



1



2

LASER IMPULSE MELT BONDING (LIMBO)

Task

As the requirements in electric mobility and high-performance electronics become more demanding, the industry is looking more and more to power electronics components that have high strength and thermal stability. Conventional joining processes of electronic components, such as soldering or wire bonding, are of limited use in these applications due to the low melting points of the solders and small cable cross-section of the wire bonds. A method is required that can join thick copper connectors to thin metallization layers on sensitive substrates without causing any damage.

Method

In the innovative process approach »Laser Impulse Melt Bonding« (LIMBO), the phases of the process and melting contact are separated energetically. As the components are separated through a defined gap, the melt volume is generated in the thicker parts to be joined in a first phase of the process. By means of laser beam modulation, the melt is accelerated toward lower joining partner. This way, metallized layer can be wetted and melted by the melting energy and the thermal stress minimized in the substrate.

Result

The process makes it possible to weld 200 μm copper sheets on 35 μm metallization layers on silicon wafers with reproducible bonds. The penetration depth in the lower joining partner is less than 20 μm . It is possible to control melt dynamics in the process by adjusting the laser modulation.

Applications

The process enables thick connectors to be joined to sensitive substrates in semiconductor technology (silicon-based components) or electronic engineering (FR4 circuit boards) without damaging the substrate. In addition to joining on sensitive substrates, process approach is applicable for firm bonding of metal components with high gap tolerances.

Contacts

Dipl.-Ing. Simon Britten
Telephone +49 241 8906-322
simon.britten@ilt.fraunhofer.de

Dipl.-Ing. Benjamin Mehlmann
Telephone +49 241 8906-613
benjamin.mehlmann@ilt.fraunhofer.de

- 1 Copper sheet contacted to metallization layer.
2 Cross-section of a copper weld on a metallized silicon wafer.