

comprises an OLED having a first terminal and a second terminal and the first terminal coupling to a first voltage source, a control circuit generating a control signal to control an OLED current supplied to the OLED according to the data signal and the scan signal, a driving transistor and a diode. The driving transistor has a first drain/source terminal, a second drain/source terminal and a gate terminal while the gate terminal receives the control signal to control a channel between the first and second drain/source terminal for adjusting the OLED current flowing through the channel. Further, the diode couples between the channel and a second voltage source.

[0016] In still another aspect, the present invention is directed to an electronic device, which comprises a signal generator for generating image signals used for displaying an image and an OLED display apparatus provided as set forth above.

[0017] Accordingly, the kink effect caused by either holes or electrons that accumulated at the back channel region of the driving transistor can be reduced since the holes or electrons can flow outward the driving transistor via the diode coupled to the channel.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

[0019] FIG. 1 is a diagram shown connection structure of driving transistor and corresponding OLED in a conventional OLED pixel.

[0020] FIG. 2A is a current-voltage curve diagram shown the influence caused by OLED reliability.

[0021] FIG. 2B is a current-voltage curve diagram shown the influence caused by OLED uniformity.

[0022] FIG. 2C is a current-voltage curve diagram shown the influence caused by TFT characteristics variation.

[0023] FIG. 3 is a circuitry block diagram shown an electronic device and OLED apparatus used therein according to one embodiment of the present invention.

[0024] FIG. 4A is a circuitry diagram shown a pixel driving circuit according to one embodiment of the present invention.

[0025] FIG. 4B is a circuitry diagram shown a pixel driving circuit according to one embodiment of the present invention.

[0026] FIG. 4C is a circuitry diagram shown a pixel driving circuit according to one embodiment of the present invention.

[0027] FIG. 5A is a top view shown structure of a driving transistor used in the pixel driving circuit according to one embodiment of the present invention.

[0028] FIG. 5B is a top view shown structure of a driving transistor used in the pixel driving circuit according to one embodiment of the present invention.

[0029] FIG. 6 is a layout diagram shown a pixel driving circuit according to one embodiment of the present invention.

DESCRIPTION OF THE EMBODIMENTS

[0030] Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

[0031] Referring to FIG. 3, which is a circuitry block diagram shown an electronic device and an OLED (Organic Light Emitting Display) apparatus used therein according to one embodiment of the present invention, the electronic device 30 comprises a signal generator 300 and an OLED display apparatus 310. The signal generator 300 generates image signals and/or control signals used for displaying an image, and sends the image signals and/or control signals to the OLED display apparatus 310.

[0032] The OLED display apparatus 310 comprises a data driver 320 for driving a plurality of data lines 322a, 322b and etc. in accordance to the image signals, a scan driver 330 for driving a plurality of scan lines 332a, 332b, 332c and etc. in accordance to the control signals, and an active area 340 comprising a plurality of OLED pixels 342a, 342b, 342c and etc. for displaying the image under control of the data lines and scan lines. For normal operation, an OLED pixel is controlled by one of the data lines and one of the scan lines. For example, OLED pixel 342a is controlled by data line 322a and scan line 332a, OLED pixel 342b is controlled by data line 322a and scan line 332b, and OLED pixel 342c is controlled by data line 322a and scan line 332c.

[0033] One embodiment of an OLED pixel is shown in FIG. 4A. Refer to FIG. 4A, OLED pixel 342a is controlled by the data line 322a and the scan line 332a. Moreover, the OLED pixel 342a comprises an OLED 430, a control circuit consists of switching transistor 400 and capacitor 420, a driving transistor 410 and a diode 440. It should be noted that the term "driving transistor" refers to a switch that provides current to and is capable of adjusting current flowing through the OLED.

[0034] In the embodiment, the control circuit, comprising switching transistor 400 and capacitor 420, generates a control signal in accordance to the data signal on the data line 322a and the scan signal on the scan line 332a. The control signal is sent to the gate terminal of the driving transistor 410 such that a channel between drain/source terminals of the driving transistor 410 can be controlled to adjust the OLED current flowing through the channel. Moreover, the diode 440 is coupled between the channel and a predetermined voltage source PVDD.

[0035] In order to make the present invention be more understandable for those with ordinary skill in the art, please refer to FIG. 5A, which is a top view shown structure of a driving transistor and a fourth terminal (a diode) used in the pixel driving circuit according to one embodiment of the present invention. In the embodiment, driving transistor 50a comprises a gate terminal 500, a source terminal 502, and a drain terminal 504. A channel 510 is formed/coupled between the source terminal 502 and the drain terminal 504.

[0036] A diode 52a can be a semiconductor diode and can serve as a fourth-terminal of the driving transistor 50a, in addition to the gate terminal 500, the source terminal 502 and the drain terminal 504. The diode 52a can include first