



(11)

EP 3 564 940 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
06.11.2019 Bulletin 2019/45

(51) Int Cl.:
G09G 3/36 (2006.01)

(21) Application number: **16925410.9**

(86) International application number:
PCT/CN2016/112344

(22) Date of filing: **27.12.2016**

(87) International publication number:
WO 2018/119650 (05.07.2018 Gazette 2018/27)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(71) Applicant: **Shenzhen Royole Technologies Co., Ltd.**
Shenzhen, Guangdong 518172 (CN)

(72) Inventors:
• **LI, Wenhui**
Shenzhen
Guangdong 518052 (CN)
• **YUAN, Ze**
Shenzhen
Guangdong 518052 (CN)

(74) Representative: **Mewburn Ellis LLP**
City Tower
40 Basinghall Street
London EC2V 5DE (GB)

(54) **PIXEL CIRCUIT DRIVING METHOD, PIXEL CIRCUIT GROUP, AND ORGANIC LIGHT-EMITTING DISPLAY DEVICE**

(57) A pixel circuit driving method is disclosed. The method including: a plurality of rows of pixel circuits are provided (101), each row of the pixel circuit includes a switch module, a driving module, a compensation module, an organic light emitting diode, a first scanning line, a second scanning line, and a data compensation line. The switch module is turned on via the first scanning line to activate the driving module. The compensation module is turned off via the second scanning line to enable a data port to output a data signal which is transmitted to the organic light emitting diode via the data compensation line, the switch module and the driving module (102) for display. The organic light emitting diode being activated, the compensation module being turned on via the second scanning line, and the switch module being turned off via the first scanning line, thus to perform compensation detection on the organic light emitting diode. based on a determination that the compensation is required, a compensation signal is outputted via a compensation terminal, and transmitted to the organic light emitting diode via the data compensation line and the compensation module (103) for performing compensation after detection.

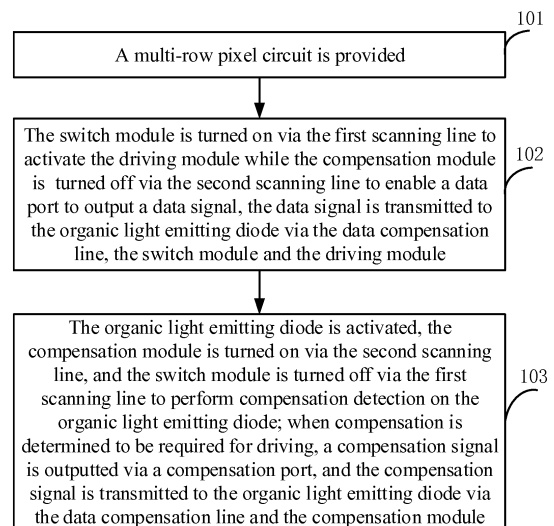


FIG. 1

Description

TECHNICAL FIELD

[0001] This present disclosure relates to the field of display, and more particularly, a pixel circuit driving method, a pixel circuit group, and an organic light emitting display device.

BACKGROUND

[0002] Generally, a pixel circuit of an active organic light emitting display device includes at least two TFTs (Thin Film Transistor) and one capacitor to drive organic light emitting diodes to emit light. Due to differentiated threshold voltages of the TFTs and aging of organic light emitting material, driving current of the organic light emitting diode changes, causing brightness of the organic light emitting diode to be varied, and further resulting in non-uniformity in organic light emitting display. Presently, the industry solves the problem of non-uniformity of the organic light emitting display by providing a compensation circuit, but the compensation circuit includes many components and circuits, thereby causing the pixel effective display aperture ratio and resolution to be decreased.

SUMMARY

[0003] Embodiments of the present disclosure disclose a pixel circuit driving method to solve the problem of uneven display of display device and improve the effective display aperture ratio and resolution.

[0004] The present disclosure also discloses a pixel circuit group and an organic light emitting display device.

[0005] Embodiments of the present disclosure disclose a pixel circuit driving method, including: providing a plurality of rows of pixel circuits, therein, each row of the pixel circuit includes a switch module, a driving module, a compensation module, an organic light emitting diode, a first scanning line, a second scanning line, and a data compensation line, therein the first scanning line is coupled to the switch module, therein the switch module is further coupled to the driving module, therein the switch module is further coupled to the data compensation line, therein the driving module receives a DC voltage and is coupled to the organic light emitting diode, therein the second scanning line is coupled to the compensation module, and the compensation module is further coupled to the driving module and the organic light emitting diode; each of the plurality of rows of pixel circuits shares an identical data compensation line, and the data compensation line is coupled to the data terminal, the compensation terminal, and the detection terminal of a driving chip; turning on the switch module via the first scanning line to activate the driving module while turning off the compensation module via the second scanning line to enable a data terminal to output a data signal, and transmitting the data signal to the organic light emitting diode via the data compensation line, the switch module and the driving module for display; activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line to perform compensation detection on the organic light emitting diode, when determining compensation is required for driving, outputting a compensation signal via a compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection; therein, the plurality of rows of pixel circuits are displayed and compensated row by row.

mitting the data signal to the organic light emitting diode via the data compensation line, the switch module and the driving module for display; activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line to perform compensation detection on the organic light emitting diode, when determining compensation is required for driving, outputting a compensation signal via a compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection; therein, the plurality of rows of pixel circuits are displayed and compensated row by row.

[0006] Therein, the switch module is a first transistor, therein the driving module is a second transistor, and the compensation module is a third transistor; therein the first scanning line is coupled to a gate of the first transistor, therein a drain of the first transistor is coupled to the data compensation line, and the source of the first transistor is coupled to a gate of the second transistor; therein a drain of the second transistor is coupled to a voltage terminal of the driving chip and is configured for receiving the DC voltage; a source of the second transistor is coupled to an anode of the organic light emitting diode, and a cathode of the organic light emitting diode is grounded; therein the second scanning line is coupled to a gate of the third transistor, therein a drain of the third transistor is coupled to the data compensation line, and a source of the third transistor is coupled to an anode of the organic light emitting diode.

[0007] Therein, turning on the switch module via the first scanning line to activate the driving module while turning off the compensation module via the second scanning line to enable a data terminal to output a data signal, and transmit the data signal to the organic light emitting diode via the data compensation line, the switch module and the driving module for display, includes: outputting a high level signal via the first scanning line and outputting a low level signal via the second scanning line, thus to cut off the third transistor and turn on the first transistor and the second transistor; the data signal outputted by the data terminal is transmitted to the organic light emitting diode via the data compensation line, the switch module and the driving module for display.

[0008] Therein, activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line to perform compensation detection on the organic light emitting diode, based on a determination that the compensation is required, outputting a compensation signal via the compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection includes: outputting a high level signal via the first scanning line to turn on the first transistor and the second transistor to activate the organic light emitting diode; out-

putting a low level signal via the first scanning line to turn on the first transistor and the second transistor is turned off, outputting a high level signal via the second scanning line to turn on the third transistor; detecting a current of the organic light emitting diode via the data compensation line and the third transistor successively; when determining the compensation is required, outputting the compensation signal via the compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the third transistor for compensating.

[0009] Therein, the activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line to perform compensation detection on the organic light emitting diode, based on a determination that the compensation is required, outputting a compensation signal via a compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection includes: outputting a high level signal via the first scanning line to turn on the first transistor and the second transistor to activate the organic light emitting diode; outputting a low level signal via the first scanning line to turn on the first transistor and the second transistor is cut off, outputting a high level signal via the second scanning line to turn on the third transistor; detecting a current of the organic light emitting diode via the data compensation line and the third transistor successively; when determining the compensation is required, outputting the compensation signal via the compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the third transistor for compensating.

[0010] Therein, before outputting a low level signal via the first scanning line to cut off the first transistor and the second transistor, and outputting a high level signal via the second scanning line to turn on the third transistor; transmitting the data signal outputted via the data terminal to the organic light emitting diode via the data compensation line and the third transistor for activating the organic light emitting diode, the method further includes: outputting a high level signal via the first scanning line to turn on the first transistor, outputting the low level signal via the data terminal and transmitting the low level signal to the second transistor via the data compensation line and the first transistor to cut off the second transistor.

[0011] Embodiments of the present disclosure disclose a pixel circuit group, applied to an organic light emitting display device, therein, the pixel circuit group includes a plurality of rows of pixel circuits; each row of the pixel circuit includes a switch module, a driving module, a compensation module, an organic light emitting diode, a first scanning line, a second scanning line, and a data compensation line; therein the first scanning line is coupled to the switch module, therein the switch module is further coupled to the driving module, therein the switch

module is further coupled to the data compensation line, therein the driving module receives a DC voltage and is coupled to the organic light emitting diode, therein the second scanning line is coupled to the compensation module, and the compensation module is further coupled to the driving module and the organic light emitting diode; each of the plurality of rows of pixel circuits shares an identical data compensation line, and the data compensation line is coupled to the data terminal, the compensation terminal, and the detection terminal of a driving chip; during a display phase, the first scanning line is configured to turn on the switch module to activate the driving module, the second scanning line is configured to turn off the compensation module to enable a data terminal to output a data signal which is transmitted to the organic light emitting diode via the data compensation line, the switch module and the driving module; during a compensation phase after detection, the organic light emitting diode being activated, the second scanning line being configured to turn on the compensation module, and the first scanning line being configured to turn off the switch module, thus to perform compensation detection on the organic light emitting diode; based on a determination that the compensation is required, the compensation terminal outputs the compensation signal, and transmits the compensation signal to the organic light emitting diode via the data compensation line and the compensation module; therein, the plurality of rows of pixel circuits are displayed and compensated row by row.

[0012] Therein, the switch module is a first transistor, therein the driving module is a second transistor, and the compensation module is a third transistor; therein the first scanning line is coupled to a gate of the first transistor, therein a drain of the first transistor is coupled to the data compensation line, and the source of the first transistor is coupled to a gate of the second transistor; therein a drain of the second transistor is coupled to a voltage terminal of the driving chip and is configured for receiving the DC voltage, therein a source of the second transistor is coupled to an anode of the organic light emitting diode, and a cathode of the organic light emitting diode is grounded; the second scanning line is coupled to a gate of the third transistor, therein a drain of the third transistor is coupled to the data compensation line, and a source of the third transistor is coupled to an anode of the organic light emitting diode.

[0013] Therein, during the display phase, the first scanning line is configured to output a high level signal and the second scanning line is configured to output a low level signal, thus to cut off the third transistor and turn on the first transistor and the second transistor; the data signal outputted by the data terminal is transmitted to the organic light emitting diode via the data compensation line, the switch module and the driving module.

[0014] Therein, during the compensation phase after detection, the first scanning line is configured to output a high level signal to turn on the first transistor and the second transistor is turned on to activate the organic light

emitting diode; the first scanning line is further configured to output a low level signal to turn on the first transistor and the second transistor is turned off, therein the second scanning line is configured to output a high level signal to turn on the third transistor to enable a current of the organic light emitting diode transmitted to the compensation terminal via the third transistor and the data compensation line successively for detecting; when determining the compensation is required, compensation terminal is configured to outputs the compensation signal and transmits the compensation signal to the organic light emitting diode via the third transistor for compensating.

[0015] Therein, during the compensation phase after detection, the first scanning line is configured to output a low level signal to cut off the first transistor and the second transistor, the second scanning line is configured to output a high level signal to turn on the third transistor; the data terminal is configured to output the data signal and transmit the data signal to the organic light emitting diode via the data compensation line and the third transistor for activating the organic light emitting diode; the compensation terminal is configured to detect a current of the organic light emitting diode via the data compensation line and the third transistor; when determining the compensation is required, the compensation terminal is further configured to output the compensation signal and transmit the compensation signal to the organic light emitting diode via the data compensation line and the third transistor.

[0016] Therein, the first scanning line is further configured to output a high level signal to turn on the first transistor before output the low level signal, the data terminal outputs the low level signal and transmits the low level signal to the second transistor via the data compensation line and the first transistor to cut off the second transistor.

[0017] Embodiments of the present disclosure disclose an organic light emitting display device, including a driving chip and a pixel circuit group coupled to the driving chip.

[0018] Embodiments of the present disclosure disclose a pixel circuit driving method, including: providing a plurality of rows of pixel circuits, therein, each row of the pixel circuit includes a switch module, a driving module, a compensation module, an organic light emitting diode, a first scanning line, a second scanning line, and a data compensation line, therein the first scanning line is coupled to the switch module, therein the switch module is further coupled to the driving module, therein the switch module is further coupled to the data compensation line, therein the driving module receives a DC voltage and is coupled to the organic light emitting diode, therein the second scanning line is coupled to the compensation module, and the compensation module is further coupled to the driving module and the organic light emitting diode; each of the plurality of rows of pixel circuits shares an identical data compensation line, and the data compensation line is coupled to the data terminal, the compensation terminal, and the detection terminal of a driving

chip; turning on the switch module via the first scanning line to activate the driving module while turning off the compensation module via the second scanning line to enable a data terminal to output a data signal, and transmitting the data signal to the organic light emitting diode via the data compensation line, the switch module and the driving module for display; activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line to perform compensation detection on the organic light emitting diode, when determining compensation is required for driving, outputting a compensation signal via a compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection; therein, the plurality of rows of pixel circuits are displayed and compensated row by row. When the organic light emitting diode is charged for display or compensated, the data compensation line is shared by the pixel circuit rather than performing corresponding functions by different lines. Therefore, the pixel circuit reduces the number of lines used in the pixel circuit and greatly improves the pixel effective display aperture ratio and resolution.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

[0019] To describe technology solutions in the embodiments of the present disclosure more clearly, the following briefly introduces the accompanying drawings required for describing the embodiments. Obviously, the accompanying drawings in the following description show merely some embodiments of the present disclosure, those of ordinary skill in the art may also derive other obvious variations according to these accompanying drawings without creative efforts.

FIG. 1 is a flowchart of a pixel circuit driving method according to a first embodiment of a first aspect of the present disclosure.

FIG. 2 is a circuit diagram of a pixel circuit group according to an embodiment of second aspect of the present disclosure.

FIG. 3 is a flow chart of step 103 in FIG. 1.

FIG. 4 is a flowchart of a pixel circuit driving method according to a second embodiment of the first aspect of the present disclosure.

FIG. 5 is a circuit diagram of an organic light emitting display according to an embodiment of third aspect of the present disclosure.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENTS

[0020] The technical solution in the embodiments of the present disclosure will be described clearly and com-

pletely hereinafter with reference to the accompanying drawings in the embodiments of the present disclosure. Obviously, the described embodiments are merely some but not all the embodiments of the present disclosure. All other embodiments obtained by a person of ordinary skill in the art according to the embodiments of the present disclosure without creative efforts shall all fall within the protection scope of the present disclosure.

[0021] In addition, the description of the following embodiments referring to accompanying drawings is provided to illustrate the specific embodiments in which the disclosure may be practiced. The directional terms mentioned in the present disclosure, such as "up", "down", "front", "back", "left", "right", "inside", "outside", "side" etc., only refer to the direction of the accompanying drawings. Therefore, the directional terminology is used to describe and understand the disclosure better and more clearly, rather than indicate or imply that the device or component must have a specific orientation, be constructed and operated in a specific orientation, therefore, it cannot be understood as a limitation of the present disclosure.

[0022] In the description of the present disclosure, it should be noted that, unless otherwise expressly stated and limited, the terms "installation", "coupled", and "connected" shall be understood broadly, for example, it can be a fixed connection, or it can be detachably connected, or integrally connected; it can be a mechanical connection; it can be directly connected, or indirectly connected through an intermediary, and it can be the internal connection of two components. For those skilled in the art, the specific meanings of the above terms in the present disclosure can be understood in a specific case.

[0023] Further, in the description of the present disclosure, unless otherwise stated, the meaning of "multiple" is two or more. If the term "process" appears in the specification, it means not only an independent process, but also cannot be clearly distinguished from other processes, as long as the expected function of the process can be realized. In addition, the numerical range represented by "~" in the specification, it means that a range in which the numerical values described before and after "-" are respectively included as a minimum value and a maximum value. In accompanying drawings, similar or identical structures are marked with the same symbol.

[0024] Referring to FIG. 1 and FIG. 2, a first embodiment of the first aspect of the present disclosure provides a pixel circuit driving method. The pixel circuit driving method includes the following steps.

[0025] At block 101, a plurality of rows of pixel circuits are provided. Therein, each row of the pixel circuit 100 includes a switch module Q1, a driving module Q2, a compensation module Q3, an organic light emitting diode D, a first scanning line L1, a second scanning line L2, and a data compensation line P. The first scanning line L1 is coupled to the switch module Q1. The switch module Q1 is further coupled to the driving module Q2. The switch module Q1 is further coupled to the data compensation

line P. The driving module Q2 receives a DC voltage and is coupled to the organic light emitting diode D. The second scanning line L2 is coupled to the compensation module Q3, and the compensation module Q3 is further coupled to the driving module Q2 and the organic light emitting diode D. The data compensation lines P of the plurality of rows of pixel circuits are the same one, and the data compensation line P is coupled to the data terminal, the compensation terminal, and the detection terminal.

[0026] It should be noted that the driving module Q2 can be connected with a voltage terminal of a driving chip to receive the DC voltage.

[0027] At block 102, the switch module Q1 is turned on via the first scanning line L1 to activate the driving module Q2 while the compensation module Q3 is turned off via the second scanning line L2, thus to enable the data terminal to output a data signal and transmit the data signal to the organic light emitting diode D via the data compensation line P, the switch module Q1 and the driving module Q2 for display.

[0028] Therein, at this time, the organic light emitting diode D is in a display stage.

[0029] At block 103, the organic light emitting diode D being activated, the compensation module Q3 being turned on via the second scanning line L2, and the switch module Q1 being turned off via the first scanning line, thus performing compensation detection for the organic light emitting diode D. Based on a determination that the compensation is required, a compensation signal is outputted via the compensation terminal, and the compensation signal is transmitted to the organic light emitting diode D via the data compensation line P and the compensation module Q3 for performing compensation after detection. Therein, the plurality of rows of pixel circuits are displayed and compensated row by row.

[0030] It should be noted that, the plurality of rows of pixel circuits being displayed and compensated row by row means that only after a current row of the pixel circuits is charged for display and compensated may the next row of the pixel circuits be charged for display and compensated.

[0031] In the embodiment, in the pixel circuit 100, when the organic light emitting diode D is charged for display or compensated, the data compensation line P is shared by the pixel circuit 100 rather than performing corresponding functions by different lines. Therefore, the pixel circuit 100 reduces the number of lines used in the pixel circuit 100 and greatly improves the pixel effective display aperture ratio and resolution.

[0032] Specifically, the switch module Q1 is a first transistor. The driving module Q2 is a second transistor. The compensation module Q3 is a third transistor. The first scanning line L1 is coupled to a gate of the first transistor, therein a drain of the first transistor is coupled to the data compensation line P, and a source of the first transistor is coupled to a gate of the second transistor; therein a drain of the second transistor is coupled to a voltage ter-

minal of the driving chip and is configured for receiving the DC voltage from the voltage terminal of the driving chip, therein a source of the second transistor is coupled to an anode of the organic light emitting diode D, and a cathode of the organic light emitting diode D is grounded; therein the second scanning line L2 is coupled to a gate of the third transistor, therein a drain of the third transistor is coupled to the data compensation line P, and a source of the third transistor is coupled to an anode of the organic light emitting diode D.

[0033] Further, the block 102 includes the following blocks.

[0034] A high level signal is outputted via the first scanning line L1 and a low level signal is outputted via the second scanning line L2, thus to cut off the third transistor and turn on the first transistor and the second transistor. The data signal outputted by the data terminal is transmitted to the organic light emitting diode D via the data compensation line P, the switch module Q1 and the driving module Q2 for display.

[0035] Referring to FIG. 3 again, further, the block 103 includes the following blocks.

[0036] At block 1031, a high level signal is outputted via the first scanning line L1 to turn on the first transistor and the second transistor to activate the organic light emitting diode D.

[0037] It should be noted that the organic light emitting diode D is activated through the second transistor in this block.

[0038] At block 1032, a low level signal is outputted via the first scanning line L1 to turn on the first transistor and the second transistor is cut off, therein a high level signal is outputted via the second scanning line L2 to turn on the third transistor. The detection terminal detects a current of the organic light emitting diode D via the data compensation line P and the third transistor successively.

[0039] At block 1033, when the compensation is determined to be required, the compensation terminal outputs the compensation signal, and transmits the compensation signal to the organic light emitting diode D via the data compensation line P and the third transistor for compensating.

[0040] It should be noted that the driving chip can determine the current offset of the organic light emitting diode D activated by the second transistor according to the current of the organic light emitting diode D received through the detection terminal, and control the compensation terminal output the compensation signal. The compensation signal is transmitted to the organic light emitting diode D via the data compensation line P to adjust the current of the organic light emitting diode D to a preset current to achieve compensation.

[0041] In the embodiment, the first to third transistors are thin film transistors.

[0042] Referring to FIG. 4, a second embodiment of the present disclosure provides a pixel circuit driving method. The pixel circuit driving method provided by the second embodiment is similar to the pixel circuit driving

method provided by the first embodiment (that is, blocks 101-102 are the same). The differences are as follows: the block of "the organic light emitting diode D being activated, the compensation module Q3 being turned on via the second scanning line L2, and the switch module Q1 being cut off via the first scanning line L1, thus to perform compensation detection on the organic light emitting diode D. Based on a determination that the compensation is required, the compensation signal is outputted via a compensation terminal, and transmitted to the organic light emitting diode D via the data compensation line P and the compensation module Q3 for performing compensation after detection" includes the following blocks.

[0043] At block 401, a low level signal is outputted via the first scanning line L1 to cut off the first transistor and the second transistor; a high level signal is outputted via the second scanning line L2 to turn on the third transistor; the data terminal outputs the data signal, and transmits the data signal to the organic light emitting diode D via the data compensation line P and the third transistor to activate the organic light emitting diode D.

[0044] At block 402, the current of the organic light emitting diode D is detected via the data compensation line P and the third transistor.

[0045] At block 403, when the compensation is determined to be required, the compensation terminal outputs the compensation signal, and transmits the compensation signal to the organic light emitting diode D via the data compensation line P and the third transistor.

[0046] It should be noted that the driving chip can determine the current offset of the organic light emitting diode D activated by the second transistor according to the current of the organic light emitting diode D received through the detection terminal, and control the compensation terminal output the compensation signal. The compensation signal is transmitted to the organic light emitting diode D via the data compensation line P to adjust the current of the organic light emitting diode D to a preset current to achieve compensation.

[0047] Further, the following block can also be included before the block 401.

[0048] The high level signal is outputted via the first scanning line to turn on the first transistor. The data terminal outputs the low level signal and transmits the low level signal to the second transistor via the data compensation line and the first transistor to cut off the second transistor.

[0049] It should be noted that, in this block, since the organic light emitting diode D is activated by the third transistor, it is necessary to cut off the second transistor before performing the detection compensation to avoid the influence of the second transistor.

[0050] It should be noted that, the pixel circuit driving method provided by the present disclosure is also applicable to a liquid crystal display device.

[0051] Referring to FIG. 2 again, a first embodiment of the second aspect of the present disclosure provides a

pixel circuit group 200. The pixel circuit group 200 is applied to an organic light emitting display device. The pixel circuit group 200 includes a plurality of rows of pixel circuits 100. Each row of the pixel circuit 100 includes a switch module 10, a driving module 20, a compensation module 30, an organic light emitting diode D, a first scanning line L1, a second scanning line L2, and a data compensation line P. The first scanning line L1 is coupled to the switch module Q1. The switch module Q1 is further coupled to the driving module Q2. The switch module Q1 is further coupled to the data compensation line P. The driving module Q2 receives a DC voltage and is coupled to the organic light emitting diode D. The second scanning line L2 is coupled to the compensation module Q3, and the compensation module Q3 is further coupled to the driving module Q2 and the organic light emitting diode D. The data compensation lines of a plurality of rows of pixel circuits are the same one, and the data compensation lines are coupled to the data terminal, the compensation terminal, and the detection terminal of a driving chip.

[0052] During the display phase, the first scanning line L1 is configured to turn on the switch module Q1 to activate the driving module D. The second scanning line L2 is configured to turn off the compensation module Q3 to enable a data terminal to output a data signal and transmits the data signal to the organic light emitting diode D via the data compensation line P, the switch module Q1 and the driving module Q2.

[0053] During the compensation phase after detection, the organic light emitting diode D being activated, the second scanning line L2 being configured to turn on the compensation module Q3, and the first scanning line L1 being configured to turn off the switch module Q1, thus to perform compensation detection on the organic light emitting diode D. Based on a determination that the compensation is required, the compensation terminal outputs the compensation signal, and transmits the compensation signal to the organic light emitting diode D via the data compensation line P and the compensation module Q3. Therein, a plurality of rows of pixel circuits are displayed and compensated row by row.

[0054] It should be noted that, the driving module Q2 can be connected with a voltage terminal of a driving chip to receive the DC voltage. The plurality of rows of pixel circuits being displayed and compensated row by row means that only after a current row of the pixel circuits is charged for display may a next row of the pixel circuits be charged for display and compensated.

[0055] In the embodiment, in the pixel circuit 100, when the organic light emitting diode D is charged for display or compensated, the data compensation line P is shared, rather than performing corresponding functions by different lines. Therefore, the pixel circuit 100 reduces the number of lines used in the pixel circuit 100 and greatly improves the pixel effective display aperture ratio and resolution.

[0056] Specifically, the switch module Q1 is a first tran-

sistor. The driving module Q2 is a second transistor. The compensation module Q3 is a third transistor. The first scanning line L1 is coupled to a gate of the first transistor, therein a drain of the first transistor is coupled to the data compensation line P, and the source of the first transistor is coupled to a gate of the second transistor; therein a drain of the second transistor is coupled to a voltage terminal of the driving chip and is configured for receiving the DC voltage, therein a source of the second transistor is coupled to an anode of the organic light emitting diode D, and a cathode of the organic light emitting diode D is grounded; therein the second scanning line L2 is coupled to a gate of the third transistor, therein a drain of the third transistor is coupled to the data compensation line P, and a source of the third transistor is coupled to an anode of the organic light emitting diode D.

[0057] Further, in the display phase, the first scanning line L1 is configured to output a high level signal to turn on the first transistor and the second transistor, therein the second scanning line L2 is configured to output a low level signal to cut off the third transistor. The data signal outputted by the data terminal is transmitted to the organic light emitting diode D via the data compensation line P, the switch module Q1 and the driving module Q2.

[0058] During the compensation phase after detection, the first scanning line L1 is configured to output a high level signal to turn on the first transistor and the second transistor is turned on to activate the organic light emitting diode D. The first scanning line L1 is further configured to output a low level signal to turn on the first transistor and the second transistor is cut off, therein the second scanning line L2 is configured to output a high level signal to turn on the third transistor to enable a current of the organic light emitting diode D transmitted to the compensation terminal via the third transistor and the data compensation line P successively for detecting. When the compensation is determined to be required, the compensation terminal is configured to output the compensation signal and transmits the compensation signal to the organic light emitting diode D via the third transistor for compensating.

[0059] It should be noted that, in the embodiment, the first scanning line L1 activate the organic light emitting diode D through the second transistor. The driving chip can determine the current offset of the organic light emitting diode D activated by the second transistor according to the current of the organic light emitting diode D received through the detection terminal, and control the compensation terminal output the compensation signal. The compensation signal is transmitted to the organic light emitting diode D via the data compensation line P to adjust the current of the organic light emitting diode D to a preset current to achieve compensation.

[0060] In another embodiment, the organic light emitting diode D can also be activated by the third transistor, that is, during the compensation phase after detection, the first scanning line L1 is configured to output a low level signal to cut off the first transistor and the second

transistor, therein the second scanning line L2 is configured to output a high level signal to turn on the third transistor. The data terminal is configured to output the data signal and transmit the data signal to the organic light emitting diode D via the data compensation line P and the third transistor for activating the organic light emitting diode D. The compensation terminal is configured to detect a current of the organic light emitting diode D via the data compensation line P and the third transistor. When the compensation is determined to be required, the compensation terminal is further configured to output the compensation signal and transmit the compensation signal to the organic light emitting diode D via the data compensation line P and the third transistor.

[0061] Therein, the driving chip can determine the current offset of the organic light emitting diode D activated by the second transistor according to the current of the organic light emitting diode D received through the detection terminal, and control the compensation terminal output the compensation signal. The compensation signal is transmitted to the organic light emitting diode D via the data compensation line P to adjust the current of the organic light emitting diode D to a preset current to achieve compensation.

[0062] It should be noted that, since the organic light emitting diode D is activated by the third transistor, it is necessary to cut off the second transistor before performing the detection compensation to avoid the influence of the second transistor. Therefore, the first scan line L1 is further configured to output a high level signal to turn on the first transistor before output a low level signal, and the data terminal is further configured to output a low level signal which transmitted to the second transistor via the data compensation line P and the first transistor to cut off the second transistor.

[0063] It should be noted that, the pixel circuit group 200 can also be applied to a liquid crystal display device.

[0064] Referring to FIG. 5, a third aspect of the present disclosure provides an organic light emitting display device 500. The organic light emitting display device includes a driving chip 510 and the above described pixel circuit group 200 connected with the driving chip 510. As the above pixel circuit group 200 has been described in detail in the above second embodiment, it will not be described herein.

[0065] In the embodiment, the organic light emitting display device 500 includes the pixel circuit 100. In the pixel circuit 100, when the organic light emitting diode D is charged for display or compensated, the data compensation line P is shared, rather than performing the corresponding functions by different lines. Therefore, the pixel circuit 100 reduces the number of lines used in the pixel circuit 100 and greatly improves the pixel effective display aperture ratio and resolution.

[0066] The above is a preferred embodiment of the present disclosure, and it should be noted that those skilled in the art may make some improvements and modifications without departing from the principle of the

present disclosure, and these improvements and modifications are also the protection scope of the present disclosure.

Claims

1. A pixel circuit driving method, comprising:

providing a plurality of rows of pixel circuits, wherein, each row of the pixel circuit comprises a switch module, a driving module, a compensation module, an organic light emitting diode, a first scanning line, a second scanning line, and a data compensation line, wherein the first scanning line is coupled to the switch module, wherein the switch module is further coupled to the driving module, wherein the switch module is further coupled to the data compensation line, wherein the driving module receives a DC voltage and is coupled to the organic light emitting diode, wherein the second scanning line is coupled to the compensation module, and the compensation module is further coupled to the driving module and the organic light emitting diode; each of the plurality of rows of pixel circuits shares an identical data compensation line, and the data compensation line is coupled to a data terminal, a compensation terminal, and a detection terminal of a driving chip; turning on the switch module via the first scanning line to activate the driving module while turning off the compensation module via the second scanning line to enable the data terminal to output a data signal and transmit the data signal to the organic light emitting diode via the data compensation line, the switch module and the driving module for display; activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line, thus performing compensation detection on the organic light emitting diode; when determining compensation is required for driving, outputting a compensation signal via a compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection; wherein, the plurality of rows of pixel circuits are displayed and compensated row by row.

2. The pixel circuit driving method according to claim 1, wherein, the switch module is a first transistor, wherein the driving module is a second transistor, and the compensation module is a third transistor; the first scanning line is coupled to a gate of the first

transistor, wherein a drain of the first transistor is coupled to the data compensation line, and a source of the first transistor is coupled to a gate of the second transistor; a drain of the second transistor is coupled to a voltage terminal of the driving chip and is configured for receiving the DC voltage, wherein a source of the second transistor is coupled to an anode of the organic light emitting diode, and a cathode of the organic light emitting diode is grounded; the second scanning line is coupled to a gate of the third transistor, wherein a drain of the third transistor is coupled to the data compensation line, and a source of the third transistor is coupled to an anode of the organic light emitting diode.

3. The pixel circuit driving method according to claim 2, wherein, turning on the switch module via the first scanning line to activate the driving module while turning off the compensation module via the second scanning line to enable the data terminal to output the data signal, and transmit the data signal to the organic light emitting diode via the data compensation line, the switch module and the driving module for display comprises:

outputting a high level signal via the first scanning line and outputting a low level signal via the second scanning line, thus to cut off the third transistor and turn on the first transistor and the second transistor;
transmitting the data signal outputted by the data terminal to the organic light emitting diode via the data compensation line, the switch module and the driving module for display.

4. The pixel circuit driving method according to claim 2, wherein the activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line, thus performing compensation detection on the organic light emitting diode; when determining compensation is required for driving, outputting a compensation signal via a compensation terminal, and transmitting the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection comprises:

outputting a high level signal via the first scanning line to turn on the first transistor and the second transistor to activate the organic light emitting diode;
outputting a low level signal via the first scanning line to turn on the first transistor and the second transistor is cut off, and outputting a high level signal via the second scanning line to turn on the third transistor; detecting a current of the or-

ganic light emitting diode via the data compensation line and the third transistor successively; when determining the compensation is required, outputting the compensation signal via the compensation terminal, and transmit the compensation signal to the organic light emitting diode via the data compensation line and the third transistor for compensating.

5. The pixel circuit driving method according to claim 2, wherein, activating the organic light emitting diode, turning on the compensation module via the second scanning line, and turning off the switch module via the first scanning line to perform compensation detection on the organic light emitting diode; when determining compensation is required for driving, outputting a compensation signal via a compensation terminal, and transmit the compensation signal to the organic light emitting diode via the data compensation line and the compensation module for performing compensation after detection comprises:

outputting a low level signal via the first scanning line to cut off the first transistor and the second transistor, outputting a high level signal via the second scanning line to turn on the third transistor; transmitting the data signal outputted via the data terminal to the organic light emitting diode via the data compensation line and the third transistor for activating the organic light emitting diode;
detecting a current of the organic light emitting diode via the data compensation line and the third transistor;
when determining the compensation is required, transmitting the compensation signal outputted via the compensation terminal to the organic light emitting diode via the data compensation line and the third transistor.

6. The pixel circuit driving method according to claim 5, wherein, before outputting a low level signal via the first scanning line to cut off the first transistor and the second transistor, and outputting a high level signal via the second scanning line to turn on the third transistor; transmitting the data signal outputted via the data terminal to the organic light emitting diode via the data compensation line and the third transistor for activating the organic light emitting diode, the method further comprises:

outputting a high level signal via the first scanning line to turn on the first transistor, outputting the low level signal via the data terminal and transmitting the low level signal to the second transistor via the data compensation line and the first transistor to cut off the second transistor.

7. A pixel circuit group, applied to an organic light emit-

ting display device, wherein, the pixel circuit group comprises a plurality of rows of pixel circuits; each row of the pixel circuit comprises a switch module, a driving module, a compensation module, an organic light emitting diode, a first scanning line, a second scanning line, and a data compensation line; wherein the first scanning line is coupled to the switch module, wherein the switch module is further coupled to the driving module, wherein the switch module is further coupled to the data compensation line, wherein the driving module receives a DC voltage and is coupled to the organic light emitting diode, wherein the second scanning line is coupled to the compensation module, and the compensation module is further coupled to the driving module and the organic light emitting diode; each of the plurality of rows of pixel circuits shares an identical data compensation line, and the data compensation line is coupled to a data terminal, a compensation terminal, and a detection terminal of a driving chip;

during a display phase, the first scanning line is configured to turn on the switch module to activate the driving module, the second scanning line is configured to turn off the compensation module to enable the data terminal to output a data signal and transmit the data signal to the organic light emitting diode via the data compensation line, the switch module and the driving module;

during a compensation phase after detection, the organic light emitting diode being activated, the second scanning line being configured to turn on the compensation module, and the first scanning line being configured to turn off the switch module, thus performing compensation detection on the organic light emitting diode; based on a determination that the compensation is required, the compensation terminal outputs a compensation signal and transmits the compensation signal to the organic light emitting diode via the data compensation line and the compensation module; wherein, the plurality of rows of pixel circuits are displayed and compensated row by row.

8. The pixel circuit group according to claim 7, wherein, the switch module is a first transistor, wherein the driving module is a second transistor, and the compensation module is a third transistor; the first scanning line is coupled to a gate of the first transistor, wherein a drain of the first transistor is coupled to the data compensation line, and a source of the first transistor is coupled to a gate of the second transistor; a drain of the second transistor is coupled to a voltage terminal of the driving chip and is configured for receiving the DC voltage, wherein a source of the second transistor is coupled to an anode of the organic light emitting diode, and a cathode of the organic light emitting diode is grounded; the second scanning line is coupled to a gate of the third transistor, wherein a drain of the third transistor is cou-

pled to the data compensation line, and a source of the third transistor is coupled to an anode of the organic light emitting diode.

9. The pixel circuit group according to claim 8, wherein, during the display phase, the first scanning line is configured to output a high level signal and the second scanning line is configured to output a low level signal, thus to cut off the third transistor and turn on the first transistor and the second transistor; the data signal outputted by the data terminal is transmitted to the organic light emitting diode via the data compensation line, the switch module and the driving module.
10. The pixel circuit group according to claim 8, wherein, during the compensation phase after detection, the first scanning line is configured to output a high level signal to turn on the first transistor and the second transistor is turned on to activate the organic light emitting diode; the first scanning line is further configured to output a low level signal to turn on the first transistor and the second transistor is cut off; the second scanning line is configured to output a high level signal to turn on the third transistor to enable a current of the organic light emitting diode transmitted to the compensation terminal via the third transistor and the data compensation line successively for detecting; when determining the compensation is required, compensation terminal is configured to outputs the compensation signal and transmits the compensation signal to the organic light emitting diode via the third transistor for compensating.
11. The pixel circuit group according to claim 8, wherein, during the compensation phase after detection, the first scanning line is configured to output a low level signal to cut off the first transistor and the second transistor; the second scanning line is configured to output a high level signal to turn on the third transistor; the data terminal is configured to output the data signal and transmit the data signal to the organic light emitting diode via the data compensation line and the third transistor for activating the organic light emitting diode; the compensation terminal is configured to detect the current of the organic light emitting diode via the data compensation line and the third transistor; when determining the compensation is required, the compensation terminal is further configured to output the compensation signal and transmit the compensation signal to the organic light emitting diode via the data compensation line and the third transistor.
12. The pixel circuit group according to claim 11, wherein, the first scanning line is further configured to output a high level signal to turn on the first transistor

before output the low level signal; the data terminal outputs the low level signal and transmits the low level signal to the second transistor via the data compensation line and the first transistor to cut off the second transistor.

5

13. An organic light emitting display device, comprising a driving chip and a pixel circuit group according to claims 7-12 coupled to the driving chip.

10

15

20

25

30

35

40

45

50

55

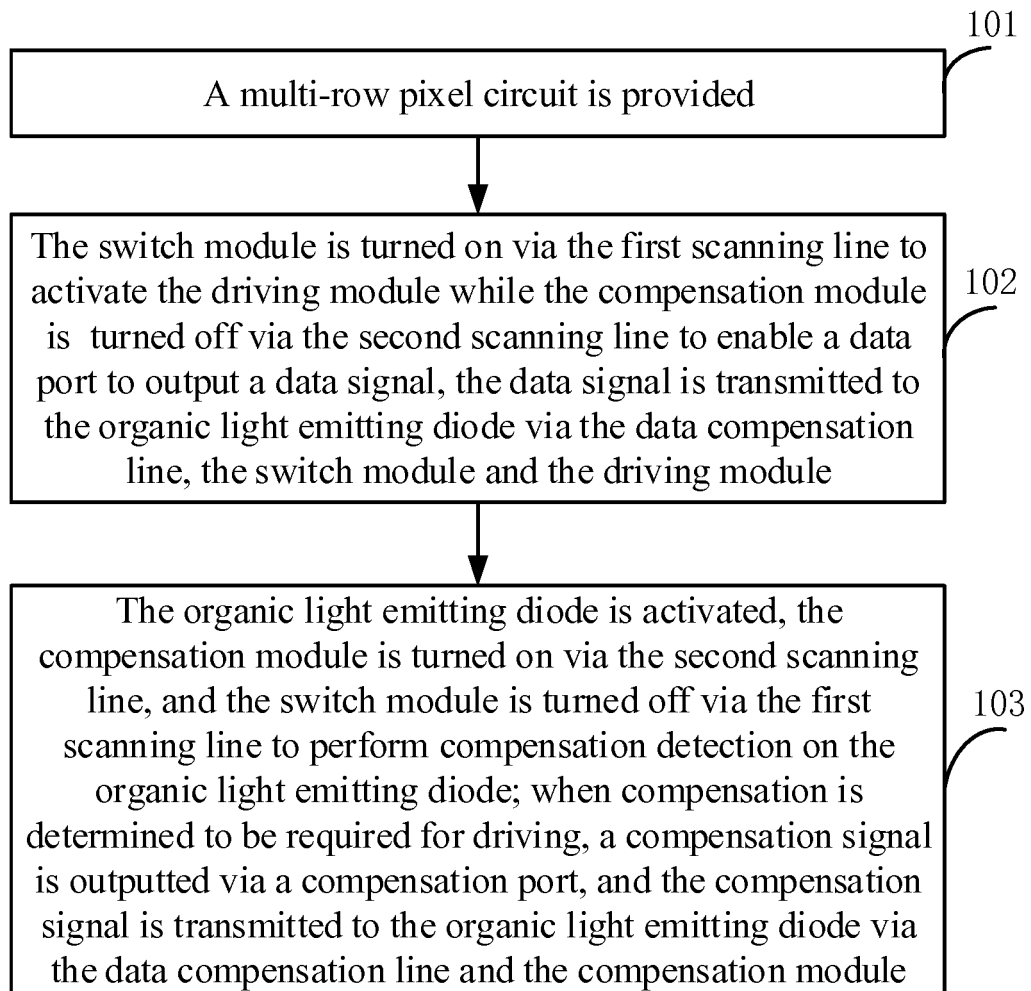


FIG. 1

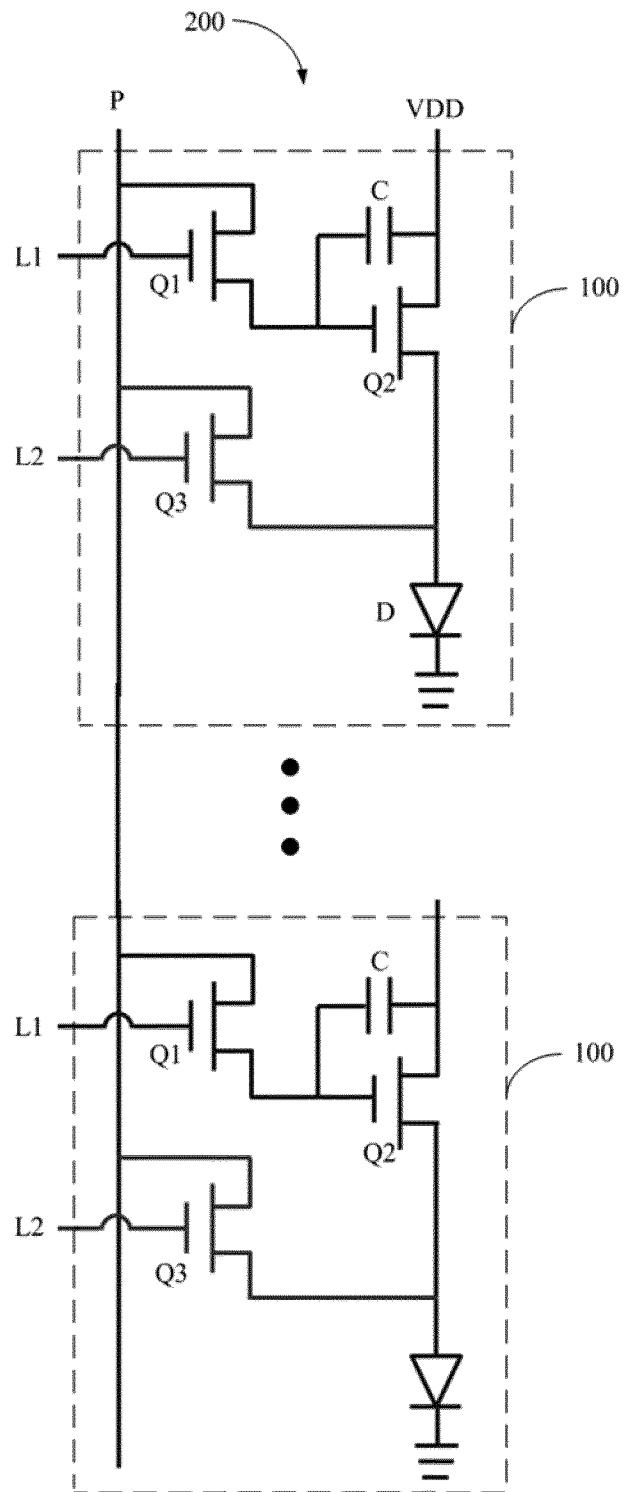


FIG. 2

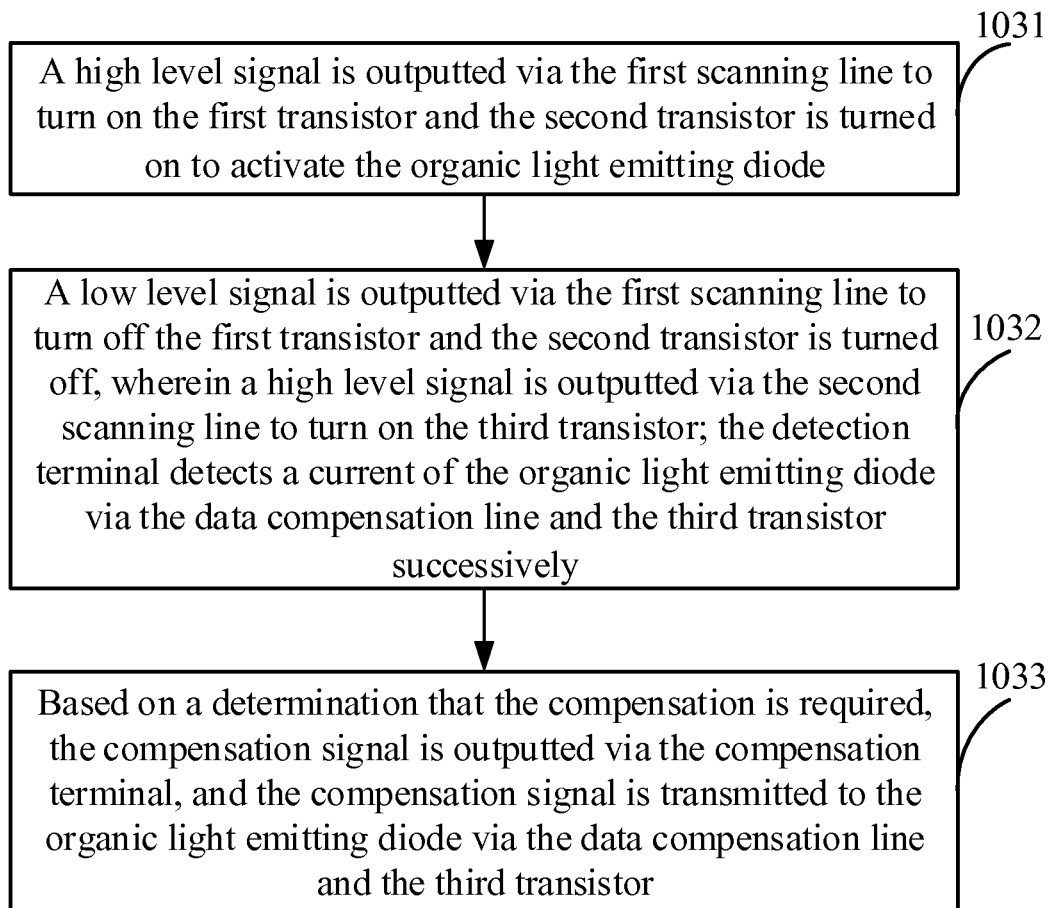


FIG.3

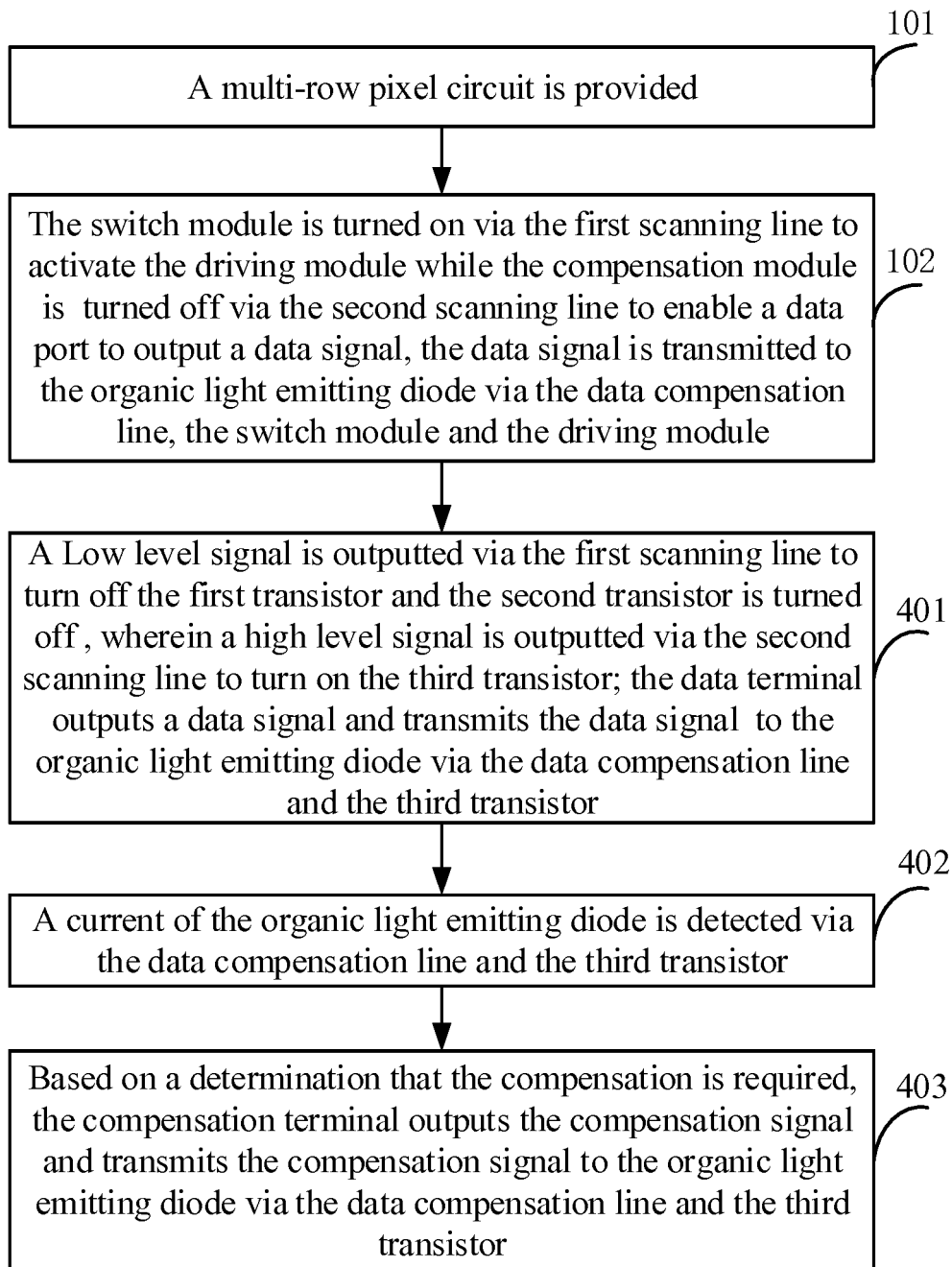


FIG.4

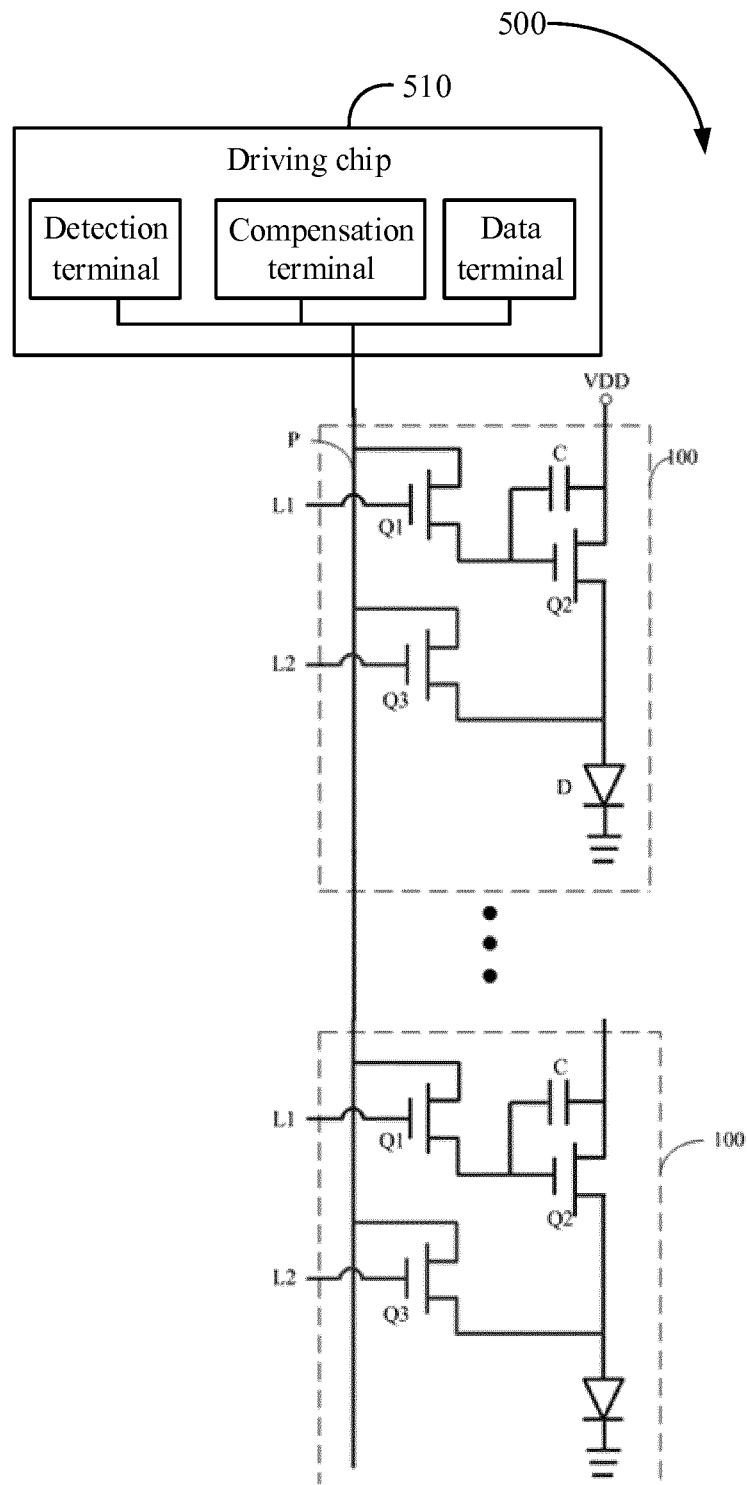


FIG.5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CN2016/112344

A. CLASSIFICATION OF SUBJECT MATTER

G09G 3/36 (2006.01) i

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)

G09G 3/-, G02F 1/13+

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 practicable, search terms used)

CNABS; SIPOABS; DWPI: 有机发光二极管, 像素电路, 检测, 开关, 补偿, 第二扫描线, detect+, gate, scan+, second, circuit?,
switch+, pixel?, oled, compensat+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 101859536 A (SAMSUNG MOBILE DISPLAY CO., LTD.) 13 October 2010 (13.10.2010), description, paragraphs [0044]-[0058], and figures 3 and 4	1-13
A	CN 103680391 A (INNOCOM TECHNOLOGY SHENZHEN CO., LTD. et al.) 26 March 2014 (26.03.2014), entire document	1-13
A	CN 104778922 A (SHAANXI UNIVERSITY OF SCIENCE & TECHNOLOGY) 15 July 2015 (15.07.2015), entire document	1-13
A	US 2005225251 A1 (TOPPOLY OPTOELECTRONICS CORP.) 13 October 2005 (13.10.2005), entire document	1-13

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search
26 September 2017

Date of mailing of the international search report
19 October 2017

Name and mailing address of the ISA
State Intellectual Property Office of the P. R. China
No. 6, Xitucheng Road, Jimenqiao
Haidian District, Beijing 100088, China
Facsimile No. (86-10) 62019451

Authorized officer
LI, Jun
Telephone No. (86-10) 62085773

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
 Information on patent family members

International application No.

PCT/CN2016/112344

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN 101859536 A	13 October 2010	JP 5043907 B2	10 October 2012
		CN 101859536 B	23 January 2013
		KR 101056317 B1	11 August 2011
		KR 20100110060 A	12 October 2010
		JP 2010244003 A	28 October 2010
		EP 2237254 B1	26 August 2015
		EP 2237254 A3	07 September 2011
		EP 2237254 A2	06 October 2010
		US 8599114 B2	03 December 2013
		US 2010253608 A1	07 October 2010
CN 103680391 A	26 March 2014	CN 103680391 B	13 January 2016
CN 104778922 A	15 July 2015	None	
US 2005225251 A1	13 October 2005	TW 200534202 A	16 October 2005
		JP 2006003621 A	05 January 2006

专利名称(译)	像素电路的驱动方法，像素电路组及有机发光显示装置		
公开(公告)号	EP3564940A4	公开(公告)日	2020-06-10
申请号	EP2016925410	申请日	2016-12-27
[标]申请(专利权)人(译)	深圳市柔宇科技有限公司		
申请(专利权)人(译)	深圳市ROYOLE TECHNOLOGIES CO. , LTD.		
当前申请(专利权)人(译)	深圳市ROYOLE TECHNOLOGIES CO. , LTD.		
[标]发明人	LI WENHUI YUAN ZE		
发明人	LI, WENHUI YUAN, ZE		
IPC分类号	G09G3/36		
CPC分类号	G09G3/3225 G09G3/3233 G09G2300/0819 G09G2300/0842 G09G2310/0251 G09G2310/0262 G09G2320/0295 G09G2320/045 G09G3/3241 G09G2300/0814 H01L27/3244		
代理机构(译)	MEWBURN ELLIS LLP		
其他公开文献	EP3564940A1		
外部链接	Espacenet		

摘要(译)

公开了一种像素电路驱动方法。该方法包括：提供多行像素电路（101），每行像素电路包括开关模块，驱动模块，补偿模块，有机发光二极管，第一扫描线，第二扫描线和数据补偿线。经由第一扫描线接通开关模块以激活驱动模块。补偿模块经由第二扫描线关闭以使数据端口能够输出数据信号，该数据信号经由数据补偿线，开关模块和驱动模块（102）传输至有机发光二极管以进行显示。激活有机发光二极管，经由第二扫描线接通补偿模块，并且经由第一扫描线断开开关模块，从而对有机发光二极管执行补偿检测。基于判断为需要补偿，通过补偿端子输出补偿信号，并通过数据补偿线和补偿模块（103）传输至有机发光二极管，以进行检测后的补偿。