

ABSTRACT

A semiconductor device includes a first substrate structure including a substrate, circuit elements on the substrate, a first interconnection structure on the circuit elements, and first metal bonding layers on the first interconnection structure; and a second substrate structure connected to the first substrate structure, and the second substrate structure includes: a plating layer; gate electrodes stacked and spaced apart from each other in a first direction below the plating layer; channel structures penetrating through the gate electrodes and extending in the first direction; a separation region penetrating through the gate electrodes and extending in a second direction; a second interconnection structure below the gate electrodes and the channel structures; second metal bonding layers below the second interconnection structure and connected to the first metal bonding layers; and dummy pattern layers between the second metal bonding layers, extending in the second direction, and including an insulating material.

FIG. 1