Driven by mobile and automotive applications, the CCM industry is expected to grow at a CAGR of 16.8% from 2014 - 2020, reaching a total aggregate revenue of US$51B by 2020.

This is Yole Développement's first report concerning compact camera modules. We've witnessed the camera module ecosystem's increasing complexity and its significance in respect to the global micro-electronics industry. Compact camera modules, mainly developed for mobile applications, have become technological marvels, bringing together heterogeneous sub-components from the semiconductor industry (CMOS image sensors and packaging elements), the optical industry (optical lens sets), and more recently the micro-motor industry (voice coil motors for AF & OIS).

There is a different market trajectory for the lens and sensor markets, which are now maturing at ~14% CAGR with the emergence of giant billion-dollar companies. The CCM and auto-focus manufacturing markets, which are still very fragmented and growing at ~20% CAGR, should experience consolidation over the next five years.

The stakes are high, since the mobile market is maturing and micro-cameras are key differentiators. The consumer appetite for slimmer mobile devices is forcing CCM players into a major technological race while at the same time demanding massive investment to keep up with volume. The CCM industry greatly benefited from the adoption of high-resolution cameras in mobile, since doubled by the adoption of front-facing ones. Current revenues are mainly driven by the increasing resolution of both rear and front-facing mobile cameras, but new applications, i.e. in automotive, are starting to play an important role.

Related reports:
- Status of the CMOS Image Sensor Industry
- Solid State Medical Imaging: X-ray and Endoscopy
- Uncooled Infrared Imaging Technology & Market Trends
- Apple iPhone 6 & 6 Plus Rear Camera Modules from Sony
- Mobileye EyeQ3® Automotive Vision-Based SoC

Find all our reports on [www.i-micronews.com](http://www.i-micronews.com)
The current CCM industry is controlled by Asian firms, mainly Korean and Japanese, but we’re also witnessing the rise of Chinese firms and the restructure of Taiwanese firms. An ongoing price war has leveled the market, and most players have operations in China or Vietnam. There is a clear market split between players mainly delivering sub-5Mp resolution cameras for the computing and low-end mobile fronts, and players producing above-5Mp for high-end rear mobile cameras. Successful strategies exist at both ends of the market, even though the rise in resolution makes the low-resolution option more challenging.

Today, being a part of the main mobile handset makers’ supply chain is a key success factor. While the rich Korean ecosystem has been able to develop itself thanks to Samsung and LG, a threat is growing due to over-dependency on a few main mobile players. Japanese CCM players have well-negotiated the demise of their own domestic mobile manufacturers, first by serving Apple and then by moving into China and serving the rising stars there. Taiwanese players’ fortunes range widely; Largan, which serves all market players, is Taiwan’s greatest success. However, other Taiwanese players have had limited market access since only a few significant mobile handset manufacturers still use a 100% Taiwanese supply chain.

Yole Développement’s report covers the entire supply chain and provides a complete player ranking analysis in respect to the CCM industry’s different activities.

**Players of the camera module industry**

The current CCM industry is quickly adapting to changing market needs.

Current CCM industry is controlled by Asian firms, mainly Korean and Japanese, but we’re also witnessing the rise of Chinese firms and the restructure of Taiwanese firms. An ongoing price war has leveled the market, and most players have operations in China or Vietnam. There is a clear market split between players mainly delivering sub-5Mp resolution cameras for the computing and low-end mobile fronts, and players producing above-5Mp for high-end rear mobile cameras. Successful strategies exist at both ends of the market, even though the rise in resolution makes the low-resolution option more challenging.

Today, being a part of the main mobile handset makers’ supply chain is a key success factor. While the rich Korean ecosystem has been able to develop itself thanks to Samsung and LG, a threat is growing due to over-dependency on a few main mobile players. Japanese CCM players have well-negotiated the demise of their own domestic mobile manufacturers, first by serving Apple and then by moving into China and serving the rising stars there. Taiwanese players’ fortunes range widely; Largan, which serves all market players, is Taiwan’s greatest success. However, other Taiwanese players have had limited market access since only a few significant mobile handset manufacturers still use a 100% Taiwanese supply chain.

Yole Développement’s report covers the entire supply chain and provides a complete player ranking analysis in respect to the CCM industry’s different activities.

**Critical technology shifts (3D, computational, motion, IR) are ahead of us, with the camera module ultimately becoming the hub for multi-sensing**

Access to technology is key in the CCM industry. At the image sensor level, access to Sony’s state-of-the-art 3D stacked sensors is a prerequisite for high-end, high-resolution modules. The integration of PDAF (Phase Detection Auto Focus) is another key technology feature. Most CIS vendors are quickly closing the technology gap with Sony, but as the investments get larger and larger only the biggest companies will be able to compete. One key on-going technology shift for high-end CCM is the integration of OIS (Optical Image Stabilization). This critical feature is mainly provided by Korean and Japanese voice coil motors (VCM) manufacturers. The high demand for VCM technology means stronger negotiating
power for players with access to it. Other propositions using wafer-level techniques are being scrutinized. Our report discusses the pros and cons of alternative AF & OIS technologies.

CCM’s future will also include new sensor types that serve not only sensing but also video and photography. Many developments are currently underway, especially for 3D.

OBJECTIVES OF THE REPORT
To provide market data on key CCM metrics and dynamics:
• CCM revenue forecast, volume shipments, and sub-component breakdown by application
• Detailed market share breakdown by player
• Application focus on key CIS growth areas: mobile, automotive, medical, security, machine vision, etc.

To provide key technical insight and analysis regarding future technology trends and challenges:
• Device technologies: from CIS, to Lens, AF & OIS features
• Assembly structure: size and performance roadmap
• Technology focus on key markets, i.e. automotive

COMPANIES CITED IN THE REPORT (non exhaustive list)
AAC Technologies, Ability Opto, Alps, Apple, Asia Optical, Brigates, BYD Microelectronics, Carlino Technology, Cammysys, Cha Diostech, Cihony, Continental, Cowell Optics, Crensys, Crystal-Optech, Ddk, DJI, Foxconn, Fujifilm, Fujinon, Fujitsu, Galaxycore, Genious Optical, Google, Gopro, Haungs Optics, Himax, Hirose, Hoya, Huawei, IM, Intel, Jawah, JSR, Kantatsu, Kinko Optical, Kolen, Kyocera, Largan, Lenovo, LG Innotek, Liteon, Magna, Materion, Mccnex, Microsoft, Mitsumi, Mobileye, Nalux, New Shicoh, Nidec, NTK, O-Film, Omnivision, On Semiconductor, Optis, Panasonic, Parrot, Partron, Pixart, Pixelplus, Powerlogic, Primax, Q-Tech, Samsung, Schott, Semco, Sharp, Sekonix, SK Hynix, Softkinetic, Sony, ST Microelectronics, Sunny, Sunex, Superpix, Suyn, TDK, Tessera, Toshiba, Truly, Valeo, Viavi (Fr. JDSU), Volvo, Xiaomi, Zeiss, Zte and more ...

TABLE OF CONTENTS
REPORT OBJECTIVES AND SCOPE 5
METHODOLOGY 7
EXECUTIVE SUMMARY 12
1- INTRODUCTION 34
> Camera module definition
> What, which, where, how, how much
> Cost breakdown by resolution
> Cost breakdown by application
2- MARKET FORECAST 52
> Segmentation
> 2012-2020 volume shipment forecast by market
> 2012-2020 volume shipment forecast by application
> 2012-2020 ASP forecast by application
> 2012-2020 revenue forecast by market
> 2012-2020 revenue forecast by application
> 2012-2020 revenue forecast by component
> Analysis of the CCM market
3- COMPANY ECOSYSTEM 68
> CCM industry ecosystem
> CCM industry value chain
> Mobile camera supply chain
> Automotive camera supply chain
> 2014 CCM revenue market share
> CCM market share analysis
> 2014 CCM-CIS revenue market share
> 2014 CCM-lens revenue market share
> 2014 CCM-AP&OIS revenue market share
> 2014 CCM-AF&OIS market share analysis
> CCM ecosystem analysis
4- APPLICATION TRENDS 94
> Mobile
> Consumer
> Automotive
> Other: medical, machine vision, IOT
5- TECHNOLOGY TRENDS 140
> Image sensor
> Optics
> IR cut filter
> Connectors
> Packaging
> Specific manufacturing equipment
> AF & OIS
6- AUTOMOTIVE TECHNOLOGY FOCUS 172
> Image sensor
> Optics
> Packaging
7- CONCLUSIONS AND PERSPECTIVES 183

AUTHORS
From 1999, Pierre Cambou has been part of the imaging industry. He has earned 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. 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 Irlinx) in order to bring to market a disruptive Man to Machine interaction technology. 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, a dedicated business structure in charge of exploiting the wide range of intellectual asset of the company. In January 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.
Please process my order for Camera Module Industry Report:

- Camera Module Industry Report: EUR 5,990*
- System Plus Consulting Mobile CCM Technology Review: EUR 4,990*
- Bundle offer: EUR 8,990*

*For price in dollars please use the day’s exchange rate  
*All reports are delivered electronically in pdf format  
*For French customer, add 20 % for VAT

*Our prices are subject to change. Please check our new releases and price changes on www.systemplus.fr. The present document is valid 6 months after its publishing date: December 2015

**SHIP TO**
Name (Mr/Ms/Dr/Pr):
......................................................................................
Job Title:
......................................................................................
Company:
......................................................................................
Address:
......................................................................................
City: State:  
......................................................................................
Postcode/Zip:  
......................................................................................
Country:
......................................................................................
VAT ID Number for EU members:
......................................................................................
Tel:
......................................................................................
Email:
......................................................................................
Date:
......................................................................................
Signature:
......................................................................................

**PAYMENT**
DELIVERY on receipt of payment:

By credit card:
Number: |__|__|__|__|  |__|__|__|__|  |__|__|__|__|  
Expiration date: |__|__| / |__|__|  
Card Verification Value: |__|__|__|

By bank transfer:
HSBC - CAE: Le Terminal -2 rue du Charron- 44800 St Herblain France
BIC code: CCFRFRPP

In EUR
Bank code : 30056 - Branch code : 00955 - Account : 09550003234
IBAN: FR76 3005 6009 5509 5500 0323 439

In USD
Bank code : 30056 - Branch code : 00955 - Account : 09550003247
IBAN: FR76 3005 6009 5509 5500 0324 797

Return order by:
FAX: +33 2 53 55 10 59
MAIL: SYSTEM PLUS CONSULTING
21 rue La Noué Bras de Fer
44200 Nantes – France

Contact:
EMAIL: sales@systemplus.fr
TEL: +33 2 40 18 09 16

**BILLING CONTACT**
Name: ..............................................................................
Email: ..............................................................................
Phone: ..............................................................................

**ABOUT SYSTEM PLUS CONSULTING**
System Plus Consulting is specialized in the cost analysis of electronics from semiconductor devices to electronic systems. A complete range of services and costing tools to provide in-depth production cost studies and to estimate the objective selling price of a product is available.

Our services:
TECHNOLOGY ANALYSIS - COSTING SERVICES - COSTING TOOLS - TRAININGS

www.systemplus.fr - sales@systemplus.fr
1. INTRODUCTION
The present terms and conditions apply to the offers, sales and deliveries of services managed by System Plus Consulting except in the case of a particular written agreement. Buyer must note that placing an order means an agreement without any restriction with these terms and conditions.

2. PRICES
Prices of the purchased services are those which are in force on the date the order is placed. Prices are in Euros and worked out without taxes. Consequently, the taxes and possible added costs agreed when the order is placed will be charged on these initial prices. System Plus Consulting may change its prices whenever the company thinks it necessary. However, the company commits itself in invoicing at the prices in force on the date the order is placed.

3. REBATES and DISCOUNTS
The quoted prices already include the rebates and discounts that System Plus Consulting could have granted according to the number of orders placed by the Buyer, or other specific conditions. No discount is granted in case of early payment.

4. TERMS OF PAYMENT
System Plus Consulting delivered services are to be paid within 30 days end of month by bank transfer except in the case of a particular written agreement. If the payment does not reach System Plus Consulting on the deadline, the Buyer has to pay System Plus Consulting a penalty for late payment the amount of which is three times the legal interest rate. The legal interest rate is the current one on the delivery date. This penalty is worked out on the unpaid invoice amount, starting from the invoice deadline. This penalty is sent without previous notice. When payment terms are over 30 days end of month, the Buyer has to pay a deposit which amount is 10% of the total invoice amount when placing his order.

5. OWNERSHIP
System Plus Consulting remains sole owner of the delivered services until total payment of the invoice.

6. DELIVERIES
The delivery schedule on the purchase order is given for information only and cannot be strictly guaranteed. Consequently any reasonable delay in the delivery of services will not allow the buyer to claim for damages or to cancel the order.

7. ENTRUSTED GOODS SHIPMENT
The transport costs and risks are fully born by the Buyer. Should the customer wish to ensure the goods against lost or damage on the base of their real value, he must imperatively point it out to System Plus Consulting when the shipment takes place. Without any specific requirement, insurance terms for the return of goods will be the carrier current ones (reimbursement based on good weight instead of the real value).

8. FORCE MAJEURE
System Plus Consulting responsibility will not be involved in non execution or late delivery of one of its duties described in the current terms and conditions if these are the result of a force majeure case. Therefore, the force majeure includes all external event unpredictable and irresistible as defined by the article 1148 of the French Code Civil?

9. CONFIDENTIALITY
As a rule, all information handed by customers to system Plus Consulting are considered as strictly confidential. A non-disclosure agreement can be signed on demand.

10. RESPONSABILITY LIMITATION
The Buyer is responsible for the use and interpretations he makes of the reports delivered by System Plus Consulting. Consequently, System Plus Consulting responsibility can in no case be called into question for any direct or indirect damage, financial or otherwise, that may result from the use of the results of our analysis or results obtained using one of our costing tools.

11. APPLICABLE LAW
Any dispute that may arise about the interpretation or execution of the current terms and conditions shall be resolved applying the French law. If the dispute cannot be settled out-of-court, the competent Court will be the Tribunal de Commerce de Nantes.