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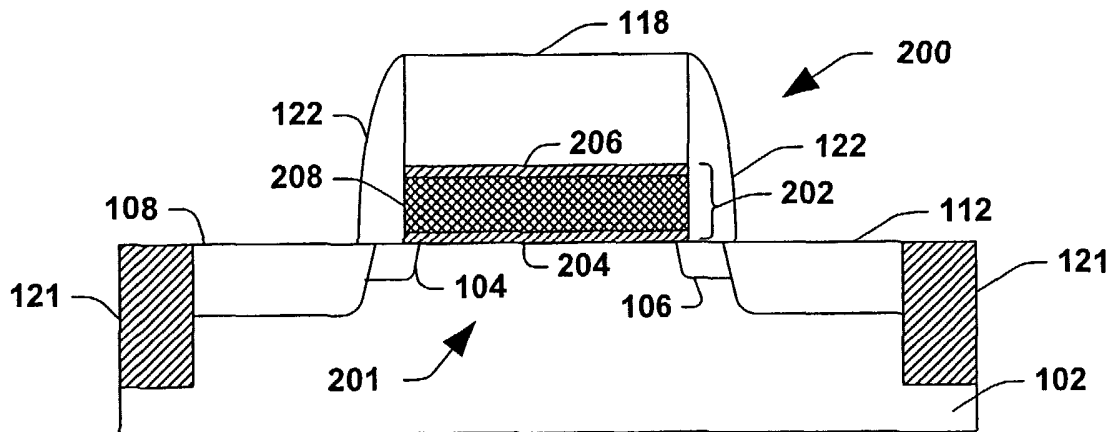
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: GATE OXIDE PROCESS METHODS FOR HIGH PERFORMANCE MOS TRANSISTORS BY REDUCING REMOTE SCATTERING



(57) Abstract: The present invention relates to a MOS transistor structure (200, 210, 400) and method of manufacture (300, 500) which provides a high-k dielectric gate insulator (202, 402) for reduced gate current leakage while concurrently reducing remote scattering, thereby improving transistor carrier mobility.

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# INTERNATIONAL SEARCH REPORT

International Application No  
**PCT/US 03/15194**

**A. CLASSIFICATION OF SUBJECT MATTER**  
IPC 7 H01L29/51 H01L29/49

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 6 278 164 B1 (AOYAMA TOMONORI ET AL) 21 August 2001 (2001-08-21) column 1, line 60 - line 66; figure 1B	1,8 3,4,9 2
Y	----- EP 0 707 344 A (HITACHI LTD) 17 April 1996 (1996-04-17) claims 5,6 -----	3,4,9

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

**27 August 2003**

Date of mailing of the international search report

**08 JAN 2004**

Name and mailing address of the ISA

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 03/15194

## 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.:

1-4, 8, 9

### 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: 1-4,8,9

FET with a high-k dielectric film interposed by two silicon dioxide films (claims 1 and 8).  
The thickness of the silicon dioxide films is a monolayer (claim 2).

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2. claims: 5-7,10

FET with a high-k dielectric film over a thin silicon dioxide film and with a "high-k metal" gate electrode overlying the gate insulator and corresponding to the high-k dielectric material.

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## INTERNATIONAL SEARCH REPORT

 In: Application No  
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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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