SmartProtect - Shallow Laser Marking for Memory Chips and Other Thin Substrates

Challenge

Manufacturers of thin and/or delicate components need to create marks on their products without any risk of thermal damage to the underlying material. A standout example is high-capacity memory chips consisting of multiple stacked ICs with mold compound <100 microns thickness. These applications need a marking method with minimal penetration but that still delivers high contrast.

Solution

SmartProtect technology from Coherent provides an ideal solution for all these applications and more. The key to its success can be seen in figure 1. Most lasers suitable for marking produce a circular beam, where the intensity peaks in the middle of the beam and tails away at the edges. This is then focused to a small spot on the target to produce a mark by some type of thermal or photochemical interaction. The penetration depth depends on the laser intensity; there is an ideal fluence (intensity) for every material and marking application. When the intensity is below this level the mark has low contrast, but when the intensity is well above this level, the excess power merely causes more underlying heating. The problem is simlar to marking soft paper with a pencil. If the pencil is very sharp it can pierce through the paper. Instead, the paper can be safely marked with a pencil with a flat tip rather than a sharp point.

SmartProtect eliminates this trade-off using novel optics to reshape and focus the laser. Now the beam profile is flat without any high intensity center that could penetrate and damage the substrate.

Benefit

SmartProtect creates high-contrast characters with sharp edges, without the risk of underlying thermal damage in the center of the laser spot. High-contrast marks can be safely created in mold compound with maximum penetration ≤10 microns. Wide lines can be marked in a single pass. SmartProtect is also ideal for creating (smooth surface) marks on heat spreaders.

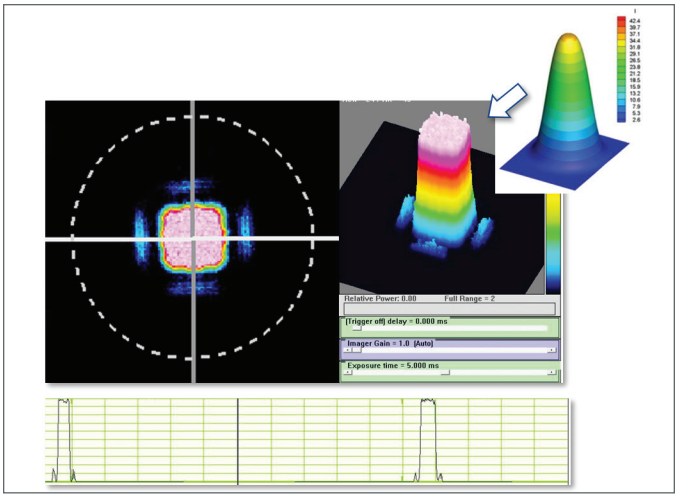

Figure 1. The beam from most laser markers has a high intensity in the center. SmartProtect delivers near-uniform intensity enabling depth and contrast optimization.

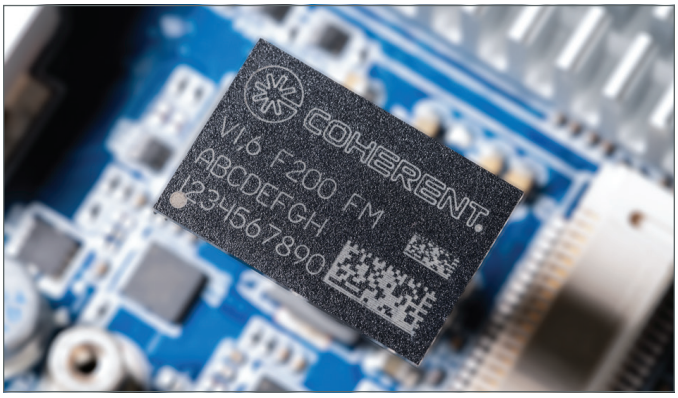

Figure 2. SmartProtect is a perfect solution for marking high-capacity memory chips and other thin packages.

Figure 3. SmartProtect technology is an ideal method for marking heat spreaders.

Application Field

Marking of memory chips or other thin IC packages and heat spreaders.

Contact

Dr. Dietrich Tönnies, Product Line Manager, Munich, Germany
Email: dietrich.toennies@coherent.com

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