High-Resolution 8.13M-Pixel Diagonal 11.07 mm (Type 2/3) Color CCD
for Consumer Digital Still Cameras Supports 30 frames/s VGA Moving Picture Imaging

ICX456AQ/AQF

The demands for higher pixel counts and increased functionality in CCDs show no sign of letting up in the rapidly expanding digital still camera market.
To respond to these demands, Sony has now developed a new 8.13M-pixel diagonal 11.07 mm (Type 2/3) interlaced CCD, the ICX456AQ/AQF. In addition to the high resolution provided by its 8.13M effective pixels, the ICX456AQ/AQF includes a horizontal and vertical pixel addition function that allows it to achieve both high pixel count still picture and high-quality moving picture. The ICX456AQ/AQF also provides an extensive set of pixel addition and decimating readout modes, allowing it to support a wide range of imaging conditions.

- **ICX456AQ: Primary color filters, 28-pin DIP**
  ICX456AQF: Primary color filters, 28-pin SOP
- **High resolution: 8.13M effective pixels (3288H × 2472V)**
- **High-quality moving picture: VGA equivalent moving picture and a wide range of other readout modes as well.**
- **Excellent basic characteristics: 3-field readout method**

The ICX456AQ/AQF is a diagonal 11.07 mm (Type 2/3) 8.13M-effective pixel CCD image sensor for use in high-resolution consumer digital still cameras. It boasts the industry's highest pixel count in Type 2/3 and smaller image size. Since it has the same sensor size as Sony's earlier ICX282AQ/AQF, it allows an 8M-pixel digital still camera to be implemented without changing the optical system.

High Resolution

CCD development passed through the 1.3M-pixel, 2.0M-pixel, 3.0M-pixel, and 5.0M-pixel stages, with the pixel count increasing by a factor of about 1.6× at each stage. This increase in the pixel count corresponds to a difference in resolution that can be clearly recognized by the human eye. Sony therefore selected 8.0M pixels as the next step in increased pixel counts since it represents a 1.6× increase over 5.0M pixels. This new resolution class achieves resolutions in both the horizontal and vertical directions of about 1900 TV lines (see photograph 1) and can create high-quality prints with about 200 dpi at the A3 size and about 300 dpi at the A4 size. This pixel count also allows either the print size to be multiplied by a factor of two in both the horizontal and vertical directions, the image to be cropped by 1/2 both horizontally and vertically, or a factor of 2× digital zoom to be used, and still achieve a resolution equivalent to that of a 2M-pixel camera (see photograph 2).

V O I C E

We developed this new 8M-pixel CCD that achieves both high pixel count still picture and high-quality moving picture to respond to market desires for both higher pixel counts and increased functionality. I'm confident that this new device will provide users with high-quality pictures, both still and moving pictures. I strongly recommend that you consider developing digital still camera products that take advantage of the features provided by this device.

High-Quality Moving Picture Achieved

The ICX456AQ/AQF includes a horizontal and vertical pixel addition function and implements an extensive set of readout modes based on a variety of pixel addition and decimation functions. In the 4/12-line readout mode (with horizontal addition), the sensor can achieve high-speed imaging and high-quality moving picture equivalent to VGA resolution at 30 frames/s. In addition, by adding together the signals from 4 pixels, it can achieve four times the sensitivity. Other functions include 2/6-line readout mode, which can acquire images at three times the frame rate, 4/24-line readout mode (with horizontal addition) that can output images for AF/AE control and LCD finder verification at 60 frames/s, higher speed AF control mode and an expanded display mode for image verification in the LCD finder. Thus the ICX456AQ/AQF provides an extensive set of readout modes and can support a wide range of imaging conditions.

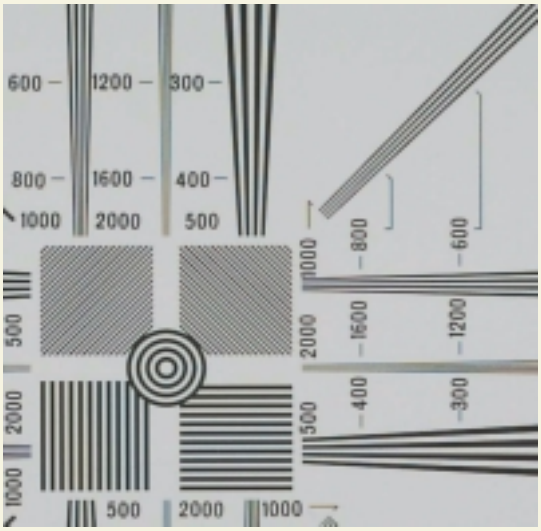
Excellent Basic Characteristics

To increase the dynamic range, the ICX456AQ/AQF adopts the same 3-field readout mode used in Sony's earlier ICX432DQ/DQF and ICX452AQ/AQF image sensors. This readout mode allows finer design rules to be used in the vertical transfer block, which in turn allows the photodiode block to be made larger. Other additional improvements made it possible for the ICX456AQ/AQF to achieve a saturation signal level of 420 mV, a sensitivity of 200 mV, and a smear value of -90 dB despite the increased pixel count and image size. (See table 2.)

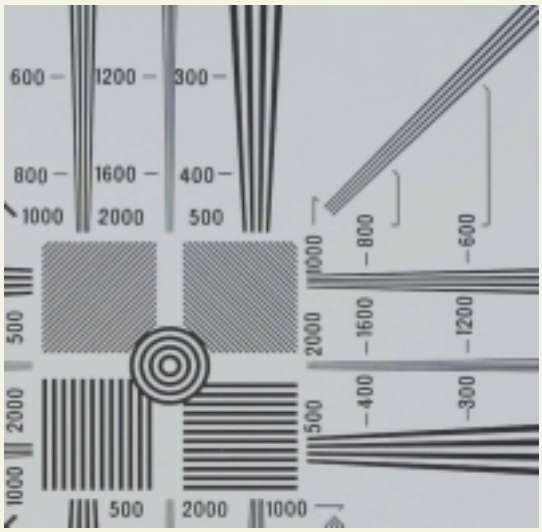
Timing Generator IC

Sony also provides the CXD3622GA driver timing generator IC that includes built-in horizontal and vertical drivers. In addition to the 4/12-line readout mode that makes VGA equivalent high-quality moving picture possible, this IC also supports other readout modes as well.

ICX282 (5.07M pixels): About 1500 TV lines



ICX456 (8.13M pixels): About 1900 TV lines



■ **Photograph 1 Resolution Charts**

ICX456 (8.13M pixels)

2M pixels

[Enlargement]
The appearance of sharpness and detail is retained when the print size is enlarged by 2× in both the horizontal and vertical directions

[Cropping or Digital Zoom]
This sensor provides an image quality equivalent to a 2M-pixel camera when the image is cropped by 1/2 in both directions, or when a 2× digital zoom is applied.

■ **Photograph 2 Sample Prints**

■ **Table 1 Device Structure**

Item	ICX456AQ/AQF
Image size	Diagonal 11.07 mm (Type 2/3)
Transfer method	Frame readout interline transfer method
Readout method	3-field readout
Total number of pixels	Approx. 8.31M (3350H × 2482V)
Number of effective pixels	Approx. 8.13M (3288H × 2472V)
Number of active pixels	Approx. 8.07M (3280H × 2460V)
Number of recommended recording pixels (Aspect ratio: 4:3)	Approx. 7.99M (3264H × 2448V)
Unit cell size	2.7 µm (H) × 2.7 µm (V)
Horizontal drive frequency	33.75 MHz
Package	28-pin plastic DIP/SOP

■ **Table 2 Image Sensor Characteristics**

Item		ICX456AQ/AQF	Remarks
Sensitivity (G signal)		200 mV	3200 K, 706 cd/m^2, 1/30 s accumulation, F5.6
Saturation signal	Frame readout mode	420 mV	Ta = 60°C
Smear (F5.6)	Frame readout mode	–90 dB	None when a mechanical shutter is used, V/10 method
	4/12-line readout mode*	–80.5 dB	
	4/24-line readout mode*	–74.4 dB	
Frame rate	Frame readout mode	3.33 frames/s	
	4/12-line readout mode*	30 frames/s	Number of output lines: 412
	4/24-line readout mode*	60 frames/s	Number of output lines: 206

*: With horizontal addition

Note: This device was designed for use in consumer digital still cameras and may not be appropriate for other applications. Contact your Sony representative for consultation when considering this product for use on other applications.