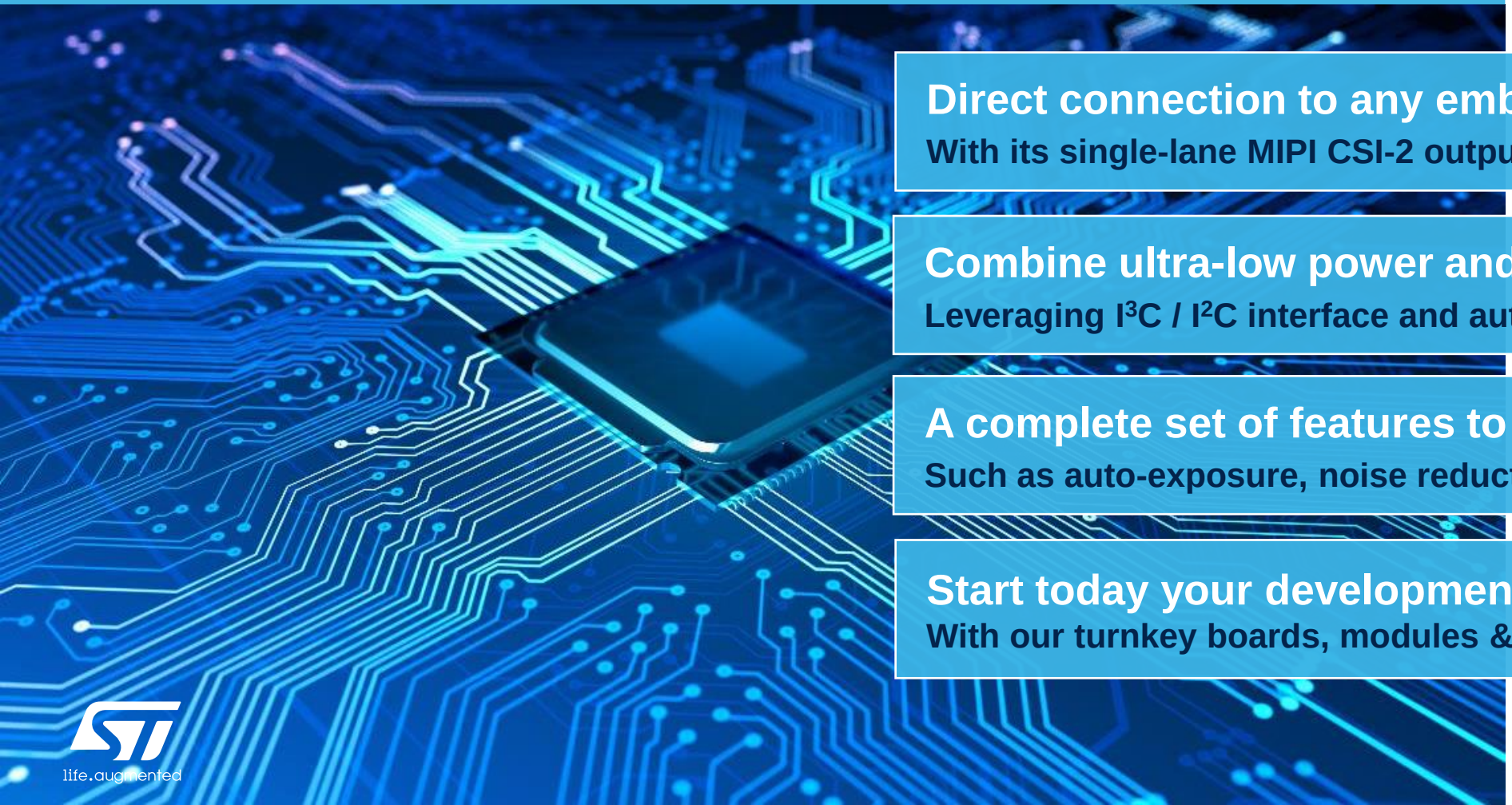
VD55G1 camera sensor

- The enabler of tomorrow’s computer vision
- Crystal-clear images with ST technologies
- A tiny solution to fit in everywhere
- Demonstration: Low-power camera reader

The enabler of tomorrow’s computer vision

VD55G1 camera sensor



Direct connection to any embedded processor
With its single-lane MIPI CSI-2 output

Combine ultra-low power and zero latency
Leveraging I^3C / I^2C interface and auto wake-up feature

A complete set of features to ease computer vision
Such as auto-exposure, noise reduction, background removal

Start today your development
With our turnkey boards, modules & Linux drivers for VD55G1

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Electronic specifications

MIPI CSI-2 output, ideal for embedded processing platforms
Selectable 1 lane to work optimally even with entry-level platforms

I²C & I³C control interfaces for easy device add on
Operates either in standard I²C (up to 1 MHz) or high-bandwidth I³C (12.5 MHz)

Low power consumption for extended battery time
20 mW at 30 fps | 34 mW at 60 fps | 70 mW at 150 fps | ≤ 1.5 mW Stand by

Benefit from 4 programmable GPIOs
For LED synchronization, external frame start or PWM control

Easing PCB design with low voltages and few capacitors need
Supplies: 2.8 V A, 1.8 V DIO, 1.15 V D | Up to 5 small capacitors only

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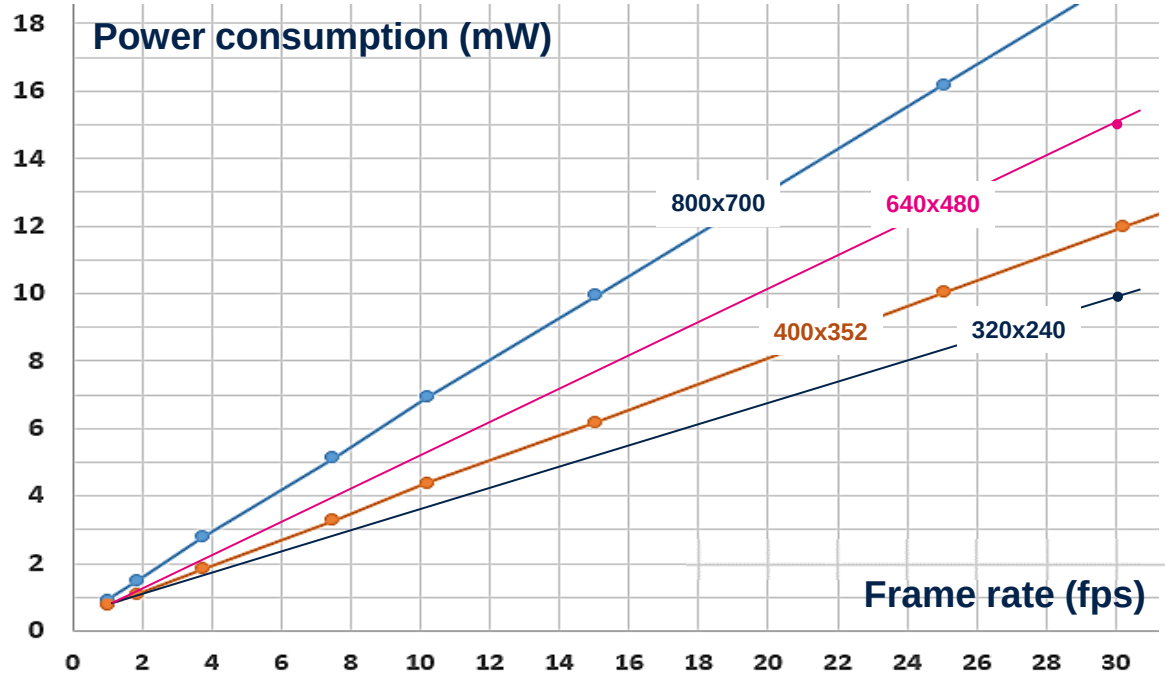
Low power for extended battery time

Low power in streaming mode & Auto wake up feature

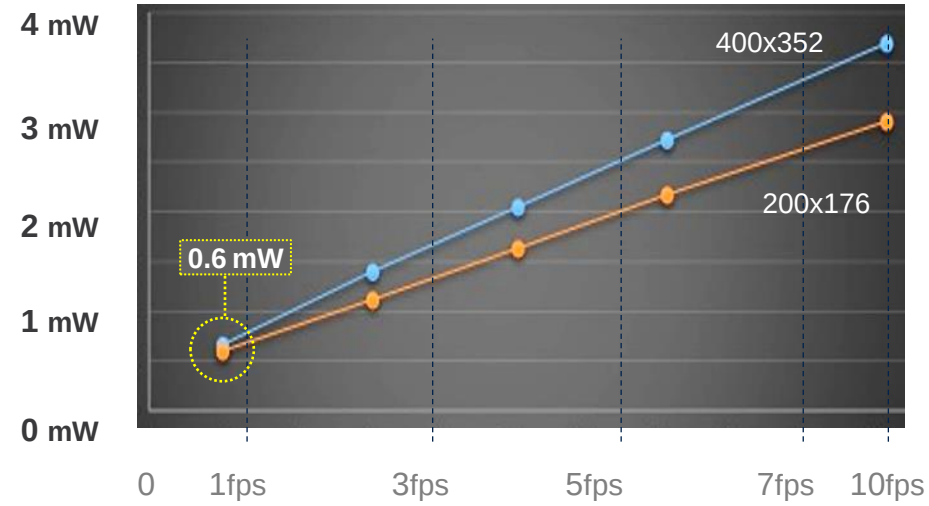
Very low power streaming



Optimized for battery-friendly

- Full image quality preserved in ultra-low power
- All features & modes fully functional

Auto wake up



Auto wake-up feature

- Autonomous simple scene analysis
- Wake-up the host if change detected
- Ultra-low power for always-on sensing

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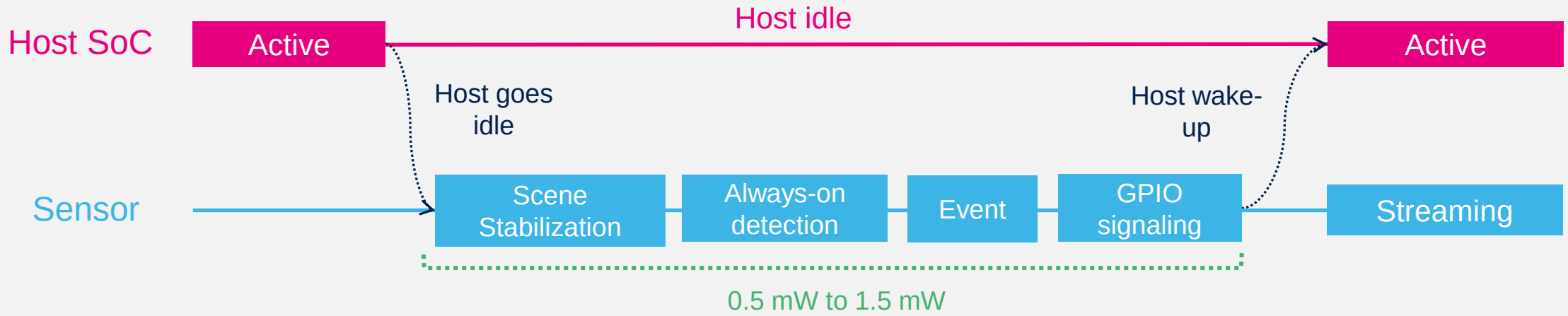
Auto wake up feature

To optimize power consumption & data processing at system level

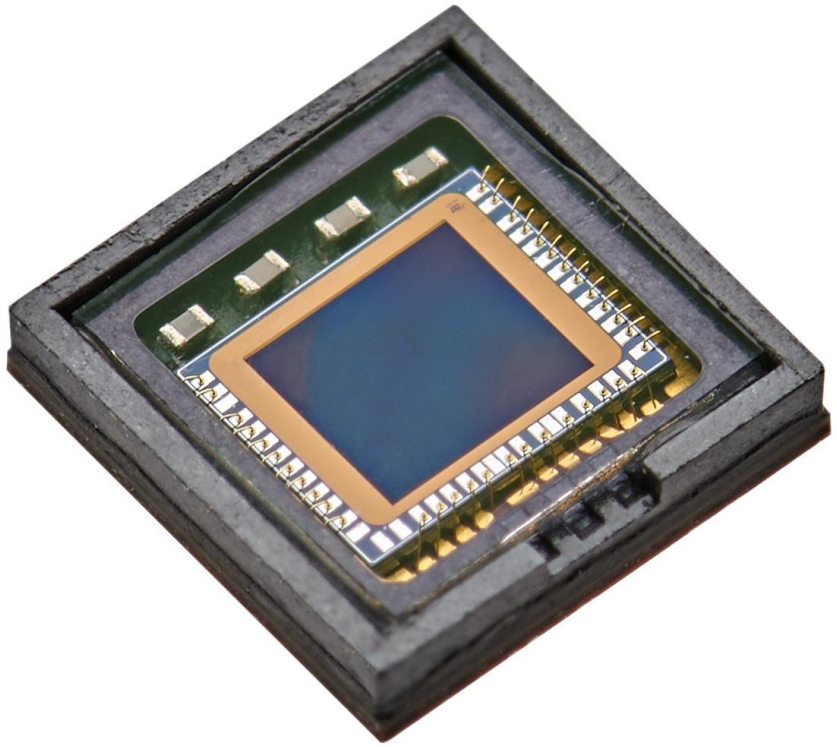
With **Auto-Wake Up feature,** the VD55G1 **autonomously detects action or scene change in low power** while the host is in idle state to reduce power consumption at system level.



The image sensor analyzes the scene to look for a significant change. Unless a change is detected, no image is output. Once a change is detected, GPIO signal rises an event to the host that can enable the full streaming of image.

Crystal-clear images with ST technologies

VD55G1 camera sensor



Excellent image quality in any light condition
High sensitivity solution thanks to BSI technology

Sharp capture of the smallest details
High dynamic range & superior MTF with CDTI technology

Perfectly suited for near-infrared too
High QE & MTF up to 940 nm thanks to BSI & CDTI

Safe supply made in Europe
Proprietary technologies from ST foundry in France

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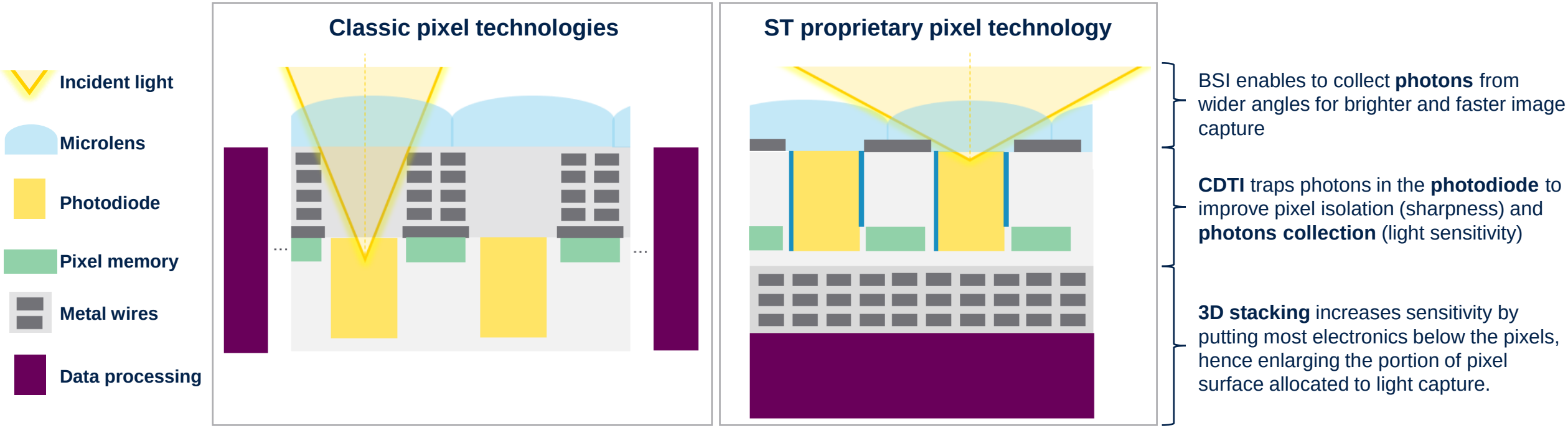
Proprietary global shutter BSI technology [1/4]

Providing unique performance for high-quality images

Proprietary 2.61µm **pixel** developed by **ST.** Combines the **latest achievements** in the field of imaging and wafer processing **BSI** (Back Side Illumination), **3D stacking**, and **CDTI** (Capacitor Deep Trench Isolation).



BSI enables to collect **photons** from wider angles for brighter and faster image capture

CDTI traps photons in the **photodiode** to improve pixel isolation (sharpness) and **photons collection** (light sensitivity)

3D stacking increases sensitivity by putting most electronics below the pixels, hence enlarging the portion of pixel surface allocated to light capture.

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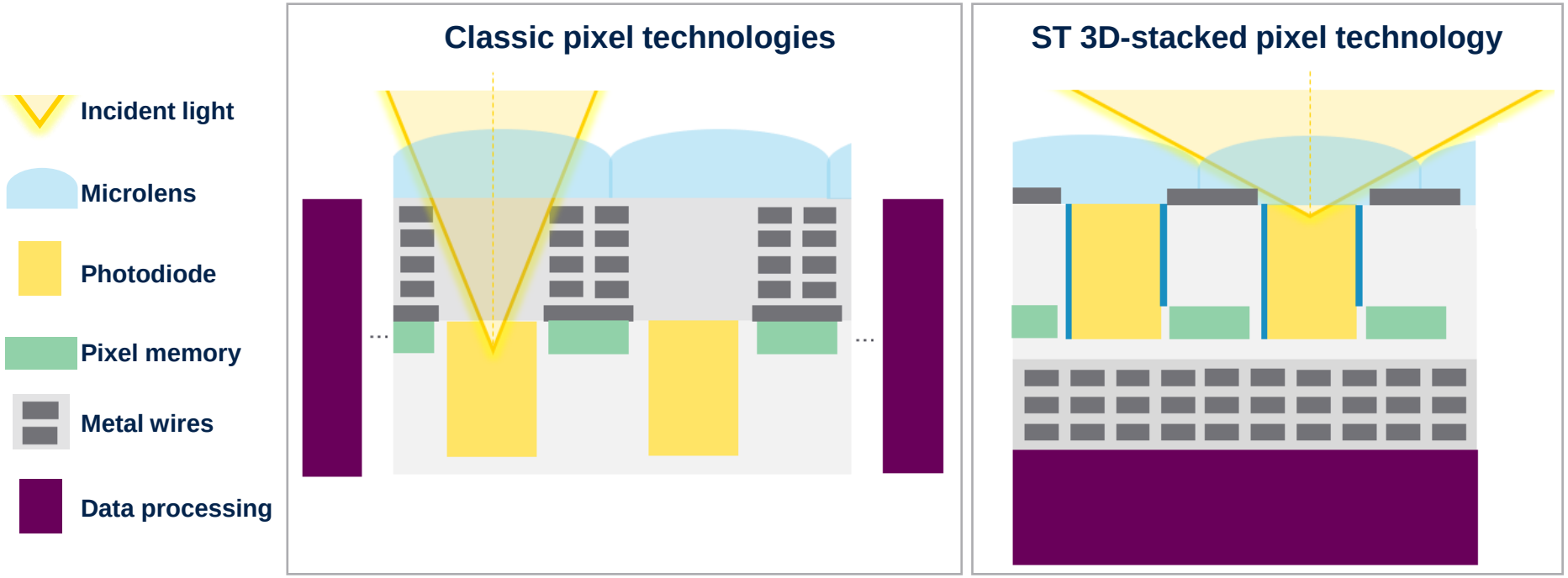
Proprietary global shutter BSI technology [2/4]

1. The benefits of back-side illumination (BSI)

With **back side illuminated** technology by ST, metal wires are put below the photodiodes collecting light in the silicon.
It enables to collect light from wider angles without being limited by the metal wires and **increases the angular response** of the sensor



Benefits

- Brighter image for the same footprint
- Larger choice of lenses
- Better image quality in low-light applications or in dark scenes
- Enable faster image capture when light is limited.
- Save lighting cost

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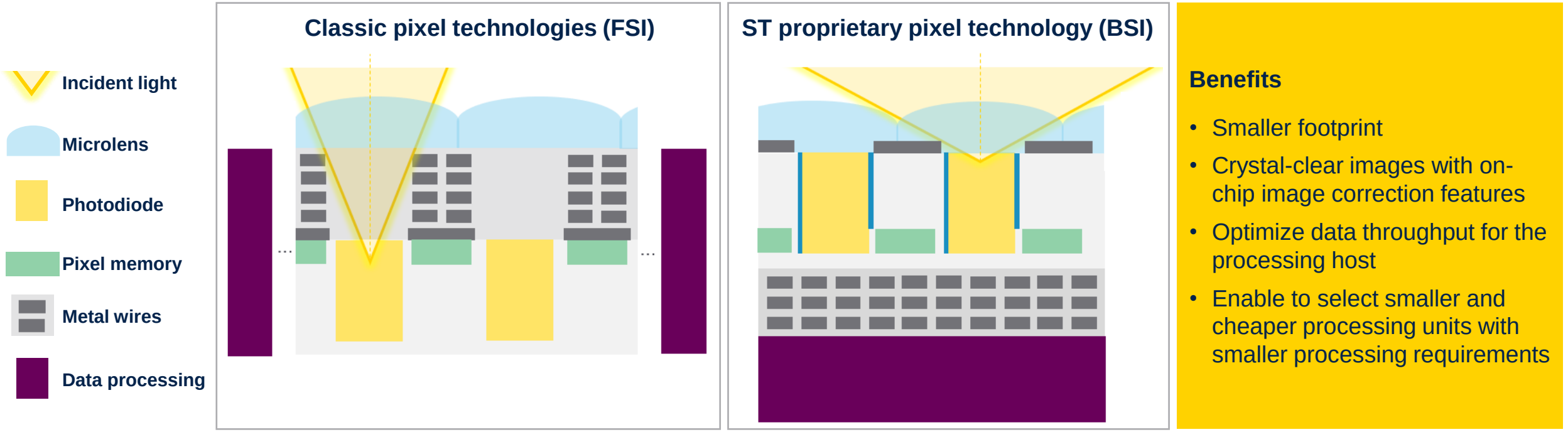
Proprietary global shutter BSI technology [3/4]

2. The benefits of advanced 3D stacking process

Enables to stack several layers of silicon. It enables placing the data processing electronics in a second bottom layer instead of around the pixel array to **minimize the size of sensor** while expanding the capabilities to **embed extra smart features** in the chip.



Benefits

- Smaller footprint
- Crystal-clear images with on-chip image correction features
- Optimize data throughput for the processing host
- Enable to select smaller and cheaper processing units with smaller processing requirements

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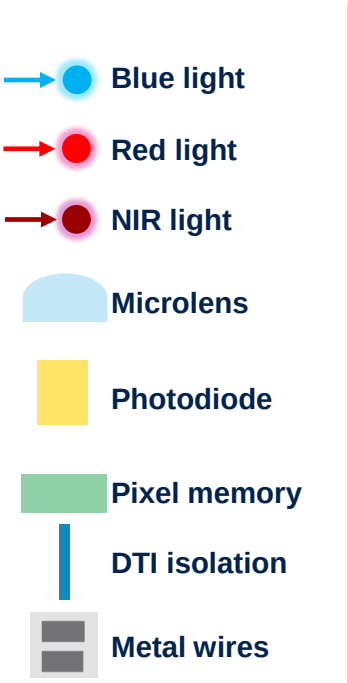
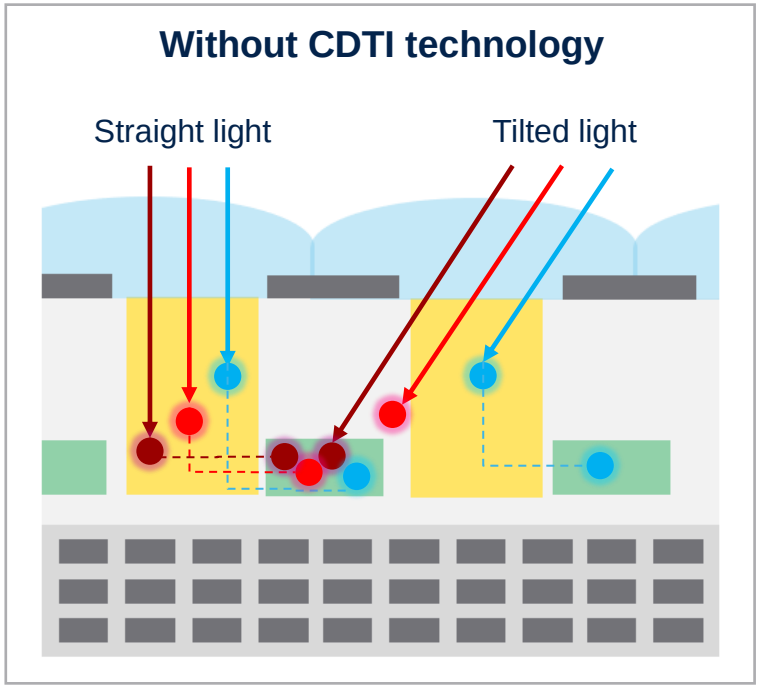
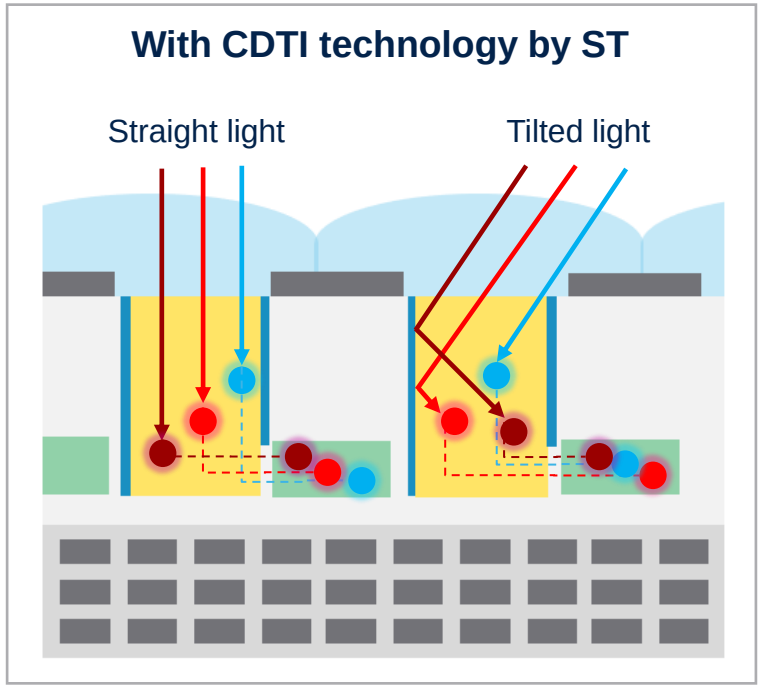
Proprietary global shutter BSI technology [4/4]

3. The benefits of Capacitor Deep Trench Isolation (CDTI)

ST image sensor integrates CDTI technology: isolating layers are built around the photodiode to trap light.
This prevents part of the light to be lost in the rest of the silicon or to travel to the neighboring pixel creating a blurry image.







Benefits

- Brighter and sharper images, especially in NIR.
- Better image quality in low-light applications or in dark scenes
- Enable faster image capture when light is limited
- Save lighting cost

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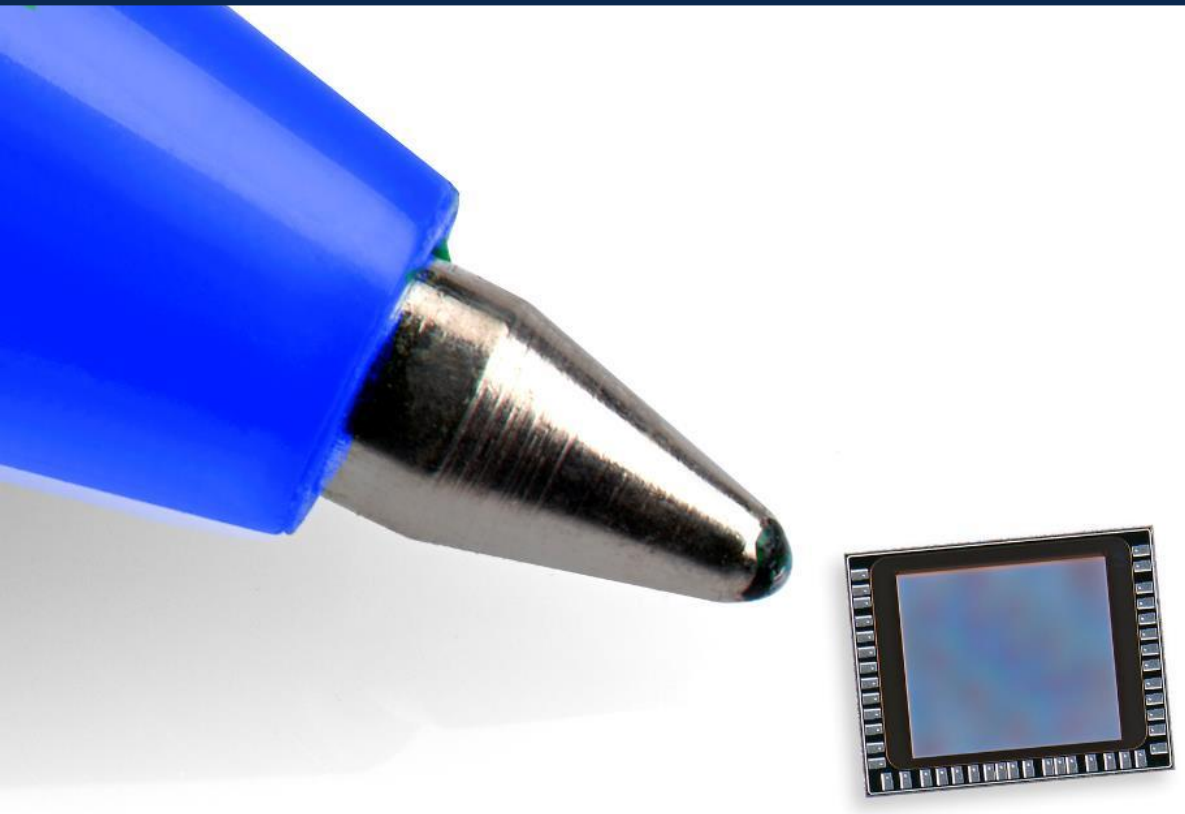
A tiny solution to fit in everywhere

VD55G1 camera sensor



Ultra-optimized outline

2.73 x 2.16 mm² thanks to true 3D-stacking technology

Enabling tiny package & module designs

Down to 4 mm square including capacitors

Matching a wide range of affordable lenses

With its 2.3 mm optical format & high angular response

Low power for extended battery time

Leveraging low-power streaming & auto wake-up feature

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Mechanical specifications

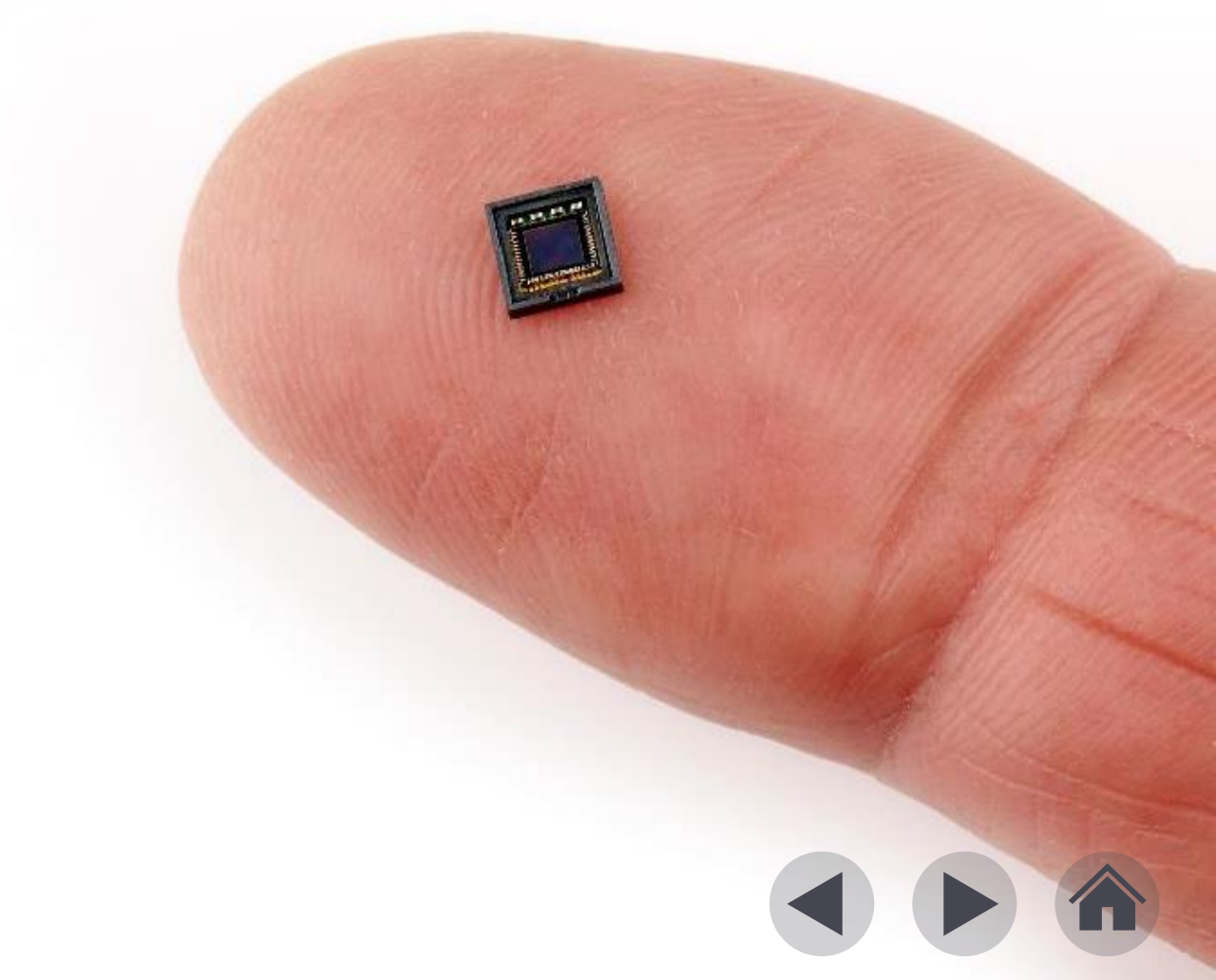
Ultra-optimized die dimension
thanks to true 3D-stacking architecture
Pixel array represents 66% of die surface

Tiny footprint that fits in everywhere
2.73 (H) x 2.16 (V) mm die dimensions

Enabling ultra-small package design
Down to 4.0 x 4.0 mm² PLCC incl. capacitors

Minimize your product size with a centered die
Optimum match between die optical & mechanical centers

Robust design in temperature
Wide operating range from -30 to +85°C junction temperature



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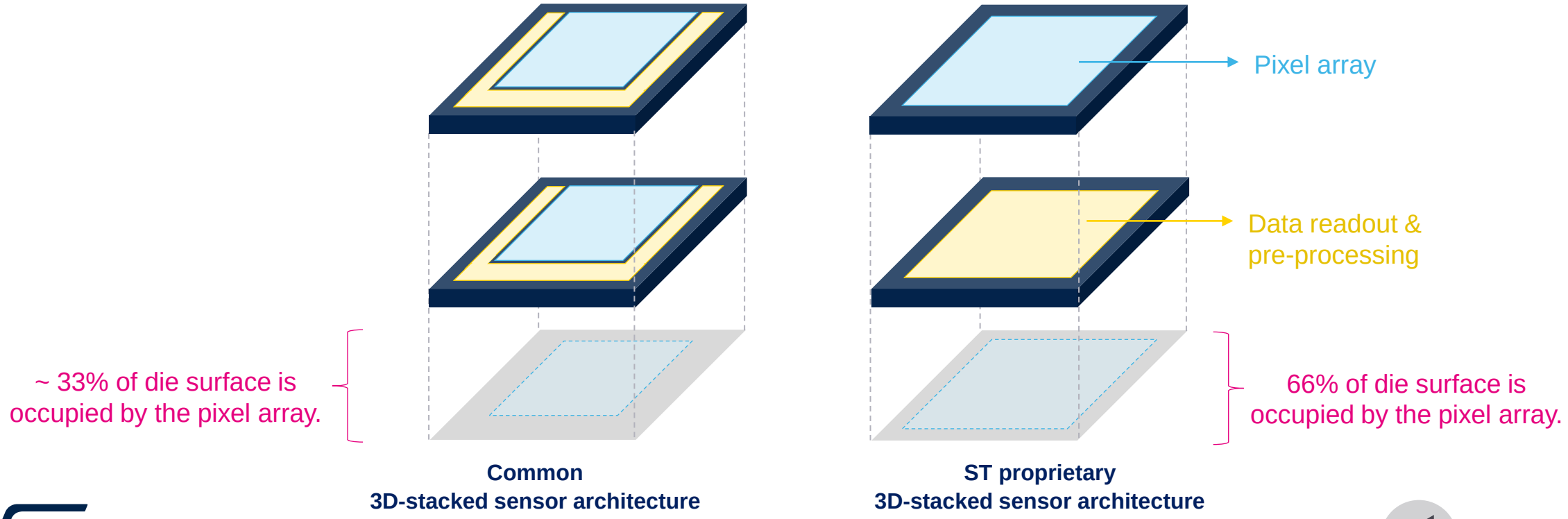
Mechanical specifications

True 3D-stacking enables to increase light sensitive area while reducing footprint

ST image sensors are made of a **top layer for pixels** only and a **bottom layer for data** conversion and pre-processing. This advanced architecture **maximizes** the light sensitive area (in **sensitivity** and in **resolution**) **while minimizing footprint**.



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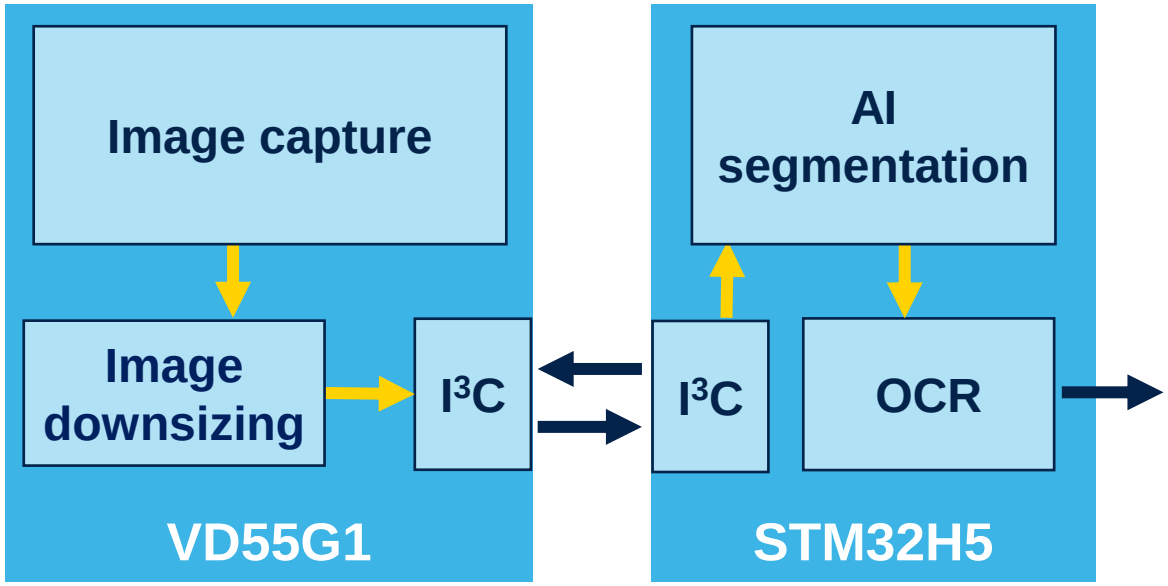
Demonstration of a low-power camera reader

VD55G1 camera sensor with STM32H5 microcontroller



A cost-effective & low-power setup

Based on ST latest camera sensor & microcontroller

Easy to integrate

I^3C interface to reduce PCB complexity & cost

Ideal for battery-powered solutions

Always-on with ultra-low total power consumption

Everything you need from a single supplier

Fully based on ST complementary products

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