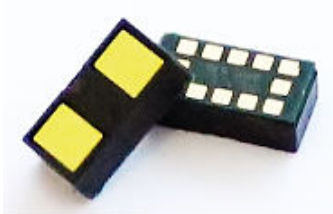# Time-of-Flight long-distance ranging sensor with advanced multizone and multiobject detection

Features

- Fully integrated miniature module
    - Emitter: 940 nm invisible laser (VCSEL) and its analog driver
    - Receiving array with integrated lens
    - Low-power microcontroller running advanced digital firmware
    - Size: 4.9 x 2.5 x 1.56 mm
- Fast, accurate distance ranging, with:
    - A comprehensive application note (AN5573) providing detailed technical guidance for defining the performance in ranging mode, scanning mode, and autonomous mode
    - Up to 800 cm ranging
    - 60 Hz ranging capability up to 300 cm
    - Immunity to cover window crosstalk and fingerprint smudge, at long distances, with patented algorithms (direct Time-of-Flight)
    - Multiobject detection capability
    - Multizone scanning and selectable array (2x2, 3x3, 4x4, or defined by the user through software)
- Easy integration
    - A keystone correction example code for projectors with the STSW-IMG047
    - Single reflowable component
    - Single power supply 2v8
    - Works with many types of cover window material
    - I²C interface (up to 1 MHz)
    - Xshutdown (reset) and interrupt GPIO (general-purpose input/output)
    - Full set of software drivers (Linux® and Android compatible) for turnkey ranging

Product summary	
Order code	VL53L1CBV0FY/1
Package	Optical LGA12 with liner
Packing	Tape and reel (with liner)
AN5573 application note	
STSW-IMG047 software	

Applications

- Laser assisted autofocus: enhances the camera AF system speed and robustness, especially in difficult scenes (low light and low contrast). Ideal companion for PDAF sensors.
- Video focus tracking assistance at 60 Hz
- Scene understanding with multiobject detection: "choose the focus point"
- Dual camera stereoscopy and 3D depth assistance thanks to multizone measurements
- Presence detection (autonomous timed mode), typically to lock/unlock and power on/off devices like notebooks, tablets or white goods

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For further information contact your local STMicroelectronics sales office.

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Description

The VL53L1 is a laser ranging miniature ToF (Time-of-Flight) sensor. It covers applications requiring long distance ranging up to 800 cm (ranging mode), multizone ranging (scanning mode) and low-power (autonomous mode). A comprehensive application note (AN5573) provides technical details on the programming interface including its bare driver. The API (application programming interface) enables the device to be controlled and managed in these three modes, to meet the requirements of all applications.

The VL53L1 is enhanced with the STSW-IMG047 software. It provides example code for keystone correction thanks to the multizone scanning mode of the sensor. This feature is essential for projectors, ensuring that images are displayed correctly, regardless of the angle of projection. Leveraging STMicroelectronics' FlightSense technology, the STSW-IMG047 offers users precise and accurate image projection adjustments. This technology corrects any keystone distortion, which occurs when a projector is positioned at an angle, resulting in a nonrectangular image.

The VL53L1 is housed in a miniature and reflowable package. It integrates a single photon avalanche diode (SPAD) array, physical infrared filters, and optics. All this helps to achieve the best ranging performance in various ambient lighting conditions, with a range of cover window options.

With patented algorithms and ingenious module construction, the VL53L1 is also able to detect different objects within the FoV (field of view). Its depth information (histogram) is at 60 Hz.

Scene browsing and multizone detection are now possible with the VL53L1, thanks to a software customizable detection array. This provides a quicker "touch to focus", or mini depth map use cases.

1 Technical specification

Figure 1. VL53L1 block diagram
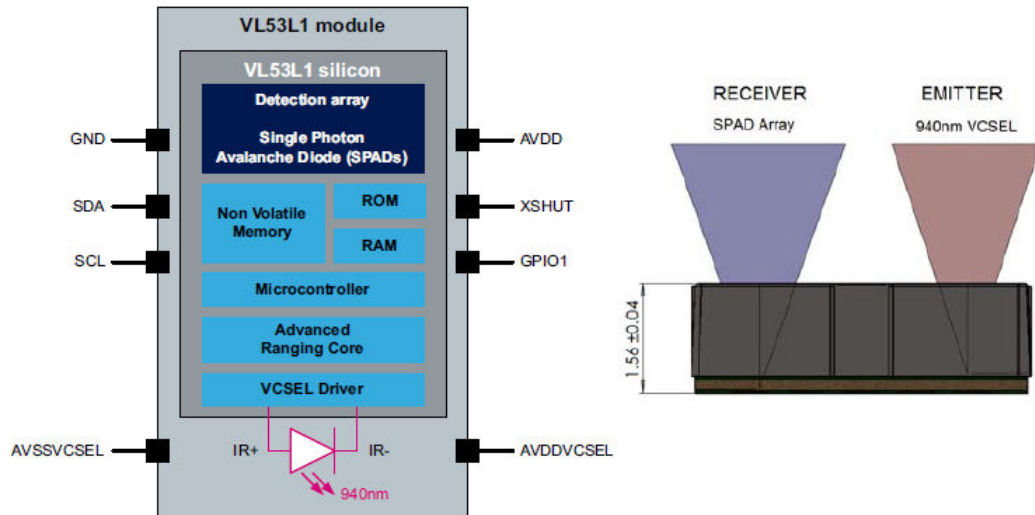
Revision history

Table 1. **Document revision history**

Date	Version	Changes
14-Fev-2017	1	Initial release
17-Fev-2017	2	Updated Table 1: Product summary
30-Oct-2020	3	Increased ranging distance from 4 m to 8 m Removed ECOPACK section
25-Apr-2024	4	Updated Product summary, Features, and Description.

IMPORTANT NOTICE – READ CAREFULLY