

Optical Sensing Solutions

AI-suited Time-of-Flight depth sensor



Stereovision cameras enabling vSLAM



Advanced camera in a small form factor



SWIR sensor based on quantum film



AI-Suited Time-of-Flight Depth Sensor

Depth sensor providing output matching AI needs

Ensuring consistent data with smart preprocessing

Reducing system energy consumption at the edge

Leveraging on ST ecosystem hardware & software



CH Compact Histogram

Depth sensor providing sensor output matching AI needs



Innovative depth sensor ensuring consistent and reliable data with smart preprocessing



Flexible data output format to meet system constraints while preserving quality



Perfect integration to ST EdgeAI ecosystem for a fast prototyping and design



Benefit examples using full power of ToF

Coffee cup detection



Detect the coffee cup whatever the material of the cup.
Stop pouring the coffee before the cup is full

User satisfaction

Floor type recognition



Adapt the vacuum speed when the floor is changing

Reliability

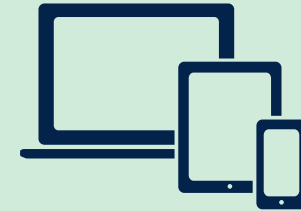
Gesture recognition



Recognize more gesture and be able to recognize hand positions

User experience

Head orientation



Save device power by knowing where the user is watching

Power saving

People counting



Count the people whatever the number of people passing is the FoV and whatever the direction

Monitoring



Stereovision Cameras Enabling vSLAM

Enabling SLAM, 6DoF and Gesture Tracking



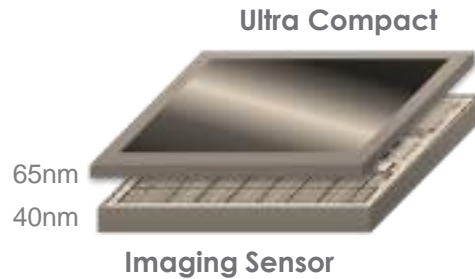
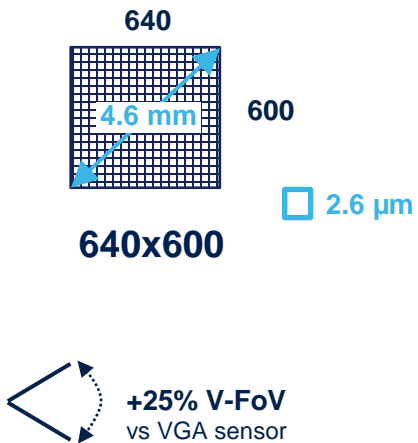
Higher resolution in a smaller form factor

Best sensitivity in NIR up to 940 nm

Low power scaling with frame-rate and resolution

VD55G0 Image Sensor specifications

Smallest 640x600 global shutter sensor, smaller size with higher resolution than VGA



Sensor

Tools

Sensor characteristics

- 0.4Mp = 644 x 604 pixels array
- 2.61 μm BSI Global Shutter
- Full C-DTI with deep photodiode
- High Sensitivity & Sharpness, from visible to near-IR
- Auto-exposure, Defect correction, Temperature sensor
- Only 2.6mm x 2.5mm die size, requiring small footprint

Development Tools

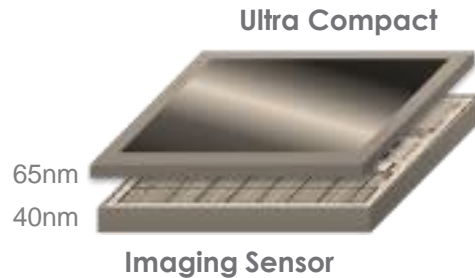
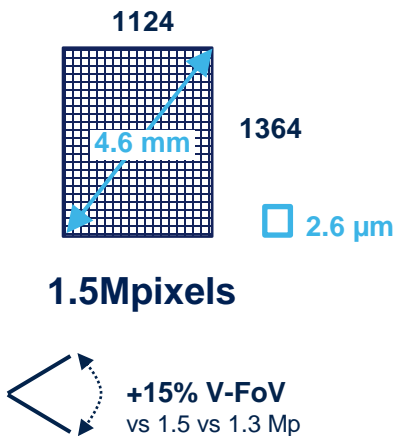
- Evaluation Kit (GUI and SDK)
- Linux Driver & 96boards plugin
- Raspberry plugin
- STM32MCU adapter board & driver

High integration & low power

- Larger pixel for higher sensitivity, more pixel than usual VGA but the smallest existing die size
- Unique single die Global Shutter, with no trade-of on the pixel performance
- Low power, with 12mW at 10fps full resolution
- Power scaling with frame-rate and resolution

VD56G3 Image Sensor specifications

Smallest 1.5Mp global shutter sensor, embedding Motion Vectors



Sensor

Tools

Sensor characteristics

- 1.5Mp = 1124 x 1364 pixels array
- 2.61 μm BSI Global Shutter
- Full C-DTI with deep photodiode
- High Sensitivity & Sharpness, from visible to near-IR
- Auto-exposure, Defect correction, Temperature sensor
- Only 4.3mm x 3.6mm die size
- 4 independent frame setups, linkable as flexible sequences
- Both Bayer RGB and Monochrome (Visible+NIR) versions

Development Tools

- Evaluation Kit (GUI and SDK)
- Linux Driver & 96boards plugin
- Raspberry plugin
- STM32MCU adapter board & driver

Embedded Motion Vectors

- Embedded Motion Vectors, fully hardware for best power/perf ratio
- Fully autonomous, VD56G3 outputs the vector stream through CSI2 with or without images. No need for external computing.
- Automatically detects point of interest, and track their position change
- Up to 2000 vectors of movement per frame at 60fps

Enabling SLAM

Without image output but motion vectors

Embedded Optical Flow

Privacy with no image out mode

Up to 2000 features & vectors

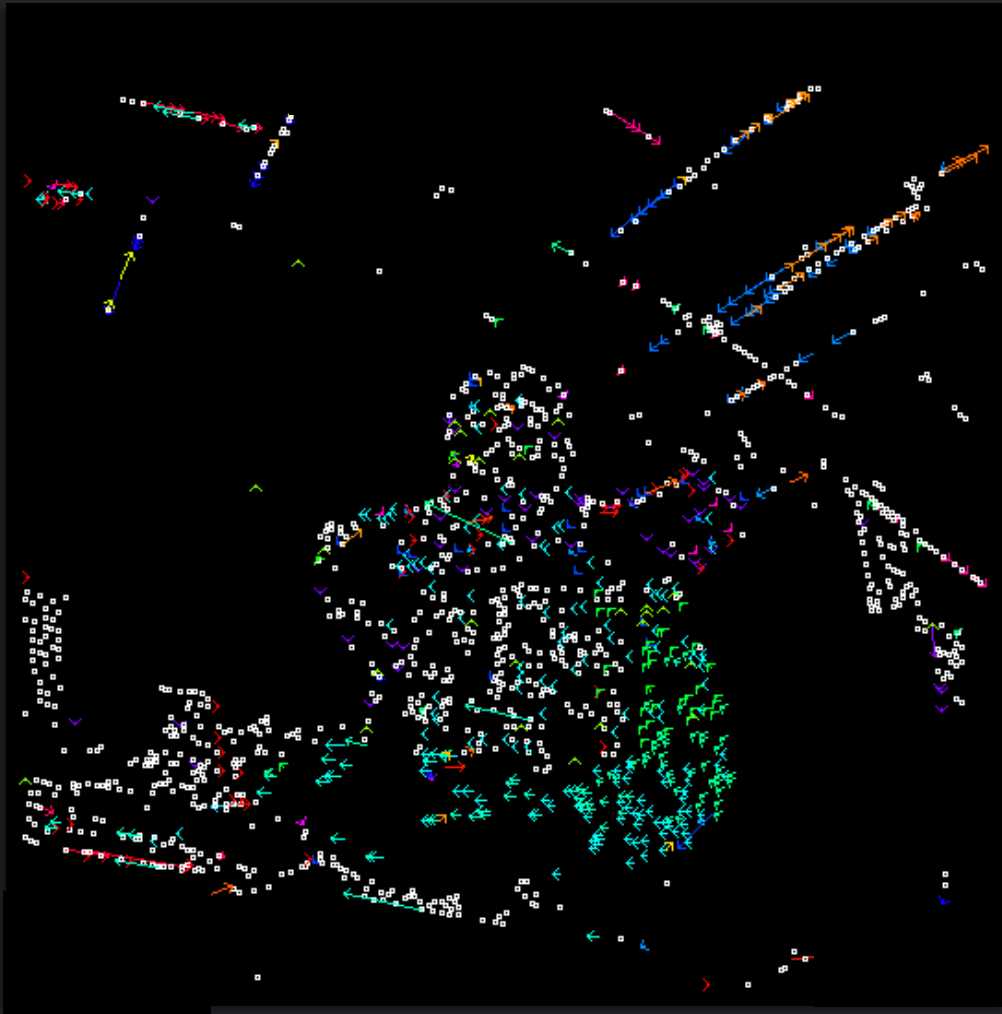
Up to 300fps

VD56G3 Mono, RGB or RGB-IR

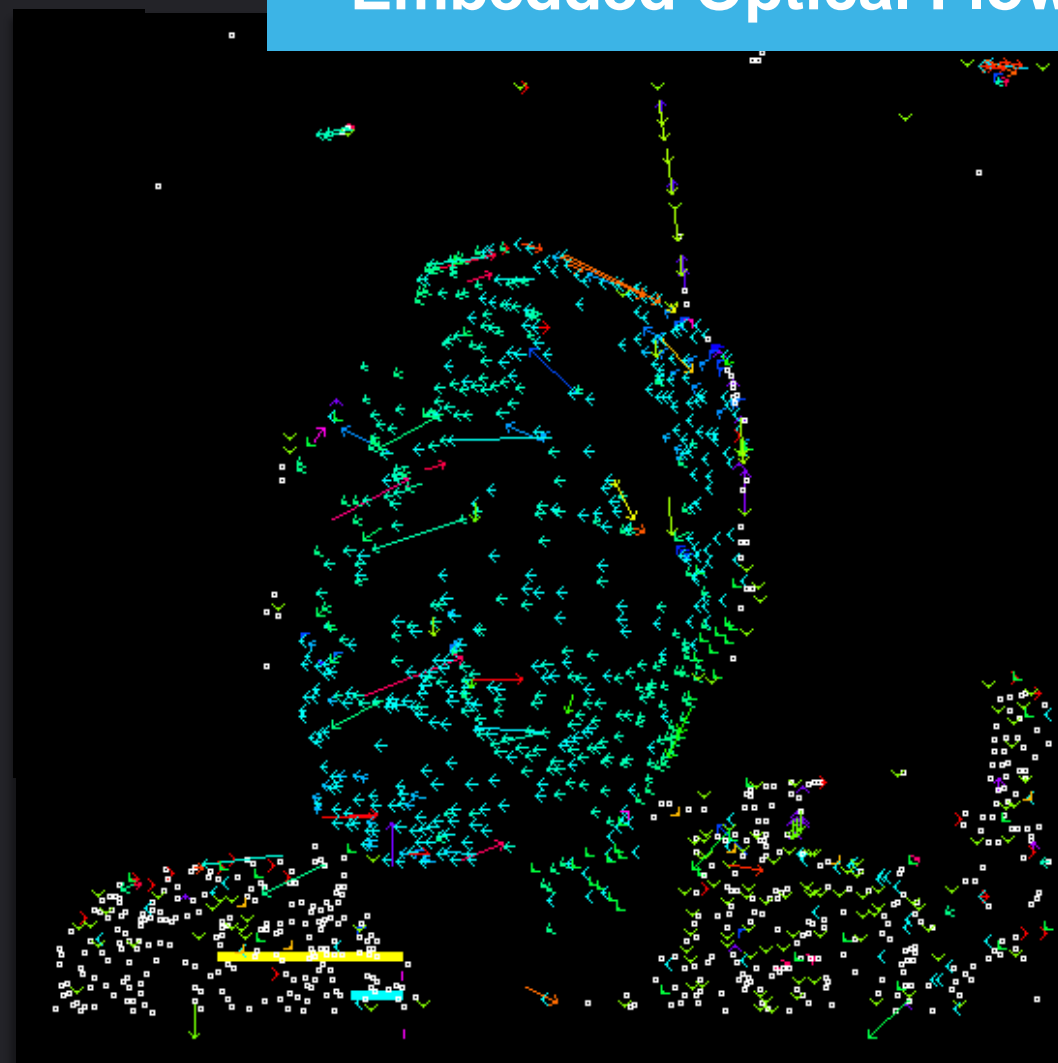


User interaction

Out point of interest, no image out



Embedded Optical Flow



Key scene info output only



Advanced Global Shutter in a Compact Form Factor

Enabling more features in smaller form factor

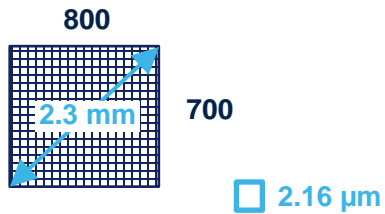
Most compact sensor with better performances

Very-low power with always-on and auto wake-up

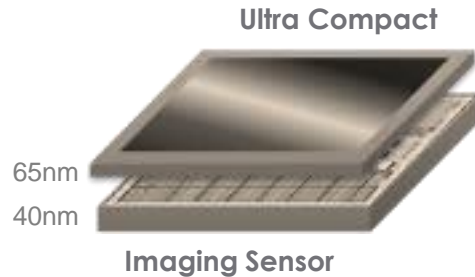
Innovative in-sensor features with smart sensing

VD55G1 Image Sensor specifications

Smallest 800x700 global shutter sensor, even smaller size than other VGA sensors



800x700



Sensor

Tools

Sensor characteristics

- 0.6 Mp = 804 x 704 pixels array
- 2.16 μm BSI Global Shutter
- Full C-DTI with deep photodiode
- High Sensitivity & Sharpness, from visible to near-IR
- Low noise GS pixel, combined with embedded smart denoising
- Auto-exposure, Defect correction, Temperature sensor
- Only 2.7 mm x 2.2 mm die size, tiny footprint (& option for CSP)

Development Tools

- Evaluation Kit (GUI and SDK)
- Linux Driver & 96boards plugin
- Raspberry plugin
- STM32MCU adapter board & driver

High integration & low power

- Smallest pixel, high performance & Global Shutter
- Smallest sensor size vs VGA, with +82% resolution vs 640x480
- Very low power, full IQ, all features ON, full resolution
 - 20 mW at 30 fps (39 mW at 60 fps)
 - 1 mW at 1 fps (5 mW at 10 fps VGA)

In-pixel Background Removal

Easing user detection & foreground isolation | Assisting in background blurring



Scene

Ambient light + illuminated NIR



Sensor output

illuminated NIR data only

Single frame background removal

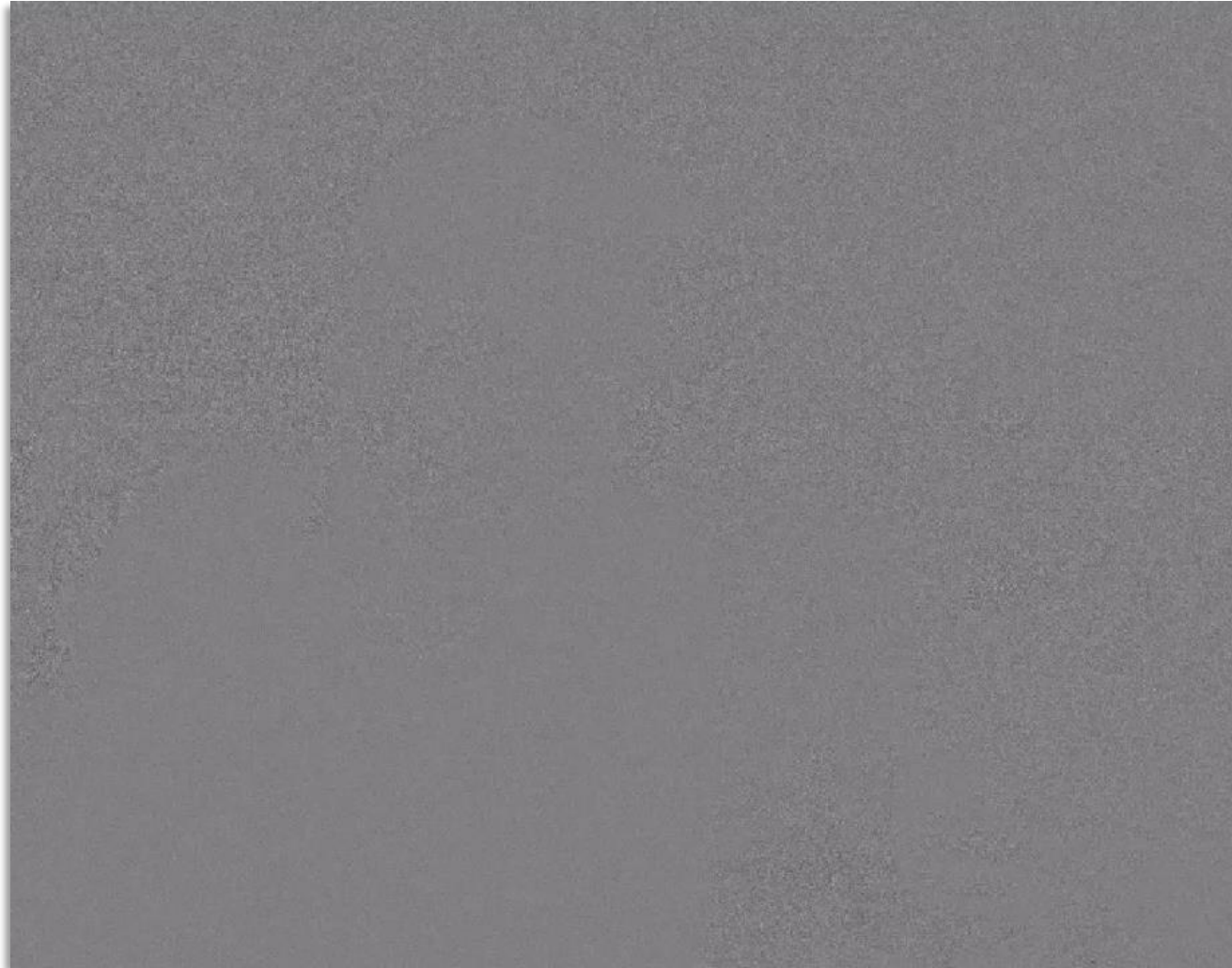
- Autonomous
- Without need for host computing
- No latency drawback
- No impact on power consumption

Only the foreground is sent to the host

- Only the user near surrounding is sensed
- Easy the privacy control

Differential mode: Single frame with only pixel changes

Opportunity for a new paradigm for use cases with *event-like* image



Applications

- Motion detection
- Gesture & hand tracking
- Scene change detection
- Object tracking

SWIR Sensor based on Quantum Film

ST's SWIR sensor revolutionizing multiple markets

2.3 Mp Global Shutter at 60fps

Exceptional QE and PLS at 1360nm

Ultra compact form factor thanks to quantum film

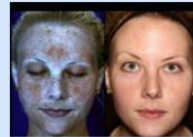
ST's SWIR sensor revolutionizing multiple markets

Personal electronics

RGB-QF/Multi-Color SWIR Imagers/RGB+SWIR Image Fusion/Night Time Photography & Video



Behind OLED Sensing/Face-ID/Eye tracking



SWIR 3D Sensing/Object Scanning/3D photography



Health Imaging & Monitoring



Single Point Spectrometry & Hyperspectral Imaging

Agriculture / Food Analysis



Anti-Spoofing



Water & Environment Analysis



Health Monitoring w/Deep Skin Penetration



Security/Surveillance



Adverse driving conditions



Animal/Pedestrian Detection

Visible +SWIR Image Fusion



See through haze/fog/smoke



Machine Vision



Plastic waste sorting including difficult black plastics

Medical



Sorting/Quality Control



Pharmaceuticals