




# STMicroelectronics UM3067 X-NUCLEO-53L7A1 Expansion Board User Manual

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## Introduction

The X-NUCLEO-53L7A1 is an expansion board for any STM32 Nucleo development board equipped with Arduino R3 connectors. It provides a complete evaluation kit that allows you to learn, evaluate, and develop applications using the VL53L7CX Time-of-Flight 8×8 multizone ranging sensor with 90° FoV. The expansion board is delivered with a cover glass holder in which you can fit three different spacers of 0.25, 0.5, and 1 mm height below the cover glass to simulate various air gaps. A small oval cover glass fitting the sensor is included. Several ST expansion boards can be stacked through the Arduino connectors, which allow, for example, the development of VL53L7CX applications with Bluetooth or Wi-Fi interfaces.

Figure 1. X-NUCLEO-53L7A1 expansion board, spacers, cover glass holder, and oval cover glass



## Getting started

### Safety considerations

#### Electrostatic precautions

**Warning:** Take electrostatic precautions, including ground straps, when using the X-NUCLEO-53L7A1 expansion board. Failure to prevent electrostatic discharge could damage the device.

Figure 2. Electrostatic logo



#### Laser safety considerations

The VL53L7CX contains a laser emitter and the corresponding drive circuitry. The laser output is designed to remain within Class 1 laser safety limits under all reasonable 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 you use the STMicroelectronics recommended device settings and respect the operating conditions specified in the data sheet. 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



### Features

- VL53L7CX Time-of-Flight 8×8 multizone ranging sensor with 90° FoV
- Accurate absolute ranging distance, independent of the reflectance of the target
- Up to 350 cm ranging
- Histogram-based technology
- Multiobject detection capability
- 0.25, 0.5, and 1 mm spacers to simulate air gaps
- One cover glass to protect the sensor from dust
- Compatible with STM32 Nucleo development boards
- Equipped with Arduino® UNO R3 connectors
- Full system software supplied, including code examples and graphical user interface
- RoHS, CE, UKCA, and China RoHS compliant

#### VL53L7CX Time-of-Flight sensor characteristics

- Laser wavelength: 940 nm
- Invisible laser radiation
- Maximum laser power emitted: 130 mW
- Integration time: 2 ms minimum

### Spacers and covers

The X-NUCLEO-53L7A1 expansion board is delivered with:

- three spacers of 0.25 mm, 0.5 mm, and 1 mm height, used to simulate different air gaps between the VL53L7CX and the rectangular-shaped cover glass;
- two nine-pin headers that allow connecting the two breakout boards to the X-NUCLEO-53L7A1 expansion board.

**Attention:** The VL53L7CX is delivered with a liner to prevent potential foreign material from piercing the module holes during the assembly process. Remove this liner before use.

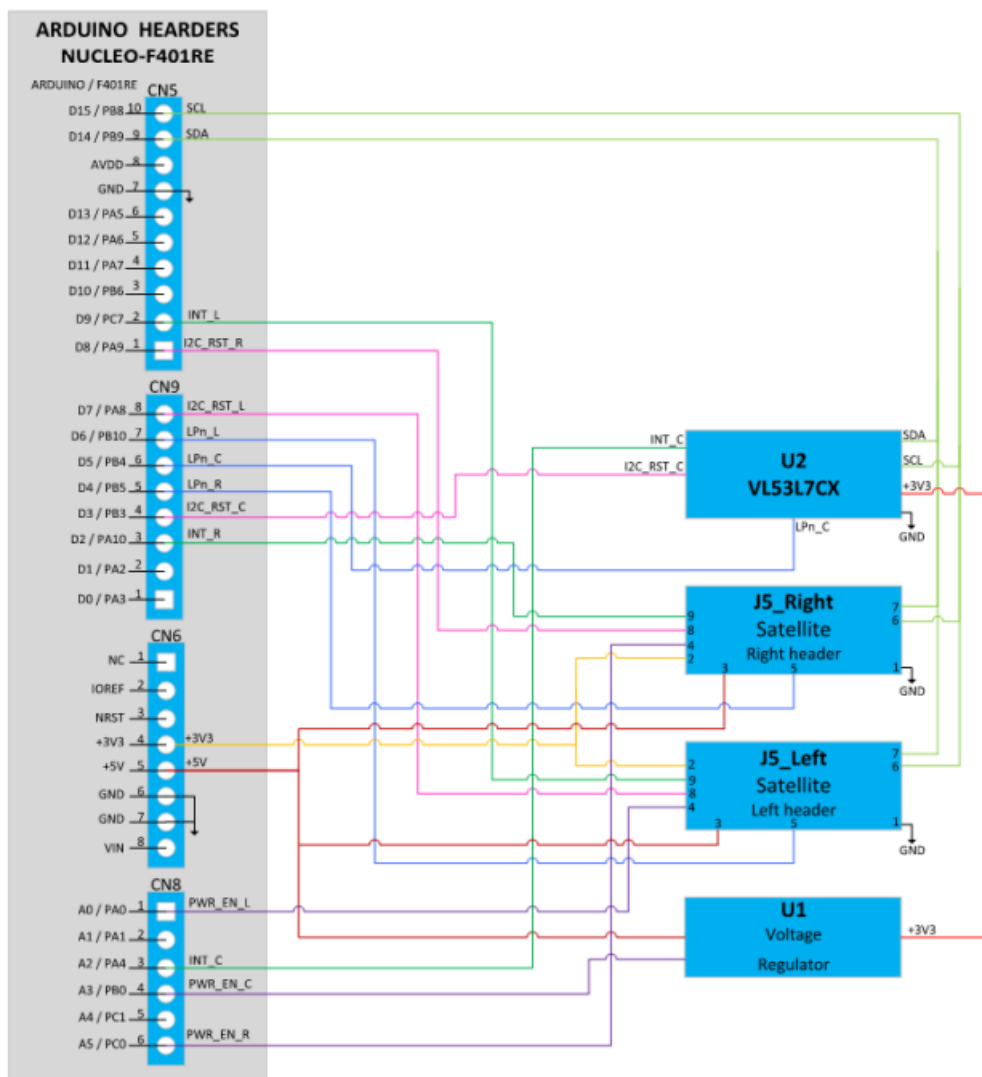
### Ordering information

Table 1. Ordering information

Order code	Core product
X-NUCLEO-53L7A1	<a href="#">VL53L7CX</a>

### Simplified schematic

Figure 4. X-NUCLEO-53L7A1 expansion board – simplified schematic



## Using the expansion board

The X-NUCLEO-53L7A1 expansion board allows the user to test the VL53L7CX sensor functionality, to program it and to understand how to develop an application using this sensor. The X-NUCLEO-53L7A1 integrates:

- the VL53L7CX sensor;
- Arduino UNO R3 connectors;
- Connectors for SATEL-VL53L7CX optional breakout boards;

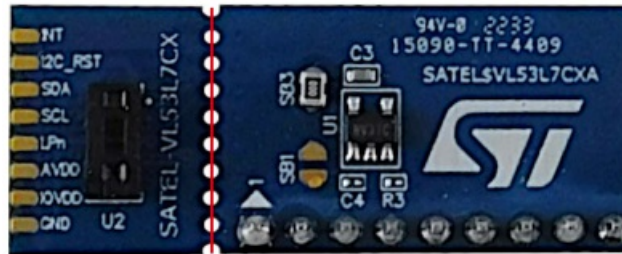
**Important:** Program a microcontroller to control the VL53L7CX through the I2C bus. The application software and an example of the C-ANSI source code are available on the sensor web page.

The X-NUCLEO-53L7A1 expansion board can be connected to the STM32 Nucleo development board through the Arduino UNO R3 connectors (CN5, CN6, CN8, and CN9) as shown in Figure 4.

## Breakout boards

The X-NUCLEO-53L7A1 package does not include the VL53L7CX breakout boards. You can purchase them in a pack of two PCBs as SATEL-VL53L7CX. The X-NUCLEO-53L7A1 supplies the VL53L7CX breakout boards at 3.3 V (see Figure 4). For mechanical integration purposes, it could be interesting to use the mini PCB by breaking the SATELVL53L7CX along the red line as shown in the figure below. It is easier to integrate this setup into a customer's device thanks to its small size.

Figure 5. SATEL-VL53L7CX



The SATEL-VL53L7CX boards can be directly plugged onto the X-NUCLEO-53L7A1 through the two 9-pin headers (see Figure 6. SATEL-VL53L7CX breakout boards connected to the X-NUCLEO-53L7A1 expansion board). As an alternative, they can be connected to the X-NUCLEO-53L7A1 by using the mini PCB through flying wires (see Figure 7).

Figure 6. SATEL-VL53L7CX breakout boards connected to the X-NUCLEO-53L7A1 expansion board



Figure 7. VL53L7CX mini PCB flying wire connection to the X-NUCLEO-53L7A1 expansion board



## Graphical user interface (GUI) and programming example for the X-NUCLEO-53L7A1

To evaluate the VL53L7CX device performance, use the related GUI. The X-NUCLEO-53L7A1 expansion board requires the NUCLEO-F401RE development board to use the GUI.

**Important:** Despite the fact that the X-NUCLEO-53L7A1 can be stacked on any STM32 Nucleo board equipped the Arduino R3 connectors, the GUI is designed to work with the NUCLEO-F401RE only. Download the GUI (in the Tools and Software tab of the X-NUCLEO-53L7A1 web page) to evaluate the VL53L7CX.

## Schematic diagrams

Figure 8. X-NUCLEO-53L7A1 circuit schematic (1 of 5)

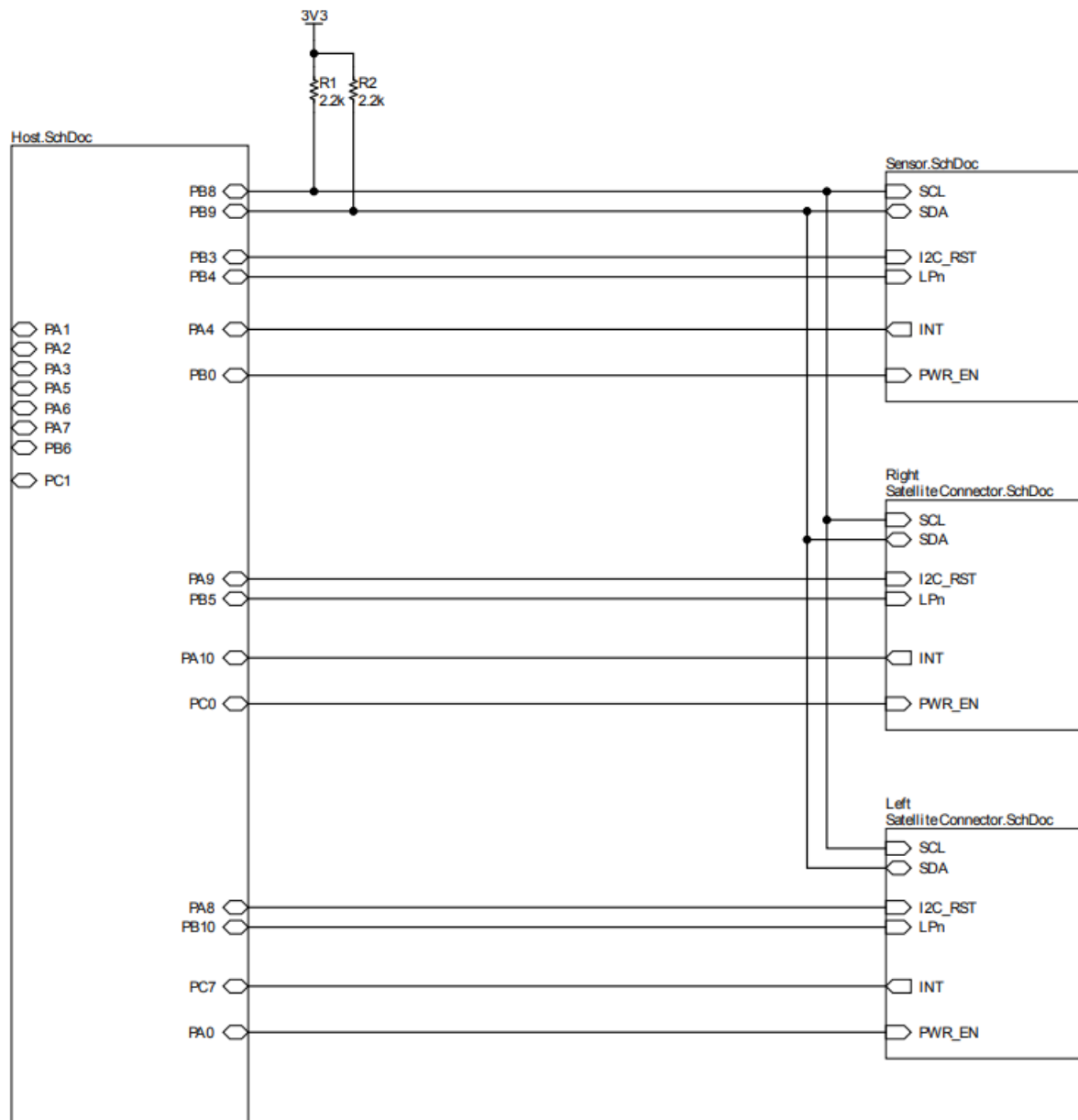


Figure 9. X-NUCLEO-53L7A1 circuit schematic (2 of 5)



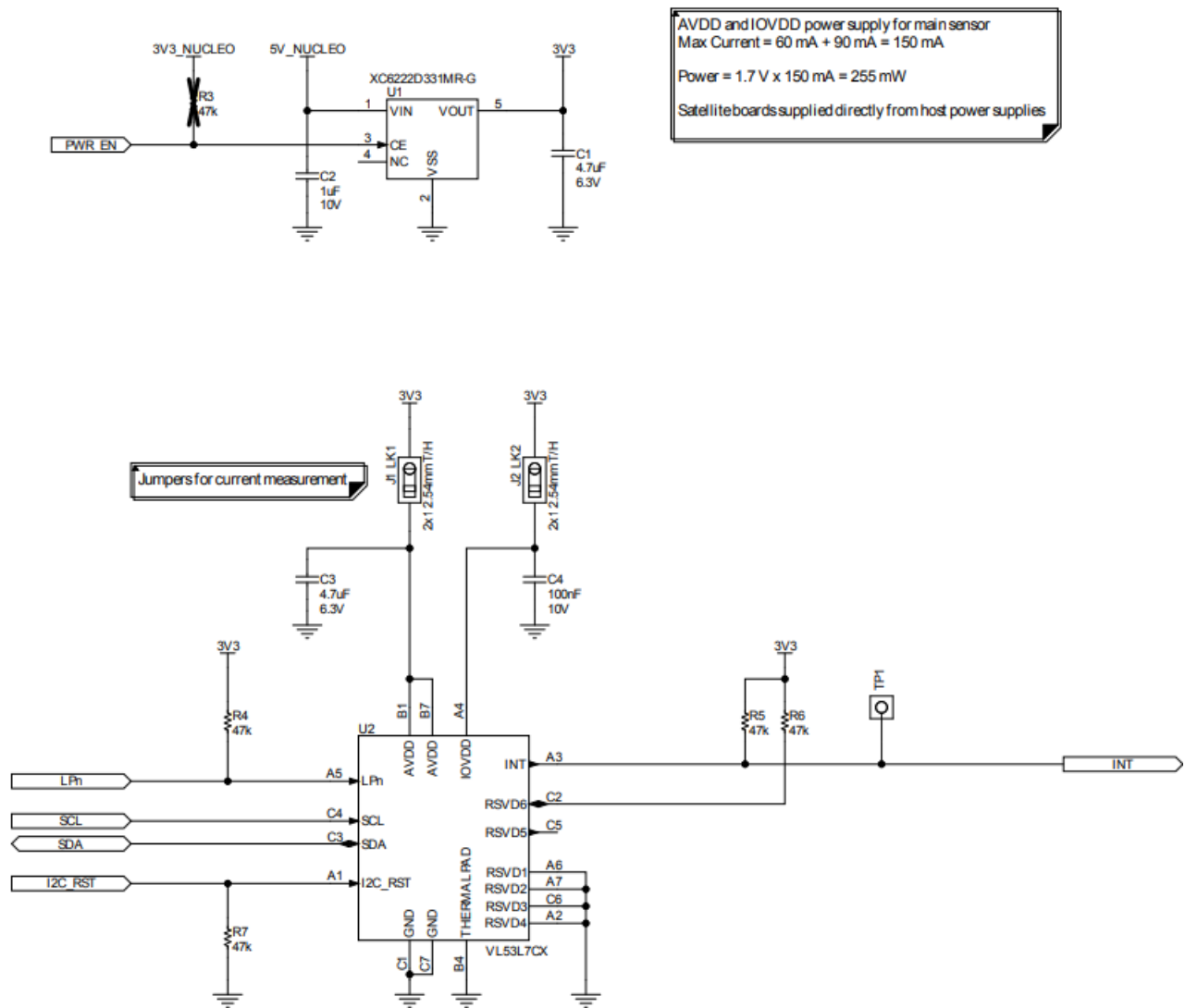


Figure 10. X-NUCLEO-53L7A1 circuit schematic (3 of 5)  
**Nucleo Arduino Connectors**

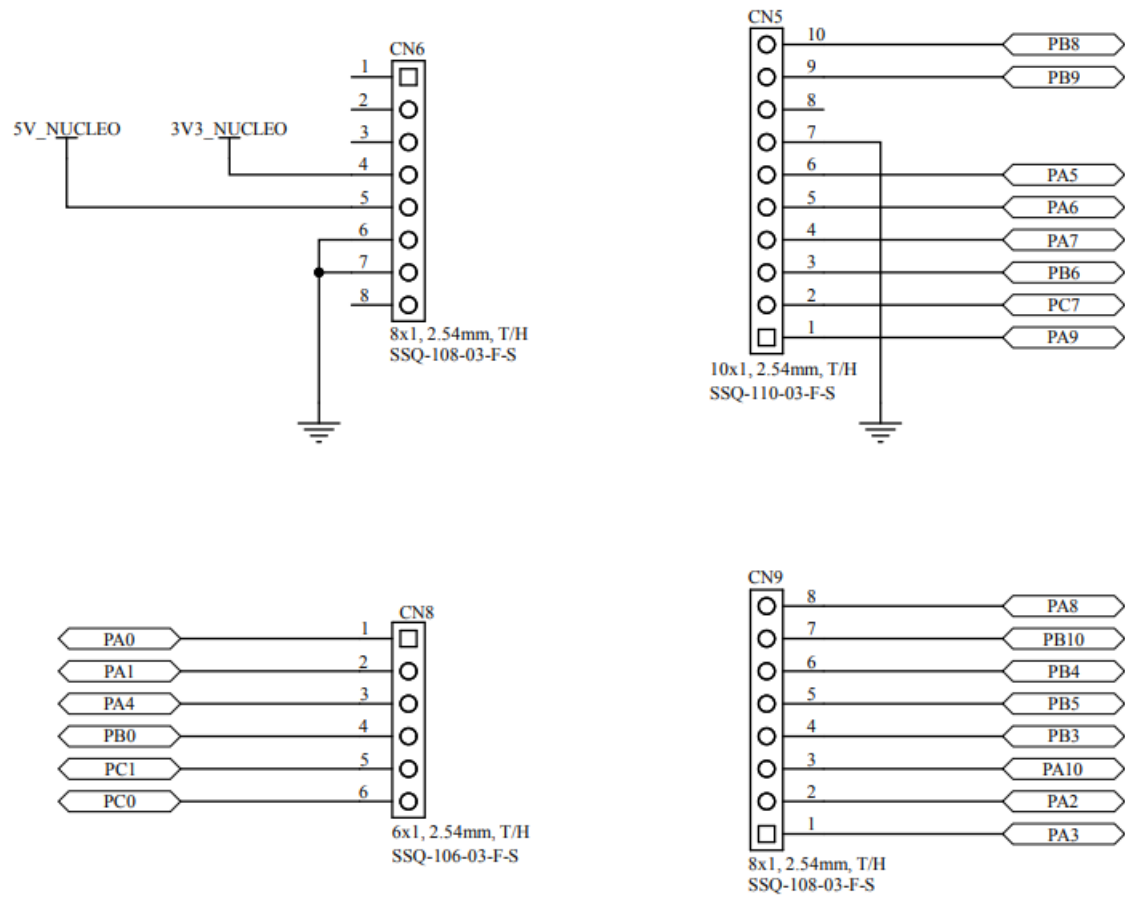


Figure 11. X-NUCLEO-53L7A1 circuit schematic (4 of 5)

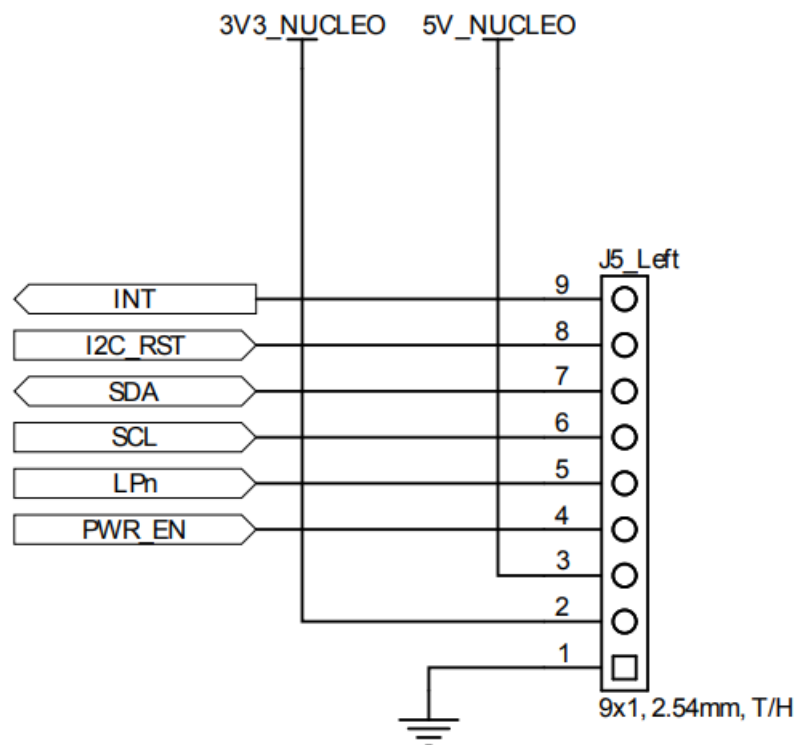
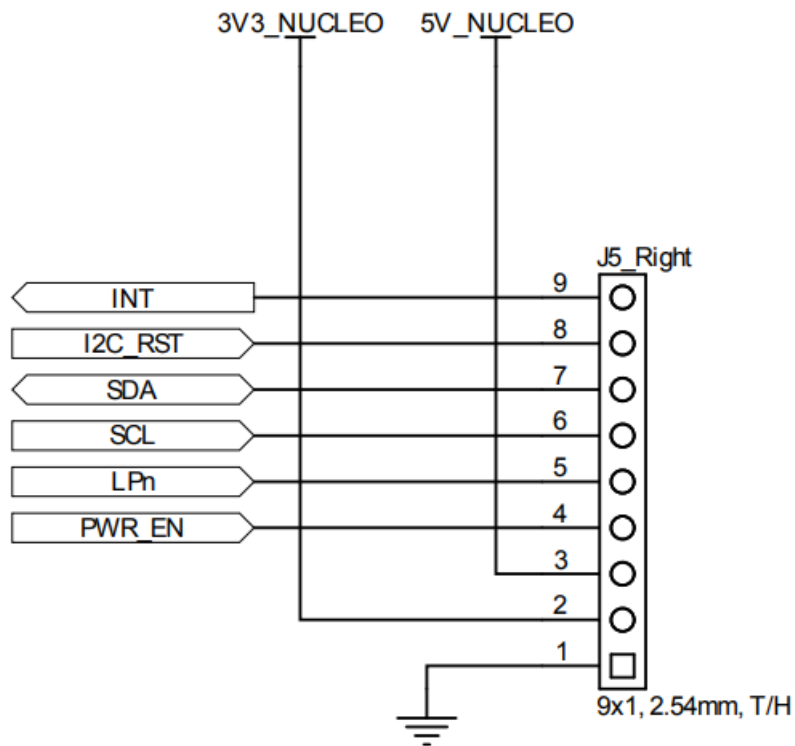


Figure 12. X-NUCLEO-53L7A1 circuit schematic (5 of 5)



## Bill of materials

Table 2. X-NUCLEO-53L7A1 bill of materials

Item	Q.ty	Ref.	Part/value	Description	Manufacturer	Order code
1	0	R3 Not Fitted	47k, 0201, 1/20W	RES, 47k, 1%, 1/20W, 0201	Panasonic	ERJ1GNF4702C
2	1	C4 Fitted	100nF, 0201, 10V	CAP, CER, 100nF, 10V, X5R, 0201	Murata	GRM033R61A104KE15D
3	1	C2 Fitted	1uF, 0201, 10V	CAP, CER, 1uF, 10V, X5R, 0201	Samsung	CL03A105KP3NSNC
4	1	CN5 Fitted	—	CONN, HEADER, 10POS, SNG, 2.54mm, T/H	Samtec	SSQ-110-03-F-S
5	1	CN8 Fitted	—	CONN, HEADER, 6POS, SNG, 2.54mm, T/H	Samtec	SSQ-106-03-F-S

6	1	U2 Fitted	VL53L7CXV0GC/ 1	Time-of-Flight 8×8 multizone ranging sensor with wide field of v	ST	<a href="#">VL53L7CXV0GC/1</a>
7	1	U1 Fitted	SOT-25	IC, REG, LDO, 3.3V, 0.7A, SO T25	Torex Semiconductor	XC6222D331MR-G
8	1	A1 Fitted		PCB X-NUCLEO-53L7A1	manufacturer	PCB4132B
9	2	C1, C3 Fitted	4.7uF, 0402, 6.3 V	CAP, CER, 4.7 uF, 6.3V, X5R, 0402	TDK	C1005X5R0J475K050BC
10	2	J1, J2 Fitted		CONN, HEADER, 2POS, 2.54 MM, T/H, VERT	Harwin	M20-9990245
11	2	J5_Left, J5_Right Fitted	–	CONN, HEADER, 9POS, SNG L, 2.54mm, T/H	Samtec	SSW-109-01-G-S
12	2	CN6, CN9 Fitted	–	CONN, HEADER, 8POS, SNG L, 2,54mm, T/H	Samtec	SSQ-108-03-F-S
13	2	R1, R2 Fitted	2.2k, 0402, 1/16 W	RES, 2.2k, 1%, 1/16W, 0402	Stackpole Electronics	RMCF0402FT2K20
14	2	LK1, LK2 Fitted	–	LINK, HEADER, 2.54 MM	Harwin	M7571-05
15	4	R4, R5, R6, R7 Fitted	47k, 0201, 1/20 W	RES, 47k, 1%, 1/20W, 0201	Panasonic	ERJ1GNF4702C

## Board versions

Table 3. X-NUCLEO-53L7A1 versions

PCB version	Schematic diagrams	Bill of materials
X\$NUCLEO-53L7A1- (1)	<a href="#">X\$NUCLEO-53L7A1- schematic diagram</a>	<a href="#">X\$NUCLEO-53L7A1-bill of material</a>

1. This code identifies the X-NUCLEO-53L7A1 expansion board first version. It is printed on the board PCB.

## Regulatory compliance information

Notice for US Federal Communication Commission (FCC) For evaluation only; not FCC approved for resale.  
FCC NOTICE – This kit is designed to allow:

1. Product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and
2. Software developers to write software applications for use with the end product.

This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter 3.1.2

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### Notice for European Union

This device is in conformity with the essential requirements of the Directive 2014/30/EU (EMC) and of the Directive 2015/863/EU (RoHS).

### Notice for United Kingdom

This device is in compliance with the UK Electromagnetic Compatibility Regulations 2016 (UK S.I. 2016 No. 1091) and with the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (UK S.I. 2012 No. 3032).

## Appendix A References

- VL53L7CX data sheet
- X-NUCLEO-53L7A1 data brief: DB4808
- X-CUBE-TOF1 data brief: DB4449

## Revision history


Table 4. Document revision history

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## Documents / Resources

	<p><a href="#">STMicroelectronics UM3067 X-NUCLEO-53L7A1 Expansion Board [pdf] User Manual</a> UM3067 X-NUCLEO-53L7A1 Expansion Board, UM3067, X-NUCLEO-53L7A1 Expansion Board, Expansion Board, Board</p>
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## References

- [STMicroelectronics: Our technology starts with you](#)
- [VL53L7CX - Time-of-Flight 8x8 multizone ranging sensor with 90 degrees FoV - STMicroelectronics](#)
- [STMicroelectronics Trademark List - STMicroelectronics](#)
- [NUCLEO-F401RE - STM32 Nucleo-64 development board with STM32F401RE MCU, supports Arduino and ST morpho connectivity - STMicroelectronics](#)
- [SATEL-VL53L7CX - Breakout board based on the VL53L7CX Time-of-Flight 8x8 multizone ranging sensor with 90° FoV - STMicroelectronics](#)
- [VL53L7CX - Time-of-Flight 8x8 multizone ranging sensor with 90 degrees FoV - STMicroelectronics](#)
- [X-CUBE-TOF1 - Time-of-Flight sensors software expansion for STM32Cube - STMicroelectronics](#)
- [X-NUCLEO-53L7A1 - Time-of-Flight 8x8 multizone ranging sensor with 90° FoV expansion board based on the VL53L7CX for STM32 Nucleo - STMicroelectronics](#)
- [STM32 Nucleo Boards - STMicroelectronics](#)