GaN & SiC for Power Electronics applications
COMPANIES CITED IN THE REPORT

ABB, Alstom, APEI, AT&S, Ascatron, Bombardier, Cissoid, CREE, Danfoss, Delphi, DENSO, Efficient Power Conversion, Exagan, Fairchild, Fraunhofer IISB, Fuji Electric, GaN System, GE, GeneSiC, Global Power Device, Global Power Technology, HestiaPower, Hitachi, IBS, Infineon, MicroSemi, Mitsubishi, Northrop Grumman, Panasonic, Philips, Powerex, Raytheon, RENESAS, RFMD, ROHM, Sanrex, Schneider Electric, Semikron, Shindengen, SMA, STMicroelectronics, Sumitomo SEI, Toshiba, Toyota, Transphorm, United Silicon Carbide, Yaskawa...etc...
EXECUTIVE SUMMARY: SIC DIODES VS TRANSISTORS

• After two tough years, 2014 is the recovery year for power electronics. The market size reached $11.5 billion in 2014 with a CAGR of +8.4%. When we look forward, the projection of the power market is very promising. The overall power electronics market size is expected to grow to more than 17 billion in 2020.

• The total SiC device market is estimated to more than $133 M in 2014 and the projection for 2020 is more than $436 M, with a 2014-2020 CAGR of 22%.
14 years of SiC diode, 4 years of low voltage GaN HEMT and SiC MOSFET, less than two years of 650V GaN HEMTs.

First SiC diode

SiC JFET

SiC MOSFET


20-200V GaN HEMT

650V HEMT

And more...

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
Total GaN-based power device market size is expected to grow to more than $300 M in 2020 in our nominal scenario.

**PROJECTION OF GaN POWER DEVICE MARKET SIZE**

Split by application- Nominal scenario

<table>
<thead>
<tr>
<th>Year</th>
<th>Application</th>
<th>Market Size (M$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>Application A</td>
<td>100</td>
</tr>
<tr>
<td>2015</td>
<td>Application B</td>
<td>150</td>
</tr>
<tr>
<td>2016</td>
<td>Application C</td>
<td>200</td>
</tr>
<tr>
<td>2017</td>
<td>Application D</td>
<td>250</td>
</tr>
<tr>
<td>2018</td>
<td>Application E</td>
<td>300</td>
</tr>
<tr>
<td>2019</td>
<td>Application F</td>
<td>350</td>
</tr>
<tr>
<td>2020</td>
<td>Application G</td>
<td>400</td>
</tr>
</tbody>
</table>

**GaN device market size split by applicative markets (M$)**
As a function of voltage range

For high voltage applications, SiC is used, while GaN is mainly used for low voltage applications. The 600-900V range is the battle field.

- **Low-Voltage**
  - PFC/Power supply
  - Audio Amplifier

- **Medium-Voltage**
  - PV Inverter
  - Motor Control
  - UPS
  - Wind Mills
  - Rail Transport

- **High-Voltage**
  - Ships & Vessels
  - Smart Power Grid

SiC diodes

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
Tentative estimation of Market Share of SiC Device makers in 2014

ROHM and ST is gaining market share.
Evolutions in CREE’s MOSFET Structure

- Improvement in the current density and modification of epi thickness from Gen 1 to Gen 2.

As courtesy of System Plus Consulting:
Reverse Costing Analysis: Cree SiC MOSFET and Z-Rec Diode CAS120M12BM2 1200V

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
The higher the device frequency, the more important the consequence of device parasitic.

**CHALLENGE OF DEVICE PACKAGING**

Device Parasitic

- **SiC MOSFETs**
- **GaN HEMTs**
- **RF GaN**

**Needs to reduce device parasitic**

- Low TO
- PQFN
- High LGA

**Power Electronics**

- **Embedded die**

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
CREE just launched 900V SiC MOSFET in 2015, challenging the existing Super Junction MOSFET.

Due to the better physical characteristics, WBG devices such as SiC MOSFET usually have lower on-resistance compared to Silicon MOSFETs.

- Silicon devices are ranging from 600 V to 800 V
- CREE: Commercial 900V devices

---

DEVICE BENCHMARK

Cree’s 900V SiC MOSFET positioning vs Silicon SJ-MOSFETs

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
ORDER FORM
GaN and SiC for power electronics applications report

BILL TO
Name (Mr/Ms/Dr/Pr):
Job Title:
Company:
Address:
City:
State:
Postal Code/Zip:
Country*

*VAT ID Number for EU members:

Tel:
Email:
Date:

PAYMENT

BY CREDIT CARD
Visa  Mastercard  Amex

Name of the Card Holder:
Credit Card Number:
Card Verification
Value (3 digits except AMEX: 4 digits):
Expiration date:

BY BANK TRANSFER
BANK INFO: HSBC, 1 place de la Bourse,
F-69002 Lyon, France,
Bank code: 30056, Branch code : 00170
Account No: 0170 200 1565  87,
SWIFT or BIC code: CCFRFRPP,
IBAN: FR76 3005 6001 7001 7020 0156 587

RETURN ORDER BY
• FAX: +33 (0)472 83 01 83
• MAIL: YOLE DÉVELOPPEMENT, Le Quartz,
75 Cours Emile Zola, 69100 Villeurbanne/Lyon - France

SALES CONTACTS
• North America: Steve Laferriere - laferriere@yole.fr
• Japan & Asia: Takashi Onozawa - onozawa@yole.fr
• Europe & RoW: Jérôme Azemar - azemar@yole.fr
• Korea: Hailey Yang - yang@yole.fr
• General: info@yole.fr

*(1) Our Terms and Conditions of Sale are available at www.yole.fr/Terms_and_Conditions_of_Sale.aspx
The present document is valid 24 months after its publishing date: July 23rd, 2015

PRODUCT ORDER
Please enter my order for above named report :

☐ One user license*: Euro 4,990
☐ Multi user license: Euro 5,990
- The report will be ready for delivery from August 24th, 2015
- For price in dollars, please use the day’s exchange rate.
- All reports are delivered electronically at payment reception.
- For French customers, add 20% for VAT

I hereby accept Yole Développement’s Terms and Conditions of Sale*(1)
Signature:

*One user license means only one person at the company can use the report.

SHIPPING CONTACT
First Name:
Email:
Last Name:
Phone:

ABOUT YOLE DEVELOPPEMENT
Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media in addition to corporate finance services. With a strong focus on emerging applications using silicon and/or micro manufacturing (technology or process), Yole Développement group has expanded to include more than 50 associates worldwide covering MEMS, Compound Semiconductors, LED, Image Sensors, Optoelectronics, Microfluidics & Medical, Photovoltaics, Advanced Packaging, Manufacturing, Nanomaterials and Power Electronics.
The group supports industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to develop their business.

CONSULTING
• Market data & research, marketing analysis
• Technology analysis
• Reverse engineering & costing services
• Strategy consulting
• Patent analysis

FINANCIAL SERVICES
• Mergers & Acquisitions
• Due diligence
• Fundraising

More information on www.yolefinance.com

RESEARCH
• Collection of technology & market reports
• Manufacturing cost simulation tools
• Component reverse engineering & costing analysis
• Patent investigation

More information on www.i-micronews.com/reports

MEDIA & EVENTS
• i-Micronews.com, online disruptive technologies website
• @Micronews, weekly e-newsletter
• Technology Magazines dedicated to MEMS, Advanced Packaging, LED and Power Electronics
• Communication & webcasts services
• Events: Yole Seminars, Market Briefings...
More information on www.i-micronews.com

CONTACTS
For more information about :
• Consulting Services: Jean-Christophe Eloy (eloy@yole.fr)
• Financial Services: Jean-Christophe Eloy (eloy@yole.fr)
• Report Business: David Jourdan (jourdan@yole.fr)
• Press relations: Sandrine Leroy (leroy@yole.fr)
Definitions: “Acceptance”: Action by which the Buyer accepts the terms and conditions of sale in their entirety. It is done by signing the purchase order which mentions “I hereby accept Yole’s Terms and Conditions of Sale”.

“Buyer”: Any business user (i.e. any person acting in the course of its business activities, for its business needs) entering into the following general conditions to the exclusion of consumers acting in their private interest.

“Contracting Parties” or “Parties”: The Seller on the one hand and the Buyer on the other hand.

“Intellectual Property Rights” (“IPR”) means any rights held by Yole Développement on any patents, trademarks, registered models, designs, copyrights, inventions, commercial secrets and know-how, technical information, company or trading names, brands, software, intellectual property rights or similar in any part of the world, notwithstanding the fact that they have been registered or not and including any pending registration of one of the above mentioned rights.

“Licence”: Corporate license: purchased under “Annual Subscription” program, the report can be used by unlimited users within the company. Joint-ventures are not included.

“Product” or “Products”: Depending on the purchase order, reports or databases on MEMS, CSC, Optics/MOEMS, Nano, bio... to be bought either one at a time or with a corporate subscription. (i.e. subscription for a period of 12 calendar months). The annual subscription to a package (i.e. a global discount based on the number of reports that the Buyer purchases in a year) as well as the support service, global installations, remote support on line on 1-microwaves and a consulting approach, is defined in the order. Reports are established in PowerPoint and delivered on a PDF format and the database may include Excel files.

“Seller”: Based in Lyon (France headquarters), Yole Développement is a market development and research company created to bring advanced technology information to the forefront of its application. Our reports are based on the future of technologies as well as market forecasts for advanced technology industrial projects. With more than 20 market analysts, Yole works worldwide with the key industrial companies, R&D institutes and investors to help them understand the markets and technology trends.

1. SCOPE

1.1 The Contracting Parties undertake to observe the following general conditions when agreed by the Buyer and the Seller. ANY ADDITIONAL, DIFFERENT, OR CONFLICTING TERMS AND CONDITIONS IN ANY OTHER DOCUMENTS ISSUED BY THE BUYER AT ANY TIME ARE HEREBY OBJECTIONS TO THE SELLER, SHALL BE WHOLLY INAPPLICABLE TO ANY SALE MADE HEREUNDER AND SHALL NOT BE BINDING IN ANY WAY ON THE SELLER.

1.2 The Seller reserves the right to refuse to sell to any person acting in the course of its business activities for its business needs) entering into the following general conditions to the exclusion of consumers acting in their private interest.

2. MAILING OF THE PRODUCTS

2.1 The Products are sent by email to the Buyer.

• within (1) month from the order for Products already released; or
• within a reasonable time for Products ordered prior to their effective release. In this case, the Seller shall use its best endeavours to inform the Buyer of an indicative date and approximate time in which the Products are mailed.

2.2 Some weeks prior to the release date the Seller can propose a pre-release discount to the Buyer.

The Seller shall by no means be responsible for any delay in receipt of such mailings, including incases where a new event or access to new contradictory information would require for the analyst extra time to compute or compare the data to the latest date that the Seller has sent the purchase order which mentions “I hereby accept Yole’s Terms and Conditions of Sale”. This results in accepting the price of the Product as notified by the Seller on the one hand and the Buyer on the other hand.

3. PRICE, INVOICING AND PAYMENT

3.1 Prices are given in the orders corresponding to each Product sold on a unit basis or corresponding to annual subscriptions. They are VAT exempted prices. The prices charged to the Buyer may be reevaluated from time to time. The effective price is deemed to be one applicable at the time of the order.

3.2 Yole may offer a pre-release discount for the companies willing to acquire in the future the specific report and agreeing on the fact that the report may be release later than the anticipated release date. In exchange to this uncertainty, the company will get a discount that can vary from 15% to 30%.

3.3 Payments due by the Buyer shall be sent by cheque payable to Yole Développement, credit card or by electronic transfer to the following account:

HSBC, 1 place de la Bourse 69002 Lyon France
Bank code: 30056
Branch code: 001
Account n°: 0170 200 1565 87
BIC or SWIFT code: CCFRFRPP
IBAN: FR75 3005 6601 0170 200 1565 87
To ensure the payments, the Seller reserves the right to request down payments from the Buyer. In this case, the need of down payments will be mentioned on the order.

3.4 Payments due by the Buyer to the Seller within 30 days from invoice date, except in the case of a particular written agreement. If the Buyer fails to pay within this time and fails to contact the Seller, the latter shall be entitled to invoiced interest in arrears based on the annual rate Ref of the «BCE» + 7 points, in accordance with article L. 441-6 of the French Commercial Code. The consequences in these circumstances, orders, reports or products, are delivered only after receipt of the payment.

3.5 In the event of termination of the contract, or of misconduct, during the contract, the Seller will have the right to invoice at the stage in progress, and to take legal action for damages.

4. LIABILITIES

4.1 The Buyer or any other individual or legal person acting on its behalf, being a business user buying the Products for its business activities, shall be solely responsible for choosing the Products and for the use and interpretations he makes of the documents it purchases, of the results he obtains, and of the advice and acts it deduces thereof.

4.2 The Seller shall only be liable for (i) direct and (ii) foreseeable pecuniary risks, which correspond to the Products or arising from a material breach of this agreement.

4.3 In no event shall the Seller be liable for:

a) damages of any kind, including without limitation, incidental or consequential damages (including, but not limited to, damages for loss of profits, business interruption and loss of programs or data) arising from the use of the Products or inability to use the Seller’s website or the Products, or any information provided on the website, or in the Products;

b) any unauthorized copying, use, disclosure or other inaccuracies in the Product or interpretations thereof.

4.4 All the information contained in the Products has been obtained from sources believed to be reliable. The Seller does not warrant the accuracy, completeness adequacy or reliability of such information, which cannot be guaranteed to be free from errors.

4.5 All the Products that the Seller sells may, upon prior notice to the Buyer from time to time to be modified by or substituted with similar Products meeting the needs of the Buyer. This modification is made in good faith, based on the latest information provided by the Seller, provided that the Seller ensures the substituted Product is similar to the Product initially ordered.

4.6 In the event of inspection, it is acknowledged that the Products contain defects, the Seller undertakes to replace the defective products as far as the supplies allow and without indemnities or compensation of any kind for labor costs, delays, damage to reputation or any other loss or omission. The replacement is guaranteed for a maximum of two months starting from the delivery date. Any replacement is excluded for any event as set out in the Product report, disclaimer and limitations in article 3.

4.7 The deadlines that the Seller is asked to state for the mailing of the Products are given for information only and are not binding. The Buyer shall not look for compensation or any damages or cancellation of the orders, except for non-acceptable delays exceeding 4 months from the stated deadline, without information from the Seller. In such case only, the Buyer shall be entitled to ask for a reimbursement of its first down payment to the exclusion of any further damages.

4.8 The Seller does not make any warranties, express or implied, including, without limitation, those of saleable quality and fitness for a particular purpose, with respect to the Products. Although the Seller shall take all necessary precaution and precautions Products for infection of viruses, worms, Trojan horses or other codes containing contaminating or destructive properties before mailing the Products, the Seller cannot guarantee that any Product will be free from infection.

5. FORCE MAJEUR

The Buyer shall not be liable for any delay in performance directly or indirectly caused by or resulting from acts of nature, fire, flood, accident, riot, war, government intervention, embargoes, strikes, labor difficulties, equipment failure, late deliveries by suppliers or other causes which are beyond the control, and not the fault of the Seller.

6. PROTECTION OF THE SELLER’S IPR

6.1 All the IPR attached to the Products and are remain the property of the Seller (i.e. any person acting in the course of its business activities, for its business needs) entering into the following general conditions to the exclusion of consumers acting in their private interest.

6.2 The Buyer agreed not to disclose, copy, reproduce, redistribute, resell or publish the Product, or any part of it to any other party other than employees of its company. The Buyer shall have the right to use the Products solely for its own internal information purposes. In particular, the Buyer shall therefore not use the Product for purposes such as:

• Information storage and retrieval systems;

• Recordings and retransmissions over any network (including any local area network);

• Use in any timesharing, service bureau, bulletin board or similar arrangement or public display;

• Providing any Product to any other online service (including bulletin boards or the Internet);

• Licensing, leasing, selling, offering for sale or assigning the Product.

6.3 The Buyer shall be solely responsible towards the Seller of all infringements of this obligation, whether this infringement comes from its employees or from any person to whom the Buyer has sent the Products and shall personally take care of any related proceedings, and the Buyer shall bear related financial consequences.

6.4 The Buyer shall define within its company point of contact for the needs of the contract. This person will be the recipient of any report and shall be responsible for respecting of the copyrights and will guarantee that the Products are not disseminated out of the company.

6.5 In the context of any dispute or conflict, the person in contact shall decide who within the Buyer, shall be entitled to access on line the reports on 1-microwens.com. In this respect, the Seller will give the Buyer a maximum of 10 passwords, unless the multiple sites organization of the Buyer requires more passwords. The Seller reserves the right to check from time to time the correct use of this password.

6.6 In case of a multi-site license, only the employee of the Buyer can access the report or the employee of the companies in which the Buyer have 100% shares. As a matter of fact, an investor or a company, the joint venture done with a third party etc...cannot access the report and should pay a full license price.

7. TERMINATION

7.1 If the Buyer cancels the order in whole or in part or postpones the date of mailing, the Buyer shall indemnify the Seller for the entire costs that have been incurred as at the date of notification by the Buyer of such delay or cancellation. This may also apply for any other direct or indirect consequential damages.

7.2 In the event of breach by one Party under these conditions or the order, the non-breaching Party may send a notification to the other by recorded delivery letter upon which, after a period of thirty (30) days without solving the problem, the non-breaching Party shall be entitled to terminate all the pending orders, without being liable for any compensation.

8. MISCELLANEOUS

8.1 All terms and conditions of these Terms and Conditions are for the benefit of the Seller itself, but also for its licensees, employees and agents. Each of them is entitled to assert and enforce those provisions against the Buyer.

Any modification or amendment of these Terms and Conditions and valid shall be made in writing. They shall be effective upon receipt by the other Party. The Seller may, from time to time, update these Terms and Conditions and the Buyer agrees that any new or revised version of these terms and conditions, provided they have been communicated to him in due time.

9. GOVERNING LAW AND JURISDICTION

9.1 Any dispute arising out or linked to these Terms and Conditions or contracts concluded under these Terms and Conditions shall be settled by the French Commercial Courts of Lyon, which shall have exclusive jurisdiction upon such issues.

9.2 French law shall govern the relation between the Buyer and the Seller, in accordance with these Terms and Conditions.
Yole Développement

From Technologies to Market
FIELDS OF EXPERTISE

Yole Développement’s 30 analysts operate in the following areas

- MEMS & Sensors
- Compound Semi.
- LED
- Imaging
- Photonics
- MedTech
- Manufacturing
- Power Electronics
- Advanced Packaging
- PV

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
4 BUSINESS MODELS

- Consulting and Analysis
  - Market data & research, marketing analysis
  - Technology analysis
  - Strategy consulting
  - Reverse engineering & costing
  - Patent analysis
  - www.yole.fr

- Reports
  - Market & Technology reports
  - Patent Investigation and patent infringement risk analysis
  - Teardowns & Reverse Costing Analysis
  - Cost Simulation Tool
  - www.i-Micronews.com/reports

- Media
  - i-Micronews.com website
  - @Micronews e-newsletter
  - Technology magazines
  - Communication & webcast services
  - Events
  - www.i-Micronews.com

- Financial services
  - M&A (buying and selling)
  - Due diligence
  - Fundraising
  - Maturation of companies
  - IP portfolio management & optimization
  - www.yolefinance.com
  - www.bmorpho.com

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
A GROUP OF COMPANIES

Market, technology and strategy consulting
www.yole.fr

M&A operations
Due diligences
www.yolefinance.com

Fundraising
Maturation of companies
IP portfolio management & optimization
www.bmorpho.com

Manufacturing costs analysis
Teardown and reverse engineering
Cost simulation tools
www.systemplus.fr

IP analysis
Patent assessment
www.knowmade.fr

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
40% of our business is in EU countries

30% of our business is in Asia

30% of our business is in North America

OUR GLOBAL ACTIVITY

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
Custom analysis scope is defined with you to meet your information and budget needs.
SERVING THE ENTIRE SUPPLY CHAIN

Our analysts provide market analysis, technology evaluation, and business plan along the entire supply chain.

Integrators and end-users

Device makers

Suppliers: material, equipment, OSAT, foundries...

Financial investors, R&D centers

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
SERVING MULTIPLE INDUSTRIAL FIELDS

We are working across multiple industries to understand the impact of More-than-Moore technologies from device to system.

From A to Z…

©2015 | www.yole.fr | GaN & SiC for Power Electronics applications
Yole Développement publishes a comprehensive collection of market & technology reports and patent analysis in:

- MEMS & Sensors
- Imaging
- Medical technologies (MedTech)
- Advanced packaging
- Power electronics
- Compound semiconductors
- OLED, LED & Laser diode
- Semiconductor Manufacturing
- Photovoltaics
- Batteries

Our reports are unmatched in quality and technology depth and typically include:

- Technology trends and evolution: costs, barriers, roadmaps, etc.
- Supply & value chain analysis: business models, relationships, value flows, etc.
- In-depth analysis of applications and market drivers: challenges, inflection points, etc.
- Market data ($, units, wafer starts, etc.)

Every year, Yole Développement, System Plus Consulting and Knowmade publish +60 reports.
Take the full benefit from our Bundle and Annual Subscription offers.
OUR 2015 REPORTS PLANNING

MARKET & TECHNOLOGY REPORTS by Yole Développement

- **MEMS & SENSORS**
  - Sensors and Data Management for Autonomous Vehicles
  - High End Gyroscopes and Accelerometer Applications
  - AlN Thin Film Markets And Applications
  - Sensors for Wearable Electronics And Mobile Healthcare
  - Status of the MEMS Industry
  - Uncooled IR Imagers
  - IR Detectors
  - High End Gyro, Accelerometers and IMU
  - Non-Volatile Memory
  - MEMS for RF filters and Antenna Switches - BAW / SAW

- **IMAGING & OPTOELECTRONICS**
  - Camera Module Packaging (Vol 1 : Market & Technology Trends / Vol 2 Teardowns & Reverse Engineering)
  - Uncooled IR Imagers
  - Wafer Level Optics
  - Status of the CMOS Image Sensors
  - Machine Vision

- **MEDTECH**
  - Microfluidic for Sample Preparation
  - Microfluidic Applications
  - Sensors for Wearable Electronics And Mobile Healthcare

- **COMPOUND SEMICONDUCTORS**
  - High Purity Alumina (HPA)
  - Sapphire
  - Wide Bandgap Materials For Power Electronics: SiC, GaN (and also Ga2O3, AlN, Diamond, Graphene… as a trend)

- **LED**
  - LED Module
  - OLED for Lighting
  - UV LED
  - LED Phosphors Market

- **POWER ELECTRONICS**
  - Power Packaging
  - Thermal Management for LED and Power
  - Power Electronics for Renewable Energy
  - Energy Management For Smart Grid And Smart Cities
  - Status of Chinese Power Electronics Industry
  - New Technologies For Data Center
  - Inverter Market Trends For 2013 – 2020 And Major Technology Changes*
  - IGBT Markets And Application Trends
  - Power Electronics for HEV/EV*
  - Status of Power Electronics Industry

- **ADVANCED PACKAGING**
  - Advanced Packaging in Emerging Markets in China
  - Status of the Advanced Packaging Industry
  - Supply Chain Readiness for Panel Manufacturing in Packaging
  - WLCSP*
  - Flip Chip Business Update
  - 2.5D & 3DIC Business Update
  - Fan-Out and Embedded Business Update

- **MANUFACTURING**
  - Lithography for MEMS, Advanced Packaging and LED
  - Thinning & Dicing Equipment for Advanced Packaging, MEMS, Photovoltaics, LED, CMOS Image Sensors
  - Non-Volatile Memory
  - Status of Chinese Power Electronics Industry
  - Status of Power Electronics Industry

* Reports to be decided within 2015
OUR 2015 REPORTS PLANNING

PATENT ANALYSIS by Knowmade

- Patent Infringement (crossed analysis based on Knowmade and System Plus Analysis expertise)
  - MEMS Microphone Applications (Q1)

- Patent Investigation (crossed analysis based on Knowmade & Yole Développement expertise)
  - Power GaN (Q2)
  - Phosphors for LED - Update (Q2)
  - MEMS Gyroscope - Update (Q2)
  - LED Packaging (Q4)
  - 6-axis & 9-axis IMUs (Q4)
  - Microbatteries (Q4)

- Patent Landscape
  - Capacitive Fingerprint Sensors (Q1)
  - Biomedical Photoacoustic Imaging (Q1)
  - ReRAM Non-Volatile Memories (Q2)

TEAR-DOWN & REVERSE COSTING by System Plus Consulting

More than 30 teardowns and reverse costing analysis and cost simulation tools to be published in 2015.

* Reports to be decided within 2015
OUR 2014 PUBLISHED REPORTS LIST

MARKET & TECHNOLOGY REPORTS
by Yole Développement

- MEMS & SENSORS
  - Technologies & Sensors for the Internet of Things: Businesses & Market Trends 2014-2024
  - MEMS Microphone: Market, Applications and Business Trends 2014
  - Status of the MEMS industry
  - MEMS & Sensors for Mobile Phones and Tablets
  - Inertial MEMS Manufacturing Technical Trends
  - New Detection Principles & Technical Evolution for MEMS & NEMS
  - 6/9 DOF Applications in Consumer Electronics

- IMAGING & OPTOELECTRONICS
  - Status of the CMOS Image Sensor Industry
  - Uncooled Infrared Imaging Technology & Market Trends
  - Silicon Photonics

- MEDTECH
  - Point of Care Testing: Applications for Microfluidic Technologies
  - Solid State Medical Imaging: X-ray and Endoscopy

- COMPOUND SEMICONDUCTORS
  - RF GaN Technology & Market Analysis: Applications, Players, Devices & Substrates 2010-2020
  - SiC Modules, Devices and Substrates for Power Electronics Market
  - GaN-on-Si Substrate Technology and Market for LED and Power Electronics
  - Power GaN Market
  - Graphene Materials for Opto & Electronic Applications
  - Sapphire Applications and Market: from LED to Consumer Electronics

- LED
  - LED Packaging
  - LED Front-End Manufacturing Trends
  - LED Front-End Equipment Market

- POWER ELECTRONICS
  - Power Electronics for HEV/EV
  - Inverters
  - Gate Driver Unit Market for Power Transistors

- PHOTOVOLTAICS
  - Emerging and Innovative Technology Approaches in the Solar Industry

- ADVANCED PACKAGING
  - 3DIC Equipment and Materials
  - 3DIC & 2.5D TSV Interconnect for Advanced Packaging - 2014 Business Update

- MANUFACTURING
  - Market & Technology Trends in Materials & Equipment for Printed & Flexible Electronics
  - Permanent Wafer Bonding for Semiconductor: Application Trends & Technology

PATENT ANALYSIS
by Knowmade

- LED Based on Nano-wires Patent Investigation
- GaN on Si Patent Investigation (LED, Power devices and RF Devices)
- New MEMS Devices Patent Investigation
- Non Volatile Memory Patent Investigation

TEARDOWN & REVERSE COSTING
by System Plus Consulting

More than 30 teardowns and reverse costing analysis and cost simulation tools to be published in 2014.
About Micronews Media

Micronews Media, powered by Yole Développement, ensures you the best visibility in the disruptive semiconductor community. With our services, we help you to reach your customers worldwide with the media products they prefer, including our website, e-newsletter, webcasts, and magazines. Invest in a high added-value editorial program and get access to Yole Développement’s network (48,000+ contacts).

Five supports and channels for your visibility

- A technology magazine to highlight your visibility with advertisements, company profiles, product descriptions and white papers
- A webcast to highlight your expertise and develop your business identifying commercial leads
- Articles, advertisements & logo and banners dedicated to your company, its products and expertise in @Micronews e-newsletter and on i-Micronews.com
COMMUNICATION SERVICES

• All services listed below are available on-demand.

  o i-Micronews.com, the website
    • Slider – Banners (on English or Japanese websites) – Articles – Logo and profile as sponsor
  o @Micronews, the e-newsletter
    • Headline article - Tiles
  o Custom webcast
    • Develop your dedicated event with a high added-value program. A turnkey event with Yole support (logistics, promotion, data…)
  o Technology Magazines: Custom – Co-produced
    • Increase your visibility through a dedicated technology magazine with ads, company profile, product descriptions and white papers. It can be a custom magazine: your company is the only one to benefit from it – or a co-produced one: up to 2 companies.

• Contacts:
  • Camille Veyrier (veyrier@yole.fr) and Clotilde Fabre (fabre@yole.fr), Media & Communication Coordinators.
CONTACT INFORMATION

- **Consulting and Specific Analysis**
  - North America: Steve LaFerriere, Business Development Manager, Yole Inc
    Email: laferriere@yole.fr
  - Japan: Yutaka Katano, General Manager, Yole Japan & President, Yole K.K.
    Email: katano@yole.fr
  - RoW: Jean-Christophe Eloy, President & CEO, Yole Développement
    Email: eloy@yole.fr

- **Report business**
  - North America: Steve LaFerriere, Business Development Manager, Yole Inc
    Email: laferriere@yole.fr
  - Europe: Jérôme Azemar, Business Development Manager, European Office
    Email: azemar@yole.fr
  - Japan & Asia: Takashi Onozawa, Sales Asia & General Manager, Yole K.K.
    Email: onozawa@yole.fr
  - Korea: Hailey Yang, Business Development Manager, Korean Office
    Email: yang@yole.fr

- **Financial services**
  - Jean-Christophe Eloy, CEO & President
    Email: eloy@yole.fr

- **General**
  - Email: info@yole.fr

Follow us on