A guide to highlight the differences between VL6180 and VL53L4CD

Introduction

VL6180 product (order code VL6180V1NR/1) is reaching end of life. To replace this product in the customer applications, ST recommends moving to the VL53L4CD module.

This application note highlights the main differences between VL6180 and VL53L4CD, to help customers in their migration.

For more details on VL6180 or VL53L4CD, refer to datasheets and user manuals listed below.

Figure 1. VL6180

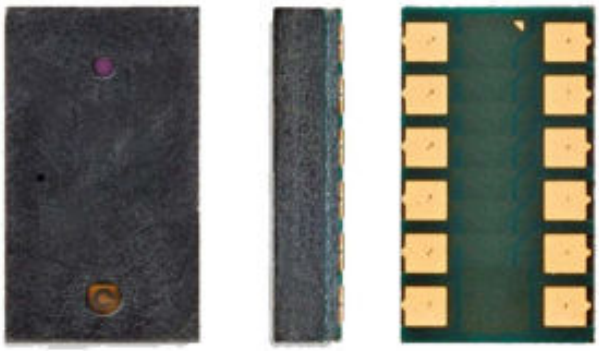

Figure 2. VL53L4CD

References:

- VL6180 datasheet (DS9818)
- VL53L4CD datasheet (DS13812)
- VL6180 user manual (UM2760)
- VL53L4CD user manual (UM2931)

1 Hardware

1.1 Module

Table 1. Module details

Parameter	VL6180	VL53L4CD
Package size	**4.8 x 2.8** x 1.0 mm	**4.4 x 2.4** x 1.0 mm
Package type	Optical LGA 12 without liner	Optical LGA 12 **with or without** liner
AVDD and VCSEL power supply	Single power supply	
ROHS	EcoPack2	

1.2 Interfaces and control

Table 2. Interfaces and control

Parameter	VL6180	VL53L4CD
Interface	I2C	
Max frequency of the interface	up to **400 kHz**	up to **1 MHz**
Control	Register level	Abstracted API
Device address	0x52, reconfigurable using API	
I2C index formatting	16 bits	
XSHUTDOWN pin	**Available through GPIO/CE**	Available
Interrupt on thresholds	Available	
Drivers	C or Linux drivers	

1.3 Emission and FoV

Table 3. Emission and FoV

Parameter	VL6180	VL53L4CD
VCSEL wavelength	**850 nm**	**940 nm**
Laser safety	Class1 IEC 60825-1:2014 EN 60825-1:2014+A11:2021 and with EN 50689:2021	
Field of view	Equivalent	

Note: Refer to the datasheets' outline drawings section to get the detailed values, and to AN5894 for the description of the fields of view of STMicroelectronics' Time-of-Flight sensors.

1.4 Operating and storage conditions

Table 4. Operating and storage conditions

Parameter	VL6180	VL53L4CD
Operating voltage AVDD and AVDDVCSEL	2.6 to **3.0 V**	2.6 to **3.5 V**
Operating temperature	**-20 to 70°C**	**-30 to 85°C**
Storage temperature	-40 to 85°C	
ESD	+/- 2 kV for human body +/- 500 V for charged device model	

2 Calibrations conditions

Table 5. **Calibrations conditions**

Parameter	VL6180	VL53L4CD
Offset calibration	**88%** reflectance target **50 mm**	**17%** reflectance target **10 to 255 mm**
Xtalk calibration	17% reflectance target	

3 Features and modes

3.1 Features

Table 6. Features

Parameter	VL6180	VL53L4CD
Extended range – upscale factor	Available	**Not available**
Wrap around detection	Integrated in **driver**	Integrated in **device**
Estimated maximum ranging distance	Available	**Not available**
Getting measurement	Polling or interrupt	

3.2 Ranging modes, integration time and frequency

Table 7. Ranging modes, integration time and frequency

Parameter	VL6180	VL53L4CD
Ranging modes	**Single** and continuous range	Continuous range
ECE (Early convergence estimation)	Available	**Not available** (refer to Section 4.3: Power consumption)
Integration time	**Variable, up to 15 ms**	**Static, user defined**
Max ranging frequency	—	100 Hz
Min ranging frequency	—	0.2 Hz
Detection thresholds	Available	
Manual temperature recalibration	Not available	**Available**

4 Performances

Test conditions: The VL6180 and VL53L4CD are tested with default driver settings.

4.1 Maximum ranging

Table 8. Maximum ranging

Parameter	VL6180	VL53L4CD ULD
Dark, White target (88%)	560 mm	>1300 mm
Dark, Grey target (17%)	520 mm	560 mm
500 Lux, White target (88%)	260 mm	420 mm
500 Lux, Grey target (17%)	280 mm	460 mm

4.2 Accuracy

Table 9. Accuracy in range 10-300 nm

Parameter	VL6180	VL53L4CD ULD
Dark, White target (88%)	+/- 20 mm	+/- 10 mm
Dark, Grey target (17%)	+/- 20 mm	+/- 10 mm
500 Lux, White target (88%)	+/- 40 mm	+/- 15 mm
500 Lux, Grey target (17%)	+/- 40 mm	+/- 15 mm

Table 10. Accuracy in range >300 nm

Parameter	VL6180	VL53L4CD ULD
Dark, White target (88%)	+/- 7 %	+/- 5 %
Dark, Grey target (17%)	+/- 7 %	+/- 7 %
500 Lux, White target (88%)	+/- 15 %	+/- 15 %
500 Lux, Grey target (17%)	+/- 15 %	+/- 15 %

4.3 Power consumption

VL6180 was tested using the standard driver which embeds a feature called ECE. This feature helps to reduce power consumption when no target is present.

VL53L4CD was tested with two driver versions:

- Ultra light driver: the standard ultralow driver, which ranges continuously at 30 fps by default. No ECE is available on this driver. The ULD driver is available on st.com in the software package called STSW-IMG026
- Optimized ultralow power driver: this is an example code, which aims to mimic the ECE feature from VL6180. This example code is available on st.com in the software package called STSW-IMG049_ECE

Table 11. Power consumption

Parameter	VL6180	VL53L4CD Optimized ULP driver	VL53L4CD ULD driver
Consumption without target	154 uJ	171 uJ	2700 uJ
Consumption when target is present	435 uJ	1638 uJ	2700 uJ

Revision history

Table 12. **Document revision history**

Date	Version	Changes
19-Jul-2024	1	Initial release