



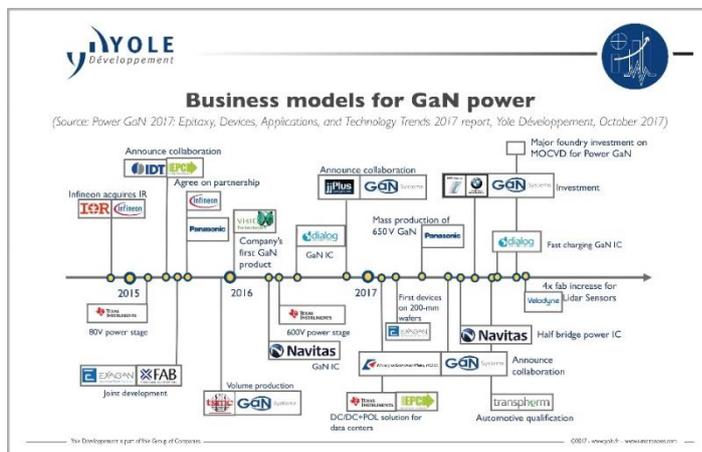
## FOR IMMEDIATE RELEASE:

### GaN<sup>1</sup> power device industry: the supply chain is acting to support market growth

Extracted from: Power GaN 2017 and GaN-on-Silicon Transistor report from Yole Développement & GaN-on-Silicon Transistor Comparison 2018 report from System Plus Consulting – April 2018

**LYON, France – April 5, 2018:** “The GaN power market remains small compared to the US\$30 billion silicon power semiconductor market”, asserts **Dr. Hong Lin, Technology & Market Analyst at Yole Développement (Yole)**. “However, it has an enormous potential in the short term due to its suitability for high performance and high frequency solutions.”

The GaN power business was worth about US\$12 million in 2016, but at Yole, analysts project that the market will reach US\$460 million by 2022, with an impressive 79% CAGR<sup>2</sup>. Amongst the numerous applications, the market research company mentions Lidar, wireless power and envelope tracking. They are high-end low/medium voltage applications. Today GaN technology is the only existing solution to meet their specific requirements.



Although today only a few players are showing commercial GaN activities, many firms have GaN activities. Therefore, the power GaN supply chain prepares for production. During the 2016-2017 period, Yole's analysts identified lot of investments that are clearly supporting development and implementation of GaN devices.

Yole differentiates GaN power supply chain into two main models: IDM<sup>3</sup> and foundry. Both models will co-exist while

there are different needs on the market, for example in consumer and industrial applications, explain Yole's analysts in the Power GaN report<sup>4</sup>.

“The business model is directly linked to the final product/application,” explains **Dr. Ana Villamor, Technology & Market Analyst from Yole**. “Today, many questions related to the chip's integration and to the

<sup>1</sup> GaN : Gallium Nitride

<sup>2</sup> CAGR: Compound Annual Growth Rate

<sup>3</sup> IDM : Integrated Device Manufacturer

<sup>4</sup> Source : [Power GaN 2017: Epitaxy, Devices, Applications, and Technology Trends report](#), Yole Développement, 2017

system's interface are still pending. And they condition the business relationship between the GaN companies”.

GaN manufacturers continue developing new products and provide samples to costumers, as is the case with EPC and its wireless charging line. Indeed EPC is still the current market leader today. Other players including GaN systems sell also low voltage GaN transistors.

System Plus Consulting, part of Yole Group of Companies, reveals a detailed comparison of GaN-on-Silicon transistors in its new report, [GaN-on-Silicon Transistor Comparison](#). The company analyzes the existing GaN-on-Silicon offers. This overview is the state of the art of GaN-on-Silicon HEMT<sup>5</sup>. Indeed it highlights the differences between the design and manufacturing processes, the impacts at epitaxy, device

and packaging level and related production costs. Devices analyzed by System Plus Consulting have been developed by the leading companies: EPC, Texas Instruments, Panasonic, GaN Systems and Transphorm.

“The current GaN device market is mainly dominated by devices <200V. 600V devices are expected to take off and keep growing. But the <200V market share will increase again when GaN begins to replace MOSFETs in different applications and

**SYSTEM Plus CONSULTING**

**GaN technical challenges & potential**  
(Source: GaN on Silicon Transistor Comparison report, System Plus Consulting, April 2018)

AlGaIn/GaN HEMTs showed their potential as candidates to substitute Si devices for high frequency applications with high power and low noise. But it faces several technical challenges:

- Epitaxy: lattice mismatch problems between GaN and Si.
- Normaly ON: the 2DEG<sup>5</sup> technology is normaly ON
- Packaging & integration

GaN System 600V HEMT epitaxy

Transphorm Cascode configuration

TI 600V HEMT GaN integration

<sup>5</sup> 2 Dimensional Electrons Gas

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enables new applications,” comments **Dr. Elena Barbarini, Project Manager, Power Electronics and Compound Semiconductors at System Plus Consulting**. And she adds: “GaN-on-Silicon has been a promising solution since the very beginning as its potential of CMOS compatibility and reduced cost”.

Both companies Yole and System Plus Consulting will attend a selection of key conferences during the next months.

At [CS International](#), Dr. Hong Lin will present the latest results focused on the GaN industry. She will describe the GaN-on-Silicon landscape including power electronics, RF and lighting market segments. "GaN on Si Market and industry development" presentation will take place on April 10 at 3:35 PM. During the conference, Yole also proposes another presentation focused on the microLED technologies. More information on [i-micronews.com](#).

In addition, Dr. Elena Barbarini will attend [ISPSD](#), [PCIM Europe](#) and [SCAPE](#).

For more information about this program, please contact [Fanny Vitrey](#), Marketing & Communication Assistant at Yole.

<sup>5</sup> HEMT : High-Electron-Mobility Transistor

Full description of both reports, Power GaN and GaN-on-Silicon Transistor Comparison are available respectively on [i-micronews.com](http://i-micronews.com) and [System Plus Consulting](#) website.

### ABOUT THE REPORTS MENTIONED IN THIS PRESS RELEASE:

Yole Développement and System Plus Consulting have combined their compound semiconductor & power electronics expertise to offer a comprehensive collection of reports. Amongst them, Power GaN report from Yole Développement comes with a complementary report from System Plus Consulting, named GaN-on-Silicon Transistor Comparison:

- [Power GaN 2017: Epitaxy, Devices, Applications, and Technology Trends report:](#)  
*The GaN power device supply chain is acting to support market growth.* - Produced by Yole Développement.  
**Companies cited in the report:**  
Aixtron, Allos, Alpha&Omega, Amec, Apple, AT&S, BMW, Coorstek, Dialog Semiconductors, Dowa, Efficient Power Conversion, EpiGaN, Episil, Epistar, Evatran, Exagan, Fairchild, Ford, Fuji Electric, GaN Systems, Imec, Infineon, IQE, LG electronics, Jedec, Kyma, Navitas Semiconductors, Neditex, and more.... [Full list](#)
- [Power Integrated Circuit 2017 - Quarterly Update Q4, 2017](#)  
*Power ICs reached \$17.3B US dollars in 2017. Power management ICs grew as key end application markets expand.* – Produced by Yole Développement.  
Companies cited in the report:  
Alpha and Omega Semiconductor, Analog Devices, Dialog Semiconductor, Diodes, Fuji Electric, Infineon Technologies, Intersil, IXYS, Linear Technology, Lite-On Semiconductor, MagnaChip, Maxim Integrated... [Full list](#)
- [GaN-on-Silicon Transistor Comparison 2018](#)  
*Dive deep into the technology and cost of GaN-on-silicon HEMTs from EPC, Transphorm, GaN Systems, Panasonic and Texas Instruments* – Produced by System Plus Consulting.

#### Authors:

**Dr. Hong Lin** works at Yole Développement, the "More than Moore" market research and strategy consulting company, as a technology and market analyst since 2013. She is specialized in compound semiconductors and provides technical and economic analysis. Before joining Yole Développement, she worked as R&D engineer at Newstep Technologies. She was in charge of the development of cold cathodes by PECVD for visible and UV lamp applications based on nanotechnologies. She holds a Ph.D in Physics and Chemistry of materials.

**Dr. Ana Villamor** serves as a Technology & Market Analyst | Power Electronics at Yole Développement. She is involved in many custom studies and reports focused on emerging power electronics technologies at Yole Développement, including device technology and reliability analysis (MOSFET, IGBT, HEMT, etc). In addition, Ana is leading the quarterly power management market updates released in 2017.

Previously Ana was involved in a high-added value collaboration related to SJ Power MOSFETs, within the CNM research center for the leading power electronic company ON Semiconductor. During this partnership and after two years as Silicon Development Engineer, she acquired a relevant technical expertise and a deep knowledge of the power electronic industry.

Ana is author and co-author of several papers as well as a patent. She holds an Electronics Engineering degree completed by a Master in micro and nano electronics, both from Universitat Autònoma de Barcelona (SP).

As a project manager at System Plus Consulting, **Dr. Elena Barbarini** is in charge of costing analyses for MEMS, IC and Power Semiconductors. She has a deep knowledge of Electronics R&D and Manufacturing environment. Elena holds a Master in Nanotechnologies and a PhD in PowerElectronics.

### 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. More info on [www.systemplus.fr](http://www.systemplus.fr).

#### **ABOUT YOLE DEVELOPPEMENT**

Founded in 1998, Yole Développement 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 and image sensors, Compound Semiconductors, RF Electronics, Solid-state lighting, Displays, software, Optoelectronics, Microfluidics & Medical, Advanced Packaging, Manufacturing, Nanomaterials, Power Electronics and Batteries & Energy Management.



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](#) and [Twitter](#).

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