

2008

Development of a full-frame 35-mm 24.18-million-pixel CMOS image sensor (Sony)

~ Discrete Semiconductor/Others ~

The CMOS image sensor is older than the CCD, and its concept was proposed in 1967.

Since it can be manufactured by a standard CMOS process, there is an advantage that the system on chip is easier than CCD which requires its special manufacturing process. It also features a single power supply and low power consumption operation.

Since the CMOS image sensor has a transistor amplifier for each pixel, it has a serious problem that the S/N ratio of the video signal is deteriorated by the performance variation of amplification transistors. For this reason, CCD image sensor had been mainly used for digital cameras and the like which required high image quality.

However, in 1999, the mobile phone "VP-210" was released from DDI which had a built-in digital camera first in the world, and the camera built-in became the mainstream of mobile phones. For the digital cameras, CMOS image sensors were adopted with the power consumption of one digit less than CCD. In 2004, the number of shipments of CMOS image sensor exceeded the number of CCD sensors. In addition, CMOS image sensors are often used for digital single-lens reflex cameras because of the requirement of low power consumption of large-sized image sensors. For example, a 3.25M pixel CMOS image sensor was adopted to the digital single-lens reflex camera "EOS D30" released by Canon in 2000.

In digital single-lens reflex cameras, there is a strong demand for a 35mm full-size sensor, and Sony developed the world's first 35mm full size CMOS image sensor with 24.81 million effective pixels in 2008. Canon also released a 35 mm full size 20.1 million-pixel CMOS image sensor at almost the same time, and it released the world's first digital single-lens reflex camera "EOS 5D Mark II" that was capable of shooting HDTV movies by using this sensor.

Various noise reduction and control techniques were adopted as the countermeasure against the fixed pattern noise which was unavoidable in CMOS image sensor, including a technique of on-chip fixed pattern noise reduction in which only the noise information for each light signal was read and it was then subtracted from the signal with noise, as shown in Fig.2.

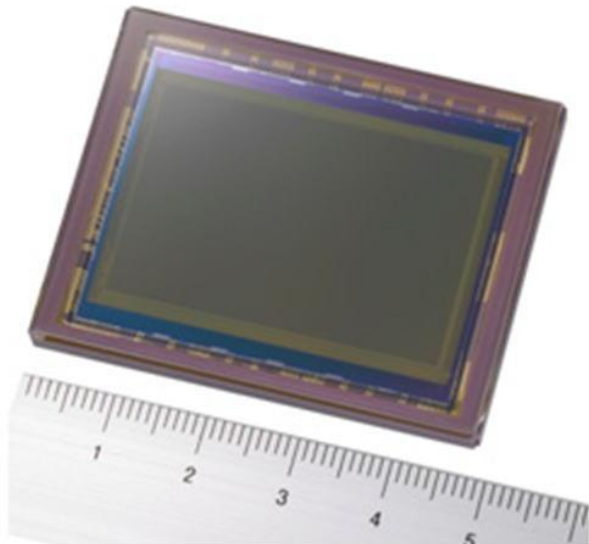


Image size	43.3mm diagonal (2.7" type)
Total number of pixels	6236(H) x 4124(V) Approx. 25.72M pixels
Effective number of pixels	6104(H) x 4064(V) Approx. 24.81M pixels
Chip size	41.0mm(H) x 31.9mm(V)
Unit cell size	5.94μm(H) x 5.94μm(V)

Fig.1: Photo and specification of 35mm full size CMOS image sensor

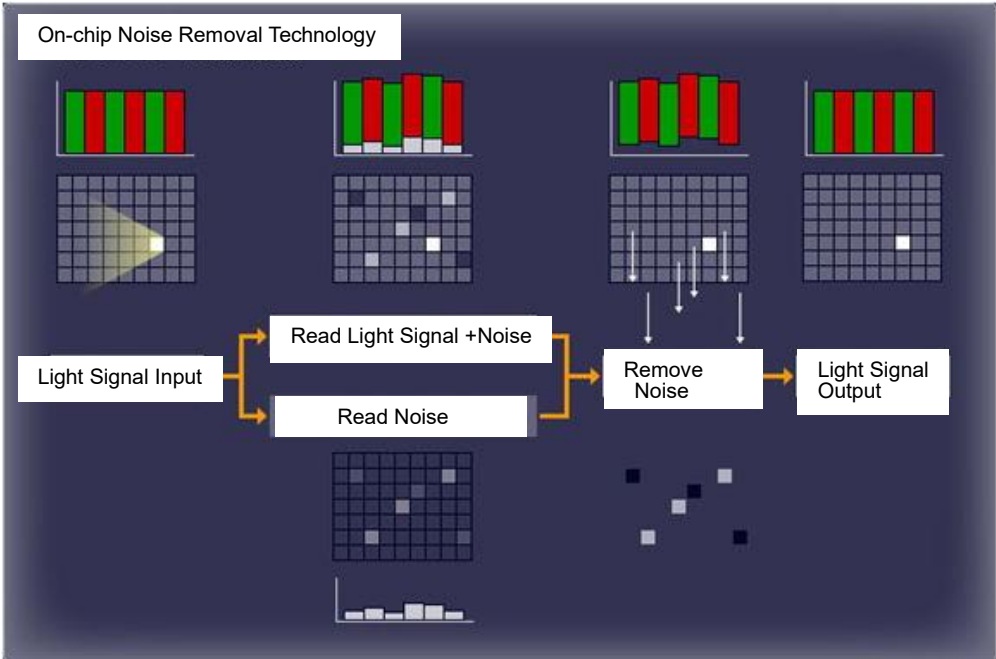


Fig.2: On-chip noise removal technology to remove fixed pattern noise