ABSTRACT

An image sensor pixel that includes a photoelectric conversion unit supported by a substrate and an insulator adjacent to the substrate. The pixel includes a cascaded light guide that is located within an opening of the insulator and extends above the insulator such that a portion of the cascaded light guide has an air interface. The air interface improves the internal reflection of the cascaded light guide. The cascaded light guide may include a self-aligned color filter having air-gaps between adjacent color filters. These characteristics of the light guide eliminate the need for a microlens. Additionally, an anti-reflection stack is interposed between the substrate and the light guide to reduce backward reflection from the image sensor. Two pixels of having different color filters may have a difference in the thickness of an anti-reflection film within the anti-reflection stack.