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(19) **United States**(12) **Patent Application Publication**
KIM(10) **Pub. No.: US 2008/0013029 A1**(43) **Pub. Date: Jan. 17, 2008**(54) **LIQUID CRYSTAL PANEL AND LIQUID
CRYSTAL DISPLAY DEVICE HAVING THE
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G02F 1/1345 (2006.01)(52) **U.S. Cl.** **349/150; 349/149**(75) **Inventor: Eun Hong KIM, Daegu (KR)**

Correspondence Address:

**BIRCH STEWART KOLASCH & BIRCH
PO BOX 747
FALLS CHURCH, VA 22040-0747**(57) **ABSTRACT**

Disclosed is a liquid crystal display device to minimize resistance difference between link lines. The liquid crystal display device includes a liquid crystal panel including a display unit in which pixels are provided in the form of a matrix and a plurality of pad units provided at a peripheral portion in at least one side of the display unit and including a plurality of connection pads having widths different from each other, and a tape carrier package including a plurality of output pads corresponding to the plurality of pad units, in which driving integrated circuits are mounted on the output pads to drive the liquid crystal panel, and the output pads have widths different from each other corresponding to the plurality of connection pads.

(73) **Assignee: LG. Philips LCD Co., Ltd., Seoul (KR)**(21) **Appl. No.: 11/768,121**(22) **Filed: Jun. 25, 2007**(30) **Foreign Application Priority Data**

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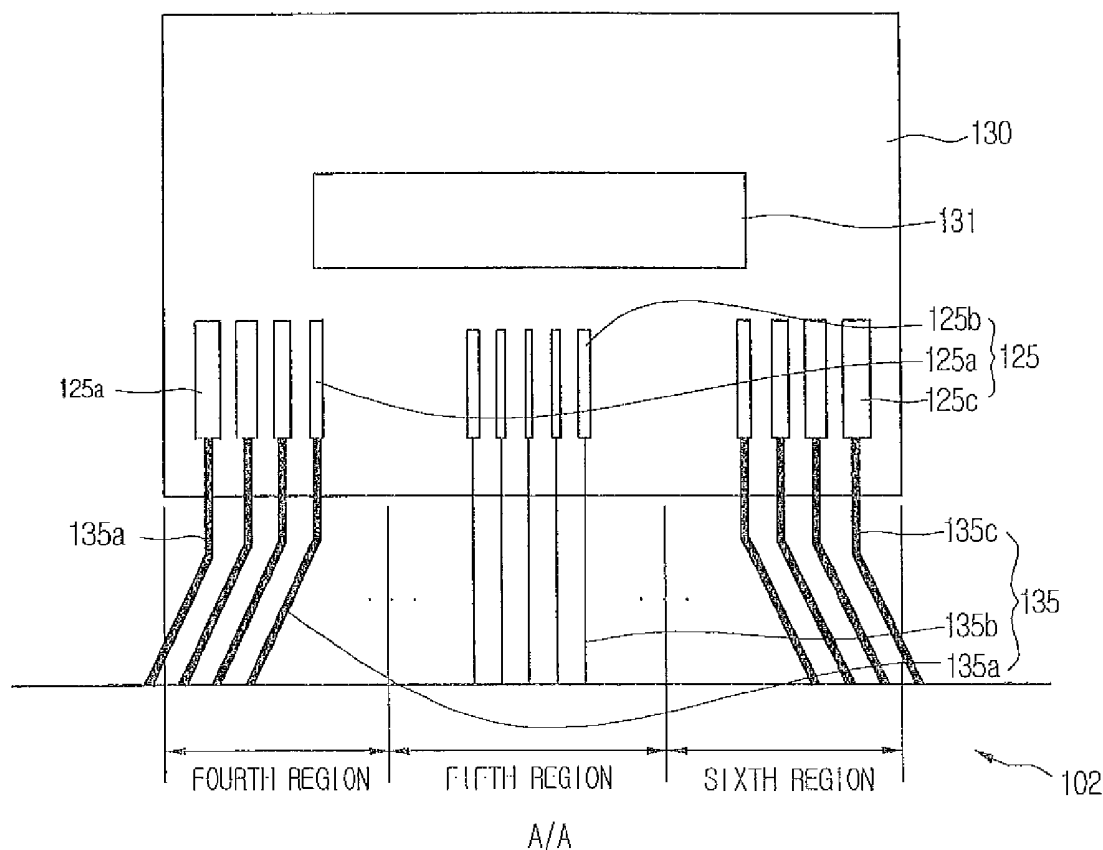


FIG. 1(Related Art)

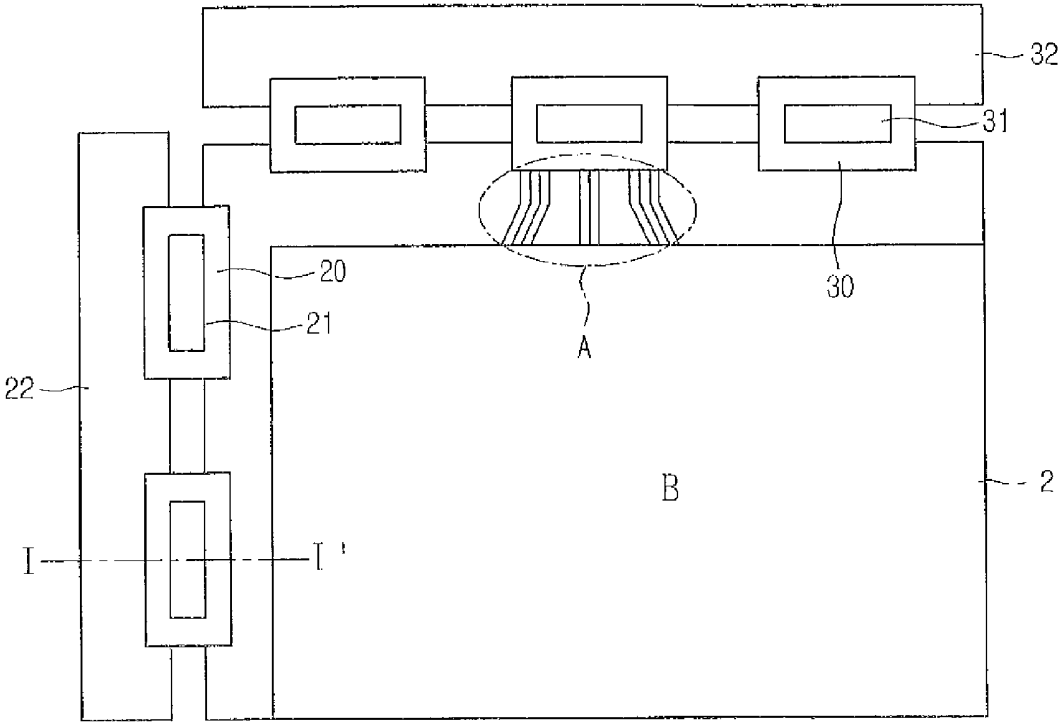


FIG. 2(Related Art)

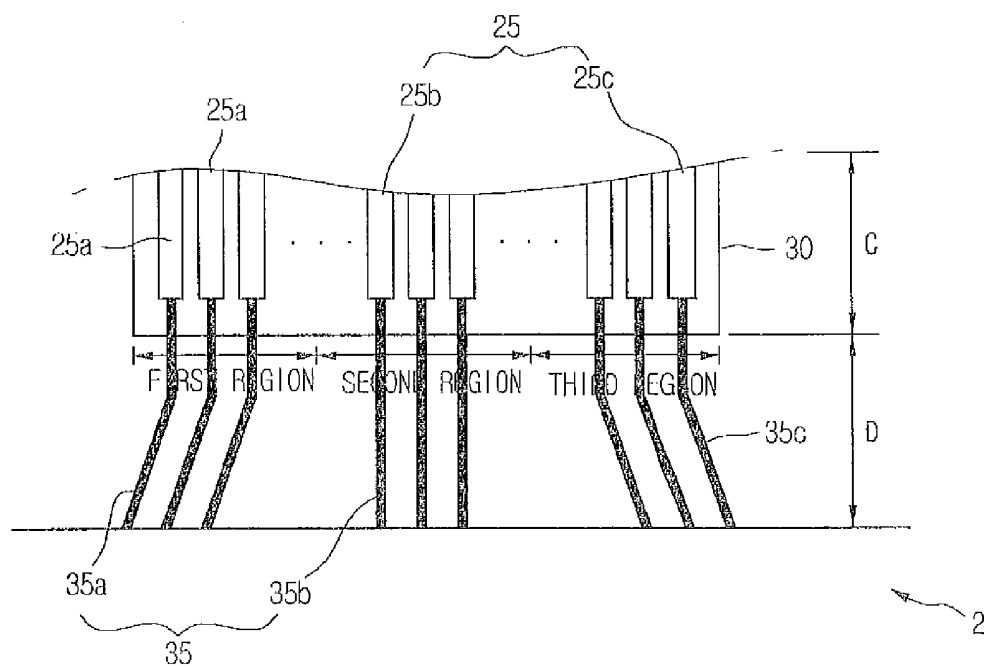


FIG. 3

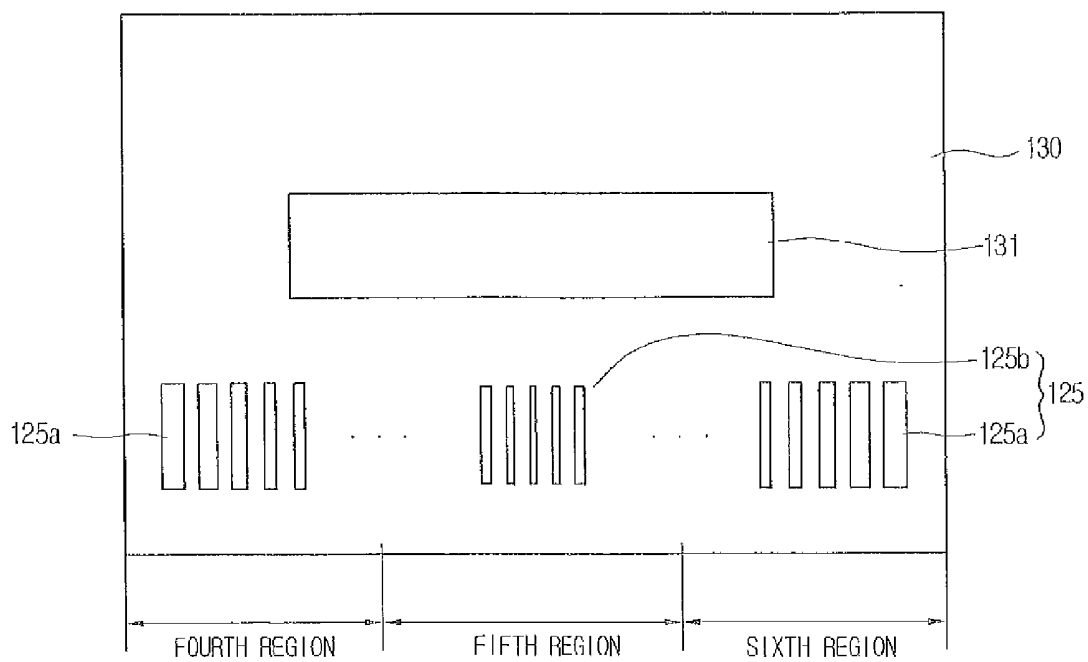
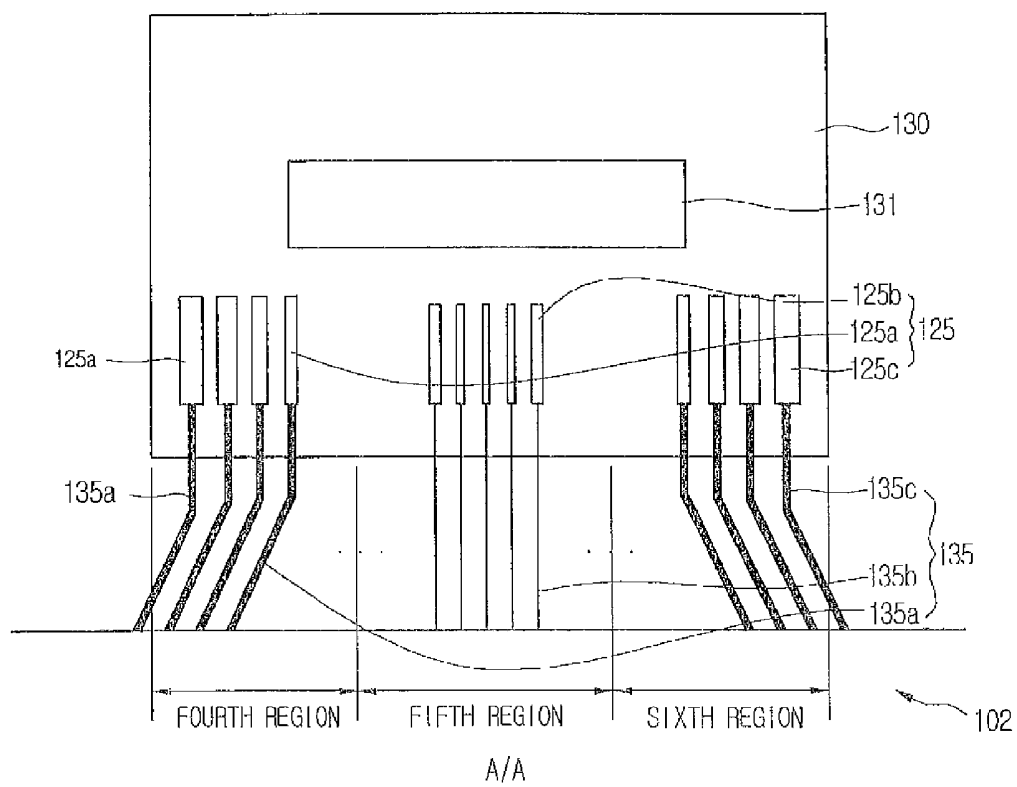


FIG. 4



LIQUID CRYSTAL PANEL AND LIQUID CRYSTAL DISPLAY DEVICE HAVING THE SAME

[0001] The present application claims priority under 35 U.S.C. 119 and 35 U.S.C. 365 to Korean Patent Application No. 10-2006-0059691 (filed on Jun. 29, 2006), which is hereby incorporated by reference in its entirety.

BACKGROUND OF INVENTION

[0002] 1. Field of Invention

[0003] The present invention relates to a liquid crystal panel, and more particularly, to a liquid crystal panel capable of minimizing resistance difference between link lines and a liquid crystal display device having the same.

[0004] 2. Description of Related Art

[0005] As the information-oriented society has developed, there are various demands for display apparatuses. To satisfy the demands, various flat display devices such as a liquid crystal display device (LCD, hereinafter referred to as 'LCD'), a plasma display panel (PDP), and electro-luminescent display (ELD), and the like are developed and some of them has already been utilized as a display device in various equipments.

[0006] The liquid crystal display device is configured such that a data printed circuit board (PCB) for applying a data signal and a gate printed circuit board for applying a driving signal are coupled with a liquid crystal panel, in which an array substrate and a color filter substrate are bonded to each other, by means of a gate tape carrier package (TCP) and a data tape carrier package (TCP).

[0007] FIG. 1 is a plan view schematically illustrating a related liquid crystal display device.

[0008] As illustrated in FIG. 1, the related liquid crystal display device includes a liquid crystal panel 2, in which an array substrate having a plurality of gate lines and data lines intersecting each other is coupled with a color filter substrate having red, green and blue color filter layers by interposing a liquid crystal layer therebetween, and a gate (or scan) printed circuit board 22 (PCB) attached to a left side (or right side) of the liquid crystal panel 2 by interposing a gate (or scan) TCP 20 therebetween.

[0009] Moreover, a data (or source) printed circuit board (PCB) 32 is attached to the upper side (or the lower side) of the liquid crystal panel 2 by interposing the data (or source) TCP 30 therebetween.

[0010] The gate TCP 20 and the data TCP 30 electrically connect the gate PCB 22, the data PCB 32, and the liquid crystal panel 2 to each other to supply a signal supplied from the gate PCB 22 and the data PCB 32 to the liquid crystal panel 2.

[0011] The driving signal processed by the gate PCB 22 is supplied to the gate lines arranged in the liquid crystal panel 2 through the gate TCP 20, and similarly, a data signal processed by the data PCB 32 is supplied to the data lines arranged in the liquid crystal panel 2 through the data TCP 30.

[0012] A gate driver IC 21 is mounted on the gate TCP 20, and the gate driver IC 21 adjusts the driving signal supplied from the gate PCB 22 through a predetermined scheme to provide the adjusted driving signal to the gate lines arranged in the liquid crystal panel 2.

[0013] A data driver IC 31 is mounted on the data TCP 30, and the data driver IC 31 processes the data signal supplied from the data PCB 32 through a predetermined scheme to provide the processed driving signal to the data lines arranged in the liquid crystal panel 2.

[0014] FIG. 2 is a view illustrating a portion A shown in FIG. 1 in detail.

[0015] As illustrated in FIGS. 1 and 2, the data TCP 30 is provided with a plurality of output pads 25, in which the output pads 25 are connected to the data lines arranged in a display area A of the liquid crystal panel 2 by a plurality of link lines 35 corresponding to the output pads 25 one by one. In this case, the link lines 35 are formed in a non-display area B of the liquid crystal panel 2. In more detail, the output pads 25 are formed in a pad region C on the non-display area B of the liquid crystal panel 9, and the plurality of link lines 35 are formed on a link region D of the non-display area B of the liquid crystal panel 2.

[0016] The plurality of output pads 25 provided in the data TCP 30 are classified into first to third output pads 25a to 25c according to regions where the output pads 25 are located in the data TCP 30.

[0017] The second region of the data TCP 30, as illustrated in FIG. 2, indicates the central region among the regions where the output pads 25 are located in the data TCP 30. The first and third regions of the data TCP 30, as illustrated in FIG. 2, indicate the outer regions among the regions where the output pads 25 are located in the data TCP 30. More precisely, the first region is a left-side (or right-side) region to the second region and the third region is a right-side (or left-side) region to the second region. An output pad 25 located in the first region among the output pads 25 is referred to as a first output pad 25a, an output pad 25 located in the second region among the output pads 25 is referred to as a second output pad 25b, and an output pad 25 located in the third region in the data TCP 30 among the output pads 25 is referred to as a third output pad 25c.

[0018] Similar to the plurality of output pads 25, from among the plurality of link lines 35, a link line electrically connected to the first output pad 25a is referred to as a first link line 35a, a link line electrically connected to the second output pad 25b is referred to as a second link line 35b, and a link line electrically connected to the third output pad 25c is referred to as a third link line 35c.

[0019] In other words, the first link line 35a is electrically connected to the first output pad 25a, the second link line 35b is electrically connected to the second output pad 25b, and the third link line 35c is electrically connected to the third output pad 25c.

[0020] Due to the region where the first to third output pads 25a to 25c are positioned, the length of the first link line 35a electrically connected to the first output pad 25a and the length of the third link line 35c electrically connected to the third output pad are longer than that of the second link line 35b electrically connected to the second output pad 25b formed in the second region.

[0021] Since the length of the first and third link lines 35a and 35c is longer than that of the second link line 35b, line resistance of the first and third link lines 35a and 35c is greater than that of the second link line 35b. For this reason, a resistance difference occurs among the first to third link lines 35a to 35c connected to the first to third output pads 25a to 25c, respectively. Due to the resistance difference between the first to third link lines 35a to 35c, the data

signals supplied to the data lines corresponding to the first to third link lines **35a** to **35c** are distorted, so a problem such as degradation of image quality may occur.

[0022] In order to compensate for the resistance difference between the first to third link lines **35a** to **35c**, a process of forming a pattern to compensate for the resistance difference must be performed relative to the second link line **35b**, causing increase of manufacturing costs.

SUMMARY OF THE INVENTION

[0023] Accordingly, the present invention is directed to a liquid crystal display device that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

[0024] It is an aspect of the present invention to provide a liquid crystal panel capable of minimizing a resistance difference between link lines and a liquid crystal display device having the same.

[0025] It is another aspect of the present invention to provide a liquid crystal panel for improving an image quality and a liquid crystal display device having the same.

[0026] In one aspect, the present invention provides a liquid crystal panel comprising a display unit in which pixels are provided in the form of a matrix, a plurality of pad units provided at a peripheral portion in at least one side of the display unit and including a plurality of connection pads having widths different from each other, and a plurality of link units corresponding to the pad units and including a plurality of link lines having widths different from each other to connect the plurality of connection pads to the display unit.

[0027] In another aspect, the present invention provides a liquid crystal display device comprising a liquid crystal panel including a display unit, in which pixels are provided in the form of a matrix, and a plurality of pad units provided at a peripheral portion in at least one side of the display unit and including a plurality of connection pads having widths different from each other, and a tape carrier package including a plurality of output pads corresponding to the plurality of pad units, in which driving integrated circuits are mounted on the output pads to drive the liquid crystal panel and the output pads have widths different from each other corresponding to the connection pad.

[0028] In still another aspect, the present invention provides a liquid crystal display device comprising a liquid crystal panel including a display unit in which pixels are provided in a form of a matrix, a plurality of pad units provided at a peripheral portion in at least one side of the display unit and including a plurality of connection pads having widths different from each other, and a plurality of link units corresponding to the pad units and including a plurality of link lines having widths different from each other to connect the plurality of connection pads to the display unit, and a tape carrier package including a plurality of output pads corresponding to the plurality of pad units, in which driving integrated circuits are mounted on the output pads to drive the liquid crystal panel, and the output pads have widths different from each other corresponding to the plurality of connection pads.

[0029] Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The

objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

[0030] It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory, and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention.

[0032] FIG. 1 is a plan view schematically illustrating a related liquid crystal display device;

[0033] FIG. 2 is a detail view illustrating a portion A shown in FIG. 1;

[0034] FIG. 3 is a detail view illustrating a data TCP according to an embodiment of the present invention; and

[0035] FIG. 4 is a view illustrating a part of a liquid crystal display device using the data TCP in FIG. 3.

DETAILED DESCRIPTION OF EMBODIMENTS ACCORDING TO THE INVENTION

[0036] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0037] FIG. 3 is a detail view illustrating a data TCP according to an embodiment of the present invention.

[0038] As illustrated in FIG. 3, a data driver IC **131** is positioned at the central portion of a data TCP **30** according to the embodiment of the present invention, and a plurality of output pads **125** are positioned at the lower side of the data TCP **30**.

[0039] The lower side of the data TCP **130** is divided into fourth to sixth regions. The fourth and sixth regions indicate outer portions of the lower side of the data TCP **130**, and the fifth region indicates the central portion of the lower side of the data TCP **130**.

[0040] From among the plurality of output pads **125**, output pads formed in the fourth region in the lower side of the data TCP **130** are referred to as first output pads **125a**, output pads formed in the fifth region in the lower side of the data TCP **130** are referred to as second output pads **125b**, and output pads formed in the sixth region in the lower side of the data TCP **130** are referred to as third output pads **125c**.

[0041] A plurality of driving circuit units are mounted on the data driver IC **131**, and various signals and voltages output from the plurality of driving circuit units are supplied to the plurality of output pads **125** formed in the data TCP **130**.

[0042] The data driver IC **131** is mounted on the data TCP **130**, and the data TCP **130** having the data driver IC **131** is positioned between a liquid crystal panel (not shown) and a data PCB.

[0043] The data TCP **130** receives a data controlling signal and a driving voltage for driving the data driver IC **131** from the data PCB to provide the same to the data driver IC **131**.

[0044] The driving voltage and the controlling signal generated by the data driver IC 131 are supplied to the plurality of output pads 125.

[0045] Widths of the first and third output pads 125a and 125c that are formed in the fourth and sixth regions of the lower side of the data TCP 130 are different from those of the second output pads 125b formed in the fifth region of the lower side of the data TCP 130. In other words, the widths of the plurality of output pads 125 formed in the lower side of the data TCP 130 gradually decrease from the fourth region to the fifth region and gradually increase from the fifth region to the sixth region. The widths of the first and third output pads 125a and 125c formed in the fourth and sixth regions gradually decrease in the direction of the fifth region, and widths of the second output pads 125b formed in the fifth region gradually increase in the direction of the fourth and sixth regions.

[0046] The widths of the first and third output pads 125a and 125c formed in the fourth and sixth regions are greater than those of the second output pads 125b formed in the fifth region. In other words, the widths of the second output pads 125b are less than those of the first and third output pads 125a and 125c. This feature can be applied not only to the first to third output pads 125a to 125c formed in the lower side of the data TCP 130, but also output pads (not shown) formed in the lower side of the data TCP 130.

[0047] FIG. 4 is a view illustrating a part of a liquid crystal display device using the data TCP in FIG. 3.

[0048] As illustrated in FIG. 4, the data TCP 130 is electrically connected to a liquid crystal panel 102 via a plurality of link lines 135. The plurality of link lines 135 correspond to a plurality of output pads 125 formed in the lower side of the data TCP 130 one by one. In this case, a pad unit including a plurality of connection pads, which are electrically connected to the first to third output pads 125a to 125c formed in the data TCP 130, is provided on the peripheral portion of the display region of the liquid crystal panel 102. The connection pads have the same widths as those of corresponding ones of the first to third output pads 125a to 125c.

[0049] The first output pads 125a formed in the fourth region of the lower side of the data TCP 130 are electrically connected to the first link lines 135a of the plurality of link lines 135, the second output pads 125b formed in the fifth region of the lower side of the data TCP 130 are electrically connected to the second link lines 135b of the plurality of link lines 135, and the third output pads 125c formed in the sixth region of the lower side of the data TCP 130 are electrically connected to the third link lines 135c of the plurality of link lines 135. In this case, the plurality of link lines 135 are provided in a link unit corresponding to the pad unit of the liquid crystal panel 102 to be electrically connected to the first to third output pads 125a to 125c.

[0050] As described above, the widths of the first and third output pads 125a and 125c formed in the fourth and sixth regions are different from those of the second output pads 125b formed in the fifth region.

[0051] Similarly, line widths of the first link lines 135a electrically connected to the first output pads 125a and the third link lines 135c electrically connected to the third output pads 125c are different from those of the second link lines electrically connected to the second output pads 125b.

[0052] In other words, the plurality of link lines 135 are configured such that the widths gradually decrease from the

fourth region to the fifth region and gradually increase from the fifth region to the sixth region. The line widths of the first and third link lines 135a and 135c electrically connected to the first and third output pads 125a and 125c that are formed in the fourth and sixth regions gradually decrease in the direction of the fifth region, and the line widths of the second link lines 135b electrically connected to the second output pads 125b that are formed in the fifth region gradually increase in the direction of the fourth and sixth regions.

[0053] In other words, when the widths of the first and third output pads 125a and 125c are different from those of the second output pads 125b, the lengths of the first link lines 135a connected to the first output pads 125a and the third link lines 135c connected to the third output pads 125c are different from the lengths of the second link lines 135b connected to the second output pads 125b.

[0054] The line widths of the first and third link lines 135a and 135c are greater than the line widths of the second link lines 135b. In other words, the line widths of the second link lines 135b are less than the line widths of the first and third link lines 135a and 135c.

[0055] Consequently, the widths of the first and third output pads 125a and 125c formed in the fourth and sixth regions of the data TCP 130 are greater than the widths of the second output pads 125b formed in the fifth region of the data TCP 130. The line widths of the first and third link lines 135a and 135c electrically connected to the first and third output pads 125a and 125c, respectively, are greater than the line widths of the second link lines 135b electrically connected to the second output pads 125b.

[0056] The lengths of the first and third link lines 135a and 135c are longer than the lengths of the second link lines 135b for a process. Since the first and third link lines 135a and 135c are formed in the outer region, rather than the second link lines 135b, the lengths of the first and third link lines 135a and 135c are longer than the lengths of the second link lines 135b.

[0057] In this case, the line resistances of the first to third link lines 135a to 135c are directly proportional to the lengths of the first to third link lines 135a to 135c, respectively, and are inversely proportional to the line widths of the first to third link lines 135a to 135c, respectively.

[0058] Since the lengths of the first and third link lines 135a and 135c are longer than the lengths of the second link lines 135b, the line resistances of the first and third link lines 135a and 135c are greater than the line resistances of the second link lines 135b.

[0059] However, since the line widths of the first and third link lines 135a and 135c are greater than the line widths of the second link lines 135b, the line resistance difference caused by the line length difference between the first to third link lines 135a to 135c can be compensated.

[0060] Therefore, in the liquid crystal display device according to the embodiment of the present invention, the line resistance difference between the first to third link lines 135a to 135c can be minimized. As the line resistance difference between the first to third link lines 135a to 135c are minimized, the distortion of the data signals applied to the data lines corresponding to the first to third link lines 135a to 135c is minimized and the image quality can be improved.

[0061] In the liquid crystal display device according to the embodiment of the present invention, the widths of the first and third output pads 125a and 125c which are positioned in

the fourth and sixth regions of the data TCP **130** are different from the widths of the second output pads **125b** positioned in the fifth region of the data TCP **130**.

[0062] Moreover, in the liquid crystal display device according to the embodiment of the present invention, the lengths of the first link lines **135a** electrically connected to the first output pads **12a** the third link lines **135c** electrically connected to the third output pads **125c** are different from the second link lines **135b** electrically connected to the second output pads **125b**.

[0063] Thus, the line resistance difference, which is caused by the length difference between the first to third link lines **135a** to **135c**, can be minimized.

[0064] Furthermore, in the liquid crystal display device according to the embodiment of the present invention, the line resistance difference caused by the length difference between the first to third link lines **135a** to **135c** can be minimized without providing any compensation patterns.

[0065] As described above, according to the liquid crystal display device of the present invention, the widths of the output pads positioned in the TCP are different from each other and the line widths of the link lines corresponding to the output pads one by one are different from each other so that the line resistance difference caused by the length difference between the link lines can be minimized.

[0066] Moreover, in the liquid crystal display of the present invention, the line resistance difference between the link lines is minimized so that the distortion of the data signals applied to the data lines corresponding to the link lines is minimized and the image quality can be improved.

[0067] As described above, according to the liquid crystal display device of the present invention, the widths of the output pads in the TCP electrically connected to the link lines connected to the data lines are different from each other and the line widths of the link lines corresponding to the output pads one by one are different from each other, so that the line resistance difference occurring due to the length difference between the link lines caused by a process can be minimized.

[0068] Furthermore, according to the liquid crystal display of the present invention, the line resistance difference of the related liquid crystal panel occurring due to the length difference between the link lines can be minimized by making the widths of the output pads different from each other and the line widths of the link lines connected to the output pads different from each other without providing any compensation patterns.

[0069] In addition, according to the liquid crystal display device of the present invention, the line resistance difference between the link lines is minimized such that the distortion of the data signals applied to the data lines corresponding to the link lines is minimized and the image quality can be improved.

[0070] Although the embodiment of the present invention has been described with respect to the data TCP for illustrative purposes, the description can be applied to the gate TCP. In other words, the widths of the output pads on the gate TCP can be different from each other and the line widths of the link lines connected to the output pads and the gate lines can be different from each other.

[0071] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without

departing from the scope and spirit of the invention as disclosed in the accompanying claims.

1. A liquid crystal panel comprising:

a display unit in which pixels are provided in a form of a matrix;

a plurality of pad units provided at a peripheral portion in at least one side of the display unit and including a plurality of connection pads having widths different from each other; and

a plurality of link units corresponding to the pad units and including a plurality of link lines having widths different from each other to connect the plurality of connection pads to the display unit.

2. The liquid crystal panel of claim 1, further comprising a tape carrier package including a plurality of output pads corresponding to the plurality of pad units and having widths different from each other corresponding to the plurality of connection pads.

3. The liquid crystal panel of claim 1, wherein the width of the plurality of the connection pads decreases from one other side of the plurality of pad units to a central portion thereof, and increases from the central portion to the other outer side of the plurality of pad units.

4. A liquid crystal display device comprising:

a liquid crystal panel including a display unit, in which pixels are provided in a form of a matrix, and a plurality of pad units provided at a peripheral portion in at least one side of the display unit and including a plurality of connection pads having widths different from each other; and

a tape carrier package including a plurality of output pads corresponding to the plurality of pad units, in which driving integrated circuits are mounted on the output pads to drive the liquid crystal panel and the output pads have widths different from each other corresponding to the connection pad.

5. The liquid crystal display device of claim 4, further comprising a plurality of link units including a plurality of link lines corresponding to the plurality of pad units and having widths different from each other to connect the plurality of the connection pads to the display unit.

6. The liquid crystal display device of claim 4, wherein the width of the plurality of the connection pads decreases from one outer side of the plurality of pad units to a central portion thereof, and increases from the central portion to the other outer side of the plurality of pad units.

7. The liquid crystal display device of claim 4, wherein the width of the plurality of the connection pads decreases from one outer side of the plurality of tape carriers to a central portion thereof, and increases from the central portion to the other outer side of the plurality of tape carriers.

8. The liquid crystal display device of claim 5, wherein the plurality of link lines are electrically connected to a plurality of data lines of the display unit.

9. A liquid crystal display device comprising:

a liquid crystal panel including a display unit in which pixels are provided in a form of a matrix, a plurality of pad units provided at a peripheral portion in at least one side of the display unit and including a plurality of connection pads having widths different from each other, and a plurality of link units corresponding to the pad units and including a plurality of link lines having widths different from each other to connect the plurality of connection pads to the display unit; and

a tape carrier package including a plurality of output pads corresponding to the plurality of pad units, in which driving integrated circuits are mounted to the output pads to drive the liquid crystal panel, and the output pads have widths different from each other corresponding to the plurality of connection pads.

10. The liquid crystal display device of claim **9**, wherein the width of the plurality of the connection pads decreases from one outer side of the plurality of pad units to a central portion thereof, and increases from the central portion to the other outer side of the plurality of pad units.

11. The liquid crystal display device of claim **9**, wherein the width of the plurality of the connection pads decreases from one outer side of the plurality of tape carriers to a central portion thereof, and increases from the central portion to the other outer side of the plurality of tape carriers.

12. The liquid crystal display device of claim **9**, wherein the plurality of link lines are electrically connected to a plurality of data lines of the display unit.

* * * * *

专利名称(译)	液晶面板和具有该液晶面板的液晶显示装置		
公开(公告)号	US20080013029A1	公开(公告)日	2008-01-17
申请号	US11/768121	申请日	2007-06-25
[标]申请(专利权)人(译)	乐金显示有限公司		
申请(专利权)人(译)	LG.飞利浦液晶CO., LTD.		
当前申请(专利权)人(译)	LG DISPLAY CO., LTD.		
[标]发明人	KIM EUN HONG		
发明人	KIM, EUN HONG		
IPC分类号	G02F1/1345		
CPC分类号	G02F1/1345		
优先权	1020060059691 2006-06-29 KR		
其他公开文献	US8421980		
外部链接	Espacenet USPTO		

摘要(译)

公开了一种液晶显示装置，以最小化连接线之间的电阻差。该液晶显示装置包括：液晶面板，包括：显示单元，其中像素以矩阵的形式提供；以及多个焊盘单元，设置在显示单元的至少一侧的周边部分，并且包括多个宽带彼此不同的连接垫，以及包括与多个垫单元对应的多个输出垫的带载封装，其中驱动集成电路安装在输出垫上以驱动液晶面板，以及输出垫具有与多个连接焊盘对应的宽度彼此不同的宽度。

