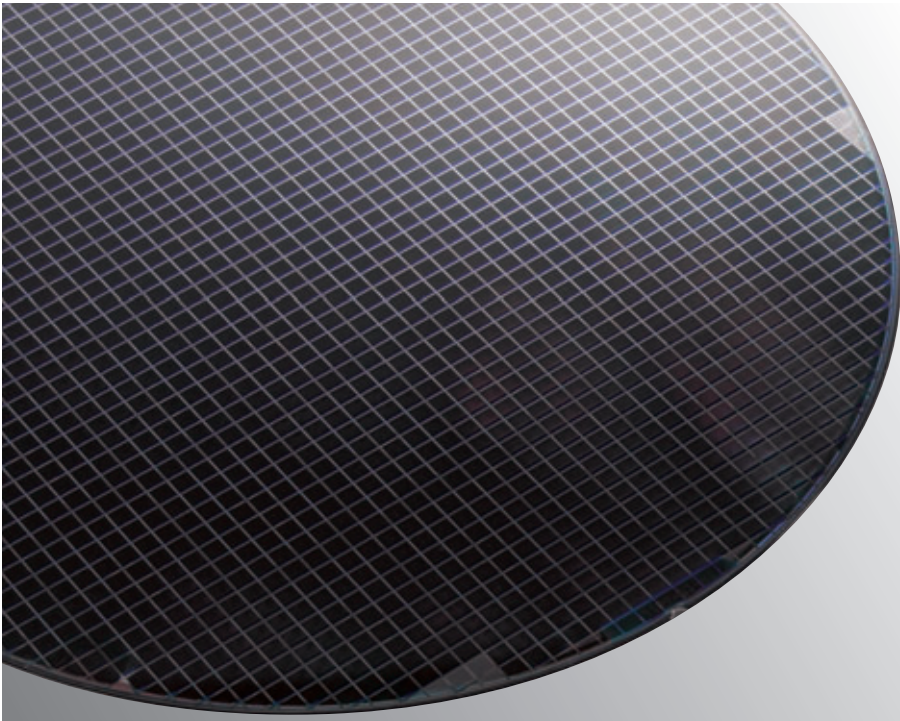


## ■ On-chip Color Filters (Color Filter Array and Micro-Lens)



### Enriching the visual world with its high color reproducibility

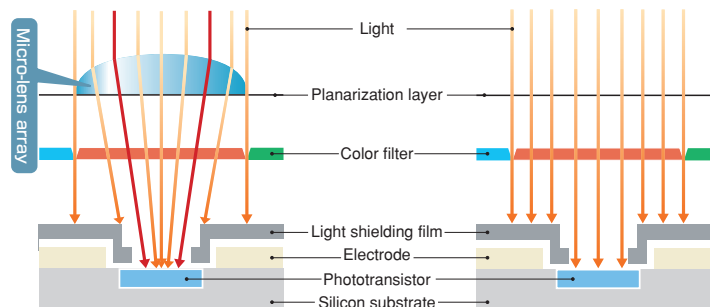
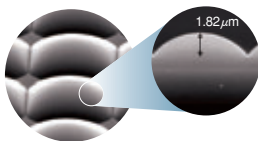
On-chip color filters (Color Filter Array : CFA) are indispensable for CCD and CMOS image sensors as the image input elements and for small size display devices such as LCOS to provide color images. As the markets for digital cameras and cellular phones with the camera function have expanded, demand for CFA has also been increasing. Color filter of red, green and blue (RGB) as the primary colors of light or cyan, magenta, yellow and green (CMYG) as the complimentary colors is directly formed on each of the phototransistors generated on a silicon wafer. In addition, the micro-lens array is formed on CFA in order to enhance light gathering power of the image sensor and to improve sensitivity. Toppan's On-chip color filter (CFA) has won a high reputation for its own color reproduction and fine fabrication technologies developed by printing technology.

### Effect of micro-lens array

#### With micro-lens array

A higher volume of light can be gathered onto the phototransistor by changing the light direction through the effect of a lens.

SEM image of micro-lens array



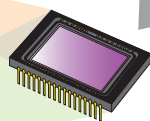
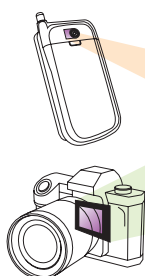
#### Without micro-lens array

Inferior in light gathering efficiency



### What is the image sensor?

The image sensor consists of a large number of small elements called pixels. Each pixel further consists of the phototransistor and the light transfer portion. Although the phototransistor generates electric signals once it receives light, it does not produce any color image since the element reacts only to light and darkness. Therefore, CFA is formed on the phototransistor in order to detect certain light strength and to take the image as a color image.



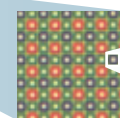
Chip



Wafer on which CFA is formed

\* Once light is exposed on it, rainbow color is seen by reflection.

On-chip color filter (CFA)



Micro-lens array

