

ABSTRACT

A semiconductor device includes a substrate, a substrate insulating layer, a first isolation region, gate electrodes, a plurality of channel layers, source/drain regions, a backside contact plug, and a backside isolation region. The substrate includes a first region and a second region. The substrate insulating layer is disposed on a lower surface of the substrate. The first isolation region passes through the substrate and extends towards the substrate insulating layer. The gate electrodes are disposed on an upper surface of the substrate. The plurality of channel layers are surrounded by the gate electrodes. The source/drain regions are disposed at opposite sides of the gate electrodes, and are connected to the plurality of channel layers. The backside contact plug is connected to the source/drain regions. The backside isolation region passes through the substrate and the substrate insulating layer, and the backside isolation region separates the substrate.

FIG. 2