WHAT IS CLAIMED IS:

1. An image sensor, comprising:

a semiconductor substrate having a first region and a second region;

an isolation region filling a first isolation trench that partially penetrates the semiconductor substrate;

a plurality of photoelectric conversion regions defined by the isolation region and forming a first hexagonal array on a plane that is parallel to a surface of the semiconductor substrate; and

a plurality of microlenses respectively corresponding to the plurality of photoelectric conversion regions, and forming a second hexagonal array on the plane that is parallel to the surface of the semiconductor substrate,

wherein the isolation region includes an insulating liner,

wherein the insulating liner extends from the first isolation trench to a second isolation trench and completely covers a first inner wall of the first isolation trench, a second inner wall of the second isolation trench and a first surface of the semiconductor substrate, and

an insulating layer that completely covers the insulating liner between the first isolation trench and the second isolation trench.

2. The image sensor of claim 1, wherein the plurality of photoelectric conversion regions and the plurality of microlenses are arranged in a zigzag along a first direction that is parallel to the surface of the semiconductor substrate, and are arranged in columns along a second direction that is perpendicular to the first direction.

3. The image sensor of claim 1 or claim 2, wherein the plurality of microlenses each have a rectangular bottom surface and are arranged in a first staggered array on the plane that is parallel to the surface of the semiconductor substrate.

4. The image sensor of claim 3, wherein the plurality of photoelectric conversion regions each have a rectangular planar shape and are arranged in a second staggered array on the plane that is parallel to the surface of the semiconductor substrate.

5. The image sensor of claim 3, wherein the plurality of photoelectric conversion regions each have a hexagonal planar shape and are arranged in a honeycomb array on the plane that is parallel to the surface of the semiconductor substrate.

6. The image sensor of any one of claims 1 to 5, wherein the isolation region has a mesh shape on the plane that is parallel to the surface of the semiconductor substrate.

7. The image sensor of claim 1, wherein the plurality of microlenses each have a hexagonal bottom surface and are arranged in a first honeycomb array on the plane that is parallel to the surface of the semiconductor substrate.

8. The image sensor of claim 7, wherein the plurality of photoelectric conversion regions each have a rectangular planar shape and are arranged in a staggered array on the plane that is parallel to the surface of the semiconductor substrate.

9. The image sensor of claim 7, wherein the plurality of photoelectric conversion regions each have a hexagonal planar shape and are arranged in a second honeycomb array on the plane that is parallel to the surface of the semiconductor substrate.

10. The image sensor of any one of claims 1 to 9, wherein, in the first region, respective centers of a first microlens of the plurality of microlenses and a first photoelectric conversion region of the plurality of photoelectric conversion regions, which correspond to that of the first microlens, on the plane that is parallel to the surface of the semiconductor substrate, match with each other along a direction that is perpendicular to the surface of the semiconductor substrate.

11. The image sensor of claim 10, wherein, in the second region, respective centers of a second microlens of the plurality of microlenses and a second photoelectric conversion region of the plurality of photoelectric conversion regions, which corresponds to that of the second microlens, on the plane that is parallel to the surface of the semiconductor substrate, are spaced apart from each other along a direction that is parallel to the surface of the semiconductor substrate.

12. An image sensor, comprising:

a semiconductor substrate;

an isolation region comprising an insulating liner and a conductive buried layer, wherein the insulating liner covers a first inner wall of a first isolation trench that penetrates the semiconductor substrate, a first surface of the semiconductor substrate and extends to a second inner wall of a second isolation trench that penetrates the semiconductor substrate, and the conductive buried layer is disposed on the insulating liner in the first isolation trench and the second isolation trench;

a plurality of photoelectric conversion regions defined by the isolation region and forming a first hexagonal array on a plane that is parallel to the first surface of the semiconductor substrate;

a plurality of microlenses respectively corresponding to the plurality of photoelectric conversion regions, and forming a second hexagonal array on the plane that is parallel to the first surface of the semiconductor substrate; and

an insulating layer that completely covers the insulating liner between the first isolation trench and the second isolation trench.

13. The image sensor of claim 12, wherein

a bottom surface of each of the plurality of microlenses and a planar shape of each of the plurality of photoelectric conversion regions have a rectangular shape, and

the plurality of microlenses and the plurality of photoelectric conversion regions are arranged in a staggered array on the plane that is parallel to the first surface of the semiconductor substrate.

14. The image sensor of claim 12, wherein

a bottom surface of each of the plurality of microlenses and a planar shape of each of the plurality of photoelectric conversion regions have a hexagonal shape, and

the plurality of microlenses and the plurality of photoelectric conversion regions are arranged in a honeycomb array on the plane that is parallel to the first surface of the semiconductor substrate.

15. The image sensor of any one of claims 12 to 14, wherein

the isolation trench penetrates through a portion of the semiconductor substrate from the first surface of the semiconductor substrate to a second surface of the semiconductor substrate, and

the isolation region contacts an isolation layer at a bottom of the isolation trench, the isolation layer being disposed on the second surface of the semiconductor substrate.

16. The image sensor of any one of claims 12 to 14, wherein the isolation trench completely penetrates through the semiconductor substrate from the first surface of the semiconductor substrate to a second surface of the semiconductor substrate.

17. An image sensor, comprising:

a semiconductor substrate having a first region and a second region;

an isolation region filling a first isolation trench that partially penetrates the semiconductor substrate;

a plurality of photoelectric conversion regions defined by the isolation region and forming a first array on a plane that is parallel to a surface of the semiconductor substrate; and

a plurality of microlenses respectively corresponding to the plurality of photoelectric conversion regions, and forming a second array on the plane that is parallel to the surface of the semiconductor substrate,

wherein a center of each of a first photoelectric conversion region of the plurality of photoelectric conversion regions and a first microlens of the plurality of microlenses corresponding to the first photoelectric conversion region overlap each other in the first region, and a center of each of a second photoelectric conversion region of the plurality of photoelectric conversion regions and a second microlens of the plurality of microlenses corresponding to the second photoelectric conversion region do not overlap each other in the second region,

wherein the isolation region includes an insulating liner,

wherein the insulating liner extends from the first isolation trench to a second isolation trench and completely covers a first inner wall of the first isolation trench, a second inner wall of the second isolation trench and a first surface of the semiconductor substrate, and

an insulating layer that completely covers the insulating liner between the first isolation trench and the second isolation trench.

18. The image sensor of claim 17, wherein the plurality of photoelectric conversion regions are arranged along a first direction parallel to the surface of the semiconductor substrate, and the plurality of microlenses are arranged along the first direction.

19. The image sensor of claim 18, wherein the center of the first photoelectric conversion region and the center of the first microlens correspond to a first line passing through the first photoelectric conversion region and the first microlens along a second direction perpendicular to the first direction.

20. The image sensor of claim 19, wherein the center of second photoelectric conversion region corresponds to a second line passing through the second photoelectric conversion region along the second direction, and the center of second microlens corresponds to a third line passing through the second microlens along the second direction, wherein the second and third lines are spaced apart from each other in the first direction.