

High speed soldering using laser printing for the assembly of electronic components

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Recent advancements in printed circuit board (PCB) assembly and IC packaging technology demand high resolution for ultra-fine pitch components (<0.3mm and <60 μm respectively), high throughput and compatibility with flexible substrates. These challenges are poorly met by the conventional deposition techniques (i.e. stencil printing [1]), thus the need for a digital and high-resolution deposition technology is essential. Laser-Induced Forward Transfer (LIFT) can offer an excellent alternative for assembly and packaging of electronic components: it is fully compatible with a wide variety of materials [2,3], it is environmentally friendly and offers versatile control over the printed volume with high throughput [4]. In this work, a novel process for printing lead-free, jettable solder paste (powder size 15-25 μm ; metal loading 87%) relying on LIFT is reported. A side-view imaging configuration is employed by coupling a LIFT setup with a high-speed camera for the real-time visualization of the ejection process. The experimental data from the captured videos are analyzed to determine morphological aspects, such as the volume of the printed pattern. Transfers are achieved with diameters ranging from 50 to 150 μm and printed volumes down to sub-nl. The fabrication of patterns, such as lines, on the PCB pads has been accomplished by scanning the laser beam over the donor surface, creating in this way consecutive jets which form overlapping droplets, as shown in Figure 1(a). The resulting printed patterns with 1 m/s scanning speed of the laser beam are presented in Figure 1(b). Finally, the reported process is applied for the actual assembly of a 0.22 mm ultra-fine pitch BGA IC on FR4 type PCBs, resulting in functional demonstrators.

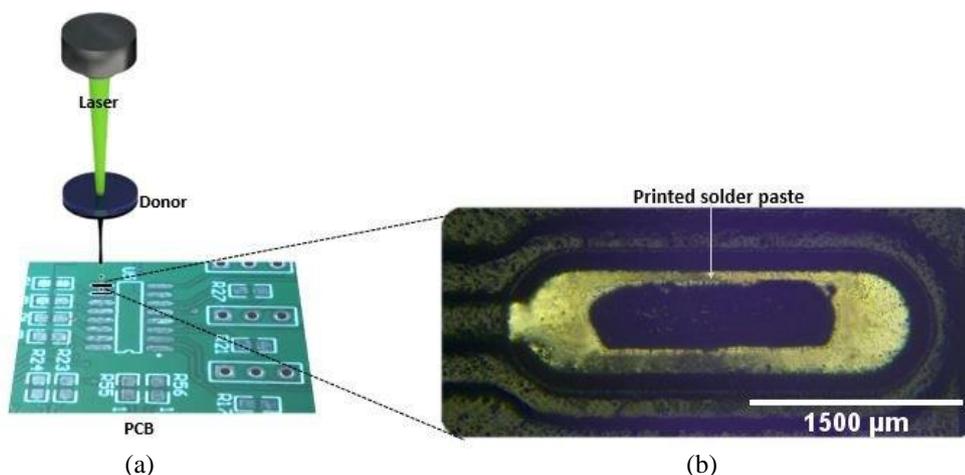


Figure 1 (a) Schematic representation of laser printing solder paste on PCB. (b) Optical microscope image of printed solder paste at 1 m/s scanning speed, on PCB pad

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