ABSTRACT

A semiconductor device includes a substrate, circuit devices on the substrate, lower interconnection lines electrically connected to the circuit devices, a peripheral region insulating layer covering the lower interconnection lines, a source structure on the peripheral region insulating layer, gate electrodes stacked and spaced apart from each other in a first direction on the source structure, channel structures penetrating through the gate electrodes and each including a channel layer, contact plugs penetrating through the gate electrodes and the source structure, extending in the first direction, and connected to a portion of the lower interconnection lines, and spacer layers between the contact plugs and the source structure and including a material different from a material of the insulating layer in the peripheral region, wherein each of the spacer layers has a first width on an upper surface and has a second width greater than the first width on a lower surface.

FIG. 2A