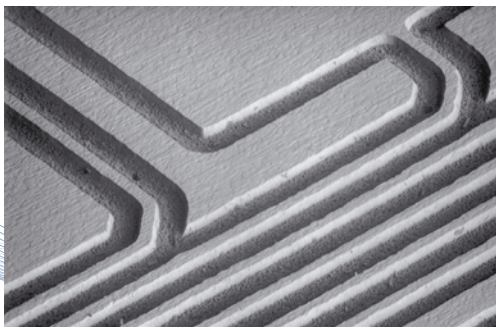
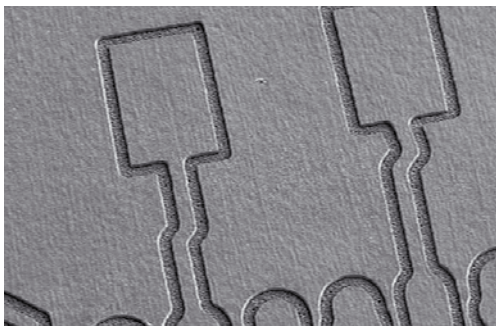
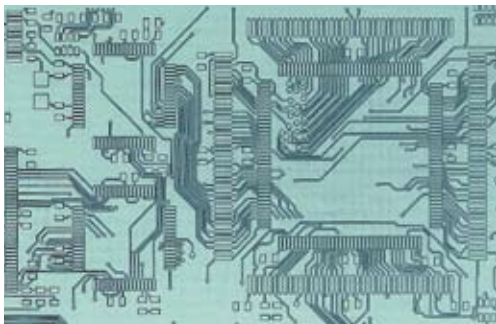
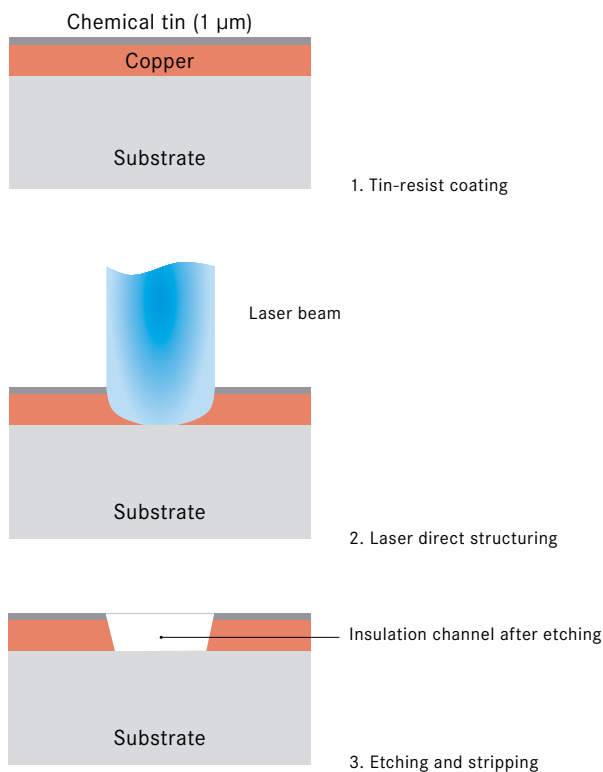


Application Report
LPKF MicroLine UV Laser Systems
Laser Removal of chemical tin for
the production of ultra-fine lines



Production of ultra-fine lines (50 µm lines/spaces) by laser-structuring of chemical tin (tin-resist technology)

Photo-lithographic exposure hits physical and economic boundaries when faced with the required enhancement in resolution of the circuit layout for high density interconnects (HDI) in particular. In conventional film exposure, material distortion in the inner and/or outer layers and in the films themselves can cause registration and positioning problems and thus considerably reduce the yield. In many cases, high densities are only specified in specific areas within one layer of an HDI circuit board. Whereas most of the area can be produced using conventional photo-lithographic techniques, an efficient alternative for high density areas is tin-resist technology. This enables the economic production of parts of the circuit board with 50 µm lines and spaces, at the same time guaranteeing high yields.



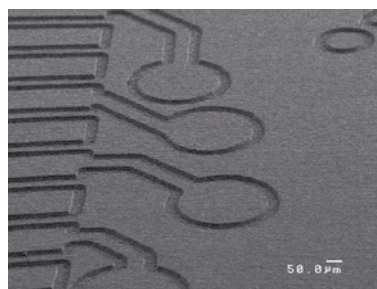
Process principle

The copper covered base material used in traditional panel-plating processes is initially coated in a continuous chemical tinning line with a homogenous, non-etchable tin-resist (Unicon ER®). The tin-resist is removed by the laser beam in the areas to be etched, whereby a large part of the copper layer is ablated at the same time. The very thin tin-resist coating and the strongly thinned copper layer improve the etching process. Etching times and

under-etching can thus be effectively minimised. The laser source used is a frequency-tripled Nd:YAG-laser with a wavelength of 355 nm. Because of its excellent focussing ability, extremely narrow channels can be structured in the tin-resist. In an alkaline etching bath, insulation channels are created around the conductor lines in the area of the ablated track. Line widths and spaces <50 µm can thus be realised. The tin needs only to be stripped prior to the further processing of the circuit board. Tin-resist structuring is superbly suited for the production of ultra-fine line areas on HDI multilayers. The highest registration requirements are met by on-line scaling.

Advantages of laser direct removal

- No photo-lithography
- Reduction of technology steps
- Ultra-fine line resolution with <50 µm lines and spaces realisable
- Efficient reduction of pad size as well as line widths and spaces
- Ideally suited for small areas with high densities, i.e. large areas are produced using conventional photolithography, while small ones with high densities are produced using laser structuring
- Automatic correction of position and process-related material distortion by fiducial registration of the inner and outer layers and online scaling
- Compatible with standard plating and etching processes
- Structuring directly from CAD data



40 µm lines and spaces on 20 µm copper base material

LPKF MicroLine UV Systems

- Frequency-tripled Nd:YAG laser operating at 355 nm wavelength for the production of ultra-fine structures
- Substrate dimensions up to 18" x 24"
- Scanner system for highest structuring speeds
- Telecentric optics for vertical channel geometries
- High-precision, high dynamic x-y table
- Automatic substrate handling
- Automatic alignment: camera-based vision system for fiducial registration and online scaling
- Automatic system calibration
- Input data formats: Gerber, HP-GL™, Excellon, DXF, etc.
- Debris extraction during processing
- TÜV certified

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