

## How to setup and run the VL53L5CX-SATEL using an STM32 Nucleo64 board

### Introduction

The purpose of this document is to describe how to set up and run the VL53L5CX-SATEL directly connected to an STM32 Nucleo64 board.

The VL53L5CX-SATEL breakout boards can be used for easy integration into customer devices.

The PCB section supporting the VL53L5CX module is perforated so that developers can break off the mini PCB for use in a 3.3 V supply application using flying wires. This makes it easier to integrate the VL53L5CX-SATEL breakout boards into development and evaluation devices due to their small size.

The VL53L5CX-SATEL is designed to connect remotely the VL53L5CX sensor to any type of electronic controller. To quick start such application, this document explains where to connect this board to the [NUCLEO-F401RE board](#), where to find the dedicated code example, and how to make it operate.

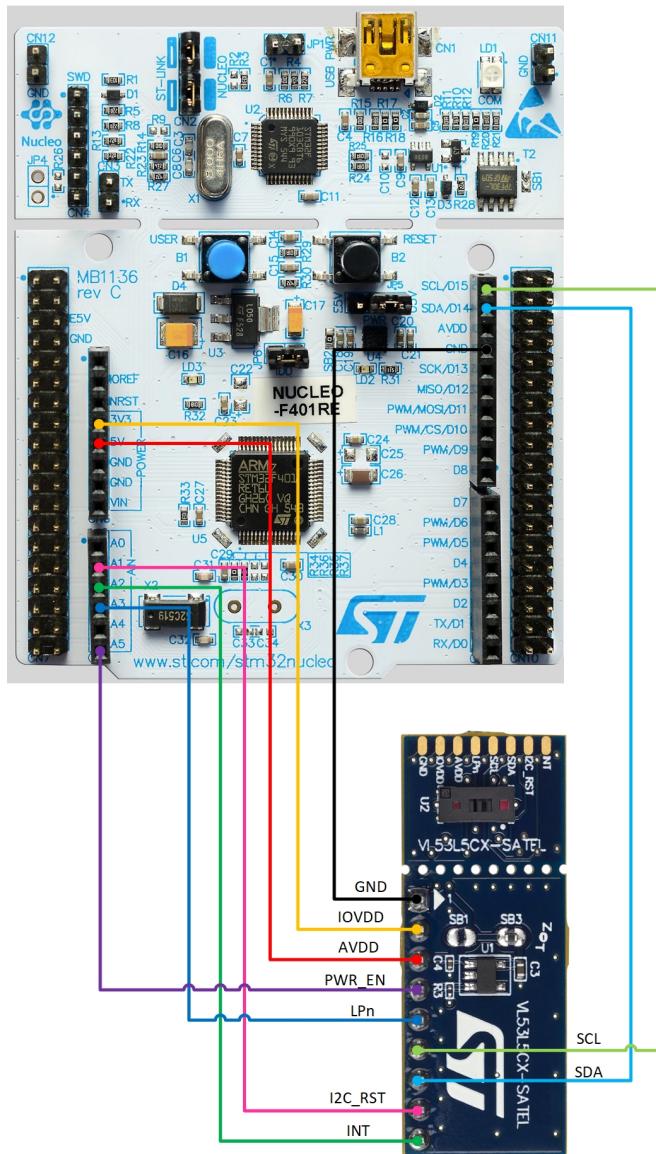
# 1 Hardware connections guidelines

## 1.1

### Connecting the VL53L5CX-SATEL to a NUCLEO-F401RE board

The Figure 1. VL53L5CX-SATEL flying lead connection to NUCLEO-F401RE shows the schematic to connect directly a VL53L5CX-SATEL board to a NUCLEO-F401RE board without the X-NUCLEO-53L5A1 expansion board.

Figure 1. VL53L5CX-SATEL flying lead connection to NUCLEO-F401RE



The pin list connection between the boards is described in Table 1. Connections between VL53L5CX-SATEL and NUCLEO-F401RE.

**Table 1. Connections between VL53L5CX-SATEL and NUCLEO-F401RE**

LEFT Connectors					RIGHT Connectors					
CN No.	VL53L5C X-SATEL	Pin No.	Pin Name	MCU Pin	MCU Pin	Pin Name	Pin No.	VL53L5C X-SATEL	CN No.	
-	-	-	-	-	PB8	D15	10	SCL		
-	-	-	-	-	PB9	D14	9	SDA		
-	-	-	-	-	-	AREF	8			
-	-	-	-	-	-	GND	7	GND		
CN6 Power	-	1	NC	-	PA5	D13	6		CN5 Digital	
	-	2	IOREF	-	PA6	D12	5			
	-	3	RESET	NRST	PA7	D11	4			
	IOVDD	4	+3V3	-	PB6	D10	3			
	AVDD	5	+5V	-	PC7	D9	2			
		6	GND	-	PA9	D8	1			
		7	GND	-	-	-	-	-		
		8	VIN	-	PA8	D7	8			
-		-	-	-	PB10	D6	7			
CN8 Analog		1	A0	PA0	PB4	D5	6		CN9 Digital	
	I2C_RST	2	A1	PA1	PB5	D4	5			
	INT	3	A2	PA4	PB3	D3	4			
	LPn	4	A3	PB0	PA10	D2	3			
		5	A4	PC1	PA2	D1	2			
	PWR_EN	6	A5	PC0	PA3	D0	1			

## 1.2

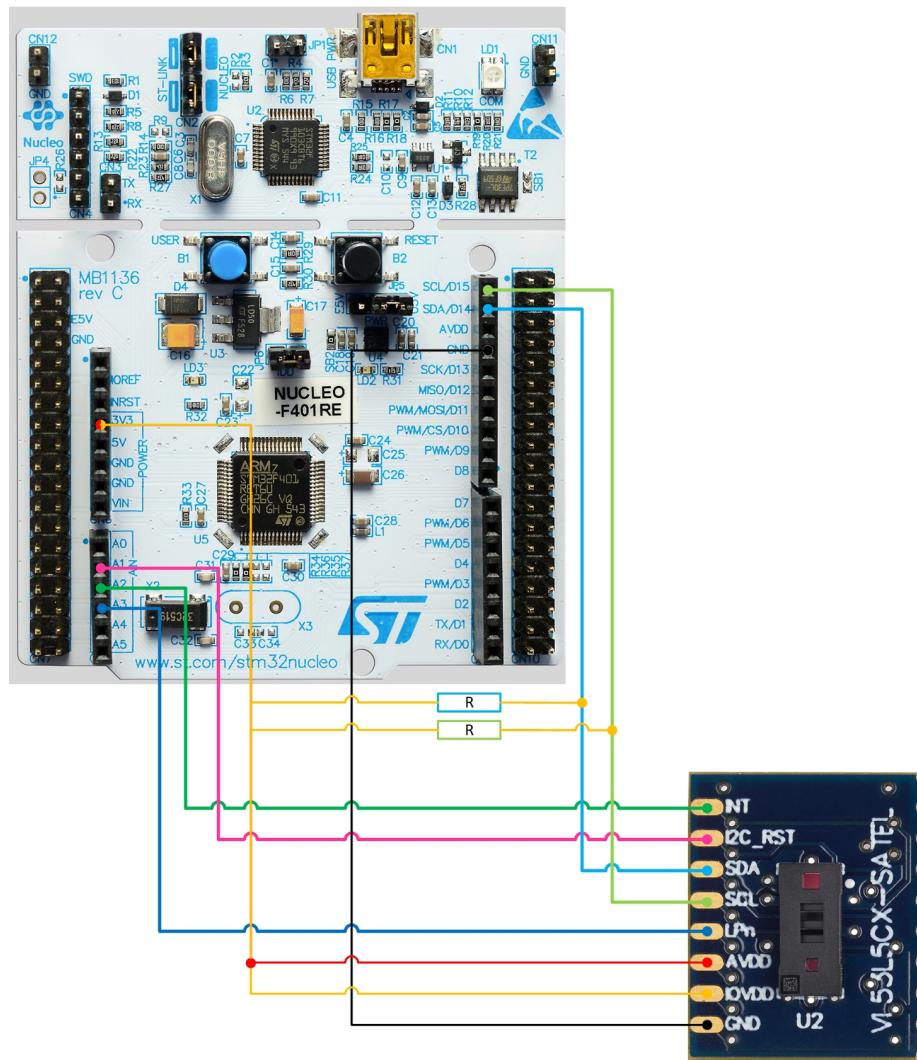
### Connecting the breakout VL53L5CX-SATEL to a NUCLEO-F401RE board

For the mechanical integration purpose, user may use the satellite breakout PCB with its miniaturized size and solder the wires on the PCB to connect to the NUCLEO-F401RE. Refer to Figure 2. VL53L5CX mini PCB flying lead connection to NUCLEO-F401RE.

Note:

*Two additional pull up resistors to I<sub>2</sub>C lines are required. The resistors value can be in range of [2.2K to 4.7K]*

Figure 2. VL53L5CX mini PCB flying lead connection to NUCLEO-F401RE



$$R = [2.2\text{K}, 4.7\text{K}]$$

## 2 Programming guidelines

The software project to make the sensor board work directly with the NUCLEO-F401RE is available on [ST website](#).

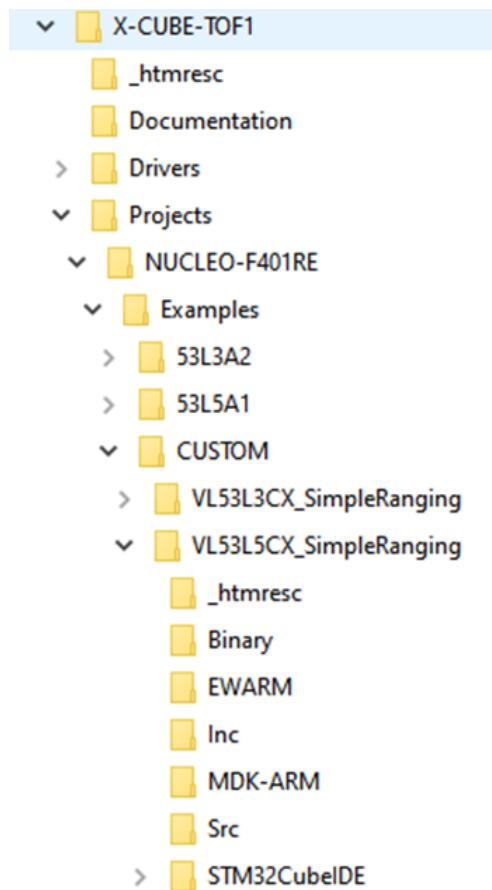
The user must download the package X-CUBE-TOF1, then install the X-CUBE-TOF1 SW pack in CubeMX.

The precompiled SW project is available under:

C:\Users\username\STM32Cube\Repository\Packs\STMicroelectronics\X-CUBE-TOF1\2.0.0\Projects\NUCLEO-F401RE\Examples\CUSTOM\VL53L5CX\_SimpleRanging.

A VL53L5CX-SATEL board project for NUCLEO-F401RE is available in the directory tree as shown in the following figure. The difference between ST common Expansion board X-NUCLEO-53L5A1 and this board is the classification name. This project is part of the "CUSTOM" directory.

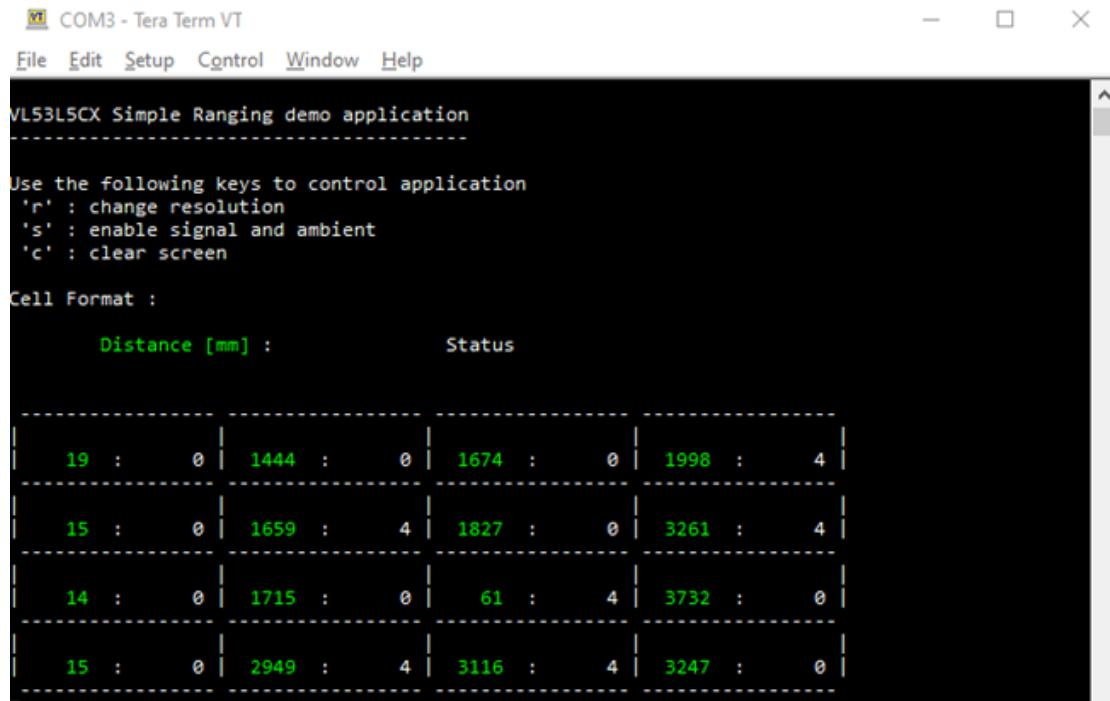
Figure 3. X-CUBE-TOF1 directory



The project is developed for IAR, Keil and STM32CubeIDE toolkits. The user can select any software development kit and make it run.

Another method is to push directly the embedded software binary file. For such task, user can simply drag and drop the binary file "VL..." located in the Binary directory, into the STM32 target represented by "NODE\_F401RE" in the PC file tree.

By default, the software programs the sensor in 4x4 mode. The result can be rendered using a serial tool (such as Teraterm) to access the Nucleo COM port, as shown in [Figure 4. Display rendering by default 4x4 mode](#).

**Figure 4.** Display rendering by default 4x4 mode

COM3 - Tera Term VT

File Edit Setup Control Window Help

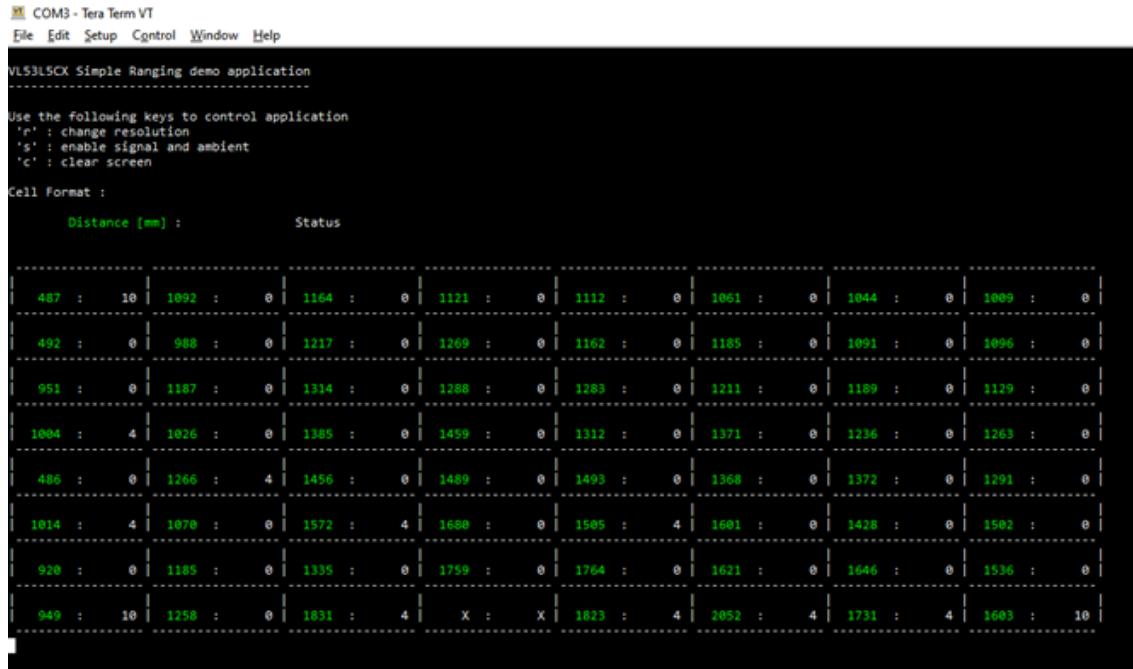
VL53L5CX Simple Ranging demo application

Use the following keys to control application  
'r' : change resolution  
's' : enable signal and ambient  
'c' : clear screen

Cell Format :

Distance [mm]	Status
19 : 0   1444 : 0   1674 : 0   1998 : 4	
15 : 0   1659 : 4   1827 : 0   3261 : 4	
14 : 0   1715 : 0   61 : 4   3732 : 0	
15 : 0   2949 : 4   3116 : 4   3247 : 0	

This project embeds a bidirectional communication by UART. By default, some options can be triggered like the resolution for example by typing "r". It is switched to 8x8 mode as shown in [Figure 5. Display rendering for 8x8 mode](#).

**Figure 5.** Display rendering for 8x8 mode

COM3 - Tera Term VT

File Edit Setup Control Window Help

VL53L5CX Simple Ranging demo application

Use the following keys to control application  
'r' : change resolution  
's' : enable signal and ambient  
'c' : clear screen

Cell Format :

Distance [mm]	Status
487 : 10   1092 : 0   1164 : 0   1121 : 0   1112 : 0   1061 : 0   1044 : 0   1009 : 0	
492 : 0   988 : 0   1217 : 0   1269 : 0   1162 : 0   1185 : 0   1091 : 0   1096 : 0	
951 : 0   1187 : 0   1314 : 0   1288 : 0   1283 : 0   1211 : 0   1189 : 0   1129 : 0	
1004 : 4   1026 : 0   1385 : 0   1459 : 0   1312 : 0   1371 : 0   1236 : 0   1263 : 0	
486 : 0   1266 : 4   1456 : 0   1489 : 0   1493 : 0   1368 : 0   1372 : 0   1291 : 0	
1014 : 4   1070 : 0   1572 : 4   1680 : 0   1585 : 4   1601 : 0   1428 : 0   1502 : 0	
920 : 0   1185 : 0   1335 : 0   1759 : 0   1764 : 0   1621 : 0   1646 : 0   1536 : 0	
949 : 10   1258 : 0   1831 : 4   X : X   1823 : 4   2052 : 4   1731 : 4   1603 : 10	

## Revision history

**Table 2. Document revision history**

Date	Version	Changes
14-Oct-2021	1	Initial release
09-Dec-2021	2	Added information regarding breakout board in <a href="#">Section Introduction</a> . Added <a href="#">Section 1.2 Connecting the breakout VL53L5CX-SATEL to a NUCLEO-F401RE board</a> .

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