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(54) **Organic light emitting display device**

Organische lichtemittierende Anzeigevorrichtung

Dispositif d'affichage électroluminescent organique

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of the Korean Patent Application No. 10-2013-0166795 filed on December 30, 2013.

BACKGROUND

Field of the Invention

[0002] The present invention relates to an organic light emitting display device, and more particularly, to an organic light emitting display device for adjusting a threshold voltage shift.

Discussion of the Related Art

[0003] Flat panel display devices in related art are becoming thin and light and have low consumption power. Liquid crystal display (LCD) devices included in flat panel display devices include a thin film transistor (TFT) and have high quality resolution, color display, and image quality. Liquid crystal display devices are commercialized for notebook computers, tablet computers, and desktop computers. In particular, organic light emitting display devices are self-emitting devices, and have a fast response time, low power consumption, high emission efficiency, and a wide viewing angle.

[0004] **FIG. 1** is an exemplary diagram schematically illustrating a related art organic light emitting display device. The related art organic light emitting display device includes an emission unit OA including an organic light emitting diode OLED and a pixel circuit unit CA that includes a first switching transistor ST1, a second switching transistor ST2, a driving transistor DT, and a capacitor Cst which drives the emission unit OA.

[0005] The pixel circuit unit CA includes a data line DL through which a data voltage Vdata is supplied to the first switching transistor ST1, a gate line GL through which a scan signal Scan is supplied, a power line PL through which a first driving voltage Vdd is supplied to the driving transistor DT, a sensing signal line SL through which a sense signal Sense is supplied to the second switching transistor ST2, and a reference voltage line RL through which a reference voltage Vref is supplied. The organic light emitting diode OLED included in the emission unit OA is electrically connected between a source of the driving transistor DT and a cathode voltage Vss terminal. The organic light emitting diode OLED emits light with a data current Ioled supplied from the driving transistor DT.

[0006] The pixel circuit unit CA includes a light blocking layer 20 which is formed for preventing external light from being input to the first switching transistor ST1, second switching transistor ST2, and driving transistor DT of the pixel circuit unit CA. That is, the light blocking layer 20 covers the pixel circuit unit CA.

[0007] However, in the related art organic light emitting display device, a characteristic deviation of a threshold voltage "Vth" of a driving transistor occurs in each pixel due to a process differential, and a plurality of the driving transistors are deteriorated at different speeds when the related art organic light emitting display device is driven for a long time. The deterioration of the plurality of the driving transistors causes a quality of an image to be degraded.

[0008] US 2009/0243482 A1 discloses a display device employing an organic electroluminescence element (paragraph 0002) and addresses the problem of aging TFTs whose gate threshold voltage (Vth) shifts to a "plus potential side" over time (paragraphs 0006...0008). The solution disclosed centers on a "light blocking film 33" which prevents light from entering two switching transistors (Tr11, Tr12) but which is not provided at a driver transistor (Tr13) (paragraphs 0071, 0079, 0080). The resulting selective irradiation of the driver transistor (Tr13) shifts its threshold voltage to the minus side and, thus, cancels out the positive shift caused by aging (paragraph 0080).

[0009] US 2009/0135111 A1 discloses a display apparatus including a plurality of pixels and pixel circuits which may comprise electroluminescent elements (paragraphs 0003...0005). The document addresses the problem that leak currents of switching transistors may disturb a compensating function assigned to those transistors: they may be part of a "driving signal fixing circuit" (paragraph 0033) designed to compensate for fluctuations of the threshold voltage of an aging driving transistor (paragraphs 0015...0020) so as to keep the current of the driving transistor at a fixed level. In that context, the document teaches to pay *"attention to leak current arising from light irradiation"* and to cover the *"light incoming side of the transistors ... with a light blocking layer"* in order to prevent a *"fluctuation of the transistors by light irradiation"* (paragraph 0040). A light-induced leak current of a switching transistor may be less tolerable than a leak current of the driving transistor. Therefore, the light blocking layer should be more performant for the switching transistor than for the driving transistor (paragraphs 0041, 0043, 0047). In an extreme case, the driving transistor may not be shielded against light, whereas an associated sampling or switching transistor is required to be shielded by the light blocking layer (paragraph 0286).

[0010] WO 2009/110623 A1 is entitled *"Method of treating semiconductor element"* and addresses the problem of a shifting threshold voltage of a TFT supplying current to an organic light-emitting diode (page 3, lines 22 to 25). The document seeks to treat the semiconductor channel layer of the TFT so as to compensate for an undesired change in the threshold voltage caused by aging, for example (paragraph bridging pages 3/4; page 4, lines 22 to 25). To this end, the document teaches the use of light irradiation onto the TFT semiconductor element as a way of inducing a threshold voltage shift opposite to the undesired shift (abstract; page 4, lines 3 to

9; page 5, lines 12 to 21). The light irradiation may be performed while the undesired threshold voltage shift is occurring (paragraph bridging pages 5/6). A filter may be placed between the light source and the semiconductor to shield the semiconductor from light in a selected range of wavelengths (page 4, lines 17 to 21).

SUMMARY

[0011] Accordingly, the present invention is directed to providing an organic light emitting display device that substantially obviates one or more problems due to limitations and disadvantages of the related art. An aspect of the present invention is directed to providing an organic light emitting display device that controls a threshold voltage shift of a transistor to improve a reliability of a threshold voltage.

[0012] Additional advantages and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or can be learned from practice of the invention. The objectives and other advantages of the invention can be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0013] To achieve these and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, there is provided an organic light emitting display device according to claim 1.

[0014] Implementations of the invention are specified in the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiments of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. 1 is an exemplary diagram schematically illustrating a related art organic light emitting display device;

FIG. 2 is a plan view schematically illustrating another organic light emitting display device;

FIGS. 3A and 3B are exemplary diagrams illustrating the changes in an amount of current with respect to threshold voltages of first and second switching transistors;

FIG. 4 is a cross-sectional view schematically illustrating a driving transistor according to Figure 2;

FIG. 5 is a cross-sectional view schematically illustrating first and second switching transistors according to Figure 2;

FIG. 6 is a plan view schematically illustrating another organic light emitting display device;

FIG. 7 is a plan view schematically illustrating an organic light emitting display device according to a first embodiment of the present invention;

FIGS. 8A and 8B are exemplary diagrams illustrating the changes in an amount of current with respect to a threshold voltage of a driving transistor when a sub-pixel emits white and blue light; and

FIG. 9 is a plan view schematically illustrating an organic light emitting display device according to a second embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0016] Reference will now be made in detail to the exemplary embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0017] In the specification, in adding reference numerals for elements in each drawing, it should be noted that like reference numerals already used to denote like elements in other drawings are used for elements wherever possible.

[0018] The terms described in the specification should be understood as follows.

[0019] As used herein, the singular forms "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms "first" and "second" are for differentiating one element from the other element, and these elements should not be limited by these terms.

[0020] It will be further understood that the terms "comprises," "comprising," "has," "having," "includes," and/or "including," when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The term "at least one" should be understood as including any and all combinations of one or more of the associated listed items. For example, the meaning of "at least one of a first item, a second item, and a third item" denotes the combination of all items proposed from two or more of the first item, the second item, and the third item as well as the first item, the second item, or the third item. The term "on" should be construed as including a case where one element is formed at a top of another element and moreover a case where a third element is disposed therebetween.

[0021] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0022] **FIG. 2** is a plan view schematically illustrating an organic light emitting display device described as technical background. A pixel circuit unit CA includes a first switching transistor ST1, a second switching transistor ST2, a driving transistor DT, and a capacitor Cst.

However, the pixel circuit unit CA may include at least one switching transistor. The organic light emitting display device according to Figure 2 includes an emission unit OA, which includes an organic light emitting diode OLED. The organic light emitting display device includes a pixel circuit unit CA. The pixel circuit unit CA includes a first switching transistor ST1, a second switching transistor ST2, a driving transistor DT, a capacitor Cst, a gate line GL, a sensing signal line SL, a data line DL, a driving power line PL, and a reference voltage line RL, which drive the emission unit OA. To provide an additional description, a sub-pixel included in the organic light emitting display device includes the emission unit OA and the pixel circuit unit CA.

[0023] The gate line GL and the sensing signal line SL can be formed in parallel in a first direction (e.g., a horizontal direction). The data line DL, the driving power line PL, and the reference voltage line RL can be formed in parallel in a second direction (e.g., a vertical direction) to intersect the gate line GL and the sensing signal line SL. A scan signal (e.g., a gate driving signal) can be applied from a gate driver to the gate line GL, and a sensing signal can be applied to the sensing signal line SL. A data voltage "Vdata" can be supplied from a data driver to the data line DL, a reference voltage "Vref" can be supplied to the reference voltage line RL, and a first driving voltage "Vdd" can be supplied to the driving power line PL. Each of the first switching transistor ST1, the second switching transistor ST2, and the driving transistor DT can be an N-type transistor, and can be formed of an oxide transistor. However, each of the transistors ST1, ST2, and DT may be formed of a P-type transistor.

[0024] The first switching transistor ST1 is turned on according to the scan signal having a gate-on voltage level supplied to the gate line GL, and supplies the data voltage, via the data line DL, to the driving transistor DT. The second switching transistor ST2 is turned on according to the sensing signal having the gate-on voltage level supplied to the sensing signal line SL, and supplies the reference voltage, via the reference voltage line RL, to the driving transistor DT.

[0025] The capacitor Cst is connected to the driving transistor DT. The capacitor Cst is charged with a voltage, and turns on the driving transistor DT with the charged voltage. The driving transistor DT turned on with the voltage of the capacitor Cst controls an amount of current which flows from a first driving voltage terminal to the organic light emitting diode OLED.

[0026] The organic light emitting diode OLED emits light with a data current "Ioled" supplied from the driving transistor DT to emit single color light having luminance corresponding to the data current.

[0027] To this end, the organic light emitting diode OLED can include an anode electrode connected to a second node "N2", an organic layer formed on the anode electrode, and a cathode electrode formed on the organic layer.

[0028] The organic layer can be formed to have a structure of a hole transport layer/organic emission layer/electron transport layer or a structure of a hole injection layer/hole transport layer/organic emission layer/electron transport layer/electron injection layer. The organic layer can further include a function layer for enhancing the emission efficiency and/or service life of the organic emission layer. A second driving voltage "Vss" can be supplied to a cathode electrode of the organic light emitting diode OLED through a second driving power line which is formed as a line type.

[0029] When the first switching transistor ST1, the second switching transistor ST2, and the driving transistor DT are each formed of an oxide transistor, a threshold voltage "Vth" is shifted by light. The pixel circuit unit CA can include a light blocking unit LS, including a light blocking layer 110 which is formed for blocking light input to the pixel circuit unit CA. The pixel circuit unit CA can include an opening OP in which the light blocking layer 110 is not formed. In particular, in the organic light emitting display device according to Figure 2, light is blocked by the light blocking unit LS including the light blocking layer 110, and thus, the threshold voltage is prevented from being shifted to a negative polarity (-). Light is input through the opening OP, and thus, the threshold voltage is prevented from being shifted to a positive polarity (+).

[0030] The light blocking unit LS, an area in which the light blocking layer 110 is formed, is disposed under the driving transistor DT, and prevents light from being input to the driving transistor DT. The opening OP, which is an area in which the light blocking layer 110 is not formed, is disposed under the first and second switching transistors ST1 and ST2, and allows light to be input to the first and second switching transistors ST1 and ST2. The first and second switching transistors ST1 and ST2 receive a very high switching voltage during a short turn-on period, unlike a driving condition of the driving transistor DT.

[0031] The switching voltage is a high voltage of 20 V or more, and is supplied at every frame, and thus, the threshold voltage is shifted to a positive polarity (+). However, when an opening in which the light blocking layer 110 is not formed under the first and second switching transistors ST1 and ST2 is provided, light can be input to the first and second switching transistors ST1 and ST2, and thus, the threshold voltage is prevented from being shifted to a positive polarity (+).

[0032] Next, **FIGS. 3A and 3B** are exemplary diagrams showing the changes in an amount of current with respect to the threshold voltages of the first and second switching transistors. An amount of current is reduced when the threshold voltages of the first and second switching transistors ST1 and ST2 are shifted to a positive polarity (+).Because the opening OP in which the light blocking layer 110 is not formed is provided under the first and second switching transistors ST1 and ST2, light can be input to the first and second switching transistors ST1 and ST2, and thus, the threshold voltage is shifted to a negative polarity (-), causing an increase in an amount of current.

[0033] Next, **FIG. 4** is a cross-sectional view schematically illustrating the driving transistor according to Figure 2, and illustrates a cross-sectional surface taken along line A-B of FIG. 2. The driving transistor DT includes the light blocking layer 110, a buffer layer 120, an active layer 130, a gate insulating layer 140, a gate electrode 150, an inter-layer dielectric 160, a source electrode 170a, a drain electrode 170b, and a protective layer 180 which are sequentially formed on a substrate 100.

[0034] The substrate 100 is formed of a transparent insulating substrate formed of glass, quartz, ceramic, or plastic. However, when the substrate 100 is formed of plastic, the substrate 100 may be formed of a flexible substrate. The light blocking layer 110, which blocks light input to the active layer 130, is formed on the substrate 100. The light blocking layer 110 can be formed of one of a conductor, semiconductor such as amorphous silicon or amorphous germanium, and a black resin material, and can be formed of a light-blocking material.

[0035] Moreover, the threshold voltage of the driving transistor can be shifted by adjusting a thickness S of the light blocking layer 110. That is, when the light blocking layer 110 is thickly formed, an amount of light input to a transistor is reduced, and when the light blocking layer 110 is thinly formed, an amount of light input to the transistor increases. Therefore, the light blocking layer 110 can be thickly formed to allow the threshold voltage to be shifted to a positive polarity (+). Also, the light blocking layer 110 can be thinly formed to allow the threshold voltage to be shifted to a negative polarity (-).

[0036] The buffer layer 120 is formed on the light blocking layer 110, and can be formed of an inorganic insulating material such as oxide silicon (SiO_2) or nitride silicon (SiNx). The buffer layer 120 is provided for preventing a characteristic of the active layer 130 from being degraded due to an alkali ion which is emitted from the inside of the substrate 100 when the active layer 130 formed on the buffer layer 120 is crystallized. However, when the active layer 130 for which a crystallization process is not performed is provided, the buffer layer 120 cannot be provided.

[0037] The active layer 130 includes an active area 130a which is formed of silicon and configures a channel, and source and drain areas 130b and 130c on which high-concentration impurities are doped are provided at both side surfaces of the active area 130a. The gate insulating layer 140 is formed on the active layer 130. The gate electrode 150 and a gate line can be formed on the gate insulating layer 140. The inter-layer dielectric 160 is formed all over the substrate in which the gate electrode 150 and the gate line are formed. In this case, the inter-layer dielectric 160 includes a contact hole CH that contacts the source and drain electrodes with the source and drain areas 130b and 130c disposed at the both side surfaces of the active area 130a. The source and drain electrodes 170a and 170b, which are separated from each other and respectively contact the source and drain areas 130b and 130c exposed through the contact hole CH, are formed on the inter-layer dielectric 160 including the contact hole CH. The protective layer 180 is formed on the source and drain electrodes 170a and 170b.

[0038] In the following description, repetitive descriptions on a material and structure of each element are not provided.

[0039] Next, **FIG. 5** is a cross-sectional view schematically illustrating the first and second switching transistors according to Figure 2, and illustrates a cross-sectional surface taken along line C-D of FIG. 2. The first and second switching transistors of FIG. 5 are the same as the above-described driving transistor of FIG. 4 except the light blocking layer 110 has been removed. Thus, like reference numerals refer to like elements, and descriptions on the same elements are not repeated. As seen in FIG. 5, each of the first and second switching transistors ST1 and ST2 (refer to Fig. 2), which have the light blocking layer 110 removed, includes a buffer layer 120, an active layer 130, a gate insulating layer 140, a gate electrode 150, an inter-layer dielectric 160, a source electrode 170a, a drain electrode 170b, and a protective layer 180 which are sequentially formed on a substrate 100.

[0040] As described above, according to Figure 2, the light blocking layer 110 is not formed in an area where the first and second switching transistors ST1 and ST2 are formed, and thus, light can be input to the first and second switching transistors ST1 and ST2. Accordingly, the threshold voltage can be prevented from being shifted to a positive polarity (+).

[0041] To this end, the organic light emitting display device according to Figure 2 includes a pixel circuit unit CA which includes at least one or more switching transistors ST1 and ST2 and a driving transistor DT. The pixel circuit unit CA includes a light blocking unit LS, including a light blocking layer 110 which is formed for blocking light input to the driving transistor DT, and an opening OP in which the light blocking layer 110 is not formed in order for light to be input to the first and second switching transistors ST1 and ST2. The organic light emitting display device according to Figure 2 selectively blocks light input to the pixel circuit unit CA to adjust the threshold voltage, thereby enhancing a reliability of the threshold voltage.

[0042] Next, **FIG.** 6 is a plan view schematically illustrating another organic light emitting display device described as technical background. The organic light emitting display device of FIG. 6 is the same as the organic light emitting display device of FIG. 2 except a structure of the pixel circuit unit CA is different. Thus, like reference numerals refer to like elements, and descriptions for the same elements are not repeated.

[0043] The organic light emitting display device according to Figure 6 includes an emission unit OA, which includes an organic light emitting diode OLED, and a pixel circuit unit CA that includes at least one switching transistor (e.g., a first switching transistor ST1 and a second switching transistor ST2), a driving transistor DT, a capacitor Cst, a gate line GL, a sensing signal line SL, a

data line DL, a driving power line PL, and a reference voltage line RL, which drive the emission unit OA.

[0044] Here, the pixel circuit unit CA includes a light blocking unit LS, including a light blocking layer 110 which is formed for blocking light input to the pixel circuit unit CA, and an opening OP in which the light blocking layer 110 is not formed. The opening OP is an area in which the at least one or more switching transistors (e.g., the first switching transistor ST1 and the second switching transistor ST2) are formed, and the light blocking unit LS is an area other than the emission unit OA and the opening OP in a sub-pixel which includes the emission unit OA and the pixel circuit unit CA. Degrees of stresses of the first and second switching transistors ST1 and ST2 can be changed depending on driving times of the first and second switching transistors ST1 and ST2 to shift a threshold voltage of the driving transistor DT. Accordingly, the opening OP is formed in an area where one of the first and second switching transistors ST1 and ST2 is formed, and thus, a threshold voltage shift can be effectively controlled, thereby enhancing a reliability of the threshold voltage.

[0045] Next, **FIG. 7** is a plan view schematically illustrating an organic light emitting display device according to a first embodiment of the present invention. The organic light emitting display device of FIG. 7 is the same as the organic light emitting display device of FIG. 2 except that a structure of a pixel circuit unit CA is different. Thus, like reference numerals refer to like elements, and descriptions on the same elements are not repeated. As seen in FIG. 7, the organic light emitting display device according to the first embodiment includes an emission unit OA, which includes an organic light emitting diode OLED, and a pixel circuit unit CA that includes at least one switching transistor (e.g., a first switching transistor ST1 and a second switching transistor ST2), a driving transistor DT, a capacitor Cst, a gate line GL, a sensing signal line SL, a data line DL, a driving power line PL, and a reference voltage line RL, which drive the emission unit OA.

[0046] The pixel circuit unit CA includes a light blocking unit LS, including a light blocking layer 110 which is formed for blocking light input to the pixel circuit unit CA, and an opening OP in the light blocking layer 110. An area in which the light blocking unit LS and the opening OP are formed is different depending on a color R, W, G or B of a sub-pixel including the emission unit OA.

[0047] When the sub-pixel emits white (W) or blue (B) light, the opening OP is an area in which the at least one switching transistor (e.g., the first switching transistor ST1 and the second switching transistor ST2) and the driving transistor DT are formed. When the sub-pixel emits red (R) or green (G) light, the opening OP is an area in which the at least one switching transistor is formed. In this case, the light blocking unit LS is an area other than the emission unit OA and the opening OP in a sub-pixel which includes the emission unit OA and the pixel circuit unit CA.

[0048] A frequency at which white (W) or blue (B) light is emitted by a sub-pixel is higher than a frequency at which red (R) or green (G) light is emitted by the sub-pixel. That is, the number of times the threshold voltage of the driving transistor DT is shifted to a positive polarity (+) is higher when the sub-pixel emits white (W) or blue (B) light than when the sub-pixel emits red (R) or green (G) light. Therefore, according to the first embodiment, when the sub-pixel emits white (W) or blue (B) light, the light blocking layer 110 is not formed in an area where the driving transistor DT is formed, and thus, the threshold voltage can be prevented from being shifted to a positive polarity (+).

[0049] Next, **FIGS. 8A and 8B** are exemplary diagrams showing the changes in an amount of current with respect to a threshold voltage of a driving transistor when the sub-pixel emits white (W) or blue (B) light according to the first embodiment of the present invention. When the sub-pixel emits white (W) or blue (B) light, the threshold voltage of the driving transistor DT is shifted to a positive polarity (+), and thus, an amount of data current "Ioled" is reduced. The opening OP includes an area in which the driving transistor DT of the sub-pixel emitting white (W) or blue (B) light is provided, and light is input to the driving transistor DT. Therefore, the threshold voltage can be shifted to a negative polarity (-), and thus, an amount of current increases.

[0050] Next, **FIG. 9** is a plan view schematically illustrating an organic light emitting display device according to a second embodiment of the present invention. The organic light emitting display device of FIG. 9 is the same as the organic light emitting display device of FIG. 7 except that a structure of an opening OP formed in an area where a driving transistor DT is formed is different. Thus, like reference numerals refer to like elements, and descriptions on the same elements are not repeated.

[0051] A pixel circuit unit CA includes a light blocking unit LS, including a light blocking layer 110 which is formed for blocking light input to the pixel circuit unit CA, and an opening OP in the light blocking layer 110. In this case, the light blocking unit LS and the opening OP is different depending on a color R, W, G or B of a sub-pixel including the emission unit OA.

[0052] In the organic light emitting display device according to the second embodiment of the present invention, when the sub-pixel emits white (W) or blue (B) light, the opening OP in the light blocking layer 110 is provided at a portion d of an area in which the driving transistor DT is formed. Therefore, in the organic light emitting display device according to the second embodiment of the present invention, a threshold voltage shift of the driving transistor DT is adjusted according to a value of a frequency at which white (W) or blue (B) light is emitted by the sub-pixel, thereby enhancing a reliability of the threshold voltage. For example, the pixel circuit unit CA can have a 3T1C structure which includes the first switching transistor ST1, the second switching transistor ST2, the driving transistor DT, and the capacitor Cst. Or, the

pixel circuit unit CA can have a 2T1C structure. The organic light emitting display device includes the pixel circuit unit, the light blocking unit that includes the light blocking layer formed for blocking light input to the pixel circuit unit, and the opening in the light blocking layer. The organic light emitting display device selectively blocks the light input to the pixel circuit unit, thereby adjusting the threshold voltage of the driving transistor to enhance a reliability of the threshold voltage. The opening is provided in an area where one or more switching transistors are formed to effectively control a threshold voltage shift thereby implementing a stable switching function.

[0053] According to the first embodiment, when the sub-pixel including the emission unit emits white (W) or blue (B) light, the opening is provided in an area where the switching transistor and the driving transistor are formed, and when the sub-pixel emits red (R) or green (G) light, the opening is provided in an area where the switching transistor is formed, thereby adjusting the threshold voltages of the white (W) or blue (B) sub-pixels to enhance a reliability of the threshold voltages. According to the second embodiment, when the sub-pixel including the emission unit emits white (W) or blue (B) light, the opening is provided in only a portion of an area where the driving transistor is formed, and thus, a threshold voltage shift of the driving transistor is adjusted based on a value of a frequency corresponding to light emitted by white (W) or blue (B) sub-pixels, thereby enhancing a reliability of the threshold voltage.

[0054] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention within the scope of the appended claims.

Claims

1. An organic light emitting display device comprising at least a first sub-pixel configured to emit white or blue light and a second sub-pixel configured to emit red or green light, each sub-pixel comprising:

   an emission unit (OA) including an organic light emitting diode (OLED); and
   a pixel circuit unit (CA) including:

   a driving transistor (DT),
   at least one switching transistor (ST1, ST2),
   a capacitor (Cst),
   a light blocking unit (LS) including a light blocking layer (110), and
   an opening (OP) in the light blocking layer (110),
   wherein the pixel circuit unit (CA) is configured to drive the emission unit (OA), and the light blocking layer (110) and opening (OP) are configured to selectively block the light input to the pixel circuit unit (CA);
   wherein the area of the opening (OP) in the light blocking layer (110) of the first sub-pixel is different from the area of the opening (OP) in the light blocking layer (110) of the second sub-pixel, and
   the light blocking unit (LS) in each sub-pixel is an area other than the emission unit (OA) and the opening (OP) in the respective sub-pixel;
   wherein the opening (OP) in the light blocking layer (110) of the first sub-pixel is an area in which at least one of the switching transistors (ST1; ST2) of the first sub-pixel is provided and at least a portion of an area in which the driving transistor (DT) of the first sub-pixel is provided,
   and the opening (OP) in the light blocking layer (110) of the second sub-pixel is an area in which at least one of the switching transistors (ST1; ST2) of the second sub-pixel is provided, and the light blocking layer (110) is provided in an area including the driving transistor (DT) of the second sub-pixel.

2. The organic light emitting display device of claim 1, wherein each of the at least one switching transistor (ST1, ST2) and the driving transistor (DT) includes an active layer (130), a gate electrode (150), a source electrode (170a), and a drain electrode (170b).

3. The organic light emitting display device of claim 2, wherein the active layer (130) is formed of an oxide semiconductor.

4. The organic light emitting display device of any one of claims 1 to 3, wherein the light blocking layer (110) is formed of one of a conductive material, a semiconductor material, and a black resin material.

5. The organic light emitting display device of any one of claims 1 to 4, wherein a light transmittance of the light blocking layer (110) depends on a thickness of the light blocking layer (110).

Patentansprüche

1. Eine organische lichtemittierende Anzeigevorrichtung, die mindestens ein erstes Subpixel, das dazu eingerichtet ist, weißes oder blaues Licht zu emittieren, und ein zweites Subpixel, das dazu eingerichtet ist, rotes oder grünes Licht zu emittieren, aufweist, jedes Subpixel aufweisend:

   eine Emissionseinheit (OA), die eine organische lichtemittierende Diode (OLED) aufweist; und

eine Pixelschaltkreiseinheit (CA), aufweisend:

einen Ansteuerungstransistor (DT),
mindestens einen Schalt-Transistor (ST1, ST2),
einen Kondensator (Cst),
eine lichtblockierende Einheit (LS), die eine lichtblockierende Schicht (110) aufweist, und
eine Öffnung (OP) in der lichtblockierenden Schicht (110),
wobei die Pixelschaltkreiseinheit (CA) dazu eingerichtet ist, die Emissionseinheit (OA) anzusteuern, und die lichtblockierende Schicht (110) und die Öffnung (OP) dazu eingerichtet sind, das auf die Pixelschaltkreiseinheit (CA) einfallende Licht selektiv zu blockieren;
wobei der Bereich der Öffnung (OP) in der lichtblockierenden Schicht (110) des ersten Subpixels verschieden ist von dem Bereich der Öffnung (OP) in der lichtblockierenden Schicht (110) des zweiten Subpixels, und die lichtblockierende Einheit (LS) in jedem Subpixel ein Bereich ist, der verschieden ist von der Emissionseinheit (OA) und der Öffnung (OP) in dem entsprechenden Subpixel;
wobei die Öffnung (OP) in der lichtblockierenden Schicht (110) des ersten Subpixels ein Bereich, in dem mindestens einer der Schalt-Transistoren (ST1; ST2) des ersten Subpixels bereitgestellt ist, und mindestens ein Abschnitt eines Bereichs, in dem der Ansteuerungstransistor (DT) des ersten Subpixels bereitgestellt ist, ist,
und die Öffnung (OP) in der lichtblockierenden Schicht (110) des zweiten Subpixels ein Bereich ist, in dem mindestens einer der Schalt-Transistoren (ST1; ST2) des zweiten Subpixels bereitgestellt ist, und die lichtblockierende Schicht (110) in einem Bereich bereitgestellt ist, der den Ansteuerungstransistor (DT) des zweiten Subpixels aufweist.

2. Die organische lichtemittierende Anzeigevorrichtung gemäß Anspruch 1, wobei jeder des mindestens einen SchaltTransistors (ST1, ST2) und des Ansteuerungstransistors (DT) eine aktive Schicht (130), eine Gate-Elektrode (150), eine Source-Elektrode (170a) und eine Drain-Elektrode (170b) aufweist.

3. Die organische lichtemittierende Anzeigevorrichtung gemäß Anspruch 2, wobei die aktive Schicht (130) aus einem Oxidhalbleiter gebildet ist.

4. Die organische lichtemittierende Anzeigevorrichtung gemäß einem der Ansprüche 1 bis 3, wobei die lichtblockierende Schicht (110) aus einem von einem leitfähigen Material, einem Halbleitermaterial und einem schwarzen Harzmaterial gebildet ist.

5. Die organische lichtemittierende Anzeigevorrichtung gemäß einem der Ansprüche 1 bis 4, wobei eine Lichtdurchlässigkeit der lichtblockierenden Schicht (110) von einer Dicke der lichtblockierenden Schicht (110) abhängt.

Revendications

1. Un dispositif d'affichage émetteur de lumière organique comprenant au moins un premier sous-pixel configuré pour émettre une lumière blanche ou bleue et un second sous-pixel configuré pour émettre une lumière rouge ou verte, chaque sous-pixel comprenant :

une unité d'émission (OA) comprenant une diode électroluminescente organique (OLED) ; et
une unité de circuit de pixel (CA), comprenant :

un transistor de commande (DT),
au moins un transistor de commutation (ST1, ST2),
un condensateur (Cst),
une unité de blocage de lumière (LS) comprenant une couche de blocage de lumière (110), et
une ouverture (OP) dans la couche de blocage de lumière (110),
où l'unité de circuit de pixel (CA) est configurée pour commander l'unité d'émission (OA), et la couche de blocage de lumière (110) et l'ouverture (OP) sont configurées pour bloquer sélectivement la lumière incidente sur l'unité de circuit de pixel (CA) ;
où la zone de l'ouverture (OP) dans la couche de blocage de lumière (110) du premier sous-pixel est différente de la zone de l'ouverture (OP) dans la couche de blocage de lumière (110) du second sous-pixel, et
l'unité de blocage de lumière (LS) dans chaque sous-pixel est une zone autre que l'unité d'émission (OA) et l'ouverture (OP) dans le sous-pixel respectif ;
où l'ouverture (OP) dans la couche de blocage de lumière (110) du premier sous-pixel est une zone dans laquelle au moins un des transistors de commutation (ST1 ; ST2) du premier sous-pixel est prévu et au moins une partie d'une zone dans laquelle le transistor de commande (DT) du premier sous-pixel est prévu,

et l'ouverture (OP) dans la couche de blocage de lumière (110) du second sous-pixel est une zone dans laquelle au moins un des transistors de commutation (ST1 ; ST2) du second sous-pixel est prévu, et la couche de blocage de lumière (110) est prévue dans une zone comprenant le transistor de commande (DT) du second sous-pixel.

2. Le dispositif d'affichage émetteur de lumière organique selon la revendication 1, dans lequel chacun dudit au moins un transistor de commutation (ST1, ST2) et dudit transistor de commande (DT) présente une couche active (130), une électrode de grille (150), une électrode de source (170a) et une électrode de drain (170b).

3. Le dispositif d'affichage émetteur de lumière organique selon la revendication 2, dans lequel la couche active (130) est formée d'un semi-conducteur d'oxyde.

4. Le dispositif d'affichage émetteur de lumière organique selon l'une quelconque des revendications 1 à 3, dans lequel la couche de blocage de lumière (110) est formée d'un parmi un matériau conducteur, un matériau semi-conducteur et un matériau de résine noire.

5. Le dispositif d'affichage émetteur de lumière organique selon l'une quelconque des revendications 1 à 4, dans lequel une transmittance de lumière de la couche de blocage de lumière (110) dépend d'une épaisseur de la couche de blocage de lumière (110).

FIG. 1

Related Art

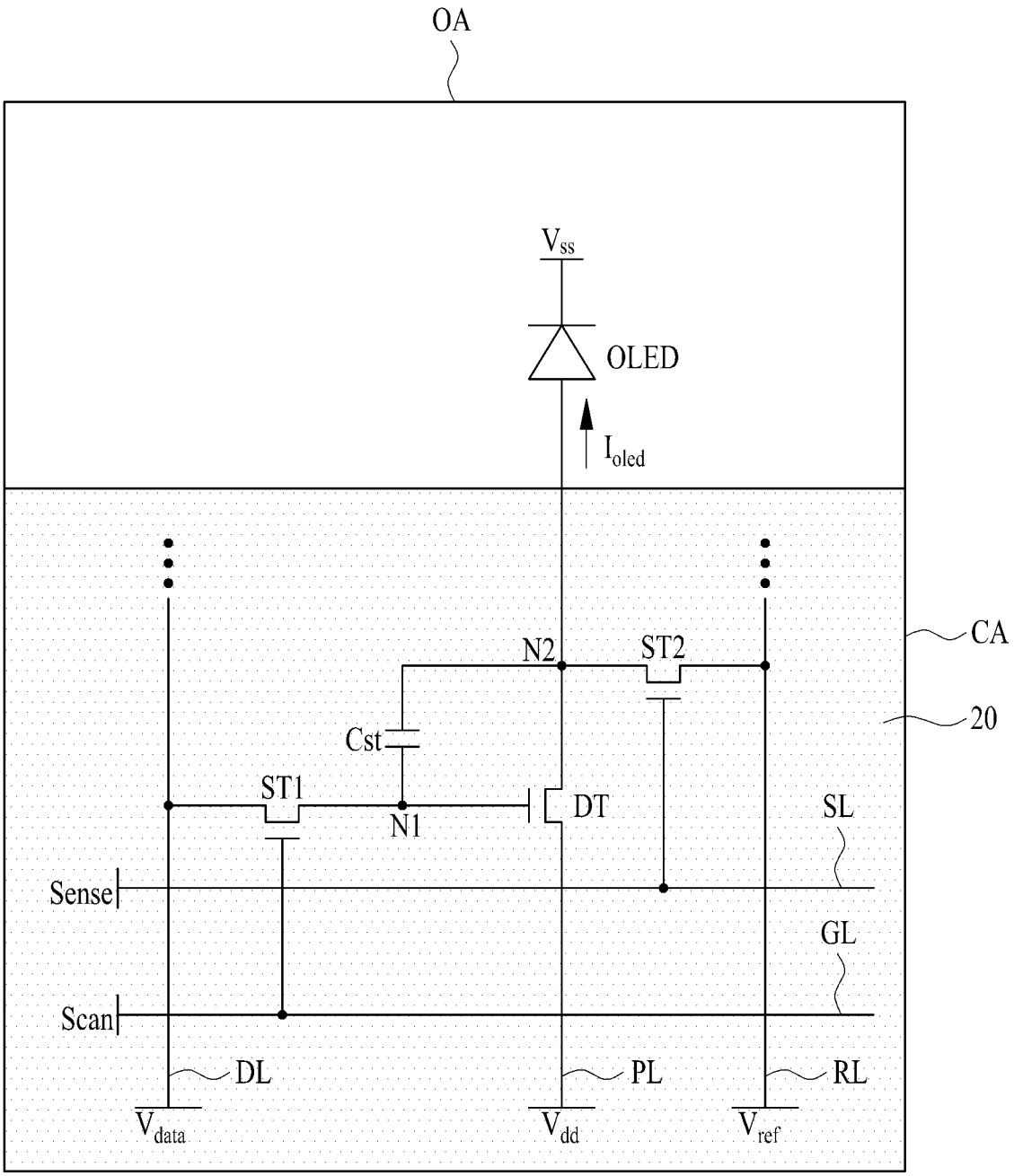


FIG. 2

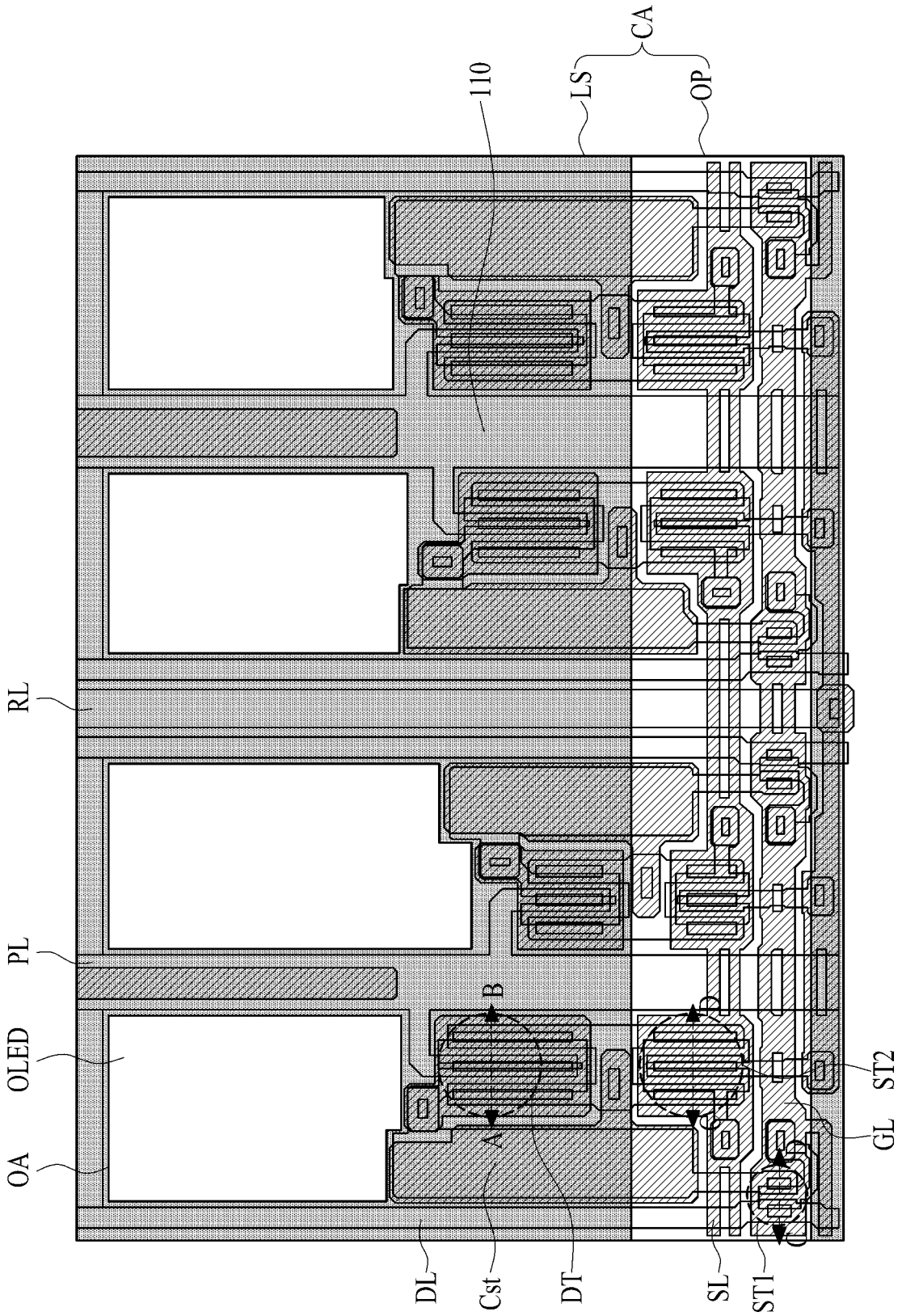


FIG. 3A

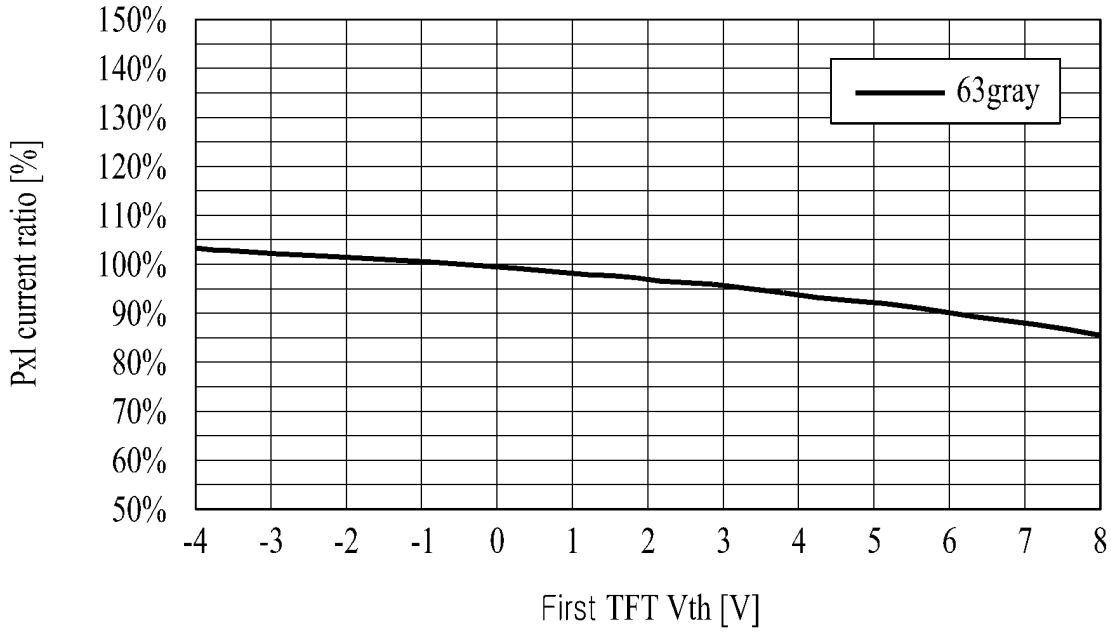
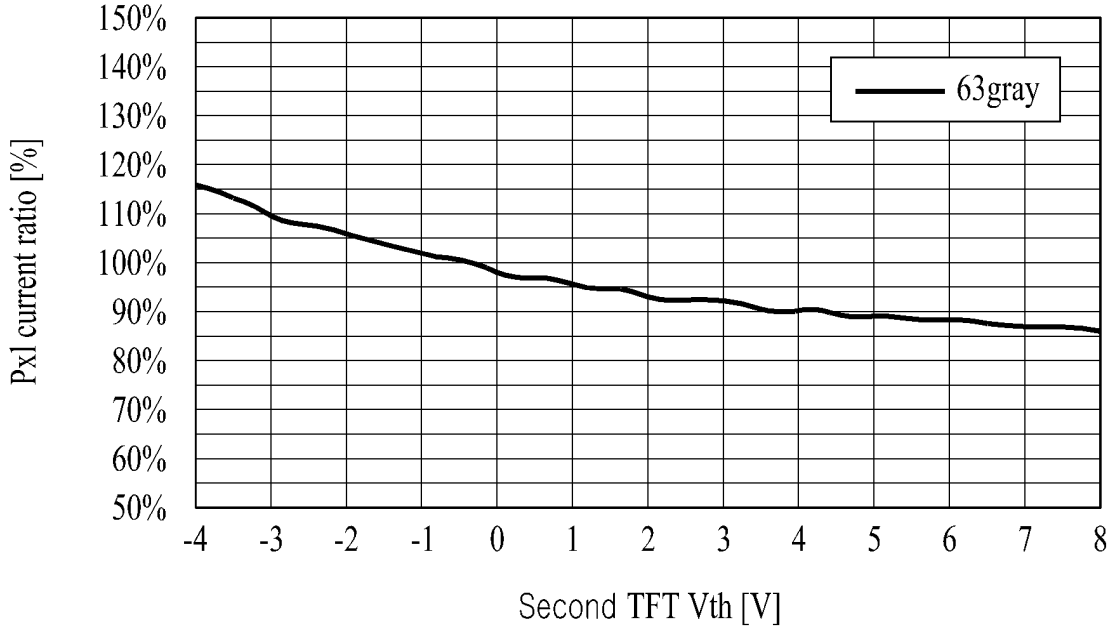

150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
Pxl current ratio [%]
63gray
-4
-3
-2
-1
0
1
2
3
4
5
6
7
8
First TFT Vth [V]

FIG. 3B


150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
Pxl current ratio [%]
63gray
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-2
-1
0
1
2
3
4
5
6
7
8
Second TFT Vth [V]

FIG. 4

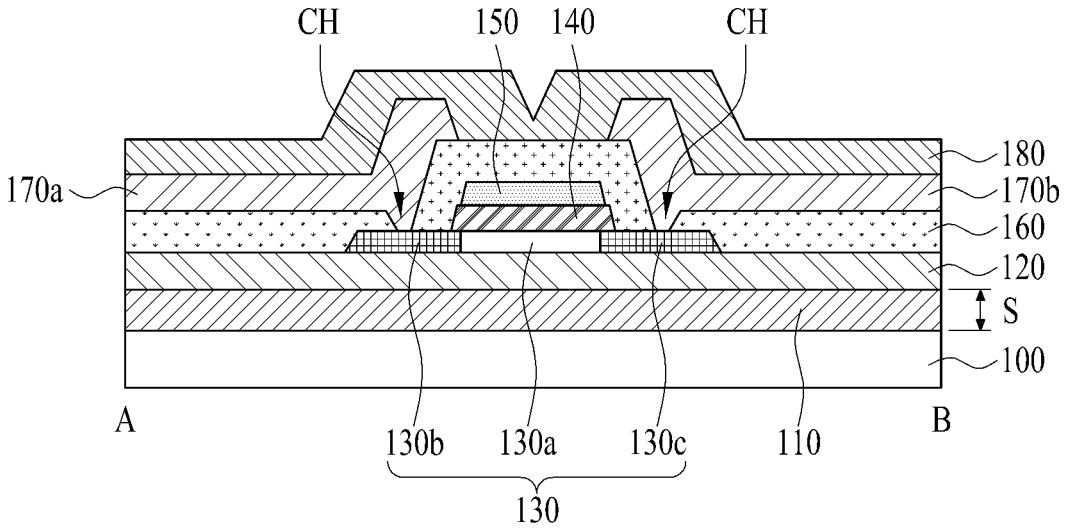

CH
150
140
CH
180
170a
170b
160
120
S
100
A
B
130b
130a
130c
110
130

FIG. 5

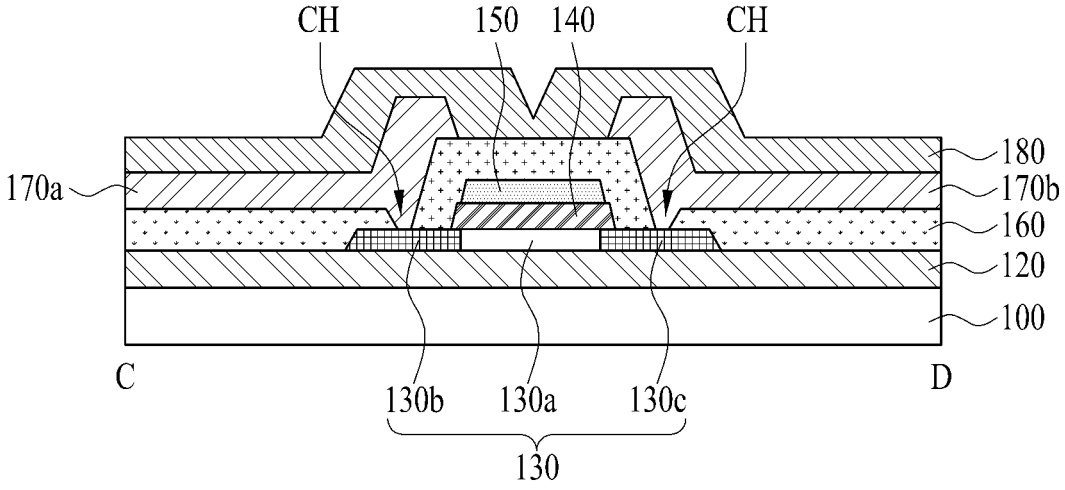

CH
150
140
CH
180
170a
170b
160
120
100
C
D
130b
130a
130c
130

FIG. 6

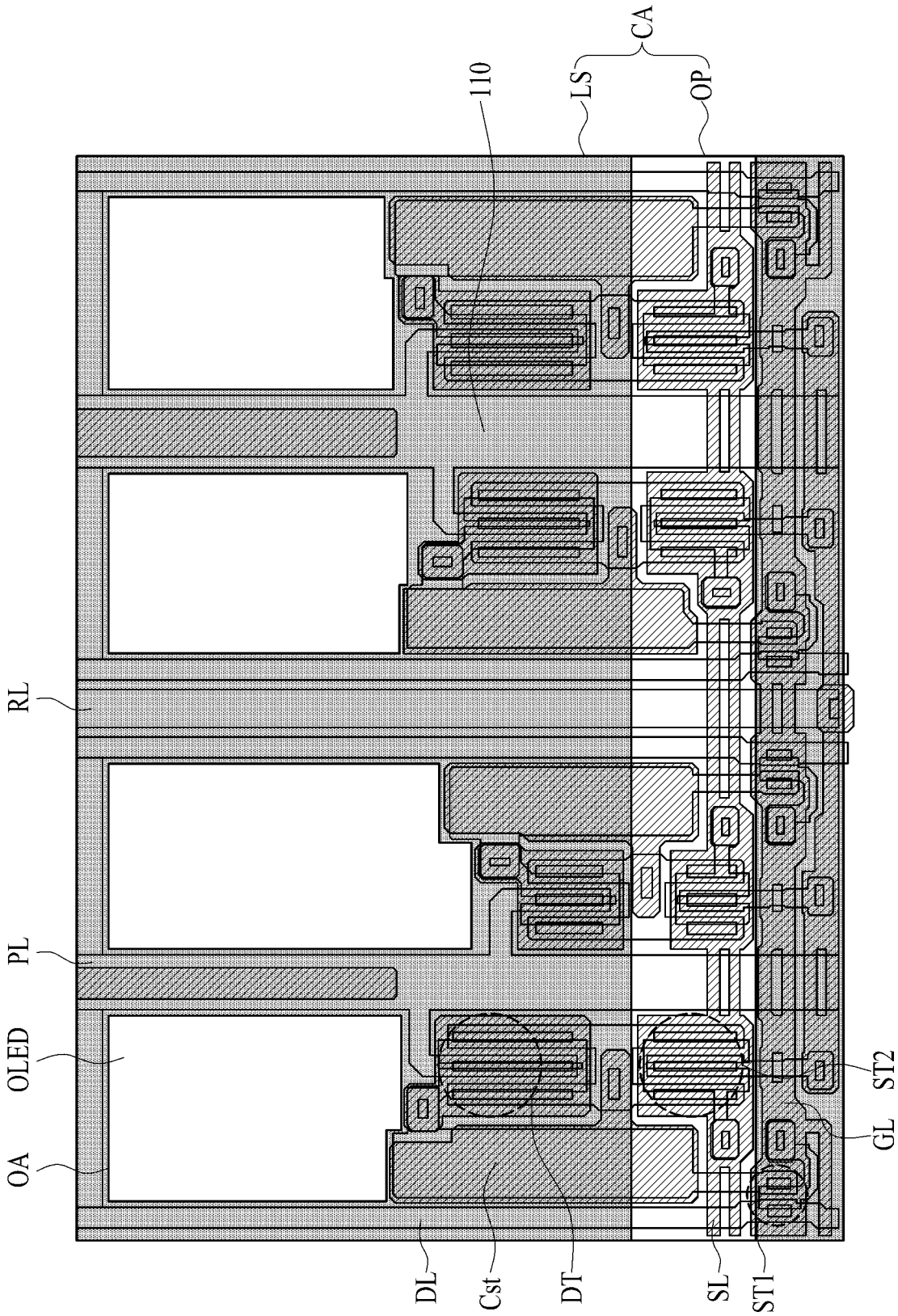


FIG. 7

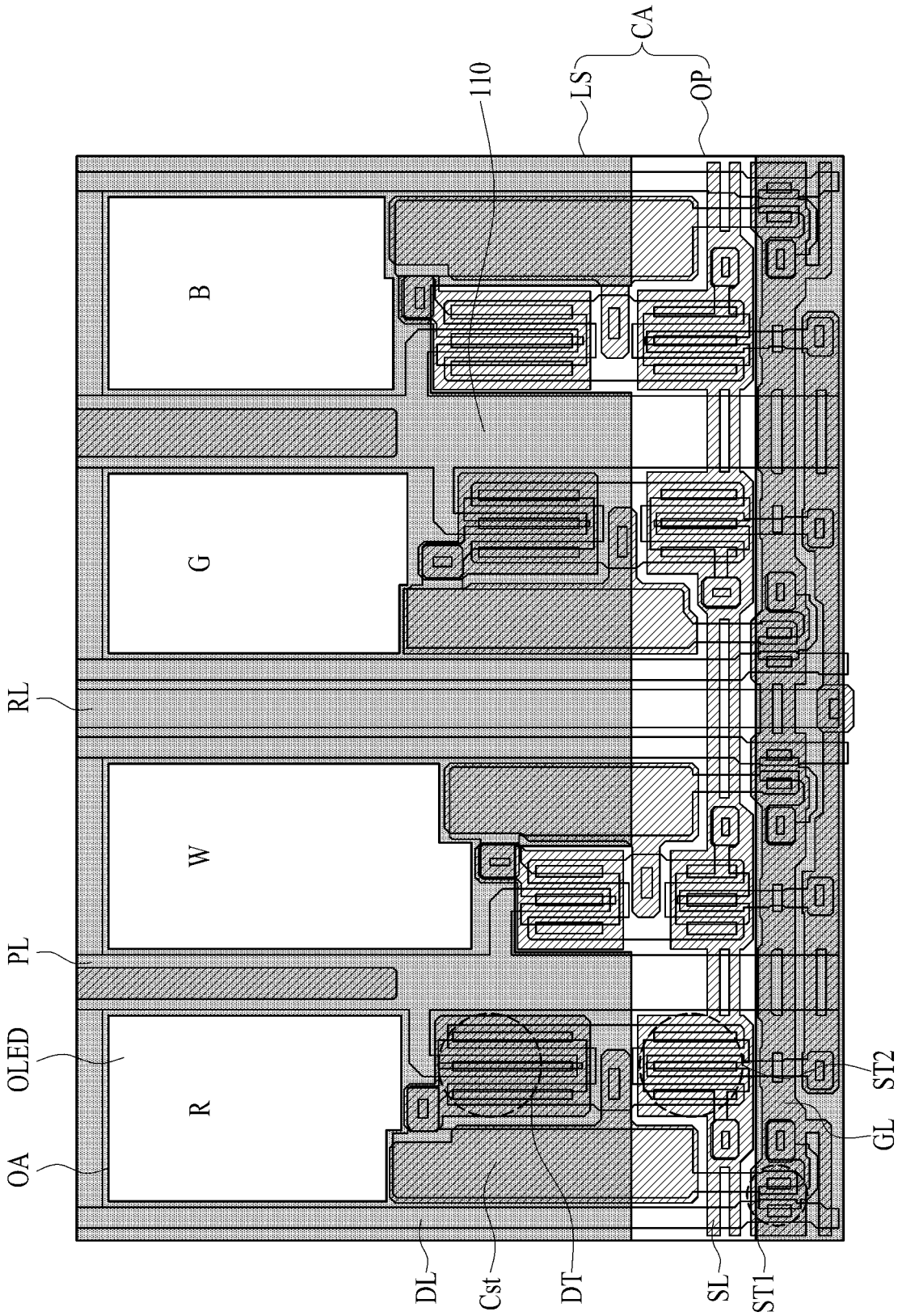


FIG. 8A

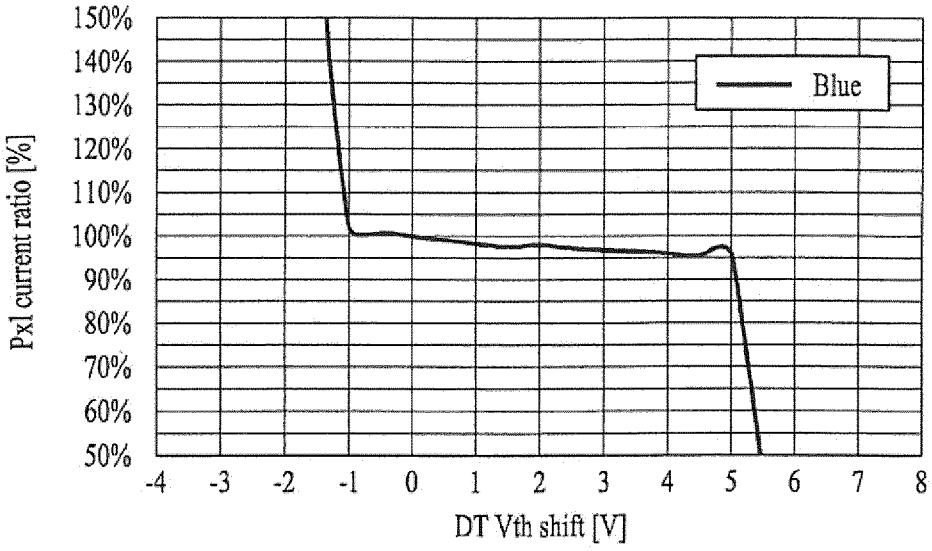

150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
Pxl current ratio [%]
-4 -3 -2 -1 0 1 2 3 4 5 6 7 8
DT Vth shift [V]
Blue

FIG. 8B

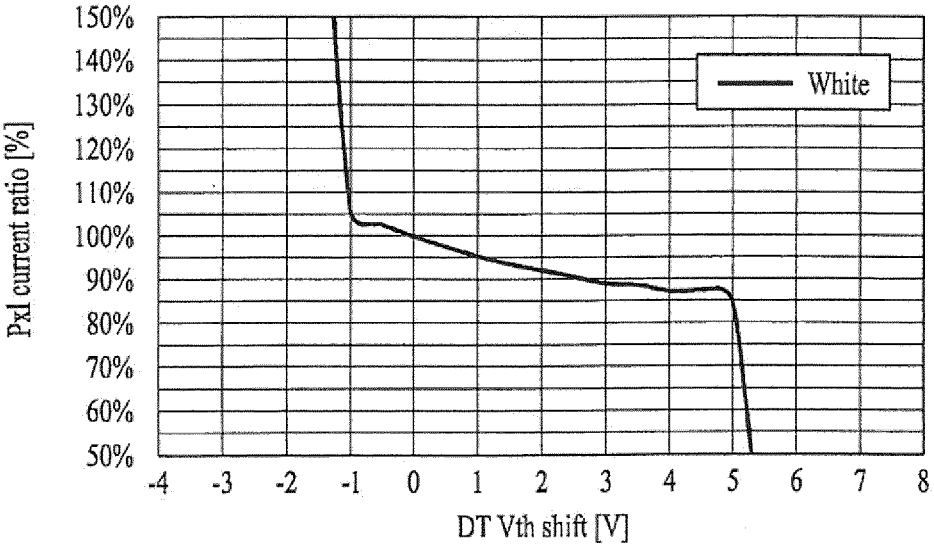
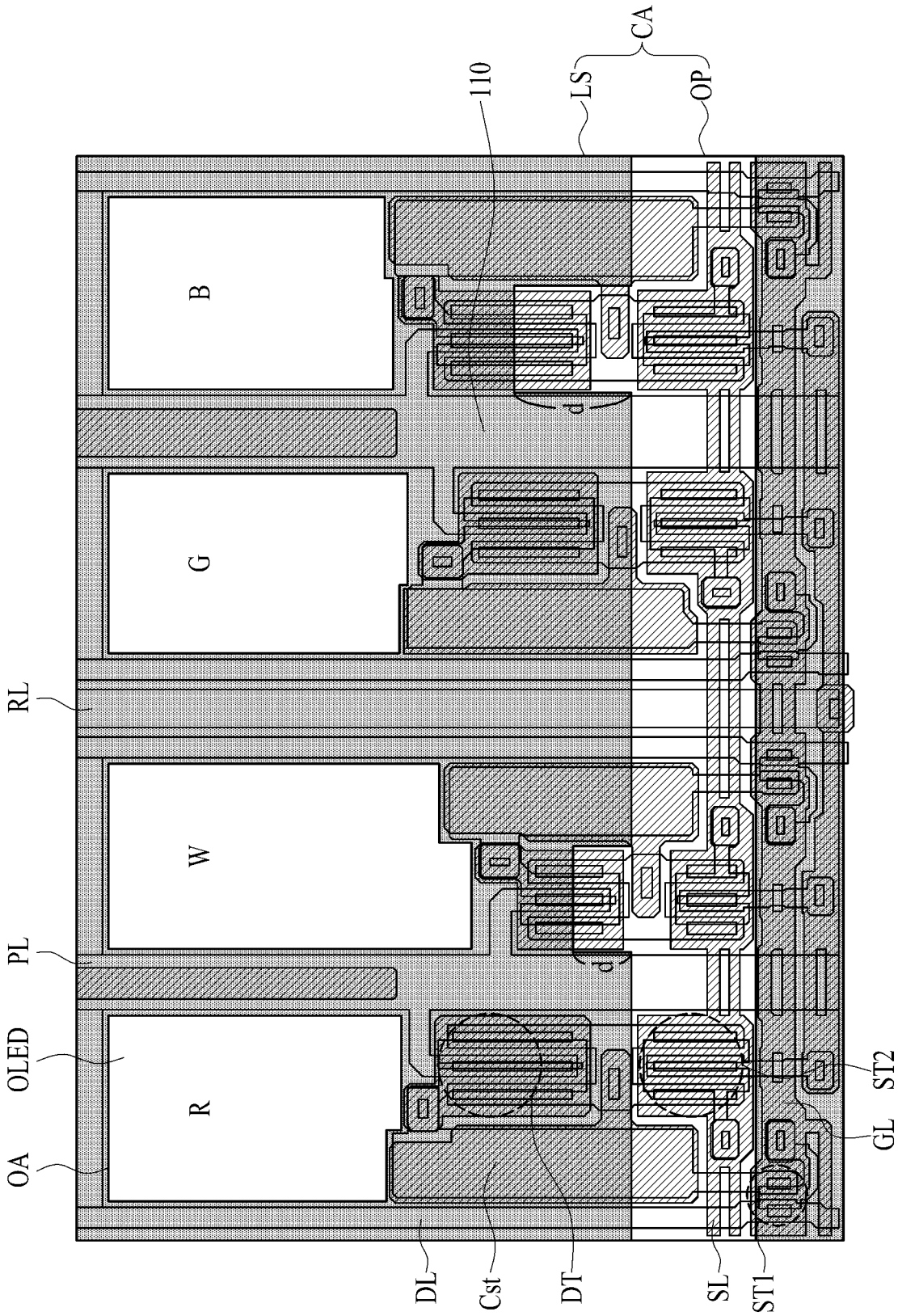

150%
140%
130%
120%
110%
100%
90%
80%
70%
60%
50%
Pxl current ratio [%]
-4 -3 -2 -1 0 1 2 3 4 5 6 7 8
DT Vth shift [V]
White

FIG. 9



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 1020130166795 **[0001]**
- US 20090243482 A1 **[0008]**
- US 20090135111 A1 **[0009]**
- WO 2009110623 A1 **[0010]**

专利名称(译)	有机电致发光显示装置		
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申请号	EP2014195329	申请日	2014-11-28
[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO. , LTD.		
[标]发明人	LEE SEON MI NAM WOO JIN		
发明人	LEE, SEON MI NAM, WOO JIN		
IPC分类号	H01L27/32		
CPC分类号	H01L27/3213 H01L27/3272 G09G3/2003 G09G3/3208 G09G2300/0452 G09G2300/0842 G09G2300/0871 G09G2310/0289 G09G2320/0233 G09G2320/043		
优先权	1020130166795 2013-12-30 KR		
其他公开文献	EP2889913A2 EP2889913A3		
外部链接	Espacenet		

摘要(译)

一种有机发光显示装置,包括发光单元(OA)和像素电路单元(CA)。 发射单元(OA)包括有机发光二极管(OLED)。 像素电路单元(CA)包括驱动晶体管(DT),至少一个或多个开关晶体管(ST1,ST2),电容器(Cst),遮光单元(LS)和开口(OP),其中 没有形成遮光层(110)。 遮光单元(LS)包括遮光层(110),该遮光层(110)阻挡输入到像素电路单元(CA)的光。 像素电路单元(CA)被配置为驱动发射单元并选择性地阻挡输入到像素电路单元(CA)的光。

FIG. 1
Related Art