



life.augmented

# Going further with FlightSense™





# Agenda

1 Introduction

2 **FlightSense™** ToF  
mass market roadmap

3 Highlights on new  
products features

4 ToF sensors KPIs  
comparison

5 New **FlightSense™** ToF  
sensors – Focus

6 Tools ordering codes

7 **FlightSense™** vs. other  
proximity sensing technologies



# ST pioneer and leader in Time-of-Flight (ToF)

**ST is #1 Worldwide ToF sensor supplier**

## 4 Generations

of all-in-one ToF solution deployed since 5 years

**>155 phones with FlightSense™**

Above 15 smartphone OEMs

**Hundreds other customers**

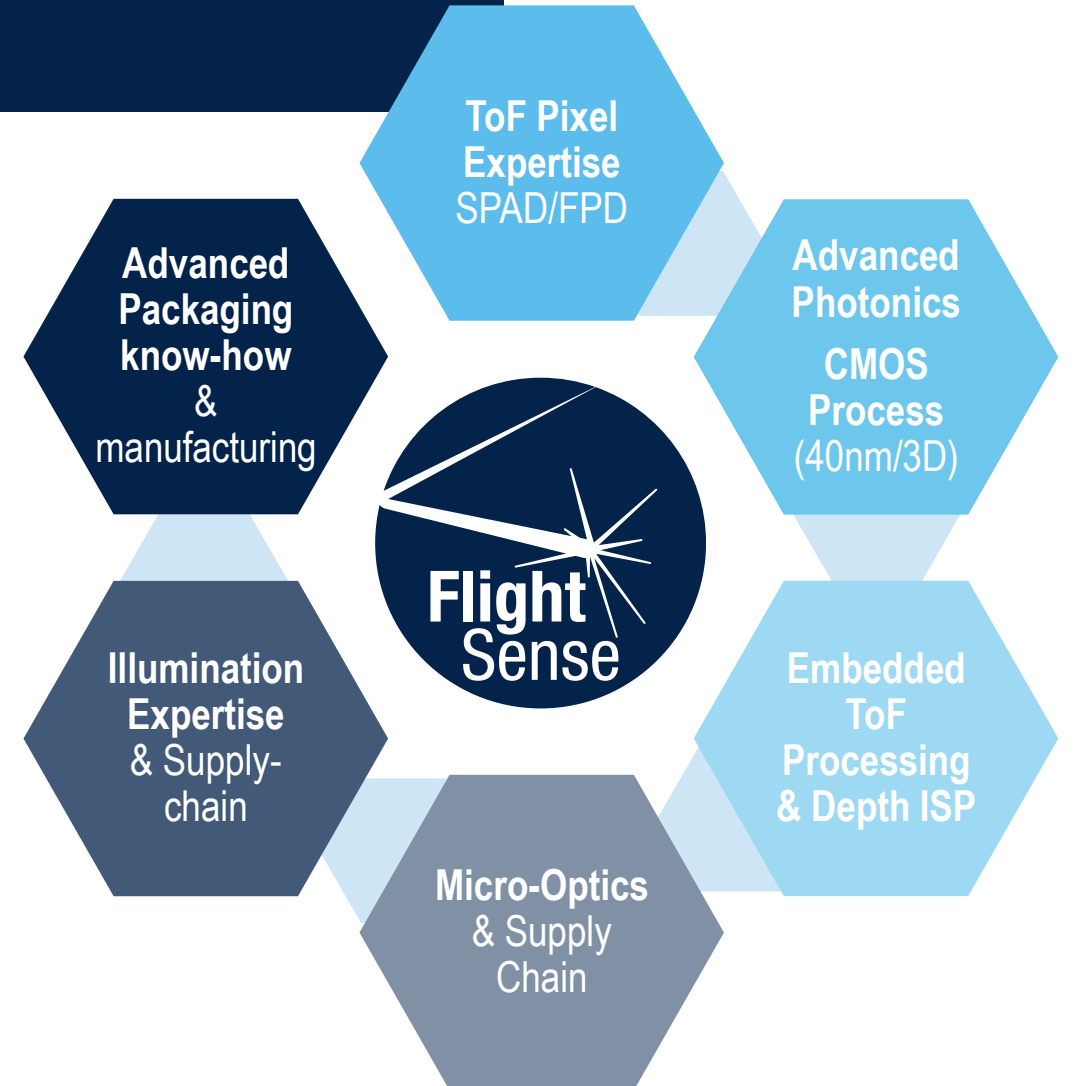
Hundreds non wireless end-products in the market

**>40,000**

Evaluation kits deployed

**>1Bu**

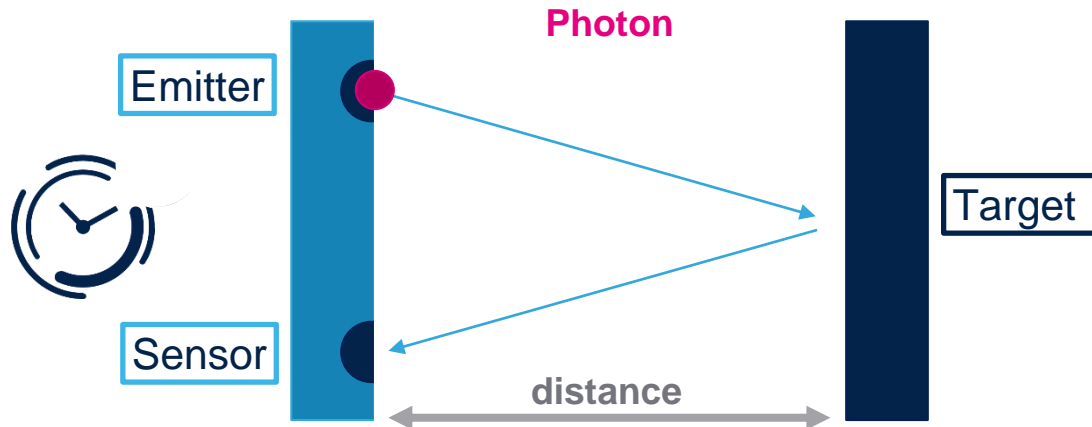
ToF units shipped. Mastering end-to-end supply chain





# FlightSense™ ... making light work

## Time-of-Flight Principle



$$\text{Measured distance} = \text{Photon travel time} / 2 \times \text{Speed of light}$$

1cm round-trip takes 67ps

ST proprietary **FlightSense™** technology

True distance measurement  
Independent of target size, color & reflectance

Fast and low power

Truly invisible 940 nm illumination



# FlightSense™

## Typical module overview

All-in-One (illumination & sensor) Time of Flight system  
→ Optimized size / performance / cost mix

Advanced optics with  
integrated IR filter

State-of-art assembly & testing  
manufacturing ST line in SHZ



Monolithic ToF SoC, SPAD Array,  
RAM/ROM & powerful Class1  
VCSEL driver

High power VCSEL  
Full Class 1 safety



# FlightSense™ product longevity 7-year commitment



## FlightSense™ benefits from ST Longevity Program

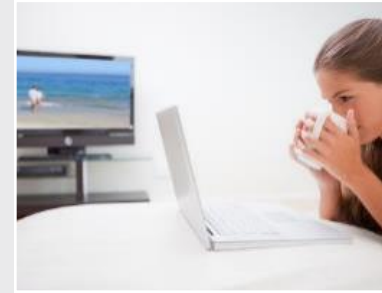
### 7-year longevity from Product Introduction Date

- VL6180X since January 2015
- VL6180V1 since January 2019
- VL53L0CX since January 2019
- VL53L3CX since January 2019
- VL53L1CX since January 2019





# Smart optical sensing & FlightSense™ ... making light work



## Camera Assistance

- Laser autofocus
- Touch-to-Focus
- Scene understanding
- AWB assist based on 940nm content

## Ranging & Proximity

- True ToF distance
- High accuracy
- Up-to 4 meters

## Multispectral & Flicker

- True tone color display & ALS
- Camera AWB
- Light flicker measurement and correction

## Face Identification

- Face anti-spoofing
- Cost, power, size optimized
- All-in-one depth sensing

## Presence, User Detect

- Security
- Comfort
- Power saving
- Eye protection
- Wellness

## Depth Map & AR/VR

- All-in-one Module
- High resolution receiver
- Gesture
- Consumer LiDAR

# FlightSense™ ST ToF ranging sensors

## **Mass-market roadmap**





# FlightSense™ mass-market roadmap

Overall performance



XX° FoV



Programmable FoV  
XX° Max



Up to 4 zones  
sequentially



Histogram  
MultiObject detection



Perf. Under Ambient

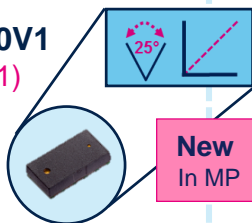


Smudge correction



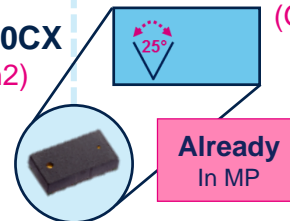
Close distance  
Linearity

VL6180V1  
(Gen1)



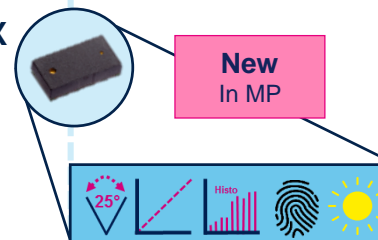
100cm

VL53L0CX  
(Gen2)



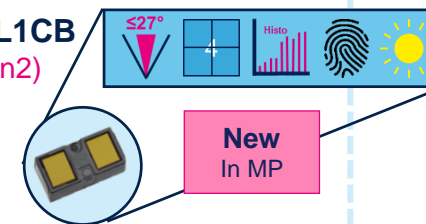
200cm

VL53L3CX  
(Gen2)

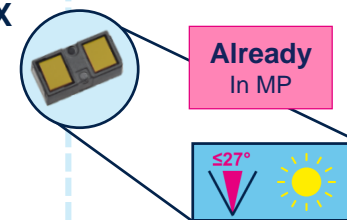


300cm

VL53L1CB  
(Gen2)



VL53L1CX  
(Gen2)



400cm

Max. Distance  
measurement in cm  
(in the dark)



# FlightSense™ mass-market roadmap



	VL6180V1 Proximity sensor	VL53L0CX Ranging sensor	VL53L3CX Proxy + Multi target sensor	VL53L1CX Long Distance sensor	VL53L1CB Long Distance + Multi target sensor
Distance measurement	Proximity up to 62cm	Ranging up to 2 meters	Proximity + Ranging up to 3 meters	Long Ranging up to 4 meters	3.2 meters (Histogram) up to 4 meters (Lite ranging)
Close distance linearity	++ (>2.5cm)		++ (>2.5cm)	+ (>4cm)	+ (>4cm)
Performance under ambient light (along windows with strong outside light)		+ (80cm)	++ (100cm)	+++ (135cm)	+ (90cm)
Resolution	1 zone	1 zone	1 zone	1 zone	1 zone or <b>sequential MultiZone</b>
FoV	25° No Lens	25° No Lens	25° No Lens	27° (SWconfig) Lens on Rx	27° (SW config) Lens on Rx
Multi-target detection (Histogram)	No	No	Yes	No	Yes
X-talk / Smudge immunity	X-talk compensation	X-talk compensation	Immunity >80cm <80cm: Smudge compensation	X-talk compensation	Immunity >80cm <80cm: Smudge compensation
Power Consumption	1.7mA	19mA (low power mode available)	16mA	16mA (low power mode available)	16mA
Driver size	ROM 3.9kB to 4.5kB RAM 0.14kB	ROM 13.5kB to 23.4kB RAM 0.78kB	ROM 28.5kB to 36kB RAM 0.31kB	ROM 9.8kB to 14.6kB RAM 0.30kB (ultra lite driver available)	ROM 31kB to 47.6kB RAM 0.31kB
Small all-in-one modules	4.8 x 2.8 x 1.0 mm	4.4 x 2.4 x 1.0 mm	4.4 x 2.4 x 1.0 mm	4.9 x 2.5 x 1.56 mm	4.9 x 2.5 x 1.56 mm








# FlightSense™ ST ToF ranging sensors

## Highlights on new product features

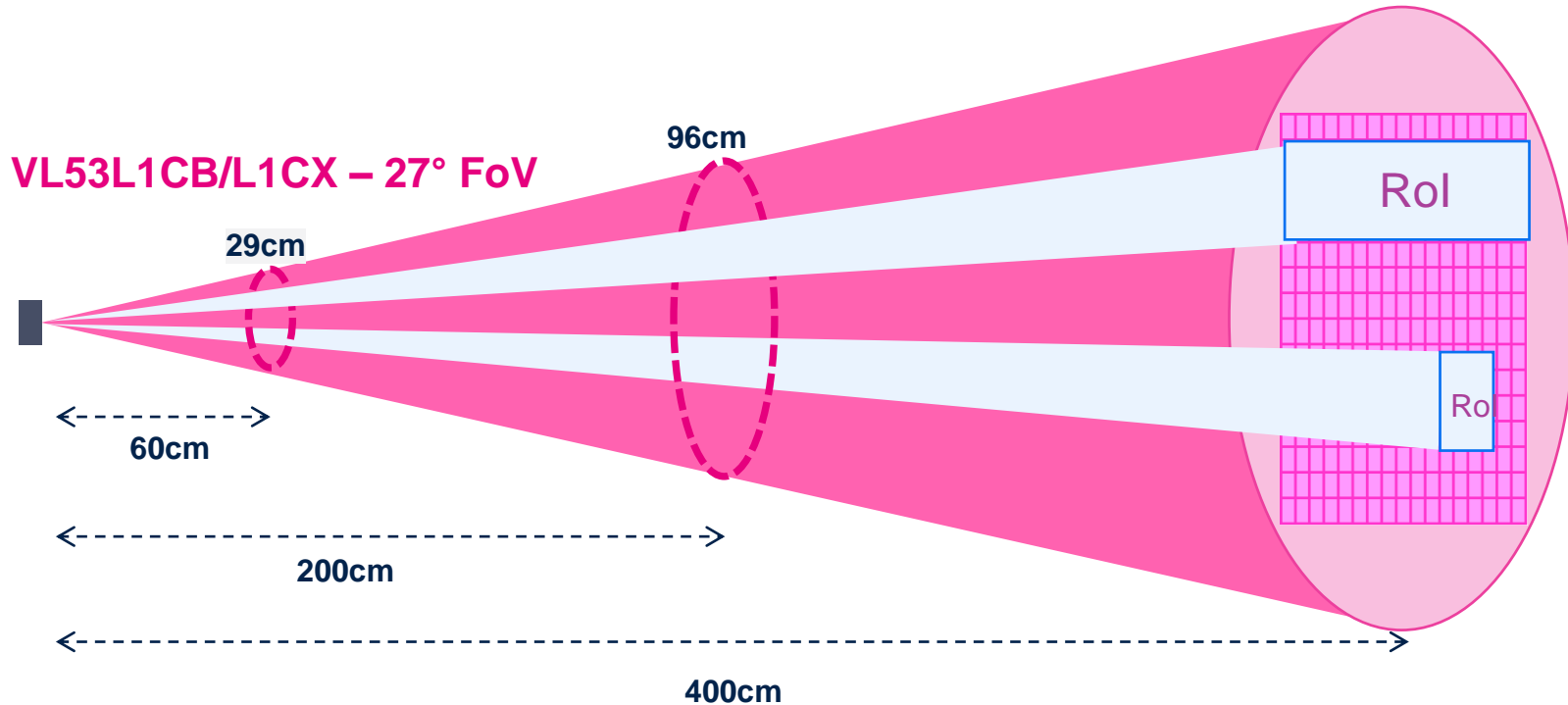


# Programmable Field of View VL53L1CX & VL53L1CB

Flexible FOV selections => Regions of Interest ( RoI )

-  XX° FoV
-  Programmable FoV  
XX° Max
-  Up to 4 zones  
sequentially
-  Histogram  
MultiObject detection
-  Perf. Under Ambient
-  Smudge correction
-  Close distance  
Linearity (+: Excellent)

VL53L1CB/L1CX – 27° FoV

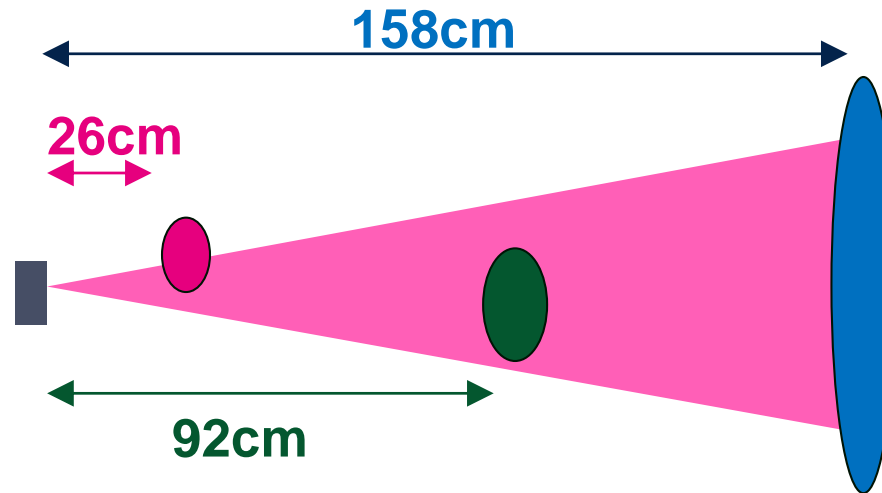


ROI zone size (In SPADs)	Diagonal FOV covered by the zone
4x4	15 ° (smallest)
8x8	20 °
16x16	27 ° (largest, full FoV)



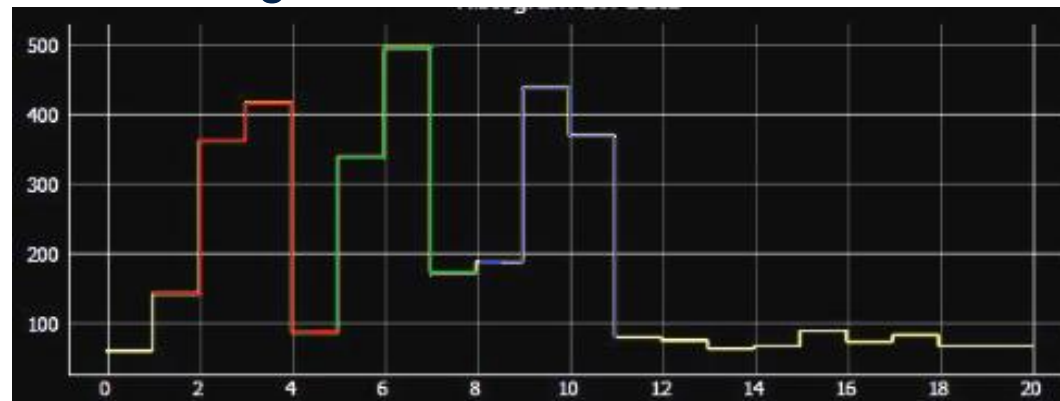
# Multi-object detection VL53L3CX & VL53L1CB

	XX° FoV
	Programmable FoV XX° Max
	Up to 4 zones sequentially
	Histogram MultiObject detection
	Perf. Under Ambient
	Smudge correction
	Close distance Linearity (+: Excellent)










- Output ranging distance for each object (60~70cm granularity)
- Only direct ToF can do it. Indirect ToF cannot output multi bins and extract distance with correct resolution
- Allow first object detection
- Allow background removal

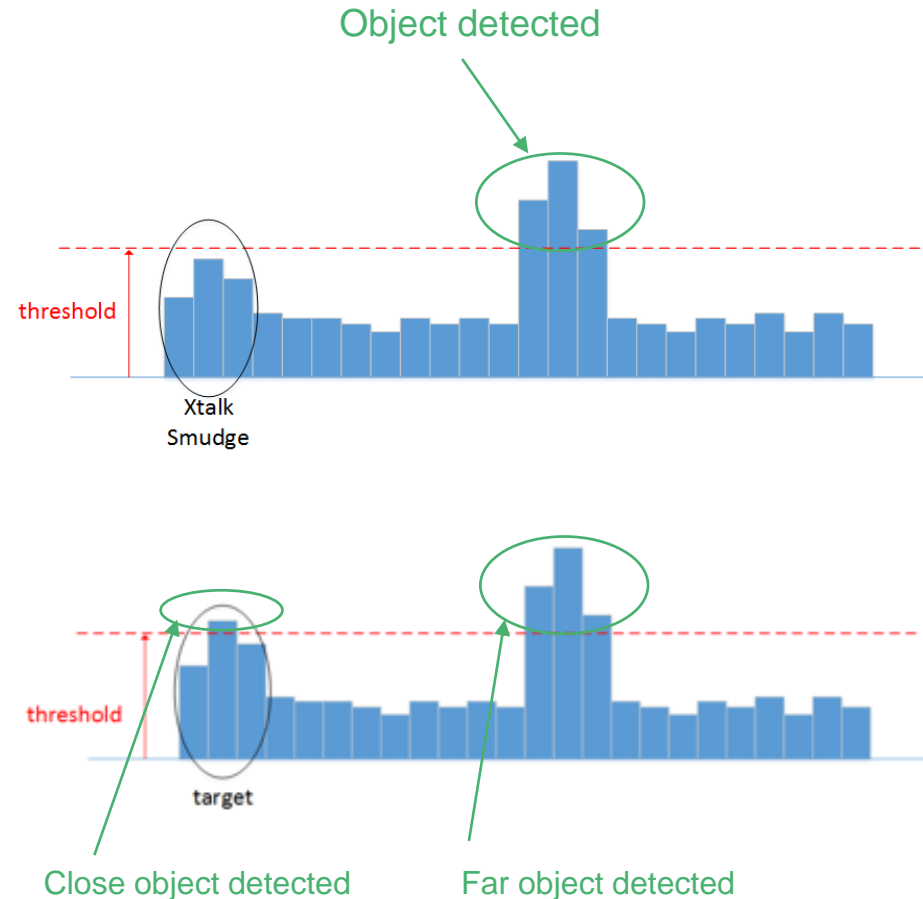
Histogram based





# Histogram architecture VL53L3CX & VL53L1CB

	XX° FoV
	Programmable FoV XX° Max
	Up to 4 zones sequentially
	Histogram MultiObject detection
	Perf. Under Ambient
	Smudge correction
	Close distance Linearity (+: Excellent)










- The histogram is based on 24 bins
  - a bin is a “time window”, representing the amount of photons back on the sensor during a certain period of time.
- A detected object will cover ~3 bins
  - 3 bins per object, equivalent to ~80cm. The typical depth separation between objects has to be at least 80 cm, to detect 2 different objects.
- The histogram allows cover glass crosstalk immunity beyond 80 cm, and dynamic smudge compensation

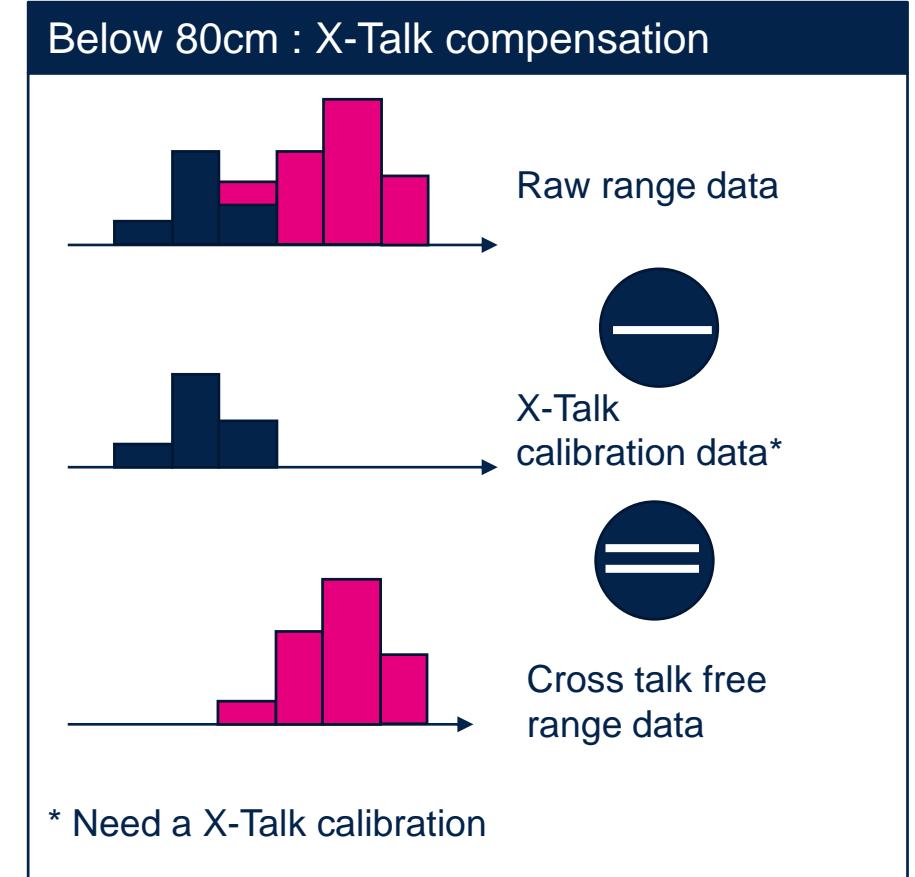
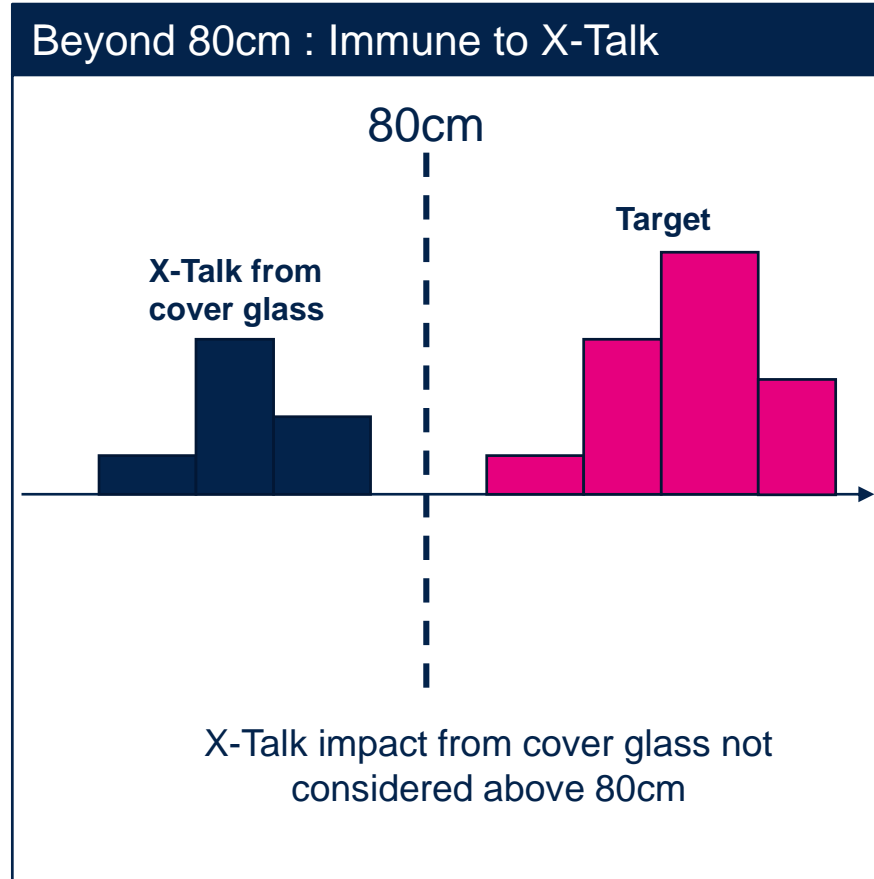
*Note : The “threshold” is a minimal signal threshold for valid target detection*



# X-Talk immunity principle

## Accurate distance whatever the smudge or X-Talk

-  XX° FoV
-  Programmable FoV XX° Max
-  Up to 4 zones sequentially
-  Histogram MultiObject detection
-  Perf. Under Ambient
-  Smudge correction
-  Close distance Linearity (+: Excellent)

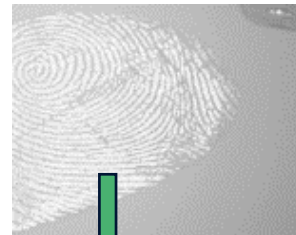




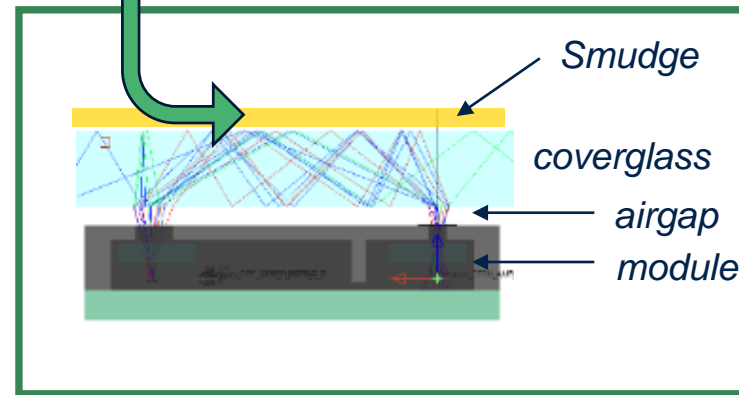


# Smudge detection VL53L3CX & VL53L1CB

- XX° FoV
- Programmable FoV XX° Max
- Up to 4 zones sequentially
- Histogram MultiObject detection
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity (+: Excellent)



Cover-window crosstalk  
+ **Smudge**, dust, or  
fingerprint crosstalk



Beyond 80cm, the smudge has no impact on the distance measurement thanks to the histogram.

## Below 80cm : X-Talk compensation



X-Talk calibration data  
without smudge



X-talk increase due  
to smudge



New X-Talk calibration  
data for smudge  
compensation

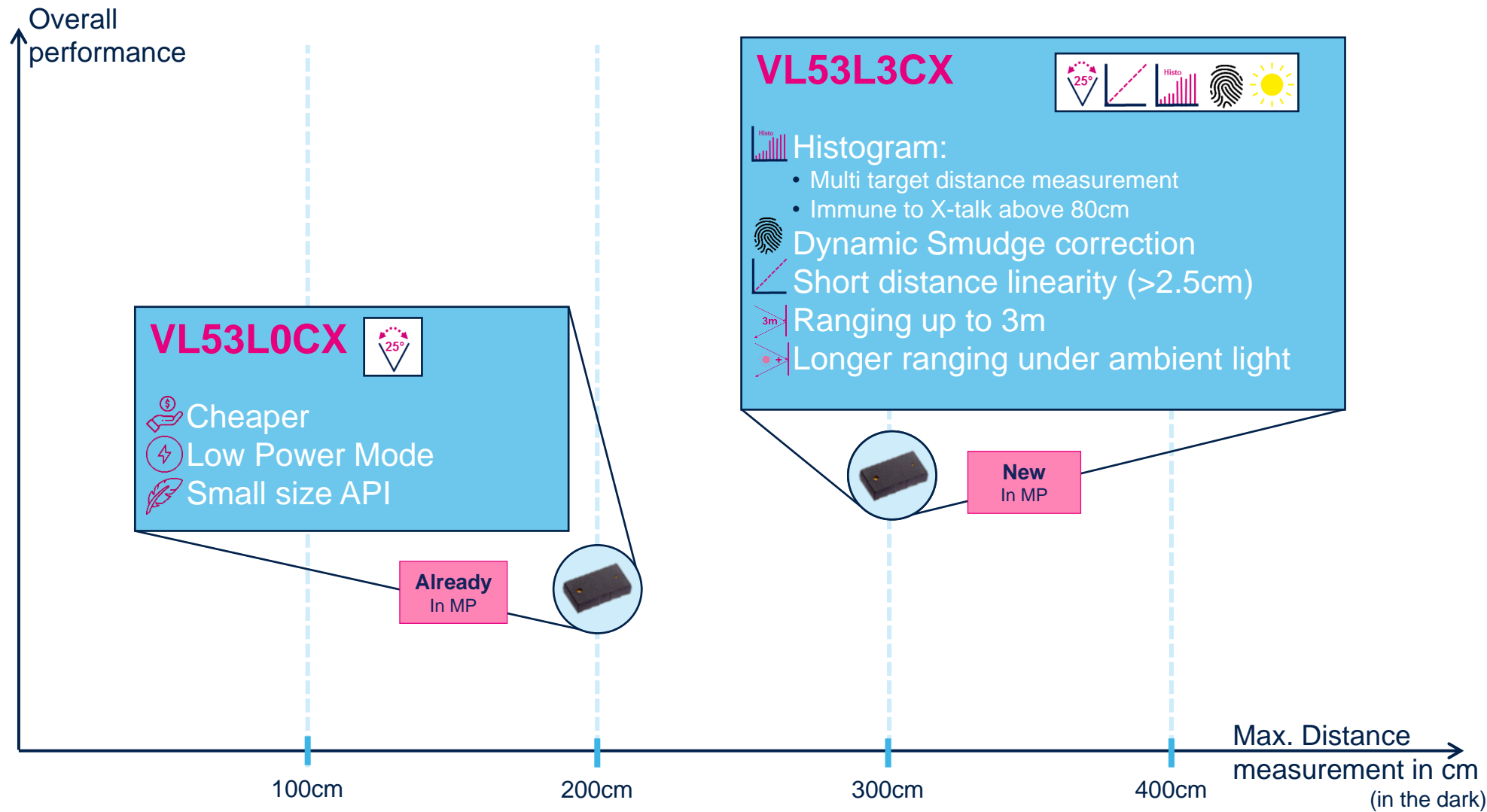
# ToF sensors KPIs comparisons



# FlightSense™ mass-market roadmap

## VL53L0CX vs VL53L3CX

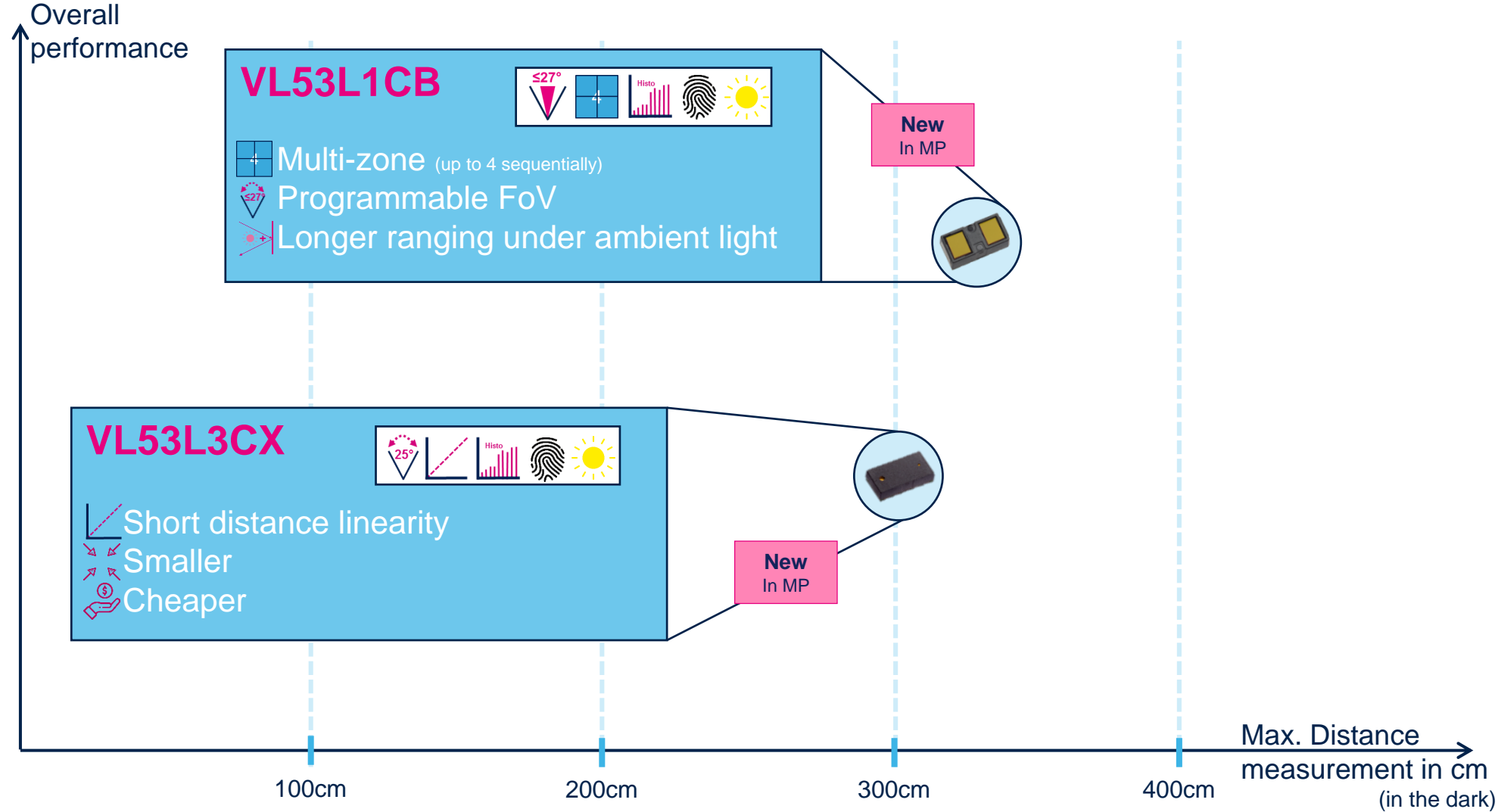
- XX° FoV
- Programmable FoV XX° Max
- Up to 4 zones sequentially
- Histogram MultiObject detection
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity





# FlightSense™ mass-market roadmap

## VL53L3CX vs VL53L1CB





# FlightSense™ mass-market roadmap

## VL53L1CB vs VL53L1CX

Overall performance ↑

### VL53L1CB

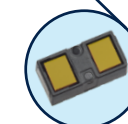


#### Histogram:

- Multi target distance measurement
- Immune to X-talk above 80cm
- Longer max distance with low reflectance target (Histo Merge)

#### Dynamic Smudge correction

New  
In MP



### VL53L1CX



#### Ranging up to 4m

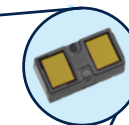
#### ULD API (Ultra Light Driver)

#### Documentation (People counting, smart shelves, linux example code, Videos...)

#### Low power mode

#### Cheaper

Already  
In MP



100cm

200cm

300cm

400cm

Max. Distance  
measurement in cm  
(in the dark)



XX° FoV



Programmable FoV  
XX° Max



Up to 4 zones  
sequentially



Histogram  
MultiObject detection



Perf. Under Ambient



Smudge correction



Close distance  
Linearity



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# New ToF sensors – Focus



# VL6180V1

## Proximity sensor



**OLGA:** 4.8 x 2.8 x 1 mm  
**FoV :** 25° diagonal  
**Single zone**

### Highlights

- **Proven technology.**
- **Robust** and accurate proximity detection
- Measures actual distance in cm **up to 60cm**
- **Independent of target reflectance / color**
- **Fully integrated** (near IR 850nm VCSEL emitter, filters, SPAD receiving array, advanced  $\mu$ C)
- **Low power** (stdby 1uA, active 5mW at 10Hz)
- Complete API package and **Android driver**
- Laser Class1 device (eye safe)



### Uses-cases

- Reliable Proximity detection
- User detection to safely power off touch screen or control white goods
- Obstacle detection
- Wall tracking
- Basic gesture

### Application examples



Vacuum cleaners



Service  
Robots



Wearable  
& IoT

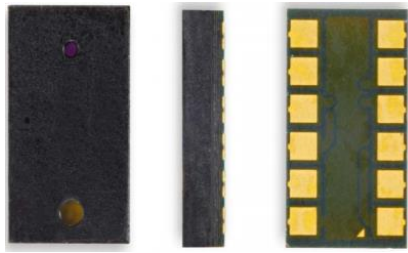


White Goods



Faucets





# VL6180V1 proximity sensor

## Technical specification

Feature	Detail
Package	Optical LGA12
Size	4.8 x 2.8 x 1 mm
Ranging	Ranging up to 62 cm maximum (dependent on target reflectance and external conditions).
Field of View	25°
Operating voltage ( AVDD )	2.6 V to 3 V
Typical power consumption	Hardware Standby (GPIO0 = 0): < 1 $\mu$ A SW Standby: < 1 $\mu$ A Active ranging average consumption (including VCSEL): 1.7 mA (typical) <sup>(1)</sup>
Function temperature range	- 20 to 70°C
IR emitter	850 nm
I <sup>2</sup> C (Clock / Data)	Up to 400 kHz serial bus
XSHUT ( GPIO0 )	XSHUT (in): HW power down when put at zero
GPIO1	Information pin: Thresholds or sample ready interrupts



# VL6180V1 support on st.com

## Videos



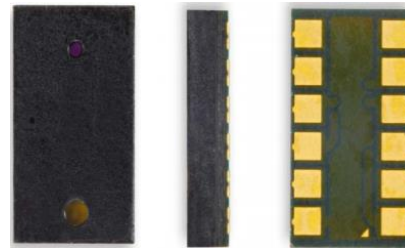
All-in-one proximity and ambient light sensing module

## User Manuals

- X-CUBE UM
- X-NUCLEO UM

## Documentation

Description	Version	Size	Action
<input type="checkbox"/> <b>DS9818</b> Proximity sensing module	13.0	1.98 MB	<a href="#">PDF</a>
<input type="checkbox"/> <b>DB1904</b> Time-of-Flight proximity sensor and IR emitter two-in-one module	5.0	771.48 KB	<a href="#">PDF</a>



## Software

- API (driver)
- GUI for X-NUCLEO
- X-CUBE example



# VL53L3CX

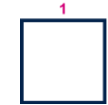
## High-performance proximity sensor, combining short distance linearity & ranging performance

### Highlights

- Full FoV ranging : **300cm+** (white target, no IR)
- **High-performance proximity** sensor
- Excellent **short distance linearity**
- **Multi-target distance measurement** based on ST Histogram patented algorithms
- **Immunity to cover glass cross-talk** beyond 80cm
- Automatic **fingerprint smudge compensation**
- Miniature ToF product



OLGA: 4.4 x 2.4 x 1 mm  
FoV : 25° diagonal  
Single zone



### Uses-cases

- Presence user detection
- Obstacle detection
- Accurate distance scanning

### Application examples



AR/VR



Tablets



Service Robots



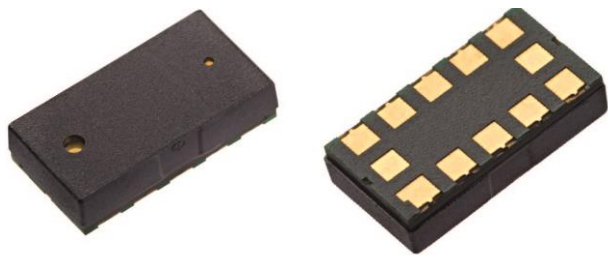
Trucks



Industrial



Warehouse



# VL53L3CX ranging sensor

## Technical specification

Feature	Detail
Package	Miniature Optical LGA12
Size	4.4 x 2.4 x 1 mm - Compatible with VL53L0X
Ranging	Ranging up to 310 cm (Indoor, under 88% white target reflectance). Up to 290 cm ( Indoor, under 54% light grey target reflectance)
Field of View	25°
Operating voltage ( AVDD )	2.6 V to 3.5 V
Typical power consumption	Hardware Standby (GPIO0 = 0): < 5 $\mu$ A SW Standby: < 6 $\mu$ A Active ranging average consumption (including VCSEL): 16 mA (typical) <sup>(1)</sup>
Function temperature range	- 20 to 85°C
IR emitter	940 nm
I <sup>2</sup> C (Clock / Data)	Up to 1 MHz serial bus
XSHUT ( GPIO0 )	XSHUT (in): HW power down when put at zero
GPIO1	Information pin: Thresholds or sample ready interrupts

<sup>(1)</sup> 30 Hz sampling rate, 33msec ranging budget

# VL53L3CX – Ranging performance

## Ranging capabilities with a 30 ms ranging operation (Fast mode)



	 <b>Indoor (no IR)</b>	 <b>Outdoor</b>
<b>White Target 88%</b>	<b>310cm</b>	<b>100cm</b>
<b>Light Grey Target 54%</b>	<b>290cm</b>	<b>70cm</b>
<b>Grey Target 17%</b>	<b>170cm</b>	<b>70cm</b>

### Measurement conditions without Cover glass :

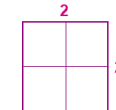
- Typical value with a detection rate at 94%
- Targets reflectance used : Grey 17%, Light grey 54%, White (88%)
- Indoor : no Infrared / Outdoor : eq. 5kLux equivalent sunlight (10kcps/SPAD)
- Nominal Voltage (2v8) and Temperature (23°C)
- All distances are for a complete Field of View covered (FOV = 25deg)

## ToF sensor with lens, for long distance ranging and FoV programming

### Highlights

- Full FoV ranging : **320cm+** (white target, no IR)
- **SPAD array zone selection** (from 4x4 SPADs up to 16x16 SPADs full screen), for FoV control
- SPAD array with **Multi-object distance measurement within each zone**
- **Integrated lens** for enhanced return signal, multi-zone detection and better immunity to IR ambient
- Multi-pass temporal filtering
  - **Immunity to cover glass crosstalk beyond 80cm**
  - Automatic **fingerprint smudge compensation**
  - Advanced histogram and object detection

**OLGA:** 4.9 x 2.5 x 1.56 mm  
**FoV :** 27° diagonal max – Programmable FoV  
 Single zone or Multi-zone.



### Uses-cases

- Presence user detection
- Obstacle detection
- Accurate objects distance scanning

### Applications



Laptops



White Goods



Smart home



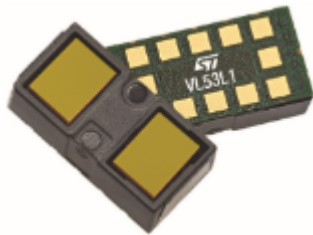
Logistic



Service Robots



Vacuum cleaners



# VL53L1CB ranging sensor technical specification

Feature	Detail
Package	Miniature Optical LGA12
Size	4.9 x 2.5 x 1.56 mm - Compatible with VL53L1X
Ranging	Up to 320 cm (Indoor, under 88% white target reflectance) with full FoV @60 Hz Up to 250 cm (Indoor, 88% white target reflectance) with 8x8 SPADs ROI @60 Hz
Field of View	Programmable FoV 27° max
Operating voltage ( AVDD )	2.6V to 3.5V (typ. 2.8V)
Typical power consumption	Hardware Standby (GPIO0 = 0): < 5 $\mu$ A SW Standby: < 6 $\mu$ A Active ranging average consumption (including VCSEL): 16 mA (typical) <sup>(1)</sup>
Function temperature range	- 20 to 85°C
IR emitter	940 nm
I <sup>2</sup> C (Clock / Data)	Up to 1 MHz serial bus
XSHUT ( GPIO0 )	XSHUT (in): HW power down when put at zero
GPIO1	Information pin: Thresholds or sample ready interrupts

<sup>(1)</sup> Ranging mode with 16msec timing budget



# VL53L1CB – Ranging performance

**Ranging capabilities with a 16 ms ranging operation,  
under histogram mode**



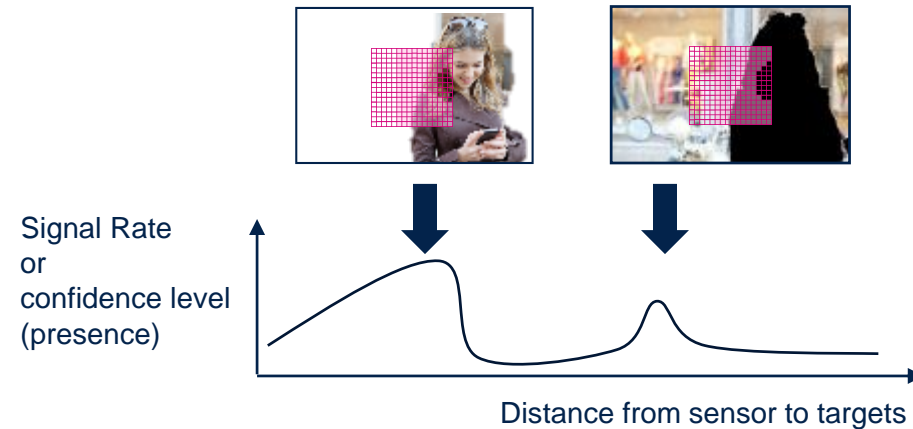
	 <b>Indoor (no IR)</b>	 <b>Outdoor</b>
<b>White Target 88%</b>	<b>320cm</b>	<b>90cm</b>
<b>Grey Target 17%</b>	<b>230cm</b>	<b>90cm</b>

## Measurement conditions without Cover glass :

- Typical values
- Targets reflectance used : Grey 17%, White (88%)
- Indoor : no Infrared / Outdoor : eq. 5kLux equivalent sunlight (10kcps/SPAD)
- Nominal Voltage (2v8) and Temperature (23°C)
- All distances are for a complete Field of View covered (FOV = 27deg)
- Detection rate is considered at 94% minimum

# Multi-object detection within the FoV

## Foreground and background separation



VL53L3CX & VL53L1CB perform advanced ranging with **direct ToF temporal filter** :

- **Only possible with direct ToF**
- **Multiple object detection** within the same FoV, up to 60 Hz
  - Ideal for complex scenes management (foreground / background)
  - Distance (in mm) also provided, for single or multi objects
- **Immune to cover glass crosstalk beyond 80 cm**, and compensation capability below 80 cm
- **Real time smudge detection and compensation** (On the fly = at each run)

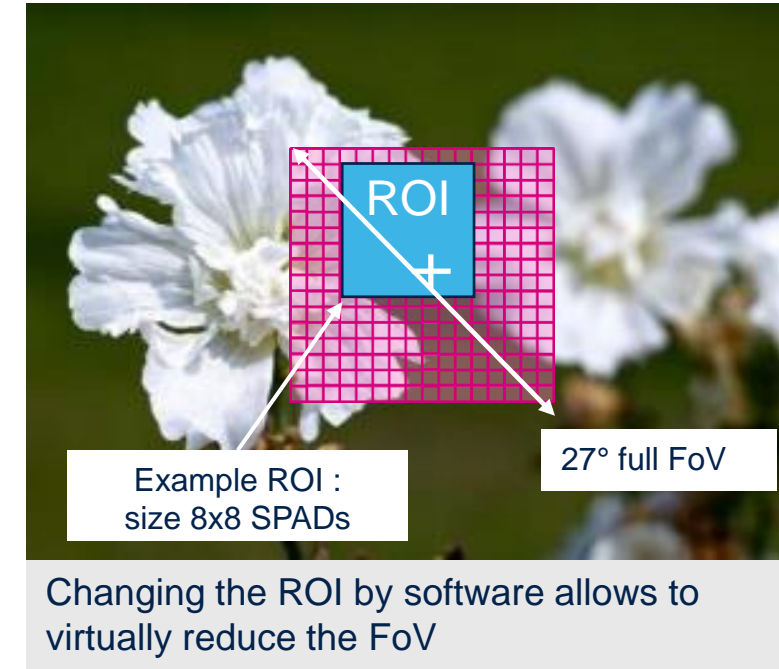


# VL53L1CB allows custom FoV selection

## Region of interest (ROI) selection by the user

ROI zone size	Diagonal FOV covered by the zone
4x4 spads	15° (smallest)
8x8 spads	20°
16x16 spads	27.0 (largest, full FoV)

- No fixed pre-defined size for the sensing array (Region of Interest)  
Unlike other sensors on the market or VL53L0CX
- Sensing array is composed by 16x16 SPADs (Single Photon Avalanche Diodes) that **can be selected by customer**
- VL53L1 returns the distance to object covered by the ROI FoV
- **User defines the 2 corners of the array**, through SW driver (API) or the Eval Kit GUI.  
It could even be rectangular. Only condition is to have a minimum of 4x4 SPADs array.
- The change of ROI can be done “on the fly” by the host



# Tools ordering codes



STM32 Open  
Development  
Environment

# Ecosystem and tools

## Imaging products supported by ST ecosystem & and expanding optical partnership network

### Complete package

- X-NUCLEO expansion board



- P-NUCLEO packs with STM32 NUCLEO



- Stand-alone Breakout boards



### STM32 ODE

- **FlightSense™** fully integrated in STM32 Ecosystem
- Compatible with NUCLEO-F401RE and NUCLEO-L476RG
- Referenced on mbed & Arduino platforms

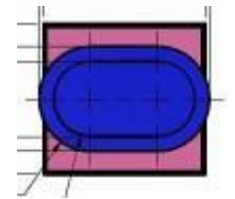
### Cover glasses

#### Oval Cover Glass:

- Reference cover glass proposed in NUCLEO development boards

#### Square Cover Glass:





- 3 spacers 0.25/0.5/1mm to create various air gaps
- Cover glass holder





# VL6180V1 ordering codes


Go to [www.st.com/VL6180](http://www.st.com/VL6180) or contact your usual distributor

ON st.com	Item	Picture	Commercial Product (= Order Code)	Comments
	VL6180V1 sensor		VL6180V1NR/1	Delivery in T&R MOQ: 5Ku LT = 16 weeks
	VL6180V1 Nucleo™ Expansion board		X-NUCLEO-6180A1/	To go along with STM32F401 Nucleo board. Comes with 2x 2v8 Breakout boards
	Pack: VL6180V1 Nucleo™ Expansion board + STM32F401 NUCLEO		P-NUCLEO-6180A1/	X-NUCLEO-6180A1 expansion board delivered together with STM32F401 NUCLEO board
	VL6180V1 Breakout boards		VL6180-SATEL	2x Breakout boards delivered



# VL53L0CX ordering codes

Go to [www.st.com/VL53L0X](http://www.st.com/VL53L0X) or contact your usual distributor

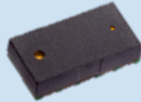



ON st.com	Item	Picture	Commercial Product (= Order Code)	Comments
	VL53L0CX sensor		VL53L0CXV0DH/1	Delivery in T&R MOQ: 5Ku With protective liner <b>LT = 16 weeks</b>
	VL53L0CX Nucleo™ Expansion board		X-NUCLEO-53L0A1/	To go along with STM32F401 Nucleo board. Comes with cover-glass holder, cover-window, 3x spacers, 2x 2v8 Breakout boards
	Pack: VL53L0CX Nucleo™ Expansion board + STM32F401 NUCLEO		P-NUCLEO-53L0A1/	X-NUCLEO-53L0A1 expansion board delivered together with STM32F401 NUCLEO board
	VL53L0CX Breakout boards		53L0-SATEL-I1	2x Breakout boards delivered





# VL53L3CX ordering codes





Go to [www.st.com/VL53L3CX](http://www.st.com/VL53L3CX) or contact your usual distributor

ON st.com	Item	Picture	Commercial Product (= Order Code)	Comments
	VL53L3CX sensor		VL53L3CXV0DH/1	Delivery in T&R MOQ: 4.5Ku With protective liner <b>LT = 16 weeks</b>
	VL53L3CX Nucleo™ Expansion board		X-NUCLEO-53L3A2/	To go along with STM32F401 Nucleo board. Comes with cover-glass holder, 2x cover-window samples, 3x spacers, 2x 2v8 Breakout boards
	Pack: VL53L3CX Nucleo™ Expansion board + STM32F401 NUCLEO		P-NUCLEO-53L3A2/	X-NUCLEO-53L3A2 expansion board delivered together with STM32F401 NUCLEO board
	VL53L3CX Breakout boards		VL53L3CX-SATEL	2x Breakout boards delivered



# VL53L1CX ordering codes

Go to [www.st.com/VL53L1X](http://www.st.com/VL53L1X) or contact your usual distributor

ON st.com	Item	Picture	Commercial Product (= Order Code)	Comments
	VL53L1CX sensor		VL53L1CXV0FY/1	Delivery in T&R MOQ: 3.6Ku With protective liner <b>LT = 16 weeks</b>
	VL53L1CX Nucleo™ Expansion board		X-NUCLEO-53L1A1/	To go along with STM32F401 Nucleo board. Comes with cover-glass holder, 2x cover-window samples, 3x spacers, 2x 2v8 Breakout boards
	Pack: VL53L1CX Nucleo™ Expansion board + STM32F401 NUCLEO		P-NUCLEO-53L1A1/	X-NUCLEO-53L1A1 expansion board delivered together with STM32F401 NUCLEO board
	VL53L1CX Breakout boards		VL53L1X-SATEL	2x Breakout boards delivered



# VL53L1CB ordering codes

Go to [www.st.com/VL53L1CB](http://www.st.com/VL53L1CB) or contact your usual distributor

Item	Picture	Commercial Product (= Order Code)	Comments
VL53L1CB sensor		VL53L1CBV0FY/1	Delivery in T&R MOQ: 3.6ku With protective liner <b>LT = 16 weeks</b>
VL53L1CB Nucleo™ Expansion board		X-NUCLEO-53L1A2/	To go along with STM32F401 Nucleo board. Comes with cover-glass holder, 3x cover-window samples, 3x spacers, 2x 2v8 Breakout boards
Pack: VL53L1CB Nucleo™ Expansion board + STM32F401 NUCLEO		P-NUCLEO-53L1A2/	X-NUCLEO-53L1A2 expansion board delivered together with STM32F401 NUCLEO board
VL53L1CB Breakout boards		VL53L1-SATEL	2x Breakout boards delivered



# www.st.com on-line marketing

## Pick your FlightSense™

Numerous on-line support tools & a growing set of use-cases  
webinars and videos



**VL53L1X Calibration free  
dirty environment cover  
glass solution**



**Getting Started with  
VL53L1X ToF sensor**

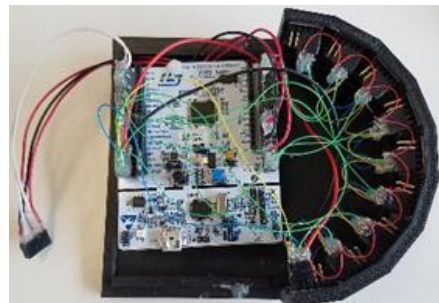


**People Counting Using a  
Single ST Time-of-Flight  
Sensor (VL53L0CX)**

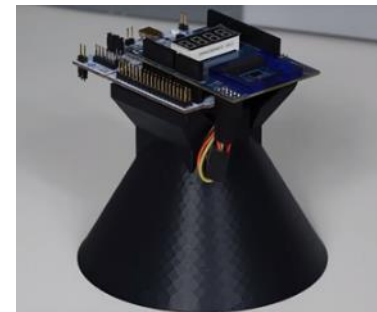


**VL53L1X - smart shelves  
demonstrating  
programmable region-of-  
interest (ROI)**

New on YouTube...



Mini LIDAR  
(9x VL53L1CX)



Reflectometer  
(VL53L0CX)

# FlightSense™ vs. Other proximity sensing technologies



# FlightSense™ vs. other proximity sensing technologies

	Radar	UltraSonic	Conventional IR	ST FlightSense™
Size/Weight	Large PCB Novelda: 15 x 4 x 1.5mm with antenna IFX SOLI: ~5.x by 3.x mm	2xToF	Small/Light	Small
Mechanical integration	Complex (antenna) Works through cover if no impact on high freq.	Need hole (impact on ID)	Easy (if all-in-one)	Easy (all in one, reflowable) Need Cover window
FoV	~180deg. (@2m then lower)	~180deg tbc	~25deg	27 to 61deg diagonal
Real distance output	Yes (5.4cm intervals)	No	No	Real distance in mm
Ranging distance	40cm to 9m	20cm to few meters	0cm to 20/80cm (1)	0cm to 4m (1)
Speed	Slow Boot-up and user detection (tbc)	tbc	Boot-up: few ms User detect.: Depends on target reflectance User vs Chair: Not possible	Boot-up: few ms User detect: 20ms @ 1Hz (ranging freq. programmable) User vs Chair distinction: 30s Maxi
Reliability of ranging data	First target detected only May detect through wall Sensitive to object charge	Impacted by wide sound from environment	Impacted by target reflectivity and IR ambient light	Not impacted by target reflectivity Multi target detection Sensitive to IR ambient light
Power consumption	~2.5mW in Std.by @1m (higher for longer distance)	Very Low	Low (1) depending on model and conditions	Low (0.9mW for User detection under autonomous mode)

# Thank you

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