SONY

# IMX124LQT

Diagonal 6.46 mm (Type 1/2.8) 3.21M-Effective Pixel Color CMOS Image Sensor

## Back-Illuminated CMOS Image Sensor with Newly Developed Pixel for Industrial Applications

Sony developed approximately 3.21M-effective pixel back-illuminated CMOS image sensor, "IMX124LQT", achieved full HD output support, and improved low light performance for industrial applications.
This time 2.5 µm unit pixel with back-illuminated structure was renewed for industrial applications, and the low light performance drastically improved. The sensitivity improved approximately 2.7 times compared with the existing front-illuminated structure 2.5 µm unit pixel, the IMX036LQR*1.

※1: See the New Products section in CX-NEWS, Volume 58.

- Back-illuminated structure with 2.5 µm unit pixel
- High sensitivity (2.7 times compared with the existing structure product)
- Supporting full HD 1080p mode
- 12 bit A/D converters in 0.1 dB steps setting
- Multiple frame set output mode

Exmor R

*Exmor R is a trademark of Sony Corporation. The Exmor R is a Sony's CMOS image sensor with significantly enhanced imaging characteristics including sensitivity and low noise by changing fundamental structure of ExmorTM pixel adopted column parallel A/D converter to back-illuminated type.

STARVIS

*STARVIS is a trademark of Sony Corporation. The STARVIS is back-illuminated pixel technology for CMOS image sensors for surveillance camera applications. It features a sensitivity of 2000 mV or more per 1 µm2 (color product, when imaging with a 706 cd/m2 light source, F5.6 in 1 s accumulation equivalent), and realizes high picture quality in the visible-light and near infrared light regions.

## Newly Developed High Sensitivity Pixel

High sensitivity is one of the most demanded characteristics for industrial applications cameras. 2.5 µm unit pixel with back-illuminated structure has been developed for the first time for industrial applications, and the sensitivity increased to a large extent compared with the existing structure product. (See photograph 1.) Besides, it realizes better sensitivity both in the visible region and the near infrared region comparing with the IMX236LQJ*2, which has front-illuminated 2.8 µm unit pixel structure and improved the near infrared sensitivity.

*2: See the New Products Information released in September, 2013.

## Low Light Performance

One of the characteristics of back-illuminated structure is better sensitivity due to effective light collection without the wiring layer between the on-chip lens and the photodiode.
For the purposes including security cameras, the cameras are mostly installed in dark locations at lower F-numbers. In that case, the incident light falls on the sensor at a sharp angle, and the wiring layer between the on-chip lens and the photodiode makes a big difference for the amount of light reaching on the photodiode.
The IMX124LQT with the back-illuminated structure opens the diaphragm up to F1.2 based on the sensitivity value F5.6, and it collects approximately 1.7 times amount of light compared with the IMX036LQR with the existing structure. The light collection is more effective as shown in graph 1.
This makes a significant component for the cameras installed in low light environment.

## Convenient Sensor

The interface includes low-voltage LVDS serial output used in the IMX236LQJ or IMX178LQJ*3. It is also equipped with the control functions such as I2C, 4-wire serial, master drive, or slave drive, which are same control functions of CMOS image sensors for the existing industrial applications, which makes the connections easier.
And the amplifier built in the IMX124LQT is able to set the gain in 0.1 dB steps up to 51 dB at the maximum, so the sensor makes possible to set fine gain control.
Furthermore, in multiple frame output, separate setting of exposure time and gain for the combined frame can be set at the same time. This function combined with rear-end signal processing is able to produce wider dynamic range images.

*3 See the New Products Information released in September, 2013.

## ＜Photograph 1＞ Comparisons with the Existing Sony Product

Condition 1: 2000 lx F5.6 (QXGA image 60 frame/s)

IMX036LQR (the existing 3M product)
Internal gain 0 dB/ADC 10 bit mode

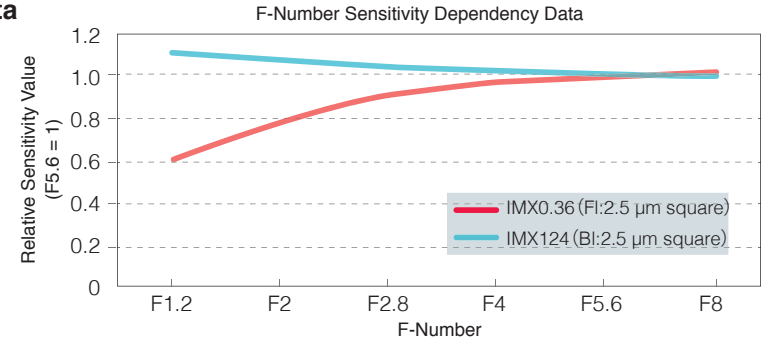
IMX124LQT (the new product)
Internal gain 0 dB/ADC 12 bit mode

IMX036LQR (the existing 3M product)
Internal gain 42 dB/ADC 10 bit mode

IMX124LQT (the new product)
Internal gain 51 dB/ADC 12 bit mode

## ＜Graph 1＞F-Number Sensitivity Dependent Data

*This graph shows relative sensitivity against the ideal output value for the diaphragm. The output value is 1 at F5.6.




### ＜Table 1＞ Device Structure

| Item | | IMX124LQT |
|---|---|---|
| Image size | | Diagonal 6.46 mm (Type 1/2.8) (QXGA mode)<br>Diagonal 5.56 mm (Type 1/3.2) (Full HD mode) |
| Number of effective pixels | | 2065 (H) × 1553 (V) approx. 3.21M pixels |
| Unit cell size | | 2.50 µm (H) × 2.50 µm (V) |
| Optical blacks | Horizontal | Front: 0 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 | | 98-pin LGA |
| Supply voltage $V_{DD}$ (Typ.) | | 2.8 V / 1.8 V / 1.2 V |

### ＜Table 2＞ Image Sensor Characteristics

| Item | | Value | Remarks |
|---|---|---|---|
| G sensitivity (F5.6) | Typ. | 540 mV | 1/30s accumulation |
| Saturation signal | Min. | 812 mV | Tj = 60 °C |

### ＜Table 3＞ Basic Drive Mode

| Drive mode | Interface | ADC | Frame rate (Max.) | Bit rate (Max.) |
|---|---|---|---|---|
| QXGA | Low voltage LVDS serial 4 ch | 12 bit | 60 frame/s | 648 Mbps/ch |
| | Low voltage LVDS serial 2 ch | 12 bit | 30 frame/s | 648 Mbps/ch |
| Full HD | Low voltage LVDS serial 4 ch | 12 bit | 60 frame/s | 594 Mbps/ch |
| | Low voltage LVDS serial 2 ch | 12 bit | 30 frame/s | 594 Mbps/ch |