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Dr. Ana Villamor

Ana Villamor, PhD serves as a Technology & Market Analyst, Power Electronics & Compound Semiconductors within the Power & Wireless division at Yole Développement (Yole). 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 and PhD. in micro and nano electronics from Universitat Autonoma de Barcelona (SP).

Contact: villamor@yole.fr
COMPANIES CITED IN THIS REPORT

This report focalises in Silicon wafers and devices. Generally, the total power market figures:
• Include SiC and GaN general forecasts.
• Does not include Power management.
Status of the Power IC 2019 will be published in Q4 2019 for more information.

On the other hand, MOSFET figures include only Silicon as there is a dedicated report from Yole which is exhaustive for SiC.
HISTORICAL PERSPECTIVE OF DRIVING APPLICATIONS

Today, the automotive segment, especially EV/HEVs, drives both technological development and market demand.

Industrial
- Power Supply
- Motor drive
- UPS
- Autonomous driving, IoT...

Renewables
- PV
- Grid
- Wind
- Renewable energy, stationary battery energy storage, charging infrastructure, HVDC deployment...

Automotive
- EV/HEV
- Strong synergies with other segments
- EV/HEV inverters, boost converter, DC-DC converter, 48V converter, on-board charger...

Time
GLOBAL POWER ELECTRONICS MARKETS

2018-2024

POWER MOSFET MARKET METRICS & FORECASTS
Estimation of total power MOSFET

IGBT MARKET METRICS & FORECASTS
IGBT discrete market forecasts till 2024

MARKET SHARE EVOLUTION FOR DIFFERENT APPLICATIONS
SiC power application market share

IGBT MODULE MARKET METRICS & FORECASTS
IGBT module market forecasts till 2024
POWER ELECTRONICS MARKET SHARE

Split by device type, 2018 vs 2024
MARKET TRENDS BY APPLICATION

SYSTEM LEVEL TRENDS
EV/HEV and automotive auxiliaries

SYSTEM LEVEL TRENDS
Wind and Rail

APPLICATION TRENDS
PV Inverter

PV AND RELATED ENERGY STORAGE
2018 PV installations in the world

Overview of main established and emerging markets and installed PV capacity in 2018.
MARKET TRENDS BY PRODUCT
Main power players investing in 300mm fabs or in 200mm expansion

- **Diodes Inc**
- **ON Semiconductor**

*Non-exhaustive list

Both Diodes Inc and ON Semiconductor investments are done in existing fabs. Therefore, the time to production will be shorter.

In China, Silan Microelectronics and China Resources Microelectronics are constructing a 12-inch production line in Xiamen and in Chongqing, respectively. GTA Semiconductor, is working on its professional, automotive-grade IGBT production line.
RANKINGS AND M&A

EVOLUTION OF POWER ELECTRONICS LANDSCAPE
Device and module level

KEY PLAYERS AND POWER ELECTRONICS LANDSCAPE
Revenues in 2018 split by power device (IGBT, MOSFET and others)

Power semiconductor market of discrete and modules in 2018, in M$ 

KEY PLAYERS AND POWER ELECTRONICS LANDSCAPE
Geographical locations of main power semiconductor players & Foundries®

*Non-exhaustive list

KEY PLAYERS AND POWER ELECTRONICS LANDSCAPE
Who is involved in each device?

Power semiconductor market of discrete and modules in 2018, in M$

Many new players in the foundry business have added new accounts for future revenue growth.
MARKET SHARES AND SUPPLY CHAIN
KEY PLAYERS AND POWER ELECTRONICS LANDSCAPE

Revenues in 2018 split by power device (IGBT, MOSFET and others)

*Non-exhaustive list of companies

**Modules and discrete are added together in IGBT and MOSFET
**FOCUS ON CHINA**

**SIGNIFICANT EVENTS IN POWER INDUSTRY SINCE 2017**

SAIC, world's largest automaker, launches a 100kW all-electric bus.

**FOCUS ON CHINA**

**Chinese gap comes from power semiconductor devices**

China has increased its manufacturing capabilities enabling it to capture market share currently held by foreign firms such as STMicroelectronics.

When moving gap between China and foreign firms:
- At device level, reducing market share.
- Investments in Wafer production.

**FOCUS ON CHINA**

**Different market segments with different influence from the Government**

- The Chinese government has a strong influence in some of the strategic industries for the country.

- **Government Control**
- **Government Support**
- **Relatively Free Market**
TECHNOLOGY INTEGRATION IN EV

Examples

- Integration is a key parameter in the EV industry to reduce size and weight of the inverter, without a
- ...
Power MOSFET/IGBT?

The power electronics industry is experiencing a shift in its dynamics. The shift comes from the increase of demand predicted for coming years, which translates into a move for 300mm wafer-based production. In 2018 there was saturation of 200mm wafer demand, leading to wafer price rise instead of wafer supply. As of today, more than seven power electronics players have announced investments in new fabrication capabilities, to be in production from 2021.

Infineon has invested $1.9B in Villach to build a second fab for power devices on 300mm wafers. STMicroelectronics has also started the expansion of its Agrate site for 300mm production, for Bipolar CMOS-DMOS, power MOSFETs and IGBTs. Another example is Bosch, which has also started building its 300mm fab in Dresden, preparing for the imminent increase in volumes for both automotive and Internet of Things (IoT) applications. Chinese players have also started the expansion to 300mm, like Silan Microelectronics or GTA Semiconductors, the latter having confirmed that it is working on its automotive-grade IGBT production line.

A concern with these moves might be the equipment delivery time. This is one of the reasons why players such as ON Semiconductor and Diodes Inc have acquired an existing fab. Such acquisitions also require lower investments. The ramp up for production for ON Semiconductor will therefore be in 2020 with advanced CMOS technology. Once that transfer is complete in 2022, the equipment can be used for a possible ramp up in power devices, depending on demand, as the equipment will already be established. A choice must be made.

We will have to keep a close eye on the next steps of the power electronics players as they shape the power semiconductor industry in coming years. An overview of the full power supply chain and a focus on the 300mm transition is included in this report.

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ELECTRIFICATION IS STILL THE KEY MARKET DRIVER OF THE POWER ELECTRONICS INDUSTRY

The power electronics market comprised $53.4B for power inverters in 2018, and $17.5B for power semiconductor devices. Key driving factors include electrical power conversion optimization and expansion, driven by electrification trends in transportation, CO2 emission reduction goals, the development of clean electricity sources, and industrialization. We can say that the main driving application with a huge market potential and technological innovation is electric and hybrid electric vehicles (EV/HEVs). But let’s not forget that
there are other applications that are boosted by electrification needs and by EV/HEVs. This is the case in renewable energy, which is boosted by clean driving trends and growing electricity consumption. More grid lines also need to be deployed to sustain greater amounts of required energy. Similarly, more energy storage systems need to be deployed for better distribution of the energy to the grid. The grid must also reach newly installed EV charging stations outside cities, enabling many cars to be plugged in at the same time with an acceptable charging time. Moreover, if we take into account automated driving and long term vehicle-to-everything (V2X) communication, more data centers could be required, more LiDAR systems, along with other supporting technology. Hence, we are living an era where established applications are boosted by electrification and also by the EV/HEV transition, making the power electronics market very interesting to follow.

How are these applications evolving? Which are the main drivers? How is this translating to power semiconductors? And to Silicon substrates? All of these topics are discussed in this report.

**Power electronics industry: driving applications’ perspectives**

![Diagram showing the different markets in the power semiconductor area, from silicon wafer to discrete device, module and inverter.](https://example.com/power-electronics-industry-diagram.png)
REPORT OBJECTIVES
• Assess the market for wafers, devices, modules and inverters
• Understand the market dynamics for the whole power electronics industry
• Identify the key drivers that will shape the market in the future
• Have an overview on the different components used in power electronics and its integration
• Understand the main technological challenges to overcome and the solutions developed so far
• Provide a clear overview of the different applications driving the power electronics business
• Present data ranking the power electronics industry leaders, describing supply chain consolidation, the latest M&A activity and future trends in the power player landscape

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WHAT’S NEW
• Update on power electronics wafer level market from 2018 to 2024
• Update on power electronics’ major discrete and module segments, specifically IGBT and MOSFET, from 2018 to 2024
• Updated global SiC and GaN markets
• Forecast comparison for discretes and modules by type of device and material
• Update of power electronics inverter market from 2018 to 2024
• Market and technology trends for each power electronics application
• Company revenues in 2018
• Power electronics player ranking and landscape analysis for 2018
• Analysis of the latest M&A activity
• Overview of technology status for power electronics
• Focus on packaging trends
• Wide band gap update

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AUTHOR
Ana Villamor, PhD serves as a Technology & Market Analyst, Power Electronics & Compound Semiconductors within the Power & Wireless division at Yole Développement (Yole). 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 $ 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 and PhD. in micro and nano electronics from Universitat Autonoma de Barcelona (SP).
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The “More than Moore” market research, technology and strategy consulting company Yole Développement, along with its partners System Plus Consulting, PISEO, KnowMade and Blumorpho, supports 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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- Imaging
- Photonics & Optoelectronics
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If you are looking for:

- An analysis of your product market and technology
- A review of how your competitors are evolving
- An understanding of your manufacturing and production costs
- An understanding of your industry’s technology roadmap and related IPs
- A clear view supply chain evolution

Our reports and monitors are for you!

Our team of over 70 analysts, including PhD and MBA qualified industry veterans from Yole Développement, System Plus Consulting and KnowMade, collect information, identify trends, challenges, emerging markets, and competitive environments. They turn that information into results and give you a complete picture of your industry’s landscape. In the past 20 years, we have worked on more than 2,000 projects, interacting with technology professionals and high-level opinion makers from the main players of their industries and realized more than 5,000 interviews per year.

WHAT TO EXPECT IN 2019?

In 2019 we will extend our offering with a new ‘monitor’ product which provides more updates on your industry during the year. The Yole Group of Companies is also building on and expanding its investigations of the memory industry. Moreover, in parallel, the Yole Group reaffirms its commitment to a new collection of reports mixing software and hardware and is increasing its involvement in displays, radio-frequency (RF) technology, advanced substrates, batteries and compound semiconductors. Last but not least, System Plus Consulting is developing its teardowns service providing 120+ offers related to phones, smart home, wearables and connected devices. Discover our 2019 program right now, and ensure you get a true vision of the industry. Stay tuned!
18 fields of excellence combined with six markets to provide a complete picture of your industry landscape

**Market – Technology – Strategy – by Yole Développement**
Yole Développement (Yole) offers market reports including quantitative market forecasts, technology trends, company strategy evaluation and in-depth application analyses. Yole will publish more than 55 reports in 2019, with our partner PISEO contributing to some of the lighting reports.

The Reverse Costing® report developed by System Plus Consulting provides full teardowns, including detailed photos, precise measurements, material analyses, manufacturing process flows, supply chain evaluations, manufacturing cost analyses and selling price estimations. The reports listed below are comparisons of several analyzed components from System Plus Consulting. More reports are however available, and over 60 reports will be released in 2019. The complete list is available at www.systemplus.fr.

**Patent Reports – by KnowMade**
More than describing the status of the IP situation, these analyses provide a missing link between patented technologies and market, technological and business trends. They offer an understanding of the competitive landscape and technology developments from a patent perspective. They include key insights into key IP players, key patents and future technology trends. For 2019 KnowMade will release over 15 reports.

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**The markets targeted are:**

- Mobile & Consumer
- Automotive & Transportation
- Medical
- Industrial
- Telecom & Infrastructure
- Defense & Aerospace

Linked reports are dealing with the same topic to provide a more detailed analysis.
OUR 2019 REPORTS COLLECTION (1/5)

18 fields of excellence combined with six markets to provide a complete picture of your industry landscape

MEMS & SENSORS
- MARKET AND TECHNOLOGY REPORT
  - Status of the MEMS Industry 2019 - Update
  - Status of the Audio Industry 2019 - New
  - Uncooled Infrared Imagers and Detectors 2019 – Update
  - Consumer Biometrics: Technologies and Market Trends 2018
  - MEMS Pressure Sensor Market and Technologies 2018
  - Gas & Particle Sensors 2018
- STRUCTURE, PROCESS & COST REPORT
  - MEMS & Sensors Comparison 2019
  - MEMS Pressure Sensor Comparison 2018
  - Particle Sensors Comparison 2019
  - Miniaturized Gas Sensors Comparison 2018
- PATENT REPORT
  - MEMS Foundry Business Portfolio 2019 - New
  - Miniaturized Gas Sensors 2019 - New

PHOTONIC AND OPTOELECTRONICS
- MARKET AND TECHNOLOGY REPORT
  - Silicon Photonics and Photonic Integrated Circuits 2019
  - LiDARs for Automotive and Industrial Applications 2019 - Update
- PATENT REPORT
  - Silicon Photonics for Data Centers: Optical Transceiver 2019 - New
  - LiDAR for Automotive 2018

RF DEVICES AND TECHNOLOGIES
- MARKET AND TECHNOLOGY REPORT
  - 5G’s Impact on RF Front-End Module and Connectivity for Cell Phones 2019 – Update
  - 5G Impact on Telecom Infrastructure 2019 - New
  - Radar and Wireless for Automotive: Market and Technology Trends 2019 - Update
  - Advanced RF Antenna Market & Technology 2019 - New
  - RF Standards and Technologies for Connected Objects 2018
- STRUCTURE, PROCESS & COST REPORT
  - RF Front-End Module Comparison 2019 - Update
  - Automotive Radar RF Chipset Comparison 2018
- PATENT REPORT
  - Antenna for 5G Wireless Communications 2019 - New
  - RF Front End Modules for Cellphones 2018
  - RF Filter for 5G Wireless Communications: Materials and Technologies 2019
  - RF GaN 2019 – Patent Landscape Analysis

Update: 2018 version still available

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OUR 2019 REPORTS COLLECTION (2/5)

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IMAGING

○ MARKET AND TECHNOLOGY REPORT
  - Status of the CIS Industry 2019: Technology and Foundry Business - Update
  - Imaging for Automotive 2019 - Update
  - Neuromorphic Technologies for Sensing 2019 - Update
  - Status of the CCM and WLO Industry 2019 – Update
  - 3D Imaging & Sensing 2018
  - Machine Vision for Industry and Automation 2018
  - Sensors for Robotic Vehicles 2018

○ STRUCTURE, PROCESS & COST REPORT
  - Compact Camera Modules Comparison 2019
  - CMOS Image Sensors Comparison 2019

○ PATENT REPORT
  - Facial & Gesture Recognition Technologies in Mobile Devices 2019 - New
  - Apple iPhone X Proximity Sensor & Flood Illuminator 2018

MEDICAL IMAGING AND BIOPHOTONICS

○ MARKET AND TECHNOLOGY REPORT
  - X-Ray Detectors for Medical, Industrial and Security Applications 2019 - New
  - Microscopy Life Science Cameras: Market and Technology Analysis 2019
  - Ultrasound technologies for Medical, Industrial and Consumer Applications 2018

○ PATENT REPORT
  - Optical Coherence Tomography Medical Imaging 2018

MICROFLUIDICS

○ MARKET AND TECHNOLOGY REPORT
  - Status of the Microfluidics Industry 2019 - Update
  - Organ-on-a-Chip Market & Technology Landscape 2019 - Update
  - Point-of-Need Testing Application of Microfluidic Technologies 2018
  - Liquid Biopsy: from Isolation to Downstream Applications 2018
  - Chinese Microfluidics Industry 2018

○ PATENT REPORT
  - Microfluidic Manufacturing Technologies 2019 – New
  - Nanopore Sequencing 2019 – New

INKJET AND ACCURATE DISPENSING

○ MARKET AND TECHNOLOGY REPORT
  - Inkjet Printheads - Dispensing Technologies & Market Landscape 2019 - Update
  - Emerging Printing Technologies for Microsystem Manufacturing 2019 - New
  - Inkjet Functional and Additive Manufacturing for Electronics 2018

○ STRUCTURE, PROCESS & COST REPORT
  - Piezoelectric Materials from Bulk to Thin Film Comparison 2019

Update: 2018 version still available

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18 fields of excellence combined with six markets to provide a complete picture of your industry landscape

**BIOTECHNOLOGIES**
- **MARKET AND TECHNOLOGY REPORT**
  - CRISPR-Cas9 Technology: From Lab to Industries 2018
  - Personalized Medicine 2019 – New

- **PATENT REPORT**
  - Neurotechnologies and Brain Computer Interface 2018
  - BioMEMS & Non-Invasive Sensors: Microsystems for Life Sciences & Healthcare 2018

**BIOMEMS & MEDICAL MICROSYSTEMS**
- **MARKET AND TECHNOLOGY REPORT**
  - Medical Wearables: Market & Technology Analysis 2019 - New
  - Neurotechnologies and Brain Computer Interface 2018
  - BioMEMS & Non-Invasive Sensors: Microsystems for Life Sciences & Healthcare 2018

- **PATENT REPORT**
  - 3D Cell Printing 2019 - New
  - Circulating Tumor Cells Isolation 2019 - New

**SOFTWARE AND COMPUTING**
- **MARKET AND TECHNOLOGY REPORT**
  - Artificial Intelligence Computing For Automotive 2019 - New
  - Hardware and Software for Artificial Intelligence (AI) in Consumer Applications 2019 - Update
  - Image Signal Processor and Vision Processor Market and Technology Trends 2019
  - xPU (Processing Units) for Cryptocurrency, Blockchain, HPC and Gaming 2019 – New

- **PATENT REPORT**
  - Artificial Intelligence for Medical Diagnostics - New

**MEMORY**
- **MARKET AND TECHNOLOGY REPORT**
  - Status of the Memory Industry 2019 - New
  - MRAM Technology and Business 2019 - New
  - Emerging Non Volatile Memory 2018

- **STRUCTURE, PROCESS & COST REPORT**
  - Memory Comparison 2019

- **PATENT REPORT**
  - Magnetoresistive Random-Access Memory (MRAM) 2019 - New
  - 3D Non-Volatile Memory 2018

**ADVANCED PACKAGING**
- **MARKET AND TECHNOLOGY REPORT**
  - Fan Out Packaging Technologies and Market Trends 2019 - Update
  - 3D TSV Integration and Monolithic Business Update 2019 - Update
  - Advanced RF SiP for Cellphones 2019 - Update
  - Status of Advanced Packaging Industry 2019 - Update
  - Status of Advanced Substrates 2019 - Update
  - Panel Level Packaging Trends 2019 - Update
  - Automotive Packaging 2019 - New
  - Trends in Automotive Packaging 2018
  - Thin-Film Integrated Passive Devices 2018

- **STRUCTURE, PROCESS & COST REPORT**
  - Advanced RF SiP for Cellphones Comparison 2019

Update : 2018 version still available
OUR 2019 REPORTS COLLECTION (4/5)

18 fields of excellence combined with six markets to provide a complete picture of your industry landscape

**SEMICONDUCTOR MANUFACTURING**

- **MARKET AND TECHNOLOGY REPORT**
  - Nano Imprint Lithography 2019 - New
  - Equipment and Materials for Fan Out Packaging 2019 - Update
  - Equipment for More than Moore: Thin Film Deposition & Etching 2019 - New
  - Wafer Starts for More Than Moore Applications 2018
  - Polymeric Materials at Wafer-Level for Advanced Packaging 2018
  - Bonding and Lithography Equipment Market for More than Moore Devices 2018

- **STRUCTURE, PROCESS & COST REPORT**
  - Wafer Bonding Comparison 2018

- **PATENT REPORT**
  - Hybrid Bonding for 3D Stack 2019 – New

**SOLID STATE LIGHTING**

- **MARKET AND TECHNOLOGY REPORT**
  - Status of the Solid State Light Source Industry 2019 - New
  - Edge Emitting Lasers (EELS) 2019 - New
  - Light Shaping Technologies 2019 - New
  - Automotive Advanced Front Lighting Systems 2019 - New
  - VCSELS - Technology, Industry and Market Trends 2019 - Update
  - IR LEDs and Laser Diodes – Technology, Applications, and Industry Trends 2018
  - UV LEDs - Technology, Manufacturing and Application Trends 2018
  - LiFi: Technology, Industry and Market Trends 2018

- **STRUCTURE, PROCESS & COST REPORT**
  - VCSEL Comparison 2019

- **PATENT REPORT**
  - VCSELs 2018

**DISPLAY**

- **MARKET AND TECHNOLOGY REPORT**
  - Next Generation 3D Display 2019 - New
  - Next Generation Human Machine Interaction (HMI) in Displays 2019 - New
  - Micro-and Mini-LED Displays 2019 - Update
  - Technologies And Markets for Next Generation Televisions
  - Displays & Optical Vision Systems for VR, AR & MR 2018

- **PATENT REPORT**
  - MicroLED Displays: Intellectual Property Landscape 2018
OUR 2019 REPORTS COLLECTION (5/5)

18 fields of excellence combined with six markets to provide a complete picture of your industry landscape

POWER ELECTRONICS

- MARKET AND TECHNOLOGY REPORT
  - Power SiC: Materials, Devices and Applications 2019 - Update
  - Power Electronics for EV/HEV and e-mobility: Market, Innovations and Trends 2019 - Update
  - Status of the Power Electronics Industry 2019 - Update
  - Discrete Power Packaging: Material Market and Technology Trends 2019 - New
  - Status of the Power ICs Industry 2019 - Update
  - Status of the Passive Components for the Power Electronics Industry 2019 - Update
  - Status of the Inverter Industry 2019 - Update
  - Status of the Power Module Packaging Industry 2019 - Update
  - Wireless Charging Market Expectations and Technology Trends 2018
  - Power GaN 2018: Epitaxy, Devices, Applications and Technology Trends

- STRUCTURE, PROCESS & COST REPORT
  - Automotive Power Module Packaging Comparison 2018
  - GaN-on-Silicon Transistor Comparison 2019
  - SiC Transistor Comparison 2019

- PATENT REPORT
  - Power SiC: Materials, Devices and Modules 2019 - New
  - Power GaN: Materials, Devices and Modules 2019 – Update

BATTERY & ENERGY MANAGEMENT

- MARKET AND TECHNOLOGY REPORT
  - Status of the Rechargeable Li-ion Battery Industry 2019 - New
  - Li-ion Battery Packs for Automotive and Stationary Storage Applications 2019 - Update

- PATENT REPORT
  - Battery Energy Density Increase: Materials and Emerging Technologies 2019 - New
  - Solid-State Batteries 2019 - New
  - Status of the Battery Patents 2018

COMPUND SEMI.

- MARKET AND TECHNOLOGY REPORT
  - Emerging Semiconductor Substrates: Market & Technology Trends 2019 - New
  - Status of the Compound Semiconductor Industry 2019 - New
  - InP Materials, Devices and Applications 2019 - New
  - GaAs Wafer and Epiwafer Market: RF, Photonics, LED and PV Applications 2018

- PATENT REPORT
  - GaN-on-Silicon Substrate: Materials, Devices and Applications 2019 - Update

Update: 2018 version still available

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OUR 2019 MONITORS COLLECTION (1/2)

Get the most updated overview of your market to monitor your strategy

Yole Développement, System Plus Consulting and KnowMade, all part of the Yole Group of Companies, are launching a collection of 10 monitors in 2019. The monitors aim to provide updated market, technology and patent data as well dedicated quarterly analyses of the evolution in your industry over the previous 12 months. Furthermore, you can benefit from direct access to the analyst for an on-demand Q&A and discussion session regarding trend analyses, forecasts and breaking news. Topics covered will be compact camera modules (CCMs), advanced packaging, compound semiconductors, microfluidics, batteries, RF and memory.

MARKET MONITOR by Yole Développement

A FULL PACKAGE:
The monitors will provide the evolution of the market in units, wafer area and revenues. They will also offer insights into what is driving the business and a close look at what is happening will also be covered in it.

The following deliverables will be included in the monitors:
- An Excel database with all historical and forecast data
- A PDF slide deck with graphs and comments/analyses covering the expected evolutions

ADVANCED PACKAGING – NEW
This monitor will provide the evolution of the advanced packaging platforms. It will cover Fan-Out Wafer Level Packaging (WLP), Fan-Out Panel Level Packaging (PLP), Wafer-Level Chip Scale Packaging (WLCSP), Flip Chip packaging platforms, and 2.5D and 3D Through Silicon Via (TSV) integration. Frequency: Quarterly, starting from Q3 2019

REVERSE TECHNOLOGY MONITOR by System Plus Consulting

SMARTPHONES – NEW
To stay updated on the latest components, packaging and silicon chip choices of the smartphone makers, System Plus Consulting has created its first Smartphone Reverse Technology monitor. This year, get access to the packaging and silicon content database of at least 20 different flagship smartphones – more than five per quarter. Starting at the beginning of 2019, the monitor will include an Excel database report for each phone and a quarterly comparison.

COMPOUND SEMI. – NEW
This monitor will describe how the compound semiconductor industry is evolving. It will offer a close look at GaAs, InP, SiC, GaN and other compounds of interest providing wafer volumes, revenues, application breakdowns and momentum. Frequency: Quarterly, starting from Q3 2019

CAMERA MODULE – NEW
This monitor will provide the evolution of the imaging industry, with a close look at image sensor, camera module, lens and VCM. Volumes, revenues and momentum of companies like Sony, Samsung, Omnivision and OnSemi will thus be analysed. Frequency: Quarterly, starting from Q3 2019

MEMORY – UPDATE
For the memory industry you can have access to a quarterly monitor, as well as an additional service, a monthly pricing. Both services can be bought separately:
- DRAM Service: Including a quarterly monitor and monthly pricing.
- NAND Service: Including a quarterly monitor and monthly pricing.

Yole Développement

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OUR 2019 MONITORS COLLECTION (2/2)

Get the most updated overview of your market to monitor your strategy

PATENT MONITOR by KnowMade

A FULL PACKAGE:
Starting at the beginning of the year, the KnowMade monitors include the following deliverables:

- An Excel file including the monthly IP database of:
  - New patent applications
  - Newly granted patents
  - Expired or abandoned patents
  - Transfer of IP rights through re-assignment and licensing
  - Patent litigation and opposition

- Quarterly report including a PDF slide deck with the key facts & figures of the quarter: IP trends over the three last months, with a close look to key IP players and key patented technologies.

- GaN for Power & RF Electronics
  Wafers and epiwafers, GaN-on-SiC, silicon, sapphire or diamond, semiconductor devices such as transistors, and diodes, devices and applications including converters, rectifiers, switches, amplifiers, filters, and Monolithic Microwave Integrated Circuits (MMICs), packaging, modules and systems.

- GaN for Optoelectronics & Photonics
  Wafers and epiwafers, GaN-on-sapphire, SiC or silicon; semiconductor devices such as LEDs and lasers; and applications including lighting, display, visible communication, photonics, packaging, modules and systems.

- Li-ion Batteries
  Anodes made of lithium metal, silicon, and lithium titanate (LTO); cathodes made of Lithium Iron Phosphate (LFP), Nickel-Manganese-Cobalt (NMC), Lithium Nickel Cobalt Aluminium Oxide (NCA), Lithium Nickel Metal Dioxide (LiNiM02), Lithium Metal Phosphate (LiMPO4), and Lithium Metal Tetroxide (LiMO4); electrolytes including liquid, polymer/gel, and solid inorganics; ceramic and other separators; battery cells including thin film/microbattery, flexible, cylindrical and prismatic; and battery packs and systems.

- Post Li-ion Batteries
  Battery technologies including redox-flow batteries, sodium-ion, lithiumsulfur, lithium-air, and magnesium-ion, and their supply chains, including electrodes, electrolytes, battery cells and battery packs/systems.

- Solid-State Batteries
  Supply chain including electrodes, battery cells, battery packs/systems and electrolytes, including polymer, inorganic and inorganic/polymer, inorganic materials, including argyrodites, Lithium Super Ionic CONductor, (LISICONs), Thio-LISICONs, sulfide glasses, oxide glasses, perovskites, anti-perovskites and garnets.

- RF Acoustic Wave Filters
  Including Surface Acoustic Wave (SAW), Temperature Compensated (TC)- SAW, Bulk Acoustic Wave- Free-standing Bulk Acoustic Resonator (BAWFBAR), BAW-Solidly-Mounted Resonator (BAW-SMR), and Packaging.

- RF Power Amplifiers
  Including Low Noise Amplifiers, Doherty Amplifiers, Packaging, and Millimeter-Wave technology.

- RF Front-End Modules

- Microfluidics
  From components to chips and systems, including all applications.
To meet the growing demand for market, technological and business information, i-Micronews Media integrates several tools able to reach each individual contact within its network.

We will ensure your company benefits from this

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**Unique, cost-effective ways to reach global audiences.**

Online display advertising campaigns are great strategies for improving your product/brand visibility. They are also an efficient way to adapt with the demands of the times and to evolve an effective marketing plan and strategy.

| #15,800+ monthly unique visitors on i-Micronews.com | #110 attendees on average in events | #380 registrants per webcast on average to gain new leads for your business |
| #10,900+ weekly readers of i-Micronews e-newsletter | #7+ key events planned for 2019 on different topics | |

**Brand visibility, networking opportunities**

Today’s technology makes it easy for us to communicate regularly, quickly, and inexpensively – but when understanding each other is critical, there is no substitute for meeting in-person. Events are the best way to exchange ideas with your customers, partners, prospects while increasing your brand/product visibility.

**Targeted audience involvement equals clear, concise perception of your company’s message.**

Webcasts are a smart, innovative way of communicating to a wider targeted audience. Webcasts create very useful, dynamic reference material for attendees and also for absentees, thanks to the recording technology.

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