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FOBA White Paper
Laser Marking in the Semiconductor Industry

Economic and cost-effective: laser marking on surface-mounted devices (SMD)

Laser marked surface-mounted devices

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Economic and cost-effective:
Laser marking on SMDs

The increased use of surface-mount technology (SMT) together with higher packing densities enables an ongoing size reduction of single components in the semiconductor industry. For the marking of miniaturized parts, the utilization of laser markers gains in importance: laser systems are well-suited for micro-markings as they mark precisely and at the same time economically and cost-effectively.

SMT, surface-mount technology, is today's state-of-the-art technique for manufacturing electronic circuits. It describes how single components or single discrete devices are mounted directly onto the surface of printed circuit boards (PCBs). Typical surface-mounted devices (SMD) include transistors, diodes, capacitors, resistors and integrated circuits (IC).

Challenges in the semiconductor industry

The increased use of SMT together with higher packing densities leads to an ongoing size reduction of single components. This miniaturization within electronic parts requires high-precision micro markings on materials such as ceramics, various plastics (e.g. epoxy resin), metals and metalloids (e.g. silicone).

Marking contents include information on type and production or traceability codes and range from simple alphanumeric codes to complex 2D codes, logos or individual data. As many single components and devices are extremely small, marked data often do not exceed the micrometer range (example for SMD surface area: 0.6 mm x 0.8 mm).

Typical marking contents

SMD resistors are usually marked with their resistance values using two particularly assigned numbers and a variable number. SMD aluminum electrolytic capacitors, such as tantalum capacitors and film capacitors, are marked in the same way using two particularly assigned digits and a variable digit. Discrete devices, e.g. transistors and diodes, are often marked with an individual alphanumeric code (maximum three characters).

Marking solutions for SMT applications are generally integrated into tape-to-reel machines. A typical tape-to-reel machine includes backend processes. Besides handling and packaging processes, executed by the passive component feeder, the tape-to-reel module and the SMD orientation device, laser marking, mark inspection and 3D vision testing are typical parts of the SMD manufacturing process. The efficient integration of all process steps enables very low reject rates.

1 Perfectly readable microchip Content is marked within an area of 6 x 6 mm, marking time 45 ms
2 Smallest and finest line width Marked within an area of 2 x 1 mm in 10 ms
3 600 µm character height, marking time 29 ms (2.5 x 1.25 mm marking field in 18 ms)

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Overall, the variety and miniaturization of SMDs require such diverse process steps and distinct objectives and conditions within the SMT production:

- → Minimizing setup frequency
- → Optimizing job and lot planning/changes
- → Capacity sharing to several production lines
- → Highest production throughputs
- → Optimizing machine operation (line balancing)
- → Zero defect tolerance

The general requirements of the SMT industry as well as tight production lines and electronic handling machines demand a flexible integration and easy-to-use marking solution.

Our solution for laser marking on surface-mounted devices

With its small, short and compact design, **FOBA C.0100** is the **shortest marking laser on the market**. Mounting screws on all sides of the system allow a trouble-free horizontal or vertical assembly in lines and machines. The one-box design, the flexible software/interfacing concept and the two beam exit versions (0° or 90°) guarantee a flexible integration and minimized setup time. The laser's scripting interface (with Ethernet and serial interface) ensures for an optimal production line balancing and a seamless integration even into complex production lines.

Marked component
Marking field: 4 x 4 mm,
Marking time: 45 ms

FOBA's CO_2 laser marker ensures throughputs up to 300 parts per minute. With a lifetime up to 50,000 operating hours and virtually no consumables, FOBA C.0100 is the first choice for the cost-effective and economical laser marking on SMD components and devices.

Smallest and finest high resolution codes are prerequisite for SMD microparts with a size up to a few square millimeters. Here, FOBA C.0100 provides zero-tolerance quality and anytime traceable laser marks up to 50 µm line width and character heights up to 250 µm on moving and static products.

Smaller widths well below 30 µm and character heights of 150 µm can be achieved with the **fiber laser markers LF050-5/10**. The continuous wave marking lasers have been primarily designed to mark molded housings of discrete and integrated components as well as circuit boards with high quality marks and in the shortest of time. LF050 works reliably and is easy and flexible to integrate into any production environment. Thanks to the maintenance-free laser source (up to 100,000 operating hours) and a simple air cooling system, LF050 is the best alternative to FOBA C.0100 and an excellent marking and identification solution for the electronics industry.

Solutions for marking on SMDs:
FOBA marking lasers C.0100
and LF050

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