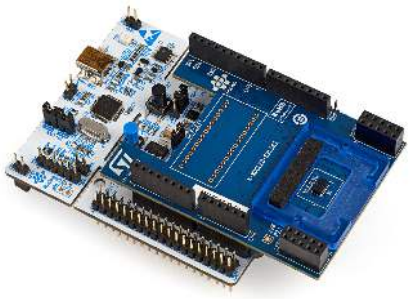
P-NUCLEO-53L3A2

Data brief

VL53L3CX nucleo pack with X-NUCLEO-53L3A2 expansion board and STM32F401RE nucleo board



Features

- VL53L3CX Time-of-Flight (ToF) ranging sensor with multi target detection expansion board (X-NUCLEO-53L3A2)
- STM32F401RE nucleo board
- Two VL53L3CX breakout boards
- 0.25, 0.5, and 1 mm height spacers to simulate air gaps
- Two different cover windows
- Equipped with an Arduino UNO R3 connector
- RoHS compliant
- The two VL53L3CX breakout boards can be connected onto the P-NUCLEO-53L3A2 expansion board to integrate the VL53L3CX into the customer's application
- Full system SW is supplied, including code examples and graphical user interface (GUI). All this can be downloaded on www.st.com/VL53L3CX from the "Tools & Software" page

Description

The P-NUCLEO-53L3A2 is a complete evaluation kit allowing anyone to learn, evaluate, and develop their application using the VL53L3CX, Time-of-Flight (ToF), ranging sensor with multi target detection.

The VL53L3CX is the latest ToF product from STMicroelectronics and embeds ST's third generation FlightSense patented technology. It combines a high performance proximity and ranging sensor, with multi target distance measurements and automatic smudge correction. The miniature reflowable package integrates a single photon avalanche diode (SPAD) array and physical infrared filters to achieve the best ranging performance in various ambient lighting conditions, with a wide range of cover glass windows.

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, choosing from the various combinations of performance, power consumption, and features.

Device summary	
Order code	**Description**
P-NUCLEO-53L3A2	P-NUCLEO-53L3A2 and NUCLEO-F401RE boards

1 Board descriptions

1.1 NUCLEO-F401RE board

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

1.2 X-NUCLEO-53L3A2 expansion board

The X-NUCLEO-53L3A2 expansion board allows the user to test the VL53L3CX functionality and to program it, which helps understand how to develop an application using the VL53L3CX. It integrates:

- a 2.8 V regulator to supply the VL53L3CX 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-53L3A2 expansion board. The required software is available on www.st.com/vl53l3cx.

The X-NUCLEO-53L3A2 expansion board and the NUCLEO-F401RE board are connected through the 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 Uno connector layout

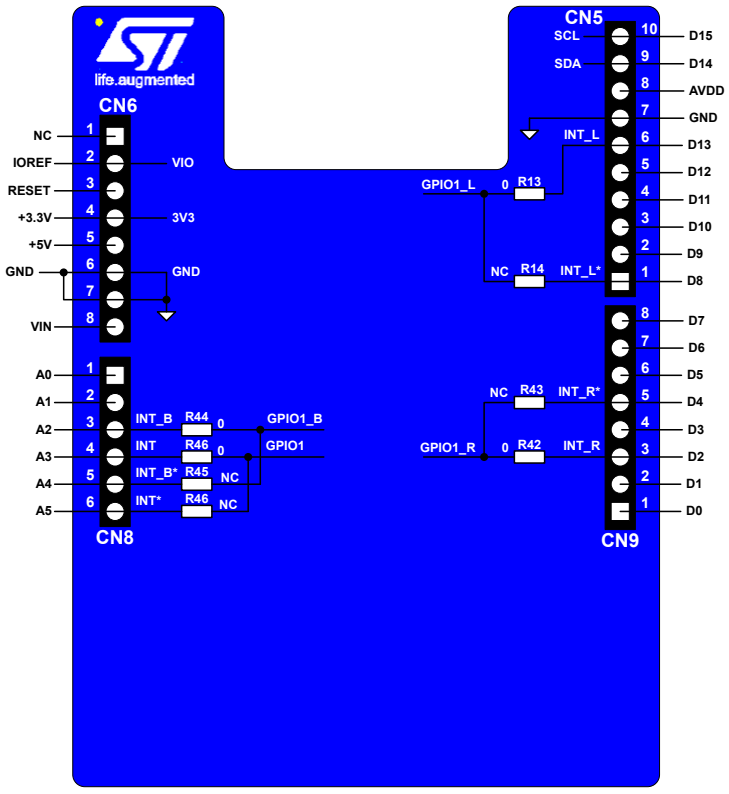


Table 1. Arduino Uno left connector on NUCLEO-F401RE board

CN number	VL53L3CX expansion board	Pin number	Pin name	MCU pin	X-NUCLEO-53L3A2 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 VL53L3CX on-board soldered device
		4	NC	PB0	Not used
	GPIO1	5	INT*	PC1 (1)	By default unused interrupt signal from VL53L3CX 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. Arduino Uno right connector on NUCLEO-F401RE board

CN number	VL53L3CX expansion board	Pin number	Pin name	MCU pin	X-NUCLEO-53L3A2 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 VL53L3CX left breakout board (1)
		1	INT_L	PA9	By default unused interrupt signal from optional VL53L3CX 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 VL53L3CX right breakout board (1)
		4	NC	PB3	Not used
	GPIO1_R	3	INT_R	PA10	By default unused interrupt signal from optional VL53L3CX right breakout board (1)
		2	NC	PA2	Not used
		1		PA3	

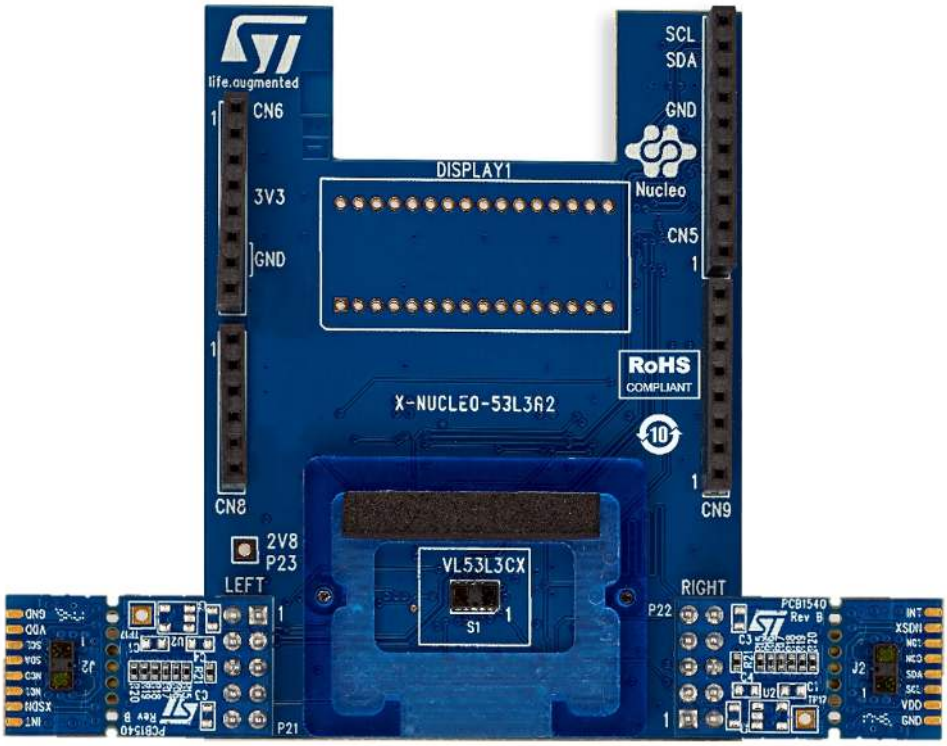
1. *These interrupt signals are duplicated, but not used by default, which offers a hardware connection to the breakout board VL53L3CX interrupt signals and flexibility in case of a conflict on the MCU interface when the expansion board is used superposed with other expansion boards. In such cases, select, through a solder drop, the MCU port which is free.*

1.3 Optional VL53L3CX breakout boards

The VL53L3CX breakout boards can be directly plugged onto the X-NUCLEO-53L3A2 expansion board through two 10-pin connectors or 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 “VL53L3CX mini PCB” which is smaller and integrates more easily into the customer’s devices.

Figure 2. Connections of VL53L3CX breakout boards



2 Laser safety considerations

The VL53L3CX 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 the 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
16-Apr-2020	1	Initial release

Contents