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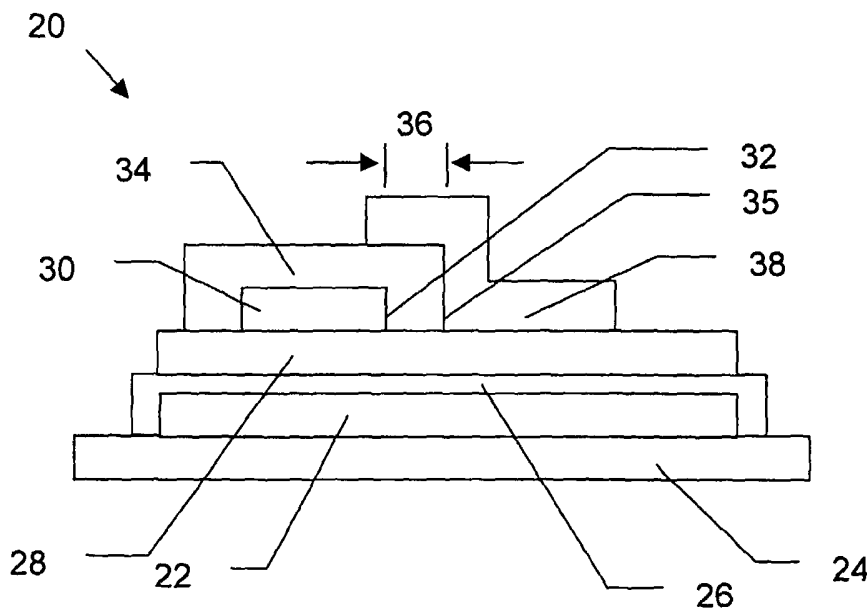
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**Declarations under Rule 4.17:**

— as to the identity of the inventor (Rule 4.17(i))

[Continued on next page]

(54) Title: THIN FILM SEMICONDUCTOR DEVICES AND METHODS OF MAKING



(57) Abstract: In one method of forming a semiconductor device (20, 40, 50, 60, 70, 80), a first electrode (30) is formed electrically coupled with a semiconductor material (28). After the first electrode (30) is formed, an insulator (34, 74) is formed over the semiconductor material (28) adjoining the first electrode (30) and extending a selected distance (36, 76) from the first electrode (30). After the insulator (34, 74) is formed, a second electrode (38, 62, 78) is formed electrically coupled with the semiconductor material (28) adjoining the insulator (34, 74).

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- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

**Published:**

- *with international search report*

**(88) Date of publication of the international search report:**  
3 August 2006

*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.*

# INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2005/034913

**A. CLASSIFICATION OF SUBJECT MATTER**  
H01L29/417 H01L21/336 H01L29/786 H01L29/739

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/111663 A1 (YAGI SHIGERU) 19 June 2003 (2003-06-19)	1-6, 8, 10-12, 14-20
A	figure 1	7
A	US 4 602 192 A (NOMURA ET AL) 22 July 1986 (1986-07-22) figure 1	1, 15
A	EP 0 273 743 A (KABUSHIKI KAISHA TOSHIBA) 6 July 1988 (1988-07-06) figure 8	1, 15
A	US 2003/059984 A1 (SIRRINGHAUS HENNING ET AL) 27 March 2003 (2003-03-27) paragraph [0103] - paragraph [0117]; figure 7	9, 13
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Further documents are listed in the continuation of Box C.       See patent family annex.

\* Special categories of cited documents :

<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"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</p> <p>"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.</p> <p>"&amp;" document member of the same patent family</p>
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Date of the actual completion of the international search  <b>30 March 2006</b>	Date of mailing of the international search report  <b>12 04 2006</b>
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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  <b>Juhl, A</b>
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2005/034913

## Box 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 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 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.:

### 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: 1-8,10-12,14-20

Reacting the material of a first electrode to form an insulating layer portion having a predetermined extent which determines the length of the active (channel) region in the semiconductor layer.

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2. claim: 9

Use of insulating material that wets a first electrode more than the semiconductor material to form a insulating layer portion having a predetermined extent which determines thereby the length of the active region in the semiconductor layer.

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3. claim: 13

Use of a second electrode material that wets the semiconductor more than the insulating layer to form a second electrode layer having a uniform thickness.

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2005/034913

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 03/056641 A (PLASTIC LOGIC LIMITED; CAMBRIDGE UNIVERSITY TECHNICAL SERVICES LIMITED) 10 July 2003 (2003-07-10) figures 8,11,12 -----	9,13
A	US 2004/029382 A1 (KAWASE TAKEO) 12 February 2004 (2004-02-12) paragraph [0067] - paragraph [0074]; figure 9 -----	9,13

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No  
PCT/US2005/034913

Patent document cited in search report	A1	Publication date	Patent family member(s)	Publication date
US 2003111663	A1	19-06-2003	JP 2003179233 A	27-06-2003
US 4602192	A	22-07-1986	DE 3480243 D1 EP 0139764 A1 WO 8403992 A1	23-11-1989 08-05-1985 11-10-1984
EP 0273743	A	06-07-1988	JP 63166236 A	09-07-1988
US 2003059984	A1	27-03-2003	AU 781789 B2 AU 2016001 A BR 0016643 A CA 2395004 A1 CN 1425202 A EP 1243033 A1 WO 0147045 A1 JP 2003518756 T	16-06-2005 03-07-2001 07-01-2003 28-06-2001 18-06-2003 25-09-2002 28-06-2001 10-06-2003
WO 03056641	A	10-07-2003	AU 2002353205 A1 CN 1618136 A EP 1459397 A1 JP 2005513818 T US 2005151820 A1	15-07-2003 18-05-2005 22-09-2004 12-05-2005 14-07-2005
US 2004029382	A1	12-02-2004	CN 1462484 A EP 1366529 A1 GB 2373095 A WO 02073712 A1 JP 2004530292 T TW 573314 B	17-12-2003 03-12-2003 11-09-2002 19-09-2002 30-09-2004 21-01-2004