

ABSTRACT

A semiconductor device includes a substrate having a conductive region and an insulating region; gate electrodes including sub-gate electrodes spaced apart from each other and stacked in a first direction perpendicular to an upper surface of the substrate and extending
5 in a second direction perpendicular to the first direction and gate connectors connecting the sub-gate electrodes disposed on the same level; channel structures penetrating through the gate electrodes and extending in the conductive region of the substrate; and a first dummy channel structure penetrating through the gate electrodes and extending in the insulating region of the substrate and disposed adjacent to at least one side of the gate connectors in a
10 third direction perpendicular to the first and second directions.

FIG. 3A