SOLID-STATE IMAGING DEVICE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a solid-state imaging device having a plurality of substrates.

Priority is claimed on Japanese Patent Application No. 2014-097010, filed on May 8, 2014, the contents of which are incorporated herein by reference.

Description of Related Art

Solid-state imaging devices having a plurality of substrates have been disclosed. For example, Japanese Unexamined Patent Application, First Publication No. 2013-247548 discloses a solid-state imaging device having a first substrate in which photoelectric transducers for imaging signals are arranged, and a second substrate in which photoelectric transducers for auto-focusing are arranged. An auto-focusing operation is attained by processing signals based on signal charges generated by the photoelectric transducers arranged in the second substrate.

SUMMARY OF THE INVENTION

A first aspect of the present invention is a solid-state imaging device including a first substrate configured such that a plurality of first pixels having first photoelectric conversion units are arranged in a two-dimensional matrix; a second substrate configured such that a plurality of second pixels having second photoelectric conversion units are arranged in a two-dimensional matrix; and a plurality of color filters arranged corresponding to each of the first pixels. A plurality of the first pixels corresponding to the color filters of two or more colors constitute a pixel group. A plurality of the pixel groups are arranged so that each of the pixel groups corresponds to the second pixels. A light which is transmitted through the color filters enters the first photoelectric conversion units of the first pixels corresponding to the color filters. A light which is transmitted through the pixel group enters the second photoelectric conversion unit of the second pixel corresponding to the pixel group. The number of colors of the color filters corresponding to the plurality of first pixels that constitute the pixel group, and the number of the first pixels corresponding to each color are equal to each other among the plurality of pixel groups.

According to the solid-state imaging device related to a second aspect of the present invention based on the first aspect, the color filters may include R filters having a peak of transmittance in a red wavelength band; G filters having a peak of transmittance in a green wavelength band; and B filters having a peak of transmittance in a blue wavelength band. The pixel group may include two or more of the first pixels corresponding to the R filters.

According to the solid-state imaging device related to a third aspect of the present invention based on the second aspect, the R filters, the G filters, and the B filters may be arranged so as to constitute a Bayer array, and the pixel group may include only two of the first pixels corresponding to the R filters and one of the first pixels corresponding to the G filter.

According to the solid-state imaging device related to a fourth aspect of the present invention based on the first aspect, the color filters may include R filters having a peak of transmittance in a red wavelength band; G filters having a peak of transmittance in a green wavelength band; and B filters having a peak of transmittance in a blue wavelength band. The R filters, the G filters, and the B filters may be arranged so as to constitute a Bayer array. The pixel group may include one or more combinations of only one of the first pixels corresponding to one of the R filters included in a unit array of the Bayer array, two of the first pixels corresponding to two of the G filters included in the unit array of the Bayer array, and one of the first pixels corresponding to one of the B filters included in the unit array of the Bayer array.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view illustrating a configuration example of a solid-state imaging device according to a first embodiment of the present invention.

FIG. **2** is a cross-sectional view illustrating the configuration example of the solid-state imaging device according to the first embodiment of the present invention.

FIG. **3** is a plan view illustrating a configuration example of a solid-state imaging device according to a first modified example of the first embodiment of the present invention.

FIG. **4** is a plan view illustrating a configuration example of a solid-state imaging device according to a second modified example of the first embodiment of the present invention.

FIG. **5** is a plan view illustrating a configuration example of a solid-state imaging device according to a third modified example of the first embodiment of the present invention.

FIG. **6** is a plan view illustrating a configuration example of a solid-state imaging device according to a fourth modified example of the first embodiment of the present invention.

FIG. **7** is a plan view illustrating a configuration example of a solid-state imaging device according to a second embodiment of the present invention.

FIG. **8** is a plan view illustrating a configuration example of a solid-state imaging device according to a first modified example of the second embodiment of the present invention.

FIG. **9** is a plan view illustrating a configuration example of a solid-state imaging device according to a second modified example of the second embodiment of the present invention.

FIG. **10** is a plan view illustrating a configuration example of a solid-state imaging device according to a third modified example of the second embodiment of the present invention.

FIG. **11** is a plan view illustrating a configuration example of a solid-state imaging device having a plurality of substrates.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention will be described below referring to the drawings.

First Embodiment

First, a first embodiment of the present invention will be described. FIG. **1** illustrates a configuration example of a solid-state imaging device **1000** according to the present embodiment. As illustrated in FIG. **1**, the solid-state imaging device **1000** has a first substrate **10** and a second substrate **20**. The first substrate **10** and the second substrate **20** overlap each other in a direction perpendicular to a principal surface of each substrate. The principal surface is the widest surface among a plurality of surfaces that constitute the surface of the substrate. A state where the first substrate **10** and the