SONY

Pregius & Pregius S technology guide

SONY

Global Shutter Technology
Pregius™ & Pregius S™

OVERVIEW

Pregius is a global shutter pixel technology for active pixel CMOS image sensors that adopts Sony Semiconductor Solutions Corporation's low-noise CCD structure to realize high-quality images. This technology has been name Pregius to represent the combination (Precision GS) of the low-noise performance of CCD with the high-speed and high-precision performance (Precision) of global shutter (GS) required by FA applications.

In a further advancement of Pregius, the newly developed Pregius S technology adopts a back-illuminated structure to simultaneously realize a smaller image sensor and a faster frame rate, while still maintaining the high imaging performance of Pregius. In addition, the adoption of a stacked structure has secured a large surface area for the signal processing circuits, so it has become possible to equip it with various new functions.

TECHNICAL FEATURES

Global shutter and rolling shutter

There are broadly two types of CMOS image sensors. One uses rolling shutters that capture images by line-sequential scanning, and the other adopts global shutters that take images in the focal plane in one shot. While the rolling shutter causes distortion in the images of fast-moving objects, the global shutter is able to capture a high-speed moving image without focal plane distortion by capturing the entire object before output. Is is also easy to synchronize with flash in, for example, machine vision inspection processes, enabling to improve the takt time.

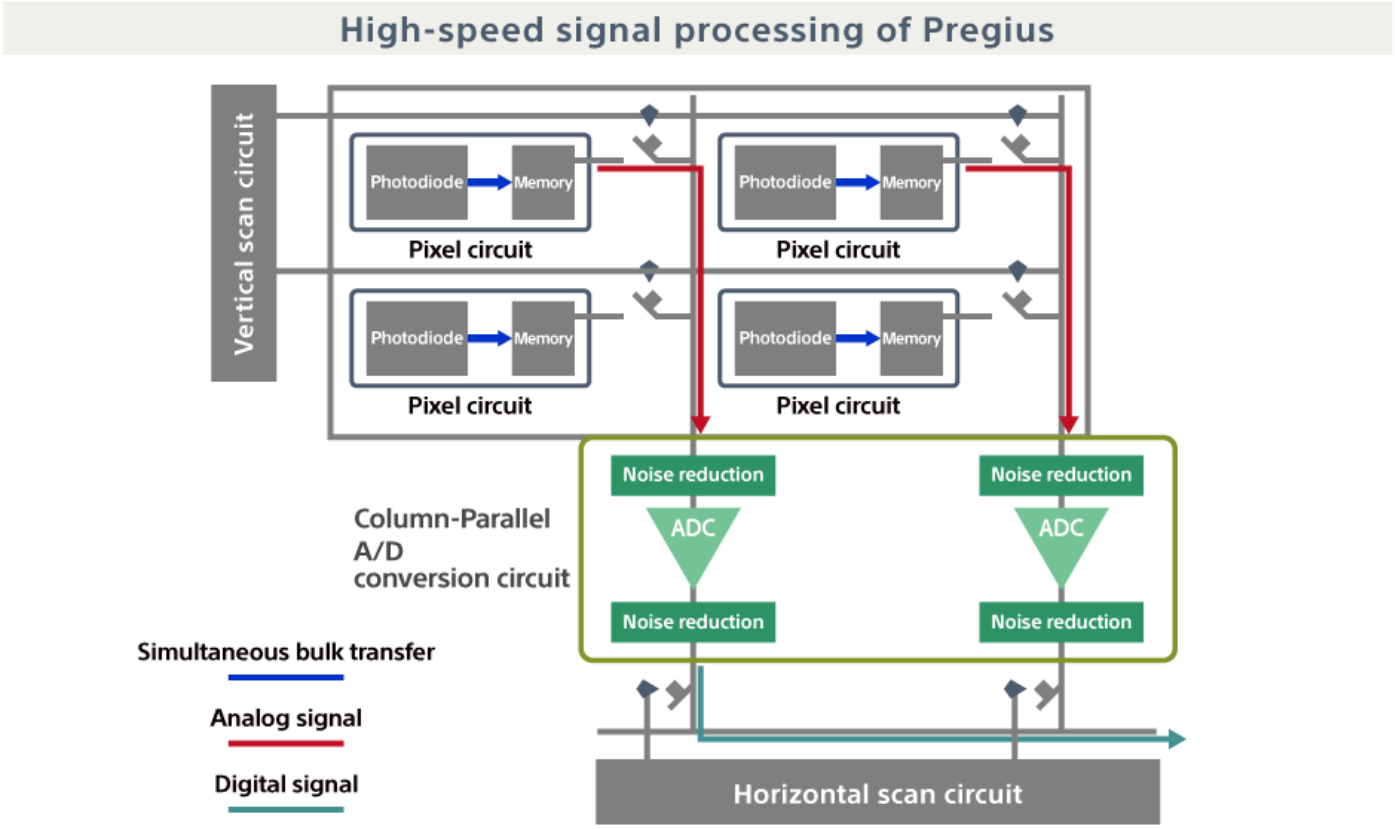
High-speed signal processing and high-image quality

High-speed signal processing and high-image quality are some of Pregius advantages. Pregius enables high-speed, high-precision machine vision inspection in a production line, signficantly enhancing the productivity.
Additionnal features, such as recording only specified areas in an image, help to make image inspection more efficient, further enhancing the efficiency of production lines.

High-speed signal processing and low-noise in one image sensor

Previous comprises a light receiving section (photodiode) with the excellent low-noise property of CCD and a memory section. The light simultaneously sensed by each photodiode of all pixels is converted to digital signal and transferred to their respective memory sections before processed. By processing the simultaneous digital signals all at once, the resulting image has no distortion. It offers an ideal functionality for moving object inspection.

The key to the high-speed of CMOS image sensors with Pregius technology is the parallel processing. The CMOS image sensors are equipped with A/D conversion circuits, which transform the analog signal from the pixel to a digital signal. An array of several thousands of these circuits arranged horizontally realizes the high-speed processing by operating simultaneously. In the A/D conversion circuit, the analog circuit that causes noise has been changed to a different configuration so that it automatically suppresses noise. In this way, the technology both realizes the high-speed and low-noise in one image sensors.



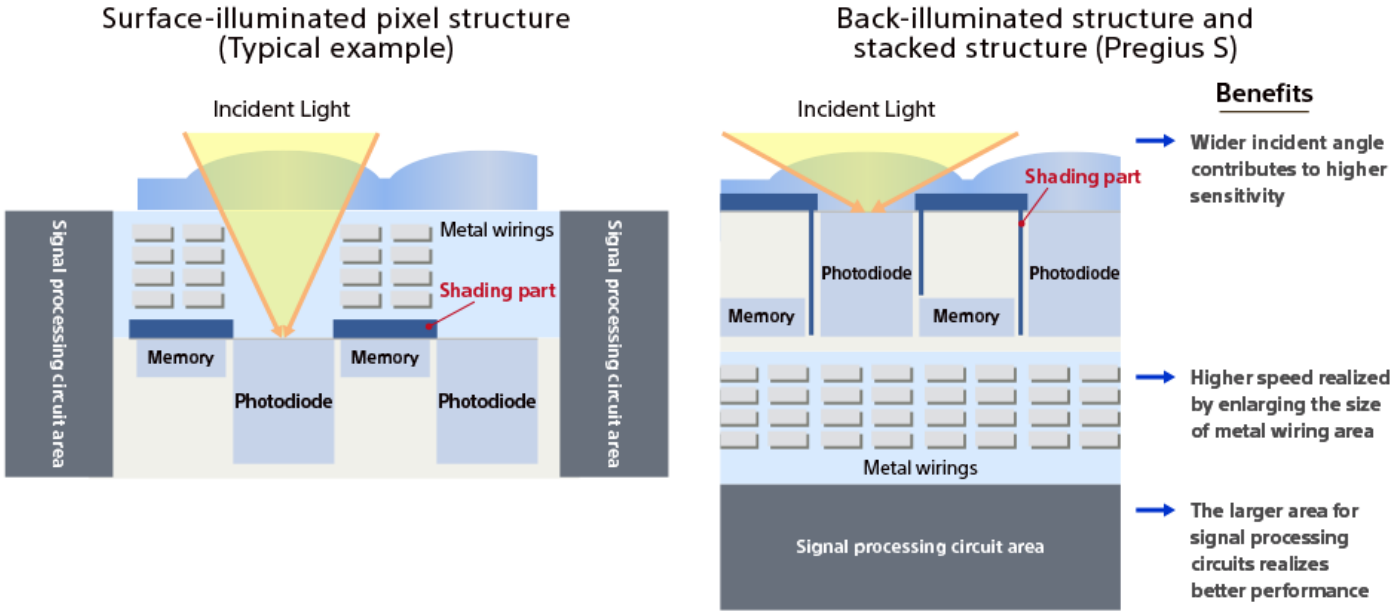
Pregius S technology

The Pregius S technology is an advanced form of Pregius technology explained above. In the Pregius S technology, the adoption of the back-illuminated structure makes it possible to achieve a faster frame rate, and the employment of the stacked structure realizes miniaturization, installation of various functions, and expansion of functions of the image sensors.

Advantages of the back-illuminated structure and stacked structure (Pregius S)

The first merit of back-illuminated structure is that it allows a wider incident angle, as illustrated below. Normally, the issues for a structure like this include measures for noise suppression and dark current. On Pregius S, Sony newly developed an original photodiode structure and light-shielding structure thatwere optimized for the back-illuminated structure. These greatly improved the sensitivity and saturation properties while also suppressing the noise generation. By utilizing these properties, it is also possible to maintain the image quality while achieving the miniaturization of pixels, which makes more compact image sensor possible.

Furthermore, by adopting a stacked structure that overlays the pixel section and the signal processing section (see the figure on the right), Sony succeeded in simultaneously achieving both a smaller sensor size and more functions as a result of the expanded signal processing circuit area.



Functionalities of image sensors with Pregius S technology

Tracking ROI
When an object, like a barcode on a conveyor belt, enters into the pre-defined ROI (Region Of Interest), tracking starts and the images are taken. This reduces the load of data processing to the back processor.

Motion detection
The sensor outputs images only when it detects motion. This reduces the processing time and the power consumption.

Dual ADC (Analog Digital Converter)
Two images with high and low gains are shot in parallel and combined within the sensor. The improved visibility contributes to the improvement of recognition in inspection and reduces the total inspection time.

APPLICATIONS

Barcode recognition

In the logistics industry, the sorting process is automated using barcode identification, and there are demands for improved accuracy and high speeds.
Global shutter image sensors are appropriate for this sector as they can capture distortion-free images of barcodes moving at high-speeds. Recently, as the increase of two-dimensional barcodes pushes up the demands for small-sized high-resolution image sensors, Sony's image sensors with miniaturization technology are adopted more.

FPD flaw inspection

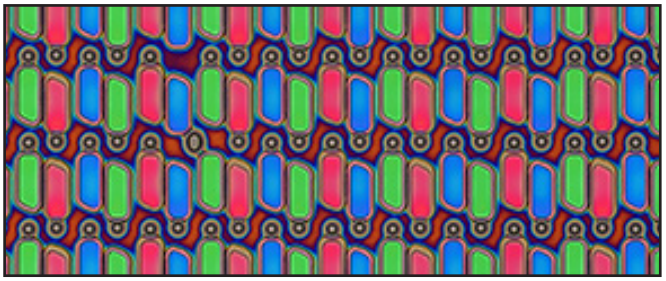
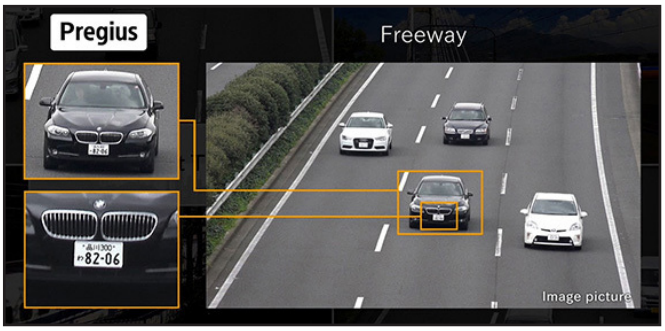


Image sensors are used in Front Panel Display (FPD) manufacturing plants to detect abnormalities and defects on the panel surfaces and wiring patterns. With the high-image quality, high-resolution and high-speed shooting capabilities, the global shutter image sensors are suitable to make the processes more efficient and accurate.

License plate recognition

To identify license plates on vehicles traveling at high-speeds, global shutter image sensors with high-speed read-out capabilities are suitable. Above all, to cover multiple lanes to monitor multiple types of cars, high-resolution image sensors are recommended.



Shape recognition

Image sensors are sometimes used in recycling sites to sort the shapes of bottles and cans. The global shutter image sensors contribute to improvement of accuracy and reduction of time, since they can capture images of objects moving event at high-speed without distortion.

Bridge examination

Bridge examination are the inspections necessary to ensure the maintenance of bridges in a good condition. As one method of such inspections, there are increasing demands for systems that combine highly mobile drones with cameras. Compared with examination by employees, it is not necessary to construct scaffolding and the examination can be completed by a small number of personnel, in a short period of time, and safety. The global shutter image sensors are highly expected for this application as they are capable of shooting images even under vibrated conditions.

Sony's Pregius™ & Pregius S™ sensors are available through Macnica ATD Europe.

MACNICA ATD EUROPE

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