

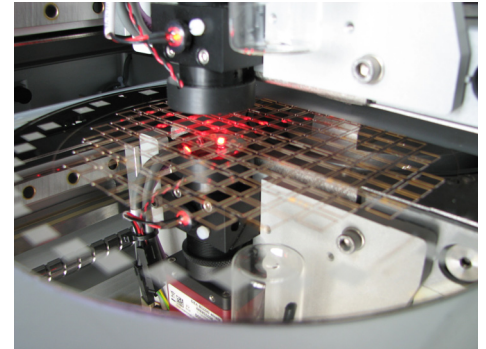
## Hybrid electronics: Chip assembly and wire bonding on digitally im- printed wafer surfaces

Digital additive printing allows low effort production of functional and/or electrically conductive structures compared to conventional microelectronics where lithographic and wet etching steps are used.

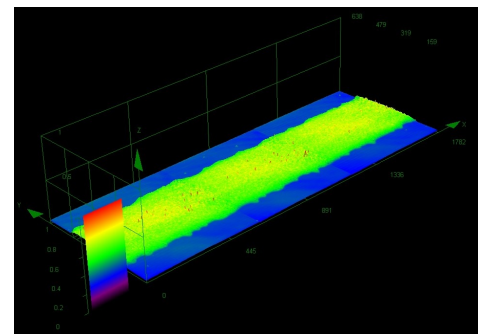
Functional printing to silicon surfaces not only aims for structures with high conductivity, but also to optimize parameters like surface homogeneity, edge definition and film adhesion.

For most production technologies, the economic "sweet spot" is a trade-off between high throughput and reduced design flexibility. Benefits of functional printing occur in a regime where production volumes are low or variability demands are high. Assembly and interconnect operations with low setup and tooling costs have good chances to meet customer expectations in this field. However, certain degrees of freedom with respect to design and layout are necessary to achieve sufficient reliability.

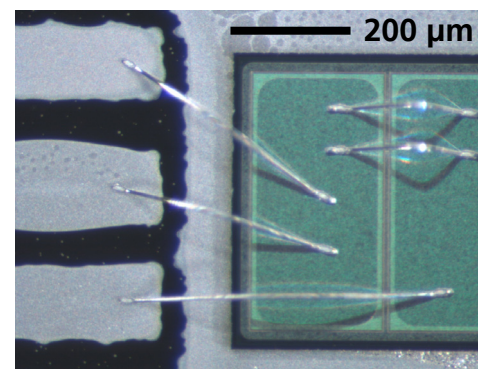
Fraunhofer ISIT now is able to serve such demands by offering inkjet printing on silicon wafer surfaces, followed by wire bonding and attachment of thin silicon chips using conductive glueing or soldering. Pull-/shear tests have shown good adhesion of wire bonds on printed structures after a special surface treatment, which makes this technology suitable for a broad range of applications.



Inkjet printing of silver lines on a silicon wafer.



Inkjet printed silver line profile on oxidized silicon wafer surface. The line width is 200  $\mu\text{m}$ ; average line height is 310 nm.



Inkjet-printed silver lines and pads with assembled silicon test chip on oxidized wafer surface.

### Fraunhofer-Institut für Siliziumtechnologie

Fraunhoferstraße 1  
D-25524 Itzehoe  
Phone +49 4821 17 4211  
info@isit.fraunhofer.de  
www.isit.fraunhofer.de

### Department Module Integration

Dr.-Ing. Dipl.-Phys. Thomas Knieling  
Phone +49 4821 17 4605  
thomas.knieling@isit.fraunhofer.de