US 20240213311A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2024/0213311 A1**

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

(54) **SILICON CARBIDE SEMICONDUCTOR DEVICE**

(71) Applicant: **FUJI ELECTRIC CO., LTD.**, Kawasaki-shi (JP)

(72) Inventors: **Syunki NARITA**, Matsumoto-city (JP); **Shinsuke HARADA**, Tsukuba-city (JP)

(73) Assignee: **FUJI ELECTRIC CO., LTD.**, Kawasaki-shi (JP)

(21) Appl. No.: **18/497,333**

(22) Filed: **Oct. 30, 2023**

(30) **Foreign Application Priority Data**

Nov. 17, 2022 (JP) 2022-184487

Publication Classification

(51) **Int. Cl.**

H01L 29/06	(2006.01)
H01L 29/16	(2006.01)
H01L 29/78	(2006.01)

(52) **U.S. Cl.**

CPC ***H01L 29/0634*** (2013.01); ***H01L 29/1608*** (2013.01); ***H01L 29/7811*** (2013.01); ***H01L 29/7813*** (2013.01)

(57) **ABSTRACT**

In an active region and an edge termination region, a drift layer is constituted by a same SJ structure with a parallel pn layer. In the edge termination region, a p^+-type extension portion between the active region and a JTE structure fixes the JTE structure to the potential of a source electrode. The p^+-type extension portion is between and in contact with a p-type base extension portion and the parallel pn layer. The p^+-type extension portion is an extension of upper portions of p^+-type regions provided in the active region to mitigate electric field near bottoms of gate trenches. Between the p-type base extension portion and the parallel pn layer is free of the lower portions of the p^+-type regions. Thus, a length in the depth direction of the p-type column regions of the edge termination region is longer than that of the p-type column regions of the active region.