It's ten years down the line from the initial Apple iPhone that started the smartphone era. Since then, CMOS imaging has benefited from huge market demand and a technology-driven environment, resulting in an $11.6B industry in 2016. Photography and video is the main application, which has been totally transformed by new use cases, new devices and new technologies. The mobile market is key for the CMOS image sensor (CIS) industry. Despite saturation in the number of handsets, the CIS market is able to maintain a 10.5% compound annual growth rate (CAGR) for the 2016-2022 period due to the introduction of dual and 3D cameras. These additional cameras are changing the industry’s drivers from form factor and image quality to interactivity. Penetration into higher added value markets such as automotive, security and medical shows that CIS products are transforming use cases across the board. CIS technology adoption allows greater automation levels at low cost, while using newly available computing architectures such as deep learning. The CMOS image sensor industry is currently in a virtuous circle where a new technology is providing true customer value.

NEW APPLICATIONS ARE TRANSFORMING THE MARKET AND TECHNOLOGY PLAYING FIELD FOR CMOS IMAGE SENSORS

The 2016 earthquake in Japan slowed down its operation and helped maintain the growth of its close competitors. Indeed, despite Toshiba’s exit from the market, two thirds of players have seen growth in the last year. Samsung, Omnivision and Panasonic have delivered 15% year-on-year growth. Those large players are increasing the weight Asia carries in the CIS industry. In the US, On Semi has suffered from the public relations mess that followed a fatal crash involving Tesla’s semi-autonomous driving system, which included a Mobileye sensor. Automotive cameras

BEYOND $11.6B IN 2016, THE CIS ECOSYSTEM HAS NOT BECOME THE OLIGOPOLY WE WOULD HAVE EXPECTED

Sony has established itself as industry leader, market and technology wise. However, the 2016 earthquake in Japan slowed down its operation and helped maintain the growth of its close competitors. Indeed, despite Toshiba’s exit from the market, two thirds of players have seen growth in the last year. Samsung, Omnivision
SPEED OF TECHNOLOGY ADOPTION MIRRORS THE APPLICATION DEVELOPMENT FRENZY

A CMOS image sensor is an analog device using a digital process. Therefore, the industry has been following a key principle of “one application, one pixel, one process”. This probably explains the dynamism of the ecosystem and the ability of different players to coexist in different markets. On Semi, Teledyne, ams and STMicroelectronics all provide perfect examples of successful differentiating strategies.

The impact of 3D semiconductors is currently a key element of the competition. Samsung has finally joined Sony as a provider of stacked back-side illuminated (BSI) sensors. Omnivision and SK Hynix will also soon launch this technology. Meanwhile, SMIC and STMicroelectronics will probably be the next players to unveil their versions of stacked technology.

Increases in CIS production capacity have momentarily stopped due to this stacked trend. This is currently mainly due to Sony, which can source its logic wafers from TSMC. In coming years Sony, Samsung, STMicroelectronics, HLMC and SK Hynix will all announce extra CIS capacity in order to meet market demand, despite stacked BSI adoption.

Image sensors have become a significant semiconductor segment alongside processors and memories. They still provide a technology-driven environment that is profit-friendly despite fierce competition. The outcome of the competition depends on a combination of application pull and technology fit. To help judge that, this report is aimed at giving the best possible snapshot of the current status of the CIS industry. Purchasers can therefore use it in order to proactively benefit from the next wave of innovations.
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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 lryma) in order to bring to market a disruptive infrared interaction technology. He has an Engineering degree from Université de Technologie de Compiègne 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’Électricité of Paris in 1979.
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