



SONY
Rolling Shutter
Technology Guide

MACNICA

SONY

Rolling Shutter Image Sensor Technology

OVERVIEW

Rolling shutter is one of pixel readout methods for CMOS image sensors. In 2009, Sony commercialized their professional rolling shutter CMOS image sensors outfitted with proprietary high-speed, low-noise, A/D conversion technology, and they have been evolving their performance continuously ever since. This article explains Sony's low-noise and high-sensitivity technologies specifically.

TECHNICAL FEATURES

Low-noise technology

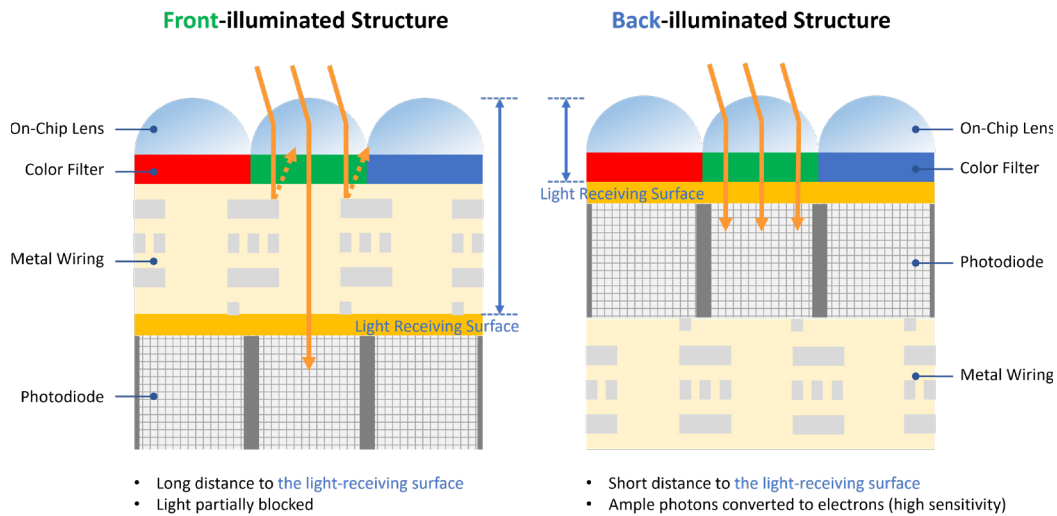
The primary characteristic of Sony's industrial rolling shutter image sensors is their low noise performance, which is achieved thanks to two main aspects of the technology. The first is noise reduction technology for each pixel in the image sensor. Using Sony's precise production technological capabilities and long-accumulated expertise in the design and development of pixel structure for image sensors, Sony's rolling shutter image sensors reduce to a low level the noise generated in pixels during photoelectric conversion or when transporting a charge. The second is Sony's proprietary column-parallel A/D conversion circuit. When the charge is converted to signal after photoelectric conversion, this circuit removes noise twice, before and after A/D conversion.

High-sensitivity technology

The secondary characteristic, high sensitivity, is achieved through a unique image sensor structure. Sony's industrial rolling shutter image sensors use the back-illuminated structure for the light-receiving parts. As shown in the figure below, in image sensors with a back-illuminated structure, the metal wiring is mounted below the photo diode layer. Compared to image sensors with a front-illuminated structure, they are less affected by the wiring layer so they can let in more light for photoelectric conversion, resulting in higher sensitivity.

The lineup also includes image sensors equipped with high-sensitivity STARVIS technology developed for security applications. The STARVIS technology also uses the same back-illuminated structure technology mentioned above.

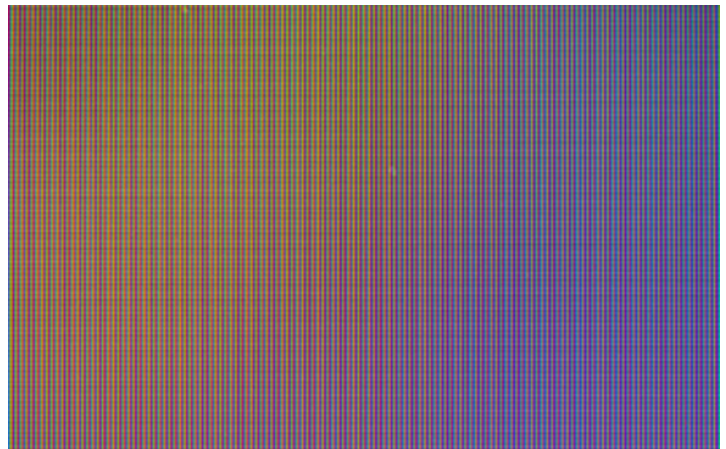
Advantages of Back-Illuminated Structure



APPLICATIONS

Flaw inspections for displays

When large image sensors are applied for the flaw inspections of displays, it is required to accurately measure the brightness of each pixel on the inspection screen to detect defects or unevenness. To improve the accuracy, an image sensor requires to have uniform pixel performance. Sony's large rolling shutter image sensors are suitable for such flaw inspection in precise level, because they offer not only high sensitivity performance but also low noise characteristics under dark conditions and less defects of pixels, despite having over 100 million pixels.



Digital microscopes



Digital microscope applications require image sensors with high sensitivity, low noise, wide dynamic range, and uniformity of characteristics of each pixel. Sony's rolling shutter image sensors have high uniformity of image quality and high sensitivity from visible light to near-infrared region, contributing to the improvement of observation accuracy of digital microscopes.

Sorting for logistics lines

When speed is not an issue, Sony's rolling shutter image sensors are often used in the sorting process on logistics lines. Rolling shutter image sensors are characterized by low noise and high sensitivity, making them suitable for imaging in low-light environments. Using a large image sensor, one camera can capture things on one meter wide conveyor belt by one shot. Such an application is quite effective for the reduction of system installation cost.



Aerial imaging



Large rolling shutter image sensors with high pixel counts are suitable for wide-area aerial photography during limited daylight hours. For example, the 4.2-inch image sensor can capture about 17 times the area of a 1-inch sensor in just a single shot, enabling the effective capture of wide areas in a short time.

Sony's Rolling Shutter Sensors are available through **Macnica Americas, Inc.**

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