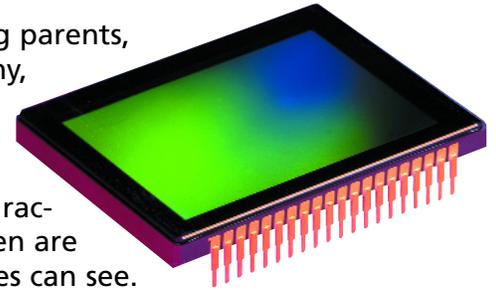
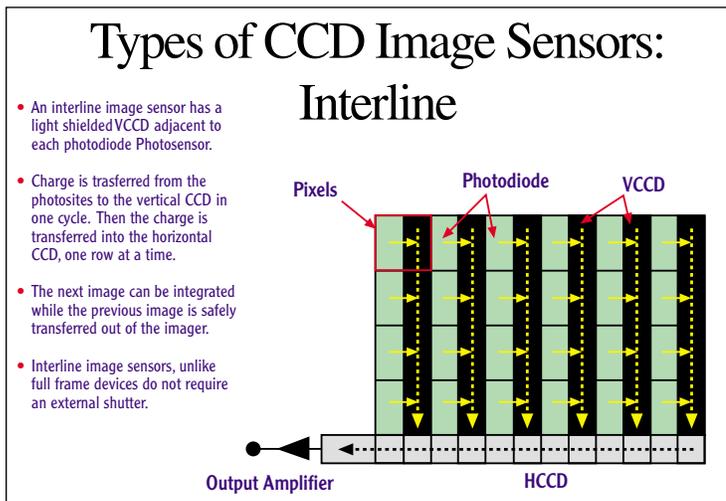


Expanding the Horizons of Professional Digital Photography

It's a pretty picture, and a familiar one: the newlyweds, their beaming parents, attendants and a fidgeting flower girl or two. Yet social photography, from weddings and family portraits to class pictures, literally stretches the boundaries of the profession, as does photojournalism. Whether a bridal party or press conference, subjects often require very high resolution, and they may be in motion, proceeding to the altar or racing down the courthouse steps. What's more, the images captured often are displayed or published in large formats, magnifying every detail the eyes can see.



Photographers who focus on this kind of work can't always rely on the what-you-see-is-what-you-get advantage of single-lens reflex (SLR) cameras. Taking pictures from the pews, sidelines or a crowded press room, they may not have time to look through a viewfinder, much less compose a shot, and they need wide-angle lens capabilities and high-speed shutter mechanisms to make the most of photo opportunities as they happen.



New digital cameras are now commercially available that are compatible with traditional 35 mm camera lenses, for taking pictures of subjects that require very high resolution for 11x14-inch or even 20x30-inch prints. The APS-format image sensors that are typically used in today's 35 mm digital SLR cameras change the effective magnification factor of the lens, causing problems especially with wide-angle photography. And the 35 mm format image sensors previously available comprise were based on 12- μ m pixels, resulting in a 6-million-pixel detector that left the professional photographer wishing for more – more pixels, that is, for higher resolution.

Now, by combining advances in image sensor architecture and pixel size, Kodak has developed an image sensor with the features and functions that deliver the large-format image quality and the high-speed shutter function professional photographers require. Subjects and action that demand a wide-angle lens and extremely fast capture will be a snap, with the new image sensor's 35 mm optical format, very fast electronic shutter function and live-motion preview feature.

Designed to Spot the Perfect Shot

The KAI-11000CM 11-million pixel interline transfer (See Above Illustration) charge-coupled-device (IT-CCD) sensor has an image resolution of 4,008-pixel horizontal and 2,672-pixel vertical in a frame size of 36 mm x 24 mm, the equivalent of traditional 35 mm film. Based on a 9- μ m pixel architecture to provide very high detail in large photographic prints, the new sensor's design also makes it possible to generate live-motion video on a studio monitor or other display, such as an LCD display. All of the photographs shown in this paper were captured using a test camera with the KAI-11000CM imager and reference design evaluation board.





A variety of image sensor architectures such as full-frame CCD, interline transfer CCD, frame transfer CCD and CMOS have evolved to fulfill different performance requirements. In contrast to full-frame CCD architecture, in which pixels collect light and store signal charge over the entire imager, as well as serve as the transfer mechanism to shift charge and read out each cell of information, interline transfer CCD architecture features pixels that have separate areas for image capture and charge transfer. The KAI-11000CM sensor's interline architecture allows an image to be captured even as the previous image is read out.



This capability is complemented by the 11-megapixel sensor's fast line dump feature (See Below Illustration), which enables sub-sampling of rows for faster frame rates. For instance, the KAI-11000CM's imaging area has five times the vertical resolution required for VGA display monitors (640x480 pixels), so just a portion of the new sensor's image area is all that's necessary to generate motion preview images quickly. While a full-frame CCD image sensor must read the entire image area to generate a photo preview, in this example, the KAI-11000CM can generate images five times faster.



The efficiency of the fast line dump feature is further enhanced by dual output mode capability. When light is converted to charge and read out by a single output CCD sensor, each row of data is moved to a separate horizontal charge transfer register, and charge packets for each row are read out serially – in one direction, such as left to right – and sensed by a charge-to-voltage conversion and amplifier section. In dual output mode, the KAI-11000CM can reverse the clocking of the right half of the horizontal CCD, so that half of the data is output to left and half to the right, effectively doubling the rate of frame generation.



As a result, the KAI-11000CM can generate images as fast as 20 frames per second, providing fluid live-motion display – and shutter speeds that far exceed the mechanical capabilities of still cameras, giving pros added assurance that critical moments will be captured. In the near future, the instant the photographer fully activates the shutter directly or remotely, the Kodak KSC-1000 timing generator will send the required clocking signals to the sensor for the desired mode of operation, and the Kodak KSC-2000 clock driver will deliver all of the voltages necessary to drive the sensor. These ancillary chips serve as a support chip set, optimizing the image sensor's performance for image quality and functionality, and providing the camera designer with easier sensor integration and more compact designs.

Unveiled at Photokina 2002, the KAI-11000CM and sensor support chips will lead to cameras that free professional photographers from their station behind the lens. No longer will they have to stalk the bride and groom for a spontaneous gesture, or sweat over the possibility that the fourth-down play wasn't framed properly. At last, with a sensor optical format equivalent to 35 mm film, photographers can take full advantage of their favorite specialty and wide-angle lenses again, plus all the benefits of fast shutter action.

Block Diagram: Fast Line Dump, Dual Outputs

The fast line dump feature can sub-sample rows in the VCCD for rapid read-out, enabling live motion preview.

Dual outputs —Users can select to operate The imager in single or dual output mode based on their application.

