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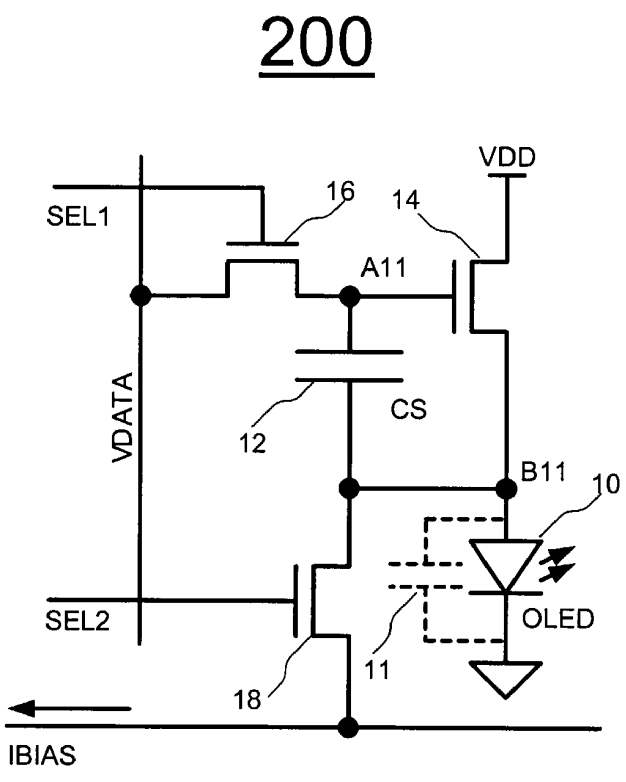
(54) Title: SYSTEM AND DRIVING METHOD FOR ACTIVE MATRIX LIGHT EMITTING DEVICE DISPLAY



(57) Abstract: Active matrix light emitting device display and its driving technique is provided. The pixel includes a light emitting device and a plurality of transistors. A capacitor may be used to store a voltage applied to a driving transistor so that a current through the light emitting device is independent of any shifts of the transistor and light emitting device characteristics. A bias data and a programming data are provided to the pixel circuit in accordance with a driving scheme.

WO 2006/053424 A1

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

System and Driving Method for Active Matrix Light Emitting Device Display

FIELD OF INVENTION

[0001] The present invention relates to a light emitting device displays, and more specifically to a driving technique for the light emitting device displays.

BACKGROUND OF THE INVENTION

[0002] Recently active-matrix organic light-emitting diode (AMOLED) displays with amorphous silicon (a-Si), poly-silicon, organic, or other driving backplane technology have become more attractive due to advantages over active matrix liquid crystal displays. An AMOLED display using a-Si backplanes, for example, has the advantages which include low temperature fabrication that broadens the use of different substrates and makes flexible displays feasible, and its low cost fabrication is well-established and yields high resolution displays with a wide viewing angle.

[0003] An AMOLED display includes an array of rows and columns of pixels, each having an organic light-emitting diode (OLED) and backplane electronics arranged in the array of rows and columns. Since the OLED is a current driven device, the pixel circuit of the AMOLED should be capable of providing an accurate and constant drive current.

[0004] One method that has been employed to drive the AMOLED display is programming the AMOLED pixel directly with current. However, the small current required by the OLED, coupled with a large parasitic capacitance, undesirably increases the settling time of the programming of the current-programmed AMOLED display. Furthermore, it is difficult to design an external driver to accurately supply the required current. For example, in CMOS technology, the transistors must work in sub-threshold regime to provide the small current required by the OLEDs, which is not ideal. Therefore, in order to use current-programmed AMOLED pixel circuits, suitable driving schemes are desirable.

[0005] Current scaling is one method that can be used to manage issues associated with the small current required by the OLEDs. In a current mirror pixel circuit, the current passing through the OLED can be scaled by having a smaller drive transistor as

compared to the mirror transistor. However, this method is not applicable for other current-programmed pixel circuits. Also, by resizing the two mirror transistors the effect of mismatch increases.

SUMMARY OF THE INVENTION

[0006] It is an object of the invention to provide a method and system that obviates or mitigates at least one of the disadvantages of existing systems.

[0007] In accordance with an aspect of the present invention there is provided a display system including: a pixel circuit having a light emitting device and a plurality of transistors, the plurality of transistors including a driving transistor for providing a pixel current to the light emitting device; a driver for programming and driving the pixel circuit, the driver providing a controllable bias signal to the pixel circuit to accelerate the programming of the pixel circuit and to compensate for a time dependent parameter of the pixel circuit; and a controller for controlling the driver to generate a stable pixel current.

[0008] In accordance with a further aspect of the present invention there is provided a pixel circuit including: a light emitting device; and a plurality of transistors, the plurality of transistors including a driving transistor for providing a pixel current to the light emitting device; wherein the pixel circuit is programmed and driven by a driver, the driver providing a controllable bias signal to the pixel circuit to accelerate the programming of the pixel circuit and to compensate for a time dependent parameter of the pixel circuit.

[0009] This summary of the invention does not necessarily describe all features of the invention.

[0010] Other aspects and features of the present invention will be readily apparent to those skilled in the art from a review of the following detailed description of preferred embodiments in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings wherein:

[0012] Figure 1 is a diagram showing a pixel circuit in accordance with an embodiment of the present invention;

[0013] Figure 2 is a timing diagram showing exemplary waveforms applied to the pixel circuit of Figure 1;

[0014] Figure 3 is a timing diagram showing further exemplary waveforms applied to the pixel circuit of Figure 1;

[0015] Figure 4 is a graph showing a current stability of the pixel circuit of Figure 1;

[0016] Figure 5 is a diagram showing a pixel circuit which has p-type transistors and corresponds to the pixel circuit of Figure 1;

[0017] Figure 6 is a timing diagram showing exemplary waveforms applied to the pixel circuit of Figure 5;

[0018] Figure 7 is a timing diagram showing further exemplary waveforms applied to the pixel circuit of Figure 5;

[0019] Figure 8 is a diagram showing a pixel circuit in accordance with a further embodiment of the present invention;

[0020] Figure 9 is a timing diagram showing exemplary waveforms applied to the pixel circuit of Figure 8;

[0021] Figure 10 is a diagram showing a pixel circuit which has p-type transistors and corresponds to the pixel circuit of Figure 8;

[0022] Figure 11 is a timing diagram showing exemplary waveforms applied to the pixel circuit of Figure 10;

[0023] Figure 12 is a diagram showing a pixel circuit in accordance with an embodiment of the present invention;

[0024] Figure 13 is a timing diagram showing exemplary waveforms applied to the display of Figure 12;

[0025] Figure 14 is a graph showing the settling time of a CBVP pixel circuit for different bias currents;

[0026] Figure 15 is a graph showing I-V characteristic of the CBVP pixel circuit as well as the total error induced in the pixel current;

[0027] Figure 16 is a diagram showing a pixel circuit which has p-type transistors and corresponds to the pixel circuit of Figure 12;

[0028] Figure 17 is a timing diagram showing exemplary waveforms applied to the display of Figure 16;

[0029] Figure 18 is a diagram showing a VBCP pixel circuit in accordance with a further embodiment of the present invention;

[0030] Figure 19 is a timing diagram showing exemplary waveforms applied to the pixel circuit of Figure 18;

[0031] Figure 20 is a diagram showing a VBCP pixel circuit which has p-type transistors and corresponds to the pixel circuit of Figure 18;

[0032] Figure 21 is a timing diagram showing exemplary waveforms applied to the pixel circuit of Figure 20;

[0033] Figure 22 is a diagram showing a driving mechanism for a display array having CBVP pixel circuits; and

[0034] Figure 23 is a diagram showing a driving mechanism for a display array having VBCP pixel circuits.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS OF THE INVENTION

[0035] Embodiments of the present invention are described using a pixel having an organic light emitting diode (OLED) and a driving thin film transistor (TFT). However,

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摘要(译)

提供有源矩阵发光装置显示器及其驱动技术。像素包括发光器件和多个晶体管。电容器可以用于存储施加到驱动晶体管的电压，使得通过发光器件的电流与晶体管和发光器件特性的任何偏移无关。根据驱动方案将偏置数据和编程数据提供给像素电路。