BA035HV3-800-1QPO - Product Specification

Rev. O

BEIJING BOE OPTOELECTRONICS TECHNOLOGY

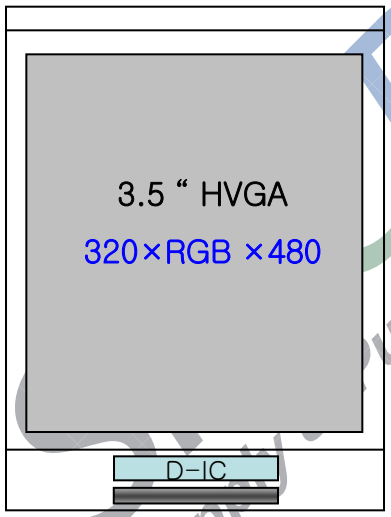
REV.	ECN NO.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2012.05.25	
0		Final spec	2012.08.20	

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

3.5”HVGA is a color active matrix TFT LCD module using amorphous silicon TFT‘ s (Thin Film Transistors) as an active switching devices. This module has a 3.5inch diagonally measured active area with HVGA resolutions (320horizontal by 480 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical Stripe and this module can display 262K colors.



1.2 Features

- High color 60%
- 0.8t Glass
- wide viewing angle (U/D/L/R)：70/60/70/70

1.3 Application

- smart mobile phone (Domestic)

1.4 General Specification

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	48.96 (H) x 73.44(V)	mm	
CF size	52.96(H) x 77.34 (V)	mm	
Number of pixels	320(H) ×480(V)	pixels	
Pixel pitch	0. 051(H) ×0.153 (V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	262K	colors	
Color gamut	60	%	
Display mode	Normally White		
Dimensional outline	52.96 (H) x 81.44(V)× 0.8	mm	
Weight	TBD	g	
Gray level inversion	12 O'clock		Figure 10
D-IC	ILI 9487 / R61581 / NT35310		

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings>

Parameter	Symbol	Min.	Max.	Unit	Remarks
LC operating Voltage *1)	V_{OP}		3.3	V	Ta=25+/-2˚C
Operating Temperature (Humidity)	T_{OP}	-20	+70	˚C	
	RH		90	%	At 60˚C
Storage Temperature (Humidity)	T_{ST}	-30	+80	˚C	
	RH		90	%	At 60˚C

*1) Liquid Crystal driving voltage
Due to the characteristics of LC Material, this voltage varies with environmental temperature.

3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. Electrical specifications > Ta=25+/-2°C

Parameter	Symbol	Value	Unit	Remarks
TFT Gate ON Voltage	VGH	12~18	V	
TFT Gate OFF Voltage	VGL	-15~ -6	V	
TFT Common Electrode Voltage	VCOM	-2~5	V	
TFT Kick-Back Voltage Max	ΔVp Max	1.0~1.5	V	
TFT Kick-Back Voltage Min	ΔVp Min	0.6~1.0	V	

Notes :
1. VGH is TFT Gate operating voltage.
2. VGL is TFT Gate operating voltage. The low voltage level of VGL signal must be fluctuates with same phase as Vcom.
3. Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc..
4. The value is just the reference value. The customer can optimize the setting value by the different D-IC

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θØ=90 (= θ12) as the 12 o'clock direction ("upward"), θØ=180 (= θ9) as the 9 o'clock direction ("left") and θØ=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, the center of the measuring spot on the Display surface shall stay fixed.
Optimum viewing angle direction is 6o'clock.

<Table 4. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	70	-	Deg.	WV Pol Note 1
		Θ_9		-	70	-	Deg.	
	Vertical	Θ_{12}		-	70	-	Deg.	
		Θ_6		-	60	-	Deg.	
Luminance Contrast ratio		CR	Θ = 0°	350	500			Note 2
Transmittance		T(%)	Θ = 0°	5.0	5.1	-	%	Base on **C** light Note 3
White Chromaticity		x_w	Θ = 0°	0.273	0.293	0.313		**C light** Note 4
		y_w		0.308	0.328	0.348		
Reproduction of color	Red	x_R	Θ = 0°	0.635	0.655	0.675		
		y_R		0.297	0.317	0.317		
	Green	x_G		0.264	0.284	0.304		
		y_G		0.527	0.547	0.567		
	Blue	x_B		0.118	0.138	0.158		
		y_B		0.106	0.126	0.146		
Threshold Voltage		Vsat		2.2	2.4	2.6	V	Figure 3
		Vth		1.1	1.3	1.5	V	
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C Θ = 0°	-	25		ms	Note 5

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see Figure 4 shown in Appendix).

2. Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state.
(see Figure 4) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value with Polarizer

4. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
Measurement condition is C- light Source & Halogen Lampe

5. The electro-optical response time measurements shall be made as Figure 5 by switching the "data" input signal ON and OFF. The times needed for the transmittance to change from 10% to 90% is Tr, and 90% to 10% is Td.

5.0 MECHANICAL CHARACTERISTICS

5.1 Dimensional Requirements

Figure 6 shown in appendix shows mechanical outlines for the panel

<Table 5. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	48.96 (H) x 73.44(V)	mm
CF size	52.96H) x 77.34(V)	mm
Number of pixels	320 (H) × 480(V)	Pixels
Pixel pitch	0. 051(H) ×0.153 (V)	mm
Pixel arrangement	RGB Vertical stripe	
Display colors	262K	colors
Display mode	Normally white	
Dimensional outline	52.96 (H) x 81.44(V)× 0.8	mm
Weight	TBD	gram

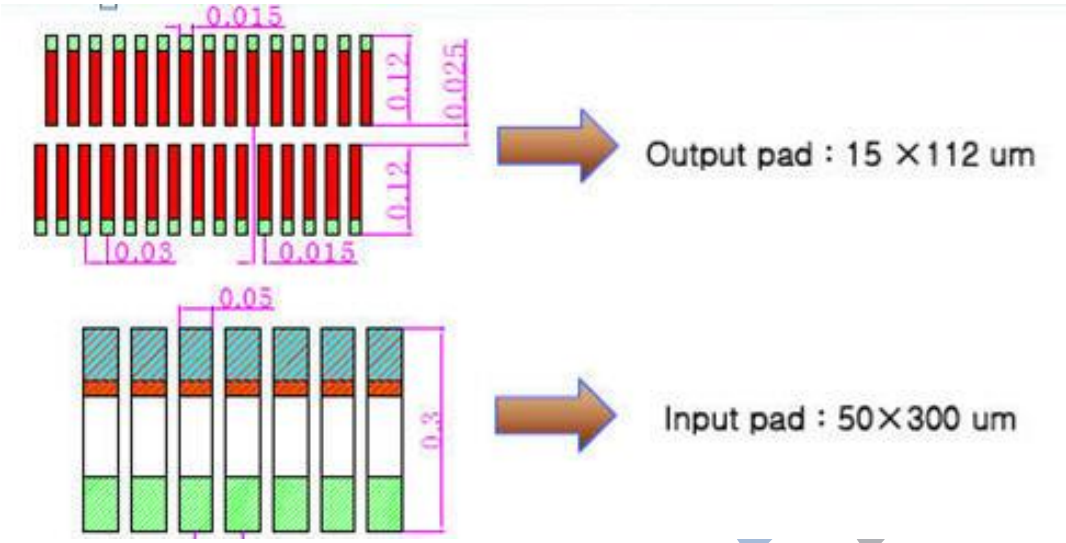
6.0 RELIABILITY TEST

<Table 6. Reliability test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 80 ℃, 240 hrs
2	Low temperature storage test	Ta = -30 ℃, 240 hrs
3	High temperature operation test	Ta = 70 ℃, 240 hrs
4	Low temperature operation test	Ta = -20 ℃, 240 hrs
5	High temperature & high humidity operation test	Ta = 60 ℃, 90%RH, 240 hrs
6	Thermal shock	Ta = -30 ℃ ↔ 80 ℃ (0.5 hr), 100 cycle
7	Press Cooking Test	2atm, 121℃, 100%, 12h
8	Image Sticking	5*5 Pattern 1hrs Recovery Time:5sec
9	Electro-static discharge test (non-operating)	Contact ±6kv ,Air ± 8kv 20Point
10	VIB (Q panel)	5-200Hz,1.47G,Random XY±Z,30min
11	Drop (Q panel)	一角三棱六面

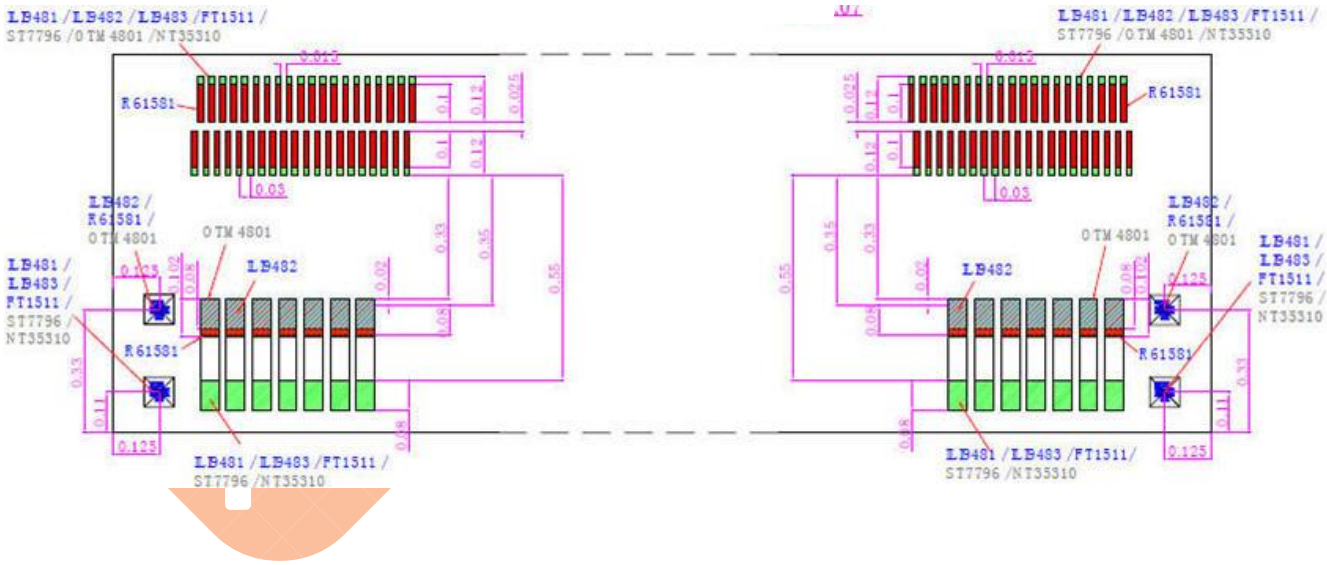
Notes : OT will respond to the issue which is caused by panel

7.0 Drive IC PAD & FPC Pin Assignment



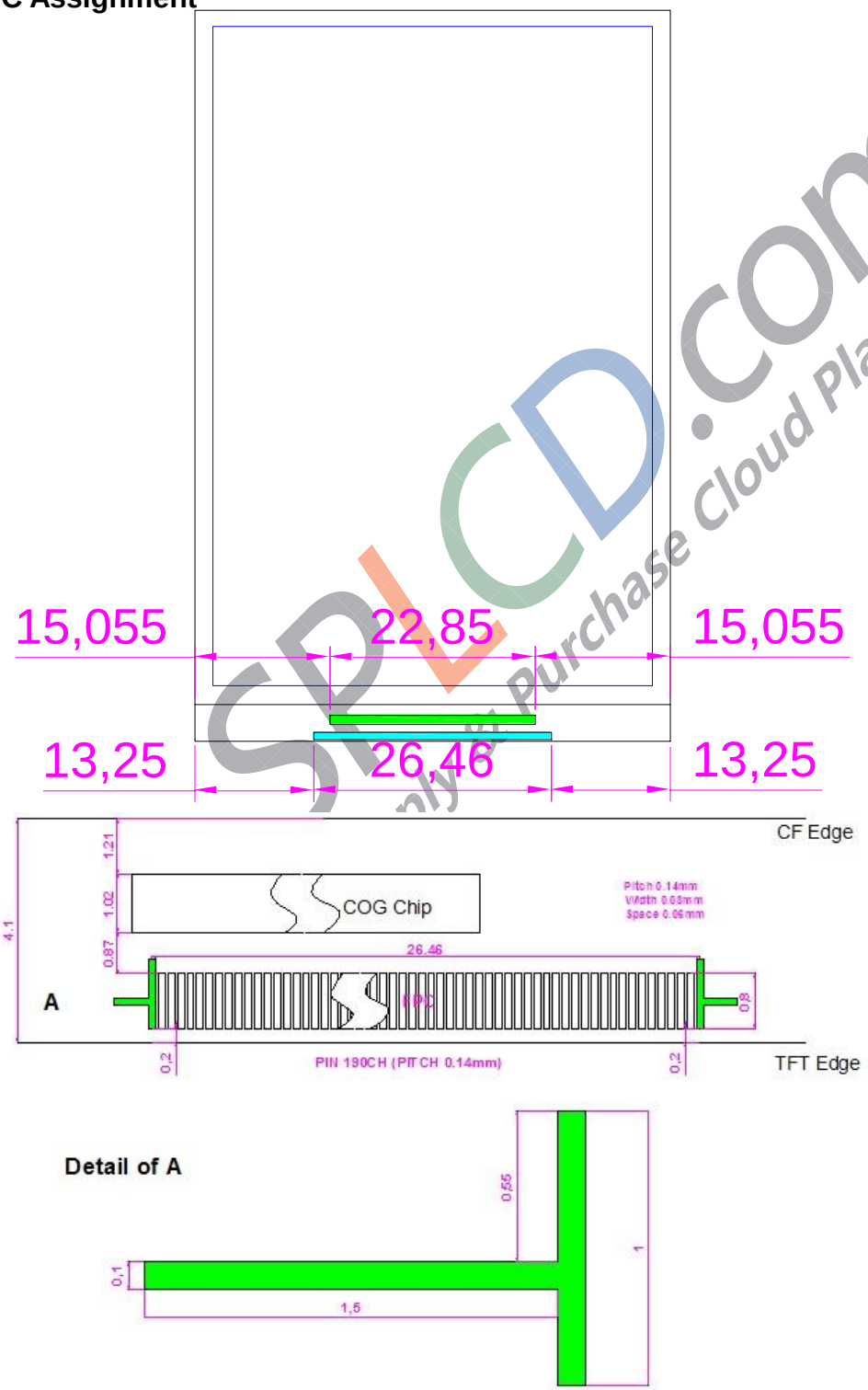
Common use IC：

ILI9481/2/3 /R61581 /FT1511/
HX8357B/C/NOVA 35310/

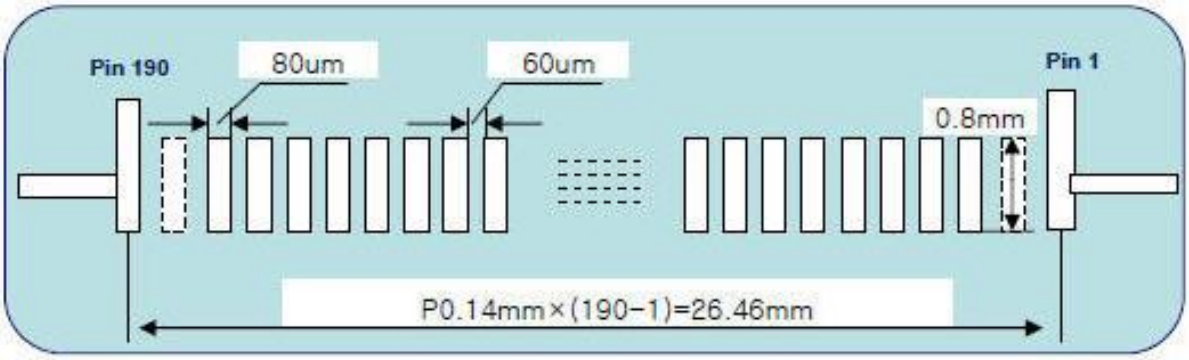


<Figure 1. Drive IC PAD Dimension>

7.1 Drive IC Assignment



7.2 FPC PIN Assignment



1	DUMMY	26	TS1(D19)	50	DB5	92~96	DDVDH
2	NULL	27	TS0(D18)	51	DB4	97~101	VCI1
3~4	VCOM	28	SD	52	DB3	102~111	VCI
5	SW	29	CM	53	DB2	112~116	C11B
6	GE_E	30	IM0/ID	54	DB1	117~122	C11A
7	GE_O	31	IM1	55	DB0	123~127	C12B
8	VPG	32	IM2	56	DOUT	128~132	C12A
9	DGND	33	RESX	57	DIN/SDA	133~137	VGL
10	VWT	34	VSYNC	58	RDX	138~139	GND
11	TESTO16	35	HSYNC	59	WRX/SCL	140~143	VGH
12	TESTO15	36	DOTCLK	60	D/CX	144~147	C13B
13	TESTO14	37	ENABLE	61	CSX	148~151	C13A
14	TESTO13	38	DB17	62	TE	152~157	C21B
15	TESTO12	39	DB16	63~64	IOVCC	158~163	C21A
16	TESTO11	40	DB15	65~67	VDD	164~172	C22B
17	TESTO9	41	DB14	68~70	GND	173~181	C22A
18	TESTO8	42	DB13	71	VGS	182	DB
19	TESTO6	43	DB12	72~73	GND	183	DG
20	TESTO4	44	DB11	74~78	VCOM	184	DR
21	TESTO2	45	DB10	79~81	VCOMH	185	G0_E
22	TS5(D23)	46	DB9	82~84	VCOML	186	G0_0
23	TS4(D22)	47	DB8	85~86	VREG1OUT	187~188	VCOM
24	TS3(D21)	48	DB7	87	MMY(VMC	189	NULL
25	TS2(D20)	49	DB6	88~91	VCL	190	DUMMY

<Figure 2. FPC Pad Dimension & FPC Pin Assignment>

8.0 APPENDIX

Figure 3. The Definition of Vth & Vsat

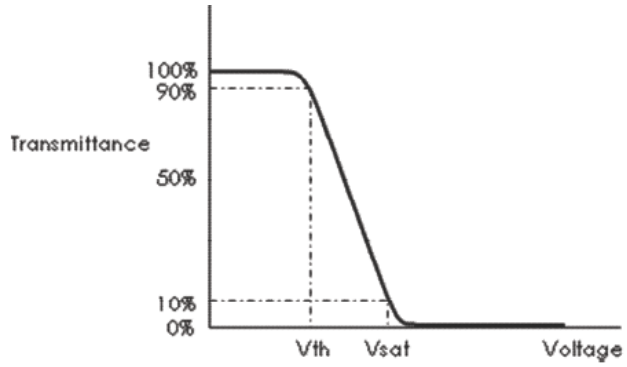


Figure 4. Measurement Set Up

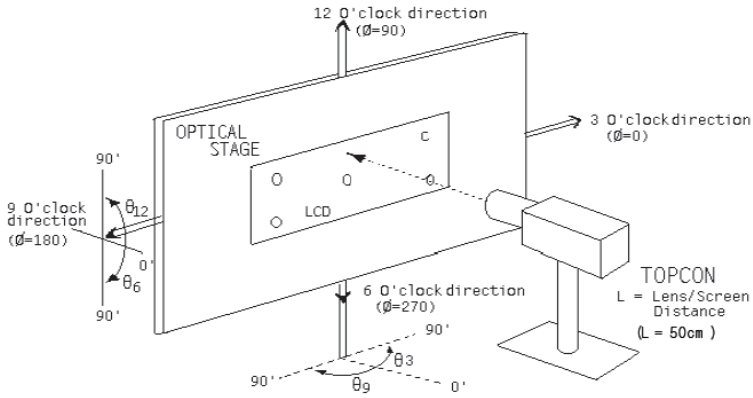


Figure 5. Response Time Testing

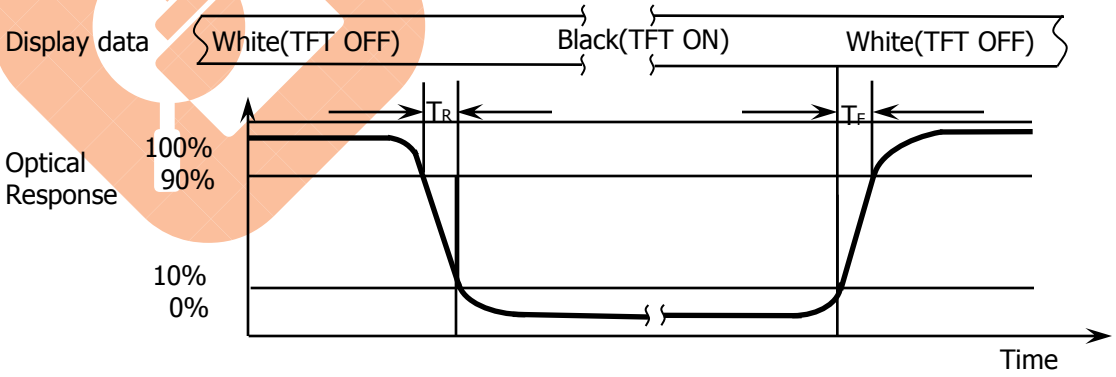
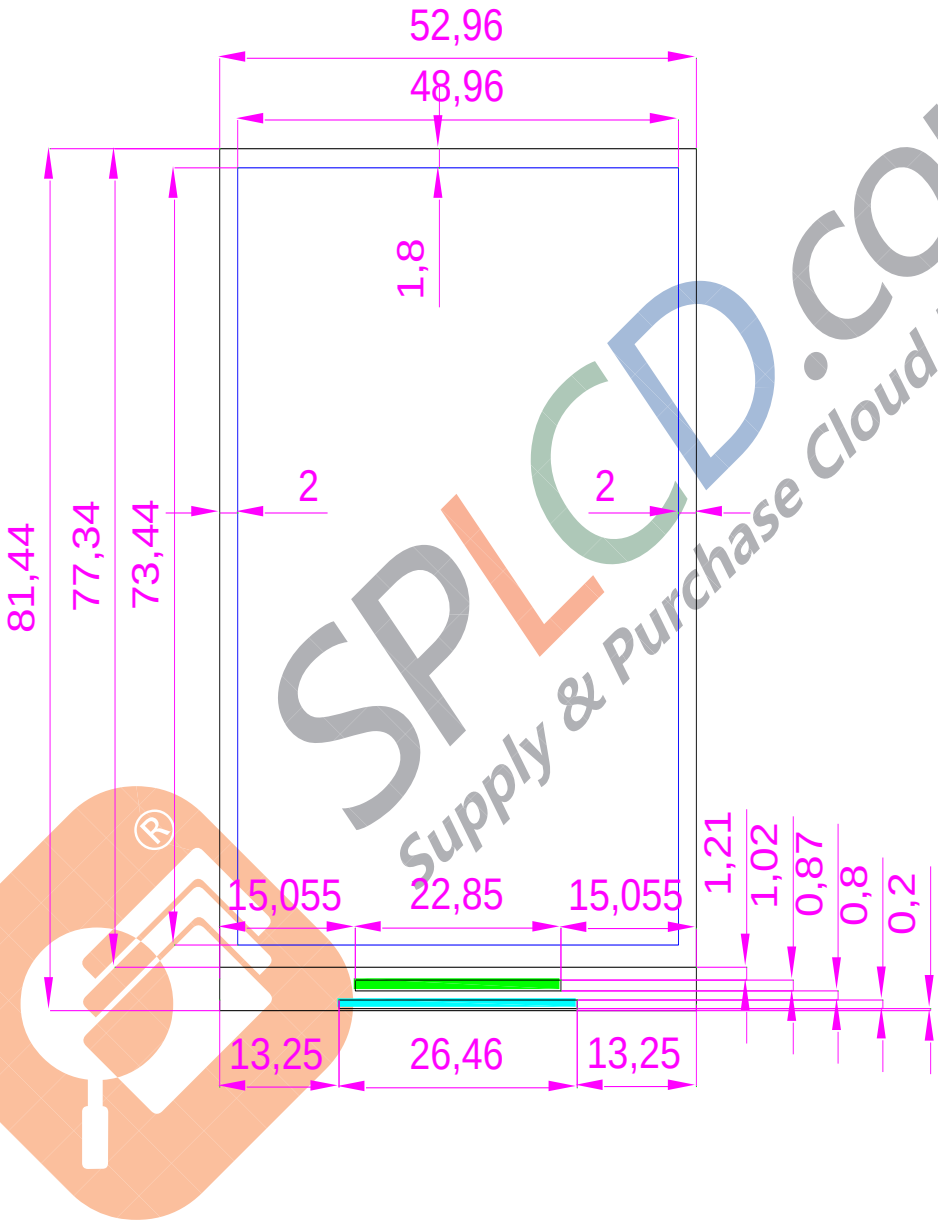


Figure 6. TFT-LCD Panel Outline Dimension



Unit：mm

Figure 7. TFT-LCD Panel Cell Test

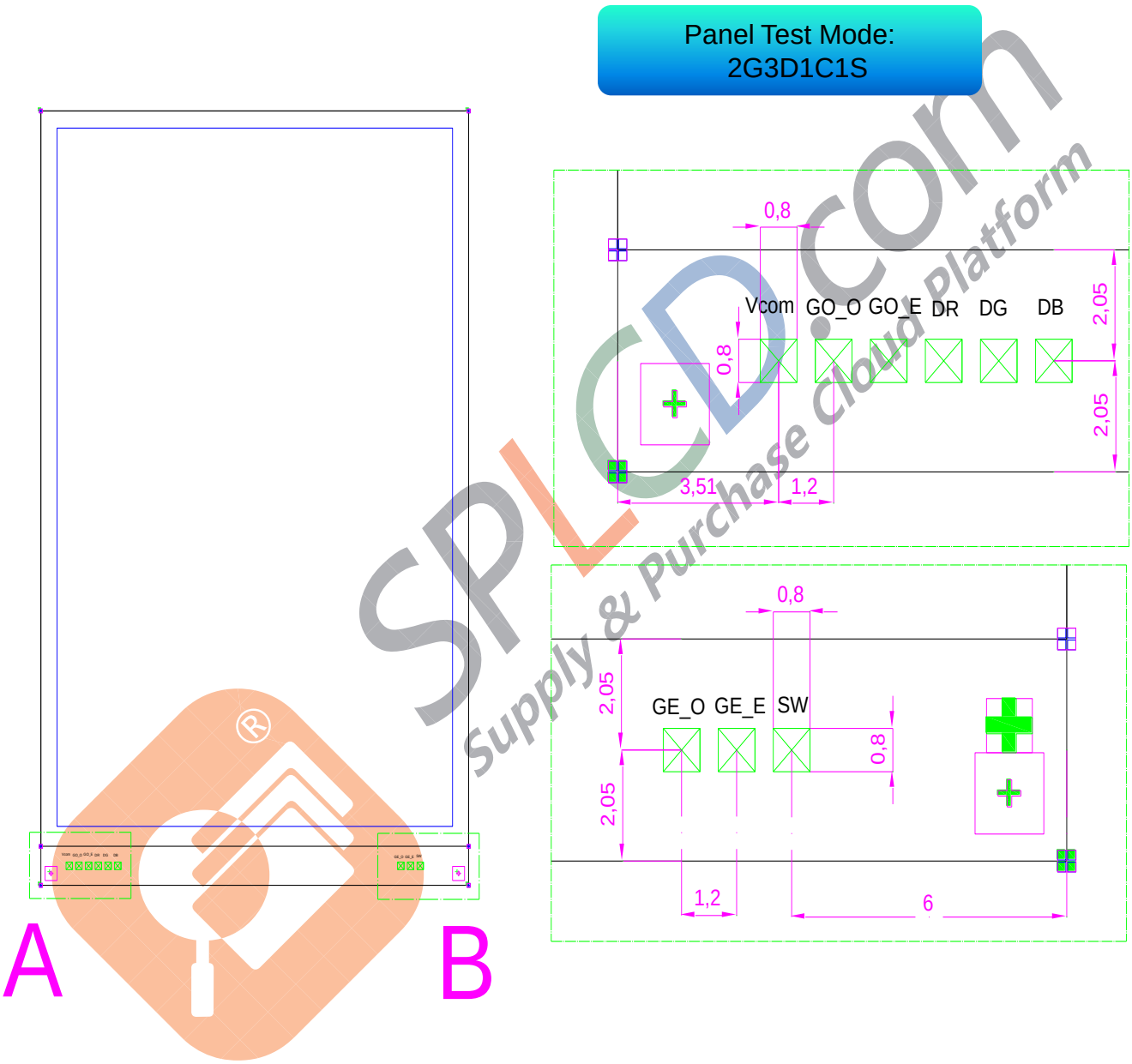
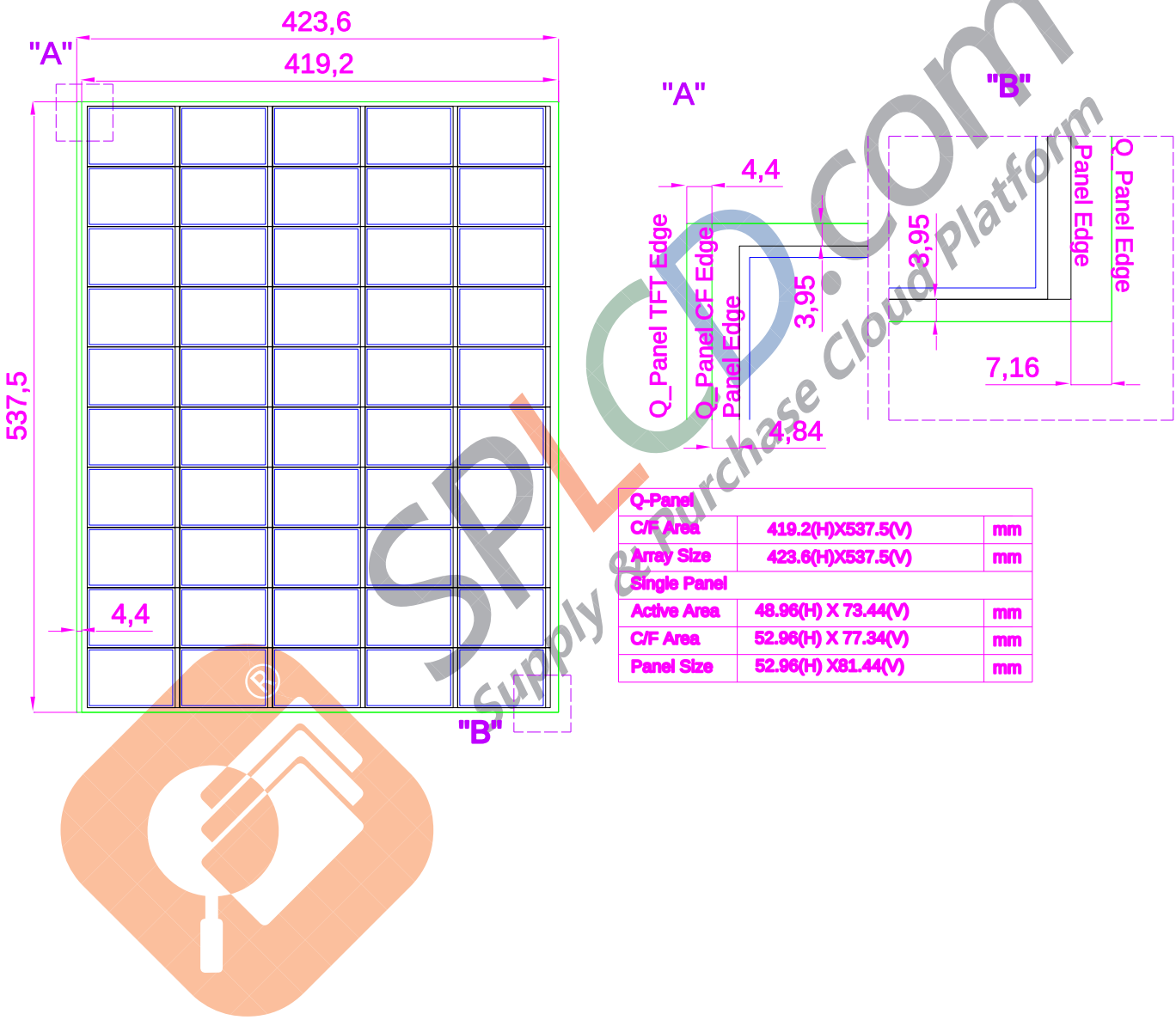
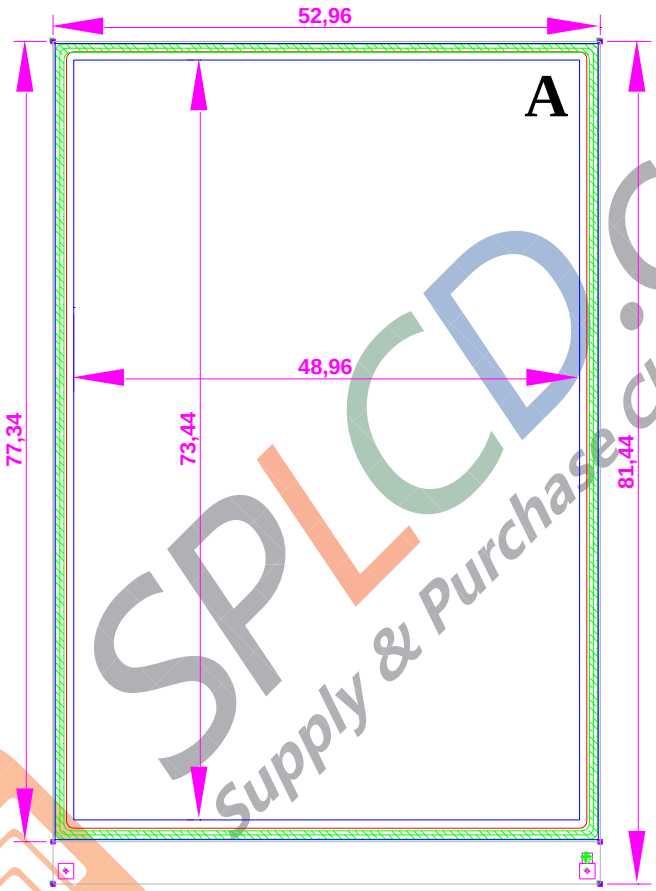


Figure 8. TFT-LCD Q Panel outline dimension



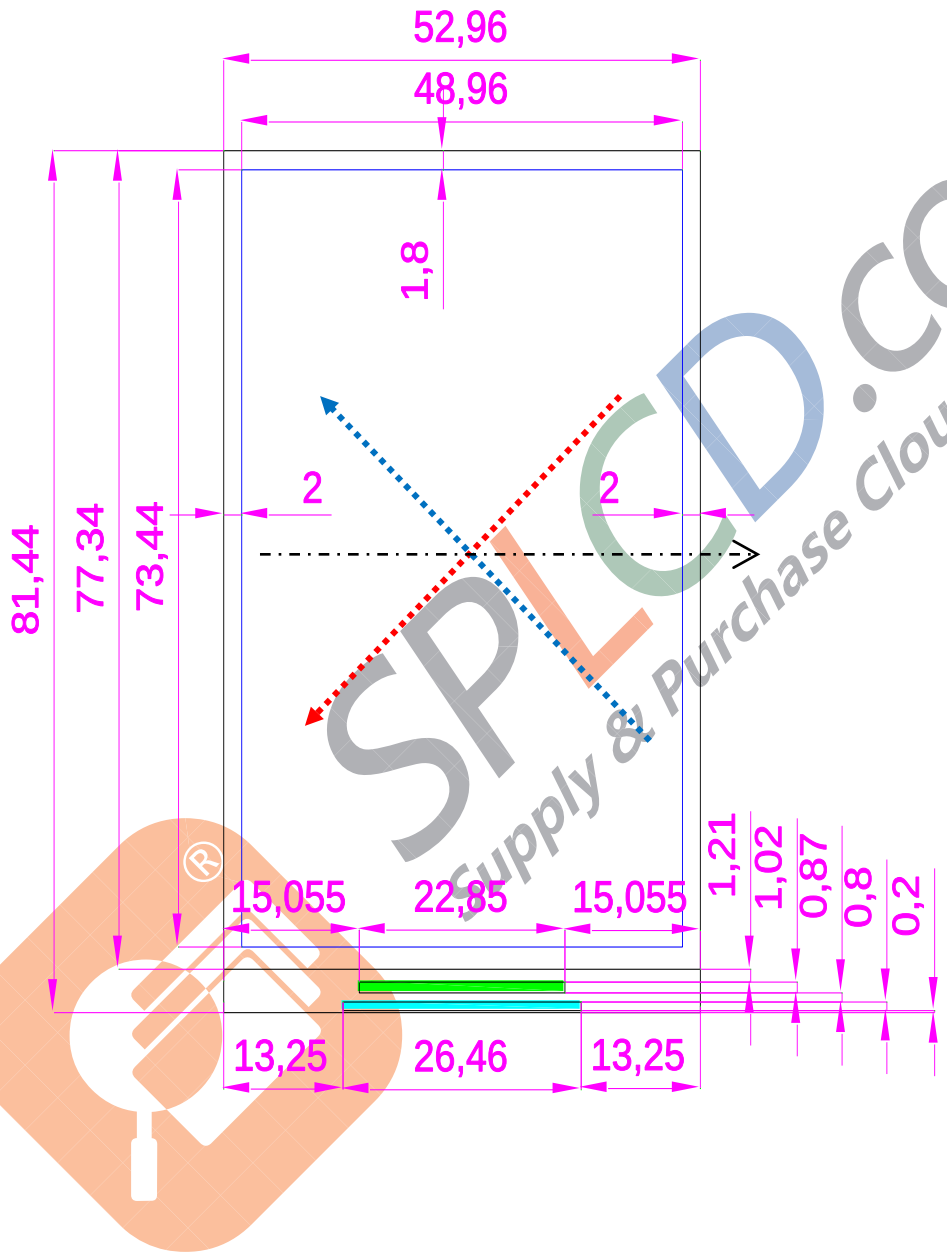
Q-Panel		
C/F Area	419.2(H)X537.5(V)	mm
Array Size	423.6(H)X537.5(V)	mm
Single Panel		
Active Area	48.96(H) X 73.44(V)	mm
C/F Area	52.96(H) X 77.34(V)	mm
Panel Size	52.96(H) X81.44(V)	mm

Figure 9. Seal on Panel



Seal width:0.8±0.2mm
Scribing Accuracy:Target ±0.15mm
Thickness 0.8t

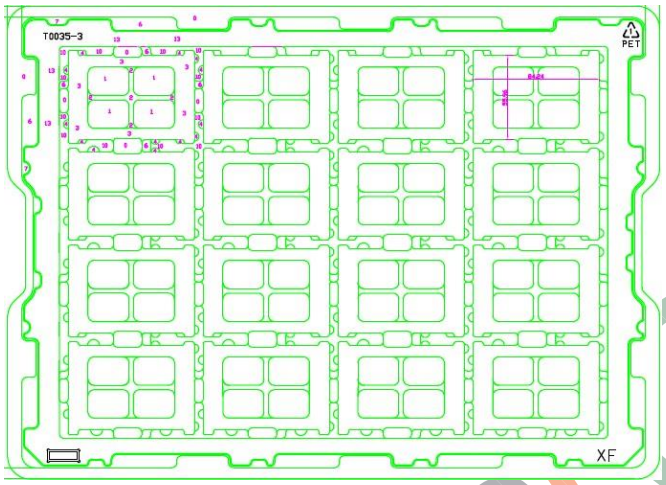
Figure 10. Gray Level Inversion Direction



9.0 Packing

9-1.PET Tray

16 pcs panel/Tray



9-2.Inner Box

33 Tray/ Box 480pcs panel/Box

9-3.outer Box

6 Inner Box/ outer Box, 240pcs/ outer Box

. Handling & Cautions

10.1 Mounting Method

- The panel of the LCD consists of two thin glasses with polarizers which easily get damaged. So extreme care should be taken when handling the LCD.
- Excessive stress or pressure on the glass of the LCD should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCD unit when it is mounted.
- If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
- To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Mount a LCD module with the specified mounting parts.

10.2 caution of LCD Handling and Cleaning

- Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration,and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass may be broken.
- The polarizers on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizers or it leads the polarizers to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent（recommended below）to clean the LCD‘s surface with wipe lightly.
  -IPA(Isopropyl Alcohol), Ethyl Alcohol, Trichlorotriflorothane
- Do not wipe the LCD's surface with dry or hard materials that will damage the polarizers and others. Do not use the following solvent.
  -Water, Ketone, Aromatics
- It is recommended that the LCD be handled with soft gloves during assembly, etc. The polarizers on the LCD's surface are vulnerable to scratch and thus to be damaged by sharp particles.
- Do not drop water or any chemicals onto the LCD's surface.
- A protective film is supplied on the LCD and should be left in place until the LCD is required for operation.
- The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC,Soldering flux,Chlorine,Sulfur,saliva or fingerprint. To prevent the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

10.3 Caution Against Static Charge

- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.4 Caution For operation

- It is indispensable to drive the LCD within the specified voltage limit since the higher Voltage than the limit causes the shorter LCD's life. An electro-chemical reaction due to DC causes undesirable deterioration of the LCD so that the use of DC drive should avoid.
- Do not connect or disconnect the LCD to or from the system when power is on.
- Never use the LCD under abnormal conditions of high temperature and high humidity.
- When expose to drastic fluctuation of temperature (hot to cold or cold to hot），the LCD may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD's surface which may affect the operation of the polarizer and the LCD.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD may turn black at temperature above its operational range. However those phenomena do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.
- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.

10.5 Packaging

- Modules use LCD element, and must be treated as such.
  -Avoid intense shock and falls from a height.
  -To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

10.6 Storage

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.
- Original protective film should be used on LCD's surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizers.
- Do not store the LCD near organic solvents or corrosive gasses.
- Keep the LCD safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCD is stored for long time in the lower temperature or mechanical shocks are applied onto the LCD.
- In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.
  -Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
  -Store in a dark place where neither exposure to direct sunlight nor light is.
  -Keep temperature in the specified storage temperature range.
  -Store with no touch on polarizer surface by the anything else. If possible, store the LCD in the packaging situation LCD when it was delivered.

10.7 Safety

- For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol an should be burned up later.
- In the case the LCD is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water an soap as soon as possible.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal should get in your eyes, flush your eyes with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.