



LASER IMPULSE METAL BONDING

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 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 Metal Bonding« (LIMBO), the two process stages – melting of the interconnector and joining on the metallization – are separated energetically. The process is driven by the acceleration of the melt over the gap, which is achieved by temporal modulation of the laser beam. As the energy of the melt is transferred to the metallization material, a weld joint is generated in the intersection between deflected melt and metallization. This leads to a minimal welding depth in the μm range in combination with a large joining diameter.

Result

The process makes it possible to weld 200 μm copper sheets on 10 μm metallization layers on FR4 circuit boards. Since the welding penetration depth is minimized to one wetting process, the critical temperature of the circuit board is not reached, and a reproducible joint is generated.

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 joining of metal components with high gap tolerances.

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- 1 Copper connector contacted to metallization circuit board.
- 2 Cross-section of copper weld on circuit board metallization.