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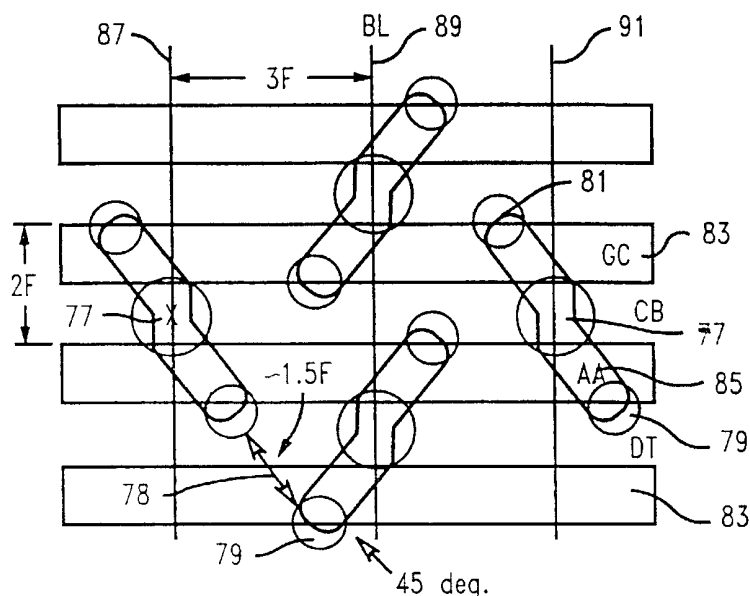
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(54) Title: TRENCH CAPACITOR DRAM CELL LAYOUT



(57) Abstract: A layout pattern for increasing the spacing between the deep trenches (79, 81) of one cell pair and the deep trenches of an adjacent cell pair in an array of semiconductor DRAM cell pairs each of which cell pairs share a common bitline contact (77) to bitlines (87, 89, 91) arranged in one direction and each of which cell pairs are coupled to gate conductors (83) arranged orthogonal to the bitlines. The layout pattern is formed by positioning the deep trenches of all of said pairs along alternate bitlines so they are offset from said bitlines along gate conductors in opposing directions. The deep trenches of all of the remaining bitlines are offset from said bitlines in opposing directions opposite to the opposing directions of said trenches along said alternate bitlines so as to form a herringbone pattern of cells.



WO 02/01606 A3



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INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L27/108

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)
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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 5 559 350 A (KABUSHIKI KAISHA TOSHIBA) 24 September 1996 (1996-09-24) column 6, line 57 -column 7, line 31; figure 13 column 12, line 14 - line 17; figure 40 ---	1-16
Y	EP 0 428 247 A (FUJITSU LTD) 22 May 1991 (1991-05-22) abstract; figures 2,11-13,21 ---	1-16
Y	US 5 305 252 A (NEC CORP) 19 April 1994 (1994-04-19) column 13, line 5 - line 9; figure 13 ---	1-16
A	US 5 461 248 A (GOLDSTAR ELECTRON CO LTD) 24 October 1995 (1995-10-24) abstract; figures 1,2 ---	1-16
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Patent family members are listed in annex.

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Date of the actual completion of the international search

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 177 576 A (HITACHI LTD) 5 January 1993 (1993-01-05) abstract; figures 6A-6G ----	1-16
A	EP 0 884 785 A (SIEMENS AG) 16 December 1998 (1998-12-16) abstract; figures -----	1-16

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/US 01/20175

Patent document cited in search report	A	Publication date	Patent family member(s)	Publication date
US 5559350	A	24-09-1996	NONE	
<hr style="border-top: 1px dashed black;"/>				
EP 0428247	A	22-05-1991	JP 2974252 B2	10-11-1999
			JP 3214670 A	19-09-1991
			US 5812444 A	22-09-1998
			DE 69030426 D1	15-05-1997
			DE 69030426 T2	17-07-1997
			EP 0428247 A2	22-05-1991
			EP 0756327 A1	29-01-1997
			EP 0762502 A1	12-03-1997
			KR 9509388 B1	21-08-1995
			US 6026010 A	15-02-2000
<hr style="border-top: 1px dashed black;"/>				
US 5305252	A	19-04-1994	JP 2792211 B2	03-09-1998
			JP 4065872 A	02-03-1992
			DE 69121483 D1	26-09-1996
			DE 69121483 T2	27-03-1997
			EP 0464686 A1	08-01-1992
			KR 9603659 B1	21-03-1996
<hr style="border-top: 1px dashed black;"/>				
US 5461248	A	24-10-1995	KR 9406681 B1	25-07-1994
			DE 4233486 A1	15-04-1993
			JP 5218335 A	27-08-1993
			US 5346845 A	13-09-1994
<hr style="border-top: 1px dashed black;"/>				
US 5177576	A	05-01-1993	JP 4014868 A	20-01-1992
<hr style="border-top: 1px dashed black;"/>				
EP 0884785	A	16-12-1998	CN 1202012 A	16-12-1998
			EP 0884785 A2	16-12-1998
			JP 11017151 A	22-01-1999
			TW 425718 B	11-03-2001
<hr style="border-top: 1px dashed black;"/>				