

High-Resolution Diagonal 8.98 mm (Type 1/1.8)
Digital Still Camera CCD Features 3.98M Pixels

ICX406AQ (primary color, DIP) ICX406AQF (primary color, SOP)

Due to the increasing popularity of digital still cameras the demand for high-resolution prints is growing stronger. To respond to this demand, Sony has developed the ICX406AQ/AQF diagonal 8.98 mm (Type 1/1.8) 3.98M-pixel interlaced CCD.

In addition to providing high resolution with an effective pixel count of 3.98M pixels, the ICX406 Series devices also achieve high sensitivity.

These devices also provide a high frame rate readout mode, AF modes, and other functions to improve the feedback speed to the AE/AF control systems and for realizing angle of view verification in an LCD finder.

- **High resolution**
Effective pixels: 3.98M pixels (2312H × 1720V)
- **High sensitivity: 220 mV (G signal)**
- **High frame rate readout mode (30 frame/s)**
- **AF modes (60 frame/s, 120 frame/s)**

The ICX406AQ/AQF is a diagonal 8.98 mm (Type 1/1.8) 3.98M-pixel CCD image sensor developed for high-resolution digital still cameras. This device provides high-resolution image capturing when used in conjunction with a mechanical shutter. Table 1 presents the device structure of the ICX406 Series devices.

■ High Resolution

By developing a 3.125 μm square unit pixel, Sony was able to achieve 3.98M effective pixels (2312H × 1720V) in a diagonal 8.98 mm (Type 1/1.8) device. This achieves a resolution of approximately 1,300 TV lines in both the horizontal and vertical directions. (See photograph 1.)

■ High Sensitivity

These devices feature improved collimation by the fine fabrication of on-chip microlenses with an optimized shape. Despite miniaturization of the unit pixel, these devices achieve a sensitivity of 220 mV (green signal). (See table 2.)

■ High Frame Rate Readout Mode and AF Modes

In addition to high frame rate readout mode, which is effective for realizing angle of view verification in real time using the LCD finder and for acquiring the data used for AE/AF and other control operations, these devices also provide even higher speed AF modes. By discarding part of the effective 215 lines of data provided by high frame rate readout mode, AF mode can output 60 frames per second in AF mode 1 and 120 frames per second in AF mode 2. Use of these AF modes can make feed-

back to the AF control system even faster.

■ System IC

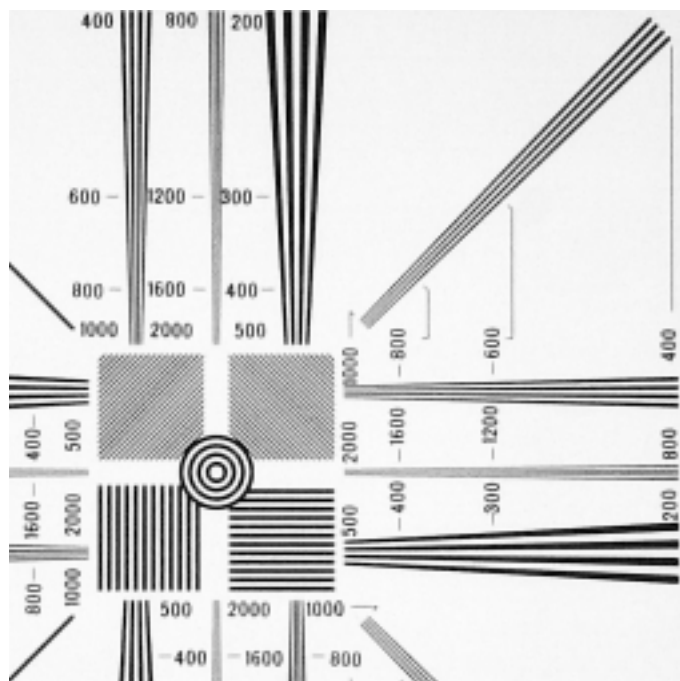
In addition to the CXD3605R built-in vertical driver timing generator IC, Sony also provides the CXD3408GA, which integrates timing generator, CDS, PGA, and A/D converter functions on a single chip. Since the CXD3408GA is provided in the ultrasmall CSP (Chip Scale Package), it can radically reduce both mounting area and footprint, and can contribute to digital still camera miniaturization. (See figure 2.)

V O I C E

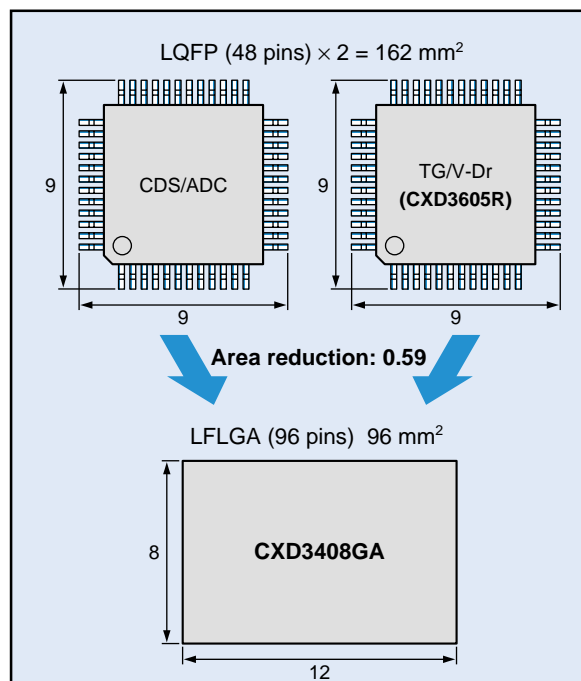
Sony has now developed a 4.0 M-pixel CCD to respond to the unrelenting demands for increased pixel counts. Using this newly-developed CCD provides even higher resolution and achieves image quality even closer to that of conventional photographs. I am confident that users of this device will be fully satisfied, and strongly recommend that you look into it for your camera products.



New Products

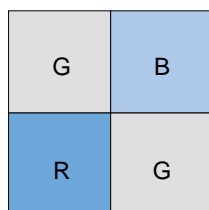


■ Photograph 1 Resolution Chart



■ Figure 2 System IC Mounting Area Comparison

Primary color filters



■ Figure 1 Color Filter Arrangement

■ Table 1 Device Structure

Item	ICX406AQ/AQF
Image size	Diagonal 8.98 mm (Type 1/1.8)
Transfer method	Frame readout interline transfer method
Total number of pixels	Approx. 4.13 M (2384H × 1734V)
Number of effective pixels	Approx. 3.98 M (2312H × 1720V)
Number of recommended recording pixels	Approx. 3.87 M (2272H × 1704V), aspect ratio: 4:3
Unit cell size	3.125 μm (H) × 3.125 μm (V), square pixels
Horizontal drive frequency	18.0 MHz
Package	20-pin plastic DIP/SOP, lead pitch: 1.27 mm
Package dimensions	13.8 mm (H) × 12.0 mm (V) × 2.9 mm (t) (Not including the leads)

■ Table 2 Image Sensor Characteristics

Item	Typical values	Remarks
Sensitivity	220 mV (G signal)	3200K, 706 cd/m ² , F5.6, 1/30 s accumulation
Saturation signal	380 mV	During frame readout
Smear	Standard mode : -90 dB High frame rate readout mode : -77 dB	None when a mechanical shutter is used
Frame rate	Standard mode : 3.33 frame/s	
	High frame rate readout mode : 30 frame/s	215-line output
	AF mode 1 : 60 frame/s	97-line output
	AF mode 2 : 120 frame/s	35-line output