2020
Reports, Monitors and Tracks
Catalogue
TABLE OF CONTENT

Stay Ahead of the Market With The Yole Group of Companies’ Analyses 5

Our Collection Of Reports
• Battery and Energy Management 6
• Compound Semiconductors and Emerging Materials
• Computing and Software
• Display
• Imaging
• Lighting
• Memory
• Packaging and Substrates
• Photonics
• Power Electronics
• RF Devices & Technologies
• Semiconductor Manufacturing
• Sensing & Actuating

Our Quarterly Monitors Collection
• Quarterly Market Monitors 12
• Reverse Technology Monitor

175+ Systems Per Year In Our 6 Tracks
• Smartphones 14
• Smart Home
• Wearable
• ADAS
• Infotainment
• Connectivity

Licenses & Rates 16
More Services 17
Yole Group of Companies 18
Contact 19
STAY AHEAD OF THE MARKET WITH THE YOLE GROUP OF COMPANIES’ ANALYSES

Discover the wide range of reports, monitors and tracks available from the Yole Group of companies

Over more than 20 years, Yole Développement has grown to become a group of companies. Together with System Plus Consulting, we now provide marketing, technology and strategy consulting, media and corporate finance services, reverse costing, structure, process and cost analysis services. Together, our group of companies is collaborating ever more closely. In 2020, we therefore will offer a collection of over 115 syndicated reports, 7 monitors and 175+ teardowns. Combining the respective expertise and methodologies from the two companies, our products cover: photonics, lighting, imaging, sensing and actuating, display, RF devices and technologies, compound semiconductors and emerging materials, power electronics, batteries and energy management, semiconductor packaging and substrates, semiconductor manufacturing, memory, computing and software.

Our team of analysts, including PhD and MBA qualified industry experts from Yole Développement and System Plus Consulting collect and analyse 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 2,300 projects, interacting with technology professionals and high-level opinion makers from the main players in their industries and completed more than 5,000 interviews per year.

What to expect in 2020?
During 2019 we introduced new additions to our “monitor” product offering, which provides continual updates on your industry during the year, and we will be expanding this offering during 2020.
In addition to the monitors, we also developed «teardown tracks» that provide you online visibility into the latest consumer technology product designs and the suppliers within them. In 2020, an automotive track will be launched, further expanding our research focused on emerging technologies.
On the traditional report side of our business, the Yole Group continues our commitment to a new collection of reports addressing six key markets: Mobile & Consumer, Automotive & Transportation, Telecom & Infrastructure, Medical, Industrial, and Defense & Aerospace.
Discover our 2020 program right now, and ensure you get a true vision.

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
• A clear view of supply chain evolution
Our reports, monitors and tracks are for you!
OUR COLLECTION OF REPORTS

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

Market – Technology – Strategy Reports – 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 2020.

The Reverse Costing reports developed by System Plus Consulting provide full tear downs, including detailed photos, precise measurements, material analyses, manufacturing process flows, supply chain evaluations, manufacturing cost analyses and selling price estimations. The reports listed here are comparisons of several analyzed components from System Plus Consulting. Over 60 new reports will be released in 2020.

The key markets targeted are:
- Mobile & Consumer
- Automotive & Transportation
- Medical
- Industrial
- Telecom & Infrastructure
- Defense & Aerospace

Key Drivers of SiP vs standalone packages

Source: Imaging for Automotive 2019, Yole Développement, June 2019
BATTERY AND ENERGY MANAGEMENT

MARKET & TECHNOLOGY REPORT
• Li-ion Battery Packs for Auto. and Stationary Storage Applications 2020
• Li-ion Battery Recycling Industry: Technology Trends and Supply Chain Analysis 2020
• Status of Rechargeable Li-ion Battery Industry 2019

COMPOUND SEMICONDUCTORS AND EMERGING MATERIALS

MARKET & TECHNOLOGY REPORT
• GaAs Wafer and Epiwafer Market: RF, Photonics, LED and PV Applications 2020
• Power SiC : Materials, Devices and Applications 2020
• RF GaN Market: Applications, Players, Technology, and Substrates 2020
• Status of SOI and Innovative Engineered Substrates: Players, Applications and Technology Trends 2020
• Emerging Semiconductor Substrates: Market & Technology Trends 2019

STRUCTURE, PROCESS & COST REPORT
• GaN Transistors Comparison 2020
• SiC Diodes Comparison 2020
• SiC Transistors Comparison 2020
• GaN-Based Wall Charger Comparison 2019
• GaN-on-Si HEMT vs Superjunction MOSFET Comparison 2019

COMPUTING AND SOFTWARE

MARKET & TECHNOLOGY REPORT
• Computing for Surveillance & Security 2020
• Artificial Intelligence for Automotive including IP 2020
• (x)PU: High-end CPU and GPU for Datacenter Applications 2020
• Artificial Intelligence Computing for Consumer 2019
• Image Signal Processor and Vision Processor Market and Technology Trends 2019
### DISPLAY

**MARKET & TECHNOLOGY REPORT**
- Displays & Optics for VR & AR 2020
- Microdisplays Technologies & Market Trends 2020
- MicroLED Displays - Intellectual Property Status & Landscape 2020
- Next Generation 3D Displays 2019
- MiniLED Displays 2019
- Next-Generation Human Machine Interaction in Displays 2019

### IMAGING

**MARKET & TECHNOLOGY REPORT**
- 2D and 3D Machine Vision for Industrial Applications 2020
- 3D Sensing & Imaging 2020
- Artificial Intelligence for Medical Imaging 2020
- Status of the Camera Module Industry 2020
- Status of CMOS Image Sensor Industry 2020
- Status of the Medical Imaging 2020
- Thermal Imaging 2020
- Imaging for Automotive 2019
- Cameras for Microscopy and Next-Generation Sequencing 2019
- Neuromorphic Sensing and Computing 2019
- X-Ray Detectors for Medical, Industrial and Security Applications 2019

### STRUCTURE, PROCESS & COST REPORT

- Automotive Camera Module Comparison 2020
- Smartphone Camera Module Comparison 2020 (4 volumes)
- Mobile Camera Module Comparison 2019
- Mobile CMOS Image Sensor Comparison 2019
- Smartphone 3D Sensing & VCSEL Comparison 2020

### LIGHTING

**MARKET & TECHNOLOGY REPORT**
- Status of the Solid State Lighting Source Industry 2020
- VCSELs - Market and Technology Trends 2020
- Edge Emitting Lasers: Market and Technology Trends 2019
- Light Shaping Technologies for Consumer and Automotive Applications 2019
- Automotive Advanced Front Lighting Systems 2019
## MEMORY

### MARKET & TECHNOLOGY REPORT
- Emerging Non Volatile Memory 2020
- Front-End Equipment and Materials for Memory: Focus on Market Forecast & Shares 2020
- Memory for AI Applications 2020: Embedded, Standalone ...
- Status of the Memory Industry 2020
- MRAM Technology and Business 2019

### STRUCTURE, PROCESS & COST REPORT
- DRAM Memory Comparison 2020
- NAND Memory Comparison 2020
- LPDDR4 Memory Comparison 2019

## PACKAGING AND SUBSTRATES

### MARKET & TECHNOLOGY REPORT
- 5G Packaging Trends 2020: RF FE Modules & Base Stations
- Fan Out Packaging Technologies and Market 2020
- Status of the Advanced Packaging Industry 2020
- System in Package (SiP) Technology and Market Trends 2020
- Photonics Packaging and Assembly 2020
- Wafer-Level Chip Scale Packaging 2020
- Equipment and Materials for Fan-Out Packaging 2019
- 2.5D / 3D TSV & Wafer-Level Stacking: Tech. & Market Updates 2019
- Advanced RF System-in-Package for Cellphones 2019
- Automotive Packaging: Market and Technologies Trends 2019
- Die Attach Equipment Market 2019
- Status of Advanced Substrates 2019

### STRUCTURE, PROCESS & COST REPORT
- IPD Comparison 2020
- Fan-Out Packaging Processes Comparison 2020

## PHOTONICS

### MARKET & TECHNOLOGY REPORT
- Quantum Technologies 2020
- LiDAR for Automotive and Industrial Applications 2020
- Silicon Photonics 2020
- Optical Transceivers for Data and Telecom 2020
SENSING AND ACTUATING

MARKET & TECHNOLOGY REPORT

• BioMEMS 2020
• High-End Inertial Sensors for Defense, Aerospace and Industrial Applications 2020
• Point-of-Need Testing: Application of Microfluidic Technologies 2020
• Sensing and Computing for ADAS Vehicle 2020
• Sensors for Robotic Mobility 2020
• Status of the MEMS Industry 2020
• Status of the Microfluidics Industry: Techniques, Manufacturing and Materials 2020
• Ultrasound Tech. for Consumer, Medical and Industrial Markets 2020
• Wearables for Consumer and Medical Markets 2020
• Emerging Printing Technologies 2019
• Inkjet Printheads: Dispensing Technologies & Market Landscape 2019
• Next Generation Sequencing & DNA Synthesis: Technology Consumables 2019
• Organs-On-Chips Market and Technology Landscape 2019
• Piezoelectric Devices: From Bulk to Thin-Film 2019
• Uncooled Infrared Imagers and Detectors 2019

STRUCTURE, PROCESS & COST REPORT

• Automotive Inertial Sensors Comparison 2020
• Consumer Magnetic Sensor Comparison 2020
• Consumer MEMS Microphones Comparison 2020
• Mobile Inertial Sensors comparison 2020
• Piezoelectric Material From Bulk to Thin Film – Comparison 2019
• Particle Sensor Comparison 2019
OUR QUARTERLY MONITORS COLLECTION

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

Quarterly Market Monitors - by Yole Développement

The 6 quarterly market monitors will provide the evolution of the market in units, wafer area and revenues but also market shares by device manufacturer and technology. They will also offer insights into what is driving the business, providing a close examination of the trends. 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
- A web portal access for data (soon available)

As part of this product, you get a direct access to the analyst.

Reverse Technology Monitors - by System Plus Consulting

With this quarterly reverse technology monitor, System Plus Consulting will provide the latest components, packaging and silicon chip choices of the related products makers. It will offer a clear view of the technological strategy of the semiconductor companies leading the market and a direct comparison between OEMs. The following deliverables will be included in the monitor:
- An Excel database with historical data from past years and the prior quarter, while adding new data for new products every quarter
- A PDF slide deck with graphs and comments/analyses to explain the main technology evolutions on the related market
- A web portal access for data (soon available)

Get direct access to the analyst and to the web portal for data.

As part of this product, you get a direct access to the analyst.

---

Market dynamics

Source: CMOS Image Sensor Service - Imaging Research, Yole Développement, July 2019

Q3 2019 die area per category (mm²)

Source: Smartphones Reverse Technology Monitor System Plus Consulting 2020
QUARTERLY MARKET MONITORS

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. Starting from Q1 2020.

Application Processor – NEW
The monitor examines and forecasts the application processor segment. It tracks processor revenue, units, and wafer volumes at both fabless chip designers and at the foundries themselves, sliced across various relevant parameters including process node, end product segment, core and IP type, etc. The monitor also examines the reported financials of players within the ecosystem. Starting from Q1 2020.

Compound Semiconductors – 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. Starting from Q4 2019.

CMOS Image Sensors
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 ON Semiconductor will thus be analysed.

DRAM
This monitor analyzes the evolution of the DRAM market in terms of revenue, shipments, capex, and near-term price evolution, as well as demand per market segment (data centers, mobile, automotive, graphics, and PC), DRAM technology evolution, and detailed profiles of main suppliers. It also provides DRAM monthly pricing to track the price evolution of key components and packaged solutions.

NAND
This monitor provides all data related to NAND revenue per quarter, NAND shipments, pricing per NAND type, near and long-term revenue, market share per quarter, capex per company, and a market demand/supply forecast, along with a complete analysis and details on the demand side, with a deep dive into client and enterprise SSD, data centers, mobile, automotive, PC, and more.

REVERSE TECHNOLOGY MONITOR

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 monitor will provide the design wins for the top smartphones OEM, the packaging evolution in term of type, footprint, pitch, as well as die area evolution per function, technology node, wafer size. It will offer a clear view of the technological strategy of the semiconductor companies leading the market and a direct comparison between OEM.
Access anytime via our web portal to 175+ new teardowns and updates, as our analysis progresses

6 teardown tracks - by System Plus Consulting

Our device teardowns cover more than 3,500 teardowns of mobile phones of all tiers, including smartphones, feature phones, and basic phones, as well as tablets, including iPads, the Samsung Galaxy, and the Microsoft Surface. Our device coverage also includes access to hundreds of wearable teardowns, including activity trackers, smart watches, trackers, VR devices, and high-tech jewelry. Smart Home teardowns include all things that make the home smart: smart thermostats, smart lighting, smart switches, surveillance cameras, smart smoke detectors, home automation hubs, and security devices. Automotive includes devices for ADAS, infotainment and telematics control units.

Web-based format, in addition to PDFs and Excels, allows access to immediate updates as our teardowns progress. Thanks to this portal, you can:
• View features and specs of each device or component
• Browse, zoom, and download imagery using our interactive tools
• Perform robust database searches on specific devices or components, and then download the sections of our teardown report that’s most relevant to them
• View detailed parts lists, BOMs, and cost summary, and then follow links to other devices employing the same component
• Plot power measurement data across all tests
• Access data updated weekly
CONSUMER

Smartphones* - 450+ products already available

APPLE
• iPhone 11 Pro 512GB
• iPhone 11 Pro 256GB

OPPO
• OPPO Reno 5G
• OPPO K1

SAMSUNG
• Samsung Galaxy A50 64GB Dual SIM
• Samsung Galaxy Fold

XIAOMI
• Xiaomi Mi Mix 3 5G 64GB
• Xiaomi Black Shark 2 128GB 8GB RAM

Smart Home* - 100+ products already available

AMAZON
• Amazon Show 5
• Amazon Echo plus (2nd gen.)

GOOGLE
• Google Home Hub
• Google Clips

Wearable* - 130+ products already available

APPLE
• Apple Airpods Pro w/Wireless charger
• Apple Watch 5

BOSE
• Bose Frames

FITBIT
• Fitbit Charge 3
• Fitbit Versa

AUTOMOTIVE

ADAS
DENSO
• Denso Monocular Forward ADAS Camera (8646C-58020)
TESLA
• Tesla Model 3 Driver Assist Autopilot 2.5 (1098058-00-L)

Infotainment
BOSE
• Bose Audio Amplifier (28063 4295R)

Connectivity
LG ELECTRONICS
• LG Electronics TUVM03IU-E (SNA 035 284 C)
CONTINENTAL
• Continental TCU-B2 (A2C7679820100)
VALEO
• Valeo Peiker Acustic Telematic Control Unit (ATM-01 R2-US-4G)

*Non-exhaustive list of products. List as of February 2020
To better meet our customers’ requirements, the Yole Group of Companies proposes 3 different user licenses and multiple bundled offers are available.

**Licensing terms for individual purchase**

2 different license options are available for the reports:

- **One user license**: 5 990 € / The report is intended for only one identified user at the Company purchasing the report - Sharing is strictly forbidden
- **Multi-user license**: 6 490 € / The report can be shared by the identified user of the Company purchasing the report with an unlimited number of employees of said Company. However, these rights are limited to the country of the identified user. Subsidiaries and joint-ventures are excluded.

**Reports bundled offers**

With our bundle offers, you choose the number of reports you are interested in and select the related ‘Bundled Offer’. You then have up to 12 months to select the required reports from the 2 publishers: Yole Développement and System Plus Consulting. Pay once and receive the reports automatically in corporate license.

Our rate are listed below:

- **Bundled Offer 3 reports**: 13 490 € / up to 31% discount*
- **Bundled Offer 6 reports**: 21 990 € / up to 44% discount *
- **Bundled Offer 12 reports**: 37 600 € / up to 52% discount *

For a different number of reports, please contact our sales team.

* From standard Yole Développement reports rate in multi user license

**CORPORATE LICENSE**

The report can be shared by the identified user of the Company purchasing the report with an unlimited number of employees of said Company on a global basis. Subsidiaries are included, while joint-ventures are excluded. Nothing herein is intended to prevent the Yole Group of Companies from offering to sell a report to an employee who shall place an order with Yole Group of Companies for such purpose.

**DISCLAIMER**: Notwithstanding the fact that persons within an organisation may be entitled to access a report pursuant to a multi-user licence or a corporate license previously sold by Yole Développement, in no event shall Yole Développement incur any liability in any form whatsoever if Yole Développement sells one or more additional licenses to use a report directly to such persons.
CUSTOM STUDY
If you need specific, strategic, financial, technical and market analysis, answers on specific questions, or to make critical decisions, the Yole Group of Companies provides consulting services. They include market, technology and strategy reports as well as structure, process and cost analysis and more.

GET DIRECT ACCESS TO THE ANALYSTS
To complement the analyses available in the reports, we provide two tailored services:

DIRECT ANALYST ACCESS
The objective is to answer your questions on a recurrent basis upon request and discuss future trends, player strategies, next disruptions and emerging applications. Answers will be provided via email and information shared will be in pdf/Excel format. Q&A via a conference call can be organized upon your request when needed. This offer represents a package of 100 hours per year.

ANALYST WORKSHOP
Get access to our analysts for a half day on-site meeting. Multiple topics and discussions can be addressed. Open exchanges can follow the presentation.

COMMUNICATION & MEDIA SERVICES
i-Micronews Media, powered by Yole Développement, offers communication and media services to the semiconductor community. In partnership with leading companies, our aim is to enhance brand visibility, reach targeted audience and support exchanges all along the semiconductor supply chain. i-Micronews.com is part of i-Micronews Media. In addition to the website, the i-Micronews mobile application has been released in 2019 to bring even more power to your fingertips.

COSTING TOOLS
If your company has specific cost simulation needs, System Plus Consulting develops costing tools:
• Process-based costing tools, where a specific process is described using libraries of equipment and consumables
• Parametric costing tools, where costs are calculated from a set of parameters, a solution best suited to standardized technologies
• On-demand costing tools
YOLE GROUP OF COMPANIES

The Yole Group of Companies composed of the following publishers, Yole Développement and System Plus Consulting collaborates ever more closely year after year to offer a complete portfolio of products and services. Indeed, combining respective expertise and methodologies from the two companies allows us to understand our customers’ strengths and guide their success in this dynamic semiconductor environment. The focus of our business is to help our customers grow.

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, as well as reverse engineering and reverse costing services. With a strong focus on emerging applications using silicon and/or micro manufacturing, the Yole Group of Companies has expanded to include more than 120 collaborators worldwide covering photonics, lighting, imaging, sensing & actuating, display, RF devices & technologies, compound semiconductors & emerging materials, power electronics, batteries & energy management, semiconductor packaging and substrates, semiconductor manufacturing, memory, computing and software. The market research, technology and strategy consulting company Yole Développement, along with its partners, supports, support industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to grow their business.

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.
Western US & Canada
Steve Laferriere - steve.laferriere@yole.fr
+1 310 600-8267

Eastern US & Canada
Chris Youman - chris.youman@yole.fr
+1 919 607 9839

Europe and RoW
Lizzie Levenez - lizzie.levenez@yole.fr
+49 15 123 544 182

Benelux, UK & Spain
Marine Wybranietz - marine.wybranietz@yole.fr
+49 69 96 21 76 78

India and RoA
Takashi Onozawa - takashi.onozawa@yole.fr
+81-80-4371-4887

Greater China
Mavis Wang - mavis.wang@yole.fr
+886 979336809 +86 136 61566824

Korea
Peter Ok - peter.ok@yole.fr
+82 1040890233

Japan
Miho Ohtake - miho.ohtake@yole.fr
+81 34405-9204

Japan and Singapore
Itsuyo Oshiba - itsuyo.oshiba@yole.fr
+81-80-3577-3042

Japan
Toru Hosaka – toru.hosaka@yole.fr
+81 90 1775 3866

Sales Coordination and Customers Service
• David Jourdan - david.jourdan@yole.fr - +33 472 83 01 90
• Fayçal El Khamassi - faycal.khamassi@yole.fr - +33 472 83 01 95