



FOR IMMEDIATE RELEASE: CSP LED lighting modules: a revolution within the LED industry?

CSP LED Lighting Modules report – PISEO & Yole
Développement – February 2017

LYON, France – March 16, 2017: “We estimates that CSP¹ LED² modules represented less than 1% of the LED module business in 2016”, says **Pierrick Boulay, Market & Technology Analyst at [Yole Développement \(Yole\)](#)** “However, with strong potential in multiple applications and the lighting industry getting experience with integrating such technology, we forecast a market share of nearly 6% by 2021.”

In the new [CSP LED Lighting Module report](#), Yole and [PISEO](#), both part of Yole Group of Company, looked at the values of CSP solution, from an integrator perspective. They use their expertise and their understanding of application requirements, LED packages architectures and long lasting system design capabilities to perform a comprehensive analysis of the benefits and drawbacks of CSP approach for different lighting applications.

CSP LEDs add value through power density offered from a small surface, confirm both partners. The first targeted application was smartphone flashes. As smartphones get thinner and add functions, so too must integrated components/modules. The small form factor and wide beam angle of CSP LEDs have also driven their use in TV backlighting units. Wide beam angles mean the pitch between LEDs can be larger, reducing the number of devices needed and in turn lowering backlight cost...

But CSP LEDs are also a means to develop new functions in lighting products and this will be the next growth driver for such LED device, detailed Yole and PISEO in their report. Some general lighting applications are likely to adopt these light sources to reduce the cost of the full system (lamp and/or luminaire). Their small size enables LED clusters, similar to COB³ LED modules but with more functionalities. CSP LED clusters promise tunable, white and HCL⁴ intended to promote a person’s well-being, mood and health, and others smart lighting functions. At middle term, such device will also help the development of AFLS⁵.



¹ CSP : Chip Scale Packaging

² LED : Light Emitting Diode

³ COB : Chip-On-Board

⁴ HCL: Human Centric Light

⁵ AFLS: Advanced Front Lighting Systems

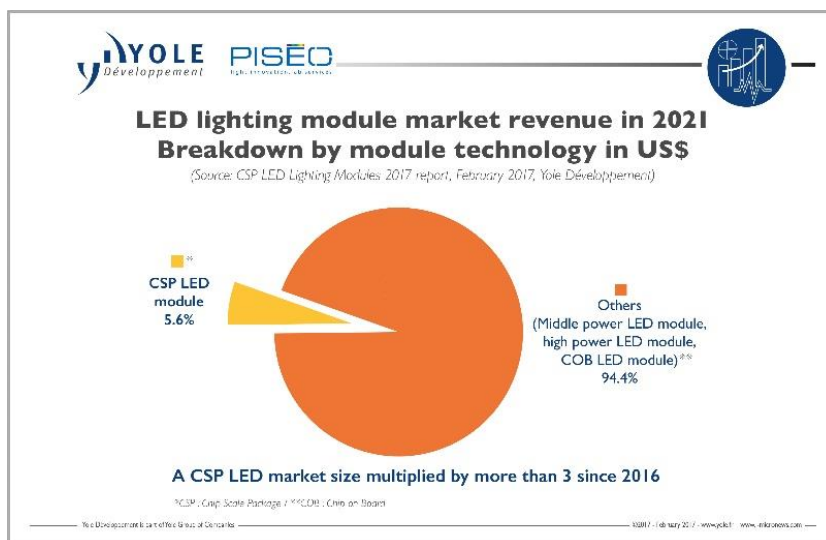
As an example, the leading company Samsung made several strategic technical choices including CSP manufacturing process to perform a LED device with a very competitive manufacturing cost: packaging and manufacturing process steps of the Samsung's CSP LED device have been deeply analysed by [System Plus Consulting](#), part of Yole Group of Companies (Source: [Samsung LMA101A reverse costing report](#), System Plus Consulting, March 2017).

Yole and PISEO experts propose you today an overview of the CSP LED lighting module, the related technology and the application requirements.

Chip-scale packages are new to the LED industry, but are the mainstay of the traditional semiconductor industry, where they improve reliability, thermal management and enable smaller packages.

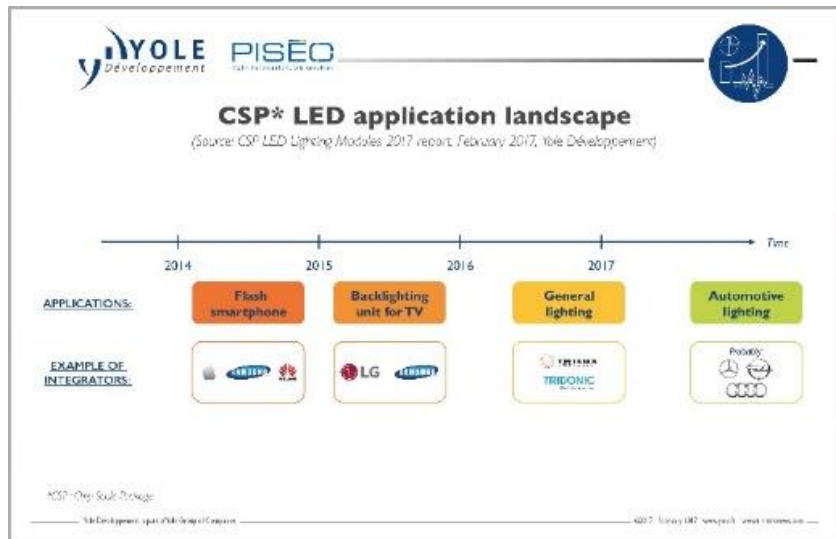
“CSP LEDs can be less than a tenth of the size of high and middle power

LEDs, increasing lumen density and simplifying integration into final products”, explains Dr Olivier Andrieu, R&D Project Director and System Architect at PISEO. “This new architecture also provides a lower thermal resistance, reporting reliability aspects on PCB level and solder management, and widen viewing angles compared to other traditional packages,” he adds.



The [CSP LED Lighting Module report](#) also points out several challenges to overcome at the device manufacturing and module integration levels. These include color uniformity, chemical stability, given there is little to no sealing off from the external environment, and control of optical properties like the radiation pattern.

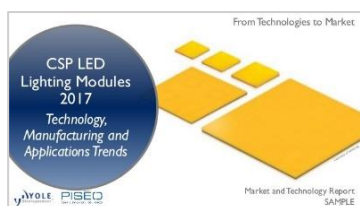
Yole and PISEO have been closely working together since PISEO's creation. Yole's analysts are daily supporting PISEO's team in their numerous projects of development and innovative research projects, bringing a dedicated expertise focused on markets analysis and applications identification. Fully embedded within an innovation process, this collaboration has been strengthened over the last years: Yole and PISEO are growing together in the LEDs & related systems industry to build innovative solutions based on disruptive technologies. And technology & market reports publication point out the added-value of this powerful combination.



The [CSP LED Lighting Module report](#) is a comprehensive study of CSP LED devices, with analyses including chip and package technology, manufacturing processes, related costs/prices, industry and market trends. It details deeply analyses CSP LED lighting module design, with a strong focus on optical design, thermal and electrical management and precautions for CSP LED integration.

A detailed description of this report is available [on i-micronews.com](http://on-i-micronews.com), [LED reports section](#).

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About **CSP LED Lighting Modules** report

CSP LED lighting modules: a potential revolution for the LED industry?

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Authors:

- **Dr Olivier Andrieu** is an R&D Project Director and Mechatronic and LED System Architect at PISEO. He is working in collaboration with Yole Développement's team to perform comprehensive technical analyses of innovative LED-based optical systems and markets.
His expertise is based on the development of disruptive solutions taking into account mechanical, electronic, optic and thermal issues to achieve application requirements. Previously, Dr Andrieu worked for EFI Automotive as head of innovation and more recently for Philips Lighting where he developed and implemented numerous LED lighting solutions on a global level.
- **Pierrick Boulay** works as Market and Technology Analyst in the fields of LED, OLED and Lighting Systems to carry out technical, economic and marketing analysis at Yole Développement, the "More than Moore" market research and strategy consulting company. He has experience in both LED lighting (general lighting, automotive lighting...) and OLED lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO - France).
- As a Senior Optical Systems Engineer, **Grégory Duchène** is in charge of optics related projects at PISEO. He has created numerous innovative designs for optical systems, based on spectral optimization and light conversion approaches. These disruptive solutions, developed in collaboration with other PISEO experts, are dedicated to general lighting, automotive and imaging applications. Gregory also collaborates with Yole Développement analysts to perform comprehensive technical and marketing analyses focusing on LED lighting modules. Before PISEO, he worked for over ten years on the development of optical designs, including control benches, LED-based lighting systems, CMOS and CCD sensors, signal processing solutions and more.
Gregory Duchene has a Master's Degree in optics from the Institut d'Optique Graduate School (IOGS - France).
- **Pars MUKISH** holds a master degree in Materials Science & Polymers (ITECH - France) and a master degree in Innovation & Technology Management (EM Lyon - France). Since 2015, Pars MUKISH has taken on responsibility for developing LED, OLED and Sapphire activities as Business Unit Manager at Yole Développement. Previously, he has worked as Marketing Analyst and Techno-Economic Analyst for several years at the CEA (French Research Center).
- **Joel Thomé** is the General Manager & Senior Research & Innovation Consultant at PISEO. In collaboration with Yole Développement's team, Joel Thome performs numerous technical and market analyses focusing on LED solutions, in addition to developing innovative optical solutions with PISEO's R&D team.
With a Master's Degree in mechanical engineering, Joel has been working in the lighting industry for more than 25 years. After beginning his career at Philips Lighting, he has recently held various global business, marketing and R&D senior management positions. During this period he developed strong expertise in lighting controls, LED technology and innovation processes including strategic roadmaps and project portfolio management. Today, Joel Thome is also the administrator of the GIL-Syndicat du Luminaire trade union organisation and the Cluster Lumière association.

Companies cited in the report

Apple, AT&S, Audi, BMW, BREE Optronics, Bright LED, Carclo, Cree, Dow Corning, Edison Opto, Epistar, ETI, Everlight, Fraen, Genesis Photonic Inc., Haeusermann, Hakko, Harvatek, Honglitrionics, Huawei, ITRI, Jufei, Kathod, Kingbright, Ledil, Lextar, LG, Lite On, Luminus Devices, Mason, Maven Optronics, Mercedes-Benz, MLS, Nationstar, Nichia, Oasis, Opel, Optotech, Osram, Philips Lumileds, and many more...



About PISEO – www.piseo.fr

A unique innovation platform dedicated to smart LED based optical systems
PISEO owns high skilled engineers and cutting edge characterization equipment, all situated in a single location. The team, mainly issued from an industrial global leader, delivers a whole set of services to the industry throughout the entire product life cycle. Therefore, PISEO runs projects from applied research up to product recycling, including market analysis, technology scouting, strategic planning and industrial design.

More info on www.piseo.fr

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About System Plus Consulting - www.systemplus.fr

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product. System Plus Consulting engineers are experts in Integrated Circuits - Power Devices & Modules - MEMS & Sensors - Photonics – LED - Imaging – Display - Packaging - Electronic Boards & Systems.

Through hundreds of analyses performed each year, System Plus Consulting offers deep added-value reports to help its customers understand their production processes and determine production costs. Based on System Plus Consulting's results, manufacturers are able to compare their production costs to those of competitors.

System Plus Consulting is part of Yole Group of Companies.

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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, LED, 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, KnowMade, PISEO and Blumorpho are part of Yole Group of Companies and support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

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