

Diagonal 9.10 mm (Type 1/1.8) 6.4M-Effective Pixel  
High-Speed High-Resolution CMOS Sensor for Consumer Products  
with Seamless Support for Both Still Image and Moving Image Capture

# IMX017CQE

Sony has now developed the IMX017CQE high-speed/high-resolution CMOS sensor that can output 6.4M-pixel images at 60 frame/s.

This sensor can also capture 6.4M-pixel high-resolution still images during moving images capture without interrupting the moving images capture. This allows it to implement seamless imaging in which the user has no need to be aware of the boundary between still and moving imaging. It furthermore supports 300 frame/s ultrahigh-speed imaging, making it possible for consumer cameras to capture moving images without missing any of the decisive moments that were previously impossible to capture. Image sensors have seen continuous progress in total pixel counts and, at the same time, in reduced feature sizes in the pixels. Now, by striving for higher speeds in addition to excellent picture quality, Sony is about to create a whole new market for image sensors.

- Diagonal 9.10 mm (Type 1/1.8) 6.4M effective pixels (2921H × 2184V)
- Pixel size: 2.5 μm unit pixel
- 12-bit column A/D converter readout
- Supports 60 frame/s transfer video capture and provides seamless transition between still and moving modes.
- High-speed output interface: 12-bit parallel LVDS with 432 MHz high-speed data rate
- Dual power supply drive (Analog: 3.0 V, Digital: 1.8 V)

In the IMX017CQE, Sony has achieved fast image acquisition and reproduction of high picture quality still images and moving images by skillfully combining the speed and integration characteristics of the CMOS sensor technology in the readout and other peripheral circuits.

## ■ Column A/D Converter Readout

The IMX017CQE integrates a separate A/D converter for each column, and performs A/D conversions in a column-parallel manner. This makes it possible to read out 6.4M pixels at the high speed of 60 frame/s. (See figure 1.)

The column-parallel A/D conversion method allows a much longer time to be

spent on each conversion compared to the earlier pixel-at-a-time conversion, and thus is a structure that is effective at reducing random noise in the system.

## ■ Increased Pixel Count and Improved High Picture Quality

To achieve high resolution and high sensitivity, Sony optimized the pixel process technology and the pixel layout and achieved a sensitivity of 4200e<sup>-</sup> (at 3200K, 706 cd/m<sup>2</sup>, and 1/30 s accumulation) in a 2.5 μm unit pixel size.

## ■ Extensive Set of Readout Modes

The IMX017CQE provides three basic readout modes: a 6.4M-pixel, 60 frame/s mode that outputs 10-bit data at a pixel rate of 432 MHz, a 2×2 addition mode that supports high picture quality moving images, and a 3×3 addition mode that supports the conventional SD mode.

In addition, it also provides a 12-bit output mode and is capable of producing 6.4M pixels 12-bit high-resolution images at 15 frame/s.

The IMX017CQE also features a vertical 1/5-line readout mode in which it is capable of 300 frame/s moving imaging, and makes it possible to see instants that could not be captured previously. (See photograph 1.)

## ■ Seamless Mode Transitions

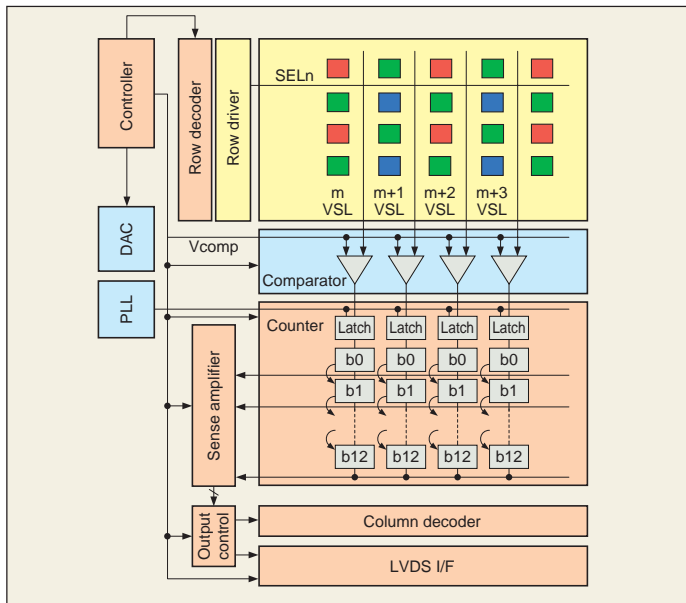
Invalid frames (i.e., drop frames) do not occur when switching from high picture quality moving image mode to still image mode, or in the reverse transition. Thus the IMX017CQE can capture 6.4M pixels high-resolution still images during moving image capture without interrupting the moving image capture.

## ■ Built-in Peripheral Circuits

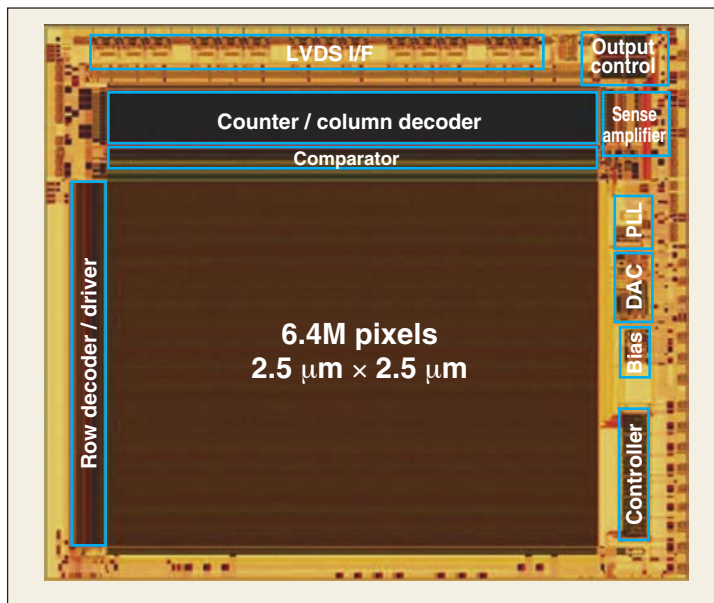
The IMX017CQE includes many of its peripheral circuits, including the horizontal and vertical drive circuits, a PLL circuit, an internal reference voltage generating circuit, and an LVDS interface.

## V O I C E

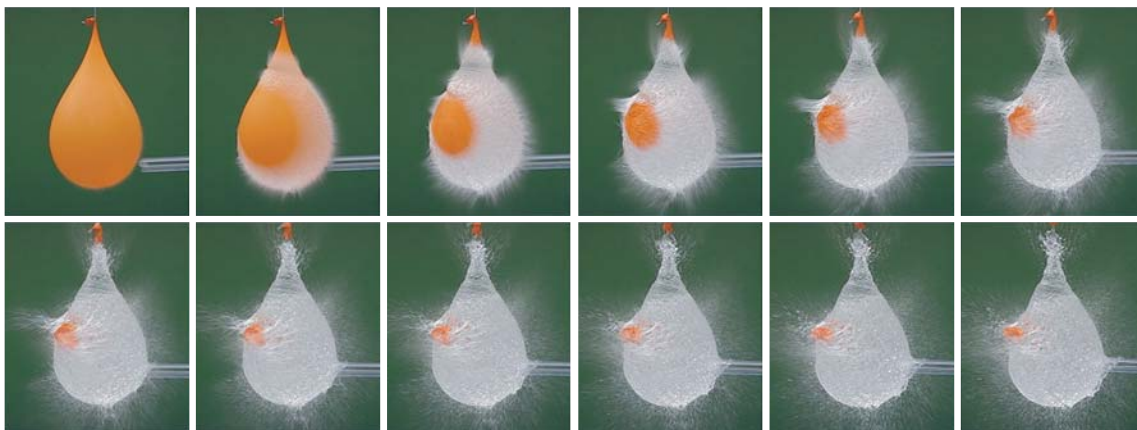
Although we ran into several difficulties due to the large number of new elements involved, the project team worked together as an integrated unit to resolve these issues. After that, all we had to do was to wait for mass production. I hope everyone will be able to experience the new world of digital imaging born from the fusion of still and moving imaging.



■ Figure 1 Column A/D Converter Readout Block Diagram



■ Figure 2 Chip Layout



■ Photograph 1 High-Speed Imaging (The instant a water balloon bursts)

■ Table 1 Device Structure

Item	IMX017CQE	
Image size	Diagonal 9.10 mm (Type 1/1.8)	
Format	4:3	
Fabrication process	0.18 μm, 1 poly, 3 metal	
Output format	Progressive scan 10-bit digital data (all pixels, 60 frame/s) 12-bit digital data (all pixels, 15 frame/s)	
Total number of pixels	Approx. 6.60M (2984H × 2212V)	
Number of effective pixels	Approx. 6.39M (2928H × 2184V)	
Number of active pixels	Approx. 6.35M (2916H × 2178V)	
Unit cell size	2.5 μm (H) × 2.5 μm (V)	
Optical black	Horizontal	Front: 48 pixels, rear: 8 pixels
	Vertical	Front: 24 pixels, rear: 4 pixels
Input clock frequency	54 MHz	

■ Table 2 Imaging Characteristics

Item	IMX017CQE	Remarks
Sensitivity (F5.6)	4200e- (typ.)	3200K, 706 cd/m <sup>2</sup> , 1/30 s accumulation, G signal
Saturation signal	10000e- (min.)	Ta = 60°C
Smear (F5.6)	None	

■ Table 3 Readout Modes

Mode	Recommended number of recording pixels	Frame rate (frame/s)	Output data rate [I/F] (MHz)	Number of bits (bit)	Remarks
Progressive scan	Approx. 6.22M (2880H × 2160V)	60	432 [216 MHz (DDR)]	10	For high picture quality video imaging
		15	108 [54 MHz (DDR)]	12	For high-resolution still photography
Horizontal and vertical 2/2-line readout	Approx. 1.56M (1440H × 1080V)	60	108 [54 MHz (DDR)]	10	
Horizontal and vertical 3/3-line readout	Approx. 0.69M (959H × 719V)	60	54 [27 MHz (DDR)]	10	
		30	27 [13.5 MHz (DDR)]	10	
Window clipping	Approx. 1.56M (1440H × 1080V)	60	108 [54 MHz (DDR)]	10	
Vertical 1/5-line readout	Approx. 1.24M (2880H × 432V)	300	432 [216 MHz (DDR)]	10	