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

Organische lichtemittierende Diodenanzeigevorrichtung

Dispositif d'affichage à diode électroluminescente organique

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] Aspects of the present invention relate to an organic light emitting diode (OLED) display device capable of minimizing a threshold voltage variation of a driving transistor in a pixel circuit, minimizing lowering of an aperture ratio, and minimizing power consumption by applying the same range of data voltages to respective pixels.

2. Description of the Related Art

[0002] Flat panel display devices, for example, liquid crystal display devices and organic light emitting diode (OLED) display devices, are lightweight and thin and are widely used as alternatives to cathode ray tube (CRT) display devices. Among these flat panel display devices, OLED display devices, in particular, have attracted considerable attention for their advantages of excellent brightness, wide viewing angle, and extra-thinness due to a back-light being unnecessary in comparison with LCD.

[0003] OLED display devices display images by forming excitons through the recombination of electrons and holes injected into an organic thin film from a cathode and an anode. The excitons generate a specific wavelength of light as the electrons and holes recombine.

[0004] OLEO display devices are classified as a passive matrix type and an active matrix type depending upon the manner in which they are driven. The active matrix type has a circuit using a thin film transistor (TFT). Although the passive matrix type is easily manufactured as its display area is simply formed by an anode and a cathode in a matrix, the use of the passive matrix type is limited to small displays due to low resolution, a high driving voltage, low life-span of materials, etc. On the other hand, the active matrix type has a TFT in every pixel of a display area to apply a uniform current to each pixel, and thus may exhibit stable brightness. Also, the active matrix type plays an important role in realization of high resolution and large displays because of its low power consumption.

[0005] The OLED display devices have a specific variation in threshold voltage of a TFT in each pixel during a fabrication process of the TFT, which results in a nonuniform brightness of the OLED display device. Thus the OLED display devices generally have a pixel circuit including a compensation circuit to compensate for the threshold voltage variation. However, the OLED display device having such a compensation circuit requires several TFTs to form the compensation circuit, thereby requiring compicated pixel circuits which decrease a light emitting area due to a reduction in aperture ratio of each pixel.

[0006] Also, to realize full-color displays, the OLED display device includes several pixels, such as red, green, and blue pixels. However, since the respective pixels have different efficiencies in their own organic light emitting diodes, data signals with different voltages have to be applied to the respective pixels in order to obtain a uniform brightness from the respective pixels, and thus data driving units that apply the data signals have to be formed in each pixel. Also, a voltage range of the data signal is also increased, and thus the data driving unit is complicated and power consumption increases.

Matsueda Y et al "35.1:2.5-in. AMOLED with integrated 6-bit gamma compensated digital data driver" 2004 SID International Symposium, San Jose, CA: SID, US, vol. XXXV, 25 May 2004 pp1116-1119 relates to an OLED display device having an active matrix that permits gamma compensation of the display.

[0007] KR 2006 0012931 discloses a light emitting display that aims to control capacitance ratios of capacitors in a pixel circuit to improve white balance.

SUMMARY OF THE INVENTION

[0008] According to an aspect of the invention, there is provided an organic light emitting diode (OLED) display device as set out in claim 1. Preferred features are additionally set out in claims 2 to 14.

[0009] Additional aspects and/or advantages of the invention will be set forth in part in the description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] These and/or other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a block diagram of an organic light emitting diode (OLED) display device according to an embodiment of the present invention;

FIG. 2 is a circuit diagram of a pixel circuit of the OLED display device according to an embodiment of the present invention;

FIG. 3 is a waveform diagram illustrating the driving of a pixel circuit of the OLED display device according to an embodiment of the present invention;

FIG. 4 is a circuit diagram of a pixel circuit of an OLED display device according to an embodiment of the present invention; and

FIG. 5 is a circuit diagram of a pixel circuit of an OLED display device according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0011] Reference will now be made in detail to the present embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to the like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures. In the drawings, length and thickness of the layers and regions may be exaggerated for clarity. Also, like numerals denote like components, and when a part is described as being "connected" with a part, the part may be "directly connected" or "electrically connected" with the part and/or a third part may be interposed therebetween.

[0012] FIG. 1 is a block diagram of an organic light emitting diode (OLED) display device according to an embodiment of the present invention. Referring to FIG. 1, the OLED display device according to this embodiment of the present invention includes a pixel unit 110 having a plurality of pixels P11~Pnm, a scan driving unit 120 electrically connected with the plurality of pixels P11~Pnm by scan lines S1~Sn to apply scan signals and control lines E1-En to apply control signals respectively to the plurality of pixels P11~Pnm, and a data driving unit 130 electrically connected with the plurality of pixels P11~Pnm by data lines D1~Dm to apply data signals to the plurality of pixels P11~Pnm. The scan driving unit 120 generates scan signals and control signals, and sequentially applies the scan and control signals through the scan lines S1~Sn and the control lines E1~En, respectively. The data driving unit 130 generates data signals, and synchronizes the data signals with the scan signals through the data lines D1~Dm to be applied to the pixel unit 110. A power voltage is applied to the pixel unit 110 from the power supply line VDD.

[0013] The pixel unit 110 includes the plurality of pixels P11~Pnm which can display a plurality of colors in order to express various gradations and emit light with specific brightness in response to the scan signals, the control signals, and the data signals.

[0014] FIG. 2 is a circuit diagram of a pixel circuit of an OLED display device according to an embodiment of the present invention. Referring to FIG. 2, each pixel P11~Pnm includes an organic light emitting diode OLED, a drive transistor Tr1, a first switching transistor Tr2, a second switching transistor Tr3, a first capacitor C1 and a second capacitor C2.

[0015] The drive transistor Tr1 is electrically connected between the organic light emitting diode OLED and a second node N2, and applies a drive current to the organic light emitting diode OLED according to a voltage of a first node N1. The first switching transistor Tr2 is electrically connected between the data line Dm and the first node N1, and transmits the data signal to the first node N1 in response to or according to the scan signal applied from the scan line Sn. The second switching transistor Tr3 is electrically connected between the second node N2 and a power supply line VDD, and transmits a power voltage to the second node N2 in response to or according to the control signal applied from the control line En. The first switching transistor Tr2, the second switching transistor Tr3, and the drive transistor Tr1 may be independently NMOS or PMOS transistors. Further, the organic light emitting diode OLED is connected between the drive transistor Tr1 and a ground VSS.

[0016] The first capacitor C1 is electrically connected between the power supply line VDD and the first node N1, and stores a voltage less than or equal to a difference between the voltage of the first node N1 and the power voltage as applied from the power supply line VDD.

[0017] The second capacitor C2 is electrically connected between the first node N1 and the second node N2, and stores a voltage less than or equal to a difference between the voltage of the first node N1 and the voltage of the second node N2.

[0018] FIG. 3 is a waveform diagram illustrating the driving of the pixel circuit of the OLED display device according to an embodiment of the present invention. In driving the pixel circuit of the OLED display device according to embodiments of the present invention, with reference to FIGS. 2 and 3, a low-level scan signal and a low-level control signal are respectively applied in a first time period T1 through the scan line Sn and the control line En.

[0019] The first switching transistor Tr2 is turned-on by the low-level scan signal so that the first switching transistor Tr2 transmits a data signal applied from the data line Dm to the first node N1. Thus, the first node N1 has the same voltage as the voltage of the data signal from the data line Dm, and the first capacitor C1 electrically connected between the first node N1 and the power supply line VDD stores the voltage difference between the voltage of the data signal from the data line Dm and the power voltage from the power supply line VDD.

[0020] Also during the first time period T1, the second switching transistor Tr3 is turned-on by the low-level control signal applied thereto by the control line En, and the second switching transistor Tr3 transmits the power voltage applied from the power supply line VDD to the second node N2. Thus, the second node N2 has the same voltage as the power voltage supplied from the power supply line VDD, and the second capacitor C2 electrically connected between the second node N2 and the first node N1 stores the voltage difference between the voltage of the data signal applied from the data line Dm through the first switching transistor Tr2 and the power voltage from the power supply line VDD, which is the same as the first capacitor C1.

[0021] In the first time period T1, because the power voltage is transmitted from the power supply line VDD to the second node N2, and the data signal is transmitted to the first node N1, the drive transistor Tr1 is turned-on, and the drive transistor Tr1 applies the drive current in response to or according to the voltage of the data signal transmitted from the data line Dm to the first node N1 to the organic light emitting diode OLED. However, the first time period T1 does not affect overall brightness because the first time period T1 is shorter than the following third time period T3.

[0022] Subsequently, in a second time period T2, a low-level scan signal is applied to the scan line Sn and a high-level control signal is applied to the control line En. The first switching transistor Tr2 remains turned-on by the low-level scan signal Sn as shown in the first time period T1, and thus the first node N1 maintains the voltage of the data signal as applied from the data line Dm, and the first capacitor C1 stores the voltage difference the voltage of the data signal and the power voltage from the power supply line VDD.

[0023] The second switching transistor Tr3 is turned-off by the high-level control signal such that the power voltage is not applied from the power supply line VDD to the second node N2. The first node N1 and the second node N2 are respectively connected to a gate terminal and a source terminal of the drive transistor Tr1, and thus the second capacitor C2 stores a threshold voltage of the drive transistor Tr1, and the second node N2 maintains a voltage corresponding to the sum of the voltage of the data signal and the threshold voltage.

[0024] Accordingly, in the second time period T2, the drive transistor Tr1 is turned-on by the voltage of the data signal applied from the data line Dm to the first node N1, and applies the drive current in response to or according to the voltage of the data signal from the data line Dm transmitted to the first node N1 to the organic light emitting diode OLED as shown in the first time period T1. However, the second time period T2 does not greatly affect the overall brightness because the second time period T2 is shorter than the following third time period T3. Also, in the second time period T2, the voltage of the second node N2 stores a difference between the threshold voltage and the first node N1, so the drive transistor Tr1 does not apply a sufficient drive current to allow the organic light emitting diode OLED to exhibit sufficient brightness.

[0025] Next, in the third time period T3, a high-level scan signal is applied to the scan line Sn, and a low-level control signal is applied to the control line En. The second switching transistor Tr3 is turned-on by the low-level control signal, and thus the second node N2 has the same voltage as the power voltage as applied by the power supply line. The first switching transistor Tr2 is turned-off by the high-level scan signal from the scan line Sn, and thus the first node N1 maintains the following voltage due to a coupling effect of the first capacitor C1 and the second capacitor C2:

$$V_{N1} = V_{data} + \frac{C_2}{(C_1 + C_2)}(ELVDD - V_{data} - V_{th}),$$

[0026] wherein, V_{N1} is a voltage of the first node, C_1 is a capacitance of the first capacitor, C_2 is a capacitance of the second capacitor, V_{data} is a voltage of the data signal, ELVDD is a power voltage, and V_{th} is a threshold voltage of the drive transistor.

[0027] In the third time period T3, the drive transistor Tr1 applies the drive current to the organic light emitting diode OLED in response to the voltage (V_{N1}) of the first node N1, and thus the brightness of the organic light emitting diode OLED in the third time period T3 is determined by a capacitance ratio of the first capacitor C1 and the second capacitor C2.

[0028] As a result, the OLED display device according to this embodiment of the present invention controls a capacitance ratio of the first and second capacitors C1 and C2 of each pixel P11-Pnm, and thus can apply a suitable drive current to an organic light emitting diode OLED of each pixel P11-Pnm regardless of the voltage of a data signal applied from the data line Dm to each pixel P11-Pnm.

[0029] FIG. 4 is a circuit diagram of a pixel circuit of an OLED display device according to another embodiment of the present invention. Referring to FIG. 4, the pixel circuit of the OLED display device according to this embodiment of the present invention includes drive transistors Tr1: first switching transistors Tr2; second switching transistors Tr3; first capacitors $C1_R$, $C1_G$, and $C1_B$; second capacitors $C2_R$, $C2_G$, and $C2_B$; red, green, and blue pixels 210, 220, and 230 including red, green, and blue organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$, respectively; data lines Dm-

1, Dm, Dm+1 for applying respective data signals to the red, green, and blue pixels 210, 220 and 230; a scan line Sn to apply a scan signal to the red, green, and blue pixels 210, 220, and 230; and a control line En to apply a control signal to the red, green, and blue pixels 210, 220, and 230. The red, green, and blue pixels 210, 220, and 230 are different from one another in capacitance ratios of the first capacitors $C1_R$, $C1_G$, and $C1_B$ to the second capacitors $C2_R$, $C2_G$, and $C2_B$.

[0030] The capacitance ratios of the first capacitors $C1_R$, $C1_G$, and $C1_B$ to the second capacitors $C2_R$, $C2_G$, and $C2_B$ are determined by the red, green, and blue organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$ in the respective pixels 210, 220, and 230. Specifically, the capacitance ratios of the first capacitors $C1_R$, $C1_G$, and $C1_B$ to the second capacitors $C2_R$, $C2_G$, and $C2_B$ in the respective pixels 210, 220, and 230 are inversely proportional to efficiencies of the red, green, and blue organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$ In the respective pixels 210, 220, and 230.

[0031] Thus, as the efficiencies of the organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$ are lowered, the second capacitors $C2_R$, $C2_G$, and $C2_B$ in the respective pixels 210, 220, and 230 have lower capacitances, and the first capacitors $C1_R$, $C1_G$, and $C1_B$ in the respective pixels 210, 220, and 230 have higher capacitances. Here, in order to control the capacitance ratios of the first capacitors $C1_R$, $C1_G$, and $C1_B$ to the second capacitors $C2_R$, $C2_G$, and $C2_B$ in the respective pixels 210, 220, and 230, the capacitances of one of both the first capacitors $C1_R$, $C1_G$, and $C1_B$ and the second capacitors $C2_R$, $C2_G$, and $C2_B$ may be set at a same capacitance in all pixels 210, 220, and 230 and those of the other capacitors may be controlled, or all capacitances of the first capacitors $C1_R$, $C1_G$, and $C1_B$ and the second capacitors $C2_R$, $C2_G$, and $C2_B$ may be controlled.

[0032] As a result, the OLED display device according to this embodiment of the present invention may differently control the capacitance ratios of the first capacitors $C1_R$, $C1_G$, and $C1_B$ to the second capacitors $C2_R$, $C2_G$, and $C2_B$ in the red, green, and blue pixels 210, 220, and 230 according to the efficiencies of the red, green, and blue organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$, respectively, thereby applying a suitable drive current to the red, green, and blue organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$, even when the data signals having the same voltage are applied to the red, green, and blue pixels 210, 220, and 230.

[0033] FIG. 5 is a circuit diagram of a pixel circuit of an OLED display device according to another embodiment of the present invention. Referring to FIG. 5, the pixel circuit of the OLED display device according to this embodiment includes drive transistors Tr1; first switching transistors Tr2; second switching transistors Tr3; first capacitors $C1_R$, $C1_G$, and $C1_B$; second capacitors $C2_R$, $C2_G$, and $C2_B$; red, green, and blue sub-pixels 310, 320, and 330 including red, green, and blue organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$, respectively; a data line Dm to apply a data signal to the sub-pixels 310, 320, and 330, a scan line Sn to apply a scan signal to the pixels 310, 320, and 330, a control line En to apply a control signal to the pixels 310, 320, and 330; and a demultiplexer 1000 electrically connected to the data line Dm to sequentially apply the data signal to the sub-pixels 310, 320, and 330. Here, the first capacitors $C1_R$, $C1_G$, and $C1_B$ and the second capacitors $C2_R$, $C2_G$, and $C2_B$ in the respective sub-pixels 310, 320, and 330 have different capacitance ratios.

[0034] The demultiplexer 1000 is electrically connected with the data line Dm, and turns on/off third, fourth, and fifth switching transistors Tr4, Tr5, and Tr6 in response to red, green, and blue data control signals C_R, C_G, and C_B to thereby sequentially apply the data signal to the red, green, and blue sub-pixels 310, 320, and 330.

[0035] Accordingly, in the OLED display device according to this embodiment of the present invention, data signals having a same voltage may be sequentially applied to three sub-pixels by the demultiplexer 1000, however, the capacitance ratios of first capacitors $C1_R$, $C1_G$, and $C1_B$ to second capacitors $C2_R$, $C2_G$, and $C2_B$ may be controlled according to efficiencies of the respective organic light emitting diodes in the respective red, green, and blue sub-pixels 310, 320, and 330 to thereby apply a suitable drive current to the organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$ of the red, green, and blue sub-pixels 310, 320, and 330.

[0036] Consequently, the OLED display device according to this embodiment of the present invention may control the capacitance ratios of the first capacitors $C1_R$, $C1_G$, and $C1_B$ to second capacitors $C2_R$, $C2_G$, and $C2_B$ in the respective red, green, and blue sub-pixels 310, 320, and 330 according to the efficiencies of the organic light emitting diodes $OLED_R$, $OLED_G$, and $OLED_B$ of the red, green, and blue sub-pixels 310, 320, and 330, and may sequentially apply the data signal to the respective red, green, and blue sub-pixels 310, 320, and 330 by a single data line Dm through the demultiplexer 1000 to thereby reduce the number of data lines in the OLED display device and increase aperture ratios of the respective red, green, and blue pixels 310, 320, and 330.

[0037] Accordingly, an OLED display device according to aspects of the present invention may control capacitance ratios of first capacitors to second capacitors of respective pixels to apply a suitable drive current to organic light emitting diodes of the pixels even when data signals having the same voltage are applied to thereby allow for simple design of a data driving unit and to decrease power consumption of the OLED display device. Also, each pixel may include an organic light emitting diode, a first switching transistor, a second switching transistor, a drive transistor, a first capacitor, and a second capacitor to thereby minimize a threshold voltage of the drive transistor and minimize lowering of an aperture ratio of the pixels.

[0038] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in this embodiment without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. An organic light emitting diode (OLED) display device, comprising:

    scan lines (S_n) arranged to apply scan signals;
    control lines (E_n) arranged to apply control signals;
    data lines (D_m) arranged to apply data signals;
    power supply lines (VDD) arranged to provide voltages; and
    pixels to display different colors, each pixel comprising:

        an organic light emitting diode,
        a drive transistor (Tr_1) having a first electrode connected to the organic light emitting diode, a second electrode directly connected to a second node (N_z) and a gate electrode directly connected to a first node (N_1), the drive transistor (Tr_1) being arranged to apply a drive current to the organic light emitting diode according to the voltage of the first node (N_1),
        a first switching transistor (Tr_2) electrically connected between a corresponding data line (D_m) and the first node (N_1), and the first switching transistor (Tr_2) is arranged to be turned on/off in response to a corresponding scan signal from a corresponding scan line (S_n),
        a second switching transistor (Tr_3) having a first electrode directly connected to the second node (N_2) and a second electrode directly connected to a corresponding power supply line (VDD) , wherein the second switching transistor (Tr_3) is arranged to be turned on/off in response to a corresponding control signal from a corresponding control line (E_n),
        a first capacitor (C_1) directly connected between the first node (N_1) and the corresponding power supply line (VDD), and
        a second capacitor (C_2) directly connected between the first node (N_1) and the second node (N_2),
        wherein ratios of the first capacitors (C_1) to the second capacitors (C_2) of the pixels displaying different colors among the several pixels are different.

2. An OLED display device according to claim 1, wherein the ratios of the first capacitors (C_1) to the second capacitors (C_2) are inversely proportional to the efficiencies of the organic light emitting diodes of the pixels.

3. An OLED display device according to claim 2, wherein the second capacitors (C_2) have capacitances proportional to the efficiencies of the organic light emitting diodes.

4. An OLED display device according to claim 3, wherein the first capacitors (C_1) of the respective pixels have a same capacitance.

5. An OLED display device according to claim 2 or claim 3, wherein the first capacitors (C_1) have capacitances inversely proportional to the efficiencies of the organic light emitting diodes.

6. An OLED display device according to claim 5 when dependent from claim 2, wherein the second capacitors (C_2) of the respective pixels have a same capacitance.

7. An OLED display device according to claim 1, wherein the said pixels are sub-pixels of a pixel unit, each pixel unit including red, green, and blue sub-pixels.

8. An OLED display device according to claim 7, wherein the second capacitors (C_2) of the respective sub-pixels have capacitances proportional to the efficiencies of the organic light emitting diodes.

9. An OLED display device according to claim 8, wherein the first capacitors (C_1) of the red, green, and blue sub-pixels have a same capacitance.

10. An OLED display device according to any one of claims 7 to 9, wherein the first capacitors (C_1) of the respective sub-pixels have capacitances inversely proportional to the efficiencies of the organic light emitting diodes.

11. An OLED display device according to claim 10 when dependent from claims 7 or 8, wherein the second capacitors (C_2) of the red, green, and blue sub-pixels have a same capacitance.

12. An OLED display device according to any one of claims 7 to 11, wherein at least two of the first switching transistor (Tr_2), the second switching transistor (Tr_3), and the drive transistor (Tr_1) are a same type.

13. An OLED display device according to claim 12, wherein the first switching transistor (Tr_2), the second switching transistor (Tr_3), and the drive transistor (Tr_1) are independently NMOS or PMOS transistors.

14. An OLED display device according to any one of claims 1 to 13, further comprising:

a demultiplexer (1000) for sequentially applying the data signals to the pixels.

Patentansprüche

1. OLED (organische lichtemittierende Diode)-Anzeigeeinrichtung, Folgendes umfassend:

Scanleitungen (S_n), angeordnet zum Anlegen von Scansignalen;
Steuerleitungen (E_n), angeordnet zum Anlegen von Steuersignalen;
Datenleitungen (D_m), angeordnet zum Anlegen von Datensignalen;
Energieversorgungsleitungen (VDD), angeordnet zum Anlegen von Spannungen;
und
Pixel zum Anzeigen von verschiedenen Farben, wobei jedes Pixel Folgendes umfasst:

eine organische lichtemittierende Diode,
einen Treibertransistor (Tr_1) mit einer ersten Elektrode, die an die organische lichtemittierende Diode angeschlossen ist, einer zweiten Elektrode, die direkt an einen zweiten Knoten (N_2) angeschlossen ist, und einer Gate-Elektrode, die direkt an einen ersten Knoten (N_1) angeschlossen ist, wobei der Treibertransistor (Tr_1) dazu angeordnet ist, einen Treiberstrom gemäß der Spannung des ersten Knotens (N_1) an die organische lichtemittierende Diode anzulegen,
einen ersten Schalttransistor (Tr_2), der zwischen einer entsprechenden Datenleitung (D_m) und dem ersten Knoten (N_1) elektrisch angeschlossen ist, und wobei der erste Schalttransistor (Tr_2) dazu angeordnet ist, als Antwort auf ein entsprechendes Scansignal aus einer entsprechenden Scanleitung (S_n) ein-/ausgeschaltet zu werden,
einen zweiten Schalttransistor (Tr_3) mit einer ersten Elektrode, die direkt an den zweiten Knoten (N_2) angeschlossen ist, und einer zweiten Elektrode, die direkt an eine entsprechenden Energieversorgungsleitung (VDD) angeschlossen ist, worin der zweite Schalttransistor (Tr_3) dazu angeordnet ist, als Antwort auf ein entsprechendes Steuersignal aus einer entsprechenden Steuerleitung (E_n) ein-/ausgeschaltet zu werden,
einen ersten Kondensator (C_1), der direkt zwischen dem ersten Knoten (N_1) und der entsprechenden Energieversorgungsleitung (VDD) angeschlossen ist, und
einen zweiten Kondensator (C_2), der direkt zwischen dem ersten Knoten (N_1) und dem zweiten Knoten (N_2) angeschlossen ist,
worin Verhältnisse der ersten Kondensatoren (C_1) zu den zweiten Kondensatoren (C_2) der Pixel, die unter den mehreren Pixeln verschiedene Farben anzeigen, verschieden sind.

2. OLED-Anzeigeeinrichtung nach Anspruch 1, worin die Verhältnisse der ersten Kondensatoren (C_1) zu den zweiten Kondensatoren (C_2) umgekehrt proportional zu den Effizienten der organischen lichtemittierenden Dioden der Pixel sind.

3. OLED-Anzeigeeinrichtung nach Anspruch 2, worin die zweiten Kondensatoren (C_2) Kapazitäten haben, die proportional zu den Effizienzen der organischen lichtemittierenden Dioden sind.

4. OLED-Anzeigeeinrichtung nach Anspruch 3, worin die ersten Kondensatoren (C_1) der jeweiligen Pixel eine gleiche Kapazität haben.

5. OLED-Anzeigeeinrichtung nach Anspruch 2 oder Anspruch 3, worin die ersten Kondensatoren (C_1) Kapazitäten haben, die umgekehrt proportional zu den Effizienzen der organischen lichtemittierenden Dioden sind.

6. OLED-Anzeigeeinrichtung nach Anspruch 5 in Abhängigkeit von Anspruch 2, worin die zweiten Kondensatoren (C_2) der jeweiligen Pixel eine gleiche Kapazität haben.

7. OLED-Anzeigeeinrichtung nach Anspruch 1, worin die Pixel Subpixel einer Pixeleinheit sind, wobei jede Pixeleinheit rote, grüne und blaue Subpixel enthält.

8. OLED-Anzeigeeinrichtung nach Anspruch 7, worin die zweiten Kondensatoren (C_2) der jeweiligen Subpixel Kapazitäten haben, die proportional zu den Effizienzen der organischen lichtemittierenden Dioden sind.

9. OLED-Anzeigeeinrichtung nach Anspruch 8, worin die ersten Kondensatoren (C_1) der roten, grünen und blauen Subpixel eine gleiche Kapazität haben.

10. OLED-Anzeigeeinrichtung nach einem der Ansprüche 7 bis 9, worin die ersten Kondensatoren (C_1) der jeweiligen Subpixel Kapazitäten haben, die umgekehrt proportional zu den Effizienzen der organischen lichtemittierenden Dioden sind.

11. OLED-Anzeigeeinrichtung nach Anspruch 10 in Abhängigkeit von den Ansprüchen 7 oder 8, worin die zweiten Kondensatoren (C_2) der roten, grünen und blauen Subpixel eine gleiche Kapazität haben.

12. OLED-Anzeigeeinrichtung nach einem der Ansprüche 7 bis 11, worin mindestens zwei des ersten Schalttransistors (Tr_2), des zweiten Schalttransistors (Tr_3) und des Treibertransistors (Tr_1) ein gleicher Typ sind.

13. OLED-Anzeigeeinrichtung nach Anspruch 12, worin der erste Schalttransistor (Tr_2), der zweite Schalttransistor (Tr_3) und der Treibertransistor (Tr_1) unabhängig NMOS- oder PMOS-Transistoren sind.

14. OLED-Anzeigeeinrichtung nach einem der Ansprüche 1 bis 13, außerdem Folgendes umfassend:

einen Demultiplexer (1000) zum sequenziellen Anlegen der Datensignale an die Pixel.

Revendications

1. Dispositif d'affichage à diodes électroluminescentes organiques (OLED), comprenant:

des lignes de balayage (S_n) agencées de manière à appliquer des signaux de balayage ;
des lignes de commande (E_n) agencées de manière à appliquer des signaux de commande ;
des lignes de données (D_m) agencées de manière à appliquer des signaux de données ;
des lignes d'alimentation électrique (VDD) agencées de manière à fournir des tensions ; et
des pixels destinés à afficher différentes couleurs, chaque pixel comprenant:

une diode électroluminescente organique ;
un transistor de commande (Tr_1) présentant une première électrode connectée à la diode électroluminescente organique, une seconde électrode connectée directement à un second noeud (N_2) et une électrode de grille directement connectée à un premier noeud (N_1), le transistor de commande (Tr_1) étant agencé de manière à appliquer un courant d'excitation à la diode électroluminescente organique selon la tension du premier noeud (N_1);
un premier transistor de commutation (Tr_2) connecté électriquement entre une ligne de données correspondante (D_m) et le premier noeud (N_1), et dans lequel le premier transistor de commutation (Tr_2) est agencé de manière à être mis sous / hors tension en réponse à un signal de balayage correspondant en provenance d'une ligne de balayage correspondante (S_n) ;
un second transistor de commutation (Tr_3) présentant une première électrode directement connectée au second noeud (N_2) et une seconde électrode connectée directement à une ligne d'alimentation électrique correspondante (VDD), dans lequel le second transistor de commutation (Tr_3) est agencé de manière à être mis sous / hors tension en réponse à un signal de commande correspondant en provenance d'une ligne de commande correspondante (E_n) ;
un premier condensateur (C_1) directement connecté entre le premier noeud (N_1) et la ligne d'alimentation

électrique correspondante (VDD) ; et
un second condensateur (C_2) directement connecté entre le premier noeud (N_1) et le second noeud (N_2) ;
dans lequel sont différents les rapports entre les premiers condensateurs (C_1) et seconds condensateurs (C_2) des pixels affichant différentes couleurs parmi les multiples pixels.

2. Dispositif d'affichage à diodes OLED selon la revendication 1, dans lequel les rapports entre les premiers condensateurs (C_1) et seconds condensateurs (C_2) sont inversement proportionnels à l'efficacité des diodes électroluminescentes organiques des pixels.

3. Dispositif d'affichage à diodes OLED selon la revendication 2, dans lequel les seconds condensateurs (C_2) ont des capacités proportionnelles à l'efficacité des diodes électroluminescentes organiques.

4. Dispositif d'affichage à diodes OLED selon la revendication 3, dans lequel les premiers condensateurs (C_1) des pixels respectifs présentent une même capacité.

5. Dispositif d'affichage à diodes OLED selon la revendication 2 ou 3, dans lequel les premiers condensateurs (C_1) ont des capacités inversement proportionnelles à l'efficacité des diodes électroluminescentes organiques.

6. Dispositif d'affichage à diodes OLED selon la revendication 5, lorsqu'elle est dépendante de la revendication 2, dans lequel les seconds condensateurs (C_2) des pixels respectifs présentent une même capacité.

7. Dispositif d'affichage à diodes OLED selon la revendication 1, dans lequel lesdits pixels sont des sous-pixels d'une unité de pixels, chaque unité de pixels comprenant des sous-pixels rouges, verts et bleus.

8. Dispositif d'affichage à diodes OLED selon la revendication 7, dans lequel les seconds condensateurs (C_2) des sous-pixels respectifs ont des capacités proportionnelles à l'efficacité des diodes électroluminescentes organiques.

9. Dispositif d'affichage à diodes OLED selon la revendication 8, dans lequel les premiers condensateurs (C_1) des sous-pixels rouges, verts et bleus présentent une même capacité.

10. Dispositif d'affichage à diodes OLED selon l'une quelconque des revendications 7 à 9, dans lequel les premiers condensateurs (C_1) des sous-pixels respectifs présentent des capacités inversement proportionnelles à l'efficacité des diodes électroluminescentes organiques.

11. Dispositif d'affichage à diodes OLED selon la revendication 10, lorsqu'elle est dépendante de la revendication 7 ou 8, dans lequel les seconds condensateurs (C_2) des sous-pixels rouges, verts et bleus présentent une même capacité.

12. Dispositif d'affichage à diodes OLED selon l'une quelconque des revendications 7 à 11, dans lequel au moins deux transistors parmi le premier transistor de commutation (Tr_2), le second transistor de commutation (Tr_3) et le transistor de commande (Tr_1) sont d'un même type.

13. Dispositif d'affichage à diodes OLED selon la revendication 12, dans lequel le premier transistor de commutation (Tr_2), le second transistor de commutation (Tr_3) et le transistor de commande (Tr_i) représentent indépendamment des transistors PMOS ou NMOS.

14. Dispositif d'affichage à diodes OLED selon l'une quelconque des revendications 1 à 13, comprenant en outre :

un démultiplexeur (1000) pour appliquer séquentiellement les signaux de données aux pixels.

FIG. 1

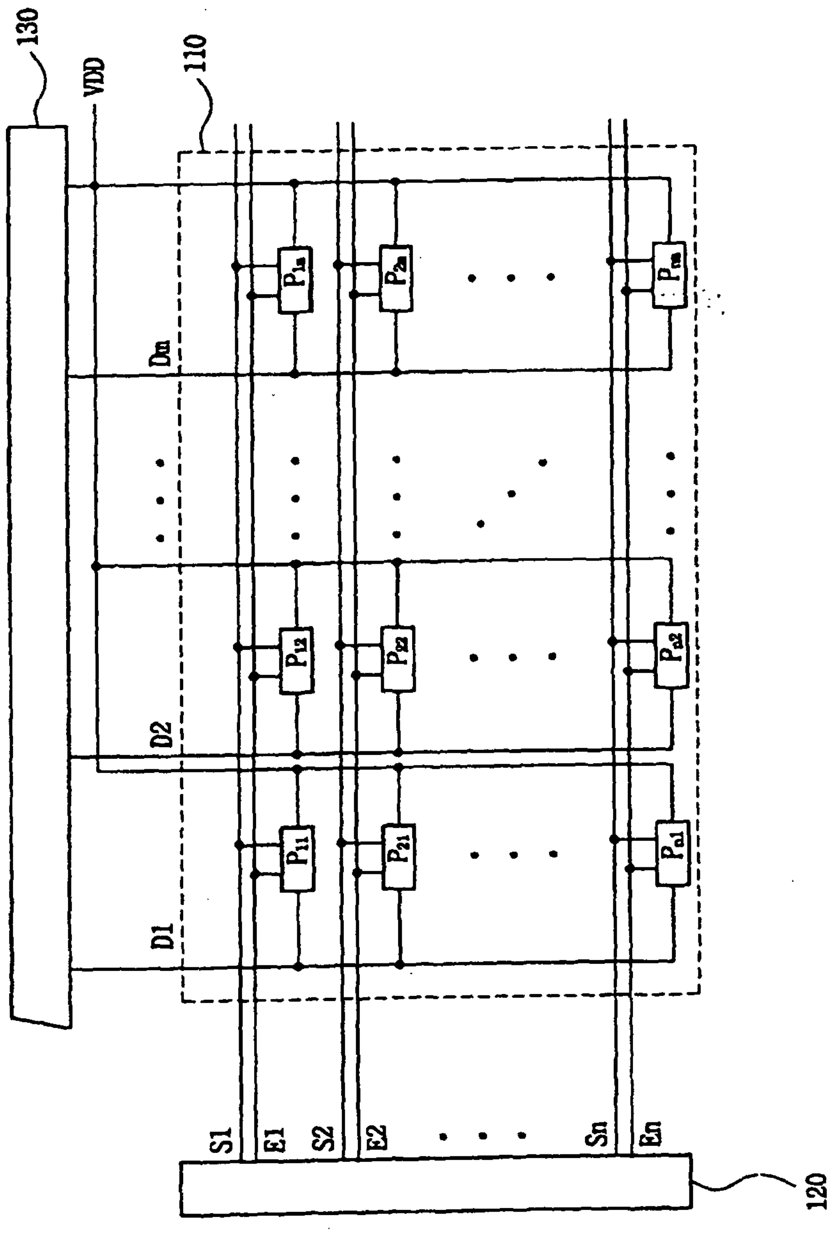


FIG. 2

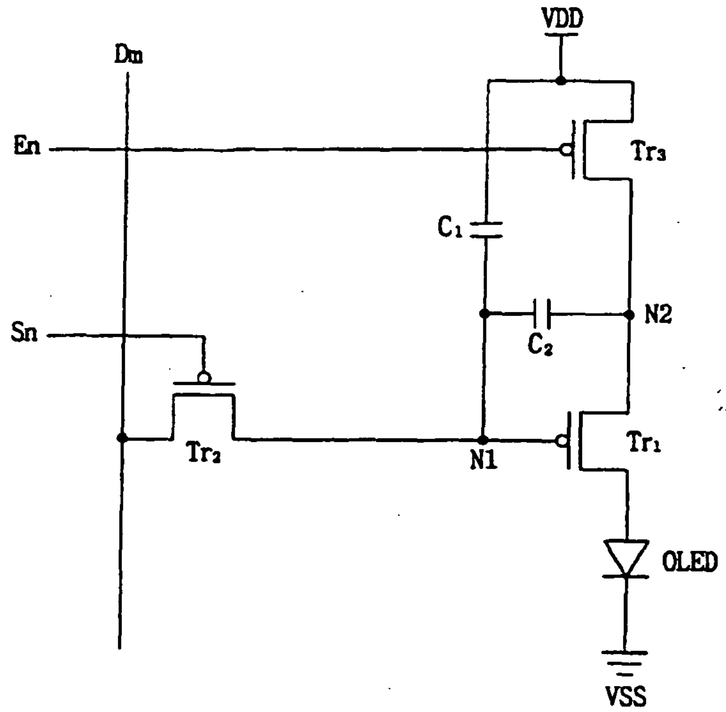


FIG. 3

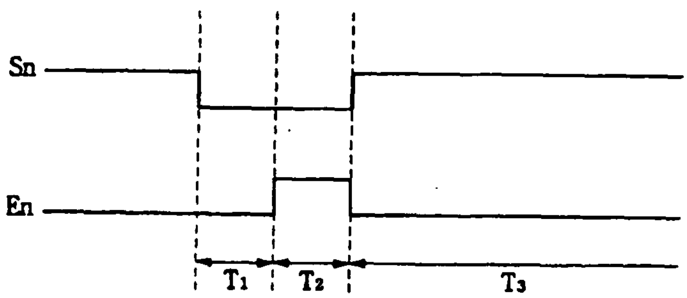
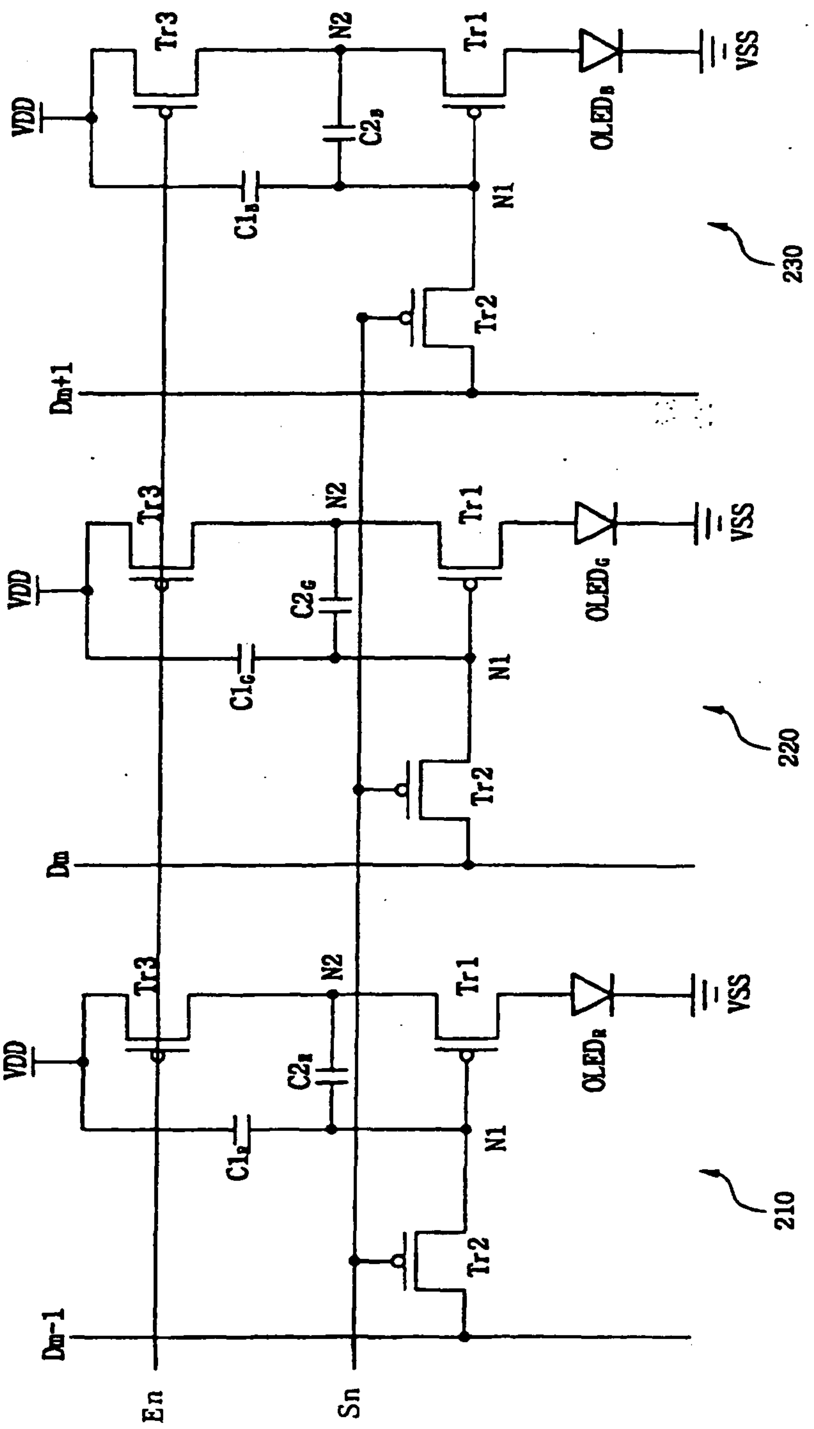


FIG. 4


VDD
Tr3
N2
Tr1
VSS
OLEDR
OLEDG
OLEDB
C1R
C2R
C1G
C2G
C1B
C2B
N1
Tr2
Dm-1
Dm
Dm+1
En
Sn
210
220
230

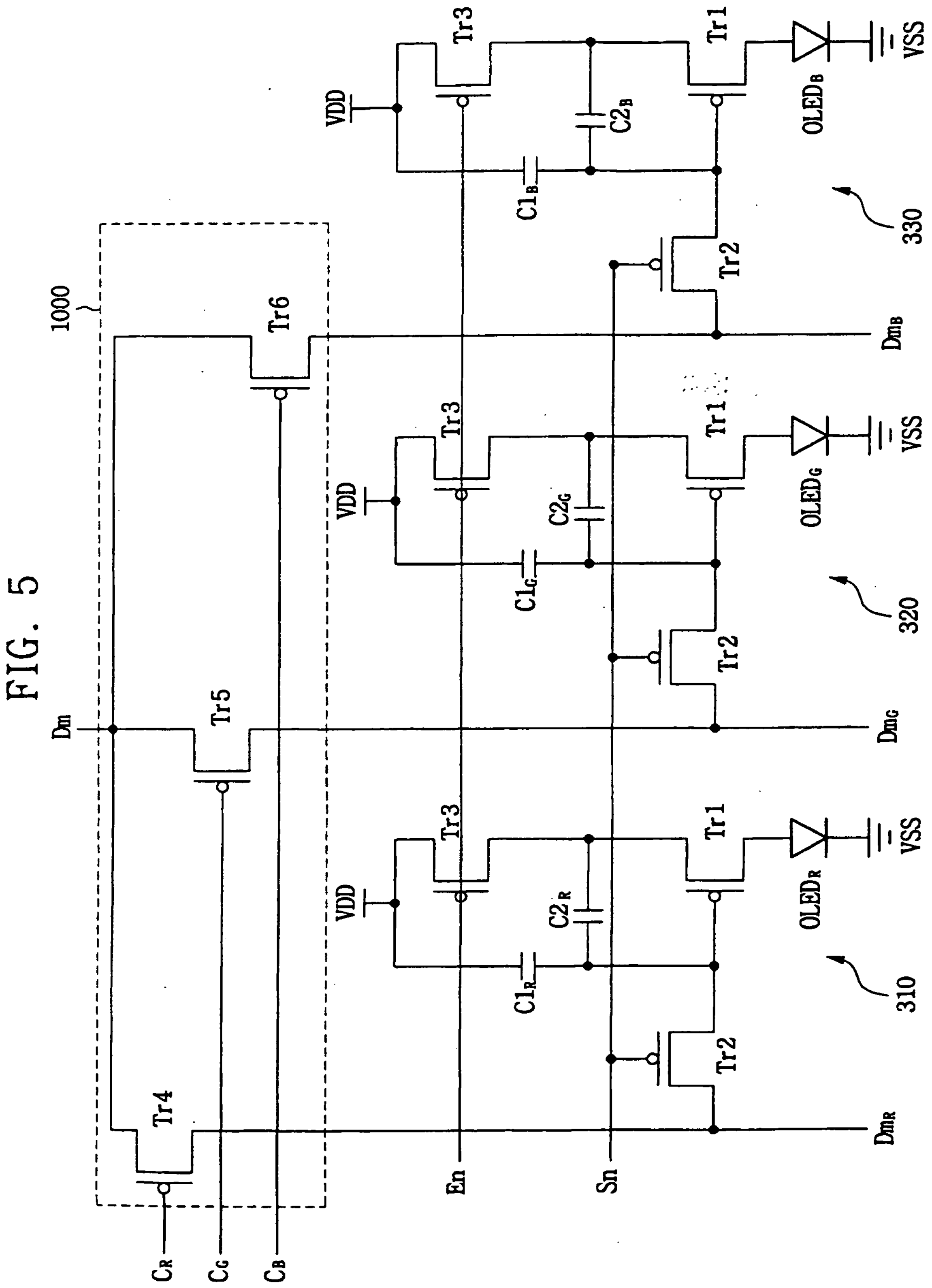

1000
Tr4
Tr5
Tr6
Dm
CR
CG
CB
En
Sn
VDD
Tr3
Tr1
Tr2
C1R
C2R
C1G
C2G
C1B
C2B
OLEDR
OLEDG
OLEDB
VSS
DmR
DmG
DmB
310
320
330

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- KR 20060012931 **[0007]**

专利名称(译)	有机发光二极管显示装置		
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[标]申请(专利权)人(译)	三星斯笛爱股份有限公司		
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IPC分类号	G09G3/32		
CPC分类号	G09G3/3233 G09G3/3291 G09G2300/0465 G09G2300/0819 G09G2300/0852 G09G2300/0861 G09G2310/0297 G09G2320/0233 G09G2330/021		
优先权	1020070061257 2007-06-21 KR		
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外部链接	Espacenet		

摘要(译)

有机发光二极管（OLED）显示装置通过将相同范围的数据电压施加到各个像素来最小化像素电路中的驱动晶体管的阈值电压变化，增加孔径比，并最小化功耗。 OLED显示装置包括电连接在第一节点和电源线之间的第一电容器;第二电容器，其电连接在第一节点和第二节点之间，其中第一和第二电容器的电容彼此不同并且是可调节的。

$$V_{N1}=V_{data}+\frac{C_2}{(C_1+C_2)}(ELVDD-V_{data}-V_{th})$$