

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
4 December 2003 (04.12.2003)

PCT

(10) International Publication Number
WO 2003/100824 A3

(51) International Patent Classification⁷: **H01L 29/92**,
21/02

(21) International Application Number:
PCT/JP2003/006671

(22) International Filing Date: 28 May 2003 (28.05.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002-154585 28 May 2002 (28.05.2002) JP

(71) Applicants (for all designated States except US):
KABUSHIKI KAISHA TOSHIBA [JP/JP]; 1-1, Shibaura
1-chome, Minato-ku, Tokyo 105-8001 (JP). **INFINEON**
TECHNOLOGIES AG [DE/DE]; St-Martin Str. 53,
81669 Munich (DE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **ARISUMI, Osamu**
[JP/JP]; c/o Intellectual Property division, Toshiba Cor-
poration, 1-1, Shibaura 1-chome, Minato-ku, Tokyo
105-8001 (JP). **IMAI, Keitaro** [JP/JP]; c/o Intel-
lectual Property division, Toshiba Corporation, 1-1,

Shibaura 1-chome, Minato-ku, Tokyo 105-8001 (JP).
YAMAKAWA, Koji [JP/JP]; c/o Intellectual Property
division, Toshiba Corporation, 1-1, Shibaura 1-chome, Mi-
nato-ku, Tokyo 105-8001 (JP). **MOON, Bum-ki** [KR/JP];
Shurosu-Senzoku-B, 6-30-9, Hatanodai, Shinagawa-ku,
Tokyo 142-0064 (JP).

(74) Agents: **SUZUYE, Takehiko** et al.; c/o Suzuye & Suzuye,
7-2, Kasumigaseki 3-chome, Chiyoda-ku, Tokyo 100-0013
(JP).

(81) Designated States (national): CN, KR, US.

(84) Designated States (regional): European patent (AT, BE,
BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU,
IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

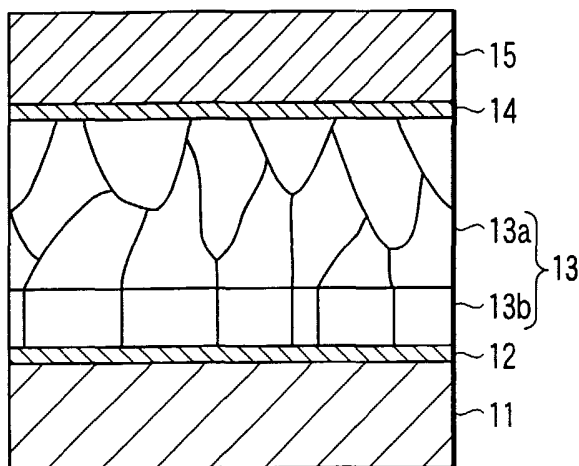
Published:

— with international search report

(88) Date of publication of the international search report:
21 May 2004

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

(54) Title: FERROELECTRIC CAPACITOR AND METHOD OF MANUFACTURING THE SAME



(57) Abstract: semiconductor device comprises a bottom electrode, a top electrode, and a dielectric film provided between the bottom electrode and the top electrode and made of a perovskite type ferroelectrics containing Pb, Zr, Ti and O, the dielectric film comprising a first portion formed of a plurality of crystal grains partitioned by grain boundaries having a plurality of directions.

WO 2003/100824 A3

INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 03/06671

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L29/92 H01L21/02

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, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	EP 0 821 415 A (TEXAS INSTRUMENTS INC) 28 January 1998 (1998-01-28) column 10, line 45 -column 15, line 17; figure 1	1,9 2-8, 10-15
X	US 6 287 637 B1 (CHU FAN ET AL) 11 September 2001 (2001-09-11) column 5, line 52 -column 8, line 18; figures	10-15
X A	US 5 635 420 A (NISHIOKA YASUSHIRO) 3 June 1997 (1997-06-03) column 3, line 13 -column 7, line 15; figures	1 2-15
	-/--	

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

24 February 2004

Date of mailing of the international search report

03/03/2004

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

Blackley, W

INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 03/06671

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/014482 A1 (AGARWAL VISHNU K ET	1
A	AL) 16 August 2001 (2001-08-16) paragraph '0013! - paragraph '0018!; figures 2-5 -----	2-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 03/06671

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0821415	A	28-01-1998	JP 10050960 A 20-02-1998
			EP 0821415 A2 28-01-1998
			SG 88732 A1 21-05-2002
			TW 440994 B 16-06-2001
US 6287637	B1	11-09-2001	US 6090443 A 18-07-2000
			US 6080499 A 27-06-2000
			EP 0892426 A2 20-01-1999
			JP 11126877 A 11-05-1999
US 5635420	A	03-06-1997	JP 8017939 A 19-01-1996
US 2001014482	A1	16-08-2001	NONE