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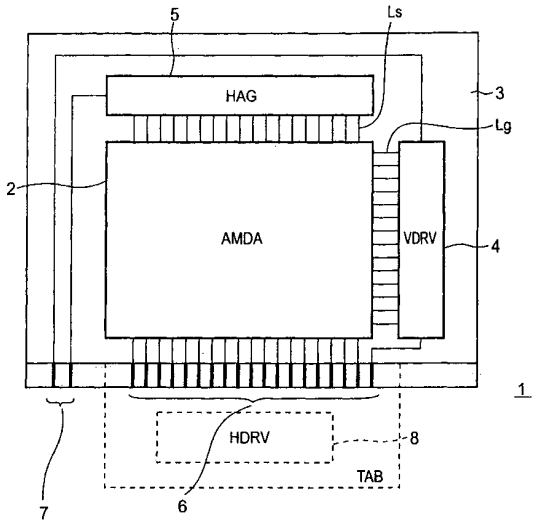
(54) LIQUID CRYSTAL DISPLAY PANEL AND METHOD FOR MANUFACTURING THE SAME, AND LIQUID CRYSTAL DISPLAY

(57) A liquid crystal display panel 1, to which an external horizontal drive circuit is connected in a TAB, COG, or other form, capable of performing aging by a substrate alone when image display is possible by connecting the external drive circuit, comprising an active matrix display area 2, a vertical drive circuit 4, and a horizontal aging circuit 5 for supplying signals to a plurality of source lines at one time provided on a substrate 3.

Also, a medium- to small-sized active matrix type liquid crystal display apparatus used for a PDA etc. able to be produced at a high quality and a low cost without using a time sharing driving method and provided with a horizontal drive circuit as an external circuit, wherein a vertical drive circuit is formed integrally with a liquid crystal display area on a glass substrate by using low temperature PolySi TFTs, a horizontal drive circuit is connected to a liquid crystal display panel substrate by COG, and output terminals of a driver IC constituting the horizontal drive circuit and source lines Ls are in a one-to-one correspondence.

FIG.1



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Description

TECHNICAL FIELD

[0001] The present invention relates to a liquid crystal display panel of an active matrix display, to be used connected to an external horizontal drive circuit or vertical drive circuit, provided with an aging circuit on a substrate thereof so that aging can be performed at the substrate of the liquid crystal display panel alone without connecting to the external horizontal drive circuit or vertical drive circuit, and a method of producing the same.

[0002] Further, the present invention relates to a liquid crystal display apparatus provided with a horizontal drive circuit as an external circuit of a liquid crystal display panel.

BACKGROUND ART

[0003] Conventionally, in a large-sized liquid crystal display apparatus for an active matrix display, a horizontal drive circuit and vertical drive circuit incorporating driver ICs for applying a predetermined voltage to the pixels are provided by TAB (tape automated bonding) or COG (chip on glass) at the outside of the substrate of the liquid crystal display panel. Further, in a small-sized liquid crystal display apparatus, the horizontal drive circuit is provided outside the substrate of the liquid crystal display panel, while the vertical drive circuit is provided integrally in the substrate of the liquid crystal display panel.

[0004] Aging is performed for displaying a predetermined image on the liquid crystal display panel to examine for defects in the panel itself before assembling the liquid crystal display panel into a liquid crystal display apparatus.

[0005] However, with a liquid crystal display panel to which external drive circuits are connected by TAB, COG, etc., it is not possible to display an image unless the external drive circuits are connected to the liquid crystal panel. Therefore, aging cannot be performed by the liquid crystal panel alone.

[0006] Therefore, there is an inconvenience that drive circuits have to be incorporated in advance as a module in order to perform aging. Furthermore, when the aging reveals any defect, reuse of the TAB, COG, or other circuits incorporated as a module requires that they be removed from the defective panel. This is troublesome. Thus, there was a problem that the work efficiency of aging was low in such liquid crystal display panels.

[0007] Also, as explained above, in a large-sized liquid crystal display apparatus for an active matrix display, the horizontal drive circuit and vertical drive circuit incorporating driver ICs for applying a predetermined voltage to the pixels are provided outside the substrate of the liquid crystal display panel by TAB, COG, etc. In this case, there is normally a one-to-one correspondence between the outputs of the external driver IC and source lines of the liquid crystal display panel. The output voltages from the output terminals of the driver ICs are supplied as they are to the corresponding source lines.

[0008] On the other hand, in a small-sized liquid crystal display apparatus for active matrix display, a time sharing drive method (selector method) is employed, the horizontal drive circuit is provided as an external circuit, and the vertical drive circuit is integrally provided in the substrate of the liquid crystal display panel.

[0009] In the time sharing drive method, a plurality of source lines are treated as one unit, and signals given to the plurality of source lines in a unit are output from the driver IC in a time series. In a liquid crystal display panel, a plurality of source lines are treated as one unit and a time sharing switch is provided, and signals in a time series output from a driver IC are divided in time by the time sharing switch and successively given to the plurality of source lines.

[0010] According to the time sharing drive method, the outputs of the driver IC of the external horizontal drive circuit and source lines of the liquid crystal display panel are not in a one-to-one correspondence. For example, a write operation is performed on three source lines by one output line of the driver IC. Accordingly, the number of output pins of the driver IC can be reduced by using the time sharing drive method.

[0011] However, in a medium-sized to small-sized liquid crystal display panel used in a PDA etc., the time sharing drive method causes the following problems:

First, since a horizontal writing time is divided in the time sharing drive method, a sufficient writing time to the source lines from the driver IC cannot be secured.

Second, a horizontal drive frequency of the driver IC has to be made higher in accordance with the number of divisions of one horizontal scanning period. For example, when dividing one horizontal scanning period into three equal portions, the driver IC has to operate at three times the horizontal drive frequency of the liquid crystal.

Third, since a pulse is required to make the time sharing switch operate and data has to be rearranged to change the order of writing to the source lines, medium-sized to small-sized liquid crystal display panels require a large power consumption and a memory for rearranging data. These are also problems.

[0012] On the other hand, a drive method relying on external circuits for both of the horizontal drive circuit and vertical drive circuit suffers from the problem that with medium-sized to small-sized liquid crystal display panels, it is not possible to take out terminals from one side of the panels. Therefore, the problems arise that the outside shape of a module becomes large and assembly of the module becomes complicated. Furthermore, the number of connection points of the liquid crys-

tal display panel and the outside becomes large, so the probability of a connection defect arising becomes higher.

DISCLOSURE OF INVENTION

[0013] A first object of the present invention is to provide a liquid crystal display panel enable panel defects to be found by aging by a panel substrate alone even when image display becomes possible by connecting drive circuits outside and capable realizing a high quality-display panel at a low cost and a method of producing the same.

[0014] A second object of the present invention is to provide a liquid crystal display apparatus capable of being provided with a horizontal drive circuit as an external circuit without using a time sharing drive method in medium- to small-sized liquid crystal display apparatuses used for PDAs etc.

[0015] The present inventors discovered that aging of a liquid crystal panel to which external drive circuits are to be connected can be performed without connecting external drive circuits to the liquid crystal display panel by providing in a substrate of the liquid crystal display panel an aging circuit able to supply signals to a plurality of lines at one time to form a simple image and that consequently the work efficiency of aging can be improved.

[0016] Namely, to attain the above objects, the present invention provides a liquid crystal display panel provided with an active matrix display area, a vertical drive circuit, and a horizontal aging circuit for supplying signals to source lines at one time on a substrate of the liquid crystal display panel and provided with a horizontal drive circuit connected externally.

[0017] Also, the present invention provides a liquid crystal display panel provided with an active matrix display area, a horizontal drive circuit, and a vertical aging circuit for supplying signals to a plurality of gate lines at one time on a substrate of the liquid crystal display panel and provided with a vertical drive circuit connected externally.

[0018] Furthermore, the present invention provides a liquid crystal display panel provided with an active matrix display area, a horizontal aging circuit for supplying signals to a plurality of source lines at one time, and a vertical aging circuit for supplying signals to a plurality of gate lines at one time on a substrate of the liquid crystal display panel and provided with a horizontal drive circuit and vertical drive circuit connected externally.

[0019] Also, as a method of producing the above liquid crystal display panel, the present invention provides a method of producing a liquid crystal display panel comprising forming a horizontal aging circuit or a vertical aging circuit in a process of forming an active matrix display area on a substrate.

[0020] Also, to attain the above objects, the present invention provides an active matrix type liquid crystal display apparatus, wherein a vertical drive circuit is formed integrally with a liquid crystal display area on a glass substrate using low temperature polySi TFTs, a horizontal drive circuit is connected to a liquid crystal display panel substrate by COG, and output terminals of a driver IC constituting the horizontal drive circuit and source lines are in a one-to-one correspondence.

[0021] According to the liquid crystal display apparatus of the present invention, since a time sharing driving method is not used and the output terminals of a driver IC constituting the horizontal drive circuit and source lines are in a one-to-one correspondence, all of a horizontal scanning period can be used for writing to one source line and the image quality can be improved, Also, the output necessary for the driver IC of the horizontal drive circuit can be made smaller compared with that in a time sharing driving method, and also it is not necessary to provide a time sharing switch, so a lower power consumption of the overall system can be achieved. Furthermore, rearrangement of signals and a memory required in the time sharing driving method become unnecessary in the present invention.

[0022] Furthermore, by providing a horizontal drive circuit having a high frequency, which is strongly required not to have any unevenness in characteristics, as an external circuit, the quality of the horizontal drive circuit can - be checked before mounting it on the liquid crystal display panel, so the yield of liquid crystal display panels can be improved and a high quality product can be provided at a lower cost.

[0023] Also, compared with the method relying on external circuits for both of the horizontal drive circuit and the vertical drive circuit, the number of connection points are small, so the yield of the products can be improved.

[0024] Since the vertical drive circuit can be formed integrally on the substrate of the liquid crystal display panel, the frame can be made smaller compared with the method relying on external circuits for both of the horizontal drive circuit and the vertical drive circuit.

BRIEF DESCRIPTION OF DRAWINGS

[0025]

FIG. 1 is a view of a circuit layout of a liquid crystal display panel according to the present invention.

FIG. 2 is a view of an example of the configuration of a horizontal aging circuit according to the present invention.

FIGS. 3A to 3E are timing charts at the time of aging.

FIG. 4 is a circuit diagram of a example of the configuration of a pixel cell of an active matrix display area.

FIG. 5 is a view of another example of the configuration of a horizontal aging circuit according to the present invention.

FIG. 6 is a view of another example of a circuit layout of a liquid crystal display panel according to the present invention.

FIG. 7 is a block diagram of a liquid crystal display apparatus according to the present invention.

FIG. 8 is a view of another specific example of a circuit layout of a liquid crystal display apparatus in FIG. 7.

BEST MODE FOR CARRYING OUT THE INVENTION

[0026] Below, the present invention will be explained with reference to the drawings. Note that identical reference numbers in the drawings indicate identical or equivalent components.

[0027] FIG. 1 is a view of a circuit layout of a liquid crystal display panel according to the present invention.

[0028] In the liquid crystal display panel 1, as shown in FIG. 1, a vertical drive circuit (VDRV) 4, a horizontal aging circuit (HAG) 5, a first-pad region 6 having narrow pitches, and a second pad region 7 are provided on a glass substrate 3 around an active matrix display area (AMDAS) 2 configured by using TFTs (thin film transistors).

[0029] Here, the vertical drive circuit 4 successively gives scanning pulses to the gate lines Lg and selects pixels in units of lines to perform vertical scanning.

[0030] The horizontal aging circuit 5 supplies signals to a plurality of source lines Ls at one time.

[0031] The horizontal aging circuit 5, for example, as shown in FIG. 2, is provided with PMOS switches PSW, comprised of p-channel MOS (PMOS) transistors whose gates are connected to a control signal line LCTL, between all source lines Ls and one signal line LSG and is configured so that all source lines Ls can be driven by one interconnection.

[0032] Note that since the horizontal aging circuit 5 is provided on a seal region of the liquid crystal display panel 1, there is no disadvantage of the external size becoming larger due to formation of the horizontal aging circuit 5.

[0033] The first pad region 6, as shown in FIG. 1, has mounted on it the horizontal drive circuit (HDRV) 8 in a TAB form at the time of actual use. Therefore, the first pad region 6 is provided with several hundreds of pads at pitches of about 80 μm corresponding to the source lines for the number of horizontal dots of the active matrix display area 2 and interconnections for vertical driving.

[0034] On the other hand, the second pad region 7 corresponds to the horizontal aging circuit 5 which drives all source lines Ls with one interconnection and is provided with not more than 10 pads including interconnections for vertical driving at pitches of about 500 μm.

[0035] Thus, the pads and external horizontal drive circuit can be easily connected by bringing them into abutment by the naked eye.

[0036] As an example of the configuration of such a second pad region 7, for example, the following may be mentioned:

1 pin = VDD (vertical drive circuit use power source)
2 pin = GRD
3 pin = VSS2 (vertical drive circuit use negative power source)
4 pin = VST (vertical drive circuit use signal)
5 pin = VCK (vertical drive circuit use signal)
6 pin = ENB (vertical drive circuit use signal)
7 pin = VCOM (counter potential)
8 pin = SIG (aging signal)
9 pin = switching between actual use mode (DC VDD:9V) and aging mode (DC VSS2:-6.5V)

[0037] FIGS. 3A to 3E are timing charts for when performing aging on this liquid crystal display panel 1. The timing charts indicate a case of VCOM inversion driving wherein a counter potential (VCOM) is inverted for every horizontal scanning period.

[0038] Note that FIG. 3C to FIG. 3E show VCOM and SIG switching between a solid line and dotted line for every field scanning period.

[0039] FIG. 4 is a circuit diagram of an example of the configuration of a pixel cell of an active matrix display area.

[0040] The pixel cell 10 is, as shown in FIG. 4, comprised of a TFT 11, a liquid crystal element (LC) 12, and a counter electrode (VCOM) 13. Such pixel cells are arranged in a matrix in the active matrix display area.

[0041] In the pixel cell 10, a gate of the TFT 11 is connected to a gate line Lg, a source is connected to a source line Ls, and a drain is connected to a pixel electrode.

[0042] In a pixel cell configured as such, as shown in FIG. 4, the difference between the aging signal SIG supplied to the source line Ls and the counter potential VCOM becomes the potential applied to the liquid crystal, so as shown in FIG. 3C to FIG. 3E, by cyclically changing the VCOM and SIG for alternating driving, polarization of liquid crystal molecules can be prevented and the image quality can be improved.

[0043] As explained above, according to the liquid crystal display panel 1, the horizontal aging circuit 5 and the vertical drive circuit 4 can be driven for white display and black display by using only the second pad region 7, i.e., even without using the first pad region 6, so aging for examining for defects of the panel itself can be performed.

[0044] Accordingly, it becomes unnecessary to mount the horizontal drive circuit 8 before the aging, and the trouble of removing the horizontal drive circuit from a liquid crystal display panel judged to be defective by the aging is also eliminated.

[0045] As a result, the work efficiency of aging can be remarkably improved. Furthermore, since aging can be easily performed only by using the second pad region 7, the productivity of liquid crystal display panels can be improved.

[0046] The present invention can be modified in various ways so long as no external drive circuit is mounted

and an aging circuit is provided on a substrate of the liquid crystal display panel for enabling aging.

[0047] For example, in the liquid crystal display panel 1 in FIG. 1, the horizontal aging circuit 5 may be configured as shown in FIG. 5.

[0048] In a horizontal aging circuit 5a in FIG. 5, source lines are gathered together for each of the three primary colors of R (red), G (green), and B (blue).

[0049] By using the horizontal aging circuit 5a, a monochrome raster can be displayed. Furthermore, by introducing a horizontal shift register circuit etc. to the horizontal aging circuit, a more complex image can be displayed at the time of aging.

[0050] In the aging circuit 5 shown in FIG. 2, the source lines Ls are provided only with PMOS switches, but it is also possible to provide as switching means of the source lines Ls only NMOS switches comprised of n-channel MOS (NMOS) transistors or to provide CMOS switches.

[0051] Also, the mode of connection of the external horizontal drive circuit and liquid crystal display panel is not limited to TAB. It may be COG etc. as well.

[0052] FIG. 6 is a view of an example of the configuration of a circuit layout of a liquid crystal display panel when connecting an external drive circuit by COG.

[0053] Furthermore, as shown in FIG. 6, when a horizontal drive circuit is connected as an external circuit to the liquid crystal display panel, a horizontal aging circuit is provided on the substrate of the liquid crystal panel as explained above, while when a vertical drive circuit is connected as an external circuit to the liquid crystal display panel, a vertical aging circuit-is provided on the substrate of the liquid crystal display panel in the same way.

[0054] Also, when both of a horizontal drive circuit and a vertical drive circuit are connected as external circuits, both of a horizontal aging circuit and a vertical aging circuit are provided on the substrate of the liquid crystal display panel.

[0055] In this case, as a vertical aging circuit, one which gathers together a plurality of gate lines by switching means such as CMOS switches, NMOS switches, or PMOS switches and supplies signals to the gathered lines is provided.

[0056] As a method of producing a liquid crystal display panel of the present invention provided with a horizontal aging circuit or a vertical aging circuit or both on a substrate of the liquid crystal display panel, it is sufficient to also form the horizontal aging circuit or vertical aging circuit in the process of forming the active matric display area on the substrate by the following well known method.

[0057] Accordingly, the liquid crystal display panel of the present invention can be produced by a production method similar to that of a conventional liquid crystal panel for active matrix display, so there is no disadvantage of an increase of steps by providing the horizontal aging circuit or vertical aging circuit.

[0058] As explained above, according to the present embodiment, instead of an external horizontal drive circuit or vertical drive circuit, an aging circuit is provided on the substrate of the liquid crystal display panel, therefore it is possible to perform aging and find potential panel defects by the substrate of the liquid crystal display panel alone. Therefore, a high quality liquid crystal display panel can be supplied at a low cost.

[0059] Next, an explanation will be given of a liquid crystal display apparatus wherein a vertical drive circuit is integrally formed with the liquid crystal display area by using low temperature polycrystalline silicon (polySi) TFTs, a horizontal drive circuit is connected to a liquid crystal display panel substrate by COG, and the output terminals of a driver IC composing the horizontal drive circuit and source lines are in a one-to-one correspondence.

[0060] FIG. 7 is a block diagram of a liquid crystal display apparatus 20 of an embodiment of the present invention.

[0061] The liquid crystal display apparatus 20 comprises a liquid crystal display area (LDA) 22 formed on a glass substrate 21 by using low temperature polySi TFT, a vertical drive circuit 23 formed integrally with the liquid crystal display area 22 by using low temperature polySi TFTs, and an external horizontal drive circuit (HDRV) 24 mounted by COG.

[0062] FIG. 8 is a view of a specific circuit example of the liquid crystal display apparatus 20 of FIG. 7.

[0063] The source lines of the liquid crystal display apparatus 20 are driven by a shift register circuit (SFT) 25, a sampling circuit (SMPL) 26, a latch circuit (LTC) 27, a digital/analog conversion circuit (DAC) 28, and an output buffer circuit (BUF) 29 configured in the driver IC of the COG connected horizontal drive circuit 24.

[0064] Here, the shift register 25 successively outputs horizontal scanning pulses to perform horizontal scanning.

[0065] The sampling circuit 26 performs successive sampling on a digital image data input here in correspondence with the horizontal scanning pulses from the shift register circuit 25. The image data sampled in the sampling circuit 26 is stored for an amount of one horizontal period in the latch circuit 27.

[0066] In the DAC 28, digital data of one horizontal period output from the latch circuit 27 is converted to an analog signal and output. The output from the output buffer circuit 29 is led to the source lines Ls of the liquid crystal display panel as it is. The output to the source lines Ls continues for one horizontal scanning period.

[0067] Consequently, in the liquid crystal display apparatus 20, the output terminals of the driver IC constituting the horizontal drive circuit 24 and the source lines are in a one-to-one correspondence.

[0068] On the other hand, the vertical drive circuit 23 opens the TFT switch 11 for every gate line Lg in synchronization with switching of the source lines Ls. As a result, writing is performed in the order of the lines for

every horizontal scan of the pixels.

[0069] Note that in each pixel cell 10a shown in FIG. 8, in addition to the configuration in FIG. 4, a first electrode is connected to a connection point of a drain of the TFT and a pixel electrode, and a second electrode has a held capacity 14 connected to the gate line Lg.

[0070] In the liquid crystal display apparatus 20, as the driving method of the liquid crystal, alternating driving wherein the voltage applied to the liquid crystal is inverted each field is preferable.

[0071] In the liquid crystal display panel, the number of connection points with an external circuit is the total of the amount of source lines of effective pixels on the horizontal drive circuit 24 side and about 10 pins for the vertical drive circuit 23.

[0072] More specifically, for example, the number of connection points becomes 320 pins in a liquid crystal display panel having 100 x 100 effective pixels. Accordingly, it is possible to gather together the connection pins at only one side of the four-sided liquid crystal display panel to mount an external circuit.

[0073] In the liquid crystal display apparatus 20, the vertical drive circuit 23 and the liquid crystal display area 22 are formed integrally on the glass substrate 21 by using low temperature polySi TFTs. Compared with high temperature polySi using a quartz glass substrate and requiring a 1000°C or more high temperature film-forming technique, low temperature polySi TFTs can be produced by a 450°C or less low temperature film forming technique, so a normal glass substrate can be used instead of a quartz glass substrate.

[0074] Accordingly, the liquid crystal display apparatus of the present invention can be produced at a low cost from this viewpoint as well.

[0075] Note that in the present invention, the TFTs formed by the low temperature polySi may be top gate types or bottom gate types.

[0076] Also, in the present invention, the horizontal drive circuit is connected to the liquid crystal display panel substrate by COG. Thus, there is some degree of freedom in mounting compared with a case of connecting the horizontal drive circuit by TAB and also the LCD module can be made smaller.

[0077] As explained above, since the liquid crystal display apparatus of the present invention does not use a time sharing driving method and has the horizontal drive circuit as an external circuit, the image quality can be improved. Also, the yield of products is improved and production at a low cost can be attained. Particularly, the liquid crystal display apparatus of the present invention is advantageous as a medium- to small-sized liquid crystal display apparatus used for a PDA etc.

INDUSTRIAL APPLICABILITY

[0078] As explained above, according to the liquid crystal display panel of the present invention, an aging circuit is provided on a substrate of the liquid crystal display panel instead of an external horizontal drive circuit or a vertical drive circuit, so aging can be performed by the substrate of the liquid crystal display panel alone, potential panel defects can be found, and a high quality liquid crystal display panel can be supplied at a low cost.

[0079] Also, according to the liquid crystal display apparatus according to the present invention, since a time sharing driving method is not used and a horizontal drive circuit is provided as an external circuit, the image quality can be improved, the yield of products is improved, and production at a low cost can be attained.

Claims

1. A liquid crystal display panel comprising an active matrix display area, a vertical drive circuit, and a horizontal aging circuit for supplying signals to a plurality of source lines at one time provided on a substrate of the liquid crystal display panel and a horizontal drive circuit connected outside.

2. A liquid crystal display panel comprising an active matrix display area, a horizontal drive circuit, and a vertical aging circuit for supplying signals to a plurality of gate lines at one time provided on a substrate of the liquid crystal display panel and a vertical drive circuit connected outside.

3. A liquid crystal display panel comprising an active matrix display area, a horizontal aging circuit for supplying signals to a plurality of source lines at one time, and a vertical aging circuit for supplying signals to a plurality of gate lines at one time provided on a substrate of the liquid crystal display panel and a horizontal drive circuit and a vertical drive circuit connected outside.

4. A liquid crystal display panel as set forth in claim 1, wherein a horizontal aging circuit or a vertical aging circuit gathers together a plurality of source lines or gate lines via CMOS switches, NMOS switches, or PMOS switches and supplies signals to the collected lines.

5. A liquid crystal display panel as set forth in claim 2, wherein a horizontal aging circuit or a vertical aging circuit gathers together a plurality of source lines or gate lines via CMOS switches, NMOS switches, or PMOS switches and supplies signals to the collected lines.

6. A liquid crystal display panel as set forth in claim 3, wherein a horizontal aging circuit or a vertical aging circuit gathers together a plurality of source lines or gate lines via CMOS switches, NMOS switches, or PMOS switches and supplies signals to the collected lines.

7. A method of producing a liquid crystal display panel comprising an active matrix display area, a vertical drive circuit, and a horizontal aging circuit for supplying signals to a plurality of source lines at one time provided on a substrate of the liquid crystal display panel and a horizontal drive circuit connected outside, said method of producing a liquid crystal display planel comprising forming the horizontal aging circuit in a process of forming the active matrix display area on the substrate.

8. A method of producing a liquid crystal display panel comprising an active matrix display area, a horizontal drive circuit, and a vertical aging circuit for supplying signals to a plurality of gate lines at one time provided on a substrate of the liquid crystal display panel and a vertical drive circuit connected outside, said method of producing a liquid crystal display planel comprising forming the vertical aging circuit in a process of forming the active matrix display area on the substrate.

9. A method of producing a liquid crystal display panel comprising an active matrix display area, a horizontal aging circuit for supplying signals to a plurality of source lines at one time, and a vertical aging circuit for supplying signals to a plurality of gate lines at one time provided on a substrate of the liquid crystal display panel and a horizontal drive circuit and a vertical drive circuit connected outside, said method of producing a liquid crystal display planel comprising forming the horizontal aging circuit and the vertical aging circuit in a process of forming the active matrix display area on the substrate.

10. A liquid crystal display apparatus of an active matrix type, wherein

a vertical drive circuit is formed integrally with a liquid crystal display area on a glass substrate by using low temperature polySi TFTs, a horizontal drive circuit is connected to a liquid crystal display panel substrate by COG, and output terminals of a driver IC constituting the horizontal drive circuit and source lines are in a one-to-one correspondence.

FIG.1

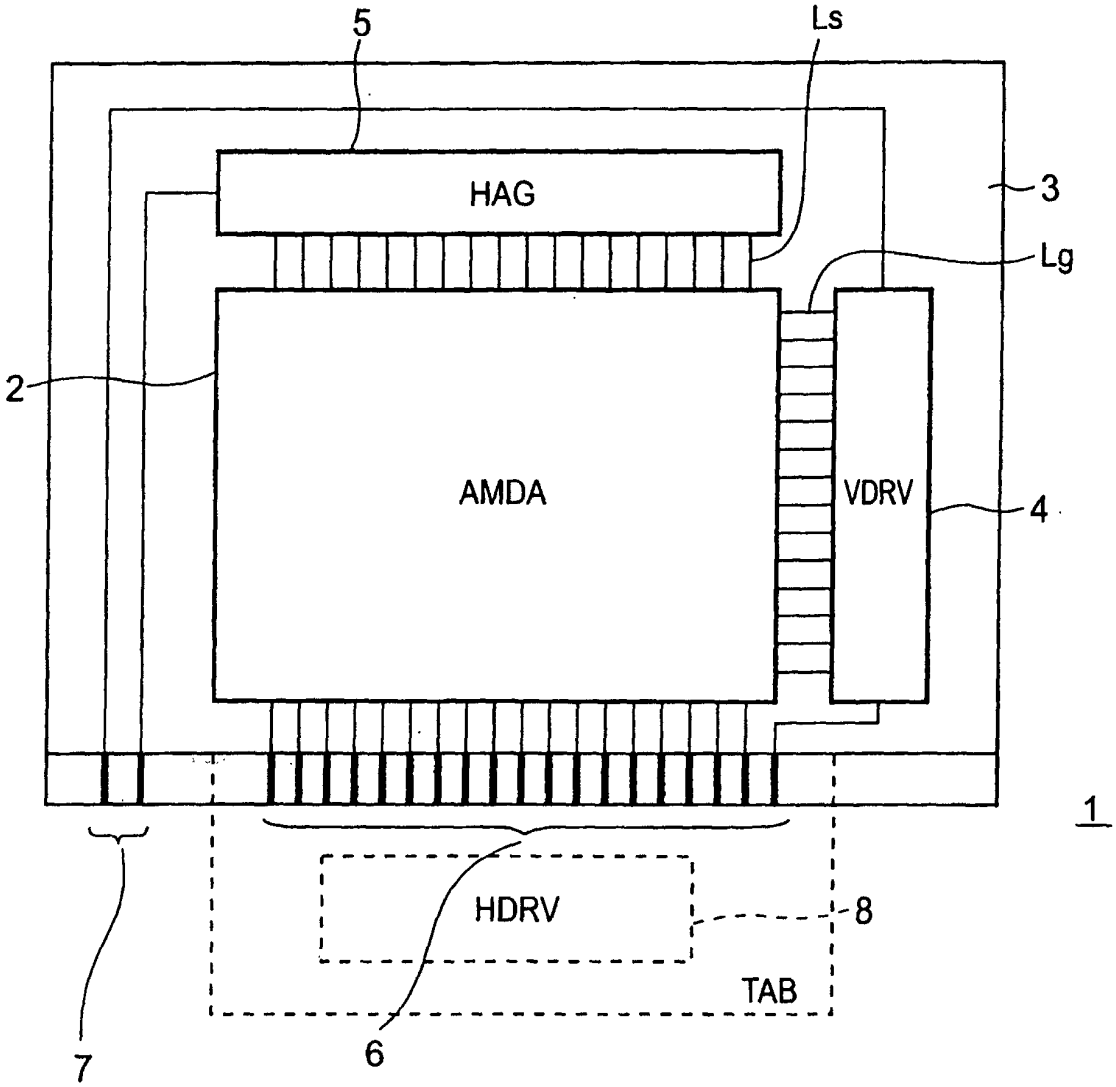
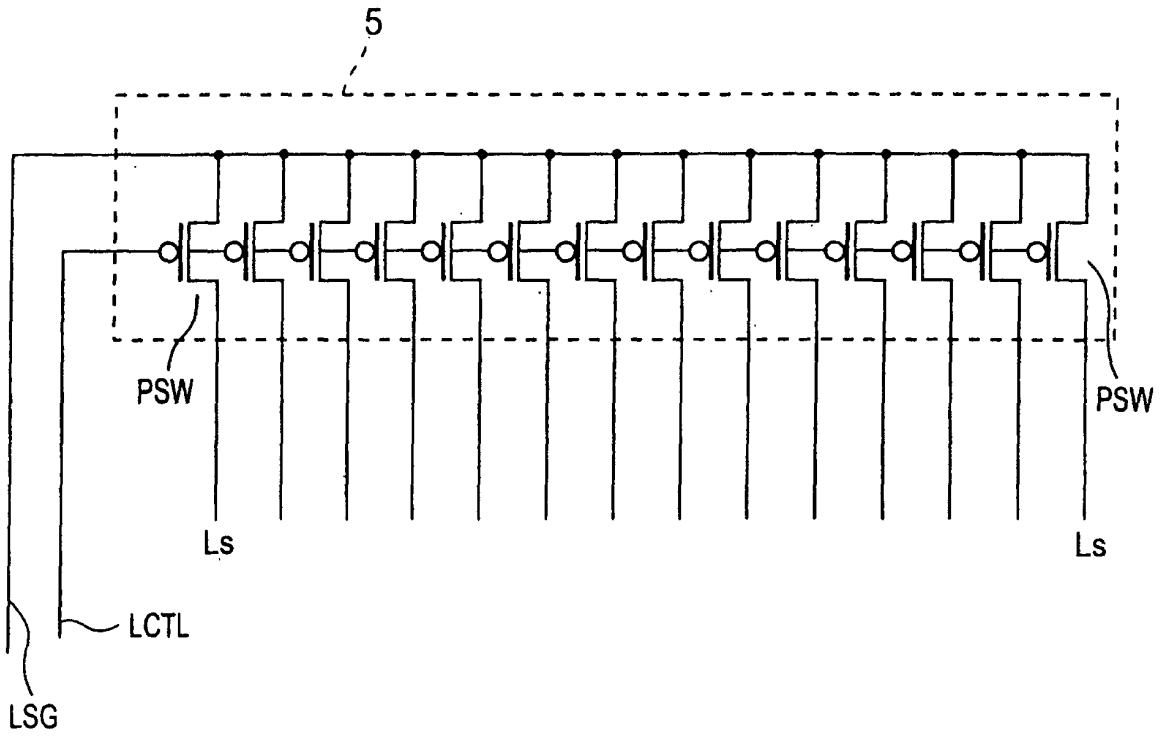


FIG.2



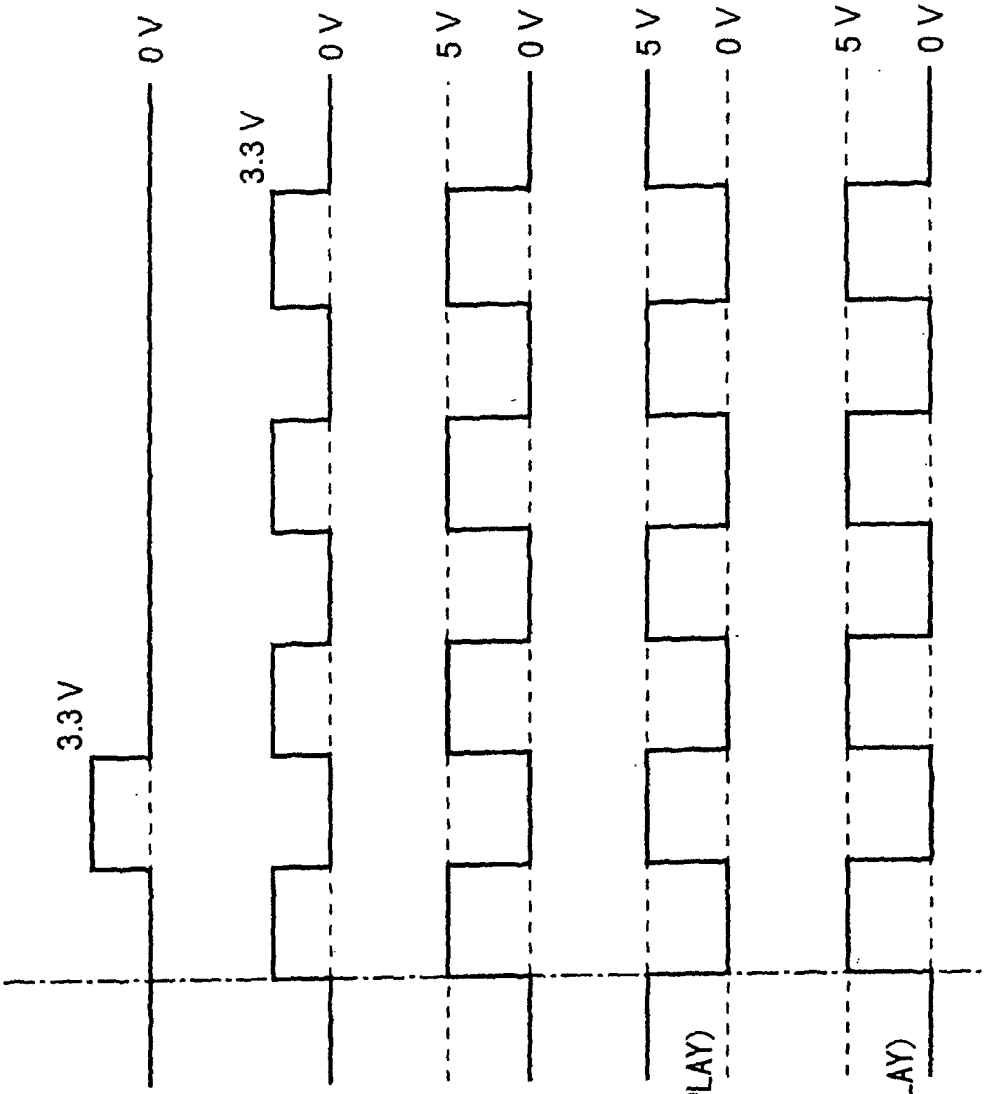


FIG.3A VST

FIG.3B VCK

FIG.3C VCOM

FIG.3D SIG (BLACK DISPLAY)

FIG.3E SIG (WHITE DISPLAY)

FIG.4

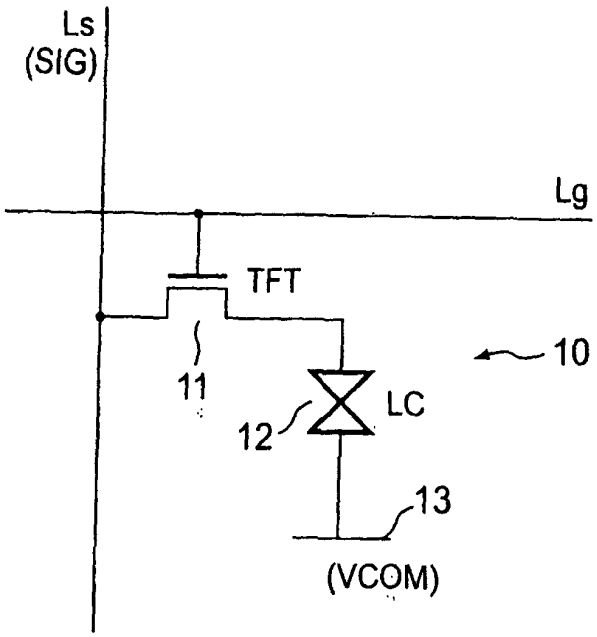


FIG.5

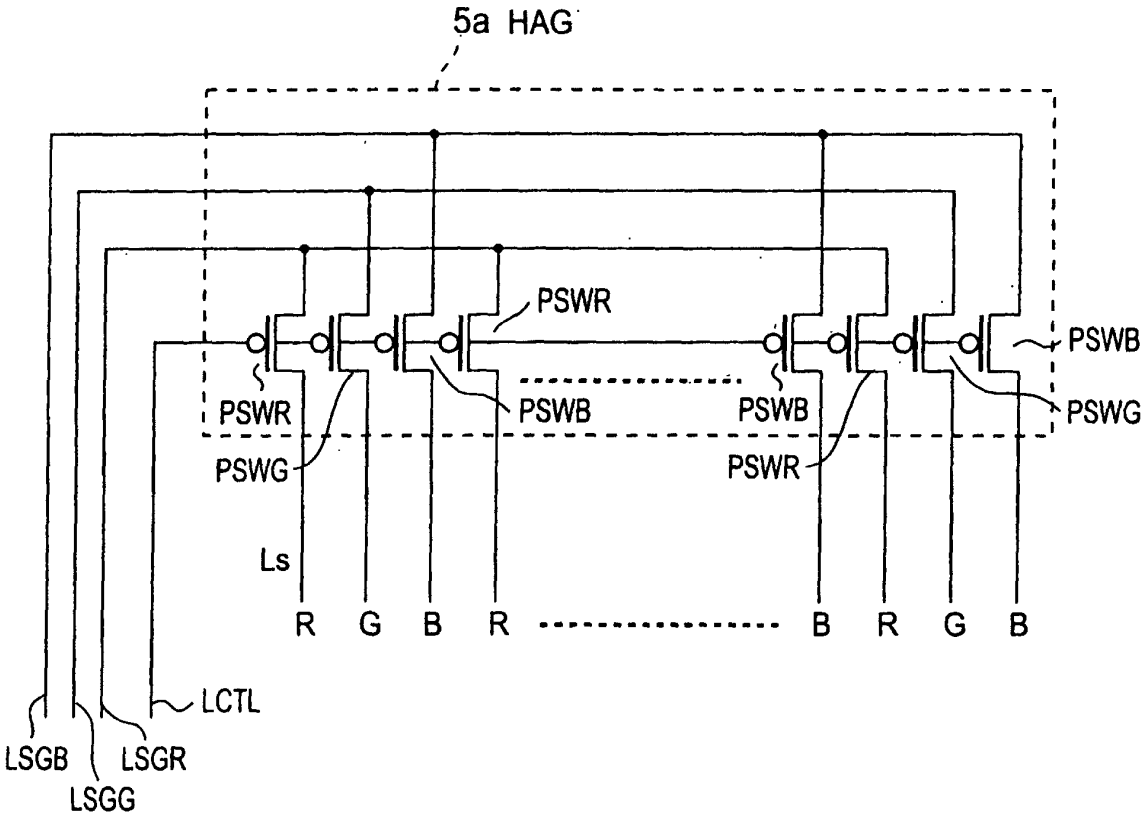

5a HAG
PSWR
PSWB
PSWR
PSWB
PSWB
PSWG
PSWG
PSWR
Ls
R G B R B R G B
LCTL
LSGB
LSGR
LSGG

FIG.6

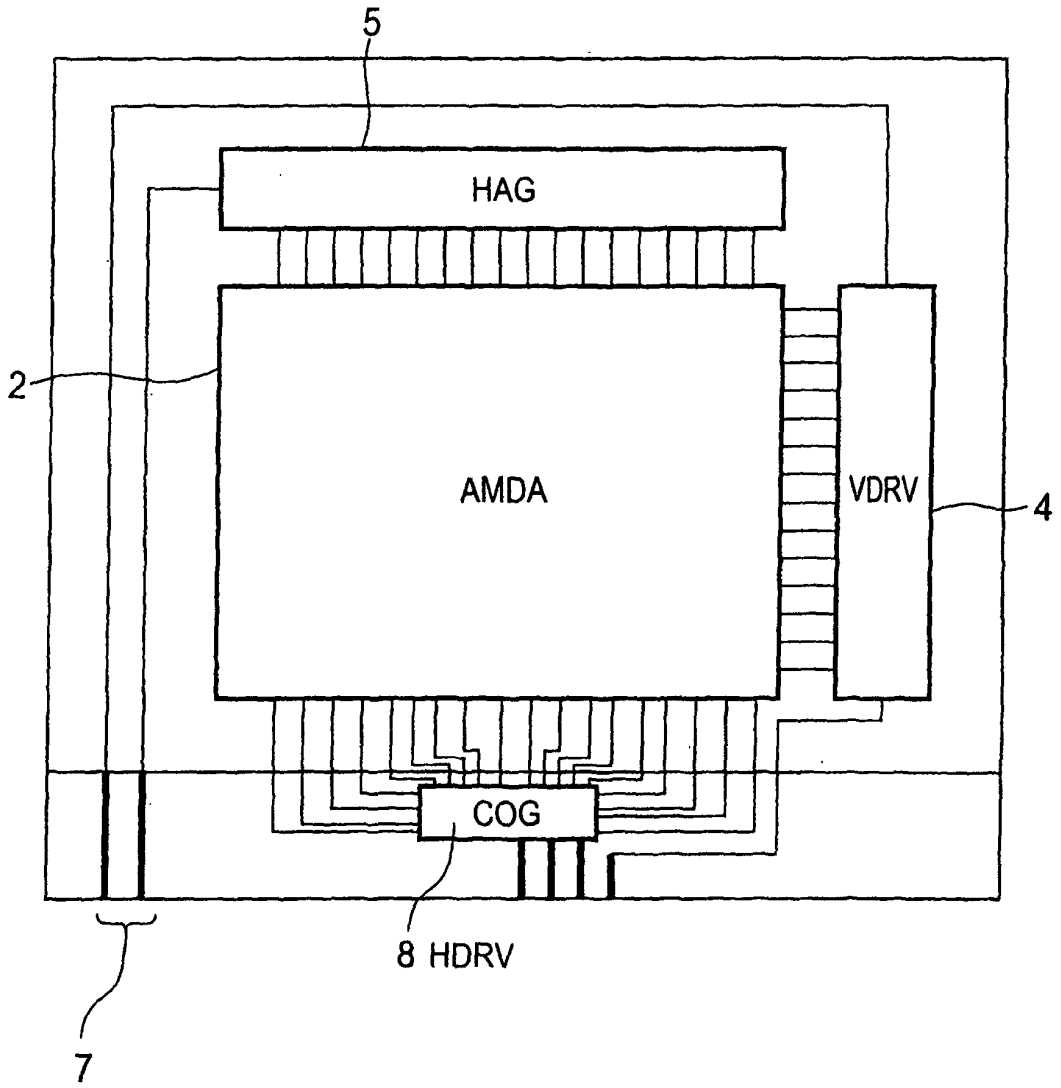


FIG.7

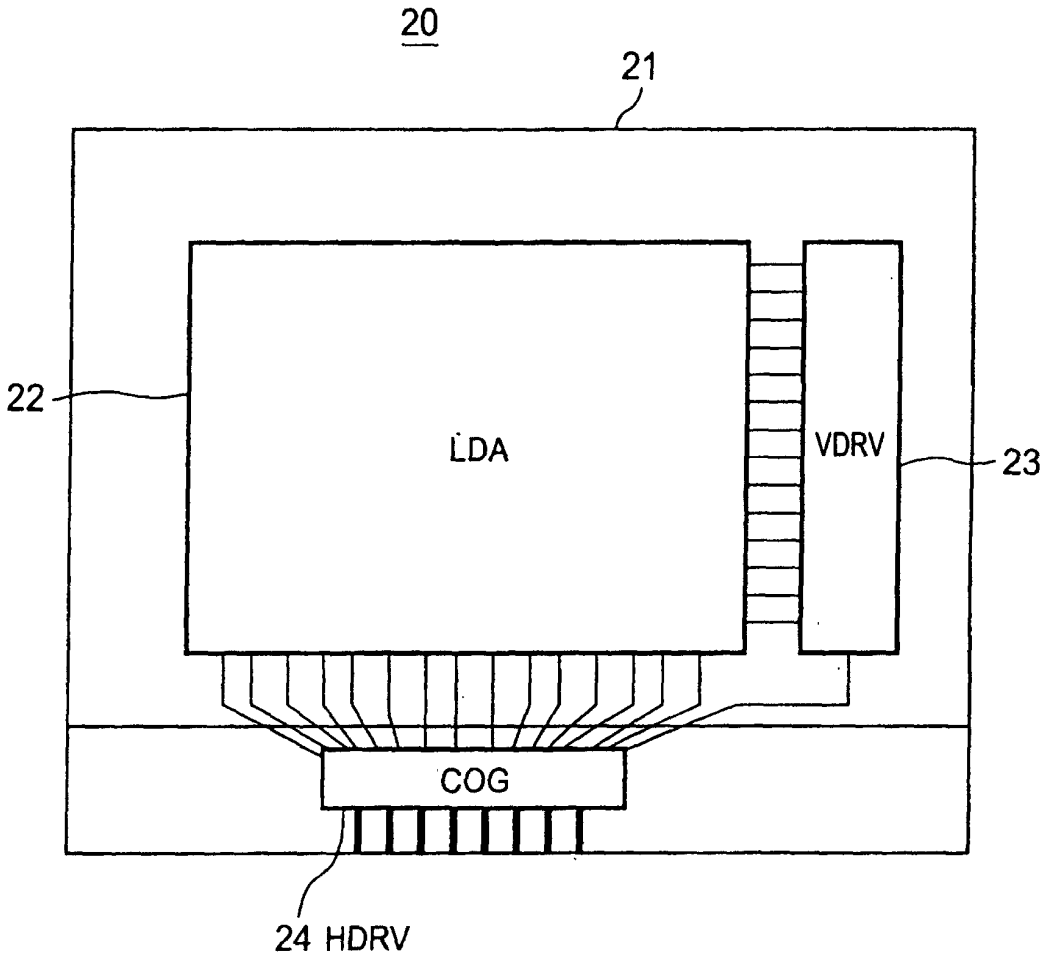
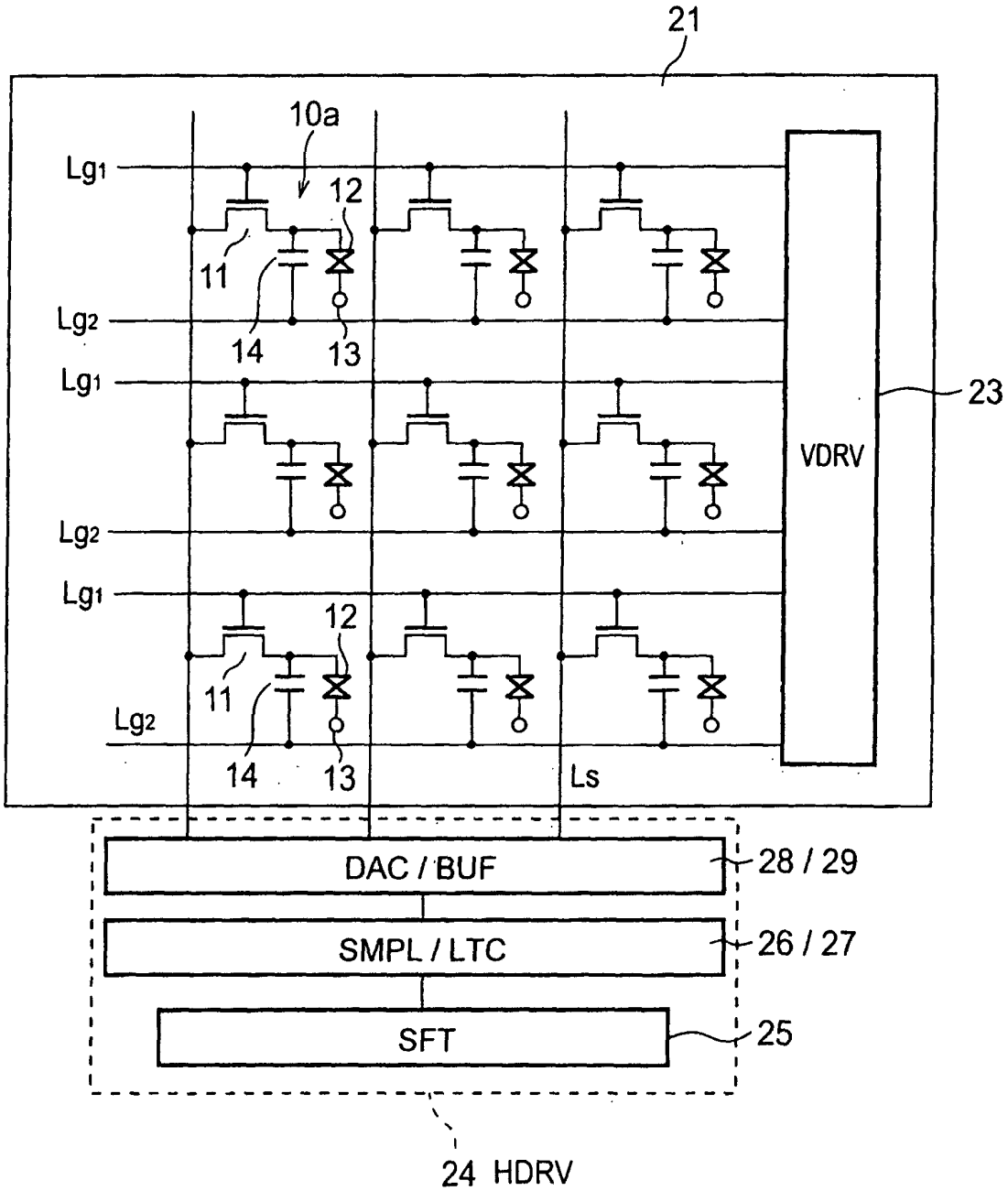


FIG.8


21
10a
Lg1
12
11
Lg2
14
13
Lg1
23
VDRV
Lg2
Lg1
12
11
Lg2
14
13
Ls
DAC / BUF
28 / 29
SMPL / LTC
26 / 27
SFT
25
24 HDRV

EXPLANATION OF REFERENCE NUMERALS

1... liquid crystal display panel

2... active matrix display area (AMDA)

3... glass substrate

4... vertical drive circuit (VDRV)

5, 5a... horizontal aging circuit (HAG)

6... first pad region

7... second pad region

8... horizontal drive circuit (HDRV)

Lg... gate line

Ls... source line

10, 10a... pixel cell

11... TFT

12... liquid crystal element

13... counter electrode

14... held capacity

20... liquid crystal display apparatus

21... glass substrate

22... liquid crystal display area (LDA)

23... vertical drive circuit (VDRV)

24... horizontal drive circuit (HDRV)

25... shift register circuit (SFT)

26... sampling circuit (SMPL)

27... latch circuit (LTC)

28... digital/analog conversion circuit (DAC)

29... output buffer circuit (BUF)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP01/06547

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] G02F1/1345, G09F9/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] G02F1/1345, G09F9/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Toroku Jitsuyo Shinan Koho 1994-2001
Kokai Jitsuyo Shinan Koho 1971-2001 Jitsuyo Shinan Toroku Koho 1996-2001

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	JP 1-130132 A (Seiko Epson Corporation), 23 May, 1989 (23.05.89), Full text; all drawings Full text; all drawings (Family: none)	1-3,7-9 4-6
Y	JP 4-288588 A (Matsushita Electronic Corporation), 13 October, 1992 (13.10.92), Par. Nos. [0010] to [0011] (Family: none)	4-6
Y	JP 10-10546 A (Furontetsuku K.K.), 16 January, 1998 (16.01.98), Par. Nos. [0006], [0018] (Family: none)	10
Y	JP 2000-131709 A (Fujitsu Limited), 12 May, 2000 (12.05.00), Par. No. [0004] (Family: none)	10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
18 September, 2001 (18.09.01)	02 October, 2001 (02.10.01)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP01/06547

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

The "special technical features" of claims 1-9 relate to "a liquid crystal display panel having an aging circuit on its substrate and connected to an external drive circuit". The "special technical feature" of claim 10 relates to "a liquid crystal display in which a vertical drive circuit is provided on its substrate, a horizontal drive circuit is connected by COG, and the output terminals of the horizontal drive circuit correspond to source lines in a one-to-one relationship".

Since there is no technical relationship among those inventions involving one or more of the same or corresponding special technical features, these groups of inventions are not so linked as to form a single general inventive concept.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☒ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (1)) (July 1992)

专利名称(译)	液晶显示面板及其制造方法和液晶显示器		
公开(公告)号	EP1220018A1	公开(公告)日	2002-07-03
申请号	EP2001954377	申请日	2001-07-30
[标]申请(专利权)人(译)	索尼公司		
申请(专利权)人(译)	索尼公司		
当前申请(专利权)人(译)	索尼公司		
[标]发明人	KIDA YOSHITOSHI C O SONY CORPORATION NAKAJIMA YOSHIHARU C O SONY CORPORATION GOTO NAOSHI C O SONY CORPORATION MAEKAWA TOSHIKAZU C O SONY CORPORATION KATAOKA HIDEO C O SONY CORPORATION		
发明人	KIDA, YOSHITOSHI, C/O SONY CORPORATION NAKAJIMA, YOSHIHARU, C/O SONY CORPORATION GOTO, NAOSHI, C/O SONY CORPORATION MAEKAWA, TOSHIKAZU, C/O SONY CORPORATION KATAOKA, HIDEO, C/O SONY CORPORATION		
IPC分类号	G02F1/13 G02F1/1362 G09G3/00 G09G3/36 G02F1/1345 G09F9/00		
CPC分类号	G02F1/13452 G02F1/13454 G02F2001/136254 G09G3/006 G09G3/3688 G09G2300/0408 G09G2330/12		
优先权	2000230993 2000-07-31 JP 2000231013 2000-07-31 JP		
其他公开文献	EP1220018A4		
外部链接	Espacenet		

摘要(译)

液晶显示面板1，外部水平驱动电路以TAB，COG或其它形式连接到液晶显示面板1，当通过连接外部驱动电路可以进行图像显示时，该液晶显示面板能够仅通过基板进行老化，包括有源矩阵显示区域2，垂直驱动电路4和水平老化电路5，用于在基板3上一次向多个源极线提供信号。另外，中小型有源矩阵型液晶显示装置用于PDA等，能够以高质量和低成本生产而不使用分时驱动方法并且设置有水平驱动电路作为外部电路，其中垂直驱动电路与液晶显示器一体形成通过使用低温PolySi TFT在玻璃基板上的区域，通过COG将水平驱动电路连接到液晶显示面板基板，并且构成驱动器IC的输出端子水平驱动电路和源极线Ls一一对应。

FIG.1