

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
31 December 2003 (31.12.2003)

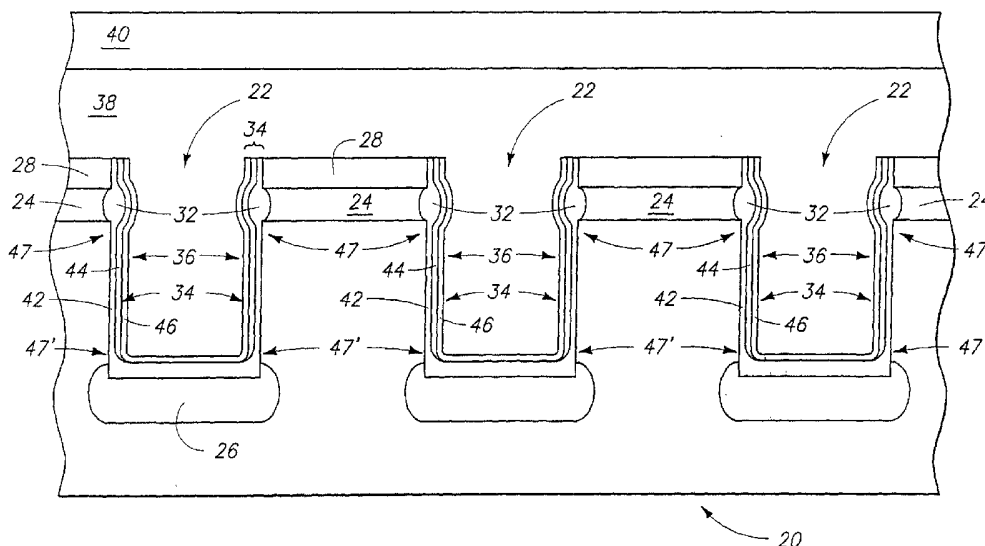
PCT

(10) International Publication Number
WO 2004/001802 A3

- (51) International Patent Classification⁷: H01L 27/115, 29/792, 21/336, 21/8246, 21/8247
- (74) Agent: LEFFERT, Thomas, W.; Leffert Jay & Polglaze, P.A., P.O. Box 581009, Minneapolis, MN 55458-1009 (US).
- (21) International Application Number: PCT/US2003/019303
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, 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, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 19 June 2003 (19.06.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data: 10/177,211 21 June 2002 (21.06.2002) US
10/232,411 29 August 2002 (29.08.2002) US
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).
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- Published: — with international search report

[Continued on next page]

(54) Title: NROM MEMORY CELL, MEMORY ARRAY, RELATED DEVICES AND METHODS



(57) Abstract: An array of memory cells configured to store at least one bit per one F^2 includes substantially vertical structures (34) providing an electronic memory function spaced apart a distance equal to one half of a minimum pitch of the array. The structures providing the electronic memory function are configured to store more than one bit per gate. The array also includes electrical contacts to the memory cells including the substantially vertical structures. The cells can be programmed to have one of a number of charge levels trapped in the gate insulator adjacent to the first source/drain region such that the channel region has a first voltage threshold region (V_{t1}) and a second voltage threshold region (V_{t2}) and such that the programmed cell operates at reduced drain source current.

WO 2004/001802 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:
5 August 2004

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/19303

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H01L27/115 H01L29/792 H01L21/336 H01L21/8246 H01L21/8247

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 114 725 A (HORAK DAVID V ET AL) 5 September 2000 (2000-09-05) column 7, line 52 - column 31, line 41; figures 8-64	1-42, 48-51 43-47
Y	----- US 5 768 192 A (EITAN BOAZ) 16 June 1998 (1998-06-16) column 2, line 41 - column 12, line 12; figures 1-8	43-47
X	----- US 5 617 351 A (MIYAKAWA MAKOTO ET AL) 1 April 1997 (1997-04-01) column 2, line 54 - column 14, line 14; figures 1-11	1,10,21, 23,32, 42,48



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 March 2004

Date of mailing of the international search report

04.06.2004

Name and mailing address of the ISA

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/19303

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-51

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-51

Array of memory cells comprising "vertical edge surfaces" that are incised into a substrate, that are "spaced apart a distance equal to one half of a pitch of the array of edges", and onto which are disposed "structures providing an electronic memory function".

2. claims: 52-112

Array of memory cells comprising a programmed MOSFET.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/19303

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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