

Two Miniature High-Resolution Digital Still Camera Color CCDs
Diagonal 6.67 mm (Type 1/2.7) 3.24M Effective Pixels and
Diagonal 5.68 mm (Type 1/3.2) 2.02M Effective Pixels

ICX432DQ/DQF, ICX434AQ/DQN

There is now demand for even more compactness in the 2 M and 3 M-pixel cameras that now form the major part of the digital still camera market.

To respond to these needs, Sony has now developed two new CCD image sensor products, the ICX432DQ/DQF (diagonal 6.67 mm (Type 1/2.7) 3.24M effective pixels) and the ICX434AQ/DQN (diagonal 5.68 mm (Type 1/3.2) 2.02M effective pixels).

This ICX432/434 Series achieve even further miniaturization while still providing high resolution by the adoption of Sony's latest fine fabrication technologies. These devices feature sensitivities and saturation signal levels equivalent to those of the Sony ICX284AQ product.

ICX432DQ/DQF

- ICX432DQ (primary color filters, 18-pin DIP)
ICX432DQF (primary color filters, 18-pin SOP)
- Diagonal 6.67 mm (Type 1/2.7) 3.24M effective pixels (2088H × 1550V)
- Three-field readout
- High sensitivity: 220 mV (green signal)
- High saturation signal: 420 mV

ICX434AQ/DQN

- ICX434AQ (primary color filters, 16-pin DIP)
ICX434DQN (primary color filters, 16-pin SOP)
- Diagonal 5.68 mm (Type 1/3.2) 2.02M effective pixels (1636H × 1236V)
- High sensitivity: 270 mV (green signal)
- High saturation signal: 420 mV

■ 3.0M Pixels Achieved in a Diagonal 6.67 mm Device

In the ICX432DQ/DQF, Sony reduced a 3.24M effective pixels sensor to a diagonal 6.67 mm device (Type 1/2.7) by developing the industry's smallest unit pixel (2.575 μm) for digital still camera applications. This device achieves further miniaturization while maintaining the resolution of earlier devices. (See table 1.) Since this device has the same diagonal length as Sony's ICX284AQ product, customers can implement a 3.0M effective pixels digital still camera without changing the lens and optical system.

■ Three-Field Readout

To respond to the desires for miniaturization and high performance, Sony adopted the three-field readout in the ICX432DQ/DQF. (See figure 1.) Since the three-field readout allows the vertical transfer area to be made narrower while retaining the amount of charge handled, it allows the photodiodes to be made that much larger and can increase the dynamic range. (See figure 2.) This technology allowed Sony to achieve a saturation signal of 420 mV despite the industry's smallest pixel size (62% of the ICX284AQ). (See table 2.)

■ High Sensitivity

In addition to introducing fine fabrication technology for the on-chip microlenses, Sony also introduced newly-developed thin-film primary color filters to increase the condensing efficiency of the microlenses. (See figure 3.) These technologies allowed Sony to achieve a sensitivity of 220 mV in the ICX432DQ/DQF. (See table 2.)

■ Miniature High-Performance 2.0 M-pixel Device

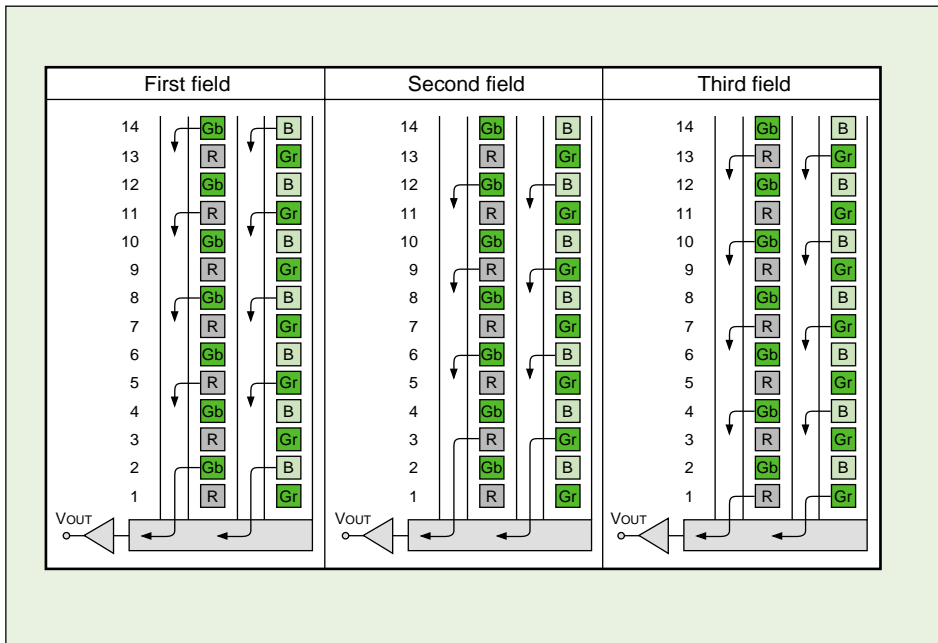
Sony achieved an image size of diagonal 5.68 mm (Type 1/3.2) in a 2.02M effective pixels device by using a 2.8 μm unit pixel. This device achieves a sensitivity of 270 mV, and a saturation signal of 420 mV. (See tables 1 and 2.) Since this device is pixel structure and drive timing signal compatible with Sony's existing ICX284AQ product, it can be used as a direct replacement.

■ System ICs

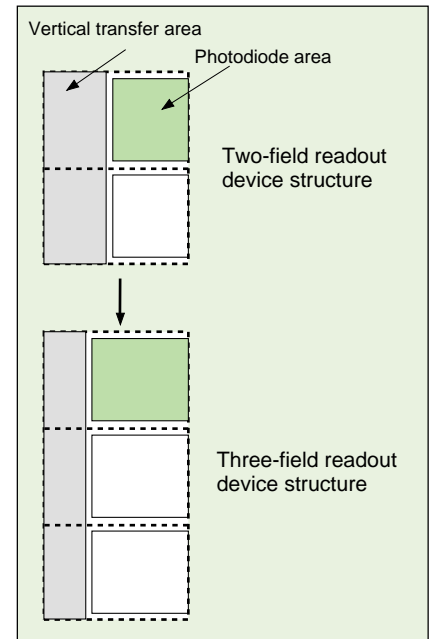
In addition to the CXD3615R timing generator IC with built-in vertical drivers for the ICX432DQ/DQF and ICX434AQ/DQN, Sony is also developing the CXD3422GA, which will integrate timing generator, CDS, PGA, and A/D converter functions on the same chip.

V O I C E

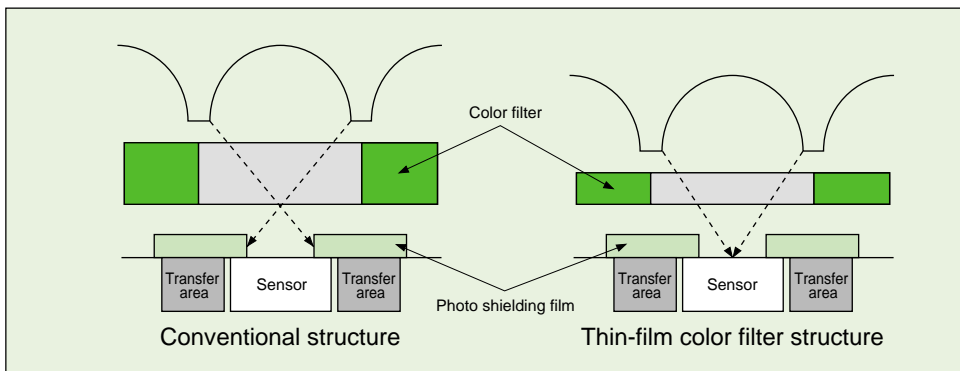
We adopted the latest fine fabrication technology to develop this miniature CCD. The result is a CCD that provides phenomenal performance for a device with a unit pixel diagonal that is under 3 μm . I strongly recommend that you look into this product.



■ Figure 1 ICX432DQ/DQF Three-Field Readout



■ Figure 2 Three-Field Readout Device Structure



■ Figure 3 Improved Condensing Efficiency Structure

■ Table 1 Device Structure

Item	ICX432DQ/ICX432DQF	ICX434AQ/ICX434DQN
Image size	Diagonal 6.67 mm (Type 1/2.7)	Diagonal 5.68 mm (Type 1/3.2)
Transfer method	Frame readout interline transfer method	Frame readout interline transfer method
Readout method	Three-field readout	Two-field readout
Number of vertical register transfer clocks	8	6
Total number of pixels	Approx. 3.34 M (2140H × 1560V)	Approx. 2.11 M (1688H × 1248V)
Number of effective pixels	Approx. 3.24 M (2088H × 1550V)	Approx. 2.02 M (1636H × 1236V)
Number of active pixels	Approx. 3.21 M (2080H × 1542V)	Approx. 1.98 M (1620H × 1220V)
Number of recommended recording pixels (aspect ratio: 4:3)	Approx. 3.15 M (2048H × 1536V)	1.92 M (1600H × 1200V)
Chip size	6.10 mm (H) × 4.95 mm (V)	5.27 mm (H) × 4.40 mm (V)
Unit cell size	2.575 μm (H) × 2.575 μm (V) Square pixels	2.8 μm (H) × 2.8 μm (V) Square pixels
Horizontal drive frequency	24.3 MHz	18.0 MHz
Package	18-pin plastic DIP/SOP	16-pin plastic DIP/SOP

■ Table 2 Image Sensor Characteristics

Item	ICX432DQ/ICX432DQF	ICX434AQ/ICX434DQN	ICX284AQ (Conventional product)	Remarks	
Sensitivity (G signal)	220 mV	270 mV	220 mV	3200 K, 706 cd/m ² , F5.6, 1/30 s accumulation	
Saturation signal	420 mV	420 mV	420 mV	During frame readout	
Smear	Frame readout mode	-87.5dB	-86 dB	-91 dB	None when a mechanical shutter is used
	High frame rate readout mode	-78 dB	-74 dB	-79 dB	
Frame rate	Frame readout mode	5.0 frame/s	7.5 frame/s	7.5 frame/s	
	High frame rate readout mode	30 frame/s (NTSC mode) 25 frame/s (PAL mode)	30 frame/s	30 frame/s	
	AF mode	60 frame/s (NTSC mode) 50 frame/s (PAL mode)	—	—	