WHAT IS CLAIMED:

1. A three-dimensional semiconductor device, comprising:

an electrode structure including a plurality of electrodes stacked on a substrate and extending in a first direction, the electrode structure comprising an upper selection electrode and a plurality of cell electrodes located below the upper selection electrode;

vertical structures penetrating the electrode structure to provide a plurality of columns spaced apart from each other in a second direction crossing the first direction; and

a dummy insulating separation layer penetrating the upper selection electrode and extending in the first direction,

wherein each of the plurality of columns includes the vertical structures arranged in the first direction,

the plurality of columns include first and second edge columns located adjacent to respective opposite edges of the electrode structure, and the plurality of columns including a center column located between the first and second edge columns,

the plurality of columns further include a first intermediate column between the first edge column and the center column, and a second intermediate column between the first intermediate column and the center column,

a first distance between the first edge column and the first intermediate column is greater than a second distance between the first intermediate column and the second intermediate column,

the second distance is greater than a third distance between the second intermediate column and the center column,

the vertical structures are arranged to have mirror symmetry with respect to the dummy insulating separation layer, and

wherein a first shortest space between the vertical structures of the first edge column, a second shortest space between the vertical structures of the first intermediate column, a third shortest space between the vertical structures of the second intermediate column, and a fourth shortest space between the vertical structures of the center column are substantially same.

2. The device of claim 1, wherein the adjacent ones of the plurality of columns are shifted in the first direction relative to one another.

3. The device of claim 1, wherein, at least one of the plurality of columns, the vertical structures arranged in the first direction are spaced apart from each other by substantially equal distances.

4. The device of claim 1, wherein, in each of the plurality of columns, the vertical structures in the first direction are spaced apart from each other by substantially equal distances.

5. The device of claim 1,

wherein the vertical structures included in the center column penetrate the dummy insulating separation layer.

6. The device of claim 1, wherein the electrode structure is provided between adjacent common source regions extending in the first direction, and

the respective opposite edges of the electrode structure face the adjacent common source regions, when viewed in a plan view.

7. The device of claim 1, wherein shortest distances between the vertical structures, which are respectively selected from the plurality of columns and are closest to each other, decrease in a direction from the first or second edge columns toward the center column.

8. A three-dimensional semiconductor device, comprising:

an electrode structure including a plurality of electrodes stacked on a substrate and extending in a first direction; and

vertical structures penetrating the electrode structure and forming a plurality of columns spaced apart from each other in a second direction crossing the first direction,

wherein each of the plurality of columns includes the vertical structures arranged in the first direction and spaced apart from each other by substantially equal distances,

wherein the plurality of columns include first and second edge columns located adjacent the respective opposite edges of the electrode structure, and the plurality of columns includes a center column located between the first and second edge columns, and a first

intermediate column between the first edge column and the center column and a second intermediate column between the first intermediate column and the center column,

wherein the first edge column includes a first vertical structure,

the first intermediate column includes a second vertical structure adjacent to the first vertical structure,

the second intermediate column includes a third vertical structure adjacent to the second vertical structure,

the center column includes a fourth vertical structure adjacent to the third vertical structure, and

a first shortest space between the first and second vertical structures is greater than a second shortest space between the second and third vertical structures,

wherein the second shortest space is greater than a third shortest space between the third and fourth vertical structures, and

wherein shortest spaces between the vertical structures are substantially the same in the first edge column, the first intermediate column, the second intermediate column and the center column.

9. The device of claim 8, wherein a diameter of the second vertical structure is greater than that of the first vertical structure, and

a diameter of the third vertical structure is greater than the diameter of the second vertical structure.

10. The device of claim 8, wherein one of two adjacent ones of the plurality of columns is shifted relative to the other in the first direction.

11. A three-dimensional semiconductor device, comprising:

an electrode structure including a plurality of electrodes stacked on a substrate and extending in a first direction, the electrode structure comprising an upper selection electrode and a plurality of cell electrodes located below the upper selection electrode; and

vertical structures penetrating the electrode structure to provide a plurality of columns spaced apart from each other in a second direction crossing the first direction,

wherein each of the plurality of columns includes the vertical structures arranged in the first direction,

the plurality of columns include first and second edge columns located adjacent to respective opposite edges of the electrode structure, and the plurality of columns including a center column located between the first and second edge columns,

the plurality of columns further include a first intermediate column between the first edge column and the center column, and a second intermediate column between the first intermediate column and the center column,

a first distance between the first edge column and the first intermediate column is greater than a second distance between the first intermediate column and the second intermediate column,

the second distance is greater than a third distance between the second intermediate column and the center column, and

wherein a first shortest space between the vertical structures of the first edge column, a second shortest space between the vertical structures of the first intermediate column, a third shortest space between the vertical structures of the second intermediate column, and a fourth shortest space between the vertical structures of the center column are substantially same.

12. The device of claim 11, wherein the adjacent ones of the plurality of columns are shifted in the first direction relative to one another.

13. The device of claim 11, wherein, at least one of the plurality of columns, the vertical structures arranged in the first direction are spaced apart from each other by substantially equal distances.

14. The device of claim 11, wherein, in each of the plurality of columns, the vertical structures in the first direction are spaced apart from each other by substantially equal distances.

15. The device of claim 11, further comprises a dummy insulating separation layer penetrating the upper selection electrode and extending in the first direction

wherein the vertical structures are arranged to have mirror symmetry with respect to the dummy insulating separation layer, the vertical structures included in the center column penetrate the dummy insulating separation layer.

16. The device of claim 11, wherein the electrode structure is provided between adjacent common source regions extending in the first direction, and

the respective opposite edges of the electrode structure face the adjacent common source regions, when viewed in a plan view.

17. The device of claim 11, wherein shortest distances between the vertical structures, which are respectively selected from the plurality of columns and are closest to each other, decrease in a direction from the first or second edge columns toward the center column.