

IMX018, IMX019

The trend towards higher pixel counts in cellular phone cameras continues to advance. In addition, there are increasing demands for improved picture quality and the inclusion of functions, such as camera shake correction or reduction, that are provided by current digital still cameras. To respond to the needs for higher pixel counts, Sony has developed and is now releasing the IMX018 3M-pixel CMOS sensor and the IMX019 2M-pixel CMOS sensor.

The IMX018 and IMX019 adopt a newly-developed 2.5 μm unit pixel and further improve the high picture quality process technologies and peripheral circuit architecture used in Sony's earlier IMX011CQ 2M-pixel CMOS sensor, which has been well received by the market. Thus these new devices achieve even higher resolution and the industry's highest level of picture quality.

- IMX018: Diagonal 6.47 mm (Type 1/2.8) 3.22M effective pixels
- IMX019: Diagonal 5.16 mm (Type 1/3.5) 2.07M effective pixels
- High picture quality CMOS sensors for cellular phones
- Built-in 10-bit A/D converters
- Extensive set of solutions

■ Achieving Higher Pixel Counts and High Picture Quality at the Same Time

At the same time as the calls for higher pixel counts and improved picture quality in cellular phone cameras, there are also strong desires for even further miniaturization in the camera modules. Thus reducing the pixel size is required at the same time as increasing the pixel count. However, simply making the pixels smaller would significantly degrade the basic characteristics of the pixels.

We developed a new 2.5 μm unit pixel for the IMX018 and IMX019. Although the area of a single pixel has been reduced to about 73% of that of the earlier IMX011CQ, in the pixel layout structure developed for these devices, we succeeded in increasing both the sensor aperture area and the ratio of the photodiode area. As a result, we were able to assure the maintenance of the basic pixel characteristics, such as the sensitivity and the saturation signal level. It is not, however, possible to completely eliminate the loss in sensitivity due to the reduction in the pixel area. Furthermore, we reduced both the random noise and the fixed pattern noise that appear in images by improvements to the pixel process technologies and peripheral circuit technologies. By thus increasing the overall signal-to-noise ratio characteristics, we achieved high picture quality in these devices.

characteristics of the peripheral circuits and achieved an even smaller chip size through a compact layout design. As a result, even though the IMX018 has an optical size larger than that of the IMX011CQ, it has a smaller overall chip size. (See figure 1.)

■ Extensive Set of Solutions

To respond to our customer's diverse needs, we provide these products in the following forms.

IMX018:

- Independent sensor
- IU018 series (lens module*1)
- MCB880 series (camera module*2)

IMX019:

- Independent sensor
- IU019 series (lens module*1)

These lens and camera modules allow the sensors to be used under optimal optical conditions.

*1: Sensor + optical system

*2: Sensor + camera DSP + optical system

V O I C E

The main difficulty in designing the CMOS sensors used in cellular phones lies in achieving good picture quality while reducing the pixel size.

I strongly recommend that you try the Sony IMX018 and IMX019; they will completely overturn everything you thought you knew about cellular phone cameras.

Sony is committed to maintaining its lead in CMOS sensor picture quality.

Tables 1 and 2 present the device structure and the imaging characteristics of the IMX018 and IMX019 CMOS sensors.

■ Reducing the Chip Size

The IMX018 and IMX019 inherit the proven column QV amplifier architecture used in the IMX011CQ.

Based on our accumulated know-how, in the design phase we both improved the

IMX011CQ (2.925 μm , 2M pixels): gain = 0 dB



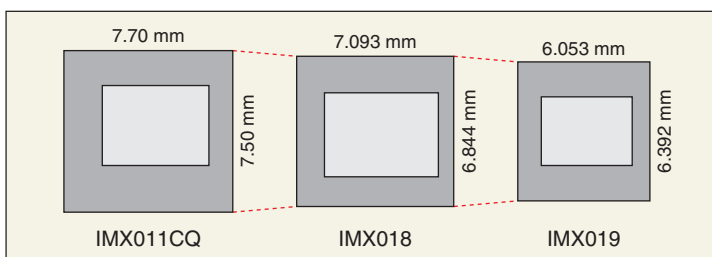
IMX018 (2.5 μm , 3M pixels): gain = 8.1 dB



■ Photograph 1 Imaging Examples (400 lx, 1/15 s accumulation)

■ Table 1 Device Structure

Item	IMX018	IMX019
Image size	Diagonal 6.47 mm (Type 1/2.8)	Diagonal 5.16 mm (Type 1/3.5)
Format	4:3	←
Fabrication process	1-poly 3-metal 0.18 μm CMOS	←
Output format	Progressive scan, digital, 10 bits	←
Interface	3-wire serial	←
Total number of pixels	Approx. 3.25M (2072H \times 1568V)	Approx. 2.10M (1656H \times 1268V)
Number of effective pixels	Approx. 3.22M (2072H \times 1552V)	Approx. 2.07M (1656H \times 1249V)
Number of active pixels	Approx. 3.19M (2064H \times 1544V)	Approx. 2.05M (1648H \times 1241V)
Unit cell size	2.5 μm (H) \times 2.5 μm (V)	←
Optical black	Horizontal	Front: 0 pixels, rear: 0 pixels
	Vertical	Front: 16 pixels, rear: 0 pixels
Horizontal drive frequency	42.0 MHz	39.0 MHz
Power supply specifications	Analog	2.7 V
	Digital	1.8 V
	Digital interface	1.8 V or 2.7 V
PGA	23.7 dB (Max.)	←



■ Figure 1 Chip Size Comparison

■ Table 2 Imaging Characteristics

Item	IMX018	IMX019	Remarks
Sensitivity (F5.6)	127 mV	127 mV	3200K, 706 cd/m ² , 1/30 s accumulation, G signal
Saturation signal	450 mV	450 mV	Ta = 60°C
Smear (F5.6)	None	None	
Frame rate	Progressive scan mode	10 frame/s	15 frame/s
	Vertical decimation by 1/2 mode	20 frame/s	30 frame/s
	Vertical decimation by 1/3 mode	30 frame/s	—