LYON, France – November 27, 2018: Enabling megatrends, the power electronics market has grown tremendously last year. Yole Développement (Yole) announces a US$32.7 billion power electronics market in 2017 in its report, Status of the Power Electronics Industry published last summer.

“2017 is showing the increase in shipments all across the different applications, mainly due to IGBTs for EV/HEV applications”, confirms Ana Villamor, PhD, Technology & Market Analyst from Yole. “In addition, our analysis highlights an impressive 8.4% year-to-year growth rate for power electronics during the next five years, in the main power inverter segments, including EV/HEV, motor drives and UPS2, “she adds.

Yole and System Plus Consulting combine their expertise to propose a deep understanding of the power electronics industry within an impressive collection of technology, market and reverse engineering reports. Therefore, both partners are analyzing technology evolution, market trends, the whole supply chain, the competitive landscape, the process flows and more.

Status of the Power Electronics Industry report is part of the power electronics reports collection. It is offering a broad overview of this industry from wafers to inverters including devices and modules.

Within this collection, Yole and System Plus Consulting teams pursue their investigation all year long and reveal their vision of the industry, market dynamics, forecasts, supply chain analysis, M&A3, technical innovations and issues and more. What will be the tomorrow’s key drivers that will shape the market? What are the main technical challenges and solutions

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1 EV/HEV: Electric and Hybrid Electric Vehicles
2 UPS: Uninterruptible Power Supplies
3 M&A: Mergers & Acquisitions
Last year saw a boom in the power electronics semiconductor market, mainly due to the increase in sales in IGBT devices for EV/HEVs and motor drives. EV/HEVs will account for almost US$1.8 billion worth of MOSFETs and more than US$1.9 billion in the IGBT market, including both discretes and modules. MOSFET demand will also be driven by EV/HEV and by networking and telecommunications, which is booming with an 8.3% CAGR between 2017 and 2023 due to the installation of 5G network infrastructure. Globally, Yole expects a very positive perspective over the next five years, with a 4% CAGR between 2017 and 2023 for the power device market.

“It is worth remembering that no system can live without power, and with the increase in innovation and new technology there is the need to keep the evolution of the power semiconductor industry on track as this is the starting point,” asserts Ana Villamor from Yole.

To understand this industry, it is important to recognize that power electronics is application driven, not technology driven, unlike other ‘More than Moore’ electronics areas. In recent years this market has grown thanks to megatrends such as the arrival of the digital era or environmental issues. “We can directly link the latter to governmental funds given by different countries for energy efficiency improvement, increasing sales of new power electronics systems”, explains Milan Rosina, PhD Principal Analyst, Power Electronics & Batteries at Yole.

As an example, the EV/HEV segment is driven technologically by CO₂ emission reduction targets, higher efficiency requirements or less dependency on the oil industry. “The electrification of passenger vehicles is revolutionizing the power electronics industry from market and business perspectives, as well as from technology innovations,” announces Milan Rosina from Yole.

There are also new semiconductor-based materials at device level: the so-called WBG⁴, as SiC⁵ or GaN⁶. “Both materials are intrinsically advantageous compared to Silicon due to their higher band gaps, lower conduction losses, and higher electron mobility,” explains Elena Barbarini, PhD, Head of Department Devices at System Plus Consulting. “This gives the possibility to reduce the size of their components and their passives since the switching frequency can be increased while having overall less losses, thus making the system more efficient. Moreover, SiC has a much higher thermal conductivity than Si…”

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⁴ WBG: Wide Band Gap
⁵ SiC : Silicon Carbide
⁶ GaN : Gallium nitride
Both SiC and GaN expect to benefit from the arrival of EV/HEV with an increase in production, and to finally have a significant entry into the power semiconductor industry. WBG manufacturers still have few years before large-scale mass production for automotive kicks in, but they are already very active and most of them are in development with OEMs to test their products. SiC products are mainly used in on-board chargers but also to some extent in the main inverter. As from 2017, BYD uses SiC MOSFETs in some of their on-board charger products. On the other hand, the main inverter market is just starting with in-field road tests by both Tesla\(^7\) and Toyota. Other car manufacturers expect to have their first SiC-based module prototypes running as from 2020. “At Yole, we expect, the SiC market for EV/HEV (including on-board chargers) will reach about US$400 million by 2022\(^8\),” announces **Hong Ling, PhD, Senior Technology & Market Analyst at Yole**.

System Plus Consulting and Yole will pursue their collaboration in 2019 to cover the latest innovations and understand the market evolution. Their aim is to point out the strategic changes of the power electronics industry, help the community to identify next business opportunities and be a stakeholder in the growth of their customers. 2019 agenda for both partners will be available soon on the following websites: [www.systemplus.fr](http://www.systemplus.fr) and [www.i-micronews.com, Reports section](http://www.i-micronews.com) and **Where to Meet Us** section. Feel free to contact us for any questions. Stay tuned!

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\(^7\) See the report from System Plus Consulting: [Tesla Model 3 Inverter with SiC Power Module from STMicroelectronics, 2018](http://www.systemplus.fr)

\(^8\) Source: [Power SiC 2018: Materials, Devices and Applications report](http://www.systemplus.fr), Yole Développement, 2018
ABOUT THE REPORTS:

- **Status of the Power Electronics Industry**
  EV/HEV, motor drives, computing and storage propel power electronics market growth, from devices to passives, packaging and integration. – Produced by Yole Développement (Yole).

  **Companies cited in the report:** ABB, Alpha and Omega Semiconductor (AOS), Amkor, Analog Devices, ASE Group, AT&S, AVX, BMW Group, Bosch, BYD, Continental, Cree, CRRC, Danfoss, Delphi, Denso, Dialog Semiconductor, Diodes Incorporated, DuPont Teijin Films, Dynex, EXAGAN, Fuji Electric, GaN Systems, General Electric … Full list

  **Authors:** Ana Villamor PhD, Technology & Market Analyst, Power Electronics - Milan Rosina PhD, Principal Analyst, Power & Wireless / Batteries

- **Power SiC: materials, devices and applications**
  Automotive is putting SiC on the road. Is the supply chain ready? – Produced by Yole Développement (Yole).

  **Companies cited in the report:** ABB, Alstom, Ascatron, Aymont, Bombardier, Basic Semiconductor, Brückwell Technology, Caly Technology, Clas-SiC wafer fab, Cree, CRRC, Danfoss, Delphi, DENSO, Dow Corning, Epiworld, Episil, Fraunhofer IISB, Fuji Electric… Full list

  **Authors:** Hong Ling, PhD, Senior Technology & Market Analyst - Ana Villamor, PhD Technology & Market Analyst, Power Electronics

- **Automotive Power Module Packaging Comparison**
  A cost-oriented review of power module packaging technologies for the automotive market. – Produced by System Plus Consulting.

  **Companies cited in the report:** Robert Bosch, Infineon Technologies, Mitsubishi, Semikron, STMicroelectronics, Toshiba and Toyota.

  **Authors:** Farid Hamrani, System Cost Engineer - Yvon Le Goff, - Véronique Le Troadec, Laboratory Engineer

- **1200V Silicon IGBT vs SiC MOSFET Comparison**
  Technology and cost analysis of thirteen silicon IGBTs and eight SiC MOSFETs from eight different manufacturers shows their potential. – Produced by System Plus Consulting.

  **Companies cited in the report:** Infineon Technologies, STMicroelectronics, Fuji, ONSemiconductors, Mitsubishi, Rohm, Wolfspeed and Littelfuse.

  **Authors:** Elena Barbarini PhD, Head of Department Devices - Véronique Le Troadec, Laboratory Engineer

- **Tesla Model 3 Inverter with SiC Power Module from STMicroelectronics**
  The first SiC power module in commercialized electric vehicles. – Produced by System Plus Consulting.

  **Authors:** Elena Barbarini PhD, Head of Department Devices - Véronique Le Troadec, Laboratory Engineer

ABOUT SYSTEM PLUS CONSULTING

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 a sister company of Yole Développement (Yole). More info. on www.systemplus.fr

ABOUT YOLE DEVELOPPEMENT

Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, reverse engineering and reverse costing services and well as IP and patent analysis. With a strong focus on emerging applications using silicon and/or micro manufacturing.
the Yole group of companies has expanded to include more than 80 collaborators worldwide covering MEMS & Sensors - Imaging - Medical Technologies - Compound Semiconductors - RF Electronics - Solid State Lighting - Displays - Photonics - Power Electronics - Batteries & Energy Management - Advanced Packaging - Semiconductor Manufacturing - Software & Computing - Memory and more...

The “More than Moore” market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO and KnowMade, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business. For more information, visit [www.yole.fr](http://www.yole.fr) and follow Yole on [LinkedIn](https://www.linkedin.com) and [Twitter](https://twitter.com).

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