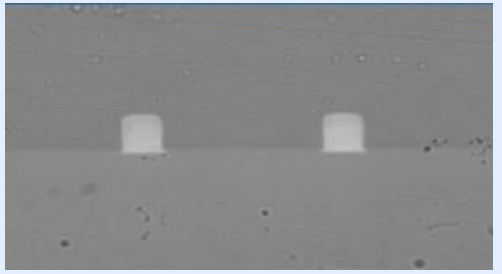
Multimode

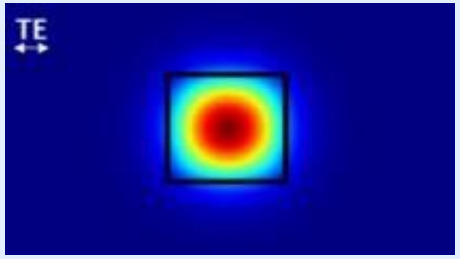
Core Size: 30 - 500 μm



Singlemode

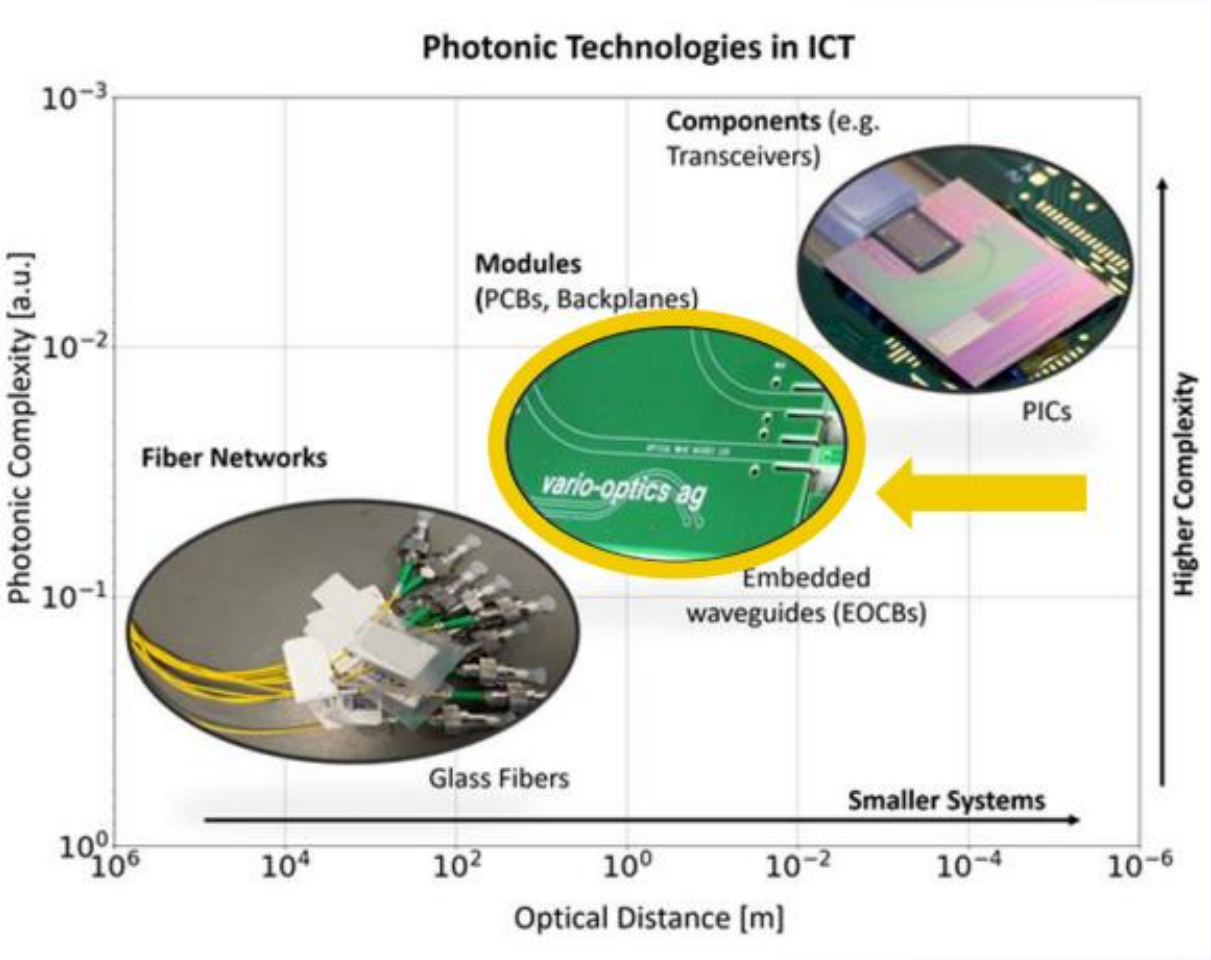
Core: 2 – 5 μm

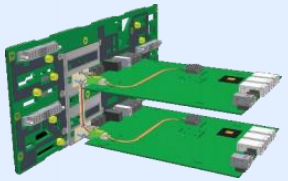




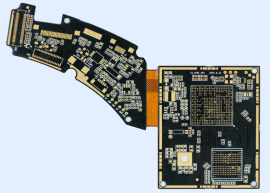
- Adjustable MFD (4 – 10 μm)
- On–chip mode conversion
- TE/TM Polarization supported
- Polarization maintaining!

Application





On-Board Photonics Optical data-transfer (high data-rates, low power consumption) in datacenter racks, flight computer etc (optical backplane)

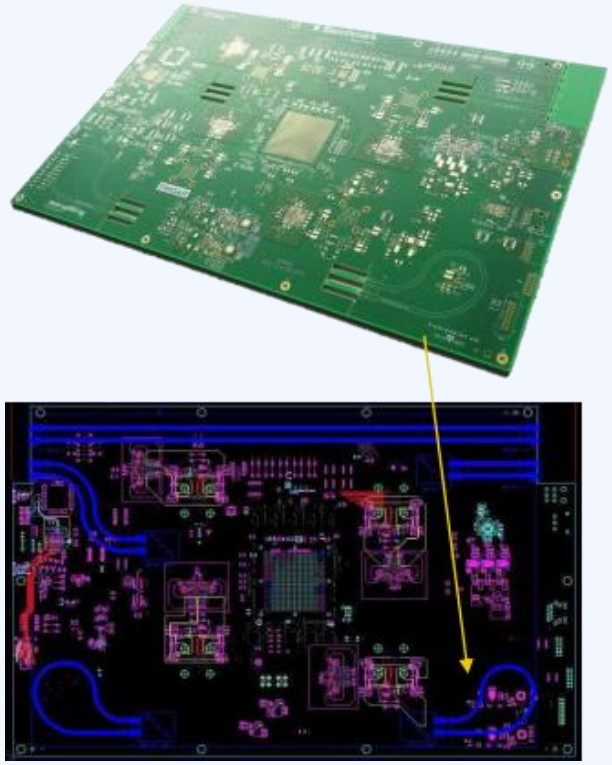


Optical Sensing Small footprint, miniaturized, highly-integrated electro-optical subsystems

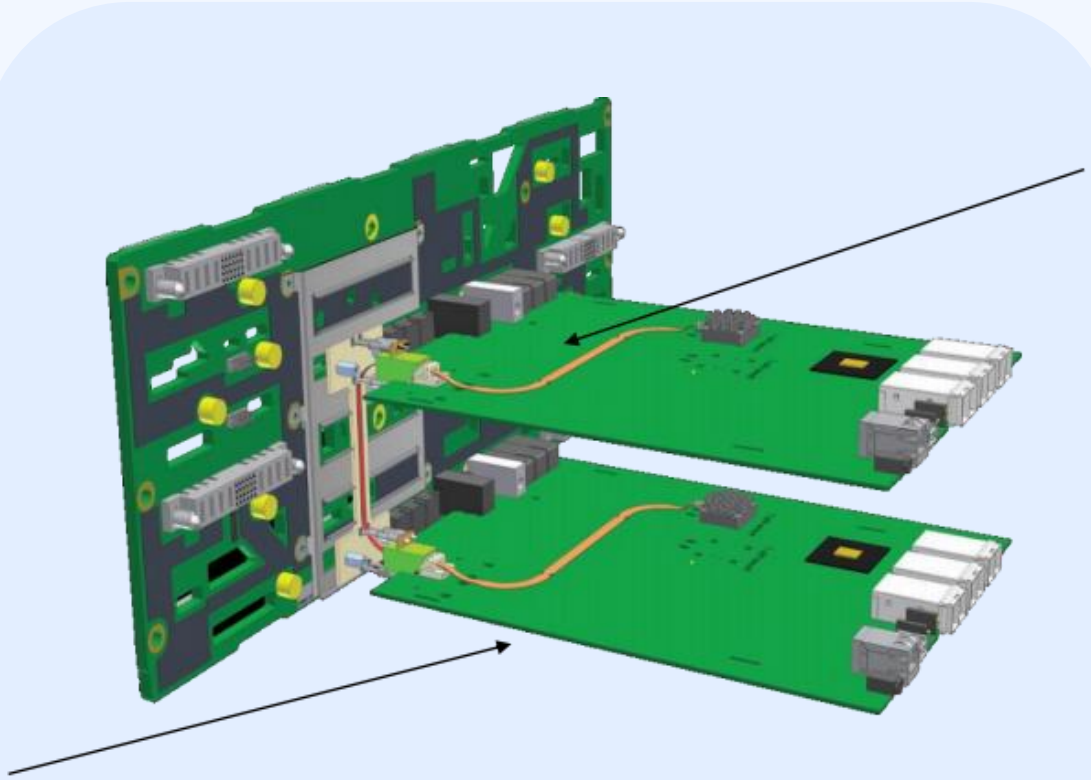
Efficient & scalable packaging/access to PICs & PIC/IC chiplets (e.g. silicon photonics)

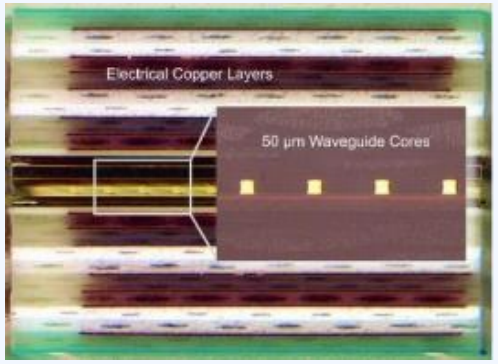
Application

Board-Level Photonics Modules Datacenter architectures



Electro-optical Stack-Up



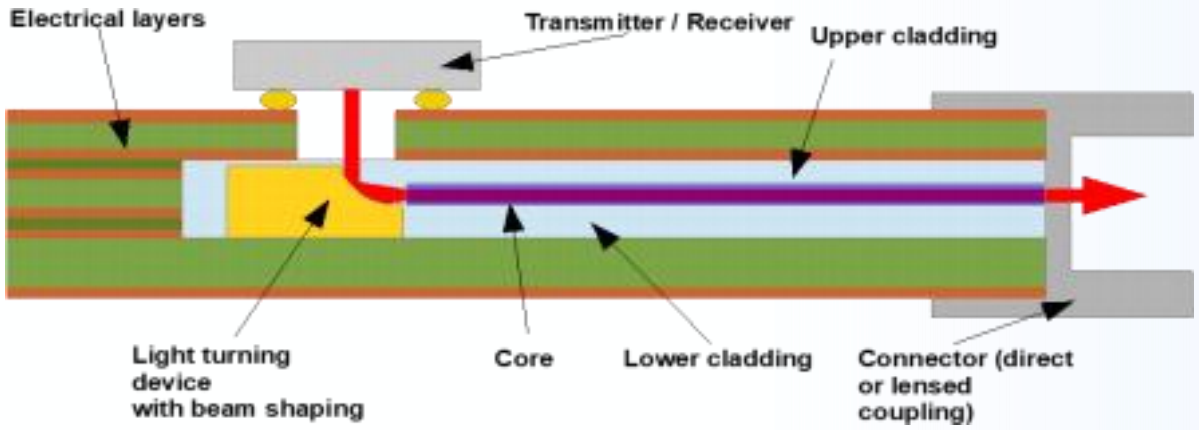


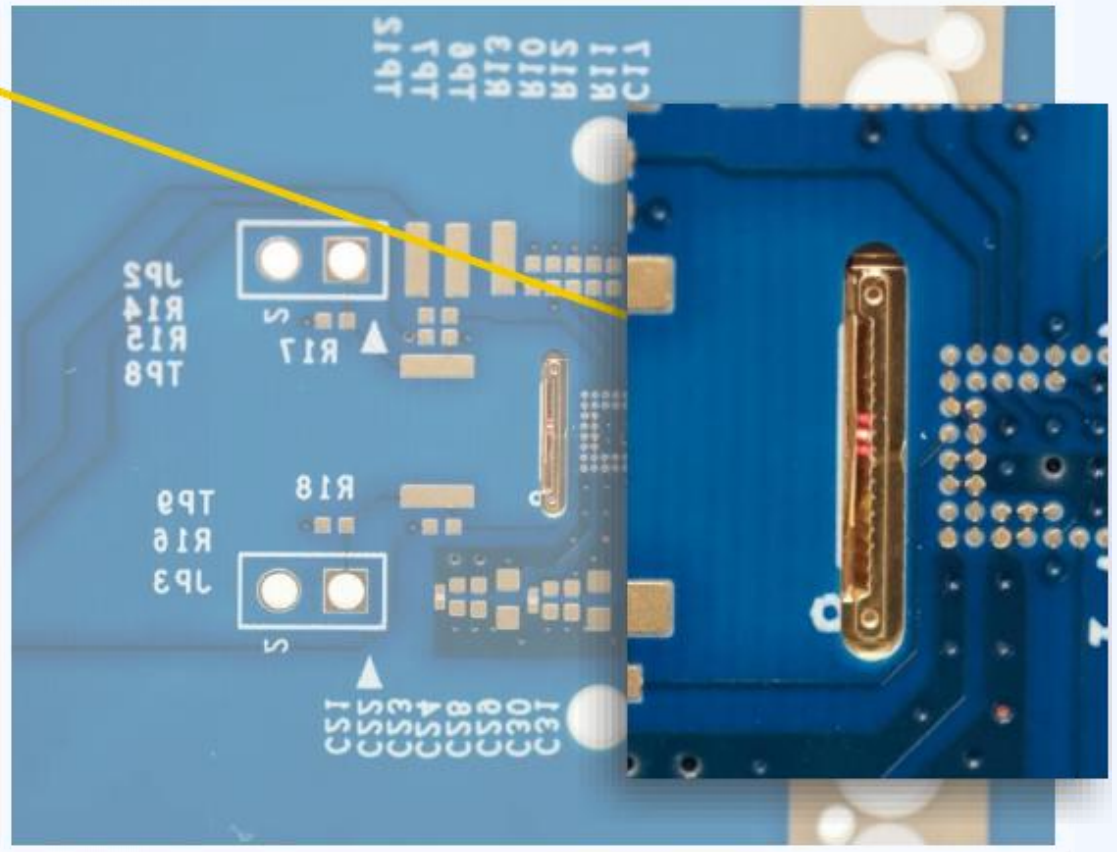
Embedded optical Waveguides

Application

High-Speed on-board communication vertical coupling

Passively aligned parabolic mirror array couples light out vertically.





Placement of optical engine with +/- 10 µm required – possible with die-bonder

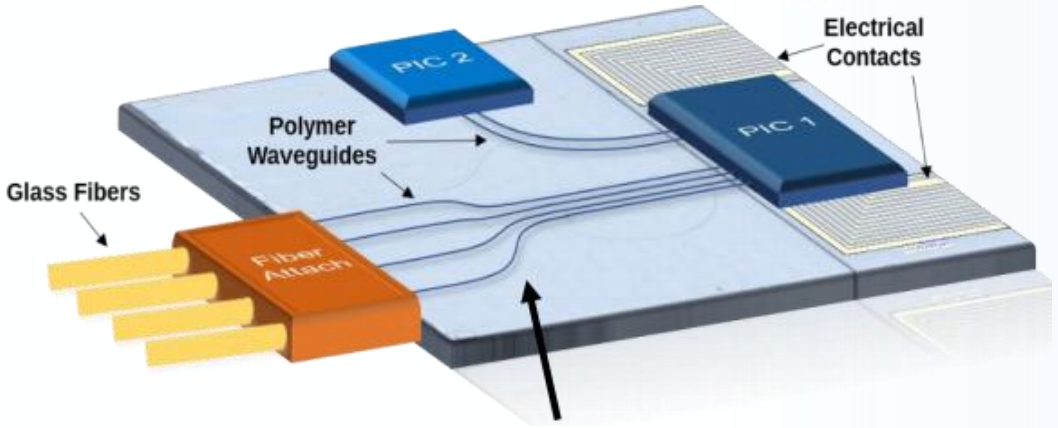
Challenges in PIC packagin

Difficulties in single module assembly (precision)

- Different materials
- Temperature stability
- Pluggable interfaces

In order for an actual module – packaging (not only assembly) is required

- Electrical
- Thermal, mechanical



Fan-Out (e.g. 30um on PIC to 127/250um Fiber pitch)

- **Planar Waveguides**

  High I/O number optical Fan-outs
  On-chip mode conversion
  (e.g. SiPh to Fiber) Polarization
  maintainingWaveguides

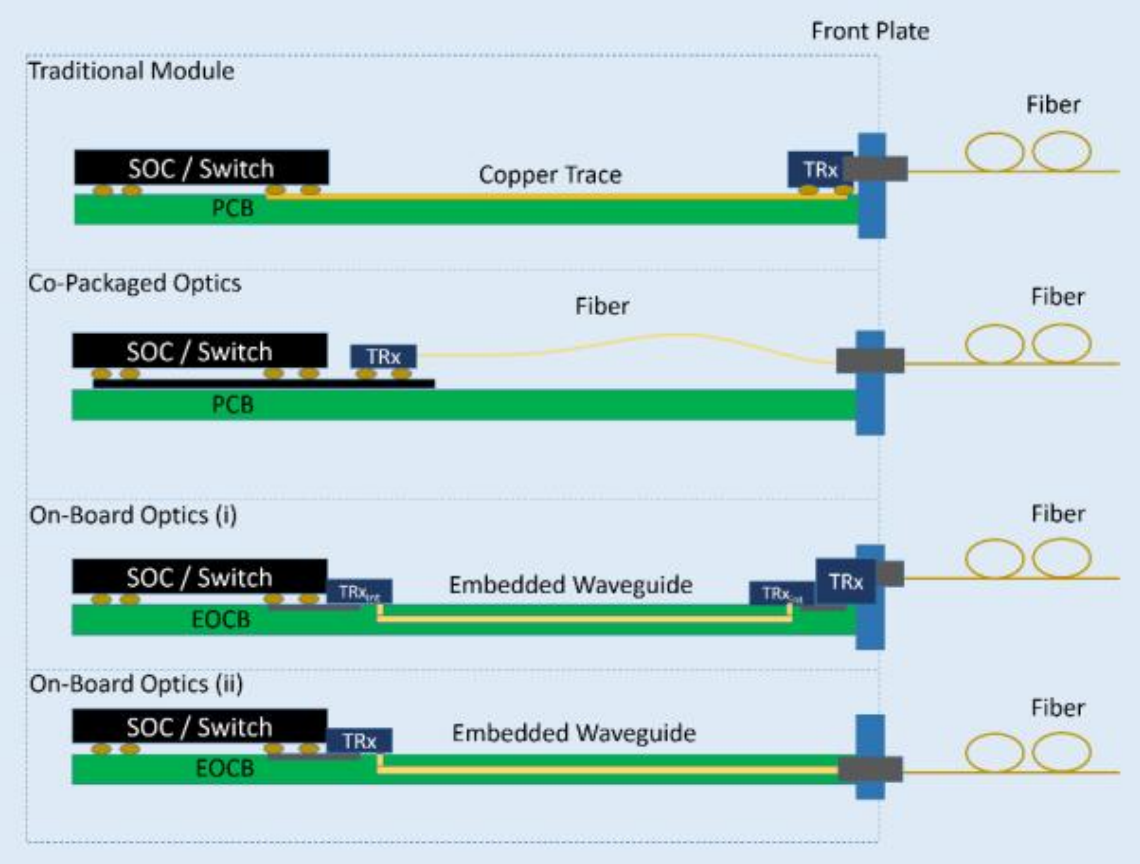
- **Electrical Interface**

  Metallization & PCB Integration
  Fine-Pitch, Flip-Chip Bonding
  RF Interface

- **Optical Interfaces**

  Efficient PIC-Waveguide Coupling
  (Adiabatic or Butt-Coupling)
  Fiber-Interface & Connectors

Future Development



→ Traditional

→ "Standard"Co-packaged optics

→ Board-Level Photonics using embedded waveguides:

- Embedded waveguides inside module (low loss)
- No fiber handling issues
- Pluggable interface at front plate

Source: From the internet