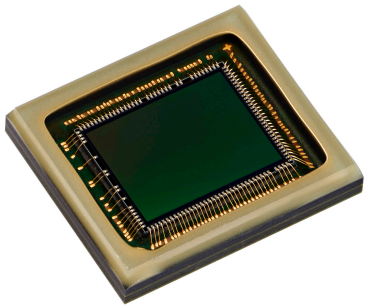
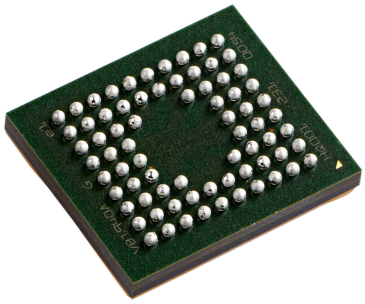
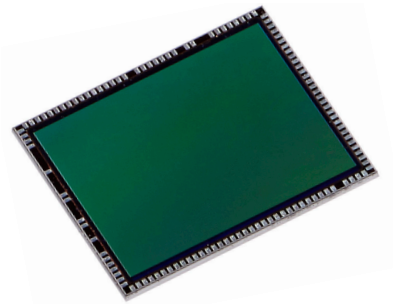
VB1940, VD1940

Data brief

Automotive grade 5.1 megapixel backside illuminated global and rolling shutter sensor for near infrared and visible scenes







Root part number	Description
VB1940	OBGA package
VD1940	Bare die

Features

Automotive compliancy

- AEC-Q100 automotive grade 2 qualified
- Operating junction temperature: -40°C to 125°C
- ISO26262 compliant to support ASIL B system integration
- Cybersecurity features

Hybrid 5.1 MP global and rolling shutter features

- 3D stacked sensor 40 nm/65 nm
- 5.1 MP sensor (2560 x 1984)
- 2.25 µm x 2.25 µm BSI (backside illuminated) pixel
- RGB/NIR pixel technology with RGB NIR 4x4 pattern
- Image array size: 5.8 mm x 4.5 mm
- Optical format 1/2.5 inch
- Bare die or OBGA package

Innovative features

- Dual exposure controls (RGB and IR)
- On-chip bayerization ISP (image signal processor)
- On-chip color HDR (high dynamic range) merges
- On-chip NIR smart upscale
- 4 programmable contexts, in a versatile sequence, with up to 32 elements

Interface

- Quad-lane transmitter MIPI CSI-2 (copyright© 2005-2010 MIPI Alliance, Inc. Standard for camera serial interface 2 (CSI-2) version 1.1), up to 1.5 Gbps per lane
- 4 programmable GPIOs (general-purpose input/outputs) to control the LED (light-emitting diode)
  - Output synchronized with sensor integration periods
  - PWM (pulse-width modulation) control
- Fast mode plus I²C control interface

Unique imaging performance

- HDR linear dynamic range up to 100 dB in rolling shutter mode
- Up to 60 frames per second at full resolution
- Ultralow noise

Applications

The VB1940, VD1940 5.1 MP image sensor is designed for a large FoV (field of view) and incabin monitoring, including driver monitoring applications. It comprises both full HDR color images and sensitive full resolution NIR images. This sensor is specifically designed to manage RGB and NIR operations. This is achieved by outputting RGB bayer color images on one side, and full resolution NIR images on the other side. The VB1940, VD1940 also includes embedded assets that target ASIL-B safety levels. In addition, this sensor contains cybersecurity features that prevent hacking.

Description

The VB1940 and VD1940 are 5.1 MP image sensors with both rolling and global shutter modes.

In rolling shutter mode, the VB1940 and VD1940 produce a single HDR color frame output through the MIPI CSI-2 interface. This is achieved by combining a short and long exposure. In addition, the user can activate a function that converts the RGB NIR pattern to an RGB format. Such format is compatible with any standard automotive ECU (electronic control unit).

In global shutter mode, the RGB pixels upscale the NIR image to full resolution. This innovative use of the NIR information is achieved thanks to the independent exposition of the NIR and RGB pixels.

The sensor captures up to 60 frames per second in a 2560 x 1984 resolution format. The device is fully configurable through the I²C serial interface. It also provides flexible frame-to-frame configuration changes via the use of programmable contexts. Up to four contexts can be sequenced in a versatile loop of up to 32 elements.

The sensor is designed as a SEOOC (safety element out of context). It is compliant with ISO26262 standards and ASIL-B safety levels.

The VB1940 and VD1940 are designed with a full set of cybersecurity features.

1 Overview

Figure 1. **VB1940, VD1940 block diagram**

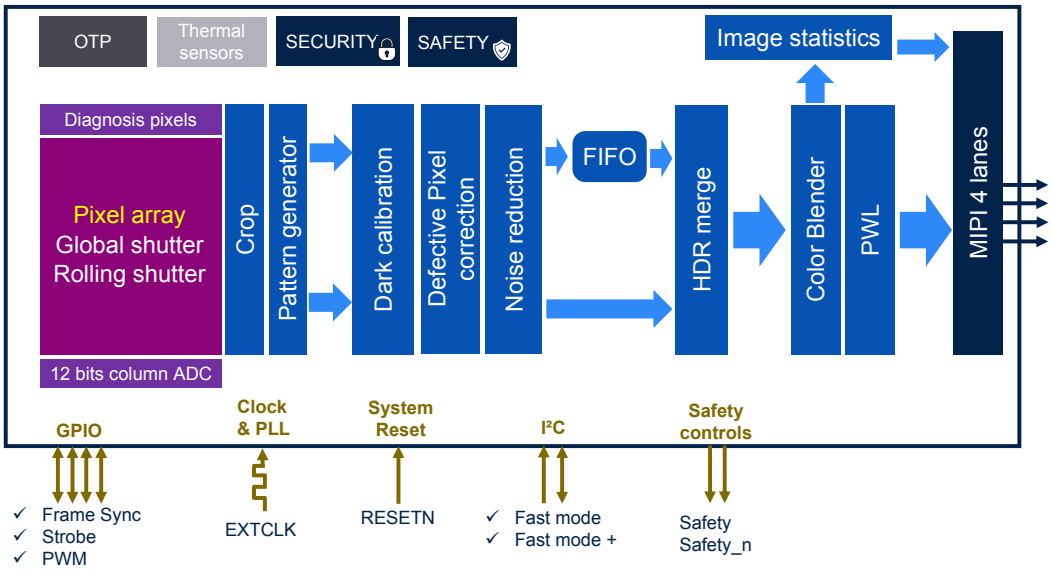
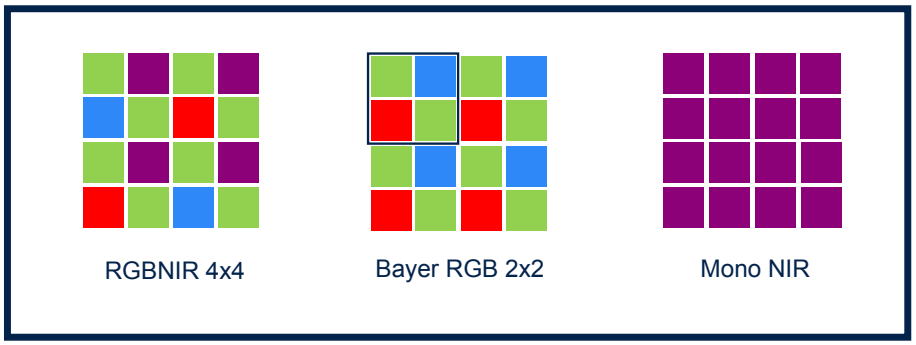


Figure 2. **VB1940, VD1940 output formats**



Revision history

Table 1. **Document revision history**

Date	Version	Changes
21-Jul-2022	1	Initial release
18-Sep-2025	2	Updated AEC-Q100 automotive grade 2 qualified. Updated *Features* and *Description* for MIPI CSI-2 version, and four programmable GPIOs, rather than six. Section 1: Overview: Updated images.

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