

WHAT IS CLAIMED IS:

~~1. A method of manufacturing a semiconductor device, the method comprising:~~

~~forming a stacked structure, the stacked structure comprising first material layers and second material layers that are alternately stacked in a vertical direction;~~

~~forming channel structures passing through the stacked structure;~~

~~forming holes passing through the stacked structure; and~~

~~forming material patterns that replace the second material layers through the holes.~~

~~2. The method of claim 1, wherein the holes include first holes, the first holes being arranged next to each other in a first horizontal direction crossing the vertical direction, and second holes, the second holes being arranged next to each other in the first horizontal direction, and~~

~~wherein the channel structures are arranged between the first holes and the second holes.~~

~~3. The method of claim 2, wherein the first holes and the second holes are arranged in a zigzag pattern.~~

4. ~~The method of claim 2, further comprising forming slits passing through the stacked structure and extending in a second horizontal direction, crossing the vertical direction,~~

5 ~~wherein, in the forming of the material patterns, the second material layers are replaced by the material patterns through the slits, and~~

~~wherein the material patterns surround the channel structures.~~

10 5. ~~The method of claim 4, wherein the second horizontal direction crosses the first horizontal direction.~~

6. ~~The method of claim 4, wherein the slits extend between the first holes and between the second holes.~~

15 7. ~~The method of claim 4, further comprising forming isolation insulating layers extending in the second horizontal direction in the stacked structure, each of the isolation insulating layers passing through at least one of the first~~
20 ~~material layers and at least one of the second material layers.~~

8. ~~The method of claim 7, wherein at least one of the isolation insulating layers is arranged between the slits adjacent to each other in the first horizontal direction.~~

9. ~~The method of claim 7, wherein the channel structures comprise:~~

~~first channel structures abutting each of the isolation insulating layers and being arranged next to each other in the second horizontal direction; and~~

~~second channel structures abutting each of the slits and arranged next to each other in the second horizontal direction.~~

10. ~~The method of claim 7, wherein the channel structures are arranged in at least two columns between the isolation insulating layers adjacent to each other, and~~

~~the channel structures are arranged in at least two columns between the slits and the isolation insulating layers adjacent to the slits.~~

11. ~~The method of claim 1, further comprising forming a vertical structure in each of the holes,~~

~~wherein the vertical structure comprises:~~

~~a sidewall insulating layer covering a sidewall of each of the holes; and~~

~~a conductive material formed in each of the holes, opened by the sidewall insulating layer.~~

~~12. The method of claim 1, further comprising forming a vertical structure in each of the holes,~~

~~wherein the vertical structure includes an insulating material, completely filling each of the holes.~~

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~~13. The method of claim 1, further comprising forming a vertical structure in each of the holes,~~

~~wherein the vertical structure includes a protruding portion, extending between the first material layers adjacent to each other.~~

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~~14~~1. A semiconductor device, comprising:

interlayer insulating layers and conductive patterns that are alternately stacked in a vertical direction;

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first holes arranged in a first horizontal direction crossing the vertical direction and passing through the interlayer insulating layers and the conductive patterns;

second holes arranged in the first horizontal direction and passing through the interlayer insulating layers and the conductive patterns;

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channel structures that are arranged between the first holes and the second holes, the channel structures passing through the interlayer insulating layers and the conductive patterns; and

vertical structures filling the first holes and the second holes and the vertical structures including protruding portions that protrude toward the adjacent conductive patterns.

5 ~~15~~2. The semiconductor device of claim ~~14~~1, wherein the first holes and the second holes are arranged in a zigzag pattern.

~~16~~3. A semiconductor device, comprising:

interlayer insulating layers and conductive patterns that
10 are alternately stacked in a vertical direction;

first holes arranged in a first horizontal direction crossing the vertical direction and passing through the interlayer insulating layers and the conductive patterns;

second holes arranged in the first horizontal direction and
15 passing through the interlayer insulating layers and the conductive patterns;

channel structures that are arranged between the first holes and the second holes, the channel structures passing through the interlayer insulating layers and the conductive
20 patterns;

a sidewall insulating layer covering a sidewall of each of the first and second holes; and

a conductive contact pillar filling each of the first and second holes and formed on the sidewall insulating layer.

174. The semiconductor device of claim 163, wherein the first holes and the second holes are arranged in a zigzag pattern.