

IMX136LQJ/LLJ

Diagonal 6.4 mm (Type 1/2.8) 2.38M-Effective Pixel Color and Black-and-White Full HD CMOS Image Sensor for Industrial Applications Achieves a High Frame Rate and a High S/N Ratio



The release of the IMX136LQJ (color) and the IMX136LLJ (black and white) CMOS image sensors brings a high frame rate, high signal-to-noise ratio and full HD to Sony's CMOS image sensor lineup for industrial applications. With the same diagonal $2.8\ \mu\text{m}$ square pixels as the IMX122LQJ*¹, it maintains the same high signal-to-noise ratio while capturing HD 1080p video at 120 frame/s.

A versatile interface means that the sensor can be tailored to different applications.

These new ICs are pin compatible with the HD capable IMX104LQJ*², which simplifies making additions to the lineup.

*1: See the New Products section in CX-NEWS, Volume 65.

*2: For details on the IMX104LQJ, see the New Products section of this volume.

- High frame rate (120 frame/s)
- Supporting HD 1080p and HD 720p modes
- Switchable I/O interface
- Built-in 10 and 12-bit A/D converters
- Multiple frame set output mode

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.

High Frame Rate and High Signal-to-Noise Ratio Characteristics

As the demand for the high resolution of full HD grows in the industrial field, there is an increasing demand for 60p output and high frame rates for functions that compose multiple frames.

These new ICs, the IMX136LQJ and the IMX136LLJ, that Sony are now releasing deliver 120 frame/s in 10-bit A/D conversion mode in the HD 1080p format and 60 frame/s in 12-bit A/D conversion mode.

To ensure both high speed and high signal-to-noise ratio, the pixel readout system and

circuits have been optimized to give them a signal-to-noise ratio that equals that of the IMX122LQJ.

A Variety of Operating Modes

In addition to the all 2.38M-pixel scan mode and HD 1080p/720p modes, the IMX136LQJ and the IMX136LLJ also provide a window cropping mode.

They also support the multiple frame set output mode to take better advantage of the high-speed frame rate. In this mode, separate exposure time and gain can be set in advance for 4 or 2 consecutive frames and sets of 4 or 2 frames can be set as a shooting condition to automatically output consecutive images. (See photograph 1.)

This mode can generate a picture with a wide dynamic range as a result of the combination of multiple frames.

Versatile Interface

The output interface has been expanded to include a high-speed low-voltage LVDS parallel output in addition to the existing CMOS parallel output.

For output of HD 1080p at up to 60 frame/s, a low-voltage LVDS serial 4-channel output (594 Mbps/channel) is provided.

Also the control interface has been modified to include a general-purpose I²C interface besides the existing 4-wire serial interface, which in combination with the output

interface provides customers with options to suit their operating conditions.

Since these new ICs are pin compatible with the IMX104LQJ, it is easy to use common designs.

Lineup

This development project adds the IMX136LQJ, a primary color filter model and the IMX136LLJ, a black-and-white model, to the lineup. (See photograph 2.)

The sensitivity of the black-and-white model (the IMX136LLJ) is 1.5 times greater than that of the color model (the IMX136LQJ). (See table 2.) For greater anti-flare characteristics, the shielding between pixels has been improved.

And both image sensors are provided in packages that can withstand high-temperature reflow soldering (peak temperature: 240°C).

V O I C E

With its high frame rate and high-speed features, the IMX136 maintains the picture quality required of a CMOS image sensor for industrial applications. We are convinced the united efforts of all project members have managed to develop two new products that will satisfy customer requirements. Customers are strongly recommended to take a closer look at the full HD world that IMX136 makes possible.

Photograph 1 Multiple Frame Set Output Example (4-frame sets: 120 frame/s drive)

Example of simultaneous photographs under low and high illumination(low exposure: 10 lx (right) and high exposure: 20000 lx (lower left))



First frame
(1/67500s accumulation)

Second frame
(8/67500s accumulation)

Third frame
(64/67500s accumulation)

Fourth frame
(512/67500s accumulation)

Photograph 2 Sample Images (HD 1080p, 12-bit A/D conversion mode, 60 frame/s)



1000 lx, 12 dB with built-in PGA at F5.6



1 lx, 42 dB with built-in PGA + 6 dB in rear end, at F1.4



1 lx, 42 dB with built-in PGA + 6 dB in rear end, at F1.4 (black and white model)

Table 1 Device Structure

Item	IMX136LQJ/LLJ	
Image size	Diagonal 6.23 mm (Type 1/2.9) (Full HD mode) Diagonal 6.40 mm (Type 1/2.8) (WUXGA mode)	
Transfer method	All-pixel scan	
Number of effective pixels	1944H × 1224V, approx. 2.38M pixels	
Chip size	8.50 mm (H) × 7.30 mm (V)	
Unit cell size	2.80 μm (H) × 2.80 μm (V)	
Optical blacks	Horizontal	Front: 4 pixels, rear: 0 pixels
	Vertical	Front: 12 pixels, rear: 0 pixels
Input drive frequency	54 MHz/27 MHz/37.125 MHz/74.25 MHz	
Package	94-pin LGA	
Supply voltage V _{DD} (typ.)	2.7 V/1.8 V/1.2 V	

Table 2 Image Sensor Characteristics

Item	IMX136LQJ	Remarks
Sensitivity (F5.6)	Typ. 425 mV*	3200K, 706 cd/m ² , 1/30s accumulation
Saturation signal	Min. 812 mV	T _j = 60°C

* The sensitivity of the IMX136LLJ is 1.5 times larger.

Table 3 Basic Drive Mode (at low voltage LVDS parallel output)

Drive mode	Number of effective pixels	ADC	Frame rate (Max.)
All-pixel scan	1944H × 1224V Approx. 2.38M pixels	10 bits	108 frame/s
		12 bits	54 frame/s
HD1080p	1944H × 1104V Approx. 2.14M pixels	10 bits	120 frame/s
		12 bits	60 frame/s
HD720p	1304H × 732V Approx. 0.95M pixels	10 bits	120 frame/s
		12 bits	60 frame/s