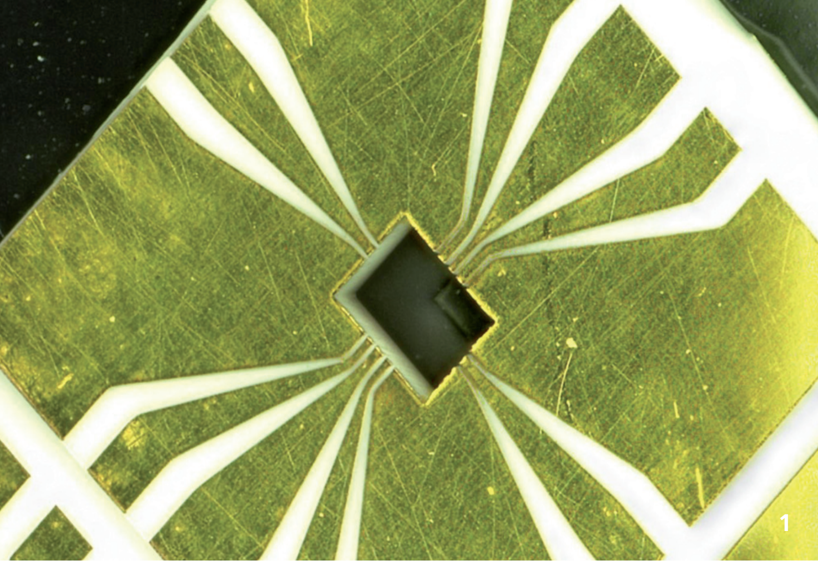

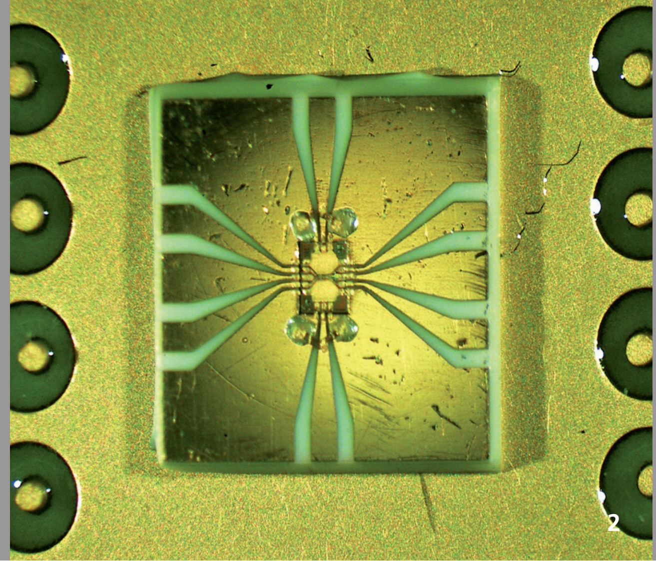

Subject to alterations in specifications and other technical information. 06/2013.

STRUCTURING OF HIGH FREQUENCY CERAMIC SUBSTRATES

Task

The trend towards high-frequency components with higher bit rates up to 100 Gbit/s requires substrates and printed circuit board structures having the necessary electrical properties and, at the same time, the small waveguide structures for such high frequencies. These components operate at frequencies above 50 GHz and have to be connected to the waveguides on the substrate via strip conductors with minimal losses. To manufacture the chip carrier, one must first make grooves in the ceramic substrates where the chips fit in exactly, and, second, implement the interconnect structures with conductor track widths of 70 µm and a spacing of 30 µm.

Method

These chips have dimensions of 1 mm x 1 mm with a thickness of 0.6 mm. To reduce the length of the bonding wires or ribbon bonding, the chip must be located on a level with the substrate surface, so that the recesses can be produced with high precision. By ablating with ultra-short pulse laser radiation with pulse durations of 10 ps, engineers at the Fraunhofer ILT have been able to manufacture the chip mount and remove the conducting paths directly from the copper coating. Thereby, the gap between the chip and substrate is less than 50 µm; this way, bond wire lengths can be reduced to about 100 µm.

1 Laser structured, metallized ceramic substrate with chip cavity.

2 Substrate carrier with inserted chip.

Result

With ultra-short pulsed lasers, both ceramic and copper coating can be removed without leaving any residue. This ultra-short pulsed laser ablation enables the production of the hole and the conductor structures in a single setup, using one laser and only modified processing parameters. Each individual chip carrier is about 5 x 5 mm in size. On a larger substrate several chip carriers are produced in a single pass and scribed with the laser. Then, the chip carriers can simply be separated by breaking them off. Recently available laser power up to 100 W makes this method suitable not only for prototyping, but also, due to the small dimensions of the structures, for the mass production of high-frequency circuit boards.

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