

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
6 May 2005 (06.05.2005)

PCT

(10) International Publication Number
WO 2005/041304 A3

(51) International Patent Classification⁷: H01L 27/146

(21) International Application Number:
PCT/US2004/028469

(22) International Filing Date:
2 September 2004 (02.09.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/654,938 5 September 2003 (05.09.2003) 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): HONG, Sungkwon, Chris [KR/US]; 2401 S. Apple St., #F205, Boise, ID 83706 (US).

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

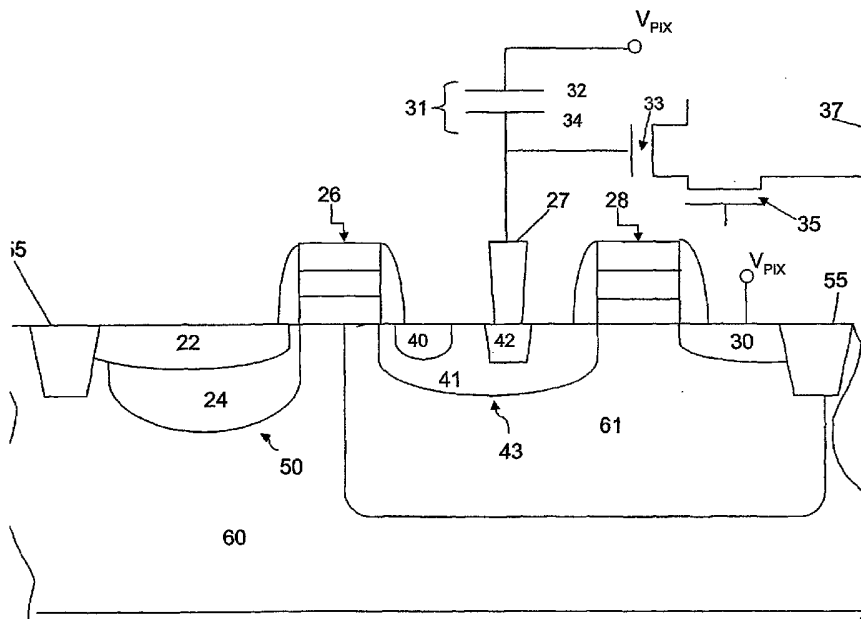
(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, 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

[Continued on next page]

(54) Title: IMAGE SENSOR HAVING PINNED FLOATING DIFFUSION DIODE



(57) Abstract: The present invention provides an image sensor having a pinned floating diffusion region in addition to a pinned photodiode. The pinned floating diffusion region increases the capacity of the sensor to store charge, increases the dynamic range of the sensor and widens intra-scene intensity variation.

WO 2005/041304 A3



— *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.

(88) Date of publication of the international search report:
30 June 2005

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/028469

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L27/146

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/020863 A1 (LEE SEO KYU ET AL) 21 February 2002 (2002-02-21) paragraphs '0032!, '0034! - '0040!; figures 4-10	1,3-6, 28,29, 31-34, 43-48, 50-53
X	US 5 880 495 A (CHEN ET AL) 9 March 1999 (1999-03-09) figures 1-7	1-6,14, 54-59,67
A	US 5 841 159 A (LEE ET AL) 24 November 1998 (1998-11-24) figures 1-4	1-80
A	US 6 388 243 B1 (BEREZIN VLADIMIR ET AL) 14 May 2002 (2002-05-14) figures 2a-5	1-80

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

2 May 2005

Date of mailing of the international search report

10/05/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Cabrita, A

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/028469

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002020863 A1	21-02-2002	KR 2001014031 A	29-12-2001
		KR 2002076510 A	11-10-2002
		CN 1329366 A	02-01-2002
		JP 2002094042 A	29-03-2002
		TW 516184 B	01-01-2003
US 5880495 A	09-03-1999	TW 415104 B	11-12-2000
US 5841159 A	24-11-1998	US 5625210 A	29-04-1997
		EP 0738010 A2	16-10-1996
		JP 8335688 A	17-12-1996
		US 6100551 A	08-08-2000
		US 6027955 A	22-02-2000
		US 5904493 A	18-05-1999
US 6388243 B1	14-05-2002	AU 3511400 A	21-09-2000
		WO 0052765 A1	08-09-2000