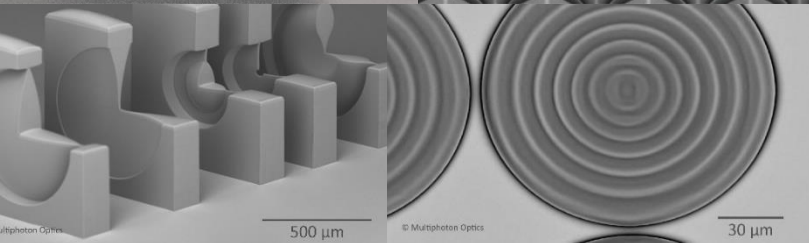
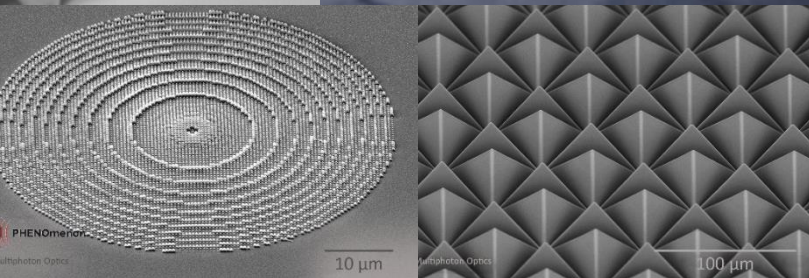
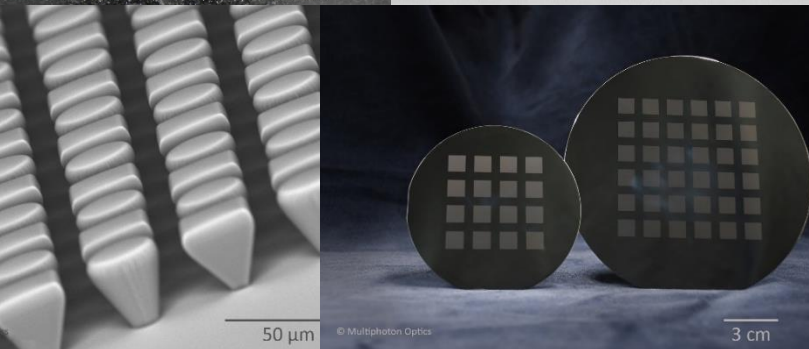
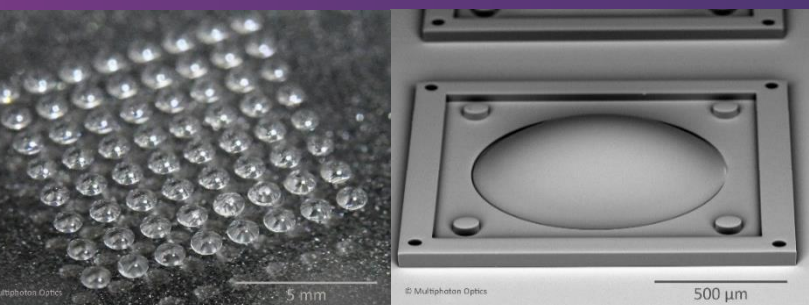


High Throughput – Scalability – High Precision

# LithoProf3D®-GSII

Maskless 3D Laser Lithography via Two-Photon Polymerization (TPP) –  
Production of Complex Functional Microstructures in  
Microoptics, Photonics, Micromechanics and Biomedical Engineering

## Product Sheet



## LithoProf3D®-GSII – Key Features

Multiphoton Optics' modular 3D printing platform LithoProf3D®-GSII enables the high precision production of complex functional microstructures with high throughput in a single process step.

Advantages of LithoProf3D®-GSII include:

- maskless 3D laser lithography via Two-Photon Polymerization (TPP),
- resolution in the submicrometer range,
- high precision and high throughput,
- stitching-free fabrication capability,
- compatibility with industrial nano and micro manufacturing processes,
- optimized for processing of ORMOCER®s (inorganic organic hybrid polymers),
- printing of optical elements and
- on-device printing: structures can be printed directly on active (LEDs, photodiodes, EELs, VCSELs) or passive (fibers, irregular substrates) components.



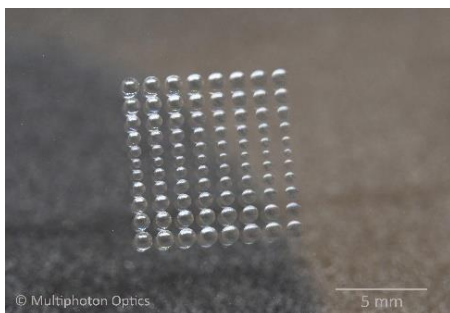
**LithoProf3D®-GSII –**  
*Ultra-fast and scalable production for research and development, and for industry applications.*

<https://multiphoton.de>

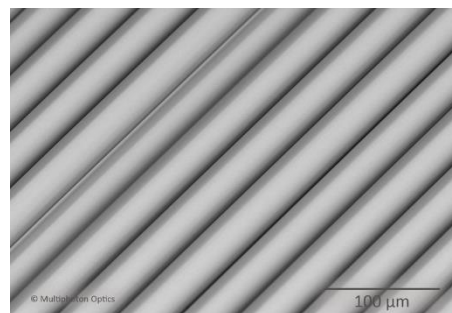
Optional hardware modules available:

- Vision2Align System for detection of alignment marks, assemblies, and components for adapted automated processes, with passive alignment.
- LithoBath3D as an optional exposure configuration enabling the fabrication for large-scale structures in the cm range.
- Chucks for different substrate formats and shapes (4" wafers, microscope slides, small samples, ...).
- LithoDILL3D, providing capability of Dip-In 3D Lithography.

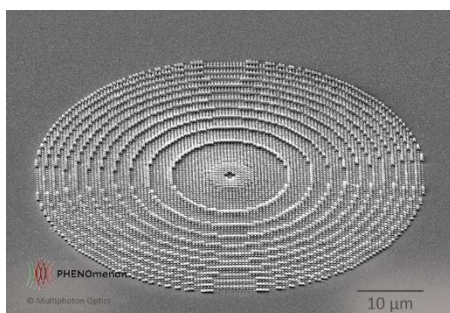
## Application Examples



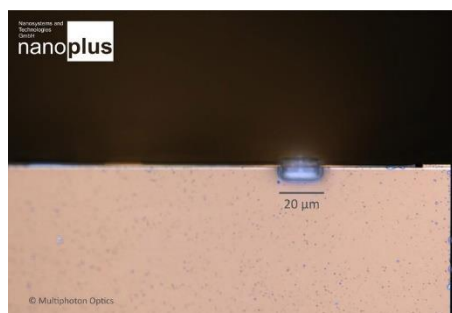
*Microlens array with varying sizes and shapes for imaging and sensor applications.*



*Cylindrical microlens array fabricated without stitching by using Multiphoton Optics' IFoV writing mode.*



*Meta lens for visible light. Printing resolution at the 100 nm scale can be achieved.*



*Microlens printed directly on the laser facet: On-device printing via Multiphoton Optics' TPP allows the further miniaturization of components.*

## LithoProf3D®-GSII – Data Sheet

Reference

<b>Fabrication</b>		
Max. average power for fabrication	≤ 200 mW	
Min. feature size	≈ 100 nm (lateral), ≈ 270 nm (vertical)	1,2,3,4
Autofocus	Optical detection of interfaces with very low difference in refractive index	
Autofocus reproducibility	± 50 nm	10
Substrate loading size	Standard size up to 4", up to 8" possible with accessible 4" area	5
Substrate type	Wide range of materials and substrates.	
Substrate thickness	≤ 49 mm	
Print volume	Top-down exposure: 100 mm x 100 mm x 9.1 mm Bath exposure: 55 mm x 55 mm x 17 mm	5
Operation mode	5-axes system PSO (Position Synchronized Output) for Stage Only, Galvo Only, Mixed Mode (Stages plus Galvo), Infinite Field of View (IFoV) Mode with synchronization of axes and galvo movements.	
Fabrication speed	<100 mm/s at high position accuracy >100 mm/s for relaxed position accuracy	1
<b>Software</b>		
Control software	LithoStream (touch screen) — Virtual Machine Code Translator	
Working desk software	LithoSoft3D — Virtual Machine Code Creator	
<b>Laser</b>		
Pulse duration	≤ 250 fs	
Repetition rate	(63 ± 0.6) MHz	
Average output power	> 650 mW	
Pulse energy	> 10 nJ	
Wavelength	(522 ± 3) nm	
Stability at output	< 1 %	
Beam quality M <sup>2</sup>	< 1.15	
Beam divergence	< 0.5 mrad	
<b>Focusing Optics</b>		
Numerical aperture	NA 0.55 (air) to 1.4 (immersion)	
Magnification	40x to 100x	
Working distance	Up to 9.1 mm	
Field of View (FoV)	Up to 500 μm x 500 μm	6

## LithoProf3D®-GSII – Data Sheet

Reference

<b>Positioning System</b>		
<b>Galvo scanner</b>		
Positioning stability	≥ 1 nm	1,7
<b>Stages</b>		
Type	Electromagnetic direct drive	
Bearing	Air guided	
Travel distance (lateral)	100 mm x 100 mm	5
Travel distance (vertical)	50 mm	5
Max. speed	Up to 50 mm/s	
Accuracy	± 0.2 µm per axis	
Repeatability	Down to ± 0.05 µm per axis	
Positioning stability	≥ 5 nm	8
<b>Installation Requirements</b>		
Voltage	115/230 V	
Frequency	50 – 60 Hz	
Fuse current	16 A	
Laser safety	Class 1	
Ambient conditions	16 –25 °C	
Optimal conditions	20 °C ± 2 °C, indoors, free of vibration	
Temperature stability	± 1 °C	
Relative humidity	40 – 80 % non-condensing	
Compressed air	6 – 8 bar	
Footprint (W x L x H)	1.7 m x 1.6 m x 1.9 m	
Weight	< 1,700 kg	
Room	Yellow light and cleanroom compatible	11

- 1 Dependent on focusing optics.
- 2 Dependent on material system.
- 3 Dependent on fabrication parameters.
- 4 Dependent on sample configuration.
- 5 Stages with larger travel distance available on request.
- 6 The FoV in this example is given for an objective with an NA of 0.6 (x40).
- 7 Determined for NA 1.4 100x and integration time of 8 s with a resolution of 0.1 ms.
- 8 Determined for an integration time of 8 s with a resolution of 0.1 ms.
- 9 Housed system; class 4 during maintenance.
- 10 Determined for ORMOCOMP® on soda-lime glass and 100x NA 1.4 objective.
- 11 Yellow light is required for handling photosensitive materials, no cleanroom is necessary, but system can be also installed in cleanroom environment.