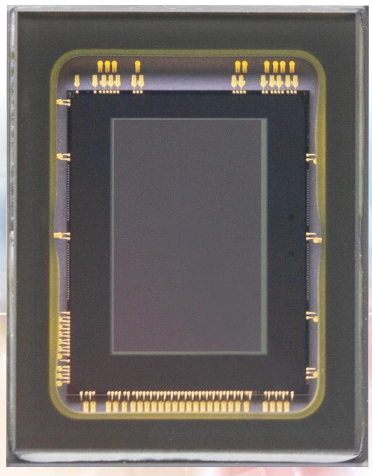
SONY

IMX178LQJ

Diagonal 8.92 mm (Type 1/1.8) 6.44M-Effective Pixel Color CMOS Image Sensor



Back-illuminated Structure CMOS Image Sensor for Security Cameras and Industrial Applications Achieves High Sensitivity and High Dynamic Range

Sony developed back-illuminated structure CMOS image sensor, "IMX178LQJ", supporting three formats of 4:3, 5:4, and 16:9 ratio with type 1/2 in 5M-Effective pixel. Adopting back-illuminated structure with 2.4 µm unit pixel and 14 bit ADC, it provides all three advantages of high resolution, high sensitivity, and high dynamic range, which are necessary for security cameras.

- Back-illuminated structure 2.4 µm unit pixel
- 10 bit/12 bit/14 bit A/D converters
- Supporting type 1/2 5M effective pixels in 3 formats
- HLP (High Light Performance) mode
- LLP (Low Light Performance) mode
- Pin compatible with the existing product "IMX185LQJ"*1

*1: For details on the IMX185LQJ, see the New Products section of this volume.

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 ExmorTM pixel adopted column parallel A/D converter to back-illuminated type.

STARVIS

*STARVIS is a trademark of Sony Corporation. The STARVIS is back-illuminated pixel technology used in CMOS image sensors for surveillance camera applications. It features a sensitivity of 2000 mV or more per 1 µm^2 (color product, when imaging with a 706 cd/m2 light source, F5.6 in 1 s accumulation equivalent), and realizes high picture quality in the visible-light and near infrared light regions.

High Sensitivity

To achieve high sensitivity, which is one of the most important characteristics for security cameras, this time Sony developed back-illuminated structure 2.4 µm unit pixel and accomplished the equivalent sensitivity as the existing back-illuminated structure 2.8 µm unit pixel, "IMX136LQJ"*2. Also near infrared sensitivity was improved from the IMX136LQJ, which is equivalent to the IMX236LQJ*3, and it is suitable for Day/Night cameras and near infrared light LED used as auxiliary light.

*2: See the New Products section in CX-NEWS, Volume 68.
*3: For details on the IMX236LQJ, see the New Products section of this volume.

High Dynamic Range

Dynamic range is determined by the ratio of saturation signal and dark random noise. The IMX178LQJ featuring 14 bit ADC reduced quantization noise and also suppressed dark random noise. At the result, high dynamic range was achieved, which is equivalent to the existing 3.75 µm unit pixel, the IMX104LQJ*4. It enables clear image quality in light and dark areas even for the objects with high contrast.

*4: See the New Products section in CX-NEWS, Volume 68.

Image Format

The format for image size of security camera is typically 4:3, 5:4 for fisheye lens, or 16:9 for full HD. The IMX178LQJ supports all these three formats in 5M pixels high resolution. Also it secures high resolution as well as high sensitivity and high dynamic range at the same time, therefore the specification works best for high performance security cameras with type 1/2 lenses.

Compatibility with Existing Sony Products

The IMX178LQJ is pin compatible with the 3.75 µm unit pixel full HD image sensor, the ICX185LQJ, supporting type 1/2 lenses. If you are using the IMX185LQJ, please do not miss the chance to try the performance of the IMX178LQJ.

＜Photograph 1＞ All-pixel Scan, and 5M Pixels in Three Formats: 4:3, 5:4, and 16:9

Number of recommended recording pixels: All-pixel scan approx. 6.29M pixels (3:2), approx. 5.04M pixels (4:3), approx. 5.24M pixels (5:4), and approx. 5.31M pixels (16:9).

All-pixel scan
recommended recording
3072H × 2048V

5M 4:3
recommended recording
2592H × 1944V

5M 5:4
recommended recording
2560H × 2048V

5M 16:9
recommended recording
3072H × 1728V

＜Photograph 2＞ Sample Images

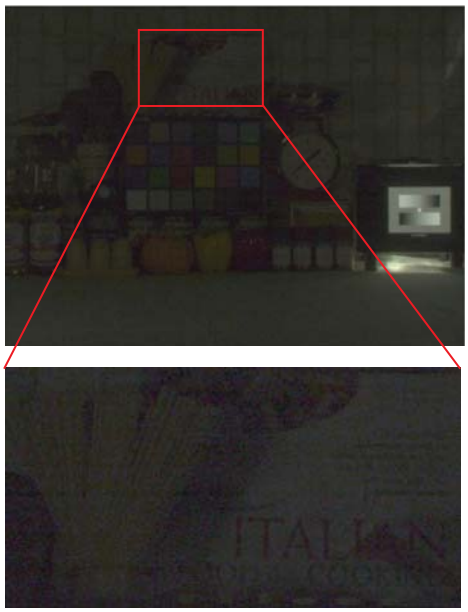
(recommended recording approx. 5.04M pixels, 4:3, ADC 12 bit mode, 59.94 frame/s)

1000 lx HLP mode internal gain 12 dB, F5.6

1 lx LLP mode internal gain 51 dB, F1.4

＜Photograph 3＞ High Dynamic Range Imaging

(recommended recording approx. 5.04M pixels, 4:3, 29.97 frame/s HLP mode, internal gain 0 dB, F5.6)



A/D conversion 12 bit mode

A/D conversion 14 bit mode

＜Table 1＞ Device Structure

Item		IMX178LQJ
image size		Diagonal 8.92 mm (Type 1/1.8) Approx. 6.38M pixels all-pixel scan Diagonal 7.83 mm (Type 1/2.0) Approx. 5.11M pixels 4:3 Diagonal 7.92 mm (Type 1/2.0) Approx. 5.32M pixels 5:4 Diagonal 8.51 mm (Type 1/1.9) Approx. 5.39M pixels 16:9
Transfer method		All-pixel scan
Number of effective pixels		3096 (H) × 2080 (V) Approx. 6.44M pixels
Unit cell size		2.4 µm (H) × 2.4 µm (V)
Optical blacks	Horizontal	Front:0 pixels, rear: 0 pixels
	Vertical	Front:14 pixels, rear: 0 pixels
Input drive frequency		54 MHz/27 MHz/74.25 MHz/37.125 MHz
Package		128-pin LGA
Supply voltage V_{DD} (Typ.)		2.9 V/1.8 V/1.2 V

＜Table 2＞ Image Sensor Characteristics

Item		IMX178LQJ	Remarks
sensitivity (F5.6)	Typ.	425 mV	1/30s accumulation
Saturation signal	Min.	945 mV	Tj = 60 °C

＜Table 3＞ Basic Drive Mode

Drive mode	Number of recommended recording pixels	ADC	
All-pixel scan	3072 (H) × 2048 (V) approx. 6.29M pixels	12 bit	29.97 frame/s
		14 bit	29.97 frame/s
5M 4:3	2592 (H) × 1944 (V) approx. 5.04M pixels	12 bit	59.94 frame/s
		14 bit	29.97 frame/s
5M 5:4	2560 (H) × 2048 (V) approx. 5.24M pixels	12 bit	59.94 frame/s
		14 bit	29.97 frame/s
5M 16:9	3072 (H) ×1728 (V) approx. 5.31M pixels	12 bit	60 frame/s
		14 bit	30 frame/s