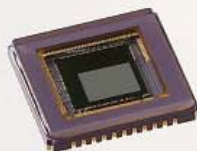


IMX035LQR

Diagonal 6.08 mm (Type 1/3) 1.39M-Effective Pixel Color CMOS Sensor for Industrial Applications Achieves a High Frame Rate and a High S/N Ratio



Sony has now developed the IMX035LQR CMOS sensor for industrial applications, a device that achieves both a high frame rate and a high signal-to-noise ratio.

The IMX035LQR provides the resolution of a 1.3M-pixel sensor and can produce a maximum frame rate of 120 frame/s (in 10-bit A/D conversion mode). Using pixel technologies fostered in Sony's CCD development work, the IMX035LQR achieves high signal-to-noise ratio and high sensitivity characteristics that are not available in existing industrial CMOS sensors.

Sony has also developed a black-and-white version (IMX035LLR) in the same package and a package variant color product (IMX035LQZ) at the same time.

- High sensitivity (460 mV typ.)
- High signal-to-noise ratio (+3 dB compared to existing Sony products)
- Extensive set of drive modes
- 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.

High Sensitivity and Signal-to-Noise Ratio Characteristics

To achieve a high signal-to-noise ratio in the IMX035LQR, Sony adopted their unique column-parallel A/D conversion method*¹ in this device. This technology is highly respected since it aims at reducing circuit noise and furthermore achieving high sensitivity even during high-speed operation using the sensitivity increasing pixel technologies developed in Sony's work on CCDs.

Compared to Sony's existing IMX012, the IMX035LQR achieves a sensitivity 1.5 or more times higher at an operating frame rate of 30 frame/s (Ta = 60°C). This makes it

possible to image subjects in low light using a lower gain setting, and even when the gain is increased, noise is suppressed. As a result, this device produces high signal-to-noise ratio video.

*1: See the Featuring article in Sony CX-News Vol.47.

Extensive Set of Drive Modes

In addition to the all 1.3M-pixel scan mode, the IMX035LQR also provides a horizontal and vertical 2/2-line addition mode, a vertical 1/2 elimination mode, and a window cropping mode. Furthermore, Sony has newly added an HD720p mode that supports 720p high-definition TV readout. Thus the IMX035LQR provides the functions required to support a wide range of user needs as a high-speed CMOS sensor for industrial applications.

I/O Interface Switching Function

The IMX035LQR adopts a low-voltage LVDS 1-port DDR output method for small-signal data output, and thus achieves both high frame rate readout and low I/O noise levels. This device's high frame rate readout mode can acquire video images at up to 120 frame/s (in 10-bit A/D conversion mode) in all 1.3M-pixel scan mode. The IMX035LQR also provides a CMOS 1-port SDR output for the all 1.3M-pixel scan mode at 30 frame/s. This mode can be selected according to the application or mounting conditions. Other features include internal A/D converters

that can be switched between 10 and 12-bit operation so that customers can select the desired A/D converter bit depth.

IMX035LLR and IMX035LQZ

Sony has developed two other related products: the IMX035LLR (a black-and-white device) that includes a black filter (functions as a mask) and achieves a peak sensitivity value about twice that of the IMX035LQR, and the IMX035LQZ (a color device) that adopts the QFN package for easier mounting.

All three products are provided in packages that can withstand high-temperature reflow soldering (peak temperature: 260°C).

VOICE

In developing the IMX035, our group consisted of designers from several related divisions and it was a pleasure to proceed with this development while sharing our various experiences and specialized areas of expertise. While there were several issues to be solved, including signal-to-noise ratio and sensitivity characteristics under low ambient light levels and high-speed operation, we took the time to solve these one at a time and as a result created a product that will respond to our customers' desires. We strongly recommend that you take a look at the images produced by this device.

Photograph 1 Sample Images (1.3M-pixel images at 120 frame/s)



2500lx, Gain Analog 6 dB



10lx, Gain Analog 18 dB, Gain Digital 6 dB

Table 1 Device Structure Comparison

Item		IMX035	IMX012	ICX445
Image size		Diagonal 6.08 mm (Type 1/3)	Diagonal 4.74 mm (Type 1/3.8)	Diagonal 6.0 mm (Type 1/3)
Transfer method		All-pixel	All-pixel	Interline
Total number of pixels		Approx. 1.49M (1384H × 1076V)	Approx. 1.33M (1304H × 1017V)	Approx. 1.32M (1348H × 976V)
Number of effective pixels		Approx. 1.39M (1329H × 1049V)	Approx. 1.28M (1296H × 985V)	Approx. 1.25M (1296H × 966V)
Chip size		7.64 mm (H) × 7.64 mm (V)	6.452 mm (H) × 6.402 mm (V)	6.26 mm (H) × 5.01 mm (V)
Unit cell size		3.63 μm (H) × 3.63 μm (V)	2.925 μm (H) × 2.925 μm (V)	3.75 μm (H) × 3.75 μm (V)
Optical black	Horizontal	Front: 44 pixels, rear: 7 pixels	Front: 8 pixels, rear: 0 pixels	Front: 12 pixels, rear: 40 pixels
	Vertical	Front: 24 pixels, rear: 3 pixels	Front: 16 pixels, rear: 16 pixels	Front: 8 pixels, rear: 2 pixels
Number of dummy bits	Horizontal	Front: 4 pixels, rear: 0 pixels	Front: 0 pixels, rear: 74 pixels	Front: 4 pixels
	Vertical	Front: 0 pixels, rear: 0 pixels	Front: 36 pixels, rear: 13 pixels	Front: 2 pixels
Horizontal drive frequency		54 MHz	50 MHz/27 MHz	36 MHz (NTSC) 29 MHz (PAL)
Package		LGA (152 pins)/QFN (46 pins)	QFN (44 pins)	DIP (24 pins)
Supply voltages V _{DD} /V _L (typ.)		3.0 V/1.8 V	2.7 V/1.8 V	15 V/-8.5 V/3.6 V

Table 2 Image Sensor Characteristics

Item		IMX035	IMX012	ICX445	Remarks
Sensitivity (F5.6)	Typ.	460mV	290mV	460mV	3200K, 706 cd/m ²
Saturation signal	Min.	830mV	550mV	350mV	T _a = 60°C