

# LiDAR – making significant inroads into our factories and warehouses

LiDAR (Light Detection and Ranging) technology has been making significant inroads into the industrial automation sector, enabling increased efficiency, quality, and cost savings. Hamamatsu Photonics is at the forefront of this technological advancement, offering high-quality sources and detectors for industrial LiDAR applications, and pushing their performance limits to match future industrial needs.

The level of automation in industry closely follows technological progress. Industries are frequently the first to adopt new technologies with the resources at their disposal. The many benefits offered by LiDAR make the adoption of this new technology attractive.

LiDAR has penetrated deep into industrial automation. It operates by measuring the time it takes for light to travel from a source to an object, and back to the source<sup>[1]</sup>. This allows the distance of the object from the light source to be calculated.

The technology is utilized in various industrial applications including distance measurement, obstacle detection by automated guided vehicles (AGVs), and the operation of automatic doors. The key applications for LiDAR technology include autonomous navigation of vehicles, robotic and machine vision systems, and 3D mapping.

Industries demand high levels of performance from LiDAR due to the risk factors involved in certain applications. To consider an example, malfunctioning LiDAR in AGVs that are moving heavy loads can cause

significant damage to workers or property. Therefore, industrial LiDAR require high-quality components that are robust, offer excellent performance and have a longer lifespan. They must withstand a wide range of temperatures, humidity, dust, ambient light, and impulsive forces over extended periods while maintaining consistent performance and reliability.

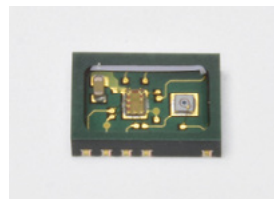
Hamamatsu is renowned for the quality of its products and is a trusted manufacturer and supplier of LiDAR solutions for industrial applications. Through continuous innovations in active material composition, photonic design and packaging technologies, Hamamatsu pushes the performance limits of LiDAR sources. **Pulse laser diodes<sup>[1]</sup> (PLDs)** and detectors like **avalanche photodiodes<sup>[3]</sup> (APDs)** and **silicon photomultipliers<sup>[4]</sup> (SiPMs)** are key to this technology. The current generation of PLDs<sup>[2]</sup> offers improved energy efficiency and smaller package sizes, with operating frequencies greater than 100s of KHz, emitting pulses shorter than 10 ns and peak powers greater than 100 W. Hamamatsu's PLDs come in a standard TO-can or ceramic package<sup>[2]</sup> and among the applications for these are distance measuring instruments and laser range finders.



They are also useful in security environments with the need for hazard monitoring. There are other options, such as the innovative SMD (Surface Mount Design) package, with resin encapsulation. The SMD package has a smaller footprint and it can be used in place of PLD based on VCSEL design. There are several customization options, including module solutions. Complementing the PLDs are a wide range of fast detectors like APDs and SiPMs, also known as **multipixel photon counters (MPPC®s)**<sup>[5]</sup>. These detectors are available as a single sensor or as arrays. Like the PLDs, the detectors are also available in multiple packaging options and module solutions<sup>[6&7]</sup>.



One of many Hamamatsu Photonics' pulsed laser diodes (PLD).



Hamamatsu photosensor S15597-01CT including a Si APD.



Hamamatsu photosensor S14137-01CR including a 16-element APD array.

Industrial applications often have different requirements, including **package type**, **power supply**, **mechanical characteristics**, and **data handling**. With these many variables, it can be difficult to find the right off-the-shelf solution. Hamamatsu's engineers are readily available to support customers in finding the ideal solution for their LiDAR application and discuss any customization requirements they may have.

For more information visit our website [www.hamamatsu.com](http://www.hamamatsu.com) or email [info@hamamatsu.eu](mailto:info@hamamatsu.eu)

## References

<sup>[1]</sup> <https://www.hamamatsu.com/eu/en/applications/automotive/lidar.html>

<sup>[2]</sup> <https://www.hamamatsu.com/eu/en/product/lasers/semiconductor-lasers/plds.html>

<sup>[3]</sup> <https://www.hamamatsu.com/eu/en/product/optical-sensors/distance-position-sensor/lidar-sensor/si-apd-for-lidar.html>

<sup>[4]</sup> [https://www.hamamatsu.com/eu/en/product/optical-sensors/mppc/mppc\\_mppc-array.html](https://www.hamamatsu.com/eu/en/product/optical-sensors/mppc/mppc_mppc-array.html)

<sup>[5]</sup> [https://www.hamamatsu.com/eu/en/product/optical-sensors/mppc/what\\_is\\_mppc.html](https://www.hamamatsu.com/eu/en/product/optical-sensors/mppc/what_is_mppc.html)

<sup>[6]</sup> <https://www.hamamatsu.com/eu/en/product/optical-sensors/distance-position-sensor/lidar-sensor/photosensor-with-front-end-ic/S14137-01CR.html>

<sup>[7]</sup> <https://www.hamamatsu.com/eu/en/product/optical-sensors/distance-position-sensor/lidar-sensor/photosensor-with-front-end-ic/S15597-01CT.html>