

High-Resolution Diagonal 7.18 mm (Type 1/2.5) 6.04M-Effective Pixel
Digital Still Camera CCD for Consumer Products

ICX624 Series

[ICX624AQN/CQV/CQZ]

The trends towards further miniaturization and increased pixel counts in the digital still camera market continue to progress without pause. Furthermore, market needs for improved imaging characteristics continue to increase as well.

To respond to these needs, Sony is now releasing the ICX624AQN/CQV/CQZ diagonal 7.18 mm (Type 1/2.5) 6.04M-effective pixel interline CCDs. These devices not only achieve further miniaturization and higher resolution with a 2.03 μm unit pixel by taking full advantage of Sony's unique fine fabrication technology, but also improve smear and other imaging characteristics over earlier 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. A further plus is that these device hold the supply voltage to an even lower level than earlier CCDs to achieve even lower power consumption, making them truly optimal imaging devices for compact digital still cameras.

- Diagonal 7.18 mm (Type 1/2.5), 6.04M effective pixels (2840H \times 2128V)
- Pixel size: 2.03 μm unit pixel
- 4-field readout
- Supports 30 frame/s VGA moving picture imaging
- High sensitivity: 170 mV
Low smear: -90 dB (for still imaging)
- Low power
- New miniature package (QFN)

The trend in pixel counts in consumer digital still cameras is about to shift from the current mainstream, 5M-pixel devices to the 6M-pixel level. To achieve 6M pixels in the Type 1/2.5 size, which is the current mainstream in compact digital still cameras, Sony had to achieve a high-performance CCD with a 2.03 μm unit pixel. (See table 1.)

V O I C E

We adopted many of Sony's unique leading-edge technologies to improve the sensitivity and other imaging characteristics at the same time as making the unit pixels even smaller. While there were many difficulties associated with developing these new technologies, the project members came together as a group and solved these one by one to make progress towards the technological leap of the 2.0 μm unit pixel. I strongly recommend that you consider adopting this device in your digital still camera products with increasing pixel counts.

■ High Sensitivity

Sony succeeded in increasing the light sensitive area in the ICX624AQN/CQV/CQZ (the ICX624 Series) device pixels by reducing the width of the interconnects in the pixel block required for CCD drive to one half the previous width. Furthermore, to take maximum advantage of that result, Sony developed technology that enlarges the aperture area of the photo shielding film and, despite reducing the unit pixel area by 15% compared to the earlier structure, increased the pixel aperture area by 7%. (See figure 1.) The adoption of this technology allowed Sony to achieve a sensitivity of 170 mV despite the extremely fine pixels with a unit pixel size of 2.03 μm . (See table 2.)

■ Low Smear

To reduce smear, a type of noise that occurs when imaging high brightness subjects, Sony developed a new vertical register. To reduce the probability of contamination by the noise signal, Sony reduced the cross sectional area by 35% from the earlier structure. (See figure 2.) These improvements made it possible to achieve a smear of -90 dB (still imaging) in the ICX624 Series devices. (See table 2.)

■ Low Power

In the ICX624 Series, Sony revised the structure of the electronic circuits and devices used in the CCD. These changes made it possible to reduce the voltage from the 15 V used in earlier products to 12 V without harming the signal-to-noise ratio or frequency response in the slightest. This succeeded in cutting the operating CCD power consumption in half.

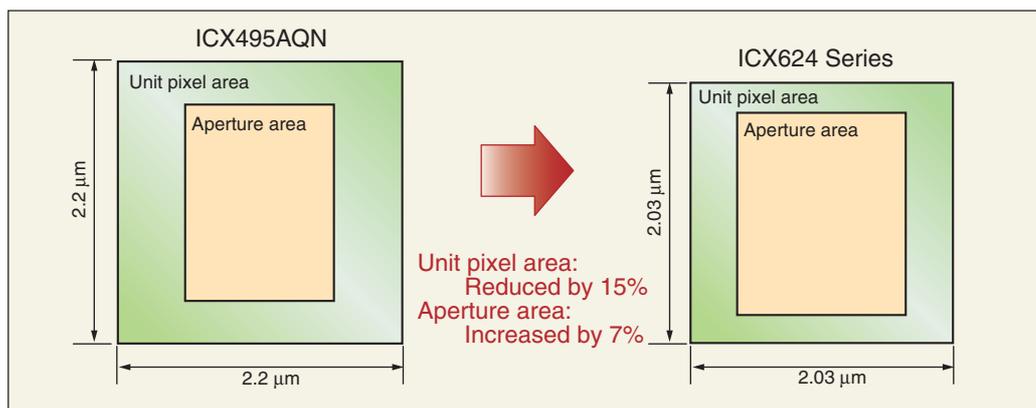
■ New Miniature Package

In addition to the earlier SOP and SON package types, Sony also provides these devices in the new miniature QFN package. The QFN package reduces the area by 36% and the thickness by 31% compared to the AQN package. (See figure 3.) Customers can now select an ICX624 device from an even wider range of packages to match their needs.

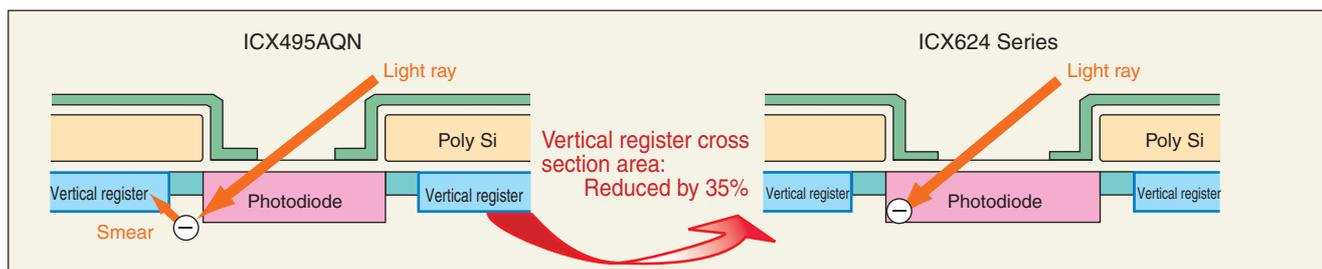
* QFN: Quad Flat Non-Leaded Package

■ Timing Generator IC

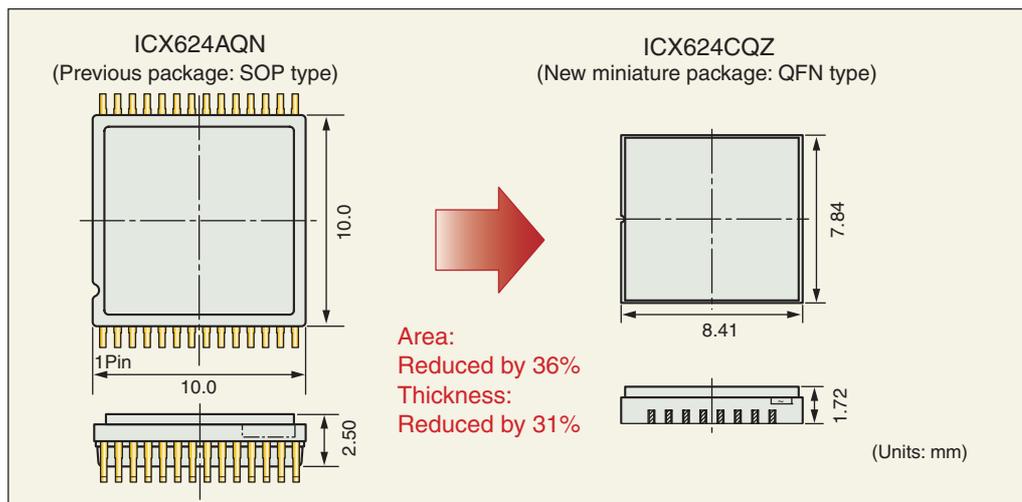
Sony is also releasing the CXD3639GA programmable timing generator IC with built-in horizontal and vertical drivers. This driver supports not only VGA moving picture mode, but high frame rate readout mode and AF mode as well.



■ Figure 1 Enlarged View of the Light-Sensitive Area



■ Figure 2 Vertical Register Structure Schematic Diagram



■ Figure 3 Package Dimensions

■ Table 1 Device Structure

Item	ICX624 Series
Image size	Diagonal 7.18 mm (Type 1/2.5)
Transfer method	Frame readout interline transfer method
Readout method	4-field readout
Total number of pixels	Approx. 6.18M (2892H × 2138V)
Number of effective pixels	Approx. 6.04M (2840H × 2128 V)
Number of active pixels	Approx. 6.00M (2832H × 2120 V)
Number of recommended recording pixels (Aspect ratio: 4:3)	Approx. 5.95M (2816H × 2112 V)
Unit cell size	2.03 μm (H) × 2.03 μm (V)
Horizontal drive frequency	33.75 MHz
Package	AQN: 28-pin SOP (Plastic) CQV: 28-pin SON (Ceramic) CQZ: 27-pin QFN (Ceramic)

■ Table 2 Image Sensor Characteristics

Item	ICX495AQN	ICX624 Series	Remarks
Sensitivity (G signal)	150 mV (Typ.)	170 mV (Typ.)	3200K, 706 cd/m ² , 1/30 s accumulation, F5.6
Saturation signal	Frame readout mode	420 mV (Min.)	Ta = 60°C, per pixel
	4/8-line readout mode*1	200 mV (Min.)	
	4/16-line readout mode*1	200 mV (Min.)	
Smear	Frame readout mode	-86 dB (Typ.)	None when a mechanical shutter is used, V/10 method, F5.6
	4/8-line readout mode	-80 dB (Typ.)	
	4/16-line readout mode	-74 dB (Typ.)	
Frame rate	Frame readout mode	4.28 frame/s	Number of output lines*2 · ICX495: 490 lines · ICX624: 532 lines Number of output lines*2 · ICX495: 245 lines · ICX624: 266 lines
	4/8-line readout mode*1	30 frame/s	
	4/16-line readout mode*1	60 frame/s	

*1 : With horizontal addition

*2 : 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.