LYON, France – September 28, 2017: The LED lighting module industry is showing the emergence of innovative functions and the introduction of new market segments including automotive, smart lighting and horticultural markets. In this context, Yole Développement (Yole) estimates the market and presents its vision of the industry in its new technology and market report titled LED Lighting Module Technology Industry & Market.

According to Yole’s Solid State Lighting team, the LED lighting module market, including flexible LED strips, reached nearly US$4 billion in 2016 and will grow to US$13.8 billion by 2022. “LED technology is increasingly penetrating general lighting applications, thanks to how easily integrators can use it,” announces Pierrick Boulay, Technology & Market Analyst, Solid-State Lighting at Yole. “The LED lighting module market will therefore deliver a 22.6% CAGR between 2017 and 2022.”

Yole’s report provides a comprehensive overview of the LED lighting modules including technologies, markets and applications, main functions and integration into lighting systems. The company propose a deep analysis of the positioning of each module type, including mid-power, high-power, COB and flexible strip and the main technologies in use. Industry structure, future trends and market data are also analyzed in this report.

What is the status of the LED lighting module industry? Yole’s analysts offer you a snapshot of this market.

General lighting is not a ‘blue ocean market’ any more, due to strong price pressure and intense competition between LED players. Therefore, LED

---

1 LED: Lighting Emitting Diode
2 CAGR: Compound Annual Growth Rate
3 COB: Chip-On-Board
module manufacturers are seeking growth engines, following the example provided by the packaged LED industry a few years ago. Therefore, LED companies are diversifying their activities and looking for market opportunities. These emerging market segments include horticultural lighting, automotive lighting and smart lighting, and are going beyond visible light into the IR\(^4\) or UV\(^5\) parts of the spectrum. All of these applications are attractive by showing much higher margins, compared to general lighting ones.

The modules used in these applications require a high level of expertise, a strong industrial knowledge and technical skill. LED module manufacturers targeting these new applications are betting integrators will not have the competencies needed. In addition, high market demand will help them move higher in the value chain.

“A good example is Everlight”, comment Pierrick Boulay, from Yole. “Initially positioned as a light source supplier, it then started developing COB technology. It is now seeking to enter the automotive lighting business, positioning itself as an advanced module supplier.”

In parallel, beyond visible light, UV and IR LED modules are increasingly used, pushed by rapidly growing applications like UV curing and IR surveillance cameras. Large numbers of LEDs is used in each module, and thermal management is crucial for performance, especially for UV applications.

Driven by mid-power modules, this industry will treble in the next five years (in value). Therefore, mid-power LEDs can be used in almost all applications. In 2016, the mid-power LED modules are driving the market, providing 60% of market revenues. In parallel, high-power LEDs are used only in applications requiring high luminous flux in a small module. As a result, the number of applications using high power LED modules is limited and represents only 7% of market (in revenues). COB\(^6\) LED modules provide a compromise on size, LES\(^7\) area, luminous flux and power consumption. COB LED modules are therefore dedicated to many

---

\(^4\) IR : Infra Red  
\(^5\) UV : Ultra-Violet  
\(^6\) COB : Chip-on-board  
\(^7\) LES : Light Emitting Surface
applications, and lead the total LED module market in volumes shipped. However, as these modules are relatively easy to manufacture in few steps, the associated ASP\(^8\) is low. Consequently, COB LED modules represent only 20% of market revenue.

In parallel, flexible LED strips can be directly used as LED lighting systems, mostly in indirect lighting applications. These modules are the ability to be easily implemented for residential and commercial lighting. Recent developments, like using LED chips instead of packaged LEDs on a flexible substrate, allow much higher efficiency, opening doors to new applications such as linear lighting.

Yole’s analysts offer you today a comprehensive technology and market analysis dedicated to the LED lighting module industry. A detailed description of this report is available on [i-micronews.com, LED reports section](http://www.i-micronews.com).

Yole is also part of the LED Professional Symposium (LpS 2017) program with a relevant presentation on "2017 LED Industry Update: Highlights and Future trends" led by Pars Mukish, Solid-State Lighting Business Unit Manager at Yole. This presentation will be available soon on i-micronews.com in the dedicated section.

The conference takes place from Tuesday to Thursday this week in Bregenz, Germany. Program & registration are available on [LpS website](http://www.led-symposium.org).

---

\(^8\) ASP: Average Selling Price
About LED Lighting Module Technology Industry & Market Trends report:
After wide use in general lighting applications, LED module manufacturers are now looking for new applications with higher margins…
Produced by Yole Développement (Yole) part of Yole Group of Companies.
*Companies cited in the report:

Authors
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).
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).

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)

####