STMicroelectronics ToF Proximity Sensor & Flood Illuminator in the Apple iPhone X

Patent-to-Product Mapping - August 2018

What are the main patented features of Apple iPhone X proximity sensor and flood illuminator?

Apple iPhone X: a trove of new tech sensors

Released in November 2017, the Apple iPhone X marks the 10th anniversary of the iPhone product line. With this new generation come several new technologies that make the iPhone X unique. Among the main new features we find are the screen design, OLED display, advanced true-depth camera, and optical array sensors (which enable facial ID). In addition to these new features, the iPhone X has an impressive number of sensors, especially those that are integrated into a small space at the top of the iPhone X screen. The sensor panel includes an infrared camera, flood illuminator, proximity sensor, and an ambient light sensor, along with a front camera, dot projector, speaker, and microphone. To achieve such a complex solution, Apple successfully built and managed a strong network comprised of many players. The iPhone X’s time of flight (ToF) proximity sensor and flood illuminator are good examples of this network’s aptitude. Indeed, manufacturing these two devices required the work of three companies: STMicroelectronics, Philips, and Lumentum. In such a complex network, understanding each player’s patented features, IP position, and strategy was critical.

With a CAGR of 82% from 2016 - 2023 (according to Yole Développement), the consumer market will drive the development of 3D imaging and sensing technologies. Today, the iPhone X’s sensors are part of the first generation of imaging and sensing devices to be integrated in a cellphone, but many will follow. In this report, Knowmade and its partner, System Plus Consulting, join forces and provide key information for understanding the roles, dynamics, and IP strategies of the players involved in the manufacturing of the iPhone X’s proximity sensor and flood illuminator.

Included in the same package, both components have been torn down and analyzed by System Plus Consulting, revealing their main characteristics. Based on this teardown analysis, Knowmade has identified the closest patents to these technologies and described the main proprietary features.

REPORT OUTLINE

• STMicroelectronics ToF proximity sensor & flood illuminator in the Apple iPhone X
• Patent-to-product mapping
• August 2018
• Ref.: 18006
• PDF > 110 slides
• €6,490 for a multi-user license

REPORT’S KEY FEATURES:

➢ Link between key product features and patents owned by STMicroelectronics, Lumentum, and Philips
➢ Essential patent portfolio analysis for STMicroelectronics, Lumentum, and Philips, related to VCSEL and ToF sensors. Includes:
  • Time evolution of patent publications, and countries of patent filings
  • Current legal status of patents
  • Citation network and competitive IP networks
➢ Deep insight into technology data, including teardown analysis of:
  • STMicroelectronics ToF sensor
  • Philips’ VCSEL source
  • Lumentum’s VCSEL array

RELATED REPORTS

• STMicroelectronics Time of Flight Proximity Sensor & Flood Illuminator in the Apple iPhone X, 2018 - System Plus Consulting
• Lenovo Phab2Pro 3D ToF Camera, 2017 - System Plus Consulting
• Apple iPhone X - Infrared Dot Projector, 2017 - System Plus Consulting
• STMicroelectronics Time of Flight Proximity Sensor in the Apple iPhone 7 Plus, 2017 - System Plus Consulting
• 3D Imaging & Sensing, 2018 - Yole Développement
**THIS REPORT’S METHODOLOGY**

To reveal the main features of the Apple iPhone X’s proximity sensor and flood illuminator, Knowmade has analyzed the patent portfolios of STMicroelectronics, Lumentum, and Philips. For each player, Knowmade has performed:

- A selection of relevant and related patents
- A global IP analysis in order to understand each player’s IP strategy and position
- A deep analysis of patents related to the Apple iPhone X product

![Patent-to-product methodology](image)

**THIS REPORT’S MAIN ASSETS**

- Identify the IP players involved in manufacturing the Apple iPhone X’s proximity sensor and flood illuminator
- Understand these players’ strategy and position in the IP landscape

From STMicroelectronics’ patent portfolio to Lumentum’s VCSEL-focused portfolio, more than 500 inventions related to ToF sensors and VCSEL have been identified. A global IP analysis allows us to understand the position of each player by positioning their patents within their IP competitive landscape and highlighting their actual IP dynamic regarding patent publication and geographic coverage.

- Analyzing IP players’ product-related patents

This report provides an understanding of the key features asserted by the patents of STMicroelectronics, Lumentum, and Philips. Each patent related to the Apple iPhone X’s sensor is detailed. Main characteristics and their impact on the manufacturing process, device performance, cost, etc. are highlighted too.

![Patent to product mapping](image)

Note: All details are given in the report.
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**ABOUT KNOWMADE**

Specialized in the analysis of patents and scientific information, Knowmade provides technology intelligence and IP strategy consulting services. The company supports the business development of R&D organizations, industrial companies, and investors by offering them a deep understanding of their IP environment and technology trends. Knowmade operates in the following industrial sectors: compound semiconductors, power electronics, RF & microwave technologies, LED/OLED lighting & display, photonics, memory, MEMS & sensors, manufacturing & advanced packaging, battery & energy management, biotechnology, pharmaceuticals, medical devices, medical imaging, and agri-food & environment.

Knowmade’s experts provide prior art search, patent landscape analysis, scientific literature analysis, patent valuation, IP due diligence, and freedom-to-operate analysis. The company also delivers litigation/licensing support, technology scouting, and IP/technology observation. Knowmade’s analysts combine their technical and patent expertise with powerful analytics tools and proprietary methodologies, delivering invaluable patent analyses and scientific reviews.

**ABOUT SYSTEM PLUS CONSULTING**

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