New High-Definition, Multifunctional CCDs
for Consumer Maximum-Pixel-Count Digital VCRs
1/3-Inch, 630,000/740,000-Pixel CCD Image Sensors

ICX080AK, ICX081AK

Digital camcorders have been selling well since their introduction by all leading manufacturers in 1995. Starting with top-end 3-CCD models, the lineup is gradually being extended to include smaller, lower-priced models, and this trend can be expected to continue over the next year.

To meet the needs of these new models, Sony has developed high-definition, multifunctional 1/3-inch, 630,000/740,000-pixel CCDs.

While supporting functions such as 16:9 high-definition, full-width capability, 4:3 wide-angle electronic vibration stabilizer, and high-magnification electronic zoom, these new CCDs offer improved ease of use with such features as reduced supply voltage and clock amplitude, and adjustment-free design.

- 630,000/740,000 pixels for consumer maximum-pixel-count applications
- 16:9 wide screen support (18 MHz, 5fsc/4fsc)
- 4:3 electronic vibration stabilizer supports, pan/tilt*1 / MPEG2 support (13.5 MHz)
- Electronic zoom support(x1 to x4)
- Low voltage, low power consumption
  Supply voltage: 12 V
  Horizontal register drive amplitude: 2.7 to 3.6 V
  Reset gate drive amplitude: 2.7 to 3.6 V
- No reset gate or subatrste bias adjustment required

*1 Pan/Tilt = Operations involving rotating the camera horizontally and vertically

630,000/740,000 Pixels for Consumer Maximum-Pixel-Count Applications

In the sensor construction, Sony's 1/4-inch, 380,000-pixel state-of-the-art technology has been used to achieve 630,000/740,000 pixels in a 1/3-inch optical size suitable for consumer products (table 1). This has made possible such features as the first 16:9 high-definition, full-width capability for consumer applications, and the highest level of 4:3 wide-angle electronic vibration stabilizer in the consumer field.

Targeting the growing PC market, all the major manufacturers released digital still cameras in 1995, and these have been selling well. 740,000-pixel CCDs are also suitable for use in high-definition digital still cameras (figure 1).

16:9 Wide Screen Support (18 MHz, 5fsc/4fsc)

By means of vertical-only V-CCD high-speed transfer from 630,000/740,000 pixels, it is possible to delineate an area corresponding to the TV system within the CCD and achieve a 16:9 wide image. The aspect ratio can be realized within the permitted range even with a horizontal drive frequency of 13.5 x | 4/3 = 18 MHz conforming to the DV specification, and with either NTSC 5 fsc or PAL 4 fsc.

4:3 Electronic Vibration Stabilizer, Pan/Tilt Support

Using a process of excision with external line memory, a horizontal resolution of 450 TV lines is maintained with a 1/4-inch optical size 4:3 aspect ratio, and it is possible to obtain a wide-angle electronic vibration stabilizer area (33% in both the horizontal and vertical direction). This area can be used not only for electronic vibration stabilizer, but also for electronic panning/tilting. The effective area is suitable for digital VCR, MPEG2 (main level), and similar moving image compression processing.

Electronic Zoom Support (x1 to x4)

V-CCD high-speed transfer supports a maximum sweep-out transfer frequency of 643 kHz, and electronic zoom/vibration stabilizer of 150% at x2 and 200% at x4. It is also useful for electronic panning/tilting of monitor cameras.

Low Voltage, Low Power Consumption, Adjustment-Free Design

If primary consideration is given to image characteristics, it is difficult to achieve low-voltage operation. The supply voltage, in particular, which relates directly to the sensor characteristics, has never previously been reduced to less than 15 V (Sony data). Through such techniques as process optimization, 12 V operation has now been achieved while at the same time improving image characteristics (including a smear improvement of -3 dB). Sony has also succeeded in providing on-chip non-volatile analog memory transistors, and has achieved elimination of external adjustment for the reset gates—for which adjustment-free capability alone was previously difficult—together with a reduction in minimum amplitude from 4.5 to 2.7 V. Together with the use of a 2.7 V H-CCD voltage, this provides compatibility with the lower voltages of peripheral ICs. This technology has also been employed in the substrate bias circuit to eliminate external adjustment (figures 2 and 3).

V O I C E

Designed for the new digital, wide-screen age while maintaining continuity with conventional systems, the ICX080AK and ICX081AK CCDs offer maximum results (functions) with the minimum necessary number of pixels. With compact camera design in mind, they feature low voltage, low power consumption, adjustment-free design, and fewer peripheral components, without sacrificing picture quality, for all-round greater ease of use.

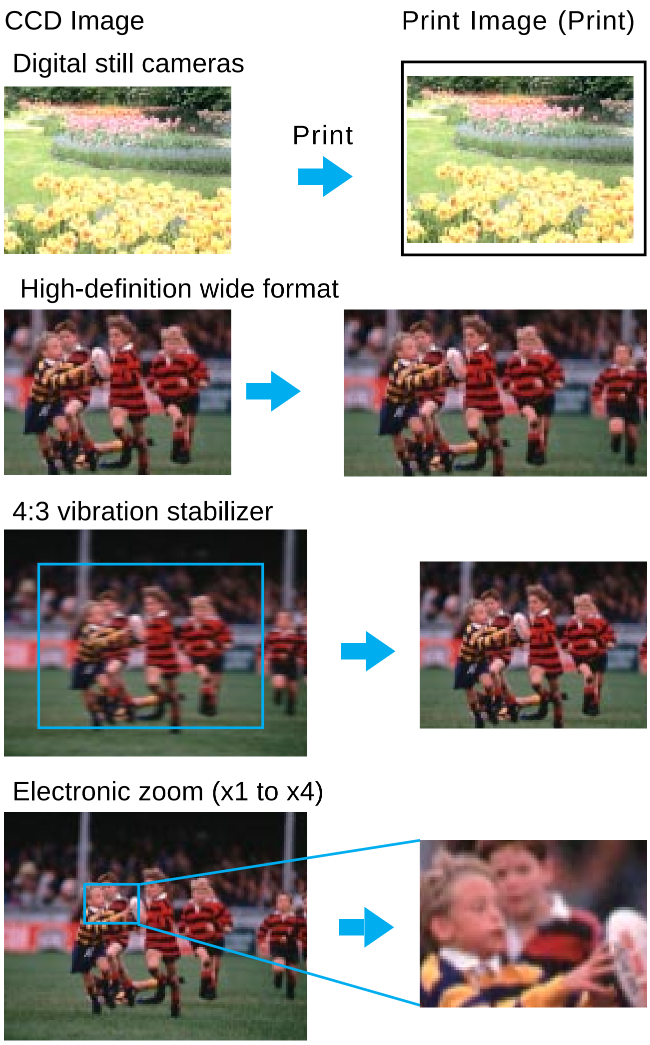

Figure 1 ICX080AK/ICX081AK Functions

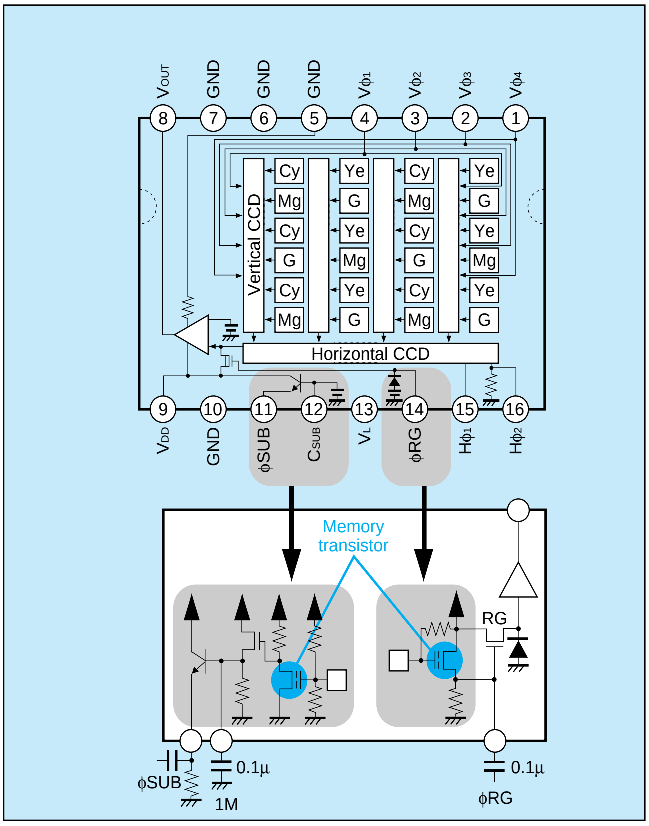

Figure 2 ICX080AK/ICX081AK Block Diagram and Newly Developed Bias Circuit

Table 1 ICX080AK/ICX081AK Specifications

	ICX080AK (NTSC)	ICX081AK (PAL)
Type	Interline transfer CCD image sensor	
Optical size	1/3-inch format (effective diameter: 6 mm)	
Total number of pixels	Approx. 680,000 (1016H×674V)	Approx. 810,000 (1016H×794V)
Total number of effective pixels	Approx. 630,000 (962H×654V)	Approx. 740,000 (962H×774V)
Number of effective pixels		
4 : 3 TV system	Approx. 340,000 (711H×485V)	Approx. 400,000 (702H×575V)
16 : 9 18MHz	Approx. 460,000 (948H×485V)	Approx. 540,000 (936H×575V)
16 : 9 5fsc/4fsc	Approx. 460,000 (942H×485V)	Approx. 530,000 (922H×575V)
Pixel size	5.05Hμm×5.55Vμm	5.15Hμm×4.75Vμm
Chip size	5.90mm (H)×4.92mm (V)	
Color filter arrangement	Complementary color mosaic (Mg, G, Ye, Cy)	
Package	16-pin plastic DIP	
Sensitivity Y (F5.6)	300mV	
Sensor saturation signal level	600mV	540mV
Dark signal output	0.5mV (60°C)	
Smear (1/10 V)	/90dB	
Electronic shutter	Max. 1/10000 s (variable speed)	

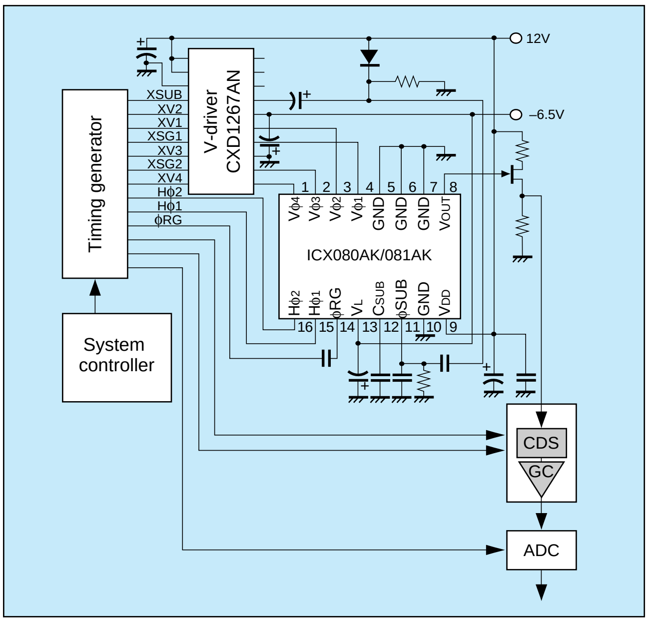

Figure 3 Sample Drive Circuit