ST presence detection technologies
Thermal MOS and Time-of-Flight

IR presence sensor

Multizone Time-of-Flight sensors

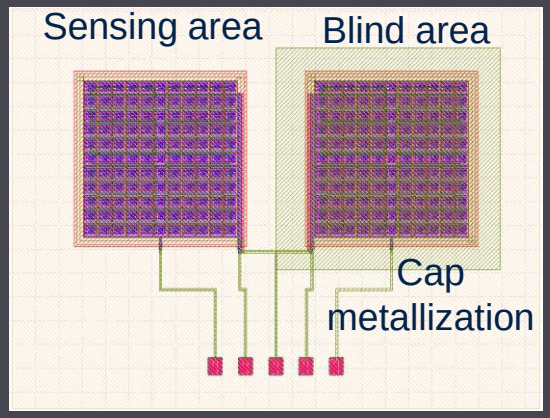
Fusion of TMOS and ToF sensing for advanced applications

Hardware & software ecosystem STEVAL-PDETECT1

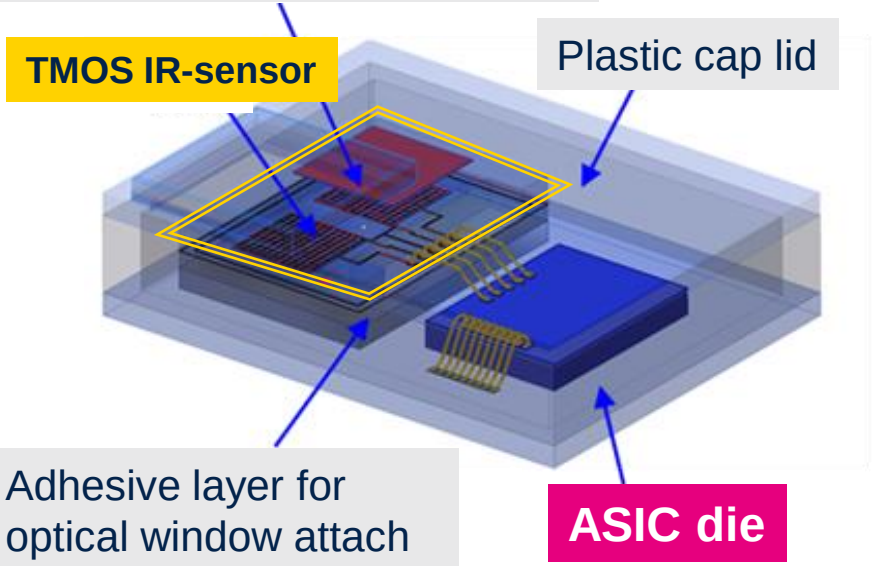
What is TMOS sensing technology?

IR sensor for human and object presence and movement detection

TMOS sensing element



Optical window for IR radiation
5 to 20 µm wavelength



Based on CMOS transistor, thermally isolated

Integrated MEMS absorber to improve sensitivity

High vacuum in wafer level packing

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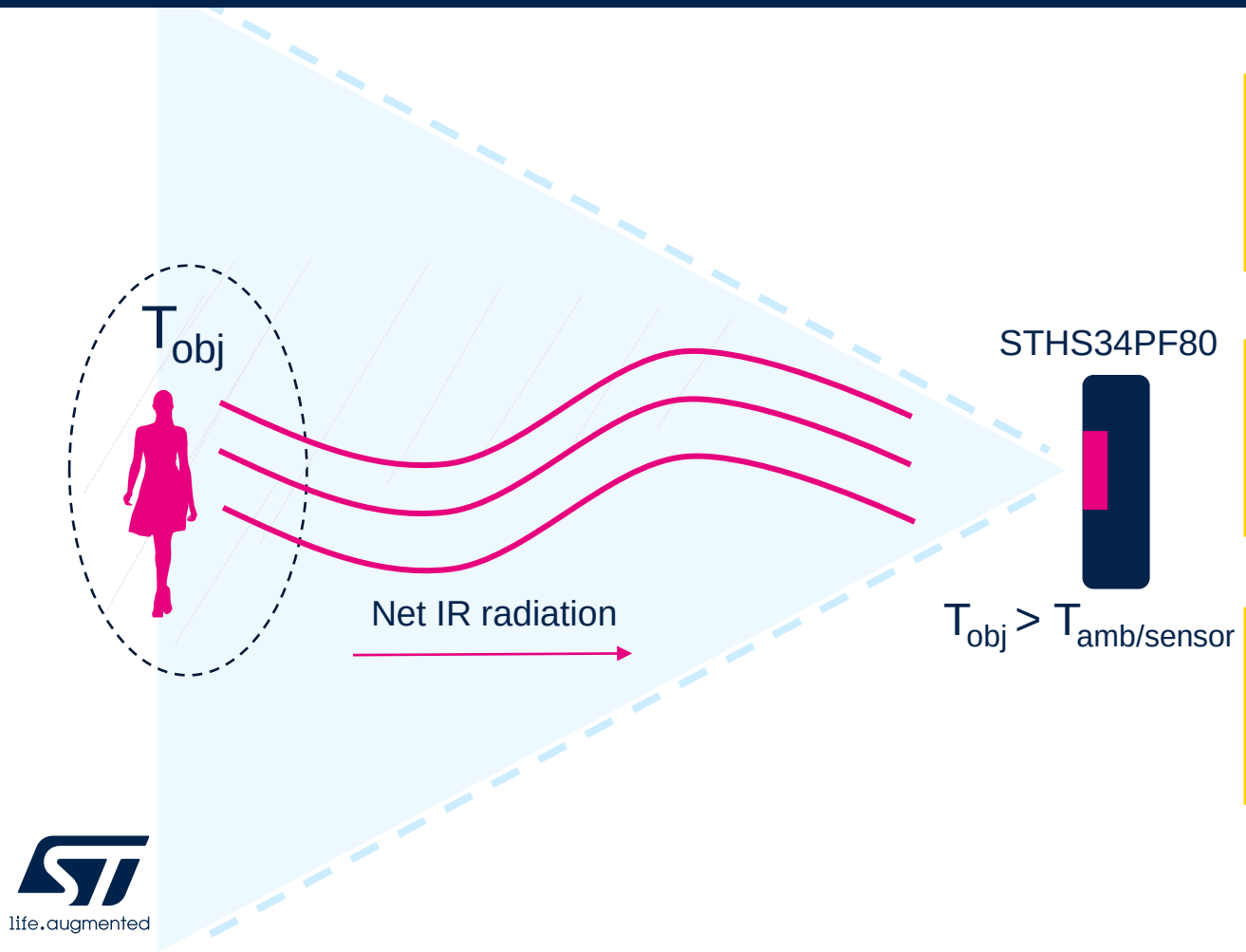
STHS34PF80 infrared presence sensor

Disruptive TMOS sensing technology



Nonintrusive presence detection

Based on invisible infrared heat

Low power

Can be configured to operate in very low power modes (5 µA typ @ 1 Hz)

Single chip solution

Small surface mount technology package

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STHS34PF80 use cases

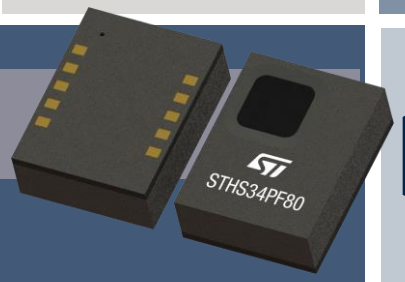
Presence, motion, and occupancy detection

HVAC

Thermostat

Security systems

LGA-10L
3.2 x 4.2 x 1.455 mm



- Single chip solution
- Tiny size compared to PIR
- Digital output
- Embedded presence & motion logic
- Ultralow current consumption

Asset tracking

Hotel occupancy

Room entry detection

Smart lightning

Air purifier

Access controls

Dispenser

Faucet

Baby room

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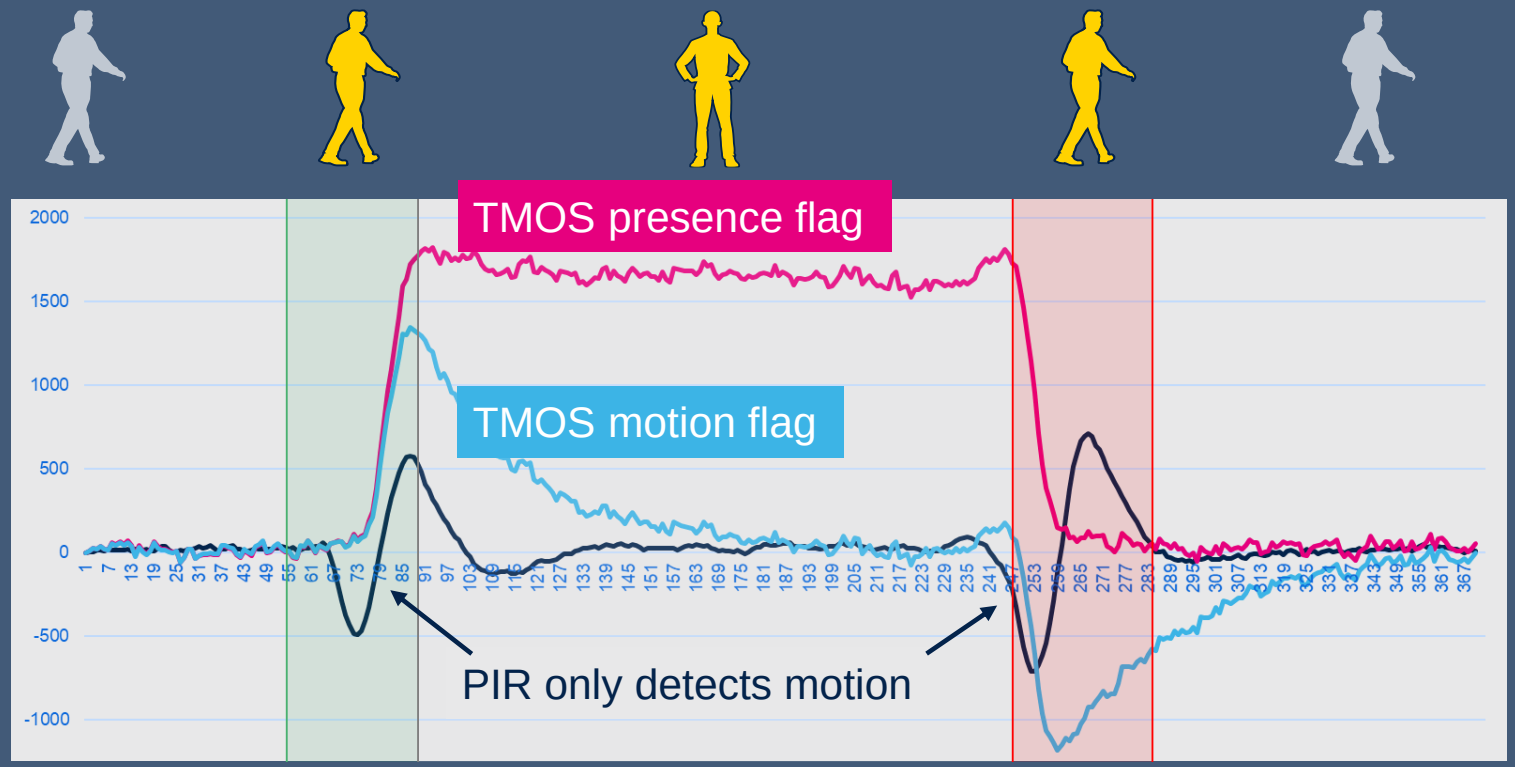
Infrared (IR) TMOS vs PIR

Only TMOS can detect stationary and moving people



- ✓ Smaller package
- ✓ Simpler hardware design
- ✓ Digital features
- ✓ Robustness

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ST FlightSense Time-of-Flight technology

Optical depth sensors measure the time during which photons bounce off objects in the field-of-view

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

Nonintrusive presence detection

Based on invisible infrared light

Photon based

Speed of light measurement accuracy and reliability

Advanced computing

Multiple outputs to create smart use cases

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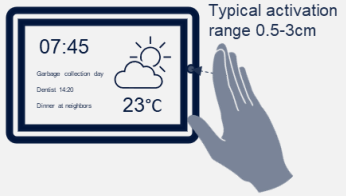
Presence detection application examples

FlightSense enables energy saving & smart user experience

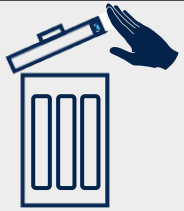
Presence detection

Accessibility	Security	Power saving
Car park Notify available parking	**ATM** Wake up when someone approaches Alert someone is behind the user	**Thermostat** Adapt the temperature, wake up or monitor traffic



Other applications

Hygiene

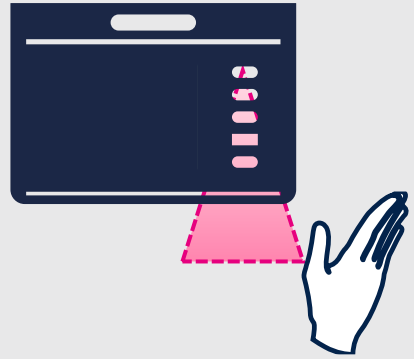


Open bin

Enable home control console display

Two-in-one application

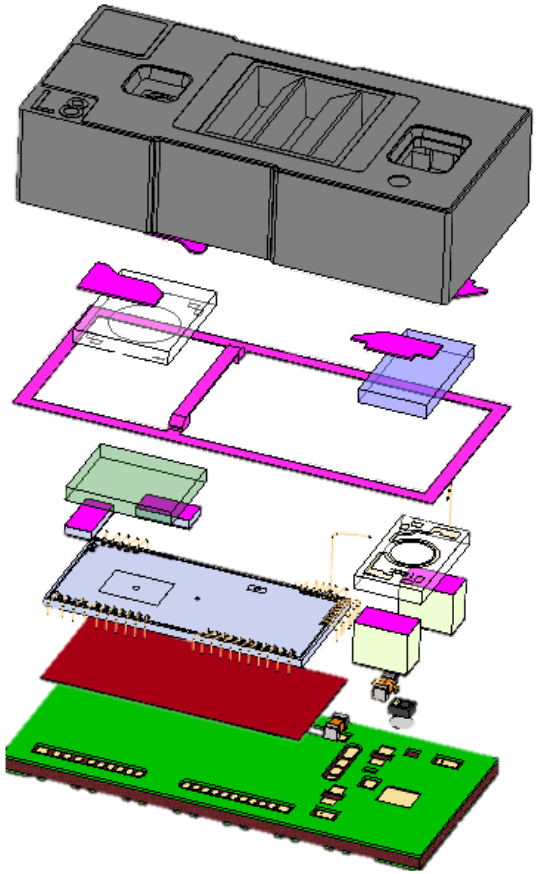
Enhance your devices with ST gesture recognition



Quickly interact with the thermostat interface

What’s inside a FlightSense module?

Time-of-Flight SoC	SPAD receiver Laser driver
Highly efficient VCSEL	940 nm IR emitter Class 1 safety
Advanced optics	IR lens and filters Metasurface optics (new sensors)
State-of-art assembly & testing	ST manufacturing line In-house metasurface optics



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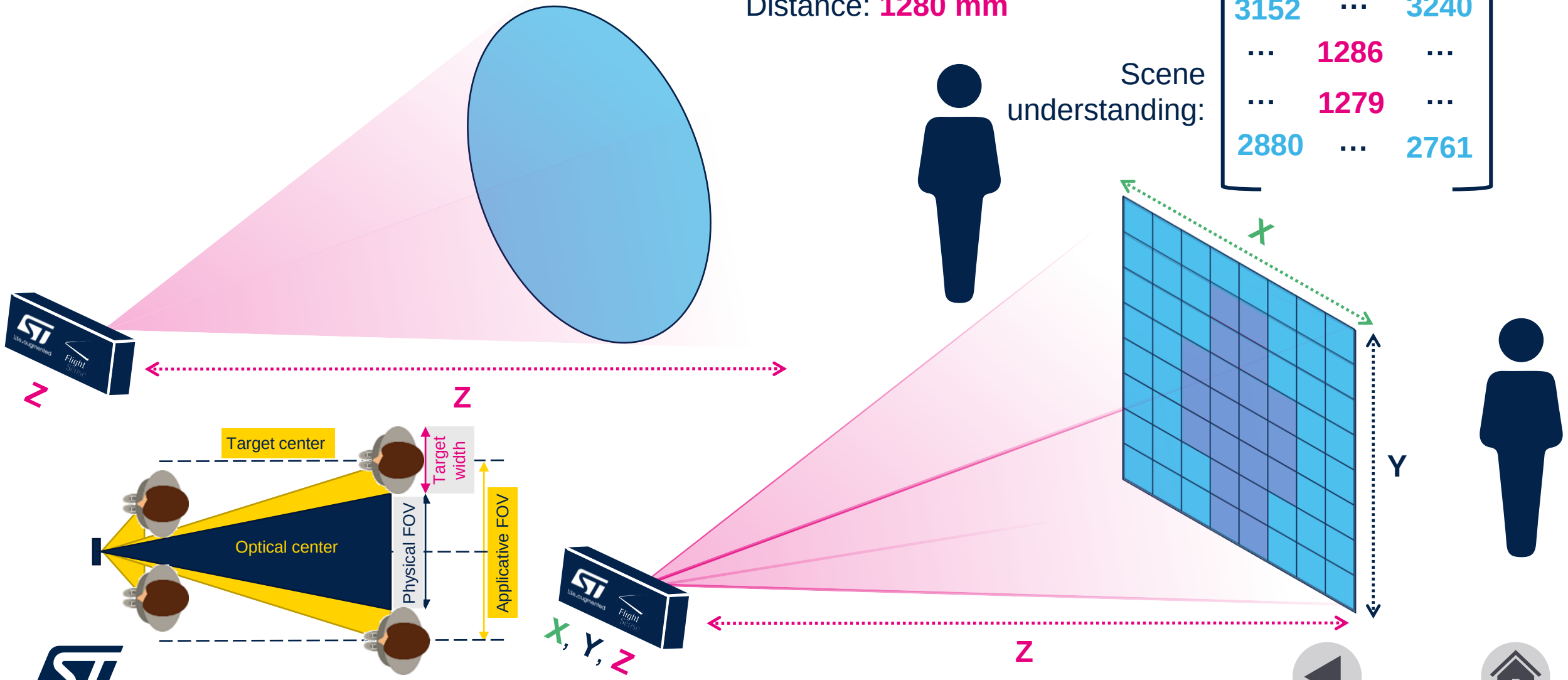
Single and multizone Time-of-Flight sensors



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Smart thermostats

Detection and interaction features made possible by ST intelligent and ultralow power technologies

TMOS value added
Ultralow power consumption (µW)
Optical stack flexibility

ToF value added
Touchless gesture control
Room occupancy

Low power consumption with embedded presence & motion algorithms

Range up to 4 m (more with lens) and wide field-of-view (20° to 120°)

Touchless control, passing-by, and people counting

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Indoor surveillance and wireless room sensors

Detect presence and movement indoors, detect if presence is within a given distance, collect data to improve energy efficiency

Presence detection when user isn’t moving

Long range and wide field-of-view

Real-time data analysis and statistics for building occupancy management

TMOS value added

Ultralow power consumption (µW)

Optical stack flexibility

ToF value added

Room occupancy

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Smart speakers

Room occupancy, smart home and lighting control systems, multiroom audio management, room mapping for sound optimization

Low power consumption enabled by embedded presence and motion algorithms

Long range and wide field-of-view

Touchless control and live user location features made possible with ST presence detection technologies

TMOS value added

Embedded presence detection algorithms

Wide field of view

ToF value added

Touchless gesture control

Scene understanding

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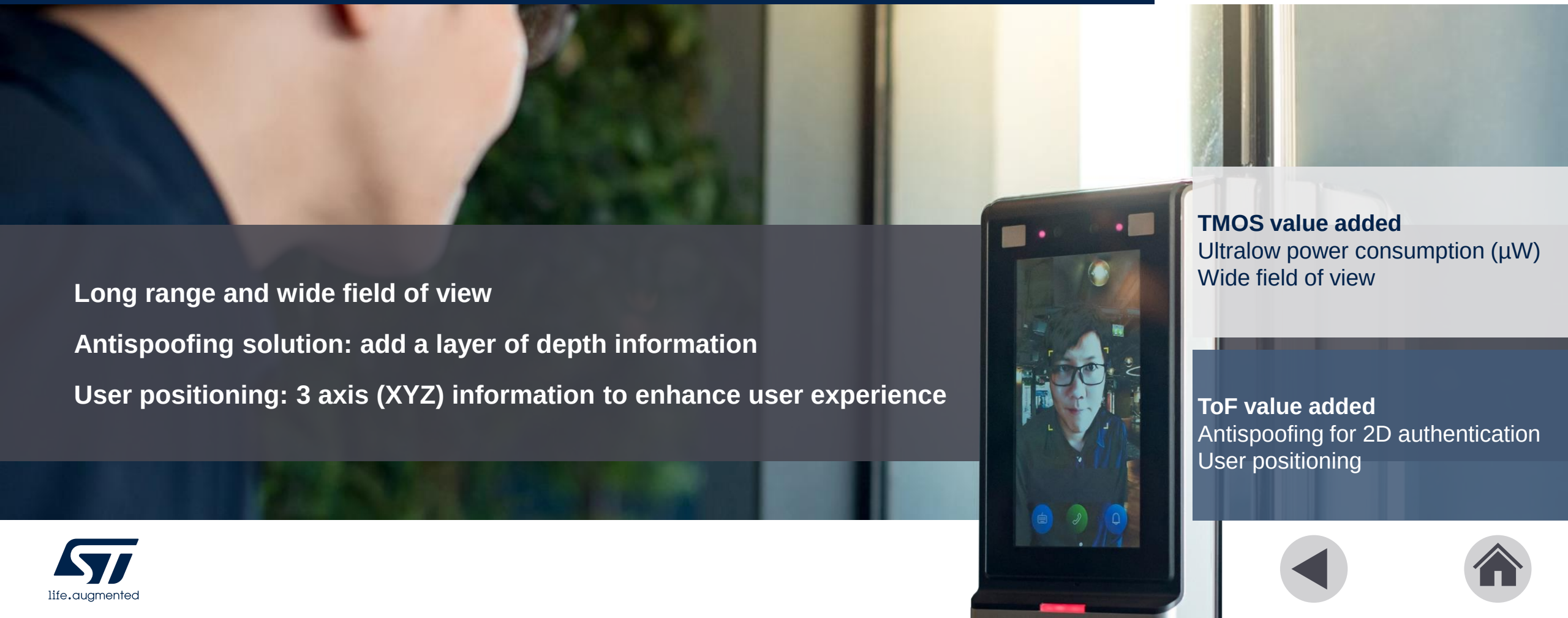
Smart cameras

Detect approaching users, enable display and other higher power components, assist camera authentication



Long range and wide field of view

Antispoofing solution: add a layer of depth information

User positioning: 3 axis (XYZ) information to enhance user experience

TMOS value added
Ultralow power consumption (µW)
Wide field of view

ToF value added
Antispoofing for 2D authentication
User positioning

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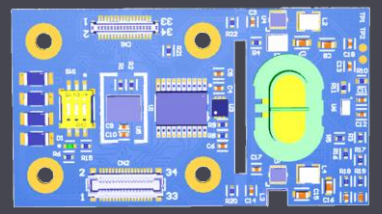
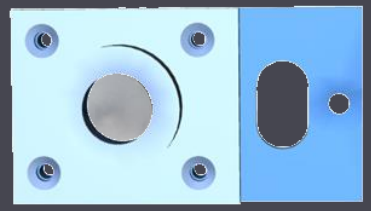
Presence detection add-on for STWIN.box

Enable low power, user privacy, and reduce false triggering with multisensor modalities



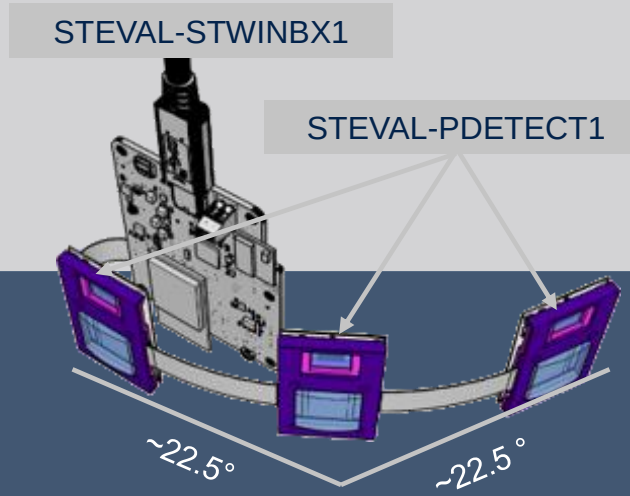
STEVAL-PDETECT1



TMOS lens and case

ToF cover glass

34-pin 3 cm flex cable



Key sensors

- VD6283TX45/1 ambient light sensor
- VL53L8CXV0GC proximity sensor
- STHS34PF80 infrared TMOS sensor

Supports up to 3 add-ons connected simultaneously for multisensor tracking TMOS Lens and ToF cover glass with example case included

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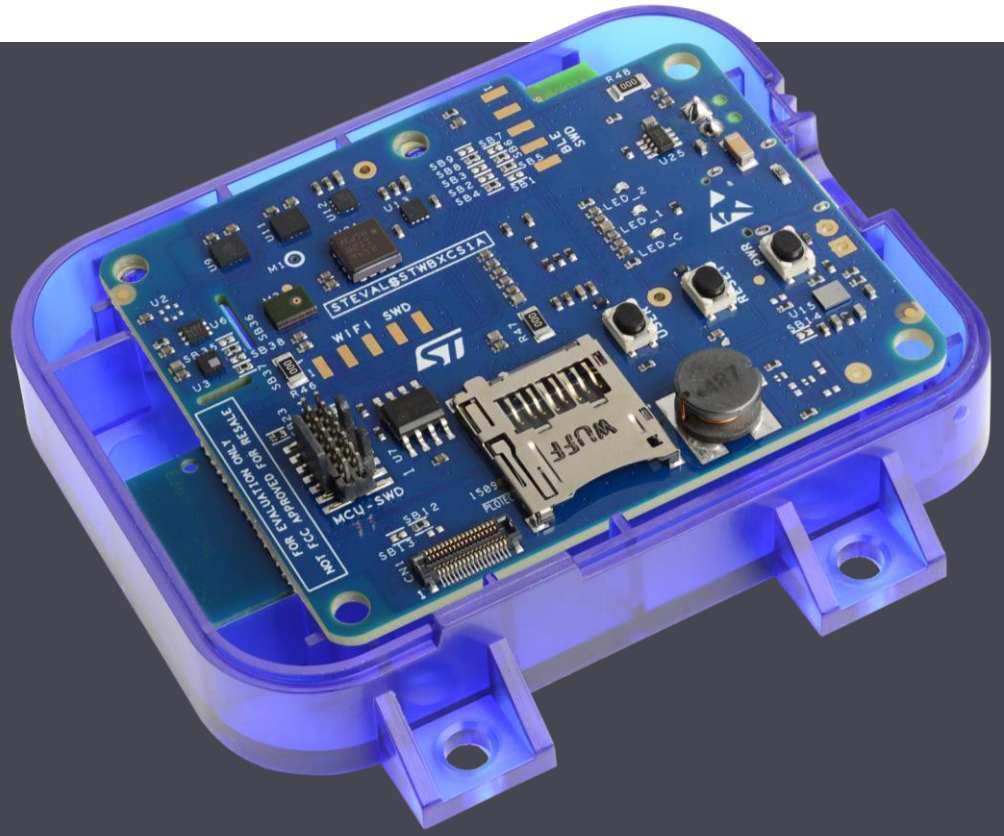
STWIN.box: SensorTile wireless industrial node



STEVAL-STWINBX1

- Main board
- Battery + plastic case for field testing
- STLINK adapter + cable for programming
- DIL24 adapter + flex cable

Develop industrial monitoring applications using motion, ultrasound, temperature, and pressure sensors

Includes Wi-Fi, Bluetooth, NFC, serial interface, SPI/I^2C/USART

Application software support

- **High-speed data logging function pack**
- **STBLESensor mobile phone app**

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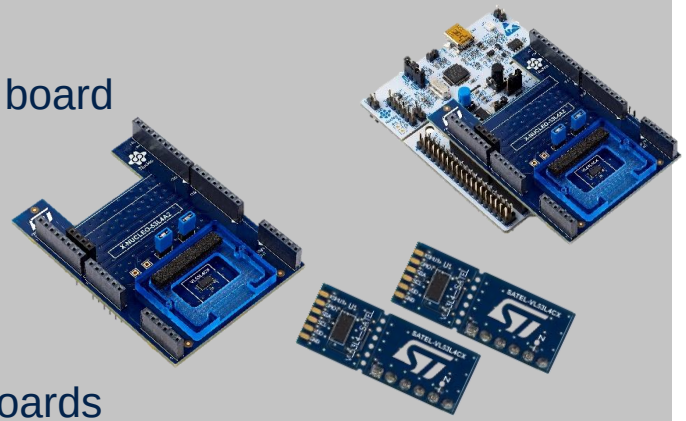
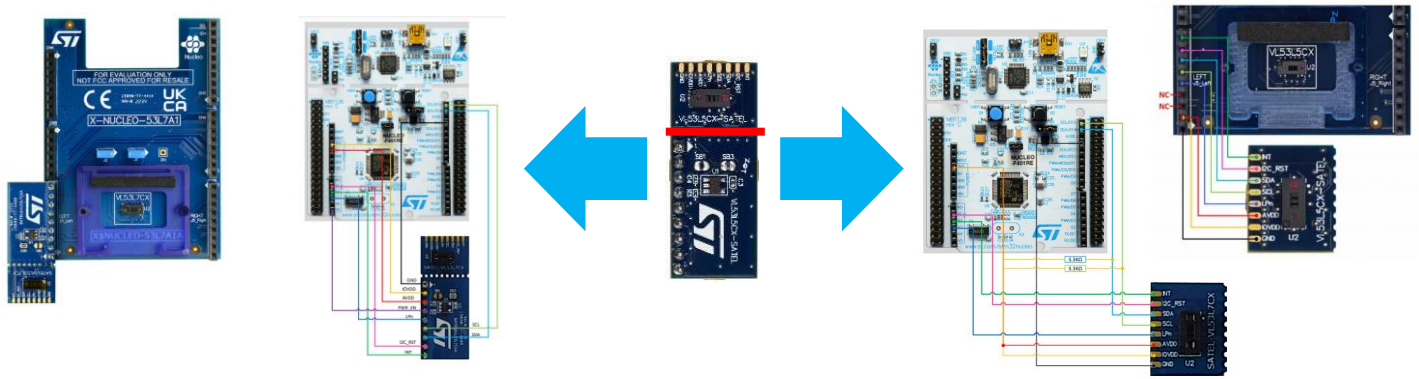
Time-of-Flight ecosystem and tools

Development boards

- X-NUCLEO expansion board
- P-NUCLEO packs with STM32 Nucleo



- Standalone breakout boards
  - For quick & easy integration in custom applications
  - Can connect to X-NUCLEO or any Nucleo board

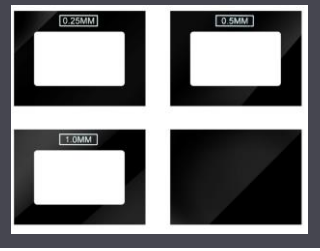


STM32 ODE

- **Flight**Sense fully integrated in STM32 ecosystem
- Compatible with all STM32 Nucleo boards thanks to **CubeMX**
- Referenced on Mbed, Arduino & Raspberry Pi platforms

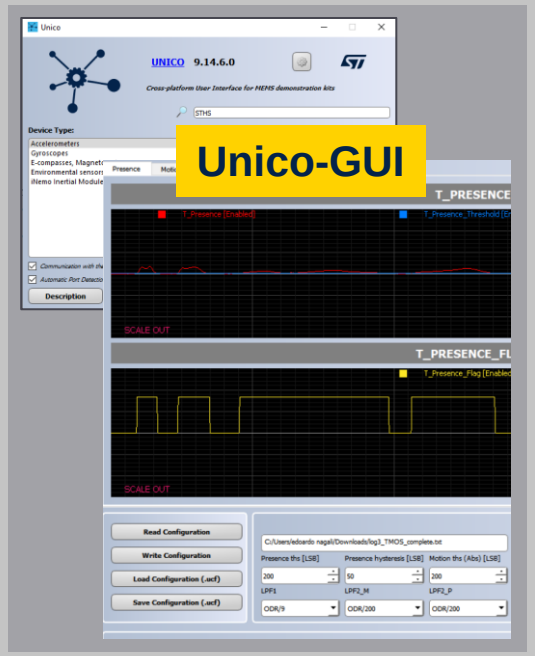
Cover glass

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

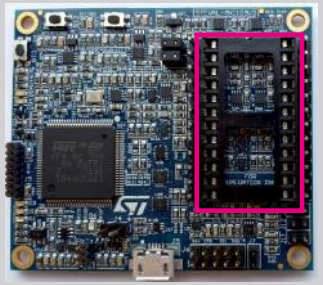


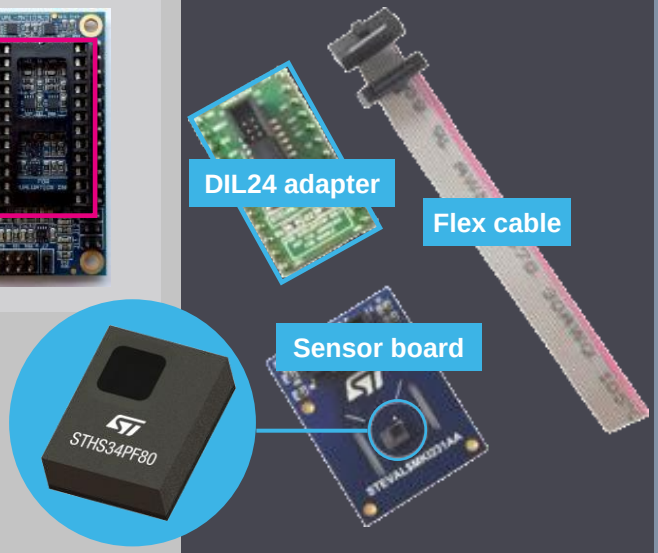
STHS34PF80 IR TMOS evaluation and development platforms

Evaluation



ProfiMEMS motherboard
STEVAL-MKI109V3



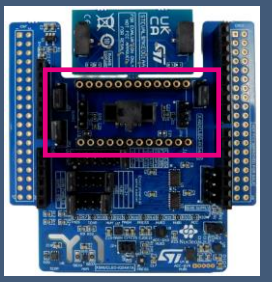


STEVAL-MKI231KA
*includes optional lens

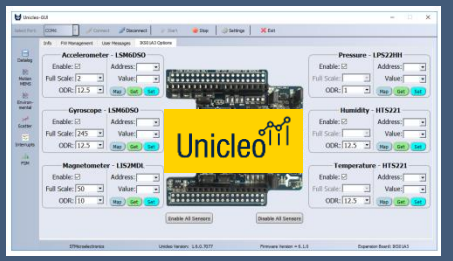
STM32 Open Development Environment

STM32 Nucleo
NUCLEO-xxx

Expansion
X-NUCLEO-IKS4A1
X-NUCLEO-IKS01A3



Graphical user interface



X-CUBE-MEMS1
Software library for temperature compensation & presence detection

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