ABSTRACT

A semiconductor device including a substrate, a plurality of lower electrodes on the substrate, a dielectric layer stack covering the lower electrodes, and an upper electrode covering the dielectric layer stack may be provided. The dielectric layer stack may include a first dielectric layer on the plurality of lower electrodes, the first dielectric layer including a material having anti-ferroelectricity or paraelectricity, and a second dielectric layer between the first dielectric layer and the upper electrode, the second dielectric layer including a material having ferroelectricity. The upper electrode may include a first upper electrode layer including an N-type impurity.

FIG. 2