

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
30 June 2005 (30.06.2005)

PCT

(10) International Publication Number
WO 2005/059971 A3

(51) International Patent Classification⁷: H01L 27/146, 27/15, 21/329, 21/336, 21/84, G09G 3/32

(74) Agents: WILLIAMSON, Paul, L. et al.; c/o Philips Intellectual Property & Standards, Cross Oak Lane, Redhill Surrey RH1 5HA (GB).

(21) International Application Number: PCT/IB2004/052778

(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, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date: 13 December 2004 (13.12.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
0329002.0 15 December 2003 (15.12.2003) GB
0426413.1 2 December 2004 (02.12.2004) GB

(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).

(71) Applicant (for all designated States except US): KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

(72) Inventor; and

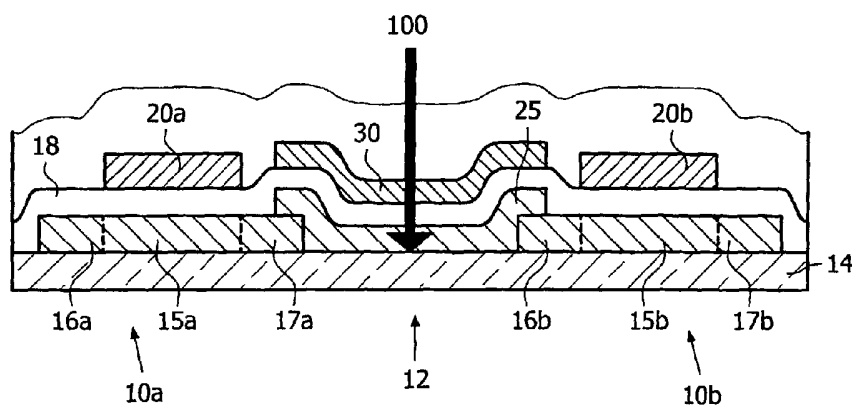
(75) Inventor/Applicant (for US only): DEANE, Steven, C. [GB/GB]; c/o Philips Intellectual Property & Standards (GB).

Declaration under Rule 4.17:

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ,

[Continued on next page]

(54) Title: ACTIVE MATRIX PIXEL DEVICE WITH PHOTO SENSOR



(57) Abstract: An active matrix pixel device is provided, for example an electroluminescent display device, the device comprising circuitry supported by a substrate and including a polysilicon TFT (10) and an amorphous silicon thin film PIN diode (12). Polysilicon islands are formed before an amorphous silicon layer is deposited for the PIN diode. This avoids the exposure of the amorphous silicon to high temperature processing. The TFT comprises doped source/drain regions (16a,17a), one of which (17a) may also provide the n-type or p-type doped region for the diode. Advantageously, the requirement to provide a separate doped region for the photodiode is removed, thereby saving processing costs. A second TFT (10b) having a doped source/drain region (16b,17b) of the opposite conductivity type may provide the other doped region (16b) for the diode, wherein the intrinsic region (25) is disposed laterally between the two TFTs, overlying each of the respective polysilicon islands.

WO 2005/059971 A3



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, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (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 patent (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

(88) Date of publication of the international search report:

4 August 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/IB2004/052778

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7 H01L27/146 H01L27/15 H01L21/329 H01L21/336 H01L21/84 G09G3/32		
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 G09G		
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 4 862 237 A (MOROZUMI ET AL) 29 August 1989 (1989-08-29) column 5, line 1 - column 7, line 15 column 6, line 15 - line 18 column 6, line 29 - line 30 column 6, line 38 - line 41 figure 5 figure 14	1,2,5,6, 10,11
X	----- US 5 262 649 A (ANTONUK ET AL) 16 November 1993 (1993-11-16) column 7, line 55 - column 9, line 39 column 8, line 13 - line 16 figure 1 ----- -/--	1,5,11
<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>"&" document member of the same patent family</p> </div> </div>		
Date of the actual completion of the international search	Date of mailing of the international search report	
14 June 2005	23/06/2005	
Name and mailing address of the ISA	Authorized officer	
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	Bernabé Prieto, A	

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB2004/052778

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 634 800 A (PHILIPS ELECTRONICS UK LIMITED; PHILIPS ELECTRONICS N.V) 18 January 1995 (1995-01-18) column 6, line 46 - column 12, line 19 figure 1 -----	1,5,11
A	US 2001/052597 A1 (YOUNG NIGEL D ET AL) 20 December 2001 (2001-12-20) the whole document figures 2-4 -----	1-11
A	US 5 589 694 A (TAKAYAMA ET AL) 31 December 1996 (1996-12-31) the whole document -----	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB2004/052778

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4862237	A	29-08-1989	JP 59126666 A	21-07-1984
			JP 60064467 A	13-04-1985
			JP 3135524 A	10-06-1991
			JP 3135525 A	10-06-1991
US 5262649	A	16-11-1993	US 5079426 A	07-01-1992
			AT 191977 T	15-05-2000
			CA 2127453 A1	22-07-1993
			DE 69328447 D1	25-05-2000
			DE 69328447 T2	21-12-2000
			EP 0724729 A1	07-08-1996
			JP 7502865 T	23-03-1995
			WO 9314418 A1	22-07-1993
			CA 2065246 A1	07-03-1991
			EP 1167999 A1	02-01-2002
			EP 0490997 A1	24-06-1992
			JP 3050402 B2	12-06-2000
			JP 5503770 T	17-06-1993
WO 9103745 A1	21-03-1991			
EP 0634800	A	18-01-1995	DE 69401685 D1	20-03-1997
			DE 69401685 T2	24-07-1997
			EP 0634800 A1	18-01-1995
			JP 7078954 A	20-03-1995
			US 5451766 A	19-09-1995
US 2001052597	A1	20-12-2001	WO 0199191 A1	27-12-2001
			EP 1222691 A1	17-07-2002
			JP 2003536115 T	02-12-2003
US 5589694	A	31-12-1996	JP 3347803 B2	20-11-2002
			JP 6275805 A	30-09-1994
			JP 3347804 B2	20-11-2002
			JP 6275806 A	30-09-1994
			JP 3402380 B2	06-05-2003
			JP 6275807 A	30-09-1994
			JP 3329512 B2	30-09-2002
			JP 6275808 A	30-09-1994
			JP 3403994 B2	06-05-2003
			JP 2000299454 A	24-10-2000
			US 5501989 A	26-03-1996
			US 5744822 A	28-04-1998
			JP 3405955 B2	12-05-2003
JP 2000294798 A	20-10-2000			