

Ultra-low Smear (-100 dB) High Image Quality Digital Still Camera CCD 1/4-Inch 330,000-Pixel Progressive Scan Color CCD Image Sensor

ICX098AK

The digital still camera market is ready to exhibit rapid growth. Sony has achieved the high sensitivity and low smear strongly desired by the market and has developed a 1/4-inch 330,000-pixel progressive scan color CCD image sensor for the optimal VGA resolution for digital still cameras and personal computer image capturing devices.

This device features a "monitoring mode" that can provide a 60 field per second output so that images can be easily displayed on an LCD or other monitor without the use of an intermediate frame memory.

- All pixels can be output sequentially in 1/30 second
- Supports the VGA resolution standard (640H × 480V)
- Square pixels
- Achieves high sensitivity and low smear (-100 dB)
- Supports 60 field per second monitoring output with line selection
- Can be driven by a system identical to the ICX084AK 1/3-inch 330,000-pixel progressive scan CCD

The ICX098AK is a 1/4-inch 330,000-pixel progressive scan color CCD image sensor that supports the VGA resolution standard and is optimal for use in image capturing applications such as digital still cameras. It allows the signals for all pixels in a given exposure period to be read out without the use of a mechanical shutter. Figure 1 shows the block diagram of the ICX098AK, table 1 lists the pin description, and table 2 lists its characteristics.

■ Square Pixel Geometry Adopted

The adoption of a device geometry with perfectly square pixels means that post-image acquisition processing is simplified and that images without distortion can be acquired. Since the ICX098AK also adopts a pixel count that matches the VGA standard, it is an optimal device for personal computer image capturing applications.

■ High Sensitivity and Low Smear

Increased sensitivity was achieved by the adoption of a new process and optimization of the pixel units. This device also achieves the industry's best (lowest) smear level of -100 dB for VGA CCD image sensors.

■ High Color Reproducibility and Increased Light Resistance

The ICX098AK adopts a primary color mosaic coding scheme using pigment filters as its color filter arrangement (see figure 2) and achieves excellent color reproducibility and improved light resistance.

■ Improved Ease of Use

By making the substrate voltage and reset gate bias adjustment free, the ICX098AK allows the number of components in the peripheral circuits to be reduced. Also, the ICX098AK achieves lower power consumption by lowering the reset gate and horizontal register transfer clock voltages from 5 to 3.3 V.

■ Supports Monitoring Mode

Images with 240 vertical lines and a 60 field per second rate can be acquired by applying line selection to the signals from the whole effective area as shown in figure 2. This can contribute to reduced system costs and power consumption in applications that provide outputs to LCD or other monitors.

■ Timing Generator IC Provided

Sony developed the CXD2452R timing generator IC for driver that supports the monitoring mode described above at the same time as the ICX098AK. Figure 3 shows the structure of a system using these devices.

■ Applications

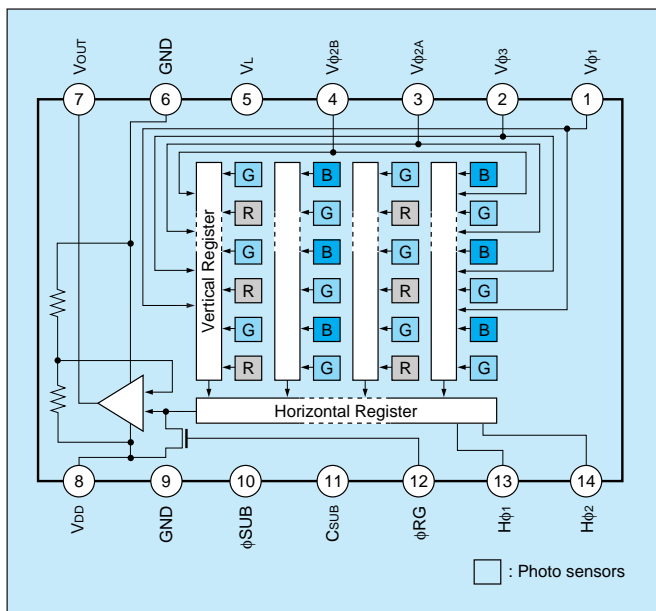
- Digital still cameras
- Personal computer image capturing devices

V O I C E

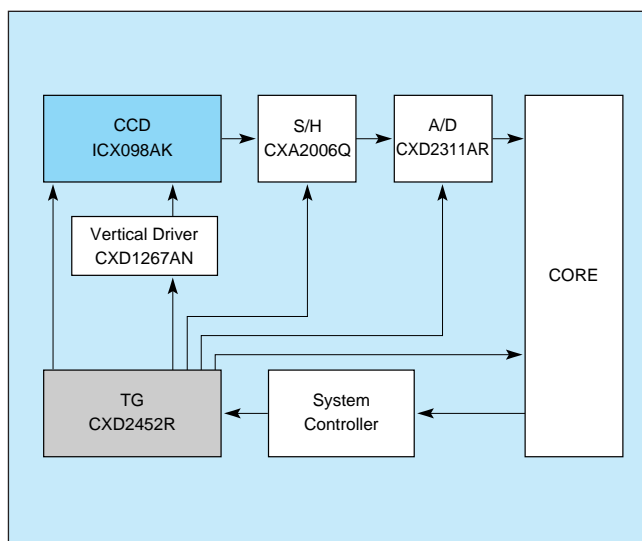
The ICX098AK is not just a 1/4-inch version of the earlier VGA progressive scan CCDs, but has the additional sales points of improved characteristics and monitoring mode operation, and as such is a device that provides improved ease of use. This is a product worth looking into for both still image applications such as digital still cameras and moving image applications such as personal computer based video conferencing.



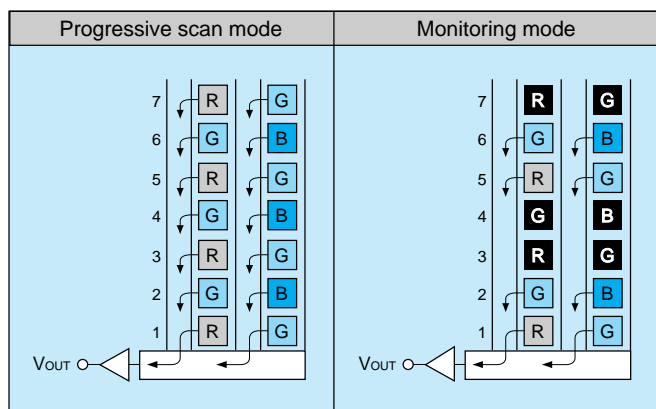
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■ Figure 1 ICX098AK Block Diagram



■ Figure 3 Sample System Structure



Note: The pixels shown in black are pixels that are not read out.

■ Figure 2 ICX098AK Color Coding and Monitoring Mode

■ Table 1 ICX098AK Pin Description

Pin No.	Symbol	Description
1	V ϕ 1	Vertical register transfer clock
2	V ϕ 3	Vertical register transfer clock
3	V ϕ 2A	Vertical register transfer clock
4	V ϕ 2B	Vertical register transfer clock
5	V _L	Protection transistor bias
6	GND	GND
7	V _{OUT}	Signal output
8	V _{DD}	Circuit power supply
9	GND	GND
10	ϕ SUB	Substrate clock
11	C _{SUB}	Substrate bias
12	ϕ RG	Reset gate clock
13	H ϕ 1	Horizontal register transfer clock
14	H ϕ 2	Horizontal register transfer clock

■ Table 2 ICX098AK Characteristics

	ICX098AK	ICX084AK
Optical size	1/4 inch	1/3 inch
Number of effective pixels	330,000 pixels (659H x 494V)	
Unit cell size	5.6 (H) x 5.6 (V) μ m ²	7.4 (H) x 7.4 (V) μ m ²
Horizontal drive frequency	12.27MHz	
Number of output channels	One channel	
Frame rate	30frame per second	
Color coding	Primary color mosaic (Bayer) arrangement	
Horizontal resolution	400 TV lines (or better)	
Vertical resolution	400 TV lines (or better)	
Sensor saturation signal level	500mV	
Sensitivity	440mV (F5.6, G sensitivity)	450mV(F5.6, G sensitivity)
Smear (V/10)	- 100dB	- 86dB
Electronic shutter	1/30 to 1/10000 second (variable speed)	
H ϕ and ϕ RG drive voltage	3.3 V (5.0-V drive is also possible)	5.0V

Note: The sensor saturation signal level and sensitivity are for 1/30 second accumulation mode.