

Improved Picture Quality and Increased Functionality

Black-and-White CCD Camera System

- **New CCD structure that is highly sensitive in the near infrared light region, a range that is invisible to the human eye.**

EXview HAD CCD™

- **The timing controller IC includes the vertical driver circuit and provides additional functionality.**

CXD2463R

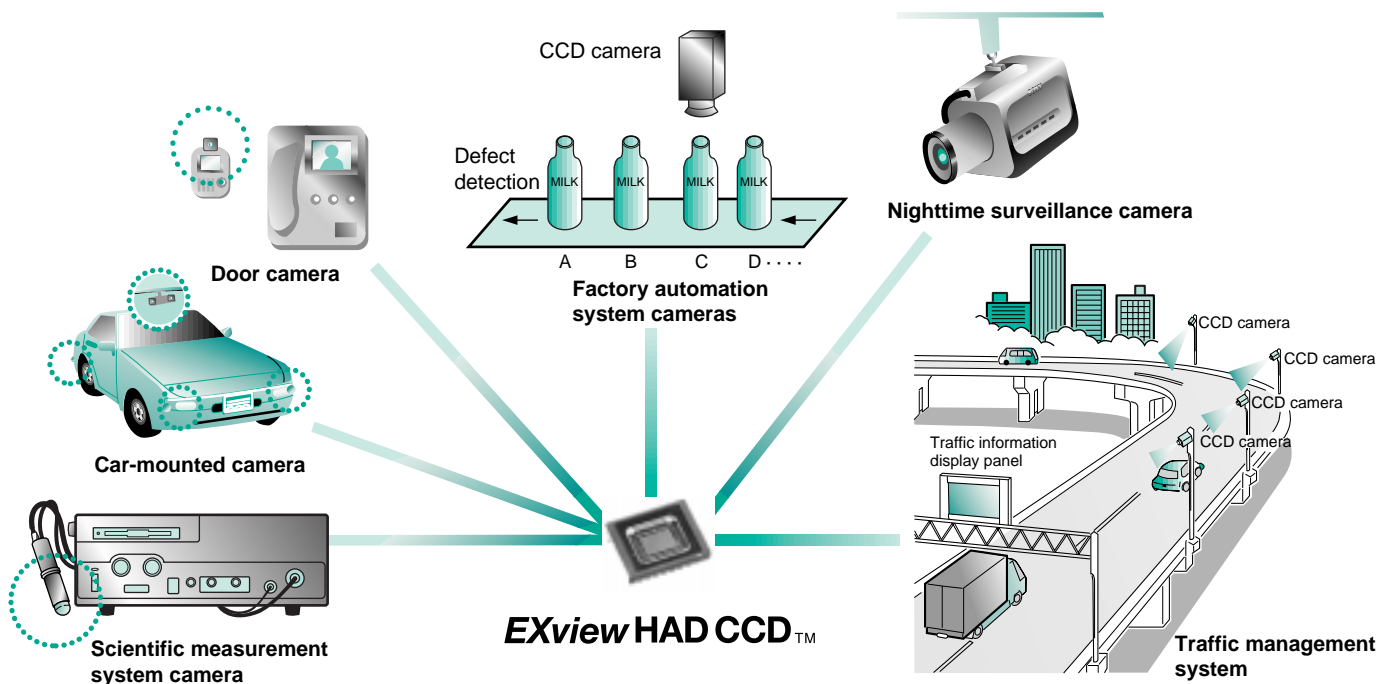
* EXview HAD CCD is a trademark of Sony Corporation.

The surveillance camera market is one of the most important CCD application areas. There are strong demands for improvements in the basic characteristics of CCD devices to provide higher performance cameras in this market. In addition to Sony's earlier technologies, such as the HAD sensor and on-chip microlenses, Sony has developed the Super HAD CCD technology to respond to these demands.

However, in the field of surveillance cameras, there are needs to film with high sensitivity in the dark environment. To answer these needs, Sony has now developed the EXview HAD CCD, which features a new structure that is highly sensitive in the near infrared light region, a range that is invisible to the human eye. This makes it possible to film in the dark by irradiating near infrared light which is invisible to the human eye onto the object being filmed. The EXview HAD CCD can be used in a wide range of applications, from nighttime surveillance cameras, to cameras for factory automation systems, door cameras, and cameras for scientific measurement. Furthermore, this device can contribute to automotive safety in car-mounted cameras and traffic management systems. (See figure 1.)

Sony has also developed a new timing controller IC, the CXD2463R, that supports 250K and 380K-pixel black-and-white CCDs, including this device. Since this device provides extensive functionality in addition to on-chip vertical drivers, such as external synchronization and backlighting correction, it can contribute to camera miniaturization and increased functionality.

Cameras with improved image quality and increased functionality can be constructed by using an EXview HAD CCD in combination with the CXD2463R. We recommend that you try this new black-and-white CCD camera system chip set.



■ Figure 1 Applications Proposed for the EXview HAD CCD

New CCD Structure That Is Highly Sensitive in the Near Infrared Light Region, a Range That Is Invisible to the Human Eye

EXview HAD CCD™ ICX248AL ICX249AL

- Increased sensitivity achieved from the visible light to the near infrared light regions
- Low smear (-10 dB as compared to conventional products)
- High saturation signal level (+2 dB as compared to conventional products)
- Supports electronic shutter function
- Pixel counts, pin configurations, and drive specifications identical to conventional products (ICX038DLA and ICX039DLA)

1) Increased sensitivity achieved from the visible light to the near infrared light regions

Light in the near infrared light region which has long wavelengths is converted into photoelectricity deep in the semiconductor's silicon, so in conventional CCD structure, sensors were incapable of efficiently gathering the charge which has undergone photoelectric conversion. The EXview HAD CCD structure now developed by Sony allows charge due to near infrared light, which was ineffective in conventional CCD devices, to be used as video information. As a result, device sensitivity has been significantly increased from the visible light region through the near infrared light region. (See photograph 1.) Figure 2 compares the spectral sensitivity characteristics of the EXview HAD CCD with conventional CCDs. As opposed to conventional CCDs, which exhibit a curve that peaks at wavelength of about 500 nm and decreases as the wavelength increases, the EXview HAD CCD provides a significantly increased sensitivity from the visible light to the near infrared light regions. Sony's first product using this new technology is a 1/2-inch 380K-pixel CCD.

2) Low smear and high saturation signal level

By adopting the EXview HAD CCD structure, Sony has achieved the industry's lowest smear level (-120 dB) in a 1/2-inch 380K-pixel CCD. Also, since this device achieves a saturation signal level +2 dB higher than conventional CCDs, it can contribute increased image quality in end products, especially because it achieves both higher sensitivity and a higher saturation signal level at the same time. (See table 1.)

3) Compatibility with conventional products maintained

Since this device inherits the HAD sensor adopted in conventional CCDs, at the same time as featuring a low dark current, it also can support electronic shutter function. Furthermore, since it has the same pixel count, the same pin configuration, and the same drive specifications as conventional products, it can be used as a direct replacement. Sony also provides color products based on the EXview HAD CCD structure, but these products have different spectral sensitivity characteristics than conventional products.

EXview HAD CCD (ICX248AL)

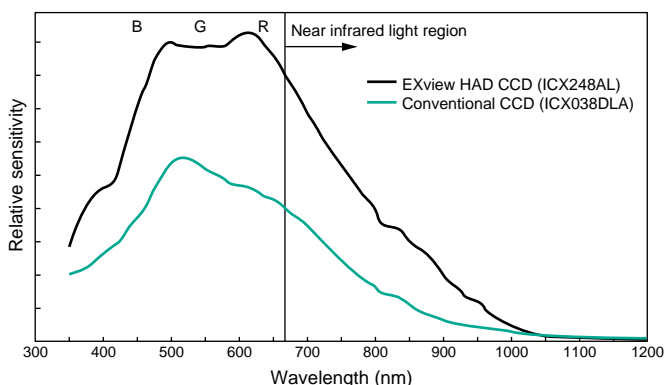


Conventional CCD (ICX038DLA)



Imaging conditions:
LED illumination in a completely dark room
LED specifications:
Light source output: 8.9 mW
Wavelength: 945 nm
Half width: 45 nm
Illumination distance: 1 meter

■ Photograph 1 Comparison of Images of EXview HAD CCD and conventional CCD



■ Figure 2 Spectral Sensitivity Characteristics of EXview HAD CCD and conventional CCD

■ Table 1 Imaging Characteristics of EXview HAD CCD and conventional CCD

• Black-and-white products

Item	ICX248AL	ICX038DLA	Remarks
Visible light sensitivity + Near infrared light sensitivity (F8)	4200mV	1700mV	3200K, 706cd/m ²
Smear (F5.6)	-120dB	-110dB	V/10 method
Saturation signal level	1000mV	800mV	Ta = 60°C

• Color products

Item	ICX248AK	ICX038DNA	Remarks
Sensitivity (F5.6)	1000mV	660mV	3200K, 706cd/m ²
Smear (F5.6)	-120dB	-110dB	V/10 method
Saturation signal level	1000mV	800mV	Ta = 60°C

Multi-Function Timing Controller IC CXD2463R

- On-chip vertical and horizontal CCD clock drivers
- Backlighting correction function
- External synchronization function (Supports Line-Lock and VS-Lock)
- Electronic iris function (Supports the use of a low-speed limiter.)
- Electronic shutter function (Allows the selection of one of eight settings from the following ranges:
EIA: 1/60 s to 1/100,000 s
CCIR: 1/50 s to 1/100,000 s)
- Supports both 250K and 380K-pixel CCDs

1) On-chip vertical driver for compact system design

The vertical driver circuit was integrated into the CXD2463R. Since this allows a camera system, including the CCD itself to be implemented with just three chips, it allows miniature cameras to be implemented with a simple structure. (See figure 4.)

2) Backlighting correction supported with three detection windows

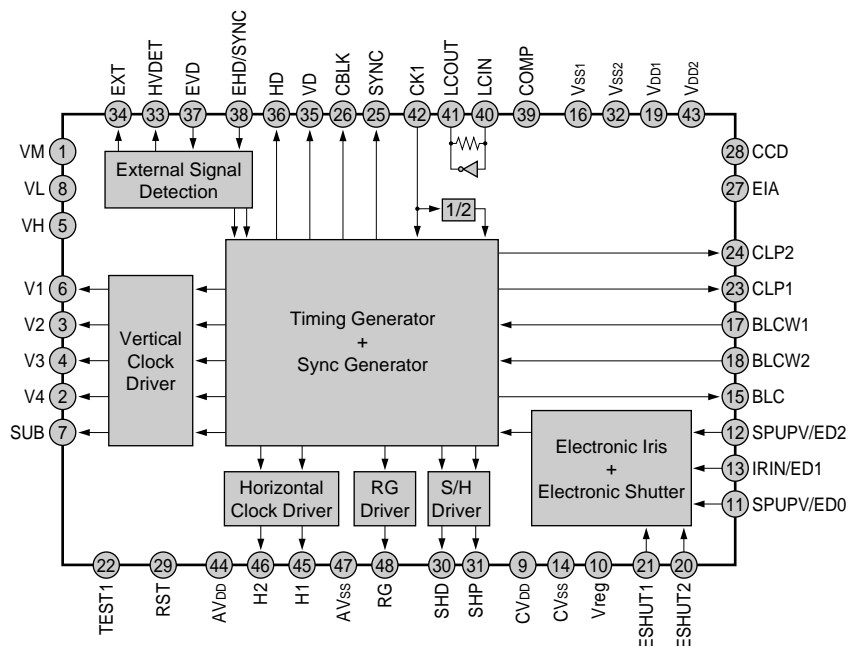
The CXD2463R can output three types of window pulse for backlighting correction. Each window uses an analog switch to turn the iris signal on or off and implement backlighting correction. (See figure 5.)

3) Support for external synchronization functions

The CXD2463R supports Line-Lock, VS-Lock, and HD/VD input as external synchronization functions. The CXD2463R automatically switches to the corresponding synchronization mode according to the combination of signals actually input. The CXD2463R also includes a function for output in which the operating state is in the Line-Lock, VS-Lock, or internal synchronization modes based on the result of that judgment. This allows the CXD2463R to automatically switch the oscillator system based on the input signals. (See table 3.)

■ Table 2 CXD2463R and CXD2400R Functions

Function	CXD2463R	CXD2400R
On-chip vertical driver	○	×
Backlighting correction function	Three types of window pulse	×
External synchronization function	VReset + HPLL Line-Lock	VReset + HPLL
Electronic iris function that supports a low-speed limiter	○	×
Applicable CCDs	250K and 380K-pixel CCDs	250K-pixel CCDs
Noninterlaced function	×	○
Frame storage function	×	○



■ Figure 3 CXD2463R Block Diagram (48-pin LQFP package)

4) Electronic iris and shutter functions support a wide range of exposure control

The CXD2463R supports both electronic iris and electronic shutter functions. The electronic iris function supports two modes, normal mode and a low-speed limiter mode that aims for flickerless images under fluorescent light when the EIA: 1/100 limiter function is operating.

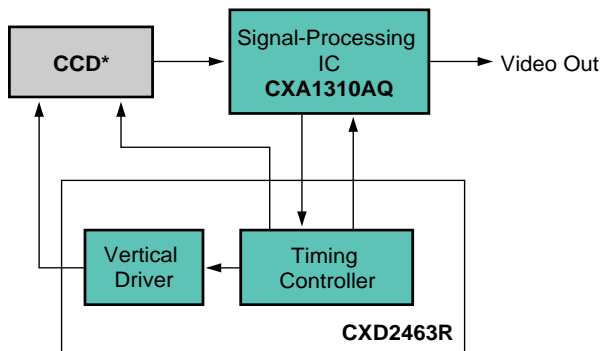
The electronic shutter function allows one of eight shutter speeds to be selected from either 1/60 s to 1/100,000 s (in EIA mode) or from 1/50 s to 1/100,000 s (in CCIR mode).

5) Support for a wide range of CCDs: from 1/4-inch to 1/2-inch optical size devices

The CXD2463R can drive black-and-white CCDs with either 250K or 380K pixels in a wide range of optical sizes, from 1/4-inch to 1/2-inch devices. Thus this device can help suppress cost increases when constructing multiple camera systems by allowing a common board to be used. (See figure 4.)

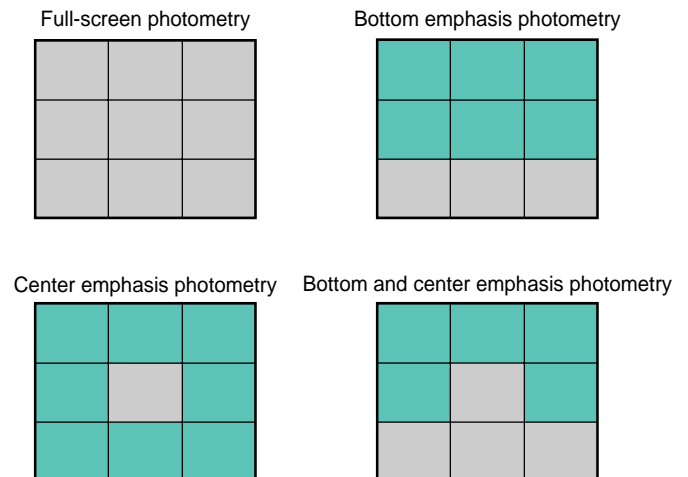
Future Developments

Due to its high performance, the EXview HAD CCD introduced above is expected to be deployed in a wide variety of applications. While we at Sony have applied this EXview HAD CCD technology to 1/2-inch 380K and 440K-pixel CCDs, we plan to take advantage of the fine fabrication technology that is a strong point of this technology and developing and extending this technology to both miniature as well as multi-pixel CCDs only to in-car navigation systems, but to any type of portable equipment.



*: Applicable CCDs
 1/2-inch 380K-pixel CCDs: ICX038DLA/039DLA, ICX248AL/249AL
 1/3-inch 250K-pixel CCDs: ICX054BL/055BL
 1/3-inch 380K-pixel CCDs: ICX058CL/059CL
 1/4-inch 250K-pixel CCDs: ICX086AL/087AL, ICX206AL/207AL
 1/4-inch 380K-pixel CCDs: ICX068AL/069AL, ICX208AL/209AL

■ Figure 4 CXD2463R System Block Diagram



■ Figure 5 CXD2463R Backlighting Correction Function (window pulse generation)

■ Table 3 CXD2463R External Synchronization Automatic Discrimination

I/O	Symbol	Pin No.	EHD/SYNC and EVD pins input signal states and HVDET and EXT pins discrimination result				
I	EHD/SYNC	38	HD	No signal	HD	Sync	No signal
I	EVD	37	No signal	VD	VD	Post-sync separator circuit HD signal	No signal
O	HVDET	33	L	H	L	L	L
O	EXT	34	L	H	H	H	L
Mode			Internal	Line-Lock	VReset + HPLL	VReset + HPLL	Internal

*: For the above external input signals, correct discrimination is not guaranteed if nonstandard signals are input.