



(19) **United States**

(12) **Patent Application Publication**
Jang et al.

(10) **Pub. No.: US 2007/0024547 A1**
(43) **Pub. Date: Feb. 1, 2007**

(54) **ORGANIC LIGHT EMITTING DIODE
DISPLAY DEVICE AND A DRIVING
METHOD THEREOF**

(52) **U.S. Cl. 345/81**

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(57) **ABSTRACT**

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Disclosed are an Organic Light Emitting Diode (OLED) display device having a pixel circuit which use a thin film transistor (TFT) as an active device and a driving method thereof. The OLED display device can constantly obtain luminance of the light emitting elements by elapsed time, because the brightness of the pixel for the signal voltage is not varied by a characteristic variance of the transistor (e.g., a driving element) and the OLED. Accordingly, the OLED display device according to the present invention can minimize the variance of the pixel brightness due to deterioration of the transistor and the OLED caused by usage for a long time and increase life span of the display device. Further, the OLED display device can display high quality of the image even in case of the high precision display, because it is controlled to flow the current to OLED included in each pixel.

(21) Appl. No.: **11/396,925**

(22) Filed: **Apr. 3, 2006**

(30) **Foreign Application Priority Data**

Jul. 27, 2005 (KR)..... 10-2005-0068514

Publication Classification

(51) **Int. Cl.**
G09G 3/30 (2006.01)

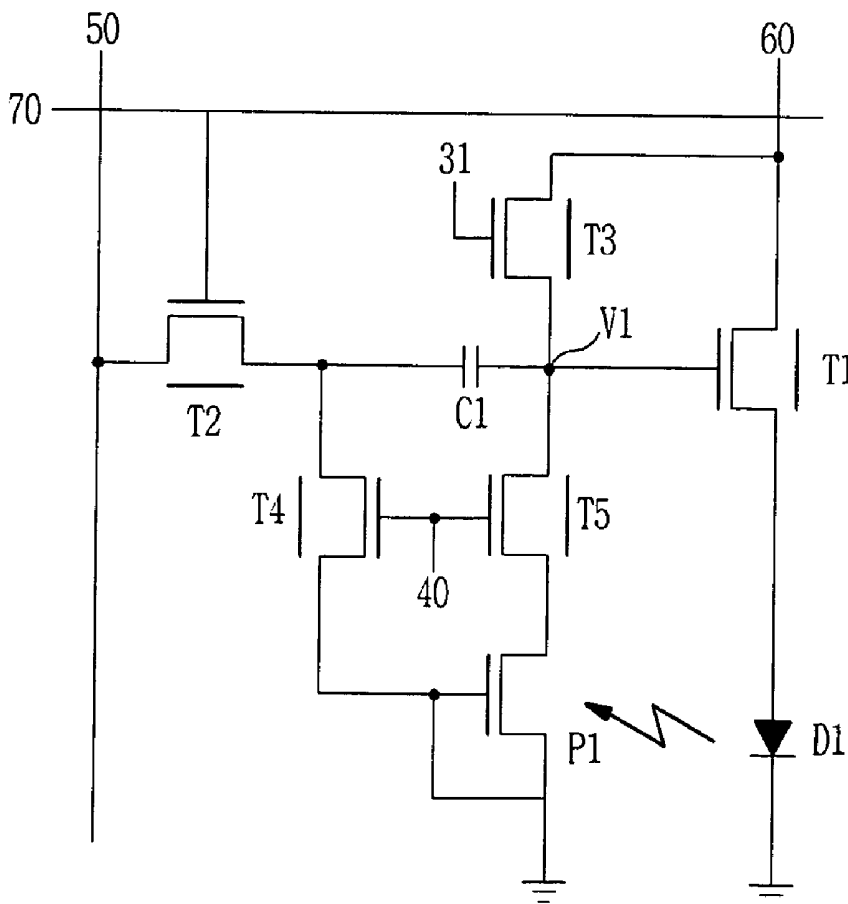


FIG. 1

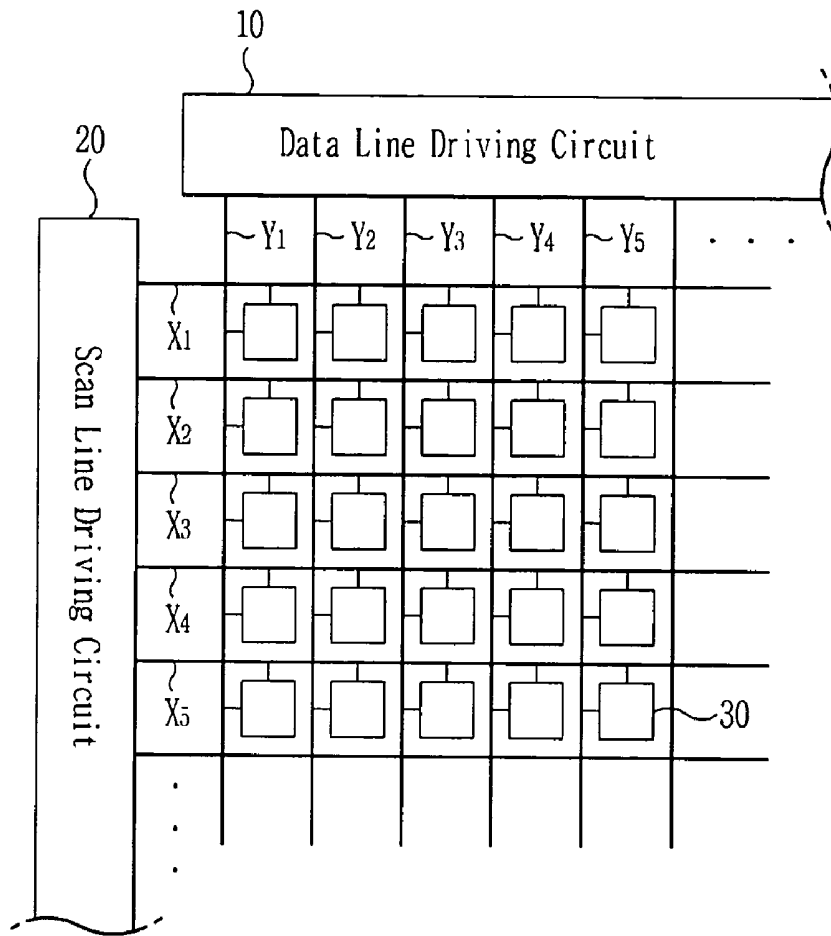


FIG. 2

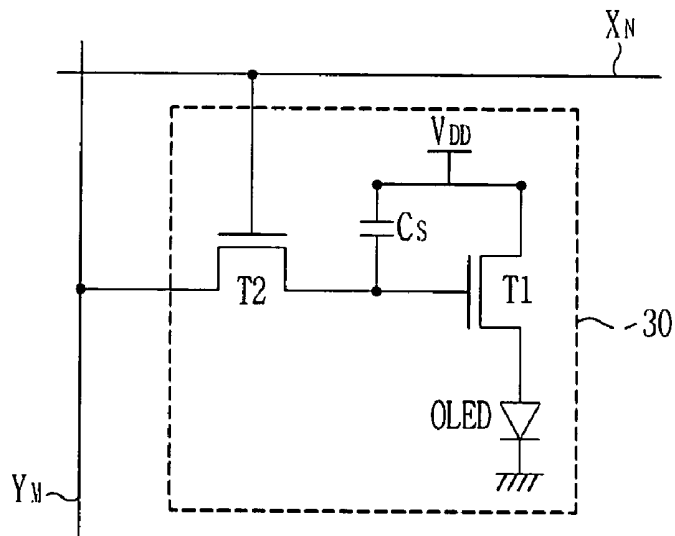


FIG.3

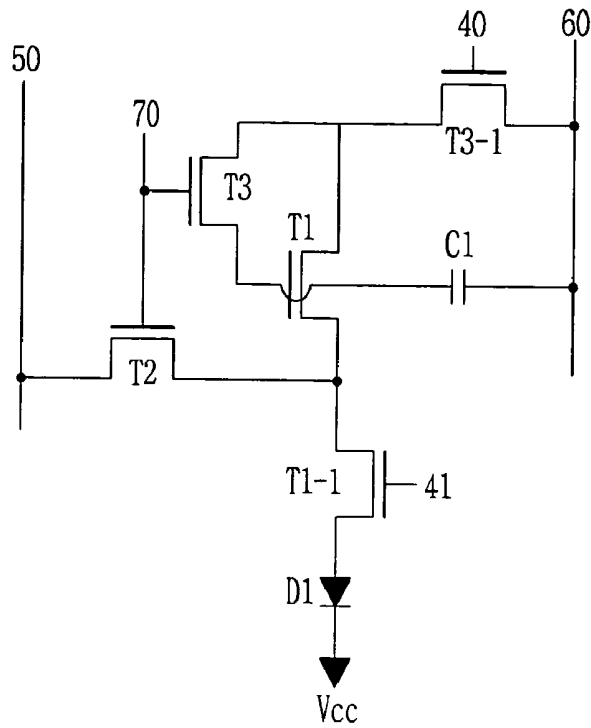


FIG.4

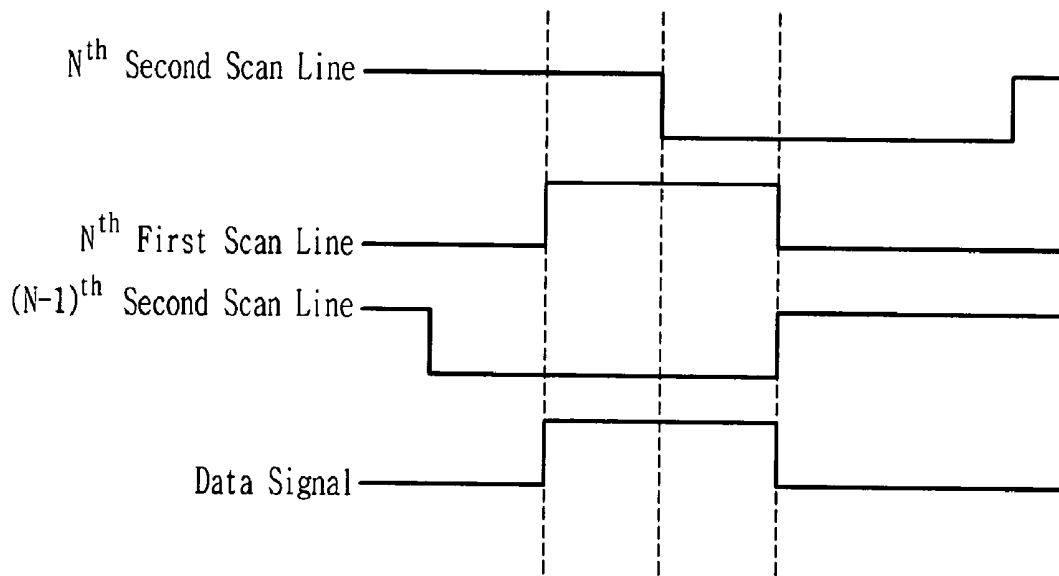


FIG.5

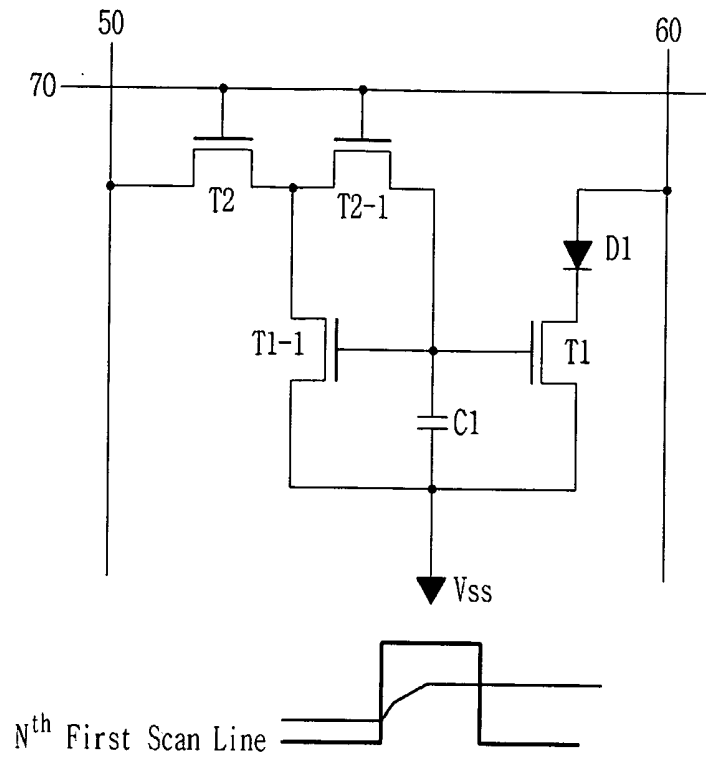


FIG.6A

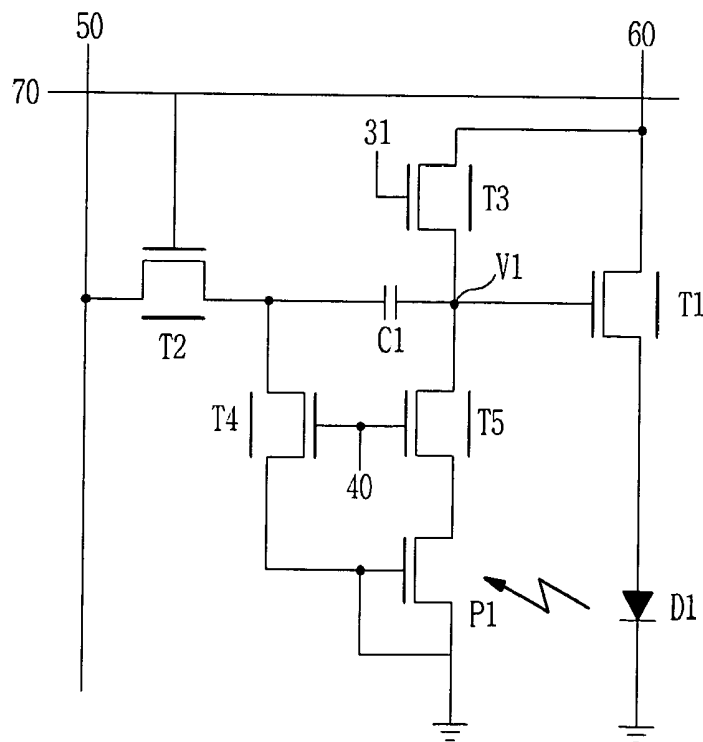


FIG.6B

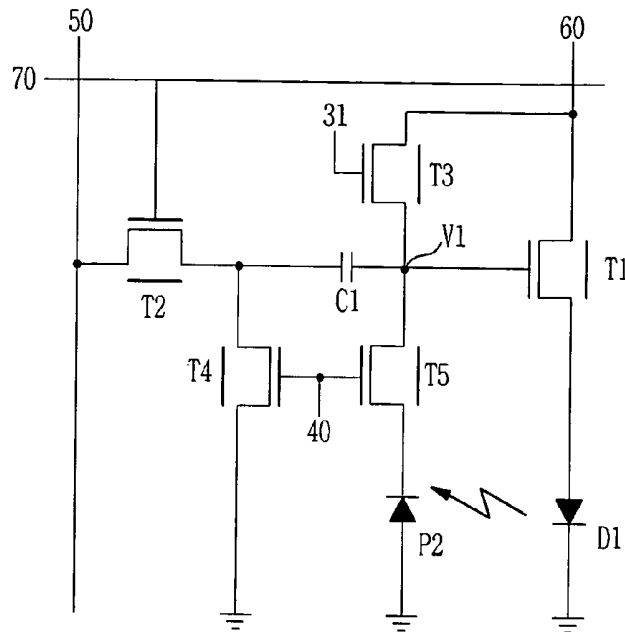
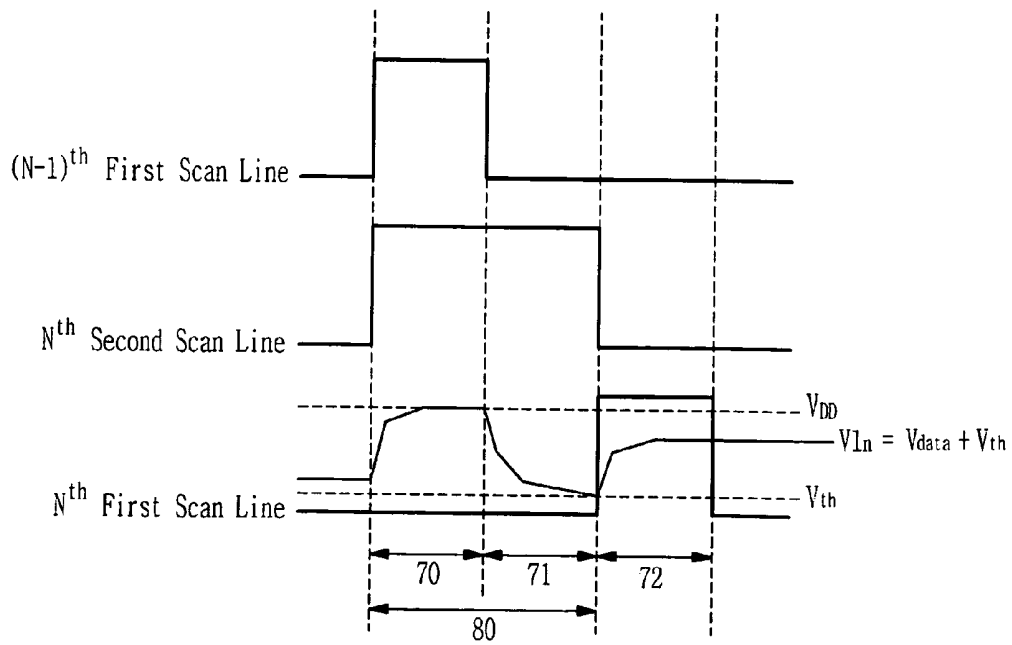


FIG.7



ORGANIC LIGHT EMITTING DIODE DISPLAY DEVICE AND A DRIVING METHOD THEREOF

CLAIM FOR PRIORITY

[0001] This application claims priority to Korean Patent Application No. 10-2005-0068514 filed on Jul. 27, 2005, in the Korean Intellectual Property Office (KIPO), the entire contents of which are hereby incorporated by reference.

BACKGROUND

[0002] 1. Field of the Invention

[0003] Example embodiments of the present invention relates in general to the field of an Organic Light Emitting Diode (OLED) display device having a pixel circuit and a driving method thereof, and more specifically to an Organic Light Emitting Diode (OLED) display device having a pixel circuit which use a thin film transistor (TFT) as an active device and a driving method thereof.

[0004] 2. Description of the Related Art

[0005] Presently, the OLED display device as a thin-film type display device can apply a Passive Matrix (PM) driving method and hence an Active Matrix (AM) driving method, in the same method as the LCD in which has been used widely and commercially.

[0006] The passive matrix driving method can have a simple structure and apply data exactly to each pixel. However, the passive matrix driving method is difficult to be applied to a large screen and a high-precision display. Accordingly, the development of the active matrix driving method has been actively proceeding.

[0007] A pixel circuit of the OLED display device will be now explained with reference to FIGS. 1 and 2 according to a conventional active matrix driving method.

[0008] FIG. 1 is a schematic diagram illustrating the OLED display device having a pixel circuit according to a conventional active matrix method.

[0009] Referring to FIG. 1, in the OLED display device, a plurality of scan lines ($X_1, X_2, X_3, \dots, X_n$) for selecting and non-selecting the pixels 30 for a desired scan cycle (e.g., a frame period according to a NTSC standard) and a plurality of data lines ($Y_1, Y_2, Y_3, \dots, Y_n$) for supplying luminance information so as to drive the pixels 30 are arranged in a matrix type. The pixels 30 are arranged in each intersection portion in which the scan lines and the data lines are arranged in the matrix type. The respective pixels 30 are composed of a pixel circuit.

[0010] The scan lines ($X_1, X_2, X_3, \dots, X_n$) are connected to a scan line driving circuit 20, and the data lines ($Y_1, Y_2, Y_3, \dots, Y_n$) are connected to a data line driving circuit 10. A desired image can be represented by selecting sequentially the scan lines ($X_1, X_2, X_3, \dots, X_n$) by the data line driving circuit 10, supplying a voltage (or current) of the luminance information from the data lines ($Y_1, Y_2, Y_3, \dots, Y_n$) by the data line driving circuit 10, and filling repeatedly the voltage of the luminance information.

[0011] In this case, the passive matrix type OLED display device emits light only while light-emitting elements included in the respective pixels 30 are being selected, while an active matrix type OLED display device continuously

performs the light emission of the light-emitting elements even after the voltage filling of the luminance information is finished.

[0012] Thus, in the large screen and high-precision display, the active matrix type OLED display device is more superior to the passive matrix type OLED display device because the driving current level of the light-emitting element is low.

[0013] Hereinafter, a driving operation of the OLED display device having the plurality of pixels 30 will be explained in detailed.

[0014] First, the scan line driving circuit 20 selects one X_N of the scan lines ($X_1, X_2, X_3, \dots, X_n$) and transmits a selecting signal. In the data line driving circuit 10, the data of the luminance information is transmitted to pixels arranged in transverse direction via the data lines ($Y_1, Y_2, Y_3, \dots, Y_n$).

[0015] Then, the scan line driving circuit 20 transmits a non-selected signal to the selected scan line X_N , and then selects the next scan line (X_{N+1}) so as to transmit the select signal. If the selection signal and the non-selected signal are sequentially transmitted to the scan line, the OLED display device can obtain a desired display by transmitting repeatedly the data.

[0016] FIG. 2 is a circuit diagram illustrating a conventional pixel circuit according to an active matrix method.

[0017] Referring to FIG. 2, a pixel circuit for driving a pixel 30 includes two NMOS transistors T1 and T2, and an OLED. The pixel circuit includes the OLED, a first transistor T1 for controlling a current, a second transistor T2, and a capacitor C_S .

[0018] A source terminal of the first transistor T1 is connected to a positive pole (i.e., anode), and a drain terminal thereof is connected to a positive power source (V_{DD}). A gate terminal of the second transistor T2 is connected to a scan line X_N , and a drain terminal thereof is connected to a data line Y_M , and a source terminal thereof is connected to the gate terminal of the first transistor T1 and the capacitor C_{ST} .

[0019] A negative pole (i.e., cathode) of the OLED is connected to a negative supply source (V_{SS}). Thus, a current of the OLED is controlled by applying a voltage of the data line Y_M to the gate terminal of the first transistor T1 via the second transistor T2.

[0020] Hereinafter, a driving operation of the pixel circuit will be explained.

[0021] When the gate terminal of the second transistor T2 receives a selection signal from the scan line X_N , the second transistor T2 is turned on. At this time, a voltage corresponding to luminance information, which is applied to the data line Y_M by the data line driving circuit, is transmitted to the gate terminal of the first transistor T1 via the second transistor T2, and the luminance information voltage is stored in the capacitor C_{ST} .

[0022] Accordingly, even while the second transistor T2 is turned off by receiving the non-selected signal supplied from the scan line X_N over one frame period, the voltage of the gate terminal of the first transistor T1 is constantly hold by

the capacitor C_{ST} and thus the current flowing to the OLED via the first transistor T1 is constantly maintained.

[0023] As such, in conventional pixel circuit, since the current flowing to the OLED is the same as the current flowing from the drain terminal of the first transistor T1 to the source terminal thereof, the current is controlled by the voltage of the gate terminal of the first transistor T1. However, the current may be different from the magnitude of a desired current due to a characteristic deterioration caused by operation of the first transistor T1 for a long time.

[0024] A thin film transistor used in the display device is an active element suitable for the large screen and high precision display. However, even though the thin film transistor is formed on the same substrate, there is a problem that a threshold voltage of the thin film transistor is increased by several hundreds of \square or more than 1 Volt according to time variation.

[0025] For example, even though a same signal potential V_w is supplied to the gate of the thin film transistor in different time (e.g., several month later), if the threshold voltage of the transistor included in each pixel is different, the current value flowing to the OLED deviates from a value necessary for each pixel, and thus long life span necessary for the display device can not be expected.

[0026] The increasing of the threshold voltage for varying the current flowing to the OLED can not avoid according as the time flows. The characteristic deterioration produced by utilizing the display device for a long time causes an initial value to be greatly varied and the deterioration of the OLED causes a luminance to be greatly varied. This enables the quality of definition or brightness of the display device to be greatly varied, thereby decreasing life span of the display device.

[0027] FIG. 3 is a circuit diagram illustrating a voltage compensating circuit according to a conventional active matrix method, and FIG. 4 is a timing chart illustrating a driving of the voltage compensating circuit according to the conventional active matrix method.

[0028] Referring to FIGS. 3 and 4, the conventional voltage compensating circuit usually compensates a threshold voltage of the first transistor T1, but does not compensate a field effect mobility of the first transistor T1 and a characteristic deterioration of the OLED.

[0029] FIG. 5 is a circuit diagram illustrating a current compensating pixel circuit and a timing chart for driving the circuit according to a conventional general active matrix method.

[0030] Referring to FIG. 5, the current compensating circuit compensates a current-voltage characteristic variance of the first transistor T1 and the OLED, but does not compensate an efficiency variance of the OLED.

SUMMARY

[0031] Accordingly, the present invention is provided to substantially obviate one or more problems due to limitations and disadvantages of the related art.

[0032] Example embodiments of the present invention provide an OLED display device having a pixel circuit for sensing light emitted from the OLED using a photo sensor

and applying a driving current according as the sensed value is sent by feedback to an input signal so as to represent a constant luminance with respect to the input signal irrespective of an increasing of a threshold voltage used in an active matrix and a characteristic deterioration of the OLED.

[0033] In some example embodiments, an OLED display device includes a scan line driving circuit configured to apply sequentially a selecting signal or a non-selecting signal to a plurality of scan lines; a data line driving circuit configured to apply a voltage corresponding to image information to a plurality of data lines; and an OLED having a pixel circuit arranged in each point where the scan lines and the data lines are intersected. The pixel circuit includes: an OLED D1 having two terminals; a first transistor of which a source terminal is connected to an anode terminal of the OLED, and a drain terminal is connected to a power supply, for providing a current to the OLED according to an applied voltage; a second transistor of which a gate terminal is connected to a first scan line and a drain terminal is connected to the data line; a third transistor of which a drain terminal is connected to the source terminal of the first transistor and the power supply, and a gate terminal is connected to a first scan line of former terminal, and a source terminal is connected to the gate terminal of the first transistor; a fourth transistor of which a drain terminal is connected to the source terminal of the second transistor, a source terminal is connected to a common electrode, and a gate terminal is connected to a second scan line; a fifth transistor of which a drain terminal is connected to the gate terminal of the first transistor and the source terminal of the third transistor, and a gate terminal is connected to the second scan line and the gate terminal of the fourth transistor; a capacitor of which one terminal is connected to the gate terminal of the first transistor, the source terminal of the third transistor and the drain terminal of the fifth transistor, and the other terminal is connected to the source terminal of the second transistor and the drain terminal of the fourth transistor; and a photo sensor of which one terminal is connected to the drain terminal of the fifth transistor, and the other terminal is connected to a common electrode.

[0034] Preferably, the photo sensor may be a thin film transistor type photo sensor using a photo leak current of the thin film transistor or a photodiode, and be formed of amorphous silicon, polycrystalline or crystalline silicon.

[0035] Preferably, the transistor may be amorphous silicon thin film transistor, or polycrystalline or crystalline thin film transistor.

[0036] Preferably, the transistor may be an inverted-staggered type that a gate is firstly formed on an insulator substrate.

[0037] In other example embodiments, a driving method of an OLED display device including a scan line driving circuit configured to apply sequentially a selecting signal or a non-selecting signal to a plurality of scan lines; a data line driving circuit configured to apply a voltage corresponding to image information to a plurality of data lines; and a pixel circuit arranged in each point where the scan lines and the data lines are intersected, includes: enabling the selecting signal to be transmitted to a gate terminal of a third transistor via a first scan line of former terminal (i.e. (N-1)th first scan line) so as to turn on the third transistor to increase a pixel voltage V_1 , and enabling a fourth and fifth transistor to be

turned on according as the first scan line of the former terminal (i.e. $(N-1)^{\text{th}}$ first scan line) is selected and simultaneously a second scan line (i.e., N^{th} scan line) is selected; enabling the OLED to emitting light by the increasing of the pixel voltage and enabling the pixel voltage to be maintained to a constant voltage according as a leak current of a photo sensor is increased; enabling the third transistor to be turned off by applying the non-selecting signal to the first scan line of the former terminal (i.e. $(N-1)^{\text{th}}$ first scan line), enabling the photo sensor to produce an photo current until the OLED is turned off so as to decrease gradually the pixel voltage, and setting the pixel voltage, when the non-selecting signal is applied to the second scan line, to the gate terminal of the first transistor; enabling the second transistor to be turned on by applying the selecting signal via a first scan line (i.e., N^{th} first scan line), storing a voltage (V_{data}) corresponding to luminance information transmitted from the data line via the turned on second transistor and simultaneously varying the voltage of the gate terminal of the first transistor; and enabling the first transistor to be turned on according as the voltage is applied to the gate terminal of the first transistor and emitting light from the OLED by flowing constant current to the OLED.

[0038] Preferably, the photo sensor may be a photo diode or a thin film transistor type photo sensor using a photo leak current of the thin film transistor.

[0039] Preferably, after the non-selecting signal is applied to the first scan line (i.e., N^{th} first scan line), the voltage of the gate terminal of the first transistor and the current flowing to the OLED is constantly maintained by the voltage stored in the capacitor for 1 frame period.

[0040] The pixel voltage V_1 for the 1 frame period is to add a voltage V_{th} set to the gate terminal of the first transistor while turning off the OLED to a voltage V_{data} corresponding to luminance information transmitted through the data line.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] Example embodiments of the present invention will become more apparent by describing in detail example embodiments of the present invention with reference to the accompanying drawings, in which:

[0042] FIG. 1 is a schematic diagram illustrating an OLED display device having a pixel circuit according to a conventional active matrix method;

[0043] FIG. 2 is a circuit diagram illustrating a conventional pixel circuit according to an active matrix method;

[0044] FIG. 3 is a circuit diagram illustrating a conventional voltage compensating circuit according to an active matrix method;

[0045] FIG. 4 is a timing chart explaining a driving operation of the conventional voltage compensating circuit according to an active matrix method;

[0046] FIG. 5 is a circuit diagram illustrating the conventional voltage compensating circuit according to an active matrix method and a timing chart explaining a driving operation thereof;

[0047] FIG. 6A is a diagram illustrating the constituents of a compensating pixel circuit using an optical feedback

according to an active matrix method according to one example embodiment of the present invention;

[0048] FIG. 6B is a diagram illustrating the constituents of a compensating pixel circuit using an optical feedback according to an active matrix method according to another example embodiment of the present invention;

[0049] FIG. 7 is a timing chart explaining a driving operation of a compensating pixel circuit using an optical feedback according to an active matrix method according to an example embodiment of the present invention.

DESCRIPTION OF EXAMPLE EMBODIMENTS OF THE PRESENT INVENTION

[0050] Example embodiments of the present invention are disclosed herein. However, specific structural and functional details disclosed herein are merely representative for purposes of describing example embodiments of the present invention, however, example embodiments of the present invention may be embodied in many alternate forms and should not be construed as limited to example embodiments of the present invention set forth herein.

[0051] Accordingly, while the invention is susceptible to various modifications and alternative forms, specific embodiments thereof are shown by way of example in the drawings and will herein be described in detail. It should be understood, however, that there is no intent to limit the invention to the particular forms disclosed, but on the contrary, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention. Like numbers refer to like elements throughout the description of the figures.

[0052] Hereinafter, an OLED display device and a driving method thereof of the present invention will be described in detail with reference to the accompanying drawings. The embodiment will be explained in detail for enabling people who have common intellects in a corresponding field to execute the present invention.

[0053] The present invention forms a thin film transistor array of the OLED composed of amorphous silicon thin film transistor on an insulating substrate. In this case, the amorphous silicon thin film transistor on the insulating substrate is used as a switching element, and a photo sensor detects light of the OLED and sends feedback to a pixel signal.

[0054] According to the present invention, the photo sensor may be a thin film transistor type photo sensor using a photo leak current of the thin film transistor or a photodiode, the driving transistor may be amorphous silicon thin film transistor, or polycrystalline or crystal thin film transistor, and the transistor may be an inverted-staggered type that a gate is firstly formed on an insulating substrate.

[0055] The OLED display device according to the present invention may include a scan line driving circuit configured to apply sequentially a selecting signal or a non-selecting signal to a plurality of scan lines; a data line driving circuit configured to apply a voltage corresponding to image information to a plurality of data lines; and a pixel circuit arranged in each point where the scan lines and the data lines are intersected.

[0056] FIG. 6A is a diagram illustrating an optical feedback type compensating circuit included in an OLED display device according to one example embodiment of the present invention.

[0057] As shown in FIG. 6A, the pixel circuit included in the OLED display device is composed of NMOS transistors T1, T2, T3, T4 and T5, a photo sensor P1, a capacitor C1, and an organic light emitting diode D1.

[0058] A cathode terminal of the OLED D1 is connected to a ground, and an anode terminal thereof is connected to the source terminal of the first transistor T1.

[0059] The drain terminal of the first transistor T1 of which the source terminal is connected to the anode terminal of the OLED is connected to a power supply 60, and applies a current to the OLED according to an applied voltage.

[0060] A gate terminal of the first transistor T1 is connected to a source terminal of the third transistor T3, a drain terminal of the fifth transistor and the capacitor C1.

[0061] A drain terminal of the third transistor T3, of which a source terminal is connected to the gate terminal of the first transistor T1, is connected to the power supply 60 and the drain terminal of the first transistor T1, and a gate terminal of the third transistor T3 is connected to the first scan line of the former terminal (i.e., (N-1)th first scan line) 31.

[0062] A gate terminal of the fifth transistor T5 of which a drain terminal is connected to the gate terminal of the first transistor T1 is connected to a second scan line (i.e. Nth scan line) 40, and the source terminal of the fifth transistor T5 is connected to one terminal of the photo sensor P1. The embodiment of FIG. 6A uses the thin film transistor type photo sensor.

[0063] One terminal of the photo sensor is connected to the source terminal of the fifth transistor T5, and the other terminal thereof is connected to a common electrode.

[0064] One terminal of the capacitor C1, which is connected to the gate terminal of the first transistor T1, is connected to the source of the second transistor T2 and the drain terminal of the fourth transistor T4, and the other terminal thereof is connected to the gate terminal of the first transistor T1, the source terminal of the third transistor T3 and the drain terminal of the fifth transistor T5.

[0065] The gate terminal of the second transistor T2, to which one terminal of the capacitor C1 is connected, is connected to the first scan line (i.e., Nth first scan line) 70, and the drain terminal thereof is connected to the data line 50. Accordingly, a voltage corresponding to luminance information applied from the data line 50 is transferred to the gate terminal of the first transistor T1 by a capacitance-coupling of the capacitor C1 via the second transistor T2 in order to control a current of the OLED.

[0066] The gate terminal of the fourth transistor, to which a drain terminal is connected to one terminal of the capacitor C1, is connected to the second scan line (i.e., Nth second scan line) 40, and the source thereof is connected to the common electrode.

[0067] FIG. 7 is a timing chart explaining a driving operation of a compensating pixel circuit using an optical feedback according to an active matrix method according to an example embodiment of the present invention.

[0068] A driving method of the OLED display device may include a scan line driving circuit configured to apply sequentially a selecting signal or a non-selecting signal to a plurality of scan lines, a data line driving circuit configured

to apply a voltage corresponding to image information to a plurality of data lines, and a pixel circuit arranged in each point where the scan lines and the data lines are intersected. The driving method will now be explained.

[0069] First, when an selecting signal is applied through the first scan line of the former terminal (i.e., (N-1)th first scan line), the third transistor is turned on by applying the selecting signal to the gate terminal of the third transistor T3, thereby increasing a pixel voltage V1. The fourth and fifth transistor are turned on by enabling the first scan line of the former terminal (i.e., (N-1)th first scan line) to be selected and simultaneously enabling the second scan line (i.e., Nth second scan line) 40 to be selected.

[0070] When the first transistor T1 is turned on according as the pixel voltage is increased, the current applied from the power supply 60 flows through the OLED D1, and the OLED D1 emits light. A leak current of the photo sensor P1 is increased by emitting light from the OLED D1, and the pixel voltage is maintained to a constant voltage (i.e., region 70 of FIG. 7).

[0071] In this case, the third transistor T3 is turned off according as the non-selecting signal is applied to the first scan line of the former terminal (i.e., (N-1)th first scan line) 31. Then, the photo sensor P1 produces a photo current until the OLED is turned off, thereby lowering gradually the pixel voltage. When the non-selecting signal is applied to the second scan line 40, the pixel voltage is set to the gate terminal of the first transistor (region 71 of FIG. 7). The region 71 of FIG. 7 may be an optical feedback region, and a region that the voltage of the gate terminal of the first transistor T1 is stored when the OLED D1 is turned off.

[0072] In this state, the second transistor is turned on by enabling the second scan line 40 to be non-selected and enabling the selecting signal to be applied through the first scan line (i.e., Nth second scan line) 70. Accordingly, a voltage V_{data} corresponding to luminance information transmitted from the data line via the turned-on second transistor is transferred to the capacitor C1.

[0073] The voltage corresponding to the transferred luminance information causes the voltage of the gate terminal of the first transistor T1 to be varied by the capacitance coupling of the capacitor C1, and simultaneously is stored in the capacitor C1.

[0074] The first transistor T1 is turned on according as the voltage corresponding to the luminance information is applied to the gate terminal of the first transistor T1. The current applied from the power supply 60 flows constantly to the OLED via the first transistor T1. The OLED emits light by the current flowing constantly to the OLED (region 72 of FIG. 7).

[0075] In this state, even when the non-selecting signal is applied to the first scan line (i.e., Nth first scan line) 70, the constant current is flown to the OLED for 1 frame period. In other words, by the voltage stored in the capacitor C1, the voltage of the gate terminal of the first transistor T1 is constantly maintained for 1 frame period, and thus the current flowing to the OLED is also constantly maintained.

[0076] The pixel voltage V_{in} for the 1 frame period is to add a voltage V_{th} set to the gate terminal of the first transistor

while turning off the OLED to a voltage V_{th} corresponding to luminance information transmitted through the data line.

[0077] As described above, the OLED display device and the driving method thereof use the thin film transistor type as the photo sensor included in the pixel circuit.

[0078] FIG. 6B shows a pixel circuit for compensating an optical feedback using P-i-N photo diode P2 as the photo sensor.

[0079] Since the OLED display device and the driving method thereof as shown in FIG. 6B is the same embodiment as that using the above-described thin film transistor type photo sensor P1, the explanation will be omitted.

[0080] The active matrix type OLED display device having the compensating circuit using the optical feedback according to the present invention senses a final output, i.e. brightness of light of the pixel, and voluntarily controls the brightness of the pixel. Accordingly, the OLED display device can obtain the quality of the image which the brightness of the pixel is not varied according to the signal, even when a usage time of the display device is increased and the threshold voltage and the mobility are varied.

[0081] As described above, according to the preferred embodiments of the present invention, the OLED display device can constantly obtain luminance of the light emitting elements by elapsed time, because the brightness of the pixel for the signal voltage is not varied by a characteristic variance of the transistor (e.g., a driving element) and the OLED. Accordingly, the OLED display device according to the present invention can minimize the variance of the pixel brightness due to deterioration of the transistor and the OLED produced by usage for a long time and increase life span of the display device.

[0082] Further, the OLED display device can display high quality of the image even in case of the high precision display, because it is controlled to flow the current to OLED included in each pixel.

[0083] Further, the OLED display device can have very long life span in comparison with other OLED display device, and thus be variously applied to a science field and a commercial field.

[0084] While the example embodiments of the present invention and their advantages have been described in detail, it should be understood that various changes, substitutions and alternations may be made herein without departing from the scope of the invention.

What is claimed is:

1. an OLED display device including a scan line driving circuit configured to apply sequentially a selecting signal or a non-selecting signal to a plurality of scan lines; a data line driving circuit configured to apply a voltage corresponding to image information to a plurality of data lines; and a pixel circuit arranged in each point where the scan lines and the data lines are intersected,

Wherein the pixel circuit comprising:

an OLED D1 having two terminals;

a first transistor of which a source terminal is connected to an anode terminal of the OLED, and a drain terminal

is connected to a power supply, for providing a current to the OLED according to an applied voltage;

a second transistor of which a gate terminal is connected to a first scan line and a drain terminal is connected to the data line;

a third transistor of which a drain terminal is connected to the source terminal of the first transistor and the power supply, and a gate terminal is connected to a first scan line of the former terminal, and a source terminal is connected to the gate terminal of the first transistor;

a fourth transistor of which a drain terminal is connected to the source terminal of the second transistor, a source terminal is connected to a common electrode, and a gate terminal is connected to a second scan line;

a fifth transistor of which a drain terminal is connected to the gate terminal of the first transistor and the source terminal of the third transistor, and a gate terminal is connected to the second scan line and the gate terminal of the fourth transistor;

a capacitor of which one terminal is connected to the gate terminal of the first transistor, the source terminal of the third transistor and the drain terminal of the fifth transistor, and the other terminal is connected to the source terminal of the second transistor and the drain terminal of the fourth transistor; and

a photo sensor of which one terminal is connected to the drain terminal of the fifth transistor, and the other terminal is connected to the common electrode.

2. The OLED display device of claim 1, wherein the photo sensor may be a thin film transistor type photo sensor using a photo leak current of the thin film transistor.

3. The OLED display device of claim 1, wherein the photo sensor may be a photodiode.

4. The OLED display device of claim 2 or 3, wherein the photo sensor may be formed of amorphous silicon.

5. The OLED display device of claim 2, wherein the transistors may be amorphous silicon thin film transistor.

6. The OLED display device of claim 2, wherein the transistors may be a polycrystalline or crystal thin film transistor.

7. The OLED display device of claim 2, wherein the transistors may be an inverted-staggered type that a gate is firstly formed on an insulator substrate.

8. The OLED display device of claim 2, wherein the transistors may be NMOS type.

9. a driving method of an OLED display device including a scan line driving circuit configured to apply sequentially a selecting signal or a non-selecting signal to a plurality of scan lines; a data line driving circuit configured to apply a voltage corresponding to image information to a plurality of data lines; and a pixel circuit arranged in each point where the scan lines and the data lines are intersected, comprising:

enabling the selecting signal to be transmitted to a gate terminal of a third transistor via a first scan line of former terminal (i.e. $(N-1)^{th}$ first scan line) and the third transistor to be turned on to increase a pixel voltage V_1 , and enabling a fourth and fifth transistor to be turned on according as the first scan line of former terminal (i.e. $(N-1)^{th}$ first scan line) is selected and simultaneously a second scan line (i.e., N^{th} second scan line);

enabling the OLED to emitting light by the increasing of the pixel voltage and enabling the pixel voltage to maintained to a constant voltage according as a leak current of an photo sensor is increased;

enabling the third transistor to be turned off by applying the non-selecting signal to the first scan line of former terminal (i.e. $(N-1)^{\text{th}}$ first scan line), enabling the photo sensor to produce an photo current until the OLED is turned off so as to decrease gradually the pixel voltage, and setting the pixel voltage, when the non-selecting signal is applied to the second scan line, to the gate terminal of the first transistor;

enabling the second transistor to be turned on by applying the selecting signal via a first scan line (i.e., N^{th} first scan line), storing a voltage (V_{data}) corresponding to luminance information transmitted from the data line via the turned-on second transistor and simultaneously varying the voltage of the gate terminal of the first transistor; and

enabling the first transistor to be turned on according as the voltage is applied to the gate terminal of the first transistor and emitting light from the OLED by flowing constant current to the OLED.

10. The driving method of claim 9, wherein the photo sensor may be a thin film transistor type photo sensor using a photo leak current of the thin film transistor or photo diode

11. The driving method of claim 9, wherein after the non-selecting signal is applied to the first scan line (i.e., N^{th} first scan line), the voltage of the gate terminal of the first transistor and the current flowing to the OLED are constantly maintained by the voltage stored in the capacitor for 1 frame period.

12. The driving method of claim 11, wherein the pixel voltage $V1$ for the 1 frame period is to add a voltage V_{th} set to the gate terminal of the first transistor while turning off the OLED to a voltage V_{data} corresponding to luminance information transmitted through the data line.

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专利名称(译)	有机发光二极管显示装置及其驱动方法		
公开(公告)号	US20070024547A1	公开(公告)日	2007-02-01
申请号	US11/396925	申请日	2006-04-03
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IPC分类号	G09G3/30		
CPC分类号	G09G3/3233 G09G2300/0819 G09G2300/0842 G09G2360/148 G09G2320/043 G09G2320/045 G09G2360/145 G09G2310/0262		
优先权	1020050068514 2005-07-27 KR		
其他公开文献	US7944415		
外部链接	Espacenet USPTO		

摘要(译)

公开了一种有机发光二极管 (OLED) 显示装置及其驱动方法, 所述有机发光二极管具有使用薄膜晶体管 (TFT) 作为有源装置的像素电路。 OLED显示装置可以通过经过的时间不断地获得发光元件的亮度, 因为信号电压的像素的亮度不会因晶体管 (例如, 驱动元件) 和 OLED的特性变化而变化。因此, 根据本发明的 OLED显示装置可以最小化由于长时间使用引起的晶体管和 OLED的劣化导致的像素亮度的变化并且增加显示装置的寿命。此外, 即使在高精度显示的情况下, OLED显示装置也可以显示高质量的图像, 因为控制使电流流到包括在每个像素中的 OLED。

