FOR IMMEDIATE RELEASE:

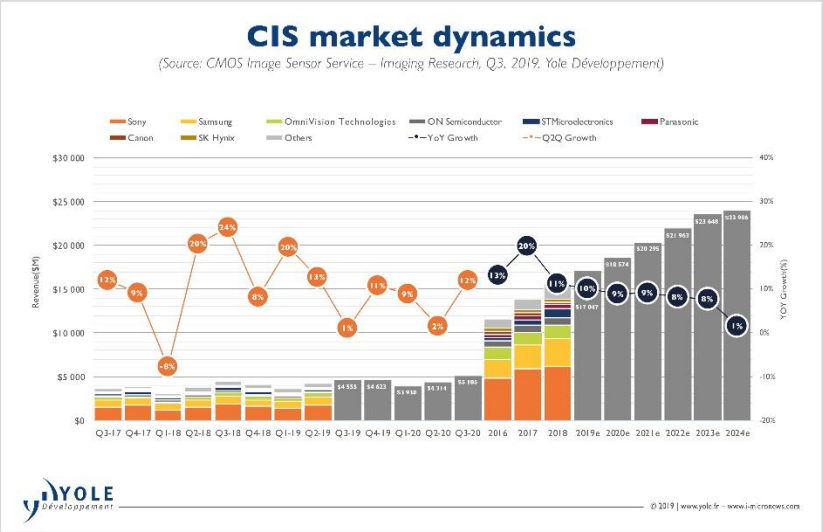
CIS[1] industry: what is behind the growth of Q2 2019?

Extracted from :

- CMOS Image Sensor Service – Imaging Research – Yole Développement, Q3 2019
- Status of the CMOS Image Sensor Industry report – Yole Développement, 2018

LYON, France – October 4, 2019: *"Q2 2019 has exceeded our expectations, with+7% but there is little good news beyond mobile,"* announces **Pierre Cambou, Principal Analyst, Imaging at Yole Développement (Yole).** In 2019, the CIS industry still enjoys thriving growth thanks to the mobile market. But after conducting a quarterly analysis focused on individual markets and players, the picture is in fact much different than what the global number show.

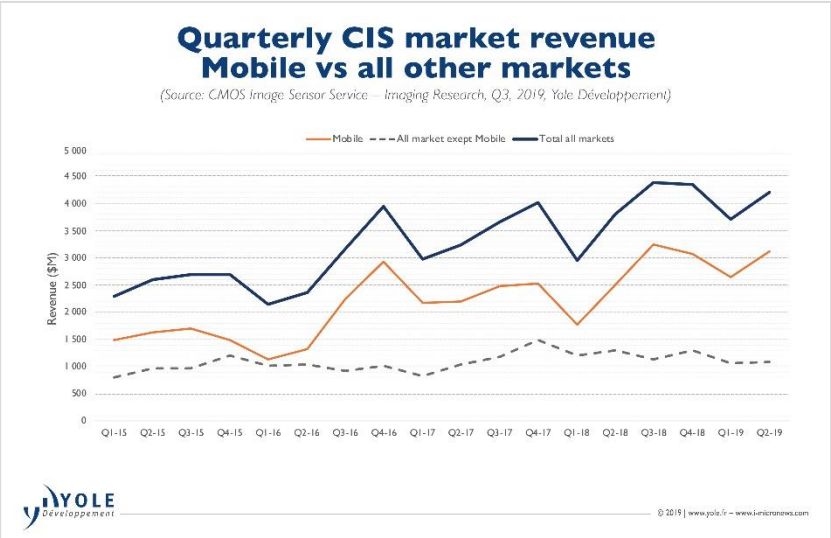
What is the latest news? What is the status of market indicators? Is the market growing or decreasing? What are the revenues of the leading companies? What are their strategies for capitalizing on market evolution? Yole addresses these questions today in its CIS Quarterly Market Monitor Q3 2019 analysis. Recently, Yole's analysts have provided similar analyses for memory markets like DRAM and NAND, and the CIS Quarterly Market Monitor is the latest chapter in this initiative.



CIS' extensive growth has seen this semiconductor specialty market reach a revenue of US$15.5 billion in 2018. The size and dynamics of the main CIS markets and players led Yole to conclude that a CIS quarterly monitor was essential for better monitoring and a deeper understanding of the market's short and medium-term trends. Meanwhile, the broader five-year forecast will still be delivered on a yearly basis via Yole's Status of the CMOS Image Sensor Industry report. Both products are positioned as two complementary analyses of the same industry, under the Yole Imaging Research umbrella.

The CIS industry: a market with its own growth engine

[1] CIS : CMOS Image Sensor



In line with last year's published forecast in Yole's Status of the CIS Industry 2018 report, the CIS industry is exactly where Yole's analysts predicted it would be at this time of year. While Q1 2018 was a little treacherous, Q1 2019 was representative of the last five years' seasonality, and then Q2 2019 was actually slightly better (+7%) than expected. These are traditionally the two smallest quarters for CIS, when mobile and consumer product sales are at their lowest. Mobile represents 68% of overall CIS sales, and according to Yole's analysts this will not change much over the next five years.

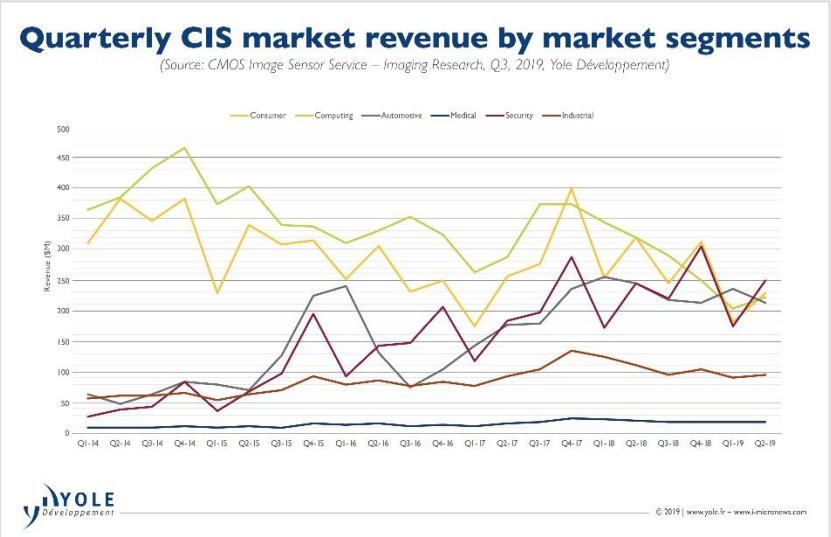
In the immediate future, Yole expects CIS quarterly sales to reach US$4.6 billion in the fourth quarter, mirroring the expected 10% YoY growth rate for 2019. This is an incredible double-digit growth prospect, especially in the context of mobile saturation and overall industry cyclical recession.

Yes, Yole's analysts can confirm: CIS definitely has its own growth engine – an engine powered by the proliferation of cameras in mobile, which have hit new heights in 2019 since most high-end flagships deliver 5 – 6 cameras per phone. Yole expects this trend to continue over the next 3 – 4 years, before coming to a somewhat abrupt end. Analysts have arbitrarily set their YoY growth expectation at 1% in 2024 to bring this insight to light, and chase away the trolls if for no other reason.

Q1 & Q2 2019: automotive and security become the 2nd-largest CIS market segments

"If we peer below the CIS market's surface, things begin to look way more interesting – lending more value to our quarterly analysis", explains **Chenmeijing Liang, Technology & Market Analyst, Imaging Activities at Yole.** And she details Yole's analysis:

- Since Q4 2017, "all markets except mobile" have been on a downward slope. At that time, they had reached US$1.5 billion, but are now down to US$1.1 billion, a -26% drop. This "all markets except mobile" aggregate is usually less sensitive to seasonality. These markets went through rough times in 2016 for several reasons, but were actually exhibiting high-



growth momentum on a multi-annual basis. In fact, the sum of these markets had doubled from Q1 2015, which translates to a +26% CAGR during 2015 – 2017. But then the industry basically lost a full year's growth – so what is actually happening before Yole's quarterly-monitoring eyes?

Looking closer at the "other" market breakdown, the two largest segments, consumer photography (DSC, DSLR, action cameras, drones) and computing (PC, laptop, tablets), have been on a slippery slope for a long time and are now on par with the other two segments: automotive and security.

- Q1 2019 and Q2 2019 are notable as the first time that automotive, and then security, became the second-largest CIS segments. This is definitely breaking news, and it will affect the rankings and strategy of the main CIS players. However, this is not all "honor and glory" for the automotive and security markets:

  The downturn in the Chinese and U.S. automotive markets is affecting automotive CIS sales, despite the growing number of cameras per car. While Yole's initial five-year growth expectation was +19% CAGR for automotive CIS, YoY growth for 2019 is heading towards a -5% to -10% decrease.

  The same is more or less true for security, which Yole's analysts originally announced a five-year +19% CAGR [2] expectation for. Unfortunately, YoY growth will likely end up flat in 2019.

  The largest disappointment is the industrial segment, which had enjoyed a +26% CAGR from 2014 – 2017. But after reaching US$135 million in Q4 2017, it is now back in the US$100 million-per-quarter range. A global halt to capital expenditures in the semiconductor and automotive industries is probably the main reason. On the bright side, positive news from China leads us to the conclusion that this was simply a needed adjustment due to cyclical markets, and that growth could resume in 2020 since the bottom seems to have been reached. Time will tell, and the quarterly analysis will be an

[2] CAGR : Compound Annual Growth Rate

indispensable resource with which to follow these CIS markets.

Imaging industry: what's next?

Yole's analysts work with the leading CIS players to collect and analyze valuable market and technology data. Other benefits include gaining an understanding of these players' vision for the industry, and evaluating market growth and technological evolution on an ongoing basis.
Additionally, Yole's Imaging team attends a year-long selection of key conferences, trade shows, and webcasts. These onsite/online events provide opportunities for Yole's imaging experts to share their vision of the industry and debate with leading players.

- In early September, Yole's Imaging team was pleased to welcome leading companies to the 2nd Executive Forum on 3D Sensing for Consumers, powered by Yole. During these few hours, imaging companies and Yole's analysts had the opportunity to exchange and debate over the latest technical and market trends. Each leading player's strategy was discussed, and business opportunities were identified. Post-show report and presentations are available on i-Micronews.com.
- Last June, Yole's Imaging team revealed its detailed vision of the imaging market for automotive during a dedicated webcast: Automotive Imaging on its Way to Sensing. Along with experts from System Plus Consulting, Yole's analysts had the opportunity to highlight and analyze the penetration of imaging technologies within the automotive market segment.
  "Automotive imaging has reached market significance well beyond what consumer digital cameras achieved at their peak in 2012", asserts Pierre Cambou, at Yole. *"124 million camera units were produced for automotive applications in 2018, slightly more than the 96 million light vehicles made that year. The key indicator here is the average number of cameras per car, which is expected to rise towards three by 2024…."*
  This webcast is still available – you can watch the recorded version on i-Micronews.com.

Stay tuned to i-Micronews.com for more information about Yole's Imaging activities!

ABOUT THE QUARTERLY MARKET MONITOR

CMOS IMAGE SENSOR Service – Imaging Research:

As camera quantity and die size increase per end-device, a 10.1% year-on-year growth rate is expected for 2019. – Powered by Yole Développement

Key features of the monitor:

- Quarterly update of the data
- Market forecast through 2024 in $US, units, and wafers
- Market share (Sony, Samsung, OmniVision, ON Semiconductor, STMicroelectronics, Panasonic, Canon, SK Hynix) from 2015 to present: by revenue ($US), segment ($US), technology (wafer), and foundry (wafer)
- Demand forecast through 2024 by category (i.e. mobile, consumer, security, auto), in revenue ($US) and units
- Supply forecast through 2024: by supplier for wafer production (wpm, by fab), technology mix (% of wafers), and process node (% of wafers)

As well as :

- Status of the CMOS Image Sensor Industry 2018

Proliferation of cameras for imaging and sensing is driving CMOS image sensor (CIS) growth – Produced by Yole Développement.

About the Imaging team:

Pierre Cambou has been part of the imaging industry since 1999. He first took several positions at Thomson TCS, which became Atmel Grenoble in 2001 and e2v Semiconductors in 2006. In 2012 Pierre founded Vence Innovation, later renamed Irlynx, to bring to market an infrared sensor technology for smart environments and interactions. He has an Engineering degree from Université de Technologie de Compiègne and a Master of Science from Virginia Tech. Pierre also graduated with an MBA from Grenoble Ecole de Management. In 2014 he joined Yole Développement as Principal Analyst, Imaging at Yole Développement (Yole).

Guillaume Girardin, PhD is Director of the Photonics, Sensing & Display Division at Yole Développement, part of Yole Group of Companies. As director he also performs several technical activities covering sensing technologies, including solid-state lighting & display, MEMS, sensors, actuators, imaging, photonics and optoelectronics fields.

Based on his valuable experience in the semiconductor industry, Guillaume manages the expansion of the technical and market expertise of his team, by increasing synergies around imaging, lighting and display, and enlarging the optoelectronics scope. The team interacts daily with leading companies allowing the analysts to collect a large amount of data and integrate their understanding of the evolution of the market with technology breakthroughs. In parallel, Guillaume's mission is focused on the management of business relationships with leaders of the industry and the development of market research and strategy consulting activities within the Yole Group.

Dr Girardin holds a Ph.D. In Physics and Nanotechnology from the Claude Bernard University Lyon 1 (Lyon, France) and an M.Sc. in Technology and Innovation Management from EM Lyon School of Business (Lyon, France).

Chenmeijing Liang works as a Technology & Market Analyst within the Photonics, Sensing & Display Division at Yole Développement (Yole). As part of the Imaging team, Chenmeijing contributes daily to analyses of CIS markets, related technologies and market strategies of the leading semiconductor companies, as well as the quarterly reports. Prior to Yole, she was engaged in the development of R&D projects: Chenmeijing was a member of Group PSA R&D department where she worked on Vehicle 3D Holography Imaging projects. In addition, she assisted with various technical and commercial projects. Chenmeijing Liang holds a master's Degree in the field of Applied physics and Optical engineering from Paris-Saclay University and University Pierre and Marie Curie (UPMC) (Paris, France).

Richard Liu is a Technology and Market Analyst in the Photonics, Sensing & Display division at Yole Développement, part of Yole Group of Companies. Based in Shenzhen (China), Richard is dedicated on imaging activity (Monitors) as well as the development of technology & market reports

Prior to Yole, Richard was engaged in camera module design on image sensor, AF/OIS at Onsemi, before this, he worked as a customer-application-technologist in Micron/Aptina Imaging. Richard has over 12 years post graduate experience in both of imaging semiconductor and camera module industry, he has the successful track record in developing projects for the tier one smart phone and module makers, which brought him wide industry connection in the CMOS image sensor supply chain and ecosystem

Richard graduated from Wuhan University (China) and holds an Electronics Engineering Degree.

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, Batteries & Energy Management and Memory.

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 and follow Yole on LinkedIn and Twitter.

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