

MICRO-OPTICS FOR COMPACT TRANSCEIVER SOLUTIONS

or ... HOW TO MAKE (YOUR!) OPTICAL CO-PACKAGING EASIER

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- + **Founded 1998**
- + **Refractive microoptics**
- + **Diffraction microoptics**
- + **Worldwide client base in data/telecom, metrology, semiconductor, instruments**
- + **Part of the SUSS MicroTec Group**

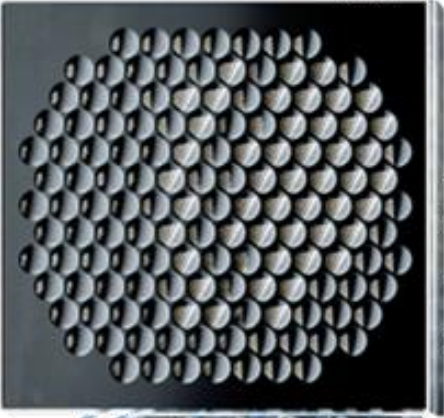
8" (200mm) Wafer Cleanroom Fab & Imprint Lithography Production

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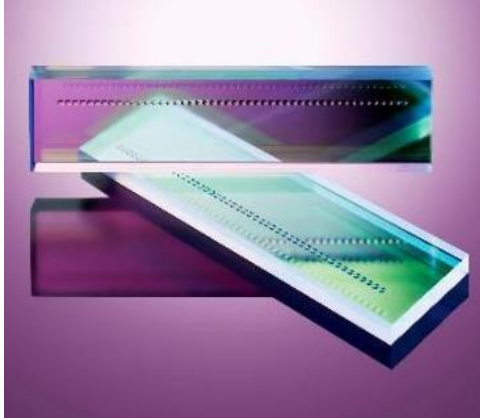
Automotive Qualified Imprint Production

PRODUCTS AND MARKETS

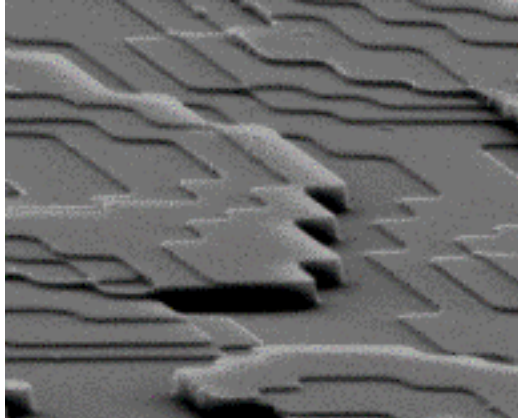
+ AUTOMOTIVE



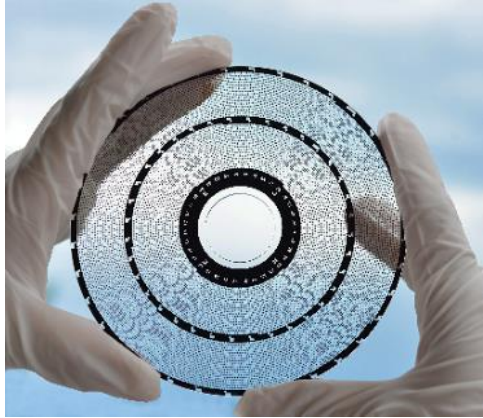
+ TELE/DATACOM



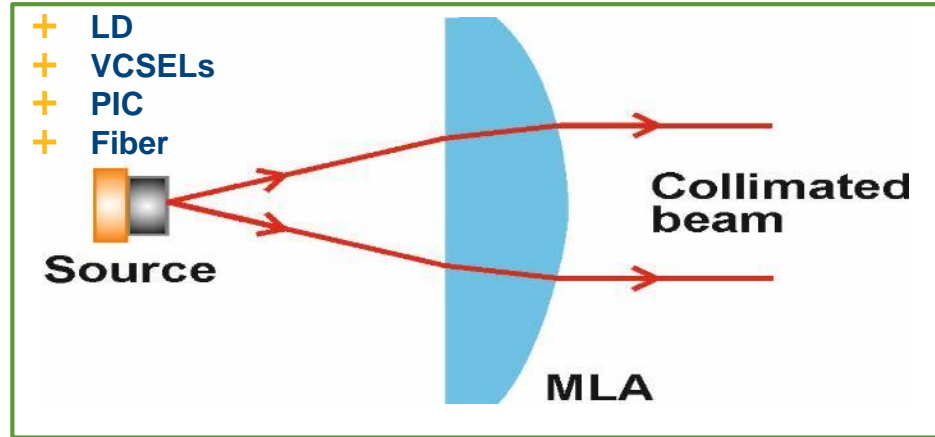
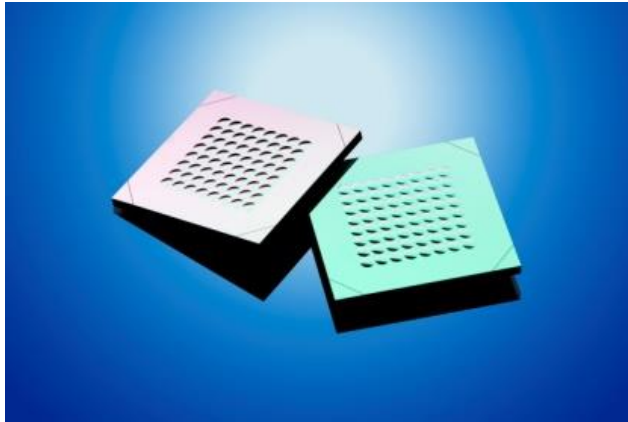
+ SEMICONDUCTOR



+ MEDICAL



+ Collimators



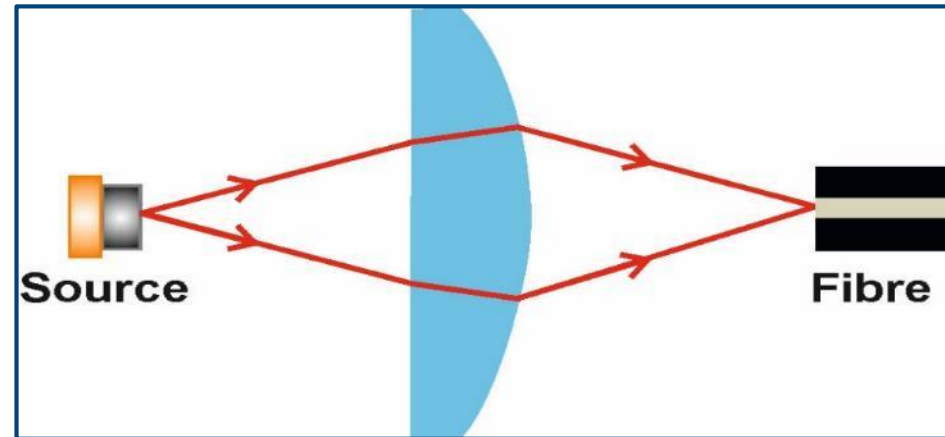
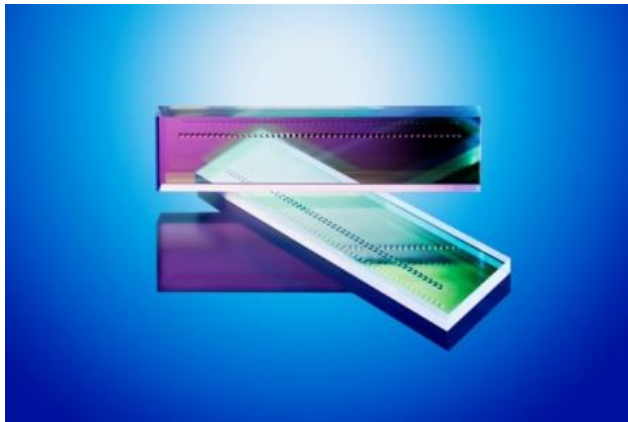
Materials

- + Fused silica
- + Silicon

Form factors

- + Spheres
- + Aspheres
- + Arrays
- + Singlets
- + Single sided
- + Double sided

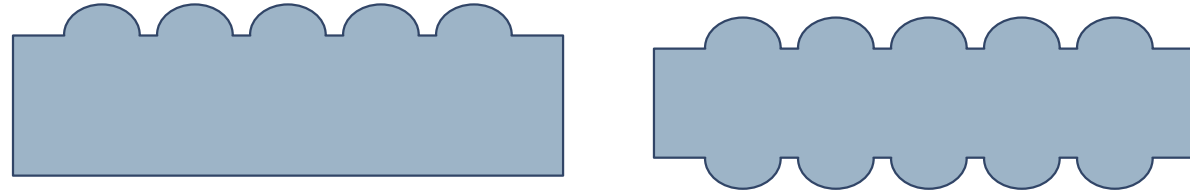
+ Re-Focusing



MICROLENS ARRAYS – FORM FACTOR OPTIONS

Protruding lenses

- Most economic options
- Single- and double-side



Materials: Fused silica and silicon
Shapes: Spheres and aspheres

Recessed lenses

- For stacking with other micro-optical elements

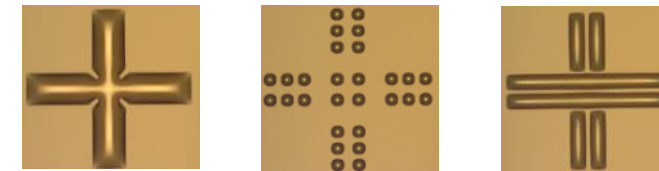


And the combination of all these options!

Recessed lenses with fiducials and backside cavity

- Best for large volume packaging

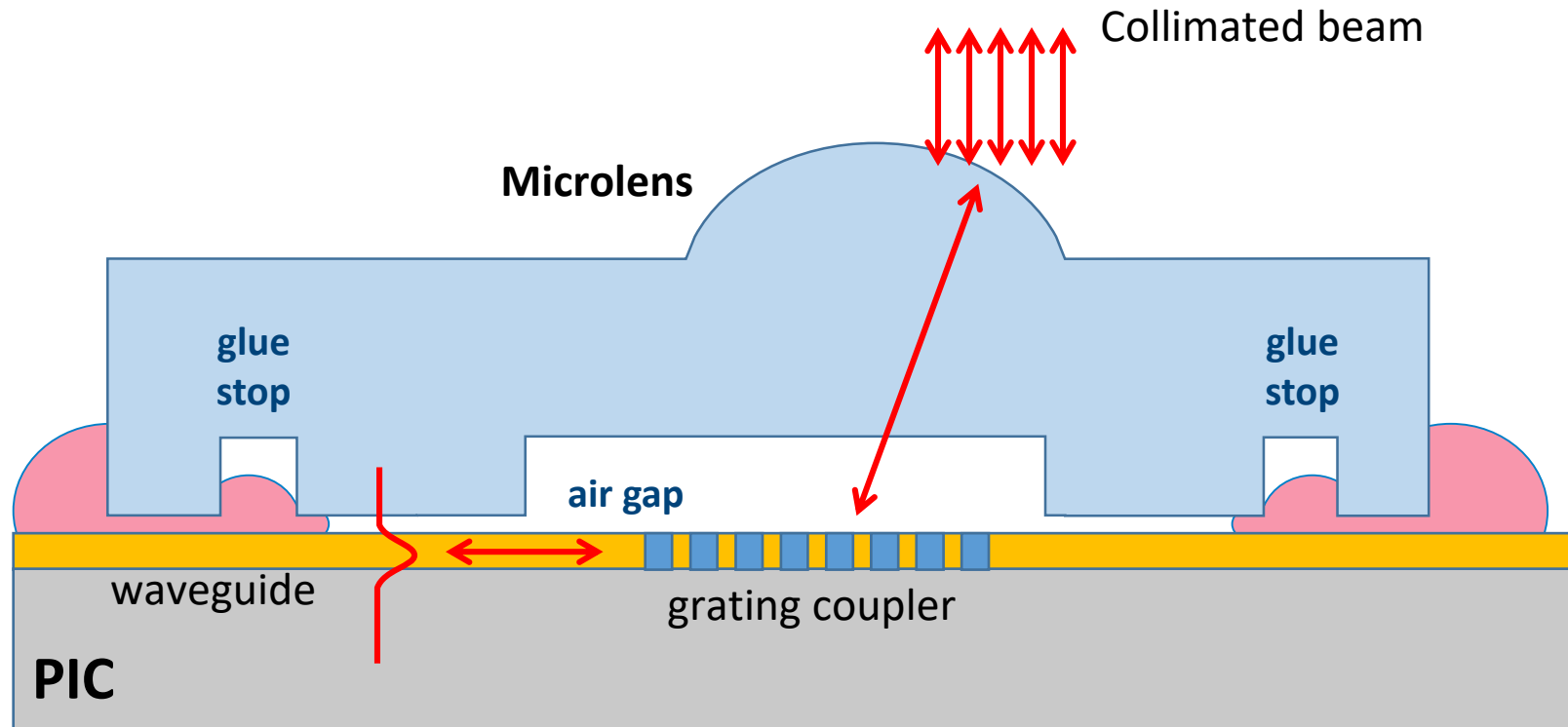
+ Fiducials for vision systems



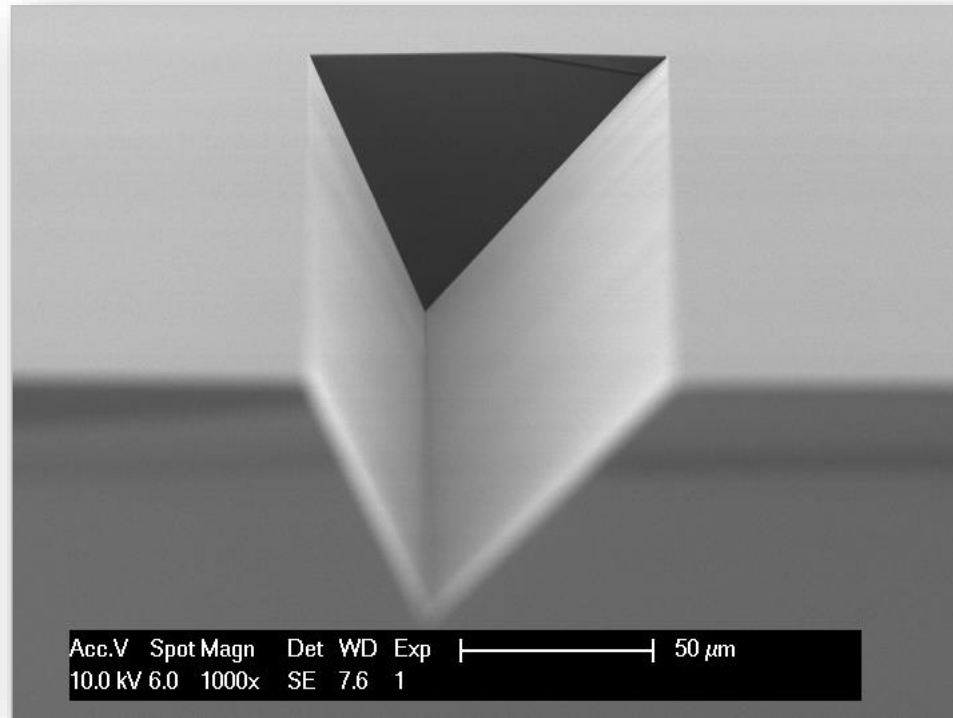
trenches & cavities

MICROLENSES WITH PACKING FEATURES

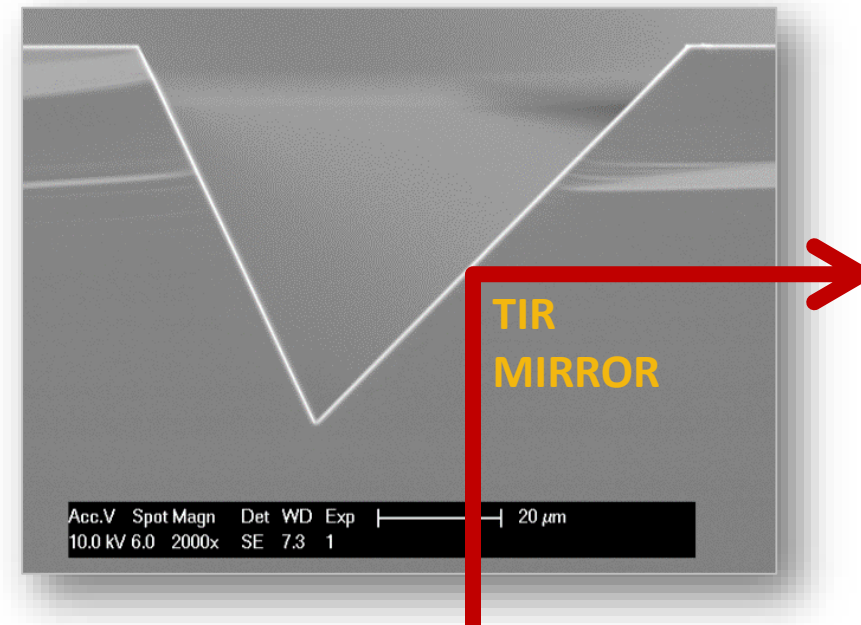
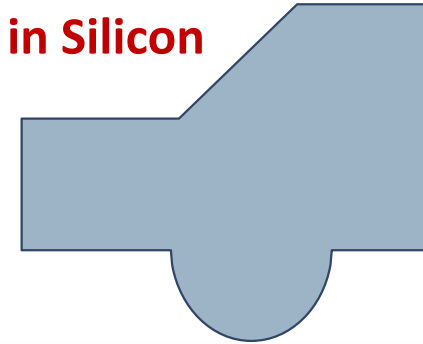
- + Gap between PIC and grating for defined optical interface.
 - + Dust free and no adhesive at grating coupler
 - + Beam expansion
- + Small trenches as glue stops.



45° PRISM WITH INTEGRATED 90° MIRROR (Silicon)



90°-Turn
Prism in Silicon



Highly integrated:

- Combine with lens and DRIE
- V-Grooves can be used as mirrors or for passive fiber alignment

INTEGRATED 90° PRISM WITH MICROLENS ARRAY

+ Materials

- Silicon or fused silica

+ Optical function

- 90° bent
- Re-Focusing
- Collimating

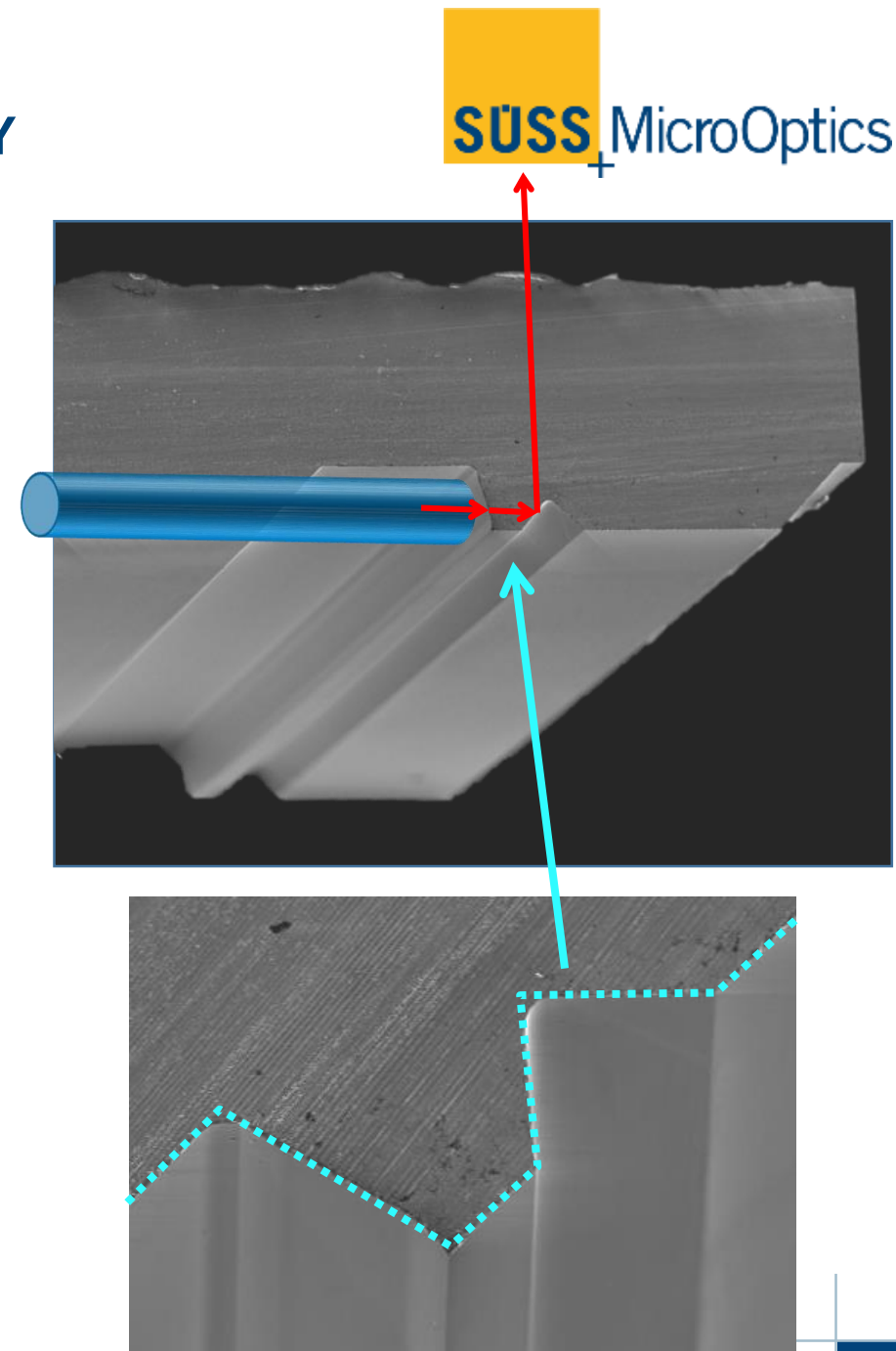
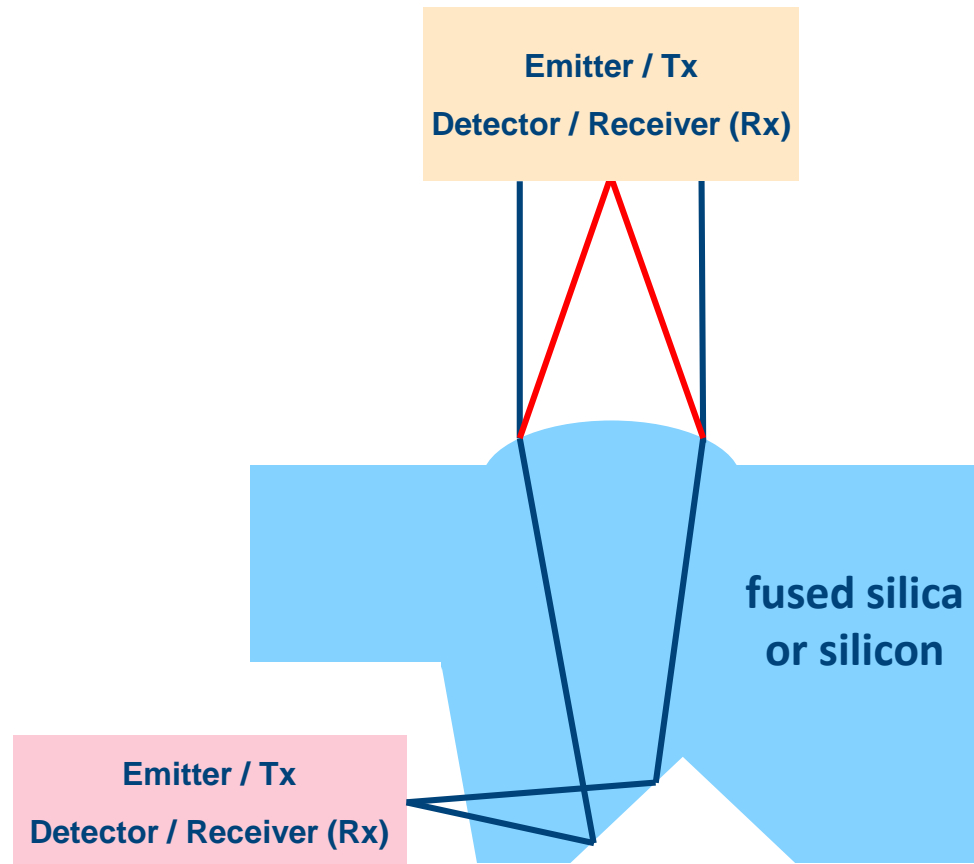
+ Emitting devices

- PIC waveguide
- SMF or MMF

+ Detection devices

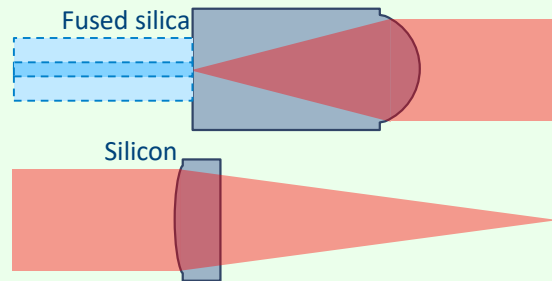
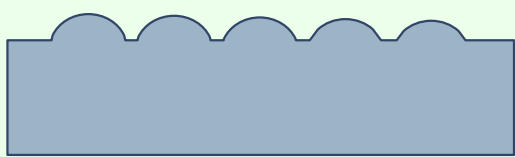
- SMF or MMF
- APD

+ Angles and depths can be customized

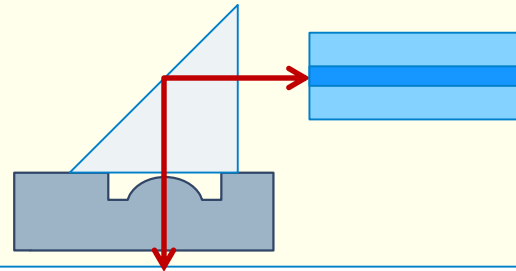
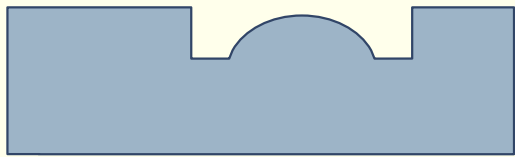


❖ Micro-Optics With Easy-Assembly Features

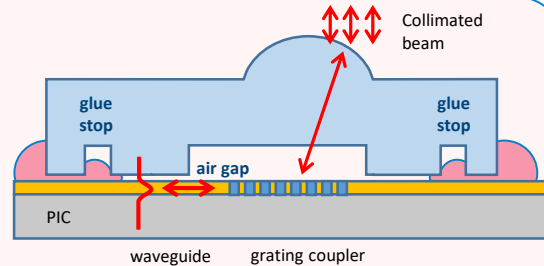
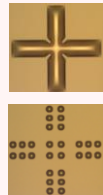
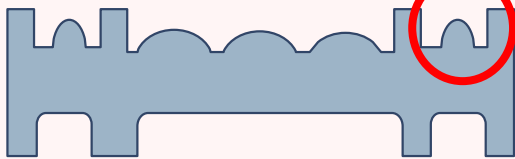
Protruding lenses for collimation



Recessed microlenses for stacking



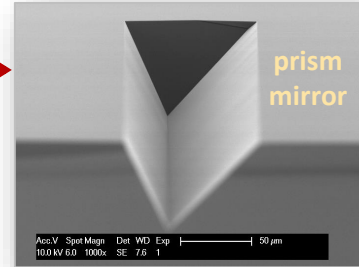
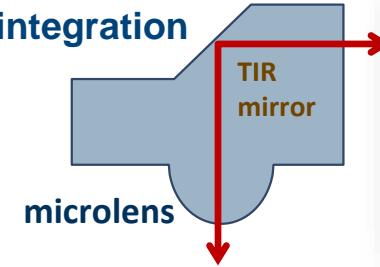
Microlenses with "adhesive management", air gap, fiducials and trenches



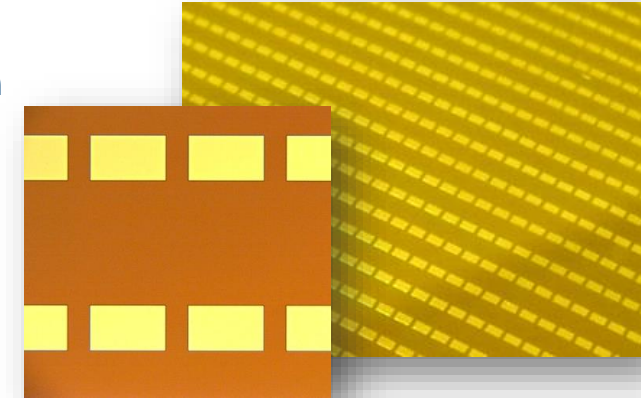
Microoptics costs lower

❖ Special Features

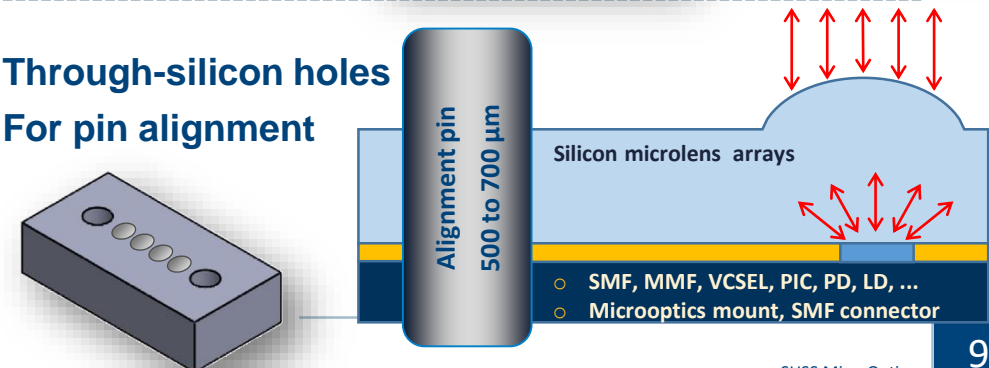
- + Integrated prisms
- + For high level integration



- + AuSn solder pads
- + Less than 3 µm thin
- + For reflow process



- + Through-silicon holes
- + For pin alignment



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Thank you!



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