

VL53L5CX

Time-of-Flight 8x8 multizone ranging sensor with wide field of view



First real time native 8x8 multi-zone Time-of-Flight sensor with wide field-of-view, multi-target detection and distance measurement for each zone

Multi-zone distance measurements with up to 8x8 real time native zones and a wide 63° diagonal field of view. Each zone of the sensor can measure the distance to a target at up to 4 meters with a maximum frequency of 60 Hz. With ST's patented histogram algorithms, the VL53L5CX detects multiple objects within the FoV and ensures immunity to cover glass crosstalk beyond 60 cm.



KEY FEATURES & BENEFITS

- Multizone ranging output with 8x8 real time native separate zones
- Square 45°x45° field-of-view (63° diagonal)
- Up to 4 meters
- Multitarget detection and distance measurement in each zone
- Motion indicator for each zone
- 60 Hz frame rate capability
- Autonomous Low power mode with programmable thresholds
- Histogram processing
- Invisible (940 nm) emitted light

KEY APPLICATIONS

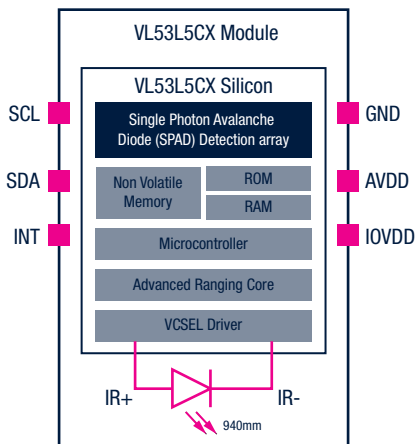
- Scene understanding
- 3D room mapping
- Obstacle detection for robotics applications
- Content management (load in trucks, tanks, waste bins)
- Gesture recognition
- Liquid level control
- Smart buildings and smart lighting (user detection to wake up devices)
- Keystone correction for video projectors
- Laser-assisted autofocus (LAF)
- Augmented reality/Virtual reality
- IoT (user and object detection)

Technology

The first multi-zone Time-of-Flight (ToF) ranging sensor, the VL53L5CX is a state-of-the-art sensor that offers multi-target detection and distance measurement in each zone at up to 4 meters. Housed in a miniature reflowable package, it integrates a SPAD array, physical infrared filters, and Diffractive Optical Elements (DOE) to achieve the best ranging performance in various ambient lighting conditions.

Unlike conventional IR sensors, the VL53L5CX uses ST's latest generation, direct ToF technology which allows absolute distance measurement regardless of the target color and reflectance. It provides accurate ranging up to 4 meters and can work at fast speeds (60 Hz), which makes it the fastest, multizone, miniature ToF sensor on the market.

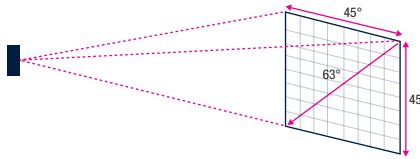
System Block Diagram



Module design

With a small all-in-one form factor (6.4 x 3.0 x 1.5 mm), the VL53L5CX is easy to integrate and is compatible with a wide range of cover glass materials. It is also very flexible as it can support different power supply options.

Multi-zone resolution



The use of a DOE above the vertical cavity surface emitting laser (VCSEL) allows a square field-of-view of 45°x45° (63° diagonal) to be projected onto the scene. The reflection of this light is focused by the receiver lens onto a SPAD array.

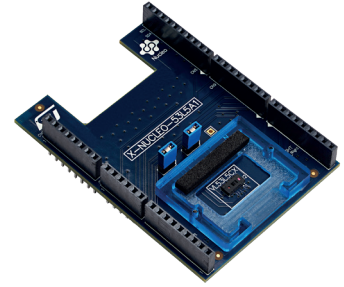
The VL53L5CX can range up to 8x8 zones at 15 Hz for higher resolution or use 4x4 zones at 60 Hz for faster ranging measurements.

Moreover, the VL53L5CX is also able to detect multiple objects in the FoV thanks to ST's patented histogram algorithms.

Tools and software

The VL53L5CX expansion board (X-NUCLEO-53L5A1) is designed for use with any of the STM32 Nucleo boards thanks to the STM32Cube Time-of-Flight sensor expansion software (X-CUBE-TOF1). This software reduces development time and cost.

A VL53L5CX Expansion pack (P-NUCLEO-53L5A1) is also available and includes the Expansion board plus the STM32F401RE development board (NUCLEO-F401RE).



A set of two VL53L5CX breakout boards (VL53L5CX-SATEL) helps developers easily integrate the VL53L5CX sensor into their prototypes for a faster time to market.



To further enable the development of end-user applications, ST delivers a Linux driver (STSW-IMG025) and an Ultra Lite Driver (STSW-IMG023) which includes a set of C functions for controlling the VL53L5CX sensor.

In addition to continuously developing new software and example code to help ease design efforts, ST regularly publishes how-to and informational videos and documentation to explain how developers can get the most out of the VL53L5CX.

Part number	Package size (mm)	Number of zones	Operating range	Max ranging frequency	Power consumption in Autonomous mode (*)	Supply voltage	Optimum operating temperature
VL53L5CXV0GC/1	6.4 x 3.0 x 1.5	8x8 = 64 zones	3.5 m	15 Hz	11 mW	IOVDD: 1.8, 2.8 or 3.3 V	-30 to 85 °C
		4x4 = 16 zones	4 m	60 Hz	4.5 mW	AVDD: 2.8 or 3.3 V	

Note (*): Power consumption with no target, 1Hz, 5ms integration time



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