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# FlightSense™ ST time-of-flight Proximity and Ranging sensors

## Mass-Market presentation

Imaging Division  
Personal Electronics, Industrial & MassMarket

Updated the 02<sup>nd</sup>, July 2020

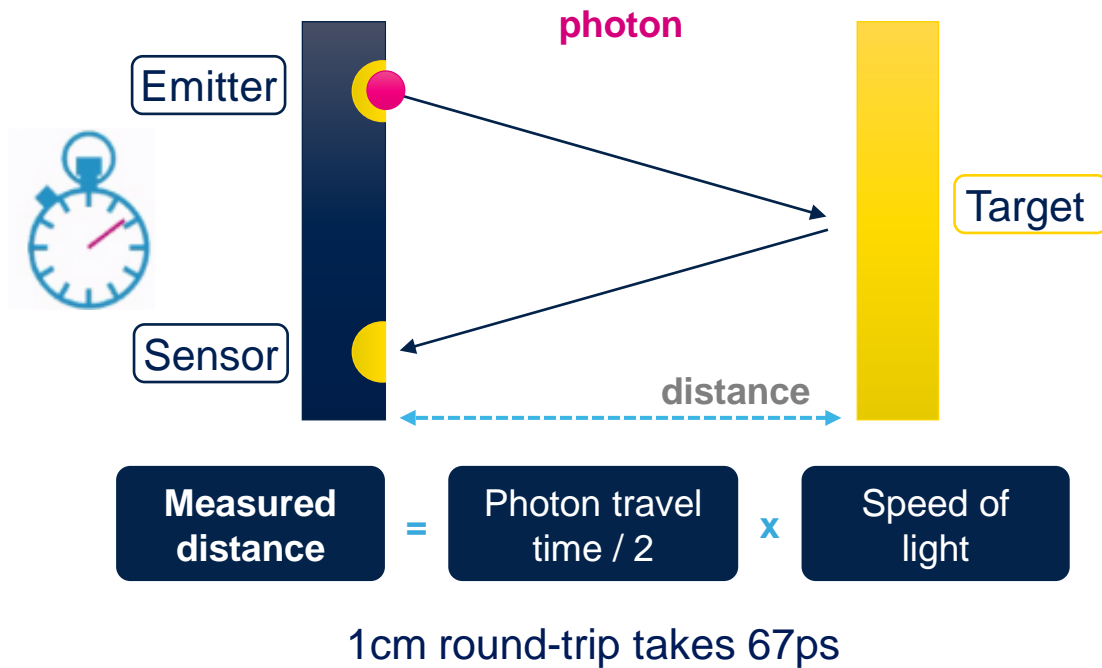




# FlightSense™

... Making Light work

## Time-of-Flight Principle



ST proprietary **FlightSense™** technology

True distance measurement

Independent of target size, color & reflectance

Fast and low power

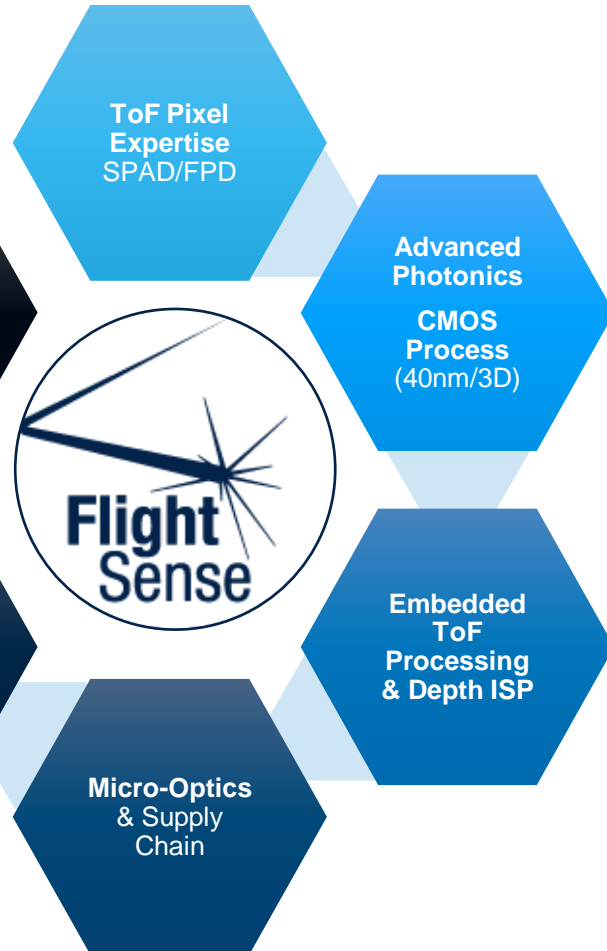
Truly invisible 940nm illumination



# FlightSense™

## ST Pioneer and Leader in Time-of-Flight (ToF)

ST is #1 Worldwide Time-of-Flight sensor supplier



### 4 Generations

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

### >50 OEMs

Over 170 phones with ST's Time of Flight technology  
Several hundreds of non wireless end products on the market  
Unlimited variety of use-cases beyond smartphones

### >42,000

Evaluation kits deployed

### 1 Billion

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



**VL53L5**

4<sup>th</sup> generation FlightSense™



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# FlightSense™

## Typical Module overview

All-in-One (illumination & sensor) Time of Flight System → Optimized Size, Performance, Cost mix

Advanced optics with  
integrated IR filters

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



**Monolithic ToF SoC**, SPAD Array,  
RAM/ROM & high safety Class1  
VCSEL driver

Full Class 1 safety  
high efficiency VCSEL



# FlightSense™ Full Class 1 Laser product Certification

All FlightSense™ products are Laser Class 1 certified, to typically higher standards than competitors



- IEC/EN Class 1 laser product certified:

- For both 60825-1 2007 and 2014 editions
- Under all operating conditions
- Under single-fault failure conditions

➔ SAFEST laser class



Product Service

- Final product laser safety certification guaranteed provided:

1. The laser output power **must not be increased** by any means, including firmware and hardware
2. No **magnifying lens** must be added to the product
3. The ToF sensors should be mounted in the consumer product under a glass/plastic material such that the sensors **cannot be physically accessed** by the user without a specialist tool



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# **FlightSense™**

## **Functions, Use-cases & Applications**



# FlightSense™

## Typical Applications



### 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



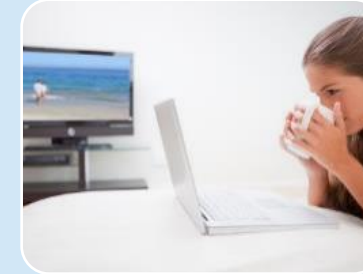
### Multispectral & Flicker

- 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

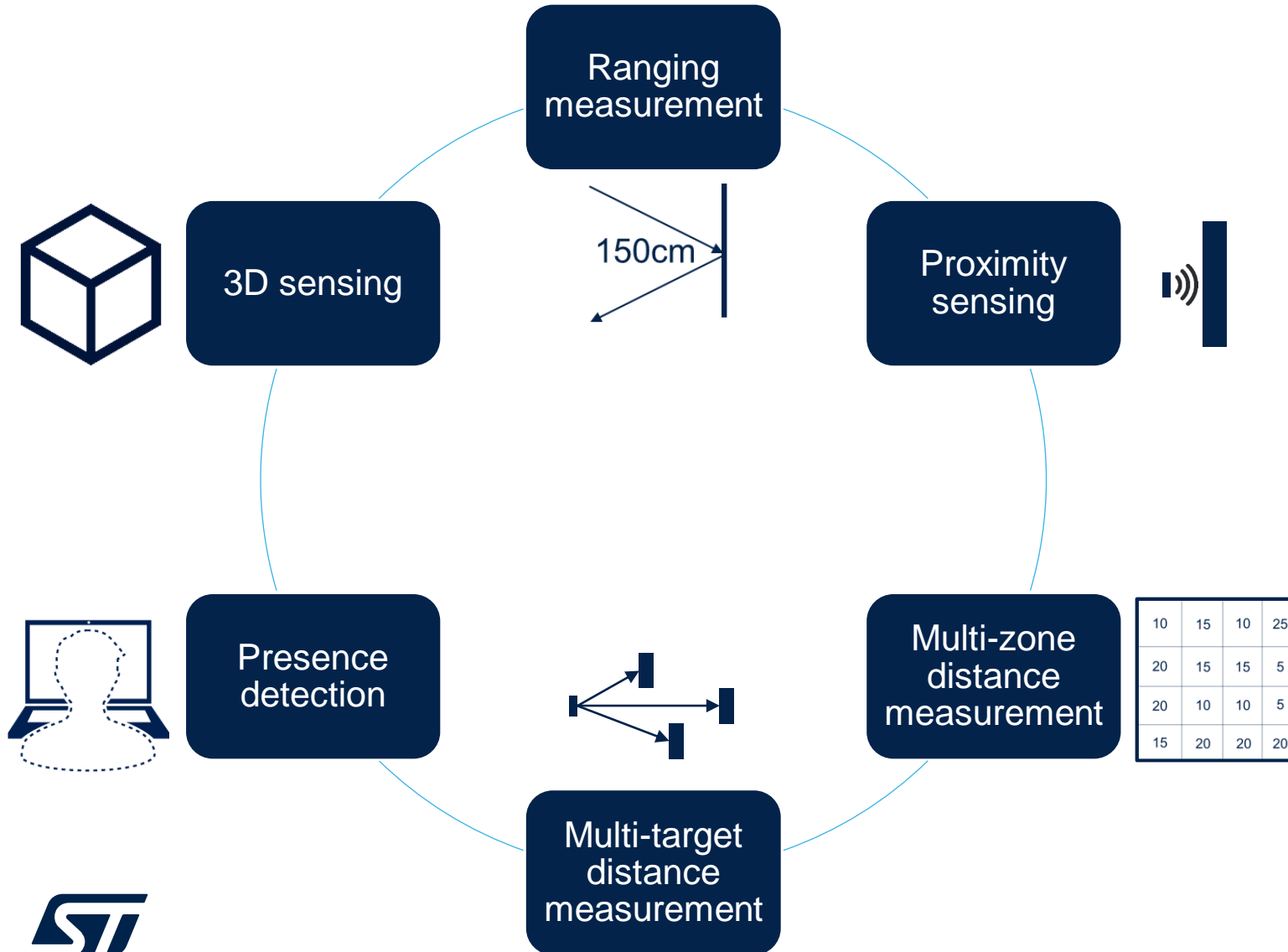


### Depth Map & AR/VR

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



# FlightSense™ sensors main functions



## Enabling multiple Use-Cases :

- Ceiling detection
- Content analysis
- Cliff detection
- Gesture control
- Hands-free operation
- Light control
- Load management
- Object detection
- Obstacle avoidance
- Occupancy detection
- Parking occupancy
- People counting
- Power saving
- SLAM
- Touch-less operation
- Presence detection
- Volume control
- Wall tracking

## To develop unlimited Markets...







# Unlimited Markets & Applications



Laptops



Tablets



Cleaning robots



Service Robots



Toys



Lighting



Printers



Public Parking



Drones



ATM



AR/VR



Smart home



Industrial



Lockers



Projectors



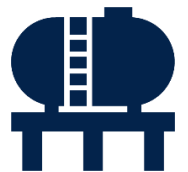
Wearable  
& IoT



Faucets



Trucks



Tanks



Dispensers



Medical



Farming



Logistics



Warehouse



Vending  
machines





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# Flightsense™ mass-market roadmap

Updated the 26<sup>th</sup> of May 2020



# FlightSense™ Mass-Market Roadmap

XX° FoV

Programmable FoV  
XX° Max

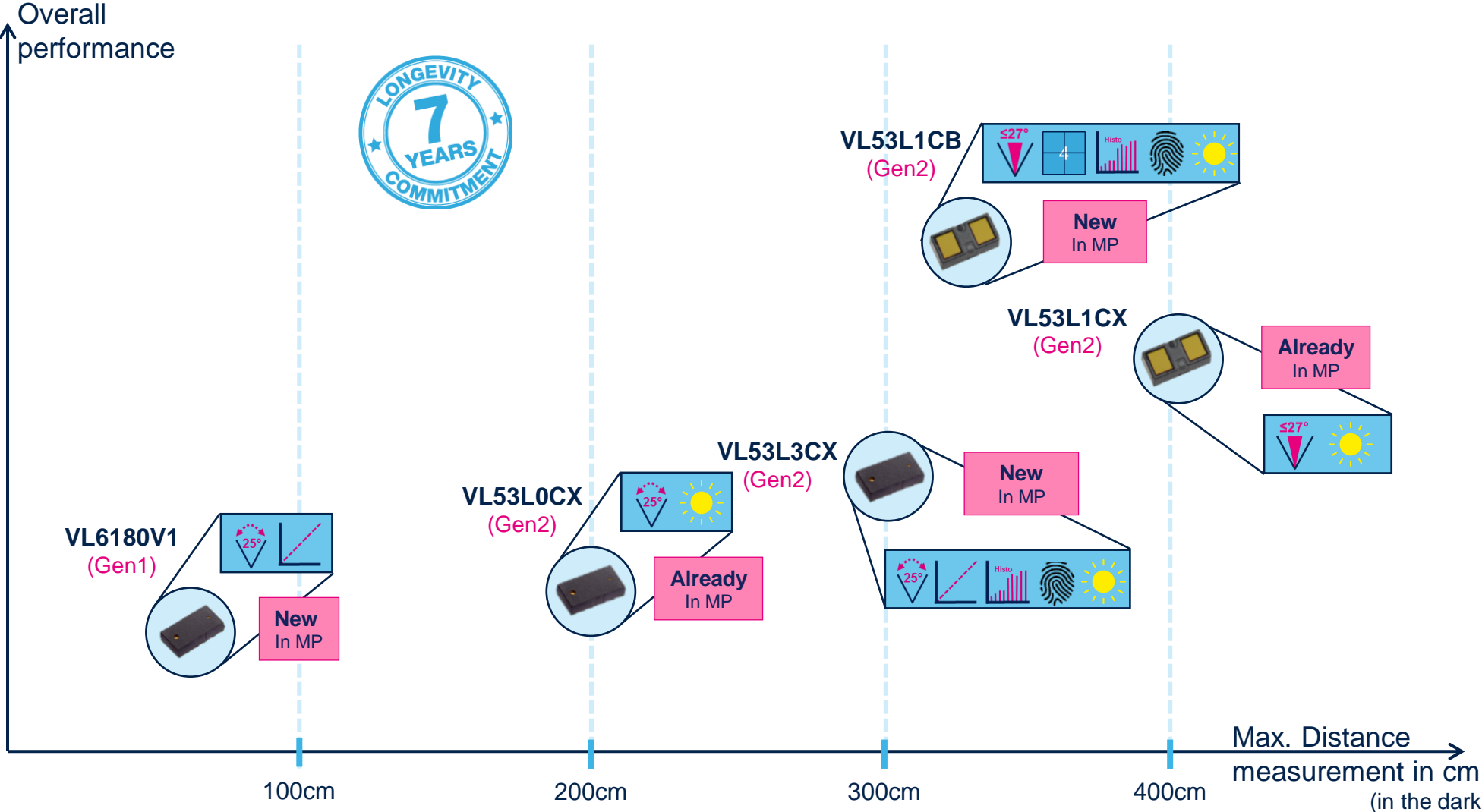
Up to 4 zones  
sequentially

Histogram  
MultiObject detection

Perf. Under Ambient

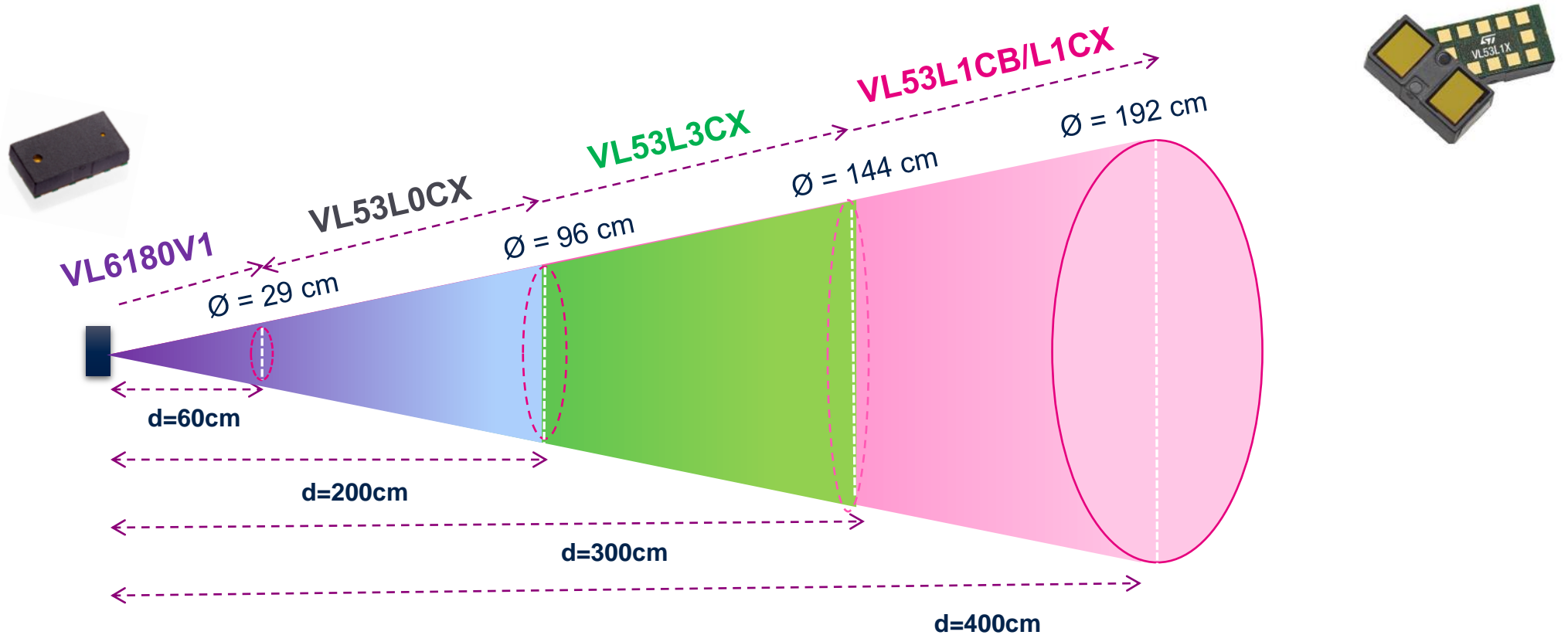
Smudge correction

Close distance  
Linearity





# Detection Cones (Optical Field-of-view FoV)





STM32 Open  
Development  
Environment

# FlightSense™ Ecosystem and tools

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

## 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

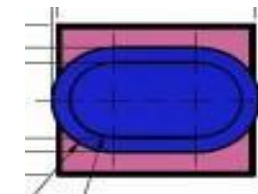
## Cover glasses

### 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



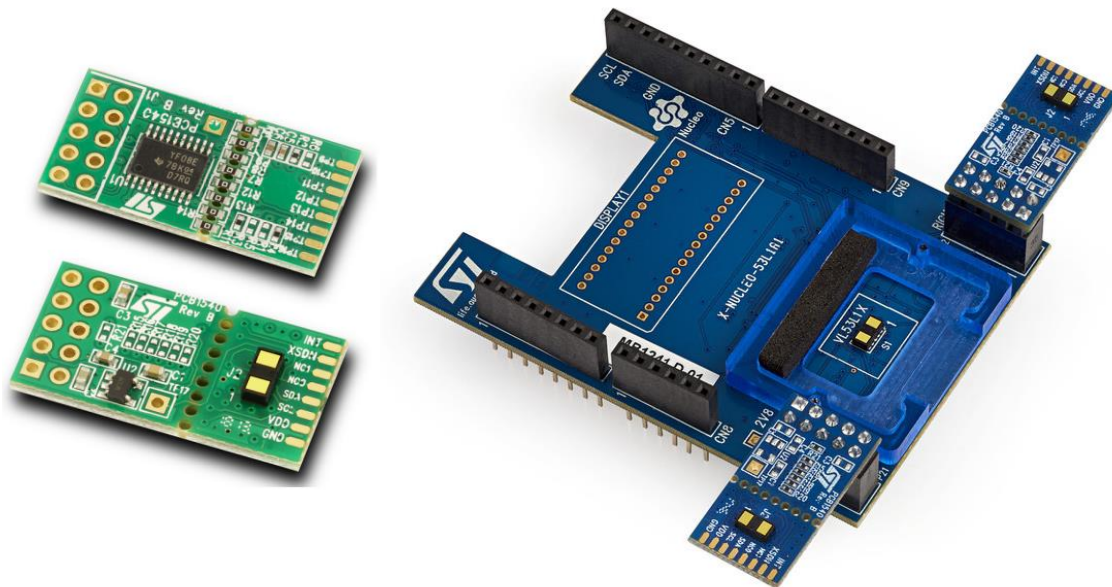
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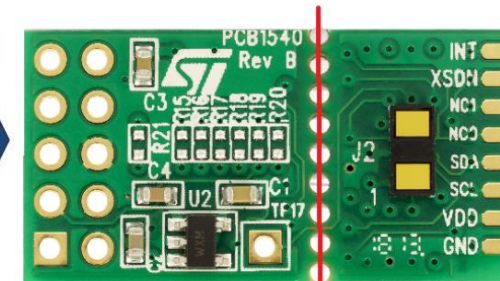
# FlightSense™ Breakout boards

Breakout boards are available for each sensor variant, for easy integration into customer's device

- The expansion boards can accept breakout boards, through connectors or flying wires
- For 2.8V supply application, the breakout board can be separated, in order to use only the “mini PCB”, easier to integrate into a customer device



5V to 2.8V  
supply  
application



Mini  
PCB



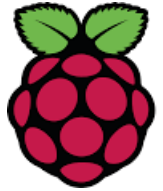
2.8V  
supply  
application







# FlightSense™ Raspberry, Arduino & arm MBED



## Raspberry Pi®

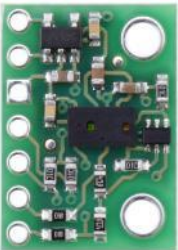
**VL53L1CX**  
breakout board



**Pololu**  
Robotics & Electronics

Forum,  
resources  
& Articles

VL6180X carrier  
(60 cm max range)



VL53L0X carrier  
(200 cm max range)



VL53L1X carrier  
(400 cm max range)



## arm MBED

**VL6180V0** →



X-NUCLEO-6180XA1 Proximity  
and Ambient Light Sensor



← **VL53L0CX**

X-NUCLEO-53L0A1 Ranging  
Sensor Expansion Board



**VL53L1CX** →

X-NUCLEO-53L1A1 Ranging  
Sensor Expansion Board



Forum, open  
source code



**GitHub**



**Videos**

**Tutorials**



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