

Diagonal 28.47 mm (Type 1.8) 12.47M-Effective Pixel CMOS Sensor for Consumer Digital SLR Cameras Features Column-Parallel A/D Conversion, High Speed, and High Picture Quality in the APS Size

IMX021

To respond to the increasing demands for picture quality at high ISO sensitivities and higher continuous drive rates in digital SLR cameras, Sony has developed and is now releasing the next-generation IMX021 12.47M-pixel APS size CMOS sensor.

This device adopts the column-parallel A/D conversion method and achieves high speed and low noise by direct A/D conversion of the signals from the pixels.

This device achieves characteristics appropriate for the next generation of digital SLR cameras.

- Diagonal 28.47 mm (Type 1.8), 12.47M effective pixels
- Column-parallel A/D conversion
- Low noise
- Fast continuous drive rate of 10.39 frame/s
- Imaging characteristics appropriate for digital SLR cameras

The IMX021 was developed to respond to needs for continuous drive performance, which is desired in digital SLR cameras, and picture quality at high ISO sensitivities, and is a diagonal 28.47 mm (Type 1.8) 12.47M effective pixel CMOS sensor.

■ High Speed and Low Noise

The IMX021 adopts the column-parallel A/D conversion method to achieve high speed and low noise. Compared to structures that do not perform parallel processing, the column-parallel A/D conversion method allows A/D conversion at lower clock frequencies and can achieve even lower noise levels since it is less susceptible to high-frequency band noise components.

Furthermore, a dual noise cancellation system in which in addition to the analog CDS, digital CDS circuits are placed in each column is adopted to reduce pixel noise. In addition, at the same time this also reduces differences between the analog CDS circuits and the A/D converters and achieves even higher picture quality. (See figure 1.) Also, since no noise can enter the signal after conversion to digital, the image data can be output at high speeds.

In this device, we achieved both the industry's highest pixel count*¹ of 12.47M pixels and high-speed imaging at 10.39 frame/s at the same time.

*¹ As of August 2007.

■ Imaging Characteristics that Support Digital SLR Cameras

For this product, we developed a new wafer process for large-scale CMOS sensors. This process takes advantage of Sony's high picture quality technologies nurtured over years of experience in CCD development. This allowed us to achieve imaging characteristics that can support digital SLR cameras. (See table 2.) This device achieves a saturation signal level of 1100 mV and a sensitivity of 500 mV despite being a high pixel count 12.47M pixel device, and provides high picture quality imaging appropriate for digital SLR cameras.

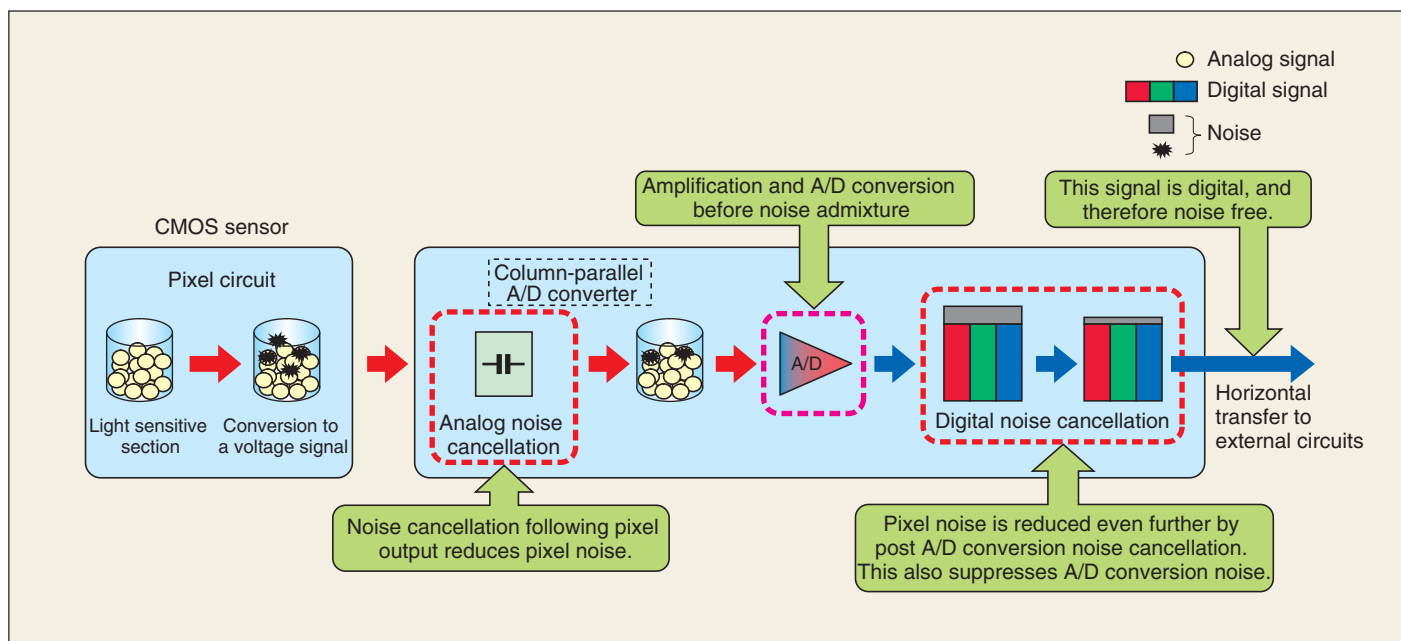
Furthermore, this sensor features a condensing design that can handle a wide range of incident angles at the sensor and thus can support the diverse interchangeable lenses used on digital SLR cameras. Furthermore, this device achieves consistent pixel characteristics across the chip surface despite being a large-scale device with a 28.47 mm diagonal.

■ Included Functions

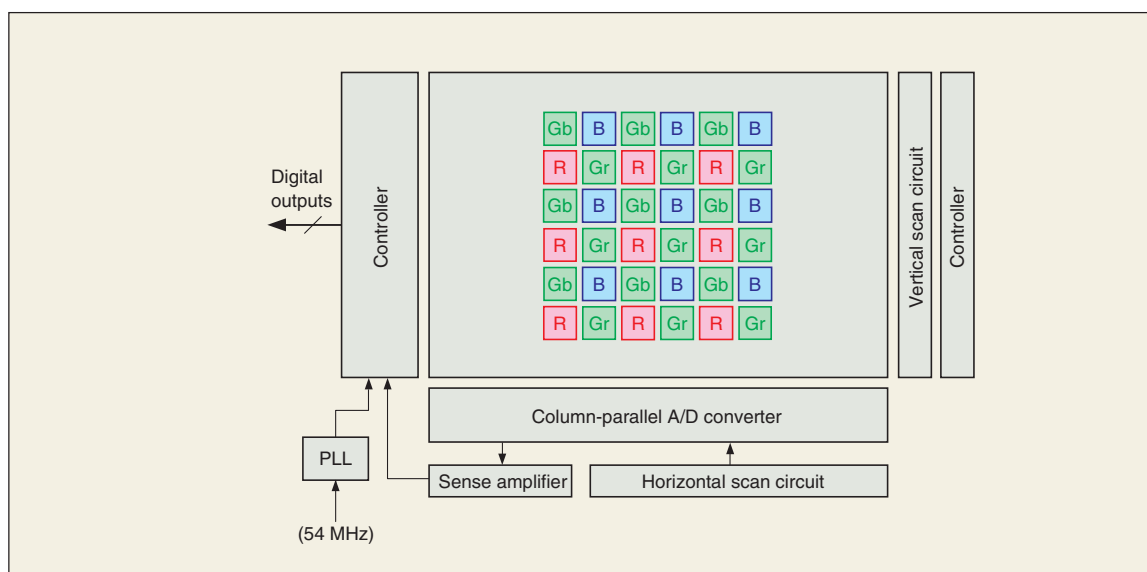
The IMX021 includes a built-in 24 dB programmable gain amplifier that can provide fully adequate gain in the analog domain. It also includes a "window readout" function that can read out part of the image. This function makes imaging at even higher frame rates possible by limiting the area of the image read out.

V O I C E

Although we faced many difficulties since both the wafer process and the sensor structure were new development efforts, everyone on the team took pleasure in these challenges and we solved them one by one. The IMX021 developed in this manner can record pleasurable moments for posterity. I strongly recommend that you look into this device.



■ Figure 1 Dual Noise Cancellation Method



■ Figure 2 Block Diagram

■ Table 1 Device Structure

Item	IMX021
Image size	Diagonal 28.47 mm (Type 1.8)
Format	3:2
Output format	12-channel parallel LVDS output
Total number of pixels	Approx. 13.05M (4428H × 2948V)
Number of effective pixels	Approx. 12.47M (4320H × 2888V)
Number of active pixels	Approx. 12.41M (4312H × 2880V)
Unit cell size	5.49 μm (H) × 5.49 μm (V)
Input clock frequency	54 MHz

■ Table 2 Imaging Characteristics and Functions

Item	IMX021	Remarks
Sensitivity (F5.6)	500 mV (Typ.)	3200K, 706 cd/m ² , 1/30 s accumulation, G signal
Saturation signal	1100 mV (Min.)	Ta = 60°C
Frame rate	10.39 frame/s	
PGA	24 dB (Max.)	
Readout modes	Progressive scan mode	
	Window readout mode	