

ABSTRACT

A semiconductor device includes: a peripheral circuit region including circuit elements, the circuit elements of a page buffer and a row decoder; and a cell region including gate electrode layers, stacked in a first direction and connected to the row decoder, and channel structures extending in the first direction to penetrate through the gate electrode layers and to be connected to the page buffer. The row decoder includes high-voltage elements, operating at a first power supply voltage, and low-voltage elements operating at a second power supply voltage, lower than the first power supply voltage. Among the high-voltage elements, at least one first high-voltage device is in a first well region doped with impurities having a first conductivity-type. At least one of the low-voltage elements is in a second well region surrounding the first well region and doped with impurities having a second conductivity-type, different from the first conductivity-type.

FIG. 5