



US 20230231052A1

(19) **United States**(12) **Patent Application Publication**
Li et al.(10) **Pub. No.: US 2023/0231052 A1**(43) **Pub. Date: Jul. 20, 2023**(54) **EPITAXIAL SOURCE/DRAIN STRUCTURE
AND METHOD OF FORMING SAME***H01L 29/66* (2006.01)*H01L 29/167* (2006.01)*H01L 29/36* (2006.01)(71) Applicant: **Taiwan Semiconductor
Manufacturing Co., Ltd.**, Hsinchu
(TW)(52) **U.S. Cl.**CPC .. *H01L 29/7848* (2013.01); *H01L 21/823807*
(2013.01); *H01L 21/823814* (2013.01); *H01L*
21/02532 (2013.01); *H01L 29/785* (2013.01);
H01L 29/6681 (2013.01); *H01L 29/167*
(2013.01); *H01L 29/36* (2013.01); *H01L*
21/02573 (2013.01)(72) Inventors: **Kun-Mu Li**, Zhudong Township (TW);
Hsueh-Chang Sung, Zhubei (TW)(21) Appl. No.: **18/186,244**(22) Filed: **Mar. 20, 2023****Related U.S. Application Data**(63) Continuation of application No. 17/199,734, filed on
Mar. 12, 2021, now Pat. No. 11,610,994, which is a
continuation of application No. 16/504,748, filed on
Jul. 8, 2019, now Pat. No. 10,950,725.(60) Provisional application No. 62/738,085, filed on Sep.
28, 2018.**Publication Classification**(51) **Int. Cl.***H01L 29/78* (2006.01)*H01L 21/8238* (2006.01)*H01L 21/02* (2006.01)

(57)

ABSTRACT

A semiconductor device and a method of forming the same are provided. The semiconductor device includes a gate stack over an active region and a source/drain region in the active region adjacent the gate stack. The source/drain region includes a first semiconductor layer having a first germanium concentration and a second semiconductor layer over the first semiconductor layer. The second semiconductor layer has a second germanium concentration greater than the first germanium concentration. The source/drain region further includes a third semiconductor layer over the second semiconductor layer and a fourth semiconductor layer over the third semiconductor layer. The third semiconductor layer has a third germanium concentration greater than the second germanium concentration. The fourth semiconductor layer has a fourth germanium concentration less than the third germanium concentration.

