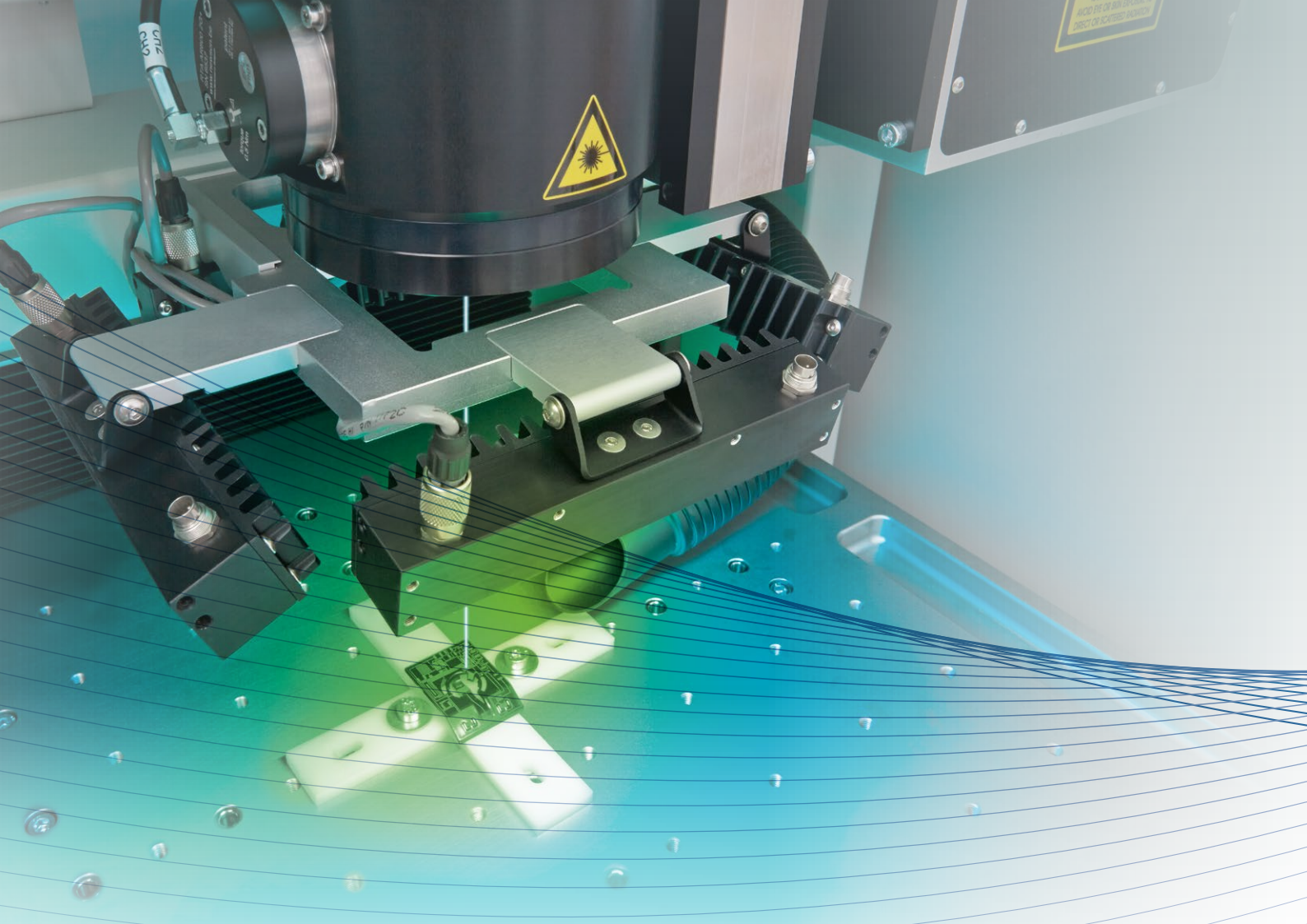


Prototyping 3D Circuitry  
Laser Direct Structuring with the  
LPKF ProtoLaser 3D





# Prototyping Three-Dimensional Circuits with Lasers

Modern electronics products are trending toward smaller size and greater complexity and functionality. Extending the interconnect pattern into the third dimension adds new potential – and laser direct structuring (LDS) is the leading technology in this field. With the ProtoLaser 3D, LPKF offers an economical and efficient laser system that accelerates prototyping of three-dimensional substrates.

## Three-Dimensional Circuitry

More than half of all smartphones today contain 3D circuitry as existing plastic parts are turned into antennas or assume interconnect roles. The foundation for laser direct structuring is an injection-molded part made of a plastic that contains an LDS additive. The laser process traces the circuit pattern and activates the additive. In a subsequent electroless metallization step, metal layers are deposited on the laser-activated circuit tracks.

Prototyping 3D circuitry starts with LPKF ProtoPaint LDS, a spray paint that is used to coat parts of any kind – even 3D printed parts – with a laser-ready surface, eliminating the need for LDS-grade plastics. Next the ProtoLaser 3D is used to structure circuit tracks, and for the last step metallization occurs using LPKF ProtoPlate LDS.

- Compact – fits easily through laboratory doors
- Flexible and economical
- Use with LPKF ProtoPaint and LPKF ProtoPlate for the complete LDS prototyping solution

### Prototyping with LPKF Laser Direct Structuring (LDS)



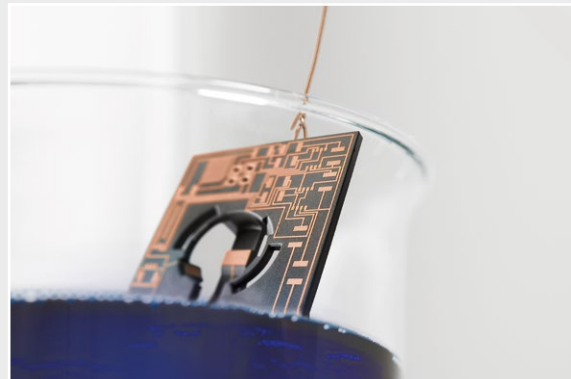
1. Creation of the three-dimensional part



2. Painting the part with LPKF ProtoPaint LDS



3. Structuring the circuit pattern with LPKF ProtoLaser 3D



4. Selective metallization with LPKF ProtoPlate LDS

### Flexible Laser Machining

The LPKF ProtoLaser was developed specifically for LDS prototyping. The system is based on the proven ProtoLaser concept used for printed circuit board prototyping. The ProtoLaser 3D work platform has dimensions of 500 mm x 500 mm and has a z-axis travel of 200 mm. A simple, low-cost workpiece fixture can be used for structuring because no mechanical stresses are created in the process.

An accurate laser pointer and vision system ensure designs are performed with precision.

The vision system detects fiducials and part contours to significantly simplify positioning and the overall structuring process. The optical components of the ProtoLaser 3D correspond to those used in LDS production systems. The same LDS design rules for production applications also pertain to the prototyping process.

The ProtoLaser 3D imports industry-standard data from CAD programs and is supported by the powerful LPKF CircuitPro 3D CAM software.

## Worldwide Support for Laser Direct Structuring

Wherever they are in the world, LPKF laser prototyping users benefit from application centers in Germany, the USA, Japan, and China. At these centers, users have access to LPKF's extensive experience in laser material processing and the laser direct structuring process. User training for technical employees and special consulting services complete the offer from the world market leader in laser systems for structuring three-dimensional molded interconnect devices. LPKF will gladly provide application reports and further information upon request.

Technical Data: LPKF ProtoLaser 3D	
<b>Structuring area (X x Y x Z)</b>	100 mm x 100 mm x 40 mm (3.9" x 3.9" x 1.6")
<b>Max. material size (X x Y x Z)</b>	300 mm x 300 mm x 130 mm (11.8" x 11.8" x 5.1")
<b>Fixturing base plate (X x Y)</b>	500 mm x 500 mm (19.7" x 19.7")
<b>Z travel of the base plate</b>	200 mm (7.8"), software controlled
<b>Accuracy*</b>	± 25 µm (1 Mil)
<b>Laser wave length</b>	IR range
<b>Laser pulse frequency</b>	10 – 100 kHz
<b>3D structuring speed</b>	1 000 mm/s (39.4"/s) <sup>a</sup>
<b>Diameter of focused laser beam</b>	50 µm ± 5 µm (1.7 Mil ± 0.2 Mil)
<b>Software</b>	LPKF CircuitPro 3D (included)
<b>Features</b>	Vision system in the optical axis of the laser beam with LED illumination, automatic suction control, controlled filter
<b>System dimensions (W x H x D)</b>	880 mm x 1 820 mm x 720 mm (34.6" x 71.7" x 28.3"), height with open door
<b>Weight</b>	300 kg (661.4 lbs), without exhaust unit
<b>Operating conditions</b>	
<b>Power supply</b>	110/230 V, 50/60 Hz, 1.25 kW
<b>Ambient temperature</b>	22 °C ± 2 °C (71.6 °F ± 4 °F)
<b>Humidity</b>	< 60 % non-condensing
<b>Cooling</b>	Air-cooled (internal cooling cycle)
<b>Hardware and software requirements</b>	Internal PC, Windows XP, 1 x external USB, 1 x internal USB, 1 x DVI (included)
<b>Required accessories</b>	Exhaust unit

\* Calibrated scanfield

a Depending on material and laser beam parameters

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