US 20070296898A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0296898 A1

Cho et al. (43) Pub. Date: Dec. 27, 2007

(54) LIQUID CRYSTAL DISPLAY

(76) Inventors: **Seon-ah Cho**, Geumjeong-gu (KR); **Yoon-sung Um**, Yongin-si (KR); **Ji-won Sohn**, Seoul (KR); **Jin-won Park**, Suwon-si (KR)

Correspondence Address:
F. CHAU & ASSOCIATES, LLC
130 WOODBURY ROAD
WOODBURY, NY 11797 (US)

(21) Appl. No.: **11/766,528**

(22) Filed: **Jun. 21, 2007**

(30) **Foreign Application Priority Data**

Jun. 27, 2006 (KR) 2006-0058293

Publication Classification

(51) **Int. Cl.**
G02F 1/1343 (2006.01)

(52) **U.S. Cl.** **349/139**

(57) **ABSTRACT**

A liquid crystal display is formed of a first insulating substrate; a conductor formed on the first insulating substrate and including a gate line and a data line; and a pixel electrode electrically connected to the gate line and the data line and including a first pixel electrode and a second pixel electrode that are adjacent each other in an extending direction of the data line and a third pixel electrode partly facing both of the first pixel electrode and the second pixel electrode. Thus, the present invention provides an LCD having an improved aperture ratio and improved light transmittance.

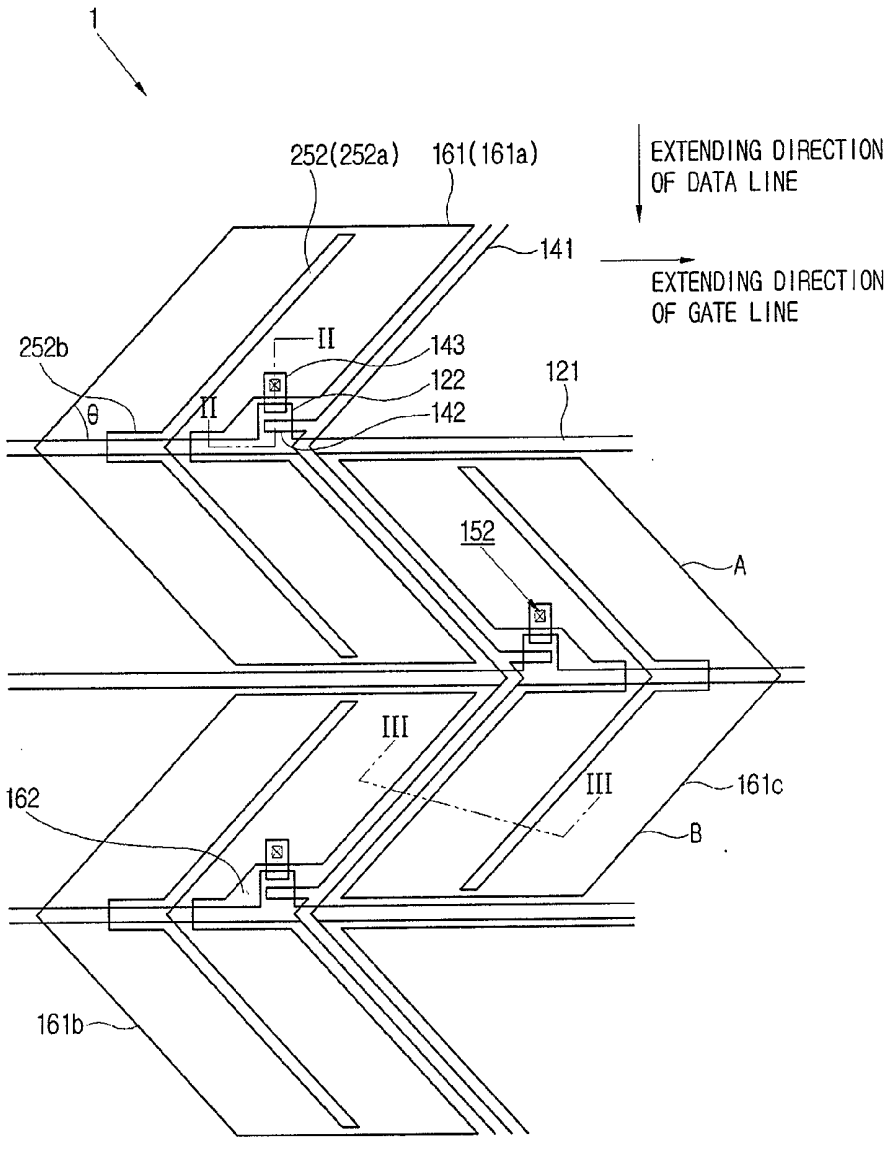


FIG. 1

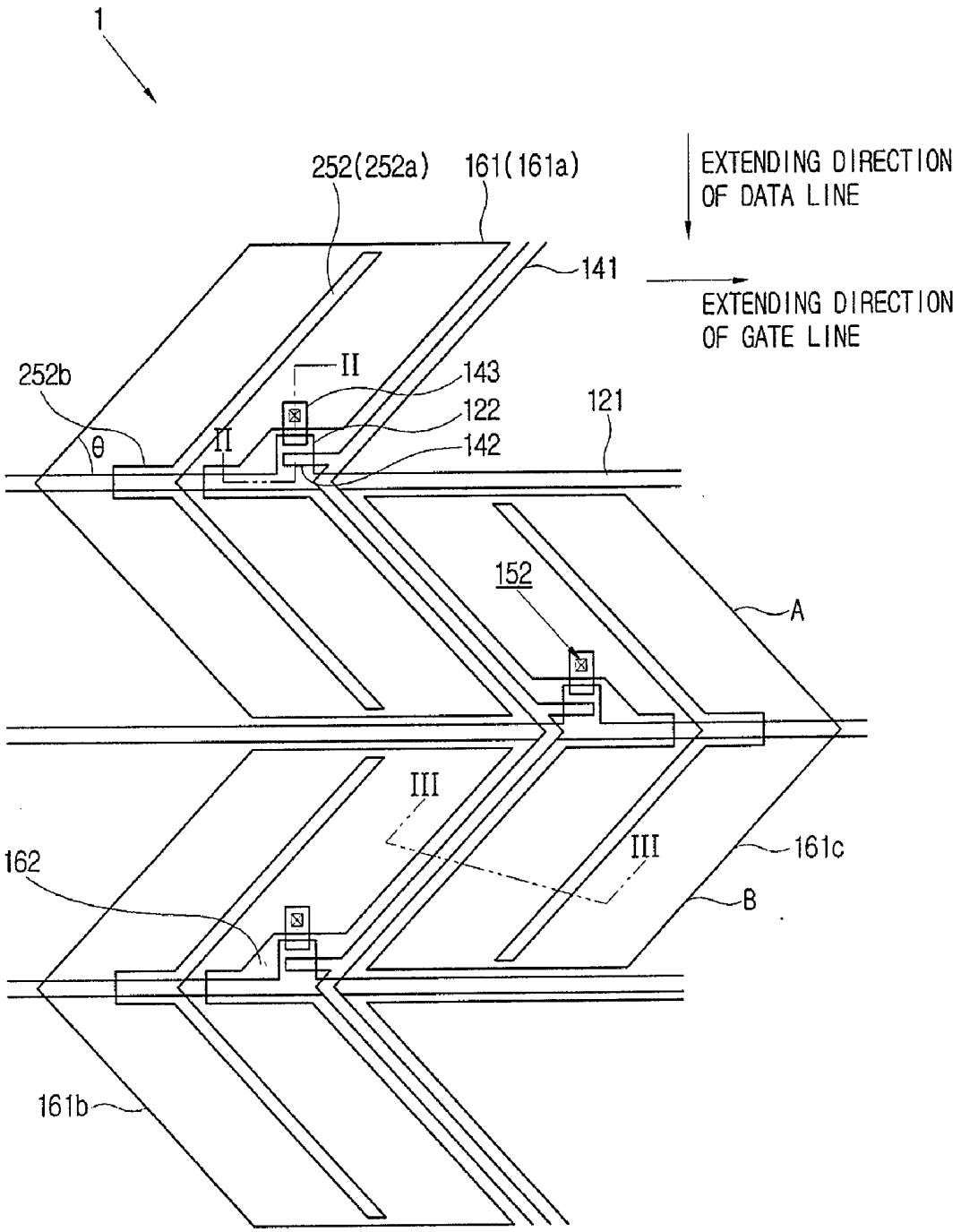

1
252(252a)
161(161a)
EXTENDING DIRECTION OF DATA LINE
141
EXTENDING DIRECTION OF GATE LINE
252b
θ
II
II
143
122
142
121
152
A
III
III
161c
B
162
161b

FIG. 2

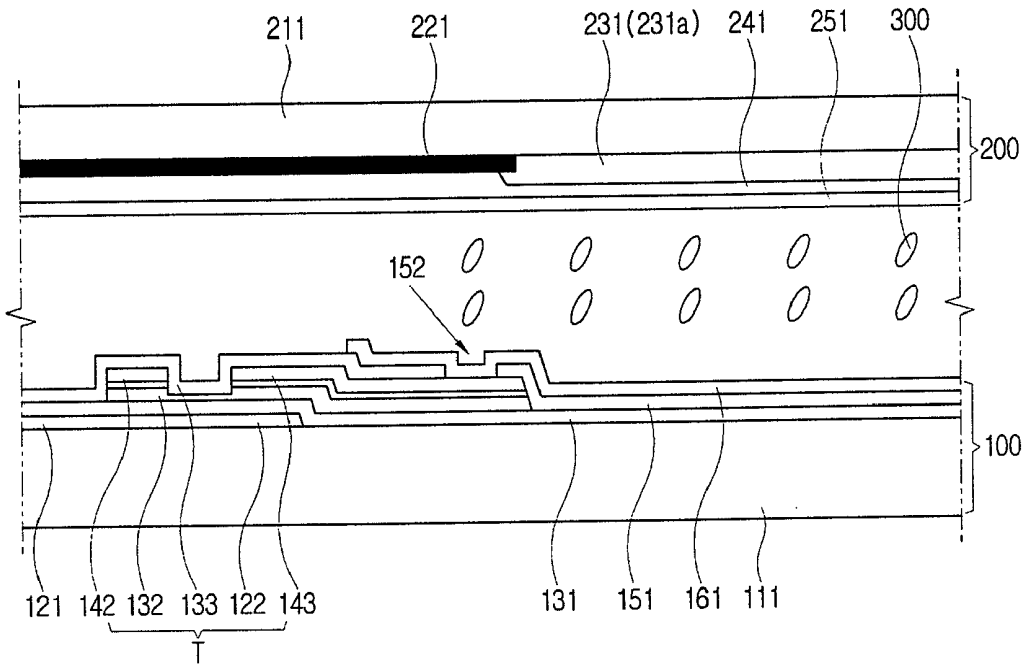

211
221
231(231a)
241
251
300
200
152
100
121
142
132
133
122
143
T
131
151
161
111

FIG. 3

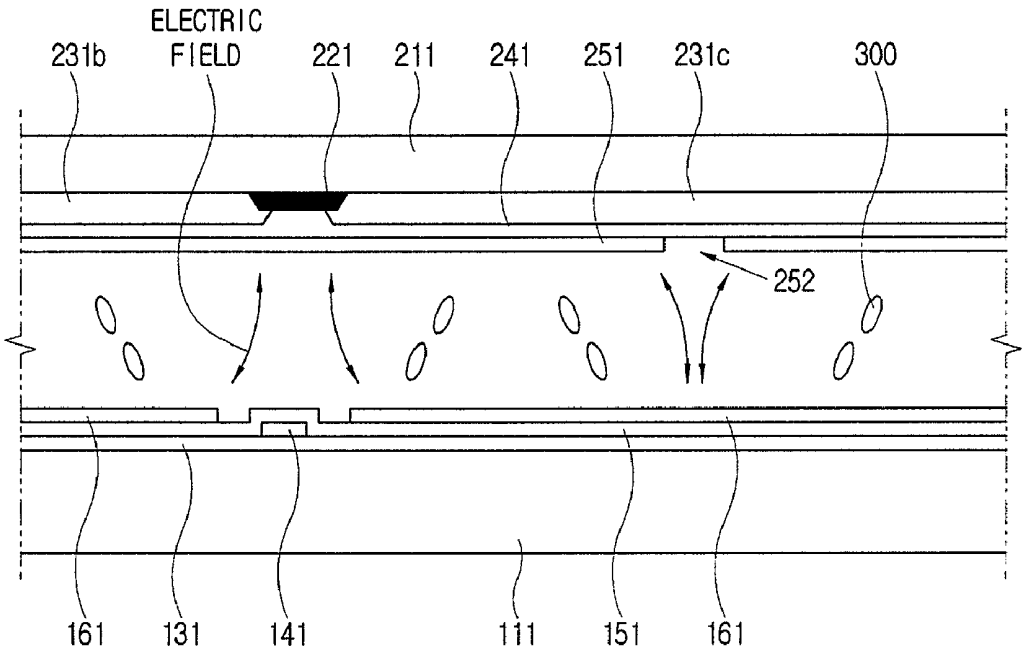

ELECTRIC FIELD
231b
221
211
241
251
231c
300
252
161
131
141
111
151
161

FIG. 4

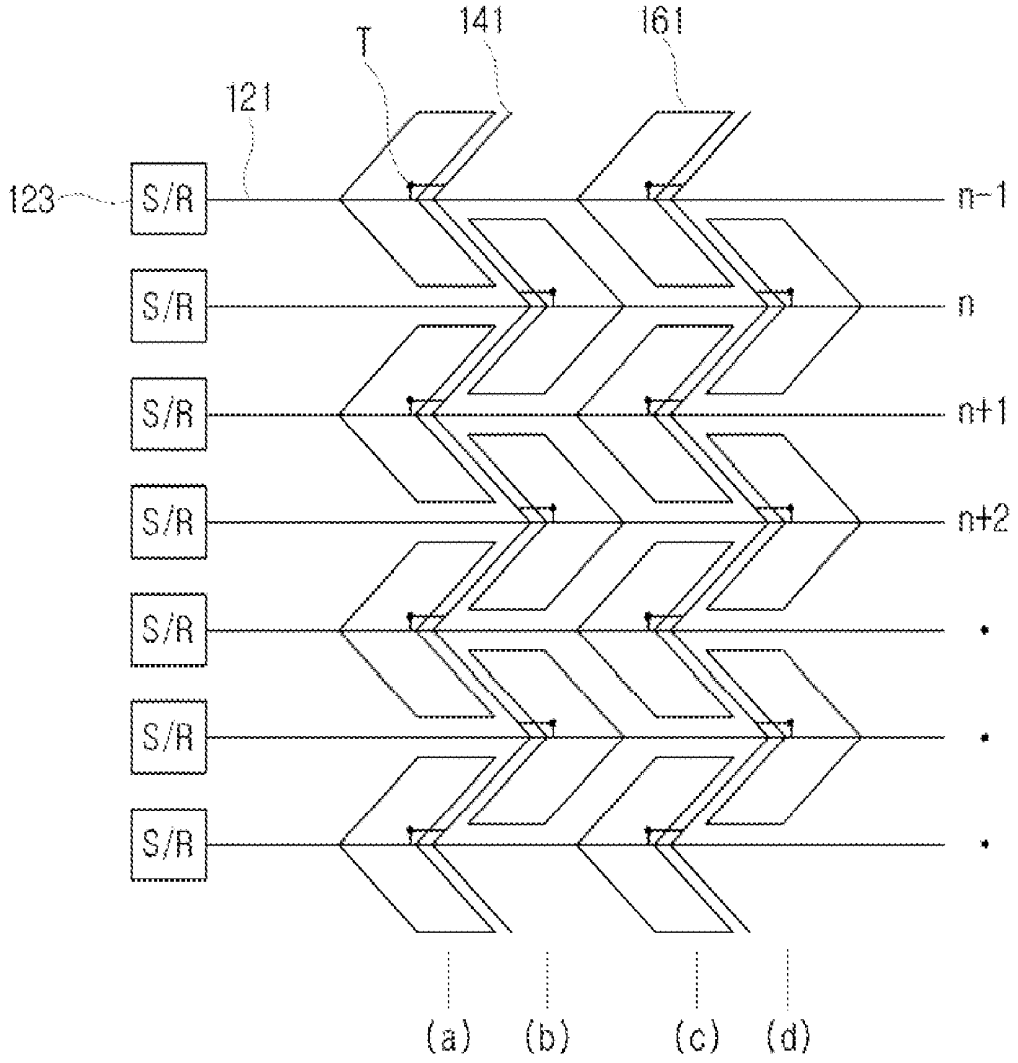


FIG. 5

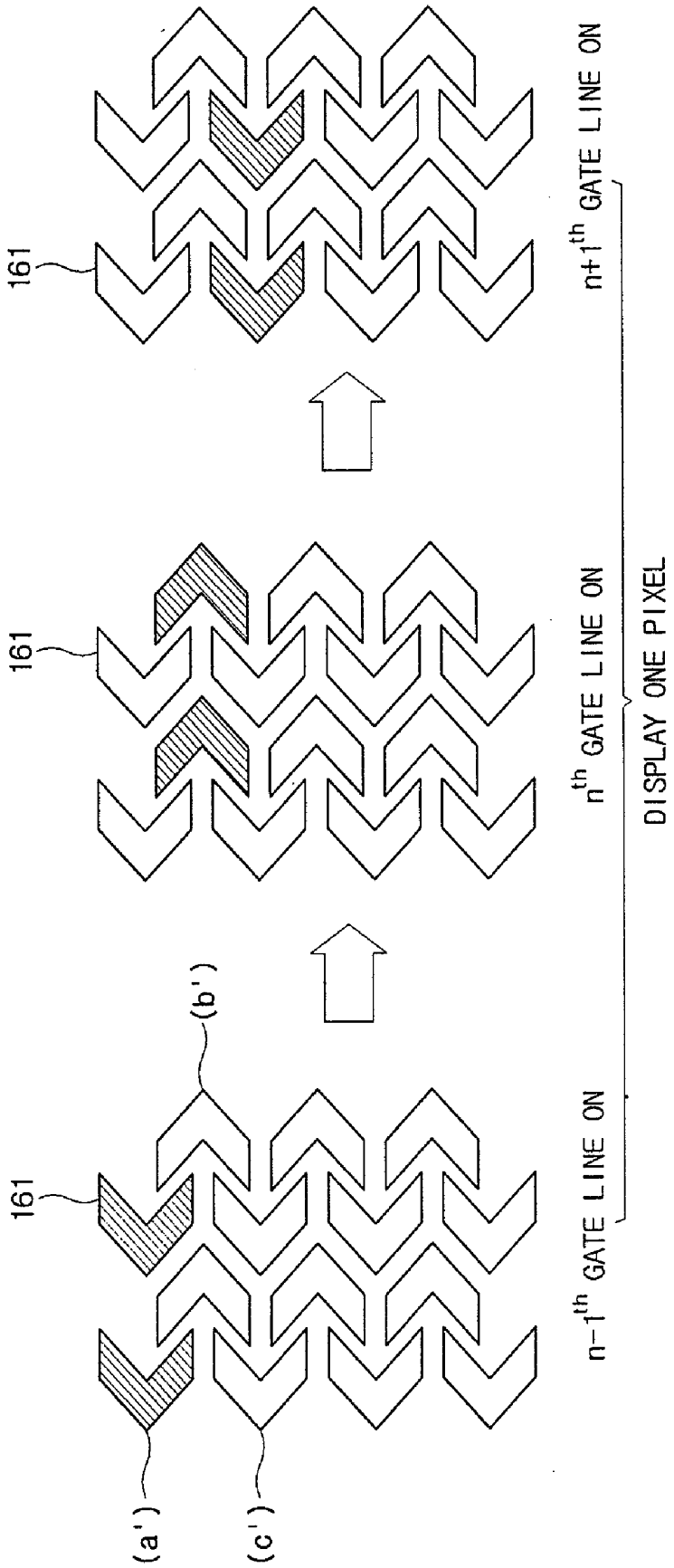

161
161
161
(a')
(b')
(c')
n-1th GATE LINE ON
nth GATE LINE ON
n+1th GATE LINE ON
DISPLAY ONE PIXEL

FIG. 6

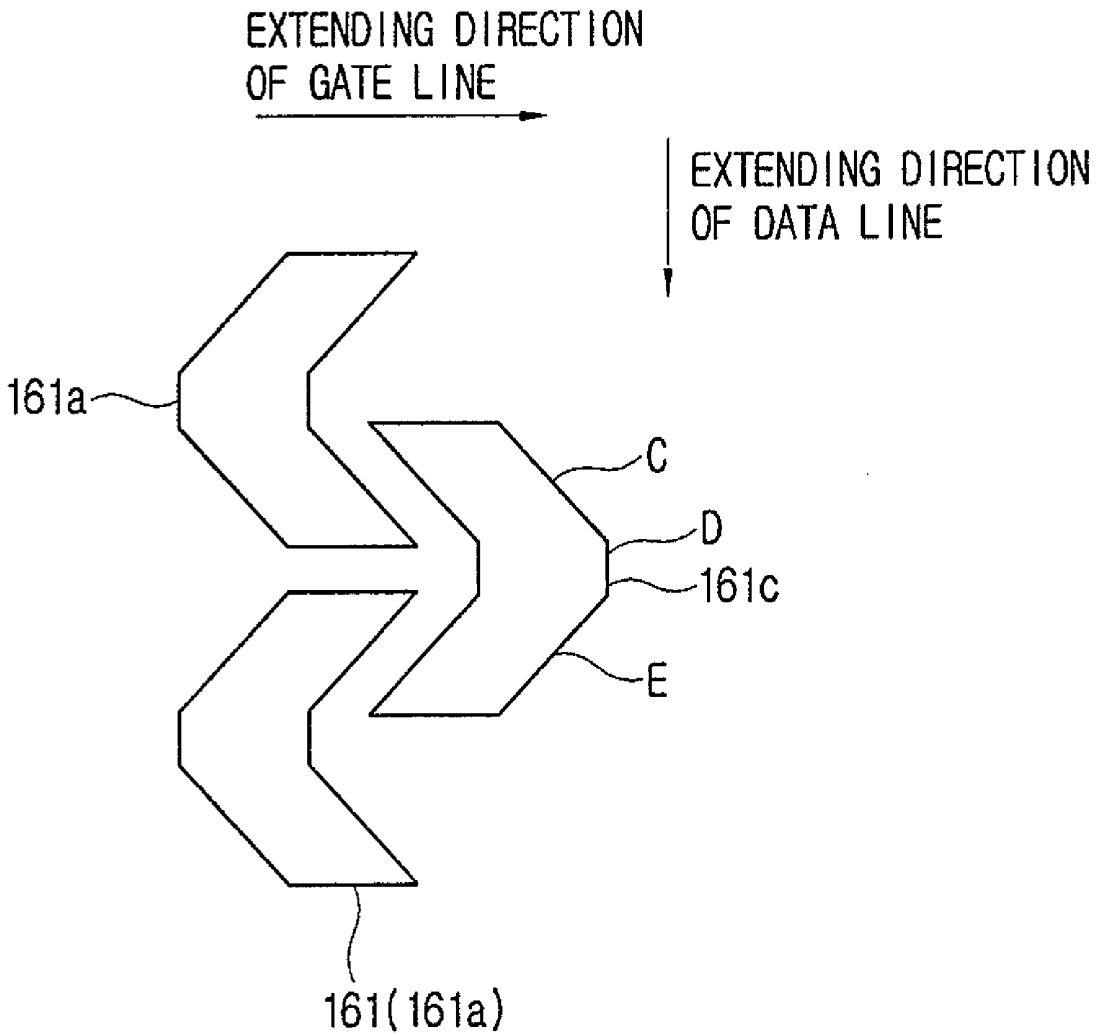
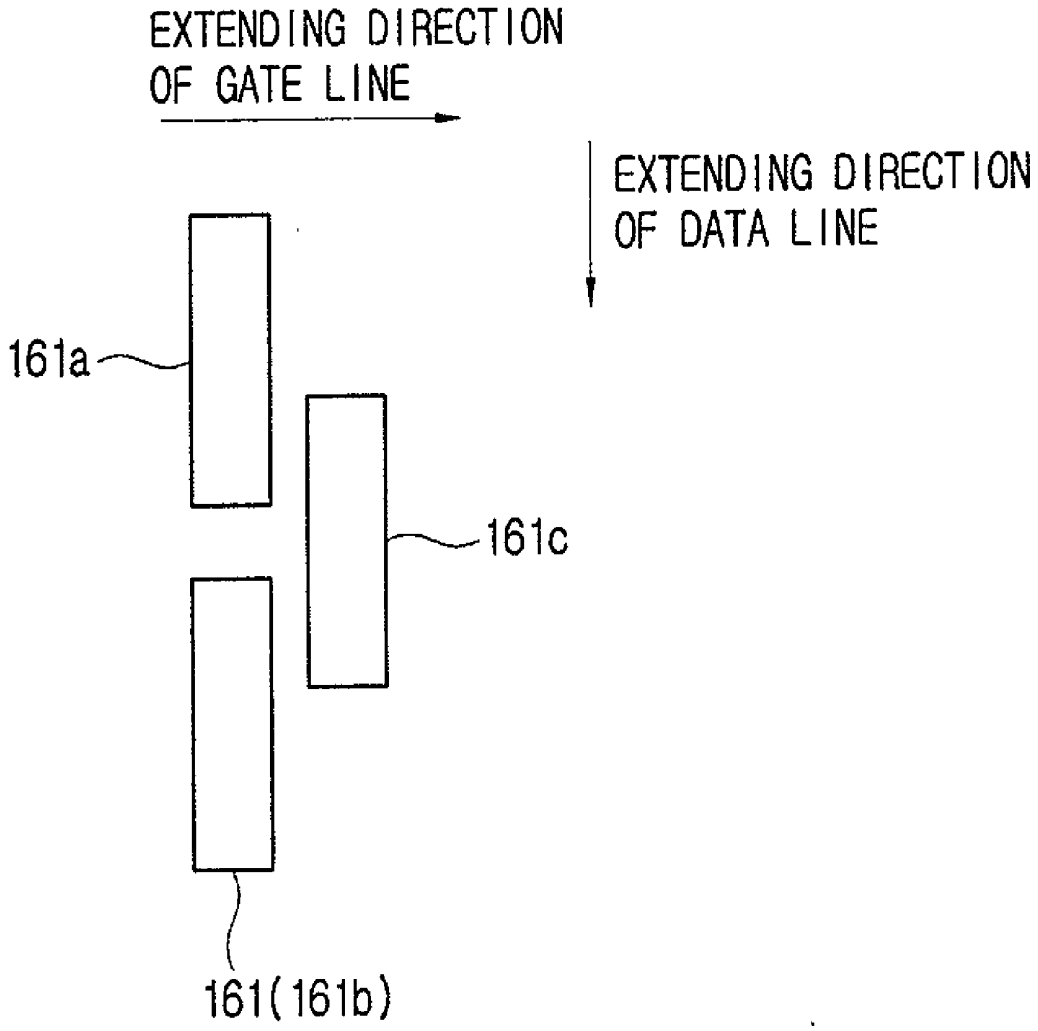

EXTENDING DIRECTION
OF GATE LINE
EXTENDING DIRECTION
OF DATA LINE
161a
C
D
161c
E
161(161a)

FIG. 7


EXTENDING DIRECTION
OF GATE LINE
EXTENDING DIRECTION
OF DATA LINE
161a
161c
161(161b)

LIQUID CRYSTAL DISPLAY

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to Korean Patent Application No. 2006-0058293, filed on Jun. 27, 2006, the disclosure of which is incorporated herein by reference in its entirety.

BACKGROUND OF THE INVENTION

[0002] 1. Technical Field

[0003] The present disclosure relates to a liquid crystal display.

[0004] 2. Discussion of Related Art

[0005] A liquid crystal display (LCD) typically comprises an LCD panel and a backlight unit. The LCD panel comprises a thin film transistor (TFT) substrate on which TFTs are formed; a color filter substrate on which color filters are formed; and a liquid crystal layer disposed therebetween. The LCD panel does not emit light by itself. Thus, the backlight unit is disposed behind the LCD panel to provide light for transmission therethrough so as to display an image.

[0006] Recently, LCDs have been employed in various display devices, such as televisions, cell phones, and the like. Although the LCD has been improved in viewing angle, color reproducibility, brightness, etc. as compared with a cathode ray tube (CRT), a plasma display panel (PDP) and the like, the LCD still requires its response speed to be improved.

[0007] A patterned vertically aligned (PVA) mode LCD is intended to provide an improved viewing angle and includes a pixel electrode and a common electrode, which have so-called cutting patterns, respectively. In the PVA mode LCD, the viewing angle is improved by adjusting the orientation of the liquid crystal molecules in the liquid crystal layer using a fringe field, which is generated by the above-mentioned cutting pattern.

[0008] A conventional LCD including the PVA mode LCD, however, has a low aperture ratio and a low light transmittance.

SUMMARY OF THE INVENTION

[0009] Exemplary embodiments of the present invention provide an LCD having an improved aperture ratio and an improved light transmittance.

[0010] According to an exemplary embodiment of the present invention, a liquid crystal display comprises: a first insulating substrate; a wire formed on the first insulating substrate and including a gate line and a data line; and a pixel electrode electrically connected to the gate line and the data line and including a first pixel electrode and a second pixel electrode, which are adjacent each other in an extending direction of the data line, and a third pixel electrode partially facing both the first pixel electrode and the second pixel electrode.

[0011] In an exemplary embodiment of the present invention, the first pixel electrode, the second pixel electrode and the third pixel electrode are connected to different gate lines, respectively.

[0012] According to an exemplary embodiment of the present invention, the gate line connected to the third pixel electrode passes along a boundary of the first pixel electrode and the second pixel electrode.

[0013] In an exemplary embodiment of the present invention, the first pixel electrode, the second pixel electrode and the third pixel electrode are connected to the same data line.

[0014] According to an exemplary embodiment of the present invention, the pixel electrodes connected to the data line are disposed alternately right and left with respect to the data line along the extending direction of the data line.

[0015] According to an exemplary embodiment of the present invention, the liquid crystal display further comprises a shift register connected to the gate line to apply a driving signal to the gate line. The shift register is formed on first insulating substrate.

[0016] In an exemplary embodiment of the present invention, lateral sides of the pixel electrodes in the extending direction of the data line are zigzag-shaped.

[0017] According to an exemplary embodiment of the present invention, the data line extends along the lateral sides of the pixel electrodes.

[0018] According to an exemplary embodiment of the present invention, the lateral sides of the pixel electrode form an angle of 40 degrees to 50 degrees with respect to the extending direction of the gate line.

[0019] In an exemplary embodiment of the present invention, a pixel electrode cutting pattern is formed on the pixel electrode along the extending direction of the gate line.

[0020] In an exemplary embodiment of the present invention, the liquid crystal display further comprises a second insulating substrate facing the pixel electrode, and a liquid crystal layer in a vertically aligned (VA) mode formed between the pixel electrode and a second insulating substrate.

[0021] According to an exemplary embodiment of the present invention, the liquid crystal display further comprises a common electrode formed on the second insulating substrate, wherein a common electrode cutting pattern is formed on the common electrode so as to be parallel with the lateral sides of the pixel electrodes.

[0022] In an exemplary embodiment of the present invention, the first pixel electrode, the second pixel electrode and the third pixel electrode are sequentially driven.

[0023] According to an exemplary embodiment of the present invention, a liquid crystal display comprises a plurality of pixel electrodes that are chevron-shaped and include a first pixel electrode and a second electrode disposed adjacent to each other in a first direction and a third pixel electrode partially facing both the first pixel electrode and the second electrode in a second direction perpendicular to the first direction.

[0024] In an exemplary embodiment of the present invention, each pixel electrode comprises an upper part and a lower part bent from the upper part, the upper part of the third pixel electrode faces the lower part of the first pixel electrode, and the lower part of the third pixel electrode faces the upper part of the second pixel electrode.

[0025] According to an exemplary embodiment of the present invention, the first pixel electrode, the second pixel electrode and the third pixel electrode are sequentially driven.

[0026] According to exemplary embodiment of the present invention, a liquid crystal display comprises: an insulating substrate; a conductor formed on the insulating substrate and including a gate line and a data line; and a pixel electrode connected to the gate line and the data line, the pixel electrode connected to the data line including a first pixel electrode disposed in the left side of the data line and a second pixel electrode disposed in the right side of the data line, the first pixel electrode and the second pixel electrode partly facing in an extending direction of the gate line, the pixel electrode being chevron-shaped, the data line formed along the circumference of the pixel electrode.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027] Exemplary embodiments of the present disclosure will be understood in more detail from the following descriptions taken in conjunction with the accompanying drawings of which:

[0028] FIG. **1** is an arrangement view of an LCD according to an exemplary embodiment of the present invention;

[0029] FIG. **2** is a sectional view taken along line II-II in FIG. **1**;

[0030] FIG. **3** is a sectional view taken along line III-III in FIG. **1**;

[0031] FIG. **4** illustrates connection of a pixel electrode and a line in the LCD according to the exemplary embodiment of the present invention shown in FIG. **1**;

[0032] FIG. **5** illustrates a driving method of the LCD according to the exemplary embodiment of the present invention shown in FIG. **1**;

[0033] FIG. **6** is an arrangement view of a pixel electrode in an LCD according to an exemplary embodiment of the present invention; and

[0034] FIG. **7** is an arrangement view of a pixel electrode in an LCD according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0035] Exemplary embodiments of the present invention will be described in more detail with reference to the accompanying drawings. The present invention may, however, be embodied in many different forms and should not be construed as limited to the exemplary embodiments set forth herein.

[0036] Referring to FIGS. **1** through **3**, an LCD according to an exemplary embodiment of the present invention will be described in detail.

[0037] The LCD **1** includes a TFT substrate **100**, a color filter substrate **200** facing the TFT substrate **100**, and a liquid crystal layer **300** disposed between the substrates **100** and **200**.

[0038] In regard to the TFT substrate **100**, gate wires **121** and **122** are formed on a first insulating substrate **111**. The gate wires **121** and **122** may be a single layer or multi layers. The gate wires **121** and **122** include a gate line **121** extending transversely and a gate electrode **122** connected to the gate line **121**.

[0039] The gate wires **121** and **122** may further include a storage electrode line (not shown) that overlaps with a pixel electrode **161** to form a storage capacitance.

[0040] A gate insulating layer **131** is made of silicon nitride (SiNx) or the like and is formed on the first insulating substrate **111** to cover the gate wires **121** and **122**.

[0041] A semiconductor layer **132** is made of amorphous silicon or the like and is fixed on the gate insulating layer **131** of the gate electrode **122**. An ohmic contact layer **133** is made of silicide or n+ hydrogenated amorphous silicon that is highly doped with n-type impurities and that is formed on the semiconductor layer **132**. The ohmic contact layer **133** is divided into two parts.

[0042] A data wire formed of portions **141**, **142** and **143** is formed on the ohmic contact layer **133** and on the gate insulating layer **131**. The data wire **141**, **142** and **143** may be a metal single layer or metal multi layers. The data wire **141**, **142** and **143** includes a data line **141** extending vertically to intersect the gate line **121**, a source electrode **142** branched from the data line **141** and extending over the ohmic contact layer **133**, and a drain electrode **143** separated from the source electrode **142** and formed on a part of the ohmic contact layer **133**.

[0043] The data line **141** extends up and down overall, but is bent in zigzags along a lateral side of the pixel electrode **161**. The source electrode **142** is branched from the data line **141** alternately to the right side and the left side.

[0044] A passivation layer **151** includes silicon nitride (SiNx), an a-Si:C:O layer and an a-Si:O:F layer that are deposited by plasma enhanced chemical vapor deposition (PECVD), and acrylic organic insulating layer, or the like, and is formed on the data wiring **141**, **142** and **143** and on a portion of the semiconductor layer **132** that is not covered with the data wiring **141**, **142** and **143**. A contact hole **152** is formed in the passivation layer **151** to expose the drain electrode **143**.

[0045] A pixel electrode **161** is formed on the passivation layer **151**. The pixel electrode **161** is made of a transparent conductive material, such as indium tin oxide (ITO) or indium zinc oxide (IZO).

[0046] A pixel electrode cutting pattern **162** is formed on the pixel electrode **161**. The pixel electrode cutting pattern **162** is formed to divide the liquid crystal layer **300** into a plurality of domains along with a common electrode cutting pattern **252** (described later). The pixel electrode cutting pattern **162** extends parallel with the gate line **121**.

[0047] Hereinafter, the manner in which connections are arranged between the foregoing gate line **121**, data line **141** and pixel electrode **161** will be described in detail.

[0048] The pixel electrode **161** is chevron-shaped and includes three sub-pixel electrodes **161***a*, **161***b* and **161***c*. One pixel includes three sub-pixels corresponding to the sub-pixel electrodes **161***a*, **161***b* and **161***c*. Each of the sub-pixel electrodes **161***a*, **161***b* and **161***c* has an upper part A disposed in the upper part with respect to an extending

direction of the data line and a lower part B disposed in a lower part with respect to the extending direction of the data line.

[0049] Overall, three sub-pixel electrodes **161***a*, **161***b* and **161***c* in one pixel form a triangular shape. A first sub-pixel electrode **161***a* and a second sub-pixel electrode **161***b* are disposed adjacent each other in the extending direction of the data line. A third sub-pixel electrode **161***c* faces a part of the first sub-pixel electrode **161***a* and a part of the second sub-pixel electrode **161***b* in an extending direction of the gate line.

[0050] More specifically, the upper part A of the third sub-pixel electrode **161***c* faces the lower part B of the first sub-pixel electrode **161***a*, and the lower part B of the third sub-pixel electrode **161***c* faces the upper part A of the second sub-pixel electrode **161***b*. An angle θ between the lateral side of the pixel electrode **161** and the gate line **121** is between 40 degrees and 50 degrees.

[0051] The data line **141** extends along the boundary of the sub-pixel electrodes **161***a*, **161***b* and **161***c*. That is, the data line **141** is bent in a zigzag shape but does not overlap with the sub-pixel electrodes **161***a*, **161***b* and **161***c*.

[0052] The gate line **121** extends along the boundaries of the first and second sub-pixel electrodes **161***a* and **161***b* and passes through the middle part of the third sub-pixel electrode **161***c*. In the exemplary embodiment of the present invention, the gate line **121** is formed corresponding to the pixel electrode cutting pattern **162** of the third sub-pixel electrode **161***c*.

[0053] All of the foregoing sub-pixel electrodes **161***a*, **161***b* and **161***c* in one pixel are connected to the same data line **141**. More specifically, the sub-pixel electrodes **161***a*, **161***b* and **161***c* are connected to the same data line **141** in the order of the first, third and second sub-pixel electrodes **161***a*, **161***c* and **161***b* along the extending direction of the data line. Furthermore, the left and right sides of the sub-pixel electrodes **161***a*, **161***b* and **161***c* are alternately connected to the data line **141** along the extending direction of the data line **141**.

[0054] The color filter substrate **200** will be described in the following. A black matrix **221** is formed on a second insulating substrate **211**. The black matrix **221** is disposed between red, green and blue filters to divide the filters, and to prevent light from being irradiated directly to a TFT T disposed on the TFT substrate **100**. The black matrix **221** is typically made of a photoresist organic material including a black pigment. The black pigment may be carbon black, titanium oxide or the like.

[0055] The color filter layer **231** includes the red, green and blue filters **231***a*, **231***b* and **231***c*, which are alternately disposed and separated by the black matrix **221**. The color filter layer **231** endows colors to the light irradiated from the backlight unit (not shown) and that passes through the liquid crystal layer **300**. The color filter layer **231** is generally made of a photoresist organic material.

[0056] An overcoat layer **241** is formed on the black matrix **231** and the color filter layer **221**. The overcoat layer **241** is made of an organic material and provides a flat surface. A common electrode **251** is formed on the overcoat layer **241**. The common electrode **251** is made of a transparent conductive material such as indium tin oxide (ITO) or indium zinc oxide (IZO). The common electrode **251** applies a voltage to the liquid crystal layer **300** along with the pixel electrode **161** in the TFT substrate **100**. The common electrode cutting pattern **252** is formed on the common electrode **251**. The common electrode cutting pattern **252** divides the liquid crystal layer **300** into a plurality of domains along with the pixel electrode cutting pattern **162** of the pixel electrode **161**. The common electrode cutting pattern **252** includes a first sub-cutting pattern **252***a* formed parallel with the data line **141** and a second sub-cutting pattern **252***b* formed parallel with the gate line **121**.

[0057] The pixel electrode cutting pattern **162** and the common electrode cutting pattern **252** in the first sub-pixel electrode **161***a* will be described in detail as an exemplary embodiment.

[0058] The pixel electrode cutting pattern **162** and the second sub-cutting pattern **252***b* are formed in a straight line on the gate line **121**. The first sub-pixel electrode **161***a* is divided into two parts, the upper and lower parts, by the pixel electrode cutting pattern **162** and the second sub-cutting pattern **252***b*. Meanwhile, the first sub-cutting pattern **252***a* extends parallel with the data line **141**, that is, with the lateral side of the first sub-pixel electrode **161***a*, to divide the first sub-pixel electrode **161***a* into two parts, right and left.

[0059] Accordingly, the pixel electrode **161** is divided into four domains by the pixel electrode cutting pattern **162** and the common electrode cutting pattern **252**. There four domains have substantially the same area. As described above, the pixel electrode **161** is divided into multiple domains, thereby improving a viewing angle of the LCD **1**.

[0060] The liquid crystal layer **300** is disposed between the TFT substrate **100** and the color filter substrate **200**. The liquid crystal layer **300** is in a vertically aligned (VA) mode, where liquid crystal molecules are aligned perpendicularly to the substrates **100** and **200** in a lengthwise direction under a voltage-off state between the substrates **100** and **200**.

[0061] The liquid crystal molecules with negative dielectric anisotropy are oriented perpendicularly to an electric field in a voltage-on state. If the pixel electrode cutting pattern **162** and the common electrode cutting pattern **252** are not formed, however, the orientation of the liquid crystal molecules is not determined. Accordingly, the liquid crystal molecules are disorganized and, thus, a disinclination line is formed. The pixel electrode cutting pattern **162** and the common electrode cutting pattern **252** generate a fringe field when a voltage is applied to the liquid crystal layer **300**, thereby determining the orientation of the liquid crystal molecules. Also, the liquid crystal layer **300** is divided into a plurality of domains depending on the arrangement of the pixel electrode cutting pattern **162** and the common electrode cuttin

[0063] Meanwhile, the data line **141** is formed between the pixel electrodes **161** and, thus, a display region of the pixel electrode **161** does not decrease. Accordingly, an aperture ratio of the LCD **1** increases.

[0064] FIG. **4** illustrates connections of the pixel electrode and the lines in the LCD according to the exemplary embodiment of the present invention described above.

[0065] The pixel electrodes **161** are disposed in a line (a) having a chevron shape bent to the left and in a line (b)

having a chevron shape bent to the right. One pixel electrode **161** in the line (a) faces two pixel electrodes **161** in the line (b), that is, the pixel electrodes **161** in the line (a) are disposed crosswise to the pixel electrodes **161** in the line (b). Likewise, the pixel electrodes **161** in a line (c) are disposed crosswise to the pixel electrodes **161** in a line (d).

[**0066**] Each of the pixel electrodes **161** is connected to the TFT and the TFT T is connected to the gate line **121** and the data line **141**.

[**0067**] The pixel electrodes **161** in the lines (a) and (b) are connected to the same data line **141**. The TFTs T connected to the pixel electrodes **161** in the lines (a) and (b) are disposed alternately right and left with respect to the data line **141**.

[**0068**] The data line **141** extends between the pixel electrodes **161** in the line (a) and the sub-pixel electrodes in the line (b). A portion of the gate line **121** passes through the middle parts of the pixel electrodes **161** in the lines (a) and (c), and a portion of another gate line **121** passes through the middle parts of the pixel electrodes **161** in the lines (b) and (d).

[**0069**] An end portion of the gate line **121** is connected to a shift register **123**. The shift register **123** drives the gate line **121** and provides a gate-on voltage and a gate-off voltage to the gate line **121**. The shift register **123** is formed on the insulating substrate **111** where the TFT T is formed.

[**0070**] One pixel in a triangular shape is connected to one data line **141** and three gate lines **121**. A conventional pixel with three sub-pixels in one pixel, where three pixel electrodes are disposed transversely, is connected to three data lines and one gate line. In the pixel according to the exemplary embodiment, however, the data lines decrease in number by one-third, while the gate lines increase in number by three times as compared with the conventional pixel.

[**0071**] Generally, a circuit to drive the data line **141** is more complicated and expensive than a circuit to drive the gate line **121**. In the exemplary embodiment, the circuit for the data line **141** decreases in number as the data lines **141** decrease in number by one-third, thereby reducing the cost of manufacturing the circuit for the data line **141**.

[**0072**] On the other hand, as the gate lines **121** increase in number by three times, the cost of manufacturing the circuit for the gate line **121** may increase. In the exemplary embodiment, however, the gate line **121** is driven by the shift register **123** formed on the insulating substrate **111** and, thus, the cost of manufacturing the circuit does not increase.

[**0073**] FIG. **5** illustrates a driving method of the LCD according to the exemplary embodiment of the present invention described above.

[**0074**] When the gate-on voltage is provided to the gate line **121** in the (n−1)th gate line, the TFT T connected thereto is turned on. Accordingly, the pixel electrodes **161** in a row (a') connected to the (n−1)th gate line **121** are turned on.

[**0075**] When the gate-on voltage is provided to the (n)th gate line **121**, the pixel electrodes **161** in a row (b') connected to the (n)th gate line **121** are turned on.

[**0076**] Likewise, when the gate-on voltage is provided to the (n+1)th gate line **121**, the pixel electrodes **161** in a row (c') connected to the gate line **121** in the (n+1)th are turned on. Accordingly, display of one pixel is completed. For the display of one pixel, three gate lines **121** are sequentially driven, and accordingly the data line **141** provides a data voltage for each sub-pixel electrode **161**.

[**0077**] As described above, three pixel electrodes **161** in one pixel are driven not at the same time but sequentially. Further, the gate-on voltage is provided three times for the display of one pixel.

[**0078**] The LCD **1** according to the exemplary embodiment described above is suitable for a small and medium-sized display device, such as an automobile navigation system.

[**0079**] The small and medium-sized display device generally employs an LCD with a ppi (pixels per inch) resolution of 120 to 150. The LCD **1** according to the exemplary embodiment obtains not only a good aperture ratio over 47%, but also good transmittance, response time, etc. for the small and medium-sized display device.

[**0080**] FIG. **6** is an arrangement view of a pixel electrode in an LCD according to an exemplary embodiment of the present invention.

[**0081**] The pixel electrode **161** is generally chevron-shaped and includes an upper part (C) and a lower part (E) of which lateral sides are slanted. The pixel electrode **161** includes a middle part (D) between the upper part (C) and the lower part (E), of which lateral sides are parallel with an extending direction of a data line. A right sub-pixel electrode **161***c* partially faces left sub-pixel electrodes **161***a* and **161***b* in an extending direction of a gate line.

[**0082**] The data line (not shown) in this exemplary embodiment may be formed along the lateral side of the pixel electrode **161** or formed into a straight line, which is not shown in FIG. **6**.

[**0083**] FIG. **7** shows an arrangement of a pixel electrode in an LCD according to an exemplary embodiment of the present invention.

[**0084**] The pixel electrode **161** is formed in a rectangular shape that extends lengthwise in an extending direction of a data line. A right sub-pixel electrode **161***c* partially faces left sub-pixel electrodes **161***a* and **161***b* in an extending direction of a gate line.

[**0085**] The data line in the exemplary embodiment may be formed in a straight line, which is not shown in FIG. **7**.

[**0086**] As described above, exemplary embodiments of the present invention provide an LCD that is improved in transmittance and that has an improved aperture ratio.

[**0087**] Although exemplary embodiments have been described with reference to the accompanying drawings, it is to be understood that the present invention is not limited to these exemplary embodiments but various changes and modifications can be made by one skilled in the art without departing from the spirit and scope of the present invention. All such changes and modifications are intended to be included within the scope of the invention, as defined by the appended claims.

What is claimed is:

1. A liquid crystal display comprising:

a first insulating substrate;

a conductor formed on the first insulating substrate and including a gate line and a data line; and

a pixel electrode electrically connected to the gate line and the data line and including a first pixel electrode and a second pixel electrode which are adjacent each other in an extending direction of the data line and a third pixel electrode partially facing both the first pixel electrode and the second pixel electrode.

2. The liquid crystal display according to claim 1, wherein the first pixel electrode, the second pixel electrode and the third pixel electrode are connected to different respective gate lines.

3. The liquid crystal display according to claim 2, wherein the gate line connected to the third pixel electrode passes along a boundary of the first pixel electrode and the second pixel electrode.

4. The liquid crystal display according to claim 2, wherein the first pixel electrode, the second pixel electrode and the third pixel electrode are connected to the same data line.

5. The liquid crystal display according to claim 4, wherein the first, second, and third pixel electrodes connected to the data line are disposed alternately right and left with respect to the data line along the extending direction of the data line.

6. The liquid crystal display according to claim 4, further comprising a shift register connected to the gate line to apply a driving signal to the gate line and formed on the first insulating substrate.

7. The liquid crystal display according to claim 1, wherein lateral sides of the pixel electrodes in the extending direction of the data line are zigzag-shaped.

8. The liquid crystal display according to claim 7, wherein the data line extends along the lateral sides of the pixel electrodes.

9. The liquid crystal display according to claim 8, wherein the lateral sides of the pixel electrode form an angle of 40 degrees to 50 degrees with respect to the extending direction of the gate line.

10. The liquid crystal display according to claim 7, wherein a pixel electrode cutting pattern is formed on the pixel electrode along the extending direction of the gate line.

11. The liquid crystal display according to claim 10, further comprising a second insulating substrate facing the pixel electrode, and a liquid crystal layer in a vertically aligned (VA) mode formed between the pixel electrode and the second insulating substrate.

12. The liquid crystal display according to claim 11, further comprising a common electrode formed on the second insulating substrate, wherein a common electrode cutting pattern is formed on the common electrode and is parallel with the lateral sides of the pixel electrodes.

13. The liquid crystal display according to claim 1, wherein the first pixel electrode, the second pixel electrode and the third pixel electrode are sequentially driven.

14. A liquid crystal display comprising,

a plurality of pixel electrodes that are chevron-shaped and that include a first pixel electrode and a second electrode disposed adjacent each other in a first direction and a third pixel electrode partially facing both the first pixel electrode and the second electrode in a second direction perpendicular to the first direction.

15. The liquid crystal display according to claim 14, wherein each pixel electrode comprises an upper part and a lower part bent from the upper part, the upper part of the third pixel electrode faces the lower part of the first pixel electrode, and the lower part of the third pixel electrode faces the upper part of the second pixel electrode.

16. The liquid crystal display according to claim 14, wherein the first pixel electrode, the second pixel electrode and the third pixel electrode are sequentially driven.

17. A liquid crystal display comprising:

an insulating substrate;

a conductor formed on the insulating substrate and including a gate line and a data line; and

a pixel electrode connected to the gate line and the data line,

the pixel electrode connected to the data line and including a first pixel electrode disposed at a left side of the data line and a second pixel electrode disposed at a right side of the data line, the first pixel electrode and the second pixel electrode partially facing in an extending direction of the gate line,

the pixel electrode being chevron-shaped,

the data line formed along a circumference of the pixel electrode.

* * * * *

专利名称(译)	液晶显示器		
公开(公告)号	US20070296898A1	公开(公告)日	2007-12-27
申请号	US11/766528	申请日	2007-06-21
[标]申请(专利权)人(译)	CHO AH SEON UM尹成 SOHN智 朴真WON		
申请(专利权)人(译)	CHO SEON-AH UM YOON-SUNG SOHN JI-WON 朴真WON		
当前申请(专利权)人(译)	三星电子有限公司		
[标]发明人	CHO SEON AH UM YOON SUNG SOHN JI WON PARK JIN WON		
发明人	CHO, SEON-AH UM, YOON-SUNG SOHN, JI-WON PARK, JIN-WON		
IPC分类号	G02F1/1343		
CPC分类号	G02F1/133707 G02F1/134336 G02F1/136286 G02F1/1393 G09G2310/0297 G02F2201/52 G09G3/3648 G09G2300/0452 G02F2001/134318		
优先权	1020060058293 2006-06-27 KR		
外部链接	Espacenet USPTO		

摘要(译)

液晶显示器由第一绝缘基板形成;导体，形成在第一绝缘基板上，包括栅极线和数据线;像素电极，电连接到栅极线和数据线，并包括在数据线的延伸方向上彼此相邻的第一像素电极和第二像素电极，以及部分面对第一像素的第三像素电极电极和第二像素电极。因此，本发明提供了一种具有改进的孔径比和改善的透光率的LCD。