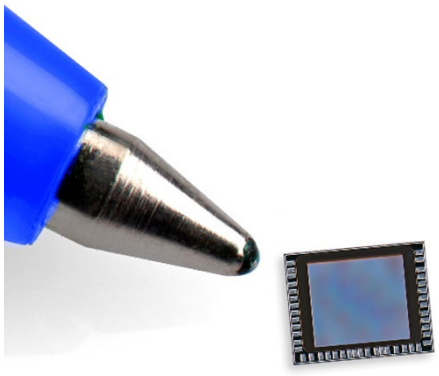
VD55G1

Data brief

Tiny, clever, low power, 0.56-megapixel, monochrome global shutter image sensor



ST Bright Sense

Order code	Description
VD55G1CCB0/RW	Monochrome, die as reconstructed wafer

Features

- Tiny sensor, which can fit everywhere:
  - World's first 2.16 µm global shutter pixel for optimum compactness
  - Footprint of only 2.73 x 2.16 mm²
  - Small optical format of 1/9 inch (800 x 700) and 1/10 inch (600 x 600)
- Ultralow power solution with:
  - Smart auto wake up feature, with ultralow power sleepy mode, and smart wake up when an event is detected
  - Low power operation of ≤ 2 mW in autowake up mode
  - Power consumption scaling with features, frame rate, and software standby
- Optimized image quality straight out of the sensor with:
  - Cutting-edge performance of ST proprietary pixels combining global shutter, BSI, CDTI, and 3D stacking
  - High sensitivity and sharpness in both visible and NIR
  - Various on-chip features to optimize image quality, such as autoexposure, noise reduction, or defect correction
- Seamless integration into embedded systems:
  - 1-lane MIPI CSI-2 output
  - I²C and I3C control interface
  - Effortless integration with VD55G1 development kit, camera modules, with drivers available from st.com

Application

- AR/VR and gaming
- PC and personal electronics
- Robotics and drones
- Biometrics
- Barcode reading and logistics
- Security
- Machine vision

Description

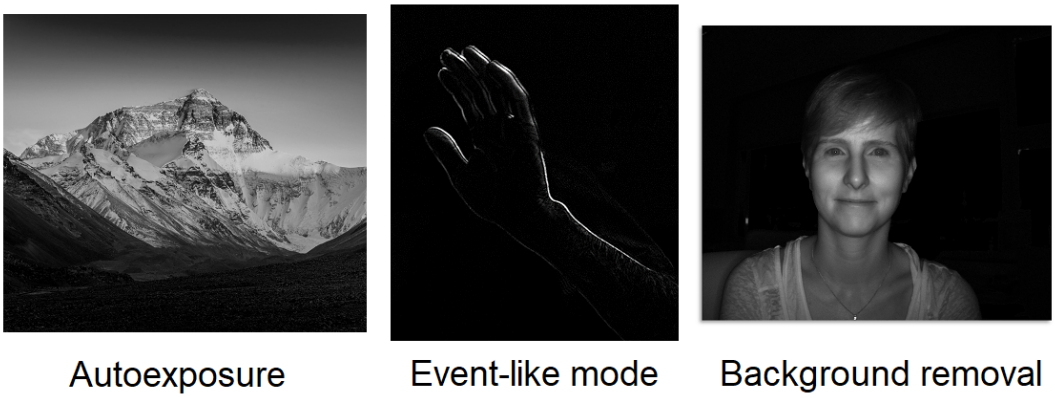
The VD55G1 is a unique ultracompact and low-power image sensor in the ST Bright Sense portfolio. It has been developed to enable the next generation of smart and power-efficient systems. Leveraging the world's first 2.16 µm global shutter pixel, the sensor highlights maximum compactness. It has a tiny 2.73 x 2.16 mm² footprint that fits into the most size-constrained devices such as AR/VR glasses or personal electronics.

With its well-thought-out design, the VD55G1 maintains low power consumption even when pushed at the highest frame rates, making it ideal for battery-powered devices. In addition to this low operating power, the sensor embeds an auto wake up feature. This enables the sensor to operate in an ultralow power sleepy mode when no change or event is detected. As soon as an event is detected, the sensor automatically sends a trigger to its host processor to switch into full streaming mode to capture the corresponding event. Thanks to this clever feature, vision system makers can finally get rid of the power-hungry, ineffective 24/7 operation of systems such as security cameras, auto-ID, or in-line product inspection.

Besides auto wake up, the VD55G1 embeds a complete toolbox of on-chip features for optimizing image quality, adjusting frame rate, or improving data efficiency. Autoexposure, noise reduction, and various image corrections help to get stunning images directly from the sensor. This sensor can perform background removal for more efficient face ID, or capture event frames in an event-like mode, enabling the output of event information in a synchronous manner.

Combining a small form factor, power efficiency, and a full range of clever features, the VD55G1 is the ideal vision extension for the next generation of smart embedded systems. Its single-lane MIPI CSI-2 output and I²C or I3C control interface makes it natively compatible with the broadest range of processing units. To facilitate further integration, the sensor is provided along with development kits, camera modules, and drivers. All can be found on st.com.

Figure 1. VD55G1 key features



1 Technical specifications

Table 1. Technical specifications

Category	Parameter	VD55G1 specifications
Resolution	Resolution	0.56 MP
	Pixel array [H x V]	804 x 704
	Aspect ratio	Close to 1: 1
Pixel	Shutter type	Global shutter
	Illumination type	BSI
	Pixel size	2.16 µm
Color	Color option	Monochrome
Frame rates (maximum)	Full resolution VGA resolution QVGA resolution	194 fps 271 fps 470 fps
Optical characteristics	Pixel array size [H x V]	1.74 mm x 1.52 mm
	Optical format	1/9 inch (2.3 mm)
	CRA	30° linear
Mechanical characteristics	Die footprint [H x V]	2.73 mm x 2.16 mm
	Die pinout	43 pins
	Operating temperature range	-30 to 85°C
Electronic characteristics	Sensor data interface	MIPI CSI-2, 1 lane | I3C
	Sensor control interface	I²C, up to 1MHz | I3C, up to 12.5 MHz
	Output format	RAW8, RAW10
	Supply voltages	2V8–1V8–1V15 or 2V8–1V2
	External clock frequency	6-27 MHz
	Power consumption	35 mW (60 fps typical) 1-2 mW (auto wake up) 0.5 mW (standby)
Embedded features	Image quality optimization	• Autoexposure • Automatic dark calibration • Noise reduction • Gamma correction • Defective pixel correction • Analog and digital gains
	Power and data optimization	• Auto wake up • Background removal • Event-like mode • Cropping • Binning • Subsampling • Context management with up to 4 contexts
	Other	• Mirror/Flip • Test pattern generation • Temperature sensor • GPIOs x4

2 Acronyms and abbreviations

Table 2. Acronyms and abbreviations

Acronym/abbreviation	Definition
3D	three dimensional
AR	augmented reality
BSI	backside illumination
CDTI	capacitive deep trench isolation
CRA	chief ray angle
CSI	camera serial interface
fps	frames per second
I²C/I3C	inter-integrated circuit (bus)
MIPI	mobile industry processor interface
PC	personal computer
QVGA	quarter video graphics array
VGA	video graphics array
VR	virtual reality

Revision history

Table 3. **Document revision history**

Date	Version	Changes
16-May-2023	1	Initial release
26-Apr-2024	2	Updated title, cover information, and description. Added ST Bright Sense subbrand, Section 1: Technical specifications, and Section 2: Acronyms and abbreviations.

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