

TNO packaging requirements

SOI
InP

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Silicon-On-Insulator

- › CMOS compatible fabrication
 - › Available production infrastructure
 - › Low-cost, high-volume
- › Typical applications
 - › Single-use sensors
 - › Datacomm in consumer products
- › Unpackaged chip price: < EUR 1,00
- › Target price of packaging: < EUR 10,00

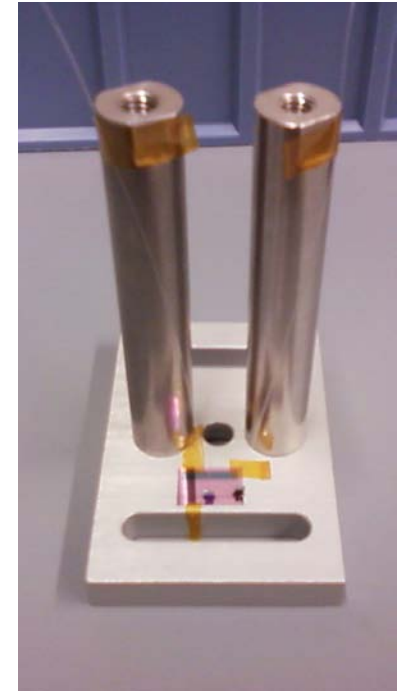
EUR 10,- for a package..??

- › Low-cost components
 - › As-cleaved fibers
 - › No TEC
- › All processing at wafer level
 - › No die-wise polishing steps
- › Alignment tolerant
 - › Fiber-matched out-of-plane grating couplers

- › Can be done

Feasibility study @ TNO

- › Process development
 - › Various concepts, grating coupler based
 - › Only fiber-chip subassembly
 - › Fiber-by-fiber for now
 - › Scalable to arrays
 - › No signal loss after fixation
- › Simulations
 - › Impact of reflections for single-fiber assemblies
- › Tool concept
 - › What tool is needed to produce 100.000 /year
 - › What degree of automation makes sense
 - › What is the cost per device



Participation in PARADIGM

- › InP enables more functionality
 - › On-board sources & detectors
 - › Amplification
 - › Performance
- › Price of die is higher...
 - › ... but not much. Packaging costs are dominant
- › Size of circuit is larger...
 - › ... a 50x50 um SOI circuit needs 1 mm² for packaging
- › InP packaging more expensive than SOI packaging
 - › Typically Spot Size Converters + lensed fiber
- › Mainly for advanced applications
 - › RF, thermal, ..., makes packaging even more expensive
 - › InP for single-use sensors not an option

TNO needs for PARADIGM

- › General requirement: accurate thermal control
- › Main component
 - › Single optical I/O
 - › > 20 Multiple electrical I/O, < 50 kHz
- › '*If it fits we put it on*' components
 - › Dual / triple optical I/O
 - › Few electrical I/O (<10), but faster (100 MHz -1 GHz)
- › Goal is a *demonstrator*
 - › Closed shiny metal box?
 - › Wire-bonded fiber-chip subassembly to be put in a glass box?

What for the future

- › More optical I/O
- › Optical isolator / polarization manipulation
- › More electrical I/O (polarization diversity: x2?)
- › In-package electronics
 - › TIAs
 - › Electrical serialization

