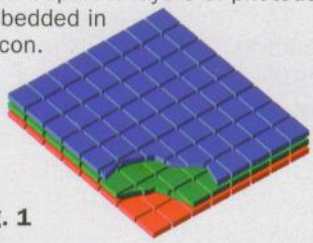
technology TODAY

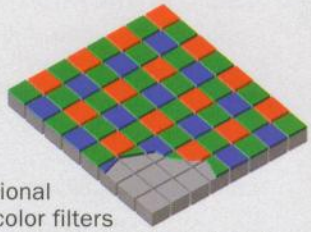
Alan Pierce
pierceaj@optonline.net

The Foveon X3 Chip = Digital Film

The CCD chip in your digital camera might have millions (one million = one megapixel) of microscopic photo diode pixels that convert light energy into electricity. Each of these pixels has a red, green, or blue filter covering its surface. These color-filtered pixels are arranged in a checkerboard pattern that converts images to three-color separations that can be combined digitally to create a picture that contains every color of the rainbow. Figure 1 compares the Foveon X3 chip with the checkerboard pattern chip that you currently have in your digital camera. The pixel count in most digital cameras is physically divided into three parts so that a third of the pixels are capturing red, a third green, and the last third blue.

A Foveon X3 image sensor features three separate layers of photodetectors embedded in silicon.





In conventional systems, color filters are applied to a single layer of photodetectors in a tiled mosaic pattern.

Fig. 1

The Foveon X3 digital chip has three layers that serve a similar purpose to the three layers in color film. Figure 2 compares the X3 chip with color film. The Foveon chip separates light by how deep each color's wavelength can penetrate silicon. The three layers transmit the data that they receive from every pixel on the chip. So Foveon pixels are the same in principle as the chemical grain that makes up a film picture. This means that every pixel actively reports light intensity data for red, green, and blue light.

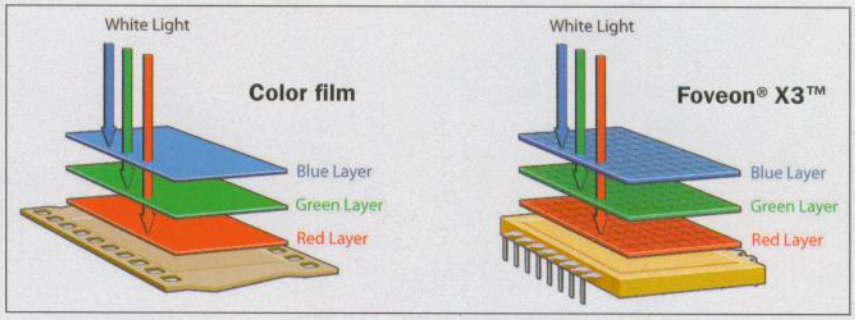
The layers of these chips are extremely thin. They are positioned to capture the light energy at the depth that red, green, and blue light penetrate silicon. The three layers together only measure one ten-thousandth of an inch in thickness. You can compare their functioning to a coin separator. You drop coins in and they are separated by size. Here, each color of light is separated by its wavelength's ability to penetrate to a particular layer. Blue penetrates the least and, thus, is picked up by layer one. Layer two picks up the wavelength for green light, and layer three picks up red light.

The Foveon chip is only slightly smaller than a 35mm negative and can create images many professional photographers feel match the quality of film. Patents currently protect this technology, and Foveon keeps its thin silicon manufacturing process a secret. Cameras that have this technology are still few in number and mostly used by professional photographers.

Learn more about the Foveon chip by typing Foveon into your favorite search engine. Also, visit their web site at www.foveon.com/prod_f7.html.

Recalling the Facts

1. How does a standard CCD chip separate light rays into red, green, and blue signals?
2. How does the Foveon X3 chip separate light into red, green, and blue signals?
3. Why do people compare the Foveon chip's design to that of color film?



4. Why would a 10-megapixel Foveon camera take more detailed pictures than a 10-megapixel CCD based camera?

Alan Pierce, Ed.D., CSIT, is a technology education consultant, technical writer, and public speaker on technology issues.