



# Time of Flight Proximity/Ranging Sensor

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# Industry's smallest Time-of-Flight

VL53L0X

World's smallest ToF ranging sensor



## New Time-of-Flight (ToF) Ranging Sensor from STMicroelectronics Boosts Range and Speed, in Industry's Smallest Footprint

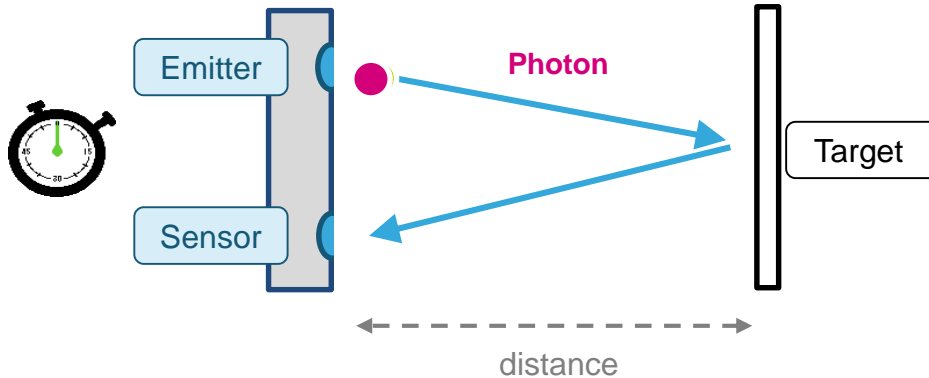


# FlightSense™ Breakthrough Technology

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Measurement at the speed of light !

## FlightSense™ Principle



Measured distance

=

Photon travel time / 2

x

Speed of light

1cm round-trip at 67ps

Fully Integrated Time of Flight Module

*ST #1 World Wide Supplier*

Direct distance measurement

*Independent of target size, color & reflectance*

Very fast (few ms)

Low power



# FlightSense™ Technology advantages

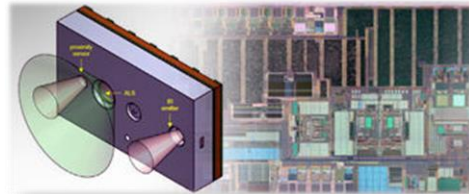


True Distance

INVISIBLE



Color independent



Fully integrated



Gesture capable



CLASS 1  
Laser product

Eye Safe



Texture independent

# FlightSense™ unlocks endless new applications...

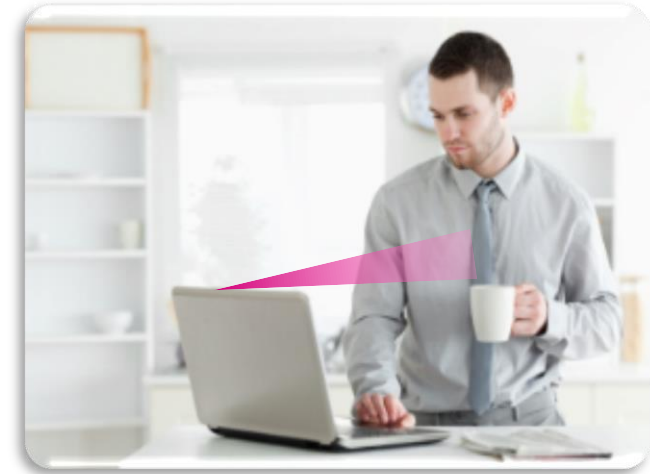


# User detection and AF assist

*Laptops & monitors*

Presence detection for screen power on / off:

- Complies with EU Regulation 801/2013 (Lot 26):  
Networked standby losses of energy
- Fast detection (<30ms)
- Independent of target reflectance and color
- Robust to ambient light and backlight



AF Assist in case of AF camera:

- ToF can provide “instant focus”
- Works in the dark
- Not influenced by low contrast target



# Gesture Recognition

## Multiple Gestures from a single FlightSense™ sensor

Single Tap



Press a virtual 'button' on top of the sensor, once

Double Tap



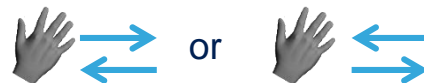
Press a virtual 'button' on top of the sensor, twice

Single Swipe



Slide hand left to right or from right to left over the sensor

Double Swipe



Slide hand from left to right and back to left or from right to left and back to right over the sensor



MASS  
PRODUCTION

## Highlights



- **Small package**
  - OLGA 4.8 x 2.8 x 1mm
- **Robust and accurate proximity detection**
- **Highly efficient ALS embedded**
- **Fully integrated**
  - Near-IR (850nm) VCSEL emitter
  - Filters
  - Receiver
  - Advanced  $\mu$ C
- **Low power**
- Field-of-View : 25°
- Laser Class1 device (eye safe)
- Independent of reflectance/color/texture
- Complete API package and **Android driver**

## Applications



### Reliable Proximity detection

- User detection to safely power off touch screen or control white goods
- Obstacle detection for robotics
- ...

### Ambient Light Sensing

Adjust the brightness of the display subject to the ambient light level detected





MASS  
PRODUCTION

## Highlights



- **World's smallest ToF sensor**
  - OLGA 4.4 x 2.4 x 1mm
- Range up to **2 meters in less than 30ms**
- **High accuracy** (up to +/- 3%)
- **Fast ranging time** (up to 50Hz)
- **Fully integrated**
  - Near-IR (940nm) VCSEL emitter
  - Filters
  - Receiver
  - Advanced  $\mu$ C
- **Low power**
- Field-of-View : 25°
- Laser Class1 device (eye safe)
- Independent of reflectance/color/texture
- Complete API package and **Android driver**

## Applications

### Laser AF

WW #1 supplier, with  
Focus in 1 frame

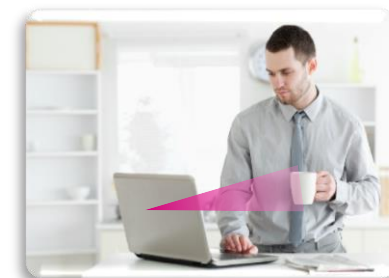


### Drones

Take-off and landing  
phase assistance.  
Ceiling detection

### User detection & Smart interaction

Power saving, zoom,  
user detection and  
counting, ...



# VL53L0X NUCLEO expansion board



**Arduino Connectors**

**4-digit display**



**PC GUI interface**

**VL53L0X**  
Ranging sensor

**2x VL53L0X satellites**  
(plugged or hardwired)

**Cover Glass sample**  
(PMMA material. Low XTalk)

**Cover Glass holder**  
(Can hold Cover Glass and spacers)

**Spacers**  
3 spacers 0.25/0.5/1mm to create various air gaps below CG

# VL53L0X Quick Start

A color code is used in the document for each component of the eco-system

## Documentation



VL53L0X GUI  
User Manual - Embedded

X-CUBE-53L0A1 (STM32Cube)  
User Manual – UM2046

X-NUCLEO-53L0A1 (HW)  
User Manual – UM2047



### VL53L0X Eval GUI - STSW-IMG006

Get ranging live curves on your PC  
Change key settings of the device  
Data logging capabilities

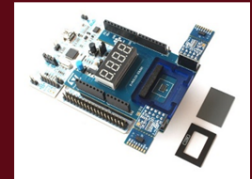
STSW-LINK009

STSW-LINK007



### X-CUBE-53L0A1 package

Full integration in STM32 MCU (real-time)  
All source code provided  
Full access to product settings  
Data logging capabilities  
Ranging and Gesture detection demo



### Hardware

P-NUCLEO-53L0A1  
X-NUCLEO-53L0A1

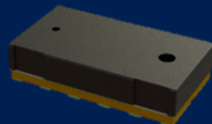
VL53L0X API User Manual - UM2039



### VL53L0X C API package – STSW-IMG005

Discover API Source code

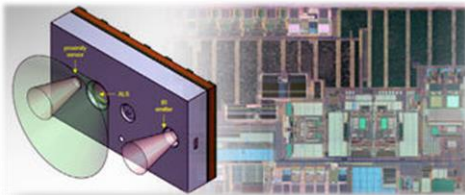
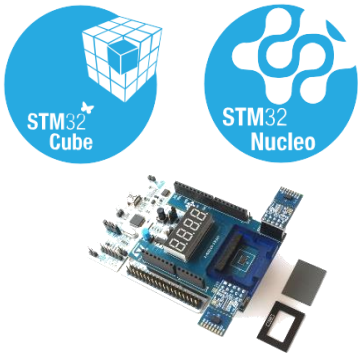
VL53L0X Datasheet – DS11555  
VL53L0X Quick Start Guide  
Applications Notes



VL53L0X : Miniature ToF Ranging & Gesture Sensor

# FlightSense™ Technology Summary

INVISIBLE



Eye Safe

Thank you

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