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[Continued on next page]

(54) Title: INTEGRATED NON-VOLATILE MEMORY AND PERIPHERAL CIRCUITRY FABRICATION

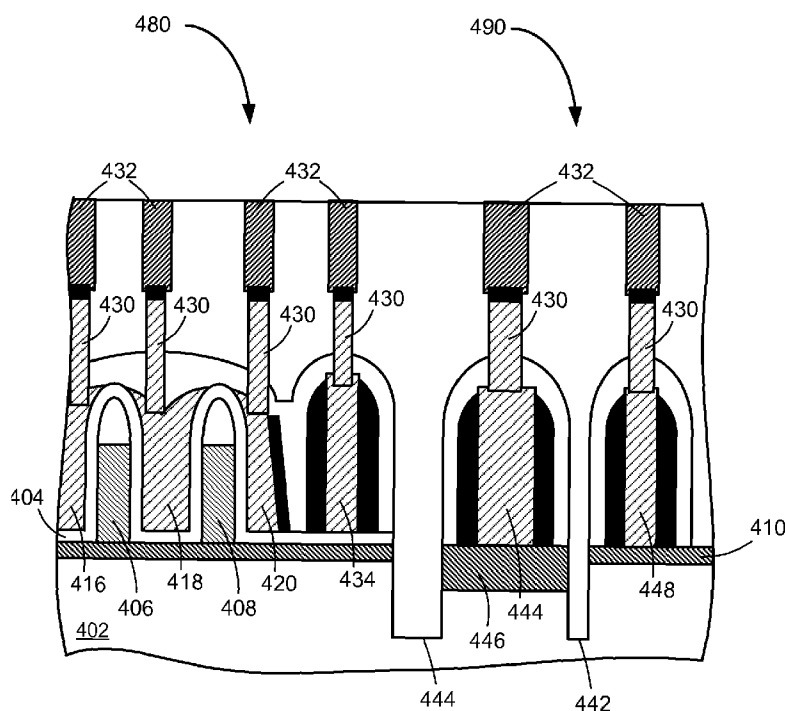


FIG. 10

(y-direction)

(57) Abstract: Non-volatile memory and integrated memory (480) and peripheral circuitry (490) fabrication processes are provided. Sets of charge storage regions (406, 408), such as NAND strings including multiple non-volatile storage elements, are formed over a semiconductor substrate (402) using a layer of charge storage material such as a first layer of polysilicon. An intermediate dielectric layer (404) is provided over the charge storage regions. A layer of conductive material such as a second layer of polysilicon is deposited over the substrate and etched to form the control gates (416, 418) for the charge storage regions and the gate regions (434) of the select transistors for the sets of storage elements. The first layer of polysilicon is removed from a portion of the substrate, facilitating fabrication of the select transistor gate regions from only the second layer of polysilicon. Peripheral circuitry formation is also incorporated into the fabrication process to form the gate regions for devices such as high voltage and logic transistors. The gate regions (444, 448) of these devices can be formed from the layer forming the control gates of the memory array.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

(88) **Date of publication of the international search report:**

20 November 2008

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/059035

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01L21/8247 H01L27/105 H01L27/115

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)

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 888 755 B2 (HARARI ELIYAHOU [US]) 3 May 2005 (2005-05-03) cited in the application	1,4-8
Y	abstract; figures 1,3-10 column 7, line 31 - column 9, line 3 -----	2,3
X	US 2005/207225 A1 (CHEN CHIOU-FENG [US] ET AL CHEN CHIOU-FENG [US] ET AL) 22 September 2005 (2005-09-22)	1,4-8
Y	abstract; figures 2-4H page 2, paragraph 23 - page 3, paragraph 46 ----- -/--	2,3

☒ Further documents are listed in the continuation of Box C.

☒ See patent family 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.

G document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2008/059035

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/146883 A1 (FURUHATA TOMOYUKI [JP]) 10 October 2002 (2002-10-10)	1
A	abstract; figures page 2, paragraph 21 - paragraph 26 page 3, paragraph 37 - page 5, paragraph 64 -----	2-8
Y	US 6 204 159 B1 (CHANG KENT KUOHUA [US] ET AL) 20 March 2001 (2001-03-20)	2,3
A	abstract; figures 3-12 column 5, line 13 - column 6, line 55 column 7, line 30 - column 9, line 13 -----	1,4-8
A	US 5 861 347 A (MAITI BIKAS [US] ET AL) 19 January 1999 (1999-01-19) the whole document -----	2,3
A	US 5 668 034 A (SERY GEORGE E [US] ET AL) 16 September 1997 (1997-09-16) the whole document -----	2,3
A	US 7 026 684 B2 (SAKUMA MAKOTO [JP] ET AL) 11 April 2006 (2006-04-11) cited in the application the whole document -----	1-8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/059035

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 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 No. III Observations where unity of invention is lacking (Continuation of item 3 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 allsearchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search reportcovers 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.:

1-8

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ 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: 1-8

Method of forming dual control gate NAND flash with the select transistor gate being from the same layer as the control gates and the select transistor gate oxide comprising the same dielectric as between control and floating gates.

2. claims: 9-21

Methods of forming dual control gate NAND flash with a peripheral transistor, the gate oxide of the peripheral transistor comprising a first dielectric which is formed before the manufacturing steps of the memory transistor.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2008/059035

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