



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, TD.

TFT-LCD Module Specification

Module NO.: TST104SVIH-M30B

Version: V2.2

☐ APPROVAL FOR SPECIFICATION

☐ APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

Presented by	Reviewed by	Approved by
Hcr	Aron	Aron

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1. General Specifications

No.	Item	Specification	Remark
1	LCD size	10.4 inch	
2	Driver element	a-Si TFT active matrix(IPS)	
3	Resolution	1024(W) RGB x768(H)	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.2055(W) x 0.2055(H)	
6	Active area	210.43(W) x 157.82(H) mm	
7	Module size	238.6(W) ×175.8(H) ×6.5(D) mm	
8	View direction	ALL	O 'clock
9	Surface treatment	AG	
10	Color arrangement	RGB-stripe	
11	Interface	LVDS	
12	Lcm power consumption	8.5W	
13	Drive IC	TBD	

Note 1: Refer to Assembly Drawing.

2. Pin Assignment

2.1. Absolute Maximum Ratings

FPC Connector is used for the module electronics interface. The recommended model is P-two 187098-30091 or equivalent

Pin No	Symbol	I/O	Function	Remark
1	NC	-	No Connection	
2	GND	P	Ground	
3	RIN3+	I	+LVDS Differential Data Input	
4	RIN3-	I	-LVDS Differential Data Input	
5	GND	P	Ground	
6	CLK+	I	+LVDS Differential Clock Input	
7	CLK-	I	-LVDS Differential Clock Input	
8	GND	P	Ground	
9	RIN2+	I	+LVDS Differential Data Input	
10	RIN2-	I	-LVDS Differential Data Input	
11	GND	P	Ground	
12	RIN1+	I	+LVDS Differential Data Input	
13	RIN1-	I	-LVDS Differential Data Input	
14	GND	P	Ground	
15	RIN0+	I	+LVDS Differential Data Input	
16	RIN0-	I	-LVDS Differential Data Input	
17	GND	P	Ground	
18	NC	-	No Connection	
19	GND	P	Ground	
20	SEL6/8	I	Selection for 6 bits/8bit LVDS data input Low or NC : 8 bit input mode High : 6 bit input mode	Note 1
21	NC	-	No Connection	
22	NC	-	No Connection	
23	NC	-	No Connection	
24	Reverse	I	Reverse panel function (Display rotation)	Note 2
25	GND	P	Ground	
26	GND	P	Ground	

27	GND	P	Ground	
28	VDD	P	Power supply: + 3.3V	
29	VDD	P	Power supply: + 3.3V	
30	VDD	P	Power supply: + 3.3V	

Note I: input; O: output; P: Power or Ground (0V).

Note 1: SEL6/8 is used for selecting 6bit/8bit LVDS data input, L or NC: 8bit; High: 6bit.

Note 2: Reverse pin is used for selecting scanning direction.

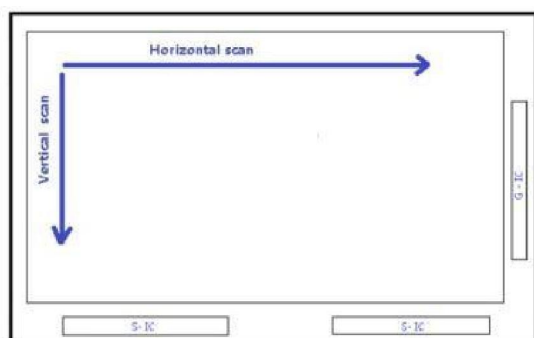


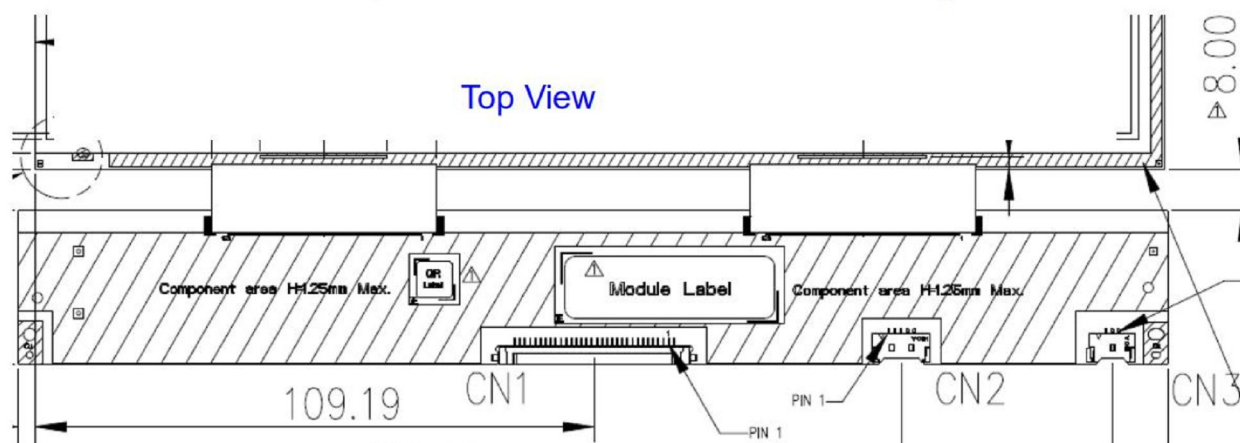
Fig. 1 Normal scan (Pin24, Reverse = Low or NC)



Fig. 2 Reverse scan (Pin24, Reverse = High)

Connector

There are 3 connectors on PCBA, location & Pin1 is showed on below figure.



Connectors' type:

1. CN1 : Input LVDS CONN, 30pins, P-two , 187098-30091
2. CN2: Input BL power CONN, 5pins, Cillux, CI4205M2HRD-NH
3. CN3: Output BL power CONN, 3pins, Cillux, CI4203M2HRD-NH

*Note: This Module CN2 and CN3 can't be used.

3. Operation Specifications

3.1. Absolute Maximum Ratings

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	VDD	-0.3	5.0	V	TA=25°C
Operation Temperature	T _{OP}	-30	80	°C	
Storage Temperature	T _{ST}	-30	80	°C	

Note1 : The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.2. Typical Operation Conditions

Test condition: GND=0V, TA=25 °C

Note1

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	Note 1
Current for Power	I _{VDD}		385	424	mA	Note 2
Input logic high voltage	V _{IH}	0.9 V _{DD}	-	V _{DD}	V	
Input logic low voltage	V _{IL}	0	-	0.1 V _{DD}	V	

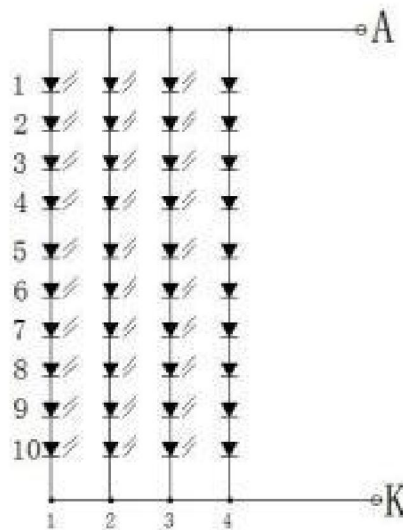
Note 1: VDD setting should match the signals output voltage of customer's system board.

Note 2: VDD =3.3V@frame 60 Hz, White pattern

3.3. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V_L	28	34	35	V	Note 1
Current for LED Backlight	I_L	-	213	-	mA	
LED life time	-	80000	-	-	Hr	Note 2

Note1: $V_L=34V$, $I_L=213mA$ (Backlight circuit: 10 series connection, 4 parallel connection), the

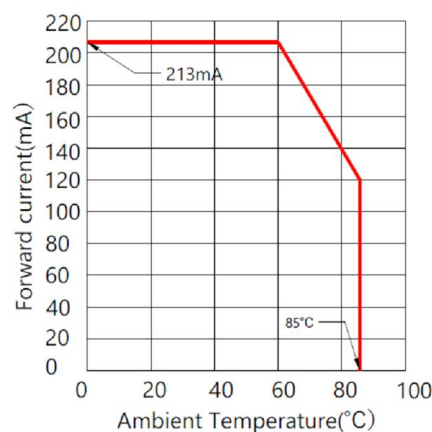


ambient temperature is 25°C.

Fig. 3-1 LED test circuit diagram

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^\circ\text{C}$ and 1/2 rated current . The LED lifetime could be decreased if operating I_L is larger than 213 mA.

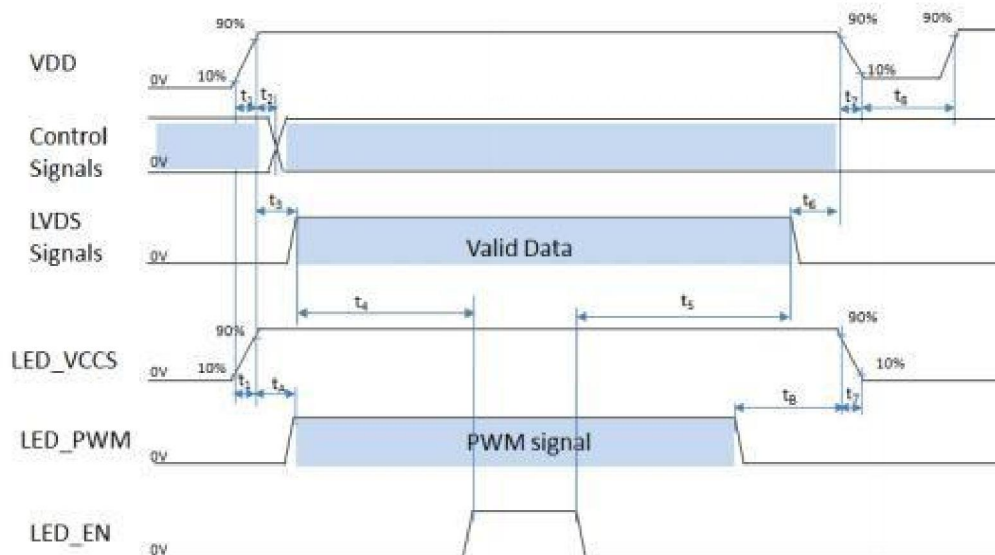
Note 3: Recommended derating curve (total supply current of LED backlight) for backlight driving



3.4. Power, Signal sequence

The power sequence specifications are shown as the following table and diagram.

Symbol	Value		Unit
	Min.	Max.	
t_1	1	20	ms
t_2	1	5	ms
t_3	10	50	ms
t_4	200	500	ms
t_5	200	500	ms
t_6	50	200	ms
t_7	0	20	ms
t_8	500	-	ms
t_A	0	50	ms
t_B	0	50	ms



Note 1: Please don't plug the interface cable of on when system is turned on.

Note 2: Please avoid floating state of the interface signal during signal invalid period.

Note 3: It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid.

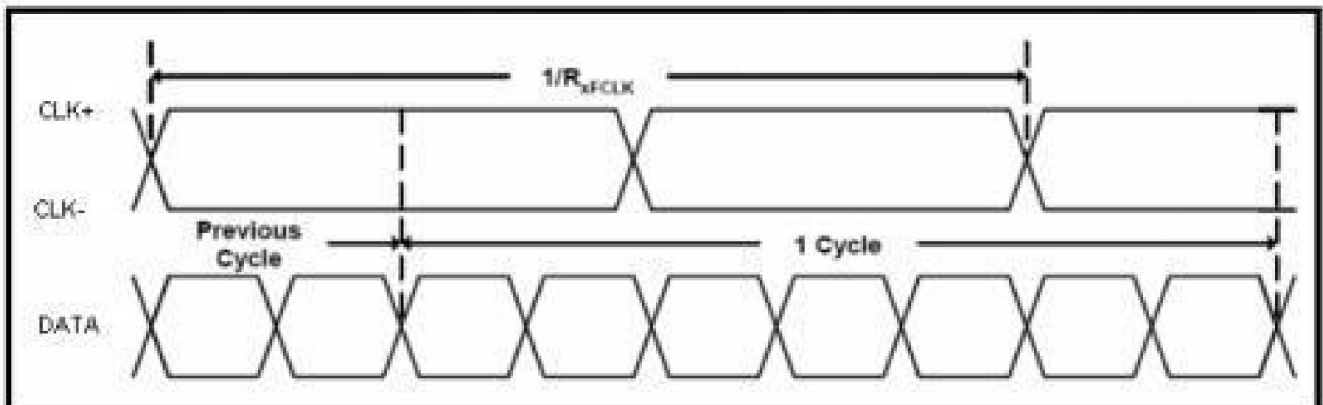
Note 4: Control signals include SEL6/8 & Reverse.

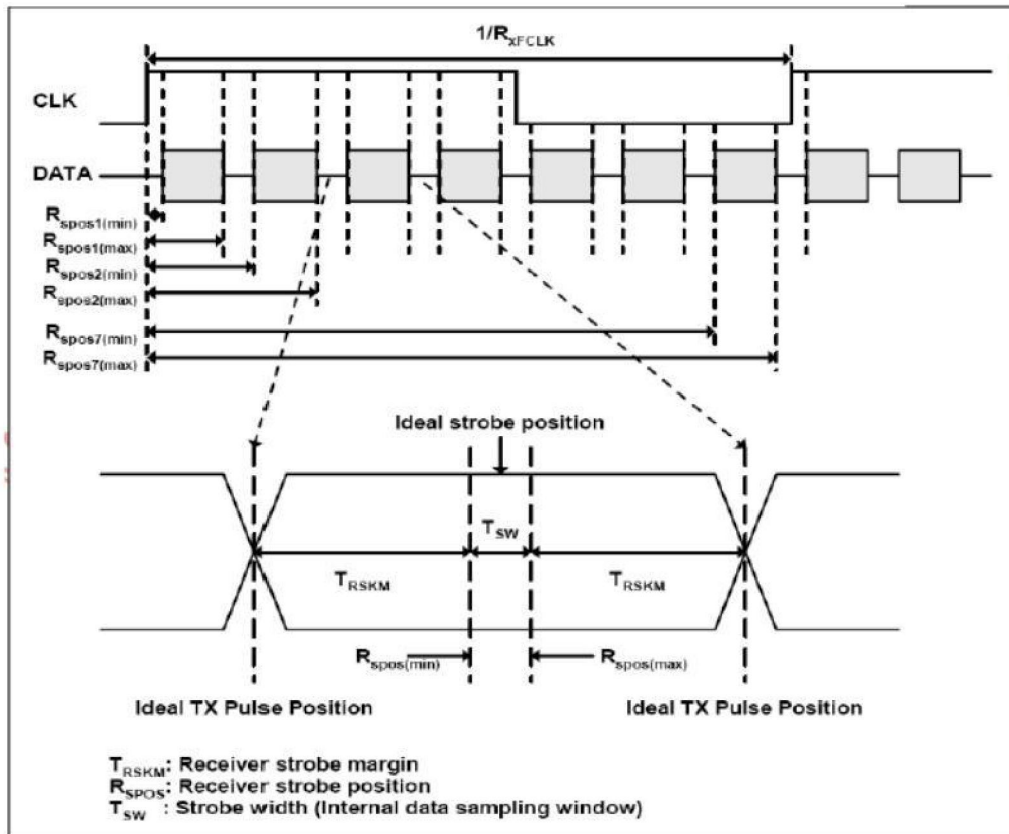
3.5. LVDS Signal timing characteristics

AC Electrical characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Clock frequency	RxFCLK	26.2	51.2	71	MHz	
Input data skew margin	TRSKM	500	500	$1/(2 \cdot RxFCLK)$	ps	Typical value for 1024*600 resolution
Clock high time	TLVCH		$4/(7 \cdot RxFCLK)$		ns	$ VID =400\text{mv}$ $RxVCM=1.2\text{V}$ $RxFCLK=71\text{MHz}$ $VDD_LVDS=3.3\text{V}$
Clock low time	TLVCL		$3/(7 \cdot RxFCLK)$		ns	
VSD setup time	TenPLL	0	TenPLL	150	us	

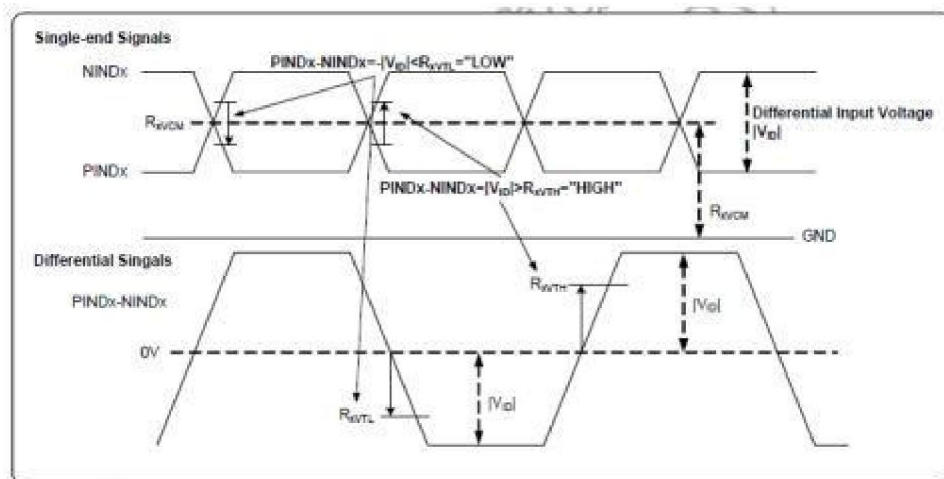
Input clock and data timing diagram





DC electrical characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	$R_{xVCM}=1.2V$
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
Input Voltage range (Singled-end)	R_{xVIN}	0	-	$VDD-1.2+ V_{ID} /2$	V	
LVDS Differential input common mode voltage	R_{xVCM}	$ V_{ID} /2$	-	$VDD-1.2$	V	
LVDS Differential voltage	$ V_{ID} $	0.2	-	0.6	V	

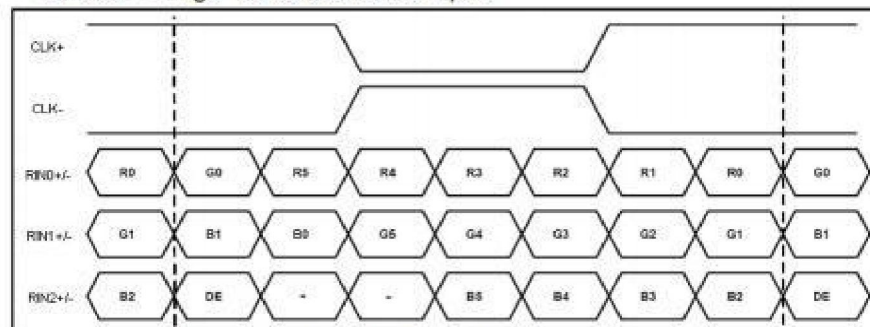


data timing

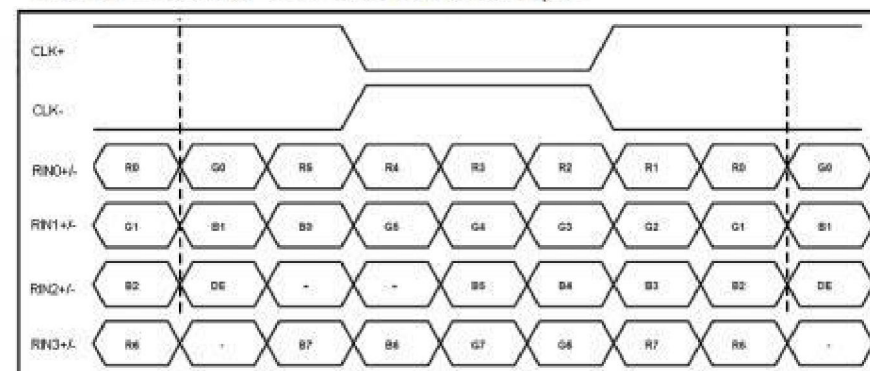
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	52	65	71	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	768			T _H
VSD period	tv	778	806	845	T _H
VSD blanking	tvbp+tvfp	10	38	77	T _H

LVDS data input format

SEL6/8 = "High" for 6 bits LVDS Input



SEL6/8 = "Low" or "NC" for 8 bits LVDS Input



4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	80	-	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	80	-	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	80	-	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	80	-	-		
Response time	T_{ON+} T_{OFF}	Normal $\theta=\Phi=0^\circ$	-	25	35	msec	Note 3
Contrast ratio	CR		800	1000	-	-	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	-	Note 2 Note 5 Note 6
	W_Y		0.28	0.33	0.38	-	
	R_X		0.615	0.645	0.675	-	
	R_Y		0.304	0.334	0.364	-	
	G_X		0.254	0.284	0.314	-	
	G_Y		0.534	0.564	0.594	-	
	B_X		0.107	0.137	0.167	-	
	B_Y		0.091	0.121	0.151	-	
Luminance	L		800	900	-	cd/m ²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7
Color Gamut	NTSC	CIE1931	55	62	-	%	
Flicker	-	$\theta=\Phi=0^\circ$ $T_a=25^\circ\text{C}$	-	-25	-	dB	Note 8
Gamma	γ		1.8	2.2	2.6		Note 9
Crosstalk	-		-	2%	-		

The test systems refer to Note 2.

Note 1: Definition of viewing angle range

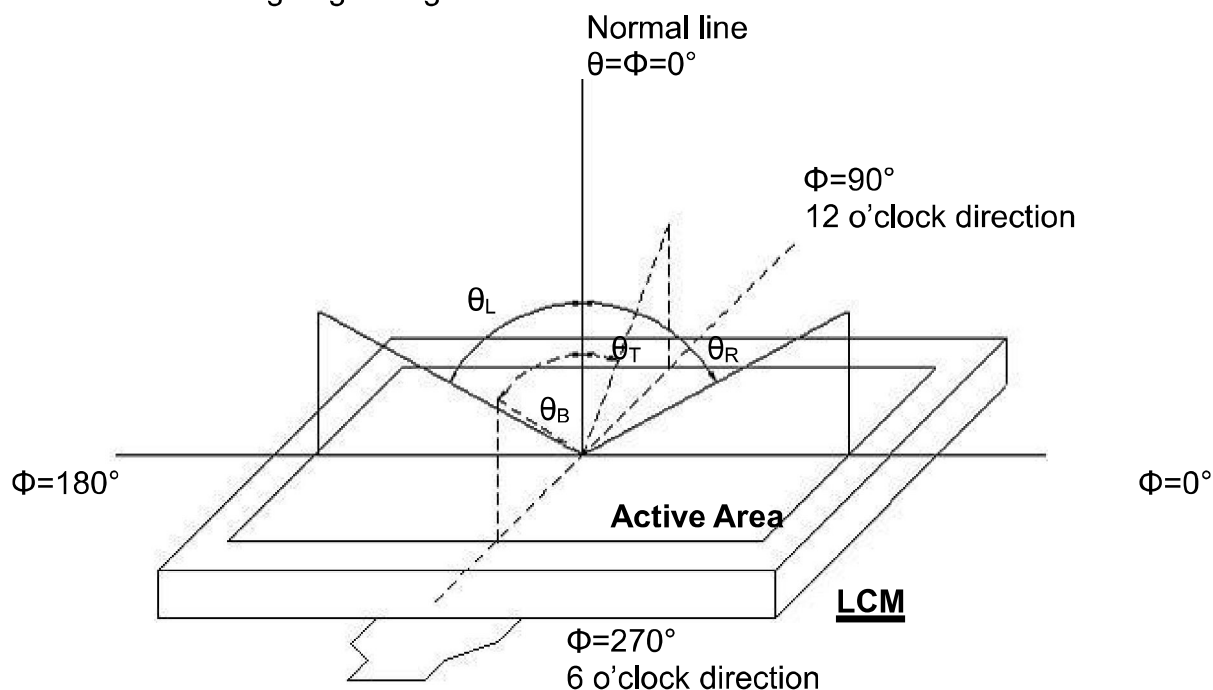


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.) or CA-210.

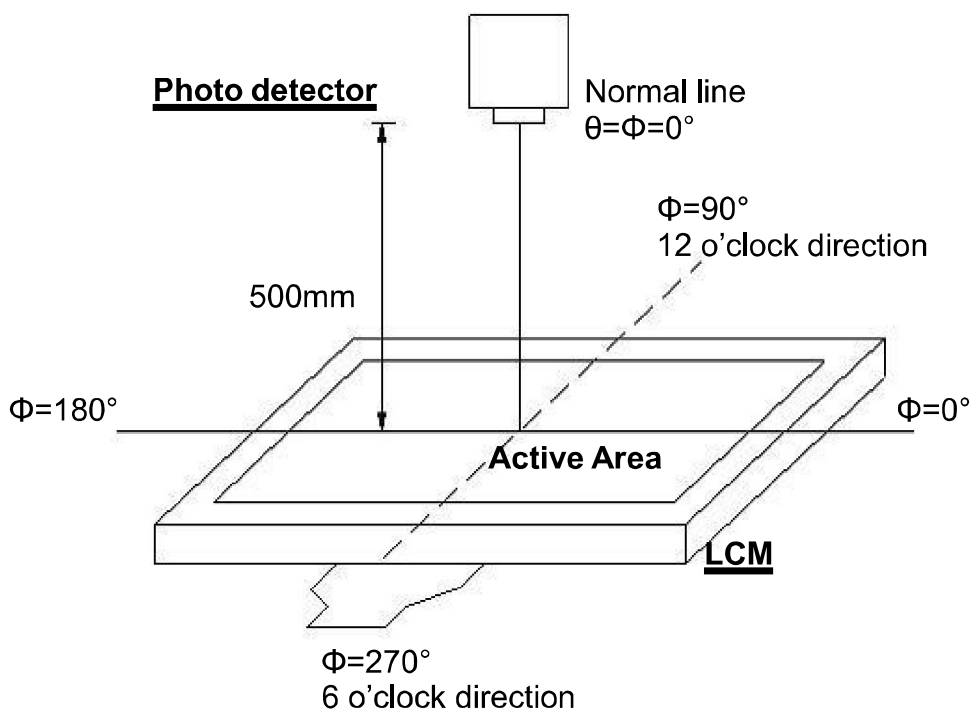


Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

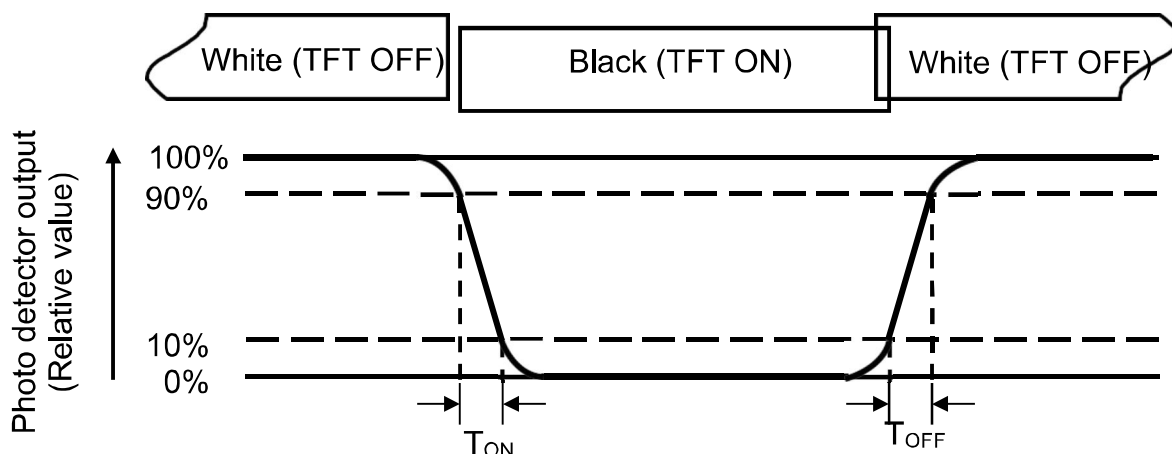


Fig. 4- 3 Definition of response time

Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the " White" state}}{\text{Luminance measured when LCD on the " Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=213\text{mA}$.

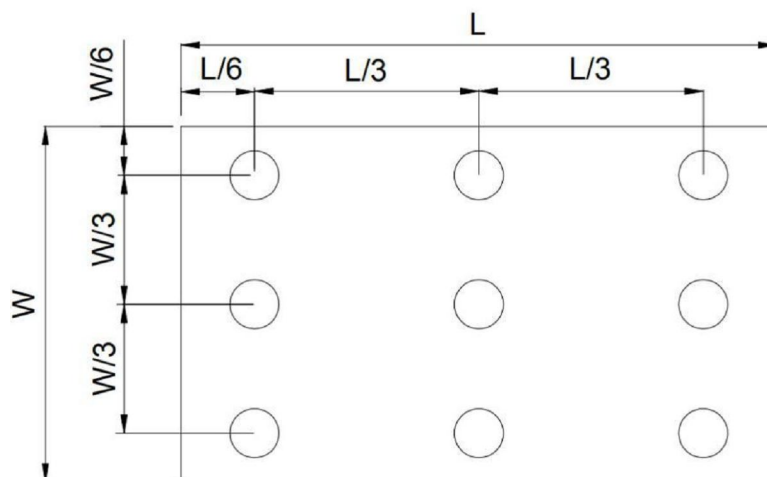
Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas(Refer to Fig. 4-4).

Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length W----- Active area width



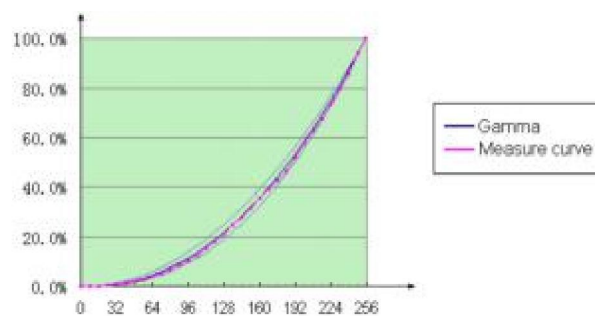
B_{MAX} : The measured maximum luminance of all measurement position.

B_{MIN} : The measured minimum luminance of all measurement position.

Note 8: Flicker test conditions and standards: priority is given to customer conditions and standards. If there is no customer condition, the test shall be conducted according to Xinli's internal standard. See below FIG for details. Test equipment: MSE or CA310.



Note 9: Gamma test condition, See below FIG for details. Test equipment: MSE or CA310.



5. Reliability Test

Item	Test Conditions		Criterion
High Temperature Storage	Ta = 80℃	240hrs	Note 1, Note3, Note 4 ,Note5
Low Temperature Storage	Ta = -30℃	240hrs	Note 1, Note3, Note 4
High Temperature Operation	Ts = 80℃	240hrs	Note 2, Note3, Note 4 , Note5
Low Temperature Operation	Ta =-30℃	240hrs	Note 1, Note3, Note 4
Operate at High Temperature and Humidity	+60℃ , 90%RH	240hrs	Note3, Note 4 Note5
Thermal Shock(non operation)	-30℃/30 min~ +80℃/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.		Note3, Note 4 Note5
Vibration Test	Sweep:10Hz~55Hz~10Hz 2G 2 hours for each direction of X. Y. Z. (6 hours for total)		
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, - 6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)		
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces		
Electro Static Discharge	Contact=+/-4KV, Air=+/-8KV,(R=330R,C=150pF), 1 sec,9point,10times/point;		
Image Sticking	25℃,chessboard 10*10, change to 50% Gray pattern, Check Point: 2hrs ND5% invisible; Release 5min ND8% invisible		
	65℃,chessboard 10*10, change to 50% Gray pattern, Check Point: 2hrs ND5% invisible; Release 5min ND8% invisible		

※Criterion:

Note 1: T_a is the ambient temperature of samples.

Note 2: T_s is the temperature of panel's surface.

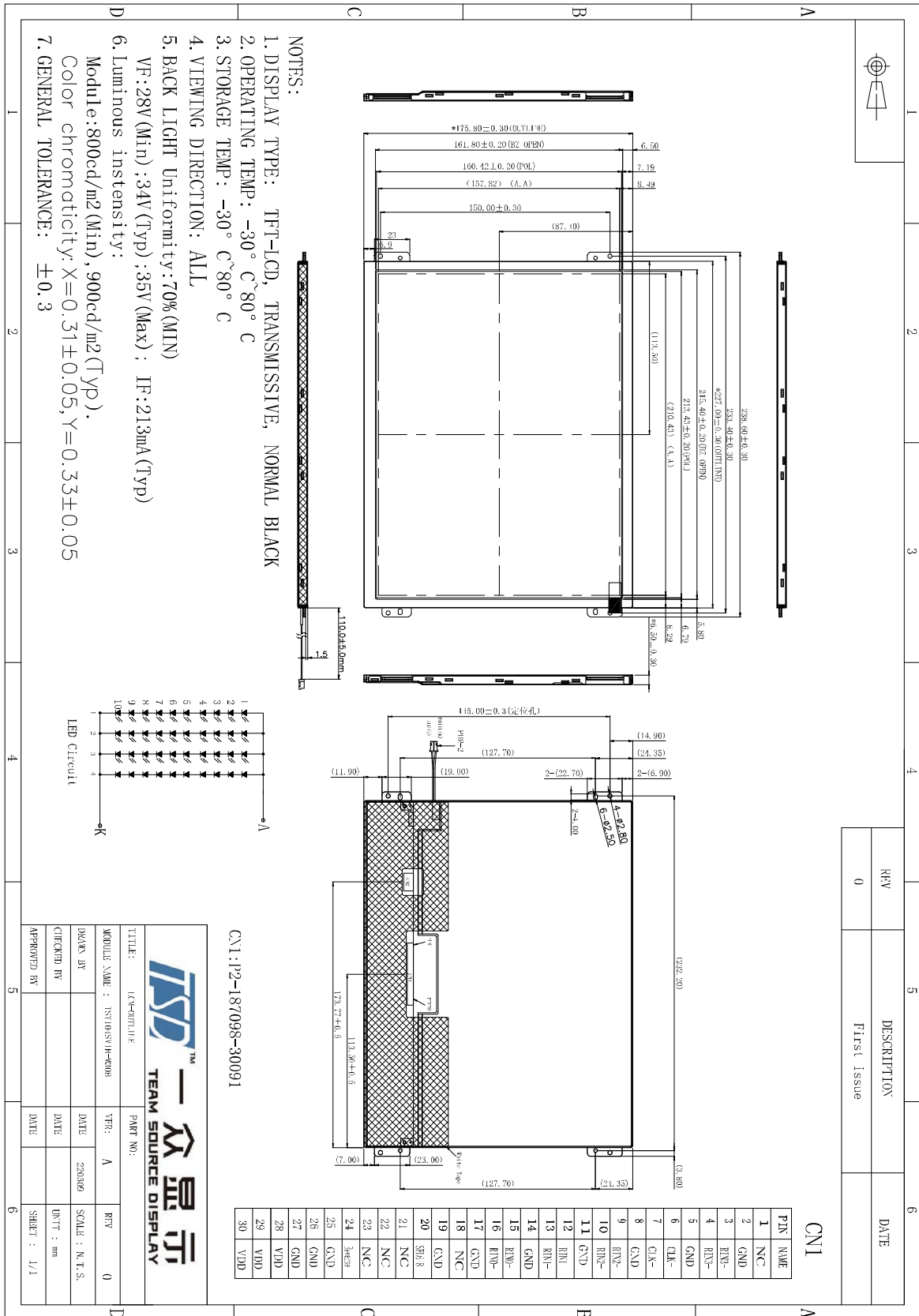
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 5: A certain level of Mura (non-uniformity) of dark / black image will happen several days after high temperature testing (H.T.T.). There is a slowly part recovery over a long time (several months). Such a long exposure time like in H.T.T. will normally not happen in a real application. Therefore the test H.T.T. was introduced to simulate cycles with normal conditions in-between but with the same total exposure time what show a significant reduced Mura.

The root cause is related to tension generated due to different amount of shrinking in the stack of layers in the polarizer sheet. The effect is more significant on larger displays like this size. An investigation into alternative polarizer material showed that there is no better alternative currently available.

6. Mechanical Drawing



7. Package Drawing

TBD

8. Inspection Standards for LCD Modules

8.1. Acceptable Criteria

Unless there is other agreement, the sampling plan for incoming inspection shall follow GB2828.1-2012

- (1) Lot size: Quantity per shipment as one lot (different model as different lot).
- (2) Sampling type: Normal inspection, single sampling.
- (3) Sampling level: Level II.
- (4) AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.0

8.2. Classification of defects

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below.

- Major defect

Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc..

- Minor defect

A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc..

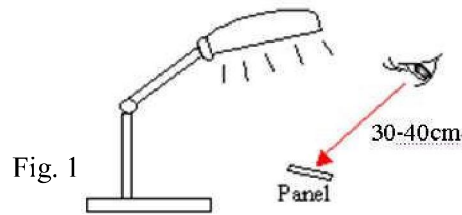
The criteria on major or minor judgment will be according with the classification of defects.

8.3. The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

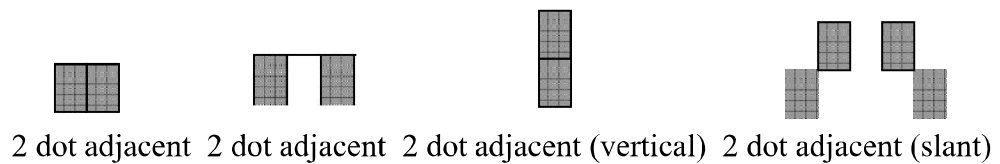
- (1) Ambient temperature: 25 ± 5 °C
- (2) Humidity: 25~75 % RH
- (3) Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance 30~40cm or more between the LCD module and eyes of inspector.
Ambient Illumination: 500~600Lux for external appearance inspection
Ambient Illumination: 200~500 Lux for light on inspection
- (4) The viewing angle:
 - a) ± 45 degree to the front surface of display panel in vertical direction.
 - b) ± 45 degree to the front surface of display panel in horizontal direction.

- (5) Display panel shall be conducted at the distance 35~40cm between the LCD module and eyes of inspector (Fig. 1)



8.4. Inspection Criteria

- (1) Definition of dot defect induced from the panel inside
 - a) Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
 - b) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.
 - c) 2 dot adjacent = 1 pair = 2 dots
Picture:



(2) Display Inspection

Items		Acceptable count
Bright dot	Random	$N \leq 1$
	2 dots adjacent	$N \leq 0$
	3 dots adjacent	$N \leq 0$
Distance	Minimum Distance Between Bright dots	5mm
Dark dot	Random	$N \leq 2$
	2 dots adjacent	$N \leq 0$
	3 dots adjacent	$N \leq 0$
Total bright and dark dot		$N \leq 2$
Distance	Minimum Distance Between dark dots Minimum Distance Between dark and bright dot.	5mm
Tiny bright dot		visible through 5% ND filter $D \leq 0.15\text{mm}$, Ignore $0.15\text{mm} < D \leq 0.3\text{mm}$, $N \leq 3$ Distance $\geq 5\text{mm}$
Display failure (V-line/H-line/Cross line etc.)		Not allowable
Mura/ Waving/ Hot spot	Not visible through 5% ND filter	

***Note: Defect which is on the Black Matrix(outside of Active Area) are not considered as a defect.**

(3) Appearance & Display inspection

Item	Standards
Foreign Black/White/Bright Spot (Display & Appearance)	$D \leq 0.15\text{mm}$, Ignore $0.15\text{mm} < D \leq 0.4\text{mm}$, $N \leq 2$ Distance $\geq 5\text{mm}$ It is shown in Fig. 2.
Foreign Black/White/Bright Line (Display & Appearance)	$W \leq 0.05\text{ mm}$, Ignore $0.05 < W \leq 0.1\text{ mm}$ $L \leq 3.0\text{ mm}$, $N \leq 2$ It is shown in Fig. 3.
Polarizer Dent/Air Bubble	$D \leq 0.15\text{mm}$, Ignore $0.15\text{mm} < D \leq 0.4\text{mm}$, $N \leq 2$ Distance $\geq 5\text{mm}$
Polarizer Scratches	$W \leq 0.05\text{ mm}$, Ignore $0.05 < W \leq 0.1\text{ mm}$ $L \leq 3.0\text{ mm}$, $N \leq 2$

Notes: If any specific defect is not included in the above defect table, this defect should be judged by MIND and customer discussion.

1. W: Width
2. L: Length
3. D: Average
Diameter
4. N: Count

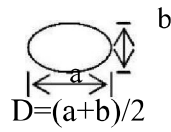


Fig. 2

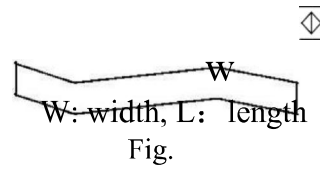


Fig.

8.5. External Appearance Inspection Criteria

Item	Contents	
FPC cable	Cable not continuous、Break-off Connector Burn-off /Break-off are not permitted.	
Metal frame (Bezel)	Scratch	*Noticeable scratch and exfoliation coating are not permitted. *The oxidized metal is not permitted.
	Incomplete assembly is not permitted.	
Backlight	Scratch	The scratch which may causes a problem in practical use is not permitted.
	Break-off	Breaking off is not permitted.
	Crack	The crack is not permitted.
Stain on Polarizer	The stain, which can't be wiped off, is not permitted.	
Tape/Label	Incorrect position, missed label is not permitted.	
Connector	Assembly NG or Function fail caused by deformation is not permitted	
Outline size	Spec. out is not permitted.	

9. General Precautions

9.1. Safety

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

9.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.

3. To avoid contamination on the display surface, do not touch the module surface with bare hands.

4. Keep a space so that the LCD panels do not touch other components.

5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.

6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.

7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

9.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.

2. Do not apply voltage which exceeds the absolute maximum rating value.

9.4. Storage

1. Store the module in a dark room where must keep at $25\pm10^{\circ}\text{C}$ and 65%RH or less.

2. Do not store the module in surroundings containing organic solvent or corrosive gas.

3. Store the module in an anti-electrostatic container or bag.

9.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.

2. Only use a soft cloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.