1/4-Inch Super HAD CCD
Color Image Sensor

Super HAD CCD

ICX206AK (NTSC), ICX207AK (PAL)
ICX208AK (NTSC), ICX209AK (PAL)

The 1/4-inch CCD has become the mainstream image sensing device in camcorders and medical electronic endoscopes.
Even higher image quality and an ever higher signal-to-noise ratio are desired in these applications.
By adopting the "Super HAD CCD* technology", the Sony ICX206AK, ICX207AK, ICX208AK, and ICX209AK provide significant increases in sensitivity and saturation signal levels when compared to previous 1/4-inch CCD products and achieve specifications that achieve the industry's highest level for this type of device.
These specifications mean that it is now possible to take advantage of the miniaturization possible with 1/4-inch optical systems and also achieve further improvements in image quality and signal-to-noise ratio.

- For use with 1/4-inch optical systems
- Sensitivity increased by 4 dB over previous Sony products by the adoption of Super HAD CCD technology
- Saturation signal level increased by 2 dB over previous 1/4-inch CCDs
- Compatibility with previous 1/4-inch CCDs maintained
- Horizontal register and reset gate drive voltage reduced to 3.0 V (minimum)

* Super HAD CCD is a registered trademark of Sony Corporation.

The ICX206AK (NTSC) and ICX207AK (PAL) are 250,000/290,000-pixel CCDs for 1/4-inch optical system color video cameras and are upwardly compatibly replacements for the current ICX086AK and ICX087AK products. The ICX208AK (NTSC) and ICX209AK (PAL) are 380,000/440,000-pixel CCDs for 1/4-inch optical system high image quality color video cameras and are upwardly compatibly replacements for the current ICX068AK and ICX069AK products. All of these products feature compatibility with previous devices and significantly improved characteristics.

V O I C E

The development concept behind these devices was "the ultimate 1/4-inch CCD." These devices incorporate all the technology fostered in the development of Sony CCDs so as to leave no possibility for competition. In particular, Sony's Super HAD CCD technology contributed a large increase in sensitivity allowing these devices to achieve the industry's highest sensitivity, even surpassing 1/3-inch CCDs.

Improved Sensitivity

Due to the reduction in size of the optical system, the amount of incident light to each pixel is reduced. Although we improved the focusing efficiency of the microlenses and optimized the pixel structure in previous 1/4-inch CCD products, these products were still not focusing all the incident light. (See figure 1.) The Super HAD CCD technology now developed minimizes this loss of incident light. The shape of the microlenses was optimized to minimize the unused areas between the microlenses that existed in previous devices. This resulted in a 30% increase in focusing efficiency. (See figure 2.) This, in combination with the adoption of a large number of other new technologies, resulted in the achievement of a total increase of +4 dB in the sensitivity of Super HAD CCDs as compared to previous devices, without a degradation in the signal-to-noise ratio. This allows these devices to provide a higher sensitivity than 1/3-inch CCDs, despite being 1/4-inch CCDs. (See tables 1 and 2.)

Increased Saturation Signal Level

The amount of charge handled was increased by optimizing the impurity profile in the charge transfer block, and the saturation signal level was increased by 25% over previous 1/4-inch CCDs, and a saturation signal level that exceeds that of 1/3-inch CCDs is assured. This allowed the signal-to-noise ratio, which is critical for image quality, to be increased.

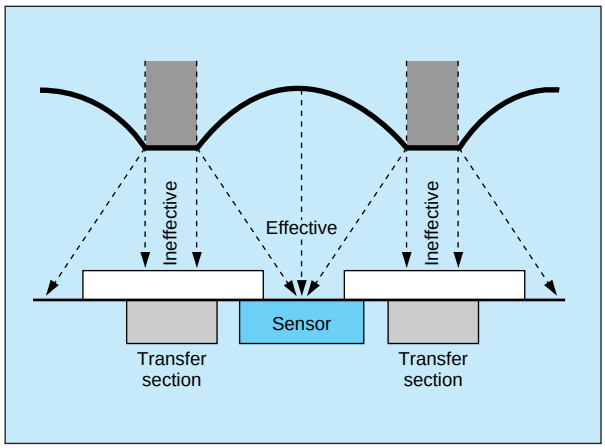
Reduced Power Consumption

The drive voltage for the horizontal register and the reset gate was reduced to 3.0 V (minimum), making it lower than that in previous products. This allowed the power consumption to be reduced by up to 15%.

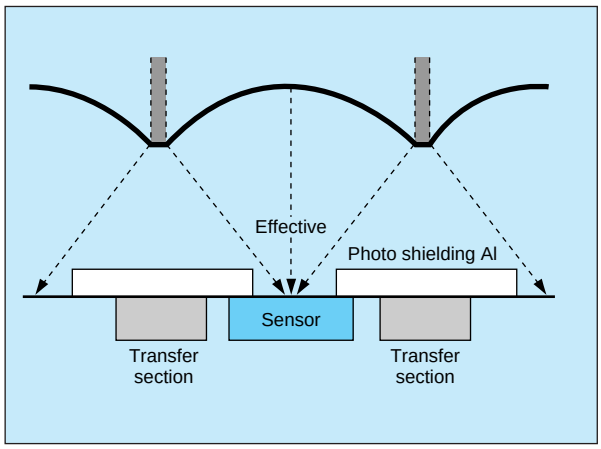
Drive Circuits

The pin arrangement in these products is the same as that used in previous 1/4-inch CCD products. Circuits used with previous 1/4-inch CCD products can be used simply by omitting certain components in the reset gate drive block. The horizontal register and reset gate drive voltages were unified and reduced. This can contribute to simplifying the peripheral circuits. (See figure 3.)

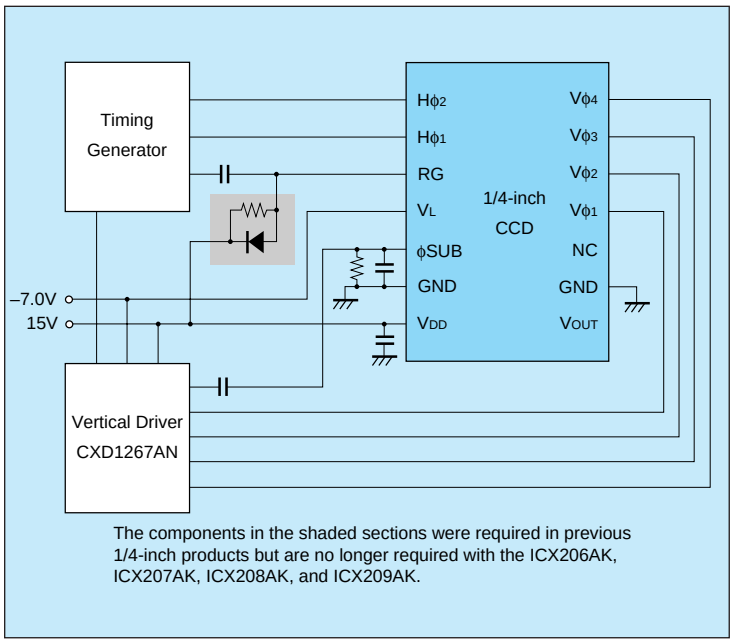
New Products



■ Figure 1 Previous CCD Sensor Structure



■ Figure 2 Super HAD CCD Sensor Structure



■ Figure 3 Drive Circuit Example

■ Table 1 Comparison of 250,000-Pixel CCD Characteristics

	ICX206AK/207AK (New 1/4-inch products)	ICX086AK/087AK (Previous 1/4-inch products)	ICX054AK/055AK (1/3-inch products)
Sensitivity (F5.6)	900mV/880mV	550mV/450mV	700mV/630mV
Saturation signal level	900mV/810mV	700mV/630mV	700mV/630mV
Horizontal drive voltage (min.)	3.0V	3.0V	4.75V
Reset gate drive voltage (min.)	3.0V	4.5V	4.5V
Voltage adjustment	Adjustment free	Adjustment free	External adjustment

■ Table 2 Comparison of 380,000-Pixel CCD Characteristics

	ICX208AK/209AK (New 1/4-inch products)	ICX068AK/069AK (Previous 1/4-inch products)	ICX058AK/059AK (1/3-inch products)
Sensitivity (F5.6)	450mV/440mV	290mV/280mV	340mV/330mV
Saturation signal level	800mV/720mV	600mV/540mV	600mV/540mV
Horizontal drive voltage (min.)	3.0V	3.3V	4.75V
Reset gate drive voltage (min.)	3.0V	4.5V	4.5V
Voltage adjustment	Adjustment free	Adjustment free	External adjustment