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(54) **Emission driving unit, emission driver, and organic light emitting display device having the same**
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Description

FIELD OF THE INVENTION

[0001] The disclosed technology relates generally to an emission driver. More particularly, the technology relates to an emission driver implemented with N-type transistors or P-type transistors.

DESCRIPTION OF THE RELATED TECHNOLOGY

[0002] According to a sequential emission method for driving an organic light emitting diode (OLED) display device, data may be scanned by each scan-line in response to a scan signal that is sequentially applied. Organic light emitting diodes may emit light according to each scan-line in response to an emission signal that is also sequentially applied. Thus, a continuous dimming effect may be achieved by controlling an off duty ratio (i.e., a length of a period in which the emission signal is not applied). In addition, a motion blur may be eliminated because an off duty ratio provides a black band insertion effect.

[0003] However, in case that an emission driver that provides the emission signal is implemented by complementary metal-oxide semiconductor (CMOS) transistors, an operational speed of the emission driver may be slow, and an inversion input signal may be additionally required for proper operation of the emission driver.

[0004] In the US 2007/052653A1 a scan driving unit is disclosed with an inversion circuit, a buffer unit and a transfer unit. In the US 2007/103389 A1 a data driving circuit is disclosed including a D/A converter connected to a latch unit which may receive digital data signals and output analog data signals. In the US 2011/0256779 A1 a light emission unit is disclosed, which requires an inverted synchronization signal and a clock signal to control the light emission. EP 2474969A1 discloses further an emission driving circuit including a number of clock signals.

SUMMARY OF THE INVENTION

[0005] One inventive aspect is an emission driving unit according to claim 1 and claim 6.

[0006] Another inventive aspect is an emission driver, which includes a first emission driving unit configured to receive a frame line mark (FLM) signal as an input signal, and to output a first emission signal and a first sequential input signal, the first emission driving unit being controlled by a first clock signal and a second clock signal. The emission driver also includes second through (n)th emission driving units, where n is an integer greater than or equal to 3. The emission driving units are configured to output second through (n)th emission signals, respectively. The second through (n)th emission driving units are controlled by the first clock signal and the second clock signal. The first through (n-1)th emission driving

units sequentially provide the first sequential input signal and second through (n-1)th sequential input signals as the input signal to the second through (n)th emission driving units, respectively, and each of the first through (n)th emission driving units includes an input signal generating circuit configured to receive the input signal according to the first clock signal, to receive the second clock signal according to the input signal, and to output one of the first through (n-1)th sequential input signals. Each emission driving unit also includes an inverter circuit configured to receive the input signal according to the first clock signal, and to invert the input signal to generate an inverter output signal. Each emission driving unit also includes an output switching circuit configured to output a first voltage having a logic high level or a second voltage having a logic low level as one of the first through (n)th emission signals in response to the inverter output signal. Each of the first through (n)th emission driving units may be implemented by transistors of the same kind. The first through (n)th emission signals may be substantially inverted versions of the FLM signal.

[0007] Another inventive aspect is an organic light emitting diode display device including a display panel configured to receive a first power voltage and a second power voltage. The display panel has a plurality of pixel circuits, and each of the pixel circuits includes an organic light emitting diode, and a scan driver configured to sequentially provide first through (n)th scan signals, where n is an integer greater than or equal to 3, to the pixel circuits via first through (n)th scan-lines. The display panel also includes a data driver configured to provide data voltages to the pixel circuits via a plurality of data-lines according to the first through (n)th scan signals, an emission driver configured to sequentially provide first through (n)th emission signals to the pixel circuits via first through (n)th emission control-lines, and a timing controller configured to provide a first clock signal and a second clock signal to the scan driver, the data driver, and the emission driver. The emission driver includes first through (n)th emission driving units that generate the first through (n)th emission signals, respectively, and each of the first through (n)th emission driving units is controlled by the first clock signal and the second clock signal. Each of the first through (n)th emission driving units is implemented by transistors of the same kind, and the first through (n)th emission driving units receive a frame line mark (FLM) signal and first through (n-1)th sequential input signals as an input signal, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Illustrative, non-limiting example embodiments will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings.

FIG. 1 is a circuit diagram illustrating an emission driving unit according to example embodiments.

FIG. 2A is a block diagram illustrating an emission driver according to example embodiments.

FIG. 2B is a timing diagram illustrating an operation of an emission driver of FIG. 2A.

FIG. 3A is a circuit diagram illustrating an inverter circuit included in an emission driving unit of FIG. 1. FIG. 3B is a timing diagram illustrating an operation of an inverter circuit of FIG. 3A.

FIG. 4 is a diagram illustrating a relation between an input and an output of an emission driving unit of FIG. 1.

FIG. 5 is a circuit diagram illustrating an emission driving unit according to example embodiments.

FIG. 6 is a circuit diagram illustrating an emission driving unit according to example embodiments.

FIG. 7 is a circuit diagram illustrating an inverter circuit included in an emission driving unit of FIG. 6.

FIG. 8 is a circuit diagram illustrating an emission driving unit according to example embodiments.

FIG. 9 is a block diagram illustrating an organic light emitting display device according to example embodiments.

FIG. 10 is a block diagram illustrating an electric device having an organic light emitting display device of FIG. 9.

DETAILED DESCRIPTION OF CERTAIN INVENTIVE EMBODIMENTS

[0009] It will be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element or intervening elements may be present. In contrast, when an element is referred to as being "directly connected" or "directly coupled" to another element, there are no intervening elements present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.).

[0010] It will be understood that embodiments of the invention may be combined if not explicitly stated otherwise.

[0011] FIG. 1 is a circuit diagram illustrating an emission driving unit according to example embodiments.

[0012] Referring to FIG. 1, the emission driving unit 100 may include an input signal generating circuit 110, an inverter circuit 130, and an output switching circuit 150.

[0013] In one example embodiment, the emission driving unit 100 may be implemented by only N-channel metal-oxide semiconductor (NMOS) transistors. In another example embodiment, the emission driving unit 100 may be implemented by only P-channel metal-oxide semiconductor (PMOS) transistors. A conventional emission driving unit is implemented by complementary metal-oxide semiconductor (CMOS) transistors including NMOS transistors and PMOS transistors. As a result, although

the conventional emission driving unit consumes low power, an operational speed of the conventional emission driving unit may be slow, and an inversion input signal may be additionally required for an operation of the conventional emission driving unit. Therefore, the emission driving unit 100 may include an inverter circuit. As a result, the emission driving unit 100 may be implemented by only N-type transistors or only P-type transistors, and may be controlled by one non-inversion input signal and two clock signals. As illustrated in FIG. 1, the emission driving unit 100 may be implemented by only NMOS transistors. Hereinafter, a structure and an operation of the emission driving unit 100 implemented by only NMOS transistors is described in detail.

[0014] The input signal generating circuit 110 receives a frame line mark signal FLM in response to a first clock signal CLK1, receives a second clock signal CLK2 according to the frame line mark signal FLM, and outputs a sequential input signal NEXT_IN. In one example embodiment, the input signal generating circuit 110 may include a first transistor M1, a second transistor M2, and a first capacitor C1. The first transistor M1 may include a source electrode, a drain electrode for receiving the frame line mark signal FLM, and a gate electrode for applying the frame line mark signal FLM to the source electrode in response to the first clock signal CLK1. The second transistor M2 may include a drain electrode for receiving the second clock signal CLK2, a gate electrode coupled to the source electrode of the first transistor M1, and a source electrode for outputting the sequential input signal NEXT_IN. The first capacitor C1 may be coupled between the source electrode of the first transistor M1 and the source electrode of the second transistor M2.

[0015] The inverter circuit 130 receives the frame line mark signal FLM in response to the first clock signal CLK1, and generates an inverter output signal IVT_OUT by inverting the frame line mark signal FLM. The inverter circuit 130 includes third through eighth transistors M3 through M8, and first through third capacitors C1 through C3.

[0016] In the inverter circuit 130, the third transistor M3 provides the frame line mark signal FLM to a first node N1 in response to the first clock signal CLK1. The fourth transistor M4 includes a gate electrode coupled to the first node N1, a source electrode coupled to a second voltage supply terminal VGL (i.e., a terminal for supplying a second voltage VGL), and a drain electrode coupled to a second node N2. The second capacitor C2 is coupled between the first node N1 and the second voltage supply terminal VGL. The fifth transistor M5 includes a drain electrode coupled to the source electrode of the second transistor M2 of the input signal generating circuit 110, a source electrode coupled to the second voltage supply terminal VGL, and a gate electrode coupled to the second node N2. The sixth transistor M6 includes a source electrode coupled to the second node N2, a drain electrode coupled to a third node N3, and a gate electrode for receiving the second clock signal CLK2. The seventh tran-

sistor M7 includes a source electrode coupled to the third node N3, a drain electrode coupled to a first voltage supply terminal VGH (i.e., a terminal for supplying a first voltage VGH), and a gate electrode for receiving the first clock signal CLK1. The eighth transistor M8 includes a gate electrode coupled to the third node N3, a drain electrode for receiving the second clock signal CLK2, and a source electrode coupled to a fourth node N4. The third capacitor C3 is coupled between the third node N3 and the fourth node N4.

[0017] The inverter circuit 130 may invert an input signal to output an inverted input signal in response to a clock signal that is periodically applied. Therefore, the inverter circuit 130 may generate the inverter output signal IVT_OUT by inverting the frame line mark signal FLM in response to the first and second clock signals CLK1 and CLK2. An operation of the inverter circuit 130 is described in detail with reference to FIGS. 3A and 3B.

[0018] The output switching circuit 150 may output a first voltage VGH having a logic high level or a second voltage VGL having a logic low level as an emission signal OUT in response to the inverter output signal IVT_OUT. Hence, the emission signal OUT output from the emission driving unit 100 may have a pulse shape. In one example embodiment, the output switching circuit 150 may include an output terminal Nout, a ninth transistor M9, and a tenth transistor M10. The emission signal OUT may be output at the output terminal Nout. The ninth transistor M9 may include a gate electrode coupled to the first node N1, a source electrode coupled to the second voltage supply terminal VGL, and a drain electrode coupled to the output terminal Nout. The tenth transistor M10 may include a gate electrode coupled to the second node N2, a source electrode coupled to the output terminal Nout, and a drain electrode coupled to the first voltage supply terminal VGH.

[0019] In the emission driving unit 100, the emission signal OUT may have an inverted shape of the frame line mark signal FLM. In one example embodiment, when the frame line mark signal FLM has one high-pulse that rises from a logic low level to a logic high level, the emission signal OUT may have one low-pulse that falls from a logic high level to a logic low level. Here, since an emission transistor included in a pixel circuit is also an NMOS transistor, the emission transistor may turn-off in a period corresponding to a logic low level of the emission signal OUT. On the other hand, the emission transistor may turn-on in a period corresponding to a logic high level of the emission signal OUT, so that an organic light emitting diode coupled to the emission transistor may emit light.

[0020] In one example embodiment, the emission signal OUT (e.g., may be referred to as a first voltage) may have a high voltage level enough to turn-on an NMOS transistor (e.g., the emission transistor), and the emission signal OUT (e.g., may be referred to as a second voltage) may have a low voltage level enough to turn-off an NMOS transistor (e.g., the emission transistor).

[0021] FIG. 2A is a block diagram illustrating an emis-

sion driver according to example embodiments.

[0022] Referring to FIG. 2A, the emission driver 200 may include a plurality of emission driving units 100_1 through 100_4. Here, the number of emission driving units corresponds to the number of scan-lines of an organic light emitting display device. For example, in case that there are N scan-lines between a display panel and a scan driver, the emission driver 200 may include N emission driving units 100_1 through 100_N. Although first through fourth emission driving units 100_1 through 100_4 are illustrated in FIG. 2A, the number of emission driving units are not limited thereto. Hereinafter, an operation of the emission driver 200 is described in detail.

[0023] The first emission driving unit 100_1 may receive a frame line mark signal FLM as an input signal, and may output a first emission signal OUT1 and a first sequential input signal NEXT_IN1. Here, the first emission driving unit 100_1 may be controlled by a first clock signal CLK1 and a second clock signal CLK2. The first emission signal OUT1 may be applied to a display panel via a first emission line. The first sequential input signal NEXT_IN1 may be applied as an input signal to a next stage (i.e., the second emission driving unit 100_2). In other words, a sequential input signal output from one stage may be used as an input signal for another stage that is adjacent to the stage. Thus, if an input signal FLM is input to the first emission driving unit 100_1, the first through third sequential input signals NEXT_IN1 through NEXT_IN3 output from the first through third emission driving units 100_1 through 100_3 may be applied to the second through fourth emission driving unit 100_2 through 100_4, respectively.

[0024] Each of the emission driving units 100_1 through 100_4 may include an input signal generating circuit, an inverter circuit, and an output switching circuit. The input signal generating circuit may receive an input signal (i.e., FLM, NEXT_IN1 through NEXT_IN3) in response to the first clock signal CLK1, may receive the second clock signal CLK2 in response to the input signal (i.e., FLM, NEXT_IN1 through NEXT_IN3), and may output one signal of the first through fourth sequential input signals NEXT_IN1 through NEXT_IN4. The inverter circuit may receive an input signal (i.e., FLM, NEXT_IN1 through NEXT_IN3) in response to the first clock signal CLK1, and may invert the input signal (i.e., FLM, NEXT_IN1 through NEXT_IN3) to generate an inverter output signal. The output switching circuit may output a first voltage having a logic high level or a second voltage having a logic low level as one signal of the first through fourth emission signals OUT1 through OUT4 in response to the inverter output signal. As described above, the emission driver 200 may be controlled by only three signals (i.e., FLM, CLK1, and CLK2) without any additional inversion signal. In one example embodiment, each of the emission driving units 100_1 through 100_4 may be implemented by transistors of the same kind (i.e., only N-type transistors or only P-type transistors).

[0025] FIG. 2B is a timing diagram illustrating opera-

tions of an emission driver of FIG. 2A.

[0026] Referring to FIGS. 2A and 2B, after the frame line mark signal FLM is applied to the first emission driving unit 100_1, the first through fourth emission signals OUT1 through OUT4 are sequentially output as the first through third sequential input signals NEXT_IN1, NEXT_IN2, and NEXT_IN3 are sequentially applied to the second through fourth emission driving unit 100_2 through 100_4. That is, a low-pulse of the emission signal (i.e., OUT1 through OUT4) may be shifted by a predetermined time interval. Therefore, organic light emitting diodes may emit light by each scan-line in a display panel that receives the first through fourth emission signals OUT1 through OUT4. In one example embodiment, each of the first through fourth emission signals OUT1 through OUT4 may have an inverted shape of the frame line mark signal FLM.

[0027] FIG. 3A is a circuit diagram illustrating an inverter circuit included in an emission driving unit of FIG. 1. FIG. 3B is a timing diagram illustrating operations of an inverter circuit of FIG. 3A.

[0028] Referring to FIGS. 3A and 3B, the inverter circuit 300 may correspond to the inverter circuit 130 of FIG. 1. In detail, an input signal IN, an output signal OUT, and a node A of the inverter circuit 300 may correspond to the frame line mark signal FLM, the inverter output signal IVT_OUT, and the third node N3 of the inverter circuit 130 of FIG. 1, respectively. As illustrated in FIG. 3A, the inverter circuit 300 may be implemented with NMOS transistors. Hereinafter, an operation of the inverter circuit 300 is described in detail.

[0029] The first transistor T1 may output a second voltage VGL having a logic low level as the output signal OUT in response to the input signal IN having a logic high level. Namely, when the input signal IN has a logic high level, the first transistor T1 may turn-on. Thus, the second voltage VGL may be output as the output signal OUT. On the other hand, when the input signal IN has a logic low level, the first transistor T1 may turn-off. Thus, a first voltage VGH having a logic high level may be output as the output signal OUT based on a first clock signal CLK1 and a second clock signal CLK2. In detail, the output signal OUT may become the first voltage VGH (i.e., a level of the output signal OUT may rise to a logic high level) at a rising edge t2 of the second clock signal CLK2 following a falling edge t1 of the input signal IN. In this way, the input signal IN may be inverted by the inverter circuit 300, and then an inverted signal of the input signal IN may be output as the output signal OUT.

[0030] FIG. 4 is a diagram illustrating a relation between an input and an output of an emission driving unit of FIG. 1.

[0031] Referring to FIGS. 1 and 4, an output signal OUT may have an inverted shape of an input signal FLM. Here, the input signal FLM may correspond to the frame line mark signal FLM of FIG. 1, and the output signal OUT may correspond to the emission signal OUT of FIG. 1. In one example embodiment, an organic light emitting

display device may be implemented with NMOS transistors. In this case, organic light emitting diodes may emit light when an emission signal having a logic high level is applied. On the other hand, organic light emitting diodes may not emit light when an emission signal having a logic low level is applied. Thus, a period in which an emission signal having a logic low level is applied may correspond to a non-emission period.

[0032] As illustrated in FIG. 4, a pulse width of a logic high level of the input signal FLM may be proportional to a pulse width of a logic low level of the output signal OUT. For instance, as a pulse width of a logic high level of the input signal FLM increases from "a" to "b", a pulse width of a logic low level of the output signal OUT may increase from "a" to "b". Thus, a length of the non-emission period may increase. According to this embodiment, a length of the non-emission period may be adjusted by adjusting a pulse width of a logic high level of the frame line mark signal FLM input to the emission driving unit 100. In the non-emission period, operations such as data scan, threshold voltage compensation, etc are performed for a pixel circuit. Hence, this embodiment may achieve a sufficient time for performing the operations such as data scan, threshold voltage compensation, etc by adjusting a length of the non-emission period.

[0033] In addition, since organic light emitting diodes do not emit light in the non-emission period, this embodiment may achieve a continuous dimming effect by adjusting a length of the non-emission period. Further, the this embodiment may eliminate a motion blur by adjusting a length of the non-emission period because the non-emission period provides a black band insertion effect. Thus, an impulse driving operation may be performed using the emission driving unit 100 that is implemented with NMOS transistors.

[0034] FIG. 5 is a circuit diagram illustrating an emission driving unit according to example embodiments.

[0035] Referring to FIG. 5, except for an output control circuit 510, the emission driving unit 500 may have the same structure as the emission driving unit 100 of FIG. 1. Thus, repeated descriptions of features of the emission driving unit 100 of FIG. 1 are omitted below. Hereinafter, operation of the emission driving unit 500 is described with focus on the output control circuit 510.

[0036] The output control circuit 510 may be coupled to an inverter circuit, and may be controlled by an output control signal ESR. The output control circuit 510 may include a first output control transistor Q1 and a second output control transistor Q2.

[0037] In one example embodiment, when the output control signal having a logic high level is applied to the output control circuit 510, a second voltage VGL having a DC level may be output as an emission signal OUT. In detail, when the output control signal ESR having a logic high level is applied, the first and second output control transistors Q1 and Q2 may turn-on. As a result, a ninth transistor M9 may turn-on because a first voltage VGH having a logic high level is applied to a gate electrode of

the ninth transistor M9. In addition, a tenth transistor M10 may turn-off because the second voltage VGL having a logic low level is applied to a gate electrode of the tenth transistor M10. Thus, the second voltage VGL may be output as the emission signal OUT by the ninth transistor M9. As described above, the emission driving unit 500 having the output control circuit 510 may control the emission signal OUT to have a DC level. For example, if an organic light emitting display device is implemented with NMOS transistors, the emission driving unit 500 may control the emission signal OUT to have a logic low DC level. On the other hand, if an organic light emitting display device is implemented with PMOS transistors, the emission driving unit 500 may control the emission signal OUT to have a logic high DC level. In addition, when the output control signal ESR having a logic low level is applied to the output control circuit 510, the first and second output control transistors Q1 and Q2 may turn-off. As a result, the emission driving unit 500 may be substantially the same circuit as the emission driving unit 100 of FIG. 1.

[0038] As described above, the output control circuit 510 may perform a function (or, operation) for maintaining the emission signal OUT to be a DC signal having a logic high level or a logic low level. In one example embodiment, the emission driving unit 500 having the output control circuit 510 may be used for initially operating an organic light emitting display device. When an organic light emitting display device is initially operated, a preparation time for a normal operation mode may be required. At this time (i.e., during the preparation time), it may be beneficial to prevent organic light emitting diodes from emitting light. Therefore, the output control signal ESR having a logic low level may be applied to the output control circuit 510 when initially operating an organic light emitting display device. As a result, organic light emitting diodes may be controlled to be in a turn-off state because the emission signal OUT has a logic low DC level during the preparation time.

[0039] FIG. 6 is a circuit diagram illustrating an emission driving unit according to example embodiments. Here, the emission driving unit 600 may be implemented with PMOS transistors. Referring to FIG. 6, the emission driving unit 600 includes an input signal generating circuit 610, an inverter circuit 630, and an output switching circuit 650.

[0040] The input signal generating circuit 610 receives a frame line mark signal FLM in response to a first clock signal CLK1, receives a second clock signal CLK2 in response to the frame line mark signal FLM, and outputs a sequential input signal NEXT_IN. In one example embodiment, the input signal generating circuit 610 may include a first transistor M1, a second transistor M2, and a first capacitor C1. The first transistor M1 may include a drain electrode, a source electrode for receiving the frame line mark signal FLM, and a gate electrode for applying the frame line mark signal FLM to the drain electrode in response to the first clock signal CLK1. The second transistor M2 may include a source electrode for re-

ceiving the second clock signal CLK2, a gate electrode coupled to the drain electrode of the first transistor M1, and a drain electrode for outputting the sequential input signal NEXT_IN. The first capacitor C1 may be coupled between the drain electrode of the first transistor M1 and the drain electrode of the second transistor M2.

[0041] The inverter circuit 630 receives the frame line mark signal FLM in response to the first clock signal CLK1, and generates an inverter output signal IVT_OUT by inverting the frame line mark signal FLM. The inverter circuit 630 includes third through eighth transistors M3 through M8, and first through third capacitors C1 through C3.

[0042] In the inverter circuit 630, the third transistor M3 provides the frame line mark signal FLM to a first node N1 in response to the first clock signal CLK1. The fourth transistor M4 includes a gate electrode coupled to the first node N1, a source electrode coupled to a first voltage supply terminal VGH (i.e., a terminal for supplying a first voltage VGH), and a drain electrode coupled to a second node N2. The second capacitor C2 is coupled between the first node N1 and the first voltage supply terminal VGH. The fifth transistor M5 includes a drain electrode coupled to the drain electrode of the second transistor M2 of the input signal generating circuit 610, a source electrode coupled to the first voltage supply terminal VGH, and a gate electrode coupled to the second node N2. The sixth transistor M6 includes a source electrode coupled to the second node N2, a drain electrode coupled to a third node N3, and a gate electrode for receiving the second clock signal CLK2. The seventh transistor M7 includes a source electrode coupled to the third node N3, a drain electrode coupled to a second voltage supply terminal VGL (i.e., a terminal for supplying a second voltage VGL), and a gate electrode for receiving the first clock signal CLK1. The eighth transistor M8 includes a gate electrode coupled to the third node N3, a source electrode for receiving the second clock signal CLK2, and a drain electrode coupled to a fourth node N4. The third capacitor C3 is coupled between the third node N3 and the fourth node N4. The inverter circuit 630 generates the inverter output signal IVT_OUT by inverting the frame line mark signal FLM in response to the first and second clock signals CLK1 and CLK2.

[0043] The output switching circuit 650 may output a first voltage VGH having a logic high level or a second voltage VGL having a logic low level as an emission signal OUT in response to the inverter output signal IVT_OUT. Hence, the emission signal OUT output from the emission driving unit 600 may have a pulse shape. In one example embodiment, the output switching circuit 650 may include an output terminal Nout, a ninth transistor M9, and a tenth transistor M10. The emission signal OUT may be output at the output terminal Nout. The ninth transistor M9 may include a gate electrode coupled to the first node N1, a source electrode coupled to the first voltage supply terminal VGH, and a drain electrode coupled to the output terminal Nout. The tenth transistor M10

may include a gate electrode coupled to the second node N2, a source electrode coupled to the output terminal Nout, and a drain electrode coupled to the second voltage supply terminal VGL.

[0044] In the emission driving unit 600, the emission signal OUT may have an inverted shape of the frame line mark signal FLM. In one example embodiment, when the frame line mark signal FLM has one low-pulse that falls from a logic high level to a logic low level, the emission signal OUT may have one high-pulse that rises from a logic low level to a logic high level. Here, since an emission transistor included in a pixel circuit is also a PMOS transistor, the emission transistor may turn-off in a period corresponding to a logic high level of the emission signal OUT. On the other hand, the emission transistor may turn-on in a period corresponding to a logic low level of the emission signal OUT, so that an organic light emitting diode coupled to the emission transistor may emit light.

[0045] In one example embodiment, the emission signal OUT (e.g., may be referred to as a first voltage) may have a high voltage level enough to turn-off an PMOS transistor (i.e., the emission transistor), and the emission signal OUT (e.g., may be referred to as a second voltage) may have a low voltage level enough to turn-on an PMOS transistor (i.e., the emission transistor).

[0046] FIG. 7 is a circuit diagram illustrating an inverter circuit included in an emission driving unit of FIG. 6.

[0047] Referring to FIG. 7, the inverter circuit 700 may correspond to the inverter circuit 630 of FIG. 6. In detail, an input signal IN, an output signal OUT, and a node A of the inverter circuit 700 may correspond to the frame line mark signal FLM, the inverter output signal IVT_OUT, and the third node N3 of the inverter circuit 630 of FIG. 6, respectively. As illustrated in FIG. 7, the inverter circuit 700 may be implemented with PMOS transistors. The first transistor T1 may output a first voltage VGH having a logic high level as the output signal OUT in response to the input signal IN having a logic low level. When the input signal IN has a logic high level, the first transistor T1 may turn-off. Thus, a second voltage VGL having a logic low level may be output as the output signal OUT based on a first clock signal CLK1 and a second clock signal CLK2.

[0048] FIG. 8 is a circuit diagram illustrating an emission driving unit according to example embodiments. Referring to FIG. 8, except for an output control circuit 810, the emission driving unit 800 may have the same structure as the emission driving unit 600 of FIG. 6.

[0049] The output control circuit 810 may be coupled to an inverter circuit, and may be controlled by an output control signal ESR. The output control circuit 810 may include a first output control transistor Q1 and a second output control transistor Q2.

[0050] In one example embodiment, when the output control signal having a logic low level is applied to the output control circuit 810, a first voltage VGH having a DC level may be output as an emission signal OUT. In detail, when the output control signal ESR having a logic

low level is applied, the first and second output control transistors Q1 and Q2 may turn-on. As a result, a ninth transistor M9 may turn-on because a second voltage VGL having a logic low level is applied to a gate electrode of the ninth transistor M9. In addition, a tenth transistor M10 may turn-off because the first voltage VGH having a logic high level is applied to a gate electrode of the tenth transistor M10. Thus, the first voltage VGH may be output as the emission signal OUT by the ninth transistor M9. On the other hand, when the output control signal ESR having a logic high level is applied to the output control circuit 810, the first and second output control transistors Q1 and Q2 may turn-off. As a result, the emission driving unit 800 may be substantially the same circuit as the emission driving unit 600 of FIG. 6.

[0051] FIG. 9 is a block diagram illustrating an organic light emitting display device according to example embodiments. Referring to FIG. 9, the organic light emitting display device 900 may include a display panel 910, a scan driver 920, a data driver 930, an emission driver 200, and a timing controller 940.

[0052] The display panel 910 may include a plurality of pixel circuits. The display panel 910 may receive a first power voltage ELVDD and a second power voltage ELVSS. Each pixel circuit may include an organic light emitting diode. The scan driver 920 may sequentially provide first through (n)th scan signals to the pixel circuits via first through (n)th scan-lines S1 through Sn, where n is an integer greater than or equal to 3. The data driver 930 may provide data voltages to the pixel circuits via a plurality of data-lines D1 through Dm based on the first through (n)th scan signals. The emission driver 200 may sequentially provide first through (n)th emission signals to the pixel circuits via first through (n)th emission control-lines EM1 through EMn. The timing controller 940 may provide a first clock signal CLK1 and a second clock signal CLK2 to the scan driver 920, the data driver 930, and the emission driver 200.

[0053] In one example embodiment, the emission driver 200 may include first through (n)th emission driving units that generates the first through (n)th emission signals, respectively. In example embodiments, each of the first through (n)th emission driving units may include an inverter circuit. Hence, each of the first through (n)th emission driving units may be implemented by only NMOS transistors or only PMOS transistors. Each of the first through (n)th emission driving units may be controlled by the first clock signal CLK1 and the second clock signal CLK2. In addition, the first through (n)th emission driving units may receive a frame line mark (FLM) signal and first through (n-1)th sequential input signals as an input signal, respectively.

[0054] In example embodiments, the emission driver 200 may be implemented with NMOS transistors. In this case, a period in which the first through (n)th emission signals have a logic low level may correspond to a period in which a data programming operation is performed for the pixel circuits. In addition, a period in which the first

through (n)th emission signals have a logic high level may correspond to a period in which organic light emitting diodes included in the pixel circuits emit light.

[0055] Meanwhile, the emission driver 200 may adjust a length of a period in which the display panel 910 displays a black image by controlling an off duty ratio of the first through (n)th emission signals. Thus, an impulse driving operation may be performed using the emission driver 200 that is implemented by transistors of the same kind (i.e., only N-type transistors or only P-type transistors).

[0056] In one example embodiment, as the emission driver 200 sequentially provide the first through (n)th emission signals to the pixel circuits, the organic light emitting diodes included in the pixel circuits may sequentially emit light.

[0057] FIG. 10 is a block diagram illustrating an electric device having an organic light emitting display device of FIG. 9. Referring to FIG. 10, the electric device 1000 may include a processor 1100, a memory device 1200, an input/output (I/O) device 1300, and an organic light emitting display (OLED) device 900. Here, the electric device 100 may correspond to any system having the OLED device 900 such as a cellular phone, a smart phone, a smart pad, a television, a personal digital assistant (PDA), a MP3 player, a laptop, a computer, a digital camera, etc.

[0058] The processor 1100 may perform various computing functions. For example, the processor 1100 may be a micro-processor, a central processing unit (CPU), etc. The processor 1100 may be coupled to the memory device 1200 and the OLED device 900 via a bus 1001. The processor 1100 may perform communications with the memory device 1200 and the OLED device 900 via an address bus, a control bus, a data bus, etc. According to some example embodiments, the processor 1100 may be coupled to an extended bus such as a peripheral component interconnection (PCI) bus.

[0059] The memory device 1200 may store data for operations of the electric device 1000. For example, the memory device 1200 may include a volatile memory device such as a dynamic random access memory (DRAM) device, a static random access memory (SRAM) device, a mobile DRAM, etc, and a non-volatile memory device such as an erasable programmable read-only memory (EPROM) device, an electrically erasable programmable read-only memory (EEPROM) device, a flash memory device, etc.

[0060] The I/O device 1300 may be coupled to the bus 1001. The I/O device may include input means such as a keyboard, a mouse, a keypad, etc, and output means such as a printer, etc. The processor 1100 may control operations of the I/O device 1300.

[0061] The OLED device 900 may be coupled to the processor 1100 via the bus 1001. The OLED device 900 may include a display panel 910 and an emission driver 200. As described above, the emission driver 200 may include an inverter circuit. Thus, the emission driver 200

may be implemented by transistors of the same kind (i.e., only N-type transistors or only P-type transistors). In addition, the emission driver 200 may freely adjust a pulse width of an emission signal by adjusting a pulse width of an input signal.

[0062] The presented concepts may be applied to an electric device having a display device. For example, the presented concepts may be applied to a monitor, a laptop, a PDA, a cellular phone, a smart phone, a smart pad, etc.

Claims

1. An emission driving unit (100), comprising:

an input signal generating circuit (110) configured to receive a frame line mark (FLM) signal according to a first clock signal (CLK1), to receive a second clock signal (CLK2) according to the FLM signal, and to output a sequential input signal (NEXT IN);

an inverter circuit (130) configured to receive the FLM signal according to the first clock signal (CLK1), and to invert the FLM signal to generate an inverter output signal (IVT_OUT); and

an output switching circuit (150) configured to output a first voltage (VGH) having a logic high level or a second voltage (VGL) having a logic low level as an emission signal (OUT) in response to the inverter output signal (IVT_OUT), wherein the input signal generating circuit (110), the inverter circuit (130), and the output switching circuit (150) are implemented with only N-channel metal-oxide semiconductor (NMOS) transistors

characterized in that the inverter circuit (130) includes

a first transistor (M1) having a source electrode, a drain electrode that receives the FLM signal, and a gate electrode that receives the first clock signal (CLK1), the FLM signal being transmitted from the drain electrode of the first transistor (M1) to the source electrode of the first transistor (M1) in response to the first clock signal (CLK1); a second transistor (M2) having a drain electrode that receives the second clock signal (CLK2), a gate electrode coupled to the source electrode of the first transistor (M1), and a source electrode that outputs the sequential input signal (NEXT IN);

and a first capacitor (C1) coupled between the source electrode of the first transistor (M1) and the source electrode of the second transistor (M2);

a third transistor (M3) configured to transmit the FLM signal to a first node (N1) in response to the first clock signal (CLK1);

- a fourth transistor (M4) having a gate electrode coupled to the first node (N1), a source electrode coupled to a second voltage supply terminal (VGL), and a drain electrode coupled to a second node (N2);
- a second capacitor (C2) coupled between the first node (N1) and the second voltage supply terminal (VGL);
- a fifth transistor (M5) having a drain electrode coupled to the source electrode of the second transistor (M2), a source electrode coupled to the second voltage supply terminal (VGL), and a gate electrode coupled to the second node (N2);
- a sixth transistor (M6) having a source electrode coupled to the second node (N2), a drain electrode coupled to a third node (N3), and a gate electrode that receives the second clock signal (CLK2);
- a seventh transistor (M7) having a source electrode coupled to the third node (N3), a drain electrode coupled to a first voltage supply terminal (VGH), and a gate electrode that receives the first clock signal (CLK1);
- an eighth transistor (M8) having a gate electrode coupled to the third node (N3), a drain electrode that receives the second clock signal (CLK2), and a source electrode coupled to a fourth node (N4); and
- a third capacitor (C3) coupled between the third node (N3) and the fourth node (N4).
2. The emission driving unit of claim 1, wherein the emission signal (OUT) is substantially an inverted version of the FLM signal.
 3. The emission driving unit of one of the previous claims, wherein the output switching circuit (150) includes:
 - an output terminal (Nout) configured to output the emission signal (OUT);
 - a ninth transistor (M9) having a gate electrode coupled to the first node (N1), a source electrode coupled to the second voltage supply terminal (VGL), and a drain electrode coupled to the output terminal (Nout); and
 - a tenth transistor (M10) having a gate electrode coupled to the second node (N2), a source electrode coupled to the output terminal (Nout), and a drain electrode coupled to the first voltage supply terminal (VGH).
 4. The emission driving unit of claim 3, further comprising:
 - an output control circuit (510) having a first output control transistor (Q1) coupled between the first voltage supply terminal (VGH) and the first node (N1),
- and a second output control transistor (Q2) coupled between the second voltage supply terminal (VGL) and the second node (N2).
5. The emission driving unit of claim 4, wherein the second voltage (VGL) having a DC level is output as the emission signal (OUT) when an output control signal having a logic high level is applied to the output control circuit (510).
 6. An emission driving unit (100), comprising:
 - an input signal generating circuit (110) configured to receive a frame line mark (FLM) signal according to a first clock signal (CLK1), to receive a second clock signal (CLK2) according to the FLM signal, and to output a sequential input signal (NEXT IN);
 - an inverter circuit (130) configured to receive the FLM signal according to the first clock signal (CLK1), and to invert the FLM signal to generate an inverter output signal (IVT_OUT); and
 - an output switching circuit (150) configured to output a first voltage (VGH) having a logic high level or a second voltage (VGL) having a logic low level as an emission signal (OUT) in response to the inverter output signal (IVT_OUT), wherein the input signal generating circuit (110), the inverter circuit (130), and the output switching circuit (150) are implemented with only P-channel metal-oxide semiconductor (PMOS) transistors and wherein the emission signal (OUT) is substantially an inverted version of the FLM signal, **characterized in that** the inverter circuit (130) includes a first transistor (M1) having a drain electrode, a source electrode that receives the FLM signal, and a gate electrode that receives the first clock signal (CLK1), the FLM signal being transmitted from the source electrode of the first transistor (M1) to the drain electrode of the first transistor (M1) in response to the first clock signal (CLK1);
 - a second transistor (M2) having a source electrode that receives the second clock signal (CLK2), a gate electrode coupled to the drain electrode of the first transistor (M1), and a drain electrode that outputs the sequential input signal (NEXT IN);
 - and a first capacitor (C1) coupled between the drain electrode of the first transistor (M1) and the drain electrode of the second transistor (M2);
 - a third transistor (M3) configured to transmit the FLM signal to a first node (N1) in response to the first clock signal (CLK1);
 - a fourth transistor (M4) having a gate electrode coupled to the first node (N1), a source electrode coupled to a first voltage supply terminal (VGH), and a drain electrode coupled to a second node

- (N2);
 a second capacitor (C2) coupled between the first node (N1) and the first voltage supply terminal (VGH);
 a fifth transistor (M5) having a drain electrode coupled to the drain electrode of the second transistor (M2), a source electrode coupled to the first voltage supply terminal (VGH), and a gate electrode coupled to the second node (N2);
 a sixth transistor (M6) having a source electrode coupled to the second node (N2), a drain electrode coupled to a third node (N3), and a gate electrode that receives the second clock signal (CLK2);
 a seventh transistor (M7) having a source electrode coupled to the third node (N3), a drain electrode coupled to a second voltage supply terminal (VGL), and a gate electrode that receives the first clock signal (CLK1);
 an eighth transistor (M8) having a gate electrode coupled to the third node (N3), a source electrode that receives the second clock signal (CLK2), and a drain electrode coupled to a fourth node (N4); and
 a third capacitor (C3) coupled between the third node (N3) and the fourth node (N4).
7. The emission driving unit of claim 6, wherein the output switching circuit (150) includes:
- an output terminal (Nout) configured to output the emission signal (OUT);
 a ninth transistor (M9) having a gate electrode coupled to the first node (N1), a source electrode coupled to the first voltage supply terminal (VGH), and a drain electrode coupled to the output terminal (Nout); and
 a tenth transistor (M10) having a gate electrode coupled to the second node (N2), a source electrode coupled to the output terminal (Nout), and a drain electrode coupled to the second voltage supply terminal (VGL).
8. The emission driving unit of claim 7, further comprising:
- an output control circuit (510) coupled to the inverter circuit (130), the output control circuit (510) being controlled by an output control signal,
 wherein the first voltage (VGH) having a DC level is output as the emission signal (OUT) when the output control signal having a logic low level is applied to the output control circuit (510).
9. An emission driver (200) comprising:
- a first emission driving unit (100) according to

one of claims 1 to 8 and configured to receive a frame line mark (FLM) signal as an input signal, and to output a first emission signal (OUT) and a first sequential input signal (NEXT_IN), the first emission driving unit (100) being controlled by a first clock signal (CLK1) and a second clock signal (CLK2); and
 second through (n)th emission driving units (100) according to one of claims 1 to 10, where n is an integer greater than or equal to 3, configured to output second through (n)th emission signals (OUT), respectively, the second through (n)th emission driving units (100) being controlled by the first clock signal (CLK1) and the second clock signal (CLK2),
 wherein the first through (n-1)th emission driving units (100) sequentially provide the first sequential input signal (NEXT_IN) and second through (n-1)th sequential input signals (NEXT_IN) as the input signal to the second through (n)th emission driving units (100), respectively.

10. An organic light emitting diode display device (900) comprising:

a display panel (910) configured to receive a first power voltage and a second power voltage, the display panel (910) having a plurality of pixel circuits, and each of the pixel circuits including an organic light emitting diode;
 a scan driver (920) configured to sequentially provide first through (n)th scan signals, where n is an integer greater than or equal to 3, to the pixel circuits via first through (n)th scan-lines;
 a data driver (930) configured to provide data voltages to the pixel circuits via a plurality of data-lines according to the first through (n)th scan signals;
 an emission driver (200) configured to sequentially provide first through (n)th emission signals (OUT) to the pixel circuits via first through (n)th emission control-lines; and
 a timing controller (940) configured to provide a first clock signal (CLK1) and a second clock signal (CLK2) to the scan driver (920), the data driver (930), and the emission driver (200),
 wherein the emission driver (200) includes first through (n)th emission driving units (100) according to one of claims 1 to 8 that generate the first through (n)th emission signals (OUT), respectively.

11. The organic light emitting display device of claim 10, wherein the emission driver (200) is implemented with N-channel metal-oxide semiconductor (NMOS) transistors,
 wherein a period during which the first through (n)th emission signals (OUT) have a logic low level cor-

responds to a period during which a data programming operation is performed for the pixel circuits, and wherein a period during which the first through (n)th emission signals (OUT) have a logic high level corresponds to a period during which the organic light emitting diodes included in the pixel circuits emit light, and/or wherein the emission driver (200) adjusts a length of a period during which the display panel displays a black image by controlling an off duty ratio of the first through (n)th emission signals (OUT).

Patentansprüche

1. Eine Emissionsantriebseinheit (100), aufweisend:

eine Eingangssignal-Erzeugungsschaltung (110), die konfiguriert ist, um ein Rahmenlinienmarkierungs (FLM)-Signal gemäß einem ersten Taktsignal (CLK1) zu empfangen, ein zweites Taktsignal (CLK2) gemäß dem FLM-Signal zu empfangen und ein sequentielles Eingangssignal (NEXT_IN) auszugeben;

eine Wechselrichterschaltung (130), die konfiguriert ist, um das FLM-Signal gemäß dem ersten Taktsignal (CLK1) zu empfangen und das FLM-Signal zu invertieren, um ein Wechselrichterausgangssignal (IVT_OUT) zu erzeugen; und

einen Ausgangsschaltkreis (150), der konfiguriert ist, um eine erste Spannung (VGH), die einen logischen hohen Pegel aufweist, oder eine zweite Spannung (VGL), die einen logischen niedrigen Pegel aufweist, als Emissionssignal (OUT) in Reaktion auf das Wechselrichterausgangssignal (IVT_OUT) auszugeben, wobei die Eingangssignal-Erzeugungsschaltung (110), die Wechselrichterschaltung (130) und der Ausgangsschaltkreis (150) ausschließlich mit N-Kanal-Metalloxid-Halbleiter (NMOS)-Transistoren implementiert werden,

dadurch gekennzeichnet, dass die Wechselrichterschaltung (130) aufweist:

einen ersten Transistor (M1), der eine Source-Elektrode, eine Drain-Elektrode, die das FLM-Signal empfängt, und eine Gate-Elektrode, die das erste Taktsignal (CLK1) empfängt, aufweist, wobei das FLM-Signal in Reaktion auf das erste Taktsignal (CLK1) von der Drain-Elektrode des ersten Transistors (M1) zur Source-Elektrode des ersten Transistors (M1) übertragen wird; einen zweiten Transistor (M2), der eine Drain-Elektrode, die das zweite Taktsignal (CLK2) empfängt, eine Gate-Elektrode, die

mit der Source-Elektrode des ersten Transistors (M1) gekoppelt ist, und eine Source-Elektrode, die das sequentielle Eingangssignal (NEXT_IN) ausgibt, aufweist; und einen ersten Kondensator (C1), der zwischen die Source-Elektrode des ersten Transistors (M1) und die Source-Elektrode des zweiten Transistors (M2) gekoppelt ist;

einen dritten Transistor (M3), der konfiguriert ist, um das FLM-Signal in Reaktion auf das erste Taktsignal (CLK1) zu einem ersten Knoten (N1) zu übertragen;

einen vierten Transistor (M4), der eine Gate-Elektrode, die mit dem ersten Knoten (N1) gekoppelt ist, eine Source-Elektrode, die mit einem zweiten Spannungsversorgungsanschluss (VGL) gekoppelt ist, und eine Drain-Elektrode, die mit einem zweiten Knoten (N2) gekoppelt ist, aufweist;

einen zweiten Kondensator (C2), der zwischen den ersten Knoten (N1) und den zweiten Spannungsversorgungsanschluss (VGL) gekoppelt ist;

einen fünften Transistor (M5), der eine Drain-Elektrode, die mit der Source-Elektrode des zweiten Transistors (M2) gekoppelt ist, eine Source-Elektrode, die mit dem zweiten Spannungsversorgungsanschluss (VGL) gekoppelt ist, und eine Gate-Elektrode, die mit dem zweiten Knoten (N2) gekoppelt ist, aufweist;

einen sechsten Transistor (M6), der eine Source-Elektrode, die mit dem zweiten Knoten (N2) gekoppelt ist, eine Drain-Elektrode, die mit einem dritten Knoten (N3) gekoppelt ist, und eine Gate-Elektrode, die das zweite Taktsignal (CLK2) empfängt, aufweist;

einen siebten Transistor (M7), der eine Source-Elektrode, die mit dem dritten Knoten (N3) gekoppelt ist, eine Drain-Elektrode, die mit einem ersten Spannungsversorgungsanschluss (VGH) gekoppelt ist, und eine Gate-Elektrode, die das erste Taktsignal (CLK1) empfängt, aufweist;

einen achten Transistor (M8), der eine Gate-Elektrode, die mit dem dritten Knoten (N3) gekoppelt ist, eine Drain-Elektrode, die das zweite Taktsignal (CLK2) empfängt, und eine Source-Elektrode, die mit einem vierten Knoten (N4) gekoppelt ist, aufweist; und

einen dritten Kondensator (C3), der zwischen den dritten Knoten (N3) und den vierten Knoten (N4) gekoppelt ist.

2. Die Emissionsantriebseinheit nach Anspruch 1, wobei das Emissionssignal (OUT) im Wesentlichen eine invertierte Version des FLM-Signals ist.

3. Die Emissionsantriebseinheit nach einem der vorhergehenden Ansprüche, wobei der Ausgangsschaltkreis (150) aufweist:

einen Ausgangsanschluss (Nout), der konfiguriert ist, um das Emissionssignal (OUT) auszugeben; 5
einen neunten Transistor (M9), der eine Gate-Elektrode, die mit dem ersten Knoten (N1) gekoppelt ist, eine Source-Elektrode, die mit dem zweiten Spannungsversorgungsanschluss (VGL) gekoppelt ist, und eine Drain-Elektrode, die mit dem Ausgangsanschluss (Nout) gekoppelt ist, aufweist; und 10
einen zehnten Transistor (M10), der eine Gate-Elektrode, die mit dem zweiten Knoten (N2) gekoppelt ist, eine Source-Elektrode, die mit dem Ausgangsanschluss (Nout) gekoppelt ist, und eine Drain-Elektrode, die mit dem ersten Spannungsversorgungsanschluss (VGH) gekoppelt ist, aufweist. 15 20

4. Die Emissionsantriebseinheit nach Anspruch 3, ferner aufweisend:

eine Ausgangssteuerungsschaltung (510), die einen ersten Ausgangssteuerungstransistor (Q1), der zwischen den ersten Spannungsversorgungsanschluss (VGH) und den ersten Knoten (N1) gekoppelt ist, und einen zweiten Ausgangssteuerungstransistor (Q2), der zwischen den zweiten Spannungsversorgungsanschluss (VGL) und den zweiten Knoten (N2) gekoppelt ist, aufweist. 25 30

5. Die Emissionsantriebseinheit nach Anspruch 4, wobei die zweite Spannung (VGL), die einen DC-Pegel aufweist, als Emissionssignal (OUT) ausgegeben wird, wenn ein Ausgangssteuerungssignal, das einen logischen hohen Pegel aufweist, an der Ausgangssteuerungsschaltung (510) anliegt. 35 40

6. Eine Emissionsantriebseinheit (100), aufweisend:

eine Eingangssignal-Erzeugungsschaltung (110), die konfiguriert ist, um ein Rahmenlinienmarkierungs (FLM)-Signal gemäß einem ersten Taktsignal (CLK1) zu empfangen, ein zweites Taktsignal (CLK2) gemäß dem FLM-Signal zu empfangen und ein sequentielles Eingangssignal (NEXT_IN) auszugeben; 45
eine Wechselrichterschaltung (130), die konfiguriert ist, um das FLM-Signal gemäß dem ersten Taktsignal (CLK1) zu empfangen und das FLM-Signal zu invertieren, um ein Wechselrichterausgangssignal (IVT_OUT) zu erzeugen; und 50
einen Ausgangsschaltkreis (150), der konfiguriert ist, um eine erste Spannung (VGH), die einen logischen hohen Pegel aufweist, oder eine 55

zweite Spannung (VGL), die einen logischen niedrigen Pegel aufweist, in Reaktion auf das Wechselrichterausgangssignal (IVT_OUT) als Emissionssignal (OUT) auszugeben, wobei die Eingangssignal-Erzeugungsschaltung (110), die Wechselrichterschaltung (130) und der Ausgangsschaltkreis (150) ausschließlich mit P-Kanal-Metalloxid-Halbleiter (PMOS)-Transistoren implementiert werden, und wobei das Emissionssignal (OUT) im Wesentlichen eine invertierte Version des FLM-Signals ist, **dadurch gekennzeichnet, dass** die Wechselrichterschaltung (130) aufweist:

einen ersten Transistor (M1), der eine Drain-Elektrode, eine Source-Elektrode, die das FLM-Signal empfängt, und eine Gate-Elektrode, die das erste Taktsignal (CLK1) empfängt, aufweist, wobei das FLM-Signal in Reaktion auf das erste Taktsignal (CLK1) von der Source-Elektrode des ersten Transistors (M1) zur Drain-Elektrode des ersten Transistors (M1) übertragen wird;

einen zweiten Transistor (M2), der eine Source-Elektrode, die das zweite Taktsignal (CLK2) empfängt, eine Gate-Elektrode, die mit der Drain-Elektrode des ersten Transistors (M1) gekoppelt ist, und eine Drain-Elektrode, die das sequentielle Eingangssignal (NEXT_IN) ausgibt, aufweist; und einen ersten Kondensator (C1), der zwischen die Drain-Elektrode des ersten Transistors (M1) und die Drain-Elektrode des zweiten Transistors (M2) gekoppelt ist;

einen dritten Transistor (M3), der konfiguriert ist, um das FLM-Signal in Reaktion auf das erste Taktsignal (CLK1) zu einem ersten Knoten (N1) zu übertragen;

einen vierten Transistor (M4), der eine Gate-Elektrode, die mit dem ersten Knoten (N1) gekoppelt ist, eine Source-Elektrode, die mit einem ersten Spannungsversorgungsanschluss (VGH) gekoppelt ist, und eine Drain-Elektrode, die mit einem zweiten Knoten (N2) gekoppelt ist, aufweist;

einen zweiten Kondensator (C2), der zwischen den ersten Knoten (N1) und den ersten Spannungsversorgungsanschluss (VGH) gekoppelt ist;

einen fünften Transistor (M5), der eine Drain-Elektrode, die mit der Drain-Elektrode des zweiten Transistors (M2) gekoppelt ist, eine Source-Elektrode, die mit dem ersten Spannungsversorgungsanschluss (VGH) gekoppelt ist, und eine Gate-Elektrode, die mit dem zweiten Knoten (N2) gekoppelt ist, aufweist;

- einen sechsten Transistor (M6), der eine Source-Elektrode, die mit dem zweiten Knoten (N2) gekoppelt ist, eine Drain-Elektrode, die mit einem dritten Knoten (N3) gekoppelt ist, und eine Gate-Elektrode, die das zweite Taktsignal (CLK2) empfängt, aufweist;
- einen siebten Transistor (M7), der eine Source-Elektrode, die mit dem dritten Knoten (N3) gekoppelt ist, eine Drain-Elektrode, die mit einem zweiten Spannungsversorgungsanschluss (VGL) gekoppelt ist, und eine Gate-Elektrode, die das erste Taktsignal (CLK1) empfängt, aufweist;
- einen achten Transistor (M8), der eine Gate-Elektrode, die mit dem dritten Knoten (N3) gekoppelt ist, eine Source-Elektrode, die das zweite Taktsignal (CLK2) empfängt, und eine Drain-Elektrode, die mit einem vierten Knoten (N4) gekoppelt ist, aufweist; und
- einen dritten Kondensator (C3), der zwischen den dritten Knoten (N3) und den vierten Knoten (N4) gekoppelt ist.
7. Die Emissionsantriebseinheit nach Anspruch 6, wobei der Ausgangsschaltkreis (150) aufweist:
- einen Ausgangsanschluss (Nout), der konfiguriert ist, um das Emissionssignal (OUT) auszugeben;
- einen neunten Transistor (M9), der eine Gate-Elektrode, die mit dem ersten Knoten (N1) gekoppelt ist, eine Source-Elektrode, die mit dem ersten Spannungsversorgungsanschluss (VGH) gekoppelt ist, und eine Drain-Elektrode, die mit dem Ausgangsanschluss (Nout) gekoppelt ist, aufweist; und
- einen zehnten Transistor (M10), der eine Gate-Elektrode, die mit dem zweiten Knoten (N2) gekoppelt ist, eine Source-Elektrode, die mit dem Ausgangsanschluss (Nout) gekoppelt ist, und eine Drain-Elektrode, die mit dem zweiten Spannungsversorgungsanschluss (VGL) gekoppelt ist, aufweist.
8. Die Emissionsantriebseinheit nach Anspruch 7, ferner aufweisend:
- eine Ausgangssteuerungsschaltung (510), die mit der Wechselrichterschaltung (130) gekoppelt ist, wobei die Ausgangssteuerungsschaltung (510) von einem Ausgangssteuerungssignal gesteuert wird,
- wobei die erste Spannung (VGH), die einen DC-Pegel aufweist, als Emissionssignal (OUT) ausgegeben wird, wenn das Ausgangssteuerungssignal, das einen logischen niedrigen Pegel aufweist, an der Ausgangssteuerungsschaltung (510) anliegt.
9. Einen Emissionstreiber (200), aufweisend:
- eine erste Emissionsantriebseinheit (100) nach einem der Ansprüche 1 bis 8, die konfiguriert ist, um ein Rahmenlinienmarkierungs (FLM)-Signal als Eingangssignal zu empfangen und ein erstes Emissionssignal (OUT) und ein erstes sequentielles Eingangssignal (NEXT_IN) auszugeben, wobei die erste Emissionsantriebseinheit (100) von einem ersten Taktsignal (CLK1) und einem zweiten Taktsignal (CLK2) gesteuert wird; und
- eine zweite bis (n)te Emissionsantriebseinheit (100) nach einem der Ansprüche 1 bis 10, wobei n eine Ganzzahl größer oder gleich 3 ist, die konfiguriert sind, um jeweils ein zweites bis (n)-tes Emissionssignal (OUT) auszugeben, wobei die zweite bis (n)-te Emissionsantriebseinheit (100) durch das erste Taktsignal (CLK1) und das zweite Taktsignal (CLK2) gesteuert werden,
- wobei die erste bis (n-1)-te Emissionsantriebseinheit (100) nacheinander das erste sequentielle Eingangssignal (NEXT_IN) und das zweite bis (n-1)-te sequentielle Eingangssignal (NEXT_IN) als Eingangssignal jeweils zur zweiten bis (n)ten Emissionsantriebseinheit (100) liefern.
10. Eine organische lichtemittierende Diodenanzeigevorrichtung (900), aufweisend:
- eine Anzeigetafel (910), die konfiguriert ist, um eine erste Leistungsspannung und eine zweite Leistungsspannung zu empfangen, wobei die Anzeigetafel (910) eine Vielzahl von Pixelschaltungen aufweist und jede der Pixelschaltungen eine organische lichtemittierende Diode aufweist;
- einen Ansteuerungstreiber (920), der konfiguriert ist, um nacheinander ein erstes bis (n)-tes Ansteuerungssignal über eine erste bis (n)te Ansteuerungsleitung zu den Pixelschaltungen zu liefern, wobei n eine Ganzzahl größer oder gleich 3 ist;
- einen Datentreiber (930), der konfiguriert ist, um die Pixelschaltungen über eine Vielzahl von Datenleitungen gemäß dem ersten bis (n)ten Ansteuerungssignal mit Datenspannungen zu versorgen;
- einen Emissionstreiber (200), der konfiguriert ist, um nacheinander ein erstes bis (n)tes Emissionssignal (OUT) über eine erste bis (n)te Emissionssteuerleitung zu den Pixelschaltungen zu liefern; und
- eine Zeitsteuerung (940), die konfiguriert ist, um ein erstes Taktsignal (CLK1) und ein zweites Taktsignal (CLK2) zum Ansteuerungstreiber

(920), zum Datentreiber (930) und zum Emissionstreiber (200) zu liefern,
wobei der Emissionstreiber (200) eine erste bis (n)te Emissionsantriebseinheit (100) nach einem der Ansprüche 1 bis 8 aufweist, die jeweils das erste bis (n)te Emissionssignal (OUT) erzeugen.

11. Die organische lichtemittierende Diodenanzeigevorrichtung nach Anspruch 10, wobei der Emissionstreiber (200) mit N-Kanal-Metalloxid-Halbleiter (NMOS)-Transistoren implementiert wird, wobei eine Periode, während der das erste bis (n)te Emissionssignal (OUT) einen logischen niedrigen Pegel aufweisen, einer Periode, während der ein Datenprogrammierungsvorgang für die Pixelschaltungen durchgeführt wird, entspricht, und wobei eine Periode, während der das erste bis (n)te Emissionssignal (OUT) einen logischen hohen Pegel aufweisen, einer Periode, während der die organischen lichtemittierenden Dioden, die in den Pixelschaltungen enthalten sind, Licht emittieren, entspricht, und/oder wobei der Emissionstreiber (200) eine Länge einer Periode, während der die Anzeigetafel ein schwarzes Bild anzeigt, durch Steuern eines AUS-Tastverhältnisses des ersten bis (n)ten Emissionssignals (OUT) einstellt.

Revendications

1. Unité d'attaque d'émission (100), comprenant :

un circuit de génération de signal d'entrée (110) configuré pour recevoir un signal de marque de ligne de trame (FLM) en fonction d'un premier signal d'horloge (CLK1), pour recevoir un second signal d'horloge (CLK2) en fonction du signal de FLM, et pour délivrer en sortie un signal d'entrée séquentielle (NEXT_IN) ;
un circuit inverseur (130) configuré pour recevoir le signal de FLM en fonction du premier signal d'horloge (CLK1), et pour inverser le signal de FLM pour générer un signal de sortie d'inverseur (IVT_OUT) ; et
un circuit de commutation de sortie (150) configuré pour délivrer en sortie une première tension (VGH) ayant un niveau logique haut ou une seconde tension (VGL) ayant un niveau logique bas en tant que signal d'émission (OUT) en réponse au signal de sortie d'inverseur (IVT_OUT),
dans laquelle le circuit de génération de signal d'entrée (110), le circuit inverseur (130) et le circuit de commutation de sortie (150) sont mis en oeuvre avec uniquement des transistors à semi-conducteur à oxyde métallique de canal N

(NMOS)

caractérisée en ce que le circuit inverseur (130) inclut

un premier transistor (M1) possédant une électrode de source, une électrode de drain qui reçoit le signal de FLM, et une électrode de grille qui reçoit le premier signal d'horloge (CLK1), le signal de FLM étant transmis de l'électrode de drain du premier transistor (M1) à l'électrode de source du premier transistor (M1) en réponse au premier signal d'horloge (CLK1) ;
un deuxième transistor (M2) possédant une électrode de drain qui reçoit le second signal d'horloge (CLK2), une électrode de grille couplée à l'électrode de source du premier transistor (M1), et une électrode de source qui délivre en sortie le signal d'entrée séquentielle (NEXT_IN) ;
et un premier condensateur (C1) couplé entre l'électrode de source du premier transistor (M1) et l'électrode de source du deuxième transistor (M2) ;
un troisième transistor (M3) configuré pour transmettre le signal de FLM à un premier noeud (N1) en réponse au premier signal d'horloge (CLK1) ;
un quatrième transistor (M4) possédant une électrode de grille couplée au premier noeud (N1), une électrode de source couplée à une seconde borne d'alimentation en tension (VGL), et une électrode de drain couplée à un deuxième noeud (N2) ;
un deuxième condensateur (C2) couplé entre le premier noeud (N1) et la seconde borne d'alimentation en tension (VGL) ;
un cinquième transistor (M5) possédant une électrode de drain couplée à l'électrode de source du deuxième transistor (M2), une électrode de source couplée à la seconde borne d'alimentation en tension (VGL), et une électrode de grille couplée au deuxième noeud (N2) ;
un sixième transistor (M6) possédant une électrode de source couplée au deuxième noeud (N2), une électrode de drain couplée à un troisième noeud (N3), et une électrode de grille qui reçoit le second signal d'horloge (CLK2) ;
un septième transistor (M7) possédant une électrode de source couplée au troisième noeud (N3), une électrode de drain couplée à une première borne d'alimentation en tension (VGH), et une électrode de grille qui reçoit le premier signal d'horloge (CLK1) ;
un huitième transistor (M8) possédant une électrode de grille couplée au troisième noeud (N3), une électrode de drain qui reçoit le second signal d'horloge (CLK2), et une électrode de source couplée à un quatrième noeud (N4) ; et
un troisième condensateur (C3) couplé entre le

- troisième noeud (N3) et le quatrième noeud (N4).
2. Unité d'attaque d'émission selon la revendication 1, dans laquelle le signal d'émission (OUT) est sensiblement une version inversée du signal de FLM. 5
 3. Unité d'attaque d'émission selon l'une des revendications précédentes, dans laquelle le circuit de commutation de sortie (150) inclut : 10
 - une borne de sortie (Nout) configurée pour délivrer en sortie le signal d'émission (OUT) ;
 - un neuvième transistor (M9) possédant une électrode de grille couplée au premier noeud (N1), une électrode de source couplée à la seconde borne d'alimentation en tension (VGL), et une électrode de drain couplée à la borne de sortie (Nout) ; et 15
 - un dixième transistor (M10) possédant une électrode de grille couplée au deuxième noeud (N2), une électrode de source couplée à la borne de sortie (Nout), et une électrode de drain couplée à la première borne d'alimentation en tension (VGH). 20 25
 4. Unité d'attaque d'émission selon la revendication 3, comprenant en outre : 30
 - un circuit de commande de sortie (510) possédant un premier transistor de commande de sortie (Q1) couplé entre la première borne d'alimentation en tension (VGH) et le premier noeud (N1), et un second transistor de commande de sortie (Q2) couplé entre la seconde borne d'alimentation en tension (VGL) et le deuxième noeud (N2). 35
 5. Unité d'attaque d'émission selon la revendication 4, dans laquelle la seconde tension (VGL) ayant un niveau de courant continu est délivrée en sortie en tant que signal d'émission (OUT) lorsqu'un signal de commande de sortie ayant un niveau logique haut est appliqué au circuit de commande de sortie (510). 40
 6. Unité d'attaque d'émission (100), comprenant : 45
 - un circuit de génération de signal d'entrée (110) configuré pour recevoir un signal de marque de ligne de trame (FLM) en fonction d'un premier signal d'horloge (CLK1), pour recevoir un second signal d'horloge (CLK2) en fonction du signal de FLM, et pour délivrer en sortie un signal d'entrée séquentielle (NEXT_IN) ; 50
 - un circuit inverseur (130) configuré pour recevoir le signal de FLM en fonction du premier signal d'horloge (CLK1), et pour inverser le signal de FLM pour générer un signal de sortie d'inverseur (IVT_OUT) ; et 55
 - un circuit de commutation de sortie (150) confi-

guré pour délivrer en sortie une première tension (VGH) ayant un niveau logique haut ou une seconde tension (VGL) ayant un niveau logique bas en tant que signal d'émission (OUT) en réponse au signal de sortie d'inverseur (IVT_OUT), où le circuit de génération de signal d'entrée (110), le circuit inverseur (130) et le circuit de commutation de sortie (150) sont mis en oeuvre avec uniquement des transistors à semi-conducteur à oxyde métallique de canal P (PMOS) et où le signal d'émission (OUT) est sensiblement une version inversée du signal de FLM, **caractérisée en ce que** le circuit inverseur (130) inclut :

un premier transistor (M1) possédant une électrode de drain, une électrode de source qui reçoit le signal de FLM, et une électrode de grille qui reçoit le premier signal d'horloge (CLK1), le signal de FLM étant transmis de l'électrode de source du premier transistor (M1) à l'électrode de drain du premier transistor (M1) en réponse au premier signal d'horloge (CLK1) ;

un deuxième transistor (M2) possédant une électrode de source qui reçoit le second signal d'horloge (CLK2), une électrode de grille couplée à l'électrode de drain du premier transistor (M1), et une électrode de drain qui délivre en sortie le signal d'entrée séquentielle (NEXT_IN) ;

et un premier condensateur (C1) couplé entre l'électrode de drain du premier transistor (M1) et l'électrode de drain du deuxième transistor (M2) ;

un troisième transistor (M3) configuré pour transmettre le signal de FLM à un premier noeud (N1) en réponse au premier signal d'horloge (CLK1) ;

un quatrième transistor (M4) possédant une électrode de grille couplée au premier noeud (N1), une électrode de source couplée à une première borne d'alimentation en tension (VGH), et une électrode de drain couplée à un deuxième noeud (N2) ;

un deuxième condensateur (C2) couplé entre le premier noeud (N1) et la première borne d'alimentation en tension (VGH) ;

un cinquième transistor (M5) possédant une électrode de drain couplée à l'électrode de drain du deuxième transistor (M2), une électrode de source couplée à la première borne d'alimentation en tension (VGH), et une électrode de grille couplée au deuxième noeud (N2) ;

un sixième transistor (M6) possédant une électrode de source couplée au deuxième noeud (N2), une électrode de drain couplée

- à un troisième noeud (N3), et une électrode de grille qui reçoit le second signal d'horloge (CLK2) ;
 un septième transistor (M7) possédant une électrode de source couplée au troisième noeud (N3), une électrode de drain couplée à une seconde borne d'alimentation en tension (VGL), et une électrode de grille qui reçoit le premier signal d'horloge (CLK1) ;
 un huitième transistor (M8) possédant une électrode de grille couplée au troisième noeud (N3), une électrode de source qui reçoit le second signal d'horloge (CLK2), et une électrode de drain couplée à un quatrième noeud (N4) ; et
 un troisième condensateur (C3) couplé entre le troisième noeud (N3) et le quatrième noeud (N4).
7. Unité d'attaque d'émission selon la revendication 6, dans laquelle le circuit de commutation de sortie (150) inclut :
- une borne de sortie (Nout) configurée pour délivrer en sortie le signal d'émission (OUT) ;
 un neuvième transistor (M9) possédant une électrode de grille couplée au premier noeud (N1), une électrode de source couplée à la première borne d'alimentation en tension (VGH), et une électrode de drain couplée à la borne de sortie (Nout) ; et
 un dixième transistor (M10) possédant une électrode de grille couplée au deuxième noeud (N2), une électrode de source couplée à la borne de sortie (Nout), et une électrode de drain couplée à la seconde borne d'alimentation en tension (VGL).
8. Unité d'attaque d'émission selon la revendication 7, comprenant en outre :
- un circuit de commande de sortie (510) couplé au circuit inverseur (130), le circuit de commande de sortie (510) étant commandé par un signal de commande de sortie, dans laquelle la première tension (VGH) ayant un niveau de courant continu est délivrée en sortie en tant que signal d'émission (OUT) lorsque le signal de commande de sortie ayant un niveau logique bas est appliqué au circuit de commande de sortie (510).
9. Élément d'attaque d'émission (200) comprenant :
- une première unité d'attaque d'émission (100) selon l'une quelconque des revendications 1 à 8 et configurée pour recevoir un signal de marque de ligne de trame (FLM) en tant que signal d'entrée, et pour délivrer en sortie un premier signal d'émission (OUT) et un premier signal d'entrée séquentielle (NEXT_IN), la première unité d'attaque d'émission (100) étant commandée par un premier signal d'horloge (CLK1) et un second signal d'horloge (CLK2) ; et des deuxième à (n)ième unités d'attaque d'émission (100) selon l'une des revendications 1 à 10, où n est un nombre entier supérieur ou égal à 3, configurées pour délivrer en sortie des deuxième à (n)ième signaux d'émission (OUT), respectivement, les deuxième à (n)ième unités d'attaque d'émission (100) étant commandées par le premier signal d'horloge (CLK1) et le second signal d'horloge (CLK2), dans lequel les première à (n-1)ième unités d'attaque d'émission (100) fournissent séquentiellement le premier signal d'entrée séquentielle (NEXT_IN) et les deuxième à (n-1)ième signaux d'entrée séquentielle (NEXT_IN) en tant que signal d'entrée aux deuxième à (n)ième unités d'attaque d'émission (100), respectivement.
10. Dispositif d'affichage à diodes électroluminescentes organiques (900) comprenant :
- un panneau d'affichage (910) configuré pour recevoir une première tension d'alimentation et une seconde tension d'alimentation, le panneau d'affichage (910) possédant une pluralité de circuits de pixels, et chacun des circuits de pixels incluant une diode électroluminescente organique ;
 un élément d'attaque de balayage (920) configuré pour fournir séquentiellement des premier à (n)ième signaux de balayage, où n est un nombre entier supérieur ou égal à 3, aux circuits de pixels via des première à (n)ième lignes de balayage ;
 un élément d'attaque de données (930) configuré pour fournir des tensions de données aux circuits de pixels via une pluralité de lignes de données en fonction des premier à (n)ième signaux de balayage ;
 un élément d'attaque d'émission (200) configuré pour fournir séquentiellement des premier à (n)ième signaux d'émission (OUT) aux circuits de pixels via des première à (n)ième lignes de commande d'émission ; et
 un contrôleur de temporisation (940) configuré pour fournir un premier signal d'horloge (CLK1) et un second signal d'horloge (CLK2) à l'élément d'attaque de balayage (920), à l'élément d'attaque de données (930) et à l'élément d'attaque d'émission (200), dans lequel l'élément d'attaque d'émission (200) inclut des première à (n)ième unités d'attaque d'émission (100) selon l'une des revendications 1 à 10.

cations 1 à 8 qui génèrent les premier à (n)ième signaux d'émission (OUT), respectivement.

11. Dispositif d'affichage électroluminescent organique selon la revendication 10, dans lequel l'élément d'attaque d'émission (200) est mis en oeuvre avec des transistors à semi-conducteur à oxyde métallique de canal N (NMOS),
dans lequel une période au cours de laquelle les premier à (n)ième signaux d'émission (OUT) ont un niveau logique bas correspond à une période au cours de laquelle une opération de programmation de données est réalisée pour les circuits de pixel, et dans lequel une période au cours de laquelle les premier à (n)ième signaux d'émission (OUT) ont un niveau logique haut correspond à une période au cours de laquelle les diodes électroluminescentes organiques incluses dans les circuits de pixels émettent de la lumière, et/ou
dans lequel l'élément d'attaque d'émission (200) règle une longueur d'une période au cours de laquelle le panneau d'affichage affiche une image noire par la commande d'un rapport cyclique de repos des premier à (n)ième signaux d'émission (OUT).

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FIG. 1

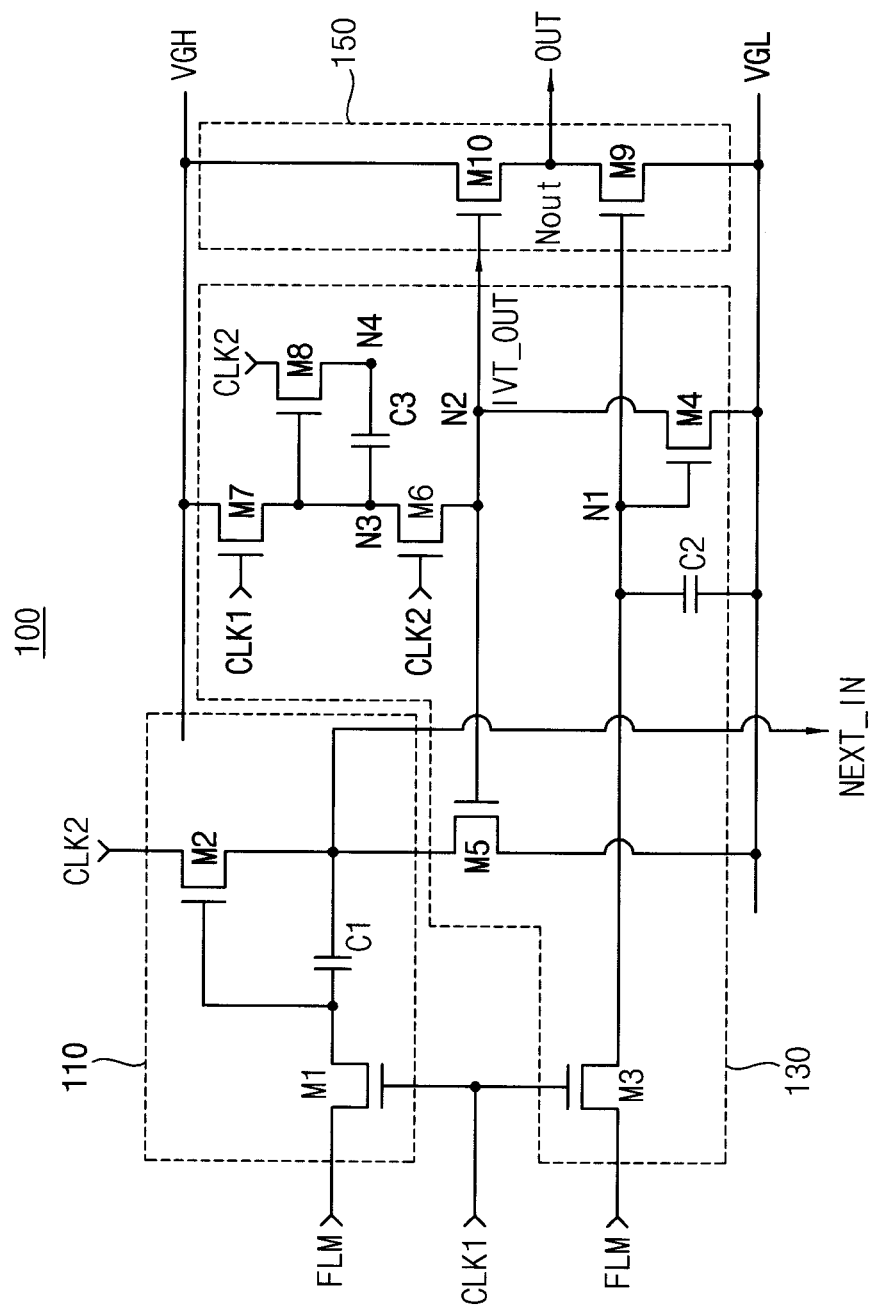


FIG. 2A

200

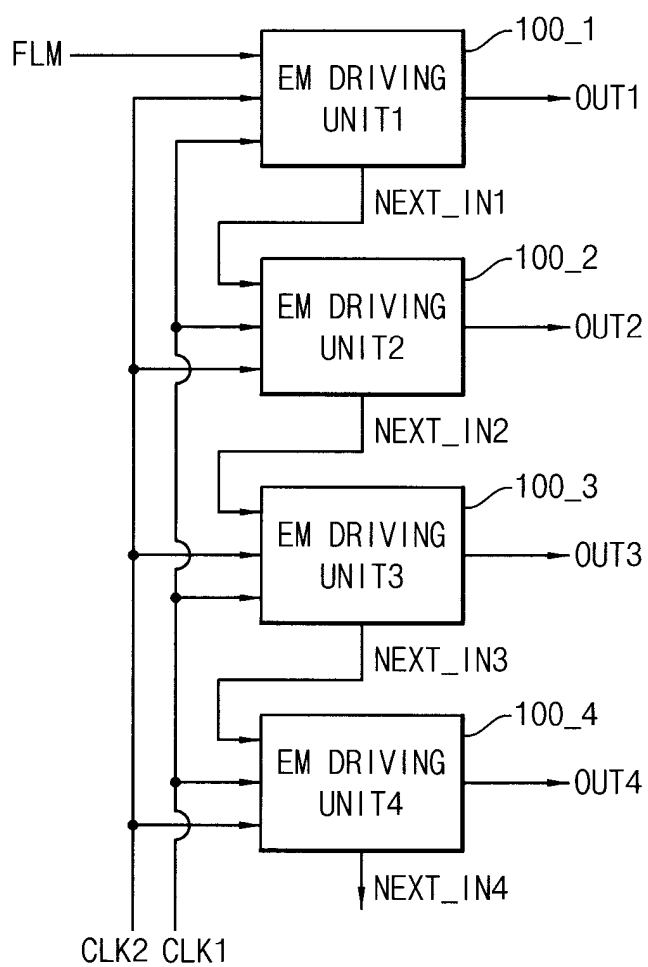


FIG. 2B

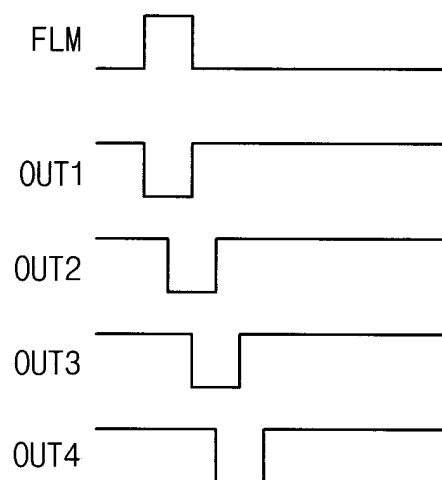


FIG. 3A

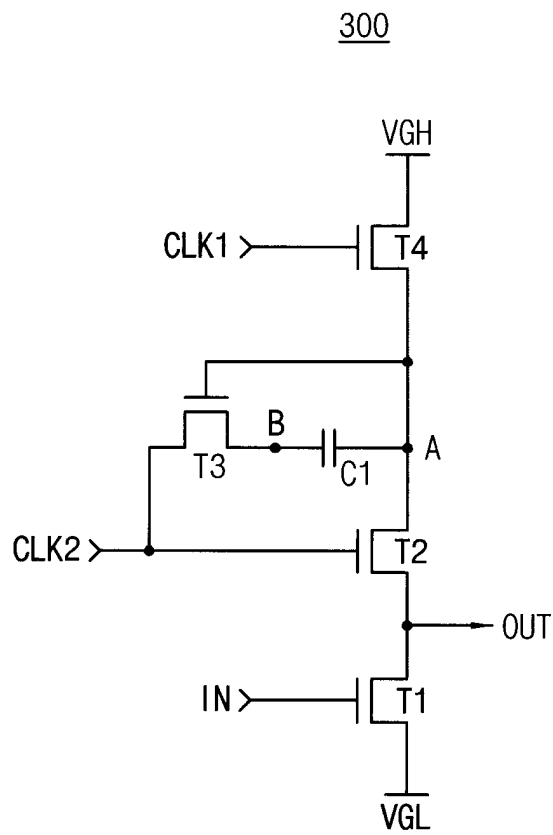


FIG. 3B

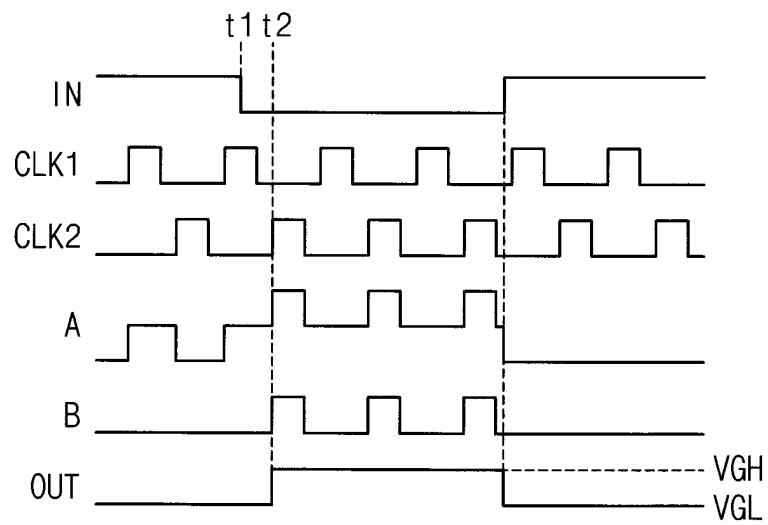


FIG. 4

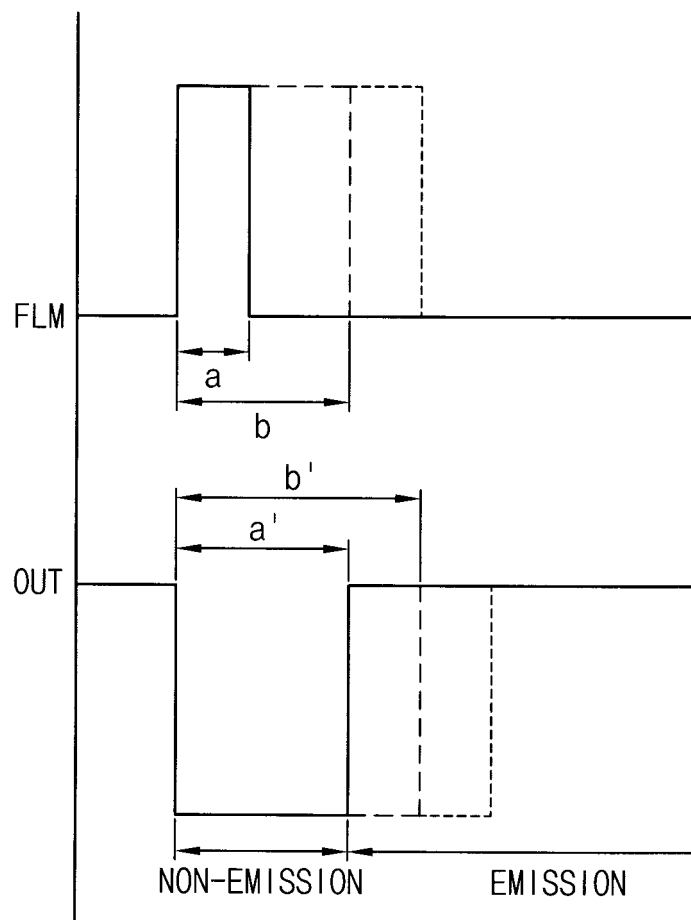


FIG. 5

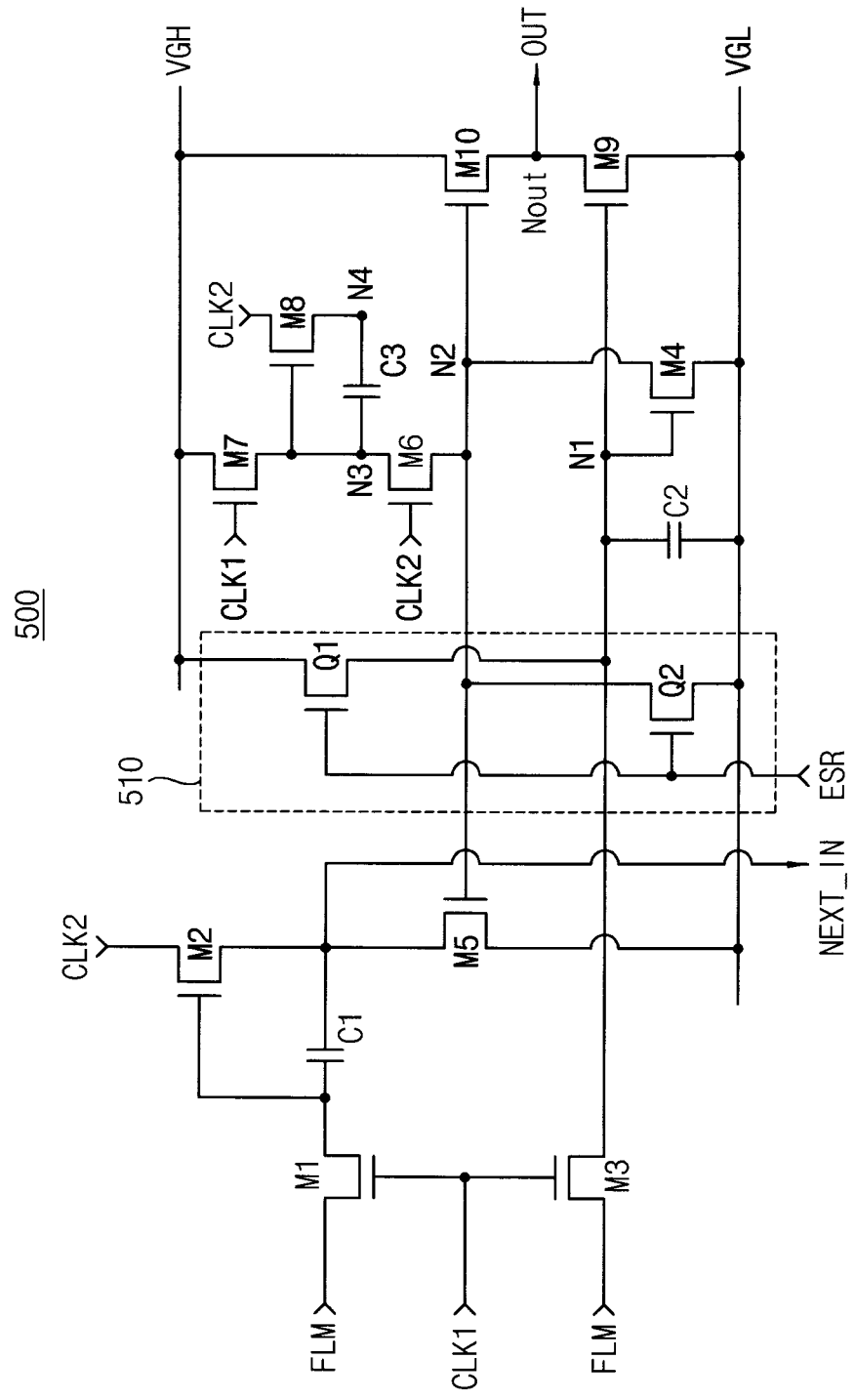


FIG. 6

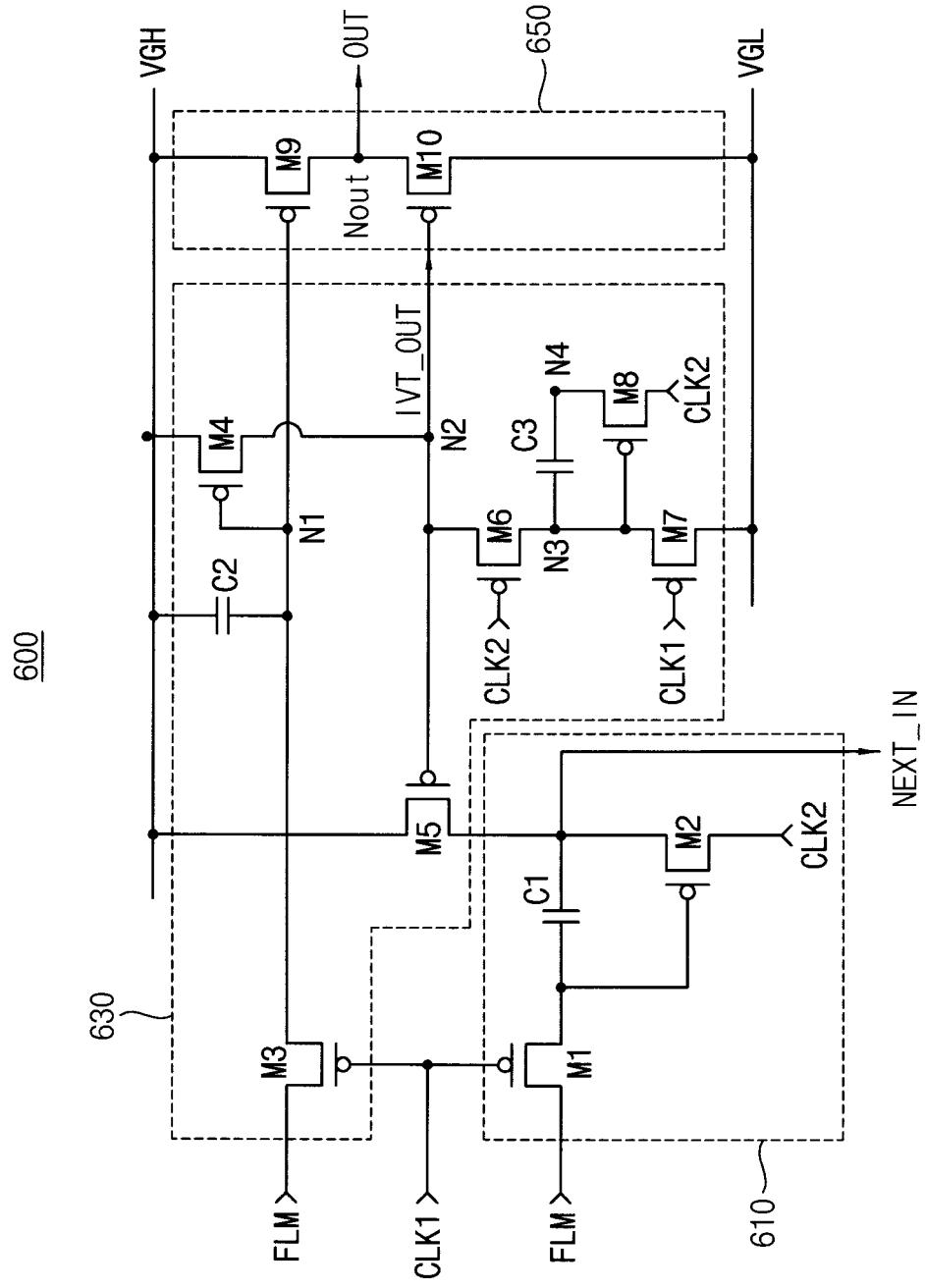


FIG. 7

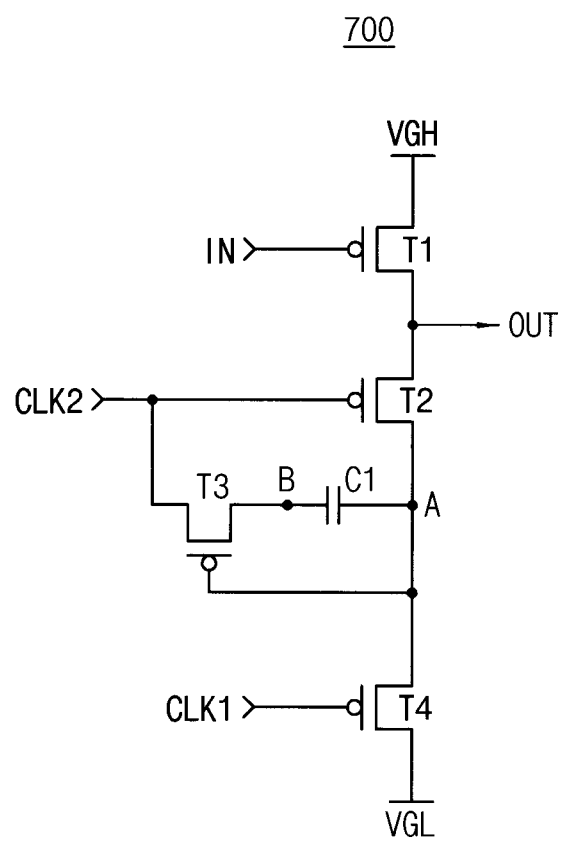


FIG. 8

800

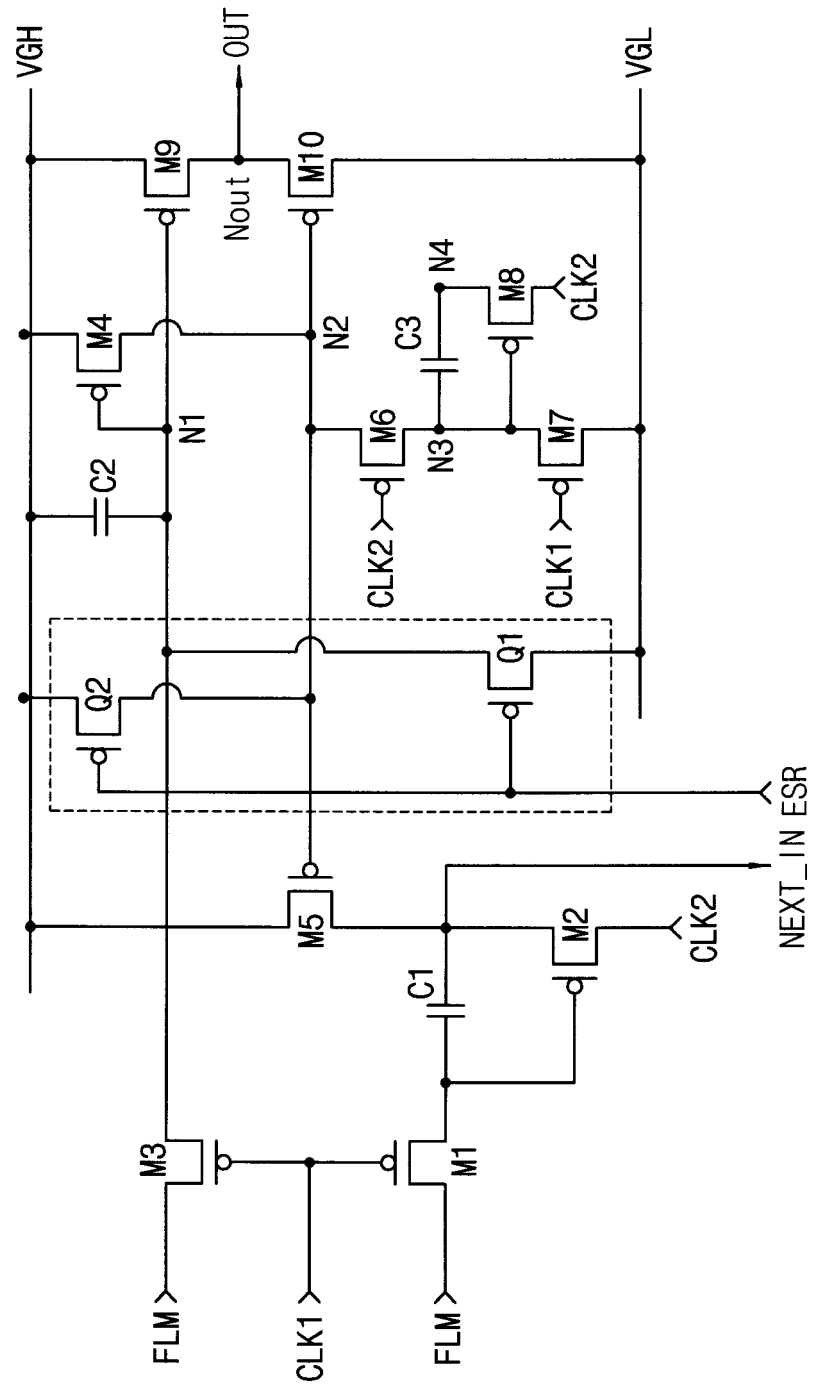


FIG. 9

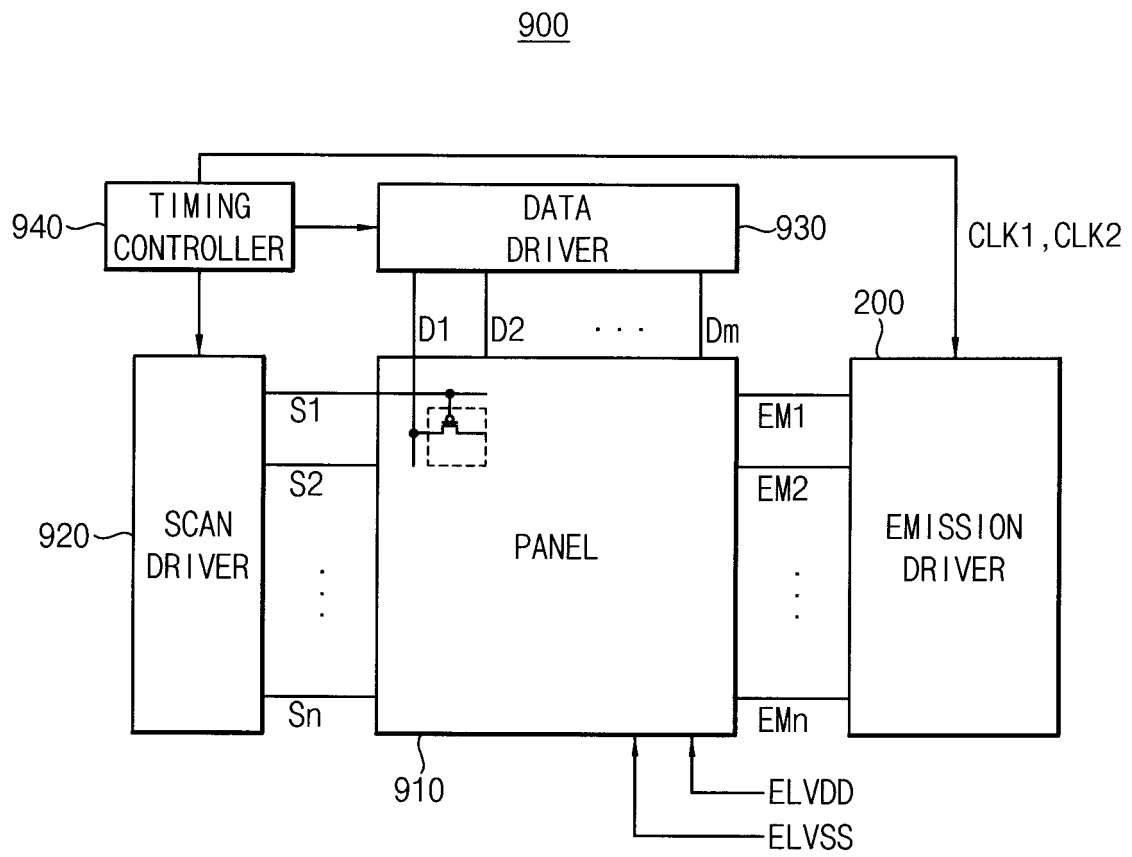
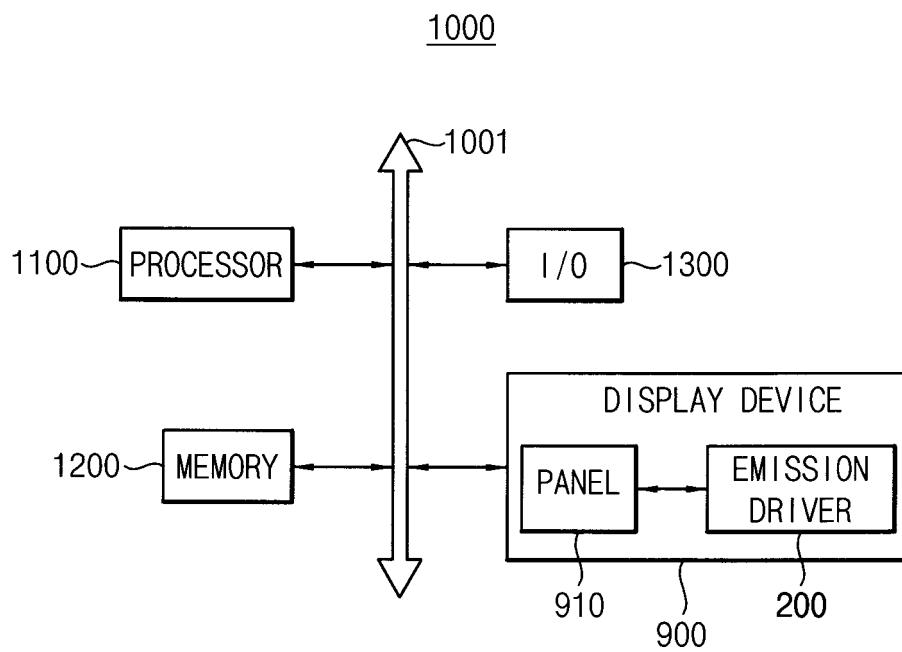


FIG. 10



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2007052653 A1 [0004]
- US 2007103389 A1 [0004]
- US 20110256779 A1 [0004]
- EP 2474969 A1 [0004]

专利名称(译)	发射驱动单元，发射驱动器以及具有该驱动单元的有机发光显示装置		
公开(公告)号	EP2634766B1	公开(公告)日	2019-09-25
申请号	EP2012193201	申请日	2012-11-19
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
[标]发明人	JEONG JIN TAE		
发明人	JEONG, JIN-TAE		
IPC分类号	G09G3/3266 G11C19/18 G11C19/28		
优先权	1020120021210 2012-02-29 KR		
其他公开文献	EP2634766A1		
外部链接	Espacenet		

摘要(译)

一方面，公开了一种发光驱动单元（100）和具有该发光驱动单元的有机发光二极管（OLED）显示器。发射驱动单元（100）包括输入信号生成电路（110），其根据第一时钟信号（CLK1）接收FLM信号，根据FLM信号接收第二时钟信号（CLK2），并输出顺序输入信号（NEXT_IN）。发射驱动单元（100）还包括反相器电路（130），该反相器电路（130）根据第一时钟信号（CLK1）接收FLM信号，并且将FLM信号反相以生成反相器输出信号（IVT_OUT）。发射驱动单元（100）还包括输出开关电路（150），输出开关电路（150）响应于此输出具有逻辑高电平的第一电压（VGH）或具有逻辑低电平的第二电压（VGL）作为发射信号（OUT）。到逆变器输出信号（IVT_OUT）。输入信号生成电路（110），反相器电路（130）和输出切换电路（150）由相同类型的晶体管实现。

FIG. 1

