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(54) LIQUID CRYSTAL DISPLAY DEVICE

FLÜSSIGKRISTALLANZEIGEVORRICHTUNG

DISPOSITIF D'AFFICHAGE À CRISTAUX LIQUIDES

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Description

[0001] This application claims priority from Chinese Patent Application No. 201110254100.3, filed with the Chinese Patent Office on August 30, 2011 and entitled "Liquid Crystal Display Device and Testing Method thereof".

Field of the Invention

[0002] The application relates to the field of display devices, and in particular to a liquid crystal display device.

Background of the Invention

[0003] A liquid crystal display device is provided with an effective display area formed by display pixels in a matrix shape, and the effective display area is provided with a plurality of scan lines extending along the row direction of the display pixels and a plurality of data lines extending along the column direction of the display pixels. Switch elements and pixel electrodes connected with the switch elements are arranged at intersections of the scan lines and the data lines, the switch elements are, for example, thin film transistors (TFTs), and the switch elements can respond to signals supplied to each scan line and send the signals from the data lines to each corresponding pixel electrode. The scan lines and the data lines extend to the peripheral part of the effective display area (for example, the extended scan lines and data lines are connected with a drive circuit), and the quality of pictures displayed in the effective display area is tested by inputting test signals at the peripheral part. The scan lines, the data lines and other circuit connecting lines are usually collectively referred to as signal lines.

[0004] With the increase of the display pixels, various signal lines such as the scan lines and the data lines in the effective display area and the peripheral part thereof are thinner and thinner in line width, and intervals are smaller and smaller, so various poor wiring conditions such as line breakage and short circuits are more and more. Therefore, for timely discovery of the poor wiring conditions, preventing large-scale poor conditions and preventing rejects from entering the next procedure to cause the waste of materials, the scan lines, the data lines and other signal lines are required to be checked after wiring so as to determine whether the poor wiring conditions exist or not.

[0005] At present, a common detecting method for the liquid crystal display device is that respective signal lines are connected together in a shorting manner by using a plurality of shorting bars, test signals are input to the shorting bars, the test signals are transmitted to the scan lines and the data lines of the effective display area through corresponding elements, and the quality of the pictures displayed in the effective display area is detected.

[0006] Details refer to Fig. 1, which is a structural schematic diagram of a liquid crystal display device in the prior art. The liquid crystal display device comprises four shorting bars 101, 102, 103 and 104, test terminals 101a, 102a, 103a and 104a connected with the four shorting bars 101, 102, 103 and 104 respectively, six data lines D11, D12, D 13, D14, D15 and D16, twelve connecting lines C1, C2, C3, C4, C5, C6, C7-1, C7-2, C8-1, C8-2, C9-1 and C9-2, three scan lines G11, G12 and G13, thin film transistors 105 and 106, through holes 107 and 108, and a switch control line 109.

[0007] In this case, the data lines D11 and D14 are red signal data lines, the data lines D12 and D15 are green signal data lines, and the data lines D13 and D16 are blue signal data lines. The data lines D11, D12, D 13, D14, D15 and D16 are electrically connected with the connecting lines C1, C2, C3, C4, C5 and C6 through the thin film transistor 105 respectively. The connecting lines C1, C4 and the shorting bar 101, the connecting lines C2, C5 and the shorting bar 102, and the connecting lines C3, C6 and the shorting bar 103 are electrically connected through the through holes 107 and connecting metals (not shown in the figure) respectively. The scan lines G11, G12 and G13 are electrically connected with the connecting lines C7-1, C8-1 and C9-1 through the through holes 108 and connecting metals (not shown in the figure) respectively; the connecting lines C7-1, C8-1 and C9-1 and the connecting lines C7-2, C8-2 and C9-2 all intersect with the switch control line 109; and switch elements 106 are respectively formed at an intersection points of the connecting lines C7-1 and C7-2 and the switch control line 109, an intersection points of the connecting lines C8-1 and C8-2 and the switch control line 109 and an intersection points of the connecting lines C9-1 and C9-2 and the switch control line 109, so that the scan lines G11, G12 and G13 are electrically connected with the shorting bar 104 through the through holes 108, the connecting metals, the connecting lines C7-1, C8-1 and C9-1, the connecting lines C7-2, C8-2 and C9-2 and the switch elements 106.

[0008] The shorting bars 101, 102 and 103 electrically connected with the data lines are called data line shorting bars. The shorting bar 104 connected with the scan lines is called a scan line shorting bar.

[0009] Generally speaking, the shorting bars 101, 102 and 103 and the connecting lines C1, C2, C3, C4, C5 and C6 are positioned in different circuit layers (not formed in a same step), so the shorting bars 101, 102 and 103 are electrically connected with the corresponding connecting lines through the through holes 107. In details, each through hole 107 comprises through holes 107-1 and 107-2, for example, the through hole 107-1 of the shorting bar 101 is electrically connected with the through hole 107-2 of the connecting line C4 through connecting metals (not shown in the figure), so that the shorting bar 101 is connected with the data line D14, and connecting modes of the other shorting bars and connecting lines are similar thereto. The connecting metals are generally indium tin oxide (ITO) or indium zinc oxide

(IZO). Electric test can be carried out through inputting test signals to the test terminals 101a, 102a, 103a and 104a.

[0010] In the prior art, the shorting bars 101, 102 and 103 and the connecting lines C1, C2, C3, C4, C5 and C6 are positioned in different circuit layers, because overline connections are required between the shorting bar 101 and the connecting lines C1, C4 and between the shorting bar 102 and the connecting lines C2, C5. As shown in Fig.1, the connecting line C1 is required to span the shorting bars 102 and 103 to be connected with the shorting bar 101. If the connecting lines and the shorting bars are formed in the same circuit layer, the connecting line C1 and the shorting bars 102 and 103 will be shorted.

[0011] In the patent document with publication number CN 102 109 688 A, it is provided a method for testing line defects of an LCD panel, an array substrate and drive wires. The LCD panel comprises a plurality of groups of drive wires and a plurality of detection terminals, and each group of the drive wires at least comprises two drive wires, wherein the LCD panel further comprises a plurality of first switches, a plurality of second switches, a first switch control wire used for controlling the plurality of first switches, and a second switch control wire used for controlling the plurality of second switches, and one end of each of the two drive wires of at least one group of the drive wires is connected with one detection terminal through one first switch and one second switch respectively. At least two drive wires share one first detection terminal, so that the using times of probes can be reduced; the distance among the detection terminals are enlarged, and the defect of detection error caused by short circuit of the adjacent probes as soon as the probes are slightly bent can be avoided.

[0012] Therefore, the liquid crystal display device in the prior art has the following defects:

firstly, in the manufacturing process of the liquid crystal display device, for example, in the procedures of picking and placing glass in array process, coating an alignment film and rubbing the alignment film in box process and the like, the ITO or the IZO at the through holes 107 is often burnt due to over-high static electricity; due to the through hole defect, the antistatic function of the shorting bars is disabled and also an array substrate experiences a phenomenon of poor display when testing electrical property, so that the product is scrapped; and

because each data line corresponds to a connecting line, the data lines D11, D12, D13, D14, D15 and D16 and the connecting lines C1, C2, C3, C4, C5 and C6 occupy a relatively larger area, which is adverse to reduce the size occupied by the test signal control part; and furthermore, because more data lines are superposed with the switch control line 109, switch signals of the switch elements are delayed.

Summary of the Invention

[0013] The application provides a liquid crystal display device. The liquid crystal display device eliminates adverse influences of the through hole defects on the test result, and can reduce the area occupied by data lines.

[0014] For solving the technical problems abovementioned, the application provides a liquid crystal display device as claimed in claim 1, claim 8 and claim 13. Further features are provided in the dependent claims.

[0015] Optically, the liquid crystal display device further comprises at least one of the following test terminals: a test terminal connected with the data line shorting bar, and test terminals connected with the switch control lines for the data lines.

[0016] Optically, the liquid crystal display device further comprises at least one of the following test terminals: a test terminal connected with the scan line shorting bar, and a test terminal connected with the switch control line for the scan lines.

[0017] According to the technical schemes abovementioned, compared with the prior art, the liquid crystal display device provided in the application eliminates through holes in the data line test part, thereby eliminating the adverse influences of the through hole defects on the liquid crystal display device and ensuring smooth operation of the electric test; the area occupied by the data line test part can be reduced through the liquid crystal display device, which is beneficial to production of small-sized liquid crystal display devices; and moreover, compared with the prior art, the number of the data lines superposed with the switch control lines for the data lines is reduced in the application, thereby reducing switch signal delay of the switch elements.

Brief Description of the Drawings

[0018]

Fig.1 is a structural schematic diagram of a liquid crystal display device in the prior art;

Fig.2 is a structural schematic diagram of a liquid crystal display device in a first embodiment of the application;

Fig.3 is an oscillogram when the liquid crystal display device displays red pictures in the first embodiment of the application;

Fig.4 is an oscillogram when the liquid crystal display device displays green pictures in the first embodiment of the application;

Fig.5 is an oscillogram when the liquid crystal display device displays blue pictures in the first embodiment of the application;

Fig.6 is a structural schematic diagram of a liquid crystal display device in a second embodiment of the application;

Fig.7 is an oscillogram when the liquid crystal display device displays red pictures in the second embodi-

ment of the application;

Fig.8 is an oscillogram when the liquid crystal display device displays green pictures in the second embodiment of the application;

Fig.9 is an oscillogram when the liquid crystal display device displays blue pictures in the second embodiment of the application;

Fig.10 is a structural schematic diagram of a liquid crystal display device in a third embodiment of the application;

Fig.11 is an oscillogram when the liquid crystal display device displays red pictures in the third embodiment of the application;

Fig.12 is an oscillogram when the liquid crystal display device displays green pictures in the third embodiment of the application; and

Fig.13 is an oscillogram when the liquid crystal display device displays blue pictures in the third embodiment of the application.

Detailed Description of the Embodiments

[0019] As mentioned in the background, because the data line shorting bar and the connecting lines are generally positioned in different circuit layers, the data line shorting bar is electrically connected with the connecting lines by means of through holes, but in the manufacturing process of the liquid crystal display device, connecting conductive layers at the through holes are frequently burnt due to over-high static electricity. Due to the through hole defect, not only is the antistatic function of the data line shorting bar disabled, but also the electric test cannot be carried out. Therefore, the application provides a liquid crystal display device and a testing method thereof, where the liquid crystal display device eliminates the through holes and thus eliminates the adverse influences of the through hole defects on the liquid crystal display device, ensures smooth operation of the electric test, and can reduce the area occupied by the data lines and can also reduce the switch signal delay of the switch elements.

First embodiment

[0020] For convenience, three scan lines and two data line sets are taken as examples for detailed description below. However, it should be realized that the number of the scan lines and the number of the data lines are not limited thereto.

[0021] Please refer to Fig.2, which is a structural schematic diagram of a liquid crystal display device in the first embodiment of the application. As shown in Fig.2, the liquid crystal display device comprises an effective display area and a test area, where the test area comprises a data line test area and a scan line test area.

[0022] The effective display area comprises three scan lines G21, G22 and G23, two data line sets D20-1 and D20-2, and a plurality of pixel units formed in areas encircled by intersecting the three scan lines G21, G22 and G23 with data lines in the two data line sets D20-1 and D20-2. The three scan lines G21, G22 and G23 are parallel to each other and are separated from each other by a fixed interval, and extend along the row direction of the array matrix of the liquid crystal display device. The data line set D20-1 comprises three adjacent data lines D21, D22 and D23; the data line set D20-2 comprises three adjacent data lines D24, D25 and D26; the six data lines D21, D22, D23, D24, D25 and D26 are parallel to each other and are separated from each other by a fixed interval, and extend along the direction vertical to the three scan lines G21, G22 and G23; and the six data lines can be made of the same material, and are formed by synchronous film forming, photo-etching and etching in the manufacturing process of the liquid crystal display device.

[0023] In this case, D21 and D24 are first data lines, D22 and D25 are second data lines, and D23 and D26 are third data lines.

[0024] The pixel units comprise red pixel units, green pixel units and blue pixel units; and the pixel units include a pixel electrode arranged in each pixel unit, where each pixel electrode is connected with a TFT; the TFT can conduct under the control of scan line signals and transmit signals from the corresponding data line to the corresponding pixel electrode to thereby control steering of liquid crystal molecules, so that one color or a combination of colors, of three primary colors, namely red, green and blue, is displayed in the display area, wherein the data lines D21 and D24 are red signal data lines and are connected with pixel electrodes R of red pixel units; the data lines D22 and D25 are green signal data lines and are connected with pixel electrodes G of green pixel units; and the data lines D23 and D26 are blue signal data lines and are connected with pixel electrodes B of blue pixel units.

[0025] It should be pointed out that in a data line set, the line sequence of respective color signal data lines is not limited thereto, and can be another line sequence. For example, the data lines D21 and D24 are green signal data lines, the data lines D22 and D25 are red signal data line, and the data lines D23 and D26 are blue signal data lines and so on.

[0026] The data line test area comprises a data line shorting bar 201, two switch control lines 202 and 203 for the data lines, a first switch element 204-1 and a second switch element 204-2 formed at intersection points of the data line set D20-1 with the switch control lines 202 and 203 for the data lines, and a first switch element 205-1 and a second switch element 205-2 formed at intersection points of the data line set D20-2 with the switch control lines 202 and 203 for the data lines.

[0027] In this case, the data switch control line 202 is a first data switch control line, and the data switch control line 203 is a second data switch control line.

[0028] Gate electrodes of the two first switch elements 204-1 and 205-1 are both arranged on the data switch

control line 202, and gate electrodes of the two second switch elements 204-2 and 205-2 are both arranged on the data switch control line 203. Source electrodes of the first switch elements 204-1 and 205-1 are directly connected with the data line shorting bar 201, and source electrodes of the second switch elements 204-2 and 205-2 are connected with the data line shorting bar 201 through the first switch elements 204-1 and 205-1. Drain electrodes of the first switch elements 204-1 and 205-1 are arranged on the data switch control line 202 and connected with the data lines D22 and D25; and drain electrodes of the second switch elements 204-2 and 205-2 are arranged on the data switch control line 203 and connected with the data lines D23 and D26. The first switch elements 204-1 and 205-1 and the second switch elements 204-2 and 205-2 in the embodiment are all thin film transistor switch elements, the data switch control line 202 is used for controlling connection and disconnection of the two first switch elements 204-1 and 205-1, and similarly, the data switch control line 203 is used for controlling connection and disconnection of the two second switch elements 204-2 and 205-2.

[0029] In this case, the gate electrodes of the first switch elements 204-1 and 205-1 are arranged on the data switch control line 202 and connected with the data switch control line 202, and specifically, the data switch control line 202 can be used as the gate electrodes of the first switch elements 204-1 and 205-1.

[0030] The gate electrodes of the second switch elements 204-2 and 205-2 are arranged on the data switch control line 203 and connected with the data switch control line 203, and specifically, the data switch control line 203 can be used as the gate electrodes of the second switch elements 204-2 and 205-2.

[0031] The source electrodes of the second switch elements 204-2 and 205-2 are connected with the data line shorting bar 201 through the first switch elements 204-1 and 205-1, and specifically, the source electrode of the second switch element 204-2 is connected with the drain electrode of the first switch element 204-1, and thus connected with the data line shorting bar 201 through the first switch element 204-1; and the source electrode of the second switch element 205-2 is connected with the drain electrode of the first switch element 205-1, and thus connected with the data line shorting bar 201 through the first switch element 205-1.

[0032] The drain electrodes of the first switch elements 204-1 and 205-1 are arranged on the data switch control line 202 and insulated with the data switch control line 202; and the drain electrodes of the second switch elements 204-2 and 205-2 are arranged on the data switch control line 203 and insulated with the data switch control line 203.

[0033] The scan line test area comprises a scan line shorting bar 206, a switch control line 207 for the scan lines, three switch elements 208-1, 208-2 and 208-3 for the scan lines, three first connecting lines C21-1, C22-1 and C23-1 for the scan lines and three second connecting lines C21-2, C22-2 and C23-2 for the scan lines. Gate electrodes of the three switch elements 208-1, 208-2 and 208-3 for the scan lines are all arranged on the switch control line 207 for the scan lines. Source electrodes of the three switch elements 208-1, 208-2 and 208-3 for the scan lines are respectively connected with the scan line shorting bar 206 through the second connecting lines C21-2, C22-2 and C23-2 for the scan lines. Drain electrodes of the three switch elements 208-1, 208-2 and 208-3 for the scan lines are arranged on the switch control line 207 for the scan lines and are respectively connected with three scan lines G21, G22 and G23 through the three first connecting lines C21-1, C22-1 and C23-1 for the scan lines.

[0034] In this case, the gate electrodes of the three switch elements 208-1, 208-2 and 208-3 for the scan lines are all arranged on the switch control line 207 for the scan lines, and specifically, the switch control line 207 for the scan lines is used as the gate electrodes of respective switch elements for the scan lines.

[0035] The drain electrodes of the three switch elements 208-1, 208-2 and 208-3 for the scan lines are arranged on the switch control line 207 for the scan lines and insulated with the switch control line 207 for the scan lines.

[0036] In the embodiment, because the three scan lines G21, G22 and G23 and the three first connecting lines C21-1, C22-1 and C23-1 for the scan lines are positioned in different conductive layers, the first connecting lines C21-1, C22-1 and C23-1 for the scan lines are connected with the three scan lines G21, G22 and G23 through three through holes 209-1, 209-2 and 209-3 respectively. Generally, after an array substrate is aligned with a color film substrate, the through holes 209-1, 209-2 and 209-3 of the scan line test area are generally packaged in frame sealing glue of the array substrate and the color film substrate, so static electricity is difficultly produced at these through holes, connecting metals (such as ITO or IZO) at these through holes are difficultly to be burnt, and thus the through holes in the scan line test area are not eliminated in the embodiment. It can be understood that the through holes and the connecting lines for the scan lines can be replaced by switch elements in the scan line test area, to thereby save the area occupied by the scan line test area.

[0037] It should be pointed out that in each embodiment of the application, the switch elements 208-1, 208-2 and 208-3 for the scan lines can also be eliminated, so that the scan lines G21, G22 and G23 are directly electrically connected with the first connecting lines C21-1, C22-1 and C23-1 for the scan lines, the second connecting lines C21-2, C22-2 and C23-2 for the scan lines and the scan line shorting bar 206 through the through holes 209-1, 209-2 and 209-3. Although in the connecting mode, the connections of the scan line shorting bar 206 with respective scan lines G21, G22 and G23 are required to be cut off by using laser after the test is completed to facilitate drive circuit module assembly of the

next step, the procedure of making the switch elements for the scan lines is reduced in this mode.

[0038] In this case, the switch elements 208-1, 208-2 and 208-3 for the scan lines are eliminated, so that the scan lines G21, G22 and G23 can be directly electrically connected with the first connecting lines C21-1, C22-1 and C23-1 for the scan lines, the second connecting lines C21-2, C22-2 and C23-2 for the scan lines and the scan line shorting bar 206 through the through holes 209-1, 209-2 and 209-3, this is because the switch elements 208-1, 208-2 and 208-3 for the scan lines are eliminated, so that the second connecting lines C21-2, C22-2 and C23-2 for the scan lines are directly connected with the scan line shorting bar 206.

[0039] In the embodiment, none of the data line shorting bar 201, the scan line shorting bar 206, the switch control lines 202 and 203 for the data lines and the switch control line 207 for the scan lines are connected with test terminals, so test signals can be directly applied to the data line shorting bar 201, the scan line shorting bar 206, the switch control lines 202 and 203 for the data lines and the switch control line 207 for the scan lines. However, it should be realized that the data line shorting bar 201, the scan line shorting bar 206, the switch control lines 202 and 203 for the data lines and the switch control line 207 for the scan lines can also be connected with the test terminals, and the test terminals can be made of the same materials as or different materials from the data line shorting bar 201, the scan line shorting bar 206, the switch control lines 202 and 203 for the data lines and the switch control line 207 for the scan lines. In addition, a plurality of test terminals can be made of the same or different materials, for example, one part of the test terminals can be made of molybdenum, while the other part of the test terminals can be made of aluminum or aluminum alloy.

[0040] According to above description, the data lines D21 and D24 are directly connected with the data line shorting bar 201, the data lines D22 and D24 are electrically connected with the data line shorting bar 201 through the first switch elements 204-1 and 205-1 respectively, and the data lines D23 and D26 are electrically connected with the data line shorting bar 201 through the first switch elements 204-1 and 205-1 and the second switch element 204-2 and 205-2 respectively; and in addition, two switch control lines 202 and 203 for the data lines are provided, where each data switch control line is connected with two switch elements, the data lines corresponding to the two switch elements on the same data switch control line correspond to pixel electrodes with the same color, and the liquid crystal display device can display pictures with different colors by applying corresponding control signals to the two switch control lines 202 and 203 for the data lines without the need of through holes, thereby eliminating the adverse influences of the through hole defects on the liquid crystal display device and ensuring smooth operation of the electric test.

[0041] Moreover, as in shown Fig.1, in the liquid crystal display device in the prior art, if line widths of the data lines D11, D12, D13, D14, D15 and D16 are all a11, line widths of the connecting lines C1, C2, C3, C4, C5 and C6 are all a12 and distances between the connecting lines and adjacent data lines are a13, and thus the distance W1 between the connecting line C1 and the data line D16 is 6*a11+6*a12+11*a13; and if a11=a12=a13=a, then W1=23a. In the embodiment, if line widths of the data lines D21, D22, D23, D24, D25 and D26 are all a21 and distances between adjacent data lines are a22, then the distance W2 between the data line D21 and the data line D26 is 6*a21+5*a22; and if a21=a22=a, then W2=11a. Compared with the prior art, in the embodiment, the width of the data line test area, which can be reduced, is W1-W2=12a. It can be seen that in comparison with the prior art, in the embodiment, the area occupied by the data line test area is reduced, thereby facilitating the production of small-sized liquid crystal display devices. Moreover, compared with the prior art, in the embodiment, the number of the data lines superposed with each data switch control line is reduced, thereby reducing the switch signal delay of the switch elements.

[0042] The application further provides a testing method for the liquid crystal display device. The testing method comprises:

S1: providing a start voltage signal to the switch control line for the scan lines, the scan line shorting bar and the switch control lines for the data lines, and providing a data voltage signal to the data line shorting bar, so that the liquid crystal display device displays black pictures or white pictures;

and in the condition that the liquid crystal display device displays the black pictures or the white pictures, executing step S2: providing a start voltage signal to the switch control line for the scan lines and the scan line shorting bar, and regulating data voltage signals on the plurality of switch control lines for the data lines and the data line shorting bar, so that the liquid crystal display device displays pictures with different colors.

[0043] The liquid crystal display device in a normally white mode is taken as an example below to describe the testing method for the liquid crystal display device according to the embodiment in details.

1) Detecting red pictures

[0044] Please refer to Fig.2 and Fig.3, where Fig.3 is an oscillogram when the liquid crystal display device displays red pictures in the first embodiment of the application. As shown in Fig.3, in a time period of one frame (comprising a time period T1 and a time period T2), the method comprises the following testing steps:

during the time period T1, providing a start voltage

signal (for example, 15V) to the switch control line 207 for the scan lines, the scan line shorting bar 206 and the switch control lines 202 and 203 for the data lines, to turn on the first switch elements 204-1 and 205-1 and the second switch elements 204-2 and 205-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 201, so that the liquid crystal display device displays black pictures; and

during the time period T2, proceeding to provide a start voltage signal to the switch control line 207 for the scan lines and the scan line shorting bar 206, to make signals on the three scan lines G21, G22 and G23 be the start voltage signal and thus to turn on the thin film transistors in all the pixel units in the effective display area; providing a cut-off voltage to the switch control lines 202 and 203 for the data lines, so that the two first switch elements 204-1 and 205-1 and the two second switch elements 204-2 and 205-2 are all in a cut-off state; and then providing a second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 to the data line shorting bar 201, and applying signals of the second voltage V2 to the corresponding red pixel electrodes R through the red signal data lines D21 and D24, so that light can penetrate the red pixel units, and finally red pictures are displayed in the display area of the liquid crystal display device. Therefore, the red pictures can be detected.

2) Detecting green pictures

[0045] Please refer to Fig.4, which is an oscillogram when the liquid crystal display device displays green pictures in the first embodiment of the application. As shown in Fig.4, in a time period of one frame (comprising a time period T1, a time period T2 and a time period T3), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 207 for the scan lines, the scan line shorting bar 206 and the switch control lines 202 and 203 for the data lines, to turn on all of the two first switch elements 204-1 and 205-1 and the two second switch elements 204-2 and 205-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 201, so that the liquid crystal display device displays black pictures;

during the time period T2, proceeding to provide a start voltage signal to the switch control line 207 for the scan lines and the scan line shorting bar 206, to make signals on the three scan lines G21, G22 and G23 be the start voltage signal and thus to turn on the thin film transistors in all the pixel units in the effective display area; providing a cut-off voltage signal to the data switch control line 203, so that the two second switch elements 204-2 and 205-2 are both in a cut-off state; simultaneously providing a start voltage signal to the data switch control line 202, so that the two first switch elements 204-1 and 205-1 are in a turn-on state; and then providing a second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 to the data line shorting bar 201, so that light can penetrate the red pixel units and the green pixel units; and

during the time period T3, proceeding to provide a start voltage signal to the switch control line 207 for the scan lines and the scan line shorting bar 206, to turn on the thin film transistors in all the pixel units in the effective display area; providing a cut-off voltage to the switch control lines 202 and 203 for the data lines, so that the two first switch elements 204-1 and 205-1 and the two second switch elements 204-2 and 205-2 are all in a cut-off state; and then providing the first voltage V1 greater than the common electrode voltage V0 to the data line shorting bar 201, so that light cannot penetrate the red pixel units, and finally green pictures are displayed in the display area of the liquid crystal display device. Therefore, the green pictures can be detected.

3) Detecting blue pictures

[0046] Please refer to Fig.5, which is an oscillogram when the liquid crystal display device displays the blue pictures in the first embodiment of the application. As shown in Fig.5, in a time period of one frame (comprising a time period T1 and a time period T2), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 207 for the scan lines, the scan line shorting bar 206 and the switch control lines 202 and 203 for the data lines, to turn on the two first switch elements 204-1 and 205-1 and the two second switch elements 204-2 and 205-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing the second voltage V2 close to the common electrode voltage V0 to the data line shorting bar 201, so that the liquid crystal display device displays white pictures; and

during the time period T2, proceeding to provide a start voltage signal to the switch control line 207 for the scan lines and the scan line shorting bar 206, to make signals on the three scan lines G21, G22 and G23 be the start voltage signal and thus to turn on the thin film transistors in all the pixel units in the effective display area; providing a cut-off voltage to the data switch control line 203, so that the two sec-

ond switch elements 204-2 and 205-2 are both in a cut-off state; simultaneously providing a start voltage to the data switch control line 202, so that the two first switch elements 204-1 and 205-1 are both in a turn-on state; and at this time, providing the first voltage V1 greater than the common electrode voltage V0 to the data line shorting bar 201, so that light cannot penetrate the red pixel units and the green pixel units, and as a result, blue pictures are displayed in the display area of the liquid crystal display device. Therefore, the blue pictures can be detected.

4) Detecting black pictures

[0047] Providing a start voltage signal (for example, 15V) to the switch control line 207 for the scan lines, the scan line shorting bar 206 and the switch control lines 202 and 203 for the data lines, to turn on the two first switch elements 204-1 and 205-1 and the two second switch elements 204-2 and 205-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 201, so that the liquid crystal display device displays black pictures; and detecting whether line defects exists.

5) Detecting white pictures

[0048] Providing a start voltage signal (for example, 15V) to the switch control line 207 for the scan lines, the scan line shorting bar 206 and the switch control lines 202 and 203 for the data lines, to turn on the two first switch elements 204-1 and 205-1 and the two second switch elements 204-2 and 205-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing the second voltage V2 close to the common electrode voltage V0 to the data line shorting bar 201, so that the liquid crystal display device displays white pictures; and detecting whether line defects exists.

[0049] With respect to the above several conditions, when the red, green and blue pictures are required to be switched, for example, when the red pictures are required to be switched into the green pictures, firstly a start voltage control signal is provided to the switch control lines 202 and 203 for the data lines, and a signal of the first voltage V1 greater than the common electrode voltage V0 is provided to the data line shorting bar 201, so that the black pictures are displayed in the effective display area; and then a start voltage signal is provided to the data switch control line 202, and the second voltage V2 close to the common electrode voltage V0 is provided to the data line shorting bar 201; and in addition, a cut-off voltage is provided to the switch control lines 202 and 203 for the data lines, and the first voltage V1 greater than the common electrode voltage V0 is provided to the data line shorting bar 201, so that the green pictures are displayed in the effective display area of the liquid crystal display device, and thus the switching from the red pictures to the green pictures is realized. The switching modes between every two of the red, green and blue pictures are similar thereto and are omitted here. When the black and grey pictures are required to be switched, only the voltage signal of the data line shorting bar need be regulated.

[0050] In conclusion, in the testing method for the liquid crystal display device provided in the embodiment, the liquid crystal display device can display pictures with various colors such as red, green, blue, black, white and grey by regulating the voltage signals on the plurality of switch control lines for the data lines, the switch control line for the scan lines, the data line shorting bar and the scan line shorting bar. Moreover, through holes are eliminated in the data line test area of the liquid crystal display device, so line defects of the scan lines or the data lines due to the through holes are eliminated in the test process, thereby increasing the testing efficiency, reducing the area occupied by the data line test area, and also reducing the switch signal delay of the switch elements.

[0051] In the above first embodiment, each data line set comprises three data lines for controlling the pixel units of three colors respectively. Further, each data line set can also comprise four data lines for controlling the pixel units of red, green, blue and white respectively. Correspondingly, the liquid crystal display device comprises three switch control lines for the data lines. Specifically:

In the basis of the above liquid crystal display device, it further comprises a third data switch control line, and each data line set further comprises a fourth data line. The third data switch control line intersects the fourth data line in each data line set, and a third switch element is formed at each intersection point. A gate electrode of the third switch element is arranged on the third data switch control line, a source electrode of the third switch element is connected with the data line shorting bar through the second switch element, and a drain electrode of the third switch element is connected with the fourth data line at the intersection point.

[0052] In this case, the gate electrode of the third switch element is arranged on the third data switch control line and is connected with the third data switch control line. The source electrode of the third switch element is connected with the data line shorting bar through the second switch element, that is, the source electrode of the third switch element is connected with the drain electrode of the second switch element, and the source electrode of the second switch element is connected with the drain electrode of the first switch element, so that the third switch element is connected with the data line shorting bar.

Second embodiment

[0053] In the first embodiment, after the test is completed, the connections of the data line shorting bar 201 with the data lines D21, D22, D23, D24, D25 and D26 are required to be cut off by using laser along the line I-I' direction as shown in Fig.2 to facilitate drive circuit module assembly in the next step, so that the laser cutting procedure is required to be added. For this, the embodiment provides a liquid crystal display device, where the liquid crystal display device comprises three switch control lines for the data lines, each data line set comprises three data lines, and switch elements (a first switch element, a second switch element and a third switch element) are formed at intersection points of each data line set and the three switch control lines for the data lines. All the data lines in the embodiment are connected with the data line shorting bar through the switch elements and the connecting lines, and none are directly connected with the data line shorting bar, so laser cutting is not required after the test is completed.

[0054] For convenience, three scan lines and two data line sets are taken as examples for detailed description below, but it should be realized that the number of the scan lines and the number of the data lines are not limited thereto.

[0055] Specifically refer to Fig.6, which is a structural schematic diagram of a liquid crystal display device in the second embodiment of the application. An effective display area of the liquid crystal display device comprises three scan lines G31, G32 and G33, two data line sets D30-1 and D30-2, and a plurality of pixel units formed in areas encircled by intersecting the three scan lines G31, G32 and G33 with respective data lines in the two data line sets D30-1 and D30-2, wherein the data line set D30-1 comprises three adjacent data lines D31, D32 and D33; and the data line set D30-2 comprises three adjacent data lines D34, D35 and D36, wherein the data lines D31 and D34 are red signal data lines and are connected with pixel electrodes R of the red pixel units; the data lines D32 and D35 are green signal data lines and are connected with pixel electrodes G of the green pixel units; and the data lines D33 and D36 are blue signal data lines and are connected with pixel electrodes B of the blue pixel units.

[0056] In this case, D31 and D34 are first data lines, D32 and D35 are second data lines, and D33 and D36 are third data lines.

[0057] It should be pointed out that in one data line set, the line sequence of respective color signal data lines is not limited thereto, and can be other sequence. For example, the data lines D31 and D34 are green signal data lines, the data lines D32 and D35 are red signal data lines, the data lines D33 and D36 are blue signal data lines and so on.

[0058] The data line test area of the liquid crystal display device comprises a data line shorting bar 301, three switch control lines 302, 303 and 310 for the data lines, a first switch element 304-1, a second switch element 304-2 and a third switch element 304-3 formed at intersection points of the data line set D30-1 and the switch control lines 302, 303 and 310 for the data lines, and a first switch element 305-1, a second switch element 305-2 and a third switch element 305-3 formed at intersection points of the data line set D30-2 and the switch control lines 302, 303 and 310 for the data lines.

[0059] In this case, the data switch control line 302 is a first data switch control line, the data switch control line 303 is a second data switch control line, and the data switch control line 310 is a third data switch control line.

[0060] Gate electrodes of the two first switch elements 304-1 and 305-1 are arranged on the data switch control line 302, gate electrodes of the two second switch elements 304-2 and 305-2 are arranged on the data switch control line 303, and gate electrodes of the two third switch elements 304-3 and 305-3 are arranged on the data switch control line 310.

[0061] Source electrodes of the two first switch elements 304-1 and 305-1 are connected with the data line shorting bar 301 through connecting lines C31-1 and C31-2;

Source electrodes of the two second switch elements 304-2 and 305-2 are connected with the data line shorting bar 301 through the two first switch elements 304-1 and 305-1 and the connecting lines C31-1 and C31-2, and specifically, the source electrode of the second switch element 304-2 is connected with the drain electrode of the first switch element 304-1, so as to be connected with the data line shorting bar 301 through the first switch element 304-1 and the connecting line C31-1; and the source electrode of the second switch element 305-2 is connected with the drain electrode of the first switch element 305-1, so as to be connected with the data line shorting bar 301 through the first switch element 305-1 and the connecting line C31-2; and

Source electrodes of the two third switch elements 304-3 and 305-3 are connected with the data line shorting bar 301 through the two first switch elements 304-1 and 305-1, the two second switch elements 304-2 and 305-2 and the connecting lines C31-1 and C31-2, and specifically, the source electrode of the third switch element 304-3 is connected with the drain electrode of the second switch element 304-2, so as to be connected with the data line shorting bar 301 through the first switch element 304-1, the second switch element 304-2 and the connecting line C31-1; and the source electrode of the third switch element 305-3 is connected with the drain electrode of the second switch element 305-2, so as to be connected with the data line shorting bar 301 through the first switch element 305-1, the second switch element 305-2 and the connecting line C32-1.

[0062] Drain electrodes of the first switch elements 304-1 and 305-1 are arranged on the data switch control line 302 and insulated with the data switch control line 302; drain electrodes of the second switch elements 304-2 and 305-2 are arranged on the data switch control

line 303 and insulated with the data switch control line 303; and drain electrodes of the third switch elements 304-3 and 305-3 are arranged on the data switch control line 310 and insulated with the data switch control line 310.

[0063] The drain electrodes of the two first switch elements 304-1 and 305-1 are connected with the data lines D31 and D34 respectively; the drain electrodes of the two second switch elements 304-2 and 305-2 are connected with the data lines D32 and D35 respectively; and the drain electrodes of the two third switch elements 304-3 and 305-3 are connected with the data lines D33 and D36 respectively.

[0064] The data switch control line 302 is used for controlling connection and disconnection of the first switch elements 304-1 and 305-1; the data switch control line 303 is used for controlling connection and disconnection of the second switch elements 304-2 and 305-2; and the data switch control line 310 is used for controlling connection and disconnection of the third switch elements 304-3 and 305-3. The scan line test area of the embodiment is the same as that of the first embodiment and is omitted here.

[0065] In the embodiment, none of the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines are connected with test terminals, so test signals can be directly applied to the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines. However, it should be realized that the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines can also be connected with the test terminals, and the test terminals can be made of the same materials as or different materials from the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines. In addition, a plurality of test terminals can be made of the same or different materials, for example, one part of the test terminals can be made of molybdenum, while the other part of the test terminals can be made of aluminum or aluminum alloy.

[0066] All the data lines in the embodiment are connected with the data line shorting bar through the switch elements and the connecting lines and none are directly connected with the data line shorting bar, so laser cutting is not required after the test is completed. Moreover, through holes are not required by the liquid crystal display device, so that the adverse influences of the through hole defect on the liquid crystal display device are eliminated, and smooth operation of the electric test can be ensured.

[0067] Moreover, as shown in Fig.6, in the embodiment, if line widths of the data lines D31, D32, D33, D34, D35 and D36 are a31 and distances between adjacent data lines are a32, then the distance W3 between the data line D31 and the data line D36 is 6*a31+5*a32; and if a31=a32=a, then W3=11a. Compared with the prior art, in the embodiment, the width of the data line test area, which can be reduced, is W1-W3=12a. It can be seen that in the embodiment, the area occupied by the data line test area is reduced, thereby facilitating the production of small-sized liquid crystal display devices. Moreover, compared with the prior art, in the embodiment, the number of the data lines superposed with each data switch control line is reduced, thereby reducing the switch signal delay of the switch elements.

[0068] The liquid crystal display device in a normally white mode is taken as an example below to describe the testing method for the liquid crystal display device according to the embodiment in details.

1) Detecting red pictures

[0069] Please refer to Fig.7, which is an oscillogram when the liquid crystal display device displays red pictures in the second embodiment of the application. As shown in Fig.7, in a time period of one frame (comprising a time period T1 and a time period T2), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 307 for the scan lines, the scan line shorting bar 306 and the switch control lines 302, 303 and 310 for the data lines, to turn on all of the two first switch elements 304-1 and 305-1, the two second switch elements 304-2 and 305-2 and the two third switch elements 304-3 and 305-3 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 301, so that the liquid crystal display device displays black pictures; and

during the time period T2, proceeding to provide a start voltage signal to the switch control line 307 for the scan lines and the scan line shorting bar 306, to make signals on the three scan lines G31, G32 and G33 be all high voltage signals and thus to turn on the thin film transistors in all the pixel units in the effective display area; providing a cut-off voltage to the switch control lines 303 and 310 for the data lines, so that the second switch elements 304-2 and 305-2 and the third switch elements 304-3 and 305-3 are all in a cut-off state; providing a start voltage to the switch control lines 302 for the data line, so that the first switch elements 304-1 and 305-1 are in a turn-on state; and providing a second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 to the data line shorting bar 301, and applying signals of the second voltage V2 to the red pixel electrodes through the red signal data lines D31 and D34, so that light can penetrate the red pixel units, and finally the red pictures are displayed in the display area of the liquid crystal display device. Therefore,

the red pictures can be detected.

2) Detecting green pictures

[0070] Please refer to Fig.8, which is an oscillogram when the liquid crystal display device displays the green pictures in the second embodiment of the application. As shown in Fig.8, in a time period of one frame (comprising a time period T1, a time period T2 and a time period T3), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 307 for the scan lines, the scan line shorting bar 306 and the switch control lines 302, 303 and 310 for the data lines, to turn on all of the two first switch elements 304-1 and 305-1, the two second switch elements 304-2 and 305-2 and the two third switch elements 304-3 and 305-3 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 301, so that the liquid crystal display device displays black pictures;

during the time period T2, proceeding to provide a start voltage signal to the switch control line 307 for the scan lines and the scan line shorting bar 306, to make signals on the three scan lines G31, G32 and G33 be the start voltage signal and thus to turn on the thin film transistors in all the pixel units in the effective display area; providing a cut-off voltage signal to the data switch control line 310, so that the two third switch elements 304-3 and 305-3 are both in a cut-off state; providing a start voltage signal to the switch control lines 302 and 303 for the data lines, so that the two first switch elements 304-1 and 305-1 and the two second switch elements 304-2 and 305-2 are all in a turn-on state; and then providing a second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 to the data line shorting bar 301, so that light can penetrate the red pixel units and the green pixel units; and

during the time period T3, proceeding to provide a start voltage signal to the switch control line 307 for the scan lines and the scan line shorting bar 306, to turn on the thin film transistors in all the pixel units in the effective display area; providing a cut-off voltage to the data switch control line 303, so that the two second switch elements 304-2 and 305-2 are both in a cut-off state; providing a start voltage to the data switch control line 302, so that the first switch elements 304-1 and 305-1 are in a turn-on state; and then providing the first voltage V1 greater than the common electrode voltage V0 to the data line shorting bar 301, so that light cannot penetrate the red pixel units, and finally the green pictures are displayed in the display area of the liquid crystal display device. Therefore, the green pictures can be detected.

3) Detecting blue pictures

[0071] Please refer to Fig.9, which is an oscillogram when the liquid crystal display device displays the blue pictures in the second embodiment of the application. As shown in Fig.9, in a time period of one frame (comprising a time period T1 and a time period T2), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 307 for the scan lines, the scan line shorting bar 306 and the switch control lines 302, 303 and 310 for the data lines, to turn on all of the two first switch elements 304-1 and 305-1, the two second switch elements 304-2 and 305-2 and the two third switch elements 304-3 and 305-3 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing the second voltage V2 close to the common electrode voltage V0 to the data line shorting bar 301, so that the liquid crystal display device displays white pictures; and

during the time period T2, proceeding to provide a start voltage signal to the switch control line 307 for the scan lines and the scan line shorting bar 306, to make signals on the three scan lines G31, G32 and G33 be the start voltage signal and thus to turn on the thin film transistors in all the pixel units in the effective display area; providing a start voltage to the switch control lines 302 and 303 for the data lines, so that the two first switch elements 304-1 and 305-1 and the two second switch elements 304-2 and 305-2 are all in a turn-on state; simultaneously providing a cut-off voltage to the data switch control line 310, so that the two third switch elements 304-3 and 305-3 are both in a cut-off state; and at this time, providing the first voltage V1 greater than the common electrode voltage V0 to the data line shorting bar 301, so that light cannot penetrate the red pixel units and the green pixel units, and finally the blue pictures are displayed in the display area of the liquid crystal display device. Therefore, the blue pictures can be detected.

4) Detecting black pictures

[0072] Providing a start voltage signal (for example, 15V) to the switch control line 307 for the scan lines, the scan line shorting bar 306 and the switch control lines 302, 303 and 310 for the data lines, to turn on all of the two first switch elements 304-1 and 305-1, the two second switch elements 304-2 and 305-2 and the two third switch elements 304-3 and 305-3 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V)

greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 301, so that the liquid crystal display device displays black pictures; and detecting whether line defects exists.

5) Detecting white pictures

[0073] Providing a start voltage signal (for example, 15V) to the switch control line 307 for the scan lines, the scan line shorting bar 306 and the switch control lines 302, 303 and 310 for the data lines, to turn on all of the two first switch elements 304-1 and 305-1, the two second switch elements 304-2 and 305-2 and the two third switch elements 304-3 and 305-3 and also to turn on thin film transistors in all the pixel units in the effective display area; and at this time, providing the second voltage V2 close to the common electrode voltage V0 to the data line shorting bar 301, so that the liquid crystal display device displays white pictures; and detecting whether line defects exists.

[0074] In conclusion, in the testing method for the liquid crystal display device provided in the embodiment, the liquid crystal display device can display pictures with various colors such as red, green, blue, black, white and grey by regulating the voltage signals on the plurality of switch control lines for the data lines, the switch control line for the scan lines, the data line shorting bar and the scan line shorting bar. All the data lines in the embodiment are connected with the data line shorting bar through the switch elements and are not directly connected with the data line shorting bar, so laser cutting is not required after the test is completed. In addition, through holes are not required by the liquid crystal display device, thereby eliminating the adverse influences of the through hole defect on the liquid crystal display device and ensuring smooth operation of the electric test. Moreover, compared with the prior art, in the embodiment, the area occupied by the data line test area is obviously reduced to thereby facilitate the production of small-sized liquid crystal display devices, the number of the data lines superposed with the switch control lines for the data lines is reduced, and the switch signal delay of the switch elements is reduced.

[0075] In the above second embodiment, each data line set comprises three data lines for controlling the pixel units of three colors respectively. Further, each data line set can also comprise four data lines for controlling the pixel units of red, green, blue and white respectively. Correspondingly, the liquid crystal display device comprises three switch control lines for the data lines. Specifically:

> In the basis of the above liquid crystal display device, it further comprises a fourth data switch control line, each data line set further comprises a fourth data line, and the fourth data line in each data line set controls pixel units with a same color. The fourth data switch control line intersects the fourth data line in each data line set, and a fourth switch element is formed at each intersection point. A gate electrode of the fourth switch element is arranged on the fourth data switch control line, a source electrode of the fourth switch element is connected with the drain electrode of the third switch element, and a drain electrode of the fourth switch element is connected with the fourth data line at the intersection point.

[0076] In this case, the gate electrode of the fourth switch element is arranged on the fourth data switch control line and connected with the fourth data switch control line. The source electrode of the fourth switch element is connected with the drain electrode of the third switch element, so as to be connected with the data line shorting bar through the third switch element, the second switch element, the first switch element and the connecting line.

Third embodiment

[0077] In the second embodiment, the source electrode of the first switch element is connected with the data line shorting bar through the connecting line, the source electrode of the second switch element is connected with the data line shorting bar through the first switch element and the connecting line, and the source electrode of the third switch element is connected with the data line shorting bar through the first switch element, the second switch element and the connecting line; that is, a test signal of the data line shorting bar of the liquid crystal display device in the second embodiment is transmitted to the red signal data lines through one switch element, transmitted to the green signal data lines through two switch elements and transmitted to the blue signal data lines through three switch elements, so the signal is delayed. Meanwhile, three time periods T1, T2 and T3 are required when a green picture is displayed. For this, the embodiment provides a liquid crystal display device. The liquid crystal display device comprises three switch control lines for data lines, each data line set comprises six data lines, and six switch elements are formed at intersection points of each data line set with the three switch control lines for the data lines. The test signal of the data line shorting bar of the liquid crystal display device can be transmitted to the corresponding data lines through only one switch element, so that the signal delay is reduced.

[0078] For convenience, four scan lines and a data line set are taken as examples for detailed description below. However, it should be realized that the number of the scan lines and the number of the data lines are not limited thereto.

[0079] Specifically refer to Fir.10, which is a structural schematic diagram of a liquid crystal display device in the third embodiment of the application. The effective display area of the liquid crystal display device comprises four scan lines G41, G42, G43 and G44, a data line set D40, and a plurality of pixel units formed in areas encircled by intersecting the four scan lines G41, G42, G43

and G44 with data lines in the data line set D40.

[0080] The data line set D40 comprises six adjacent data lines D41, D42, D43, D44, D45 and D46, wherein the data lines D41 and D44 are red signal data lines and are connected with pixel electrodes R of the red pixel units; the data lines D42 and D45 are green signal data lines and are connected with pixel electrodes G of the green pixel units; and the data lines D43 and D46 are blue signal data lines and are connected with pixel electrodes B of the blue pixel units.

[0081] In this case, D41 is a first data line, D42 is a second data line, D43 is a third data line, D44 is a fourth data line, D45 is a fifth data line, and D46 is a sixth data line.

[0082] It should be pointed out that in one data line set, the line sequence of respective color signal data lines is not limited thereto, and can be another sequence. For example, the data lines D41 and D44 are green signal data lines, the data lines D42 and D45 are blue signal data lines, the data lines D43 and D46 are red signal data lines and so on.

[0083] A first switch element 402-1, a second switch element 402-2, a third switch element 403-1, a fourth switch element 403-2, a fifth switch element 410-1 and a sixth switch element 410-2 are formed at intersection points of the data line set D40 with the three switch control lines 402, 403 and 410 for the data lines.

[0084] In this case, the data switch control line 402 is a first data switch control line, the data switch control line 403 is a second data switch control line, and the data switch control line 410 is a third data switch control line.

[0085] Gate electrodes of the first switch element 402-1 and the second switch element 402-2 are arranged on the same data switch control line 402, gate electrodes of the third switch element 403-1 and the fourth switch element 403-2 are arranged on the same data switch control line 403, and gate electrodes of the fifth switch element 410-1 and the sixth switch element 410-2 are arranged on the same data switch control line 410.

[0086] Source electrodes of the first switch element 402-1 and the third switch element 403-1 are connected with the data line shorting bar 401 through the first connecting line C41, source electrodes of the second switch element 402-2 and the sixth switch element 410-2 are connected with the data line shorting bar through the third connecting line C43, and source electrodes of the fourth switch element 403-2 and the fifth switch element 410-1 are connected with the data line shorting bar through the second connecting line C42.

[0087] Drain electrodes of the first switch element 402-1 and the second switch element 402-2 are arranged on the same data switch control line 402 and connected with the data lines for controlling the green pixel units; drain electrodes of the third switch element 403-1 and the fourth switch element 403-2 are arranged on the same data switch control line 403 and connected with the data lines for controlling the red pixel units; and drain electrodes of the fifth switch element 410-1 and the sixth switch element 410-2 are arranged on the same data switch control line 410 and connected with the data lines for controlling the blue pixel units.

[0088] The scan line test area of the embodiment is as same as that of the first embodiment and is omitted here.

[0089] In the embodiment, none of the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines are connected with test terminals, so test signals can be directly applied to the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines. However, it should be realized that the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines can also be connected with the test terminals, and the test terminals can be made of the same materials as or different materials from the data line shorting bar, the scan line shorting bar, the switch control lines for the data lines and the switch control line for the scan lines. In addition, a plurality of test terminals can be made of the same or different materials, for example, one part of the test terminals can be made of molybdenum, while the other part of the test terminals can be made of aluminum or aluminum alloy.

[0090] It can be seen from the above analysis that the test signals of the data line shorting bar of the liquid crystal display device can be transmitted to the corresponding data lines only through one switch element, so that the signal delay is reduced.

[0091] Moreover, as shown in Fig.10, in the embodiment, if line widths of the data lines D41, D42, D43, D44, D45 and D46 are a41 and distances between adjacent data lines are a42, then the distance W4 between the data line D41 and the data line D46 is 6*a41+5*a42; and if a41=a42=a, then W4=11a. Compared with the prior art, in the embodiment, the width of the data line test area, which can be reduced, is W1-W4=12a, thereby reducing the area occupied by the data line test area and facilitating the production of small-sized liquid crystal display devices.

[0092] The liquid crystal display device in a normally white mode is taken as an example below to describe the testing method for the liquid crystal display device according to the embodiment in details.

1) Detecting red pictures

[0093] Please refer to Fig. 11, which is an oscillogram when the liquid crystal display device displays the red pictures in the third embodiment of the application. As shown in Fig.11, in a time period of one frame (comprising a time period T1 and a time period T2), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 407 for the scan lines, the scan line shorting bar 406

and the switch control lines 402, 403 and 410 for the data lines, to turn on all of the first switch element 402-1, the second switch element 402-2, the third switch element 403-1, the fourth switch element 403-2, the fifth switch element 410-1 and the sixth switch element 410-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 401, so that the liquid crystal display device displays black pictures; and

during the time period T2, proceeding to provide a start voltage signal to the switch control line 407 for the scan lines and the scan line shorting bar 406, to make signals on the four scan lines G41, G42, G43 and G44 be the start voltage signals and thus to turn on the thin film transistors in all the pixel units of the effective display area; then providing a start voltage signal to the data switch control line 403, so that the third switch element 403-1 and the fourth switch element 403-2 are in a turn-on state; providing a cut-off voltage signal to the switch control lines 402 and 410 for the data lines, so that the first switch element 402-1, the second switch element 402-2, the fifth switch element 410-1 and the sixth switch element 410-2 are all in a cut-off state; and providing a second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 to the data line shorting bar 401, and applying signals of the second voltage V2 to the red pixel electrodes through the red signal data lines D41 and D44, so that light can penetrate the red pixel units, and finally the red pictures are displayed in the display area of the liquid crystal display device. Therefore, the red pictures can be detected.

2) Detecting green pictures

[0094] Please refer to Fig.12, which is an oscillogram when the liquid crystal display device displays the green pictures in the third embodiment of the application. As shown in Fig.12, in a time period of one frame (comprising a time period T1 and a time period T2), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 407 for the scan lines, the scan line shorting bar 406 and the switch control lines 402, 403 and 410 for the data lines, to turn on all of the first switch element 402-1, the second switch element 402-2, the third switch element 403-1, the fourth switch element 403-2, the fifth switch element 410-1 and the sixth switch element 410-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 401, so that the liquid crystal display device displays black pictures; and

during the time period T2, proceeding to provide a start voltage signal to the switch control line 407 for the scan lines and the scan line shorting bar 406, to make signals on the four scan lines G41, G42, G43 and G44 be the start voltage signals and thus to turn on the thin film transistors in all the pixel units in the effective display area; then providing a cut-off voltage signal to the switch control lines 403 and 410 for the data lines, so that the third switch element 403-1, the fourth switch element 403-2, the fifth switch element 410-1 and the sixth switch element 410-2 are all in a cut-off state; providing a start voltage signal to the data switch control line 402, so that the first switch element 402-1 and the second switch element 402-2 are in a turn-on state; and providing a second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 to the data line shorting bar 401, and applying signals of the second voltage V2 to the green pixel electrodes through the green signal data lines D42 and D45, so that light can penetrate the green pixel units; and finally the green pictures are displayed in the display area of the liquid crystal display device. Therefore, the green pictures can be detected.

3) Detecting blue pictures

[0095] Please refer to Fig.13, which is an oscillogram when the liquid crystal display device displays the blue pictures in the third embodiment of the application. As shown in Fig. 13, in a time period of one frame (comprising a time period T1 and a time period T2), the method comprises the following testing steps:

during the time period T1, providing a start voltage signal (for example, 15V) to the switch control line 407 for the scan lines, the scan line shorting bar 406 and the switch control lines 402, 403 and 410 for the data lines, to turn on all of the first switch element 402-1, the second switch element 402-2, the third switch element 403-1, the fourth switch element 403-2, the fifth switch element 410-1 and the sixth switch element 410-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 401, so that the liquid crystal display device displays black pictures; and

during the time period T2, proceeding to provide a start voltage signal to the switch control line 407 for the scan lines and the scan line shorting bar 406, to make signals on the four scan lines G41, G42, G43 and G44 be the start voltage signals and thus to turn on the thin film transistors in all the pixel units in the effective display area; then providing a cut-off volt-

age signal to the switch control lines 402 and 403 for the data lines, so that the first switch element 402-1, the second switch element 402-2, the third switch element 403-1 and the fourth switch element 403-2 are all in a cut-off state; providing a start voltage signal to the data line switch control line 410, so that the fifth switch element 410-1 and the sixth switch element 410-2 are in a turn-on state; and providing the second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 to the data line shorting bar 401, and applying signals of the second voltage V2 to the blue pixel electrodes through the green signal data lines D43 and D46, so that light can penetrate the blue pixel units, and finally the blue pictures are displayed in the display area of the liquid crystal display device. Therefore, the blue pictures can be detected.

4) Detecting black pictures

[0096] Providing a start voltage signal (for example, 15V) to the switch control line 407 for the scan lines, the scan line shorting bar 406 and the switch control lines 402, 403 and 410 for the data lines, to turn on all of the first switch element 402-1, the second switch element 402-2, the third switch element 403-1, the fourth switch element 403-2, the fifth switch element 410-1 and the sixth switch element 410-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing a first voltage V1 (for example, 5V) greater than a common electrode voltage V0 (for example, 0V) to the data line shorting bar 401, so that the liquid crystal display device displays black pictures; and detecting whether line defects exists.

5) Detecting white pictures

[0097] Providing a start voltage signal (for example, 15V) to the switch control line 407 for the scan lines, the scan line shorting bar 406 and the switch control lines 402, 403 and 410 for the data lines, to turn on all of the first switch element 402-1, the second switch element 402-2, the third switch element 403-1, the fourth switch element 403-2, the fifth switch element 410-1 and the sixth switch element 410-2 and also to turn on thin film transistors in all the pixel units in the effective display area; and providing the second voltage V2 (for example, 0.01V) close to the common electrode voltage V0 (for example, 0V) to the data line shorting bar 401, so that the liquid crystal display device displays the white pictures; and detecting whether line defects exists.

[0098] In the third embodiment, a data line set comprises six data lines for controlling the pixel units of three colors respectively. Further, a data line set can also comprise eight data lines for controlling the pixel units of red, green, blue and white respectively. Correspondingly, the liquid crystal display device comprises four switch control lines for the data lines.

[0099] In conclusion, in the testing method for the liquid crystal display device provided in the embodiment, the liquid crystal display device can display pictures with various colors such as red, green, blue, black, white and grey by regulating the voltage signals on the plurality of switch control lines for the data lines, the switch control line for the scan lines, the data line shorting bar and the scan line shorting bar. The test signals of the data line shorting bar of the liquid crystal display device can be transmitted to the corresponding data lines through only one switch element, and compared with the second embodiment, the signal delay is reduced. In addition, through holes are not required by the liquid crystal display device, thereby eliminating the adverse influences of the through hole defect on the liquid crystal display device and ensuring smooth operation of the electric test. Moreover, compared with the prior art, in the embodiment, the area occupied by the data line test area is obviously reduced to thereby facilitate the production of small-sized liquid crystal display devices.

[0100] It should be pointed out that the respective embodiments have been described progressively in the specification, each of the embodiments has emphasized its difference(s) from the other embodiments, and mutual reference can be made to the description of the related part(s). Moreover, very simple forms and non-precise ratios are adopted in the drawings only for the purpose of conveniently and clearly illustrating the respective embodiments of the application in an auxiliary mode.

Claims

1. A liquid crystal display device, comprising:

a plurality of scan lines (G21, G22, G23);
a plurality of data line sets (D20-1, D20-2) intersecting the plurality of scan lines, wherein each data line set comprises a first data line (D21, D24), a second data line (D22, D25) and a third data line (D23, D26);
pixel units formed in areas encircled by the intersecting scan and data lines;
a data line test area comprising a data line shorting bar (201), a first data switch control line (202) and a second data switch control line (203) and a plurality of switch elements (204-1, 204-2, 205-1, 205-2);
wherein, in each data line set (D20-1, D20-2), the first data line (D21, D24) controls pixel units with a same first color, the second data line (D22, D25) controls pixel units with a same second color, and the third data line (D23, D26) controls pixel units with a same third color, wherein the first color, the second color and the third color are different to each other;
wherein, for each data line set (D20-1, D20-2), the first data line is connected with the data line

shorting bar (201), the first data switch control line (202) overlaps with the second data line (D22, D25) at a first overlapping point, and the first switch element (204-1, 205-1) is formed at said first overlapping point, a gate electrode of the first switch element (204-1, 205-1) is provided by the first data switch control line (202), a source electrode of the first switch element (204-1, 205-1) is connected with the data line shorting bar (201), and a drain electrode of the first switch element (204-1, 205-1) is connected with the second data line (D22, D25); and
wherein, for each data line set (D20-1, D20-2), the second data switch control line (203) overlaps with the third data line (D23, D26) at a second overlapping point and the second switch element (204-2, 205-2) is formed at said second overlapping point, a gate electrode of the second switch element (204-2, 205-2) is provided by the second data switch control line (203), a source electrode of the second switch element (204-2, 205-2) is configured such that it is connectable with the data line shorting bar (201) through the first switch element (204-1, 205-1), and a drain electrode of the second switch element (204-2, 205-2) is connected with the third data line (D23, D26).

2. The liquid crystal display device of claim 1, further comprising a scan line test area comprising

a scan line shorting bar 206); a switch control line (207) for the scan lines; and switch elements for the scan lines,
wherein gate electrodes of respective switch elements for the scan lines are arranged on the switch control line for the scan lines; source electrodes of respective switch elements for the scan lines are connected with the scan line shorting bar respectively; and drain electrodes of respective switch elements for the scan lines are connected with the plurality of scan lines respectively.

3. The liquid crystal display device of claim 2, wherein the drain electrodes of respective switch elements for the scan lines are connected with the scan lines via through holes respectively.

4. The liquid crystal display device of claim 1, wherein, for each data line set (D20-1, D20-2), the source electrode of the second switch element (204-2, 205-2) is connected with the drain electrode of the first switch element (204-1, 205-1).

5. The liquid crystal display device of claim 1, further comprising a third data switch control line, wherein each data line set (D20-1, D20-2) further comprises a fourth data line, and
wherein, for each data line set (D20-1, D20-2), the fourth data line controls pixel units with a same fourth color, the third data switch control line overlaps the fourth data line at a third overlapping point, a third switch element is formed at said third overlapping point, a gate electrode of the third switch element is provided by the third data switch control line, a source electrode of the third switch element is connected with the drain electrode of the second switch element, and a drain electrode of the third switch element is connected with the fourth data line.

6. The liquid crystal display device of claim 1, further comprising at least one of the following test terminals:

a test terminal connected with the data line shorting bar; and
test terminals connected with the switch control lines for the data lines.

7. The liquid crystal display device of claim 2, further comprising at least one of the following test terminals:

a test terminal connected with the scan line shorting bar; and
a test terminal connected with the switch control line for the scan lines.

8. A liquid crystal display device comprising:

a plurality of scan lines (G31, G32, G33);
a plurality of data line sets (D30-1, D30-2) intersecting the plurality of scan lines, wherein each data line set comprises a first data line (D31, D34) a second data line (D32, D35) and a third data line (D33, D36);
pixel units formed in areas encircled by the intersecting scan and data lines;
a data line test area comprising a data line shorting bar (301), a first data switch control line (302), a second data switch control line (303), a third data switch control line (310) and a plurality of switch elements (304-1, 305-1, 304-2, 305-2);
wherein, in each data line set (D30-1, D30-2), the first data line (D31, D34) controls pixel units with a same first color, the second data line (D32, D35) controls pixel units with a same second color and the third data line (D33, D36) controls pixel units with a same third color, wherein the first color, the second color and the third color are different to each other, and
wherein, for each data line set (D30-1, D30-2), the first data switch control line (302) overlaps with the first data line (D31, D32) at a first overlapping point and the first switch element (304-1,

305-1) is formed at said first overlapping point, a gate electrode of the first switch element (304-1, 305-1) is provided by the first data switch control line (302), a source electrode of the first switch element (304-1, 305-1) is connected with the data line shorting bar (301), and a drain electrode of the first switch element (304-1, 305-1) is connected with the first data line (D31, D34);
wherein, for each data line set (D30-1, D30-2), the second data switch control line (303) overlaps with the second data line (D32, D35) at a second overlapping point and the second switch element (304-2, 305-2) is formed at said second overlapping point, a gate electrode of the second switch element (304-2, 305-2) is provided by the second data switch control line (303), a source electrode of the second switch element (304-2, 305-2) is configured such that it is connectable with the data line shorting bar (301) through the first switch element (304-1, 305-1), and a drain electrode of the second switch element (304-2, 305-2) is connected with the second data line (D32, D35); and
wherein, for each data line set (D30-1, D30-2), the third data switch control line (310) overlaps with the third data line (D33, D36) at a third overlapping point and the third switch element (304-3, 305-3) is formed at said third overlapping point, a gate electrode of the third switch element (304-3, 305-3) is provided by the third data switch control line (310), a source electrode of the third switch element (304-3, 305-3) is configured such that it is connectable with the data line shorting bar (301) through the first switch element (304-1, 305-1) and through the second switch element (304-2, 305-2), and a drain electrode of the third switch element (304-3, 305-3) is connected with the third data line (D33, D36).

9. The liquid crystal display device of claim 8, further comprising a fourth data switch control line, wherein each data line set further comprises a fourth data line, and
wherein, for each data line set (D30-1, D30-2), the fourth data line controls pixel units with a same fourth color, the fourth data switch control line overlaps the fourth data at a fourth overlapping point, a fourth switch element is formed at said fourth overlapping point, a gate electrode of the fourth switch element is provided by the fourth data switch control line, a source electrode of the fourth switch element is configured such that it is connectable with the data line shorting bar (301) through the first switch element (304-1, 305-1), through the second switch element (304-2, 305-2) and through the third switch element (304-3, 305-3), and a drain electrode of the fourth switch element is connected with the fourth data line.

10. The liquid crystal display device of claim 8, further comprising a scan line test area, comprising:

a scan line shorting bar 306), a switch control line 307) for the scan lines, switch elements for the scan lines in the same number as the scan lines, first connecting lines for the scan lines in the same number as the scan lines and second connecting lines for the scan lines in the same number as the scan lines, wherein,
gate electrodes of respective switch elements for the scan lines are arranged on the switch control line for the scan lines; and
source electrodes of respective switch elements for the scan lines are connected with the scan line shorting bar; and drain electrodes of respective switch elements for the scan lines are connected with the plurality of scan lines respectively.

11. The liquid crystal display device of claim 9, wherein the drain electrodes of respective switch elements for the scan lines are connected with the scan lines via through holes respectively.

12. The liquid crystal display device of claim 8, wherein, for each data line set (D30-1, D30-2), the source electrode of the second switch element (304-2, 305-2) is connected with the drain electrode of the first switch element (304-1, 305-1) and the source electrode of the third switch element (304-3, 305-3) is connected with die drain electrode of the second switch element (304-2, 305-2).

13. A liquid crystal display device, comprising:

a plurality of scan lines (G41, G42, G43, G44);
a plurality of data line sets intersecting the plurality of scan lines, wherein each data line set comprises a first data line (D41), a second data line (D42), a third data line (D43), a fourth data line (D44), a fifth data line (D45) and a six data line (D46);
pixel units formed in areas encircled by the intersecting scan and data lines;
a data line test area comprising a data line shorting bar (401), a first data switch control line (402), a second data switch control line (403), a third data switch control line (410) and a plurality of switch elements (402-1, 402-2, 403-1, 403-2, 410-1, 410-2);
wherein, in each data line set,
the first data line (D41) controls pixel units with a same first color, the second data line (D42) controls pixel units with a same second color, the third data line (D43) controls pixel units with a same third color, the fourth data line (D44) controls pixel units with the first color, the fifth

data line (D45) controls pixel units with the second color, the sixth data line (D46) controls pixel units with the third color, wherein the first color, the second color and the third color are different to each other, and;

wherein, for each data line set,

the first data switch control line (402) overlaps with the second data line (D42) at a first overlapping point and the first switch element (402-1) is formed at said first overlapping point and the first data switch control line (402) overlaps with the fifth data line (D45) at a second overlapping point and the second switch element (402-2) is formed at said second overlapping point, the second data switch control line (403) overlaps with the first data line (D41) at a third overlapping point and the third switch element (403-1) is formed at said third overlapping point and the second data switch control line (403) overlaps with the fourth data line (D44) at a fourth overlapping point and the fourth switch element (403-2) is formed at said fourth overlapping point, the third data switch control line (410) overlaps with the third data line (D43) at a fifth overlapping point and the fifth switch element (410-1) is formed at said fifth overlapping point and the third data switch control line (410) overlaps with the sixth data line (D46) at a sixth overlapping point and the sixth switch element (410-2) is formed at said sixth overlapping point; and

wherein, for each data line set,

gate electrodes of the first switch element (402-1) and the second switch element (402-2) are provided by the first data switch control line (402), gate electrodes of the third switch element (403-1) and the fourth switch element (403-2) are provided by the second data switch control line (403) and gate electrodes of the fifth switch element (410-1) and the sixth switch element (410-2) are provided by the third data switch control line (410);

source electrodes of the first switch element (402-1) and the third switch element (403-1) are connected to a first connecting line (C41) which itself is connected with the data line shorting bar (401), source electrodes of the fifth switch element (410-1) and the fourth switch element (403-2) are connected to a second connecting line (C42) which itself is connected with the data line shorting bar (401), and source electrodes of the second switch element (402-2) and the sixth switch element (410-2) are connected to a third connecting line (C43) which itself is connected with the data line shorting bar (401); and

a drain electrode of the first switch element (402-1) is connected with the second data line (D42), a drain electrode of the second switch element (402-2) is connected with the fifth data line (D45), a drain electrode of the third switch element (403-1) is connected with the first data line (D41), a drain electrode of the fourth switch element (403-2) is connected with the fourth data line (D44), a drain electrode of the fifth switch element (410-1) is connected with the third data line (D43), and a drain electrode of the sixth switch element (410-2) is connected with the sixth data line (D46).

14. The liquid crystal display device of claim 13, further comprising a scan line test area, comprising:

a scan line shorting bar (406); a switch control line (407) for the scan lines; and switch elements for the scan lines,

wherein gate electrodes of respective switch elements for the scan lines are arranged on the switch control line for the scan lines; source electrodes of respective switch elements for the scan lines are connected with the scan line shorting bar; and drain electrodes of respective switch elements for the scan lines are connected with the plurality of scan lines respectively.

15. The liquid crystal display device of claim 14, wherein the drain electrodes of respective switch elements for the scan lines are connected with the scan lines via through holes respectively.

Patentansprüche

1. Flüssigkristallanzeigevorrichtung, umfassend:

eine Mehrzahl von Scanleitungen (G21, G22, G23);

eine Mehrzahl von Gruppen von Datenleitungen (D20-1, D20-2), die sich mit der Mehrzahl von Scanleitungen schneiden, wobei jede Gruppe von Datenleitungen eine erste Datenleitung (D21, D24), eine zweite Datenleitung (D22, D25) und eine dritte Datenleitung (D23, D26) umfasst;

Bildpunkteinheiten, die in Bereichen ausgebildet sind, die von den sich schneidenden Scan- und Datenleitungen umgeben sind;

wobei ein Datenleitungsprüfbereich einen Datenleitungskurzschlussbügel (201), eine erste Datenschaltsteuerleitung (202) und eine zweite Datenschaltsteuerleitung (203) und eine Mehrzahl von Schaltelementen (204-1, 204-2, 205-1. 205-2) umfasst;

wobei in einer ersten Gruppe von Datenleitungen (D20-1, D20-2) die erste Datenleitung (D21, D24) Bildpunkteinheiten mit einer gleichen ersten Farbe steuert, die zweite Datenleitung (D22,

D25) Bildpunkteinheiten mit einer gleichen zweiten Farbe steuert und die dritte Datenleitung (D23, D26) Bildpunkteinheiten mit einer gleichen dritten Farbe steuert, wobei sich die erste Farbe, die zweite Farbe und die dritte Farbe voneinander unterscheiden;
wobei für jede Gruppe von Datenleitungen (D20-1, D20-2) die erste Datenleitung mit dem Datenleitungskurzschlussbügel (201) verbunden ist, die erste Datenschaltsteuerleitung (202) mit der zweiten Datenleitung (D22, D25) an einem ersten Überlappungspunkt überlappt und
das erste Schaltelement (204-1, 205-1) an dem ersten Überlappungspunkt ausgebildet ist, eine Gate-Elektrode des ersten Schalterelements (204-1, 205-1) von der ersten Datenschaltsteuerleitung (202) bereitgestellt wird, eine Source-Elektrode des ersten Schaltelements (204-1, 205-1) mit dem Datenleitungskurzschlussbügel (201) verbunden ist und eine Drain-Elektrode des ersten Schaltelements (204-1, 205-1) mit der zweiten Datenleitung (D22, D25) verbunden ist; und
wobei für jede Gruppe von Datenleitungen (D20-1, D20-2)
die zweite Datenschaltsteuerleitung (203) mit der dritten Datenleitung (D23, D26) an einem zweiten Überlappungspunkt überlappt und das zweite Schaltelement (204-2, 205-2) an dem zweiten Überlappungspunkt ausgebildet ist, eine Gate-Elektrode des zweiten Schaltelements (204-2, 205-2) von der zweiten Datenschaltsteuerleitung (203) bereitgestellt wird, eine Source-Elektrode des zweiten Schaltelements (204-2, 205-2) derart ausgelegt ist, dass sie mit dem Datenleitungskurzschlussbügel (201) über das erste Schaltelement (204-1, 205-1) verbindbar ist und eine Drain-Elektrode des zweiten Schaltelements (204-2, 205-2) mit der dritten Datenleitung (D23, D26) verbunden ist.

2. Flüssigkristallanzeigevorrichtung nach Anspruch 1, ferner umfassend einen Scanleitungsprüfbereich, der Folgendes umfasst:

einen Scanleitungskurzschlussbügel (206), eine Schaltsteuerleitung (207) für die Scanleitungen; und Schaltelemente für die Scanleitungen, wobei die Gate-Elektroden entsprechender Schaltelemente für die Scanleitungen an der Schaltsteuerleitung für die Scanleitungen angeordnet sind; Source-Elektroden entsprechender Schaltelemente für die Scanleitungen entsprechend mit dem Scanleitungskurzschlussbügel verbunden sind; und
Drain-Elektroden entsprechender Schaltelemente für die Scanleitungen entsprechend mit der Mehrzahl von Scanleitungen verbunden sind.

3. Flüssigkristallanzeigevorrichtung nach Anspruch 2, wobei die Drain-Elektroden entsprechender Schaltelemente für die Scanleitungen entsprechend über Durchgangslöcher mit den Scanleitungen verbunden sind.

4. Flüssigkristallanzeigevorrichtung nach Anspruch 1, wobei für jede Gruppe von Datenleitungen (D20-1, D20-2) die Source-Elektrode des zweiten Schaltelements (204-2, 205-2) mit der Drain-Elektrode des ersten Schaltelements (204-1, 205-1) verbunden ist.

5. Flüssigkristallanzeigevorrichtung nach Anspruch 1, ferner umfassend eine dritte Datenschaltsteuerleitung, wobei jede Gruppe von Datenleitungen (D20-1, D20-2) ferner eine vierte Datenleitung umfasst, und
wobei für jede Gruppe von Datenleitungen (D20-1, D20-2) die vierte Datenleitung Bildpunkteinheiten mit einer gleichen vierten Farbe steuert, die dritte Datenschaltsteuerleitung mit der vierten Datenleitung an einem dritten Überlappungspunkt überlappt, ein drittes Schaltelement an dem dritten Überlappungspunkt ausgebildet ist, eine Gate-Elektrode des dritten Schaltelements von der dritten Datenschaltsteuerleitung bereitgestellt wird, eine Source-Elektrode des dritten Schaltelements mit der Drain-Elektrode des zweiten Schaltelements verbunden ist und eine Drain-Elektrode des dritten Schaltelements mit der vierten Datenleitung verbunden ist.

6. Flüssigkristallanzeigevorrichtung nach Anspruch 1, ferner umfassend mindestens eine der folgenden Prüfklemmen:

eine mit dem Datenleitungskurzschlussbügel verbundene Prüfklemme; und
mit den Schaltsteuerleitungen verbundene Prüfklemmen für die Datenleitungen.

7. Flüssigkristallanzeigevorrichtung nach Anspruch 2, ferner umfassend mindestens eine der folgenden Prüfklemmen:

eine mit dem Scanleitungskurzschlussbügel verbundene Prüfklemme; und
mit den Schaltsteuerleitungen verbundene Prüfklemmen für die Scanleitungen.

8. Flüssigkristallanzeigevorrichtung, umfassend:

eine Mehrzahl von Scanleitungen (G31, G32, G33);
eine Mehrzahl von Gruppen von Datenleitungen (D30-1, D30-2), die sich mit der Mehrzahl von Scanleitungen schneiden, wobei jede Gruppe

von Datenleitungen eine erste Datenleitung (D31, D34), eine zweite Datenleitung (D32, D35) und eine dritte Datenleitung (D33, D36) umfasst;

Bildpunkteinheiten, die in Bereichen ausgebildet sind, die von den sich schneidenden Scan- und Datenleitungen umgeben sind;

wobei ein Datenleitungsprüfbereich einen Datenleitungskurzschlussbügel (301), eine erste Datenschaltsteuerleitung (302), eine zweite Datenschaltsteuerleitung (303), eine dritte Datenschaltsteuerleitung (310) und eine Mehrzahl von Schaltelementen (304-1, 305-1, 304-2, 305-2) umfasst;

wobei in einer ersten Gruppe von Datenleitungen (D30-1, D30-2) die erste Datenleitung (D31, D34) Bildpunkteinheiten mit einer gleichen ersten Farbe steuert, die zweite Datenleitung (D32, D35) Bildpunkteinheiten mit einer gleichen zweiten Farbe steuert und die dritte Datenleitung (D33, D36) Bildpunkteinheiten mit einer gleichen dritten Farbe steuert, wobei sich die erste Farbe, die zweite Farbe und die dritte Farbe voneinander unterscheiden; und

wobei für jede Gruppe von Datenleitungen (D30-1, D30-2)

die erste Datenschaltsteuerleitung (302) mit der ersten Datenleitung (D31, D32) an einem ersten Überlappungspunkt überlappt und das erste Schaltelement (304-1, 305-1) an dem ersten Überlappungspunkt ausgebildet ist, eine Gate-Elektrode des ersten Schaltelements (304-1, 305-1) von der ersten Datenschaltsteuerleitung (302) bereitgestellt wird, eine Source-Elektrode des ersten Schaltelements (304-1, 305-1) mit dem Datenleitungskurzschlussbügel (301) verbunden ist und eine Drain-Elektrode des ersten Schaltelements (304-1, 305-1) mit der ersten Datenleitung (D31, D34) verbunden ist;

wobei für jede Gruppe von Datenleitungen (D30-1, D30-2)

die zweite Datenschaltsteuerleitung (303) mit der zweiten Datenleitung (D32, D35) an einem zweiten Überlappungspunkt überlappt und das zweite Schaltelement (304-2, 305-2) an dem zweiten Überlappungspunkt ausgebildet ist, eine Gate-Elektrode des zweiten Schaltelements (304-2, 305-2) von der zweiten Datenschaltsteuerleitung (303) bereitgestellt wird, eine Source-Elektrode des zweiten Schaltelements (304-2, 305-2) derart ausgelegt ist, dass sie mit dem Datenleitungskurzschlussbügel (301) über das erste Schaltelement (304-1, 305-1) verbindbar ist, und eine Drain-Elektrode des zweiten Schaltelements (304-2, 305-2) mit der zweiten Datenleitung (D32, D35) verbunden ist; und

wobei für jede Gruppe von Datenleitungen (D30-1, D30-2) die dritte Datenschaltsteuerleitung (310) mit der dritten Datenleitung (D33, D36) an einem dritten Überlappungspunkt überlappt und das dritte Schaltelement (304-3, 305-3) an dem dritten Überlappungspunkt ausgebildet ist, eine Gate-Elektrode des dritten Schaltelements (304-3, 305-3) von der dritten Datenschaltsteuerleitung (310) bereitgestellt wird, eine Source-Elektrode des dritten Schaltelements (304-3, 305-3) derart ausgelegt ist, dass sie mit dem Datenleitungskurzschlussbügel (301) über das erste Schaltelement (304-1, 305-1) und über das zweite Schaltelement (304-2, 305-2) verbindbar ist, und eine Drain-Elektrode des dritten Schaltelements (304-3, 305-3) mit der dritten Datenleitung (D33, D36) verbunden ist.

9. Flüssigkristallanzeigevorrichtung nach Anspruch 8, ferner umfassend eine vierte Datenschaltsteuerleitung, wobei jede Gruppe von Datenleitungen ferner eine vierte Datenleitung umfasst und

wobei für jede Gruppe von Datenleitungen (D30-1, D30-2) die vierte Datenleitung Bildpunkteinheiten mit einer gleichen vierten Farbe steuert, die vierte Datenschaltsteuerleitung mit der vierten Datenleitung an einem vierten Überlappungspunkt überlappt, ein viertes Schaltelement an dem vierten Überlappungspunkt ausgebildet ist, eine Gate-Elektrode des vierten Schaltelements von der vierten Datenschaltsteuerleitung bereitgestellt wird, eine Source-Elektrode des vierten Schaltelements derart ausgelegt ist, dass sie mit dem Datenleitungskurzschlussbügel (301) über das erste Schaltelement (304-1, 305-1), über das zweite Schaltelement (304-2, 305-2) und über das dritte Schaltelement (304-3, 305-3) verbindbar ist, und eine Drain-Elektrode des vierten Schaltelements mit der vierten Datenleitung verbunden ist.

10. Flüssigkristallanzeigevorrichtung nach Anspruch 8, ferner umfassend einen Scanleitungsprüfbereich, umfassend:

einen Scanleitungskurzschlussbügel (306), eine Schaltsteuerleitung (307) für die Scanleitungen, Schaltelemente für die Scanleitungen in derselben Anzahl wie die Scanleitungen, erste Verbindungsleitungen für die Scanleitungen in derselben Anzahl wie die Scanleitungen und zweite Verbindungsleitungen für die Scanleitungen in derselben Anzahl wie die Scanleitungen, wobei

Gate-Elektroden entsprechender Schaltelemente für die Scanleitungen an der Schaltsteuerleitung für die Scanleitungen angeordnet sind; und

Source-Elektroden entsprechender Schaltelemente für die Scanleitungen mit dem Scanlei-

tungskurzschlussbügel verbunden sind; und Drain-Elektroden entsprechender Schaltelemente für die Scanleitungen entsprechend mit der Mehrzahl von Scanleitungen verbunden sind.

11. Flüssigkristallanzeigevorrichtung nach Anspruch 9, wobei die Drain-Elektroden der entsprechenden Schaltelemente für die Scanleitungen entsprechend über Durchgangslöcher mit den Scanleitungen verbunden sind.

12. Flüssigkristallanzeigevorrichtung nach Anspruch 8, wobei für jede Gruppe von Datenleitungen (D30-1, D30-2)
die Source-Elektrode des zweiten Schaltelements (304-2, 305-2) mit der Drain-Elektrode des ersten Schaltelements (304-1, 305-1) verbunden ist und die Source-Elektrode des dritten Schaltelements (304-3, 305-3) mit der Drain-Elektrode des zweiten Schaltelements (304-2, 305-2) verbunden ist.

13. Flüssigkristallanzeigevorrichtung, umfassend:

eine Mehrzahl von Scanleitungen (G41, G42, G43, G44);
eine Mehrzahl von Gruppen von Datenleitungen, die sich mit der Mehrzahl von Scanleitungen schneiden, wobei jede Gruppe von Datenleitungen eine erste Datenleitung (D41), eine zweite Datenleitung (D42), eine dritte Datenleitung (D43) eine vierte Datenleitung (D44), eine fünfte Datenleitung (D45) und eine sechste Datenleitung (D46) umfasst;
Bildpunkteinheiten, die in Bereichen ausgebildet sind, die von den sich schneidenden Scan- und Datenleitungen umgeben sind;
wobei ein Datenleitungsprüfbereich einen Datenleitungskurzschlussbügel (401), eine erste Datenschaltsteuerleitung (402), eine zweite Datenschaltsteuerleitung (403), eine dritte Datenschaltsteuerleitung (410) und eine Mehrzahl von Schaltelementen (402-1, 402-2, 403-1, 403-2, 410-1, 410-2) umfasst;
wobei in jeder Gruppe von Datenleitungen die erste Datenleitung (D41) Bildpunkteinheiten mit einer gleichen ersten Farbe steuert, die zweite Datenleitung (D42) Bildpunkteinheiten mit einer gleichen zweiten Farbe steuert, die dritte Datenleitung (D43) Bildpunkteinheiten mit einer gleichen dritten Farbe steuert, die vierte Datenleitung (D44) Bildpunkteinheiten mit der ersten Farbe steuert, die fünfte Datenleitung (D45) Bildpunkteinheiten mit der zweiten Farbe steuert, die sechste Datenleitung (D46) Bildpunkteinheiten mit der dritten Farbe steuert,
wobei sich die erste Farbe, die zweite Farbe und die dritte Farbe voneinander unterscheiden; und
wobei für jede Gruppe von Datenleitungen die erste Datenschaltsteuerleitung (402) mit der zweiten Datenleitung (D42) an einem ersten Überlappungspunkt überlappt und das erste Schaltelement (402-1) an dem ersten Überlappungspunkt ausgebildet ist und die erste Datenschaltsteuerleitung (402) mit der fünften Datenleitung (D45) an einem zweiten Überlappungspunkt überlappt und das zweite Schaltelement (402-2) an dem zweiten Überlappungspunkt ausgebildet ist, die zweite Datenschaltsteuerleitung (403) mit der ersten Datenleitung (D41) an einem dritten Überlappungspunkt überlappt und das dritte Schaltelement (403-1) an dem dritten Überlappungspunkt ausgebildet ist und die zweite Datenschaltsteuerleitung (403) mit der vierten Datenleitung (D44) an einem vierten Überlappungspunkt überlappt und das vierte Schaltelement (403-2) an dem vierten Überlappungspunkt ausgebildet ist, die dritte Datenschaltsteuerleitung (410) mit der dritten Datenleitung (D43) an einem fünften Überlappungspunkt überlappt und das fünfte Schaltelement (410-1) an dem fünften Überlappungspunkt ausgebildet ist und die dritte Datenschaltsteuerleitung (410) mit der sechsten Datenleitung (D46) an einem sechsten Überlappungspunkt überlappt und das sechste Schaltelement (410-2) an dem sechsten Überlappungspunkt ausgebildet ist; und
wobei für jede Gruppe von Datenleitungen Gate-Elektroden des ersten Schaltelements (402-1) und des zweiten Schaltelements (402-2) von der ersten Datenschaltsteuerleitung (402) bereitgestellt werden, Gate-Elektroden des dritten Schaltelements (403-1) und des vierten Schaltelements (403-2) von der zweiten Datenschaltsteuerleitung (403) bereitgestellt werden und Gate-Elektroden des fünften Schaltelements (410-1) und des sechsten Schaltelements (410-2) von der dritten Datenschaltsteuerleitung (410) bereitgestellt werden,
Source-Elektroden des ersten Schaltelements (402-1) und des dritten Schaltelements (403-1) mit einer ersten Verbindungsleitung (C41) verbunden sind, die selbst mit dem Datenleitungskurzschlussbügel (401) verbunden ist, Source-Elektroden des fünften Schaltelements (410-1) und des vierten Schaltelements (403-2) mit einer zweiten Verbindungsleitung (C42) verbunden sind, die selbst mit dem Datenleitungskurzschlussbügel (401) verbunden ist, und Source-Elektroden des zweiten Schaltelements (402-2) und des sechsten Schaltelements (410-2) mit einer dritten Verbindungsleitung (C43) verbunden sind, die selbst mit dem Datenleitungskurzschlussbügel (401) verbunden ist; und
eine Drain-Elektrode des ersten Schaltelements

(402-1) mit der zweiten Datenleitung (D42) verbunden ist; eine Drain-Elektrode des zweiten Schaltelements (402-2) mit der fünften Datenleitung (D45) verbunden ist; eine Drain-Elektrode des dritten Schaltelements (403-1) mit der ersten Datenleitung (D41) verbunden ist; eine Drain-Elektrode des vierten Schaltelements (403-2) mit der vierten Datenleitung (D44) verbunden ist; eine Drain-Elektrode des fünften Schaltelements (410-1) mit der dritten Datenleitung (D43) verbunden ist und eine Drain-Elektrode des sechsten Schaltelements (410-2) mit der sechsten Datenleitung (D46) verbunden ist.

14. Flüssigkristallanzeigevorrichtung nach Anspruch 13, ferner umfassend einen Scanleitungsprüfbereich, umfassend:

einen Scanleitungskurzschlussbügel (406); eine Schaltsteuerleitung (407) für die Scanleitungen; und Schaltelemente für die Scanleitungen, wobei Gate-Elektroden entsprechender Schaltelemente für die Scanleitungen an der Schaltsteuerleitung für die Scanleitungen angeordnet sind; Source-Elektroden entsprechender Schaltelemente für die Scanleitungen mit dem Scanleitungskurzschlussbügel verbunden sind; und Drain-Elektroden entsprechender Schaltelemente für die Scanleitungen entsprechend mit der Mehrzahl von Scanleitungen verbunden sind.

15. Flüssigkristallanzeigevorrichtung nach Anspruch 14, wobei die Drain-Elektroden der entsprechenden Schaltelemente für die Scanleitungen entsprechend über Durchgangslöcher mit den Scanleitungen verbunden sind.

Revendications

1. Dispositif d'affichage à cristaux liquides comprenant :

plusieurs lignes de balayage (G21, G22, G23) ; plusieurs ensembles de lignes de données (D20-1, D20-2) coupant les plusieurs lignes de balayage, chaque ensemble de lignes de données comprenant une première ligne de données (D21, D24), une deuxième ligne de données (D22, D25) et une troisième ligne de données (D23, D26) ;
des unités de pixels formées dans des zones encerclées par l'intersection des lignes de balayage et de données ;
une zone de test des lignes de données comprenant une barre de court-circuit des lignes de données (201), une première ligne de commande de commutation de données (202) et une deuxième ligne de commande de commutation de données (203) et plusieurs éléments de commutation (204-1, 204-2, 205-1, 205-2) ;

dans lequel, dans chaque ensemble de lignes de données (D20-1, D20-2), la première ligne de données (D21, D24) commande des unités de pixels d'une même première couleur, la deuxième ligne de données (D22, D25) commande des unités de pixels d'une même deuxième couleur et la troisième ligne de données (D23, D26) commande des unités de pixels d'une même troisième couleur, la première couleur, la deuxième couleur et la troisième couleur étant différentes les unes des autres ;
dans lequel, pour chaque ensemble de lignes de données (D20-1, D20-2), la première ligne de données est connectée à la barre de court-circuit des lignes de données (201), la première ligne de commande de commutation de données (202) chevauche la deuxième ligne de données (D22, D25) en un premier point de chevauchement et le premier élément de commutation (204-1, 205-1) est formé audit premier point de chevauchement, une électrode de grille du premier élément de commutation (204-1, 205-1) est fournie par la première ligne de commande de commutation de données (202), une électrode de source du premier élément de commutation (204-1, 205-1) est connectée à la barre de court-circuit des lignes de données (201) et une électrode de drain du premier élément de commutation (204-1, 205-1) est connectée à la deuxième ligne de données (D22, D25) ; et
dans lequel, pour chaque ensemble de lignes de données (D20-1, D20-2), la deuxième ligne de commande de commutation de données (203) chevauche la troisième ligne de données (D23, D26) en un deuxième point de chevauchement et le deuxième élément de commutation (204-2, 205-2) est formé audit deuxième point de chevauchement, une électrode de grille du deuxième élément de commutation (204-2, 205-2) est fournie par la deuxième ligne de commande de commutation de données (203), une électrode de source du deuxième élément de commutation (204-2, 205-2) est configurée de façon à pouvoir être connectée à la barre de court-circuit des lignes de données (201) via le premier élément de commutation (204-1, 205-1) et une électrode de drain du deuxième élément de commutation (204-2, 205-2) est connectée à la troisième ligne de données (D23, D26).

2. Dispositif d'affichage à cristaux liquides selon la revendication 1, comprenant en outre une zone de test des lignes de balayage comprenant :

une barre de court-circuit des lignes de balayage (206),

une ligne de contrôle de commutation (207) pour les lignes de balayage, et
des éléments de commutation pour les lignes de balayage,

les électrodes de grille d'éléments de commutation respectifs pour les lignes de balayage étant disposées sur la ligne de contrôle de commutation pour les lignes de balayage, les électrodes de source d'éléments de commutation respectifs pour les lignes de balayage étant connectées, respectivement, à la barre de court-circuit des lignes de balayage, et les électrodes de drain d'éléments de commutation respectifs pour les lignes de balayage étant connectées aux plusieurs lignes de balayage, respectivement.

3. Dispositif d'affichage à cristaux liquides selon la revendication 2, dans lequel les électrodes de drain d'éléments de commutation respectifs pour les lignes de balayage sont connectées aux lignes de balayage via des trous traversants respectifs.

4. Dispositif d'affichage à cristaux liquides selon la revendication 1 dans lequel, pour chaque ensemble de lignes de données (D20-1, D20-2), l'électrode de source du deuxième élément de commutation (204-2, 205-2) est connectée à l'électrode de drain du premier élément de commutation (204-1, 205-1).

5. Dispositif d'affichage à cristaux liquides selon la revendication 1, comprenant en outre une troisième ligne de commande de commutation de données, chaque ensemble de lignes de données (D20-1, D20-2) comprenant en outre une quatrième ligne de données et
dans lequel, pour chaque ensemble de lignes de données (D20-1, D20-2), la quatrième ligne de données contrôle des unités de pixels d'une même quatrième couleur, la troisième ligne de commande de commutation de données chevauche la quatrième ligne de données en un troisième point de chevauchement, un troisième élément de commutation est formé sur ledit troisième point de chevauchement, une électrode de grille du troisième élément de commutation est fournie par la troisième ligne de commande de commutation de données, une électrode de source du troisième élément de commutation est connectée à l'électrode de drain du deuxième élément de commutation, et une électrode de drain du troisième élément de commutation est connectée à la quatrième ligne de données.

6. Dispositif d'affichage à cristaux liquides selon la revendication 1, comprenant en outre au moins une des bornes de test suivantes :

une borne de test connectée à la barre de court-circuit des lignes de données ; et
des bornes de test connectées aux lignes de contrôle de commutation pour les lignes de données.

7. Dispositif d'affichage à cristaux liquides selon la revendication 2, comprenant en outre au moins une des bornes de test suivantes :

une borne de test connectée à la barre de court-circuit des lignes de balayage ; et
une borne de test connectée à la ligne de contrôle de commutation pour les lignes de balayage.

8. Dispositif d'affichage à cristaux liquides, comprenant :

plusieurs lignes de balayage (G31, G32, G33) ;
plusieurs ensembles de lignes de données (D30-1, D30-2) coupant les plusieurs lignes de balayage, chaque ensemble de lignes de données comprenant une première ligne de données (D31, D34), une deuxième ligne de données (D32, D35) et une troisième ligne de données (D33, D36) ;
des unités de pixels formées dans des zones encerclées par l'intersection des lignes de balayage et de données ;
une zone de test des lignes de données comprenant une barre de court-circuit des lignes de données (301), une première ligne de commande de commutation de données (302), une deuxième ligne de commande de commutation de données (303), une troisième ligne de commande de commutation de données (310) et plusieurs éléments de commutation (304-1, 305-1, 304-2, 305-2) ;

dans lequel, dans chaque ensemble de lignes de données (D30-1, D30-2), la première ligne de données (D31, D34) contrôle des unités de pixels d'une même première couleur, la deuxième ligne de données (D32, D35) contrôle des unités de pixels d'une même deuxième couleur et la troisième ligne de données (D33, D36) contrôle des unités de pixels d'une même troisième couleur, la première couleur, la deuxième couleur et la troisième couleur étant différentes les unes des autres ; et
dans lequel, pour chaque ensemble de lignes de données (D30-1, D30-2), la première ligne de commande de commutation de données (302) chevauche la première ligne de données (D31, D32) en un premier point de chevauchement et le premier élément de commutation (304-1, 305-1) est formé audit premier point de chevauchement, une électrode de grille du premier élément de commutation (304-1, 305-1) est fournie par la première ligne de comman-

de de commutation de données (302), une électrode de source du premier élément de commutation (304-1, 305-1) est connectée à la barre de court-circuit des lignes de données (301) et une électrode de drain du premier élément de commutation (304-1, 305-1) est connectée à la première ligne de données (D31, D34) ;
dans lequel, pour chaque ensemble de lignes de données (D30-1, D30-2), la deuxième ligne de commande de commutation de données (303) chevauche la deuxième ligne de données (D32, D35) en un deuxième point de chevauchement et le deuxième élément de commutation (304-2, 305-2) est formé audit deuxième point de chevauchement, une électrode de grille du deuxième élément de commutation (304-2, 305-2) est fournie par la deuxième ligne de commande de commutation de données (303), une électrode de source du deuxième élément de commutation (304-2, 305-2) est configurée de façon à pouvoir être connectée à la barre de court-circuit des lignes de données (301) via le premier élément de commutation (304-1, 305-1), et une électrode de drain du deuxième élément de commutation (304-2, 305-2) est connectée à la deuxième ligne de données (D32, D35) ; et
dans lequel, pour chaque ensemble de lignes de données (D30-1, D30-2), la troisième ligne de commande de commutation de données (310) chevauche la troisième ligne de données (D33, D36) en un troisième point de chevauchement et le troisième élément de commutation (304-3, 305-3) est formé audit troisième point de chevauchement, une électrode de grille du troisième élément de commutation (304-3, 305-3) est fournie par la troisième ligne de commande de commutation de données (310), une électrode de source du troisième élément de commutation (304-3, 305-3) est configurée de façon à pouvoir être connectée à la barre de court-circuit des lignes de données (301) via le premier élément de commutation (304-1, 305-1) et via le deuxième élément de commutation (304-2, 305-2) et une électrode de drain du troisième élément de commutation (304-3, 305-3) est connectée à la troisième ligne de données (D33, D36).

9. Dispositif d'affichage à cristaux liquides selon la revendication 8, comprenant en outre une quatrième ligne de commande de commutation de données, dans lequel chaque ensemble de lignes de données comprend en outre une quatrième ligne de données, et
dans lequel, pour chaque ensemble de lignes de données (D30-1, D30-2), la quatrième ligne de données contrôle des unités de pixels d'une même quatrième couleur, la quatrième ligne de commande de commutation de données chevauche la quatrième ligne de données en un quatrième point de chevauchement, un quatrième élément de commutation est formé audit quatrième point de chevauchement, une électrode de grille du quatrième élément de commutation est fournie par la quatrième ligne de commande de commutation de données, une électrode de source du quatrième élément de commutation est configurée de façon à pouvoir être connectée à la barre de court-circuit des lignes de données (301) via le premier élément de commutation (304-1, 305-1), via le deuxième élément de commutation (304-2, 305-2) et via le troisième élément de commutation (304-3, 305-3), et une électrode de drain du quatrième élément de commutation est connectée à la quatrième ligne de données.

10. Dispositif d'affichage à cristaux liquides selon la revendication 8, comprenant en outre une zone de test des lignes de balayage comprenant :

une barre de court-circuit des lignes de balayage (306), une ligne de contrôle de commutation (307) pour les lignes de balayage, des éléments de commutation pour les lignes de balayage en nombre égal à celui des lignes de balayage, des premières lignes de connexion pour les lignes de balayage en nombre égal à celui des lignes de balayage et des deuxièmes lignes de connexion pour les lignes de balayage en nombre égal à celui des lignes de balayage,
des électrodes de grille d'éléments de commutation respectifs pour les lignes de balayage étant disposées sur la ligne de contrôle de commutation pour les lignes de balayage ; et
des électrodes de source d'éléments de commutation respectifs pour les lignes de balayage étant connectées à la barre de court-circuit des lignes de balayage ; et
des électrodes de drain d'éléments de commutation respectifs pour les lignes de balayage étant connectées aux plusieurs lignes de balayage, respectivement.

11. Dispositif d'affichage à cristaux liquides selon la revendication 9, dans lequel les électrodes de drain d'éléments de commutation respectifs pour les lignes de balayage sont connectées aux lignes de balayage via des trous d'interconnexion respectifs.

12. Dispositif d'affichage à cristaux liquides selon la revendication 8 dans lequel, pour chaque ensemble de lignes de données (D30-1, D30-2), l'électrode de source du deuxième élément de commutation (304-2, 305-2) est connectée à l'électrode de drain du premier élément de commutation (304-1, 305-1) et l'électrode de source du troisième élément de commutation (304-3, 305-3) est connectée à l'électrode de drain du deuxième élément de commutation (304-2, 305-2).

13. Dispositif d'affichage à cristaux liquides comprenant :

plusieurs lignes de balayage (G41, G42, G43, G44) ;
plusieurs ensembles de lignes de données coupant les plusieurs lignes de balayage, chaque ensemble de lignes de données comprenant une première ligne de données (D41), une deuxième ligne de données (D42), une troisième ligne de données (D43), une quatrième ligne de données (D44), une cinquième ligne de données (D45) et une sixième ligne de données (D46) ;
des unités de pixels formées dans des zones encerclées par l'intersection des lignes de balayage et de données ;
une zone de test des lignes de données comprenant une barre de court-circuit des lignes de données (401), une première ligne de commande de commutation de données (402), une deuxième ligne de commande de commutation de données (403), une troisième ligne de commande de commutation de données (410) et plusieurs éléments de commutation (402-1, 402-2, 403-1, 403-2, 410-1, 410-2) ;

dans lequel, dans chaque ensemble de lignes de données, la première ligne de données (D41) commande des unités de pixels d'une même première couleur, la deuxième ligne de données (D42) commande des unités de pixels d'une même deuxième couleur, la troisième ligne de données (D43) commande des unités de pixels d'une même troisième couleur, la quatrième ligne de données (D44) commande des unités de pixels de la première couleur, la cinquième ligne de données (D45) commande des unités de pixels de la deuxième couleur, la sixième ligne de données (D46) commande des unités de pixels de la troisième couleur, la première couleur, la deuxième couleur et la troisième couleur étant différentes les unes des autres ; et
dans lequel, pour chaque ensemble de lignes de données, la première ligne de commande de commutation de données (402) chevauche la deuxième ligne de données (D42) en un premier point de chevauchement et le premier élément de commutation (402-1) est formé audit premier point de chevauchement et la première ligne de commande de commutation de données (402) chevauche la cinquième ligne de données (D45) en un deuxième point de chevauchement et le deuxième élément de commutation (402-2) est formé audit deuxième point de chevauchement, la deuxième ligne de commande de commutation de données (403) chevauche la première ligne de données (D41) en un troisième point de chevauchement et le troisième élément de commutation (403-1) est formé audit troisième point de chevauchement et la deuxième ligne de commande de commutation de données (403) chevauche la quatrième ligne de données (D44) en un quatrième point de chevauchement et le quatrième élément de commutation (403-2) est formé audit quatrième point de chevauchement, la troisième ligne de commande de commutation de données (410) chevauche la troisième ligne de données (D43) en un cinquième point de chevauchement et le cinquième élément de commutation (410-1) est formé audit cinquième point de chevauchement et la troisième ligne de commande de commutation de données (410) chevauche la sixième ligne de données (D46) en un sixième point de chevauchement et le sixième élément de commutation (410-2) est formé audit sixième point de chevauchement ; et
dans lequel, pour chaque ensemble de lignes de données, des électrodes de grille du premier élément de commutation (402-1) et du deuxième élément de commutation (402-2) sont fournies par la première ligne de commande de commutation de données (402), des électrodes de grille du troisième élément de commutation (403-1) et du quatrième élément de commutation (403-2) sont fournies par la deuxième ligne de commande de commutation de données (403) et des électrodes de grille du cinquième élément de commutation (410-1) et du sixième élément de commutation (410-2) sont fournies par la troisième ligne de commande de commutation de données (410) ;
des électrodes de source du premier élément de commutation (402-1) et du troisième élément de commutation (403-1) sont connectées à une première ligne de connexion (C41) qui est elle-même connectée à la barre de court-circuit des lignes de données (401), des électrodes de source du cinquième élément de commutation (410-1) et du quatrième élément de commutation (403-2) sont connectées à une deuxième ligne de connexion (C42) qui est elle-même connectée à la barre de court-circuit des lignes de données (401), et des électrodes de source du deuxième élément de commutation (402-2) et du sixième élément de commutation (410-2) sont connectées à une troisième ligne de connexion (C43) qui est elle-même connectée à la barre de court-circuit des lignes de données (401) ; et
une électrode de drain du premier élément de commutation (402-1) est connectée à la deuxième ligne de données (D42), une électrode de drain du deuxième élément de commutation (402-2) est connectée à la cinquième ligne de données (D45), une électrode de drain du troisième élément de commutation (403-1) est connectée à la première ligne de données (D41), une électrode de drain du quatrième élément de commutation (403-2) est connectée à la quatrième ligne de données (D44), une électrode de drain du cinquième élément de commutation (410-1) est connectée à la troisième ligne de données (D43),

et une électrode de drain du sixième élément de commutation (410-2) est connectée à la sixième ligne de données (D46).

14. Dispositif d'affichage à cristaux liquides selon la revendication 13, comprenant en outre une zone de test des lignes de balayage comprenant une barre de court-circuit des lignes de balayage (406), une ligne de contrôle de commutation (407) pour les lignes de balayage et des éléments de commutation pour les lignes de balayage,
dans lequel des électrodes de grille d'éléments de commutation respectifs pour les lignes de balayage sont disposées sur la ligne de contrôle de commutation pour les lignes de balayage ; des électrodes de source d'éléments de commutation respectifs pour les lignes de balayage sont connectées à la barre de court-circuit des lignes de balayage ; et des électrodes de drain d'éléments de commutation respectifs pour les lignes de balayage sont connectées aux plusieurs lignes de balayage, respectivement.

15. Dispositif d'affichage à cristaux liquides selon la revendication 14, dans lequel des les électrodes de drain d'éléments de commutation respectifs pour les lignes de balayage sont connectées aux lignes de balayage via des trous d'interconnexion respectifs.

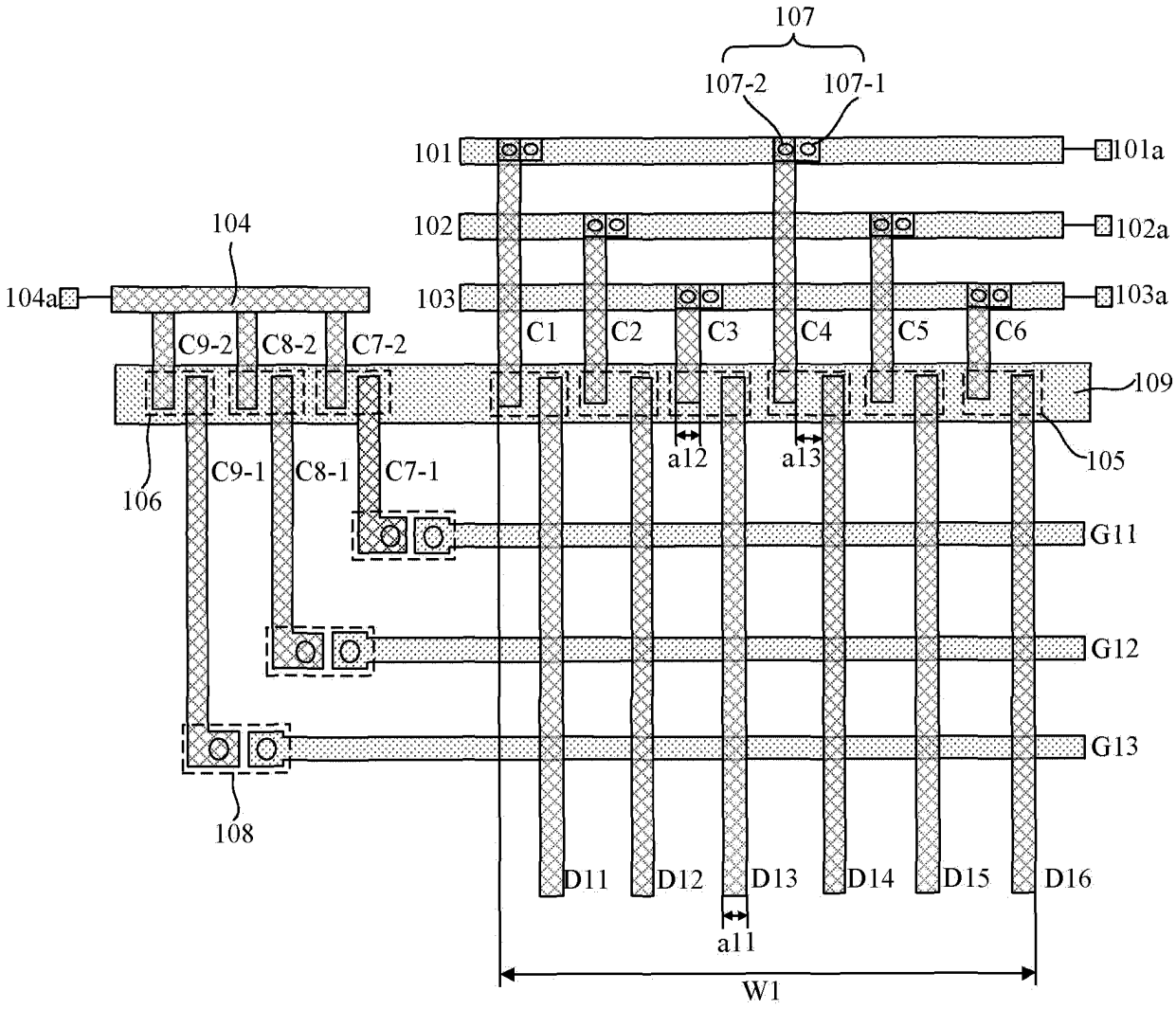

107
107-2
107-1
101
101a
102
102a
104
104a
103
103a
C1
C2
C3
C4
C5
C6
C9-2
C8-2
C7-2
109
105
a12
a13
106
C9-1
C8-1
C7-1
G11
G12
G13
108
D11
D12
D13
D14
D15
D16
a11
W1

Fig.1

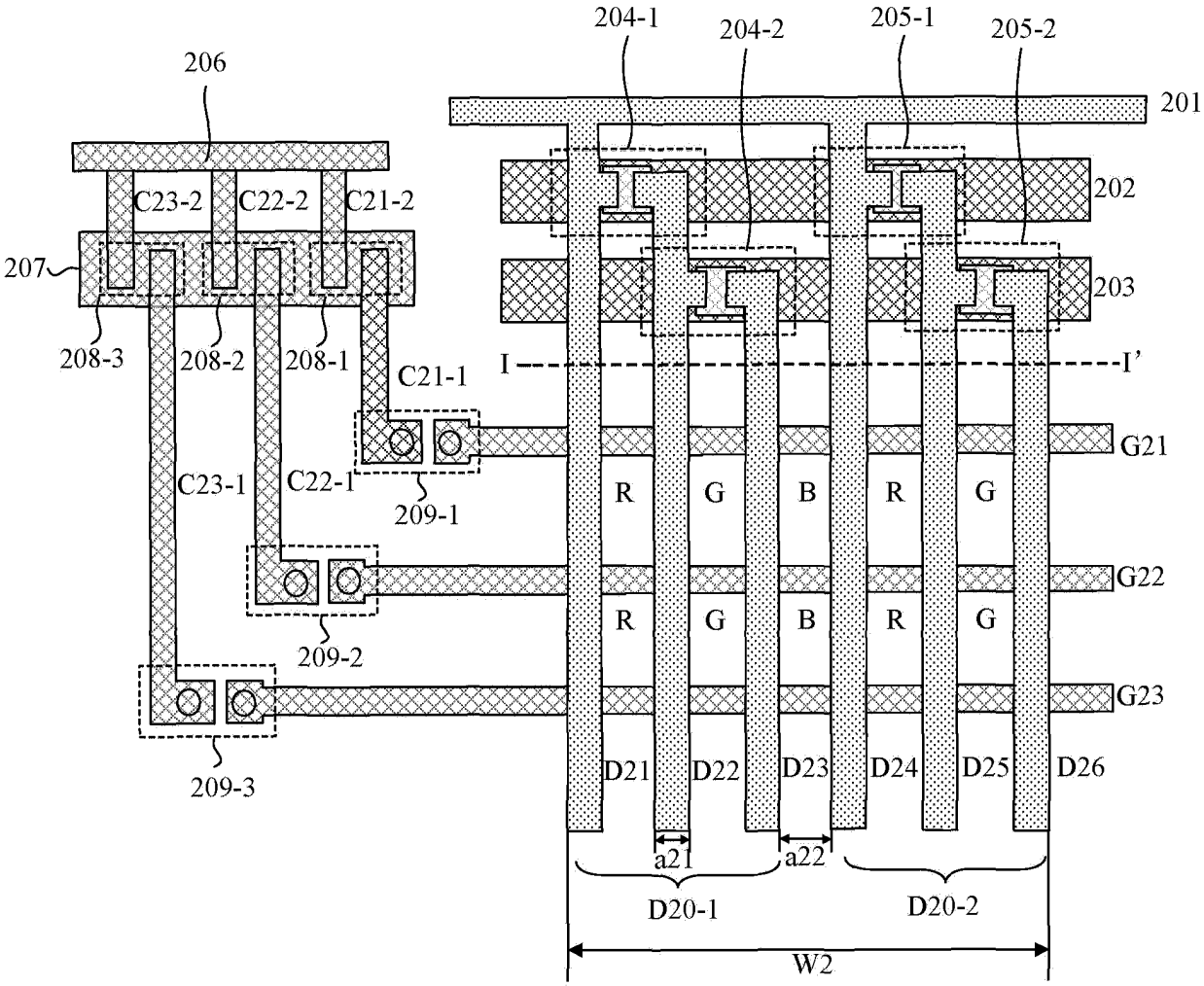

204-1
204-2
205-1
205-2
206
201
C23-2
C22-2
C21-2
202
207
203
208-3
208-2
208-1
C21-1
I
I'
G21
C23-1
C22-1
209-1
R
G
B
R
G
G22
209-2
G23
209-3
D21
D22
D23
D24
D25
D26
a21
a22
D20-1
D20-2
W2

Fig.2

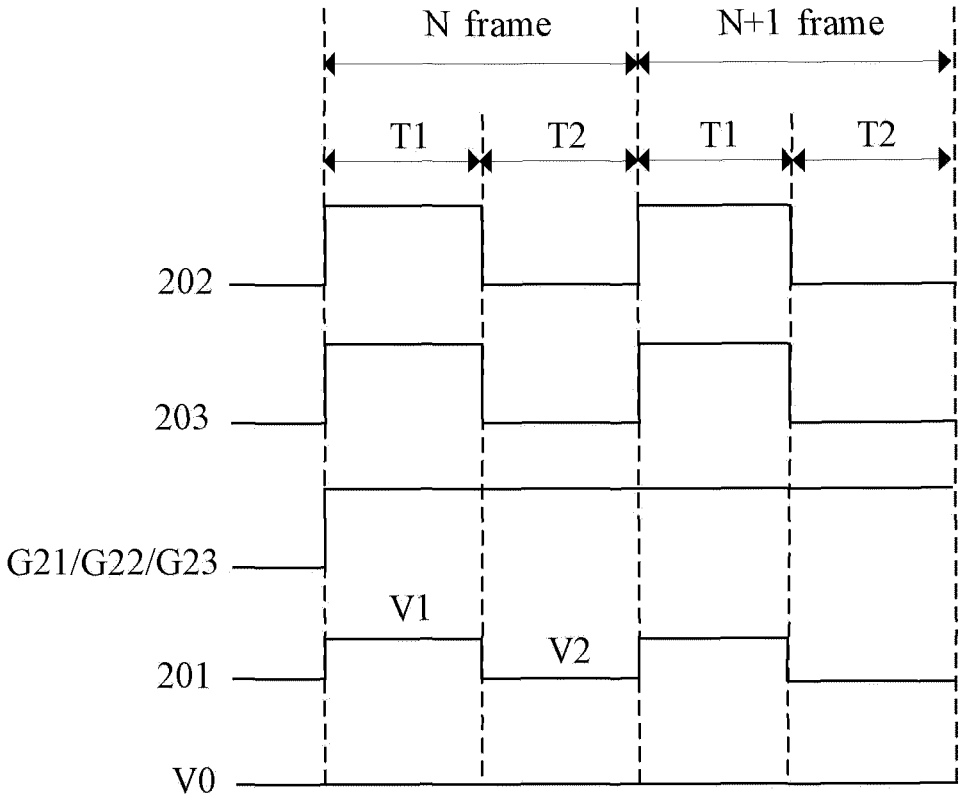


Fig.3

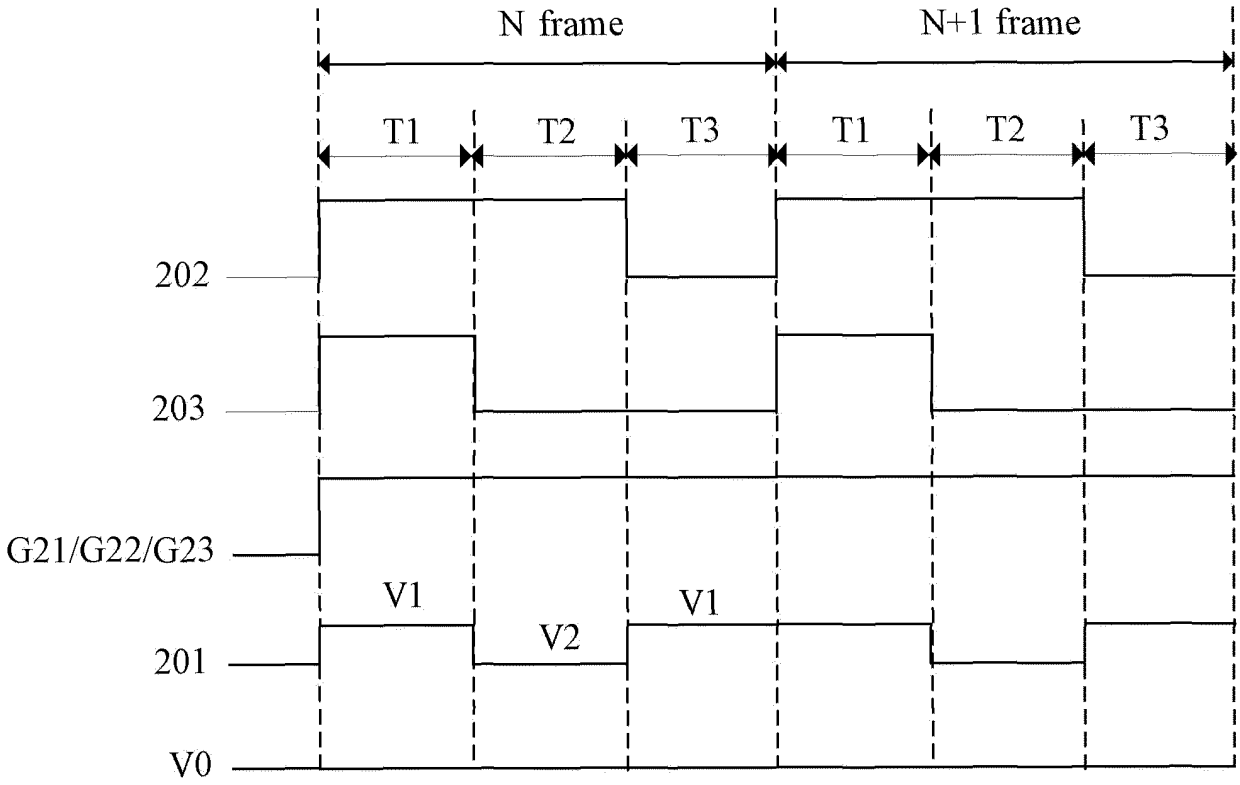

N frame
N+1 frame
T1
T2
T3
T1
T2
T3
202
203
G21/G22/G23
V1
V2
V1
201
V0

Fig.4

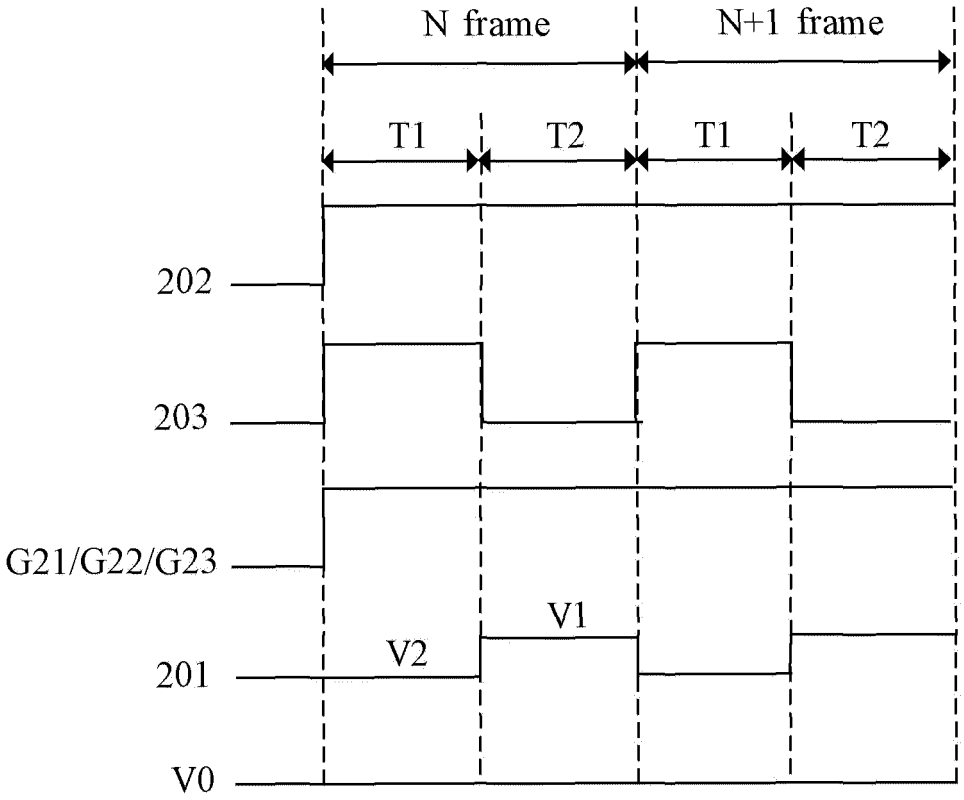


Fig.5

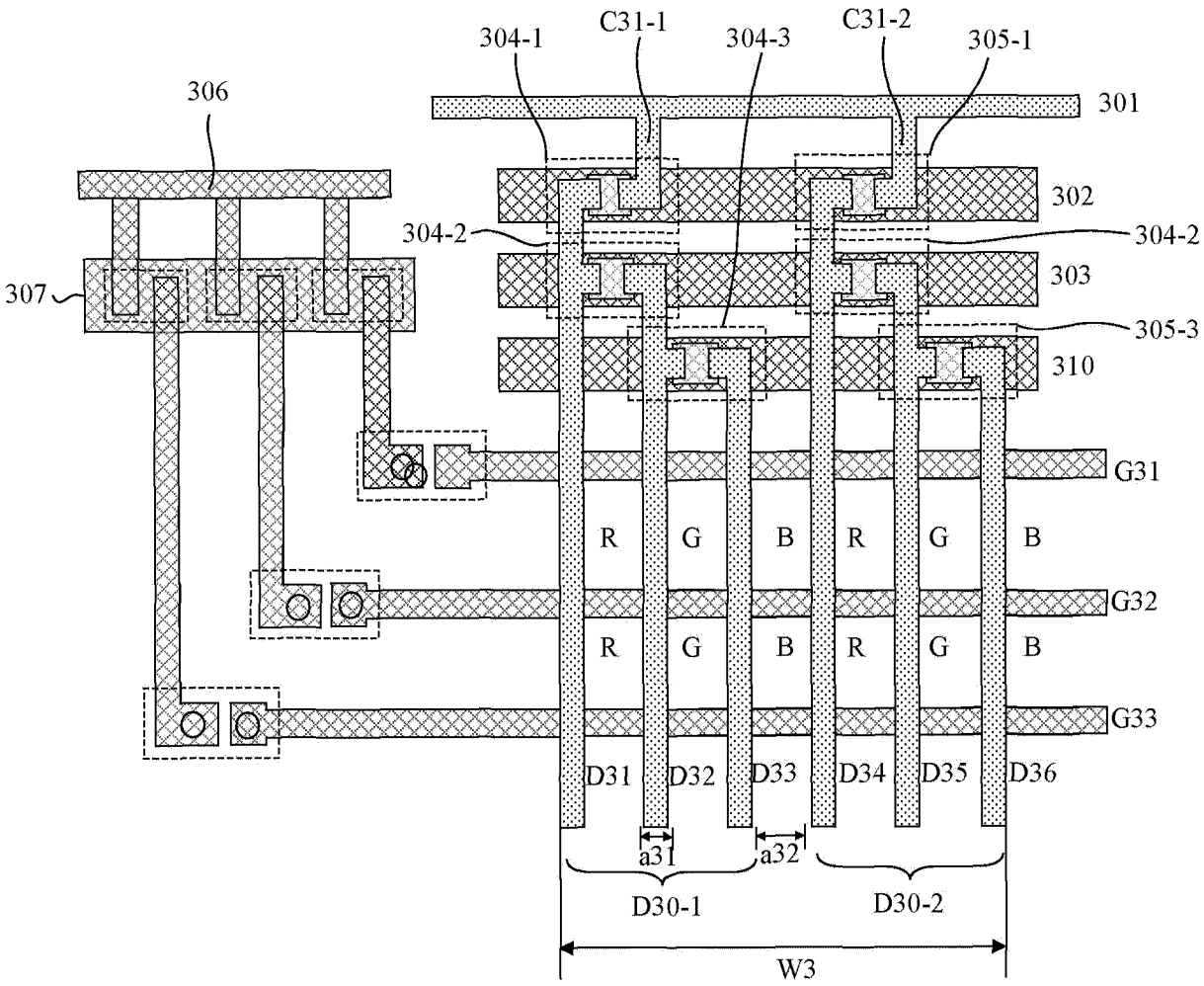

304-1
C31-1
304-3
C31-2
305-1
306
301
302
304-2
304-2
307
303
305-3
310
G31
R
G
B
R
G
B
G32
R
G
B
R
G
B
G33
D31
D32
D33
D34
D35
D36
a31
a32
D30-1
D30-2
W3

Fig.6

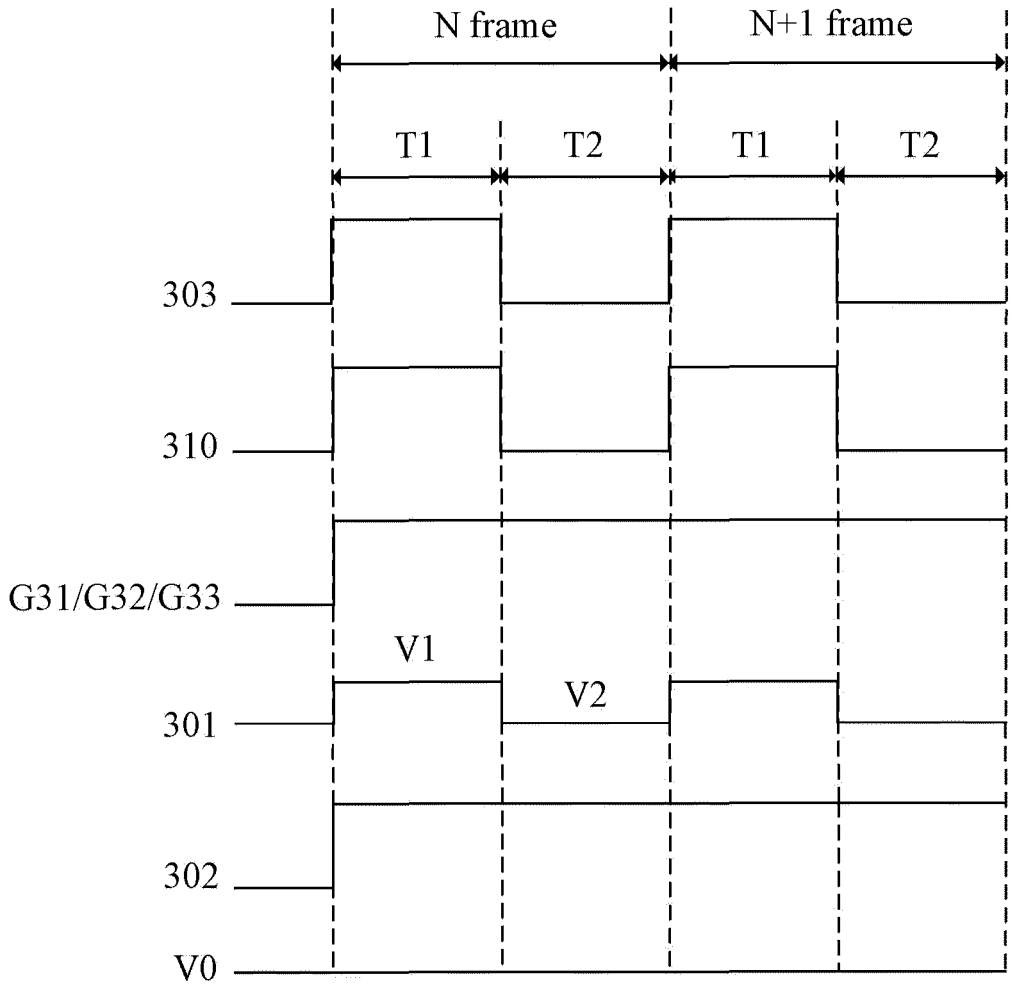


Fig.7

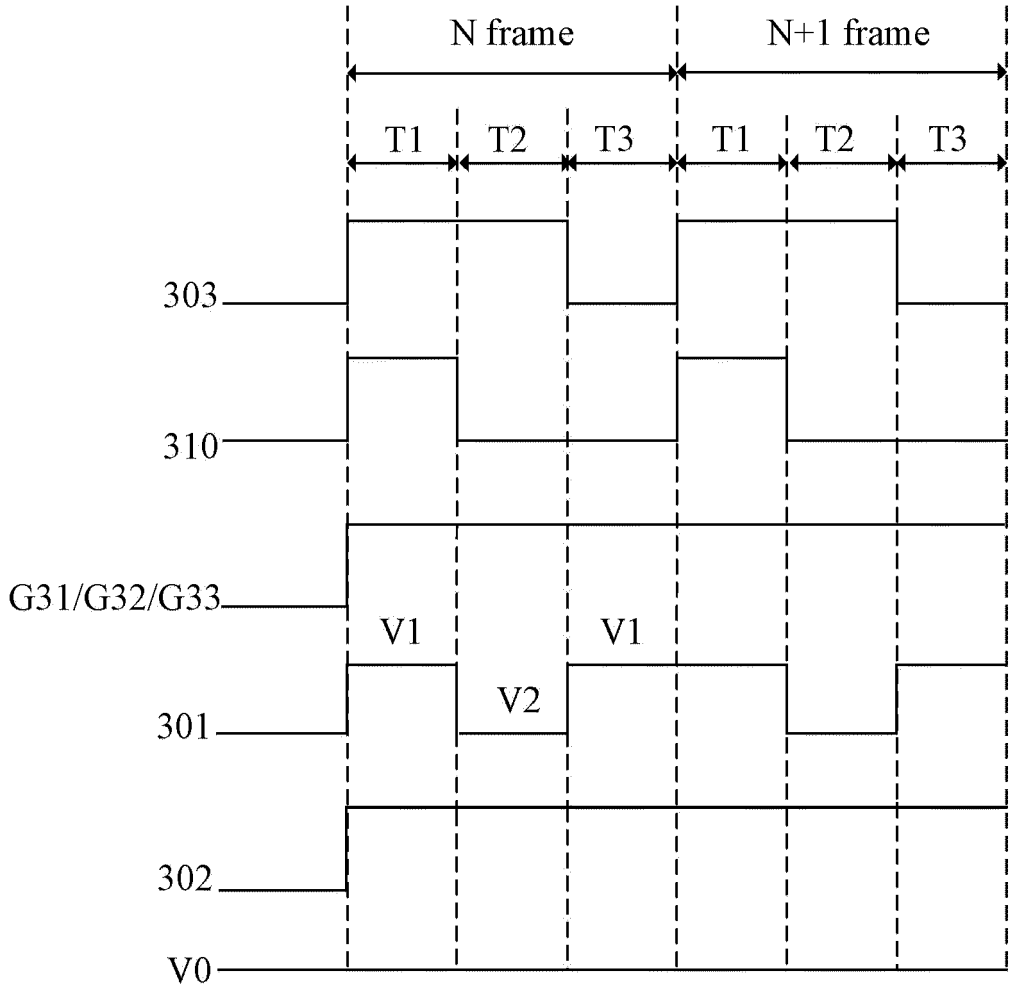

N frame
N+1 frame
T1
T2
T3
T1
T2
T3
303
310
G31/G32/G33
V1
V1
V2
301
302
V0

Fig.8

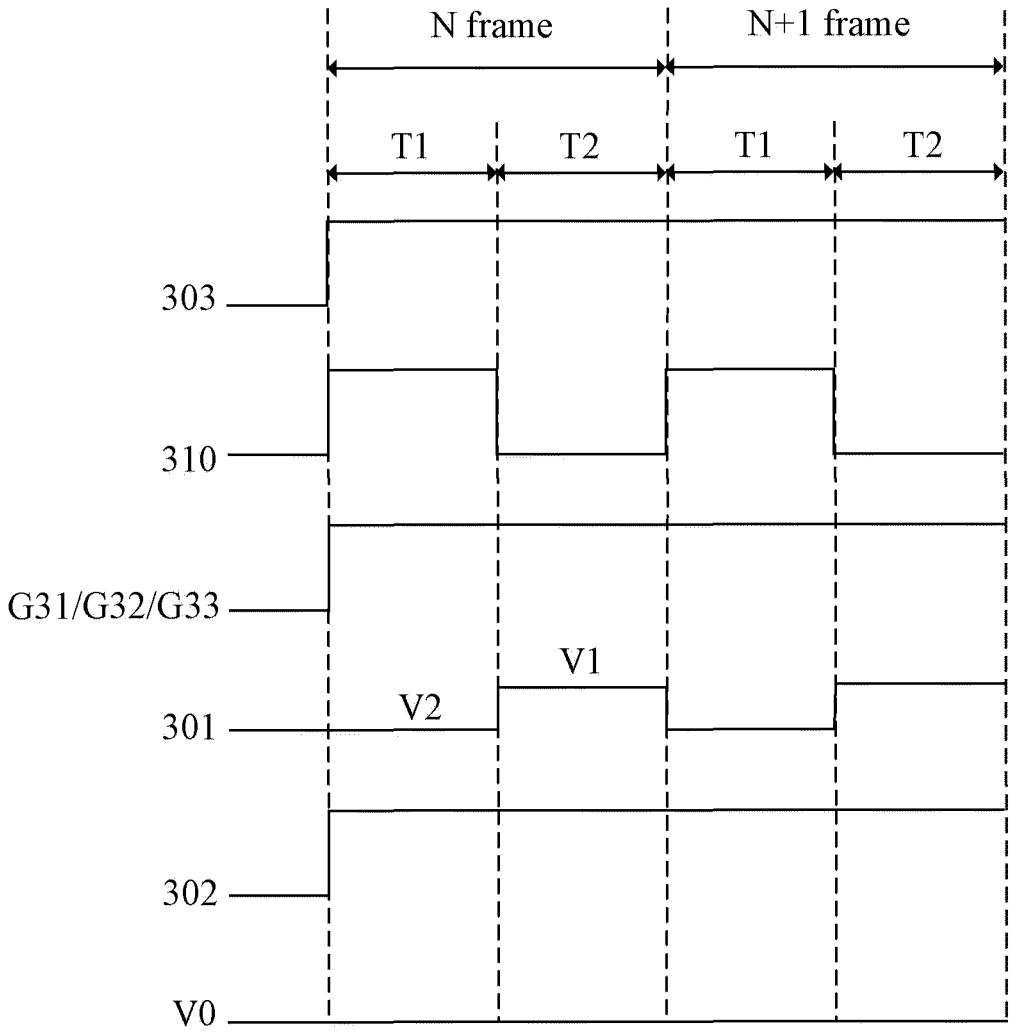
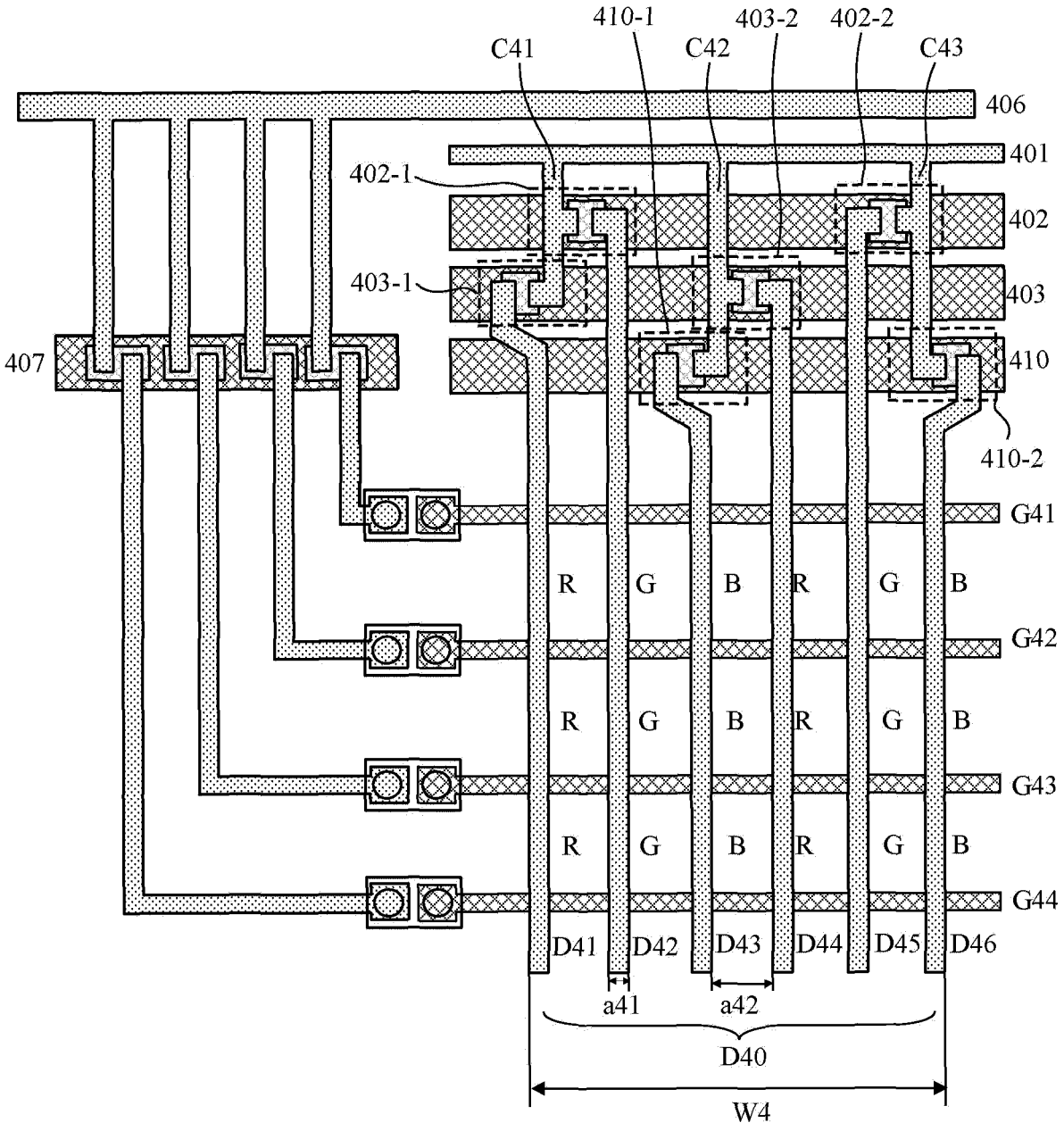


Fig.9


410-1
403-2
402-2
C41
C42
C43
406
401
402-1
402
403-1
403
407
410
410-2
G41
R
G
B
R
G
B
G42
R
G
B
R
G
B
G43
R
G
B
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G44
D41
D42
D43
D44
D45
D46
a41
a42
D40
W4

Fig.10

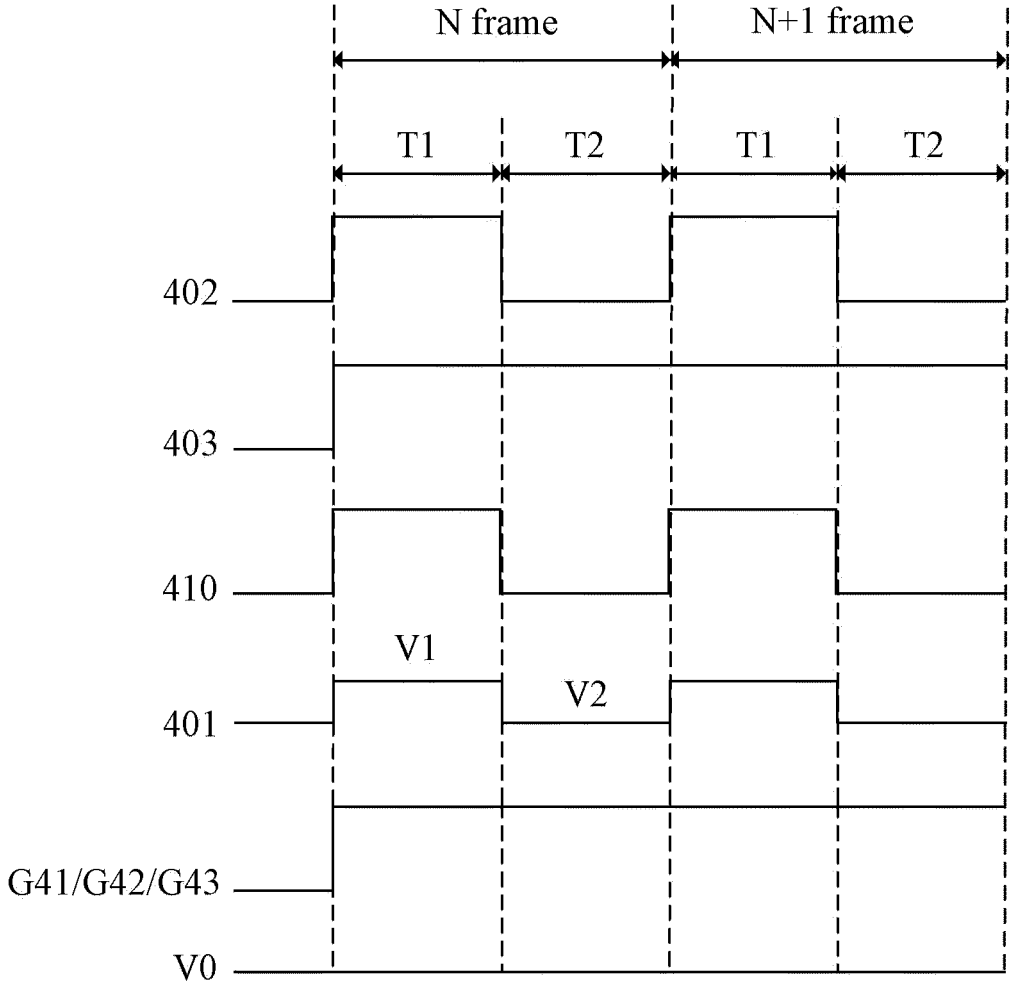

Fig.11

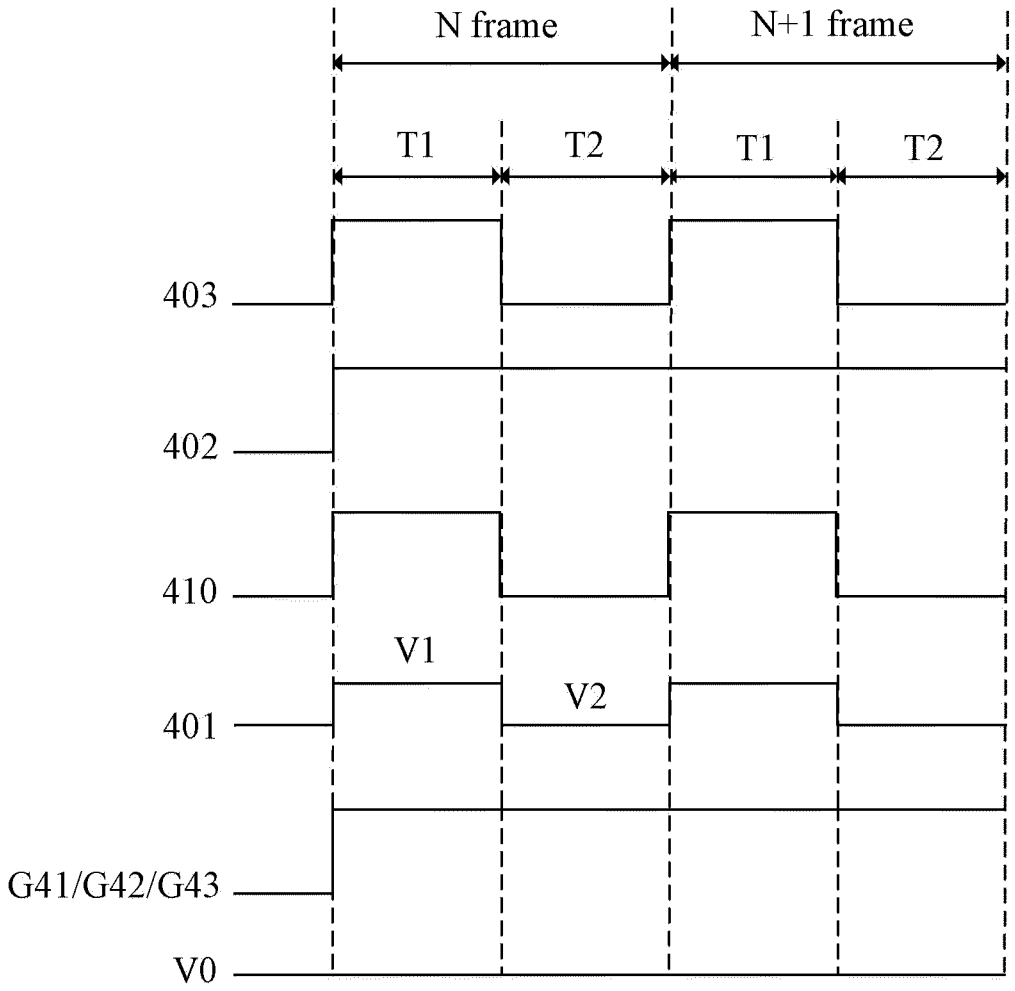

Fig.12

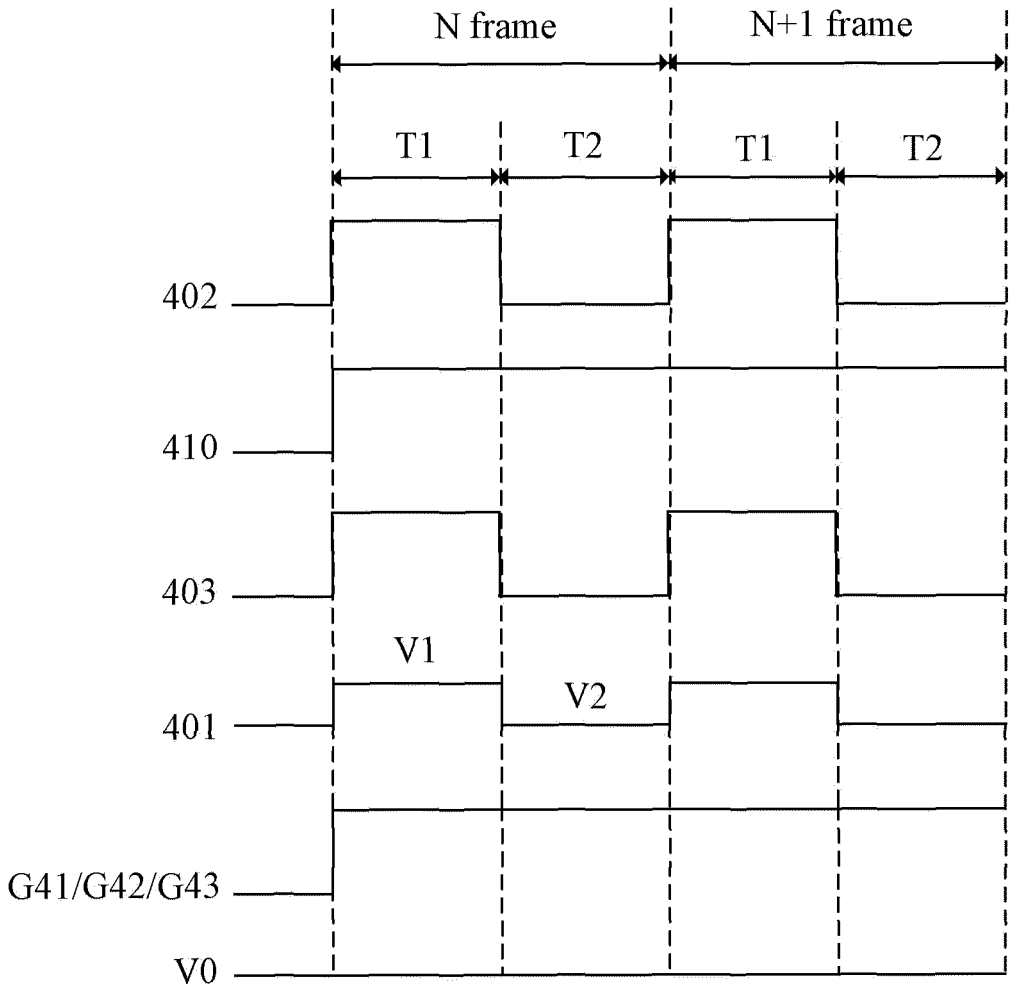

Fig.13

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 201110254100 **[0001]**
- CN 102109688 A **[0011]**

专利名称(译)	液晶显示装置		
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[标]申请(专利权)人(译)	上海天马微电子有限公司		
申请(专利权)人(译)	上海天马微电子有限公司.		
当前申请(专利权)人(译)	上海天马微电子有限公司.		
[标]发明人	HUANG XIANJUN		
发明人	HUANG, XIANJUN		
IPC分类号	G02F1/1362 G09G3/00 G02F1/13 G09G3/36		
CPC分类号	G02F1/1309 G02F1/136259 G02F1/136286 G02F2001/136254 G09G3/006 G09G3/3611 G02F1/13624		
优先权	201110254100.3 2011-08-30 CN		
其他公开文献	EP2752709A1 EP2752709A4		
外部链接	Espacenet		

摘要(译)

公开了一种液晶显示装置及其测试方法。液晶显示装置包括多条扫描线（G21，G22，G23），与扫描线（G21，G22，G23）交叉的多条数据线组（D20-1，D20-2），每条数据线设置（D20-1，D20-2）包括第一数据线（D21，D24），第二数据线（D22，D25）和第三数据线（D23，D26），像素单元形成在由每条扫描线（G21，G22，G23）和每条数据线（D21-D26），用于数据线的短路条（201），用于数据线的第一开关控制线（202）和第二开关控制线（ 203）用于数据线。每个数据线组（D20-1，D20-2）的第一数据线（D21，D24）用于控制具有相同颜色的像素单元，第二数据线（D22，D25）用于控制像素具有相同颜色的单元，第三数据线（D23，D26）用于控制具有相同颜色的像素单元。每个数据线组（D20-1，D20-2）的第一数据线（D21，D24）连接到数据线的短路棒（201）。每个数据线组（D20-1，D20-2）的第二数据线（D22，D25）与用于数据线的第一开关控制线（202）和第一开关元件（204-1,205-1）交叉。 ）在交叉点处形成。第一开关的栅极元件（204-1,205-1）设置在用于数据线的第一开关控制线（202）上，第一开关元件（204-1,205-1）的源电极连接到短路棒（201），第一开关元件（204-1,205-1）的漏极连接到第二数据线（D22，D25）。用于数据线的第二开关控制线（203）与每个数据线组（D20-1，D20-2）的第三数据线（D23，D26）和第二开关元件（204-2,205-）交叉。 2）在交叉点处形成。第二开关元件（204-2,205-2）的栅极设置在用于数据线的第二开关控制线（203）上，第二开关元件（204-2,205-2）的源极电极上。通过开关元件连接到短路棒（201），并且第二开关元件（204-2,205-2）的漏极连接到第三数据线（D23，D26）。从液晶显示装置中的数据线的测试部分去除通孔，从而消除了由通孔缺陷引起的液晶显示装置的缺点，并确保了电测试成功进行。而且，可以减小用于测试数据线的部分的区域，从而可以是小尺寸的液晶显示装置产生的。

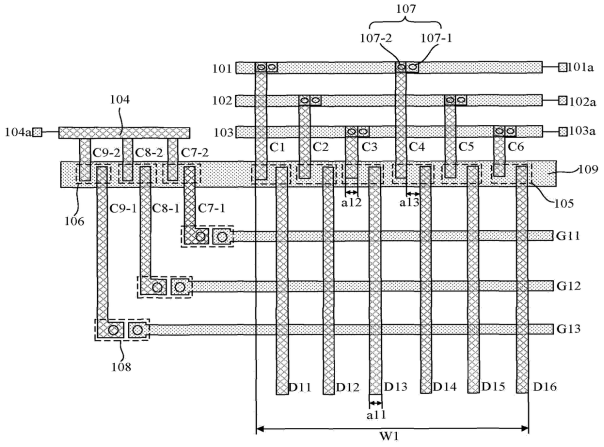

Fig.1