A nonvolatile memory array includes floating gates that have an inverted-T shape in cross section along a plane that is perpendicular to the direction along which floating cells are connected together to form a string. Adjacent strings are isolated by shallow trench isolation structures. An array having inverted-T shaped floating gates may be formed in a self-aligned manner.
Published: — with international search report

(88) Date of publication of the international search report:
7 August 2008
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

INV. H01L21/28 H01L21/336 H01L21/8247 H01L27/115 H01L29/423
H01L29/788

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

HOIL

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.


Further documents are listed in the continuation of Box C.

X 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 document or to determine the priority date of another document

*C* document referring to an oral disclosure, use, exhibition or other means

*I* 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 novel or 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

"S" document member of the same patent family

Date of the actual completion of the international search

20 March 2008

Date of mailing of the international search report

23/06/2008

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

Albrecht, Claus
## DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>paragraph [0130] - paragraph [0149]; figures 31A-40</td>
<td>2,5-12, 30</td>
</tr>
<tr>
<td></td>
<td>column 5, line 8 - column 8, line 21; figures 4A-5H</td>
<td></td>
</tr>
</tbody>
</table>
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).

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 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 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.:

   1-12, 20-32

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.

Form PCT/ISA/210 (continuation of first sheet (2)) (April 2005)
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-12, 20-32

   Method of forming an upper portion of a floating gate with STI sidewall spacers

2. claims: 13-19

   Method of forming a monolithic floating gate with floating gate sidewall oxidation process
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>WO 2005001922 A</td>
<td>06-01-2005</td>
<td>CN 101019215 A</td>
<td>15-08-2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>EP 1636834 A1</td>
<td>22-03-2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 2007521653 T</td>
<td>02-08-2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 20060023167 A</td>
<td>13-03-2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TW 257148 B</td>
<td>21-06-2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2007076485 A1</td>
<td>05-04-2007</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2005003616 A1</td>
<td>06-01-2005</td>
</tr>
<tr>
<td>US 2005212034 A1</td>
<td>29-09-2005</td>
<td>CN 1674285 A</td>
<td>28-09-2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 2005277035 A</td>
<td>06-10-2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 20050094763 A</td>
<td>28-09-2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2005091369 A1</td>
<td>29-09-2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>JP 2005101066 A</td>
<td>14-04-2005</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 20050029693 A</td>
<td>28-03-2005</td>
</tr>
</tbody>
</table>