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

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
10 February 2005 (10.02.2005)

PCT

(10) International Publication Number
WO 2005/013370 A1

(51) International Patent Classification[7]: H01L 27/146

(21) International Application Number:
PCT/US2004/022752

(22) International Filing Date: 15 July 2004 (15.07.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/629,679 30 July 2003 (30.07.2003) US

(71) Applicant *(for all designated States except US)*: **MICRON TECHNOLOGY, INC.** [US/US]; 8000 S. Federal Way, Boise, ID 83707-0006 (US).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **RHODES, HOWARD, E.** [US/US]; 631 E. Ridgefield Drive, Boise, ID 83706 (US).

(74) Agent: **D'AMICO, Thomas, J.**; Dickstein Shapiro Morin & Oshinsky LLP, 2101 L Street NW, Washington, DC 20037-1526 (US).

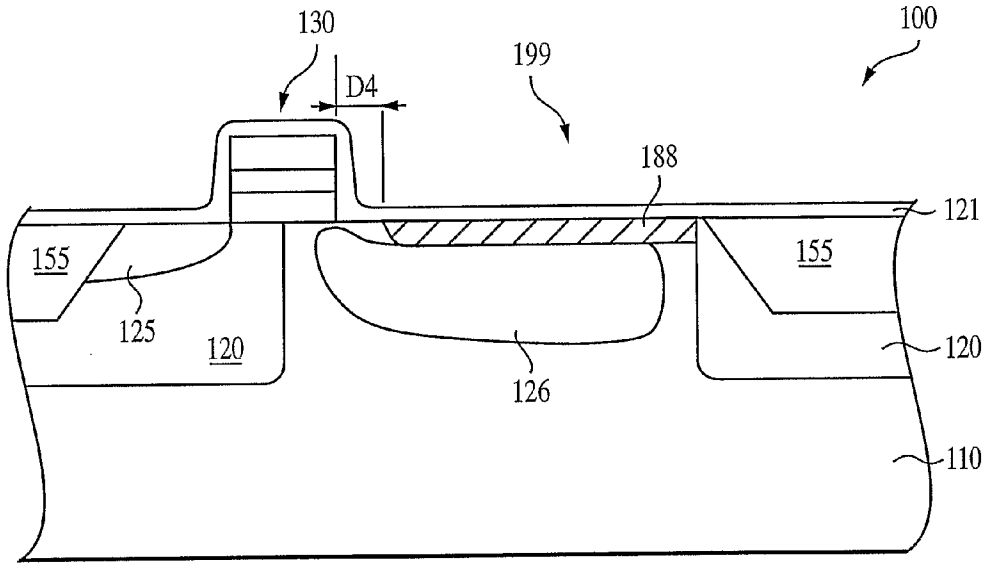
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*
— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** ANGLED PINNED PHOTODIODE FOR HIGH QUANTUM EFFICIENCY AND METHOD OF FORMATION



(57) **Abstract:** A pinned photodiode with a surface layer of a first conductivity type laterally displaced from an electrically active area of a gate structure and a charge collection region of a second conductivity type formed by an angled implant is disclosed. The angle of the charge collection region implant may be tailored so that the charge collection region contacts an adjacent edge of the transfer gate of the pixel sensor cell and minimizes, therefore, the gate overlap region and an undesirable barrier potential.

WO 2005/013370 A1