

# STATUS OF THE CMOS IMAGE SENSOR INDUSTRY 2016: NEW MARKET AND TECHNOLOGY DYNAMICS

Market & Technology report - June 2016

New functions are pushing change in CMOS image sensors, boosting the market toward \$18.8B in 2021 at 10.4% CAGR

#### **KEY FEATURES OF THE REPORT**

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- Market forecast in \$US, units, and wafer shipments through 2021
- Market segmentation with seven different segments: mobile, consumer, computing, automotive, medical, security, industry/defense/ space
- Ecosystem analysis
- Roadmap for technology evolution and future developments
- Estimated 2015 player market share by market segment
- Detailed application market forecasts through 2021

#### **OBJECTIVES OF THE REPORT**

Identification and analysis of CIS applications:

- Determination of the range of applications
- Market and technology segmentation
- Market trends and forecasts
- Key players market description

Analysis and description of the sensor technologies involved:

- Sensor forecast by application and technology
- Major global actors
- Technology trends
- Main drivers and challenges

#### WHAT'S NEW

- Updated market landscape and forecast
- Recent M&A activity
- Dual and 3D camera strategies
- Application review by market segment
- New analysis field: virtual reality and augmented reality
- Updated technology roadmap toward Hybrid Backside Illumination
- Key advances in CMOS image sensors

## BEYOND \$10B: THE CMOS IMAGE SENSOR INDUSTRY KEEPS GROWING NEW MARKET AND TECHNOLOGY DYNAMICS

Driven by renewed mobile and automotive applications, the CMOS image sensor (CIS) industry is expected to expand at a compound annual growth rate (CAGR) of 10.4% from 2015 to 2021, reaching US\$18.8B market value by 2021.

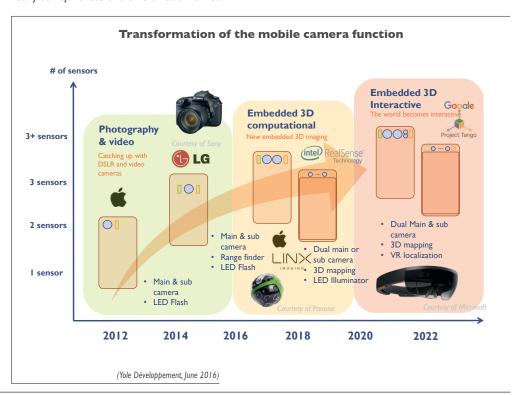
Yole Développement expects sustained growth of the CMOS image sensor industry for the next five years. Increasing camera content in smartphones will more than offset slower smartphone volume growth. The trend for dual and 3D cameras will have a major impact on CIS volumes. While it is too early to fully describe the strategy of the main actors yet, some products are already on the market. The 2016 report comprehensively covers key market and technology choices.

One big story this year is the consumer market, which is recovering from the total collapse of digital photography. While action cameras seem to have reached a ceiling, new applications such as drones, robots, virtual reality and augmented reality are ready to rejuvenate this emblematic market.

The Automotive camera market has established itself as a key growth market for CIS. The Advanced Driver Assistance (ADAS) trend is further increasing pressure on vendors to provide sensors beyond their current technical capabilities. Image analysis is the new frontier and early usage of artificial intelligence is catching people's imagination. We are therefore in the middle of an explosive growth pattern that will not slow down before 2021. An exceptionally high 23% CAGR is predicted in automotive for the 2015-2021 period.

For similar reasons to automotive, namely increasing usage of image analytics and improved performance and productivity, the security, medical and industrial market are currently thriving and all deserve specific analysis.

For all these different CIS market segments our 2016 report will provide updated details about applications, volume and revenues as well as technical analysis.



### THE CIS INDUSTRY HAS BECOME AN ATTRACTIVE PART OF THE SEMICONDUCTOR INDUSTRY, GENERATING MORE THAN \$7B OF M&A LAST YEAR

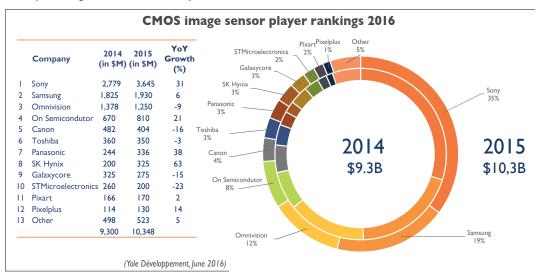
Big moves in the CIS industry have greatly modified the competitive landscape. Sony is now a market, production and technology leader. Samsung and Omnivision have remained strong. Notable mergers and acquisitions this year include the purchase of Axis by Canon for \$2.8B, Fairchild by On Semicondutor for \$2.4B and Omnivision by a Chinese investor consortium for \$1.9B. Other notable news items are the sale of Toshiba's CIS business to Sony for \$155M and in 2016 Toshiba's medical business to Canon for \$5.9B.

Sony truly demonstrated its leadership in 2015. Its capital expenditure hit \$2B, a level never seen before. That Sony has 50% of the world's production capacity with 'only' 35% global market share shows its ambition. Its current lack of profitability shows that market pressure is extremely high. It is also in the middle of key transformative changes to adapt to the impressive growth of the last five years.

Nevertheless we expect competition in CIS will remain relatively open as long as the growth pattern is maintained and key technology changes occur almost every other year.

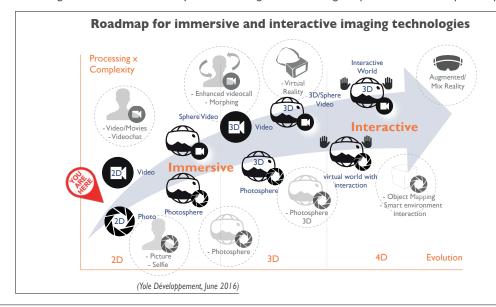
SK Hynix is a great example of how quickly a prominent position can be obtained. The company has propelled itself into the top 10 in very little time. It has been able to monetize the increasing resolution of smartphone front-facing cameras, therefore capturing business from Galaxycore and Omnivision.

Navigating through this pivotal time is difficult. Giant tech companies seem to rise and fall overnight. This report gives a global overview of key markets and technologies for CIS. It shows the present situation and the dynamic forces shaping the future.



## TECHNOLOGY REMAINS A KEY DRIVER FOR THE CIS INDUSTRY: 3D STACKING, COMPUTATIONAL APPROACHES, BIOMETRY AND MORE

As in our last report we extensively cover the switch toward backside illumination (BSI) and stacked BSI technologies. These have been major breakthroughs and are still shaping competition and market dynamics today. The stacked BSI approach is particularly interesting for production, as it separates pixel array



technology from the digital part at a time when sensors are integrating ever more features, such as Autofocus (AF) and Optical Image Stabilization

The two key drivers for the main smartphone

- Size in the X, Y and Z dimension of the camera module
- Image performance, in particular resolution, low light performance, focus and stabilization

Performing well in these two areas, dual camera technology will be a game-changer, grabbing significant market share in a short time and driving CIS industry volume and revenue. Another important change is brewing on the front face of the smartphone, driven by human-to-machine interface technology.

It is important to understand the implications of dual and 3D sensing cameras, which are part of the computational revolution. Our report will provide the updated knowledge you need to navigate these uncharted waters.

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#### TABLE OF CONTENTS (complete content on i-Micronews.com)

Executive summary 14	> Revenue market share in mobile / in digital
Introduction 30	photography / in tablets / in laptop PC / in
> Historical perspective	automotive / in security & surveillance / in medical X ray / in machine vision
> Market segmentation	Mobile market trend 78
> 2015 CIS market landscape by application	> Consumer tech device forecast

39

52

61

- > 2015 CIS market landscape by player
  - > 2010 2021 Mobile market forecast
  - > Market drivers
  - > Resolution mix
  - > Dual camera trend
  - > Number of cameras per smartphone forecast

112

128

#### Consumer market trend

> 2010 - 2021 market forecast for consumer photography / action camera / VR and AR / wearable and smartwatch / personal robotics

### Other market trend

> 2010 - 2021 market forecast for computing / automotive /medical CIS / security and surveillance / machine vision

> Automotive market drivers

### Technology trend

- > Image sensor specifications
- > BSI technologies
- > Samsung S7 focus
- > PDAF and LDAF approaches
- > Key advances

Conclusions	152
Company profile	155

#### **RELATED REPORTS**

Market forecast

> Revenue breakdown

(in 12"wafer eq.)

> Revenue rankings

> Volume rankings

X ray / vision

Players and rankings

> Revenue rankings

> Volume rankings

forecast

Ecosystem

> BSI penetration forecast

> 2010 - 2021 CIS volume shipment (in Munits)

> 2009 - 2020 CIS revenue forecast (in \$M)

> 200mm (8") to 300mm (12") transition

> Revenue market share in mobile / digital

automotive / security & surveillance /

photography / tablets / laptop PC /

> 2009 - 2020 Wafer production

> Revenue breakdown by player

> Revenue breakdown by player

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#### **AUTHORS**

From 1999, Pierre Cambou has been part of the imaging industry. Pierre took several positions at Thomson TCS which became Atmel Grenoble in 2001 and e2v Semiconductors in 2006. In 2012 he founded a start-up called Vence Innovation (now Irlynx) in order to bring to market a disruptive infrared interaction technology. He has an Engineering degree from Université de Technologie de Compiègne and a Master of Science from Virginia Tech. More recently he graduated from Grenoble Ecole de Management's MBA. He joined Yole Développement as Imaging Activity Leader in 2014.

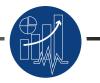


From 1996 to 1999 Jean-Luc Jaffard paved the way of imaging activity at STMicroelectronics being at the forefront of the emergence and growth of this business. At STMicroelectronics Imaging division he has been appointed Research Development and Innovation Director managing a large multidisciplinary and multicultural team and was later on promoted Deputy General Manager and Advanced Technology Director in charge of identifying, sourcing or developing the breakthrough Imaging Technologies and Applications to transform them into innovative and profitable products. In 2010 he was appointed STMicroelectronics Intellectual Property Business Unit Director. In 2014 he created the Technology and Innovation branch of Red Belt Conseil, to support High Tech actors like SME, Research Institutes, Start-ups, Analysts, Investors and public authorities. Jean-Luc Jaffard owns multiple patents in semiconductor and Imaging domains and has been invited speaker in many conferences worldwide. He studied Electronic and Microelectronic and has been graduated from Ecole Supérieure d'Electricité of Paris in 1979.





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### Status of the CMOS image sensor industry 2016: new market and technology dynamics

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More information on Jean-Christophe Eloy (eloy@yole.fr)

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