

# TMOS – Thermal MOS

TMOS technology  
Presence sensing



TMOS use cases



STHS34PF80



Technologies comparison





# Thermal MOSFET (TMOS)

TMOS measures the integration of infrared radiation of objects inside the field of view



**TMOS - Sensing element**  
CMOS + MEMS technology



**Human body**  
Radiation is about  $9.8\mu\text{m}$ , therefore it is in the center of ST IR bandwidth 5 to  $20\mu\text{m}$



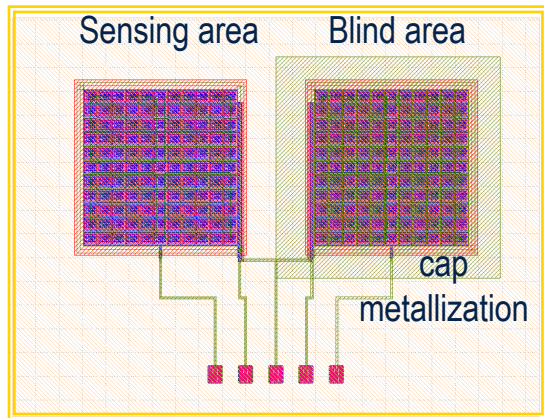
**Presence / Motion detection**  
Remote heat sensor



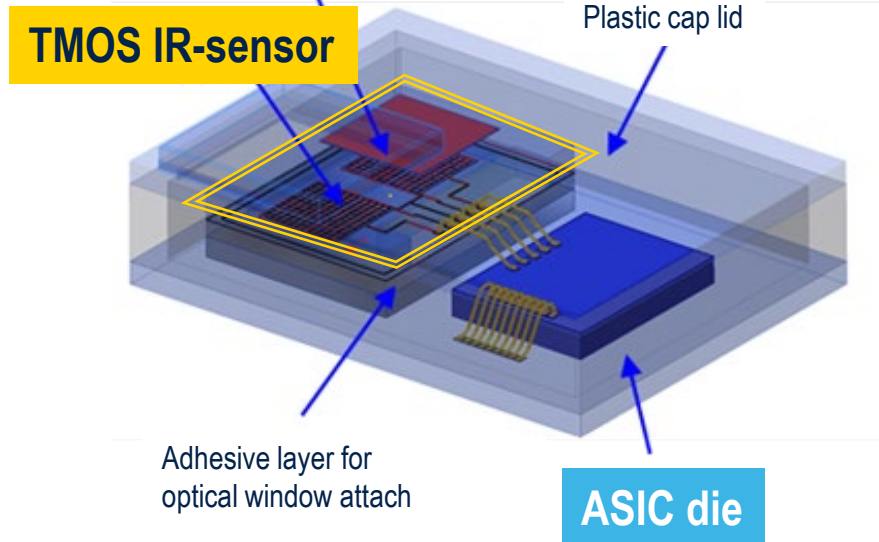
# What is the TMOS sensing technology

## ST MEMS technology

Optical window for IR radiation between  $5\mu\text{m}$  to  $20\mu\text{m}$  wavelength



TMOS Sensing element



- Based on CMOS transistor, thermally isolated
- Integrated MEMS absorber to improve sensitivity
- High vacuum in wafer level packing



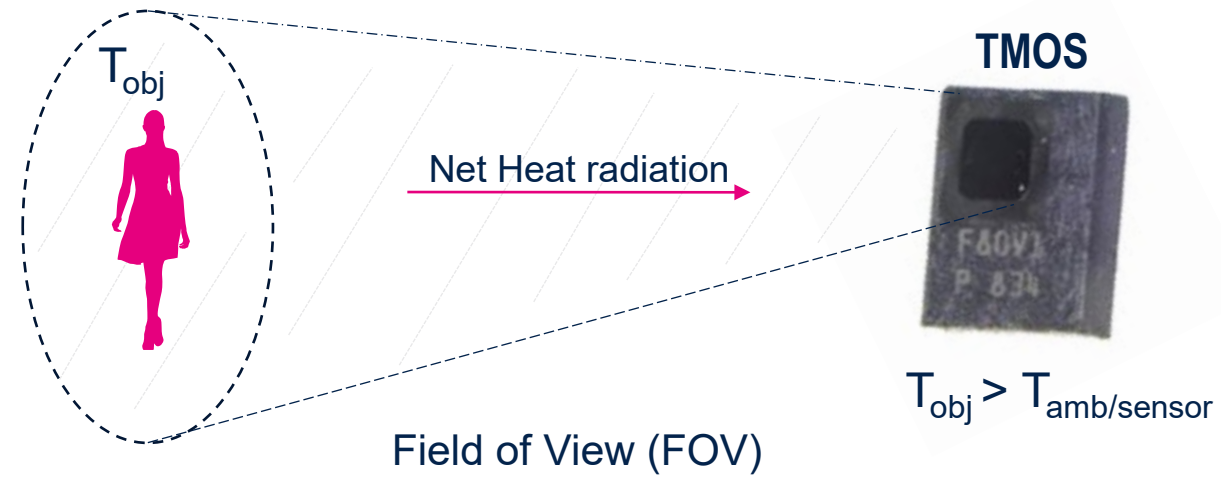


# Occupancy detection with TMOS Sensor

## Application use cases

### Presence/Movement detection

- Presence Detection
- Absence Detection
- To control Smart Lighting / HVAC / Automatic door & for security



**Sensor measures the net amount of infrared radiation that is collected in the FOV**





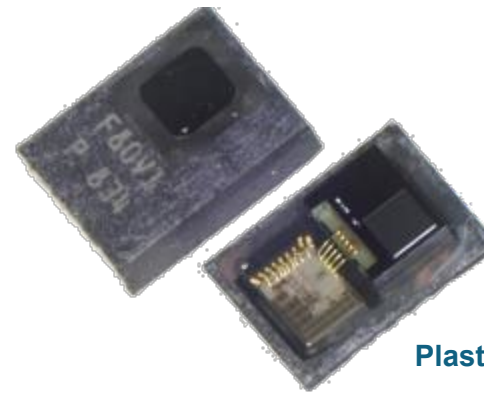
# TMOS – STHS34PF80

## Single pixel presence / Motion detector

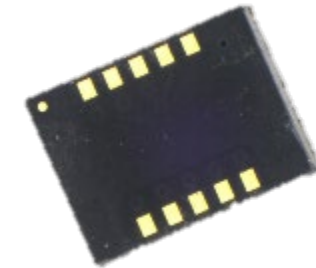
IR based technology for occupancy (**presence / motion**) detection  
measuring integration of IR radiation changed by absolute temperature

- Supply voltage: 1.7 V to 3.6 V
- Object temperature sensitivity : 2000 LSB/°C
- Supply current <sup>(1)</sup>: 10 uA @ 1Hz
- Power down current : 1 uA
- Digital I<sup>2</sup>C / 3-wires SPI interface
- Presence / movement detection up to 4 meter
- Embedded Temperature sensor for ambient
  - Accuracy (Tamb) ±0.5°C typ @ -10 ~ 60°C
- Operating wavelength 5um to 20um
- 80deg Full Field of View (FOV)

Top / inner view



Bottom view



Plastic Package w/ Embedded IR filter

**LGA-10L 3.2 x 4.2 x 1.455 mm**

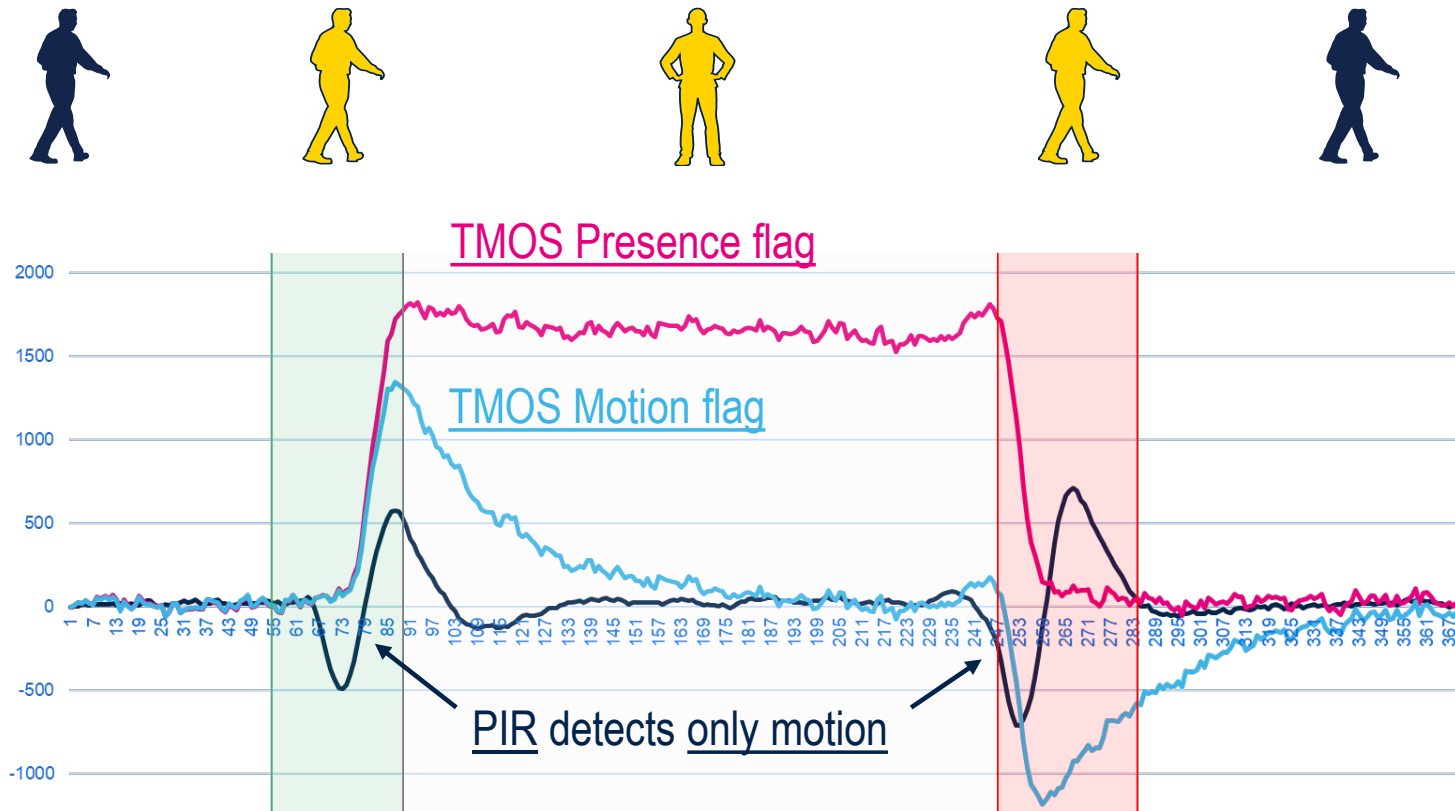
Note (1) : Average Setting TMOS=128 Temperature=1





# TMOS vs PIR

Superior performance – presence and motion detection with TMOS



## Why TMOS

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

TMOS = Thermal Metal Oxide Semiconductor  
PIR = Pyro-electric / Passive Infrared

TMOS can detect **stationary and moving** person in the field-of-view





# ST offerings vs competition

TMOS solutions from ST aims to provide the best option in terms of performance, cost, size...

Parameter	TMOS	Time-of-Flight	PIR	Thermopile	RADAR	Ultrasonic
Cost	●	●	●	●	●	●
PKG size	13mm <sup>2</sup>	<20mm <sup>2</sup>	40mm <sup>2</sup>	>20mm <sup>2</sup>	>20mm <sup>2</sup>	>100mm <sup>2</sup>
Accuracy / Sensitivity	●	●	●	●	●	●
Power consumption	●	●	●	●	●	●
Distance range	4 meter (w/o LENS) Longer with LENS	From 1mm To 4meters	Depends on Fresnel LENS	< 1meter	>10 meter	>10meter
Application integration	●	●	●	●	●	●
Stationary / Movement detection	●	●	●	●	●	●
Resist to environmental condition	Sensitive to T <sub>amb</sub>	Sensitive to sunlight	Sensitive to T <sub>amb</sub>	Sensitive to T <sub>amb</sub>	Sensitive to RF	Sensitive to noise

