VL53L0X Distance Sensor User Manual

OVERVIEW

VL53L0X Distance Sensor is a Time-of-Flight (ToF) ranging module based on the VL53L0X from ST, with accurate ranging up to 2m, it is controlled through I2C interface, and pretty low power consumption.

The VL53L0X is a ToF sensor which embeds the ST’ s second generation FlightSense patented technology.

Unlike conventional ranging sensors, the VL53L0X is able to provide accurate distance measurement whatever the target color and reflectance, achieves better anti-interference capability.

FEATURES

- I2C communication interface, control the module on/off via IO pins
- Onboard voltage translator, compatible with 3.3V/5V operating voltage
- Comes with development resources and manual (examples for Raspberry Pi/Arduino/STM32)

SPECIFICATIONS

- Operating voltage: 3.3V/5V
- Dimension: 20mm × 24mm

- Mounting holes size: 2.0mm
- Ranging distance: 30 ~ 2000mm
- Ranging accuracy: ±5% (high speed mode), ±3% (high accuracy mode)
- Ranging time (min): 20ms (high speed mode), 200ms (high accuracy mode)
- Field of view: 25°
- Laser wavelength: 940nm
- Operating temperature: -20 ~ 70°C

PINOUTS

VCC: 3.3V/5V power input

GND: ground

SDA: I2C data pin

SCL: I2C clock pin

SHUT: shutdown control, connects to IO pin

INT: interrupt output, connects to IO pin

HARDWARE

VL53L0X

VL53L0X Time-of-Flight (ToF) ranging sensor is ST’ s second generation laser-ranging module housed in the smallest package on the market today. The VL53L0X is a fully integrated miniature module which integrates embedded infrared ranging sensor, VCSEL (Vertical Cavity Surface-Emitting Laser), couples with internal physical infrared filters and a leading-edge SPAD array (Single Photon Avalanche Diodes). The VL53L0x embeds ST’ s second generation FightSense™ patented technology, has longer ranging distance, higher rate and accuracy, opening the door to various new application

VL53L0X can measure absolute distances up to 2m t whatever the target reflectances unlike conventional technologies. It’ s ultra-Low designs supports for wireless and IOT application.

Features:

- Fully integrated miniature module
  - 940 nm laser VCSEL
  - VCSEL driver
  - Ranging sensor with advanced embedded micro controller
  - 4.4 x 2.4 x 1.0 mm
- Fast, accurate distance ranging
  - Measures absolute range up to 2 m

– Reported range is independent of the target reflectance

– Advanced embedded optical cross-talk compensation to simplify cover glass selection

- Eye safe

– Class 1 laser device compliant with latest standard IEC 60825-1:2014 - 3rd edition

- Easy integration

– Single reflowable component

– No additional optics

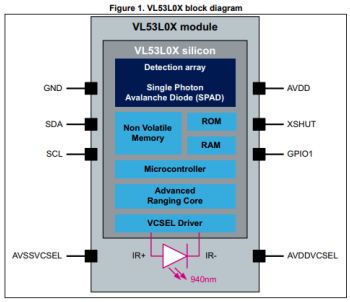
– Single power supply

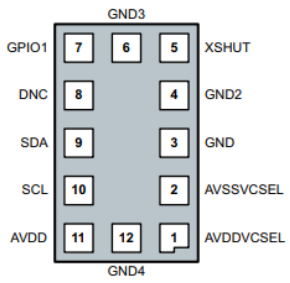
– I2C interface for device control and data transfer

– Xshutdown (reset) and interrupt GPIO

– Programmable I2C address

Pictures:





For more details, please read the datasheet

USING WITH DEMO CODES

WORKING WITH RASPBERRY PI

The demo code is based on open-source project on github:

https://github.com/cassou/VL53L0X_rasp

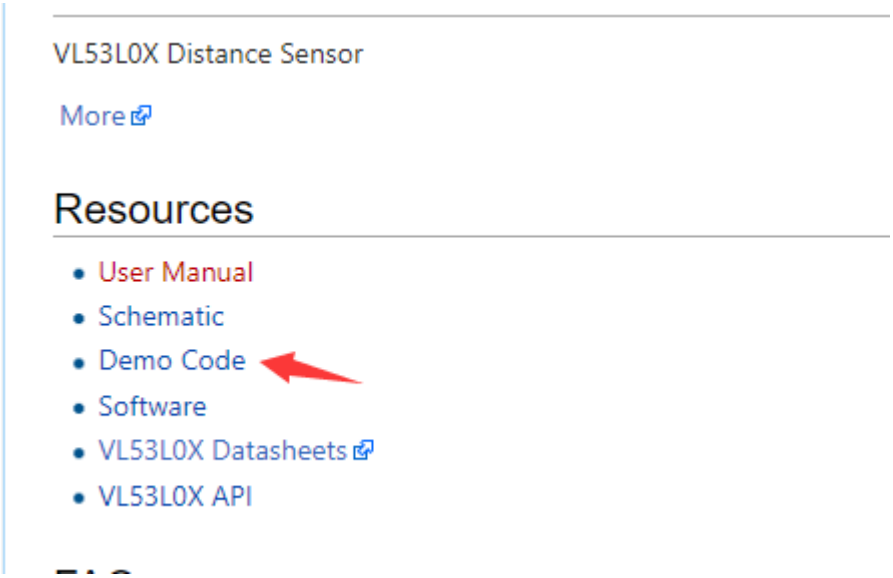
HARDWARE CONNECTION

The connection is based on Raspberry Pi 3 Mode B+

VL53L0X Distance Sensor	Raspberry Pi
VCC	3.3V
GND	GND
SDA	SDA.1
SCL	SCL.1

COMPILING AND RUNGING

1. Download demo code from Wiki

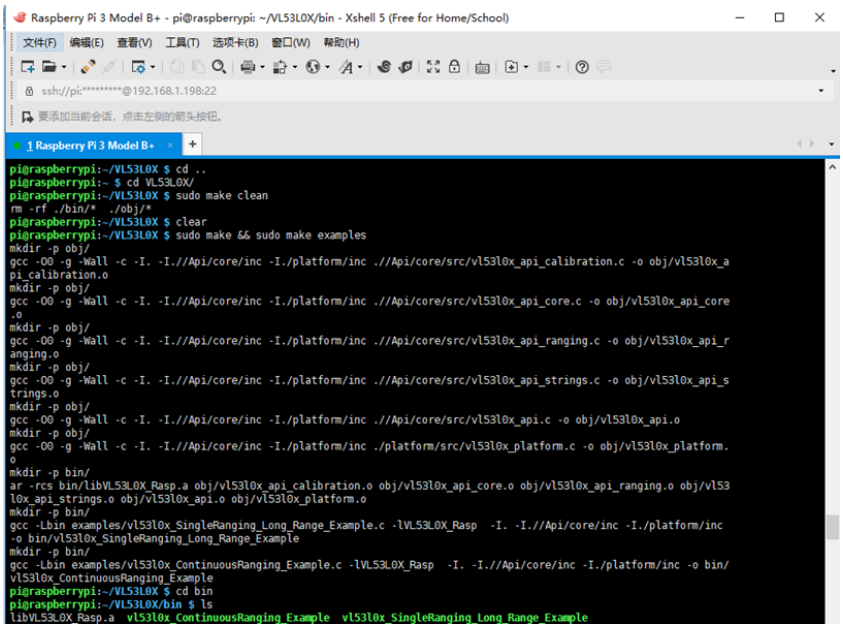


2. Unzip and copy the code of Raspberry Pi to your Pi (Recommend put on /home/pi/)

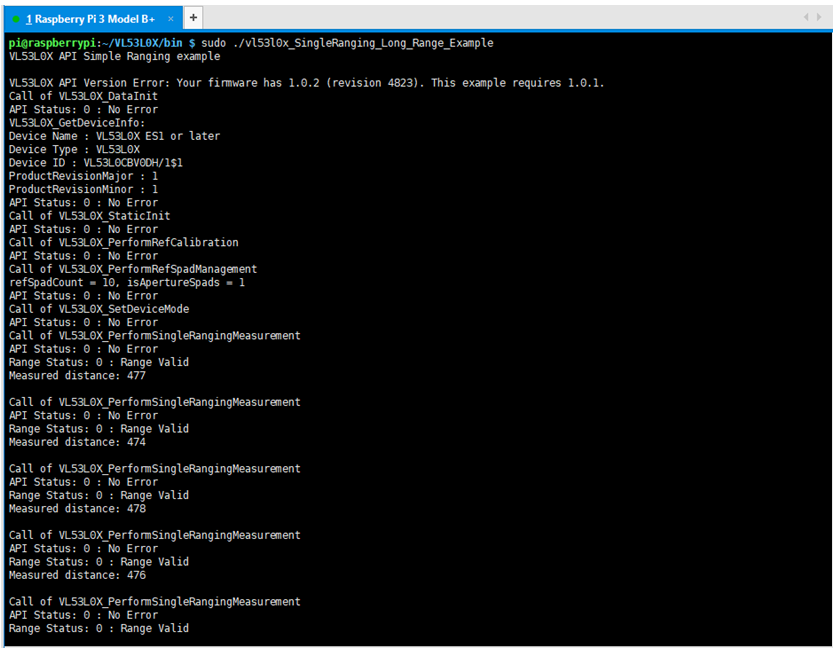
3. Enter the path of the demo code on Terminal and run this compiling command

   sudo make clean && sudo make && sudo make examples

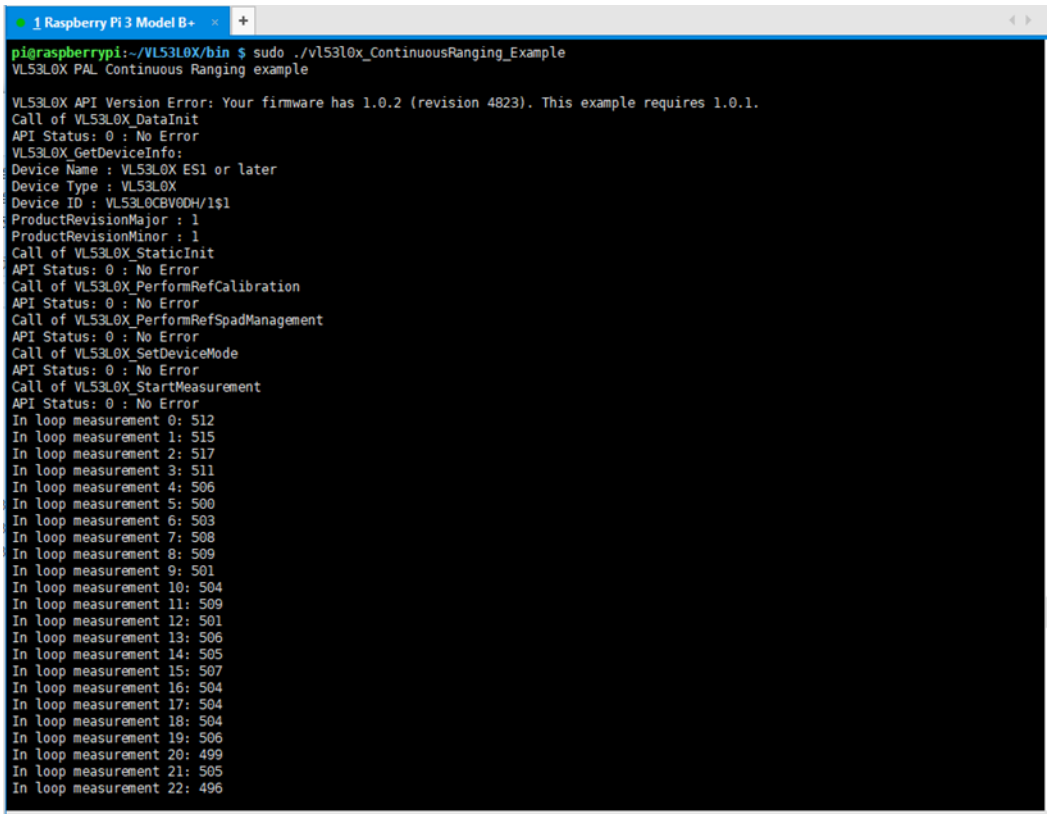
4. After compiling, enter bin folder and list the files as below:



5. Execute command to run the code *vl53l0x_SingleRanging_Long_Range_Example*:



6. Execute the command to run code *vl53l0x_ContinuousRanging_Example*:



WORKING WITH ARDUINO

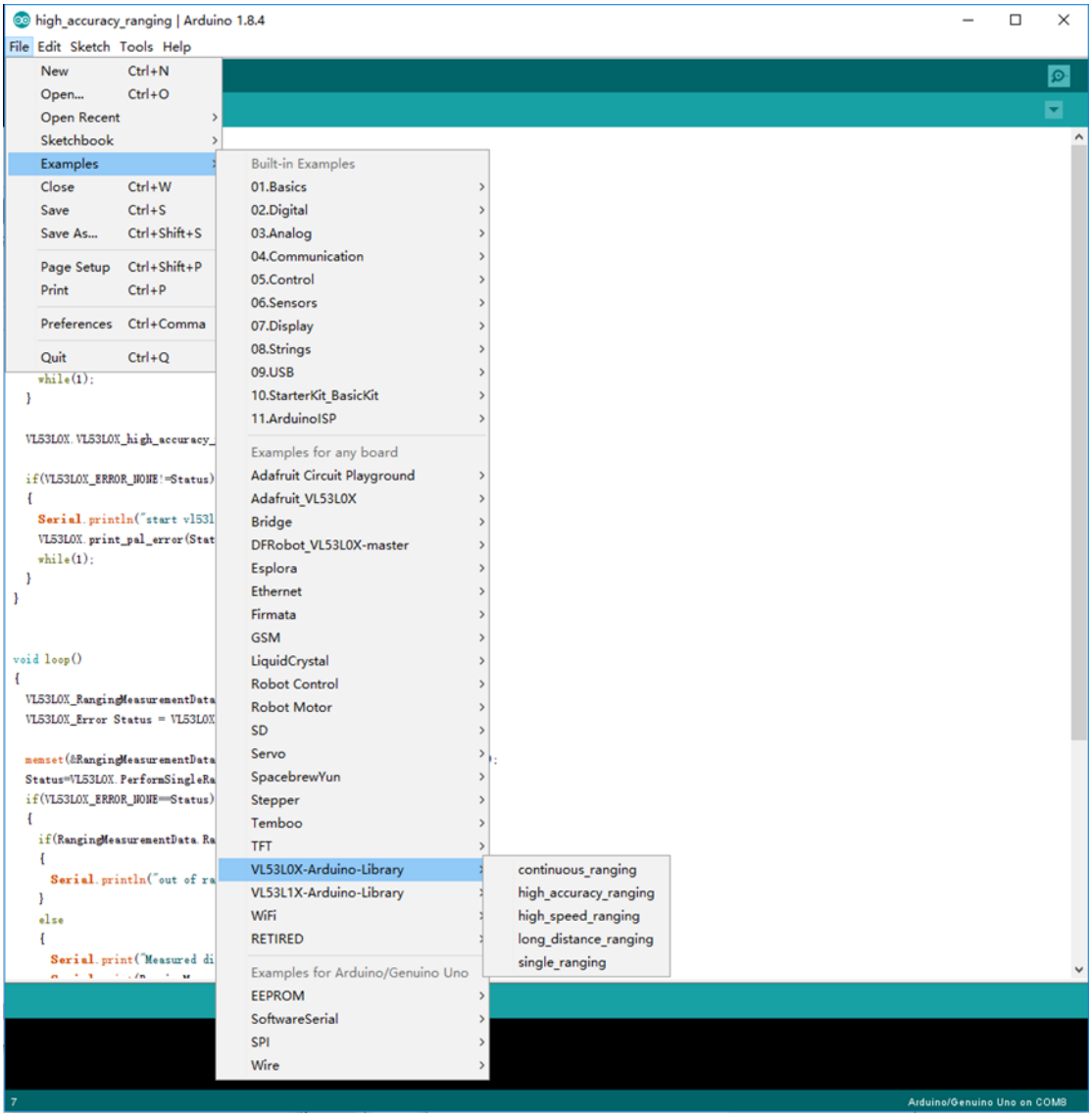
HARDWARE CONNECTION

The connection is based on Waveshare UNO PLUS

VL53L0X Distance Sensor	Arduino
VCC	3.3V
GND	GND
SDA	SDA
SCL	SCL

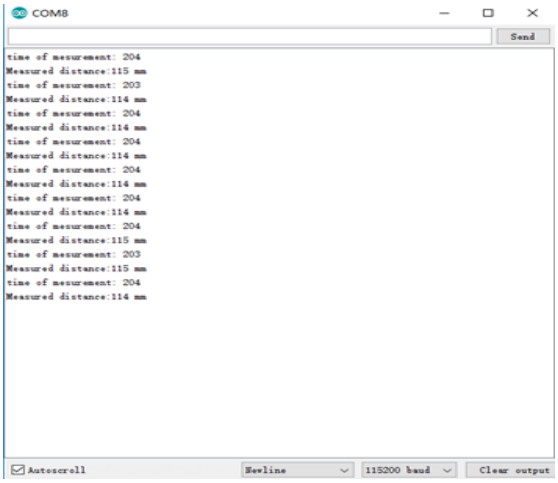
RUNING

Copy the VL53L0X-Arduino-Library folder which is under Arduino demo code directory to Arduino IDE’ s Libraries directory which is under the installation directory of your IDE. Then Open Arduino IDE, and choose File->Examples-> VL53L0X-Arduino-Library

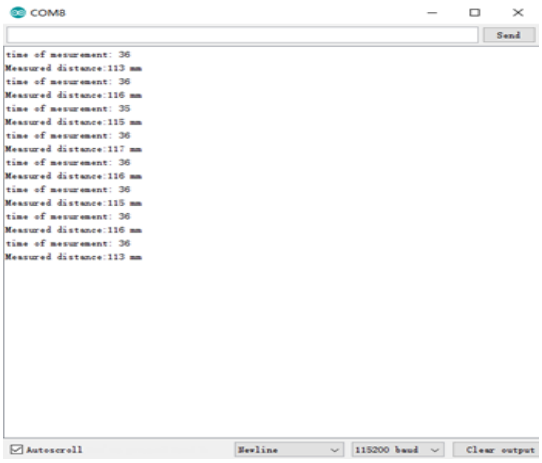


Compiling and run 5 examples for test as below:

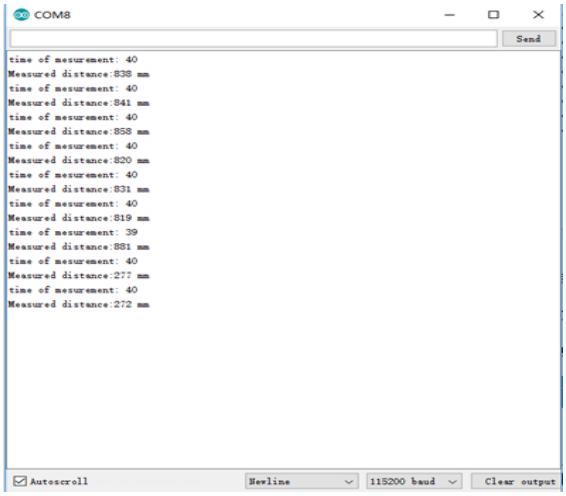
1. high_accuracy_ranging: High accuracy ranging which will cost more times



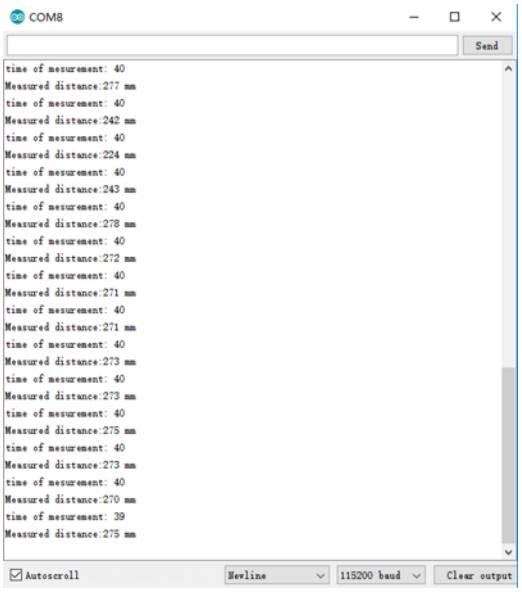
2. high_speed_ranging: Fast ranging, cost less time and low accuracy



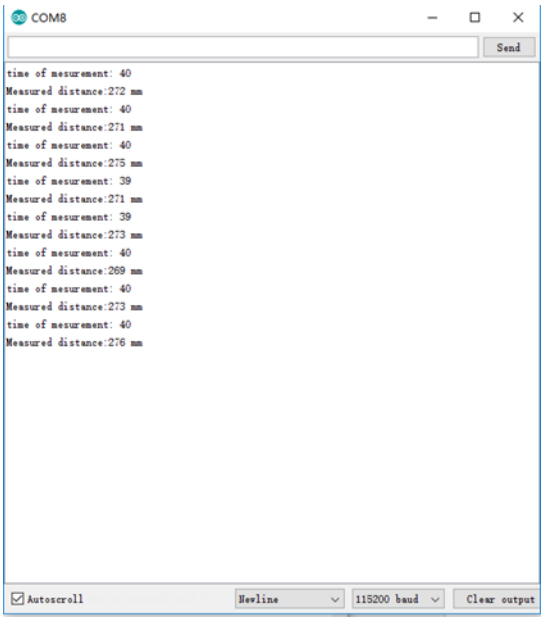
3. long_distance_ranging: Long distance ranging, with bigger measure rang



4. single_ranging: Single ranging mode



5. continuous_ranging: Continuous ranging mode



For more information about different ranging modes, please read VL53L0X API

WORKING WITH STM32

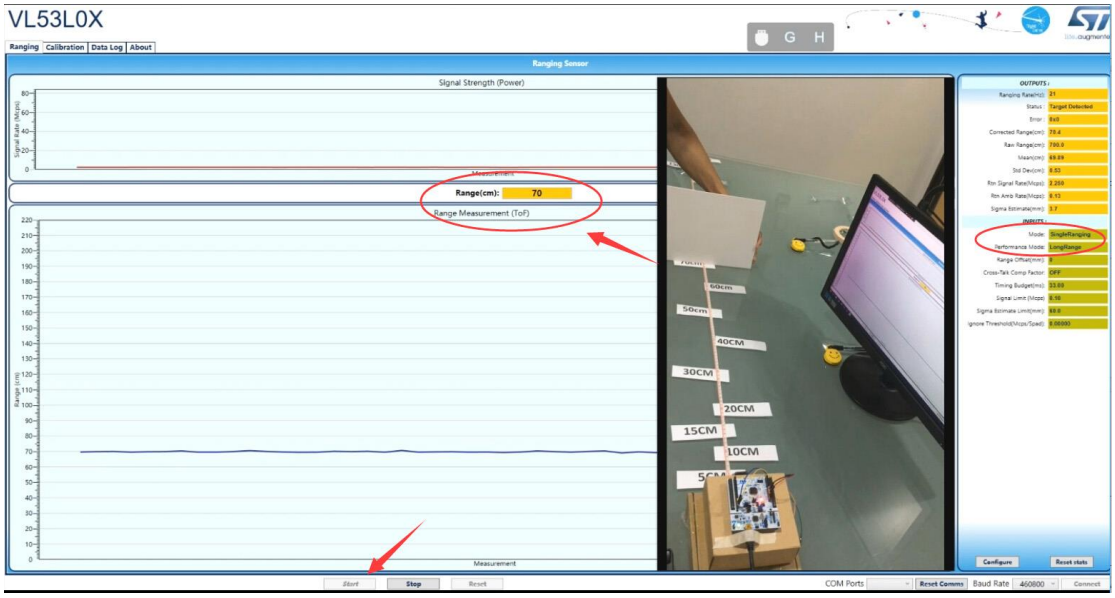
HARDWARE CONNECTION

This connection is based on XNUCLEO-F411RE/ NUCLEO-F401RE:

VL53L0X Distance Sensor	XNUCLEO-F411RE/NUCLEO-F401RE
VCC	3.3V
GND	GND
SDA	SDA
SCL	SCL

RUNNING VL53L0X_GUI

1. Connecting sensor to NUCLEO-F401RE board as Hardware connection above
2. Install ST’ s VL53L0X_GUI software and run it. The software will write the test firmware to NUCLEO board automatically. (**Note: for this example, you need to use the NUCLEO-F401RE development board, and it is not an open-source code**)
3. Switch to Low-Power Automous, Distance Mode choose Short, then click Start. Distance curve will be showed on the software



For more information about STM32 examples VL53L0X, please visit ST website.