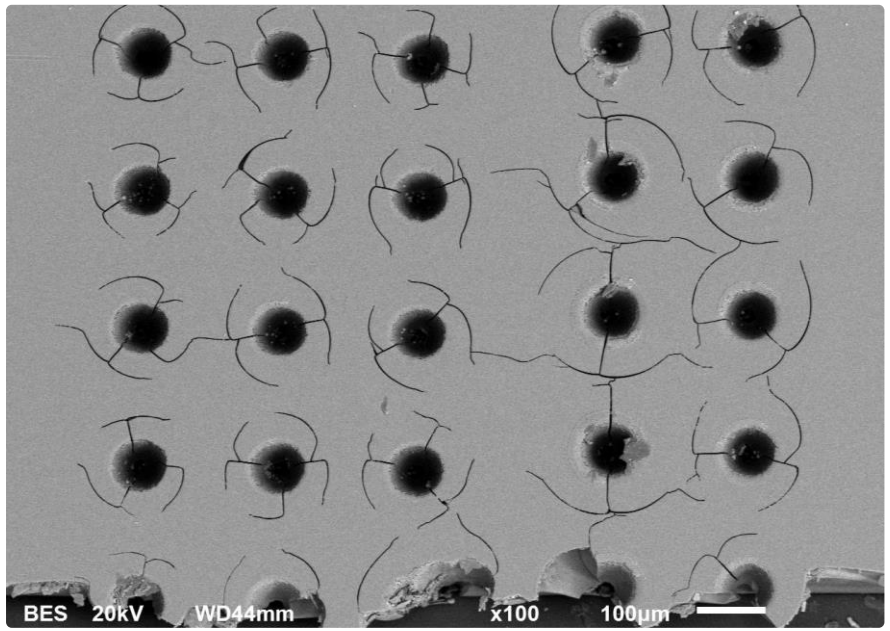
LIDE: DEFECT FREE MICRO PROCESSING OF GLASS

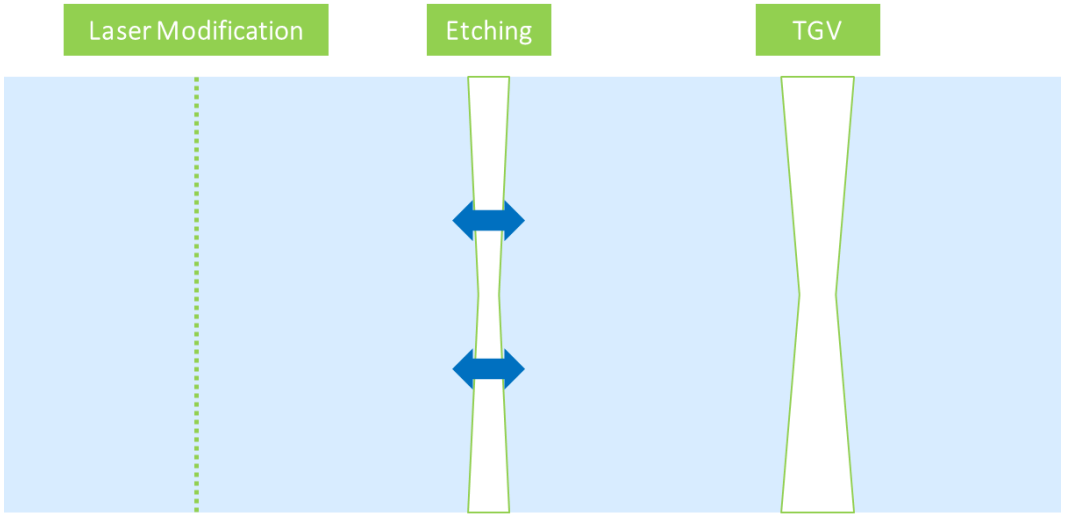
Conventional glass processing limits the application of glass due to:

- (Micro) cracks
- Chipping
- Thermally induced stress
- Low accuracy
- Low reproducibility and yield
- Debris and vapors
- Limited aspect-ratios



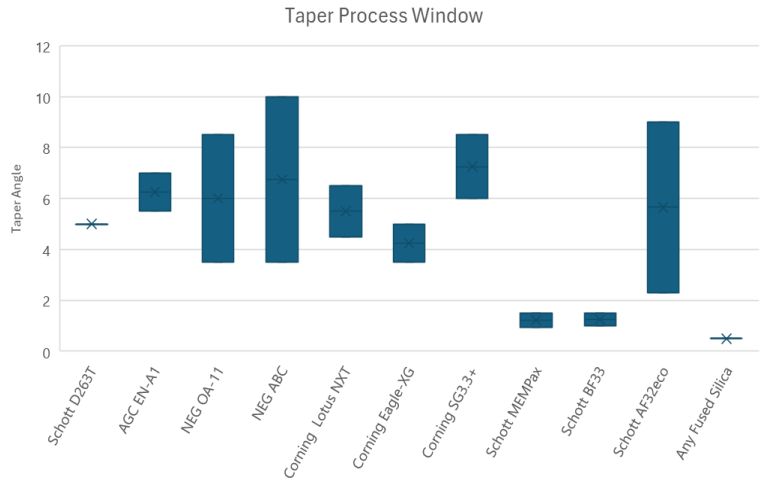
Glass is a uniquely interesting material, but only a flawless processing method can unlock its full potential.

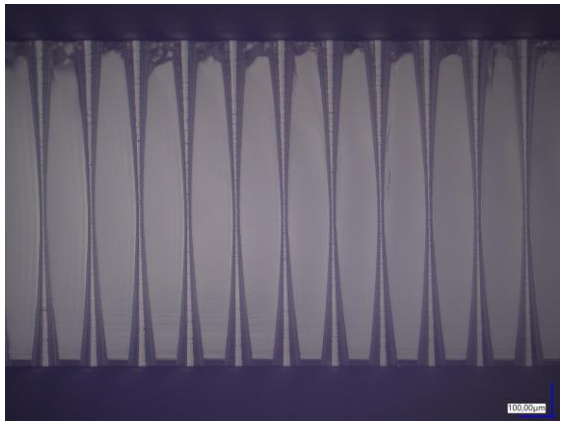
LIDE: HVM PROCESS COMPATABILITY



In the **first step**, glass of **up to 1mm** can be structured by a **single laser pulse**. Pulse positioning accuracy is >5µm Cp >1,33.

In the **second step**, the laser structured substrates are wet etched. The laser-modified regions display a much higher etch rate than the bulk material. The result is the formation of hourglass shaped holes with a tunable taper.

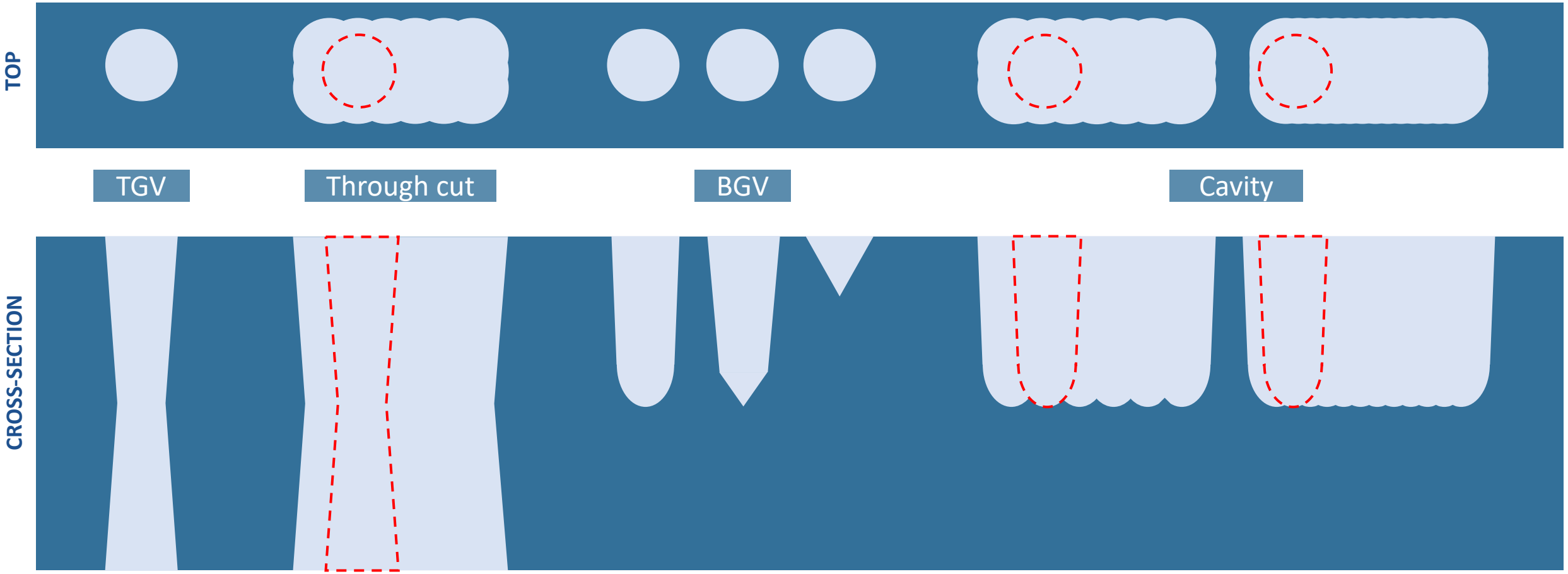




1000 µm Thickness

LIDE generates highly accurate and defect free microstructures in glass in a cost-effective manner.

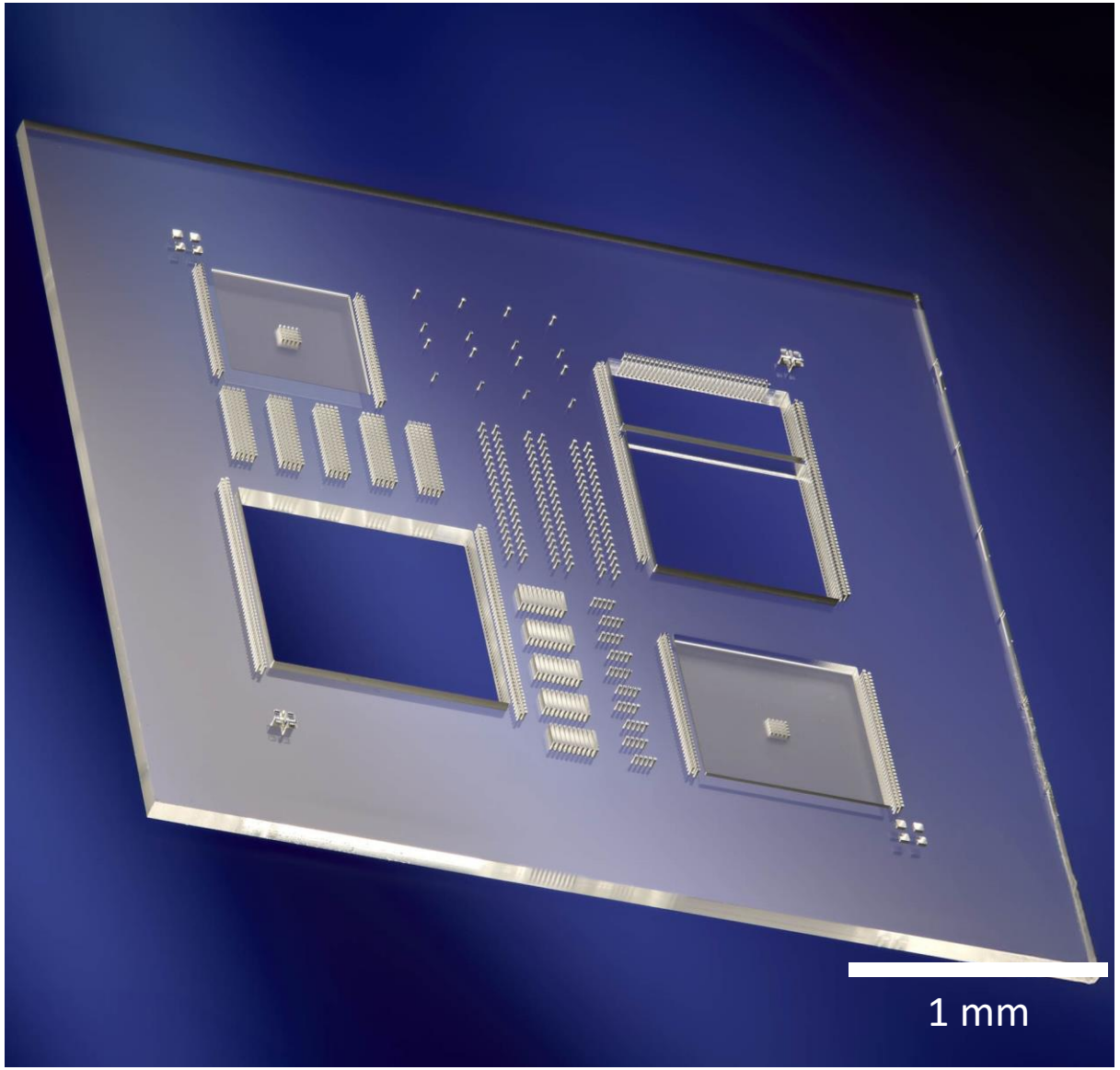
Advantages of LIDE – „More than TGV“

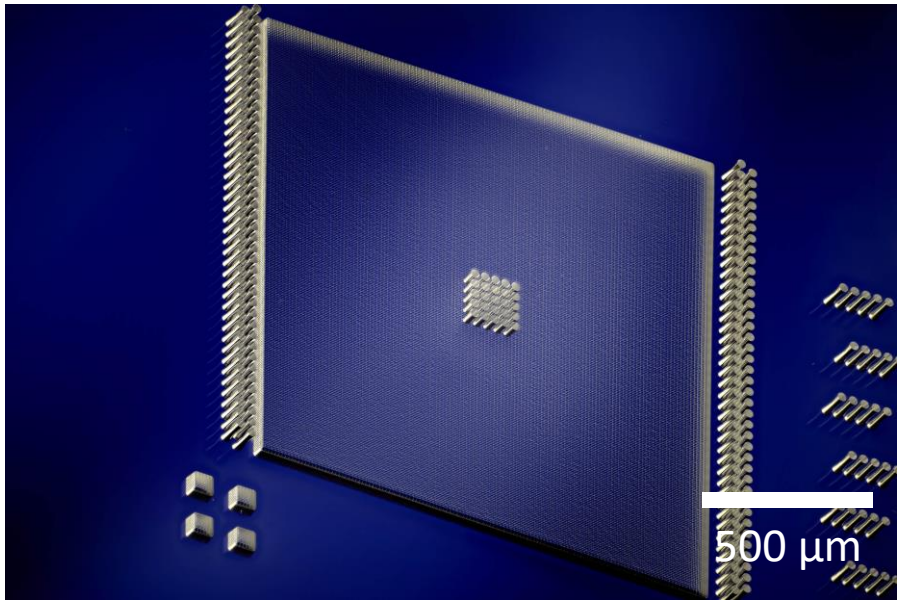


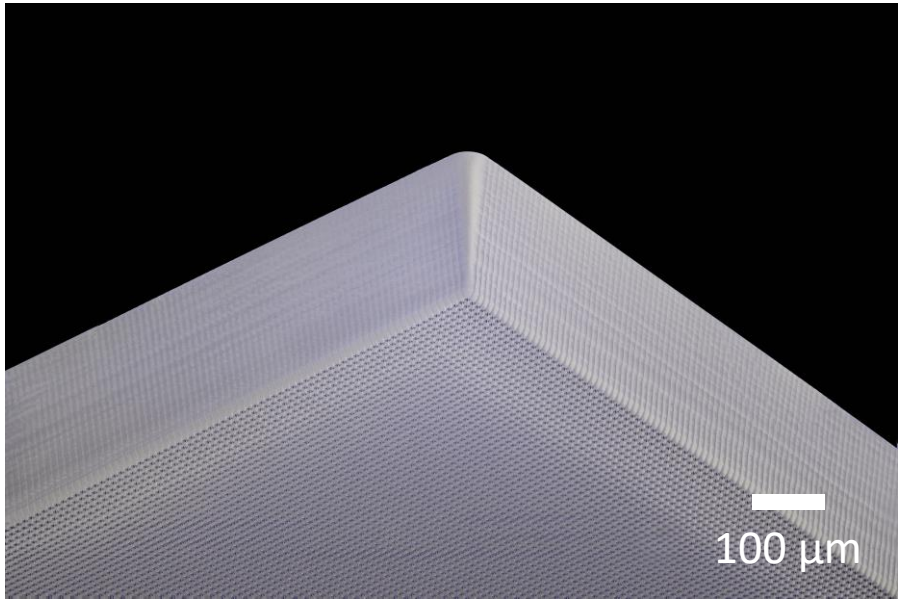
Parameters

TGV	Through cut	BGV	Cavity
• Diameter	• Surface geometry • Surface dimensions	• Diameter • Depth • Taper angle • Bottom geometry	• Surface geometry • Surface dimensions • Depth • Bottom geometry

ALL IN ONE: TGV, BGV, THROUGHCUTS, CAVITIES

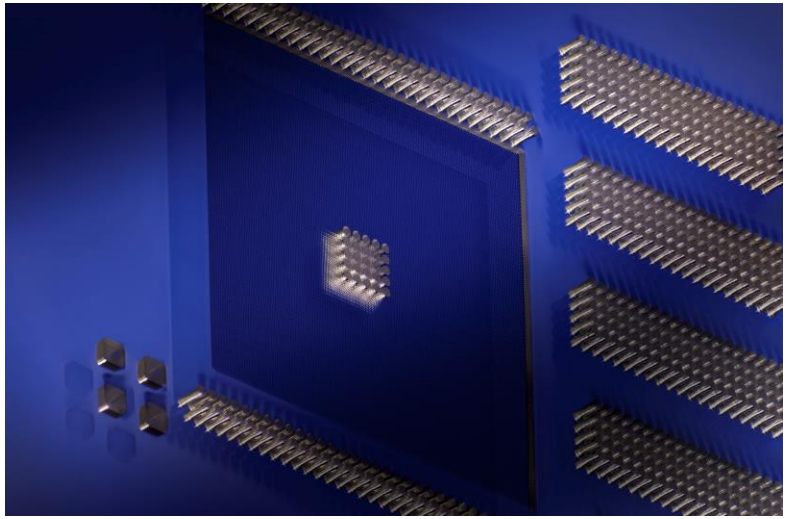
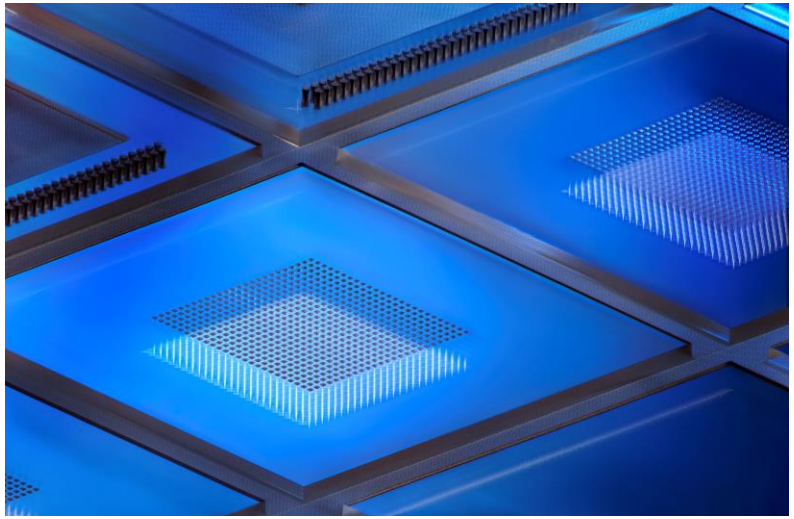
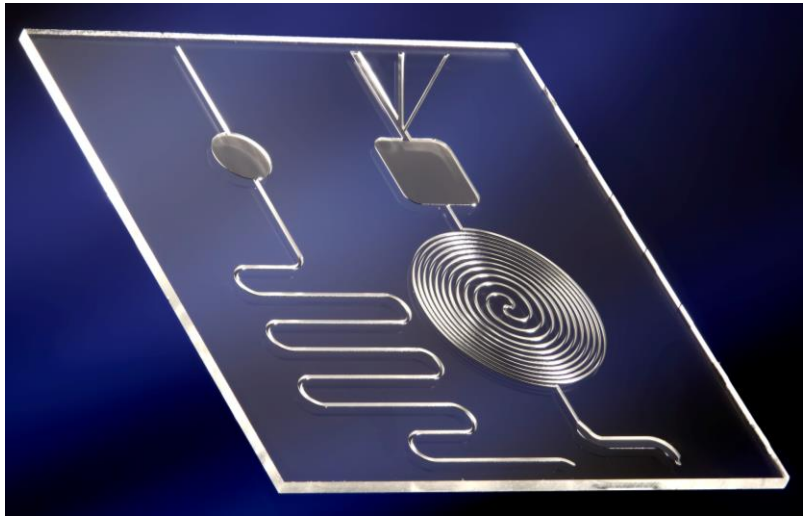
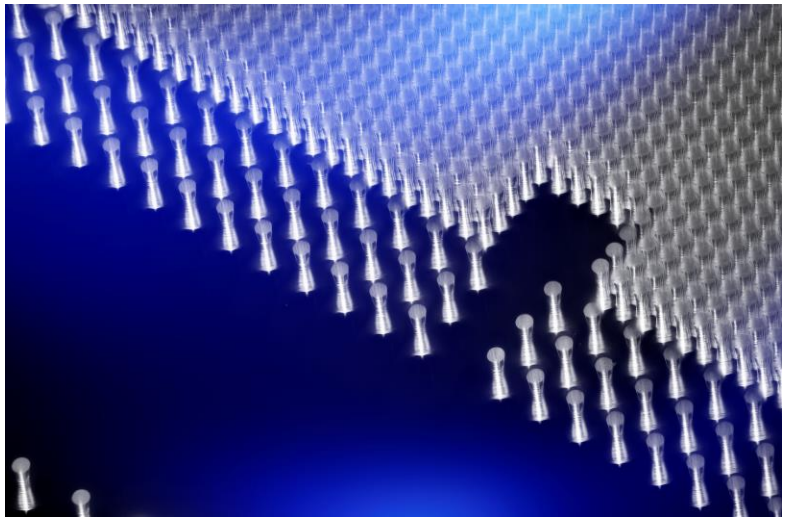
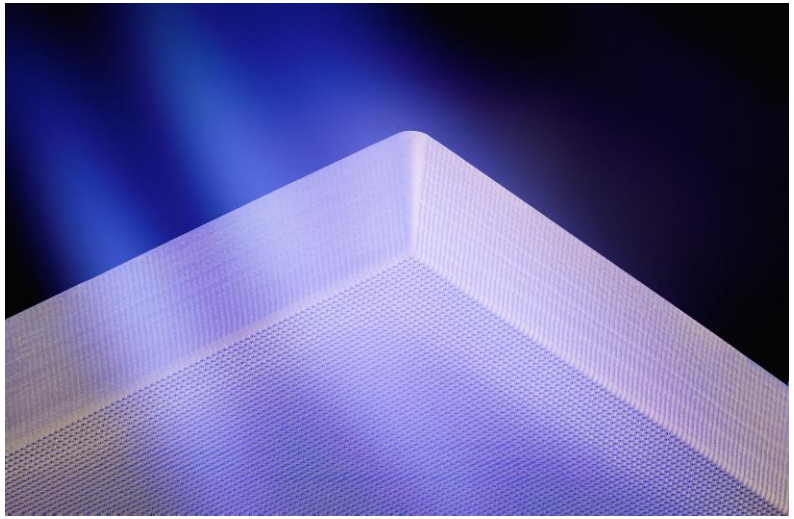
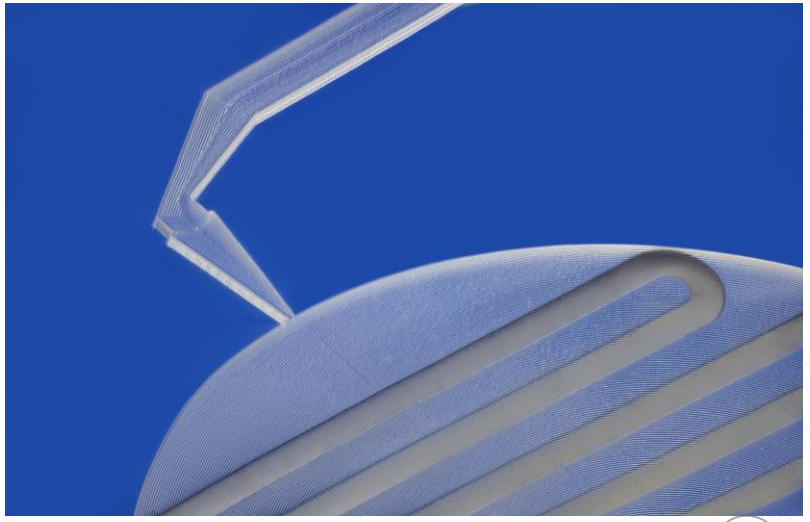




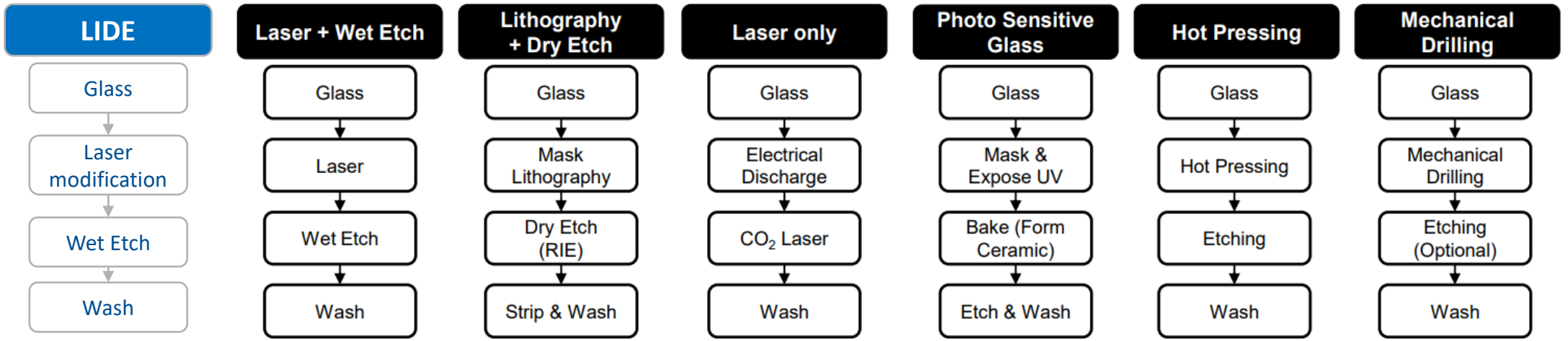


More than TGV

LPKF
Laser & Electronics

LPKF LASER INDUCED DEEP ETCHING PROCESS



No Thermal Stress						
No Defects						
All-In-One TGV, Cavity, Cutting						
HVM capability						
All Glass Types						

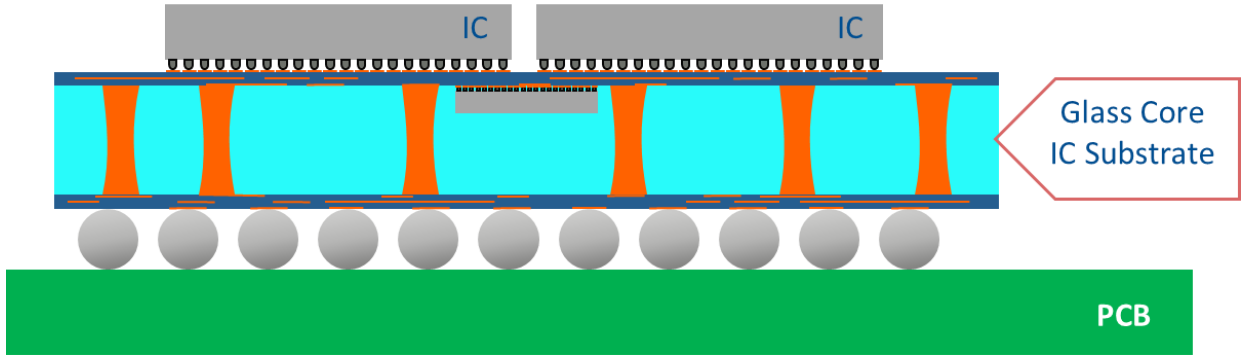
Technologically LIDE is the superior process to generate microstructures in glass and provides the scalability necessary for HVM.

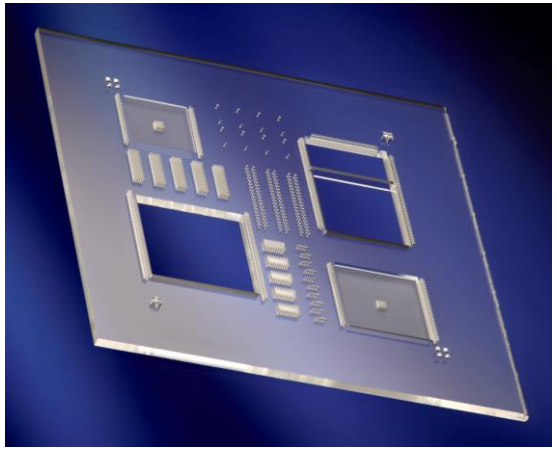
© LPKF Laser & Electronics AG

APPLICATION OF LIDE: Glass core

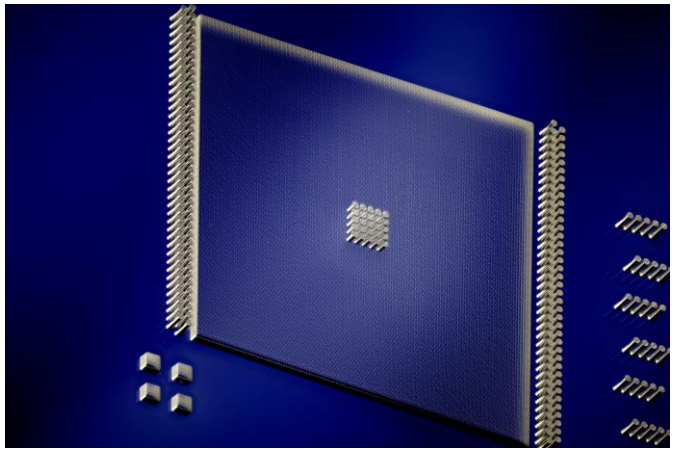
Glass core IC substrates offer better performance (especially for **H**igh **P**erformance **C**omputing)

- Enables larger IC dies
- LIDE is not restricted to specific glass types or suppliers
- enables CTE
- Lower loss
- “Interposer becomes the substrate” - Madhavan Swaminathan, Pennsylvania State University

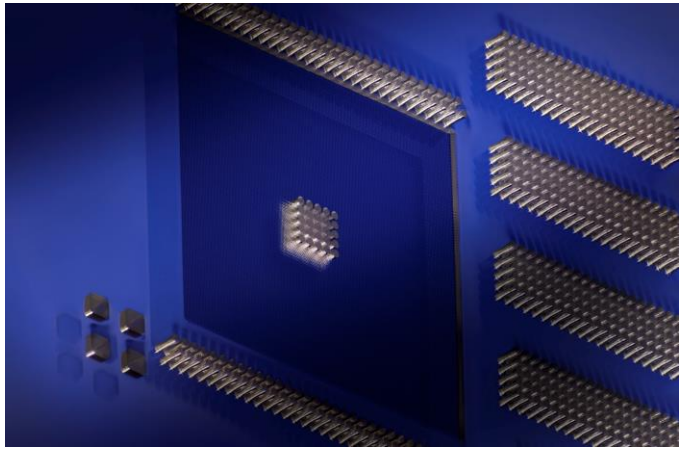




Exemple Glass Substrate



Cavity Front Side with TGV



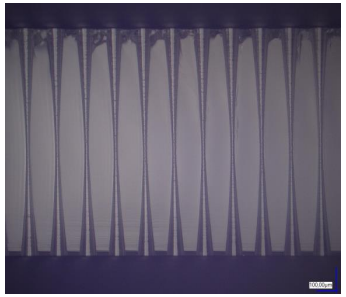
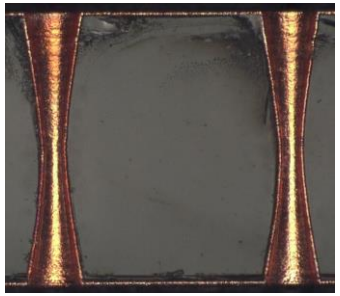
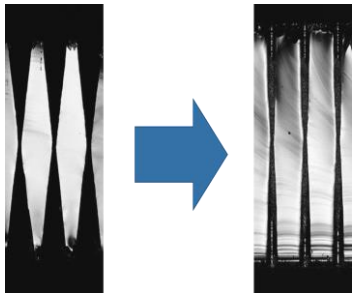
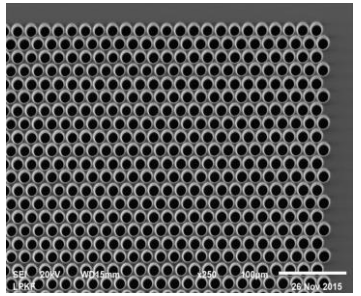
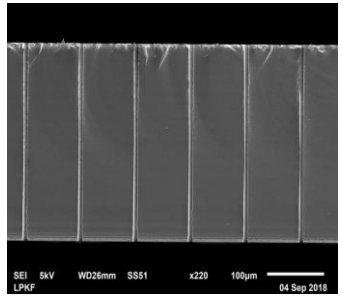
Cavity Back Side with TGV

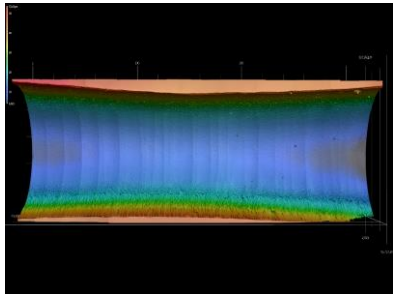
© LPKF Laser & Electronics SE

APPLICATION OF LIDE: THROUGH GLASS VIA (TGV)

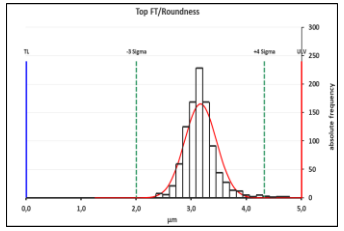
Requirements on TGVs for advanced packaging

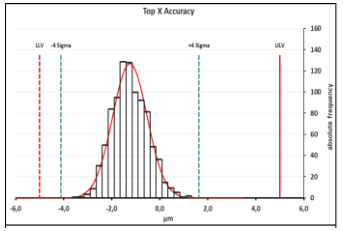
Thickness	Aspect Ratio	Taper	Pitch	Diameter	Sidewall Roughness
0.1 – 1.0 mm	1:1 – 1:50	0.1° – 30°	No pitch limitation	> 10 µm	< 0.2 µm

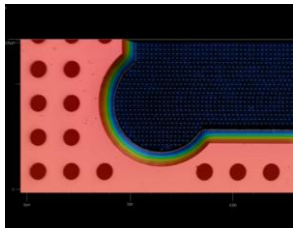
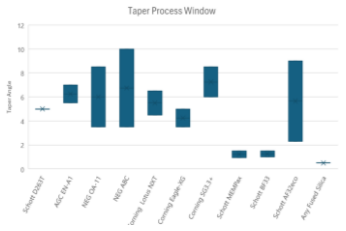






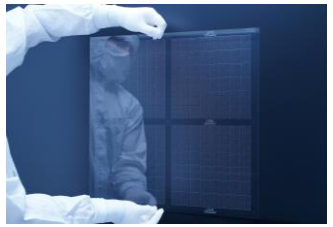
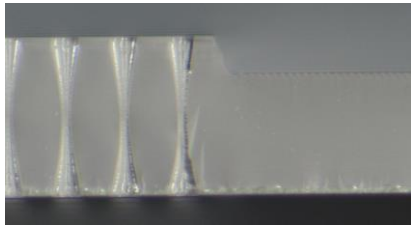


Roundness ULV	Accuracy	Distance to Cavity	Glass Type	Drill Rate	All-In-One
< 5 µm	+/- 5 µm*	< 1 µm	No limitation	5000 TGV/sec**	TGV, Cutting, Cavity





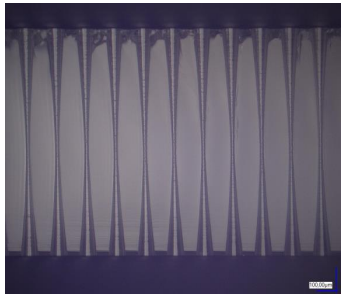
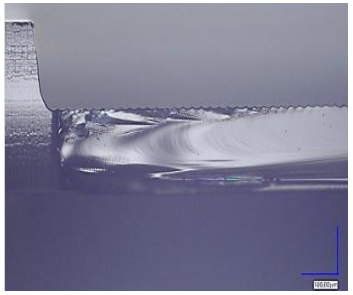
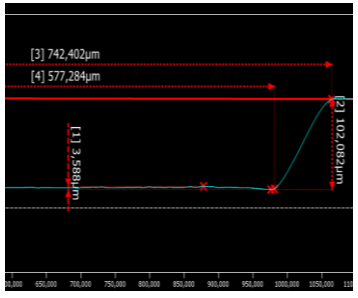
LIDE generated TGVs are extensively studied and matched all customer and downstream process requirements until today.

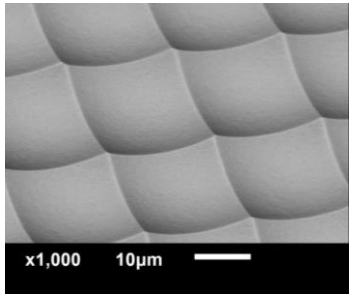
* Cp > 1.33 on a 510 mm x 515 mm panel ** Layout dependent

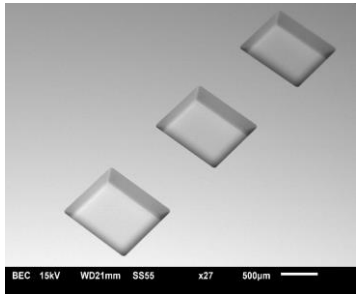
APPLICATION OF LIDE: CAVITIES

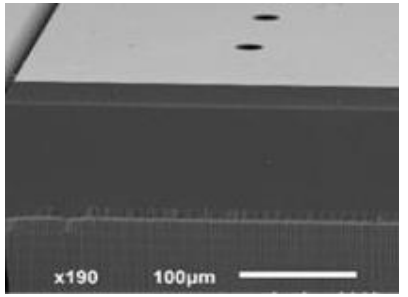
Requirements on Cavities for advanced packaging

Thickness	Pulse Pitch	Depth	Bottom Roughness	Geometry	Sidewall Roughness
0.1 – 1.0 mm	> 5 µm	> 500 µm	< 0.5 µm	Free form	< 0.2 µm

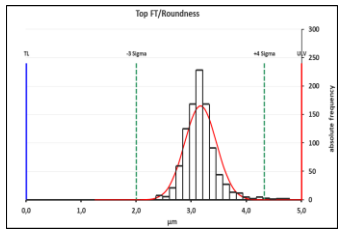




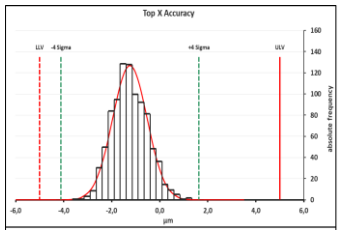


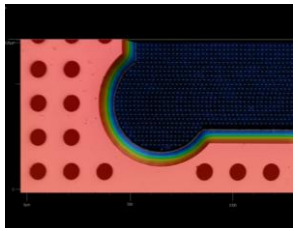
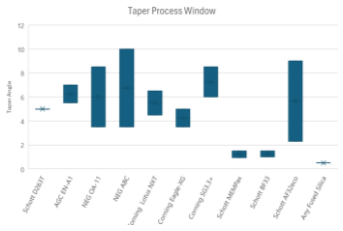


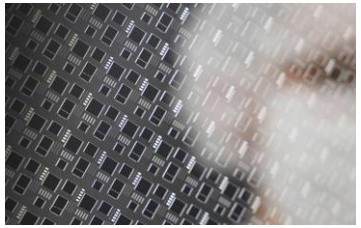
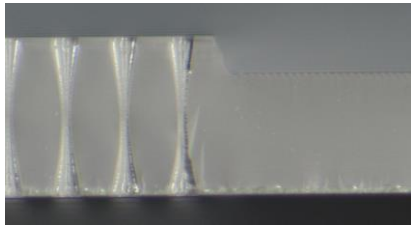


Roundness	Accuracy	Distance to TGV	Glass Type	Drill Rate	All-In-One
< 5 µm	+/- 5 µm*	< 1 µm	No limitation	5000 TGV/sec**	TGV, Cutting, Cavity





LIDE generated cavity structures and their combination with TGV are market standard outpacing competition capabilities.

* Cp > 1.33 on a 510 mm x 515 mm panel ** Layout dependent

VITRION Manufacturing SERVICE



Our Vitrion Foundry supplies customer specified glass substrates throughout the product life cycle

LIDE PROCESS

- Tools of all LIDE generations
- Clean room conditions
- Metrology capabilities

PROCESS CAPABILITIES

- 6“ – 8“ Wafer
- up to 510 x 515 mm Panel

DEVELOPMENT

- 10 years of experience
- Team of experts
- Technical application support
- Co-Development

SAMPLING

- Initial sampling
- High volume sampling
- Standard production

Contact: Jake Benz <jake.benz@lpkf.com>