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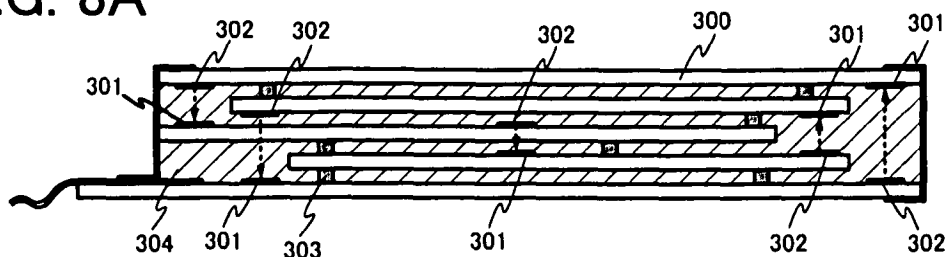
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(54) **Oled display with optical interconnect between driving plane and display plane**

(57) A semiconductor device comprising: circuits provided over a plurality of glass substrates, wherein glass substrates of the plurality of glass substrates each have both or either of a light emitting element and a photo-detecting element, and wherein a transmission of a signal

between the circuits provided over the plurality of glass substrates is performed by converting an optical signal emitted from the light emitting element into an electrical signal at the photo-detecting element, characterized in that the light emitting element emits light having directivity as the optical signal.

FIG. 8A





EUROPEAN SEARCH REPORT

Application Number
EP 10 17 8794

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 861 929 A (SPITZER MARK B [US]) 19 January 1999 (1999-01-19)	1,2,4	INV. G09G3/32 H01L27/32 H01L51/52 G06F3/14
Y	* column 2, line 47 - column 3, line 25; figure 2a *	1,2,4	
A	US 5 317 436 A (SPITZER MARK B [US] ET AL) 31 May 1994 (1994-05-31) * column 1, line 65 - column 2, line 35 *	1,2,4	
Y	WO 02/31882 A1 (MICROEMISSIVE DISPLAYS LTD [GB]; UNDERWOOD IAN [GB]; GOURLAY JAMES [GB]) 18 April 2002 (2002-04-18) * page 3, line 2 - page 6, line 19; figure 2 *	1,2,4	
A	JOHN A ROGERS ET AL: "Organic Smart Pixels and Complementary Inverter Circuits Formed on Plastic Substrates by Casting and Rubber Stamping", IEEE ELECTRON DEVICE LETTERS, IEEE SERVICE CENTER, NEW YORK, NY, US, vol. 21, no. 3, 1 March 2000 (2000-03-01), XP011018737, ISSN: 0741-3106 * the whole document *	1,2,4	
A	US 2001/026127 A1 (YONEDA KIYOSHI [JP] ET AL) 4 October 2001 (2001-10-04) * the whole document *	1,2,4	
A	EP 1 168 291 A2 (SEMICONDUCTOR ENERGY LAB [JP]) 2 January 2002 (2002-01-02) * paragraph [0186] - paragraph [0201] * * paragraph [0262] - paragraph [0268]; figures 1,14 *	1,2,4	TECHNICAL FIELDS SEARCHED (IPC) G09G H01L G06F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 March 2011	Examiner Frisch, Anna Maria
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03/82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 10 17 8794

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2001/028060 A1 (YAMAZAKI SHUNPEI [JP] ET AL) 11 October 2001 (2001-10-11) * paragraph [0228] - paragraph [0242] * * paragraph [0331] - paragraph [0348]; figures 14,19,25 *	1,2,4	
E	US 2003/151600 A1 (TAKEUCHI TSUNEO [JP] ET AL) 14 August 2003 (2003-08-14) * figure 3c *	1,2,4	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 March 2011	Examiner Frisch, Anna Maria
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03 82 (P04C01)



Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1, 2, 4

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 4

Subject 1 relates to a device with circuits provided on different substrates and interconnected via an optical signal emitted from a light source, and to details of the device concerning image pixels and a related image display.

2. claim: 3

Subject 2 also relates to a device with circuits provided on different substrates and interconnected via an optical signal emitted from a light source, and to the waveform correction of an electrical signal.

3. claim: 5

Subject 3 also relates to a device with circuits provided on different substrates and interconnected via an optical signal emitted from a light source, and to a resin provided between the substrates.

4. claim: 6

Subject 4 also relates to a device with circuits provided on different substrates and interconnected via an optical signal emitted from a light source, and to details of the relative substrate edges arrangement.

5. claim: 7

Subject 5 also relates to a device with circuits provided on different substrates and interconnected via an optical signal emitted from a light source, and to details of a particular light source used.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 17 8794

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-03-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5861929 A	19-01-1999	NONE	
US 5317436 A	31-05-1994	US 5475514 A	12-12-1995
WO 0231882 A1	18-04-2002	EP 1330843 A1	30-07-2003
		JP 2004511911 A	15-04-2004
		JP 2010004041 A	07-01-2010
		US 2004012016 A1	22-01-2004
US 2001026127 A1	04-10-2001	JP 11251059 A	17-09-1999
EP 1168291 A2	02-01-2002	CN 1329368 A	02-01-2002
		TW 512304 B	01-12-2002
		US 2003132716 A1	17-07-2003
		US 2002005696 A1	17-01-2002
US 2001028060 A1	11-10-2001	JP 4620140 B2	26-01-2011
		JP 2008209939 A	11-09-2008
		TW 480727 B	21-03-2002
		US 2008272374 A1	06-11-2008
US 2003151600 A1	14-08-2003	CN 1438617 A	27-08-2003
		TW I230548 B	01-04-2005

专利名称(译)	带有驱动平面和显示平面之间光学互连的Oled显示器		
公开(公告)号	EP2312566A3	公开(公告)日	2011-08-31
申请号	EP2010178794	申请日	2003-05-13
[标]申请(专利权)人(译)	株式会社半导体能源研究所		
申请(专利权)人(译)	半导体能源研究所有限公司.		
当前申请(专利权)人(译)	半导体能源研究所有限公司.		
[标]发明人	YAMAZAKI SHUNPEI KATO KIYOSHI ARAI YASUYUKI AKIBA MAI		
发明人	YAMAZAKI, SHUNPEI KATO, KIYOSHI ARAI, YASUYUKI AKIBA, MAI		
IPC分类号	G09G3/32 H01L27/32 H01L51/52 G06F3/14 H01L31/12 G02B6/43 H01L27/15		
CPC分类号	G09G3/3275 G02B6/43 G09G2360/14 G09G2370/08 H01L25/0657 H01L27/124 H01L27/1248 H01L2225/06527 H01L2225/06551 H01L2225/06575 H01L2924/0002		
优先权	2002137495 2002-05-13 JP		
其他公开文献	EP2312566A2		
外部链接	Espacenet		

摘要(译)

一种半导体器件，包括：设置在多个玻璃基板上的电路，其中所述多个玻璃基板中的玻璃基板各自具有发光元件和光检测元件中的任一个或任一个，并且其中在所述电路之间传输信号通过在光检测元件处将从发光元件发射的光信号转换成电信号来执行在多个玻璃基板上提供的信号，其特征在于，发光元件发出具有方向性的光作为光信号。

FIG. 8A

