



## IMX250LLR/LQR, IMX252LLR/LQR

### IMX250LLR/LQR

Diagonal 11.1 mm (Type 2/3) Approx. 5.07M-Effective Pixel Monochrome and Color CMOS Image Sensor

### IMX252LLR/LQR

Diagonal 8.9 mm (Type 1/1.8) Approx. 3.19M-Effective Pixel Monochrome and Color CMOS Image Sensor

### CMOS Image Sensors with a 3.45 $\mu\text{m}$ Pixel and Global Shutter Function for Industrial Applications

Industrial applications demand imaging of fast-moving subjects. However, there is the issue that existing CMOS image sensors are unable to accurately identify fast-moving subjects due to focal plane distortion as a result of rolling shutter operation. To address this issue, Sony has developed CMOS image sensors with a global shutter function and a 3.45  $\mu\text{m}$  pixel that is the smallest class in the industry. This small-sized 3.45  $\mu\text{m}$

pixel realizes higher sensitivity and lower noise than that of the existing 5.86  $\mu\text{m}$  pixel products, and achieves high picture quality, high resolution and high-speed imaging without focal plane distortion. In addition, these new CMOS image sensors are equipped with a variety of functions such as a trigger mode that arbitrarily controls the storage time using an external trigger signal, and ROI (region of interest) mode.

- Global shutter function
- The industry's smallest pixel size class for industrial applications (3.45  $\mu\text{m}$ )
- High sensitivity (1.1 times compared to the existing 5.86  $\mu\text{m}$  product)
- High frame rate
- A variety of functions (external trigger mode, ROI mode(maximum 64 locations), supports multiple frame set output, etc.)

#### Exmor

\* Exmor is a trademark of Sony Corporation. The Exmor is a version of Sony's high performance CMOS image sensor with high-speed processing, low noise and low power dissipation by using column-parallel A/D conversion.

#### Pregius

\* Pregius is a trademark of Sony Corporation. The Pregius is global shutter pixel technology for active pixel-type CMOS image sensors that use Sony's low-noise CCD structure, and realizes high picture quality.

### Global Shutter Function

Industrial applications require imaging of fast-moving subjects. However, there is the issue that existing CMOS image sensors are unable to accurately identify fast-moving subjects due to focal plane distortion as a result of rolling shutter

operation. The IMX250LLR/LQR and IMX252LLR/LQR address this issue by providing analog memory inside each pixel and realizing a global shutter function, which enables high-picture-quality imaging without focal plane distortion.

### The Industry's Smallest Pixel Size Class for Industrial Applications

Analog memory, transistors and other elements must be added to the inside of each pixel to realize a global shutter function, which made it a challenge to reduce the pixel size. The newly developed products use Sony's fine pixel fabrication

technology to realize a small pixel with a size of 3.45  $\mu\text{m}$  compared to the 5  $\mu\text{m}$  range that is the existing standard for global shutter pixels. This enables high-resolution imaging using a smaller lens than that of the existing products.

### High Sensitivity

In order to reduce the size of pixels equipped with a global shutter function, it is necessary to secure a sufficient pixel light-detecting area while also securing an analog memory area within the pixel, so there were concerns over a drop in sensitivity.

However, high-sensitivity pixel design technology and condensing process technology were used to increase the sensitivity of the newly developed 3.45  $\mu\text{m}$

pixel, and realized high sensitivity exceeding that of the existing 5.86  $\mu\text{m}$  product (1.1 times compared to the existing 5.86  $\mu\text{m}$  product).

In addition, EXview HAD CCD\*1 technology also increases sensitivity in the near-infrared range, enabling use with high picture quality even under near infrared light.

\*1: EXview HAD CCD is a trademark of Sony Corporation.

### High Frame Rate

Customers have strongly demanded higher frame rates for industrial applications, so an ADC 8-bit mode was added to the IMX250LLR/LQR and IMX252LLR/LQR in addition to the existing ADC 10-bit and 12-bit modes. Also, the column-parallel A/D conversion technology of Sony CMOS image sensors is used to realize

high-speed imaging of up to 163.4 [frame/s] (ADC 8-bit) for the IMX250LLR/LQR and up to 216.3 [frame/s] (ADC 8-bit) for the IMX252LLR/LQR (Table-3). This enabled further increasing the processing speed for industrial applications.

### A Variety of Functions

The IMX250LLR/LQR and IMX252LLR/LQR are equipped with a variety of functions needed for industrial applications, such as ROI mode and trigger mode. ROI mode crops arbitrary areas, and up to  $8 \times 8 = 64$  locations can be set. Various exposure methods are provided for trigger mode, which controls the exposure time using an external pulse. In addition, the IMX250LQR and IMX252LQR (color

products) are equipped with functions such as subsampling, horizontal and/or vertical inverted readout, and multiple frame set output, and the IMX250LLR and IMX252LLR (monochrome products) also have a pixel addition function in addition to color product functions.

<Photo 1>  
Global Shutter vs.  
Rolling Shutter



<Photo 2>  
Sample Images

Condition: 2000 lx F = 5.6  
(ADC 12 bit mode, 60 frame/s,  
internal gain 0 dB)



IMX250LQR (3.45 μm)



Existing product (5.86 μm)

<Photo 3>  
Sample Images  
(Near Infrared Light)

Condition: LED lighting of 850 nm  
wavelength  
F = 4.0 (ADC 12 bit mode, 60 frame/s,  
internal gain 0 dB)



IMX250LLR (3.45 μm)



Existing product (5.86 μm)

<Table 1> Device Structure

Item		IMX250LLR/LQR	IMX252LLR/LQR
Image size		Diagonal 11.1 mm (Type 2/3) progressive scan mode Diagonal 7.7 mm (Type 1/2.35) Full-HD mode	Diagonal 8.9 mm (Type 1/1.8) progressive scan mode Diagonal 7.7 mm (Type 1/2.35) Full-HD mode
Number of effective pixels		2464 (H) × 2056 (V) approx. 5.07M pixels	2064 (H) × 1544 (V) approx. 3.19M pixels
Unit cell size		3.45 μm (H) × 3.45 μm (V)	3.45 μm (H) × 3.45 μm (V)
Optical blacks	Horizontal	Front : 0 pixels, rear : 0 pixels	Front : 0 pixels, rear : 0 pixels
	Vertical	Front : 10 pixels, rear : 0 pixels	Front : 10 pixels, rear : 0 pixels
Input drive frequency		37.125 MHz / 54.0 MHz / 74.25 MHz	37.125 MHz / 54.0 MHz / 74.25 MHz
Package		226-pin LGA	226-pin LGA
Supply voltage V <sub>DD</sub> (Typ.)		3.3 V / 1.8 V / 1.2 V	3.3 V / 1.8 V / 1.2 V

<Table 2> Image Sensor Characteristics

Item		IMX250	IMX252	Remarks
sensitivity (black-and-white)	Typ.[F8]	915 mV	915 mV	3200 K, 706 cd/m <sup>2</sup> , 1/30s accumulation
Sensitivity (color)	Typ.[F5.6]	1146 mV	1146 mV	
Saturation signal	Min.	1001 mV	1001 mV	T <sub>j</sub> = 60 °C

<Table 3> Basic Drive Mode

Product name	Drive mode	Recommended number of recording pixels	ADC [bit]	Frame rate (Max.) [frame/s]
IMX250LLR/LQR	Progressive scan	2448 (H) × 2048 (V) approx. 5.01M pixels	12	89.5
			10	144.7
	Full-HD	1920 (H) × 1080 (V) approx. 2.07M pixels	8	163.4
			12	120.0
IMX252LLR/LQR	Progressive scan	2048 (H) × 1536 (V) approx. 3.15M pixels	12	118.5
			10	191.5
			8	216.2
	Full-HD	1920 (H) × 1080 (V) approx. 2.07M pixels	12	120.0
			10	120.0
			10	120.0