(19) World Intellectual Property Organization

International Bureau



(43) International Publication Date 13 December 2007 (13.12.2007)

PCT

(10) International Publication Number WO 2007/143387 A3

- (51) International Patent Classification: *H01L 27/102* (2006.01) *H01L 21/768* (2006.01)
- (21) International Application Number:

PCT/US2007/069450

- (22) International Filing Date: 22 May 2007 (22.05.2007)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:

11/444,936 31 May

31 May 2006 (31.05.2006) US

- (71) Applicant (for all designated States except US): SAN-DISK 3D LLC [US/US]; 601 McCarthy Boulevard, Milpitas, CA 95035 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): RADIGAN, Steven, J. [US/US]; 48818 Summit View Terrace, Fremont, CA 95439 (US). RAGHURAM, Usha [US/US]; 1483 Eddington Place, San Jose, CA 95129 (US). DUNTON, Samuel, V. [US/US]; 2697 Pixanne Court, San Jose, CA 95148 (US). KONEVECKI, Michael, W. [US/US]; 2032 Southwest Expressway #73, San Jose, CA 95173 (US).
- (74) Agent: DUGAN, Brian, M.; Dugan & Dugan, PC, Suite 309, 245 Saw Mill River Road, Hawthorne, NY 10532 (US).

- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, 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, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, 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, LV, MC, MT, 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).

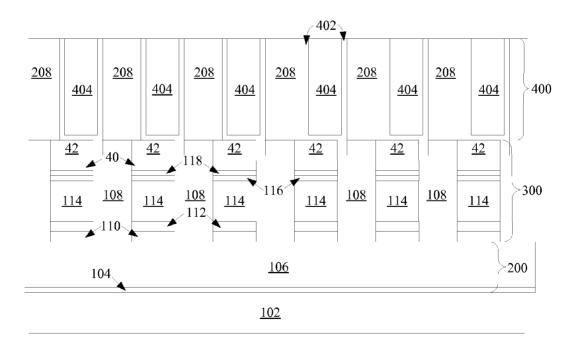
Published:

with international search report

(88) Date of publication of the international search report: 31 January 2008

[Continued on next page]

(54) Title: CONDUCTIVE HARD MASK TO PROTECT PATTERNED FEATURES DURING TRENCH ETCH



(57) Abstract: A method is provided for forming patterned features using a conductive hard mask, where the conductive hard mask protects those features during a subsequent trench etch to form Damascene conductors providing electrical connection to those features from above. The thickness of the hard mask provides a margin to avoid overetch during the trench etch which may be harmful to device performance. The method is advantageously used in formation of a monolithic three dimensional memory array.



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/US2007/069450

		101/	052007/069450
A. CLASSI INV.	IFICATION OF SUBJECT MATTER H01L27/102 H01L21/768		
According to	o International Patent Classification (IPC) or to both national classif	ication and IDC	
	SEARCHED	ication and IPC	······································
	ocumentation searched (classification system followed by classification	ation symbols)	
Documental	tion searched other than minimum documentation to the extent tha	t such documents are included in th	ie fields searched
Electronic d	data base consulted during the international search (name of data	pase and, where practical, search to	erms used)
EPO-In	ternal, WPI Data, INSPEC, IBM-TDB		
C. DOCUM	ENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the	relevant passages	Relevant to claim No.
Х	US 2004/208039 A1 (LOWREY TYLER A [US] ET AL) 21 October 2004 (2004-10-21)		1,4-12, 18, 20-23,25
Υ	abstract; claims; figures 6,8,9 paragraph [0035]		3,13-17, 19,26-28
X	US 2006/094154 A1 (LUNG HSIANG- 4 May 2006 (2006-05-04) abstract; claims; figures 2,3,1 paragraph [0023]		1,2,18, 24
Y			3,13-17, 19,26-28
X	US 6 326 270 B1 (LEE KANG-YOON 4 December 2001 (2001-12-04) abstract; claims; figures	[KR] ET AL)	1
		-/	
X Furt	ther documents are listed in the continuation of Box C.	X See patent family annex	х.
"A" docum consid "E" earlier filing o "L" docum which citatio "O" docum other	categories of cited documents: tent defining the general state of the art which is not dered to be of particular relevance document but published on or after the international date ent which may throw doubts on priority claim(s) or is cited to establish the publication date of another on or other special reason (as specified) ent referring to an oral disclosure, use, exhibition or means ent published prior to the international filling date but than the priority date claimed	"X" document of particular relevation "X" document of particular relevation cannot be considered nove involve an inventive step with document of particular relevations of the considered to involve in the considered to involve in the combined with the considered to involve in the combined with the co	onflict with the application but aciple or theory underlying the ance; the claimed Invention i or cannot be considered to hen the document is taken alone ance; the claimed invention volve an inventive step when the one or more other such docueing obvious to a person skilled
	actual completion of the international search	Date of mailing of the interna	ational search report
1 November 2007		12/11/2007	
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 Wirner, Christoph	

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/069450

tion) DOCUMENTS CONSIDERED TO BE DELEVANT	PCT/US2007/069450
Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
US 6 015 738 A (LEVY HAROLD J [US] ET AL) 18 January 2000 (2000-01-18) abstract; claims; figures 1,16 column 12, line 30 - line 31	18
US 2005/121742 A1 (PETTI CHRISTOPHER J [US] ET AL PETTI CHRISTOPHER J [US] ET AL) 9 June 2005 (2005-06-09) abstract; claims; figure 1	13,14
US 2003/003647 A1 (DENNISON CHARLES H [US] ET AL DENNISON CHARLES H [US] ET AL) 2 January 2003 (2003-01-02) abstract; claims; figures	1–28
WO 2005/018002 A (OVONYX INC [US]) 24 February 2005 (2005-02-24) abstract; claims; figures	1-28
EP 1 475 840 A (ST MICROELECTRONICS SRL [IT]; OVONYX INC [US]) 10 November 2004 (2004-11-10) abstract; claims; figures	1-28
US 6 043 163 A (TSAI CHIA-SHIUNG [TW] ET AL) 28 March 2000 (2000-03-28) abstract; claims; figures	1–28
	US 6 015 738 A (LEVY HAROLD J [US] ET AL) 18 January 2000 (2000-01-18) abstract; claims; figures 1,16 column 12, line 30 - line 31 US 2005/121742 A1 (PETTI CHRISTOPHER J [US] ET AL PETTI CHRISTOPHER J [US] ET AL) 9 June 2005 (2005-06-09) abstract; claims; figure 1 US 2003/003647 A1 (DENNISON CHARLES H [US] ET AL DENNISON CHARLES H [US] ET AL) 2 January 2003 (2003-01-02) abstract; claims; figures WO 2005/018002 A (OVONYX INC [US]) 24 February 2005 (2005-02-24) abstract; claims; figures EP 1 475 840 A (ST MICROELECTRONICS SRL [IT]; OVONYX INC [US]) 10 November 2004 (2004-11-10) abstract; claims; figures US 6 043 163 A (TSAI CHIA-SHIUNG [TW] ET AL) 28 March 2000 (2000-03-28)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2007/069450

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004208039 A	1 21-10-2004	NONE	
US 2006094154 A	1 04-05-2006	US 2007236989 A1	11-10-2007
US 6326270 E	1 04-12-2001	KR 20000028534 A	25-05-2000
US 6015738 /	18-01-2000	NONE	
US 2005121742 F	1 09-06-2005	US 2005121743 A1	09-06-2005
US 2003003647	1 02-01-2003	US 2003203555 A1	30-10-2003
WO 2005018002 A	24-02-2005	JP 2007501520 T KR 20060056367 A KR 20070087264 A US 2005029627 A1	25-01-2007 24-05-2006 27-08-2007 10-02-2005
EP 1475840 /	10-11-2004	DE 60306893 T2 US 2005024933 A1	01-02-2007 03-02-2005
US 6043163	28-03-2000	NONE	