

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2024/0251544 A1 SHIN et al.

Jul. 25, 2024 (43) **Pub. Date:**

(54) SEMICONDUCTOR MEMORY DEVICE AND METHOD OF MANUFACTURING THE SAME

(71) Applicant: SAMSUNG ELECTRONICS CO., LTD., Suwon-si (KR)

(72) Inventors: **SEUNGMIN SHIN**, Suwon-si (KR);

SANGJUN PARK, Suwon-si (KR); SUNGJOO AN, Suwon-si (KR); KIJONG PARK, Suwon-si (KR); ILYOUNG YOON, Suwon-si (KR)

(21) Appl. No.: 18/474,394 (22)Filed: Sep. 26, 2023

(30)Foreign Application Priority Data

(KR) 10-2023-0008848 Jan. 20, 2023

Publication Classification

(51) **Int. Cl.** (2006.01)H10B 12/00

(52) U.S. Cl. CPC H10B 12/315 (2023.02); H10B 12/05 (2023.02)

(57)ABSTRACT

A semiconductor memory device according to an embodiment includes: a substrate; a bit line positioned on the substrate and extending in a first direction; a channel accommodating insulating layer positioned on the substrate, and defining a channel trench exposing the bit line and extending in a second direction crossing the first direction; a channel layer extending along a bottom surface and a side surface of the channel trench and contacting the bit line; a word line positioned in the channel trench and extending in the second direction; a gate insulating layer positioned between the channel layer and the word line; and a capacitor structure positioned on the channel layer and electrically connected to the channel layer, in which the channel layer has a double layer structure of an oxide semiconductor layer and a first graphene layer.

