

# OSTSen-53L1X User Guide



**Ver 1.0**

**Hara Systems Inc.**

## 1. OSTSen-53L1X Overview

OSTSen-53L1X is an enhanced Time-of-Flight(ToF) module, which is based on STMicroelectronics VL53L1X. The VL53L1X is a state-of-art, Time-of-Flight, laser-ranging sensor, enhancing the ST FlightSense product family. It is the fastest miniature ToF sensor on the market with accurate ranging up to 4m and fast ranging frequency up to 50Hz.

Housed in miniature and reflowable package, it integrates a SPAD receiving array, a 940nm invisible Class 1 laser emitter, physical infrared filters, and optics to achieve the best ranging performance in various ambient lighting conditions with a range of cover window options

Unlike conventional IR sensors, the VL53L1X uses ST's latest generation ToF technology which allows absolute distance measurement whatever the target color and reflectance. It is also possible to program the size of the ROI on the receiving array, allowing the sensor FoV to be reduced.

## 2. Application

- User detection (autonomous low-power mode) to power on/off and lock/unlock devices like personal computers/laptops and the IOT
- Service robots and vacuum cleaners (long distance and fast distance detection)
- Drones (landing assistance, hovering, ceiling detection)
- Smart shelves and vending machines (goods inventory monitoring)
- Sanitary (robust user detection whatever the target reflectance)
- Smart building and smart lighting (people detection, gesture control)
- 1D gesture recognition
- Laser assisted autofocus which enhances the camera autofocus system speed and robustness, especially in difficult scenes (low light and low contrast) and video focus tracking assistance

## 3. Features

### 3.1 Fully integrated miniature module

- Size : 4.9 x 2.5 x 1.56 mm
- SPAD (single photon avalanche diode) receiving array with integrated lens
- Low-power microcontroller running advanced digital firmware

### 3.2 Pin-to-pin compatible with the VL53L0X

### 3.3 Fast and accurate long distance ranging

- Up to 400cm distance measurement
- Up to 50Hz ranging frequency

### 3.4 Typical full field-of-view(FoV) : 27°

### 3.5 Programmable region-of-interest(ROI) size on the receiving array, allowing the sensor FoV to be reduced

### 3.6 Programmable ROI position on the receiving array, providing multizone operation control from the host

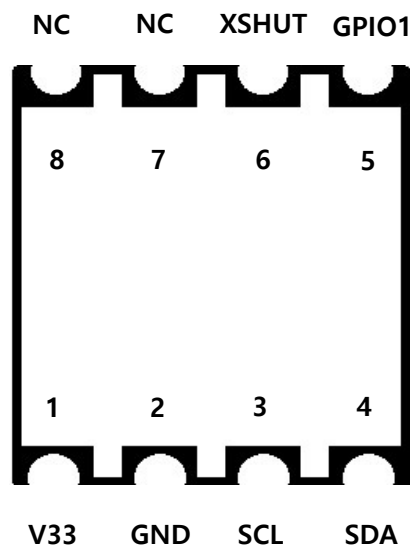
### 3.7 Easy integration

- Single reflowable component
- Can be hidden behind many cover window materials
- Software driver and code examples for turkey ranging
- Single power supply (2v8)
- I2C interface (up to 1 MHz)
- Shutdown and interrupt pins

## 4. Application Information

### 4.1 Module Pin Out and Signal Description

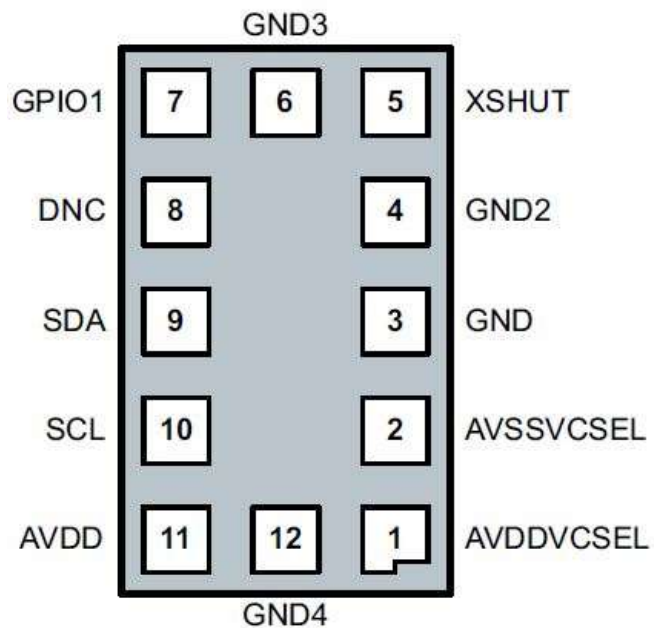
Pin Number	Pin Name	Pin Description
1	V33	Power supply voltage (2.6V ~ 3.5V)
2	GND	Power supply ground
3	SCL	I2C serial clock (SCL) Device address : 0x52
4	SDA	I2C serial data (SDA)
5	GPIO1	Interrupt output. Open drain output
6	XSHUT	Xshtutdown pin, Active LOW
7, 8	NC	Not Connect



< Top View >

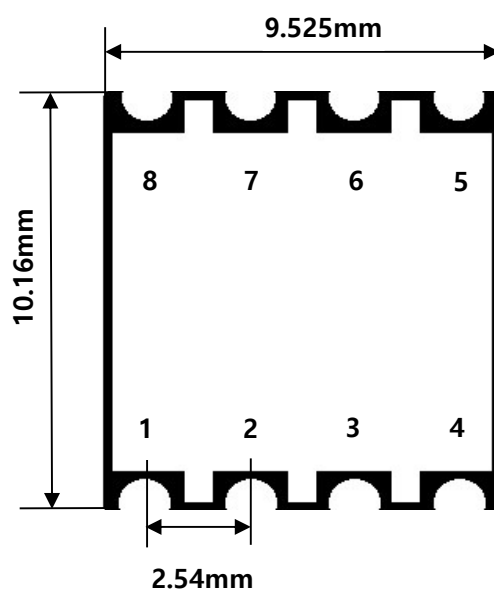
## 4.2 VL53L1X Pin out and Signal Description

Pin Number	Pin Name	Pin Description
1	AVDDVCSEL	VCSEL supply, to be connected to main supply
2	AVSSCSEL	VCSEL Ground, to be connected to main ground
3	GND	To be connected to main ground
4	GND2	To be connected to main ground
5	XSHUT	Xshutdown pin, Active LOW
6	GND3	To be connected to main ground
7	GPIO1	Interrupt output, Open drain output
8	DNC	Do Not Connect, must be left floating
9	SDA	I2C serial data
10	SCL	I2C serial clock
11	AVDD	Supply, to be connected to main supply
12	GND4	To be connected to main ground



**VL53L1X pinout (bottom view)**

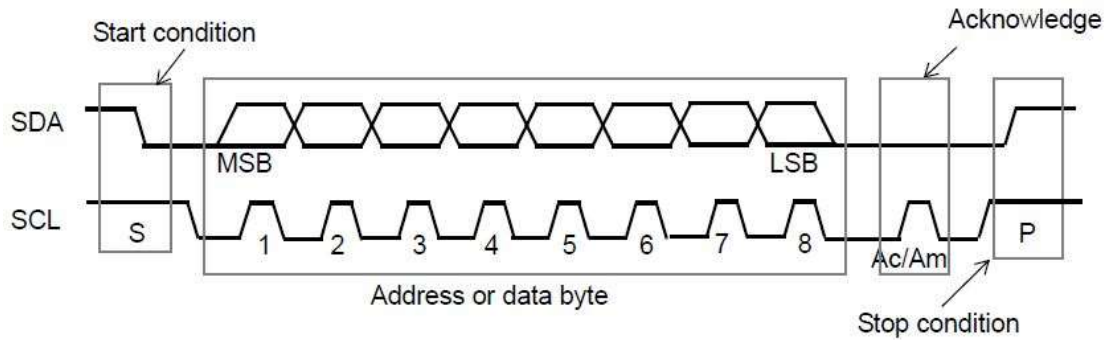
## 5. Module Dimension



< OSTSen-53L1X module >

## 6. I2C Communications

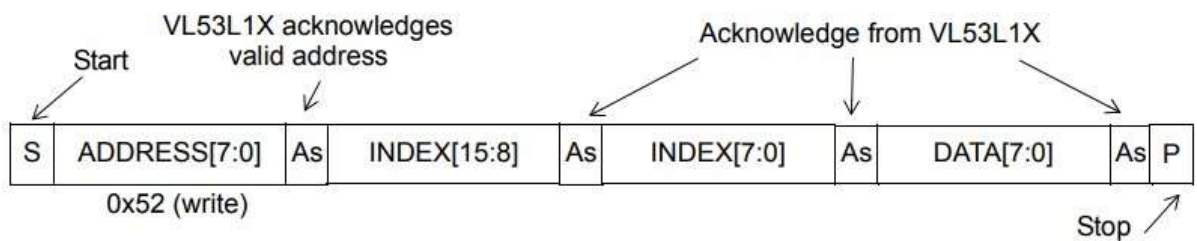
### Data transfer protocol



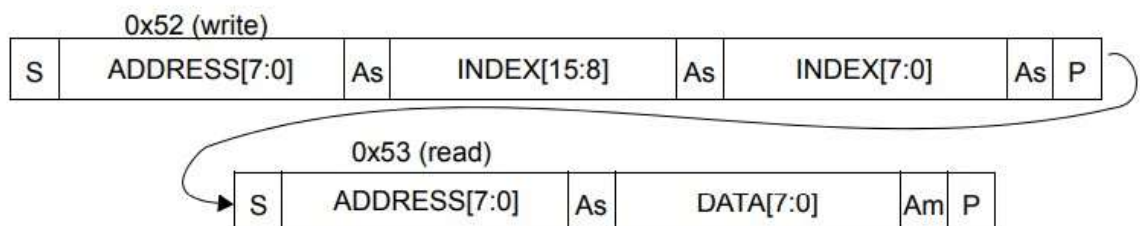
**VL53L1X I2C device address : 0x52**

MSBit							LSBit
0	1	0	1	0	0	1	R/W

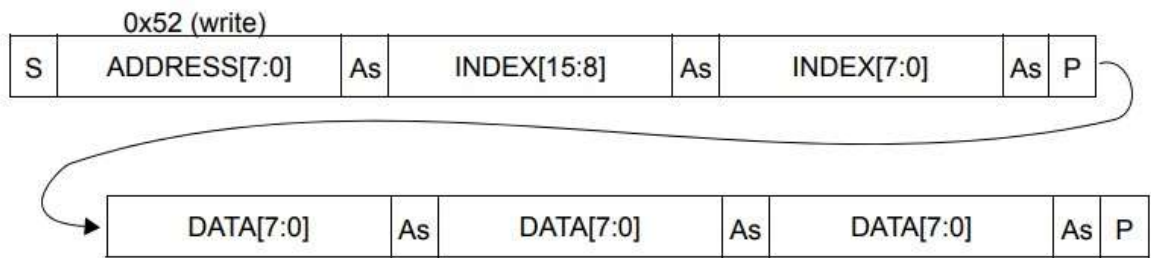
### VL53L1X data format (write)



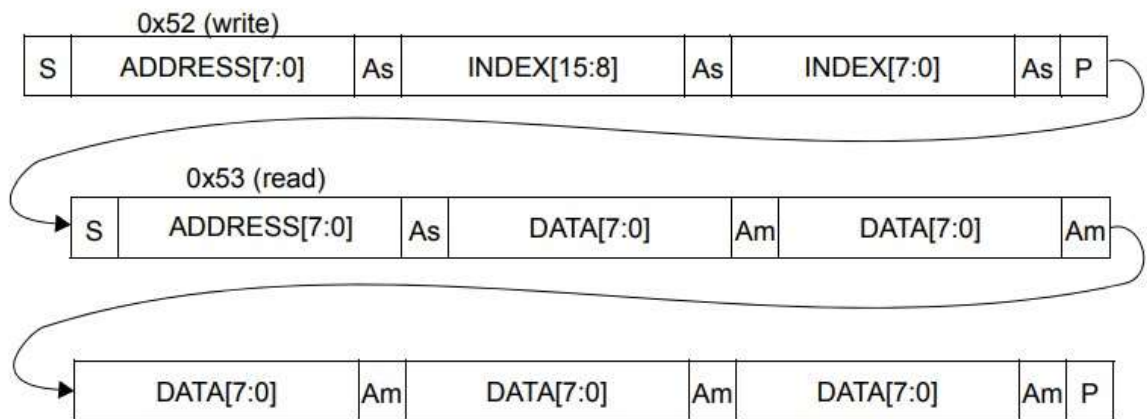
### VL53L1X data format (read)



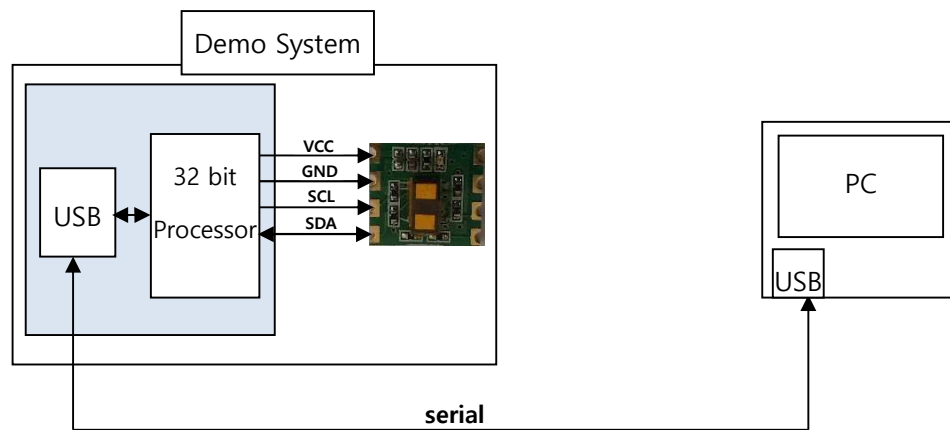
### VL53L1X data format (sequential write)



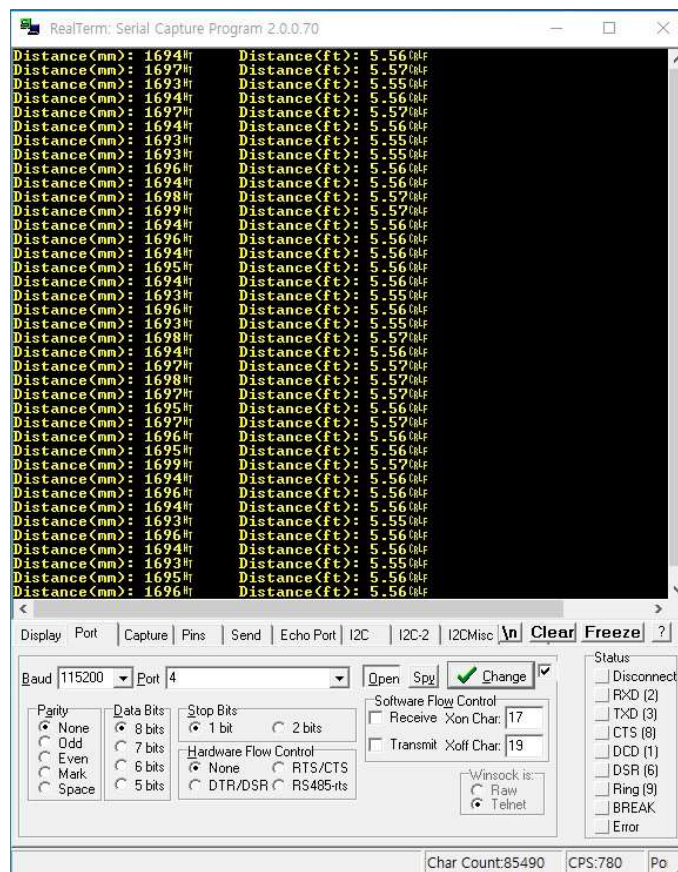
### VL53L1X data format (sequential read)



## 7. Demo System



### OSTSen-53L1X Data Display on PC





## 8. Reference

- 1) <https://www.st.com/en/imaging-and-photonics-solutions/vl53l1x.html>
  - 2) [https://www.st.com/content/st\\_com/en/products/embedded-software/proximity-sensors-software/stsw-img010.html](https://www.st.com/content/st_com/en/products/embedded-software/proximity-sensors-software/stsw-img010.html)
  - 3) <https://github.com/pololu/vl53l1x-arduino>
  - 4) [https://github.com/sparkfun/SparkFun\\_VL53L1X\\_Arduino\\_Library](https://github.com/sparkfun/SparkFun_VL53L1X_Arduino_Library)
- If you need more information or have some questions about OSTSen-53L1X, contact [ostsen@hanmail.net](mailto:ostsen@hanmail.net).