



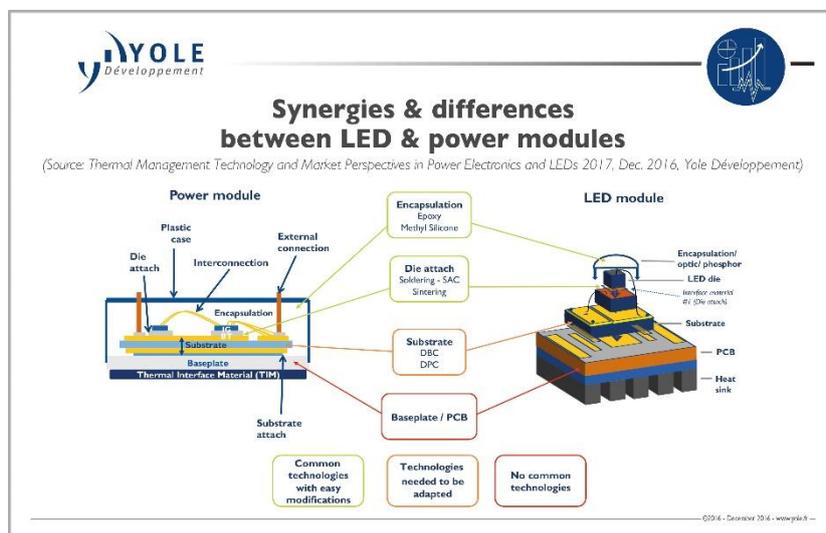
FOR IMMEDIATE RELEASE: LEDs & PE innovations are converging to handle module-level thermal management

Thermal Management for LEDs and Power Electronics 2017
report – Yole Développement – December 2016

LYON, France – December 14, 2016: In 2015, all economic indicators pointed to continued market growth for both industries, power electronics and LED¹, especially with IGBT² modules boosted by EV/HEV³ industry and general lighting applications, a killer application for LEDs since 2012⁴. To support this growth and answer the thermal management needs in power electronics and LED, lot of innovative technologies are emerging. According to [Yole Développement \(Yole\)](http://www.yole-developpement.com), one of the most impressive technical developments is the convergence of thermal management for both sectors, LED and power electronics, particularly the materials used for thermal management. The thermal management convergence is driven by the applications, announces the “More than Moore” market research and strategy consulting company, Yole.

[Thermal Management Technology & Market perspectives in Power Electronics and LEDs report](#) powered by Yole’s Power Electronics &

LED teams, reviews insight into synergies between power electronics and LED for thermal management. It describes and analyzes drivers and challenges that are facing industrial companies. This latest report proposes an overview of the market trends and technology evolution including 2015-2021 market figures, technology status and technical roadmap analysis and more. Under this report,



¹ LED: Light Emitting Diode

² IGBT: Insulated Gate Bipolar Transistor

³ EV/HEV: Electric Vehicles/Hybrid Electric Vehicles

⁴ Sources : [Status of the Power Electronics Industry report](#), Jun. 2016, Yole Développement – [LED Lighting Module Technology, Industry and Market Trends 2015 report](#), Nov. 2015, Yole Développement

Yole's analysts also offer business model and supply chain analysis across various materials used for thermal management.

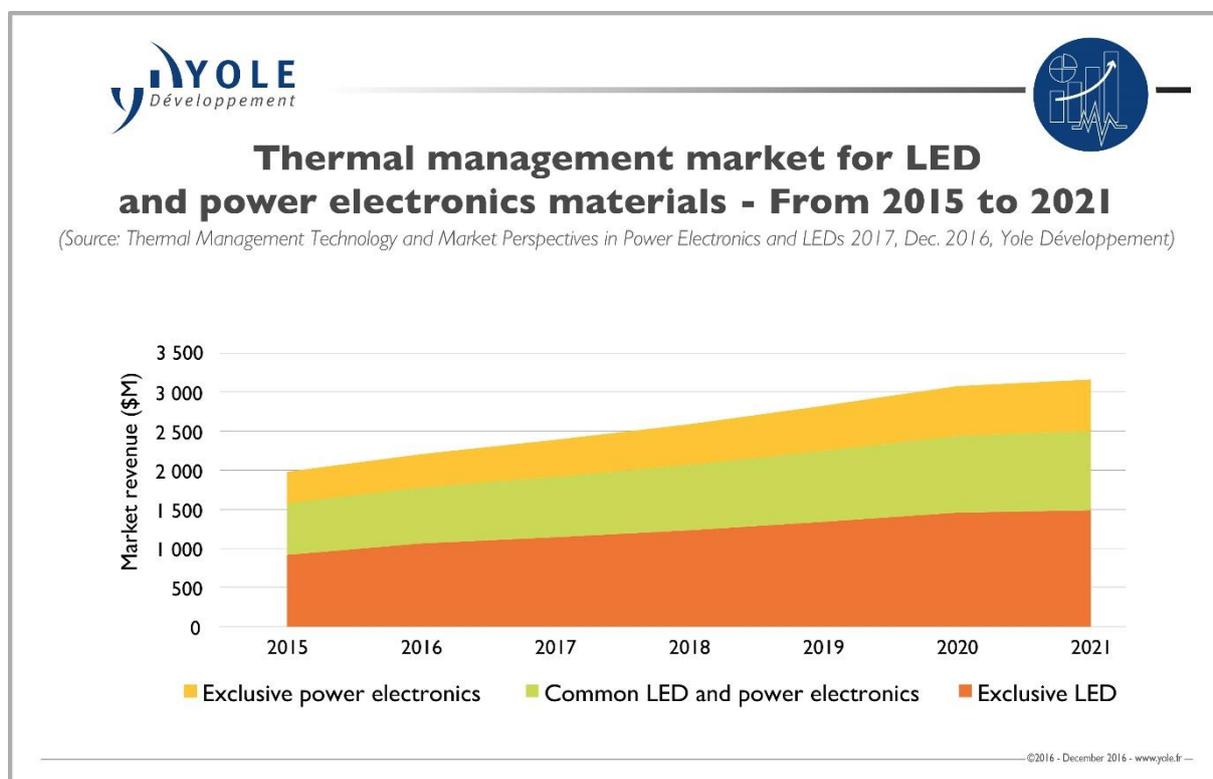
A rapid convergence of key technologies is driving unprecedented change. In this dynamic environment, Yole's goal is to understand their customers' strengths and guide their success.

"Power electronics and LEDs are different industries that today face similar challenges", explains **Dr Pierric Gueguen, Business Unit Manager at Yole**. And he adds: *"Needs for green energy with lower CO2 emissions have led these industries to develop more efficient and smaller solutions."*

At the device level, cost pressure and the need for better performance is pushing designers towards smaller and thinner chips, also leading to increased power density. Such power density targets in both power electronics and LEDs bring a convergence of thermal management requirements, supporting the development of new materials.

Among materials used for thermal management, Yole specifically investigated the market and technology evolution of die attach, substrates, baseplates/PCBs and encapsulants. Overall, the market for these materials was worth US\$1.98 billion in 2015 and will grow to US\$3.16 billion by 2021 at a CAGR⁵ of 6%.

"Their value proposition has the potential to bring business to their suppliers and key differentiating factors to device manufacturers", comments **Pierrick Boulay, Technology & Market Analyst at Yole**.



⁵ CAGR : Compound Annual Growth Rate

In 2021, the value of the market for thermal management materials will be almost 14% of the total value of the power electronics and LEDs module market. Automotive applications claim a large share of the thermal management material market, reaching almost 45% in 2021. Almost 30% of the overall market comprises technologies common to LEDs and power electronics.

“Power electronic modules represent a healthy market, worth about US\$2.9 billion in 2015 and set to reach US\$4.5 billion in 2021, growing at 9% CAGR”, explains Pierric Gueguen. In parallel, the LED packaging market reached US\$15 billion in 2015, after years of strong growth led by LED TV and general lighting. However, price pressure will moderate growth in coming years, with a 3.4% CAGR leading to a market worth US\$18.5 billion in 2021.

Power electronics and LEDs need the right materials to handle thermal management challenges. As those applications are driven by similar technical requirements, one technical solution can be adopted and developed for one industry before being used by another industry. *“The 30% of the overall thermal management material market that is common to both LED and power electronics represents US\$660 million in 2015”,* announces Pierrick Boulay. *“According to our estimations, such market segment will reach US\$1014 million in 2021”.* Moreover, another 30% can be reached by adapting existing technologies used in LED or power for the other application...

From perspectives ranging from manufacturers and material suppliers through to end users, market dynamics, drivers and challenges are presented in this report, for both power electronics and LEDs.

A detailed description of the thermal management report as well as other LED & Power Electronics reports Yole are available [on i-micronews.com, reports section](http://on-i-micronews.com, reports section).



For more information about this report, please contact:

[David Jourdan](mailto:David.Jourdan@yole.fr)

Phone: +33 472 83 01 90

About [Thermal Management Technology and Market Perspectives in Power Electronics and LEDs 2017](#) report:

▪ Authors:

Pierrick Boulay works as Market & Technology Analyst in the fields of LED, OLED and Lighting Systems to carry out technical, economic and marketing analysis at Yole. He has experience in both LED lighting (general lighting, automotive lighting...). Pierrick holds a master degree in Electronics (ESEO - France).

Dr Pierric Gueguen is Business Unit Manager for Power Electronics & Compound Semi. activities at Yole. He has a PhD in Micro and Nano Electronics and a master degree in Micro & Nanotechnologies for Integrated Circuits. He worked as PhD student at CEA-Leti in the field of 3D

Integration for Integrated Circuits & Advanced Packaging. He then joined Renault SAS, and worked for 4 years as technical project manager in R&D division.

Coralie Le Bret has been an analyst in power electronics & compound semiconductor technologies since 2014, at Yole. She graduated from INSA Lyon with an engineering degree in material sciences, specializing in semiconductors and microelectronics. At Yole she is in charge of electro-mobility and uses her expertise on materials & semicon. to follow power devices & power packaging evolution.

Pars Mukish holds a master degree in Materials Science & Polymers (ITECH) and a master degree in Innovation & Technology Management (EM Lyon). Since 2015, Pars Mukish has taken on responsibility for developing LED, OLED & Sapphire activities as Business Unit Manager at Yole. Previously, he has worked as Marketing Analyst and Techno-Economic Analyst at the CEA.

▪ Companies cited in the report:

3M, Aavid Thermalloy, ABB, ACC, Alpha, AI Technology, AM2T, Amkor, Amocera, APE, aPSI3D, AT&S, BlueStar, Besi, Bergquist, Bosch, BYD, CeramTec, CETC, Comelec, Continental, Coorstek, CPS, Creative Materials, CSR, Curamik, Danfoss, Deca Technologies, Delphi, Denka, Denso, Dow Chemical Dow Corning, Dowa, DuPont, Dynex, Emerson, Fairchild, Ferrotec, Fraunhofer, Freescale, Fuji Electric and many more...

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, 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)
- Press Relations & Corporate Communication: Sandrine Leroy (leroy@yole.fr)

###