

ABSTRACT

A semiconductor memory device includes a substrate having an upper surface; an active region spaced apart from the substrate in a vertical direction that is perpendicular to the upper surface of the substrate, and extending in a first lateral direction that is parallel to the upper surface of the substrate; a word line at least partially surrounding the active region and extending in a second lateral direction that is parallel to the upper surface of the substrate and perpendicular to the first lateral direction; a capacitor including a first electrode connected to the active region; and an insulating loop protruding from the first electrode of the capacitor toward the word line in the first lateral direction, the insulating loop surrounding a portion of the active region and including a metal element.

FIG. 4