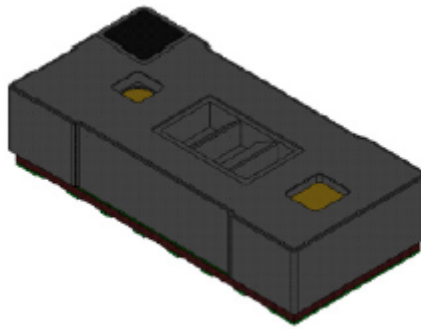# A software integration guide to implement the ultra light driver of the VL53L5CX Time-of-Flight 8 x 8 multizone ranging sensor with wide field of view

Introduction

The purpose of this user manual is to explain how to implement the platform layer required to use the VL53L5CX ultra lite driver (ULD).

Figure 1. **VL53L5CX sensor module**

References:

1. VL53L5CX datasheet (DS13754)
2. VL53L5CX ULD user manual (UM2884)

UM2887 - Rev 1 - June 2021
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1 Functional description

1.1 System overview

The VL53L5CX system is composed of a hardware module and the ULD software (VL53L5CX ULD) running on a host (see figure below). The hardware module contains the Time-of Flight (ToF) sensor. ST delivers the software driver which is referred to in this document as "the driver". This document describes the functions of the driver which are accessible to the host. These functions control the sensor and get the ranging data.

Figure 2. VL53L5CX system overview
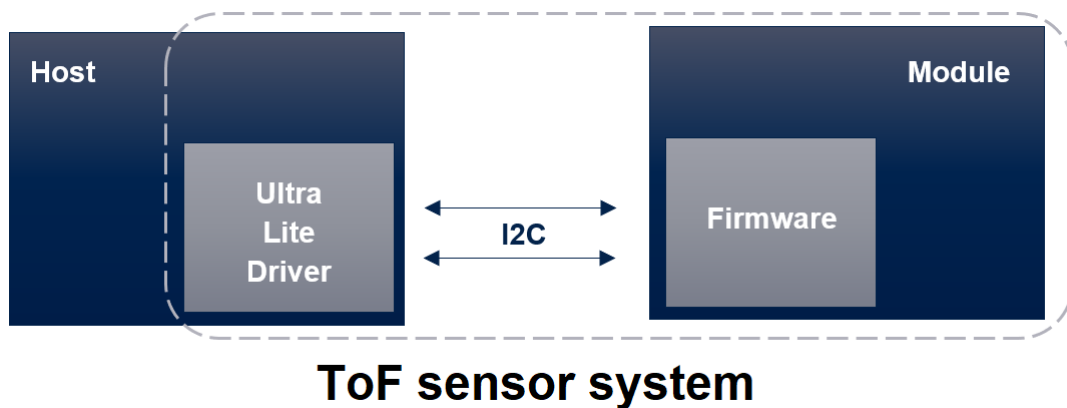
1.2 Driver architecture and content

The VL53L5CX ULD package is composed of four folders. The driver is located in the folder / VL53L5CX_ULD_API.

To correctly use the driver, the user needs to fill the two files which are located into the "Platform" folder.

They contain the functions for I2C transactions, and miscellaneous features required by the driver. The driver architecture illustrated in the following figure.

Figure 3. VL53L5CX driver architecture
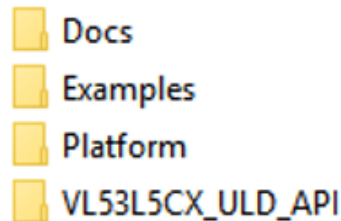
2 Memory requirements

2.1 Driver memory

As the VL53L5CX is a RAM-based sensor, firmware needs to be loaded before starting a ranging session. The firmware is automatically sent by the driver when the initialization function is called.

The firmware uses a major part of the driver (approximately 86 kbytes). The following table describes the typical size which is required by the host.

Table 1. Typical memory usage

File	Size (Kbytes in Flash)
API	92.6
Plugin Xtalk	2.4
Plugin detection threshold	0.4
Plugin motion detector	0.2
TOTAL	95.6

Note: *Total memory may differ depending on the number of targets per zone and the enabled output. The proposed values correspond to the default driver settings. Refer to the user manual UM2884 for more information.*

Note: *The optimization level (typical memory usage) in GCC is -0 s.*

3 Platform implementation

The actions described in this chapter need to be implemented by the user to use the driver. The empty functions are located in the "platform.c" file.

3.1 I2C read/write

Transactions between VL53L5CX sensor and the host are handled by I2C. The module pinout and schematics are given in the VL53L5CX datasheet (DS13754).

The user needs to implement the I2C functions to read and write the data. The minimum and maximum I2C transactions are listed in the following table.

Table 2. I2C transaction size

Setting	Size (bytes)
Min I2C Read	1
Max I2C Read	3100
Min I2C Write	1
Max I2C Write	32800

3.2 I2C bandwidth

The VL53L5CX sends or receives data through I2C when one of the following conditions is met:
- When the sensor is initialized. Firmware is loaded and a routine sequence is launched.
- When the host gets or sets the power mode.
- When the sensor is configured, started or stopped
- When the ranging data is read.
- For polling mode, when host checks if new data is ready.

Depending of the I2C clock speed, the initialization routine can take time as approximately 86 kbytes need to be loaded.

Another high I2C usage may append for high framerate, using particular configurations (all output enabled and maximum number of targets per zone). The following table gives the bandwidth for several configurations.

Table 3. IC2 bandwidth during ranging for several configurations

Driver configuration	Packet size (bytes)	Bandwidth (bytes/sec)
1 Hz - Resolution 4x4 - 1 target per zone - only get distance + target status + nb target detected	124	124
1 Hz - Resolution 8x8 - 1 target per zone - only get distance + target status + nb target detected	316	316
60 Hz - Resolution 4x4 - 4 targets per zone - all output enabled	1008	63000
15 Hz - Resolution 8x8 - 4 targets per zone - all output enabled	3360	50909

Revision history

Table 4. Document revision history

Date	Version	Changes
03-Jun-2021	1	Initial release

Contents

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