

ABSTRACT

A semiconductor device including: a first transistor which include a first gate stack on a substrate; and a second transistor which includes a second gate stack on the substrate, wherein the first gate stack includes a first ferroelectric material layer disposed on the substrate, a first work function layer disposed on the first ferroelectric material layer and a first upper gate electrode disposed on the first work function layer, wherein the second gate stack includes a second ferroelectric material layer disposed on the substrate, a second work function layer disposed on the second ferroelectric material layer and a second upper gate electrode disposed on the second work function layer, wherein the first work function layer includes the same material as the second work function layer, and wherein an effective work function of the first gate stack is different from an effective work function of the second gate stack.

FIG. 1