VCSEL – Vertical Cavity Surface Emitting Laser
Patent Landscape Analysis – November 2018

3D sensing in the Apple iPhone X paves the way for new VCSEL opportunities. How is the VCSEL-related patent landscape impacted by the rise of new applications?

NEW APPLICATIONS DRIVE CURRENT VCSEL PATENTING ACTIVITY

The release of the Apple iPhone X in 2017 and its range of optical sensors triggered new opportunities for VCSEL players to address a high-volume market. Apple’s competitors are now developing 3D sensing functions as well. However, the consumer industry is just the starting point for this new VCSEL area. Indeed, the rise of autonomous and robotic vehicles as well as medical imaging and gas sensing offer a wide range of high-volume applications that could drive the growth and development of VCSEL technology and the related market. Propelled by these new applications, the VCSEL market will enjoy a 48% Compound Annual Growth Rate (CAGR) from 2017 to 2023 and reach more than $3.5B, according to Yole Développement.

At the beginning of this new era, understanding the Intellectual Property (IP) position and strategy of historical VCSEL IP players as well as identifying the IP newcomers and the threat they represent is crucial. In this report, Knowmade has thoroughly investigated the patent landscape related to VCSELS, VCSEL arrays and Vertical External Cavity Surface Emitting Lasers (VECSCELS). Our patent landscape analysis shows significant changes in the VCSEL competitive landscape.

VCSEL-related patent activity began in the late 1980s amongst US and European datacom players like Motorola, Finisar, Broadcom and NEC. Since 2010, decreasing IP activity related to datacom and laser printing has been balanced by the emergence of new applications like LiDAR and 3D sensing. New applications like facial and gesture recognition, LiDAR and gas sensors and their promising market value have pushed many newcomers to enter the VCSEL-related IP landscape, including Apple, Heptagon/ams, Stanley Electric and LG Innotek. 3D sensing and LiDAR currently appear as the most attractive applications for main VCSEL IP players like Ricoh, Finisar, Sony, Osram and Lumentum. This change in IP strategy heralds future shifts in the VCSEL-related market. Today, the IP landscape related to VCSELS for 3D sensing is young and unsettled. A race has just started between the strong historical VCSEL IP players coming from datacom or laser printing and the newcomers/specialized players like Philips and Trilumina that need to strengthen their IP position. Thus, VCSEL IP players are entering a phase where M&A, litigation or IP acquisitions will be key.

Time evolution of patent publications for main VCSEL applications
REPORT SCOPE
In this report, Knowmade has selected and thoroughly investigated the >4,200 inventions related to VCSEL manufacturing and applications that have been published worldwide. These patents were filed by more than 900 different patent applicants.

This report also provides a deep analysis of patents related to promising technologies and main players’ IP portfolios.

REPORT’S MAIN ASSETS
• Identifying the newcomers and evaluating their portfolios’ strengths and weaknesses
In this report, Knowmade discusses the more than 50 newcomers that have entered the VCSEL IP landscape in the last seven years. Most relevant newcomer IP profiles are analyzed within, based on their market position, portfolio size, and IP activity growth.

• Understanding the key players’ patented technologies and current IP strategies
More than 900 patent applicants are involved in the VCSEL IP patent landscape. This report reveals the IP position of key players through a detailed analysis of their patent portfolios. We also provide an understanding of these players’ patented technologies, their IP strategy, and their capability to limit other firms’ patenting activity and freedom-to-operate. Moreover, we discuss the relative strength of the top patent owners as derived from their patent portfolios size, prior-art contribution, geographic coverage, and IP blocking potential, highlighting their most valuable patents.

• Analyzing IP players’ position on promising applications and their main inventions
This report provides an understanding of IP players’ positions on promising applications. Main IP players and key patents are presented for each segment, along with an understanding of the current technical challenges addressed in the patents.

• Identifying and understanding key patents related to VCSEL manufacturing
This report provides a detailed analysis of key patents rated as seminal, blocking and/or promising related to VCSEL manufacturing. Furthermore, patents related to yield improvement and eye safety have also been identified and analyzed in order to understand the actual solutions to answer these technical challenges.

USEFUL PATENT DATABASE
This report also includes an Excel database with the >10,500 patents and patent applications analyzed in this study. This useful patent database allows for multi-criteria searches and includes patent publication numbers, hyperlinks to the original documents, priority date, title, abstract, patent assignees, patent’s current legal status, and technological and application segments.
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AUTHORS

Dr. Paul Leclaire
Paul works for Knowmade in the fields of RF technologies, Wireless communications and MEMS sensors. He holds a PhD in Micro and Nanotechnology from the University of Lille, France, in partnership with IEMN in Villeneuve-d’Ascq and CRHEA-CNRS in Sophia-Antipolis, France. Paul previously worked in innovation strategy consulting firm as Consultant.
Contact: paul.leclaire@knowmade.fr

Dr. Nicolas Baron
Nicolas is CEO and co-founder of Knowmade. He manages the company’s development and strategic direction, and personally leads the Electronics & Telecom department. He holds a PhD in Physics from the University of Nice Sophia-Antipolis, France, and a Master degree in Intellectual Property Strategies and Innovation from the IEEPI in Strasbourg, France.
Contact: nicolas.baron@knowmade.fr

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