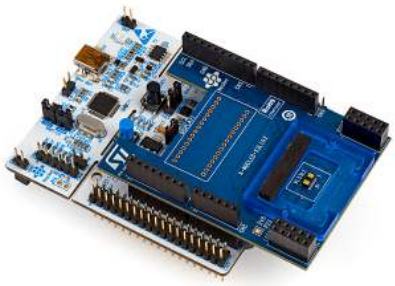
P-NUCLEO-53L1A2

Data brief

VL53L1 nucleo pack with X-NUCLEO-53L1A2 expansion board and STM32F401RE nucleo board



Features

- X-NUCLEO-53L1A2 expansion board including the VL53L1 ToF (Time-of-Flight) ranging sensor with multi object detection and FoV (field of view) programming
- STM32F401RE nucleo board
- Two VL53L1 breakout boards
- 0.25, 0.5 and 1 mm spacers to simulate air gaps between ToF sensor and cover window
- Two different cover windows
- Equipped with an Arduino UNO R3 connector
- RoHS compliant
- The two VL53L1 breakout boards can be connected onto the X-NUCLEO-53L1A2 expansion board to integrate the VL53L1 into the customer's application
- Full system SW (software) is supplied, including code examples and graphical user interface. All this can be downloaded on the product page on st.com.

Description

The P-NUCLEO-53L1A2 is a complete evaluation kit which allows anyone to learn, evaluate, and develop their application using the VL53L1 ToF, ranging sensor with multi object detection and FoV programming.

The VL53L1 is a state-of-the-art, ToF, laser-ranging, miniature sensor enhancing STMicroelectronic's FlightSense product family. Housed in a miniature and reflowable package, it integrates a SPAD (single photon avalanche diode) array, physical infrared filters, and optics to achieve the best ranging performance in various ambient lighting conditions, with a wide range of cover windows.

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

Order code	Description
P-NUCLEO-53L1A2	X-NUCLEO-53L1A2 and NUCLEO-F401RE boards

1 Board descriptions

1.1 NUCLEO-F401RE board

Information about the NUCLEO-F401RE board can be found on www.st.com.

1.2 X-NUCLEO-53L1A2 expansion board

The X-NUCLEO-53L1A2 expansion board allows the user to test the VL53L1 functionality and to program it, which helps understand how to develop an application using the VL53L1. It integrates:

- a 2.8 V regulator to supply the VL53L1 on the expansion board and two breakout boards
- two level shifters to adapt the I/O level to the main board of the microcontroller
- the necessary connectivity for the application

The NUCLEO-F401RE board has to be programmed to control the X-NUCLEO-53L1A2 expansion board. The required software suite is available on the product page on st.com and is composed of the X-CUBE-53L1A2.

The X-NUCLEO-53L1A2 expansion board and the NUCLEO-F401RE board are connected through four Arduino compatible connectors: CN5, CN6, CN8, and CN9 (see the figure and tables below).

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

Figure 1. Arduino connector layout on the X-NUCLEO-53L1A2 expansion board

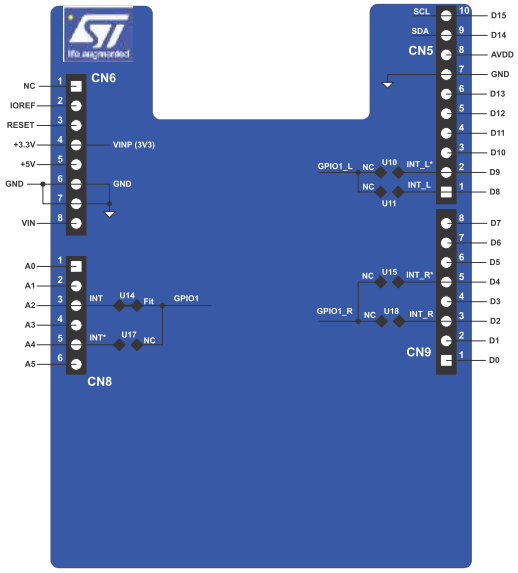


Table 1. Left connector of the Arduino on the NUCLEO-F401RE board

CN number	VL53L1 expansion board	Pin number	Pin name	MCU pin	X-NUCLEO-53L1A2 expansion board function
CN6 power		1	NC	NC	
		2		IOREF	Not used
		3		RESET	
	Power	4	3V3	3V3	3.3 V supply
		5	NC	5V	Not used
	Gnd	6	Gnd	Gnd	Gnd
		7			
		8	NC	VIN	Not used
CN8 analog		1	NC	PA0	Not used
		2		PA1	
	GPIO1	3	INT	PA4	Interrupt signal from VL53L1 on-board soldered device
		4	NC	PB0	Not used
	GPIO1	5	INT*	PC1	By default unused interrupt signal from VL53L1 on-board soldered device
		6	NC	PC0	Not used

1. *Depends on the STM32 nucleo board solder bridges (see details in the nucleo documentation). These interrupt signals are duplicated, but not used, which offers the hardware connection flexibility in case of a conflict on the MCU interface when the expansion board is used superposed with other expansion boards. In such cases, remove the solder drop from the unused interrupt and instead fit the solder drop to NC.*

Table 2. Right connector of the Arduino on the NUCLEO-F401RE board

CN number	VL53L1 expansion board	Pin number	Pin name	MCU pin	X-NUCLEO-53L1A2 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	
		4		PA7	
		3		PB6	
	GPIO1_L	2	INT_L*	PC7	By default unused interrupt signal from optional VL53L1 left breakout board (1)
		1	INT_L	PA9	By default unused interrupt signal from optional VL53L1 left breakout board (1)
CN9 digital		8	NC	PA8	Not used
		7		PB10	
		6		PB4	
	GPIO1_R	5	INT_R*	PB5	By default unused interrupt signal from optional VL53L1 right breakout board (1)
		4	NC	PB3	Not used
	GPIO1_R	3	INT_R	PA10	By default unused interrupt signal from optional VL53L1 right breakout board (1)
		2	NC	PA2	Not used
		1		PA3	

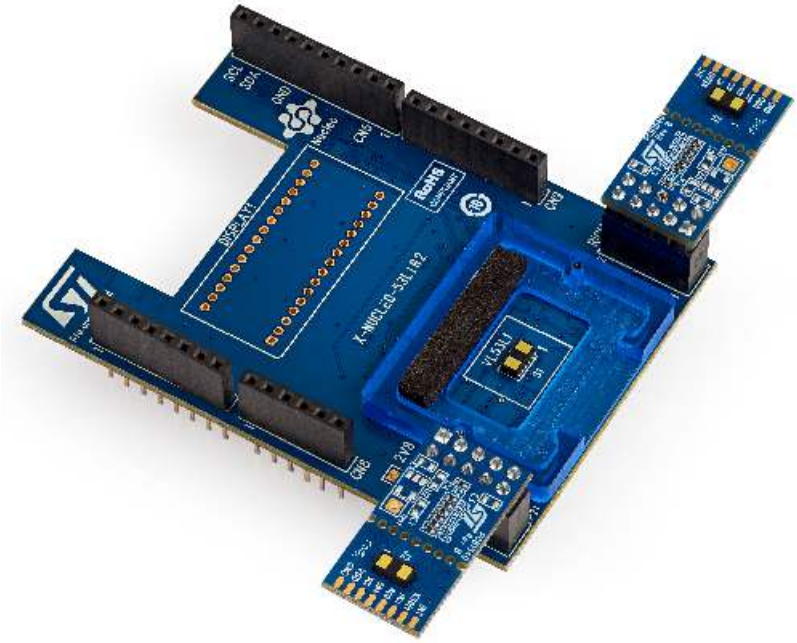
1. *These interrupt signals are duplicated, but not used by default, which offers a hardware connection to the breakout board VL53L1 interrupt signals and flexibility in case of a conflict on the MCU interface when the expansion board is used superposed with other expansion boards. In such cases, select, through a solder drop, the MCU port which is free.*

1.3 Optional VL53L1 breakout boards

The VL53L1 breakout boards can be directly plugged onto the X-NUCLEO-53L1A2 expansion board through two 10-pin connectors. Alternatively, they can be connected to the board through flying leads (see figure below).

When connected through flying leads, developers should break off the mini PCB from the breakout board and use only the “VL53L1 mini PCB” which is smaller and integrates more easily into the customer’s devices.

Figure 2. Connections of VL53L1 breakout boards



2 Laser considerations

The VL53L1 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 the IEC 60825-1:2014 (third edition). The laser output remains within Class 1 limits as long as STMicroelectronic's recommended device settings are used and the operating conditions specified in the datasheet are respected. The laser output power must not be increased and no optics should be used with the intention of focusing the laser beam.

Figure 3. Class 1 laser product label

3 Package information

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 3. **Document revision history**

Date	Version	Changes
02-Jul-2020	1	Initial release