

DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No: DLC0500AIG-2

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Record of Revision

Date	Revision No.	Summary
2014-06-28	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC0500AIG-2 active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 5.0'' display area contains 640(RGB) x 480 pixels.

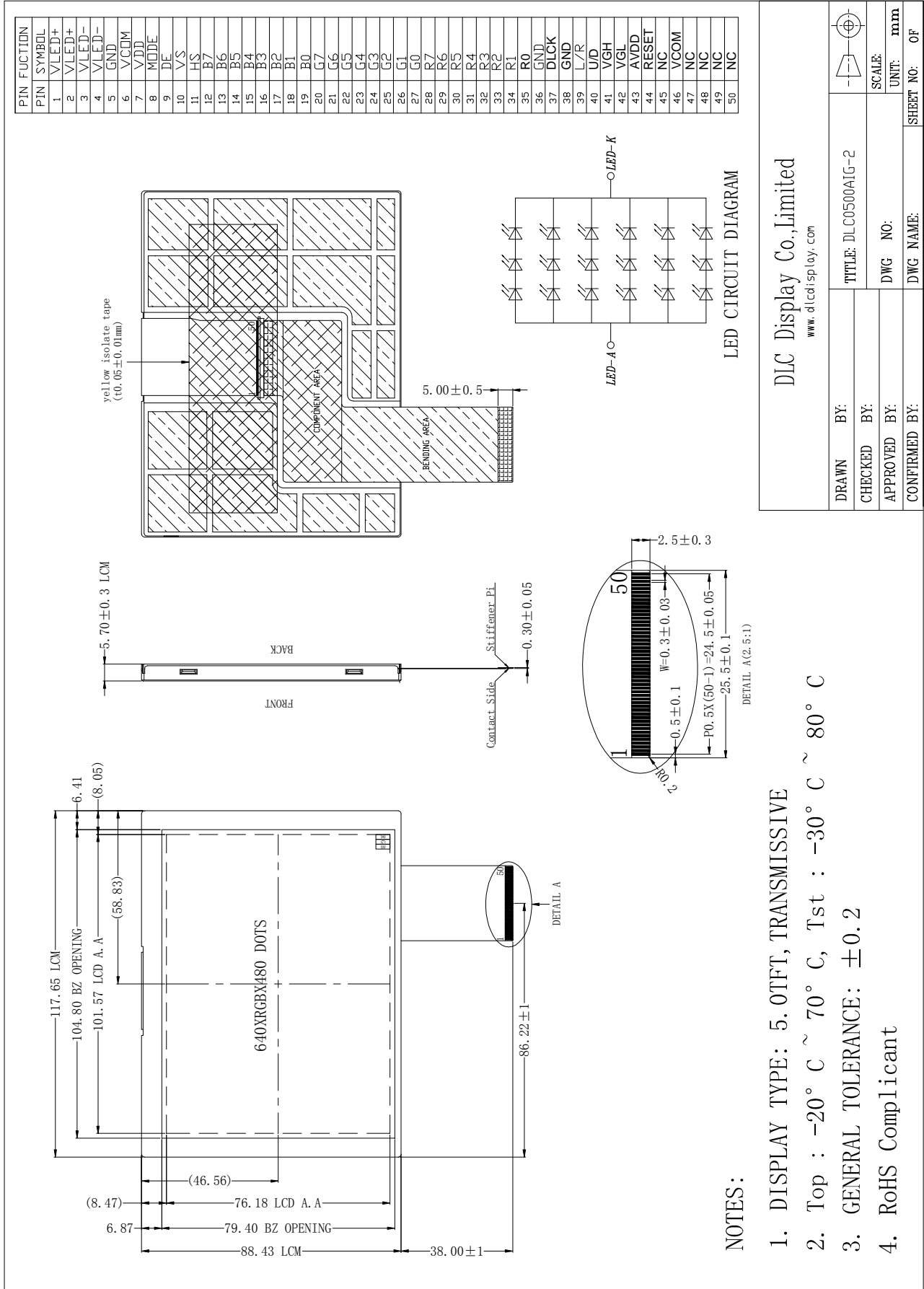
2. Application

Digital equipments which need color display, mobile navigator/video systems.

3. General Information

Item	Contents	Unit
Size	5.0	inch
Resolution	640(RGB) x 480	/
Technology type	a-Si TFT	/
Viewing Direction	12	O'Clock
Interface	RGB	
Pixel pitch (W x H)	0.053x0.159	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	117.65x 88.43x5.7	mm
Active Area(W x H)	101.57 x 76.18	mm
Display Mode	Transmissive, Normally white	/
Backlight Type	LED	/

4. Outline Drawing



5. Interface signals

Pin No.	Symbol	I/O	Function	Remark
1	VLED+	P	Power for LED Circuit	
2	VLED+	P	Power for LED Circuit	
3	VLED-	P	Power for LED Circuit	
4	VLED-	P	Power for LED Circuit	
5	GND	P	Power ground	
6	VCOM	I	VCOM input	
7	VDD	P	Power for Digital Circuit	
8	MODE	I	DE or HV mode control	Note 1
9	DE	I	Data Enable	
10	VS	I	Vsync signal input	
11	HS	I	Hsync signal input	
12	B7	I	Blue data input (MSB)	
13	B6	I	Blue data input	
14	B5	I	Blue data input	
15	B4	I	Blue data input	
16	B3	I	Blue data input	
17	B2	I	Blue data input	
18	B1	I	Blue data input	
19	B0	I	Blue data input(LSB)	
20	G7	I	Green data input(MSB)	
21	G6	I	Green data input	
22	G5	I	Green data input	
23	G4	I	Green data input	
24	G3	I	Green data input	
25	G2	I	Green data input	
26	G1	I	Green data input	
27	G0	I	Green data input(LSB)	
28	R7	I	Red data input(MSB)	
29	R6	I	Red data input	
30	R5	I	Red data input	
31	R4	I	Red data input	
32	R3	I	Red data input	
33	R2	I	Red data input	
34	R1	I	Red data input	
35	R0	I	Red data input(LSB)	
36	GND	P	Power ground	
37	DCLK	I	Sample clock	
38	GND	P	Power ground	
39	L/R	I	Select left to right scanning direction	Note 2

40	U/D	I	Select up or down scanning direction	Note 2
41	VGH	I	Positive power for scan driver	
42	VGL	I	Negative power for scan driver	
43	AVDD	P	Power for Analog Circuit	
44	RESET	I	Reset	
45	NC	-	No Connection	
46	VCOM	I	VCOM input	
47	NC	-	No Connection	
48	NC	-	No Connection	
49	NC	-	No Connection	
50	NC	-	No Connection	

The recommended connector: FH12S-50S-0.5SH(Hirose).

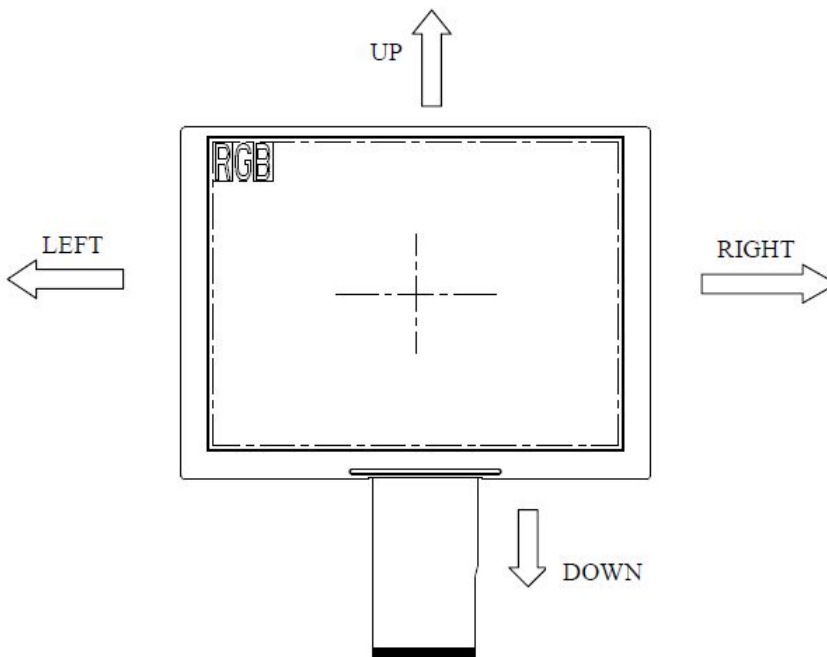
Note: I: input, O: output, P: Power

Note 1: DE Mode, Mode="H", HS floating and VS floating

HV Mode, Mode="L" and DE floating

2 Selection of scanning mode

U/D	L/R	Function
DVDD	DVDD	Up to down, left to right
GND	DVDD	Down to up, left to right
DVDD	GND	Up to down, right to left
GND	GND	Down to up, right to left



6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VDD	-0.3	3.6	V	

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. $VDD > V_{SS}$ must be maintained.

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	°C	
Storage Temperature	TSTG	-30	80	°C	

Notes:

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.
The phenomenon is reversible.
3. $T_a \leq 40^\circ\text{C}$: 85%RH MAX.
 $T_a \geq 40^\circ\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 40°C .

7. Electrical Specifications

7.1 Electrical characteristics

GND=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply voltage	VDD	2.8	3.0	3.3	V	
Current Consumption	I _{CC1}	-	20	30	mA	Normal mode
	I _{CC2}	-	0.03	0.09	mA	Sleep mode
Input Logic Voltage	V _{IL}	0	--	0.2VDD	V	
	V _{IH}	0.8VDD	--	VDD	V	
Clock Frequency	f _{CLK}		9	12	MHz	

Note:

- 1: When an optimum contrast is obtained in transmissive mode.
- 2: Tested in 1×1 chessboard pattern.

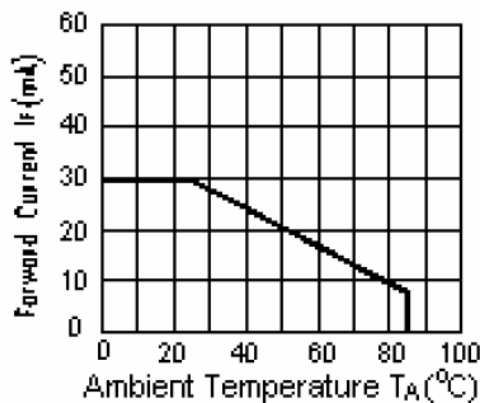
7.2 LED Backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I _F	--	120	--	mA	
Forward Voltage	V _F	--	9	--	V	
Life time	--	--	25,000	--	Hr	

Note :

- 1: The Voltage for LED Backlight is defined at Ta=25°C and I_L =120mA.
- 2: LED power consumption is around 0.132W.


 I_{LED} VS TEMP

8. Command/AC Timing

8.1 Input/output timing

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
PXLCLK clock time	Tclk	33.3	39.7	-	ns	1 Tclk
PXLCLK pulse duty	Tcwh	40	50	60	%	Tclk
DATA set-up time	Tdsu	12	-	-	ns	DATA to PXLCLK
DATA hold time	Tdhd	12	-	-	ns	DATA to PXLCLK
DE setup time	Tesu	12	-	-	ns	DE to PXLCLK
VSYNC setup time	Tvst	12	-	-	ns	
VSYNC hold time	Tvhd	12	-	-	ns	
HSYNC setup time	Thst	12	-	-	ns	
HSYNC hold time	Thhd	12	-	-	ns	
HSYNC period time	Th	22.91	31.76	-	us	
HSYNC width	Thwh	1	-	-	Tclk	
VSYNC width	Tvwh	1	-	-	Th	
HSYNC to CLKIN	Thc	-	-	1	Tclk	

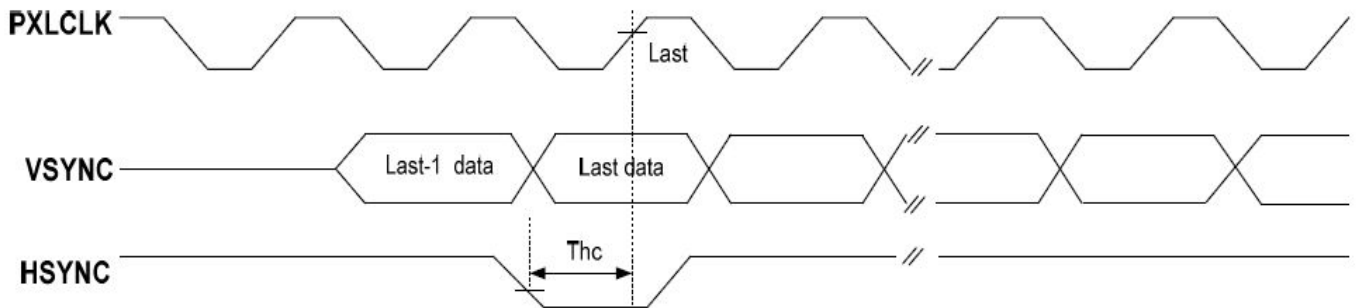
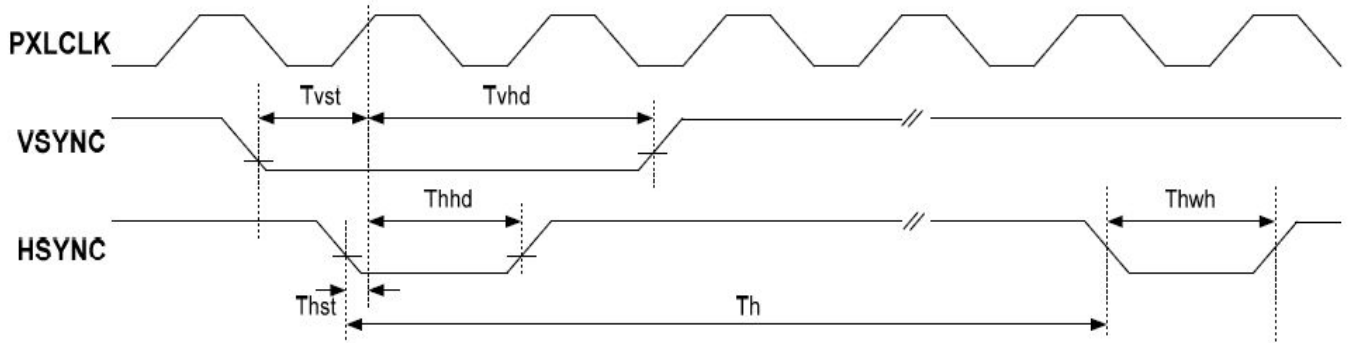
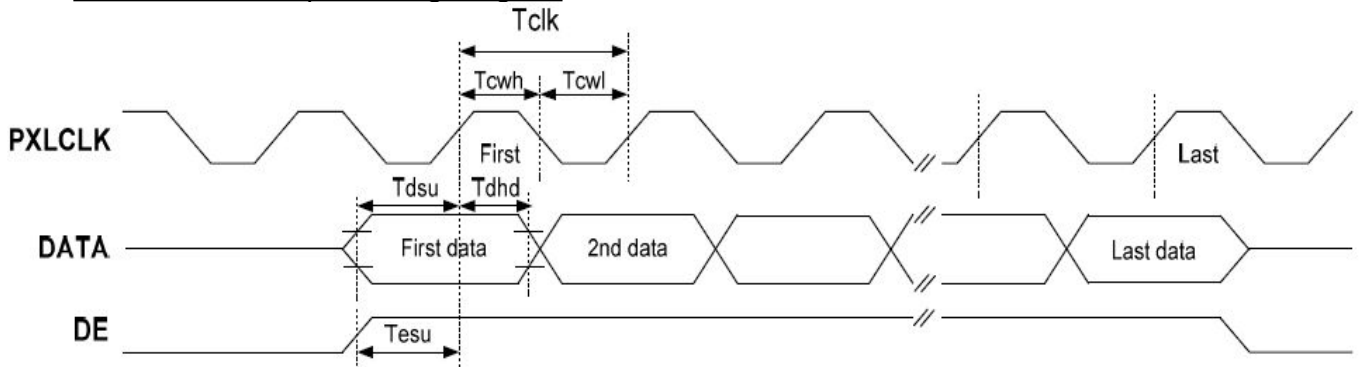
Input Timing Limitation of DE Mode

Parameter	MIN.	TYP.	MAX.	Unit	Note
THC	48	160	765	tclk	
THD	640	640	640	tclk	
TH	688	800	1405	tclk	1TH=1line
TVC	6	45	255	Line	
TVD	480	480	480	line	
TV	486	525	735	line	1TV=1field

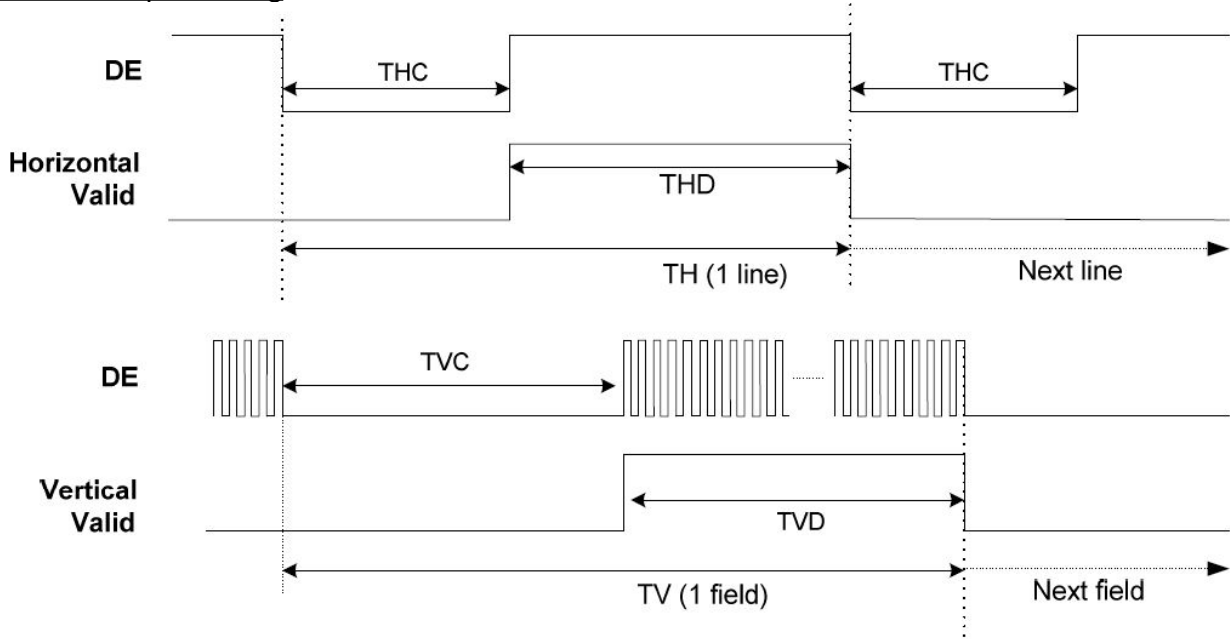
Input Timing Limitation of HV Mode

Parameter	MIN.	TYP.	MAX.	Unit	Note
Thwh	-	10	-	tclk	
Thbp	-	134	-	tclk	
Thfp	-	16	-	tclk	
THD	-	640	-	tclk	
TH	-	800	-	line	
Tvwh	-	2	-	line	
Tvbp	-	11	-	line	
Tvfp	-	32	-	line	
TVD	-	480	-	line	
TV	-	525	-	line	1TV=1field

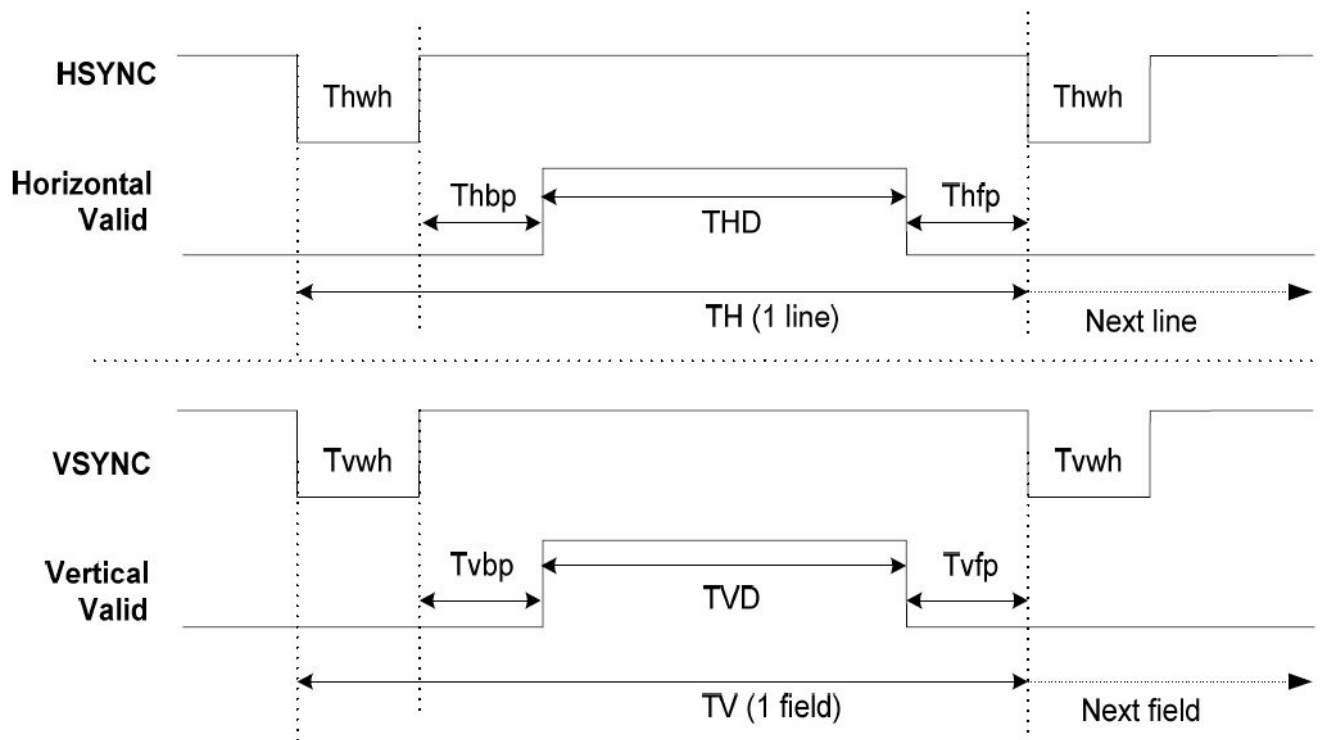
8.2 Timing Diagram
 Clock and Data Input Timing Diagram



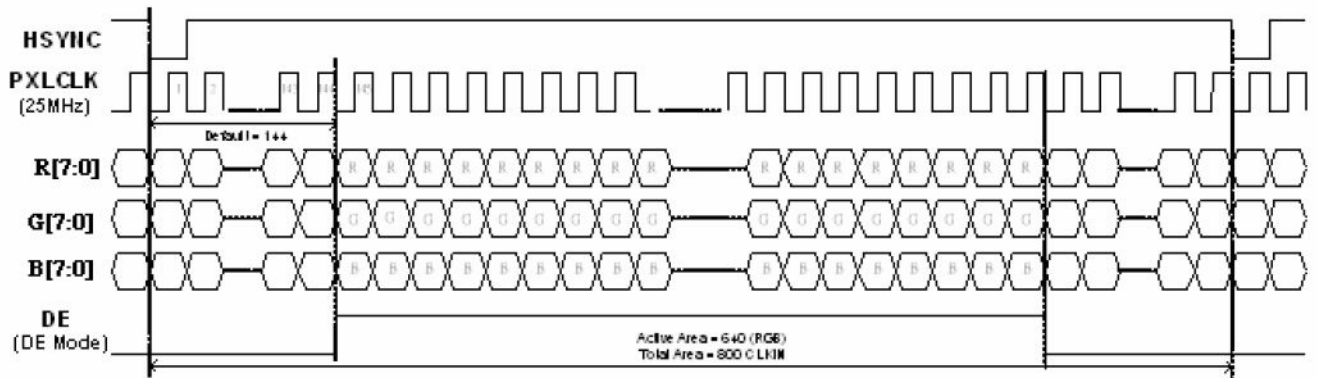
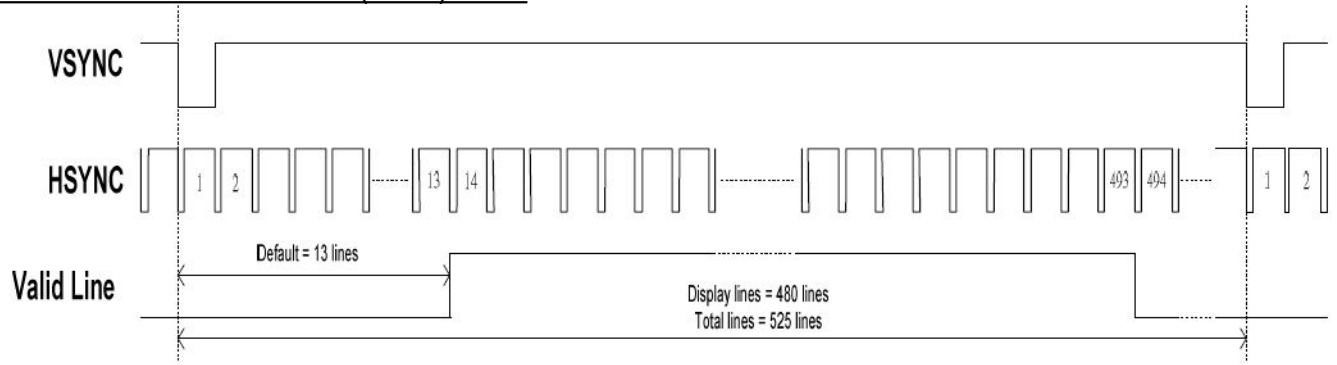
DE Mode Input Timing



HV Mode Input Timing

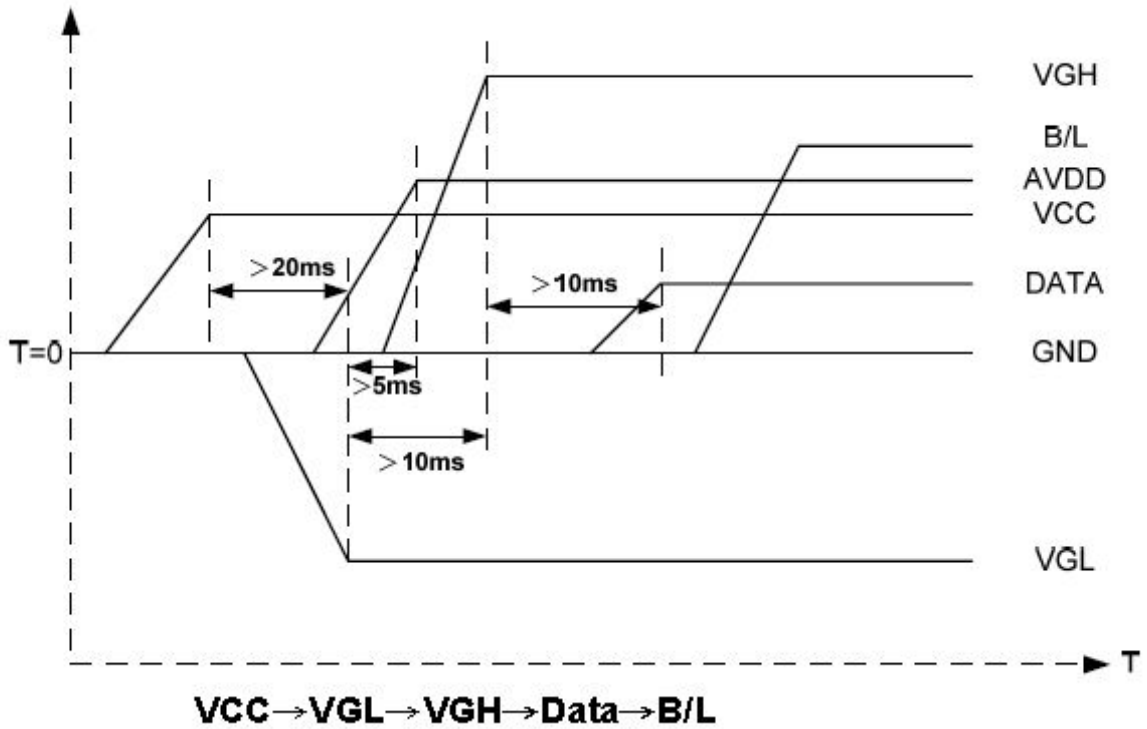


24 bit RGB mode for 640 x(RGB)x 480

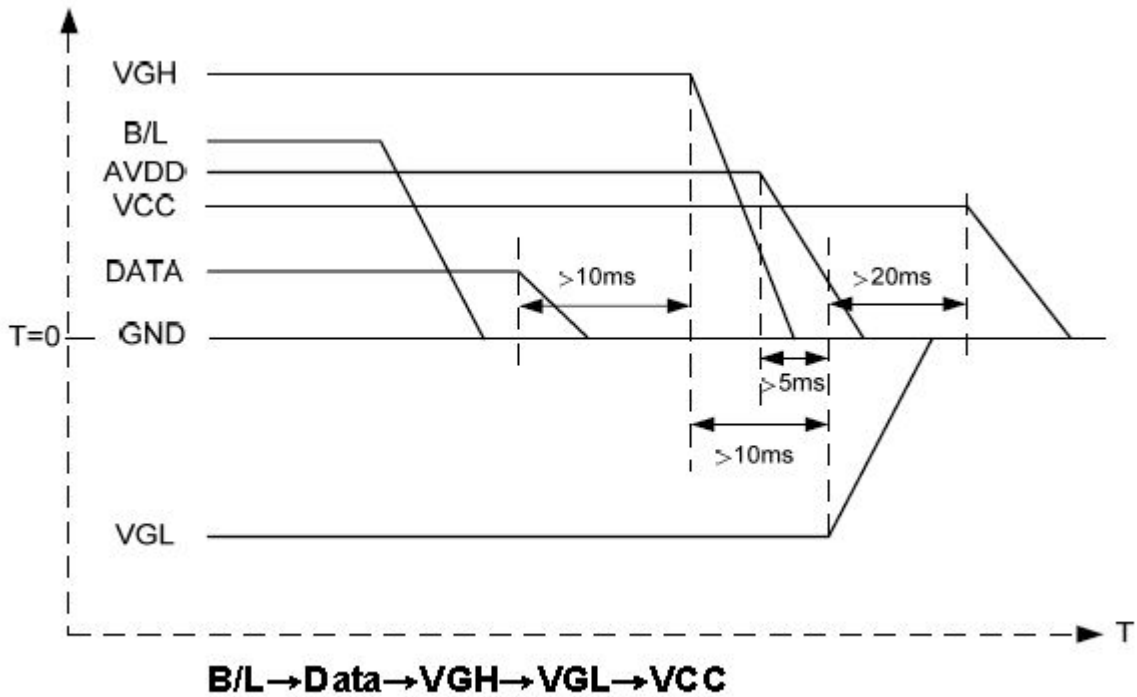


8.3 power sequence

8.3.1 power on:



8.3.2 power off:



Note: Data includes DE, VS, HS, B0~B7, G0~G7, R0~R7, DCLK.

9. Optical Specification

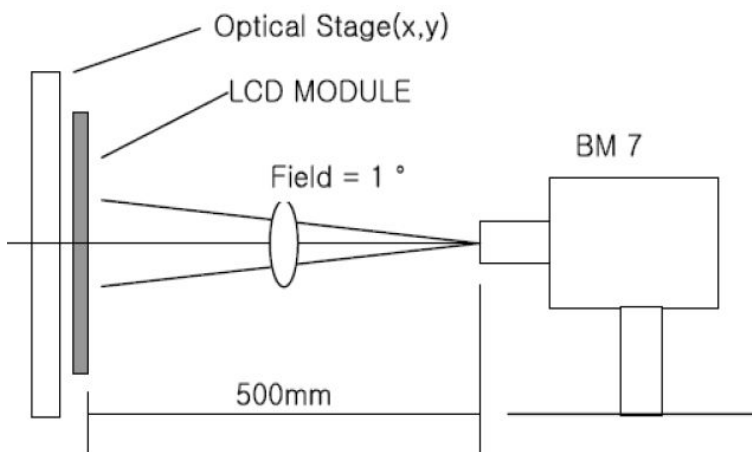
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark		
Contrast Ratio	CR	$\theta=0^\circ$	300	500	-		Note1 Note2		
Response Time	Tr/ Tf	25°C	-	10	-	ms	Note1 Note3		
				10	-				
View Angles	θT	$CR \geq 10$	-	60	-	Degree	Note 4		
	θB		-	45	-				
	θL		-	60	-				
	θR		-	60	-				
Chromaticity	White	Brightness is on	Typ-0.05	Typ+0.05			Note5, Note1		
								x	0.28
	y							0.33	
	Red							x	0.51
								y	0.34
	Green							x	0.31
								y	0.56
	Blue							x	0.15
y		0.14							
Luminance	L		-	400	-	cd/m ²	Note1 Note6		
Uniformity	U		75	80	-	%	Note1 Note7		

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

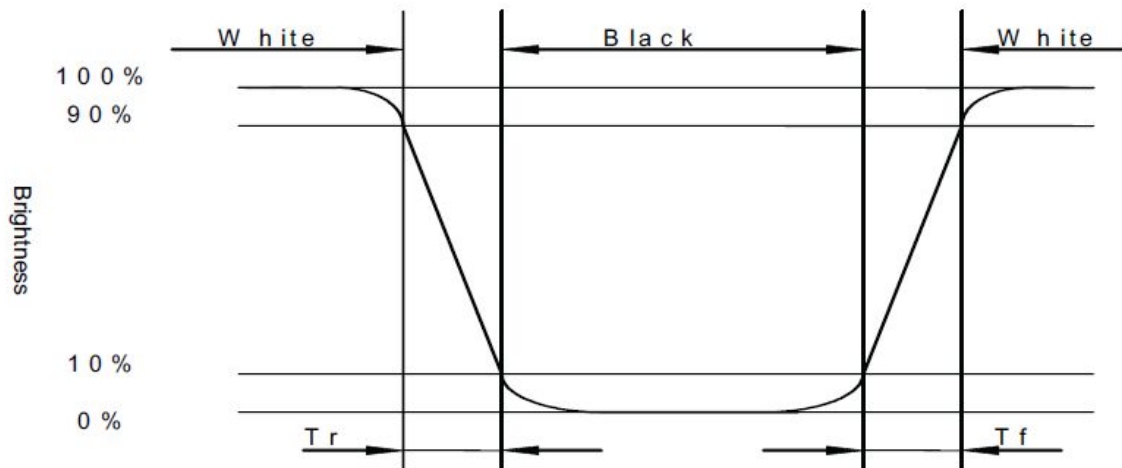


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

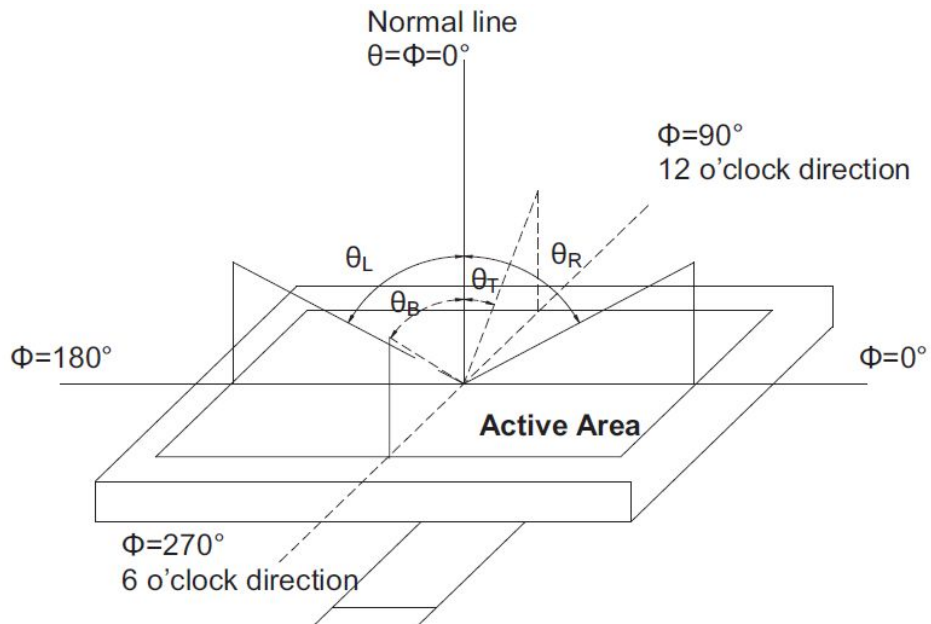
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time, T_r) and from white to black (Decay Time, T_f).



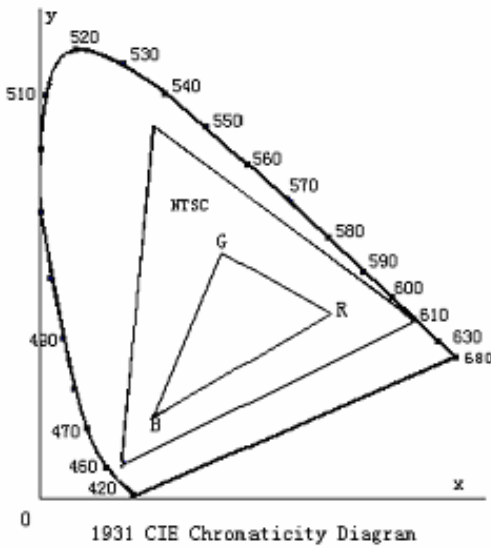
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels “White” at the center of display area on optimum contrast.

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

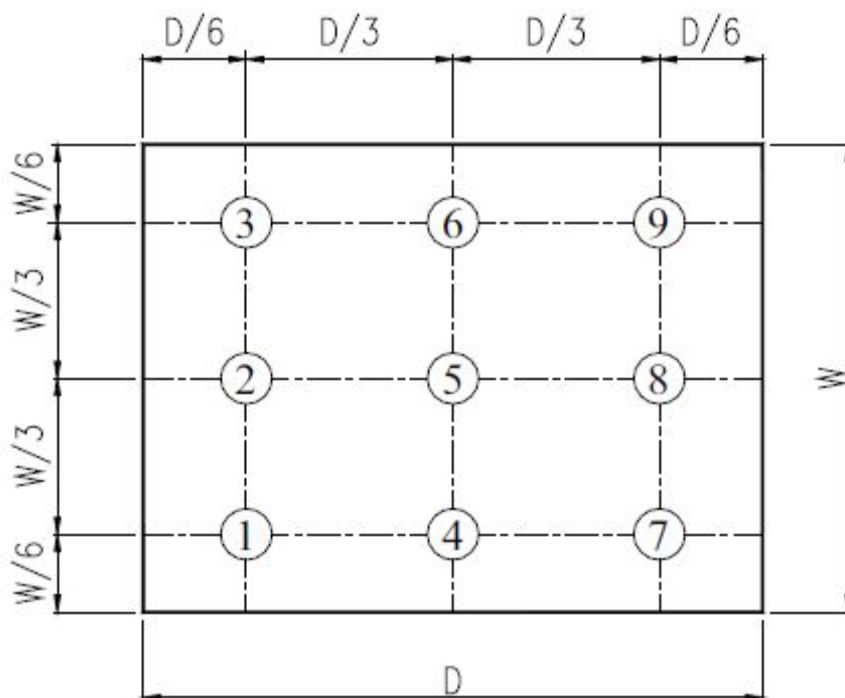


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 96hrs	Per table in below
2	Low Temp Operation	Ta=-20°C, 96hrs	Per table in below
3	High Temp Storage	Ta=+80°C, 96hrs	Per table in below
4	Low Temp Storage	Ta=-30°C, 96hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH 96 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 5 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω · 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table in below
8	Vibration (Non-operation)	10Hz~150Hz, 100m/s ² , 120min	Per table in below
9	Shock (Non-operation)	Half- sine wave,300m/s ² ,11ms	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of LCD Modules

11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

- A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability
- C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.
- D. Provide a space so that the panel does not come into contact with other components.
- E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
- F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.
- G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
- H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

- A. Ground soldering iron tips, tools and testers when they are in operation.
- B. Ground your body when handling the products.
- C. Power on the LCD module before applying the voltage to the input terminals.
- D. Do not apply voltage which exceeds the absolute maximum rating.
- E. Store the products in an anti-electrostatic bag or container.

11.4 Storage

- A. Store the products in a dark place at $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.
- B. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

- A. Do not wipe the touch panel with dry cloth, as it may cause scratch.
- B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.

