

# IMX050CQK

## Diagonal 7.59 mm (Type 1/2.3) 10.34M-Effective Pixel High-Speed, High-Sensitivity Back-Illuminated CMOS Image Sensor for Consumer Digital Still Cameras



In June 2008, Sony announced the development of a back-illuminated CMOS image sensor and in January 2009 led the industry in announcing the first commercial release of a back-illuminated CMOS image sensor for digital video cameras.

Compared to current products, these devices achieve twice the sensitivity and make it possible to capture high-quality video even in low light.

Sony has now developed the IMX050CQK back-illuminated CMOS image sensor designed for digital still cameras. By adopting both existing high-speed CMOS image sensor technology and this new sensitivity improving technology, this new device allows digital still cameras not only to capture high picture quality still images in dark locations but also to take high-speed video that captures motion that couldn't even be seen.

- Diagonal 7.59 mm (Type 1/2.3) 10.34M-effective pixels (3720H × 2780V)

- Pixel size: 1.65 μm unit pixel

- Achieves the high-speed performance of 50 frame/s imaging with 10.34M pixels

- Back-illuminated structure that achieves both higher pixel counts and higher sensitivity

**Exmor R™**

\* "Exmor R" is a trademark of Sony Corporation. The "Exmor R" is a Sony's CMOS image sensor with significantly enhanced imaging characteristics including sensitivity and low noise by changing fundamental structure of "Exmor" pixel adopted column-parallel A/D converter to back-illuminated type.

### High-Speed Performance: 10.34M Pixels at 50 Frame/s

To achieve faster performance, Sony adopted the column-parallel A/D conversion method and high-speed process technologies in the IMX050CQK. By including a low-jitter PLL circuit using faster transistors and a 576 Mbps LVDS high-speed output interface, Sony achieved 50 frame/s in all-pixel scan mode. Sony also included a new LVDS inter-channel skew adjustment function (with a step size of about 50 ps) to implement a high-speed

interface connection with the camera system IC. This function allows the largest possible setup and hold times to be assured in each LVDS output channel.

### Back-Illuminated Pixels Achieve both Higher Pixel Counts and Higher Sensitivity

To achieve the higher resolution of 10.34M effective pixels, the IMX050CQK uses a 1.65 μm unit pixel. When reducing the unit pixel size, light collecting efficiency and increasing the saturation signal level become issues. To resolve these issues, Sony adopted a back-illuminated structure. This structure improves the light collecting efficiency. Sony also optimized the pixel drive to greatly increase the saturation signal. As a result, the IMX050CQK achieves imaging characteristics with a sensitivity of 1262 digits and a saturation signal level of 2721 digits. This corresponds to a sensitivity twice that of current products. (See table 2.)

### Readout Modes that Respond to a Variety of Needs

The IMX050CQK provides a variety of readout modes to make high-speed imaging possible so that the critical moment is never lost, and to overlay multiple images to achieve low-noise still imaging. It also provides a readout mode (mode 1) that supports HDTV video (1440 × 1080) and readout modes (modes 2 to 5) that support high-speed video

at frame rates of 60 frame/s and higher. (See table 3.)

### New Miniature Package Developed to Respond to End Product Needs

The IMX050CQK is provided in a package with a package area reduced by over 30% from that of current products to support further miniaturization in digital still cameras. This contributes to slim and compact end product designs. (See figure 1.)

### Camera System IC Achieves Improved Performance

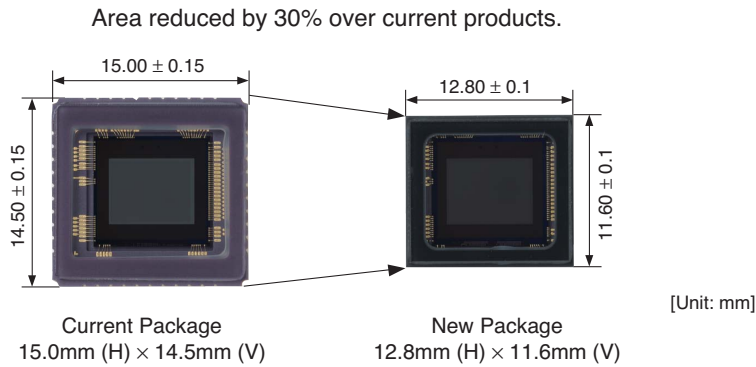
Sony has also developed the CXD4122GG\*<sup>1</sup> camera system IC that can be used with the IMX050CQK. Together, these two products mean that Sony provides the best solution for high-speed imaging system implementation.

\*<sup>1</sup> The CXD4122GG is also introduced in the New Products section in this issue.

## V O I C E

We developed the IMX050CQK with the idea of making high-resolution high picture quality imaging possible. I strongly recommend that you try out Sony's high-speed and high-sensitivity technologies that make not only nighttime, indoor, and flashless photography possible, but that also support both HD and high-speed video.

**Figure 1** New Miniature Package



**Table 1** Device Structure

Item	IMX050CQK	
Image size	Diagonal 7.59 mm (Type 1/2.3)	
Format	4:3	
Fabrication process	1-poly 4-metal 0.14 μm back-illuminated CMOS	
Output format	Digital 10/12-bit 10 ch Sub-LVDS, 480 Mbps/576 Mbps serial output	
Total number of pixels	Approx. 10.62M pixels (3816H × 2784V)	
Number of effective pixels	Approx. 10.34M pixels (3720H × 2780V)	
Number of active pixels	Approx. 10.18M pixels (3672H × 2772V)	
Unit cell size	1.65μm (H) × 1.65μm (V)	
Optical black	Horizontal	Front: 48 pixels, rear: 0 pixels
	Vertical	Front: 4 pixels, rear: 0 pixels
Power supply specifications	Analog	2.7 V
	Digital	1.8 V
	I/O	1.8 V
PGA	18/24 dB	
Input clock frequency	60/72 MHz	

**Table 2** Image Sensor Characteristics

Item	IMX050CQK	Remarks
Sensitivity (F5.6)	1262 digits (Typ.)	1/30 s accumulation, G signal
Saturation signal	2721 digits (Min.)	Ta = 60°C
S/N ratio	7.5 dB (Typ.)	About 2.37 times that for current sensors with the same pixel size

**Table 3** Readout Modes (Output Data Rate)

Drive mode	Number of recommended recording pixels	576 MHz		480 MHz	
		Frame rate [frame/s]	Number of A/D conversion bits [bit]	Frame rate [frame/s]	Number of A/D conversion bits [bit]
All-pixel scan (12 bits)	Approx. 9.98M pixels (3648H × 2736V)	19.98	12	14.98	12
All-pixel scan (10 bits)	Approx. 9.98M pixels (3648H × 2736V)	49.95	10	39.96	10
Mode 1	Approx. 2.50M pixels (1824H × 1368V)	59.94	10	29.97	10
Mode 2	Approx. 1.11M pixels (1216H × 912V)	59.94	10	59.94	9
Mode 3	Approx. 1.11M pixels (1216H × 912V)	119.88	10	59.94	10
Mode 4	Approx. 420K pixels (1216H × 342V)	239.76	9	239.76	9
Mode 5	Approx. 220K pixels (1216H × 178V)	479.52	9	419.58	9