

VL53L1X

Long-distance ranging time-of-flight (ToF) sensor



The VL53L1X is the third-generation laser-ranging sensor based on ST's patented FlightSense™ technology

This new generation VL53L1X module includes a lens and a low-power microcontroller running advanced digital firmware which ensures an unprecedented absolute distance measurement up to 4 meters. It is also possible to program the size and the position of the Region of Interest (ROI) on the receiving array to reduce the sensor field-of-view (FoV).

KEY BENEFITS

- Long range: up to 400 cm absolute distance measurement
- Fast: Up to 50 Hz ranging frequency
- High-accuracy ranging
- Low-power presence detection: <math><1.5\text{mW}</math>
- Fully integrated miniature module: 4.9 x 2.5 x 1.56 mm
- Can be hidden behind cover glass
- Programmable sensor field-of-view (FoV)

TARGETED APPLICATIONS

- Advanced user detection for power-saving and improved security in personal computers and IoT devices
- Long distance and rapid obstacle detection for robotics and smart buildings
- Hovering and landing assistance for drones
- Gesture recognition
- Camera and video assist (ultra-fast autofocus)



TECHNOLOGY

The VL53L1X is a state-of-the-art long-distance ranging ToF sensor. It contains a sensing array of SPADs (single photon avalanche diode), an integrated 940 nm invisible light source based on an eye-safe Class 1 VCSEL (vertical cavity surface-emitting laser) and a low-power embedded microcontroller. This new generation sensor integrates a lens above the SPAD array, which enables measuring distances up to 4 meters, and offers excellent ranging performance under challenging operating conditions, even when the sensor is hidden behind a colored cover window. Unlike conventional IR sensors, the VL53L1X uses ST's patented FlightSense™ technology which ensures absolute distance measurements whatever the target color and reflectance.

Thanks to advanced on-board algorithms, it is also possible to reduce the sensor FoV by programming the size and the position of the region-of-interest (ROI) on the receiving array.

An "Autonomous Low Power" mode is available, based on thresholding and interrupts, specially tuned for advanced Presence detection. It allows significant system power-saving, switching-off or waking-up the host automatically when a human or an object is detected.

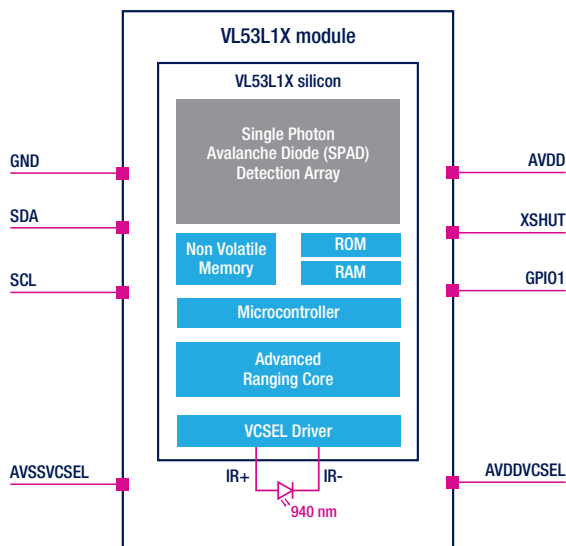
The VL53L1X is supplied with a complete documentation package, example source code and a software API (application programming interface) which is compatible with a range of microcontrollers and processors. The application software development and the physical integration into customers' devices is easy thanks to the X-NUCLEO expansion board, breakout boards and associated development ecosystem.

MODULE DESIGN

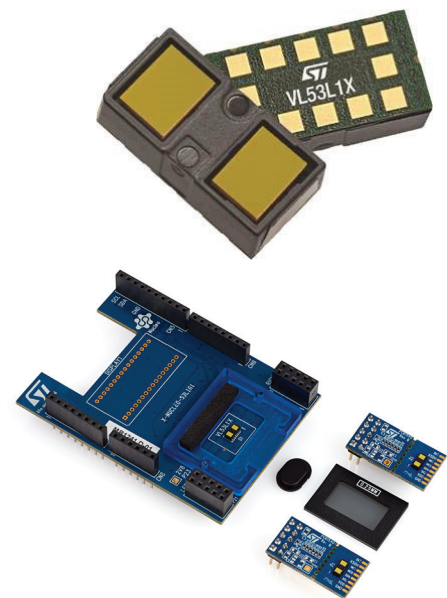
The VL53L1X is "industrial design friendly"! It is a stand-alone, all-in-one ultra-small form factor module of 4.9 x 2.5 x 1.56 mm, which can be hidden behind a wide variety of cover windows and reflowed on a motherboard or a flex PCB.

The VL53L1X is pin-to-pin compatible with the previous generation VL53L0X, which enables a natural evolution to this new generation.

SYSTEM BLOCK DIAGRAM



VL53L1X MODULE



VL53L1X
EVALUATION KIT
X-NUCLEO-53L1A1

PRODUCT DETAILS

Part number	Package size	Operating range	Power consumption	Supply voltage	Optimum operating temperature
VL53L1CXV0FY/1	4.9 x 2.5 x 1.56mm	up to 4 meters	Hardware standby (typ.): 5 μ A Ranging: <1 mW (*)	2.6 to 3.5 V	-20 to +85 °C

* Power consumption for Presence detection, no target, 1Hz, 20 ms ranging operation



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