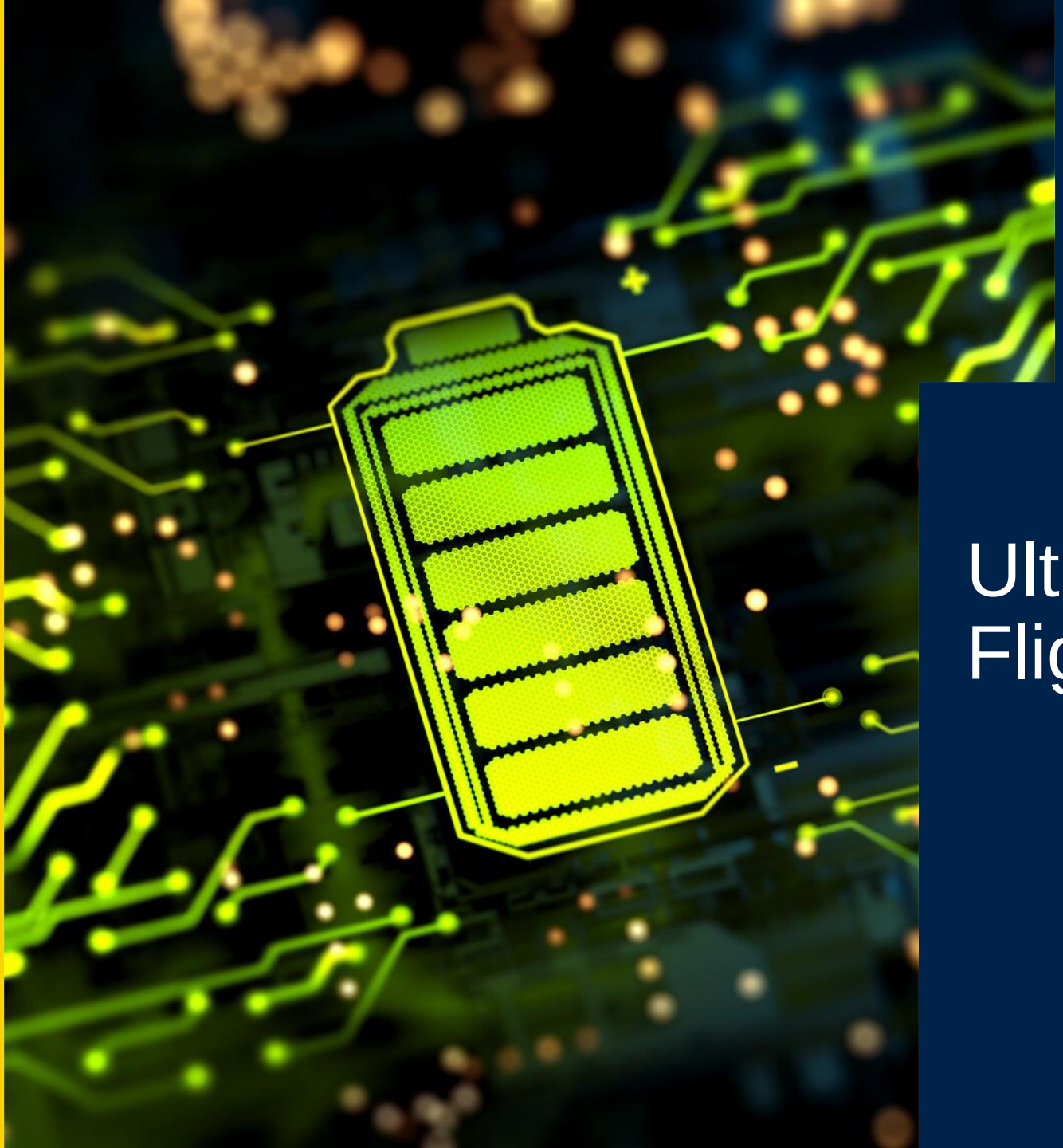

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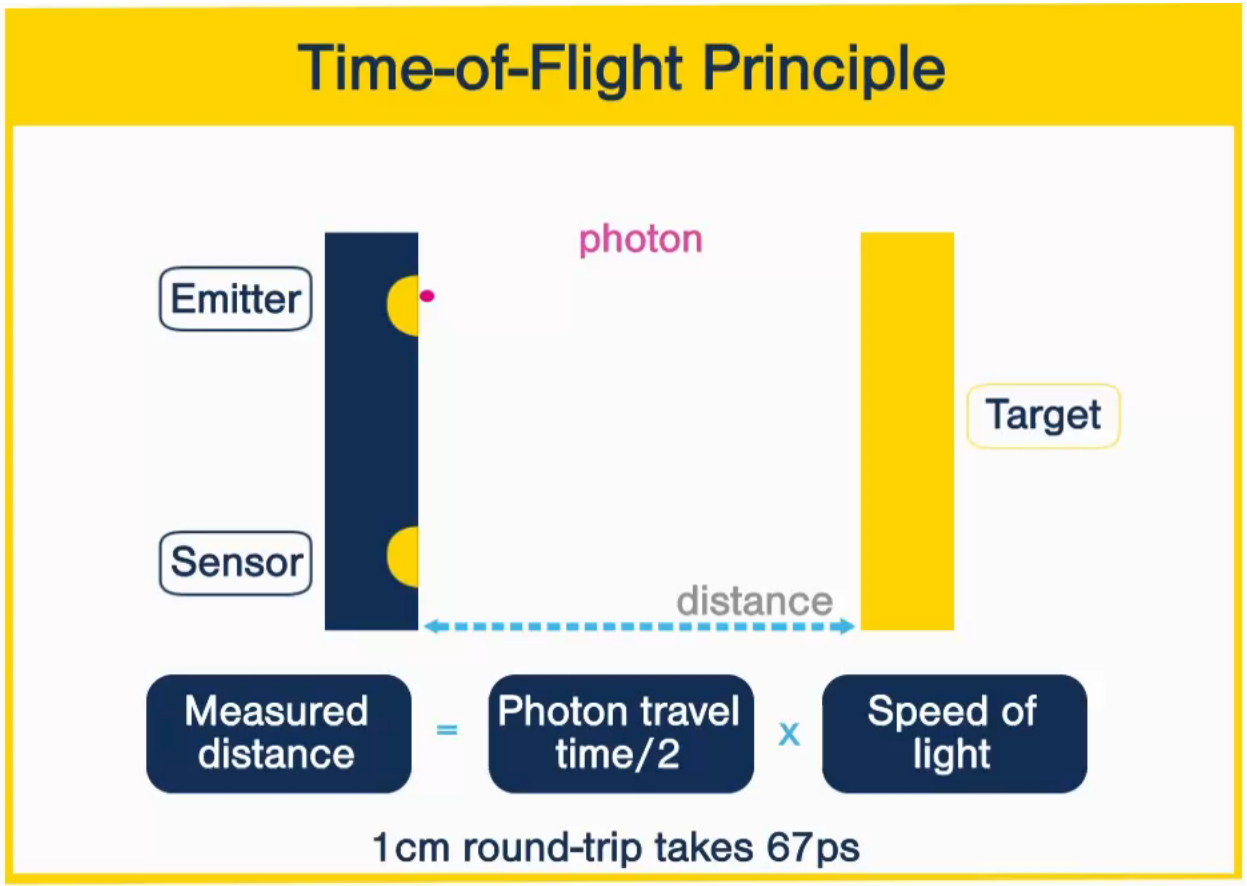
Ultra-low power Time-of-Flight sensors

Flight Sense

FlightSense*
… Making Light work



- ST proprietary FlightSense* technology
- True distance measurement
  Independent of target size, color & reflectance
- Fast and low power
- Truly invisible 940nm illumination

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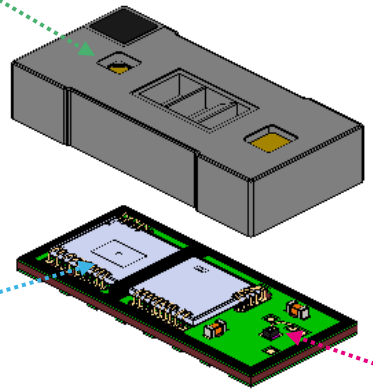
FlightSense
Typical module overview

Easy and quick integration thanks to all-in-one module including IR light VCSEL emitter and SPAD sensor receiver

Advanced optics
with IR filters

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



Time-of-Flight SoC:
SPAD receiver array
Class 1 VCSEL driver

High-efficiency VCSEL
940nm IR emitter
Class 1 certified

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

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

4 Generations
of all-in-one ToF solutions deployed in the last 7 years

> 500 customers' end-products
Unlimited variety of use-cases and markets

>60,000
Evaluation kits deployed

>1.5 Billion
ToF units shipped. Mastering end-to-end supply chain

VL53L5CX multi-zones sensor
4th generation FlightSense

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Ultra-low power ToF sensors

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UltraLow Power driver benefits

ToF ranging sensors used as detector sensors

- Ultra-low power consumption
- Not affected by target color and reflectance
- Easy to use: Detection → Interrupt
- Compatible with standard modes use (distance ranging)

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VL53L1CX ultra-low power (ULP)

High performance detection distance

1Hz frequency	Lowest consumption	Best performances
White Target 88%	**65µA** >800mm	300µA **>1400mm**
Grey Target 17%	**65µA** >250mm	300µA **>1150mm**

Package size : 4.9 x 2.5 x 1.56 mm
FoV : 27°
Single zone

Optional

Benefits of the standard mode use

- Max distance ranging : **400cm+**
- **High ranging frequency** (50Hz)
- Programmable Region-of-Interest (RoI)

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VL53L3CX ultra-low power (ULP)

Lowest power consumption

Package size : 4.4 x 2.4 x 1 mm
FoV : 25°
Single zone

1Hz frequency	Lowest consumption	Best performances
White Target 88%	**55µA** >230mm	240µA **>840mm**
Grey Target 17%	**55µA** >100mm	240µA **>310mm**

Benefits of the standard mode use

Optional

- Histogram processing
- Max distance ranging : **500cm+**
- **Multi-target distance measurement**
- **Immunity to cover glass cross-talk** beyond 80cm
- Automatic **fingerprint smudge compensation**

Which product to select?

VL53L1CX

VL53L3CX

Software code on st.com		STSW-IMG032	STSW-IMG033
Lowest conso	Power consumption*	65µA	**55µA**
	Max distance**	**>800mm**	>230mm
Max distance	Power consumption*	300µA	**240µA**
	Max distance**	**>1400mm**	>840mm
Mechanical specs	Field-of-View	27°	25°
	Module size	4.9 x 2.5 x 1.56 mm	**4.4 x 2.4 x 1.0 mm**
	Pinout	Same pinout	
Ranging mode	Processing mode	Legacy	**Histogram**
	Max distance	400 cm	**500 cm**
	Multi-target detection	No	**Yes**

* Power consumption measured at 1hz frequency

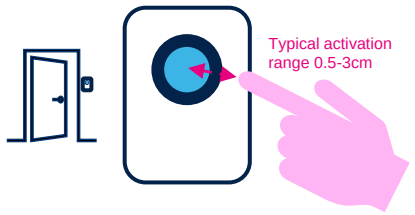
** Best conditions are indoor without IR light and using white target (88% reflectance)

Focus on Applications

Focus on touchless button

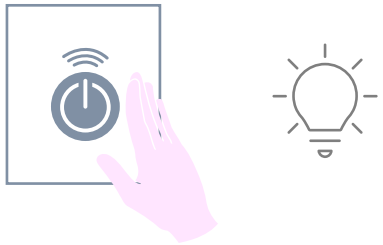
Avoid any contact with physical buttons thanks to ToF detection sensors

Smart doors



Triggers when users hand or finger is detected within a pre-defined distance

Light switches

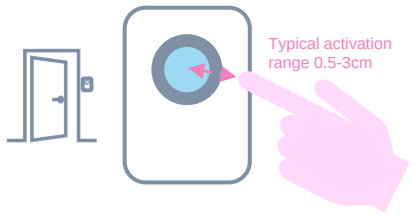


Turn on/off the light without touching the button

Focus on touchless button

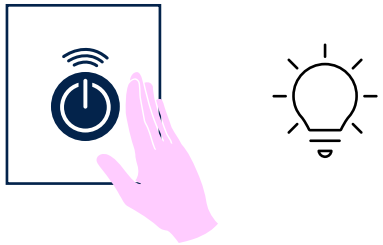
Avoid any contact with physical buttons thanks to ToF detection sensors

Smart doors

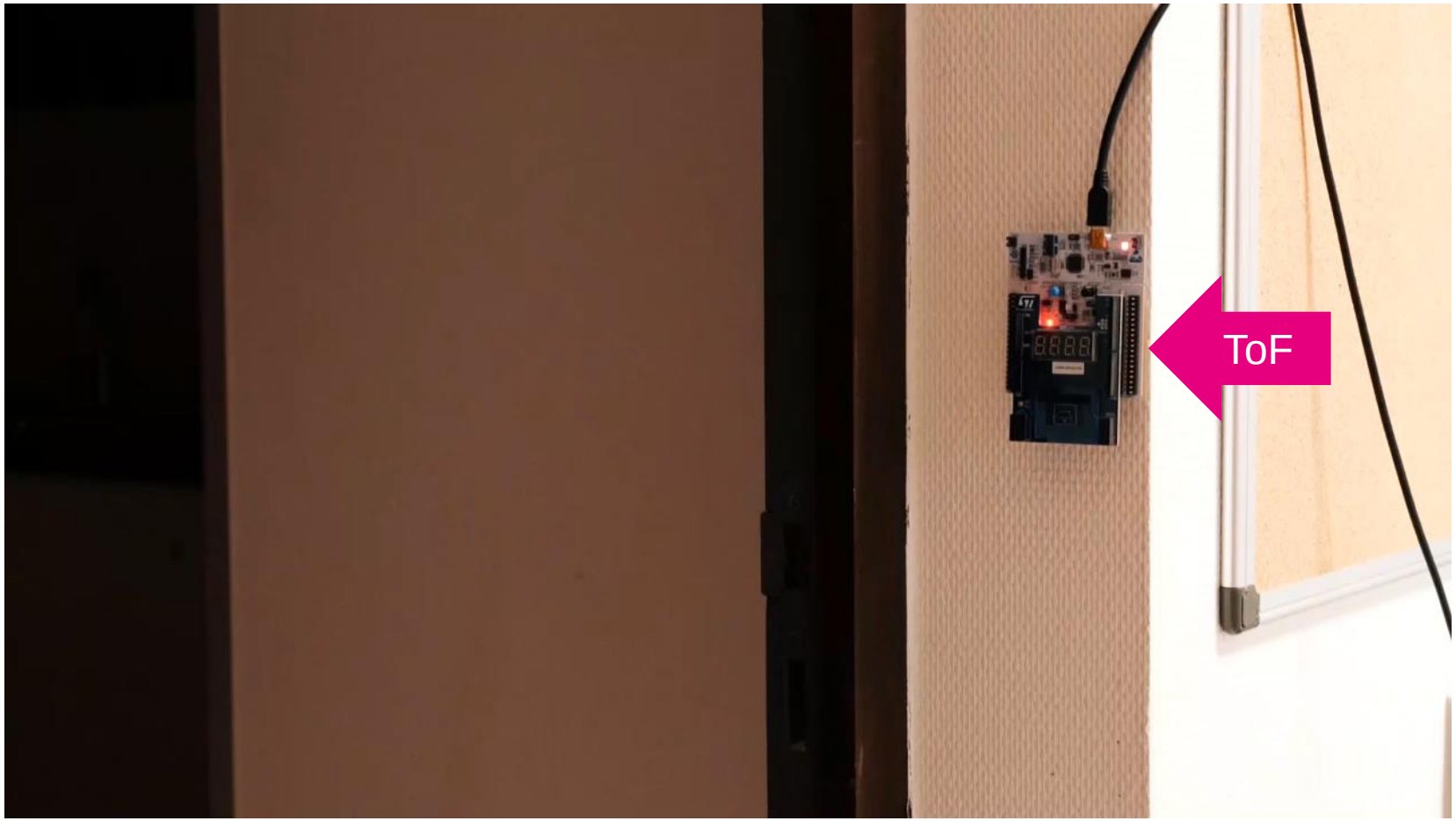


Triggers when users hand or finger is detected within a pre-defined distance

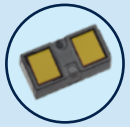
Light switches

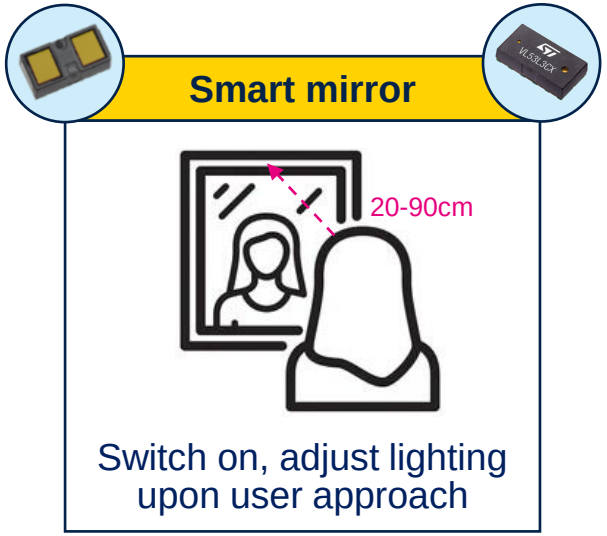


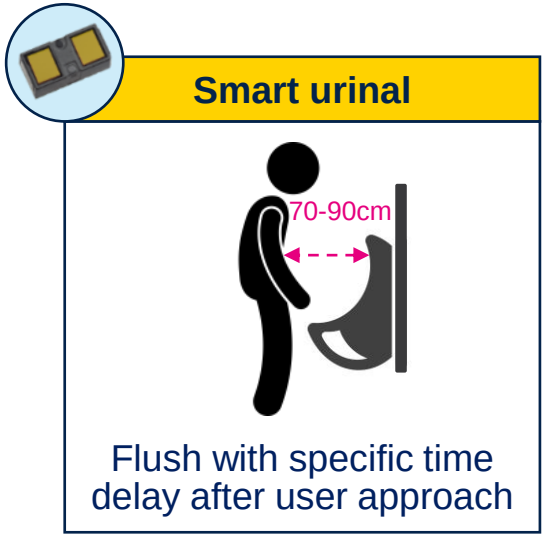
Turn on/off the light without touching the button

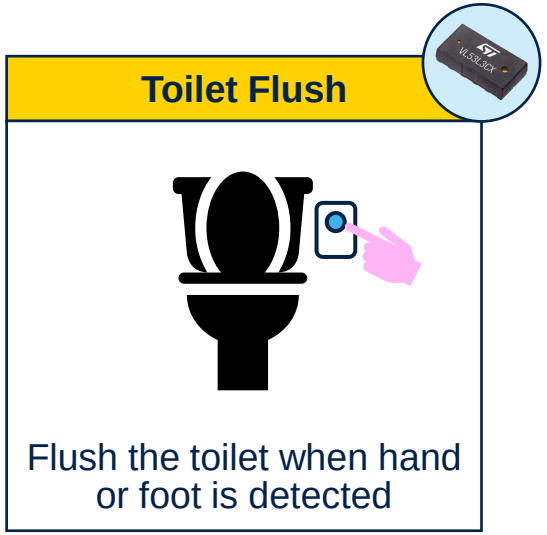


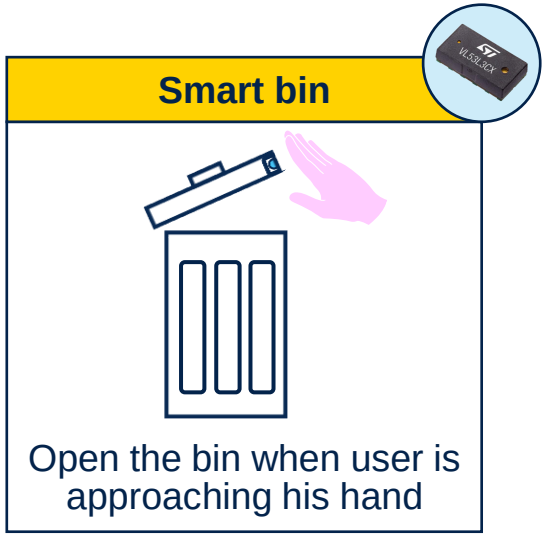
Sanitary market

Best sensor for this application	
VL53L1CX	
VL53L3CX	





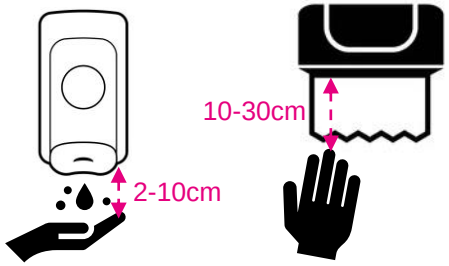




Focus on dispensers and faucets

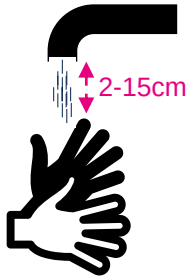
Low-power mode increases battery life-time in sanitary devices

Dispensers



Dispense soap, hand sanitizer or towel when user is detected

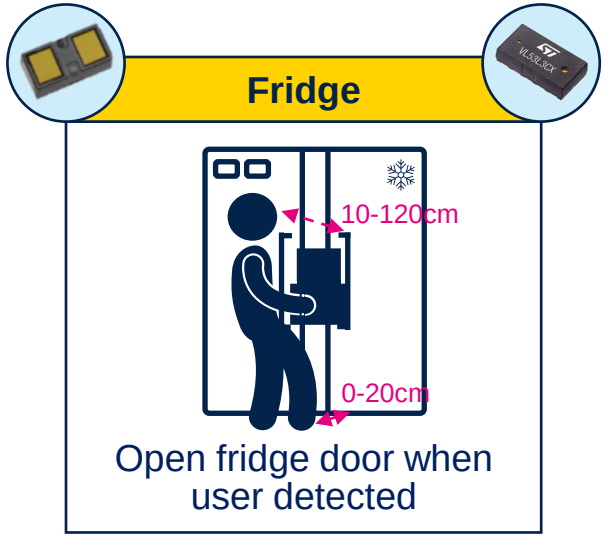
Smart faucets

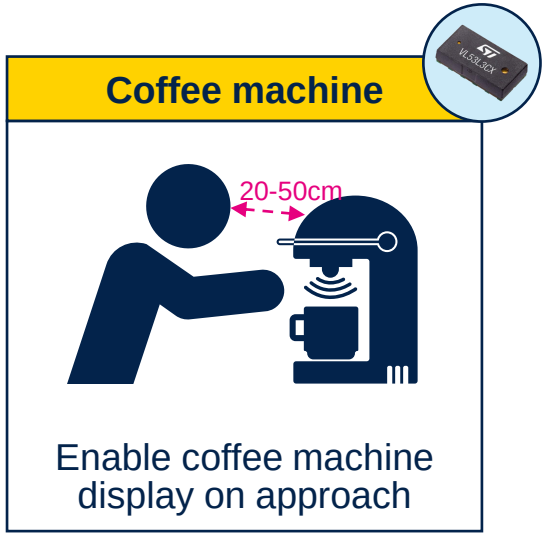


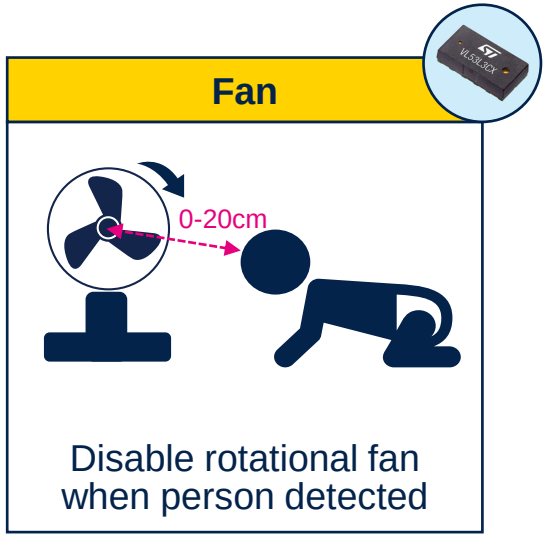
Run water when hand is detected

Best sensor for this application	
VL53L1CX	
VL53L3CX	

Home appliance and Home automation



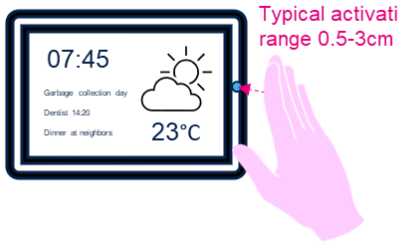




Focus on Thermostat or public screens

Reduce power consumption of your devices thanks to automatic system activation

Thermostat



Trigger when users hand or finger is detected within a pre-defined distance

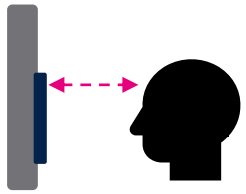
Public screen

Wake the system and turn-on the screen upon user approach

Access control

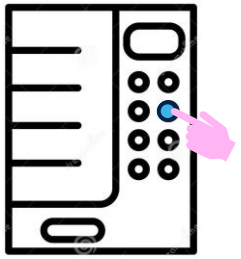
Best sensor for this application	
VL53L1CX	
VL53L3CX	

Face ID reader



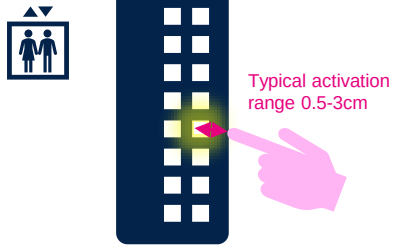
Automatically enable identification system

Vending machine



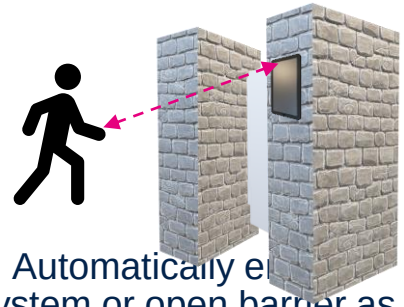
Turn-on the vending machine when user approaches

Elevator



Enable floor selection without touch

Automatic access



Automatically e system or open barrier as user approaches

UltraLow Power drivers

From ranging to detection sensor

Low power detection or full range performances

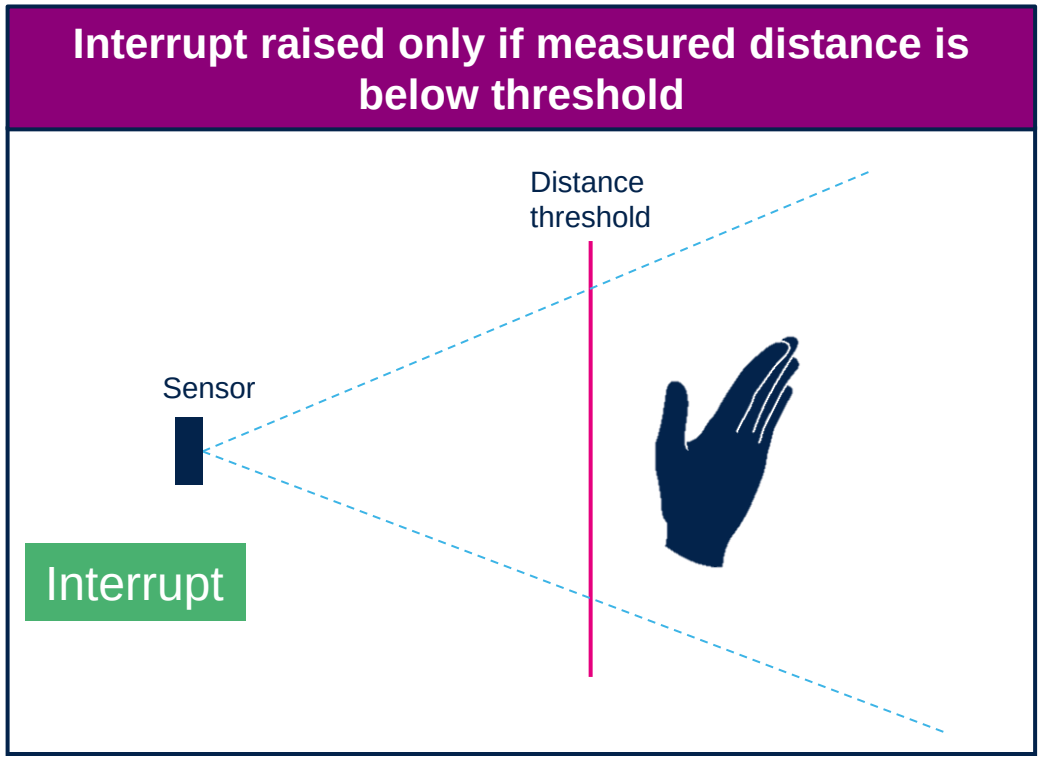
Ranging sensor – standard driver	Detection sensor – ultra low power driver
• Accurate **distance** measurement	• Detection based on **hardware interrupt**
• **Fast** measurements	• **Fast detection** rate
• **Long** distance ranging	• **Programmable detection** distance
• **Continuous** streaming	• **Autonomous** streaming

Detection sensor can be used in ULP standalone mode and then switched to standard mode in order to complete ranging measurement

Detection sensor

Autonomous mode allows to wake up the host only when a threshold is reached

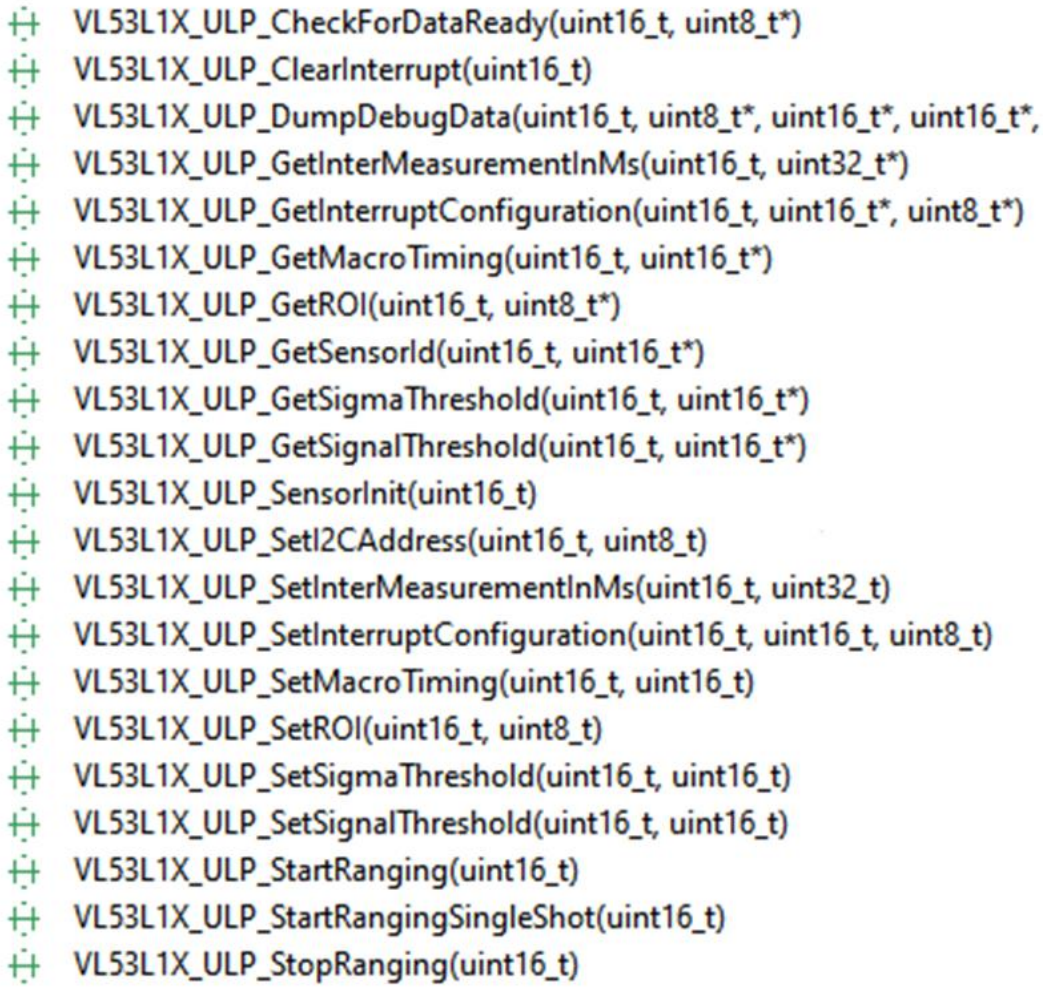
- Sensor streams **autonomously** without any host intervention
- Interrupt is raised only when **a target is detected**
- All processing is **embedded on the chip**
- User only needs to **program a threshold**



Software

Turnkey software for fast integration

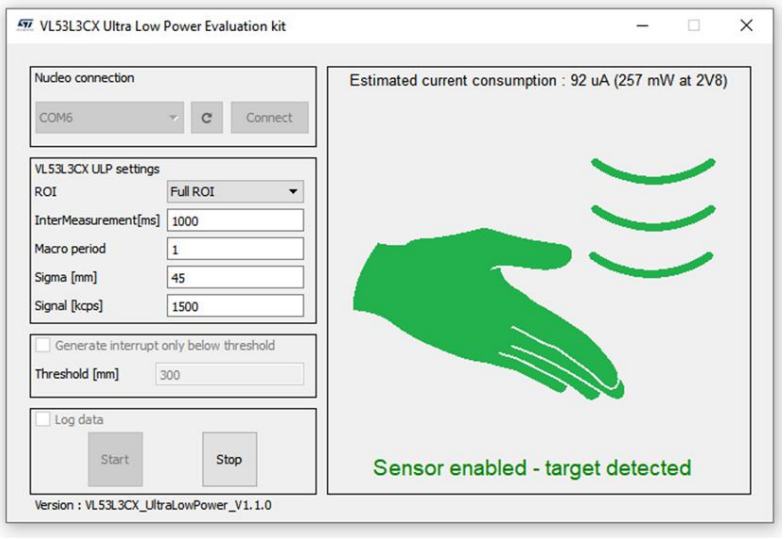
- Ultra Lite Driver
- MISRA C 2012 compliant
- Only 21 functions
- Compatible with existing ST drivers
- Calibration free
- 600 lines of code
- 1.3 Kbytes



Technical documentation

Complete toolset to start evaluation and integration

- Evaluation boards available
- Graphical user interface (GUI)
- Ultra light driver with code examples
- CubeIDE projects
- Technical documentation



	VL53L1CX	VL53L3CX
		
Software code	STSW-IMG032	STSW-IMG033
Application Note	AN5776	AN5769
GUI	Integrated to the SW zip	
Evaluation boards	Expansion board, breakout board and evaluation kit available	

Open Development Environment

Ecosystem and tools

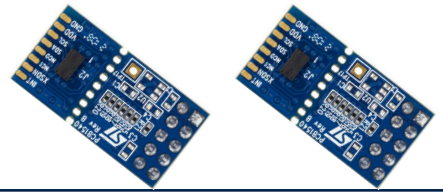
Imaging products supported by ST ecosystem

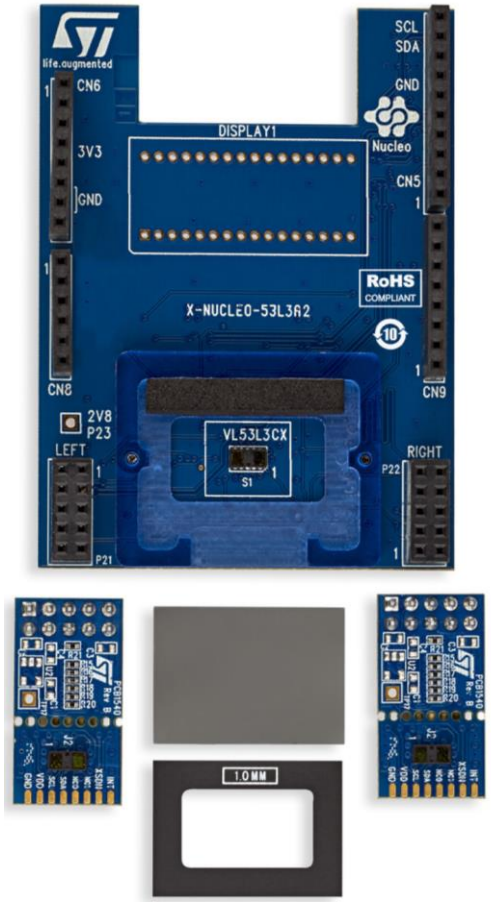
Complete package

- X-NUCLEO expansion board

- P-NUCLEO packs with STM32 NUCLEO

- Stand-alone Breakout boards





STM32 ODE

- F**light**Sense™ fully integrated in STM32 Ecosystem
- Compatible with all STM32 NUCLEO boards thanks to **CubeMX**
- Referenced on mbed, Arduino & Raspberry Pi platforms

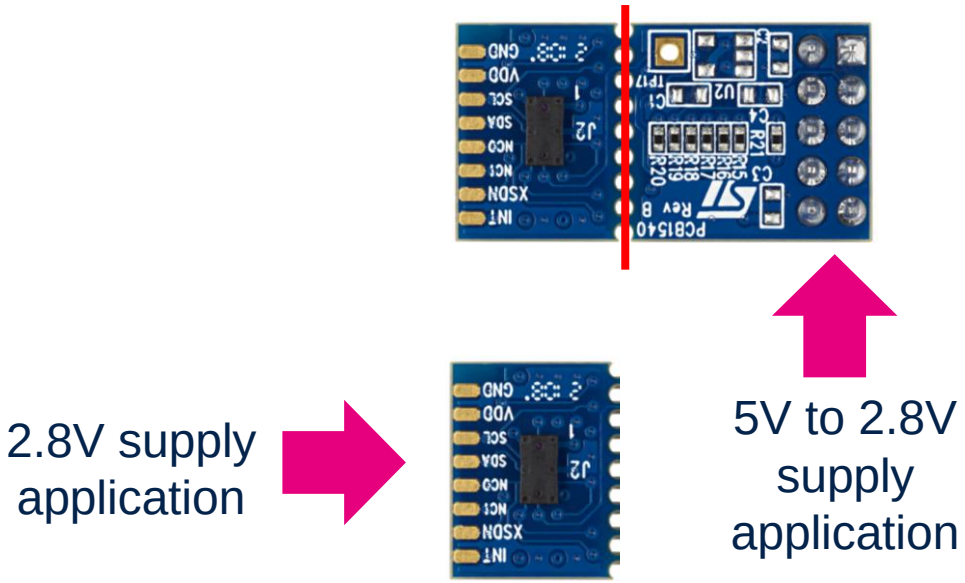
Cover glass

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

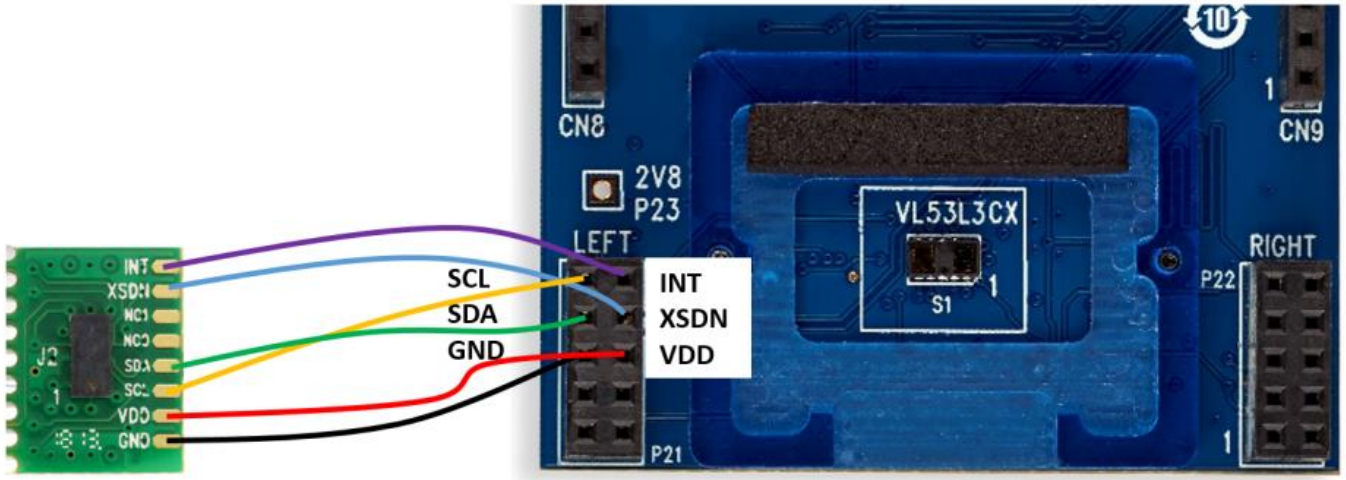
Breakout boards

Breakout boards enable easy integration at customers

- The expansion boards can accept breakout boards via connectors or flying wires



- For 2.8V supply applications, the breakout board can be separated in order to use only the “mini-PCB”, easier to integrate into a customer device



FlightSense™ VL53L1CX Ordering codes

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

Item	Picture	Commercial Product (= Order Code)	Comments
VL53L1CX sensor		**VL53L1CXV0FY/1**	Delivery in T&R MOQ: 3.6ku With protective liner
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

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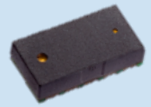
FlightSense™ VL53L3CX Ordering codes

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 MOQ: 4.5ku With protective liner
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

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FlightSense™ UltraLow Power sensors summary

Leader on Direct ToF

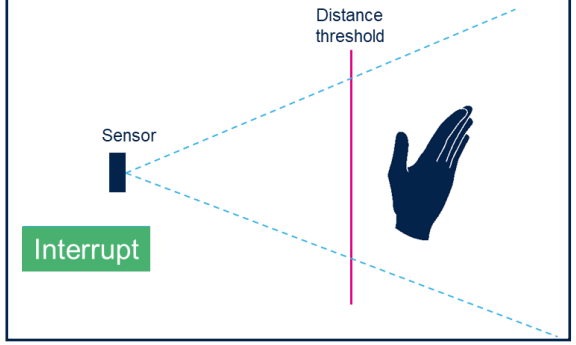
= 1st

Ultra-low Power consumption

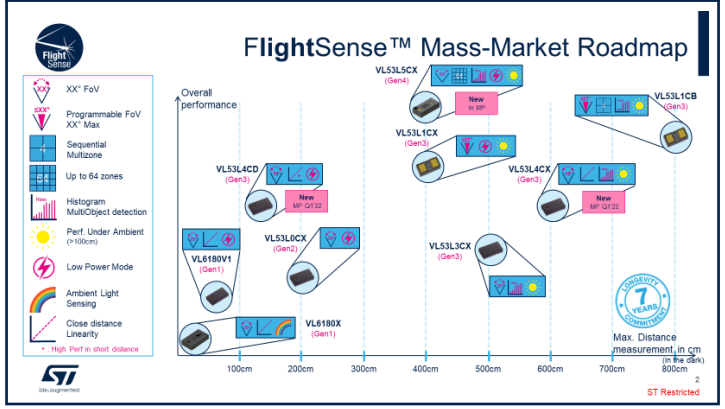
65µA → >800mm

55µA → >230mm

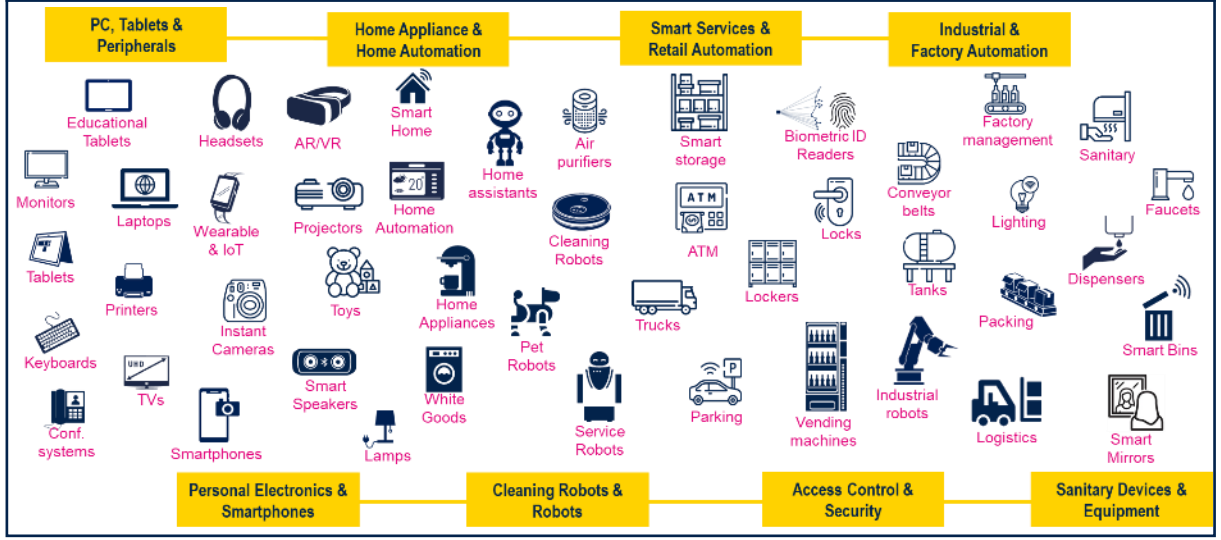
Distance threshold



Permanent evolution



Unlimited markets & applications



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Our technology starts with You

Find out more at www.st.com

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