

ABSTRACT

A semiconductor device may include a first semiconductor structure including a substrate, circuit devices on the substrate, a first interconnection structure electrically coupled to the circuit devices, and a first bonding metal layer on the circuit devices and the first interconnection structure, a second semiconductor structure connected to the first semiconductor structure on the first semiconductor structure, and the second semiconductor structure including a memory cell substrate including a conductive pattern and an insulating pattern in contact with a side surface of the conductive pattern, gate electrodes stacked and spaced apart from each other below the memory cell substrate, channel structures penetrating the gate electrodes and spaced apart from each other in a first direction, a second interconnection structure below the gate electrodes and the channel structures, a second bonding metal layer below the second interconnection structure, and the second bonding metal layer connected to the first bonding metal layer.

FIG. 2