

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
21 July 2005 (21.07.2005)

PCT

(10) International Publication Number
WO 2005/067020 A3

(51) International Patent Classification⁷: **H01L 21/3213**,
21/306, 21/265, 21/28, 21/8238

(21) International Application Number:
PCT/US2004/043393

(22) International Filing Date:
23 December 2004 (23.12.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/750,045 30 December 2003 (30.12.2003) US

(71) Applicant (for all designated States except US): **INTEL CORPORATION** [US/US]; 2200 Mission College Boulevard, Santa Clara, CA 95052 (US).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **BRASK, Justin, K.** [CA/US]; 12748 NW Bayonne Lane, Portland, OR 97229 (US).

(74) Agents: **VINCENT, Lester, J.** et al.; Blakely, Sokoloff, Taylor & Zafman LLP, 7th Floor, 12400 Wilshire Boulevard, Los Angeles, CA 90025 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, 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, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

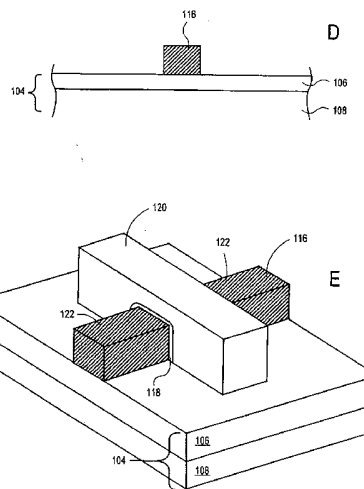
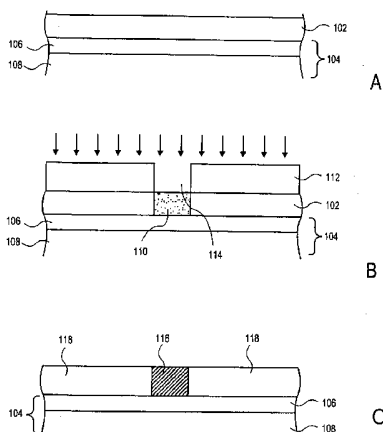
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: A METHOD OF VARYING ETCH SELECTIVITIES OF A FILM



(57) Abstract: A method of patterning a crystalline film. A crystalline film having a degenerate lattice comprising first atoms in a first region and a second region is provided. Dopants are substituted for said first atoms in said first region to form a non-degenerate crystalline film in said first region. The first region and the second region are exposed to a wet etchant wherein the wet etchant etches the degenerate lattice in said second region without etching the non-degenerate lattice in the first region.



(88) Date of publication of the international search report:
15 December 2005

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/US2004/043393

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 H01L21/3213 H01L21/306 H01L21/265 H01L21/28 H01L21/8238		
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, WPI Data, PAJ, INSPEC, IBM-TDB		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 309 975 B1 (WU ZHIQIANG ET AL) 30 October 2001 (2001-10-30) column 35, line 15 - column 36, line 16 column 37, line 48 - column 39, line 28 column 40, lines 7-43 claim 5 figures 1,2,4,6	1-24, 29-31
A	-----	26-28
X	PATENT ABSTRACTS OF JAPAN vol. 012, no. 234 (E-629), 5 July 1988 (1988-07-05) -& JP 63 028067 A (SONY CORP), 5 February 1988 (1988-02-05) abstract figure 1	1-4, 6-18, 20, 21, 23, 29-31
A	-----	5, 19, 22, 24-28
-/--		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents : <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <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> </div> <div style="width: 45%;"> <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>*G* document member of the same patent family</p> </div> </div>		
Date of the actual completion of the international search <div style="text-align: center;">23 September 2005</div>	Date of mailing of the international search report <div style="text-align: center;">28.10.2005</div>	
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: <div style="text-align: center;">Ekoué, A</div>	

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/043393

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 195 30 944 A1 (AT & T CORP., NEW YORK, N.Y., US) 11 April 1996 (1996-04-11) column 2, line 6 - column 3, line 9 figures 1,2	20-25, 29-31
A	-----	1-19, 26-28
X	GB 2 131 748 A (THE SECRETARY OF STATE FOR * DEFENCE) 27 June 1984 (1984-06-27) page 1, line 60 - page 2, line 107	20-25, 29-31
A	-----	1-19, 26-28
P,X, L	WO 2004/061915 A (INTEL CORPORATION) 22 July 2004 (2004-07-22) page 3, paragraph 20 page 4, paragraph 21-24 figures 1-8	1-4,6-8, 11-16, 20,21, 26-31
E,L	WO 2005/067026 A (INTEL CORPORATION; DOCZY, MARK, L; BRASK, JUSTIN, K; KAVALIEROS, JACK;) 21 July 2005 (2005-07-21) page 7, paragraph 19 page 9, paragraph 22 - page 14, paragraph 33 figures 1e-1k	1-4,6-8, 11-17, 19-22, 26-31
E,L	US 2005/148137 A1 (BRASK JUSTIN K ET AL) 7 July 2005 (2005-07-07) page 10, paragraph 58 - page 14, paragraph 80 figures 6A-60	1-4,6-8, 11-17, 19-22, 26-31
A	US 4 465 528 A (GOTO ET AL) 14 August 1984 (1984-08-14) column 4, lines 24-68	1-31
A	US 4 379 001 A (SAKAI ET AL) 5 April 1983 (1983-04-05) column 12, line 53 - column 13, line 49 figures 2E-2G	1-31
A	US 6 255 698 B1 (GARDNER MARK I ET AL) 3 July 2001 (2001-07-03) abstract figures 9-20	26-28
A	GB 2 358 737 A (* NEC CORPORATION) 1 August 2001 (2001-08-01) figures 3a-4d	26-28

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/043393

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: 1-25,29-31

Method for selectively etching portion of a gallium arsenide or InSb crystalline film comprising the steps of forming the GaAs or InSb crystalline film, placing dopants into interstitial sites in a first region of the crystalline film without providing dopants in a second region of the crystalline film, activating the dopants, and exposing the first and second region to a wet etchant.

2. claims: 26-28

Method for manufacturing an integrated circuit comprising the steps of forming sacrificial gate electrodes over a first and a second channel region, altering the first and/or second sacrificial gate electrode such that the first sacrificial gate electrode can be etched with an etchant without etching the second sacrificial gate electrode, forming a dielectric layer over the sacrificial gate electrodes, planarizing the dielectric layer, etching the first dielectric layer without etching the second sacrificial gate electrode so as to form a first opening, depositing a first metal in the first opening, removing the second sacrificial gate electrode so as to form a second opening, and depositing a second metal in the second opening.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US2004/043393

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6309975	B1	30-10-2001	AU 6555198 A 29-09-1998
		EP 0968526 A2 05-01-2000	
		JP 3623804 B2 23-02-2005	
		JP 2001517364 T 02-10-2001	
		JP 2004072122 A 04-03-2004	
		TW 419742 B 21-01-2001	
		WO 9840909 A2 17-09-1998	
		US 6261964 B1 17-07-2001	
JP 63028067	A	05-02-1988	NONE
DE 19530944	A1	11-04-1996	JP 8109500 A 30-04-1996
GB 2131748	A	27-06-1984	NONE
WO 2004061915	A	22-07-2004	AU 2003297140 A1 29-07-2004
		EP 1573803 A2 14-09-2005	
		US 2004121541 A1 24-06-2004	
		US 2004214385 A1 28-10-2004	
		US 2005040469 A1 24-02-2005	
WO 2005067026	A	21-07-2005	US 2005148130 A1 07-07-2005
US 2005148137	A1	07-07-2005	US 2005156171 A1 21-07-2005
US 4465528	A	14-08-1984	DE 3274923 D1 05-02-1987
		EP 0070499 A2 26-01-1983	
US 4379001	A	05-04-1983	CA 1129118 A1 03-08-1982
		DE 2928923 A1 07-02-1980	
		FR 2433833 A1 14-03-1980	
		GB 2030002 A 26-03-1980	
		NL 7905607 A 22-01-1980	
US 6255698	B1	03-07-2001	NONE
GB 2358737	A	01-08-2001	NONE