



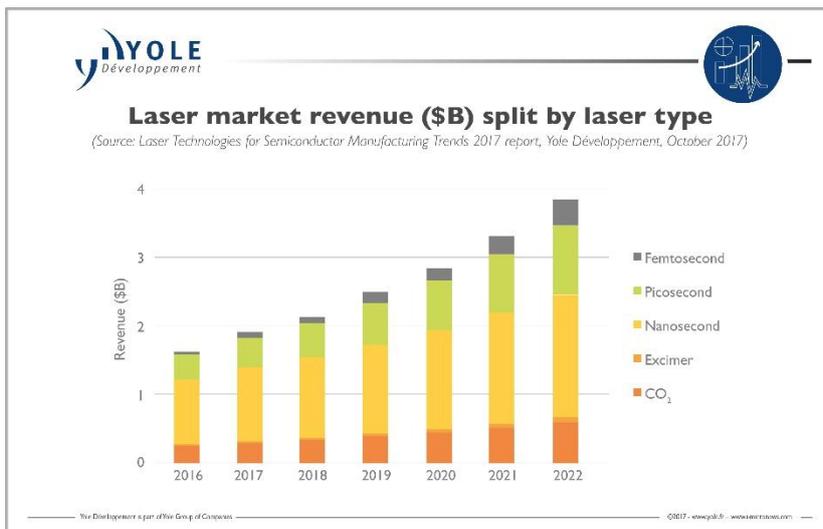
FOR IMMEDIATE RELEASE:

Laser technologies for semiconductor manufacturing: a massive adoption

Extracted from: Laser Technologies for Semiconductor Manufacturing report – Yole Développement, October 2017

LYON, France – October 11, 2017: A wide variety of laser technologies is today available to semiconductor manufacturers and enable the development of innovative semiconductor manufacturing processes. According to [Yole Développement \(Yole\)](#), the laser equipment market will grow at a 15% CAGR between 2016 and 2022 and should reach more than US\$4 billion by 2022 (excluding marking). Those figures are showing the massive adoption of laser technologies for semiconductor manufacturing processes.

In its latest report titled [Laser Technologies for Semiconductor Manufacturing](#), the market research and strategy consulting company details the status of this industry, mainly driven by dicing, via drilling and patterning in PCB flex and PCB HDI, IC substrates and semiconductor device processing. The Laser Technologies for Semiconductor Manufacturing report from Yole provides a thorough analysis of the different existing laser equipment and laser source solutions developed for semiconductor process steps. It is a comprehensive analysis highlighting the maturity level of each laser type, based on a technical roadmap until 2022. With this new report, Yole’s analysts offer a clear understanding of the laser technologies’ benefits and added value for each manufacturing process.



The Laser Technologies for Semiconductor Manufacturing report is the first of a wide collection of reports that will be released by Yole during the next months. Further its [1st Executive Forum on Laser Technologies](#) taking place in Shenzhen, China, welcoming more than 100 attendees, the “More than Moore” company Yole confirms the expansion of its activities towards the laser-based solutions.

Technologies, roadmaps, market metrics, supply chain, competitive landscape, market shares and more... all these topics will be described and deeply analyzed in Yole’s laser technology & market reports.

What are the key semiconductor manufacturing processes that are driving the laser equipment industry? Yole invites you to discover today the latest technology challenges and market evolution.

Today, laser applications in the semiconductor industry are broad and diversified. Various laser technologies have started integrating into major semiconductor processes, including laser cutting, drilling, welding/bonding, debonding, marking, patterning, measurement, deposition, driven by motherboards. They are used to process semiconductor devices, flexible and HDI¹ PCBs², and in IC³ packaging applications.

Drivers of laser methods differ from one process step to another. However, there are similar and common drivers for applicability of lasers to semiconductor and PCB processing applications. The key trends driving laser applicability and contributing to its growth are:

- The desire for die size reduction and thus further miniaturization of devices driven by computers, hand-held electronic devices such as mobile phones, tablets and electronic book readers, wearable devices and consumer electronics
- Demand for increased yield and throughput
- Better die quality
- The need to inspect voids and particles through a transparent material such as glass, which requires the use of laser methods
- Laser annealing for very high flexibility

However, the choice of the most suitable laser processing type depends strongly on the material to be processed, processing parameters, and the manufacturing process step.

Laser type is defined by parameters such as wavelength, emitting UV⁴, green, or IR⁵ light, for example, as well as the duration of pulse, for example nanosecond, picosecond or femtosecond. Users must consider which pulse length and wavelength is right for their semiconductor process step and application.

Nanosecond lasers are the most commonly used type of laser applied in semiconductor manufacturing and PCB processing, with more than 60% market share. They are followed by picosecond, CO₂ and femtosecond lasers. In the case of dicing step, the choice of laser type also depends on the material and substrate to be diced. For low dielectric constant (low-k) materials, nanosecond and picosecond UV

¹ HDI : High Density Interconnect

² PCB : Printed Circuit Boards

³ IC : Integrated Circuit

⁴ UV : Ultra-Violet

⁵ IR: Infra-Red

lasers are used to optimize optical absorption. Picosecond and femtosecond IR lasers are typically used for cutting glass and sapphire substrates but not singulating SiC⁶ substrates.

In drilling, the type of laser employed depends on the substrate. Nanosecond UV lasers are usually employed in flexible PCBs, while CO₂ lasers are largely applied for PCB HDI and IC substrates. However, for IC substrates, the choice between CO₂ and nanosecond or picosecond UV lasers depends on via diameters. Below 20µm diameters, the industry tends to go to picosecond UV lasers which are much more expensive than nanosecond UV lasers but offer superior quality.

Generally speaking, CO₂ is the cheapest and fastest laser solution and used in preference to nanosecond, picosecond or femtosecond solid state lasers for dicing, drilling, patterning, marking for applications that require high power and do not care about heat damage or dicing width. However, CO₂ is limited when small features are needed.

Nanosecond lasers are currently the dominant technology, but picosecond and femtosecond lasers could move ahead in the laser dicing equipment market. However, femtosecond laser implementation is more complex and expensive.

Yole's laser report will provide a comprehensive overview of the laser equipment and laser sources used for each semiconductor process step application, along with a detailed analysis of laser technology trends and a market forecast. It will also offer a detailed analysis of the laser equipment market by volume and value, its growth for the 2016-2022 timeframe, and breakdown by laser type and process step application. A detailed description of this report is available on [i-micronews.com, semiconductor manufacturing reports](https://www.micronews.com/semiconductor-manufacturing-reports).

⁶ SiC : Silicon Carbide



About [Laser Technologies for Semiconductor Manufacturing](#) report:

Which semiconductor manufacturing processes and solutions will drive the laser equipment market's growth? - Produced by Yole Développement (Yole) part of Yole Group of Companies.

- Companies cited in the report:

Accretech, Amplitude systems, Amphos, Applied Materials, AP systems, ASM Pacific, Coherent/Rofin, 3D Micromac, 3M, Corning, Delphi Laser, Disco, Edgewave, Electro Scientific Industries(ESI), Eolite, EO Technics, EVG, Hamamatsu, Han's laser, Hanmi Semiconductor, HG Tech, IPG Photonics, Lumentum, LPKF, JSW, JT Corp, K-Jet, Manz, MKS Instrument, ORC, Orbotech/SPTS, PacTech, QMC, Screen, Shanghai Micro Electronics Equipment (SMEE), Solmates, Synova, Sumito Heavy Industries, SUSS MicroTech, Nikon, Screen, SMEE, Tazmo, TOK, Trumpf, United Winners Laser (UW), Ushio, Veeco/Ultratech, Via Mecha, ... [Full list](#)

- Author

Amandine Pizzagalli is a Technology & Market Analyst at Yole Développement (Yole). Amandine is part of the development of the Advanced Packaging & Semiconductor Manufacturing Business Unit of Yole with the production of reports and custom consulting projects. She is in charge of comprehensive analyses focused on semiconductor equipment, materials and manufacturing processes.

Previously, Amandine was engaged in many projects of development focused on CVD and ALD processes for semiconductor applications at Air Liquide. Amandine is graduated in Electronics from CPE Lyon (France), with a technical expertise in Semiconductor & NanoElectronics and has a master focused on Semiconductor Manufacturing Technology, from KTH Royal Institute of Technology (Sweden).

She has spoken in numerous international conferences and has authored or coauthored more than 10 papers..



About Yole Développement – www.yole.fr

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole Développement group has expanded to include more than 50 collaborators worldwide covering MEMS,

Compound Semiconductors, RF Electronics, Solid-state lighting, Displays, Image Sensors, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.

The “More than Moore” company Yole, along with its partners System Plus Consulting, PISEO, Blumorpho and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

- Consulting & Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
- Reports: David Jourdan (jourdan@yole.fr)

Yole Group of Companies - Press Relations & Corporate Communication: Sandrine Leroy (leroy@yole.fr)

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