The camera module industry has reached a new stage in its development. With $27.1B of global revenues generated in 2018, Yole Développement expects it to maintain a 9.1% Compound Annual Growth Rate (CAGR) for the next 5 years. This industry, which covers image sensors, lenses, voice coil motors, illuminators and camera assemblies, will therefore reach $45.7B by 2024. The overall growth is a combination of mega trends. The main upward driver is the increasing number of cameras in products such as smartphones and cars. 3D sensing cameras are part of this trend, invading mobile devices, computing and automotive industries. If the nature of camera module making is unchanged with 3D sensing, illuminator sub-modules create a new market area. This brings new technologies, such as wafer level optics (WLO), along with it. The market for devices involved in illumination for 3D sensing accounted for $720M in 2018 and will expand ninefold within five years, reaching $6.1B by 2024. This is helping compensate for the shipment volume slowdown in smartphones, computers, tablet and digital cameras. While the complexity and cost of each individual camera is still increasing on average, reaching $5.5 per unit, we are now seeing more diversity. In recent years the distribution of resolution, optical format and camera type was only heading towards uniformly high specifications. But in 2018 the smartphone market has evolved quite dramatically. In an attempt to work around the increasing cost of imaging, mid-range phones have been implementing 2-5Mp formats that were previously fading away.

This new equilibrium between volume, cost and specification is lowering Yole Développement’s forecast with respect to the previous 2017 report, but overall the direction of the industry remains highly attractive.

### Wafer Level Optics (WLO) Finally Finds Mass Market Adoption

This report contains a special focus on the WLO industry. Several types of products are covered, such as lenses, diffusers, diffractive optical elements (DOEs), autofocus (AF) and optical image stabilization (OIS) tunable lenses. Such technologies have received huge investment between 2005 and 2010, aiming to serve cameras for mobile phones before the smartphone era. Due to the high image quality required by smartphones, WLO approaches were left aside until today. As previously forecasted, the addition of 3D sensing brought an opportunity for wafer level approaches to enter mass production and companies such as ams, Himax and AAC were able...
to provide technology to the pioneering smartphone makers. While WLO revenues were in the order of $190M in 2018 we expect revenues will grow in line with the 3D sensing trend at 55% CAGR to $1.6B in 2024. Trends on the front and back of smartphones will require additional WLO components, and the big expectation is for tunable lens AF&OIS. The WLO industry focus of this report is structured in the same way as the full report itself with a forecast, and ecosystem, application and technology trend analyses. Players mastering WLO technologies are challenging CCM players and 2019 is the right time to provide an overview and discuss the challenges ahead.

---

**THE CCM ECOSYSTEM IS EXTREMELY DYNAMIC, NEW INNOVATIONS ARE COMING**

With twelve companies with revenues above a billion dollars per annum and the next twenty companies above a hundred million dollars, the CCM industry provides opportunities for numerous players. In the last four years we have been monitoring the industry, and a few major trends have become obvious. First is the dominance of two heavyweights in image sensors and lenses, Sony and Largan, which cover up to 50% of the market’s needs. Now, these heavyweight companies are having their dominance challenged. The number of companies above one billion dollars per annum revenue is rising, while the number above one hundred million dollars is decreasing, showing that the ecosystem is getting more concentrated. The cost to enter is high and only breakthroughs such as 3D sensing allow new players and technologies to get in. The rhythm of mergers and acquisitions (M&A) has reached a climax in 2017, and now the lack of target companies has momentarily stopped acquisitions. The large camera module makers are looking to increase their margin. As new technologies get ready to enter we expect M&A to rise again in years to come, fueling the 9.1% CAGR in a virtuous cycle.

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**2012-2024 Wafer Level Optics revenue forecast by application (in $B)**

![Graph showing the forecasted revenue growth of Wafer Level Optics across different applications from 2012 to 2024 with a CAGR of 55%](image)

---

**2018 supply chain of the camera module industry**

![Diagram illustrating the supply chain of the camera module industry in 2018](image)
OBJECTIVES OF THE REPORT

- To provide market data on key CCM metrics and dynamics:
  - CCM revenue forecast, volume shipments and component share
  - Market share with detailed breakdown by player
- To provide in-depth understanding of the CCM value chain, infrastructure and players
- Who are the CCM players (CIS manufacturers, CCM manufacturers, Optics manufacturers…) and how they are related?
- To provide key technical insight and analysis about future technology trends and challenges:
  - Manufacturing technologies: design structure
  - Device technologies: CCM application across markets
  - Technology focus on game changing areas such as OIS and dual cameras

COMPANIES CITED IN THE REPORT (non exhaustive list)


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