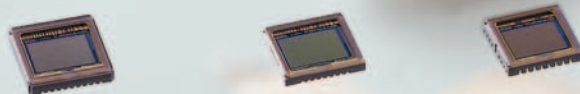


High-Resolution Color CCDs for Consumer Digital Still Cameras Support VGA Resolution Moving Picture Imaging

ICX665/675 Series Diagonal 7.705 mm (Type 1/2.3) 10.17M-Effective Pixel
ICX637CQZ Diagonal 7.215 mm (Type 1/2.5) 9.14M-Effective Pixel



In addition to the existing needs for even higher resolution in compact consumer digital still cameras, there are now increasing needs for improved high-ISO sensitivity and higher dynamic range.

Sony has now developed two new CCDs that, while maintaining high picture quality by taking advantage of Sony's unique fine pixel fabrication technologies, achieve further miniaturization, higher resolution, and superb image sensor characteristics as well. These are the ICX665/675 Series 1.68 μm unit pixel CCDs and the ICX637CQZ, which features the industry's smallest unit pixel with a size of only 1.66 μm .

ICX665/675 Series

- Diagonal 7.705 mm (Type 1/2.3) 10.17M effective pixels
- Pixel size: 1.68 μm unit pixel
- Six-field readout
- Horizontal divided into thirds output
- Horizontal 3-phase drive (ICX675 Series: horizontal 2-phase drive)

ICX637CQZ

- Diagonal 7.215 mm (Type 1/2.5) 9.14M effective pixels
- Pixel size: 1.66 μm unit pixel
- Five-field readout
- Horizontal divided into thirds output
- Horizontal 2-phase drive

The Industry's Smallest Pixel Size Achieved

As opposed to the 1.75 μm unit pixel of existing products, the ICX665/675 Series with its 1.68 μm unit pixel and the ICX637CQZ with its 1.66 μm unit pixel achieve higher pixel counts in Type 1/2.3 and Type 1/2.5 CCDs. These devices take full advantage of Sony's unique fine fabrication technologies to maximize the photodiode area and achieve higher performance in the sensitivity

characteristics, saturation signal (dynamic range), and smear characteristics. These new CCDs thus achieve equal or better basic characteristics than the existing ICX636 (diagonal 7.183 mm (Type 1/2.5) 8.15M effective pixels).

High Sensitivity, High Saturation Signal

Despite a unit pixel area reduced by about 8% from the existing Sony ICX636, the ICX665/675 Series CCDs achieve a saturation signal increased by 10% to 465 mV and an equivalent green sensitivity of 160 mV. (See table 2.)

By using finer feature sizes for all of the vertical register, read gate, and channel stop, Sony was able to increase the area of the photodiode, which converts photons to electrons and accumulates the signal charge. In addition, Sony used single-layer interconnect technology to move the microlenses to a lower layer to achieve an even smaller pixel without sacrificing condensing efficiency. (See figures 1 and 2.)

Low Smear Characteristics

In the ICX665/675 Series and the ICX637CQZ, Sony succeeded in reducing smear component admixture to the vertical registers by adopting Sony's unique fine fabrication technologies. The use of these technologies allowed Sony to improve the smear characteristics by approximately 4 dB from the existing Sony

ICX636, thus achieving a -89 dB level in frame readout mode. (See table 2.)

Readout Modes

The ICX665/675 Series CCDs features Sony's unique horizontal and vertical addition function and provide a wide variety of readout modes. These CCDs provide the following modes: frame readout mode, which can acquire the full 10.17M-effective pixel still images; frame readout horizontal addition mode, which is capable of high-sensitivity imaging at the high frame rate of 5.5 frame/s by performing horizontal 3-pixel addition; 4/12-line readout mode, which can acquire VGA resolution images at 30 frame/s, and 4/24-line readout mode, which can acquire images at the high frame rate of 60 frame/s. (See table 2.)

V O I C E

The whole development team worked together as a unified whole in a project that involved repeated trial-and-error experiments to evolve Sony's fine fabrication technology even further. At the same time as using this technology to respond to the needs for further miniaturization and higher pixel counts, we also assured superb image sensor characteristics. I strongly recommend that you look into adopting the ICX665/675/637 CCDs to respond to needs in the digital still camera market.

Figure 1 Single-Layer Interconnect Technology (Moving Microlenses to a Lower Layer)

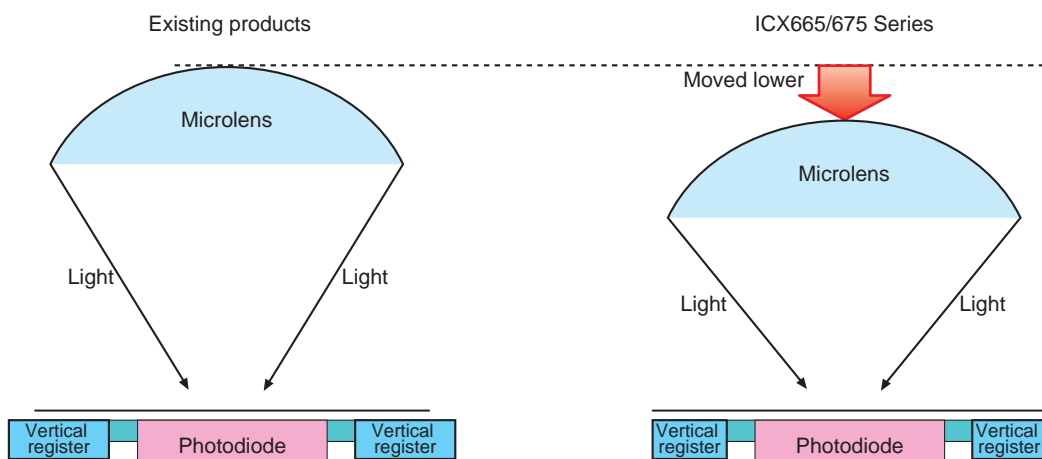


Figure 2 Single-Layer Electrode Structure

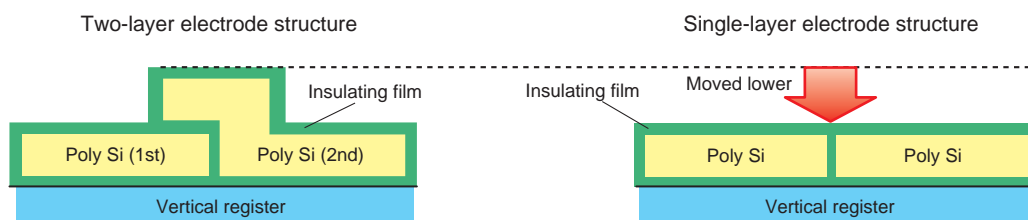


Table 1 Device Structure

Item	ICX665 Series	ICX675 Series	ICX637CQZ
Image size	Diagonal 7.705 mm (Type 1/2.3)	←	Diagonal 7.215 mm (Type 1/2.5)
Transfer method	Frame readout interline transfer method	←	←
Readout method	Vertical	6-field readout	←
	Horizontal	3-phase drive, divided into thirds	2-phase drive, divided into thirds
Total number of pixels	Approx. 10.34M (3729H × 2774V)	←	Approx. 9.30M (3537H × 2628V)
Number of effective pixels	Approx. 10.17M (3684H × 2760V)	←	Approx. 9.14M (3492H × 2616V)
Number of active pixels	Approx. 10.09M (3672H × 2748V)	←	Approx. 9.06M (3480H × 2604V)
Number of recommended recording pixels (Aspect ratio: 4:3)	Approx. 9.98M (3648H × 2736V)	←	Approx. 8.96M (3456H × 2592V)
Unit cell size	1.68 μm (H) × 1.68 μm (V)	←	1.66 μm (H) × 1.66 μm (V)
Horizontal drive frequency	38 MHz	←	←
Package	SQW: 38-pin QFN (Ceramic) SQP: 40-pin QFN (Ceramic)	CQW: 38-pin QFN (Ceramic) CQP: 40-pin QFN (Ceramic)	34-pin QFN (Ceramic)

Table 2 Image Sensor Characteristics

Item	ICX665 Series	ICX675 Series	ICX637CQZ	Remarks	
Sensitivity (G signal)	160 mV (Typ.)	←	155 mV (Typ.)	3200K, 706 cd/m ² , 1/30 s accumulation, F5.6	
Saturation signal	Frame readout mode	465 mV (Min.)	←	Ta = 60°C, per pixel	
Smear	Frame readout mode	-89.0 dB (Typ.)	←	-86.0 dB (Typ.) None when a mechanical shutter is used, 1/10 method, F5.6	
Frame rate	Frame readout mode	1.96 frame/s	←	2.38 frame/s	
	Frame readout mode *1	5.5 frame/s	←	—	
	4/12-line readout mode *1	30 frame/s	←	—	Number of output lines: 460 lines
	4/24-line readout mode *1	60 frame/s	←	—	Number of output lines: 230 lines
	4/10-line readout mode *1	—	—	30 frame/s	Number of output lines: 523 lines
4/20-line readout mode *1	—	—	60 frame/s	Number of output lines: 261 lines	

*1 With horizontal addition

Note: These devices were designed for use in consumer digital still cameras and may not be appropriate for other applications. Contact your Sony representative for consultation when considering these products for use in other applications.