High-Resolution Color CCD for Consumer Digital Still Cameras Supports VGA Resolution Moving Picture Imaging

ICX652CQZ Diagonal 9.321 mm (Type 1/1.7) 13.69M-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 the ICX652CQZ diagonal 9.321 mm (Type 1/1.7) 13.69M-effective pixel interline CCD that is appropriate for high-end models of compact consumer digital still cameras. In this device, Sony used unique fine fabrication technology to reduce the unit pixel size to 1.75 μm, increase the pixel count, and achieve still imaging with 13.69M pixels. Furthermore, this device includes a horizontal and vertical pixel addition function that can add two vertical and two horizontal pixels to achieve continuous high-sensitivity still imaging equivalent to a 3.42M-pixel sensor. The ICX652CQZ also provides high picture quality VGA resolution moving image capture at 30 frame/s.

- Diagonal 9.321 mm (Type 1/1.7) 13.69M effective pixels
- Pixel size: 1.75 μm unit pixel
- Four-field readout
- Horizontal divided into fourths output
- Horizontal 3-phase drive

The ICX652CQZ is a diagonal 9.321 mm (Type 1/1.7) 13.69M-effective pixel CCD that was designed for high-resolution consumer digital still cameras. It can capture high-resolution images by using a mechanical shutter. The ICX652CQZ is an increased pixel count version of Sony's existing ICX612CQZ (diagonal 9.299 mm (Type 1/1.7) 12.19M effective pixels) and allows customers to implement 13.5M-pixel digital still cameras with no changes to the optical system from existing cameras using the ICX612CQZ. Table 1 lists the device structure and table 2 lists the image sensor characteristics.

The Industry's Highest Pixel Count

The desires for higher pixel counts are becoming stronger in the consumer digital still camera market. Sony has now released a Type 1/1.7 13.69M-effective pixel CCD that provides the industry's highest pixel count in a consumer digital still camera.

Horizontal Divided into Fourths Output

The usual way to maintain the frame rate as the pixel count increases is to increase the drive frequency. That does, however, have the problem that power consumption increases as well.

In the ICX652CQZ, Sony developed a new horizontal divided into fourths output method (see figure 1) that uses addition to reduce the number of horizontal outputs to 1/4 the full number and achieves 30 frame/s VGA operation at the same 38 MHz drive frequency as the existing Sony ICX612CQZ.

High Sensitivity, High-Speed Still Imaging

The ICX652CQZ provides a high-sensitivity, high-speed output frame readout mode (horizontal and vertical 2 × 2 addition) to respond to the demands for higher ISOs in still imaging and improved continuous shooting functionality. (See table 2.)

In this mode, the ICX652CQZ implements both a horizontal 2-pixel addition function for the horizontal divided into fourths method and a vertical register vertical 2-pixel addition function and outputs high-sensitivity (due to 4-pixel addition) 3.42M-pixel equivalent still images at 6.1 frame/s.

Low Smear Characteristics

Improvement in image smear, which is a characteristic phenomenon in CCDs that occurs during moving picture imaging, are now strongly desired. To respond to this need, Sony has introduced a unique fine fabrication technology that makes the oxide film under the photo-shielding film thinner and succeeded in reducing smear component admixture to the vertical registers. The use of this technology allowed Sony to improve the smear characteristics by approximately 4 dB from the existing Sony ICX636 (a 1.75 μm unit cell device), thus achieving a -89 dB level in frame readout mode. (See table 2.)

V O I C E

To respond to market desires for higher pixel counts and further miniaturization, we developed a Type 1/1.7 13.69M-pixel CCD. This device provides high-sensitivity still imaging in frame readout mode (horizontal and vertical 2 × 2 addition).
I strongly recommend that you consider using this device, which we developed using a wide range of the latest technologies.

Figure 1 Horizontal Divided into Fourths Output Method

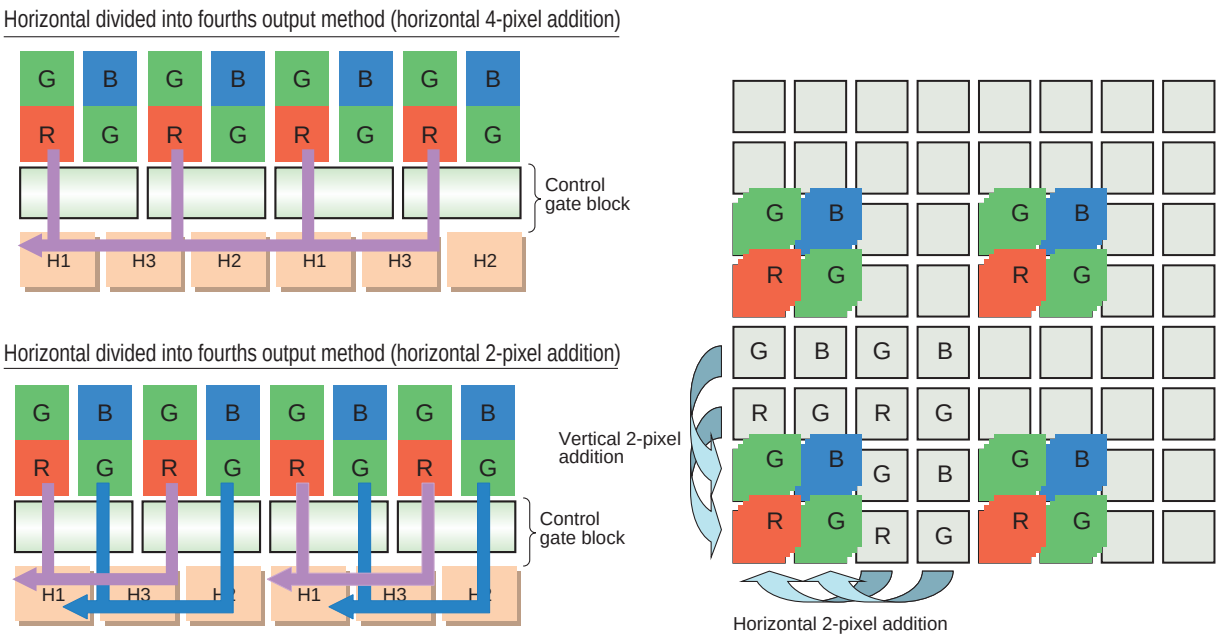

Table 1 Device Structure

Item		ICX652CQZ
Image size		Diagonal 9.321 mm (Type 1/1.7)
Transfer method		Frame readout interline transfer method
Readout method	Vertical	4-field readout
	Horizontal	3-phase drive, divided into fourths
Total number of pixels		Approx. 13.93M (4328H × 3218V)
Number of effective pixels		Approx. 13.69M (4272H × 3204V)
Number of active pixels		Approx. 13.61M (4264H × 3192V)
Number of recommended recording pixels (Aspect ratio: 4:3)		Approx. 13.48M (4240H × 3180V)
Unit cell size		1.75 µm (H) × 1.75 µm (V)
Horizontal drive frequency		38 MHz
Package		40-pin QFN (Ceramic)

Table 2 Image Sensor Characteristics

Item		ICX652CQZ	Remarks
Sensitivity (G signal)		160 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
Smear	Frame readout mode	–89.0 dB (Typ.)	None when a mechanical shutter is used, V/10 method, F5.6
Frame rate	Frame readout mode	1.7 frame/s	Number of output lines: 3204 lines
	Frame readout mode (horizontal/vertical 2 × 2 addition)	6.1 frame/s	Number of output lines: 1602 lines
	4/8-line readout mode *1	30 frame/s	Number of output lines: 800 lines
	4/16-line readout mode *1	60 frame/s	Number of output lines: 400 lines

*1 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 in other applications.