

VCSEL industry: towards a complete metamorphosis?¹

VCSEL market is seeing huge technology changes and new equilibrium for industrial suppliers.

OUTLINE:

- **Market forecasts:**
The global VCSEL² market is expected to reach US\$2.4 billion in 2026 at a 13.6% CAGR³₂₁₋₂₆, driven by datacom and mobile applications.
Mobile & consumer market segment is expected to grow to US\$1,7 billion in 2026 at a 16.4% CAGR₂₁₋₂₆.
VCSELs for automotive & mobility is expected to grow to US\$57 million in 2026, at an impressive CAGR₂₁₋₂₆ of 122%.
- **Technology trends:**
The new multi-junction technology represents the next leap forward for the VCSEL industry.
VCSEL manufacturing moved from 4" to 6" manufacturing and could soon move to 8" manufacturing.
Another trend is emerging: the integration of 3D-sensing modules under the OLED⁴ display, which could disrupt the traditional manufacturing chain.
- **Supply chain:**
Two companies are sharing the VCSEL landscape: Lumentum and II VI are taking about 80% of the VCSEL market.
There is many VCSEL suppliers, with fewer than ten big players and many medium or small players.

*“VCSEL technology is continuously evolving. It has already occurred in the past with the transition from 850nm-based VCSELs for datacom applications to 940nm-based VCSEL arrays for 3D sensing applications.” asserts **Pierrick Boulay, Technology & Market Analyst, Solid-State Lighting at Yole Développement (Yole)**. He adds: “A few years ago, smartphones embedded a notch in the front display to implement the selfie camera and the face recognition module.*

¹ Extracted from: *VCSEL - Technology and Market Trends 2021 report*, Yole Développement, 2021

² VCSEL: Vertical Cavity Surface Emitting Laser

³ CAGR: Compound Annual Growth Rate

⁴ OLED: Organic Light-Emitting Diode

These elements take up space and are unsightly. The goal is to hide these elements under the display. To enable this, a transition in the wavelength used for 3D sensing would be necessary for the light to penetrate the display.”

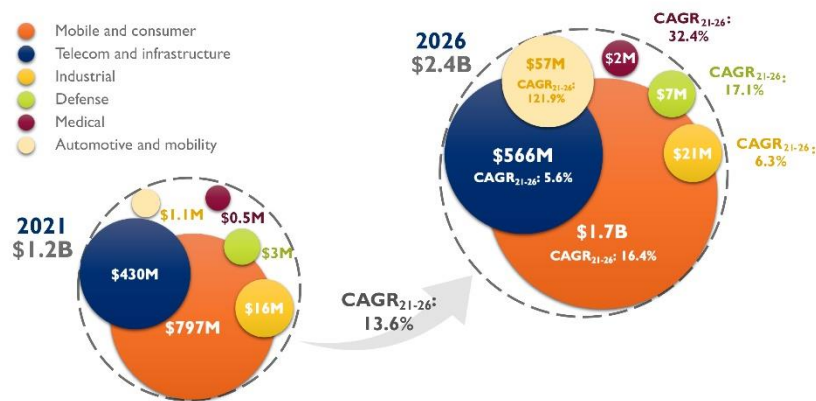
In this context, Yole investigates disruptive technologies and related markets in depth, to point out the latest innovations and underline the business opportunities.

Released today, the VCSEL - Technology and Market Trends 2021 report provides market data on different VCSEL applications, delivers an in-depth understanding of the VCSEL business value chain, players and trends and gives insights into manufacturing and associated challenges. What are the economic and technologic challenges of the VCSEL industry? Who are the top VCSEL manufacturers, what are their market share and the strategy behind? What is the VCSEL technology evolution?

Discover Yole’s solid-state lighting team’s vision.

2021–2026 VCSEL market overview

(Source: VCSELS - Technology and Market Trends 2021 report, Yole Développement, 2021)



As analyzed by Yole’s team in the new VCSEL - Technology and Market Trends 2021 report, the global VCSEL market is expected to increase from US\$1.2 billion in 2021 to US\$2.4 billion in 2026 at a 13.6% CAGR during the 2021-2026 period. This market is dominated by the mobile and consumer market, which will grow from US\$797 million in 2021 to US\$1.7 billion in 2026 at a 16.4% CAGR.

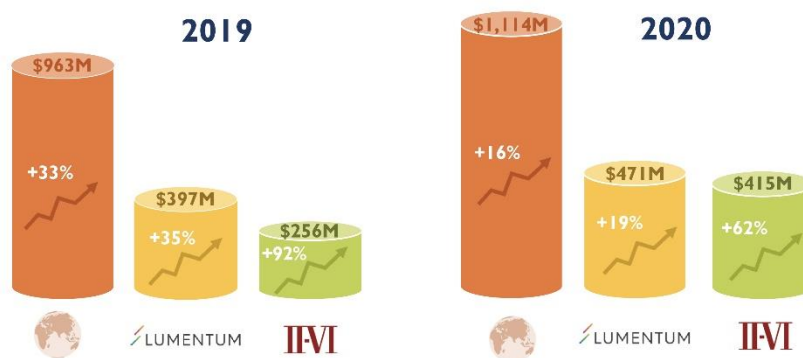
According to **Pierrick Boulay**: “In this market, revenues linked to smartphones are expected to remain stable in 2021 and 2022. This is explained by the decreasing adoption of 3D sensing modules by Android players. In 2021, only Apple is implementing VCSELS and developing AR applications. This will create a relatively flat market for two years. Growth could be back after that with Android players”. Data communications is the second biggest market, expected to generate revenue of US\$430 million in 2021 and expected to reach US\$566 million in 2026 at a CAGR of 5.6%. The automotive market is quite small in 2021 with revenue of US\$1.1 million but is expected to reach US\$57 million in 2026 at a CAGR of 122% with applications in LiDAR and driver

monitoring. Industrial applications are expected to generate revenue of US\$16 million in 2021 that could reach US\$21 million in 2026 at a CAGR of 6.3%.

Industrial revenue could take-off at mid-term with the emergence of applications using 3D LiDARs. These applications will be related to smart infrastructure and logistics.

2019 vs. 2020 main players revenue & YoY growth - Focus on Lumentum & II-VI

(Source: VCSELS - Technology and Market Trends 2021 report, Yole Développement, 2021)



It appears that OLED displays are transparent to SWIR⁵ light, around 1300 to 1400 nm. The shift from 940nm to such SWIR wavelengths will deeply impact the components and the supply chain. For 940nm, VCSELS are made from 6” GaAs⁶ wafers. SWIR VCSELS should be based on InP⁷, which is much more difficult to process, and manufacturing is currently done on 2” and/or 3” wafers.

As a **Business Unit Manager, Solid-State Lighting & Display at Yole, Pars Mukish** asserts: “The impact is not limited to the light source but also to the receiver, where silicon-based SPADs⁸ are used in the NIR⁹ region. Silicon can no longer be used in the SWIR region. SPADs will have to have to be based on InGaAs¹⁰ material or using quantum dots. In both cases, the technology is still emerging, manufacturing yields are low, and availability of components is limited. This will lead to higher component costs for both the emitter and the receiver”.

Only Apple, whose smartphones have ASPs¹¹ higher than \$1,000, can afford such a technology change.

Smartphones are not the only application where technology is evolving. Automotive applications, and LiDAR¹² in particular, will benefit from recent developments. Multi-junction

⁵ SWIR: Short Wavelength Infrared

⁶ GaAs: Gallium Arsenide

⁷ InP: Indium Phosphide

⁸ SPAD: Single Photon Avalanche Detectors

⁹ NIR: Near Infrared

¹⁰ InGaAs: Indium Gallium Arsenide

¹¹ ASP: Average Selling Prices

¹² LiDAR: Light Detection and Ranging

technology represents the next leap forward for the VCSEL industry. The multi-junction VCSEL offers many significant benefits to users. Multi-junction VCSELs, in a back-side emitting configuration, would have several advantages over their conventional sibling. Eliminating wire bonds would improve the VCSEL performance and allow the use of micro lenses to have more compact packages.

All year long, *Yole Développement* publishes numerous reports and monitors. In addition, experts realize various key presentations and organize key conferences.



In this regard, do not miss the 4th Yole Développement and CIOE forums on Imaging & LiDAR for Automotive Forum 2021, on September 1st, and on 3D Sensing for Consumer 2021, on September 2nd in Shenzhen China and online.

Register [HERE](#) to discuss with key players about the LiDAR technologies and [HERE](#) to know more about



the bright future of 3D sensing.

Make sure to be aware of the latest news coming from the industry and get an overview of our activities, including interviews with leading companies and more on [i-Micronews](#). Stay tuned!

Press contacts

Sandrine Leroy, Director, Public Relations, sandrine.leroy@yole.fr

Marion Barrier, Officer, Public Relations, marion.barrier@yole.fr

Le Quartz, 75 Cours Emile Zola – 69100 Villeurbanne – Lyon – France – +33472830189

www.yole.fr - www.i-micronews.com – [LinkedIn](#) – [Twitter](#)

About our analysts

As part of the Photonics, Sensing & Display division at Yole Développement (Yole), **Pierrick Boulay** works as Market and Technology Analyst in the fields of Solid-State Lighting and Lighting Systems to carry out technical, economic and marketing analysis. Pierrick has authored several reports and custom analysis dedicated to topics such as general lighting, automotive lighting, LiDAR, IR LEDs, UV LEDs and VCSELs. Prior to Yole, Pierrick has worked in several companies where he developed his knowledge on general lighting and on automotive lighting. In the past, he has mostly worked in R&D department for LED lighting applications. Pierrick holds a master degree in Electronics (ESEO – Angers, France).

Pars Mukish serves as a Business Unit Manager, Solid-State Lighting (SSL) & Display at Yole Développement (Yole). Pars' mission is dedicated to the development of SSL and Display activities (ie laser diode, LED and OLED). Pars actively assists and supports the development of strategic projects, working with leading customers of the company. He manages the on-going expansion of technical and market expertise of the SSL & Display team. This team interacts daily with leading companies of the industry, allowing analysts to collect a large amount of data and integrate their understanding of the evolution of the market with technology breakthroughs. Pars is also regularly involved in international conferences, giving presentations and delivering keynotes. Prior to Yole, Pars has worked as Marketing Analyst and Techno-Economic Analyst for several years at the CEA (French Research Center). Pars holds a master's in Materials Science & Polymers (ITECH - France) and a master's in Innovation & Technology Management (EM Lyon - France).

About the report

VCSEL - Technology and Market Trends 2021

Worth \$2.4B in 2026, the VCSEL market is seeing huge technology changes and a new equilibrium for industrial suppliers linked to recent acquisitions. – Performed by Yole Développement

Companies cited:

Accelink, Aixtron, Alight, ams, Anadigics, Apple, Avago, AWSC, Beam Express, Bosch, Broadcom, Canon, Changelight, Device Innovation, Egismos Technology Corporation, Emcore, Epistar, EpiWorks, Finetech, Finisar, FLIR, Foxconn, Fuji Xerox, Fujitsu, Global Communication Semiconductor, Google, Hamamatsu, Heptagon, Himax, HLJ, Honeywell, Honor, Huawei, Ibeo, II-VI, Infineon, Intel, IntelliEPI, IQE, JDSU, Landmark Opto, Lasermate, Lasertel, Laytec, LeddarTech, Lenovo, LG, Lumentum, LuxNet, Mantis Vision, Masimo, Namuga, Oclaro, OmniVision, Oppo, Optowell, Orbbec, Osram, Oxford Instruments, and more...

Related reports:

- [3D Imaging and Sensing – Technology and Market Trends 2021](#)
- [Optical Transceivers for Datacom & Telecom Market 2021](#)
- [Edge Emitting Lasers – Technology and Market Trends 2021](#)
- [LiDAR for Automotive and Industrial Applications 2020](#)
- [STMicroelectronics Proximity Sensor and Flood Illuminator](#)

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 and 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](#)

For more information and images, please visit our website [i-Micronews](#)

###