

CONFIDENTIAL

Date:Mar. 1, 2011

ATD-4418

TENTATIVE

**TECHNICAL DATA**  
**2011year model 18.5inch HD TFT-LCD cell**  
**VVH19H101G00**

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**DESCRIPTION**

The following specifications are applied to the following TFT-LCD cell.

Product Name : VVH19H101G00

Product Factory : Panasonic Liquid Crystal Display Co., Ltd. (Himeji, Japan)

**General specifications**

Effective display area	: (H)409.8×(V)230.4	(mm)
Number of pixels	: (H)1,366×(V)768	(pixels)
Pixel pitch	: (H)0.300×(V)0.300	(mm)
Color pixel arrangement	: R+G+B vertical stripe	
Display mode	: Transmissive Mode Normally black mode	
Top polarizer type	: Semi-Glare	
Viewing angle range	: Wide version (Horizontal & vertical : 178° atφ=0°,90°,180°,270°, CR ≥ 10)	
External dimensions	: (H)425.0 x (V)241.7 typ	(mm)
Weight	: Typ 410	(g)

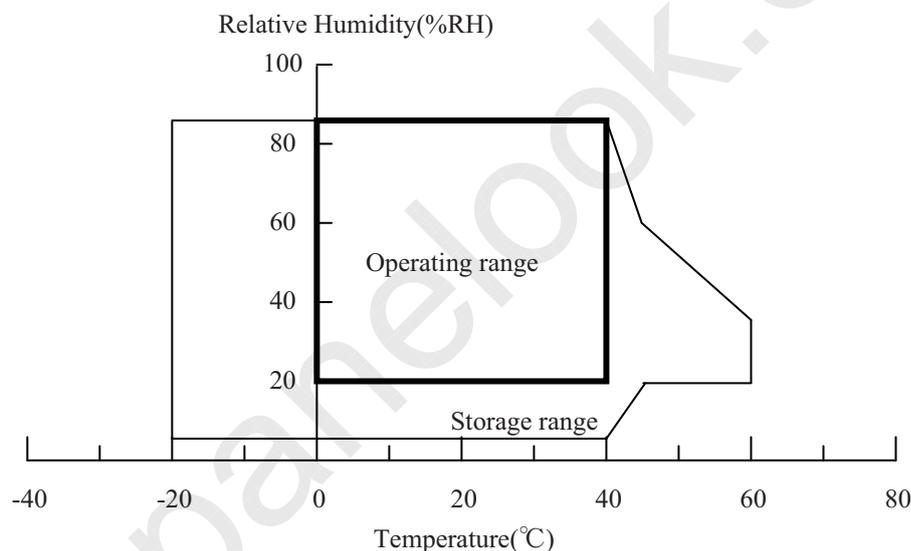
## 1. ABSOLUTE MAXIMUM RATINGS

### 1.1 Environmental absolute maximum ratings

ITEM	Operating		Storage		UNIT	NOTE
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	°C	1),5),6)
Humidity	2)		2)		%RH	1),6)
Vibration	-	4.9(0.5 G)	-	9.8(1.0G)	m/s <sup>2</sup>	3),6)
Shock	-	29.4(3 G)	-	196(20G)	m/s <sup>2</sup>	4),6)
Corrosive gas	Not acceptable		Not acceptable		-	-

Note 1) Temperature and Humidity should be applied to the glass surface of a IPS-Pro TFT LCD module, not to the system installed with a module.

- 2)  $T_a \leq 40\text{ }^\circ\text{C}$  ······ Relative humidity should be less than 85 %RH max. Dew is prohibited.  
 $T_a > 40\text{ }^\circ\text{C}$  ······ Relative humidity should be lower than the moisture of the 85 %RH at 40 °C.



- 3) Frequency of the vibration is between 15 Hz and 100 Hz. (Remove the resonance point)  
 4) Pulse width of the shock is 10 ms.  
 5) The temperature of LCD front surface would be 65 °C in operating, it may affect the optical characteristics however it does not damage the function of the module.  
 6) Environmental Absolute Maximum Ratings is based on Panasonic Liquid Crystal Display Co., Ltd. TFT-LCD module.

If the TFT-LCD cell is left alone, this environmental ratings can't be guaranteed.

The users have a responsibility in considering ability of other parts of TFT-LCD module and its process.

1.2 Electrical absolute maximum ratings

(1)TFT-LCD module

V<sub>SS</sub> = 0 V

ITEM	SYMBOL	Min.	Max.	UNIT	NOTE
Gate-Source Voltage	V <sub>gs</sub>	-35	35	V	1)
Source-Common Voltage	V <sub>sc</sub>	-10	10	V	1)
Gate-Common Voltage	V <sub>gc</sub>	-35	35	V	1)
Electrostatic durability	VESD0	±100		V	2)

- Note
- 1) Maximum and minimum voltage should not be continuously applied to TFT-LCD cell for a long time. TFT threshold Voltage have a potential to be moved by the voltage.
  - 2) Discharge coefficient : 200pF - 250 Ω, Environmental : 25°C - 70%RH

1.3 Environmental Absolute Maximum Ratings of TFT-LCD cell

- 1) Storage Condition : With shipping package
- 2) Storage temperature range : 25±5 °C
- 3) Storage humidity range : 50±10%RH
- 4) Shelf life : a month

## 2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the center of display area unless otherwise noted.

The optical characteristics should be measured in a dark room or equivalent state.

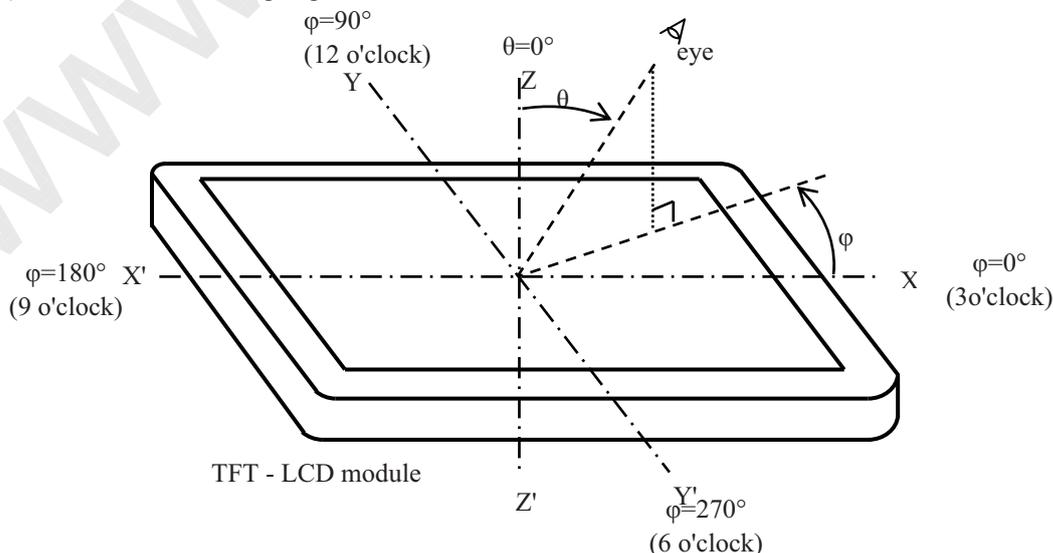
Measuring equipment : CS-1000A, or equivalent

Ambient Temperature =25 °C

Light source is backlight of Panasonic Liquid Crystal Display Co., Ltd. TFT-LCD module.

ITEM	SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE	
Contrast Ratio	C R	$\theta = 0^\circ$ 1)	800	1300	-	-	2)	
Response Time	Rise		ton	-	8	20	ms	3)
	Fall		toff	-	6	20	ms	3)
Brightness of white	Bwh		-	250	-	cd/m <sup>2</sup>		
Brightness uniformity	Buni		-	-	30	%	4)	
Color Chromaticity (CIE)	Red		$\chi$	0.560	0.590	0.620	-	【Gray scale =255/255】
			y	0.290	0.320	0.350		
	Green		$\chi$	0.280	0.310	0.340		
			y	0.550	0.580	0.610		
	Blue		$\chi$	0.120	0.150	0.180		
		y	0.035	0.065	0.095			
	White	$\chi$	0.250	0.280	0.310			
		y	0.253	0.283	0.313			
Variation of Color Position (CIE)	Red	$\Delta \chi$	-	-	0.04	-	5) 【Gray scale =255/255】	
		$\Delta y$	-	-	0.04			
	Green	$\Delta \chi$	$\theta = +50^\circ$	-	-			0.04
		$\Delta y$	$\phi = 0^\circ, 90^\circ$	-	-			0.04
	Blue	$\Delta \chi$	$180^\circ, 270^\circ$	-	-			0.04
		$\Delta y$	1)	-	-			0.04
	White	$\Delta \chi$	-	-	0.04			
		$\Delta y$	-	-	0.04			
Contrast Ratio at 85°	CR85		10	-	-	Estimated value		

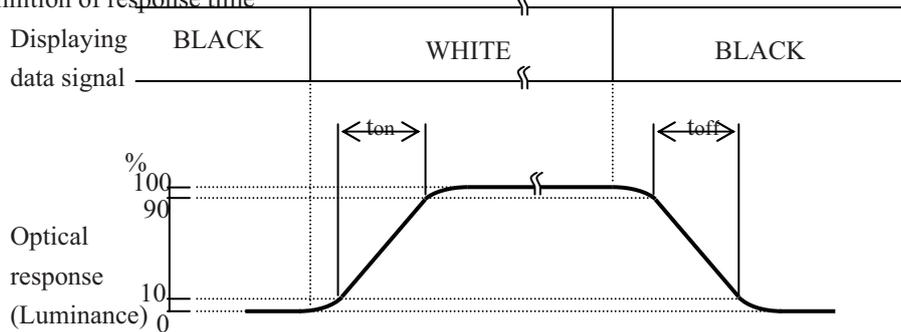
Note 1) Definition of viewing angle



Note 2) Definition of contrast ratio (CR)

$$CR = \frac{\text{(Luminance at displaying WHITE)}}{\text{(Luminance at displaying BLACK)}}$$

3) Definition of response time



4) Definition of brightness uniformity

Display pattern is white (255 level). The brightness uniformity is defined as the following equation. Brightness at each point is measured, and average, maximum and minimum brightness is calculated.

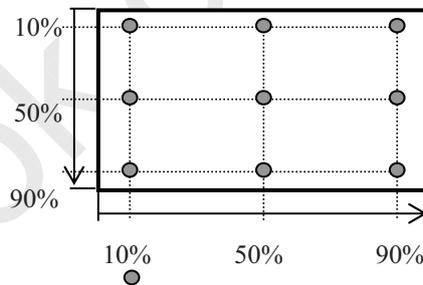
$$B_{uni} = \frac{|B_{max \text{ or } B_{min}} - B_{ave}|}{B_{ave}} \times 100$$

where,  $B_{max}$  = Maximum brightness

$B_{min}$  = Minimum brightness

$B_{ave}$  = Average brightness

$$B_{ave} = \frac{\sum_{k=1}^9 (B(k))}{9}$$



: measuring points

5) Variation of color position on CIE

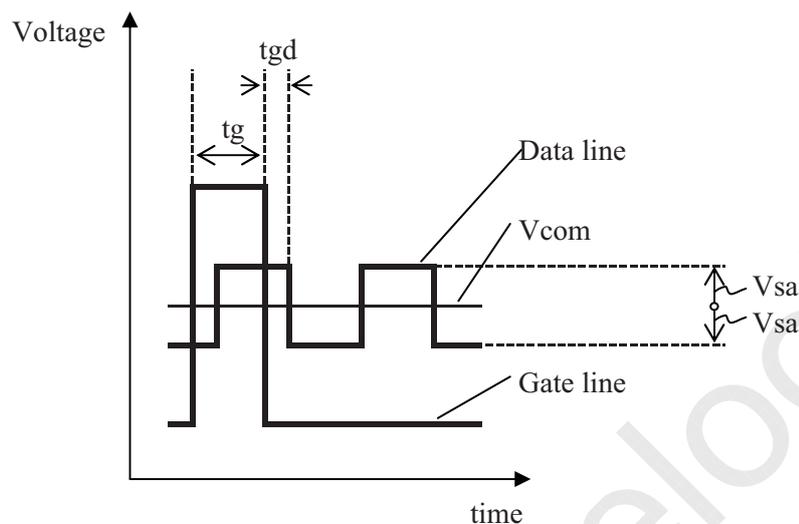
Variation of color position on CIE is defined as difference between colors at  $\theta = 0^\circ$  and at  $\theta = 50^\circ$  &  $\varphi = 0^\circ, 90^\circ, 180^\circ, 270^\circ$ .

### 3. ELECTRICAL CHARACTERISTICS

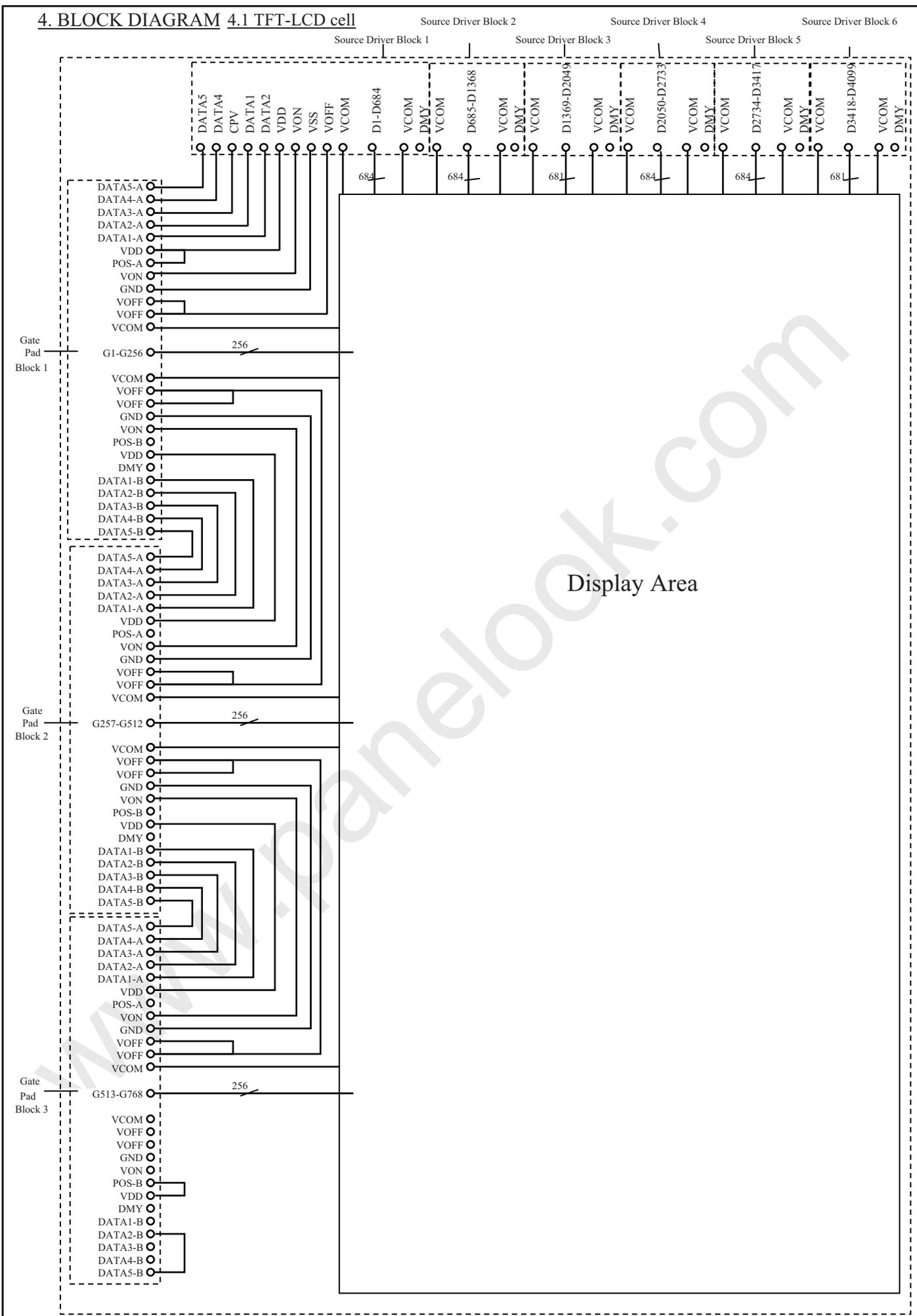
Based on Panasonic Liquid Crystal Display Co., Ltd. TFT-LCD module.

Ta=25°C、Vss=0V

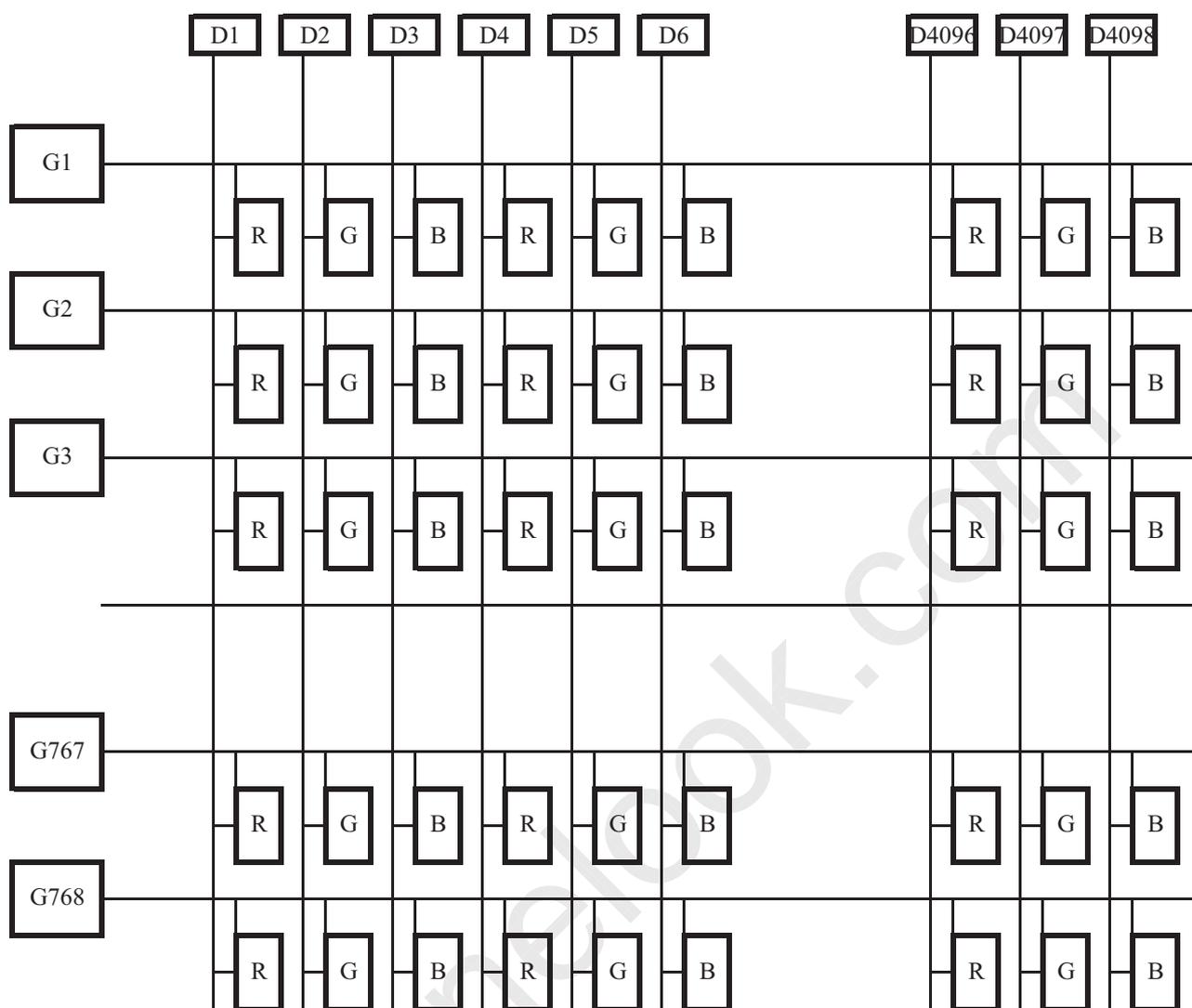
ITEM	SYMBOL	Min.	Typ.	Max.	Unit	NOTE
Gate line	VON	29	30.5	32	V	-
	VOFF	-6.3	-6	-5.7	V	-
Data line amplitude	Vsa(1)	-	(6.0)	-	V	Gray Scale = 255/255
	Vsa(0)	-	0	-	V	Gray Scale = 0/255
Common electrode	VCOM	2.5	4	5.5	V	-
Vertical Frequency	fV	48	60	62	Hz	-
Timing	tg	-	20.83	-	us	-
	tgd	-	6.22	-	us	-



4. BLOCK DIAGRAM 4.1 TFT-LCD cell



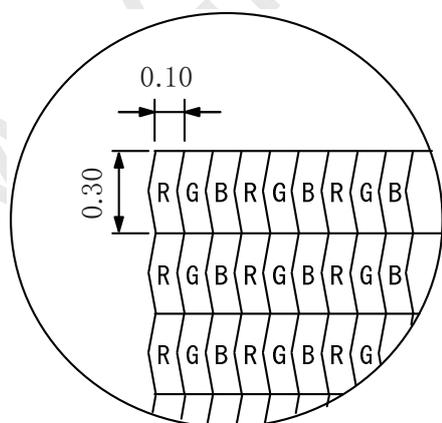
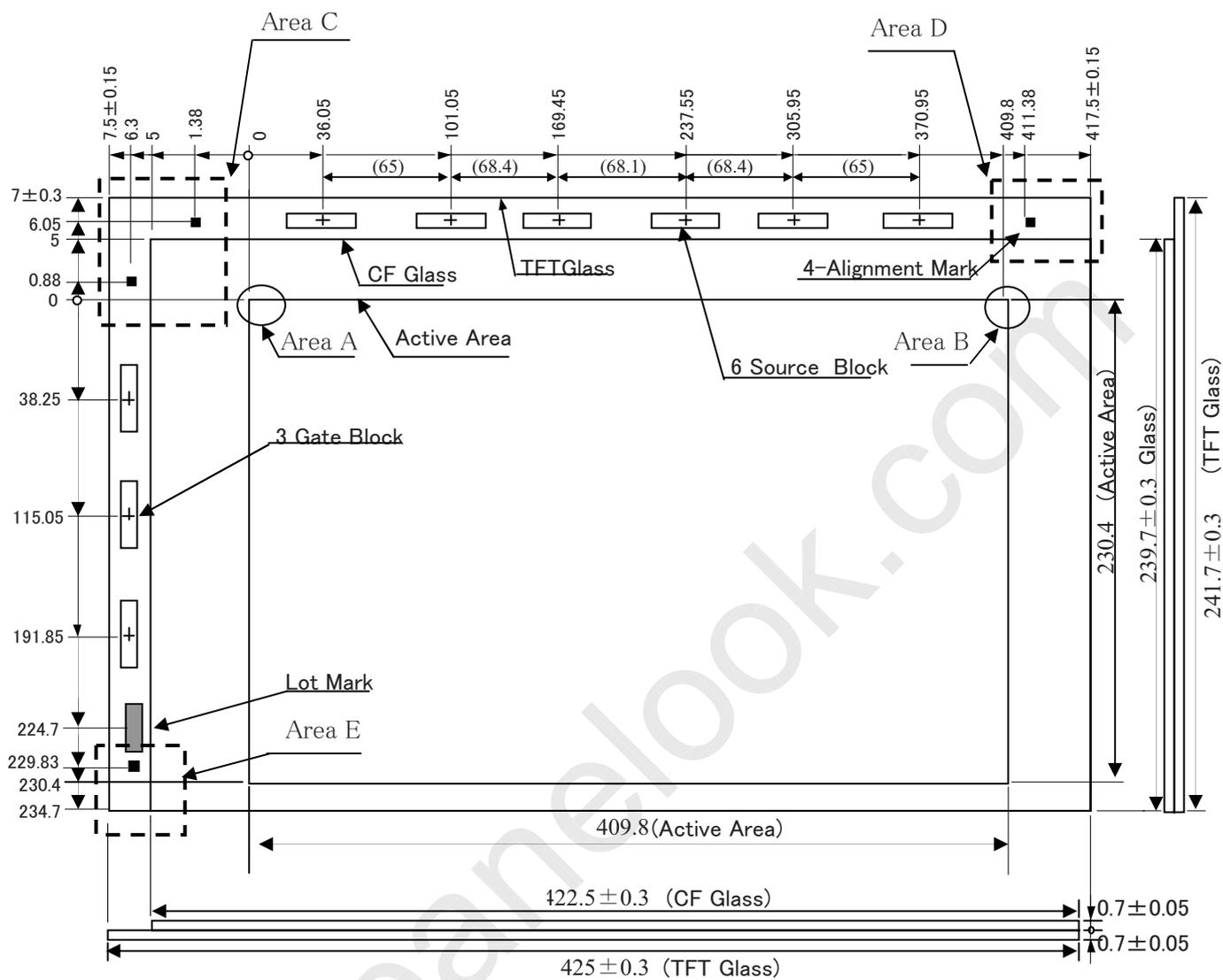
## 4.2 Correspondence between input terminals and display pixels.



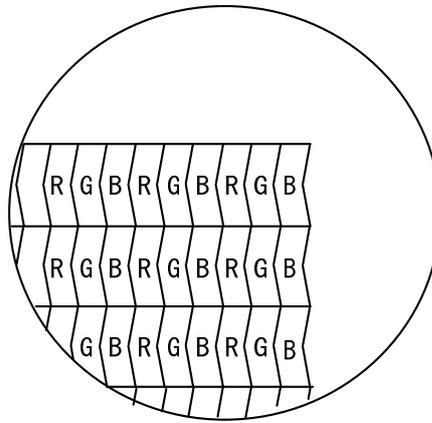
5.DIMENSIONAL OUTLINE

[unit : mm]

5.1 TFT-LCD cell dimensional outline

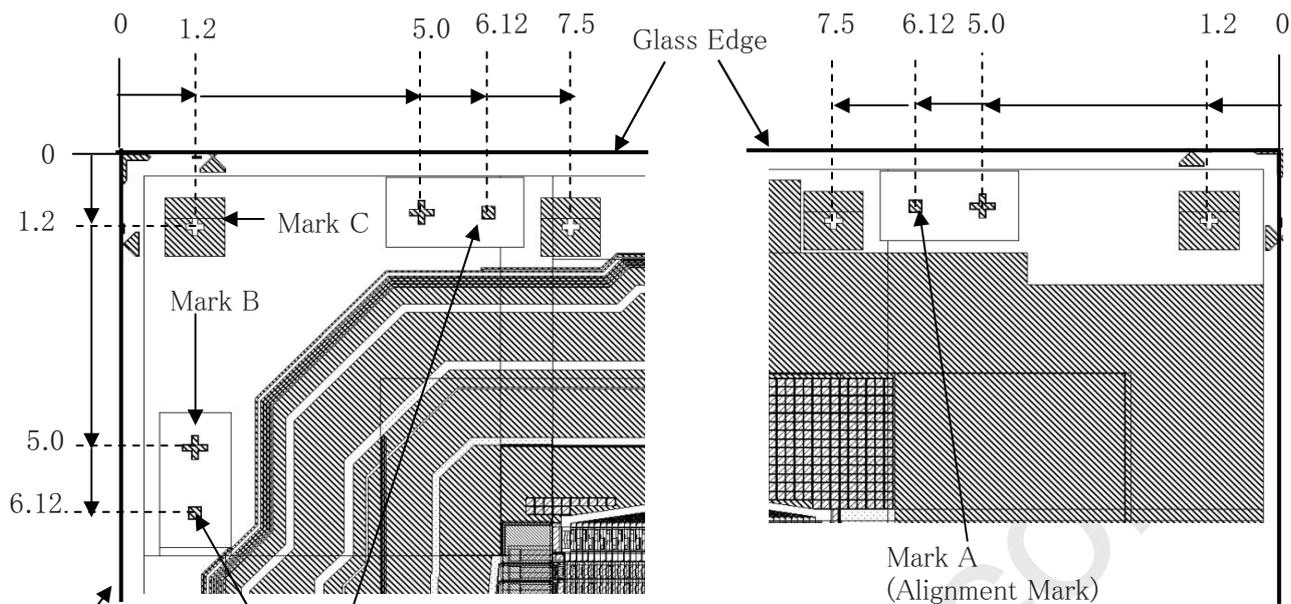


Detail of Area A



Detail of Area B

[unit : mm]

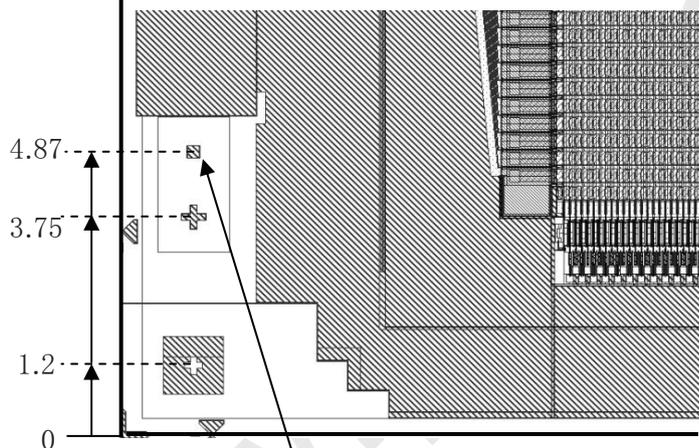


Mark A  
(Alignment Mark)

Detail of Area C

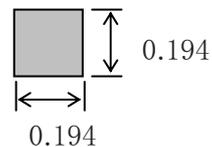
Mark A  
(Alignment Mark)

Detail of Area D



Mark A  
(Alignment Mark)

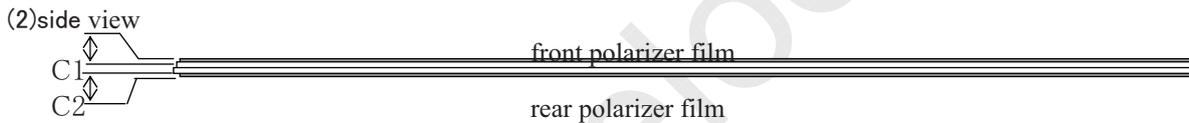
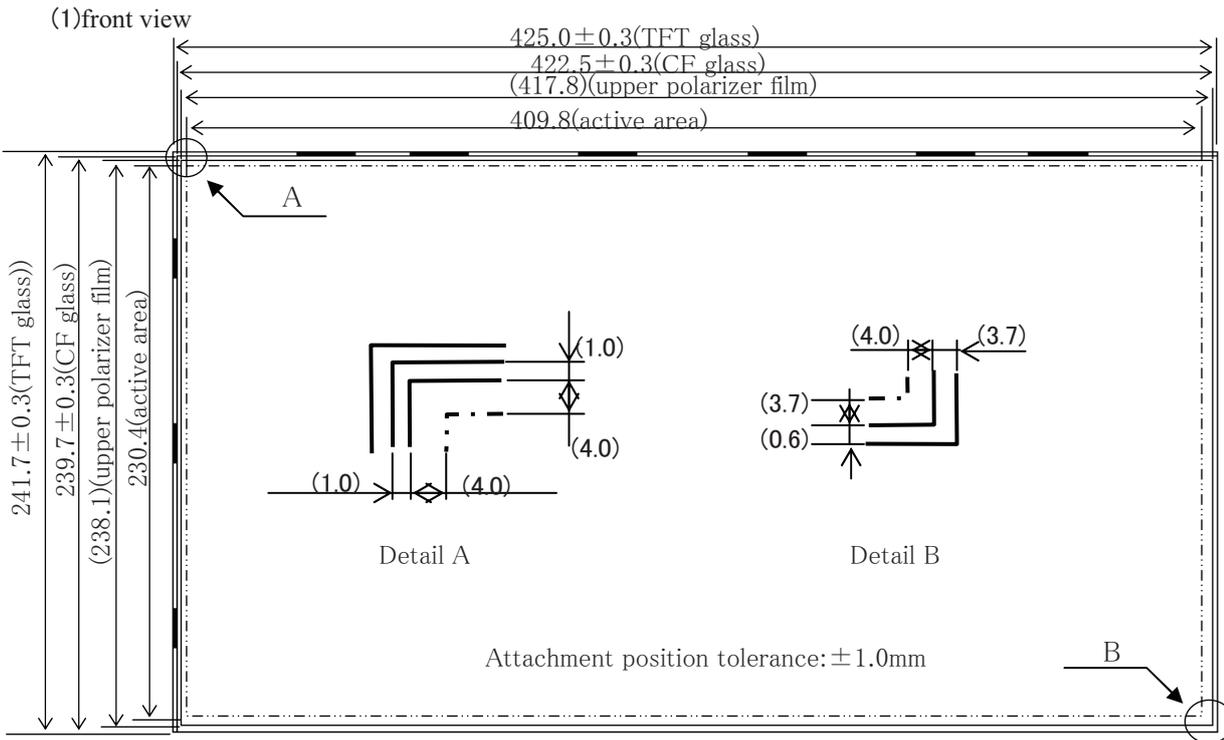
Detail of Area E



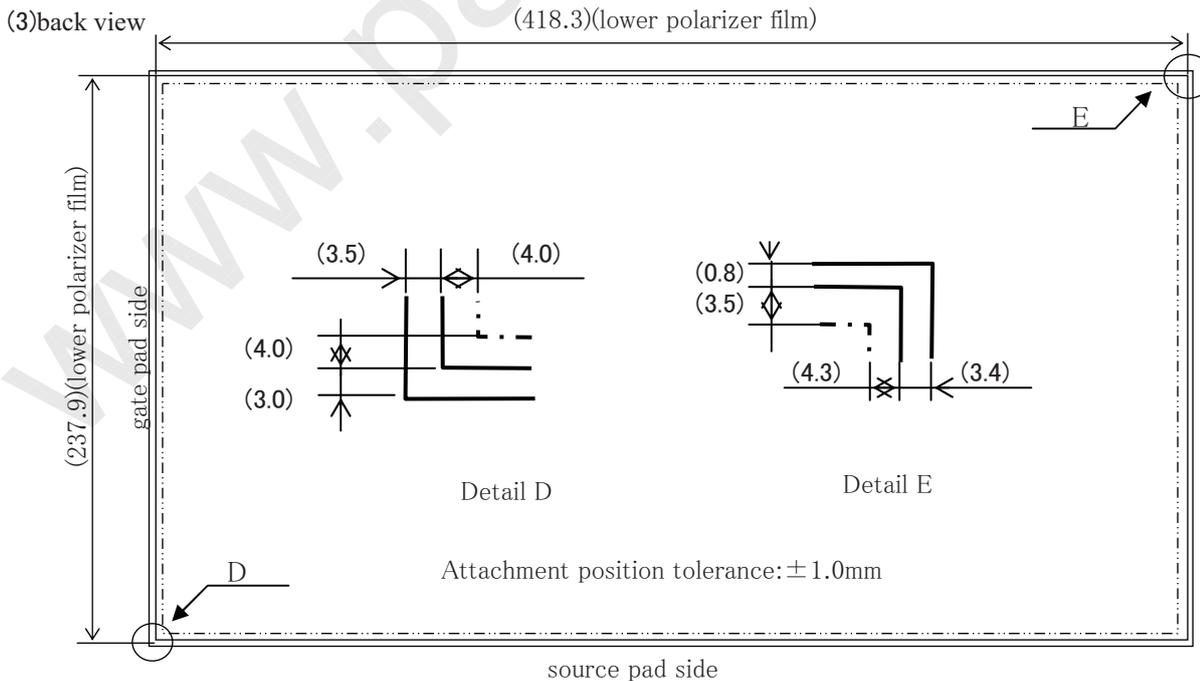
Detail of Mark A  
(Alignmentmark)

5.2 polarizer attachment

[unit : mm]



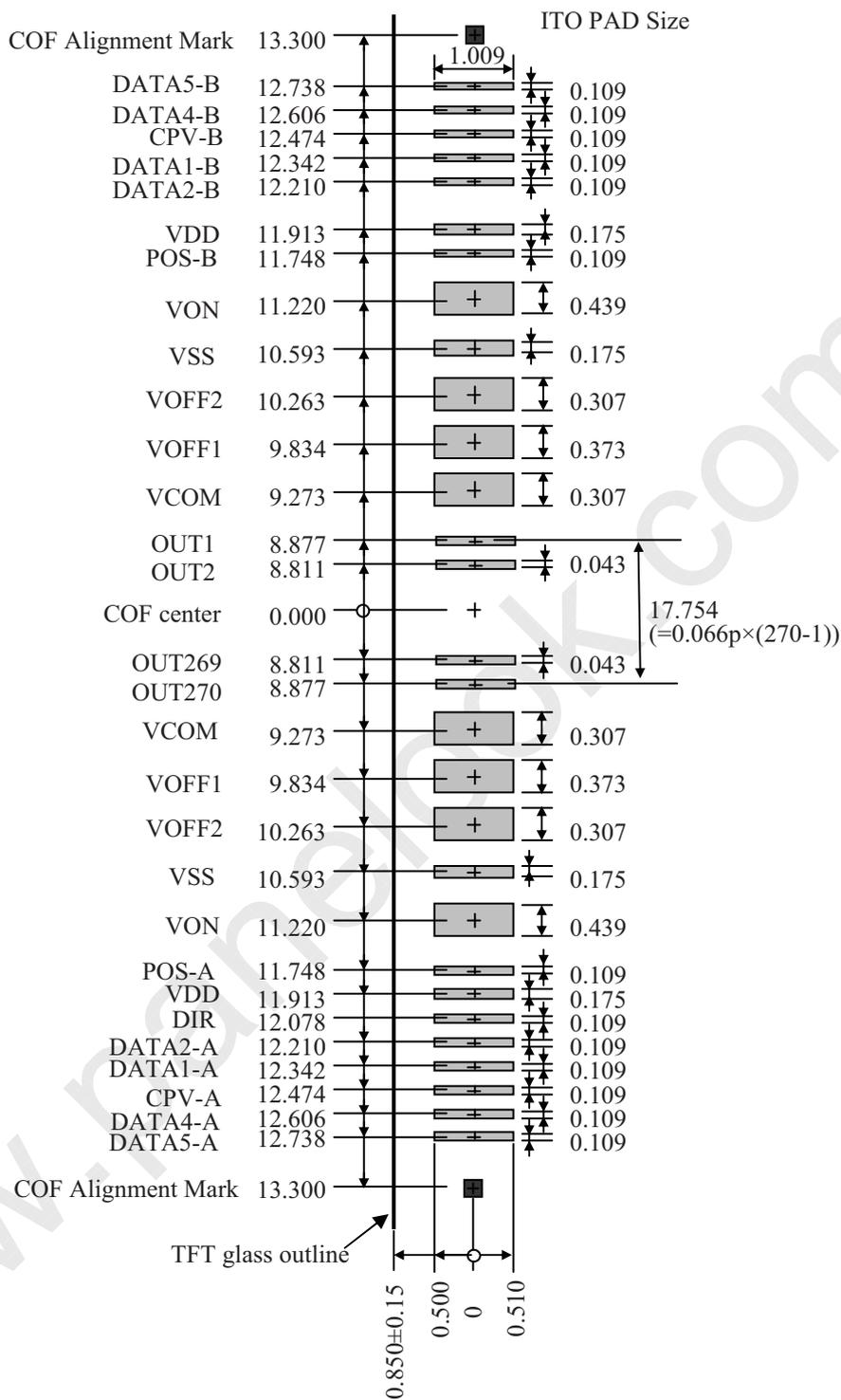
symbol	with protective film	without protective firm
C1	0.211	0.151
C2	0.206	0.146



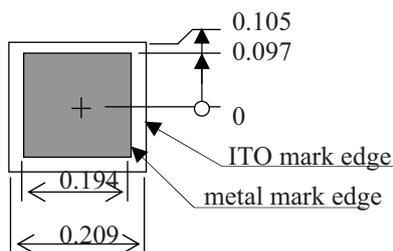
6.PAD ARRANGEMENT

[unit : mm]

6.1 GATE PAD ARRANGEMENT



COF alignment mark

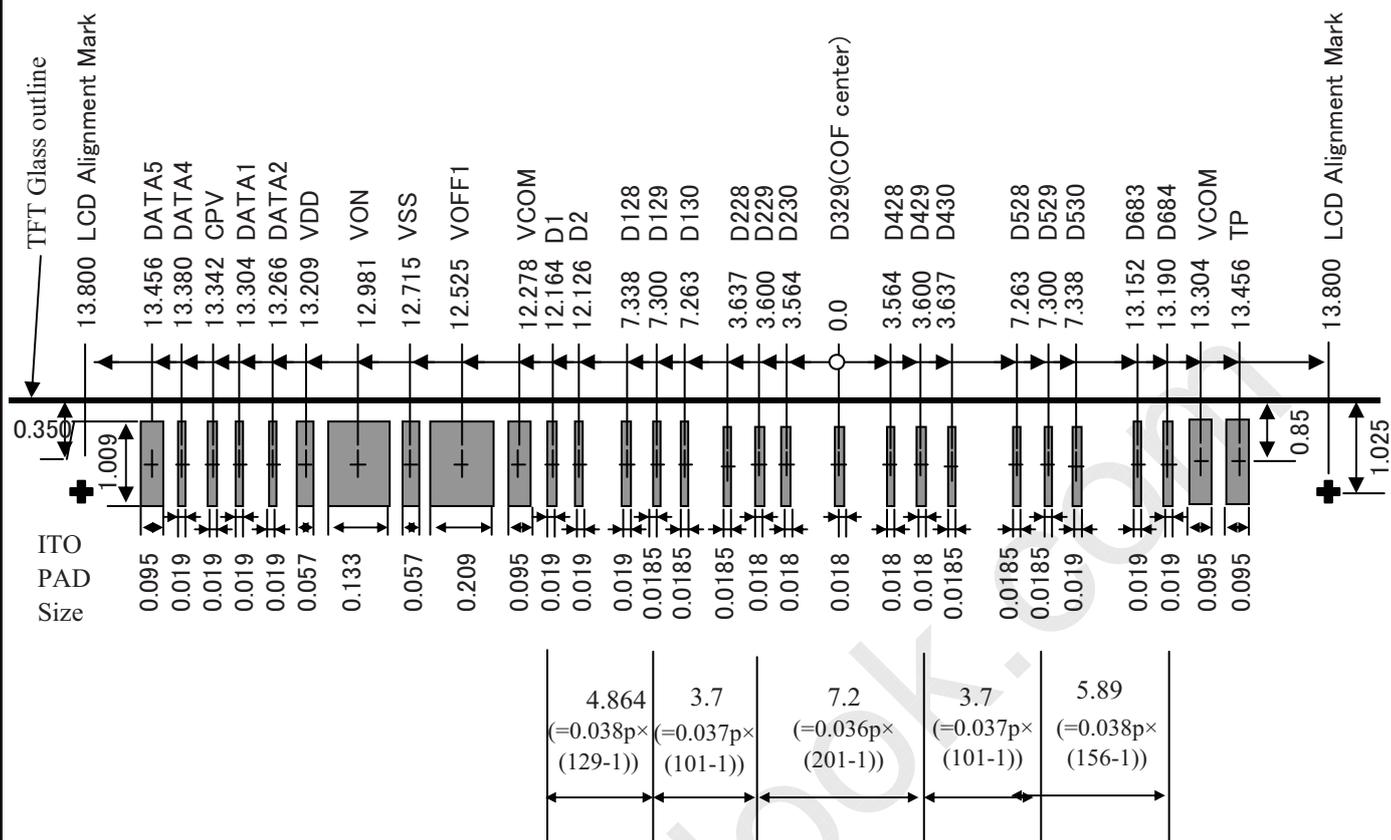


## 6.2 GATE PAD BLOCK SPECIFICATION

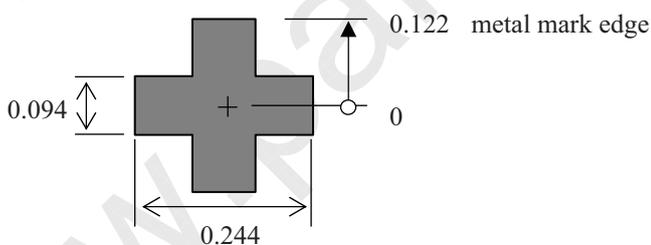
pad name	PAD specification		
	gate block 1	gate block 2	gate block 3
DATA5-B	connected	connected	connected
DATA4-B	connected	connected	connected
CPV-B	connected	connected	connected
DATA1-B	connected	connected	connected
DATA2-B	connected	connected	connected
VDD	connected	connected	connected
POS-B	connected to VDD	NC	NC
VON	connected	connected	connected
VSS	connected	connected	connected
VOFF2	connected	connected	connected
VOFF1	connected	connected	connected
VCOM	connected	connected	connected
OUT1	G1	G257	G513
:	:	:	:
OUT128	G128	G384	G640
OUT129	NC	NC	NC
:	:	:	:
OUT142	NC	NC	NC
OUT143	G129	G385	G641
:	:	:	:
OUT270	G256	G512	G768
VCOM	connected	connected	connected
VOFF1	connected	connected	NC
VOFF2	connected	connected	NC
VSS	connected	connected	NC
VON	connected	connected	NC
POS-A	NC	NC	connected to VDD
VDD	connected	connected	NC
DIR	NC	NC	NC
DATA2-A	connected	connected	NC
DATA1-A	connected	connected	NC
CPV-A	connected	connected	NC
DATA4-A	connected	connected	NC
DATA5-A	connected	connected	connected to DATA1-A

6.3 SOURCE PAD ARRANGEMENT

[unit : mm]



COF alignment mark

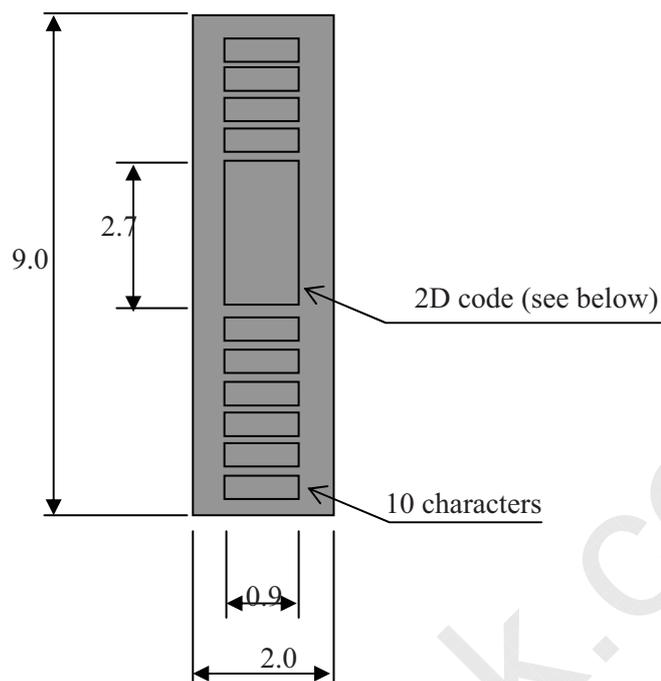


## 6.4 SOURCE PAD BLOCK SPECIFICATION

pad name	PAD specification		
	source pad block 1	source pad block 2	source pad block 3
DATA5	connected	NC	NC
DATA4	connected	NC	NC
CPV	connected	NC	NC
DATA1	connected	NC	NC
DATA2	connected	NC	NC
VDD	connected	NC	NC
VON	connected	NC	NC
VSS	connected	NC	NC
VOFF1	connected	NC	NC
VCOM	connected	connected	connected
OUT1	D1	D685	D1369
:	:	:	:
OUT681	D681	D1365	D2049
OUT682	D682	D1366	NC
OUT683	D683	D1367	NC
OUT684	D684	D1368	NC
VCOM	connected	connected	connected
TP	NC	NC	NC

pad name	PAD specification		
	source pad block 4	source pad block 5	source pad block 6
DATA5	NC	NC	NC
DATA4	NC	NC	NC
CPV	NC	NC	NC
DATA1	NC	NC	NC
DATA2	NC	NC	NC
VDD	NC	NC	NC
VON	NC	NC	NC
VSS	NC	NC	NC
VOFF1	NC	NC	NC
VCOM	connected	connected	connected
OUT1	D2050	D2734	D3418
:	:	:	:
OUT681	D2730	D3414	D4098
OUT682	D2731	D3415	NC
OUT683	D2732	D3416	NC
OUT684	D2733	D3417	NC
VCOM	connected	connected	connected
TP	NC	NC	NC

## 7. DESIGNATION OF LOT MARK



### 2D Code Specification:

Encode: Data Matrix ECC200

Size: 8 x 32 dots

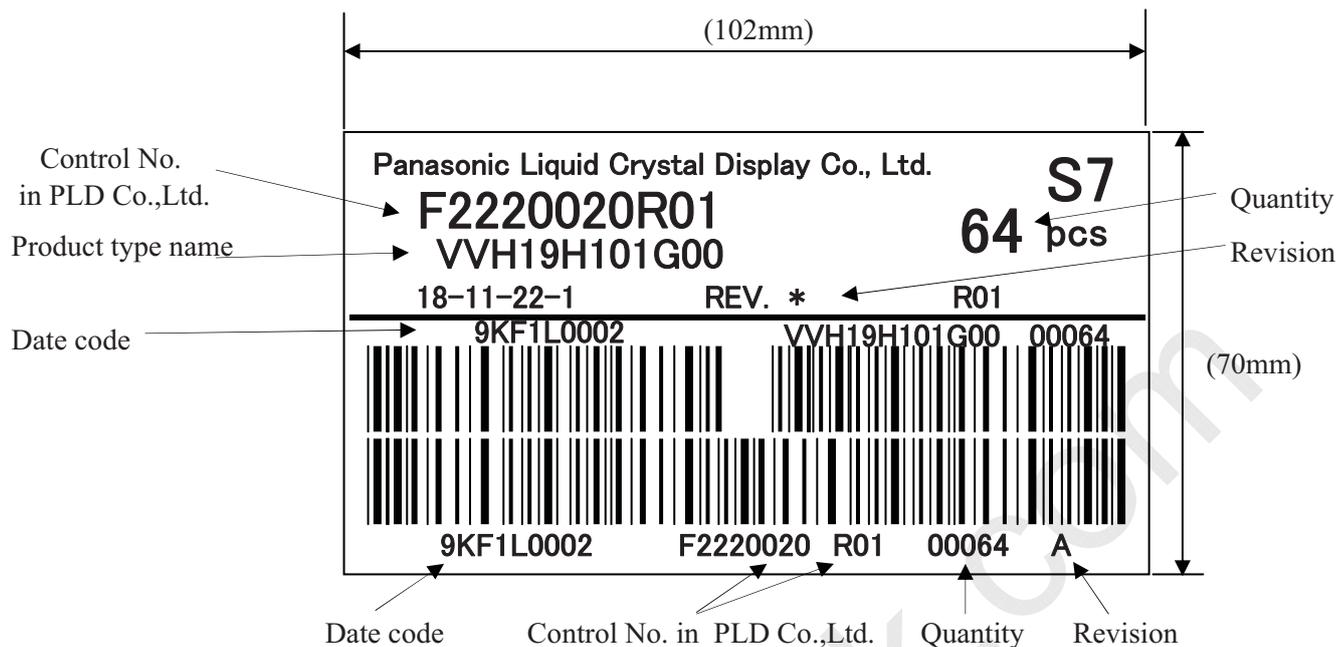
Dot size: 75  $\mu$ m x 75  $\mu$ m

Number of Characters : 13

(top 10 characters are available)

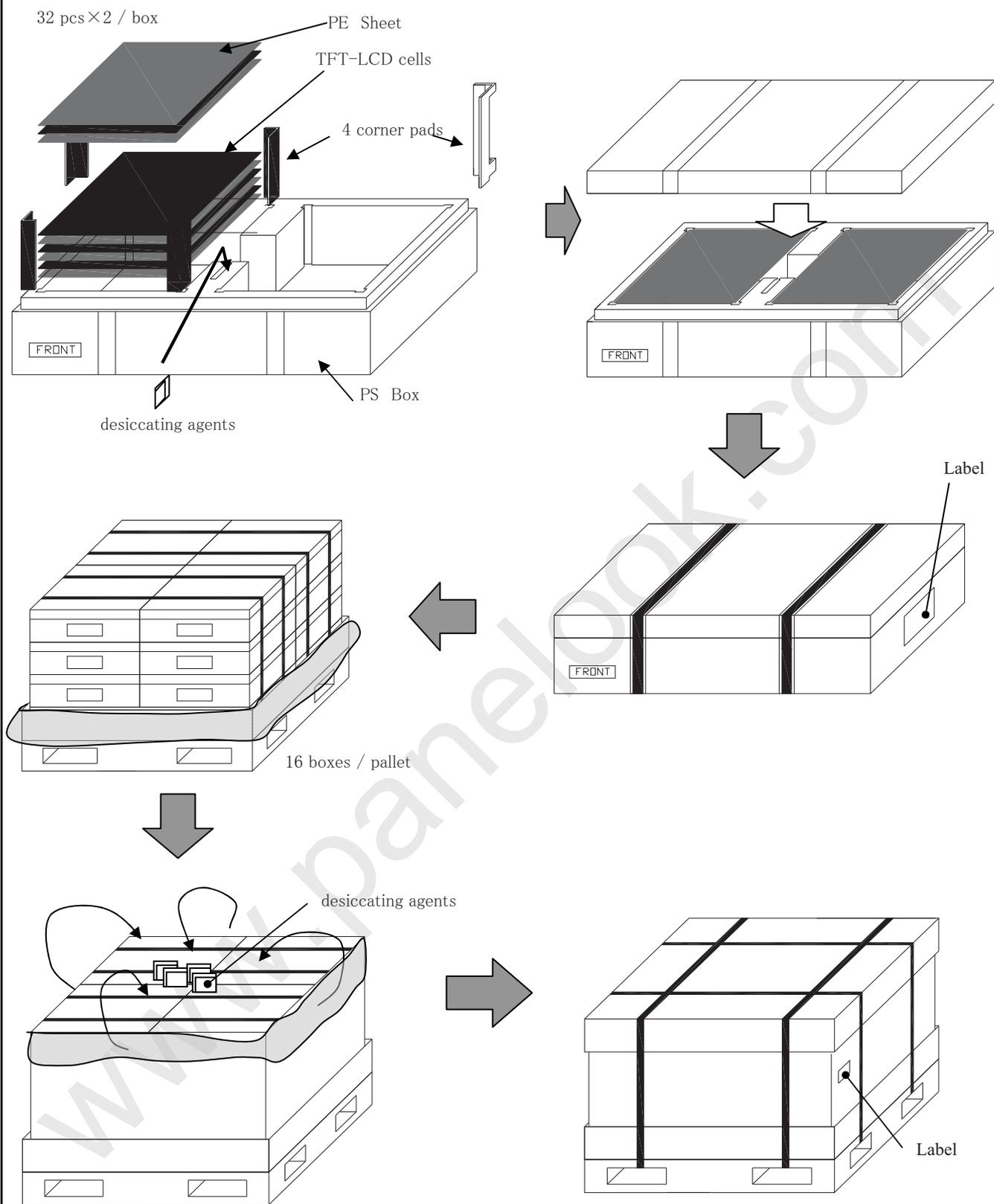
9. PACKING SPECIFICATION

9.1 LABEL SPECIFICATION



Panasonic Liquid Crystal Display Co., Ltd.	Date	Mar.1, 2011	Sheet No.	IPS4PS 2612 VVH19H101G00	page	12-1/2
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9.3 PACKING SPECIFICATION



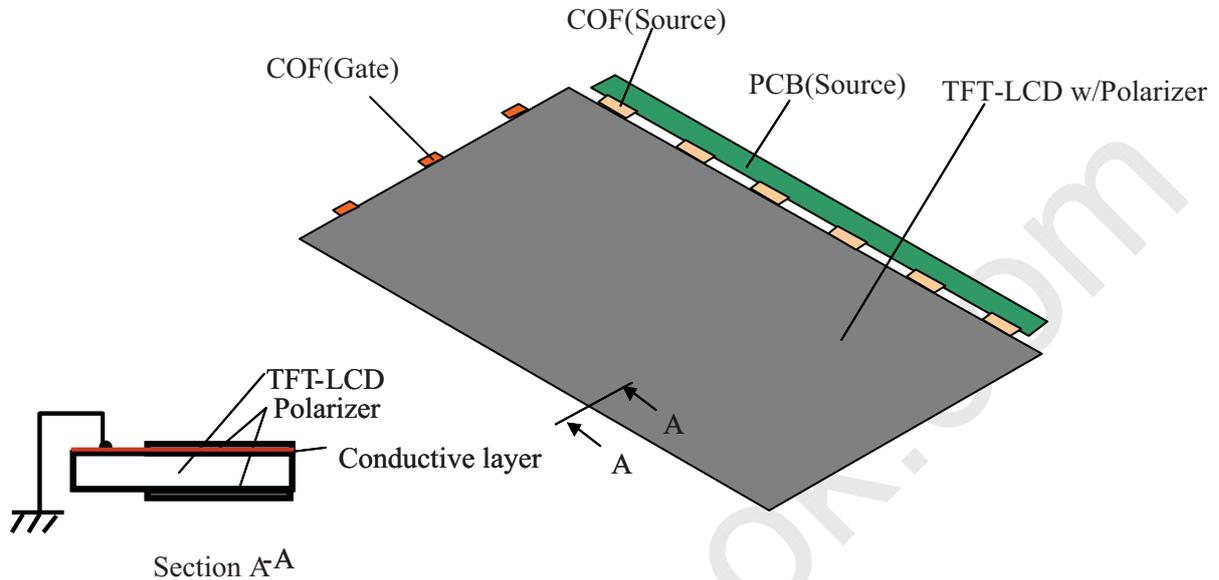
Size(L,W,H)	130 x 110 x 78 cm
Capacity	1024pcs
Gross	451 kg

## 10. PRECAUTION

Please pay attention to the followings when a TFT-LCD cell is used, handled and mounted.

### 10.1 Recommendation of GND connection of TFT-LCD open cell

(1) Please connect LCD surface (front side) to GND for prevention of static charge.

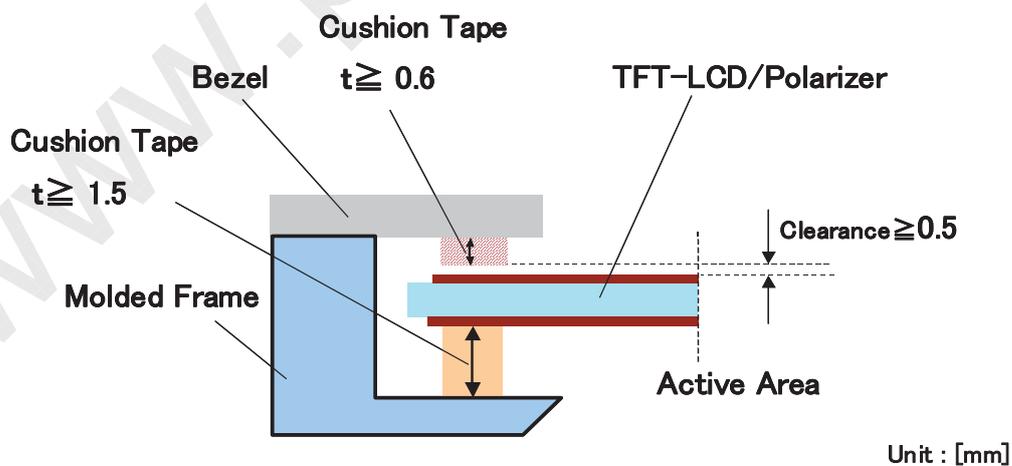


### 10.2 Recommendation of structure for supporting TFT-LCD Rim

(1) When the LCD is applied by stress, it occurs abnormal image quality.

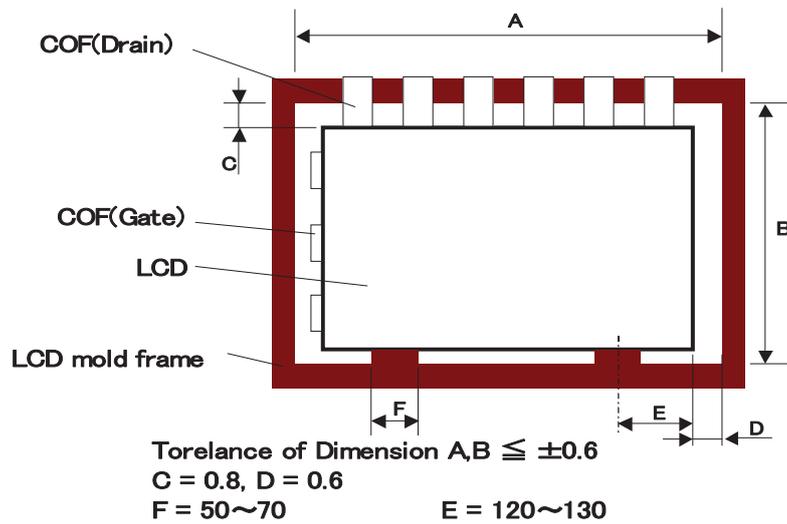
(It is confirmed visually especially in case of gray raster.)

The system shown on the drawing down below is recommended to maintain the LCD by cutting down the LCD stress.



Unit : [mm]

(2)The dimension of mold frame and LCD is recommended as follows.



Unit : [mm]

- (3)The wall of the mold frame should be laid on whole sides of the LCD as much as possible.
- (4)The holding space for the LCD should be maintained by the mold frame and the bezel.
- (5)Screw the mold frame to the lower frame at many places to keep flatness of LCD support area.
- (6)The mold frame should be the structure that is divided into four sides to keep flatness of LCD support area.
- (7)LCD support surface at lower side should smooth to cutting down the LCD stress.  
 (Put PET tape between LCD and support area, etc.)
- (8)At the time of ground connection, take a method that does not put a load to the LCD.
- (9)Use silicon rubber with hardness 20 for cushion to the mold frame side.
- (10)Use foaming cushion to Bezel side.
- (11)Flatness of the Bezel should be 0.5 which also should be the shape does not have partial changing points.
- (12)The bezel should be the structure that is divided into four sides and screwed from the upper side.
- (13)The surface of the cushion (the surface which attaches to the LCD) should be mat finishing or should put PET tape to avoid the LCD and the cushion from sticking together.

### 10.3 Precaution to operation

- (1) The ambient temperature near the operated cell and electronic parts should be satisfied with the ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.
- (2) The noise of signals applied to TFT-LCD cell may make the displayed picture noisy.  
 In this case, the signal noise should be reduced.
- (3) Optical response time, luminance and chromaticity depend on the temperature of a TFT-LCD cell.
- (4) Sudden temperature change may cause dew on and/or in the a TFT-LCD cell. Dew causes damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.
- (5) Fixed patterns displayed on a TFT-LCD cell for a long time may cause after-image. It will be recovered soon.
- (6) The TFT-LCD cell has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.
- (7)When the power is turned off, make it black raster display first. If it doesn't, pictures may remain for a while.

10.4 Precaution to polarizer

- (1)The polarizer on a TFT cell should carefully be handled due to its softness, and should not be touched, pushed or rubbed with glass, tweezers or anything than B pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand,greasy clothed or dusty clothes.
- (2) The surface of a polarizer should be gently wiped with absorbent cotton, chamois or other soft materials slightly contained petroleum benzene when the surface becomes dirty. Normal-hexane or Isopropyl alcohol as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a TFT cell. Other cleaning chemicals such as acetone, toluen, alcohol and water should not be used to clean adhesives because they cause chemical damage to a polarizer.
- (3)Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer and electronic parts may be deformed.
- (4)Touching the display area with bare hands or contaminating them is prohibited. They may leave a stain on the display. (And some cosmetics are detrimental to polarizers.)

10.5 Precaution to mounting drivers

- (1)Pay attention not to damage the area where the driver and the FPC are mounted.  
If these areas are damaged, the LCD Module may have a malfunction after it is assembled in your case.
- (2)It is recommended to get the dirt out of the terminal before the driver is mounted. In this case, isopropyl alcohol of electric industrial grade is recommended to use. Other chemicals such as acetone, toluen, alcohol and water should not be used to clean terminal because the cause chemical damage to polarizers. And soft materials should be used in order to prevent from scratching or peeling wiring material on the TFT glass. After the terminal is cleaned, make sure that no substances that corrode wiring materials (such as sodium ion and so on) remain.
- (3)TFT-LCD cell has slight warpage.  
If the warpage of the cell affects the driver mounting, it shall be fixed before the driver is mounted.
- (4) After mounting drivers on the TFT-LCD cell, TFT glass substrate on the terminal area should be covered with resin, in order to prevent from corrosion of wireing materials on TFT.

10.6 Precaution to handling TFT-LCD cell

- (1)As the display is made of glass, it is possible to be broken by a shock. Please handle it with care and prevent it from being dropped.
- (2)Opening the inner package box and handling the cell at the dirty place are not recommended.
- (3)The cell shall be handled slowly and gently, and keep away from something hard, the package box and etc.
- (4) If progressive crack occurs, do not use the cell for the product.  
It may break the TFT-LCD cell after the elapse of time.
- (5) Do not touch the edge of the glass even if you wear gloves. In the case of handling the cell, the vacuum contact shall be used on the the protective film of the polarizer film. If vacuum contact is too strong, it may give damage to the polarizer film and/or the screen. Accordingly, the adjustment of the degree of vacuum shall be needed.
- (6) Do not push the cell hard, otherwise mura may occur on the screen.
- (7)Do not leave a heavy thing on the display area of the TFT-LCD cell for a long time.  
Also, do not leave the TFT-LCD cell on the supporting bar or pad for a long time.

10.7 Electrostatic discharge control

- (1)The operator should be grounded with suitable gear such as a wrist band for handling it.  
Measures againsy electrostatic must be given to your manufacturing process, too.  
Pads on TFT-LCD cell should not be touched directly with bare hands.
- (2) Protection film for a polarizer on a TFT open cell should be slowly peeled off so that the electrostatic charge can be minimized.

10.8 Precaution to strong light exposure

- (1) The TFT open cell should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a TFT open cell may be degraded.

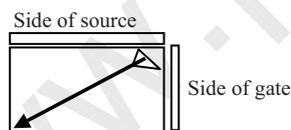
10.9 Precaution to storage

When TFT-LCD cells for replacement are stored for a long time, following precautions should be taken care of:

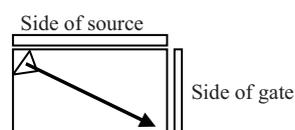
- (1) TFT-LCD cells should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage.
- (2) The surface of polarizers should not come in contact with any other object. It is recommended that TFT-LCD cells should be stored in the Panasonic Liquid Crystal Display's shipping box.

10.10 Precaution to handling protection film

- (1) The protection film for polarizers should be peeled off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band. Besides, ionized air should be blown over during peeling action. Dusts on a polarizer should be blown off by an ionized nitrogen gun and so on.
- (2) The protection film should be peeling off without rubbing it to the polarizer. Because, if the film is rubbed together with the polarizer, since the film is attached to the polarizer with a small amount of adhesive, the adhesive may remain on a polarizer.
- (3) The TFT open cell with protection film should be stored on the conditions explained in 10.9 (1). However, in case that the storage time is too long, adhesive may remain on a polarizer even after a protection film is peeled off. Besides, in case that a TFT open cell is stored at higher temperature and/or higher humidity, adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.
- (4) The adhesive can be removed easily with Normal-Hexane or isopropyl alcohol. The remained adhesive or its vestige on the polarizer should be wiped off with absorbent cotton or other soft materials such as chamois slightly contained Normal-Hexane or isopropyl alcohol.
- (5) The procedure of peeling protection film on polarizer is recommended as follows.
- (5-1) Set up LCD on the rest of the cell as the lower polarizer film comes on top gently.
- (5-2) Peel off protection film from lower polarizer film with tape.
- The protection film should be peeled as Drawing 1 or 2.



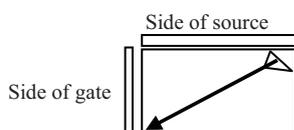
Drawing 1



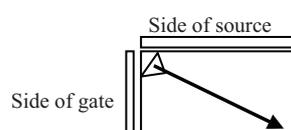
Drawing 2

- (5-3) Set up LCD on the Backlight unit as the upper polarizer film comes on top gently.
- (5-4) Connect LCD surface to GND.
- (5-5) Peel off protection film from upper polarizer film with tape.

The protection film should be peeled as Drawing 3 or 4.



Drawing 3



Drawing 4

10.11 Safety

- (1) Since a TFT cell is made of glass, handling to the broken TFT open cell should be taken care sufficiently in order not to be injured. Moreover, when any liquid(or liquid crystal) leaked out of a damaged glass cell comes in contact with your skin, immediately wash it off with soap and water.

10.12 Environmental protection

- (1) Please follow local ordinance or regulations for its disposal.

10.13 Use restrictions and limitations

- (1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.
- (2) In no event shall Panasonic Liquid Crystal Display Co., Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contract, breach of warranty, negligence, strict liability, misrepresentation and other torts.

10.14 Others

- (1) Components which may not affect any performance are subjective to change without notice because of their availability.
- (2) Never attempt to disassemble this TFT-LCD cell, There is danger such as a burn, an electric shock, and an injury. When the TFT-LCD cell is disassembled, we do not warrant these specifications including quality and safety.
- (3) The product that is repaired is not guaranteed.