

High-Resolution Diagonal 9.102 mm (Type 1/1.8) 8.13M-Effective Pixel  
Digital Still Camera CCD for Consumer Products

# ICX476 Series

## [ICX476AQF/CQV/CQZ]

Further miniaturization and increased pixel counts are strongly desired in the digital still camera market. To respond to these needs, Sony is now releasing the ICX476AQF/CQV/CQZ diagonal 9.102 mm (Type 1/1.8) 8.13M-effective pixel interline CCDs that are optimal for high-end compact digital still cameras.

Not only was Sony able to achieve both miniaturization and an increased pixel count with a 2.22  $\mu\text{m}$  unit pixel using Sony's unique fine fabrication technology, but Sony also achieved excellent basic characteristics in these devices.

These new products also include a "horizontal and vertical pixel addition function" that makes it possible for them to achieve 30 frame/s VGA resolution moving picture imaging in addition to 8.13M-effective pixel still imaging.

- Diagonal 9.102 mm (Type 1/1.8) 8.13M effective pixels (3288H  $\times$  2472V)
- Pixel size: 2.22  $\mu\text{m}$  unit pixel
- 5-field readout
- Supports 30 frame/s VGA moving picture imaging

The ICX476AQF/CQV/CQZ (the ICX476 Series) devices are diagonal 9.102 mm (Type 1/1.8) 8.13M-effective pixel CCD image sensors developed for high-resolution consumer digital still cameras. These devices, with the use of a mechanical shutter, make it possible to acquire high-resolution still images. Since the ICX476 Series is positioned as a higher pixel count version of the earlier Sony ICX489AQF (diagonal 9.107 mm (Type 1/1.8) 7.24M effective pixels) product, it allows an 8M-pixel digital still camera to be implemented based on an earlier ICX489AQF camera without changing the optical system. Table 1 lists the device structure and table 2 lists the imaging characteristics.

### ■ Resolution for 300 dpi A4 Prints

To respond to the digital still camera market needs for miniaturization and higher pixel counts, Sony targeted an approximately 300 dpi output at the A4 size (8.25  $\times$  11.5 inches) with compact digital still cameras in designing the ICX476 Series, and is now releasing these Type 1/1.8 8.13M-effective pixel CCDs that feature a 2.22  $\mu\text{m}$  unit pixel size.

### ■ Excellent Basic Imaging Characteristics

One issue for CCD developers is the increased interconnect load associated with higher pixel counts. Although the transmission delay associated with the increased load can be suppressed by making the cross sectional area of the interconnects larger, this can compromise sensitivity, smear, and saturation signal characteristics due to the reduced area of the photodiodes and degraded collimation by the microlenses.

To resolve this issue, Sony developed a unique interconnect manufacturing technology and held the interconnect load to about the same levels as in earlier Sony CCDs, despite these devices being 8M-pixel sensors. Along with this new interconnect technology, Sony also increased the photodiode area and moved the microlenses to a lower layer. This not only reduced the size of the pixels, it also achieved high sensitivity characteristics (170 mV), low smear characteristics (-86 dB at F5.6 in frame readout mode), and a

high dynamic range (420 mV (Min.) in frame readout mode). (See table 2.)

### ■ Extensive Set of Readout Modes

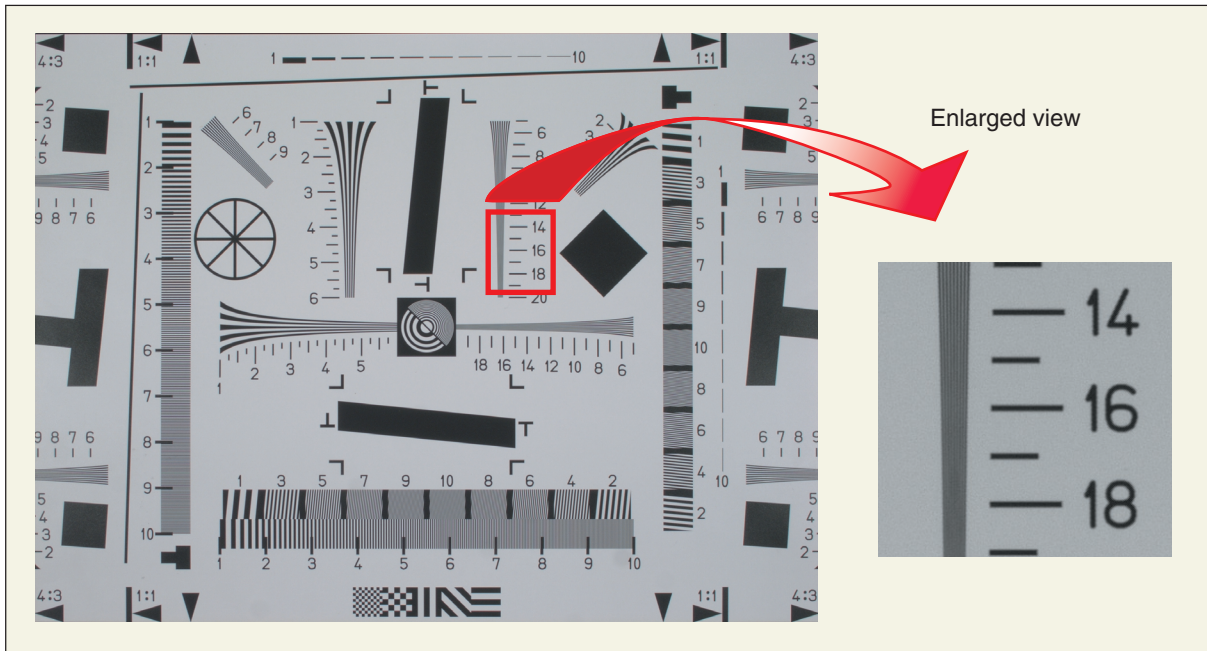
The ICX476 Series devices provide an extensive set of readout modes based on a "horizontal and vertical pixel addition function". These devices provide a frame readout mode appropriate for acquiring high-resolution images, a 4/10-line readout mode that can acquire VGA images at 30 frame/s, as well as AF and 4/20-line readout modes that focus on processing speed.

### ■ Minimizing Power Consumption

By also applying unique Sony interconnect manufacturing technology to the horizontal register electrodes, Sony was able to reduce the inter-electrode capacitance by 30% as compared to the ICX489AQF and thus suppress the increase in power consumption associated with the increased drive frequency.

V O I C E

Although we did encounter a few difficulties during the development of these devices, we were able to create products that all of us on the development team can recommend with confidence. I strongly recommend that you look into these devices to create high picture quality digital still camera products.



■ Photograph 1 Resolution Chart

■ Table 1 Device Structure

Item	ICX476 Series
Image size	Diagonal 9.102 mm (Type 1/1.8)
Transfer method	Frame readout interline transfer method
Readout method	5-field readout
Total number of pixels	Approx. 8.30M (3340H × 2486V)
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	2.22 μm (H) × 2.22 μm (V)
Horizontal drive frequency	36 MHz
Package	AQF: 28-pin SOP (Plastic) CQV: 28-pin SON (Ceramic) CQZ: 32-pin SON (Ceramic)

■ Table 2 Image Sensor Characteristics

Item	ICX476 Series	Remarks	
Sensitivity (G signal)	170 mV (Typ.)	3200K, 706 cd/m <sup>2</sup> , 1/30 s accumulation, F5.6	
Saturation signal	Frame readout mode	Ta = 60°C, per pixel	
	4/10-line readout mode* <sup>1</sup>		
	4/20-line readout mode* <sup>1</sup>		
Smear	Frame readout mode	None when a mechanical shutter is used, V/10 method, F5.6	
	4/10-line readout mode		
	4/20-line readout mode		
Frame rate	Frame readout mode	3.33 frame/s	
	4/10-line readout mode* <sup>1</sup>	30 frame/s	Number of output lines: 494 lines* <sup>2</sup>
	4/20-line readout mode* <sup>1</sup>	60 frame/s	Number of output lines: 247 lines* <sup>2</sup>

\*<sup>1</sup> : With horizontal addition

\*<sup>2</sup> : During the horizontal addition operation, two lines of signal are output in a single horizontal period.

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 in other applications.