



US 20240213302A1

(19) **United States**

(12) **Patent Application Publication**
PARK et al.

(10) **Pub. No.: US 2024/0213302 A1**

(43) **Pub. Date: Jun. 27, 2024**

(54) **INTEGRATED CIRCUIT DEVICE**

Publication Classification

(71) Applicant: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)

(51) **Int. Cl.**
H01G 4/08 (2006.01)

(72) Inventors: **Jungmin PARK**, Suwon-si (KR);
Hanjin LIM, Suwon-si (KR);
Hyungsuk JUNG, Suwon-si (KR)

(52) **U.S. Cl.**
CPC **H01L 28/40** (2013.01); **H10B 12/315**
(2023.02)

(73) Assignee: **Samsung Electronics Co., Ltd.**,
Suwon-si (KR)

(57) **ABSTRACT**

An integrated circuit device may include a transistor on a substrate and a capacitor structure electrically connected to the transistor. The capacitor structure may include a first electrode, a dielectric layer structure on the first electrode, and a second electrode on the dielectric layer structure. The dielectric layer structure may include a plurality of first dielectric layers and a plurality of second dielectric layers that are alternately stacked. The plurality of first dielectric layers may include a ferroelectric material, and the plurality of second dielectric layers may include an anti-ferroelectric material. The distribution proportion of internal defect dipoles gradually may vary in a thickness direction of the dielectric layer structure.

(21) Appl. No.: **18/394,644**

(22) Filed: **Dec. 22, 2023**

(30) **Foreign Application Priority Data**

Dec. 27, 2022 (KR) 10-2022-0186390

