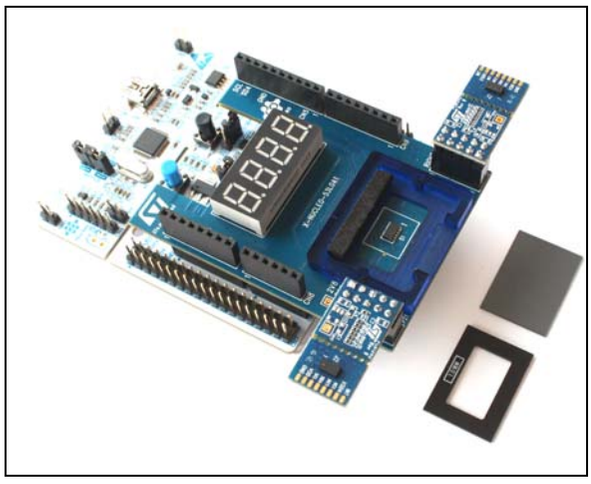
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P-NUCLEO-53L0A1

VL53L0X Nucleo pack with ranging, gesture detection sensor expansion board and STM32F401RE

Data brief



Features

- VL53L0X ranging and gesture detection expansion board (X-NUCLEO-53L0A1).
  - 4-digit display, displaying the distance of a target from the ranging sensor
  - Accurate absolute ranging distance, independent of the reflectance of the target.
- NUCLEO-F401RE STM32 Nucleo board
- Two VL53L0X satellites
- 0.25, 0.5 and 1mm height spacers to simulate air gaps
- Cover glass
- Two 10 pin connectors for VL53L0X satellite boards
- Equipped with Arduino UNO R3 connector.
- RoHS compliant.
- Basic gesture recognition application can be developed using one or two VL53L0X sensors.
- Two VL53L0X satellite boards can be connected on the X-NUCLEO-53L0A1 expansion board in order to integrate the VL53L0X in customer's application.
- Full system SW supplied, download from *www.st.com/VL53L0X* in the folder "Design resources".

Description

The P-NUCLEO-53L0A1 is an evaluation pack that provides an introduction to the ranging and gesture detection features of the VL53L0X sensor, combined with the powerful STM32F401RE microcontroller.

The VL53L0X is the latest product based on ST's patented FlightSense™ technology. This is a ground-breaking technology allowing absolute distance to be measured independent of target reflectance. Instead of estimating the distance by measuring the amount of light reflected back from the object (which is significantly influenced by color and surface), the VL53L0X precisely measures the time the light takes to travel to the nearest object and reflect back to the sensor (Time-of-Flight).

The STM32 Nucleo board, NUCLEO-F401RE, provides an affordable and flexible way for users to try out new ideas and build prototypes with any STM32 microcontroller line, choosing from the various combinations of performance, power consumption and features.



For further information contact your local STMicroelectronics sales office. www.st.com

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Ordering information

Table 1. Ordering code

Order code	Description
P-NUCLEO-53L0A1	X-NUCLEO-53L0A1 and NUCLEO-F401RE boards

NUCLEO-F401RE board

Information about NUCLEO-F401RE board can be found at http://www.st.com/stm32nucleo.

X-NUCLEO-53L0A1 expansion board

The board allows the user to test the VL53L0X functionality, to program it and to help understand how to develop an application using VL53L0X. It integrates:

- a 4-Digit display to display the range value in cm.
- a 2.8V regulator to supply the VL53L0X on the expansion board and on the two satellite boards.
- two level shifters to adapt the I/O level to the micro controller main board.
- the necessary connectivity for the application.

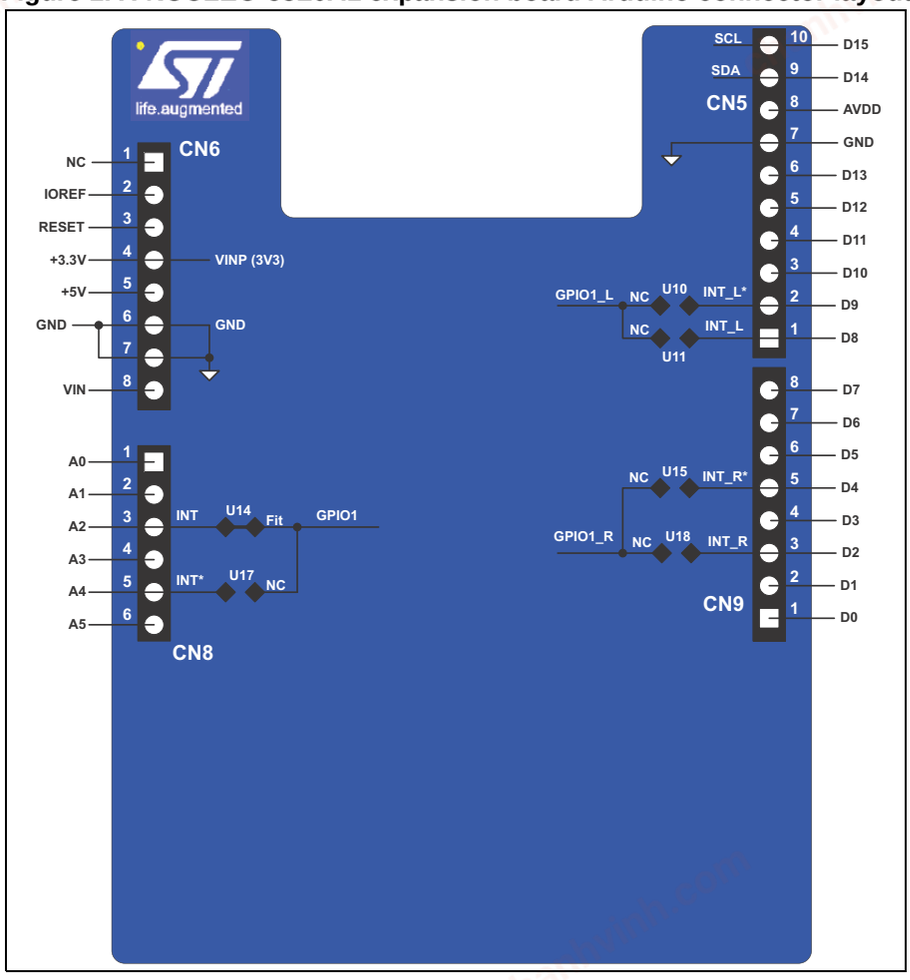
It is required to program the NUCLEO-F401RE board in order to control the X-NUCLEO-53L0A1 expansion board. For the NUCLEO-F401RE board, the required software suite is available on *www.st.com,* on the P-NUCLEO-53L0A1 page, and is composed of STSW-LINK009, STSW-LINK7 and X-CUBE-53L0A1.

The X-NUCLEO-53L0A1 expansion board and the NUCLEO-F401RE board are connected through Arduino compatible connectors CN5, CN6, CN8 and CN9 as shown in *Figure 1* and described in *Table 2* and *Table 3*.

The Arduino connectors on NUCLEO-F401RE board support Arduino Uno Revision 3.

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Figure 1. X-NUCLEO-53L0A1 expansion board Arduino connector layout



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Table 2. Arduino left connector on NUCLEO-F401RE board

CN Nb	VL53L0X board	Pin Nb	Pin name	MCU pin	X-NUCLEO-53L0A1 expansion board function
CN6 Power		1	NC	NC	
		2	NC	IOREF	Not used
		3	NC	RESET	Not used
	Power	4	+3V3	+3V3	3.3V supply
		5	NC	+5V	Not used
	Gnd	6	Gnd	Gnd	Gnd
	Gnd	7	Gnd	Gnd	Gnd
		8	NC	VIN	Not used
CN8 Analog		1	NC	PA0	Not used
		2	NC	PA1	Not used
	GPIO1	3	INT	PA4	Interrupt signal from VL53L0X on board soldered device
		4	NC	PB0	Not used
	GPIO1	5	INT*	PC1(1)	By default not used Interrupt signal from VL53L0X on board soldered device
		6	NC	PC0	Not used

1. Depends on STM32 Nucleo board solder bridges, see details on Nucleo documentation. These interrupt signals are duplicated, but not used. This offers hardware connection flexibility in case of conflict on MCU interface management when expansion board is used superposed with other expansion boards. In this case remove solder drop from the used interrupt and instead fit the solder drop in “N.C”.

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Table 3. Arduino right connector on NUCLEO-F401RE board

CN Nb	VL53L0X board	Pin Nb	Pin name	MCU pin	X-NUCLEO-53L0A1 expansion board function
CN5 Digital	SCL	10	D15	PB8	I2C1_SCL
	SDA	9	D14	PB9	I2C1_SDA
		8	NC	AVDD	Not used
	Gnd	7	Gnd	Gnd	Gnd
		6	INT_L	PA5	Not used
		5	NC	PA6	Not used
		4	NC	PA7	Not used
		3	NC	PB6	Not used
	GPIO1_L	2	INT_L*	PC7	By default not used Interrupt signal from optional VL53L0X left satellite board(1)
	GPIO1_L	1	INT_L	PA9	By default not used Interrupt signal from optional VL53L0X left satellite board(1)
CN9 Digital		8	NC	PA8	Not used
		7	NC	PB10	Not used
		6	NC	PB4	Not used
	GPIO1_R	5	INT_R*	PB5	By default not used Interrupt signal from optional VL53L0X right satellite board(1)
		4	NC	PB3	Not used
	GPIO1_R	3	INT_R	PA10	By default not used Interrupt signal from optional VL53L0X right satellite board(1)
		2	NC	PA2	Not used
		1	NC	PA3	Not used

1. These interrupt signals are duplicated, but not used by default, this offers hardware connection of the satellite board VL53L0X interrupt signals and flexibility in case of conflict on MCU interface management when expansion board is used superposed with other expansion boards. In this case select, through a solder drop, the MCU port which is free.

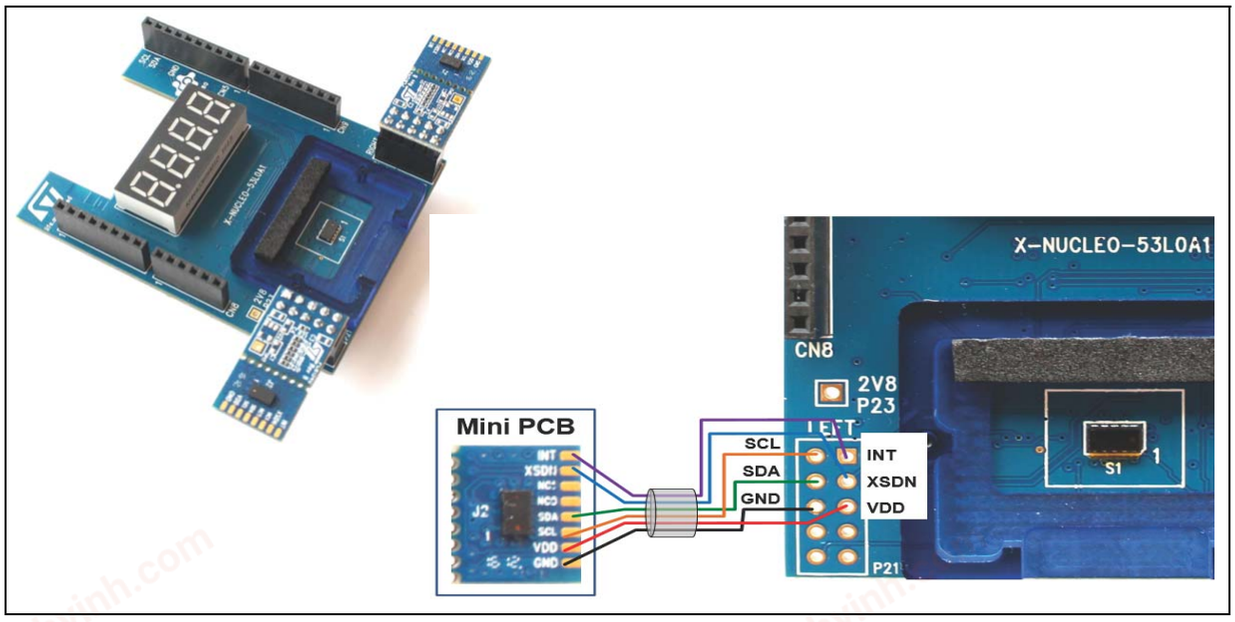
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Optional VL53L0X satellite board

The VL53L0X satellites can be directly plugged onto the X-NUCLEO-53L0A1 expansion board through the two 10 pin connectors or connected to the board through flying leads.

When connected through flying leads, developers should break off the mini PCB from the satellite board, and use only the “VL53L0X mini PCB” which benefits from a smaller form factor for easier integration into customers devices.

Figure 2. Connections of VL53L0X satellite boards



Laser consideration

The VL53L0X contains a laser emitter and corresponding drive circuitry. The laser output is designed to remain within Class 1 laser safety limits under all reasonably foreseeable conditions including single faults in compliance with IEC 60825-1:2014 (third edition). The laser output will remain within Class 1 limits as long as the STMicroelectronics recommended device settings are used and the operating conditions specified in the datasheet are respected. The laser output power must not be increased by any means and no optics should be used with the intention of focusing the laser beam.

Figure 3. Class 1 laser product label



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In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Revision history

Table 4. Document revision history

Date	Revision	Changes
02-May-2016	1	Initial release.

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