Lasers in Advanced Packaging

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Abstract

Lasers are widely used for various device packaging and interconnect applications. Photonics, optoelectronics and microelectronics devices require fabrication, integration and packaging of many subcomponents from photonics integrated systems to electronics integrated systems, discrete electronics, and a variety of substrates working as carriers and interposers such as PCBs, ceramics, glass or flexible polymers. Lasers play a critical role in advancing the economics of advanced packaging while addressing requirements related to increased precision and miniaturization needs, and here we present a variety of application examples.

Lasers are used for cutting PCBs as well as metallic and ceramic frames, and can also be used for wafer level singulation of semiconductors and metals. In laser drilling different machining techniques can be used to cover a wide range of hole sizes and geometries in a variety of materials. Micromachining of complex 3D features can be done using a micro milling process whereby material removal occurs layer by layer in a controlled fashion to achieve the desired final shape to micron level accuracy. Selective laser removal can be used for creation of electrical circuits for example patterning metallic thin films on flexible polymer or rigid glass substrates. Alternatively lasers can be used to pattern away photoresist avoiding the use of expensive lithographic masks or to remove thin protective parylene coatings for local contacts. Laser lift off of thin flexible polymer films from rigid glass substrates can be used in a variety of flexible microelectronics applications. Laser marking is important for product identification, traceability and serialization and examples are provided showing how laser parameters such as wavelength and pulse duration can be chosen to match the application requirements. Finally we show examples of how laser micro welding can be used to join both metals and plastics.

Biography: Dr. Xiangyang Song is a laser applications scientist, and specializes in laser-material interactions and laser microfabrication. He received his Ph. D. in laser plasma physics at Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Science. He has been at IPG Photonics since 2010, where he has performed multiple laser applications projects related to solar, LED, medical devices and microelectronics.