US 20090102364A1

(19) **United States**

(12) **Patent Application Publication**

Suh et al.

(10) **Pub. No.: US 2009/0102364 A1**

(43) **Pub. Date: Apr. 23, 2009**

(54) ORGANIC LIGHT EMITTING DISPLAY

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(21) Appl. No.: **12/219,261**

(22) Filed: **Jul. 18, 2008**

(30) **Foreign Application Priority Data**

Oct. 22, 2007 (KR) 10-2007-0106122

Publication Classification

(51) **Int. Cl.**
H01L 51/52 (2006.01)

(52) **U.S. Cl.** **313/504**

(57) ABSTRACT

An organic light emitting display adapted to be connectable to an external circuit board, the organic light emitting display includes a substrate, a plurality of organic light emitting diodes (OLEDs) on the substrate, and a plurality of input pads coupled with the plurality of OLEDs through wiring lines, the plurality of input pads being connectable to the external circuit board, wherein at least one of the plurality of input pads includes a lead unit extending from a respective one of the wiring lines, and a contact unit contacting the circuit board, and a resistor coupled between the lead unit and the contact unit of the at least one input pad including the lead unit and the contact unit.

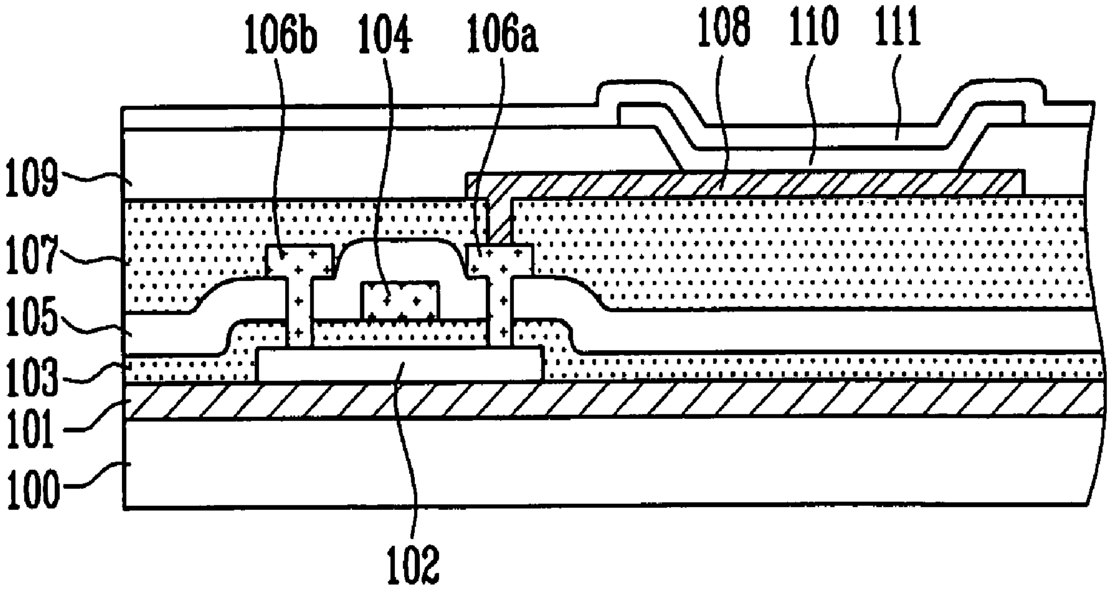


FIG. 1

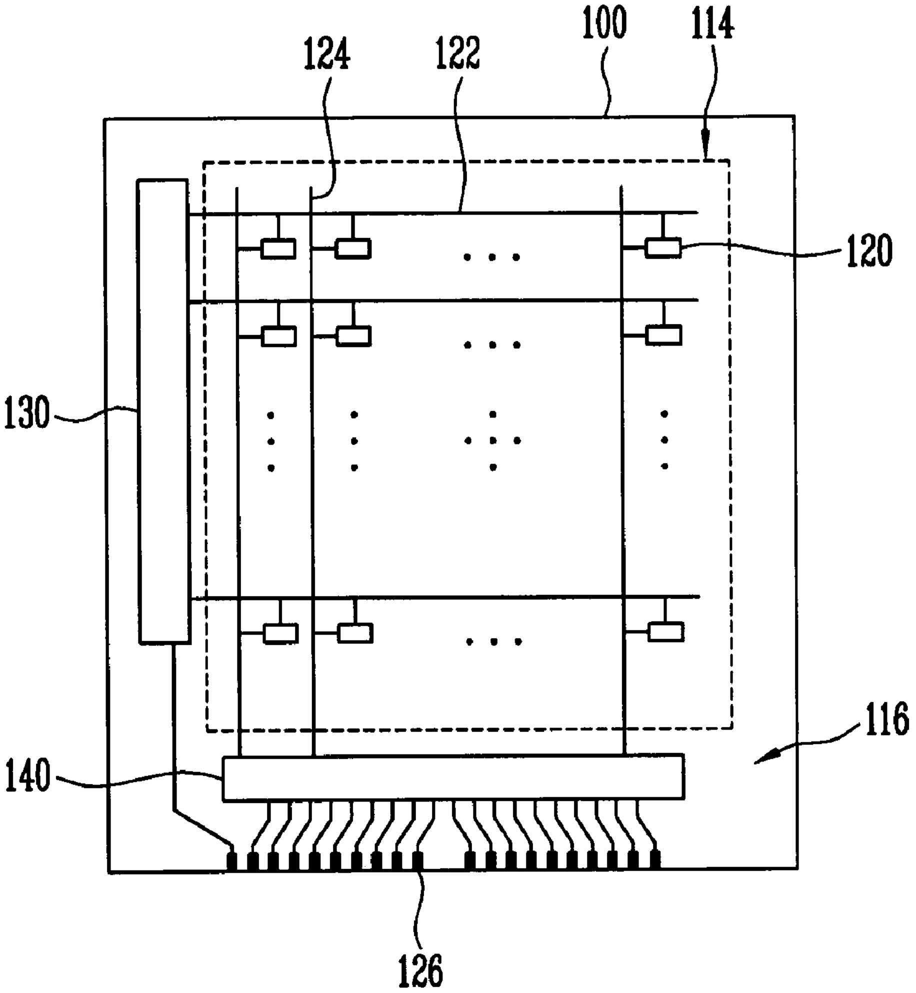

124
122
100
114
120
130
116
140
126

FIG. 2

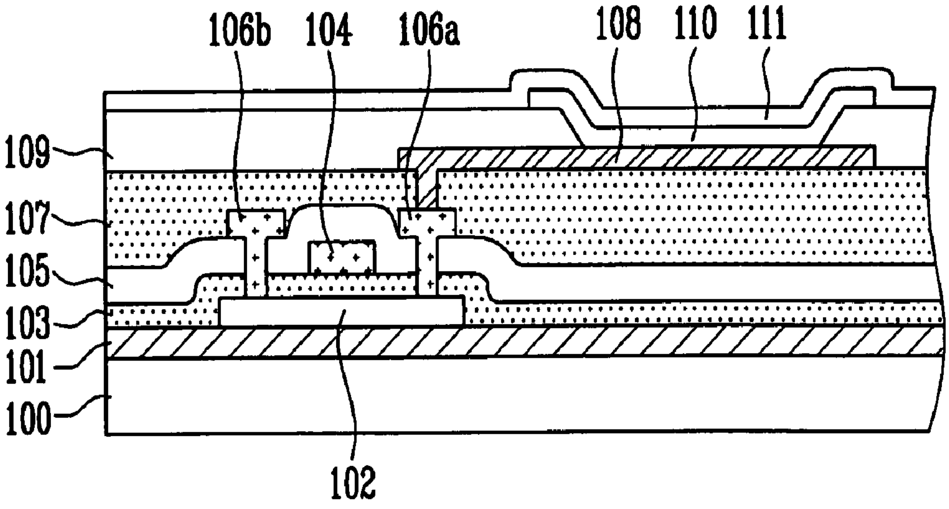

106b
104
106a
108
110
111
109
107
105
103
101
100
102

FIG. 3

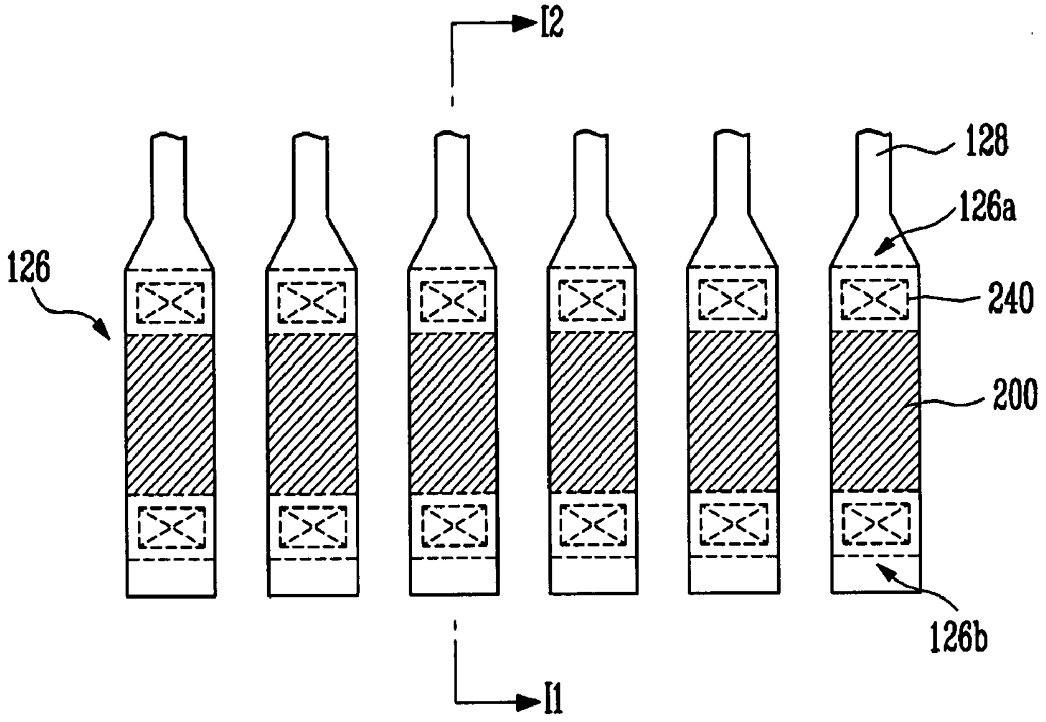


FIG. 4

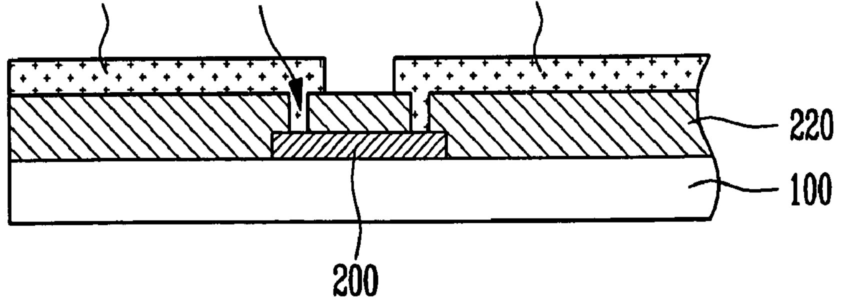


FIG. 5

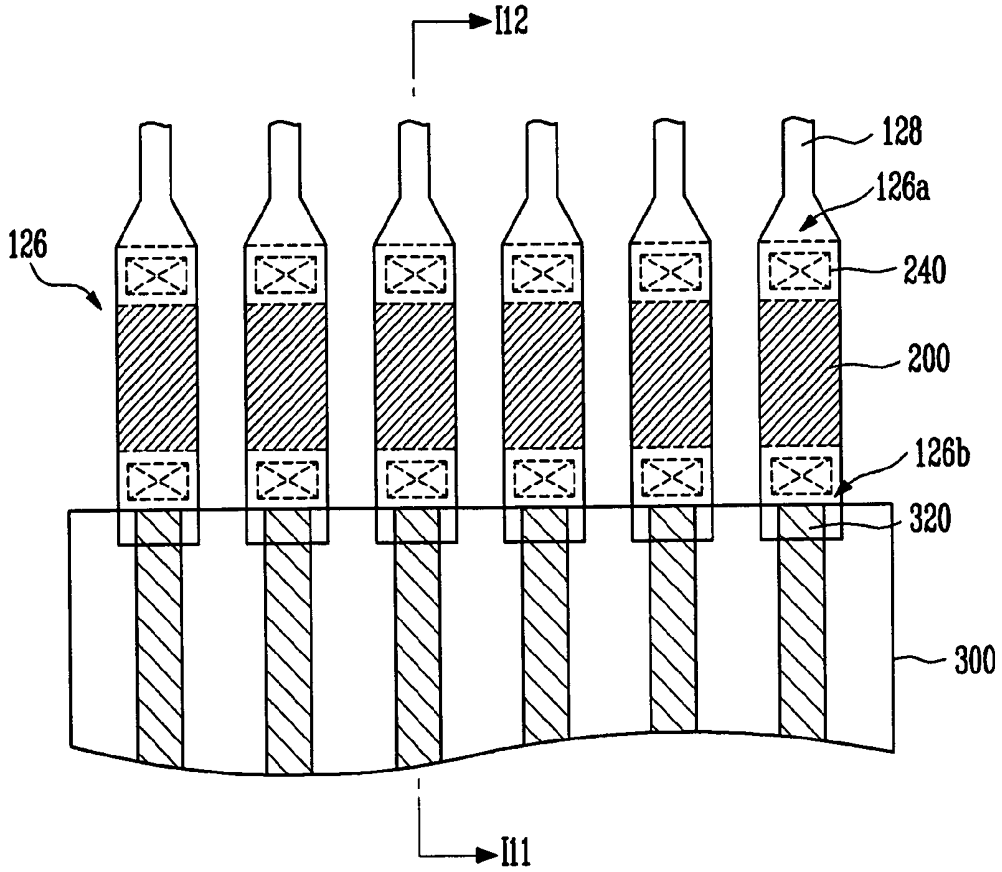

I12
128
126a
126
240
200
126b
320
300
I11

FIG. 6

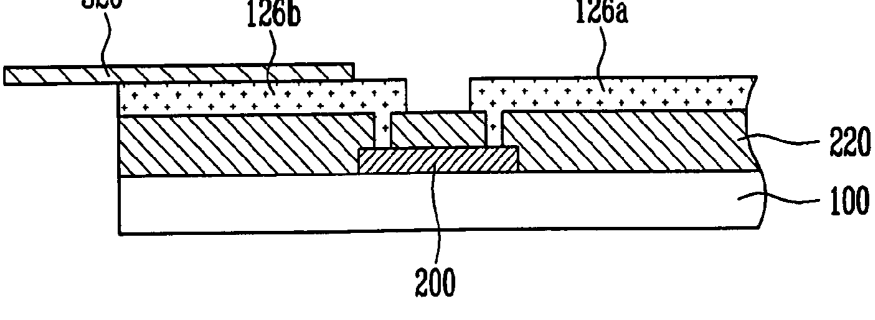
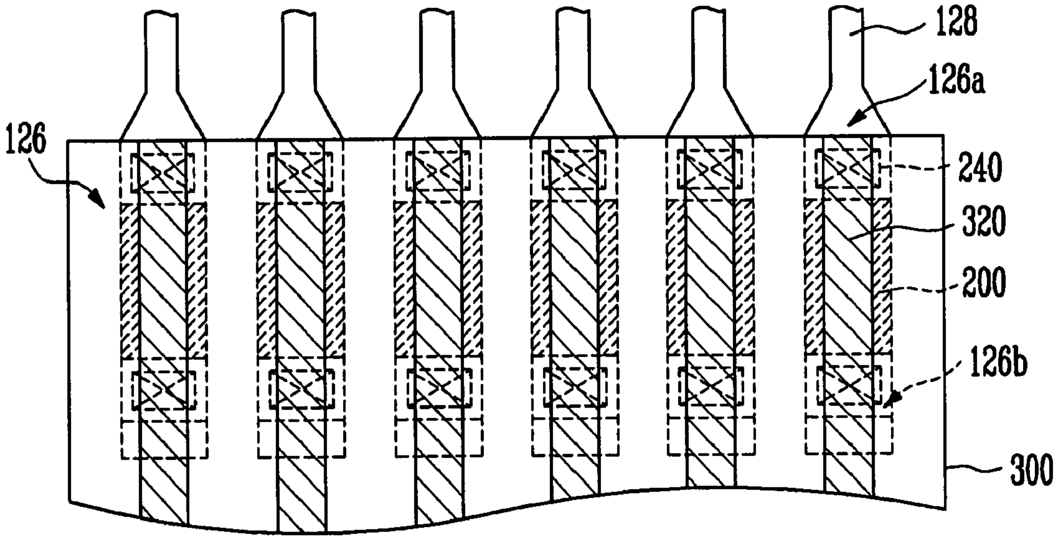

320
126b
126a
220
100
200

FIG. 7



ORGANIC LIGHT EMITTING DISPLAY

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] Embodiments relate to organic light emitting displays. More particularly, embodiments relate to organic light emitting displays including electrostatic discharge (ESD) protection such that the organic light emitting display may be protected against ESD.

[0003] 2. Description of the Related Art

[0004] In general, an organic light emitting display has a self-emission characteristic, larger viewing angle, improved contrast, improved response speed, and lower power consumption than liquid crystal displays (LCDs). Organic light emitting displays do not require a back light, and may be lighter and thinner than LCDs.

[0005] Organic light emitting displays generally include a substrate having a pixel region and a non-pixel region, and a container or an encapsulation substrate. The container or the encapsulation substrate may face the substrate so as to encapsulate the substrate, and may be attached to the substrate by a sealant, e.g., epoxy.

[0006] A plurality of organic light emitting diodes (OLEDs) coupled between scan lines and data lines, and arranged in a matrix manner, form pixels in the pixel region of the substrate. Portions of scan lines and data lines extending from the scan lines and the data lines of the pixel region, power source supply lines for operating the OLEDs, and a scan driver and a data driver for processing external signals supplied through input pads and supplying the processed signals to the scan lines and the data lines are formed in the non-pixel region.

[0007] A film-shaped flexible printed circuit (FPC) (not shown) is electrically coupled with the pad of the organic light emitting display having the above structure.

[0008] Signals, e.g., power source voltages, scan signals, and data signals, are input from the outside through the FPC.

[0009] When the signals are input, via the input pads, to the power source supply lines, the scan driver, and the data driver, the scan driver and the data driver respectively supply the scan signals and the data signals to the scan lines and the data lines. The OLEDs of the pixels selected by the scan signals emit light corresponding to the data signals.

[0010] Since the substrate of the organic light emitting display is formed of glass, a relatively large amount of electrostatic discharge (ESD) is generated during manufacturing and/or operation of the organic light emitting display. If the OLEDs and/or driving circuits, which operate at high speed and at a low voltage, are subjected to such ESD, the OLEDs and/or the driving circuits can erroneously operate and/or can be damaged due to the electric influence. When the driving circuits are subjected to the externally generated ESD through internal signal lines, operation of the driving circuits can be instantaneously stopped. As an amount and/or number of occurrences of ESD generation and/or the voltage increases, circuit wiring lines are more likely to be broken or shorted. In general, the driving circuits are more severely damaged by such ESD as the driving circuits are highly integrated (minimized).

SUMMARY OF THE INVENTION

[0011] Embodiments of the invention are therefore directed to organic light emitting displays, which substantially overcome one or more of the problems due to the limitations and disadvantages of the related art.

[0012] It is therefore a feature of an embodiment of the invention to provide organic light emitting displays capable of effectively preventing and/or reducing electrostatic discharge (ESD) from being received through input pads.

[0013] At least one of the above and other features and advantages of the invention may be realized by providing an organic light emitting display adapted to be connectable to an external circuit board, the organic light emitting display including a substrate, a plurality of organic light emitting diodes (OLEDs) on the substrate, and a plurality of input pads coupled with the plurality of OLEDs through wiring lines, the plurality of input pads being connectable to the external circuit board, wherein at least one of the plurality of input pads includes a lead unit extending from a respective one of the wiring lines, and a contact unit contacting the circuit board, and a resistor coupled between the lead unit and the contact unit of the at least one input pad including the lead unit and the contact unit.

[0014] The organic light emitting display may include driving circuits coupled between the wiring lines and the OLEDs.

[0015] The organic light emitting display may include thin film transistors (TFT) coupled between the driving circuits and the OLEDs.

[0016] The resistor may include polysilicon.

[0017] An insulating layer may be arranged between the at least one input pad and the resistor, and wherein the resistor is coupled with the contact unit and the lead unit through contact holes formed in the insulating layer.

[0018] The circuit board may be a flexible printed circuit (FPC).

[0019] When the organic light emitting display is connected to the external circuit board, the contact unit may contact the external circuit board.

[0020] When the organic light emitting display is connected to the external circuit board, the contact unit and the lead unit may contact the external circuit board.

[0021] The lead unit and the contact unit of the at least one input pad may be spaced apart from each other.

[0022] Each of the plurality of input pads may include a lead unit and a contact unit, the lead unit being spaced apart from the corresponding contact unit.

[0023] The resistor may be directly coupled between and may directly contact the lead unit and the contact unit of the at least one of the plurality of input pads.

[0024] The resistor may include a same material as, and may correspond to a same layer as, source and/or drain regions of the OLEDs.

[0025] At least one of the above and other features and advantages of the invention may be realized by providing an organic light emitting display adapted to be connectable to an external circuit board, the organic light emitting display including a substrate, a plurality of organic light emitting diodes (OLEDs) on the substrate, and a plurality of input pads coupled with the plurality of OLEDs through wiring lines, the plurality of input pads being connectable to the external circuit board, wherein each of the plurality of input pads includes a lead unit extending from a respective one of the wiring lines, and a contact unit contacting the circuit board, the lead unit being spaced apart from the contact unit.

[0026] When the organic light emitting display is connected to the external circuit board, the circuit board may contact the contact unit and the lead unit of the respective input pads.

[0027] A resistor may be coupled between the lead unit and the contact unit of each of the input pads.

[0028] The organic light emitting display may include an insulating layer between the lead unit and the contact unit of each of the input pads.

[0029] The lead units and the contact units may include a same material and correspond to a same layer as source, drain, anode and/or cathode electrodes of the OLEDs.

[0030] The input pads may be arranged along an edge portion of the substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The above and other features and advantages of the present invention will become more apparent to those of ordinary skill in the art by describing in detail exemplary embodiments thereof with reference to the attached drawings, in which:

[0032] FIG. **1** illustrates a plan view of an organic light emitting display according to an embodiment of the present invention;

[0033] FIG. **2** illustrates a cross-sectional view of the organic light emitting diode (OLED) of FIG. **1**;

[0034] FIG. **3** illustrates a plan view of exemplary input pads of FIG. **1**;

[0035] FIG. **4** illustrates a cross-sectional view taken along line I1-I2 of FIG. **3**;

[0036] FIG. **5** illustrates a plan view of the exemplary input pads of FIGS. **1** and **3** in a state in which a circuit board contacts respective contact units of the input pads;

[0037] FIG. **6** illustrates a cross-sectional view taken along line I11-I12 of FIG. **5**; and

[0038] FIG. **7** illustrates a plan view of the exemplary input pads of FIGS. **1** and **3** in a state in which a circuit board contacts contact units and lead units of the input pads.

DETAILED DESCRIPTION OF THE INVENTION

[0039] Korean Patent Application No. 10-2007-0106122, filed on Oct. 22, 2007, in the Korean Intellectual Property Office, and entitled: "Organic Light Emitting Display," is incorporated by reference herein in its entirety.

[0040] Exemplary embodiments will now be described more fully hereinafter with reference to the accompanying drawings; however, they may be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art.

[0041] In the drawing figures, the dimensions of layers and regions may be exaggerated for clarity of illustration. It will also be understood that when an element is referred to as being "between" two elements, it can be the only element between the two layers, or one or more intervening elements may also be present. Like reference numerals refer to like elements throughout the specification.

[0042] FIG. **1** illustrates a plan view of an organic light emitting display according to an exemplary embodiment the invention.

[0043] Referring to FIG. **1**, the organic light emitting display may include a substrate **100**, scan lines **122**, data lines **124**, and organic light emitting diodes (OLEDs) **120**, coupled between the scan lines **122** and the data lines **124**, in a matrix arrangement. Each of the OLEDs **120**, and respective portions of corresponding ones of the scan lines **122**, and the data lines **124**, may form pixels.

[0044] The substrate **100** may include a pixel region **114** and a non-pixel region **116**. The scan lines **122** and the data lines **124** may extend across the pixel region **114** and the non-pixel region **116**. In the non-pixel region **116**, respective portions of the scan lines **122** and the data lines **124**, power source supply lines (not shown) for operating the OLEDs **120**, a scan driver **130**, and a data driver **140** may be formed. The scan driver **130** and the data driver **140** may process external signals supplied through input pads **126**, and may supply the processed signals to the scan lines **122** and the data lines **124**, respectively.

[0045] In a passive matrix type organic light emitting display, the OLEDs **120** may be coupled between the scan lines **122** and the data lines **124** in a matrix arrangement. In an active matrix type organic light emitting display, the OLEDs **120** may be coupled between the scan lines **122** and the data lines **124** in a matrix arrangement together with thin film transistors (TFTs) (not shown) and capacitors (not shown). The TFTs may control operations of the OLEDs **120** and the capacitors may function to maintain signals.

[0046] The scan driver **130** and the data driver **140** may be formed on the non-pixel region **116** of the substrate **100**. In some embodiments, the scan driver **120** and the data driver **140** may be manufactured during processing of the OLEDs **120**. In some embodiments, the scan driver **120** and the data driver **140** may be manufactured as an additional integrated circuit semiconductor chip to be attached to the substrate **100**, e.g., via a chip on glass (COG) method or a wire bonding method, and electrically coupled with the scan lines **122** and the data lines **124**.

[0047] FIG. **2** illustrates a cross-sectional view of the OLED **120** of FIG. **1**, in which an example of the active matrix type OLED is schematically illustrated.

[0048] Referring to FIG. **2**, the OLED may include a buffer layer **101**, a semiconductor layer **102**, a gate insulating layer **103**, a gate electrode **104**, an interlayer insulating layer **105**, source and drain electrodes **106***a* and **106***b*, a planarizing layer **107**, an anode electrode **108**, a pixel defining layer **109**, an organic thin layer **110**, and a cathode electrode **111**.

[0049] The buffer layer **101** may be formed on the substrate **100**. The semiconductor layer **102** may be formed on the buffer layer **101**. The semiconductor layer **102** may provide an active layer. More particularly, the semiconductor layer **102** may provide source, drain, and channel regions of the TFTs. The gate insulating layer **103** may be formed on a top surface of the buffer layer **101** and may cover the semiconductor layer **102**.

[0050] The gate electrode **104** may be formed on the gate insulating layer **103** formed on the semiconductor layer **102**. The interlayer insulating layer **105** may be formed on the gate insulating layer **103** and may cover the gate electrode **104**. Contact holes may be formed in the interlayer insulating layer **105** and the gate insulating layer **103** to expose predetermined parts of the semiconductor layer **102**. The source and drain electrodes **106***a* and **106***b* may be coupled with the semiconductor layer **102** through the contact holes formed on the interlayer insulating layer **105**.

[0051] The planarizing layer **107** may be formed on the interlayer insulating layer **105** to cover the source and drain electrodes **106***a* and **106***b*. A via hole may be formed in the planarizing layer **107** so that the source or drain electrode **106***a* or **106***b* may be exposed. The anode electrode **108** may be coupled with the source or drain electrode **106***a* or **106***b* through the via hole and may be formed on the planarizing layer **107**. The pixel defining layer **109** may be formed on the planarizing layer **107**. The pixel defining layer **109** may be patterned to expose the anode electrode **108**.

[0052] The organic thin layer **110** and the cathode electrode **111** may be formed on the anode electrode **108**. More particularly, the organic thin layer **110** and the cathode electrode **111** may be formed on the exposed portion of the anode electrode **108**. The organic thin layer **110** may be formed to have a structure in which a hole transport layer, an organic light emitting layer, and an electron transport layer are laminated together. The organic thin layer **110** may further include a hole injection layer and an electron injection layer.

[0053] FIG. **3** illustrates an enlarged plan view of a portion of the organic light emitting display including the input pads **126**. FIG. **4** illustrates a cross-sectional view taken along line I1-I2 of FIG. **3**. FIG. **5** illustrates a plan view of exemplary input pads **126** of FIG. **3** in a state in which the external circuit board **300** overlaps and contacts contact portions **126***b* of the input pads **126**, and FIG. **6** illustrates a cross-sectional view taken along line I11-I12 of FIG. **5**.

[0054] Referring to FIG. **3**, the input pads **126** may be arranged on the substrate **100** by a predetermined distance. The input pads **126** may be coupled with driving circuits of the scan driver **130** and the data driver **140** through wiring lines **128**.

[0055] As discussed above, in organic light emitting displays, the input pads **126** may be formed at an edge portion of the substrate **100**, and may be vulnerable to electrostatic discharge (ESD).

[0056] In some embodiments of the invention, resistors **200** for preventing and/or reducing over-current from instantaneously flowing due to the ESD may be included in the input pads **126** and/or the input pads **126** may include a plurality of portions, e.g., lead units **126***a* and contact units **126***b*. More particularly, in some embodiments, e.g., the input pads **126** may include lead units **126***a* that extend from the wiring lines **128** and contact units **126***b*. The contact units **126***b* may contact pads of an external circuit board **300** (shown in FIGS. **5** and **7**). Corresponding pairs of the lead and contact units **126***a*, **126***b* may correspond to a respective one of the input pads **126**. Further, the lead unit **126***a* and the corresponding contact unit **126***b* may be spaced apart from each other, as shown, e.g., in FIGS. **3** and **4**.

[0057] The resistors **200** may be coupled between the lead units **126***a* and the contact units **126***b*. The resistors **200** may be formed of a conductive material, e.g., polysilicon. The resistors **200** may be coupled with the lead units **126***a* and the contact units **126***b* through contact holes **240**.

[0058] Referring to FIG. **4**, the resistor **200** may be formed on the substrate **100**. The resistor **200** may be formed of, e.g., polysilicon doped to have a predetermined resistance value. An insulating layer **220** may be formed on the substrate **100** where the resistor **200** is formed. The lead units **126***a* and the contact units **126***b* may be formed to be coupled with respective ends of the resistor **200** through contact holes **240** formed in the insulating layer **220**.

[0059] Referring to FIGS. **2** and **4**, the resistor **200** may be formed of the same material as the semiconductor layer **102**, and may be formed during the process of forming the semiconductor layer **102**. The insulating layer **220** may be formed of the gate insulating layer **103** and/or the interlayer insulating layer **105**. The lead units **126***a* and the contact units **126***b* may be formed of a same electrode material as and during the process of forming the source and drain electrodes **106***a* and **106***b*, the anode electrode **108** and/or the cathode electrode **111**.

[0060] In the exemplary embodiment illustrated in FIG. **5**, the external circuit board **300** does not overlap and/or contact the lead units **126***a* of the input pads **126**. However, embodiments are not limited thereto.

[0061] Referring to FIGS. **5** and **6**, the circuit board **300**, e.g., an external circuit board, may be coupled with the input pads **126** of the organic light emitting display having the structure illustrated in FIG. **3**. The circuit board **300** may be formed of a film-shaped FPC. The circuit board **300** may include pads **320**. The pads **320** of the circuit board **300** may contact the contact units **126***b* so that signals, e.g., power source voltages, scan signals, and data signals, may be input from the outside.

[0062] When the signals are input to the power source voltage supply lines, the scan driver **130**, and the data driver **140** through the input pads **126**, the scan driver **130** and the data driver **140** may supply the scan signals and the data signals to the scan lines **122** and the data lines **124**, respectively. Therefore, the OLEDs **120** of the pixels selected by the scan signals may emit light corresponding to the data signals. That is, when a predetermined voltage is applied to the anode electrode **108** and the cathode electrode **111** of the OLEDs **120** selected by the scan signals, holes injected through the anode electrode **108** and electrons injected through the cathode electrode **111** may be re-combined in the organic thin layer **110** to emit light based on a difference in energy generated by this process. Red, green, or blue light may be emitted from each of the pixels in accordance with materials that form the organic light emitting layer of the respective pixel to realize colors of multi-gray scales.

[0063] As described above, in some embodiments of organic light emitting displays according to one or more aspects of the invention, the resistors **200** may be formed in the input pads **126**, which may be vulnerable to ESD. Over-current caused by ESD may be reduced and/or prevented from flowing by the resistors **200**. In some embodiments, all or substantially all of the over-current caused by ESD may be prevented from flowing by the resistors **200**. Only driving signals may be supplied to the organic light emitting display so that the driving circuits and the OLEDs may be safely protected.

[0064] In the exemplary embodiment illustrated in FIGS. **3** and **4**, the resistors **200** are included in all of the input pads **126**. However, embodiments are not limited thereto. For example, in some embodiments, the resistors **200** may be formed only in some of the input pads **126**.

[0065] Some embodiments may provide organic light emitting displays that may effectively reduce and/or prevent all and/or substantially all ESD from being received to the input pads **126** through the edge of the substrate **100** in a state where the circuit board **300** is not coupled with the input pads **126**.

[0066] Some embodiments may reduce and/or prevent ESD from being received by the substrate **100**, from the outside, including from the circuit board **300**, through the input pads **126** or from being received by the circuit board **300**

from the substrate **100** through the input pads **126** in a state where the circuit board **300** is coupled with the input pads **126**.

[0067] FIG. **7** illustrates a plan view of the exemplary input pads **126** of FIGS. **1** and **3** in a state in which the circuit board **300** contacts and overlaps respective contact units **126***b* and lead units **126***a* of the input pads **126**.

[0068] Although the resistors **200** are included in the exemplary embodiment illustrated in FIG. **7**, in embodiments in which the pads **320** of the circuit board overlap and/or contact the lead units **126***a* and the contact units **126***b* of the input pads **126**, as shown in FIG. **7**, the resistors **200** may be omitted. In such embodiments in which the resistors **200** are omitted, it is possible to prevent wiring line resistance from increasing as a result of the resistors **200**.

[0069] In conventional cases in which resistors may be formed between input pads and driving circuits, it is possible to protect the driving circuit from the ESD. However, in such cases, the input pads and the external circuit board may be damaged by the ESD.

[0070] In some embodiments of the invention, resistors may be formed in input pads of an organic light emitting display so that it is possible to prevent and/or reduce overcurrent caused by ESD received through the substrate or the external circuit board from flowing to the other. More particularly, in some embodiments, input pads may include lead units and contact units, and resistors may be coupled between the respective lead units and the contact units so that it is possible to effectively prevent and/or reduce ESD from being received by the organic light emitting display and/or the external circuit board. In some embodiments, e.g., it is possible to effectively prevent and/or reduce ESD from being received by the input pads at an edge of the substrate in the state where the circuit board is not coupled with the input pads.

[0071] Exemplary embodiments of the present invention have been disclosed herein, and although specific terms are employed, they are used and are to be interpreted in a generic and descriptive sense only and not for purpose of limitation. Accordingly, it will be understood by those of ordinary skill in the art that various changes in form and details may be made without departing from the spirit and scope of the present invention as set forth in the following claims.

What is claimed is:

1. An organic light emitting display adapted to be connectable to an external circuit board, the organic light emitting display comprising:
a substrate;
a plurality of organic light emitting diodes (OLEDs) on the substrate; and
a plurality of input pads coupled with the plurality of OLEDs through wiring lines, the plurality of input pads being connectable to the external circuit board,
wherein at least one of the plurality of input pads includes:
  a lead unit extending from a respective one of the wiring lines, and
  a contact unit contacting the circuit board, and
a resistor coupled between the lead unit and the contact unit of the at least one input pad including the lead unit and the contact unit.

2. The organic light emitting display as claimed in claim **1**, further comprising driving circuits coupled between the wiring lines and the organic light emitting diodes.

3. The organic light emitting display as claimed in claim **2**, further comprising thin film transistors (TFT) coupled between the driving circuits and the OLEDs.

4. The organic light emitting display as claimed in claim **1**, wherein the resistor includes polysilicon.

5. The organic light emitting display as claimed in claim **1**,
wherein an insulating layer is arranged between the at least one input pad and the resistor, and
wherein the resistor is coupled with the contact unit and the lead unit through contact holes formed in the insulating layer.

6. The organic light emitting display as claimed in claim **1**, wherein the circuit board is a flexible printed circuit (FPC).

7. The organic light emitting display as claimed in claim **1**, wherein, when the organic light emitting display is connected to the external circuit board, the contact unit contacts the external circuit board.

8. The organic light emitting display as claimed in claim **1**, wherein, when the organic light emitting display is connected to the external circuit board, the contact unit and the lead unit contacts the external circuit board.

9. The organic light emitting display as claimed in claim **1**, wherein the lead unit and the contact unit of the at least one input pad are spaced apart from each other.

10. The organic light emitting display as claimed in claim **1**, wherein each of the plurality of input pads includes a lead unit and a contact unit, the lead unit being spaced apart from the corresponding contact unit.

11. The organic light emitting display as claimed in claim **1**, wherein the resistor is directly coupled between and directly contacts the lead unit and the contact unit of the at least one of the plurality of input pads.

12. The organic light emitting display as claimed in claim **1**, wherein the resistor includes a same material as and corresponds to a same layer as source and/or drain regions of the OLEDs.

13. An organic light emitting display adapted to be connectable to an external circuit board, the organic light emitting display comprising:
a substrate;
a plurality of organic light emitting diodes (OLEDs) on the substrate; and
a plurality of input pads coupled with the plurality of OLEDs through wiring lines, the plurality of input pads being connectable to the external circuit board,
wherein each of the plurality of input pads includes:
  a lead unit extending from a respective one of the wiring lines, and
  a contact unit contacting the circuit board, the lead unit being spaced apart from the contact unit.

14. The organic light emitting display as claimed in claim **13**, wherein when the organic light emitting display is connected to the external circuit board, the circuit board contacts the contact unit and the lead unit of the respective input pads.

15. The organic light emitting display as claimed in claim **13**, further comprising a resistor coupled between the lead unit and the contact unit of each of the input pads.

16. The organic light emitting display as claimed in claim **13**, further including an insulating layer between the lead unit and the contact unit of each of the input pads.

17. The organic light emitting display as claimed in claim **13**, wherein the lead units and the contact units include a same material and correspond to a same layer as source, drain, anode and/or cathode electrodes of the OLEDs.

18. The organic light emitting display as claimed in claim **13**, wherein the input pads are arranged along an edge portion of the substrate.

* * * * *

专利名称(译)	有机发光显示器		
公开(公告)号	US20090102364A1	公开(公告)日	2009-04-23
申请号	US12/219261	申请日	2008-07-18
[标]申请(专利权)人(译)	SUH MI SOOK SHIN HEY金		
申请(专利权)人(译)	SUH MI淑 SHIN HEY-JIN		
当前申请(专利权)人(译)	SUH MI淑 SHIN HEY-JIN		
[标]发明人	SUH MI SOOK SHIN HEY JIN		
发明人	SUH, MI-SOOK SHIN, HEY-JIN		
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外部链接	Espacenet USPTO		

摘要(译)

一种适于可连接到外部电路板的有机发光显示器，所述有机发光显示器包括基板，所述基板上的多个有机发光二极管（OLED），以及与所述多个OLED耦合的多个输入垫。通过布线，多个输入焊盘可连接到外部电路板，其中多个输入焊盘中的至少一个包括从相应的一个布线延伸的引线单元，以及接触电路板的接触单元，电阻器，耦合在引线单元和包括引线单元和接触单元的至少一个输入焊盘的接触单元之间。