# FlightSense™
# ST Time-of-Flight Ranging sensors

Imaging Division

Webinar for EMEA – April 2020

# Agenda

1. Introduction
2. ToF Mass Market Roadmap
3. Highlights on new products features
4. ToF sensors KPIs comparison
5. New ToF sensors - Focus
6. Tools Ordering Codes
7. Competition
8. Q&A

# 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

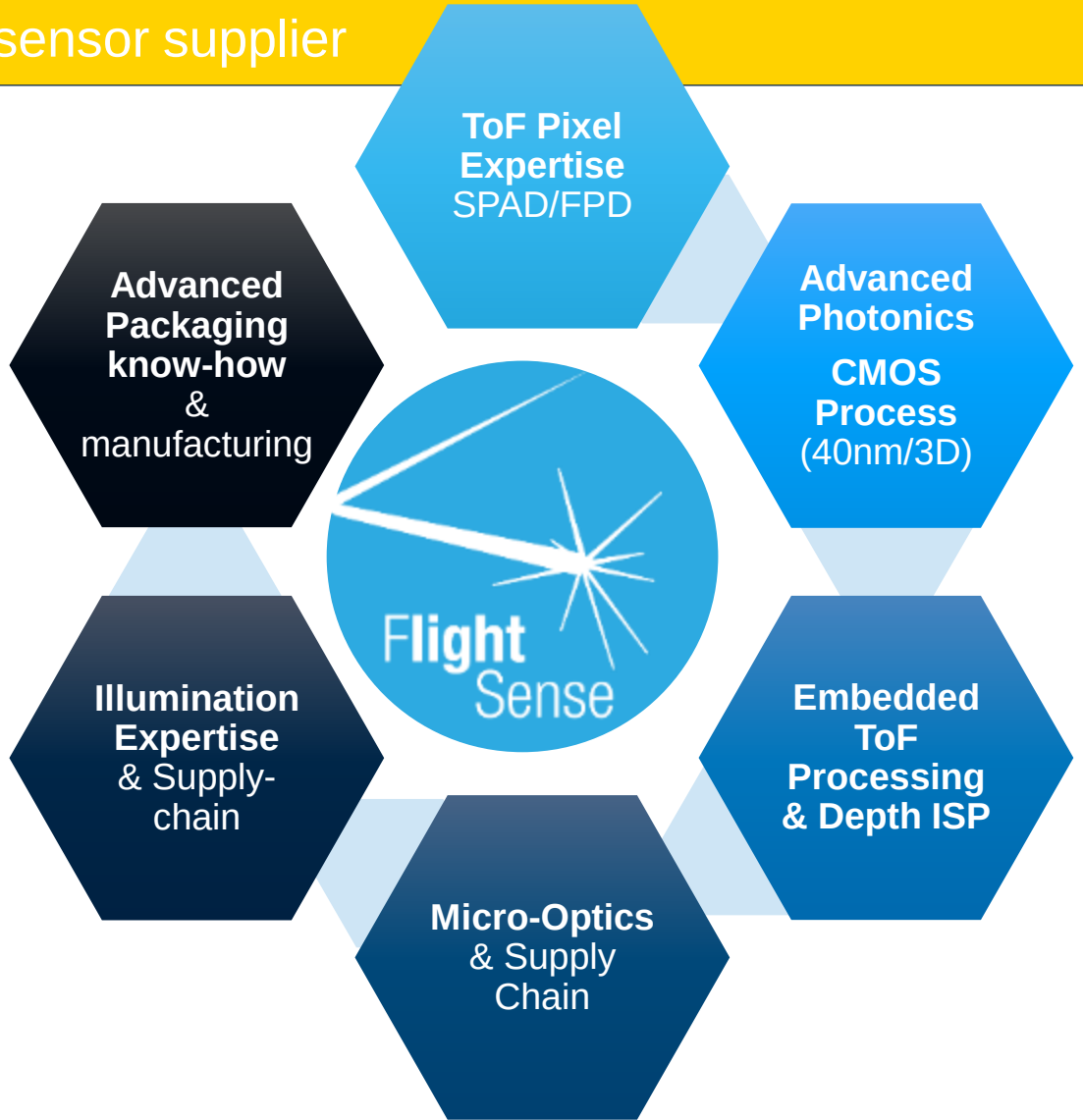
Hundreds non wireless end-products in the market

## >40,000

Evaluation kits deployed

## >1Bu

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

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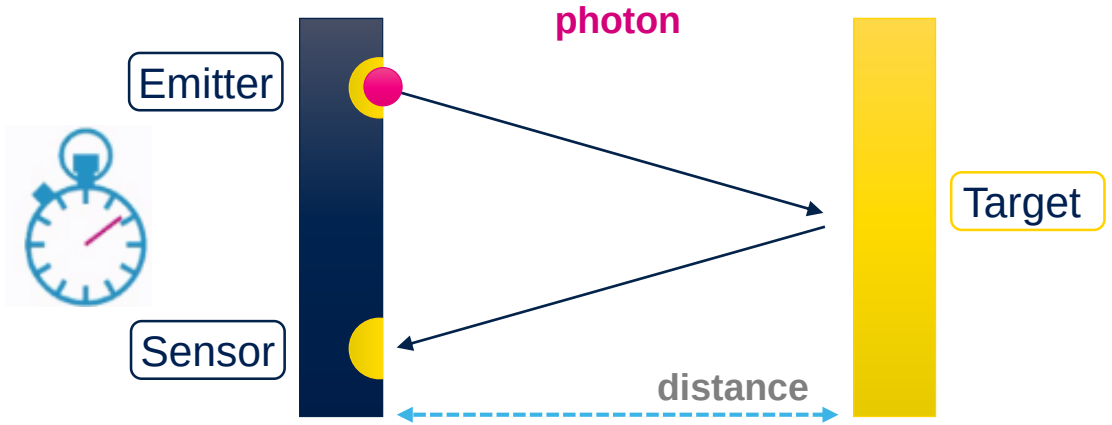
# FlightSense™… Making Light Work

## Time-of-Flight Principle




**Measured distance** = Photon travel time / 2 x 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 940nm illumination

# FlightSense™ Typical Module overview

All-in-One (illumination & sensor) Time of Flight System → Optimized Size/ Perf/ 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

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# FlightSense™ Product Longevity
## 7-year commitment

## FlightSense™ benefits from ST Longevity Program

- 7-year longevity from Product Introduction Date


- VL6180X since January 2015
- VL6180 since January 2019
- VL53L0X since January 2019
- VL53L3CX since January 2019
- VL53L1X since January 2019

Link to ST's longevity program (7 years section)

# 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

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# FlightSense™ ST Time-of-flight Ranging sensors

# Mass-Market roadmap

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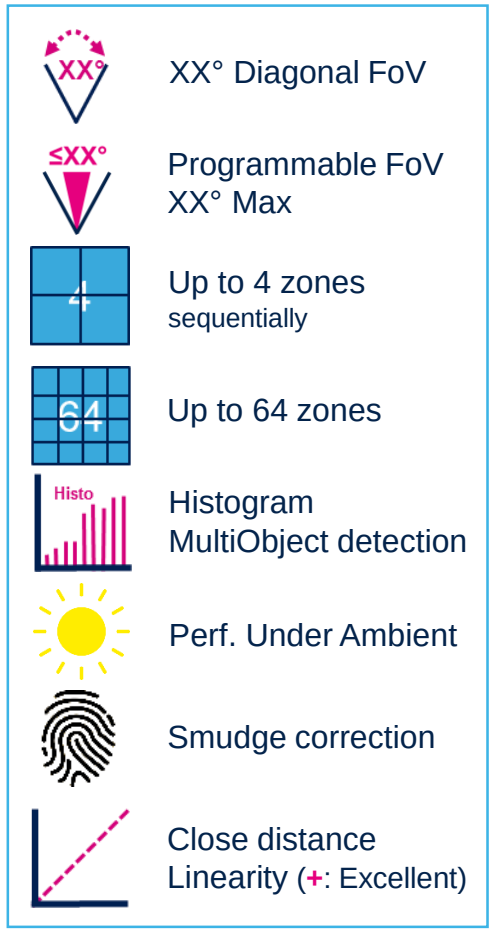
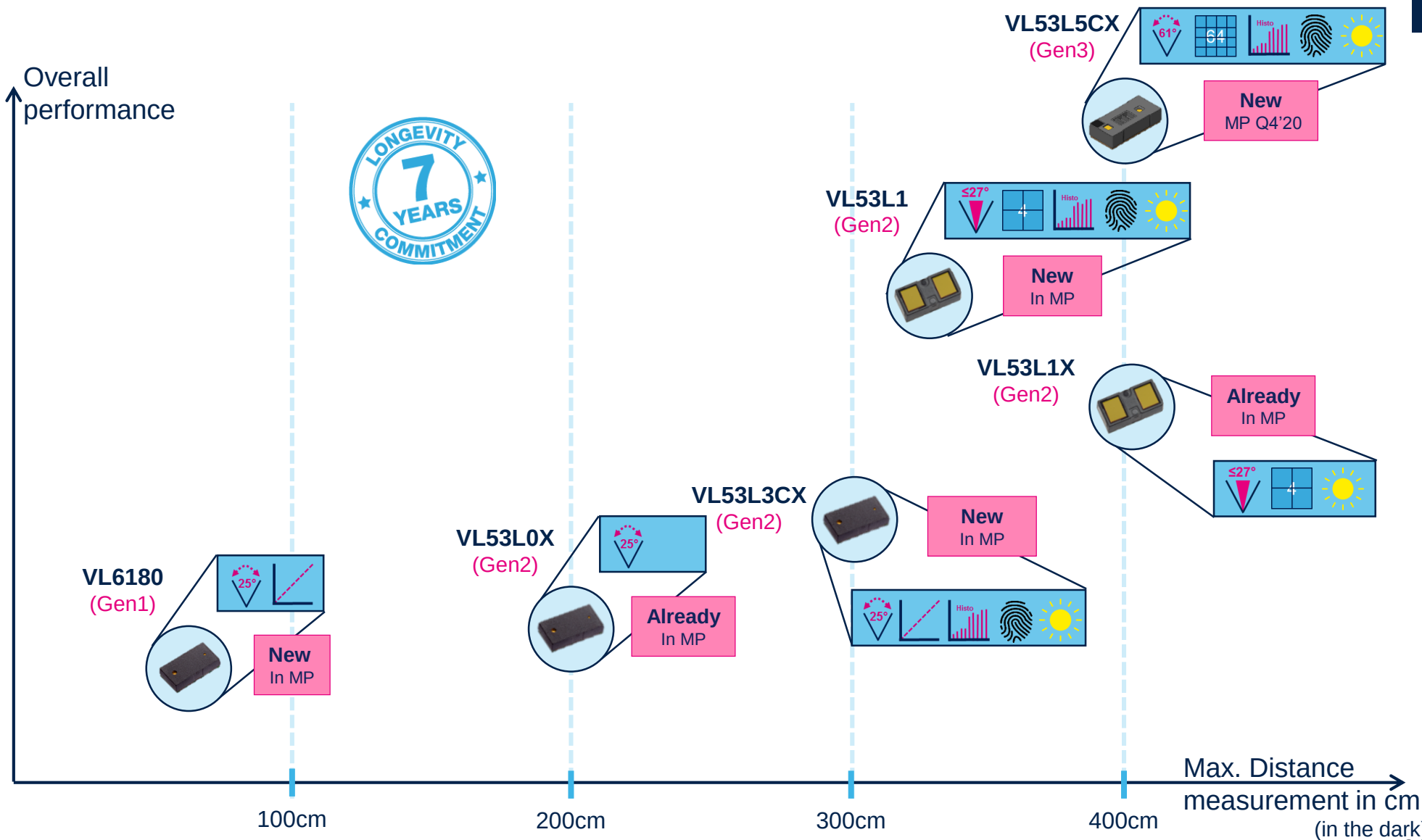
# FlightSense™ Mass-Market Roadmap



# FlightSense™ Mass-Market Roadmap

| | New: in MP<br>**VL6180**<br>Proximity sensor | **VL53L0X**<br>Ranging sensor | New: in MP<br>**VL53L3CX**<br>Proxy + Multi target sensor | **VL53L1X**<br>Long Distance sensor | New: in MP<br>**VL53L1**<br>Long Distance + Multi target sensor | New: MP Q4'20<br>**VL53L5CX**<br>MultiZones sensor |
|---|---|---|---|---|---|---|
| |  |  |  |  |  |  |
| **Distance measurement** | **Proximity**<br>**up to 50cm** | **Ranging**<br>**up to 2 meters** | **Proximity + Ranging**<br>**up to 3 meters** | **Long Ranging**<br>**up to 4 meters** | **Ranging up to 3.2m**<br>**with Histogram** | **mini Depthmap**<br>**up to 4 meters** |
| Close distance linearity | ++<br>(>2.5cm) | | ++<br>(>2.5cm) | +<br>(>4cm) | +<br>(>4cm) | (>10cm) |
| Performance under ambient light (5Klux) | | +<br>(80cm) | ++<br>(100cm) | +++<br>(150cm) | +++<br>(150cm) | ++++<br>(>150cm) |
| Resolution | 1 zone | 1 zone | 1 zone | 1 ROI 16x16 SPADs<br>or **4 ROIs 4x4 SPADs** | 1 ROI 16x16 SPADs<br>or **4 ROIs 4x4 SPADs** | **64 Zones**<br>8x8 or 4x4 |
| FoV (Diagonal) | 25° diag<br>No Lens | 25° diag<br>No Lens | 25° diag<br>No Lens | 27° diag (**SWconfig**)<br>Lens on Rx | 27° diag (**SW config**)<br>Lens on Rx | **61° diag**<br>Lens on Rx + Tx |
| Multi-target detection (Histogram) | No | No | Yes | No | Yes | Yes |
| X-talk /<br>Smudge immunity | X-talk compensation | X-talk compensation | **Immunity >80cm**<br>**<80cm: Smudge compensation** | X-talk compensation | **Immunity >80cm**<br>**<80cm: Smudge compensation** | **Immunity >60cm**<br>**<60cm: Smudge compensation** |
| Power Consumption | **1.7mA** | 19mA<br>(low power mode available) | 16mA | 16mA<br>(low power mode available) | 16mA | |
| 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 | 6.4 x 3.0 x 1.5 mm |

# FlightSense™ ST Time-of-flight Ranging sensors

## Highlights on new product features

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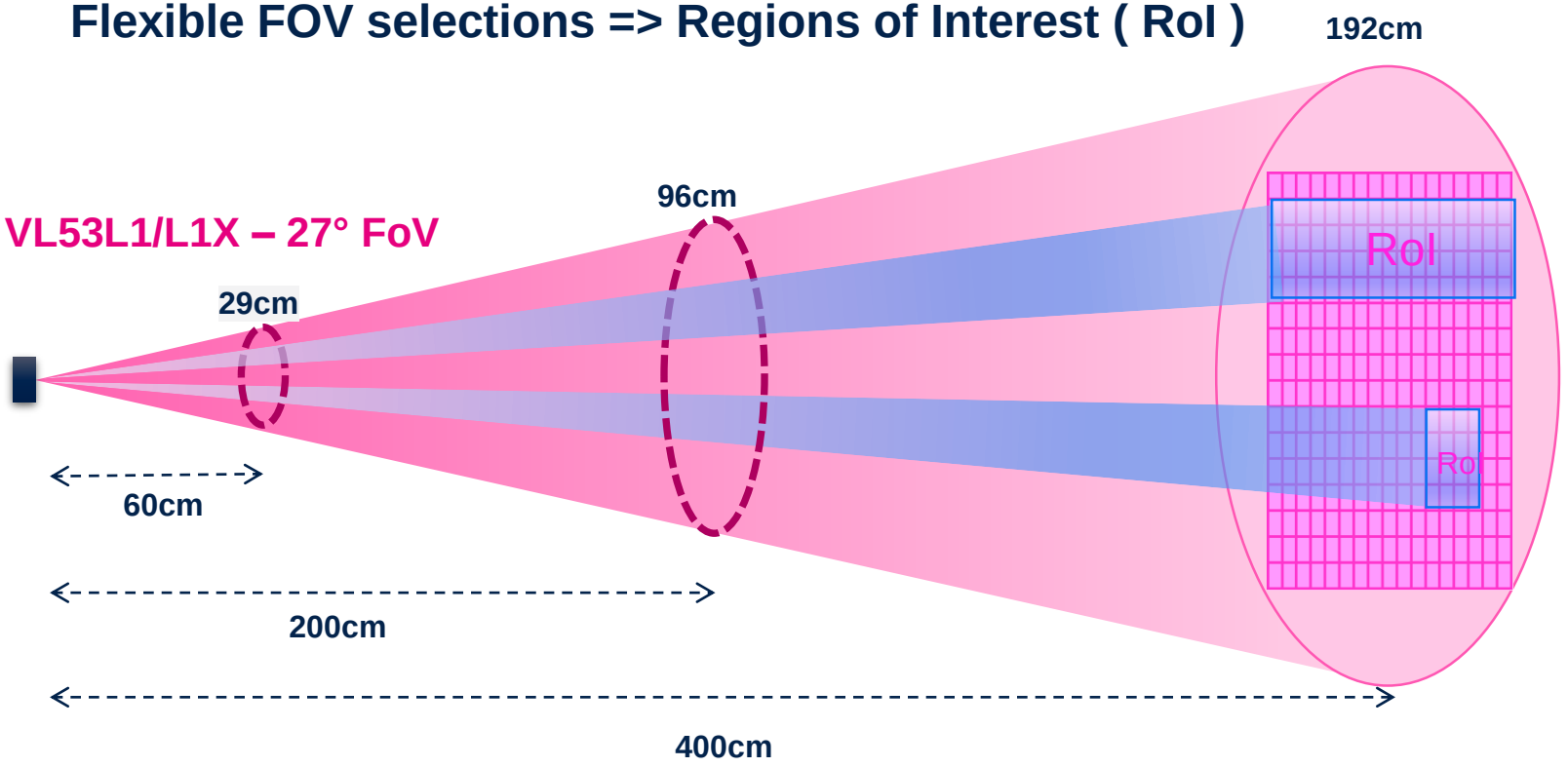
# Programmable Field of View
## VL53L1X & VL53L1

- XX° Diagonal FoV
- ≤XX° Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- Histogram MultiObject detection
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity (+: Excellent)

**Flexible FOV selections => Regions of Interest ( RoI )**

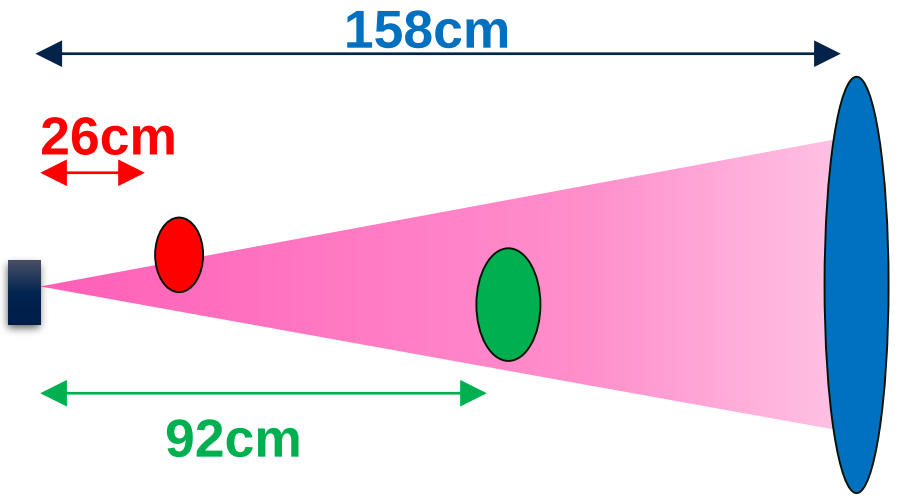



| ROI zone size (in SPADs) | Diagonal FOV covered by the zone |
|---|---|
| 4x4 | 15 ° (smallest) |
| 8x8 | 20 ° |
| 16x16 | 27 ° (largest, full FoV) |

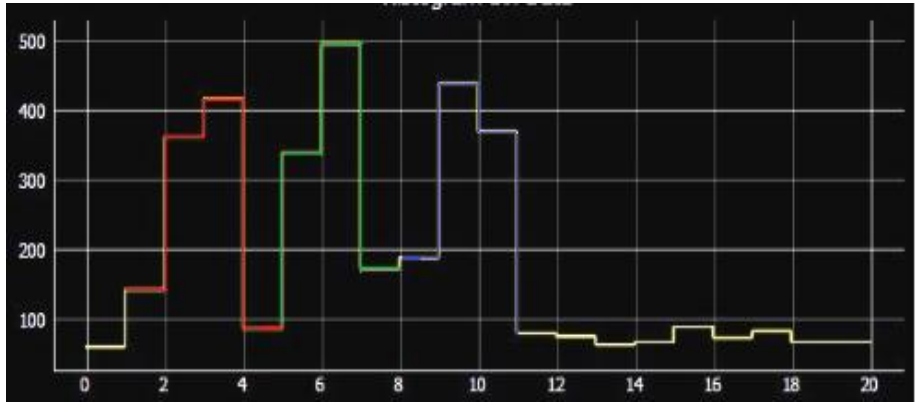
VL53L1X - ROI application note

# Multi-object detection
## VL53L3CX & VL53L1

- XX° Diagonal FoV
- Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- **Histogram MultiObject detection**
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity (+: Excellent)




Histogram based




- 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 architecture
## VL53L3CX & VL53L1

- XX° Diagonal FoV
- Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- **Histogram MultiObject detection**
- Perf. Under Ambient
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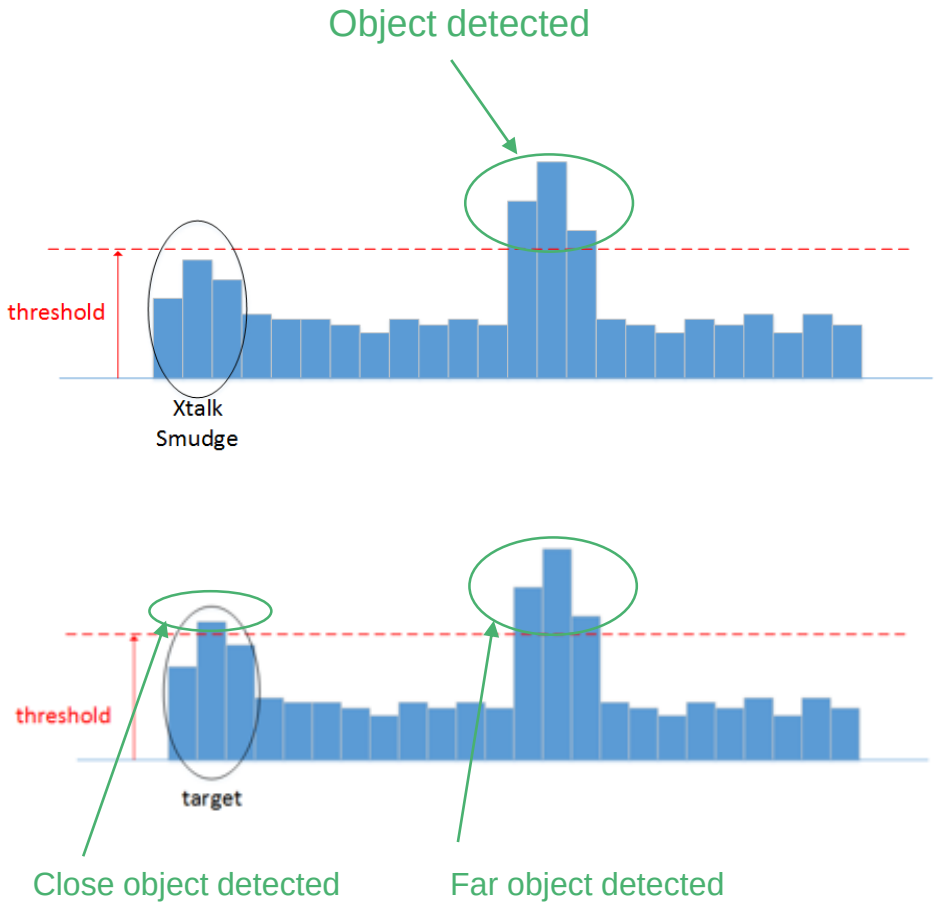
- Close distance Linearity (+: Excellent)




- 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

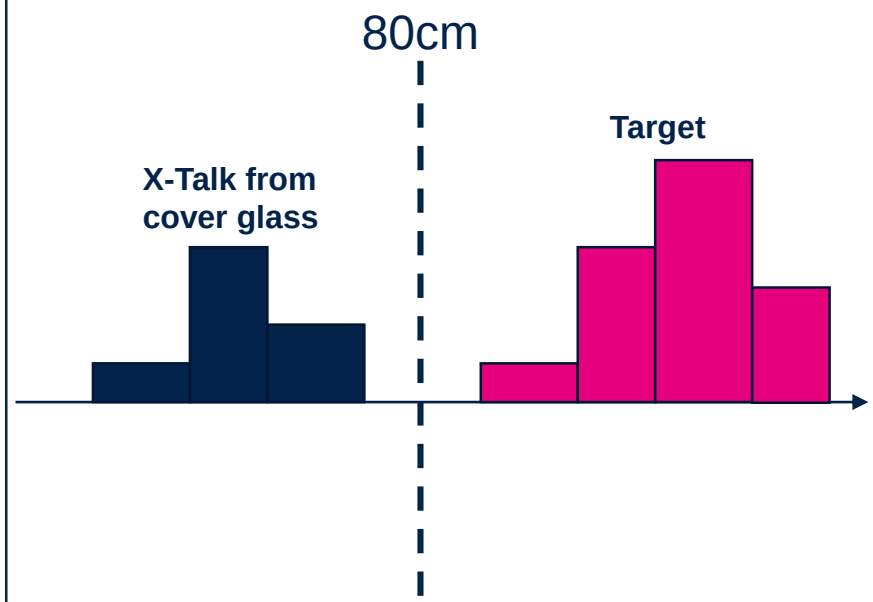
*Note : The “threshold” is a minimal signal threshold for valid target detection*

# X-Talk immunity principle

## Accurate distance whatever the smudge or X-Talk

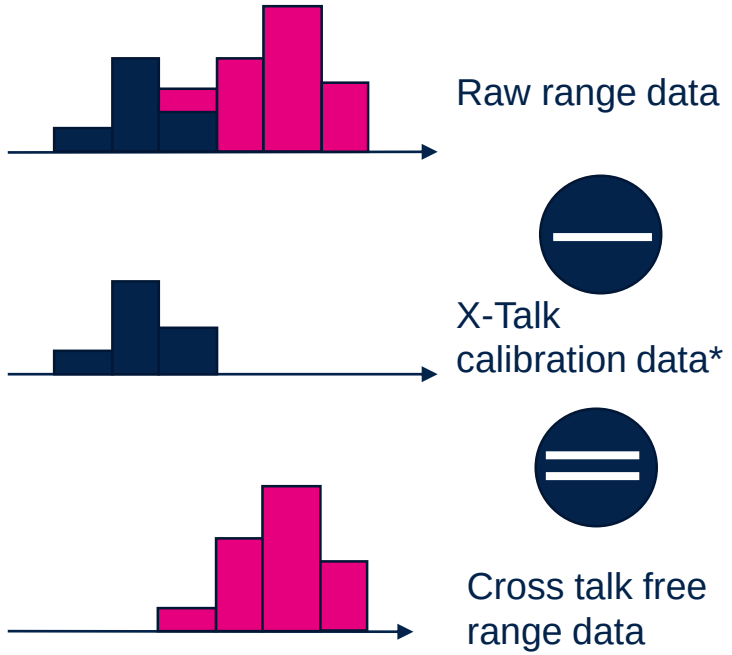
- XX° Diagonal FoV
- ≤XX° Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- **Histogram MultiObject detection**
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity (+: Excellent)

### Beyond 80cm : Immune to X-Talk




X-Talk impact from cover glass not considered above 80cm

### Below 80cm : X-Talk compensation




* Need a X-Talk calibration

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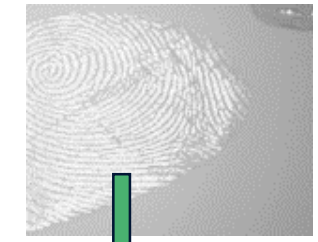
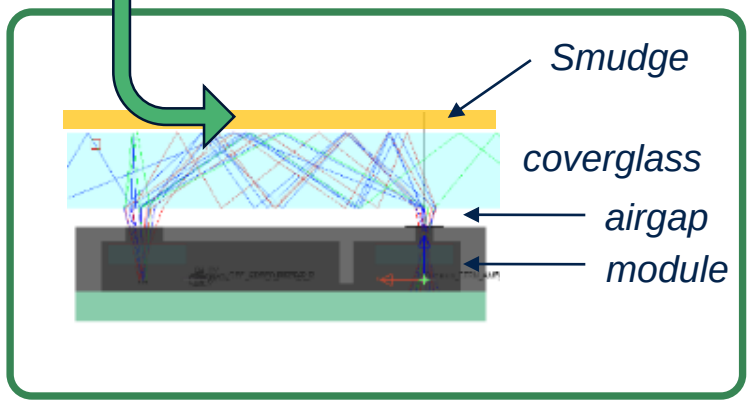
# Smudge detection
## VL53L3CX & VL53L1

- XX° Diagonal FoV
- ≤XX° Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- Histogram MultiObject detection
- Perf. Under Ambient
- **Smudge correction**
- Close distance Linearity (+: Excellent)

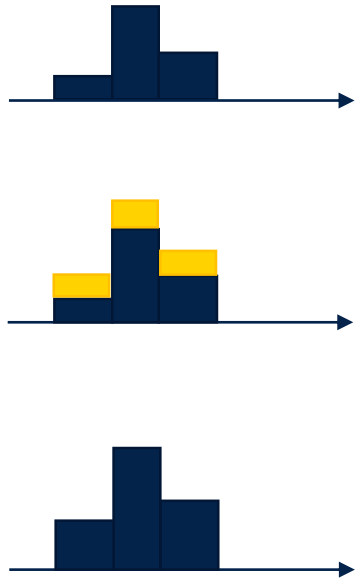


Cover-window crosstalk + **Smudge**, dust, or fingerprint crosstalk




- 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

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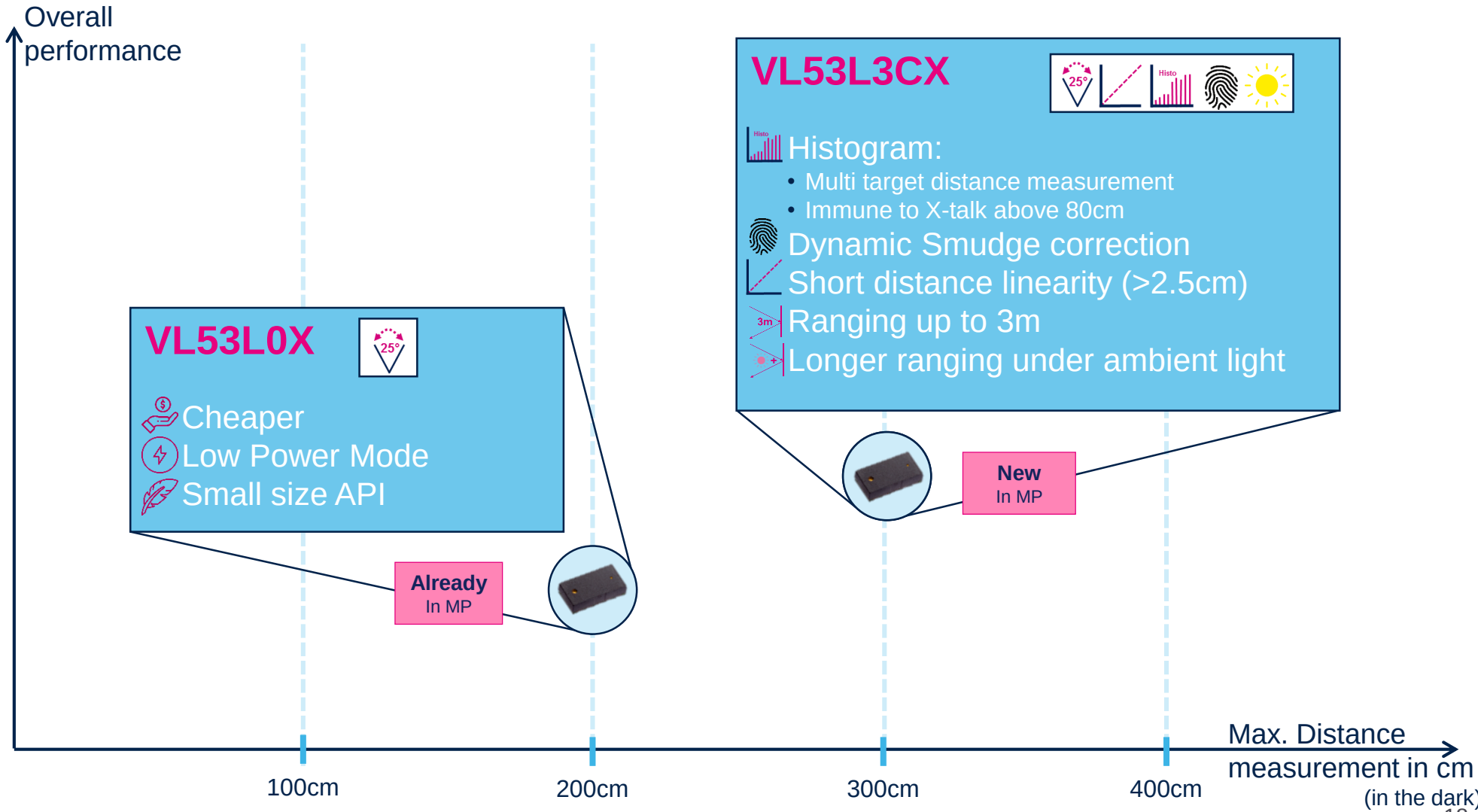
# ToF Sensors KPIs Comparisons

# FlightSense™ Mass-Market Roadmap

## VL53L0X vs VL53L3CX

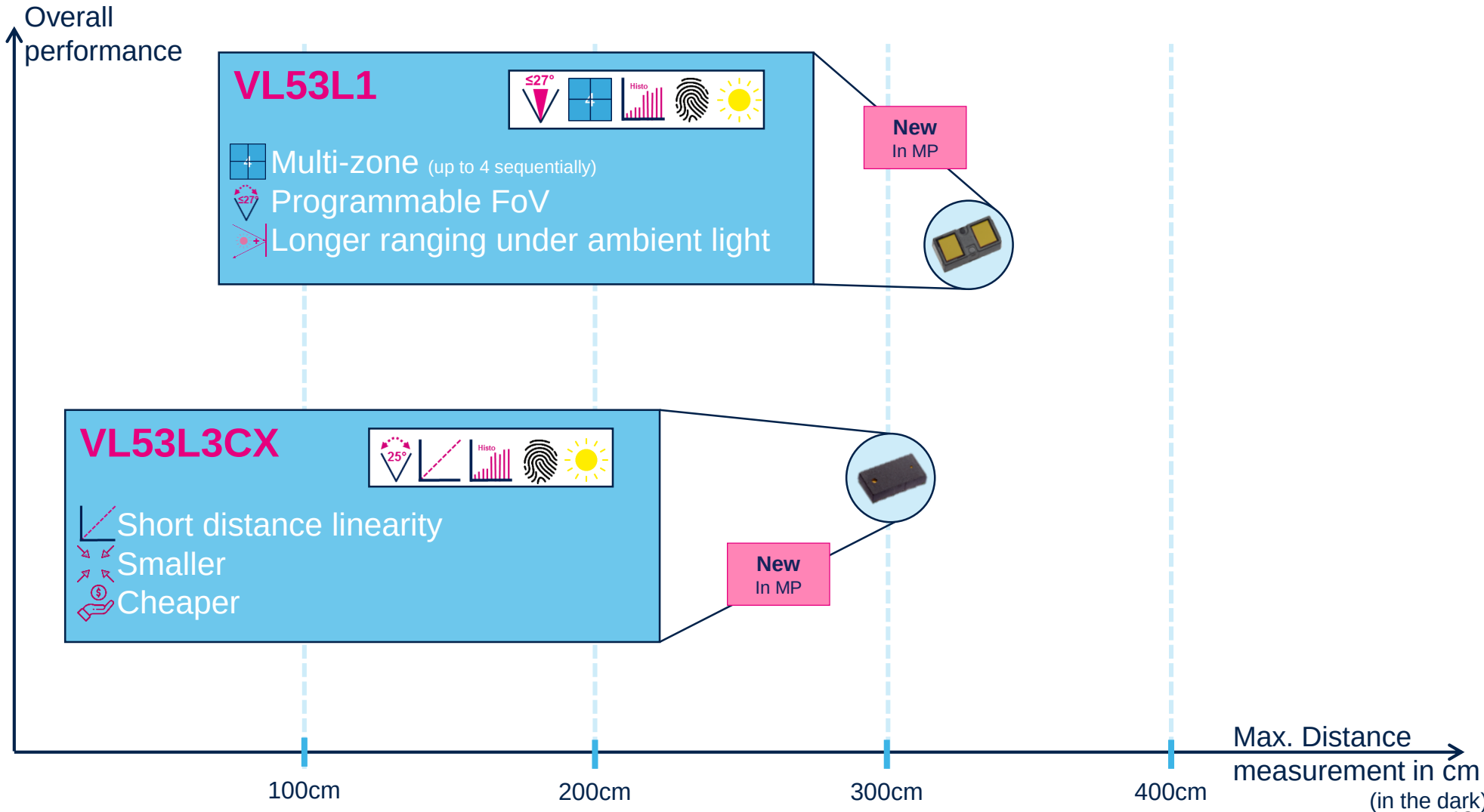
- XX° Diagonal FoV
- Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- Histogram MultiObject detection
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity (+: Excellent)



# FlightSense™ Mass-Market Roadmap

## VL53L3CX vs VL53L1

- XX° Diagonal FoV
- Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- Histogram MultiObject detection
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity (+: Excellent)

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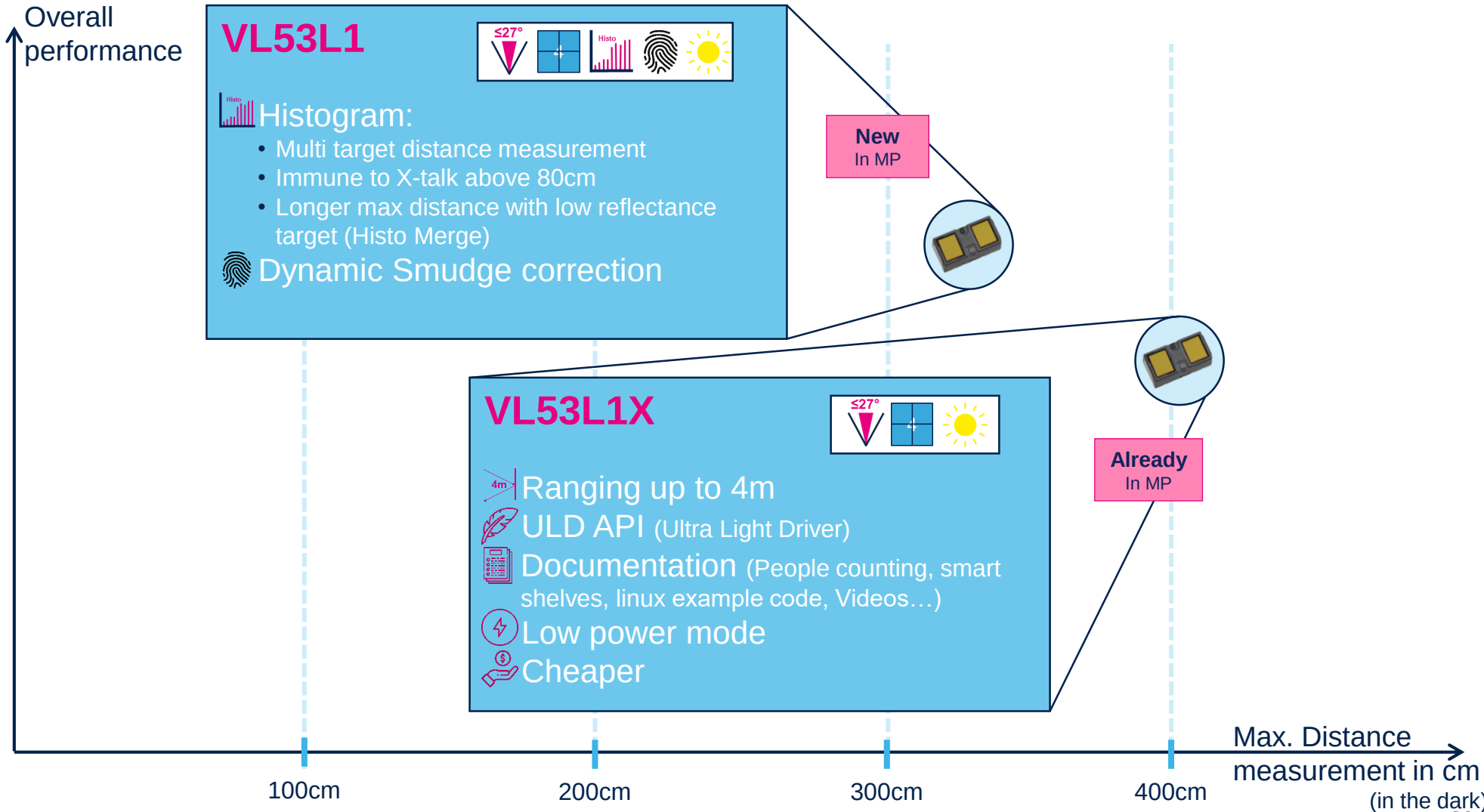
# FlightSense™ Mass-Market Roadmap

## VL53L1 vs VL53L1X

- XX° Diagonal FoV
- Programmable FoV XX° Max
- Up to 4 zones sequentially
- Up to 64 zones
- Histogram MultiObject detection
- Perf. Under Ambient
- Smudge correction
- Close distance Linearity (+: Excellent)



# New ToF Sensors - Focus

# VL6180

## 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 µC)
- **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

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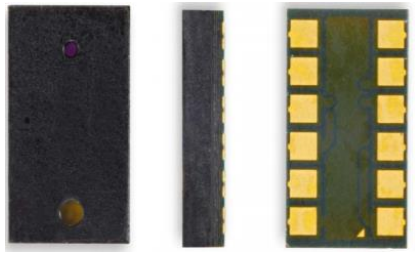
# VL6180 Proximity Sensor
## Technical Specification



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

(1) 10 Hz sampling rate, 17% reflective target at 50 mm

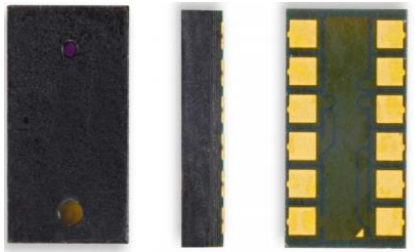
# VL6180 support on st.com

## Videos


All-in-one proximity and ambient light sensing module

## Documentation

| | Description | Version | Size | Action |
|---|---|---|---|---|
| ☐ | **DS9818**<br>Proximity sensing module | 13.0 | 1.98 MB | PDF |
| ☐ | **DB1904**<br>Time-of-Flight proximity sensor and IR emitter two-in-one module | 5.0 | 771.48 KB | PDF |



## User Manuals

- X-CUBE UM
- X-NUCLEO UM

## Software

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

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# 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


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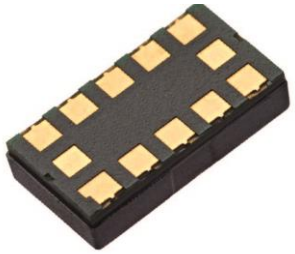


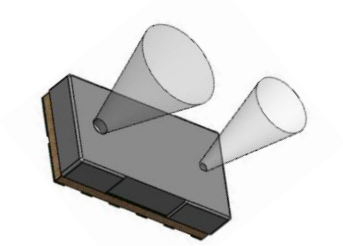
# VL53L3CX Ranging Sensor
## Technical Specification

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

(1) 30 Hz sampling rate, 33msec ranging budget

# VL53L3CX - Ranging performance

## Ranging capabilities with a 30ms Ranging Operation (Fast mode)



| |  Indoor (no IR) |  Outdoor |
|---|---|---|
| White Target 88% | 310cm | 100cm |
| Light Grey Target 54% | 290cm | 70cm |
| Grey Target 17% | 170cm | 70cm |

**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)

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# VL53L1

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

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



### 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

### Uses-cases

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

### Applications


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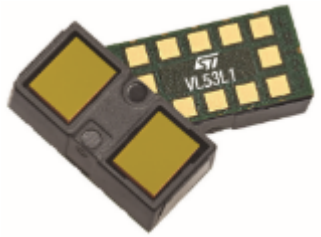


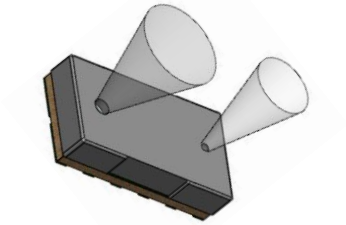

# VL53L1 Ranging Sensor
## Technical Specification

| Feature | Detail |
|---|---|
| Package | Miniature Optical LGA12 |
| Size | 4.9 x 2.5 x 1.56 mm - Compatible with VL53L1X |
| Ranging | Up to 320cm (Indoor, under 88% white target reflectance) with full FoV @60Hz<br>Up to 250cm (Indoor, 88% white target reflectance) with 8x8 SPADs ROI @60Hz |
| 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 µa<br>SW Standby: <6 µA<br>Active ranging average consumption (including VCSEL): 16 mA (typical)(1) |
| Function Temperature range | - 20 to 85°C |
| IR Emitter | 940nm |
| $I^2C$ (Clock / Data) | Up to 1MHz serial bus |
| XSHUT ( GPIO0 ) | XSHUT (in): HW power down when put at zero |
| GPIO1 | Information pin: Thresholds or sample ready interrupts |

(1) Ranging mode with 16msec timing budget

# VL53L1 - Ranging performance

## Ranging capabilities with a 16ms Ranging Operation

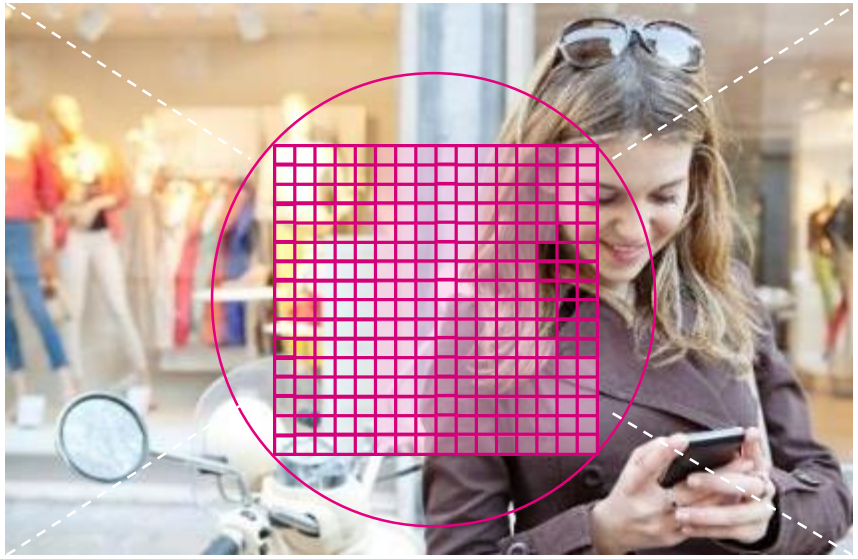


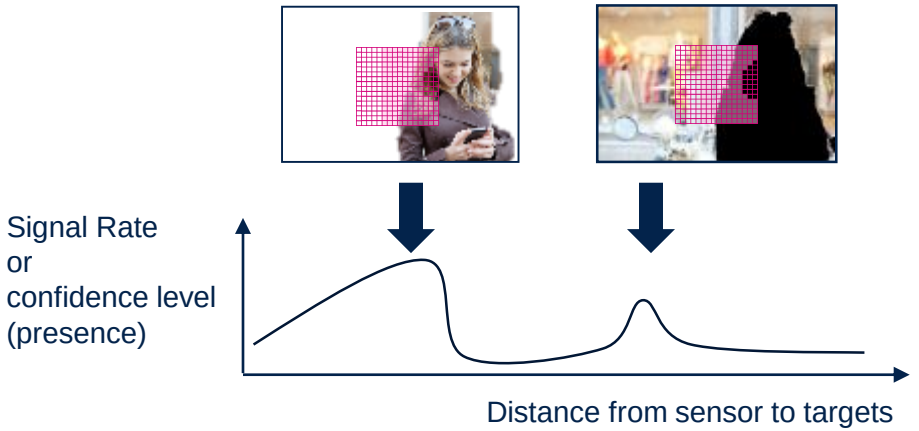
| |  Indoor (no IR) |  Outdoor |
|---|---|---|
| White Target 88% | 320cm | 90cm |
| Grey Target 17% | 230cm | 90cm |

**Measurement conditions wihout 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





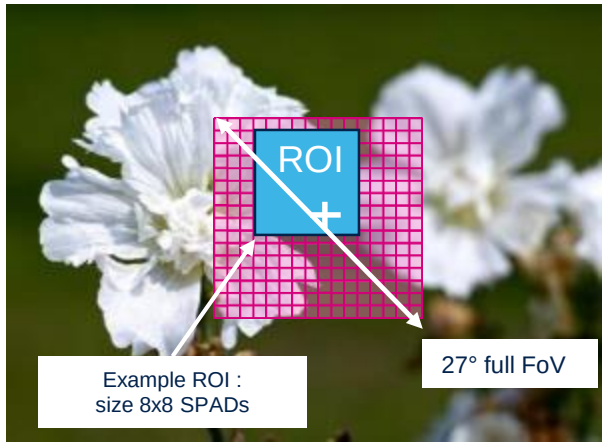

VL53L3CX & VL53L1 perform advanced ranging with direct ToF temporal filter :

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

# VL53L1 allows custom FoV selection

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

- No fixed pre-defined size for the sensing array (Region of Interest)
  Unlike other sensors on the market or VL53L0X
- 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




Changing the ROI by software allows to virtually reduce the FoV

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

# Tools Ordering Codes

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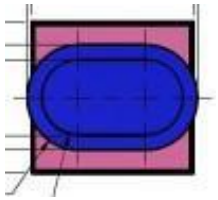
# FlightSense™ & Image Sensors
## Ecosystem and tools

Imaging products supported by ST eco-system & and expanding optical partnership network

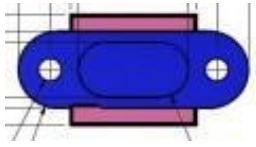
CrucialTec

HORNIX OPTICAL TECHNOLOLOGY INC.




Proximity & Ranging

User detection

FlightSense™ fully integrated in STM32 Ecosystem

Referenced on mbed & Arduino platforms

Reference cover glass proposed through NUCLEO development boards

Partners to provide modules compatible with Thick Cover Glass, wide airgaps or reduced FOV

X-NUCLEO expansion board, P-NUCLEO packs with STM32 NUCLEO, stand-alone Breakout boards for quick development

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# VL6180V1 Ordering codes

Go to www.st.com/VL6180 or contact your usual distributor

ON st.com

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

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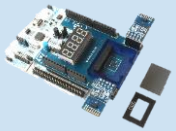
# VL53L0CX Ordering codes

Go to www.st.com/VL53L0X or contact your usual distributor

ON st.com

| Item | Picture | Commercial Product (= Order Code) | Comments |
|---|---|---|---|
| **VL53L0X sensor** |  | **VL53L0CXV0DH/1** | Delivery in T&R<br>MOQ: 5Ku<br>With protective liner<br>LT = 16 weeks |
| **VL53L0X Nucleo™ Expansion board** |  | **X-NUCLEO-53L0A1/** | To go along with STM32F401 Nucleo board.<br>Comes with cover-glass holder, cover-window, 3x spacers, 2x 2v8 Breakout boards |
| **Pack: VL53L0X Nucleo™ Expansion board + STM32F401 NUCLEO** |  | **P-NUCLEO-53L0A1/** | X-NUCLEO-53L0A1 expansion board delivered together with STM32F401 NUCLEO board |
| **VL53L0X Breakout boards** |  | **53L0-SATEL-I1** | 2x Breakout boards delivered |

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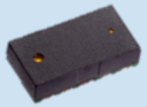
# VL53L3CX Ordering codes

Go to www.st.com/VL53L3CX or contact your usual distributor

| Item | Picture | Commercial Product (= Order Code) | Comments | |
|---|---|---|---|---|
| **VL53L3CX sensor** |  | **VL53L3CXV0DH/1** | Delivery in T&R<br>MOQ: 4.5Ku<br>With protective liner<br>LT = 16 weeks | ON st.com |
| **VL53L3CX Nucleo™ Expansion board** |  | **X-NUCLEO-53L3A2/** | To go along with STM32F401 Nucleo board.<br>Comes with cover-glass holder, 2x cover-window samples, 3x spacers, 2x 2v8 Breakout boards | On st.com May 20 |
| **Pack: VL53L3CX Nucleo™ Expansion board + STM32F401 NUCLEO** |  | **P-NUCLEO-53L3A2/** | X-NUCLEO-53L3A2 expansion board delivered together with STM32F401 NUCLEO board | On st.com May 20 |
| **VL53L3CX Breakout boards** |  | **VL53L3CX-SATEL** | 2x Breakout boards delivered | On st.com May 20 |

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# VL53L1CX Ordering codes

Go to www.st.com/VL53L1X or contact your usual distributor

ON st.com

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

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# VL53L1CB Ordering codes

On st.com May 2020

Go to www.st.com/VL53L1 or contact your usual distributor

| Item | Picture | Commercial Product (= Order Code) | Comments |
|---|---|---|---|
| **VL53L1 sensor** |  | **VL53L1CBV0FY/1** | Delivery in T&R<br>MOQ: 3.6Ku<br>With protective liner<br>LT = 16 weeks |
| **VL53L1<br>Nucleo™ Expansion board** |  | Available in May'20<br>In the meantime, please use:<br>**X-NUCLEO-53L1A1/** | To go along with STM32F401 Nucleo board.<br>Comes with cover-glass holder, 3x cover-window samples, 3x spacers, 2x 2v8 Breakout boards |
| **Pack: VL53L1 Nucleo™ Expansion board + STM32F401 NUCLEO** |  | Available in May'20<br>In the meantime, please use:<br>**P-NUCLEO-53L1A1/** | X-NUCLEO-53L1A2 expansion board delivered together with STM32F401 NUCLEO board |
| **VL53L1<br>Breakout boards** |  | Available in May'20<br>In the meantime, please use:<br>**VL53L1X-SATEL** | 2x Breakout boards delivered |

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# www.st.com On-line Marketing
# Pick your F**light**Sense™

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

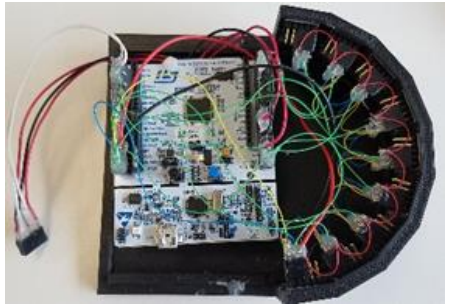

**VL53L1X Calibration free dirty environment cover glass solution**


**Getting Started with VL53L1X ToF sensor**

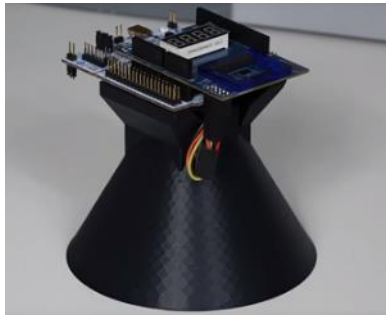

**People Counting Using a Single ST Time-of-Flight Sensor (VL530X)**


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

New on YouTube…



Mini LIDAR
(9x VL53L1X)



Reflectometer
(VL53L0X)

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# Competition

# FlightSense™ vs. other Proximity sensing technologies

| | Radar | UltraSonic | Conventional IR | ST FlightSense™ (Competition from AMS 8801 ToF) |
|---|---|---|---|---|
| **Size/Weight** | Large PCB<br>Novelda: 15 x 4 x 1.5mm with antenna<br>IFX SOLI: ~5.x by 3.x mm | 2xToF | Small/Light | Small |
| **Mechanical integration** | Complex (antenna)<br>Works through cover if no impact on high freq. | Need hole<br>(impact on ID) | Easy<br>(if all-in-one) | Easy (all in one, reflowable)<br>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<br>User detect.: Depends on target reflectance<br>User vs Chair: Not possible | Boot-up: few ms<br>User detect: 20ms @ 1Hz<br>(ranging freq. programmable)<br>User vs Chair distinction: 30s Maxi |
| **Reliability of ranging data** | First target detected only<br>May detect through wall<br>Sensitive to object charge | Impacted by wide sound from environment | Impacted by target reflectivity and IR ambient light | Not impacted by target reflectivity<br>Multi target detection<br>Sensitive to IR ambient light |
| **Power consumption** | ~2.5mW in Std.by @1m<br>(higher for longer distance) | Very Low | Low | Low<br>(0.9mW for User detection under autonomous mode) |

(1) depending on model and conditions

# Thank you



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