



US 20230403858A1

(19) **United States**(12) **Patent Application Publication**

Lin et al.

(10) **Pub. No.: US 2023/0403858 A1**(43) **Pub. Date: Dec. 14, 2023**(54) **SEMICONDUCTOR MEMORY DEVICES
AND METHODS OF MANUFACTURING
THEREOF**(71) Applicant: **Taiwan Semiconductor
Manufacturing Company, Ltd.,**
Hsinchu (TW)(72) Inventors: **Meng-Han Lin**, Hsinchu City (TW);
Chia-En Huang, Xinfeng Township
(TW); **Sai-Hooi Yeong**, Zhubei City
(TW)(73) Assignee: **Taiwan Semiconductor
Manufacturing Company, Ltd.,**
Hsinchu (TW)(21) Appl. No.: **17/835,769**(22) Filed: **Jun. 8, 2022****Publication Classification**(51) **Int. Cl.**
H01L 27/11597 (2006.01)(52) **U.S. Cl.**
CPC ... **H01L 27/11597** (2013.01); **H01L 27/11587**
(2013.01)(57) **ABSTRACT**

A semiconductor device includes a memory structure comprising a plurality of first memory cells. The semiconductor device includes a test structure disposed next to the memory structure and comprising a first monitor pattern. The plurality of first memory cells, arranged along a first lateral direction, that have a plurality of first channel films extending along a vertical direction, respectively, and share a first ferroelectric film extending along the vertical direction and the first lateral direction. The first monitor pattern includes: (a) a second channel film extending along the vertical direction and the first lateral direction; and (b) a second ferroelectric film extending along the vertical direction and the first lateral direction.

