

Camera module industry: resilience and innovations as key strengths¹

“Many cameras” approach in mobile phones and automotive continues to drive the industry forward.

OUTLINE:

- **Market figures:**

The COVID-19 pandemic combined with US-China trade tensions have marginally affected the continued growth in 2020.

The global camera module revenue should reach US\$59 billion in 2026. Yole Développement (Yole) forecasts a 9.8% CAGR² between 2020 and 2026.

The mobile CCM³ market segment is showing a 9.8% CAGR, against 14% for the automotive CCM market segment, which is becoming a significant sub-market.⁴

The consumer market segment for CCM is far ahead with a 16% CAGR₂₀₂₀₋₂₀₂₆.⁵

In 2026, the CCM revenue should be shared between actuator (11%), lens set (about 14%), camera module assembly (32%), and CIS⁶ (about 43%).

- **Technology trends:**

CIS, the most critical component in the CCM module, is still shrinking the pixel size and increasing the resolution.

Optic lens sets have introduced innovations such as using glass or free-form lenses or even liquid lenses, while OIS⁷ technology has moved from lens-shift to sensor-shift.

All the latest innovations help mobile cameras to move toward professional looking photography.

- **CCM ecosystem:**

From sub-components to manufacturing, there are numerous players in the CCM ecosystem.

Leading CCM players continue to vertically integrate upstream resources or expand their business.

¹ Extracted from:

Status of the Camera Module Industry 2021 report, Yole Développement, 2021

Camera Module Comparison 2021 Vol. 3 – Samsung Galaxy S Evolution, System Plus Consulting, 2021

Camera Module Comparison 2021 Vol. 2 – Apple iPhone Evolution, System Plus Consulting, 2021

Camera Modules Comparison 2021 – Vol. 1, System Plus Consulting, 2021

² CAGR: Compound Annual Growth Rate

³ CCM: Compact (or CMOS) Camera Module

⁴ In revenue.

⁵ In revenue.

⁶ CIS: CMOS Image Sensor

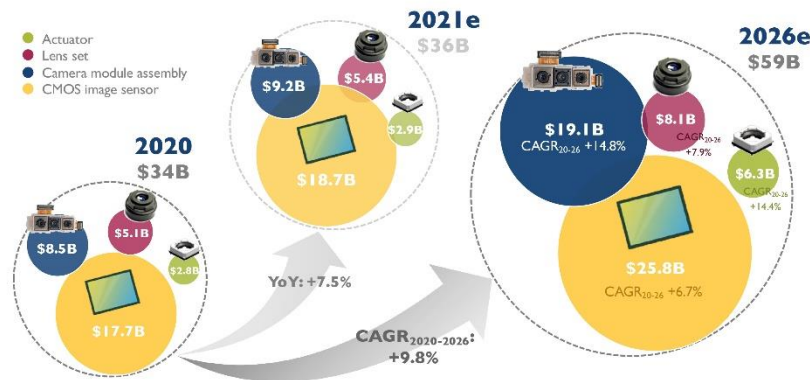
⁷ OIS: Optical Image Stabilization

LG Innotek occupies the 1st place in the CCM manufacturer rankings: the company grew rapidly in 2020 with large orders.

Not far behind, Yole sees: Sunny Optical, O-Film, and Foxconn.

2020-2026 Camera module market forecast (in \$B)

(Source: Status of the Camera Module Industry 2021 report, Yole Développement, 2021)



“During the outbreak of the pandemic in 2020, our private social life but also the entire economic life, including the CCM industry, were temporarily suspended, but swift action was taken, and the CCM industry quickly recovered.” asserts **Richard Liu, Technology & Market Analyst, Imaging at Yole Développement (Yole)**. He adds: “The trade tension between China and the US led to Huawei being banned and not being able to purchase any key chips dedicated to the production of mobile phones. This created much motion within the ecosystem. However, the drive of the CCM industry as a whole was marginally affected in 2020”.

Yole and System Plus Consulting collaborated to produce in-depth analyses fully dedicated to the CCM industry and products. Both partners combined their technical expertise and market knowledge to get a deep understanding of the current challenges.

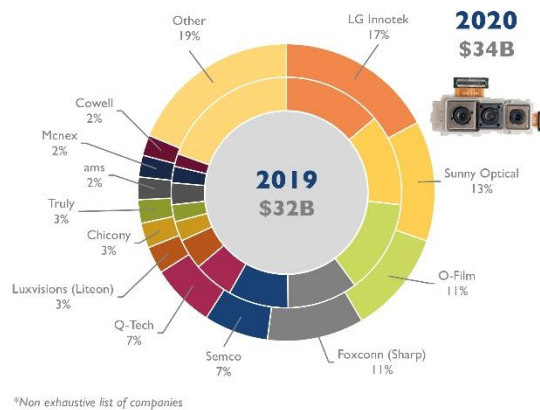
In this context, System Plus Consulting publishes a smart collection of reverse engineering studies throughout the year, focused on the comparison of CCM technologies and design choices. The latest volume is now available: Camera Module Comparison 2021 Vol. 3 – Samsung Galaxy S Evolution. This reverse engineering & costing analysis identifies Samsung’s Galaxy S camera design choices and points out the technical and cost evolution from the S7 to the S21 Ultra.

In parallel, the market research and strategy consulting company, Yole, releases today its annual imaging report: Status of the Camera Module Industry 2021. With this update, analysts offer a valuable update of the CCM ecosystem, along with a comprehensive description and study of the related markets and technologies involved. The 2021 edition delivers application

ranges, technical market segmentation, market trends and forecasts, as well as key players by market.

2019 vs. 2020 Camera module market share by players* (in %)

(Source: Status of the Camera Module Industry 2021 report, Yole Développement, 2021)



*Non exhaustive list of companies

The many cameras approach in mobile not only increases photography functions (such as macro, telephoto etc.) but also greatly improves the photographic effects. As a result, the multi-camera setups are observed in most smartphones, resulting in an increase in the number of mobile CCMs from 4.9 billion to 5.4 billion units from 2019 to 2020, a YoY⁸ growth of 10.4%.

From imaging to sensing, a 3D camera can be added in the front or rear (the front also includes optical fingerprint recognition), it positively affects the development direction of the many camera approach in mobile phones.

According to **Pierre Cambou, MSc, MBA, Principal Analyst in the Photonics and Sensing Division at Yole**: “The automotive CCM market started with a single rear camera and has now developed to ADAS⁹ combined with 360 surround-view cameras. Going from one to at least four or even more, this is characteristic of another “many cameras” trend. On the application side, ADAS is currently increasing the need for cameras. Innovations such as in-cabin cameras, as well as cameras to replace rearview mirrors are emerging. They will drive the next wave of the automotive CCM market”.

In the consumer sector, products are becoming more intelligent - connected to everything - allowing vision to play a more significant role in applications such as robots and home surveillance systems. These will also increase the need for more camera modules.

Yole expects the revenue from global camera modules to increase from US\$34 billion in 2020 to US\$59 billion in 2026, at a 9.8% CAGR.

⁸ YoY: Year-over-Year

⁹ ADAS: Advanced Driver Assist Systems

From CCM sub-components to CCM manufacturing, there are numerous players in this industry. These include the upstream CMOS¹⁰ image sensor players, lens suppliers, and the CCM manufacturers themselves, where the leading companies dominate the market.

*“The image sensor is the most critical component in the module”, emphasizes **Richard Liu**. “Sony is the market leader in the industry’s supply chain, leading the market to increasing average pixel numbers and diminishing pixel sizes. Samsung, the number two CIS player, has done an excellent job in this area, taking the lead in launching products with a small pixel size(0.64um) and high resolution(200Mp)”.*

In the No. 3 position, OmniVision is deeply engaged in the Chinese market, expanding it with its advantage of being a Chinese enterprise. As a result, it delivered excellent profits in 2020.

Peter Bonanno, Ph.D., Technology & Cost Analyst, Imaging, at System Plus Consulting adds: *“As new technology becomes available, smartphone camera hardware has changed dramatically. One thing that hasn't changed is that when it comes to flagship imaging modules, camera designers for the leading mobile OEMs continue to stick with CIS from Samsung, Sony and OmniVision”.*

According to Yole’s analysis, these top 3 players combined already had around 74% market share¹¹.

Throughout the year, Yole Développement and System Plus Consulting publish an impressive collection of imaging-dedicated reports. Experts also deliver various keynote presentations, organize key conferences, and interview leading industrial companies. Their aim is to deliver key results, the technology and market trends, and explain the major changes.

Make sure to be aware of the latest news coming from the industry and get an overview of our activities on i-Micronews.

Stay tuned!

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¹⁰ CMOS: Complementary Metal Oxide Semiconductor

¹¹ In revenue.

About our analysts

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 to imaging activity (monitors) as well as the development of technology & market reports. Prior to Yole, Richard was engaged in camera module design focusing on image sensors, AF/OIS at Onsemi. Before that, he worked as a customer-application-technologist in Micron/Aptina Imaging. Richard has over 12 years post-graduate experience in both the imaging semiconductor and camera module industries. He has a successful track record in developing projects for the tier one smartphone and module makers, which brings him industry-wide connections in the CMOS image sensor supply chain and ecosystem. Richard graduated from Wuhan University (China) and has an Electronics Engineering Degree.

Pierre Cambou MSc, MBA, is a Principal analyst in the Photonics and Sensing Division at Yole Développement (Yole). Pierre's mission is dedicated to imaging-related activities by providing market & technology analyses along with strategy consulting services to semiconductor companies. At Yole, Pierre is responsible for the CIS Quarterly Market Monitor while he has authored more than 15 Yole Market & Technology reports. Known as an expert in the imaging industry, he is regularly interviewed and quoted by leading international media. Previously, Pierre held several positions at Thomson TCS, which became Atmel Grenoble (France) in 2001 and e2v Semiconductors (France) in 2006. In 2012, he founded Vence Innovation, later renamed Irlinx (France), to bring to market an infrared sensor technology for smart environments. Pierre has an Engineering degree from Université de Technologie de Compiègne (France) and a Master of Science from Virginia Tech. (VA, USA). Pierre also graduated with an MBA from Grenoble Ecole de Management (France).

Peter Bonanno, Ph.D., is a Technology & Cost Analyst, Imaging, at System Plus Consulting, part of Yole Développement. With strong expertise in the field of imaging, optical sensors and optoelectronics, Peter performs reverse engineering & costing analyses as well as custom projects. He collaborates closely with the laboratory team, and together they create an analysis plan to reveal the device structures, technologies, and manufacturing steps used by leading imaging & photonics companies. At the same time, Peter runs a technology watch to identify the latest innovations and related manufacturing processes. His aim is to gain a comprehensive understanding of the evolution of technologies and identify the strategies of the leading manufacturers. His technology watch is supported by his participation in numerous trade shows and conferences. Peter previously worked at the US Naval Research Laboratory, where he developed tools for time-resolved 2-photon photoluminescence and UV defect imaging. He also authored many scientific papers and articles. Peter holds a Ph.D. in Electrical & Computer Engineering from the Georgia Institute of Technology (Atlanta, Georgia, USA), and a B.S. in Computer Science and Applied Physics (double major) from the New Jersey Institute of Technology (Newark, New Jersey, USA).

About the reports

Status of the Camera Module Industry 2021

The spread of the multi-camera approach from mobile phones to cars will continue to drive the CCM industry forward. –
Produced by Yole Développement

Companies cited:

AAC Technologies, Ability Opto, AGC, AMS, Alps, Apple, Asia Optical, ASM, Brigates, BYD Microelectronics, Chicony, Continental, Cowell Optics, Cresyn, Crystal-Optech, Ddk, DJI, Foxconn, Fujifilm, Fujinon, Fujitsu, GalaxyCore, Genius Optical, Google, Gopro, Haesung Optics, Himax, Hirose, Hozel, Huawei, IM, Intel, Jawah, Jabil, JSR, Kantatsu, Kyocera, Largan, Lenovo, LG Innotek, Luxvision, Magna, Materion, Microsoft, Mitsumi, Mobileye, Nalux, New Shicoh, NTK, OmniVision, On Semiconductor, OPPO, Optis, Panasonic, Parrot, Pixelplus, Powerlogic, Primax, Q-Tech, Ricoh, Samsung, Schott, Sharp, SK Hynix, SoftKinetic, Sony, STMicroelectronics, Superpix, TDK, Toshiba, Truly, Valeo, Viavi, Vivo, Volvo, Xiaomi, Xperi, Zeiss, Zeon, ZTE, and many more...

Camera Module Comparison 2021 Vol. 3 – Samsung Galaxy S Evolution

Samsung Galaxy S camera design choices, technical and cost evolution from the S7 to the S21 Ultra. – Produced by System Plus Consulting

Camera Module Comparison 2021 Vol. 2 – Apple iPhone Evolution

Apple's camera design choices from the iPhone 6S Plus to the 12 Pro Max. – Produced by System Plus Consulting

Camera Modules Comparison 2021 – Vol. 1

Technology and cost comparison of visual spectrum cameras in the 2020 flagships: the Apple iPhone 12 Pro Max, Samsung Galaxy S20 Ultra, and Huawei P40 Pro. – Produced by System Plus Consulting

Related reports:

- [Status of CMOS Image Sensor Industry 2021](#)
- [3D Imaging and Sensing – Technology and Market Trends 2021](#)
- [CMOS Image Sensor Quarterly Market Monitor](#)
- [iPhone 12 Pro Max Rear Camera](#)

About Yole Développement

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, reverse engineering and reverse costing services, as 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... [More](#)

About 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... [More](#)

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