

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau

(43) International Publication Date
20 March 2025 (20.03.2025)



(10) International Publication Number
WO 2025/059117 A1

(51) International Patent Classification:

H01L 29/78 (2006.01) H01L 29/10 (2006.01)
H01L 29/66 (2006.01) H01L 29/06 (2006.01)

(21) International Application Number:

PCT/US2024/046107

(22) International Filing Date:

11 September 2024 (11.09.2024)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/582,062 12 September 2023 (12.09.2023) US
63/574,846 04 April 2024 (04.04.2024) US

(71) Applicant: **VOLTA SEMICONDUCTOR, INC.**
[—/US]; 10517 San Felipe Rd., Cupertino, CA 95014 (US).

(72) Inventors: **NEBESNYI, Valerii**; 27 Acheon Street, Aphrodite Hills, 8509 (CY). **WIDJAJA, Yuniarto**; 10517 San Felipe Rd., Cupertino, CA 95014 (US). **ZENI, Nikolas**; 79-85 Oakfield Avenue, Glasgow, SCT G128LT (GB). **DUAN, Meng**; 79-85 Oakfield Avenue, Glasgow, SCT G128LT (GB). **ASENOV, Asen**; 17 Daleview Avenue,

Glasgow, SCT G120HE (GB). **TOPALOGLU, Ismail**; 0/2, 3 Bulldale Court, Glasgow, SCT G140ND (GB). **BENSOUIAH, Djamel**; 61 Bulmershe Road, Reading, EN RG15RW (GB).

(74) Agent: **CANNON, Alan W.**; 490 Miramonte Ave., Lakeport, CA 95453 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,

(54) Title: A SEMICONDUCTOR POWER DEVICE

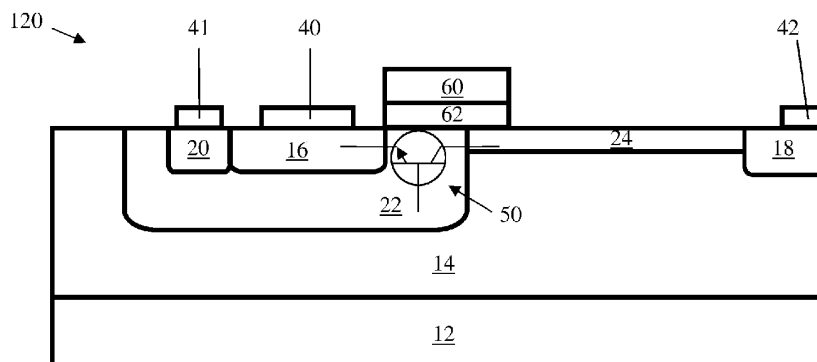


FIG. 1D

(57) Abstract: Semiconductor power devices having lower resistance and higher breakdown voltage are disclosed. Methods of operating the semiconductor power devices are disclosed. The semiconductor power device comprises: a drain region; a first region contacting the drain region and having a same conductivity type as a conductivity type of the drain region, the first region being more lightly doped compared to a doping of the drain region; a source region; a second region in contact with the first region and the source region; a gate region; a gate insulator layer positioned at least in part between the gate region and the second region; a body electrode configured to provide bias to the second region; and a source electrode configured to provide bias to the source region, wherein independent control of the second region and the source region are enabled.

[Continued on next page]

RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))