

ABSTRACT

A semiconductor device includes a substrate having first and second regions, a gate electrode stack having a plurality of gate electrodes vertically stacked and spaced apart from each other in a first direction perpendicular to an upper surface of the substrate in the first region, and extending to have different lengths in a second direction parallel to the upper surface of the substrate from the first region to the second region, first and second isolation regions extending in the second direction perpendicular to the first direction, while penetrating through the gate electrode stack on the substrate, in the first and second regions, string isolation regions disposed between the first and second isolation regions in the first region, and extending in the second direction while penetrating through a portion of the gate electrode stack, and a plurality of auxiliary isolation regions disposed linearly with the string isolation regions in at least one of the first and second regions, and spaced apart from each other in the second direction.

FIG. 3