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(54) **DISPLAY DEVICE**

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CPC ***G09G 3/18*** (2013.01); ***G09G 3/3685*** (2013.01)

(57) **ABSTRACT**

Provided is a liquid crystal display device, including: a plurality of data lines; and a plurality of source drivers configured to output a data signal to each of the plurality of data lines, in which the plurality of source drivers include a plurality of source drivers having different numbers of output channels for outputting the data signal, and in which the number of output channels of each of two first source drivers arranged at both end portions of the plurality of source drivers is set to be smaller than the number of output channels set for each of second source drivers adjacent to the two first source drivers.

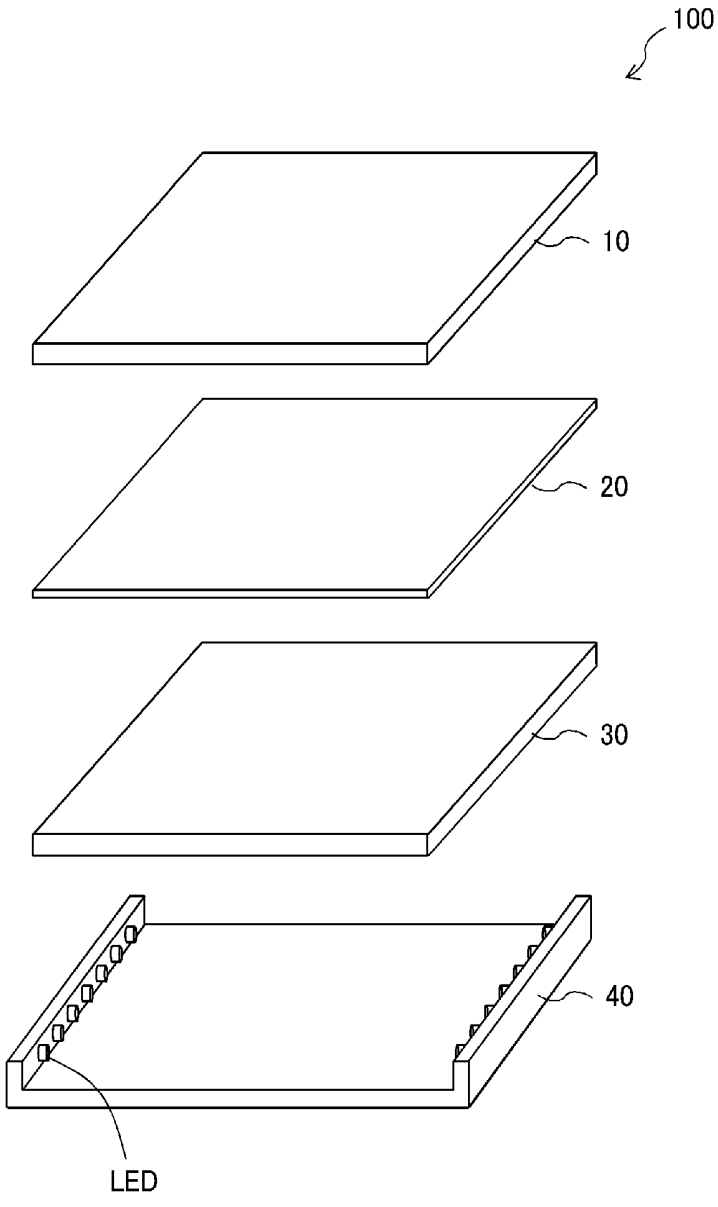
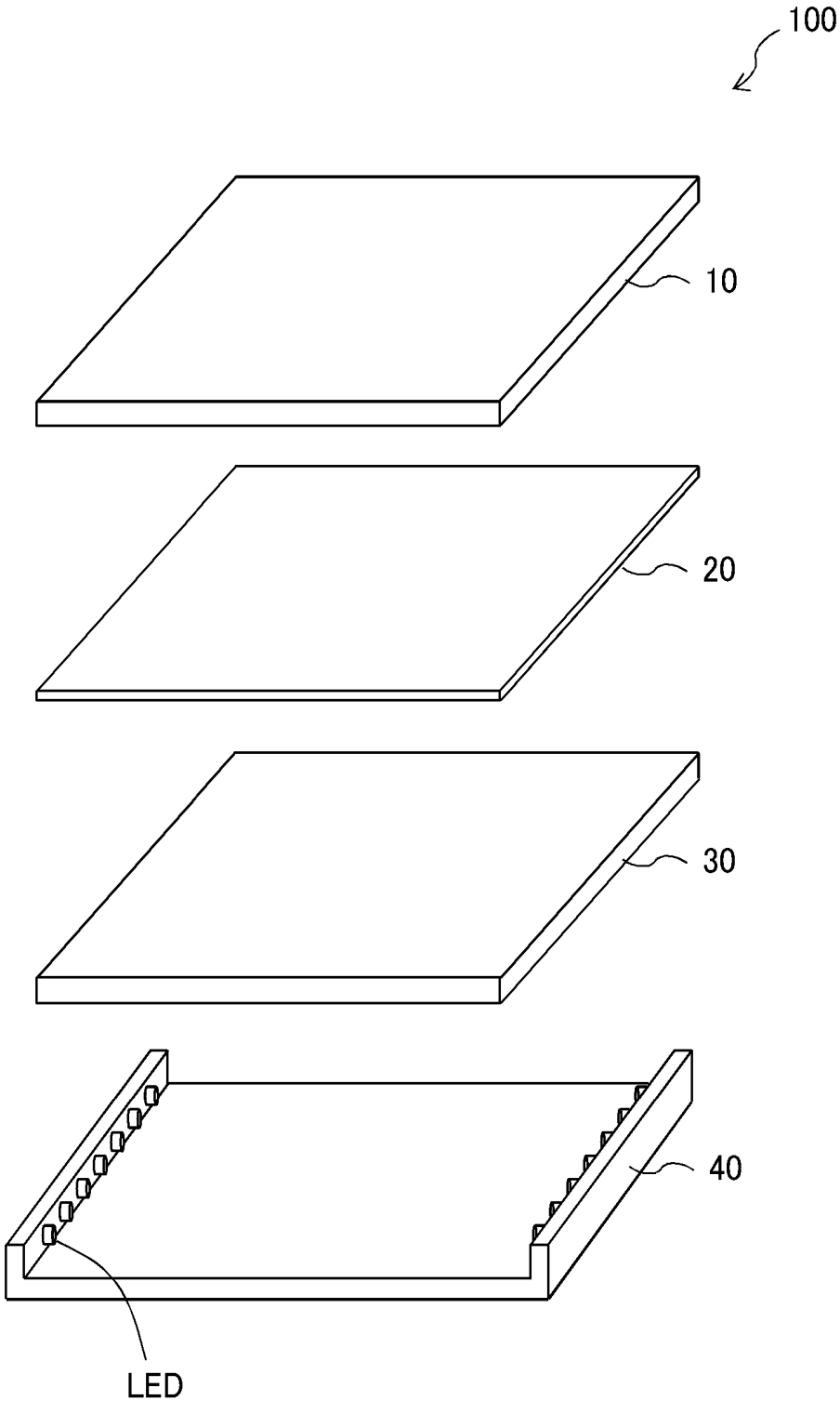


FIG.1



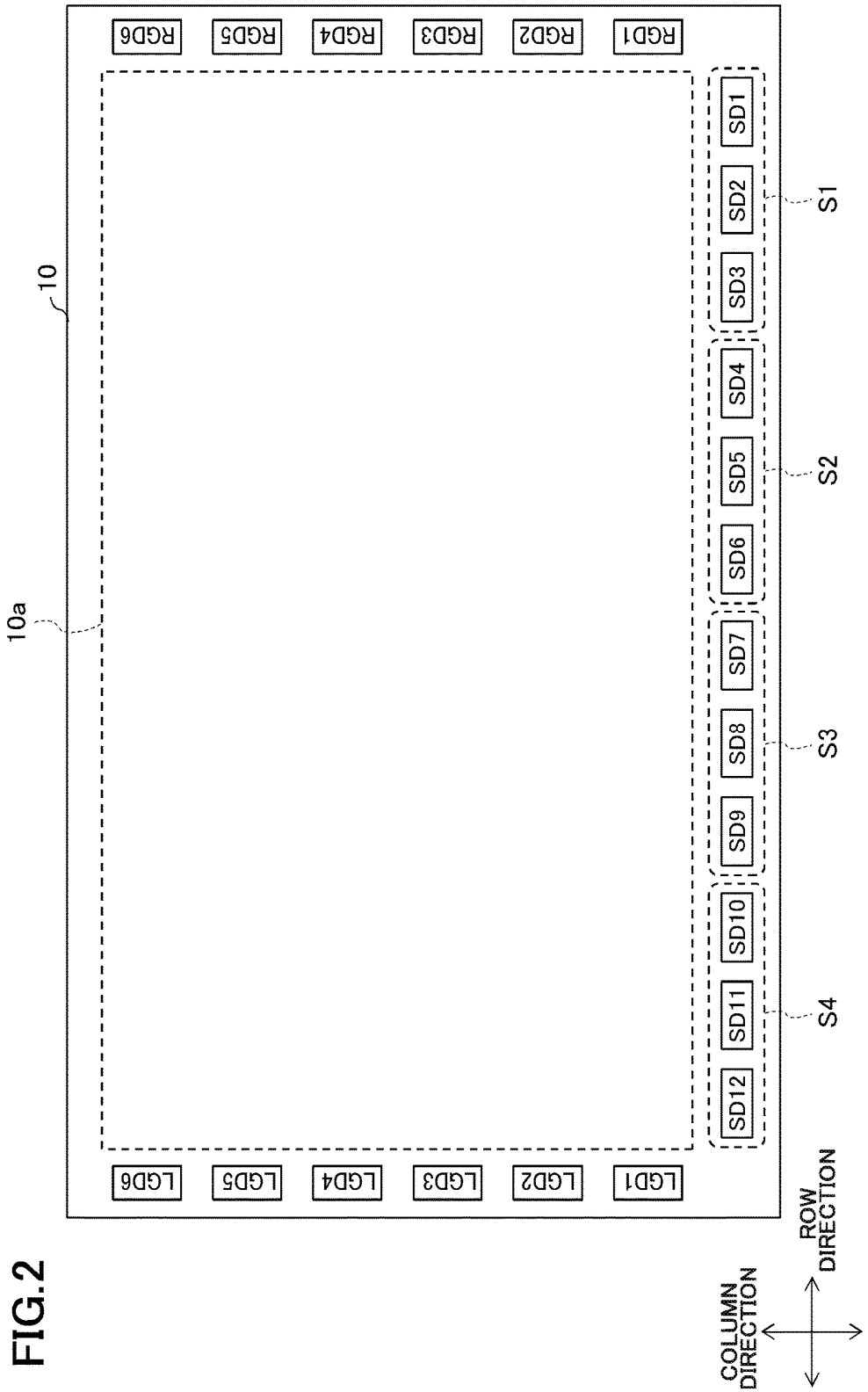

10
10a
RGD1
RGD2
RGD3
RGD4
RGD5
RGD6
LGD1
LGD2
LGD3
LGD4
LGD5
LGD6
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
S1
S2
S3
S4
ROW DIRECTION
COLUMN DIRECTION

FIG.2

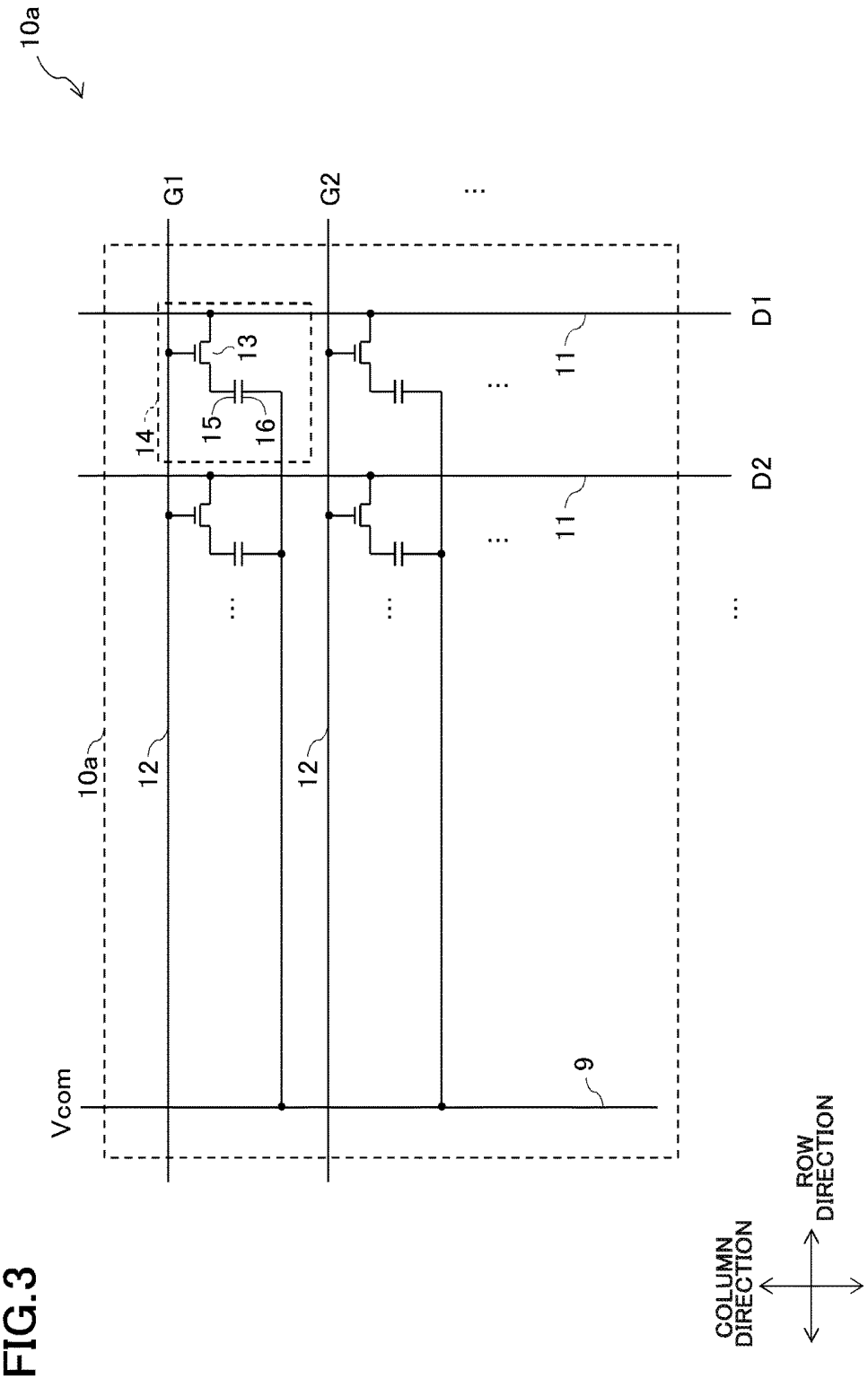

10a
G1
G2
D1
D2
11
13
14
15
16
12
9
Vcom
ROW DIRECTION
COLUMN DIRECTION

FIG.3

FIG.4

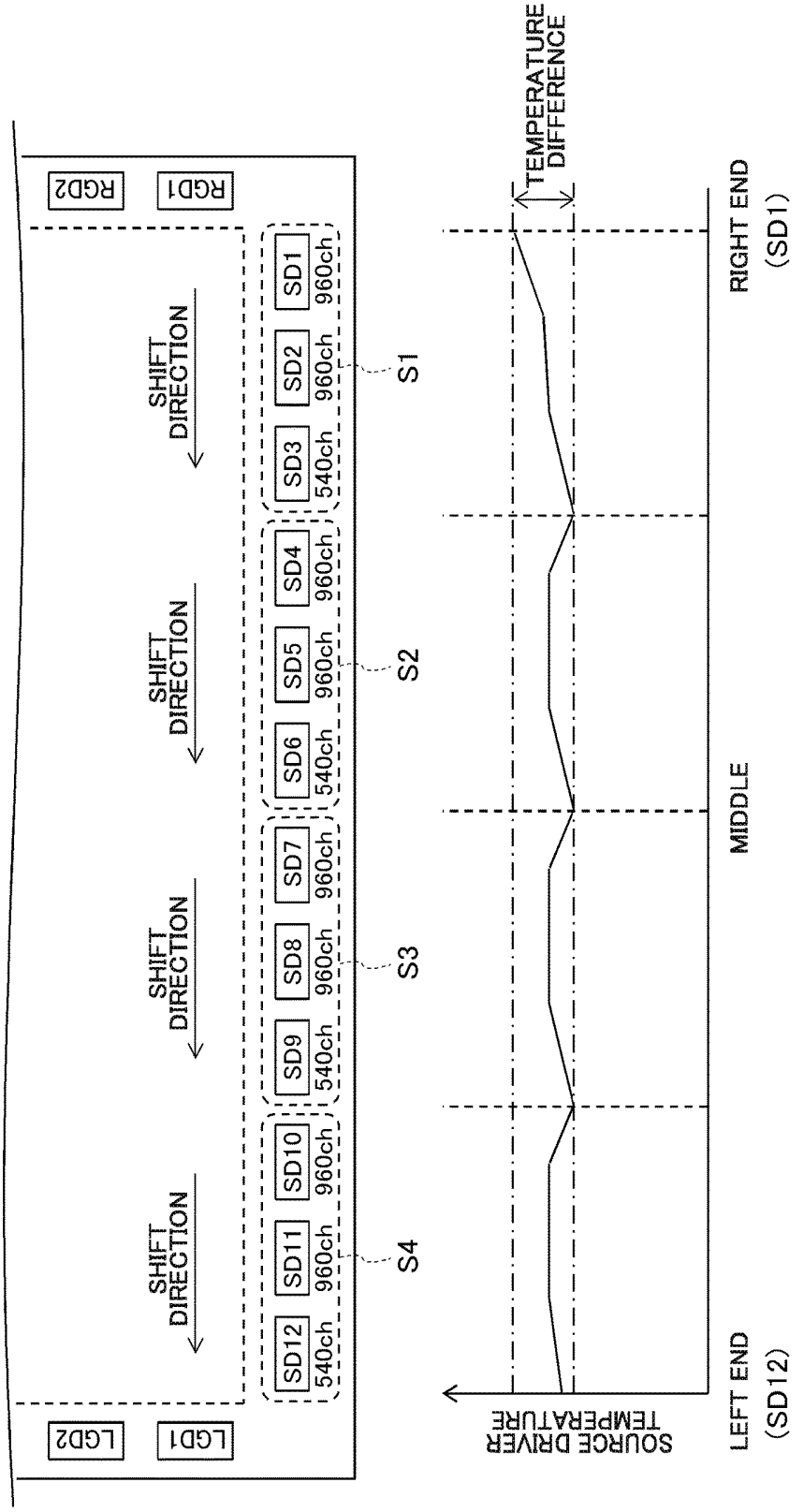

RGD2
RGD1
LGD2
LGD1
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
960ch
540ch
S1
S2
S3
S4
TEMPERATURE DIFFERENCE
SOURCE DRIVER TEMPERATURE
RIGHT END (SD1)
MIDDLE
LEFT END (SD12)

FIG.5

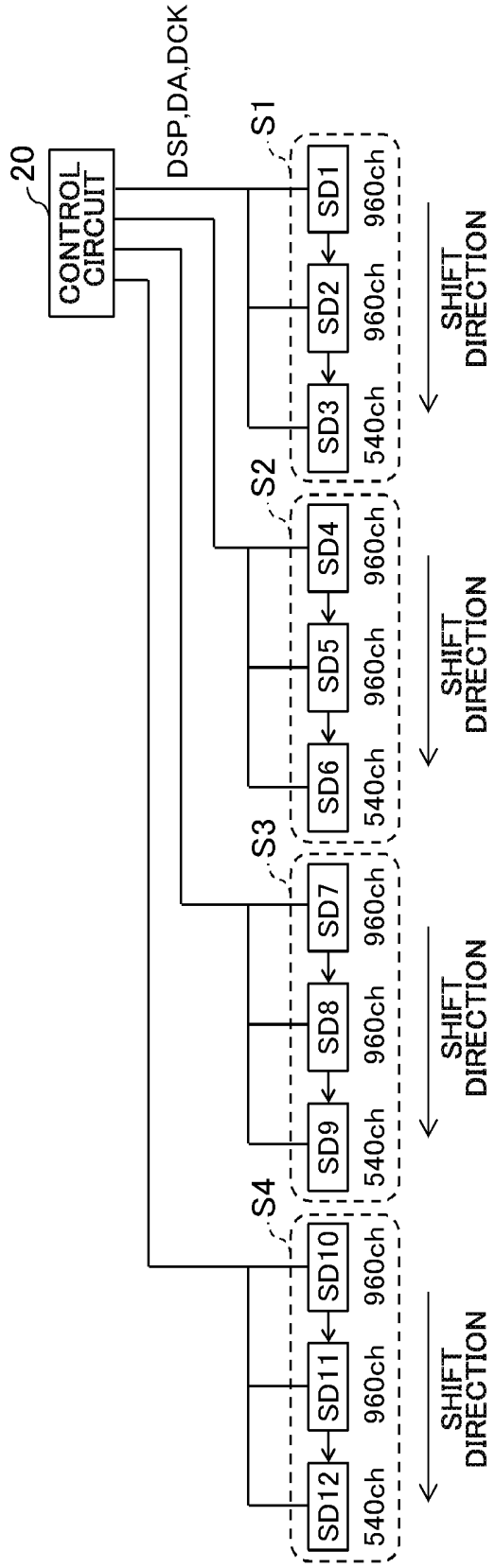

20
CONTROL CIRCUIT
DSP,DA,DCK
S1
S2
S3
S4
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
960ch
960ch
540ch
960ch
960ch
540ch
960ch
960ch
540ch
960ch
960ch
540ch
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION

FIG.6

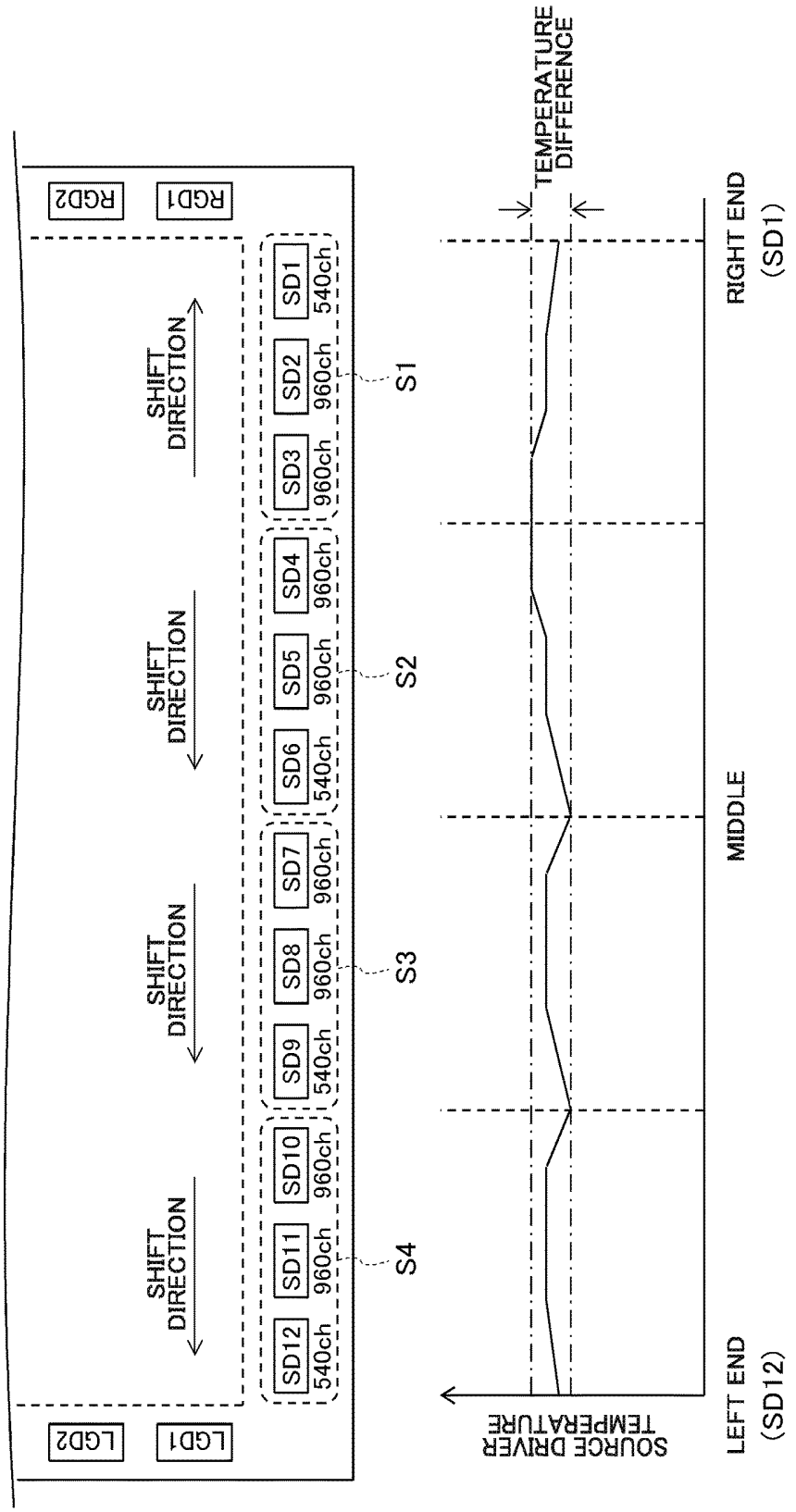

RGD2
RGD1
LGD2
LGD1
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
540ch
960ch
960ch
960ch
960ch
540ch
960ch
960ch
540ch
960ch
960ch
540ch
S1
S2
S3
S4
TEMPERATURE DIFFERENCE
SOURCE DRIVER TEMPERATURE
RIGHT END (SD1)
MIDDLE
LEFT END (SD12)

FIG. 7

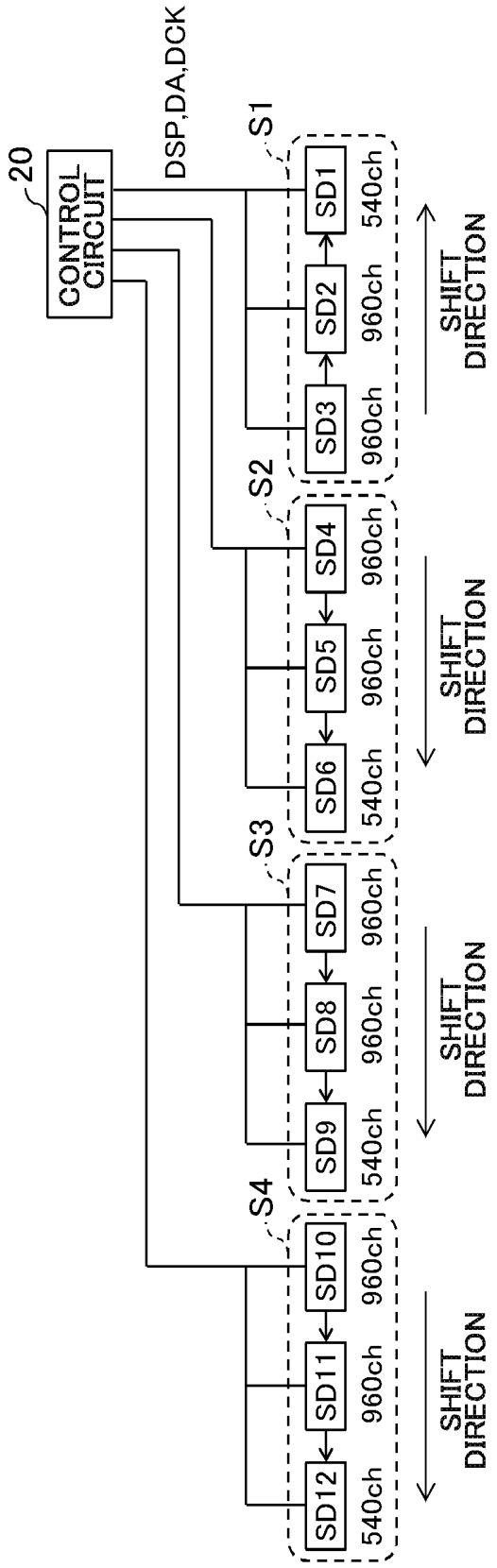

20
CONTROL CIRCUIT
DSP,DA,DCK
S1
S2
S3
S4
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
960ch
540ch
SHIFT DIRECTION

FIG.8

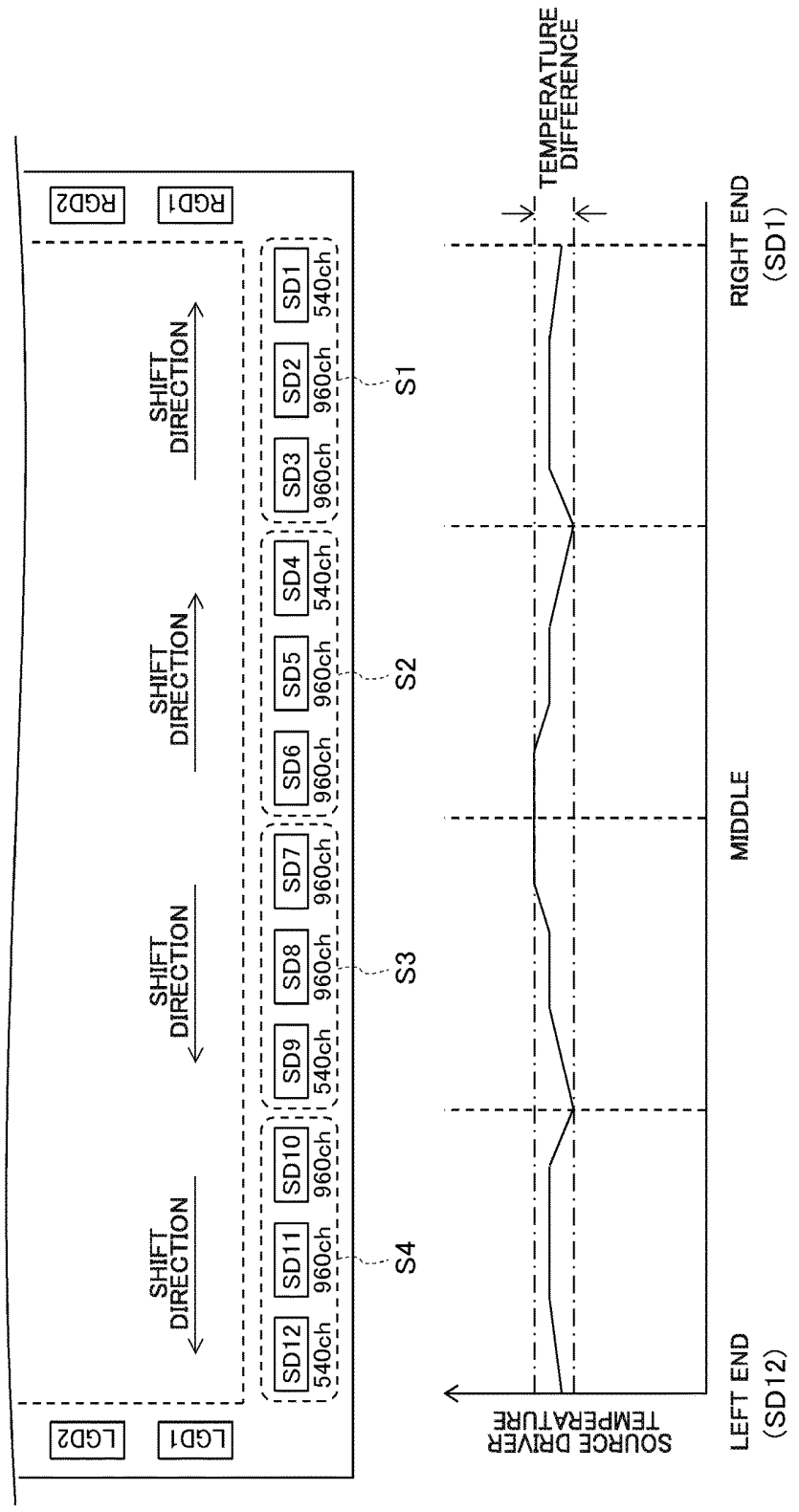
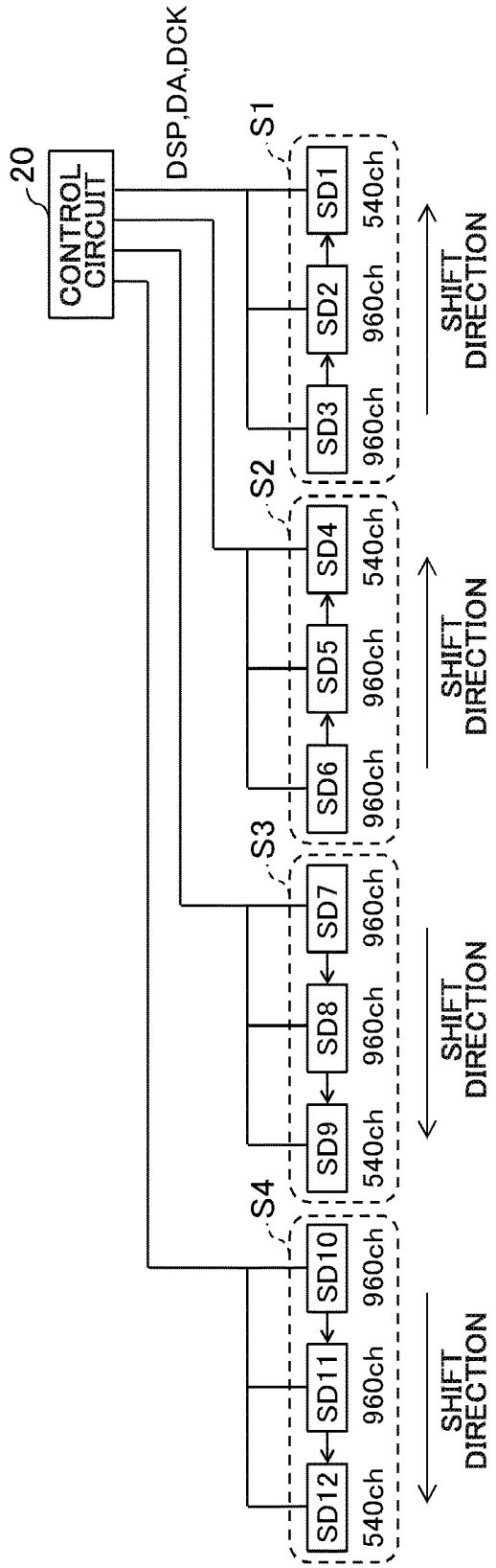

RGD2
RGD1
LGD2
LGD1
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION
SHIFT DIRECTION
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
960ch
540ch
S1
S2
S3
S4
TEMPERATURE DIFFERENCE
SOURCE DRIVER TEMPERATURE
RIGHT END (SD1)
MIDDLE
LEFT END (SD12)

FIG.9


20
CONTROL CIRCUIT
DSP,DA,DCK
S1
S2
S3
S4
SD1
SD2
SD3
SD4
SD5
SD6
SD7
SD8
SD9
SD10
SD11
SD12
960ch
540ch
SHIFT DIRECTION

DISPLAY DEVICE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present application relates to a display device.

[0003] 2. Description of the Related Art

[0004] Hitherto, there is known a liquid crystal display device in which a light source such as an LED is arranged on a side surface side of a display panel and a light guide plate is arranged on a back surface side of the display panel (see, for example, Japanese Patent Application Laid-open No. 2012-155237). In this liquid crystal display device, light emitted from the light source enters the light guide plate, and light that enters the light guide plate is surface-emitted from the light guide plate to irradiate the display panel.

SUMMARY OF THE INVENTION

[0005] In recent years, as the brightness of the liquid crystal display device becomes higher, an amount of heat generated by the light source therein becomes larger. Heat generation by the light source may adversely affect components of the liquid crystal display device. In particular, an amount of heat generated by a source driver becomes larger as the number of output channels thereof becomes larger, and thus a source driver having a large number of output channels is affected by heat generation in accordance with the number of the output channels and heat generation by the light source, and reaches a high temperature. When the temperature varies among a plurality of source drivers, a problem arises that the display quality is reduced.

[0006] The present invention has been made in view of the problem described above, and an object of the present invention is to realize a display device capable of improving display quality thereof through reduction of temperature variations among a plurality of source drivers therein.

[0007] In order to solve the above-mentioned problem, according to one embodiment of the present application, there is provided a liquid crystal display device, including: a plurality of data lines; and a plurality of source drivers configured to output a data signal to each of the plurality of data lines, in which the plurality of source drivers include a plurality of source drivers having different numbers of output channels for outputting the data signal, and in which the number of output channels of each of two first source drivers arranged at both end portions of the plurality of source drivers is set to be smaller than the number of output channels set for each of second source drivers adjacent to the two first source drivers.

[0008] The liquid crystal display device according to the one embodiment of the present application may further include: a display panel; and a backlight device configured to irradiate the display panel with light. In the liquid crystal display device, the backlight device may include a light source arranged along at least one of a left side surface or a right side surface of the display panel, the plurality of source drivers may be arranged along at least one of an upper side surface or a lower side surface of the display panel, and the two first source drivers maybe arranged at locations closer to the light source with respect to the second source drivers.

[0009] In the liquid crystal display device according to the one embodiment of the present application, each of the two first source drivers and the second source drivers may include a shift register. The shift register may be configured to perform shift operation in a direction from each of the second source drivers to corresponding one of the two first source drivers.

[0010] In the liquid crystal display device according to the one embodiment of the present application, each of the two first source drivers arranged at both the end portions may include a shift register, and a direction of shift operation of the shift register of one of the two first source drivers and a direction of shift operation of the shift register of another of the two first source drivers may be opposite to each other.

[0011] In the liquid crystal display device according to the one embodiment of the present application, each of the plurality of source drivers may include a shift register, the plurality of source drivers may be divided into a plurality of groups, each of the plurality of groups may include the first source driver and the second source driver, and in the each of the plurality of groups, the shift register may be configured to perform shift operation in a direction from the second source driver to the first source driver.

[0012] In the liquid crystal display device according to the one embodiment of the present application, each of the plurality of source drivers may include a shift register, the plurality of source drivers may be divided into a plurality of groups, and, in each of the plurality of groups, the number of output channels set for corresponding one of the plurality of source drivers, which is arranged on an upstream side in a direction of shift operation of the shift register, may be larger than the number of output channels set for corresponding one of the plurality of source drivers, which is arranged on a downstream side in the direction of the shift operation of the shift register.

[0013] In the liquid crystal display device according to the one embodiment of the present application, each of the plurality of source drivers may include a shift register, the plurality of source drivers may be divided into a plurality of groups, and, in each of the plurality of groups, the number of output channels set for corresponding one of the plurality of source drivers, which is arranged closer to a middle of a display panel, may be larger than the number of output channels set for corresponding one of the plurality of source drivers, which is arranged farther from the middle of the display panel.

[0014] According to one embodiment of the present application, there is provided a liquid crystal display device, including: a plurality of data lines; and a plurality of source drivers configured to output a data signal to each of the plurality of data lines, in which the plurality of source drivers include a plurality of source drivers having different numbers of output channels for outputting the data signal, and in which the number of output channels of at least two source drivers arranged at both end portions of the plurality of source drivers is set to be smallest of a plurality of numbers of output channels set for the plurality of source drivers, respectively.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] FIG. **1** is a perspective view for illustrating a schematic structure of a liquid crystal display device according to an embodiment of the present application.

[0016] FIG. **2** is a plan view for illustrating a schematic structure of a display panel according to the embodiment.

[0017] FIG. **3** is a plan view for illustrating a schematic structure of a display region in the display panel.

[0018] FIG. **4** is an illustration of a schematic structure and a graph for showing temperature characteristics of source drivers in a display panel of a comparative example.

[0019] FIG. **5** is a block diagram for illustrating operation of the display panel of the comparative example illustrated in FIG. **4**.

[0020] FIG. **6** is an illustration of a schematic structure and a graph for showing temperature characteristics of source drivers in the display panel according to the embodiment.

[0021] FIG. **7** is a block diagram for illustrating operation of the display panel illustrated in FIG. **6**.

[0022] FIG. **8** is an illustration of a schematic structure and a graph for showing temperature characteristics of source drivers in another display panel according to the embodiment.

[0023] FIG. **9** is a block diagram for illustrating operation of the display panel illustrated in FIG. **8**.

DETAILED DESCRIPTION OF THE INVENTION

[0024] An embodiment of the present application is described in the following with reference to the attached drawings. FIG. **1** is a perspective view for illustrating a schematic structure of a liquid crystal display device according to this embodiment. A liquid crystal display device **100** includes a display panel **10** and a backlight device arranged on a back surface side of the display panel **10** and configured to irradiate the display panel **10** with light. The backlight device includes light emitting diodes (LEDs) serving as a light source configured to emit light, a light guide plate **30** configured to introduce LED light emitted from the LEDs, a diffuser plate **20** configured to diffuse LED light emitted from the light guide plate **30**, and a frame **40** configured to receive optical members such as the LEDs, the light guide plate **30**, and the diffuser plate **20**. The LEDs are arranged on side surfaces of the display panel **10**, and thus the liquid crystal display device **100** has a structure of a so-called side light type liquid crystal display device. Note that, the light source is not limited to LEDs.

[0025] FIG. **2** is a plan view for illustrating a schematic structure of the display panel **10**. The display panel **10** includes a plurality of gate drivers GD, a plurality of source drivers SD, and a control circuit **20** (see FIG. **7**). The gate drivers GD and the source drivers SD are formed of integrated circuits (ICs). In this embodiment, a chip on glass (COG) type display panel is described as an example, but the present invention is not limited thereto, and, for example, a chip on film (COF) type display panel or a tape carrier package (TCP) type display panel may also be used.

[0026] The display panel **10** includes, for example, twelve gate drivers GD. Specifically, the display panel **10** includes six gate drivers RGD**1** to RGD**6** arranged on a right side of a display region **10***a*, and six gate drivers LGD**1** to LGD**6** arranged on a left side of the display region **10***a*. A predetermined number of output channels is set for each of the gate drivers GD, and a gate signal (scanning signal) in accordance with the number of output channels is output to a corresponding gate line. For example, the number of output channels of the gate drivers RGD**1** to RGD**5** and LGD**1** to LGD**5** is set to be 350 ch, while the number of output channels of the gate drivers RGD**6** and LGD**6** is set to be 328 ch. A scanning direction of the gate lines is not limited. For example, scanning is performed from a top to a bottom of the display panel **10**. The gate drivers may be arranged only on one side of the display region **10***a*.

[0027] The display panel **10** further includes, for example, twelve source drivers SD. Specifically, the display panel **10** includes twelve source drivers SD**1** to SD**12** arranged on a lower side of the display region **10***a*. The twelve source drivers SD are divided into four groups. A first group S**1** includes the source drivers SD**1** to SD**3**, a second group S**2** includes the source drivers SD**4** to SD**6**, a third group S**3** includes the source drivers SD**7** to SD**9**, and a fourth group S**4** includes the source drivers SD**10** to SD**12**. A predetermined number of output channels is set for each of the source drivers SD, and a data signal (source signal) in accordance with the number of output channels is output to a corresponding data line (source line). The source drivers may be arranged on the lower side of the display region **10***a*, or may be arranged both on an upper side and the lower side of the display region **10***a*.

[0028] FIG. **3** is a plan view for illustrating a schematic structure of the display region **10***a* in the display panel **10**. The display region **10***a* includes a plurality of data lines **11** that extend in a column direction and a plurality of gate lines **12** that extend in a row direction. The data lines **11** are electrically connected to the corresponding source drivers SD, respectively, and the gate lines **12** are electrically connected to the corresponding gate drivers GD, respectively, outside the display region **10***a*. A thin film transistor **13** (TFT) is formed in an intersecting portion of a data line **11** and a gate line **12**. A plurality of pixels **14** are arranged in the display panel **10** in matrix (in the row direction and in the column direction) correspondingly to the intersecting portions, respectively, of the data lines **11** and the gate lines **12**. Note that, although not shown, the display panel **10** includes a thin film transistor substrate (TFT substrate), a color filter substrate (CF substrate), and a liquid crystal layer sandwiched between the substrates. A plurality of pixel electrodes **15** corresponding to the pixels **14**, respectively, and a common electrode **16** common to the pixels **14** are formed on the TFT substrate. The common electrode **16** may be formed on the CF substrate.

[0029] A data signal (data voltage) is supplied to each of the data lines **11** from a corresponding source driver SD. A gate signal (gate voltage) is supplied to each of the gate lines **12** from a corresponding gate driver GD. A common voltage Vcom is supplied to the common electrode **16** from a common driver (not shown). When an ON voltage of a gate signal (gate ON voltage) is supplied to a gate line **12**, a thin film transistor **13** connected to the gate line **12** is turned on, and the data voltage is supplied to a pixel electrode **15** via a data line **11** connected to the thin film transistor **13**. An electric field is generated due to a difference between the data voltage supplied to the pixel electrode **15** and the common voltage Vcom supplied to the common electrode **16**. The electric field drives the liquid crystal to control transmittance of LED light emitted from the backlight device, thereby displaying an image. Note that, when color display is performed, the display is realized by supplying a desired data voltage to each of the data lines **11** connected to pixel electrodes **15** of pixels **14** corresponding to red, green, blue, and the like formed with stripe-like color filters.

[0030] Here, temperature variations among the source drivers SD are reviewed. FIG. **4** is an illustration of a schematic structure and a graph for showing temperature characteristics of the source drivers

[0031] SD in a display panel of a comparative example. FIG. **5** is a block diagram for illustrating operation of the display panel of the comparative example illustrated in FIG. **4**.

[0032] In the display panel of the comparative example, similarly to the case of the display panel **10** illustrated in FIG. **2**, the source drivers SD**1** to SD**12** are arranged on the lower side of the display region **10***a*. In the display panel of the comparative example, in each of the first group S**1**, the second group S**2**, the third group S**3**, and the fourth group S**4**, a plurality of source drivers SD are cascade connected. The number of output channels of the source drivers SD**1**, SD**2**, SD**4**, SD**5**, SD**7**, SD**8**, SD**10**, and SD**11** is set to be 960 ch, while the number of output channels of the source drivers SD**3**, SD**6**, SD**9**, and SD**12** is set to be 540 ch. A data start pulse DSP is input from the control circuit **20** to the source drivers SD**1**, SD**4**, SD**7**, and SD**10** that are arranged at endmost (rightmost in FIG. **4**) portions of the groups, respectively. Further, display data DA in accordance with the set number of output channels and a clock signal DCK are input to each of the source drivers SD**1** to SD**12**. Each of the source drivers SD**1** to SD**12** includes a shift register, and, while performing shift operation, outputs a data signal in accordance with the set number of output channels to a corresponding data line **11**.

[0033] For example, when the data start pulse DSP is input to the source driver SD**1** in the first group S**1**, the source drivers SD**1**, SD**2**, and SD**3** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **5**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**. Similarly, when the data start pulse DSP is input to the source driver SD**4** in the second group S**2**, the source drivers SD**4**, SD**5**, and SD**6** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **5**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**. The source drivers in the third group S**3** and in the fourth group S**4** operate similarly.

[0034] In the structure of the display panel of the comparative example illustrated in FIG. **4** and FIG. **5**, the source driver SD**1** having a large number of output channels for outputting the data signal is arranged at an end portion (right end) of the display panel. As the number of output channels for outputting the data signal of a source driver becomes larger, the amount of heat generated by the source driver becomes larger and the temperature becomes higher. In this case, the light source (LEDs) is arranged on the side surfaces of the display panel, and thus end portions (right end and left end) of the display panel reach a high temperature under the influence of heat generation by the light source. The source drivers arranged at end portions (right end and left end) of the display panel are close to the light source, and thus are more liable to be affected by the heat generation by the light source. Therefore, in the structure of the display panel of the comparative example, as illustrated in FIG. **4**, the source driver SD**1** reaches a higher temperature than those reached by other source drivers under the influence of the amount of heat generated in accordance with the number of output channels for outputting the data signal and the amount of heat generated by the light source. In other words, a difference between a temperature of the source driver SD**6** arranged in the middle of the display panel and the temperature of the source driver SD**1** arranged at the end portion of the display panel becomes larger. As described above, the temperatures of the plurality of source drivers vary, and thus the display quality is reduced.

[0035] The liquid crystal display device **100** according to this embodiment has a structure for uniformizing the temperature among the plurality of source drivers SD. FIG. **6** is an illustration of a schematic structure and a graph for showing temperature characteristics of the source drivers SD in the display panel **10** according to this embodiment. FIG. **7** is a block diagram for illustrating operation of the display panel **10** illustrated in FIG.

[0036] **6**.

[0037] In the display panel **10** according to this embodiment, as illustrated in FIG. **2**, the source drivers SD**1** to SD**12** are arranged on the lower side of the display region **10***a*. Further, in each of the first group S**1**, the second group S**2**, the third group S**3**, and the fourth group S**4**, the plurality of source drivers SD are cascade connected. The number of output channels of the source drivers SD**2**, SD**3**, SD**4**, SD**5**, SD**7**, SD**8**, SD**10**, and SD**11** is set to be 960 ch, while the number of output channels of the source drivers SD**1**, SD**6**, SD**9**, and SD**12** is set to be 540 ch. Specifically, the number of output channels (540 ch) of the source driver SD**1** in the display panel **10** according to this embodiment is set to be smaller than the number of output channels (960 ch) of the source driver SD**1** in the display panel of the comparative example. The data start pulse DSP is input from the control circuit **20** to the source drivers SD**3**, SD**4**, SD**7**, and SD**10** that are arranged at endmost portions of the groups, respectively. Further, the display data DA in accordance with the set number of output channels and the clock signal DCK are input to each of the source drivers SD**1** to SD**12**. Each of the source drivers SD**1** to SD**12** includes a shift register, and, while performing shift operation, outputs a data signal in accordance with the set number of output channels to a corresponding data line **11**.

[0038] For example, when the data start pulse DSP is input to the source driver SD**3** in the first group S**1**, the source drivers SD**3**, SD**2**, and SD**1** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **7**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**. Similarly, when the data start pulse DSP is input to the source driver SD**4** in the second group S**2**, the source drivers SD**4**, SD**5**, and SD**6** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **7**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**. The source drivers SD in the third group S**3** and in the fourth group S**4** operate similarly to the source drivers SD in the second group S**2**. Note that, the control circuit **20** and the source drivers SD can be operated in a well-known manner.

[0039] In the structure of the display panel **10** illustrated in FIG. **6** and FIG. **7**, the number of output channels of the source drivers SD**1** and SD**12** that are arranged at end portions (right end and left end) of the display panel **10** is set to be small. Therefore, even when the source drivers SD**1** and SD**12** are affected by the heat generation by the light source, the source drivers SD**1** and SD**12** reach a temperature that is lower than that reached by the source driver SD**1** of the comparative example (see FIG. **4**). Therefore, compared with the display panel of the comparative example illustrated in FIG. **4**, the display panel **10** can reduce temperature variations (temperature difference) among the plurality of source drivers SD**1** to SD**12**, and thus the display quality thereof can be improved.

[0040] The structure of the display device according to the present invention is not limited to the one illustrated in FIG. **6** and FIG. **7**. FIG. **8** is an illustration of a schematic structure and a graph for showing temperature characteristics of source drivers SD in another display panel **10** according to the embodiment. FIG. **9** is a block diagram for illustrating operation of the display panel **10** illustrated in FIG. **8**.

[0041] In the display panel **10** illustrated in FIG. **8**, the number of output channels of the source drivers SD**2**, SD**3**, SD**5**, SD**6**, SD**7**, SD**8**, SD**10**, and SD**11** is set to be 960 ch, while the number of output channels of the source drivers SD**1**, SD**4**, SD**9**, and SD**12** is set to be 540 ch. The data start pulse DSP is input from the control circuit **20** to the source drivers SD**3**, SD**6**, SD**7**, and SD**10** that are arranged at endmost portions of the groups, respectively. Further, the display data DA in accordance with the set number of output channels and the clock signal DCK are input to each of the source drivers SD**1** to SD**12**. Each of the source drivers SD**1** to SD**12** includes a shift register, and, while performing shift operation, outputs a data signal in accordance with the set number of output channels to a corresponding data line **11**.

[0042] For example, when the data start pulse DSP is input to the source driver SD**3** in the first group S**1**, the source drivers SD**3**, SD**2**, and SD**1** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **9**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**. Similarly, when the data start pulse DSP is input to the source driver SD**6** in the second group S**2**, the source drivers SD**6**, SD**5**, and SD**4** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **9**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**.

[0043] Further, when the data start pulse DSP is input to the source driver SD**7** in the third group S**3**, the source drivers SD**7**, SD**8**, and SD**9** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **9**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**. Similarly, when the data start pulse DSP is input to the source driver SD**10** in the fourth group S**4**, the source drivers SD**10**, SD**11**, and SD**12** transfer the data start pulse DSP in a direction of this order (shift direction illustrated in FIG. **9**) to perform shift operation, and at the same time, based on the display data DA in accordance with the set numbers of output channels and on the clock signal DCK, output data signals in accordance with the set numbers of output channels to corresponding data lines **11**.

[0044] In the structure of the display panel **10** illustrated in FIG. **8** and FIG. **9**, in the respective groups, the number of output channels of the source drivers SD**1**, SD**4**, SD**9**, and SD**12** that are arranged at end portions (right end and left end) of the display panel **10** is set to be small. Further, the groups arranged on the right side from the middle of the display panel **10** (first group S**1** and second group S**2**) perform shift operation rightward, while the groups arranged on the left side from the middle of the display panel **10** (third group S**3** and fourth group S**4**) perform shift operation leftward. Also in the above-mentioned structure, compared with the comparative example illustrated in FIG. **4**, temperature variations (temperature difference) among the plurality of source drivers SD**1** to SD**12** can be reduced, and thus the display quality can be improved.

[0045] In each of the structures described above, the number of output channels may be set to be different among the plurality of source drivers SD included in each of the groups. For example, in the display panel **10** illustrated in FIG. **6**, with regard to the first group S**1**, the number of output channels of the source driver SD**1** may be set to be 400 ch, the number of output channels of the source driver SD**2** may be set to be 960 ch, and the number of output channels of the source driver SD**3** may be set to be 1,080 ch. In other words, among a plurality of source drivers SD included in one group, the numbers of output channels of the plurality of source drivers SD may be set to reduce in the shift direction (from an upstream side to a downstream side).

[0046] As described above, in the liquid crystal display device **100** according to this embodiment, the number of output channels (540 ch) of each of two source drivers SD arranged at both end portions of the plurality of source drivers SD (for example, source drivers SD**1** and SD**12** in FIG. **6**) is set to be smaller than the number of output channels (960 ch) set for each of source drivers SD (source drivers SD**2** and SD**11**) adjacent to those source drivers SD (source drivers SD**1** and SD**12**). Further, the number of output channels of at least the two source drivers SD arranged at both the end portions of the plurality of source drivers SD is set to be the smallest (for example, 540 ch in FIG. **6**) of a plurality of numbers of output channels set for the plurality of source drivers SD, respectively. Note that, the liquid crystal display device **100** may have a structure in which the numbers of output channels of the source drivers SD are switched or a structure in which the shift directions of the shift registers are switched based on a control signal that is output from the control circuit **20**.

[0047] While there have been described what are at present considered to be certain embodiments of the invention, it will be understood that various modifications may be made thereto, and it is intended that the appended claims cover all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A display device, comprising:

a plurality of data lines; and

a plurality of source drivers configured to output a data signal to each of the plurality of data lines,

wherein the plurality of source drivers comprise a plurality of source drivers having different numbers of output channels for outputting the data signal, and

wherein the number of output channels of each of two first source drivers arranged at both end portions of the plurality of source drivers is set to be smaller than the number of output channels set for each of second source drivers adjacent to the two first source drivers.

2. The display device according to claim **1**, further comprising:

a display panel; and

a backlight device configured to irradiate the display panel with light,

wherein the backlight device comprises a light source arranged along at least one of a left side surface or a right side surface of the display panel,

wherein the plurality of source drivers are arranged along at least one of an upper side surface or a lower side surface of the display panel, and

wherein the two first source drivers are arranged at locations closer to the light source with respect to the second source drivers.

3. The display device according to claim **1**,

wherein each of the two first source drivers and the second source drivers comprises a shift register, and

wherein the shift register is configured to perform shift operation in a direction from each of the second source drivers to corresponding one of the two first source drivers.

4. The display device according to claim **1**,

wherein each of the two first source drivers arranged at both the end portions comprises a shift register, and

wherein a direction of shift operation of the shift register of one of the two first source drivers and a direction of shift operation of the shift register of another of the two first source drivers are opposite to each other.

5. The display device according to claim **1**,

wherein each of the plurality of source drivers comprises a shift register,

wherein the plurality of source drivers are divided into a plurality of groups,

wherein each of the plurality of groups comprises the first source driver and the second source driver, and

wherein, in the each of the plurality of groups, the shift register is configured to perform shift operation in a direction from the second source driver to the first source driver.

6. The display device according to claim **1**,

wherein each of the plurality of source drivers comprises a shift register,

wherein the plurality of source drivers are divided into a plurality of groups, and

wherein, in each of the plurality of groups, the number of output channels set for corresponding one of the plurality of source drivers, which is arranged on an upstream side in a direction of shift operation of the shift register, is larger than the number of output channels set for corresponding one of the plurality of source drivers, which is arranged on a downstream side in the direction of the shift operation of the shift register.

7. The display device according to claim **1**,

wherein each of the plurality of source drivers comprises a shift register,

wherein the plurality of source drivers are divided into a plurality of groups, and

wherein, in each of the plurality of groups, the number of output channels set for corresponding one of the plurality of source drivers, which is arranged closer to a middle of a display panel, is larger than the number of output channels set for corresponding one of the plurality of source drivers, which is arranged farther from the middle of the display panel.

8. A display device, comprising:

a plurality of data lines; and

a plurality of source drivers configured to output a data signal to each of the plurality of data lines,

wherein the plurality of source drivers comprise a plurality of source drivers having different numbers of output channels for outputting the data signal, and

wherein the number of output channels of at least two source drivers arranged at both end portions of the plurality of source drivers is set to be smallest of a plurality of numbers of output channels set for the plurality of source drivers, respectively.

* * * * *

专利名称(译)	显示设备		
公开(公告)号	US20170221402A1	公开(公告)日	2017-08-03
申请号	US15/009835	申请日	2016-01-29
申请(专利权)人(译)	松下液晶显示CO.，LTD.		
当前申请(专利权)人(译)	松下液晶显示CO.，LTD.		
[标]发明人	MURASHIMA KENSUKE		
发明人	MURASHIMA, KENSUKE		
IPC分类号	G09G3/18 G09G3/36		
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摘要(译)

一种液晶显示装置，包括：多条数据线;多个源极驱动器，用于向所述多条数据线中的每条数据线输出数据信号，所述多个源极驱动器包括多个源极驱动器，所述多个源极驱动器具有不同数量的输出通道，用于输出所述数据信号，所述多个源极驱动器包括：布置在多个源极驱动器的两个端部的两个第一源极驱动器中的每一个的输出通道的数量被设置为小于为与两个第一源极驱动器相邻的每个第二源极驱动器设置的输出通道的数量。