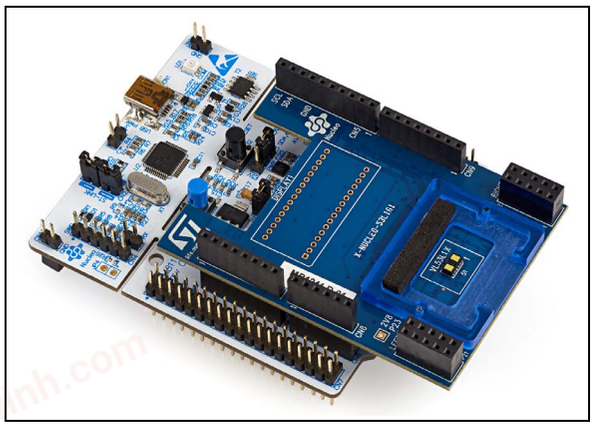
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P-NUCLEO-53L1A1

VL53L1X nucleo pack with X-NUCLEO-53L1A1 expansion board and STM32F401RE nucleo board

Data brief



Features

- VL53L1X Time-of-Flight (ToF), long-distance ranging sensor expansion board (X-NUCLEO-53L1A1)
- STM32F401RE nucleo board
- Two VL53L1X 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 VL53L1X breakout boards can be connected onto the X-NUCLEO-53L1A1 expansion board to integrate the VL53L1X into the customer's application
- Full system SW is supplied, including code examples and graphical user interface. All this can be downloaded from the folder "TOOLS AND SOFTWARE, section Ecosystem" on *www.st.com/VL53L1X*

Description

The P-NUCLEO-53L1A1 is a complete evaluation kit allowing anyone to learn, evaluate, and develop their application using the VL53L1X ToF, long-distance ranging sensor technology.

The VL53L1X is the latest product based on ST's patented FlightSense™ technology. This is a ground-breaking technology allowing absolute long-distance distance to be measured independently of target reflectance. Instead of estimating the distance by measuring the amount of light reflected back from an object (which is significantly influenced by color and surface), the VL53L1X 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, 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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1 X-NUCLEO-53L1A1 expansion board

The board allows the user to test the VL53L1X functionality, to program it, and to help understand how to develop an application using the device. It integrates:

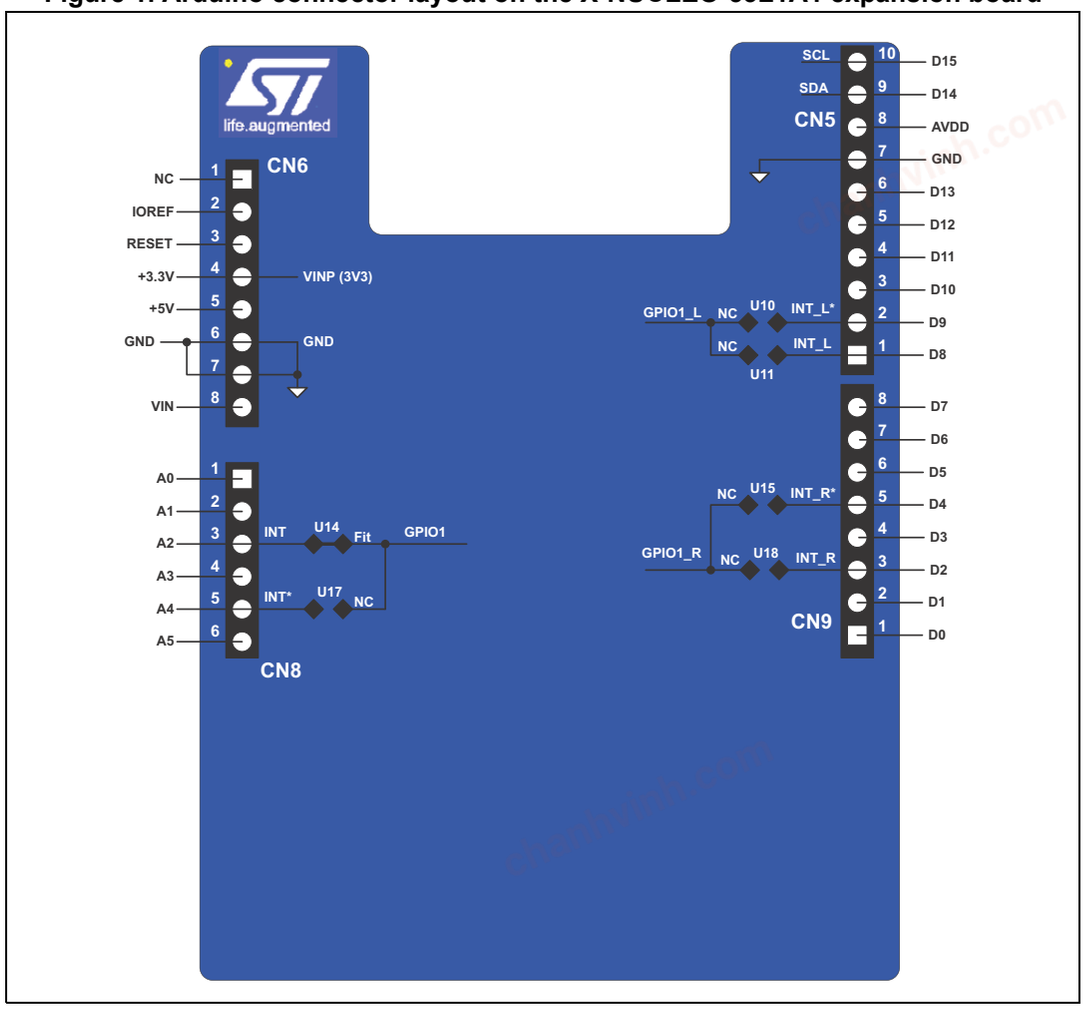
- A 2.8 V regulator to supply the VL53L1X on the expansion board and two breakout boards.
- Two level shifters to adapt the I/O level to the main board of the microcontroller
- The necessary connectivity for the application

The NUCLEO-F401RE board has to be programmed to control the X-NUCLEO-53L1A1 expansion board. The required software suite is available on www.st.com/VL53L1X and is composed of the STSW-LINK009, STSW-LINK7, and X-CUBE-53L1A1.

The X-NUCLEO-53L1A1 expansion board and the NUCLEO-F401RE board are connected through four Arduino compatible connectors: CN5, CN6, CN8, and CN9. They are shown in *Figure 3* and described in *Table 1* and *Table 2*.

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

Figure 1. Arduino connector layout on the X-NUCLEO-53L1A1 expansion board



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

CN number	VL53L1X expansion board	Pin number	Pin name	MCU pin	X-NUCLEO-53L1A1 expansion board function
CN6 power		1	NC	NC	
		2		IOREF	Not used
		3		RESET	
	Power	4	3V3	3V3	3.3 V supply
		5	NC	5 V	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 VL53L1X on-board soldered device
		4	NC	PB0	Not used
	GPIO1	5	INT*	PC1 (1)	By default not used Interrupt signal from VL53L1X on-board soldered device
		6	NC	PC0	Not used

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

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

CN number	VL53L1X expansion board	Pin number	Pin name	MCU pin	X-NUCLEO-53L1A1 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 not used Interrupt signal from optional VL53L1X left breakout board (1)
		1	INT_L	PA9	By default not used Interrupt signal from optional VL53L1X left breakout board (1)
CN9 digital		8	NC	PA8	Not used
		7	NC	PB10	
		6	NC	PB4	
	GPIO1_R	5	INT_R*	PB5	By default not used Interrupt signal from optional VL53L1X right breakout board (1)
		4	NC	PB3	Not used
	GPIO1_R	3	INT_R	PA10	By default not used Interrupt signal from optional VL53L1X right breakout board (1)
		2	NC	PA2	Not used
		1	NC	PA3	

1. These interrupt signals are duplicated, but not used by default, this offers hardware connection of the breakout board VL53L1X interrupt signals and flexibility in case of conflict on MCU interface management when expansion board is superposed with other expansion boards. In this case select, through a solder drop, the MCU port which is free.

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2 NUCLEO-F401RE board

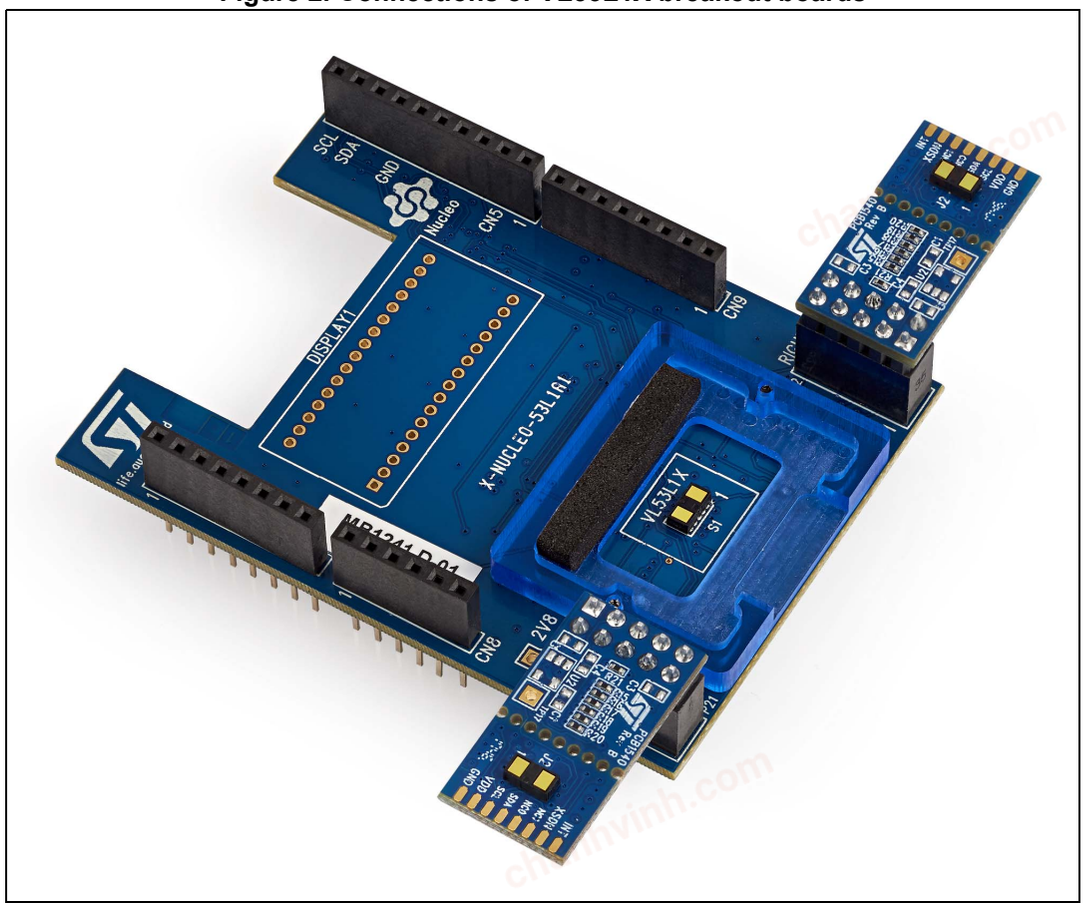
Information about the NUCLEO-F401RE board can be found at: http://www.st.com/stm32nucleo.

3 Optional VL53L1X breakout boards

The VL53L1X breakout boards can be directly plugged onto the X-NUCLEO-53L1A1 expansion board through two 10 pin connectors or they can be connected to the board through flying leads.

When connected through flying leads, developers should break off the mini PCB from the breakout board, and use only the “VL53L1X mini PCB” which is smaller and integrates more easily into the customer’s devices.

Figure 2. Connections of VL53L1X breakout boards



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4 Laser considerations

The VL53L1X 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 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 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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5 ECOPACK®

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.

6 Ordering information

Table 3. Ordering code

Order code	Description
P-NUCLEO-53L1A1	X-NUCLEO-53L1A1 and NUCLEO-F401RE boards

7 Revision history

Table 4. Document revision history

Date	Revision	Changes
02-Feb-2018	1	Initial release
15-Feb-2018	2	Updated *Features* Replaced “satellite boards” with “breakout boards” Replaced *Figure 2: Connections of VL53L1X breakout boards*.

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