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Imaging and Photonics Solutions

Overview

STMicroelectronics provides a wide range of **imaging solutions** and continues to enhance our customers products with different product categories

ST controls all aspects of the design and manufacturing chain and is one of the few imaging solution suppliers to do so. **ST's imaging teams** benefit from 500 staff contributing to all aspects of product creation starting with multiple design centers worldwide, dedicated process engineers in ST's advanced silicon fabrication plants and world-class backend manufacturing resources resulting in high **quality products for the end customer**.

ST offers a family of high-accuracy and target-independent ranging sensors, leveraging ST's own patented technology called **FlightSense™** using the Time-of-Flight (ToF) principle. ST's family of products featuring high performance, small footprint and low power consumption is ideally suited for wireless applications and handheld devices. First to enable high-volume production of fully integrated and small-sized **Time-of-Flight products**, ST's Imaging solutions are opening for more innovative use-cases and for user-experience enhancements for a wide variety of devices and application markets.

Mastering all aspects of the **imaging chain**, ST is well placed to offer custom design services to key customers with a number of custom sensors, ISPs and imaging modules already on the market. ST offers custom design services with worldwide design centers, dedicated process engineers in advanced silicon fabrication plants and world-class backend manufacturing resources. Our continuously expanding portfolio of proprietary technologies enables specialized and differentiated imaging solutions leveraging our large expertise around optical modules and sensors. **ST offers premium services** to help you build an efficient ecosystem with our existing or new partners, by sustaining a secured development and accompanying you throughout the product lifecycle with direct access to imaging experts.

Ambient Light Sensors

Overview

ST offers innovative **ambient light sensors (ALS)** that provide, in optimized package size, accurate information on ambient light, like the Illuminance (lux) level, the color temperature or the light flicker frequency.

In addition to our VL6180X that combines ambient light sensing (ALS) with a T**ime-of-Flight (ToF) range sensor** and an **IR emitter** in a single module, ST introduces the new VD6283TX, a miniature full-color sensor with advanced light flicker frequency extraction.

VD6283TX
New Full-color ALS

Benefits of ST's ambient light sensors

- Accurate lux, correlated color temperature (CCT) and distance measurement information (depending upon product)
- Easy integration with miniature or all-in-one modules
- Low power consumption
- Competitive system cost

What are ambient light sensors?

ST ambient light sensors offer, in optimized packages, photopic or color filters with precise responses that convert ambient light into Lux values with high-accuracy performance.

Full-color sensors provide a complete optical sensing solution combining the computation of the correlated color temperature (CCT) and the extraction of flickering frequencies of artificial lights, effectively removing the "banding effect" often visible on camera screens.

Combining ambient light sensor with an IR emitter and ST's patented FlightSense™ Time-of-Flight technology, the 3-in-1 combo sensors are easy to integrate and save the end-product maker long and costly optical and mechanical design optimizations.

Benefits of the miniature VD6283TX full-color sensor

Scheduled for release in 3Q21, the full-color VD6283TX ALS is the smallest 6-channel color sensor the market with 1.83 x 1.0 x 0.55 mm package. Light measurement is fast and accurate thanks to an individual ADC and readout circuitry for each color channel (Red, Green, Blue, IR, Clear and Visible). The VD6283TX uses hybrid color filters with precise responses allowing accurate computation of the correlated color temperature (CCT) and Lux information that can be used for display brightness management or scene light correction. Additionally, the VD6283TX can extract light flickering frequencies from 100 Hz to 2 kHz, including LED square signals.

Developer resources

ST ambient light sensors are supplied with a complete documentation package, example source code and a software APIs (application programming interface) which is compatible with a range of microcontrollers and processors. The application software development and the physical integration into customers' devices is easy thanks to the X-NUCLEO expansion and breakout boards which are compatible with the STM32 ODE environment and STM32CubeMX graphical user interface and initialization code generator.

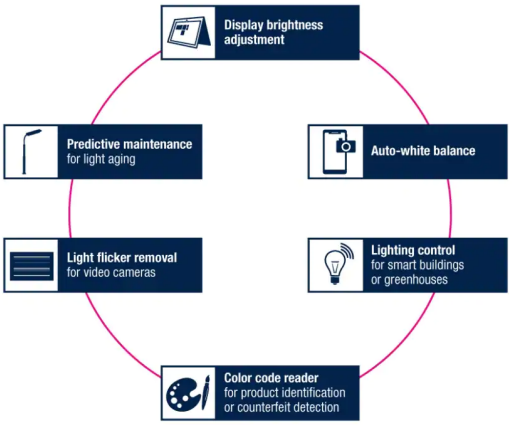
STM32 Open Development Environment

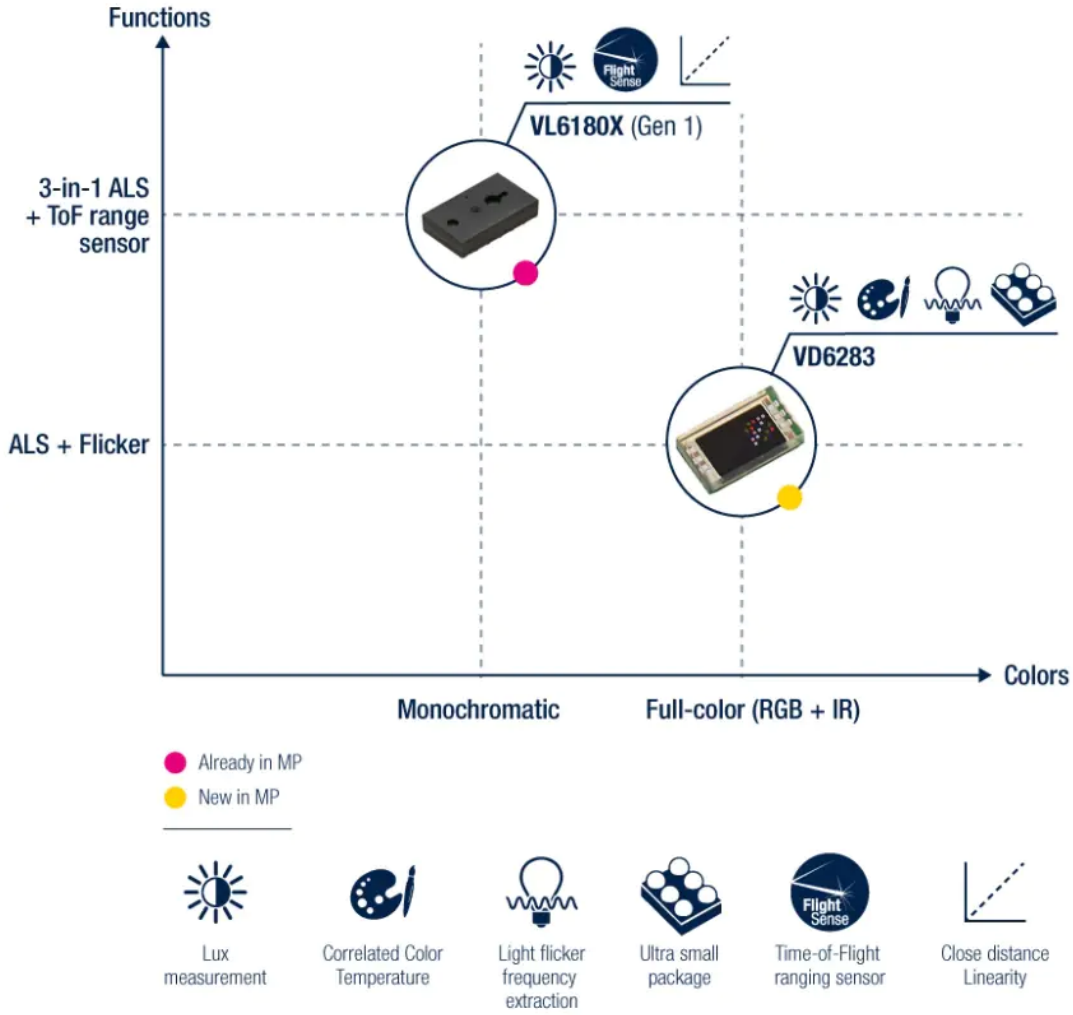
Unlimited markets and applications

There are a lot of use cases and applications compatible with our ambient light sensors including:

- Display brightness adjustment
- Auto-white balance

- Lighting control for smart buildings or greenhouses
- Color code reader for product identification or counterfeit detection
- Predictive maintenance for light aging





Imaging and Photonics Solutions/Ambient Light Sensors

Part Number	General Description	Package	Package size (mm)	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Voltage (V) min	Supply Voltage (V) max
VD6283TX	Hybrid filter multispectral sensor with light flicker engine (Ambient Light Sensor)	WLCSP T-SHAPE	1.83 x 1.0 x 0.55	-30	85	1.65	1.95
VL6180X	Time-of-Flight (ToF) proximity sensor and ambient light sensing (ALS) module	Optical	4.8 x 2.8 x 1	-20	70	2.6	3

CMOS Image Sensors

Overview

Since 1999 ST has been an industry leader in the design and manufacture of **imaging sensors**. The current product portfolio spans a wide range of traditional image sensors from entry level VGA to 24 Mpixels and will soon offer products with 100’s of millions of pixels. STMicroelectronics provides a wide range of imaging solutions and continues to enhance our customers’ products with different product categories such as CMOS image sensors, CMOS photonic sensors, processors and CIS foundry. Mastering all aspects of the imaging chain, ST is well placed to offer custom design services to key customers with a number of custom sensors, ISPs and imaging modules already on the market.

ST’s sensors now address an increasing number of imaging applications in the automotive, security, gaming, medical and high-end traditional camera market. As a leading supplier in the wireless industry, ST is constantly innovating in all aspects of our product offer. **Camera modules** featuring extended depth of field (EDoF), where the consumer benefits from an enhanced imaging experience over a traditional fixed focus (FF) approach, was first industrialized by ST. Leveraging extensive system on chip (SOC) knowhow, a wide range of features can be integrated on the same silicon die as the pixel array including autofocus (AF) drivers and lens shading correction (LSC) algorithms, as well as innovative solutions, such as high dynamic range (HDR) technology, at an affordable cost.

At the forefront of silicon process development, ST’s dedicated in-house **CMOS imaging manufacturing** facilities is ramping up for new products featuring state-of-the-art backside illumination (BSI) techniques, as well as innovative design features such as deep trench isolation (DTI) that addresses the key challenge of pixel crosstalk.

Imaging and Photonics Solutions/CMOS Image Sensors

Part Number	General Description	Package	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Voltage (V) (Analog) min	Supply Voltage (V) (Analog) max	Supply Voltage (V) (Digital) min	Supply Voltage (V) (Digital) max	Package size (mm)	Output format	Frame rate operation (Fps)
VB56G4A	Automotive grade 1.5 megapixel backside illuminated global shutter image sensor	CAV OBGA48 6.2X6.9 F6X8 0.8 042	-40	105	2.7	2.9	1.8	1.8	-	RAW8 to RAW 10	88fps full resolution
VD55G0	Consumer Global Shutter 0.4Mp	GOOD DIE	-30	85	2.7	2.9	-	-	-	-	-
VD5661	Automotive HDR Global Shutter 1.6Mp with 3.2um pixel, bare die	GOOD DIE	-40	125	2.8	2.8	1.2	1.8	-	RAW8 to RAW 16	75fps full resolution
VD56G3	Consumer Global Shutter 1.5Mp	GOOD DIE	-30	85	2.7	2.9	-	-	-	-	-
VD5761	Automotive HDR Global Shutter 2.3Mp with 3.2um pixel and bare die	GOOD DIE	-40	125	2.8	2.8	1.2	1.8	-	RAW8 to RAW 16	60fps full resolution
VG6640	Automotive 1.3 megapixel high-dynamic range image sensor	M2BGA 9X9.3X1.375 100 F10X10 PI	-40	125	2.8	2.8	1.8	2.8	9.0 x 9.3	Raw bayer data	Frame rate at HD video (720p) resolution 60fps, Frame rate at full resolution 45fps
VB1940	Automotive-grade, 5.1 Mpixel image sensor with global shutter and rolling modes for full image resolution and performance, in NIR and RGB	OBGA74 8.2X9.6X2.09	-40	105	2.65	2.9	-	-	-	-	60fps full resolution
VD16GZ	Consumer Global Shutter 1.5Mp RGB-NIR 4x4	GOOD DIE	-30	85	2.7	2.9	-	-	-	-	-
VD1940	Automotive-grade, 5.1 Mpixel image sensor with global shutter and rolling modes for full image resolution and performance, in NIR and RGB	DIE	-40	105	2.65	2.9	-	-	-	-	60fps full resolution
VD55G1	Advanced Global Shutter 2D imaging sensor with 800x700 resolution, in compact size	DIE,GOOD DIE	-30	85	2.7	2.9	1.05	1.26	-	-	-
VD66GY	Consumer Global Shutter 1.5Mp RGB Bayer	GOOD DIE	-30	85	2.7	2.9	-	-	-	-	-
VG5761	Automotive HDR Global Shutter 2.3Mp with 3.2um pixel and iBGA	IBGA104 10X8.5 3R12X10 B05 P08	-40	105	2.8	2.8	1.2	1.8	10 x 8.5	RAW8 to RAW 16	60fps full resolution

Imaging Processors

Overview

Leveraging on more than 10 years' experience in all key components of the image processing chain, ST offers a wide range of **image signal processors (ISP)** to address different markets, including high-end smartphones, security/surveillance, gaming, automotive and medical applications. The use of industry standard interfaces and rich set of APIs makes the integration of **ST's image processors** a straightforward process and helps to reduce end-product time to market.

ST's ISPs are offered as **standalone processing solutions** or can also be used as an efficient imaging bundle with ST's sensors and modules. By leveraging extensive in-house IPs, ST's ISP products provide a unique opportunity for the customer to differentiate from standard platforms through a rich feature set including innovative Bayer processing algorithms and support for high dynamic range (HDR) technology. With control over all aspects from algorithm creation, design tools up to silicon fabrication, ST is well placed to offer custom **ISP solutions**.

ST provides a wide range of imaging solutions and continues to enhance our customers' products with different product categories such as CMOS image sensors, CMOS photonic sensors, processors and CIS foundry.

ST controls all aspects of the design and manufacturing chain and is one of the few imaging solution suppliers to do so. ST's imaging teams benefit from 500 staff contributing to all aspects of product creation starting with multiple design centers worldwide, dedicated process engineers in ST's advanced silicon fabrication plants and world-class backend manufacturing resources resulting in high quality products for the end customer. Mastering all aspects of the imaging chain, ST is well placed to offer custom design services to key customers with a number of custom sensors, ISPs and imaging modules already on the market.

Imaging and Photonics Solutions/Imaging Processors

Part Number	General Description	Package	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Voltage (V) min	Supply Voltage (V) max	Package size (mm)	Output format	Frame rate operation (Fps)
STMIPID02	Dual mode MIPI CSI-2/SMIA CCP2 de-serializer	VFBGA 49 3x3x1.0	-25	70	2.8	-0.5	3 x 3 x 1.0	12-bit parallel output interface	dual lane

Time-of-Flight sensors

Overview

STMicroelectronics's 4th generation of F**light**Sense™ **sensors** offer a **multi-zone ranging sensor** able to create a 64-zone mini depth map up to 4 m.

ST **ToF sensors** are an all-in-one (emitter, receiver, and processor) system for an easy, cost effective, and small footprint integration.

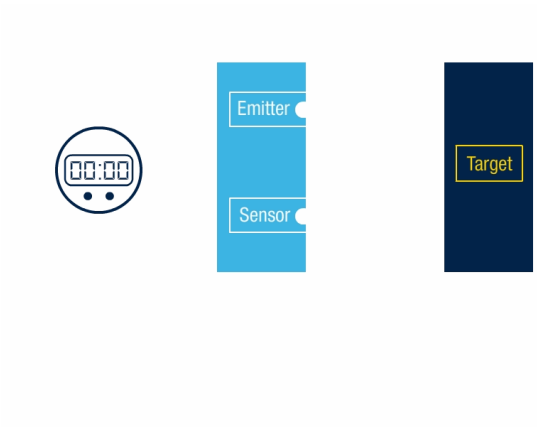
VL53L5CX
4th generation FlightSense™

Benefits of FlightSense sensors

- True distance measurement, independent of target size, color, and reflectance
- Accurate and high-speed distance measurement
- All-in-one integrated module for easy integration
- Low power consumption
- Truly invisible 940nm illumination

What is FlightSense?

FlightSense is the trademark of the ST Time-of-Flight technology. The time-of-flight principle is based on the speed of the light. An emitter sends photons which are reflected by the target and detected by the receiver (called SPAD for Single Photon Avalanche Diode). The time difference between the emission and the reception provides the actual distance of the target in millimeters with a high accuracy.



Patented histogram algorithms

ST's patented histogram algorithms enable measuring distances to multiple objects as well as increasing accuracy. In addition to increased cover-glass crosstalk immunity and improved ranging under ambient lighting, the histogram algorithms ensure real-time smudge compensation for applications operating in dirty industrial environments.

- Maximum distance measurement can reach 8 meters
- Multi-target detection and measurement in the FoV
- Smudge immunity above 60 cm

Developer resources

FlightSense proximity and ranging sensors are supplied with a complete documentation package, example source code and software APIs (application programming interface) which are compatible with a range of microcontrollers and processors. The application software development and the physical integration into OEM devices is simplified thanks to the X-NUCLEO expansion and breakout boards which are compatible with the STM32 ODE environment and STM32CubeMX graphical user interface and initialization code generator.

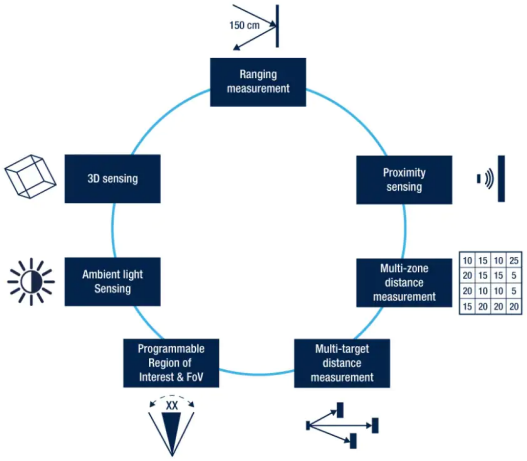
STM32 Open Development Environment

Unlimited markets and applications

ST ToF sensors enable endless variety of use-cases and applications. Some of the most

popular applications include:

- Obstacle detection for robotics and drones
- Gesture control
- User presence detection
- Liquid level measurement
- Inventory management
- Camera autofocus assist



	VL6180X	VL6180V1	VL53L4CD	VL53L0CX	VL53L1CX	VL53L3CX	VL53L4CX	VL53L1CB	VL53L5CX
	Proximity and ambient light sensor	Proximity sensor with low power consumption	Proximity sensor with high accuracy	Ranging sensor	Ranging sensor programmable FoV	Ranging and multi-target sensor	Short to long ranging, multi-target sensor	Long Distance and multi-target sensor	8x8 multizone sensor
Part number	VL6180XV0NR/1	VL6180V1NR/1	VL53L4CDV0DH/1	VL53L0CXV0DH/1	VL53L1CXV0FY/1	VL53L3CXV0DH/1	VL53L4CXV0DH/1	VL53L1CBV0FY/1	VL53L5CXV0GC/1
Max distance	20 cm	60 cm	130 cm	200 cm	400 cm	500 cm	600 cm	800 cm	400 cm
Close distance detection	•	•	•	•		•	•		
Multi-target detection						•		•	•
Multi-zone								•	•
Programmable FoV					•			•	
Lower Power mode	•	•	•	•	•				•
Ambient Light Sensing	•								

Imaging and Photonics Solutions/Time-of-Flight sensors

Part Number	General Description	Operating Range Distance (m) max	Package	Package size (mm)	Operating Temperature (°C) min	Operating Temperature (°C) max	Supply Voltage (V) min	Supply Voltage (V) max
VL53L0X	Time-of-Flight (ToF) ranging sensor	2	Optical	4.4 x 2.4 x 1	-20	70	2.6	3.5
VL53L1CB	Time-of-Flight (ToF) ranging sensor with advanced multi-zone and multi-object detection	8	Optical	4.9 x 2.5 x 1.56	-20	85	2.6	3.5
VL53L1CX	Time-of-Flight (ToF) ranging sensor based on ST's FlightSense technology	4	Optical	4.9 x 2.5 x 1.56	-20	85	2.6	3.5
VL53L3CX	Time-of-Flight (ToF) ranging sensor with multi target detection	5	Optical	4.4 x 2.4 x 1	-20	85	2.6	3.5
VL53L4CD	Time-of-Flight (ToF) high accuracy proximity sensor	1.3	Optical	4.4 x 2.4 x 1	-30	85	2.6	3.5
VL53L4CX	Time-of-Flight (ToF) sensor with extended range measurement	6	Optical	4.4 x 2.4 x 1	-30	85	2.6	3.5
VL53L5CX	Time-of-Flight 8x8 multizone ranging sensor with wide field of view (ToF)	4	OPTICAL LGA 6.40X3.03 16 PINS	6.4 x 3.0 x 1.5	-30	85	1.8	3.3
VL53L7CH	Artificial intelligence enabler, Time-of-Flight 8x8 multizone sensor with 90 degrees FoV (ToF)	-	OPT. LGA 6.40X3.0	-	-	-	-	-
VL53L7CX	Time-of-Flight 8x8 multizone ranging sensor with 90 degrees FoV (ToF)	3.5	OPT. LGA 6.40X3.0	6.4 x 3.0 x 1.6	-30	85	1.8	3.3
VL53L8	2nd generation multi-zone time-of-flight ranging sensor	-	OPT. LGA 6.40X3.0	-	-	-	-	-
VL53L8CH	Artificial intelligence enabler, high performance 8x8 multizone Time-of-Flight sensor	-	OPT. LGA 6.40X3.0	-	-	-	-	-
VL53L8CX	Low-power high-performance 8x8 multizone Time-of-Flight sensor (ToF)	4	OPT. LGA 6.40X3.0	6.4 x 3.0 x 1.75	-30	85	1.8	3.3
VL6180V1	Time-of-Flight (ToF) proximity sensor	0.6	Optical	4.8 x 2.8 x 1.0	-20	70	2.6	3
VL6180X	Time-of-Flight (ToF) proximity sensor and ambient light sensing (ALS) module	0.1	Optical	4.8 x 2.8 x 1	-20	70	2.6	3
VD55H1	Low power, low noise 3D iToF 0.5 Mpix sensor die	-	GOOD DIE	4.5 x 4.9	-30	55	-	-

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