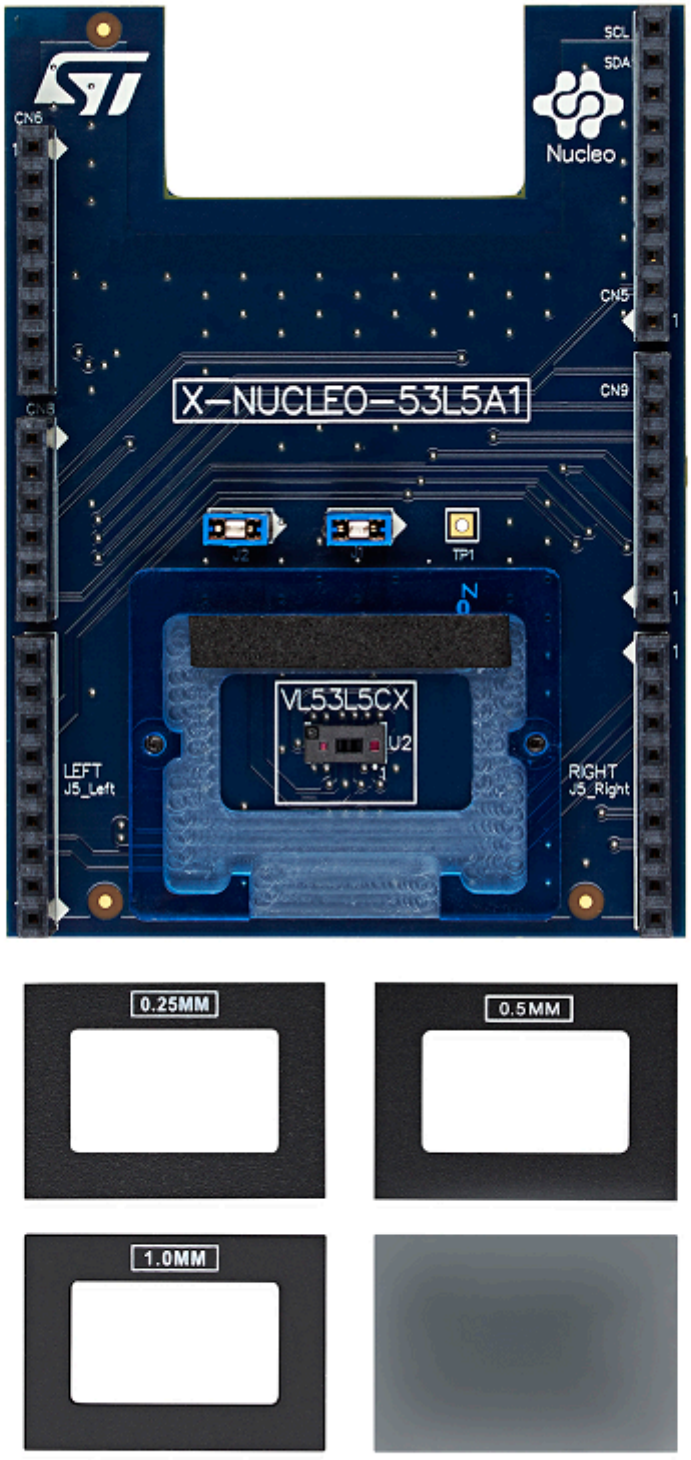
Getting started with X-NUCLEO-53L5A1 Time-of-Flight 8x8 multi-zone ranging sensor with wide FoV based on the VL53L5CX for STM32 Nucleo

Introduction

This document provides detailed hardware information on the X-NUCLEO-53L5A1 expansion board. This expansion board is compatible with the STM32 Nucleo family and the Arduino™ electronic boards. It is designed around the VL53L5CX multi-zone ranging sensor and is based on the ST patented FlightSense technology.

To allow the user to validate the VL53L5CX in an environment as close as possible to its final application, the X-NUCLEO-53L5A1 expansion board is delivered with a holder in which three different height spacers of 0.25 mm, 0.5 mm, and 1 mm can be fitted with the cover glass above the spacer. The height spacers are used to simulate different air gap distances between the VL53L5CX sensor and the cover glass.

Figure 1. **X-NUCLEO-53L5A1 expansion board, spacers, and cover glass**



1 Overview

The X-NUCLEO-53L5A1 expansion board features the VL53L5CX multi-zone ranging sensor, based on ST's FlightSense, Time-of-Flight (ToF) technology.

It is compatible with the STM32 Nucleo development board family, and with the Arduino UNO R3 connector layout.

Several ST expansion boards can be stacked through the Arduino connectors, which allows, for example, the development of VL53L5CX applications with Bluetooth or Wi-Fi interfaces.

The X-NUCLEO-53L5A1 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 VL53L5CX and the cover glass.
- A cover glass to simulate the integration of the VL53L5CX into the customer's final product.
- Two 9-pin connectors to enable the customer to connect the two breakout boards onto the X-NUCLEO-53L5A1 expansion board.

Note: The VL53L5CX is delivered with a liner to prevent potential foreign material from penetrating inside the module holes during the assembly process. This liner must be removed at the latest possible step during final assembly, before module calibration.

Table 1. Ordering information

Order code	Description
X-NUCLEO-53L5A1	STM32 Nucleo expansion board - spacers and glass

2 Document references

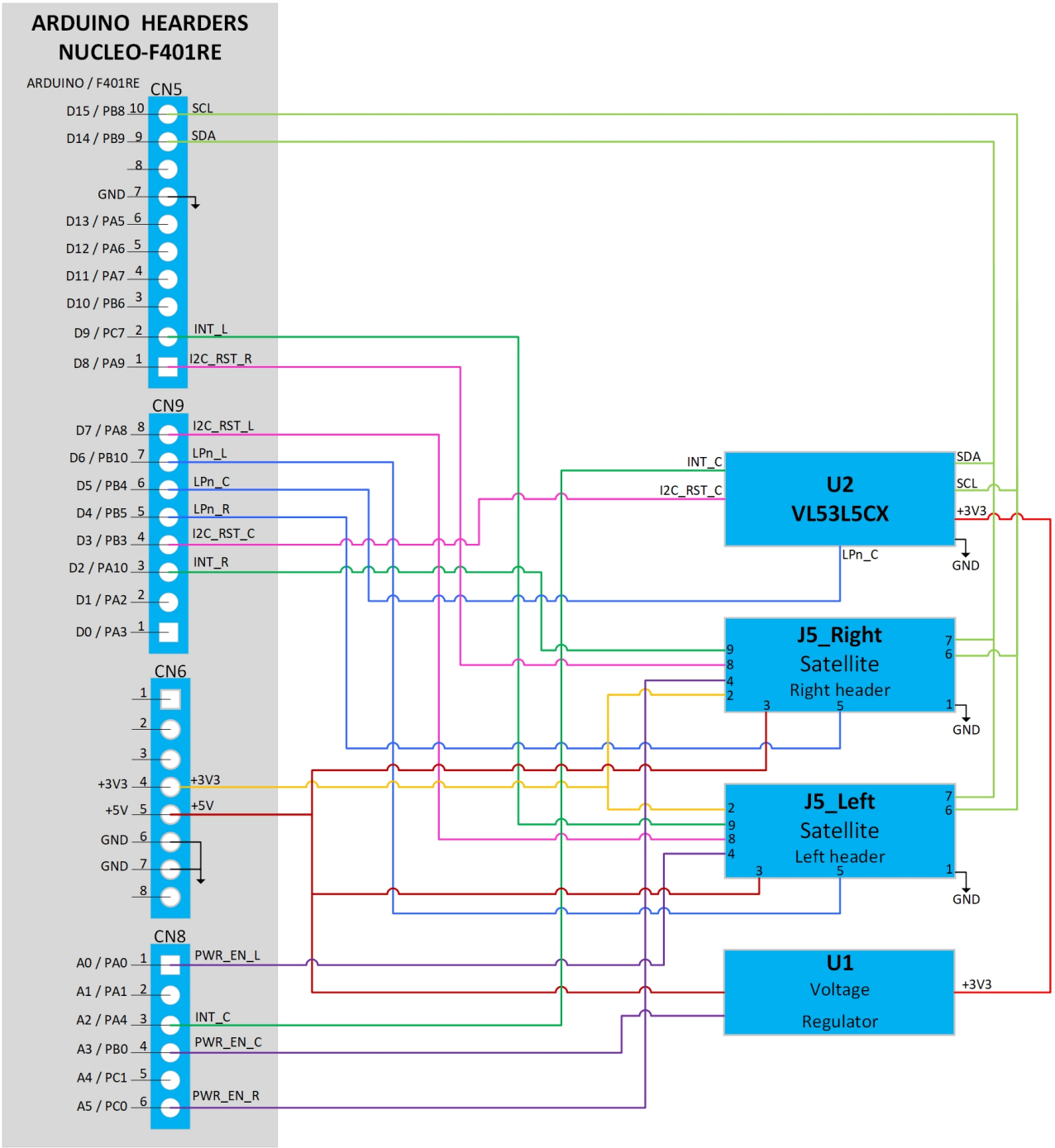
Table 2. **Document references**

Description	DocID
VL53L5CX datasheet	DS13754
X-NUCLEO-53L5A1 data brief	DB4505
P-NUCLEO-53L5A1 data brief	DB4509
X-CUBE-TOF1 data brief	DB4449
VL53L5CX-SATEL data brief	DB4506

3 X-NUCLEO-53L5A1 expansion board

This section describes the X-NUCLEO-53L5A1 expansion board features and provides useful information for understanding the electrical characteristics.

Figure 2. X-NUCLEO-53L5A1 expansion board schematic diagram



3.1 Description

The board allows the user to test the VL53L5CX functionality, to program it and to understand how to develop an application using the VL53L5CX. It integrates:

- 3.3 V regulator to supply the VL53L5CX
- Level translators to adapt the I/O level to the main board of the microcontroller
- Arduino UNO R3 connectors
- Optional VL53L5CX breakout board connectors
- Solder drops to allow different configurations of the expansion board

It is fundamental to program a microcontroller to control the VL53L5CX through the I2C bus. The application software and an example of the C-ANSI source code are available on www.st.com.

The X-NUCLEO-53L5A1 expansion board and STM32 Nucleo development board are connected through the Arduino UNO R3 connectors CN5, CN6, CN8, and CN9 as shown in Figure 2. X-NUCLEO-53L5A1 expansion board schematic diagram.

The X-NUCLEO-53L5A1 must be plugged onto the STM32 Nucleo development board through the Arduino UNO R3 connectors.

3.2 Electrical schematic

The electrical schematics can be downloaded at www.st.com, in the "CAD Resources" section of the X-NUCLEO-53L5A1.

3.3 List of materials

The list of material can be downloaded at www.st.com, in the "CAD Resources" section of the X-NUCLEO-53L5A1.

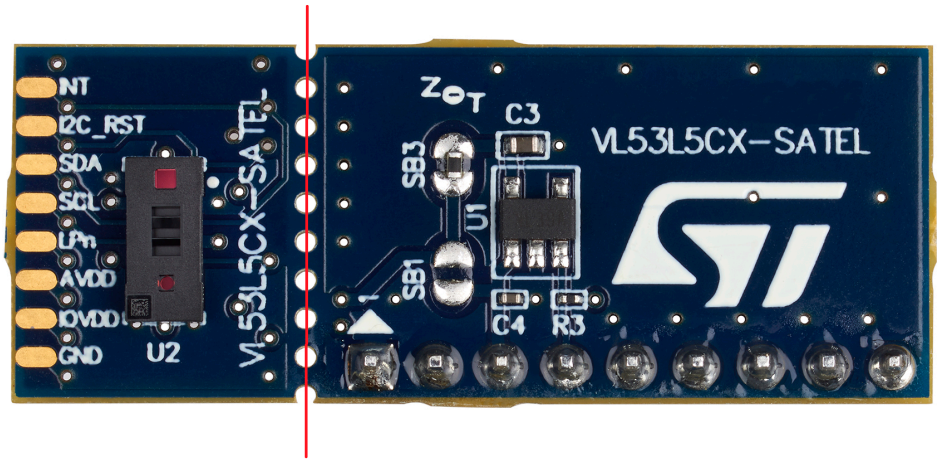
4 VL53L5CX breakout board

The VL53L5CX breakout boards are not present in the X-NUCLEO-53L5A1 package. They can be purchased by pack of two PCB under the reference VL53L5CX-SATEL.

The VL53L5CX breakout boards are supplied at 3.3 V by the regulator present on the X-NUCLEO-53L5A1 expansion board.

For 3.3 V supply applications, the breakout boards can be broken along the red line as shown in the figure below, to use the “mini PCB”. This set up is easier to integrate into a customer device due to its small size.

Figure 3. VL53L5CX breakout board layout



The VL53L5CX breakout boards can be directly plugged onto the VL53L5CX expansion board through two 9-pin connectors, or they can be connected to the board through flying wires (see figure below).

Figure 4. **VL53L5CX mini PCB flying wire connection to X-NUCLEO-53L5A1 expansion board**

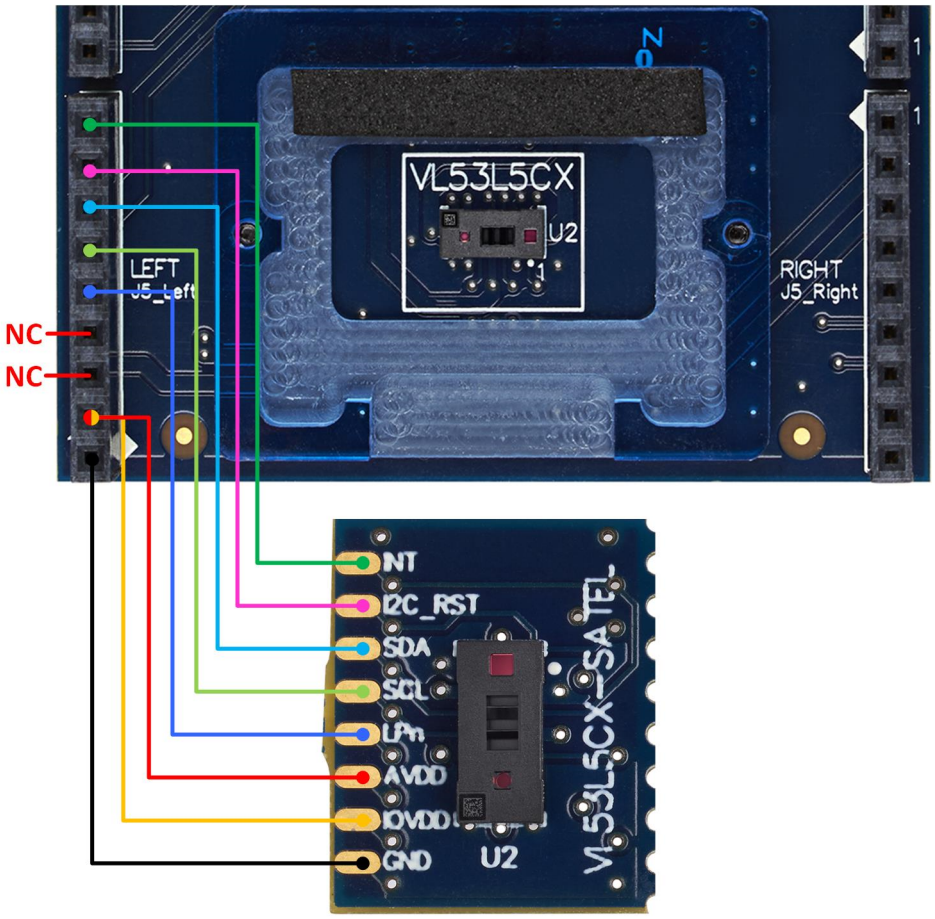
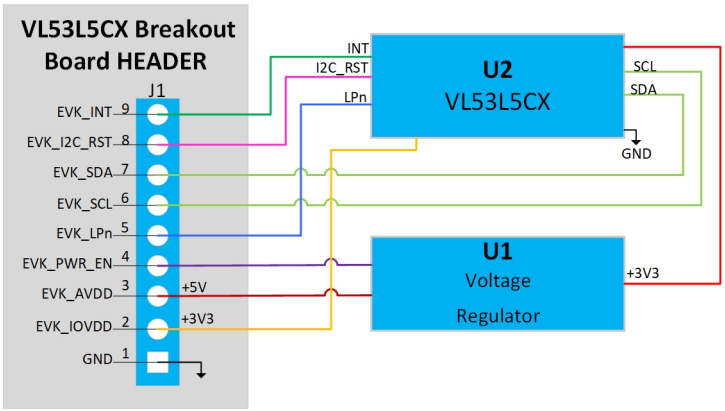


Figure 5. **VL53L5CX-SATEL**



5 Safety considerations

5.1 Electrostatic precaution

The user should exercise electrostatic precautions, including using ground straps when using the X-NUCLEO-53L5A1 expansion board. Failure to prevent electrostatic discharge could damage the device.

Figure 6. Electrostatic logo

5.2 Laser safety considerations

The VL53L5CX 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 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 7. Class 1 laser product label

Revision history

Table 3. **Document revision history**

Date	Version	Changes
16-Sep-2021	1	Initial release

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