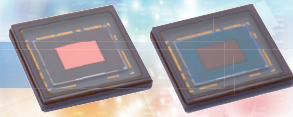


SONY

IMX273LLR/LQR



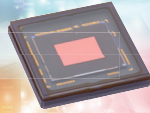
Diagonal 6.3 mm (Type 1/2.9) Approx.
1.58M-Effective Pixel Monochrome/Color
CMOS Image Sensor (Sub LVDS I/F)

IMX287LLR/LQR



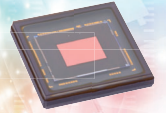
Diagonal 6.3 mm (Type 1/2.9) Approx.
0.4 M-Effective Pixel Monochrome/Color
CMOS Image Sensor (Sub LVDS I/F)

IMX296LLR



Diagonal 6.3 mm (Type 1/2.9) Approx.
1.58M-Effective Pixel Monochrome
CMOS Image Sensor (MIPI I/F)

IMX297LLR



Diagonal 6.3 mm (Type 1/2.9) Approx.
0.4 M-Effective Pixel Monochrome
CMOS Image Sensor (MIPI I/F)

CMOS Image Sensors with 3.45 μm and 6.9 μm Pixels and Global Shutter Function for Industrial and Sensing Applications

We have developed a new lineup of CMOS image sensors for industrial applications. This lineup includes optical size-type 1/2.9 CMOS image sensors with approximately 1.58M effective pixels that enable high resolution and high-speed imaging without distortion, and CMOS image sensors with approximately 0.4M effective pixels that achieve even higher resolu-

tion and higher-speed imaging by increasing the pixel size. The lineup includes monochrome products that use a MIPI interface (CSI-2-compliant) for sensing applications. All of the products in this lineup use the same package to ensure pin compatibility, enabling camera design using the same footprint pattern for the drive board.

- Global shutter function
- High frame rate
- A variety of functions (external trigger mode, multiple exposure function, ROI mode, multiple image sensor synchronization function, etc.)
- Compact device size (14 mm \times 14 mm)
- Expanded lineup (3.45 μm pixel and 6.9 μm pixel, Sub LVDS, MIPI interface (CSI-2-compliant), etc.)

Exmor

* Exmor is a registered trademark or trademark of Sony Group Corporation or its affiliates. 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 registered trademark or trademark of Sony Group Corporation or its affiliates. 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 (IMX273LLR/LQR, IMX287LLR/LQR, IMX296LLR, IMX297LLR)

Industrial applications require accurate imaging of fast-moving subjects, however conventional rolling shutter-type image sensors have problems properly capturing fast-moving subjects due to issues such as flash bands and distortion of the subject due to focal plane

phenomena. Equipped with a global shutter function, enables high-quality image capture that is not affected by focal plane distortion or flash bands (Photo-2).

High frame rate (IMX273LLR/LQR, IMX287LLR/LQR)

In response to the growing demand for higher frame rates for industrial applications, the column-parallel A/D conversion technology of Sony's CMOS image sensors was used to realize a frame rate of up to 226.5

frame/s (ADC 10-bit) for the IMX273LLR/LQR, and up to 436.9 frame/s (ADC 10-bit) for the IMX287LLR/LQR. This made it possible to further increase the processing speed for industrial applications.

High resolution (IMX273LLR/LQR, IMX296LLR)

These type 1/2.9 optical size CMOS image sensors equipped with a global shutter function have approximately 1.58M effective pixels. This results in a smaller pixel size compared to competing products, but these products also realize high picture quality (Photo-1). This

enables use for defect and scratch inspection processes that require higher resolution in addition to typical machine vision camera applications such as scanning barcodes and checking specific shapes.

High sensitivity (IMX287LLR/LQR, IMX297LLR)

Use of a 6.9 μm pixel size achieves sensitivity four times that of the IMX273LLR/LQR and IMX296LLR. This means that the same sensor output can be obtained even with a shorter shutter time, making it possible to

increase inspection speeds in factories. In addition, high sensitivity is achieved even in the near-infrared wavelength band that generally has low quantum efficiency, thereby realizing superior performance.

MIPI interface (CSI-2-compliant) (IMX296LLR, IMX297LLR)

Due to increasing sensing application demand, these products use a MIPI interface (CSI-2-compliant) as the output interface. This facilitates

diversion as a design platform for cellular device cameras and surveillance cameras, and helps to reduce product introduction cost.

A variety of functions (IMX273LLR/LQR, IMX287LLR/LQR, IMX296LLR, IMX297LLR)

These products are equipped with a variety of functions, such as trigger mode, that are needed for industrial application cameras. Various exposure methods are provided for Trigger mode, which controls the exposure time using an external pulse, such as Fast Trigger mode, which reduces the delay from trigger input until the start of exposure, Multi Exposure mode, and other modes. Regarding

functions that simultaneously control multiple cameras, in addition to conventional functions that use trigger input, an image sensor synchronization function has been newly introduced that uses sync signals output by the image sensor set as the master to control sensors set as slaves. Furthermore, the IMX273LLR/LQR supports ROI mode, which crops and outputs arbitrary areas in 4 (2 \times 2) locations.

<Photograph 1> Image sample Condition: 20 lx F 4.0 (ADC 10-bit mode, 30 frame/s, internal gain 18 dB)



IMX273
(3.75 μm pixels approx. 1.55M effective pixels)



Competing product A
(4.8 μm pixels approx. 1.31M effective pixels)



Competing product B
(4.5 μm pixels approx. 1.92M effective pixels)

<Photograph 2>
Global Shutter vs. Rolling Shutter



<Table 1> Device Structure

| Item | | IMX273LLR/LQR, IMX296LLR | IMX287LLR/LQR, IMX297LLR |
|--------------------------------|------------|---|---|
| Output image size | | Diagonal 6.3 mm (Type 1/2.9) progressive scan mode | Diagonal 6.3 mm (Type 1/2.9) progressive scan mode |
| Number of effective pixels | | 1456 (H) \times 1088 (V) approx. 1.58M pixels | 728 (H) \times 544 (V) approx. 0.4M pixels |
| Unit cell size | | 3.45 μm (H) \times 3.45 μm (V) | 6.9 μm (H) \times 6.9 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 |
| Output Interface | | Sub LVDS 8 ch (IMX273LLR/LQR) MIPI CSI-2 1lane (IMX296LLR) | Sub LVDS 4 ch (IMX287LLR/LQR) MIPI CSI-2 1lane (IMX297LLR) |
| Package | | 138-pin LGA | 138-pin LGA |
| Supply voltage V_{DD} (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 | | IMX273 | IMX287 | IMX296LLR | IMX297LLR | Remarks |
|--------------------------|-------------|---------|---------|-----------|-----------|---|
| Sensitivity (monochrome) | Typ. [F8] | 915 mV | 3660 mV | 915 mV | 3660 mV | 3200 K, 706 cd/m ² 1/30s accumulation |
| Sensitivity (color) | Typ. [F5.6] | 1146 mV | 4584 mV | — | — | |
| Saturation signal | Min. | 1001 mV | 2002 mV | 1001 mV | 2002 mV | $T_j = 60^\circ\text{C}$ |

<Table 3> Basic Drive Mode

| Product name | Drive mode | Recommended number of recording pixels | ADC [bit] | Frame rate (Max.) [frame/s] | |
|---------------|------------------|--|-----------|---|-------|
| IMX273LLR/LQR | Progressive scan | 1456 (H) \times 1088 (V) approx. 1.58M pixels | 12 | 165.9 | |
| | | | 10 | 226.5 | |
| | | | 8 | 276.0 | |
| IMX287LLR/LQR | | 728 (H) \times 544 (V) approx. 0.4M pixels | 12 | 319.9 | |
| | | | 10 | 436.9 | |
| | | | 8 | 523.5 | |
| IMX296LLR | | 1456 (H) \times 1088 (V) approx. 1.58M pixels | 10 | 60.3 | |
| IMX297LLR | | | | 728 (H) \times 544 (V) approx. 0.4M pixels | 120.8 |

