ABSTRACT OF THE DISCLOSURE

Methods and structures of a three-dimensional memory device are disclosed. In an example, the memory device includes a first staircase structure and a second staircase structure over the first staircase structure, each of the first staircase structure and the second staircase structure comprises alternately stacked conductor layers and insulating layers. The memory device can also include a first channel structure extending through the first staircase structure, a second channel structure extending through the second staircase structure and is connected with the first channel structure, a diameter of the top of the first channel structure is greater than that of the bottom of the second channel structure, and a supporting pillar extending through the first staircase structure and the second staircase structure, the supporting pillar comprises a metal layer.

FIG. 6