Time-of-Flight expansion board based on the VL53L9CX for STM32 Nucleo

Features

- Time-of-Flight expansion board based on the VL53L9CX for STM32 Nucleo:
  - dToF 3D LiDAR all-in-one module with high resolution of 2.3 K zones
  - Wide 54 x 42° FoV, providing accurate ranging from 5 cm to 9 m
- Accurate absolute ranging distance, independent of the reflectance of the target
- Operating at up to a maximum 100 frames per second over a range of 5 cm to 9 meters, this low-power module consumes just 150 mW typical system power
- Histogram-based technology
- Great ranging performance, including under strong ambient light conditions, with a range of cover glass materials
- Multiobject detection capability
- 0.25, 0.5, and 1 mm spacers to simulate air gaps
- One cover glass to protect the sensor from dust
- Outputs rich 2D data (signal, reflectance, ambient), empowering advanced AI, and processing capabilities
- 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

Description

The X-NUCLEO-53L9A1 is an expansion board for any STM32 Nucleo board equipped with the Arduino® R 3 connectors. It provides a complete evaluation kit that allows you to learn, evaluate, and develop applications based on the VL53L9CX series Time-of-Flight sensors.

Several ST expansion boards can be stacked through the Arduino® connectors, which allow, for example, the development of VL53L9CX series ToF applications with a Bluetooth® LE or Wi-Fi interfaces.

Product summary	
Time-of-Flight expansion board based on the VL53L9CX for STM32 Nucleo	X-NUCLEO-53L9A1
3D dToF LiDAR module	VL53L9CXV0VE/1
Time-of-Flight sensor software expansion for STM32Cube	X-CUBE-TOF1
STM32 Nucleo-144 development board with STM32H563ZI MCU, supports Arduino, ST Zio and morpho connectivity	NUCLEO-H563ZI
Applications	Robotics/Drones/ Humanoid robots/ Smart building/ Smart offices

DB5799 - Rev 1 - March 2026
For further information, contact your local STMicroelectronics sales office.

www.st.com

1 Ordering information

Table 1. Ordering information

Order code	PCB version	Core product
X-NUCLEO-53L9A1	XN$53L9A1A	VL53L9CX

Figure 1. X-NUCLEO-53L9A1 circuit schematic (1 of 6)

Title.SchDoc

Mechanical.SchDoc

Host Connectors.SchDoc

PA5
PA6

PC0
PC2
PC3

PD14
PD15

PE9
PE11
PE13
PE14

PF3
PF11

PG9
PG12
PG14

I3C on PB8/PB9 by default.

Power.SchDoc

Level Shifters.SchDoc

PB8   Host_SCL   Sensor_SCL
PB9   Host_SDA   Sensor_SDA

PB1   Host_SYNC_IN   Sensor_SYNC_IN
PB5   Host_CLK_IN   Sensor_CLK_IN
PB6   Host_XSHUT   Sensor_XSHUT
PB7   Host_INTR   Sensor_INTR

Sensor.SchDoc

SCL
SDA

SYNC_IN
CLK_IN
XSHUT
INTR

H5 Nucleo board   NUCLEO-H563ZI (NUH563ZI$MR1)
User Manual   UM3115
https://www.st.com/resource/en/user_manual/um3115-stm32h5-nucleo144-board-mb1404-stmicroelectronics.pdf

N6 Nucleo board   NUCLEO-N657X0-Q
User Manual   UM3417
https://www.st.com/resource/en/user_manual/um3417-stm32n6-nucleo144-board-mb1940-stmicroelectronics.pdf

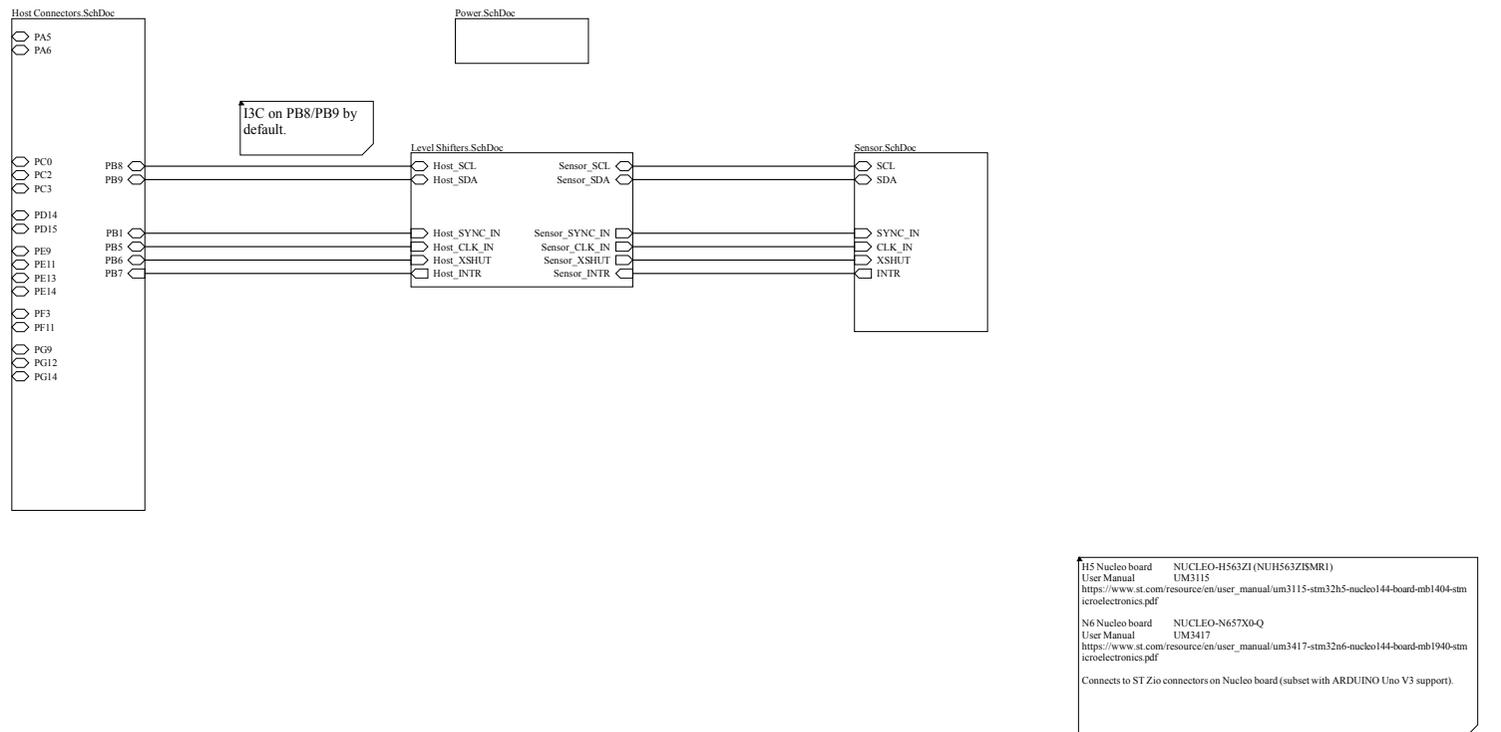Connects to ST Zio connectors on Nucleo board (subset with ARDUINO Uno V3 support).

Figure 2. X-NUCLEO-53L9A1 circuit schematic (2 of 6)

Tested with STM32H5 Nucleo-144 board (MB1404) - Order Code:NUCLEO-H563ZI

Compatible with STM32 Nucleo boards
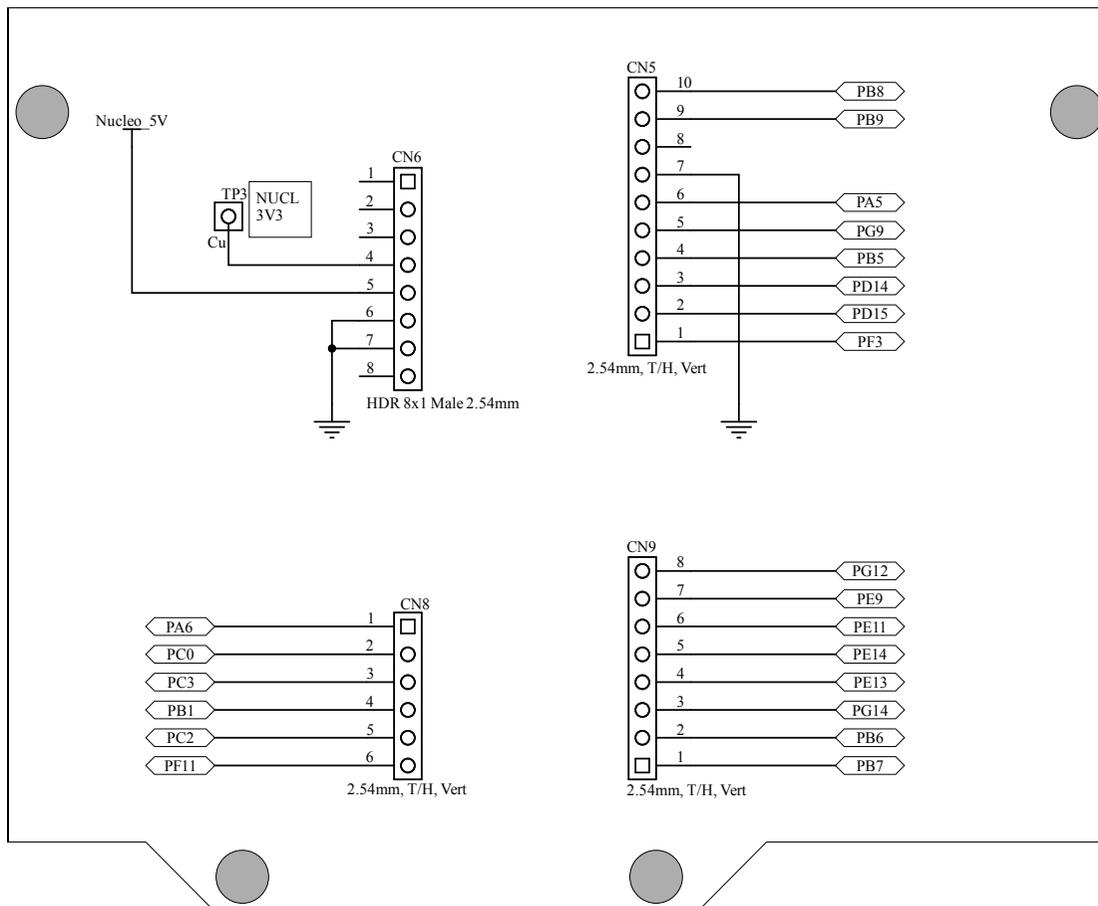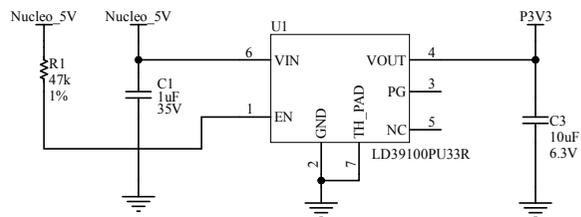
Compatible with Arduino UNO R3 connectors

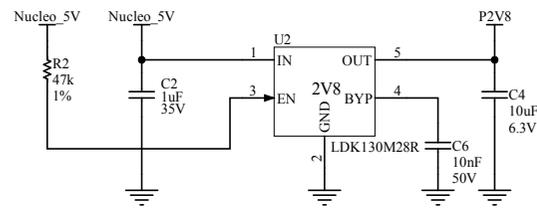## Figure 3. **X-NUCLEO-53L9A1 circuit schematic (3 of 6)**

Power Supplies

3V3 Gen

Output = 3.3 V @ 1 A

Nucleo_5V Nucleo_5V

R1
47k
1%

C1
1uF
35V

U1
6 VIN
VOUT 4
PG 3
NC 5
EN 1
GND
TH_PAD
2 7
LD39100PU33R

P3V3

C3
10uF
6.3V

2V8 Gen

Output = 2.8 V @ 300 mA

Nucleo_5V Nucleo_5V

R2
47k
1%

C2
1uF
35V

U2
1 IN
OUT 5
3 EN
2V8
BYP 4
GND
2
LDK130M28R

P2V8

C4
10uF
6.3V

C6
10nF
50V

1V8 Gen

Output = 1.8 V @ 300 mA

Nucleo_5V Nucleo_5V

R3
47k
1%

C7
1uF
35V

U3
1 IN
OUT 5
3 EN
1V8
BYP 4
GND
2
LDK130M18R

P1V8

C9
10uF
6.3V

C11
10nF
50V

1V2 Gen

Output = 1.2 V @ 300 mA

Nucleo_5V Nucleo_5V

R4
47k
1%

C8
1uF
35V

U4
1 VIN
VOUT 5
3 EN
1V2
BYP 4
VSS
2
LDK130M12R

P1V2

C10
10uF
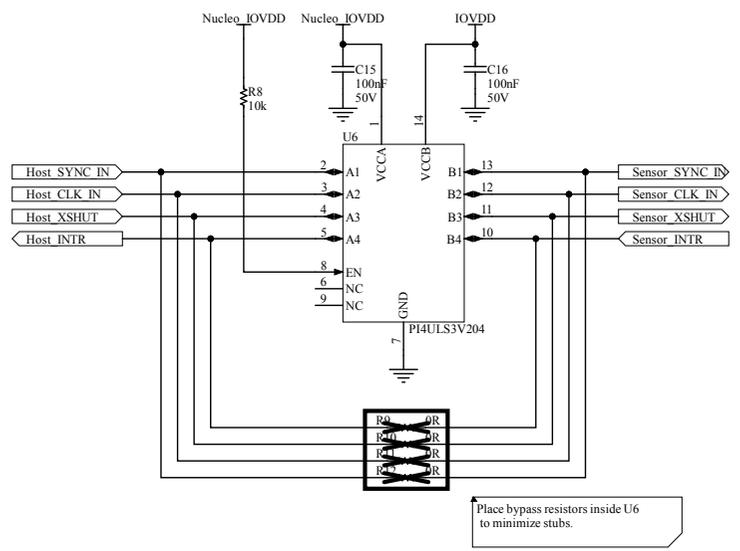6.3V

C12
10nF
50V
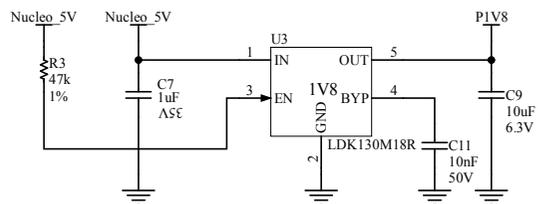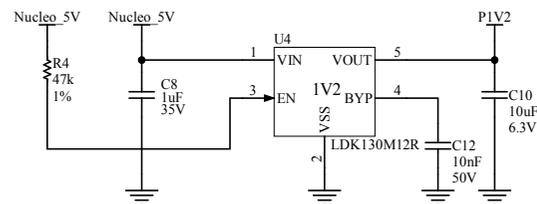
Figure 4. X-NUCLEO-53L9A1 circuit schematic (4 of 6)

V O LTA G E   L E V E L   S H I F T E R S
3.3 V or 1.8 V <--> I O V D D (1.8 V or 1.2 V)

EXT
IOVDD

P3V3
P1V8

J1
3
2
1

3x1_2.54mm

JP1[2-3]
Black
JP1[1-2]
Black

3V3
Nucleo_IOVDD
1V8

Nucleo_IOVDD   Nucleo_IOVDD   IOVDD

C13
100nF
50V

C14
100nF
50V

R5
10k

U5

Host_SDA   Host_SDA
Host_SCL   Host_SCL

2   A1   VCCA   VCCB   B1   13   Sensor_SDA
3   A2   B2   12   Sensor_SCL
4   A3   B3   11
5   A4   B4   10
8   EN
6   NC
9   NC   GND
7

PI4ULS3V204

Add GND track between I3C tracks (SDA and
SCL) on both sides of level shifter.

R4   0R
R6   0R

Place bypass resistors inside U5 to
minimize stubs.

Nucleo_IOVDD   Nucleo_IOVDD   IOVDD

C15
100nF
50V

C16
100nF
50V

R8
10k

U6

Host_SYNC_IN
Host_CLK_IN
Host_XSHUT
Host_INTR

2   A1   VCCA   VCCB   B1   13   Sensor_SYNC_IN
3   A2   B2   12   Sensor_CLK_IN
4   A3   B3   11   Sensor_XSHUT
5   A4   B4   10   Sensor_INTR
8   EN
6   NC
9   NC   GND
7

PI4ULS3V204

R9   0R
R10   0R
R11   0R
R12   0R

Place bypass resistors inside U6
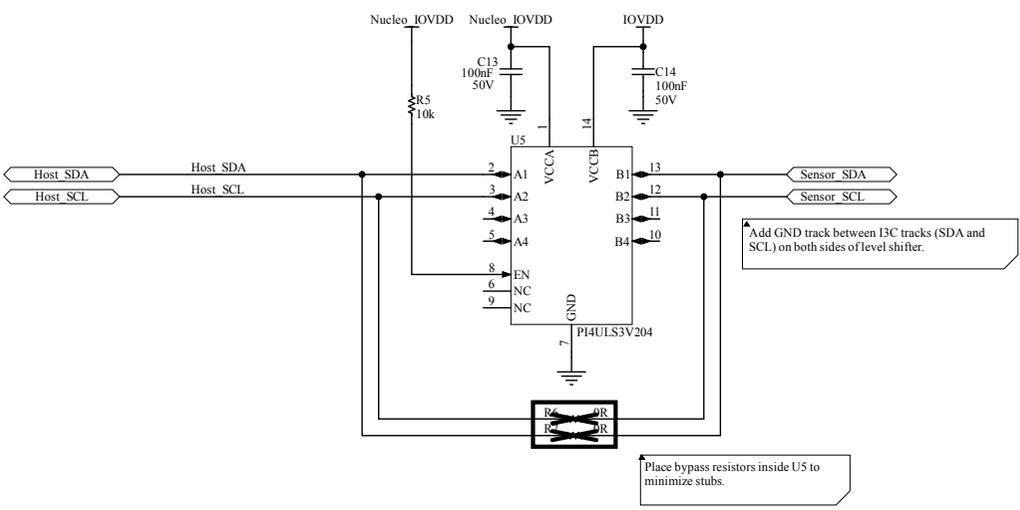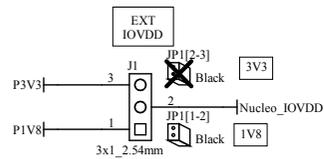to minimize stubs.

Figure 5. **X-NUCLEO-53L9A1 circuit schematic (5 of 6)**
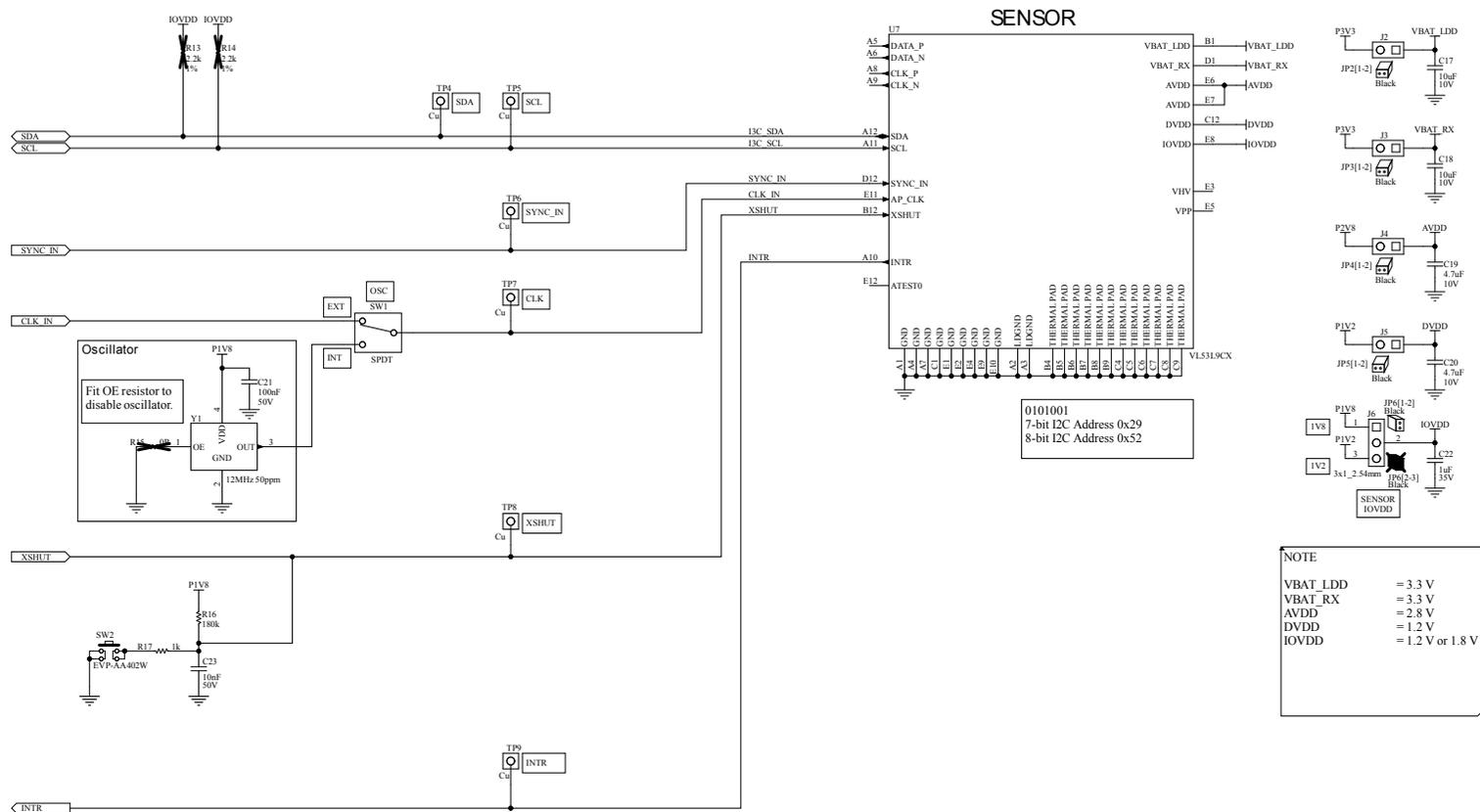

Figure 6. **X-NUCLEO-53L9A1 circuit schematic (6 of 6)**

3   Board versions

Table 2. X-NUCLEO-53L9A1 versions

PCB version	Schematic diagrams	Bill of materials
XN$53L9A1A[1]	XN$53L9A1A schematic diagrams	XN$53L9A1A bill of materials

1.   This code identifies the X-NUCLEO-53L9A1 evaluation board first version. It is printed on the board PCB.

Revision history

Table 3. Document revision history

Date	Revision	Changes
30-Mar-2026	1	Initial release.

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