IMX036LQR, IMX036LLR

Diagonal 6.49 mm (Type 1/2.8) 3.27M-Effective Pixel CMOS Sensors for Industrial Applications Achieve a High Frame Rate and a High S/N Ratio

Sony is now adding the high frame rate, high signal-to-noise ratio IMX036LQR (color) and the IMX036LLR (B&W) sensors to their product line. These devices provide a resolution of 3.2M pixels and can provide a maximum frame rate of 60 frame/s (in 10-bit A/D conversion mode). These devices produce a full high-definition television output mode and also support 1080p HD at 60 frame/s. Furthermore, these devices adopt Sony's unique column-parallel A/D conversion method*1 to achieve a high signal-to-noise ratio. The IMX036LQR/LLR are pin compatible with the IMX035LQR*2/LLR and can be easily deployed in existing systems.

*1 CX-News Vol. 47.
*2 CX-News Vol. 56.

- Diagonal 6.49 mm (Type 1/2.8) 3.27M effective pixels
- High picture quality sensor for industrial applications
- Provides a 1080p HD output mode
- Switchable I/O interface
- Built-in 10- and 12-bit A/D converters

Exmor™

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

Achieves both a Higher Pixel Count and Superb Picture Quality

As is the case with consumer cameras, higher speeds, higher pixel counts, and especially the ability to provide HDTV output are now strongly desired in cameras for industrial applications. While the pixel size must be reduced to increase the sensor pixel count, simply making the pixels smaller will degrade the basic characteristics of the pixels.
Sony has now developed the IMX036LQR/LLR image sensors, which achieve higher picture quality despite the 2.5 µm diagonal unit pixel. Compared to the existing IMX035LQR, while the area per pixel has been reduced by 47%, Sony has succeeded in acquiring the same basic pixel characteristics, such as the sensitivity and saturation signal level, by improving the pixel layout and increasing the sensor aperture area.
Sony has also reduced the random noise and the fixed pattern noise by improving the pixel process technology and improving the peripheral circuit characteristics. Due to the improvements achieved in the overall signal-to-noise characteristics, these new sensors achieve improved picture quality in low-light imaging.

Full HD Support

In addition to a 3.2M-pixel all-pixel scan mode, the IMX036LQR also provides both a horizontal and vertical 2/2-line addition mode and a horizontal and vertical 3/3-line addition mode. (See table 3.) It also achieves full HD output at 60 frame/s with 10-bit A/D conversion when a 37.125 MHz clock is provided in 1080p HD mode and can provide a full high definition output without using a frame buffer or any other timing adjustment. In this mode, the optical size is equivalent to the Type 1/3 size.
These devices also include a 12-bit mode in which the A/D converter resolution is increased, and achieve full HD high-speed drive at a maximum of 30 frame/s. In addition, these devices include both a CMOS output system and a low-voltage LVDS output system that supports high-speed readout as readout interfaces. Users can select the readout interface appropriate for the application.

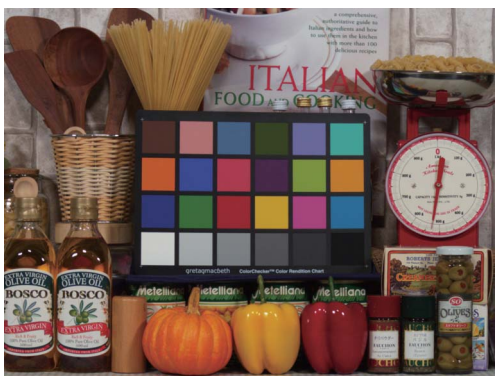
Lineup

Sony provides both a primary color filter version, the IMX036LQR, and a black-and-white version, the IMX036LLR. The IMX036LLR achieves a peak sensitivity value about twice that of the IMX036LQR.
Both are provided in packages that can withstand high-temperature reflow soldering (peak temperature: 240°C).
Furthermore, these devices are pin compatible with the IMX035LQR/LLR for easy end product lineup deployment in existing systems.

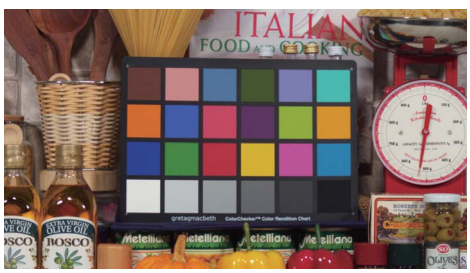
VOICE

The IMX036LQR/LLR sensors take advantage of the high-speed performance, which is a feature of Sony CMOS sensors, to achieve full HD support as industrial application sensors. With the cooperation of the related divisions, we increased the pixel sensitivity and reduced the peripheral circuit noise to create sensors that we are confident will be more than satisfactory. We strongly recommend that you take a close look at the images produced by these sensors to appreciate the high picture quality.

Photograph 1 Sample Images (2200 lx, 60 frame/s)



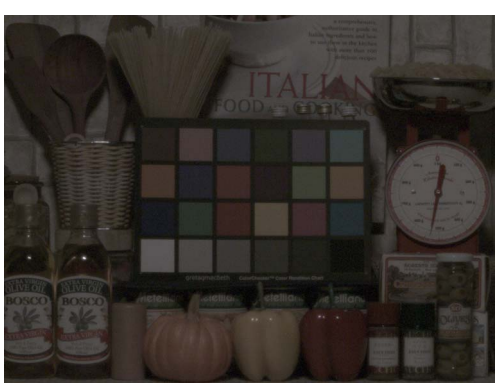
3.2M-pixel all-pixel scan mode (2048 × 1536), analog gain: 6 dB



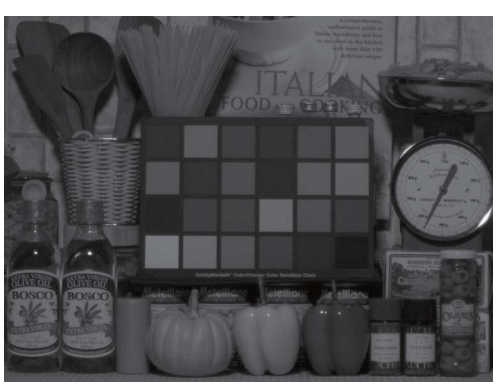
1080p HD mode*1 (1920 × 1080), analog gain: 6 dB

*1 Acquired with center cropping: the optical center is the same as in all-pixel scan mode.

Photograph 2 Sample Images (10 lx, 60 frame/s)



IMX036LQR analog gain: 24 dB



IMX036LLR analog gain: 24 dB

Table 1 Device Structure

Item		IMX036LQR/LLR
Image size		Diagonal 6.49 mm (Type 1/2.8)
Transfer method		All-pixel scan
Total number of pixels		Approx. 3.40M (2144H × 1588V)
Number of effective pixels		Approx. 3.27M (2096H × 1561V)
Chip size		7.96 mm (H) × 7.61 mm (V)
Unit cell size		2.5 µm (H) × 2.5 µm (V)
Optical black	Horizontal	Front: 48 pixels, rear: 0 pixels
	Vertical	Front: 24 pixels, rear: 3 pixels
Horizontal drive frequency		27 MHz or 54 MHz /37.125 MHz (1080p HD mode)
Package		LGA (152 pins)
Supply voltage V_{DD}/V_L (typ.)		2.7 V/1.8 V

Table 2 Image Sensor Characteristics

Item		IMX036LQR/LLR	Remarks
Sensitivity (F5.6 (LQR)/F8.0 (LLR))	Typ.	200 mV	3200K, 706 cd/m², 1/30 s accumulation
Saturation signal	Min.	400 mV	Ta = 60˚C

Table 3 Main Drive Modes

I/F	Drive mode	Frame rate	Data rate	A/D
Low-voltage LVDS (DDR)	All-pixel scan (QXGA)	60 frame/s	216 Mbps	10 bits
		15 frame/s	54 Mbps	12 bits
	1080p HD	60 frame/s	148.5 Mbps	10 bits
		30 frame/s	74.25 Mbps	12 bits
	2/2-line addition (XGA)*1	60 frame/s	54 Mbps	10 bits*2
	3/3-line addition (VGA)*1	60 frame/s	24 Mbps	10 bits*2
CMOS (SDR)	All-pixel scan (QXGA)	15 frame/s	54 Mbps	12 bits
	1080p HD	15 frame/s	37.125 Mbps	12 bits
	2/2-line addition (XGA)*1	60 frame/s	54 Mbps	10 bits*2
	3/3-line addition (VGA)*1	60 frame/s	24 Mbps	10 bits*2

*1 The addition drive modes are only supported by the IMX036LQR.
*2 The output is 12 bits.