



RAYSTAR

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RFY1230B-AWH-LNN

SPECIFICATION

CUSTOMER:

APPROVED BY	
PCB VERSION	
DATE	

FOR CUSTOMER USE ONLY

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Release DATE:

TFT Display Inspection Specification: <https://www.raystar-optronics.com/download/products.htm>

Precaution in use of TFT module: <https://www.raystar-optronics.com/download/declaration.htm>

Revision History

VERSION	DATE	REVISED PAGE NO.	Note
0	2018/08/30		First issue
A	2019/01/21		The Module update new Rev.
B	2019/12/30		Modfiy Absolute Maximum Ratings

Contents

1.Module Classification Information

2.Summary

3.General Specification

4.Interface

5.Contour Drawing

6.Block Diagram

7.Absolute Maximum Ratings

8.Electrical Characteristics

9.Interface Timing Characteristics

10.Optical Characteristics

11.Reliability

12.Other

1.Module Classification Information

R	F	Y	123	0B	-	A	W	H	-	L	N	N
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optonics Inc.	
2	Display Type : F→TFT Type, J→ Custom TFT	
3	Solution: A: 128x160 B:320x234 C:320x240 D:480x234 E:480x272 F:800x480 G:640x480 H:1024x600 I:320x480 J:240x320 K:1280x800 L:240x400 M:1024x768 N:128x128 O:480x800 P:640x320 Q:800x600 S:480x128 T:800x320	
4	Display Size : 12.3" TFT	
5	Version Code.	
6	Model Type: A : TFT LCD E : TFT+FR+CONTROL BOARD J : TFT+FR+A/D BOARD N : TFT+FR+A/D BOARD+CONTROL BOARD S : TFT+FR+POWER BOARD (DC TO DC) 1 : TFT+CONTROL BOARD	6 : TFT+FR H : TFT+D/V BOARD I : TFT+FR+D/V BOARD B : TFT+POWER BD
7	Polarizer Type, Temperature range, View direction	I→Transmissive, W. T, 6:00 ; C→Transmissive, N. T, 6:00 L→Transmissive, W.T,12:00 ; F→Transmissive, N.T,12:00 Y→Transmissive,W.T, IPS TFT ; W→Transmissive, Super W.T, IPS TFT A→Transmissive, N.T, IPS TFT Z→Transmissive, W.T, O-TFT R→Transmissive, Super W.T, O-TFT N→Transmissive, Super W.T, 6:00; Q→Transmissive, Super W.T, 12:00 V→Transmissive, Super W.T, VA TFT
8	Backlight	W : LED, White H : LED, High Light White F : CCFL, White
9	Driver Method	D: Digital A: Analog L : LVDS M:MIPI
10	Interface	N : without control board A : 8Bit B : 16Bit S:SPI Interface R: RS232 U:USB I: I2C
11	TS	N : Without TS S : resistive touch panel C : capacitive touch panel capacitive touch panel (G-F-F) G : capacitive touch panel(G-G)

2.Summary

TFT 12.3 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 12.28" (8:3) inch diagonally measured active display area with 5760 x 720 dot (1920 horizontal by 720 vertical pixel) resolution.

RAYSTAR OPTRONICS

3.General Specifications

- Size: 12.3 inch
- Pixel Number: 1920 RGB (H) x 720(V) pixel
- Module dimension: 308.1(H) x 130.0(V) x7.6 mm
- Active Area: 292.032(H) x 109.512(V) mm
- Pixel Pitch: 0.1521(H) x 0.1521 (V) mm
- LCD type: TFT, Normally Black, Transmissive
- Viewing Angle: 85/85/85/85
- Backlight Type: LED ,Normally White
- With /Without TP: Without TP
- TFT Interface: 2ch-LVDS
- Surface: Anti-Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. TFT LCD MODULE

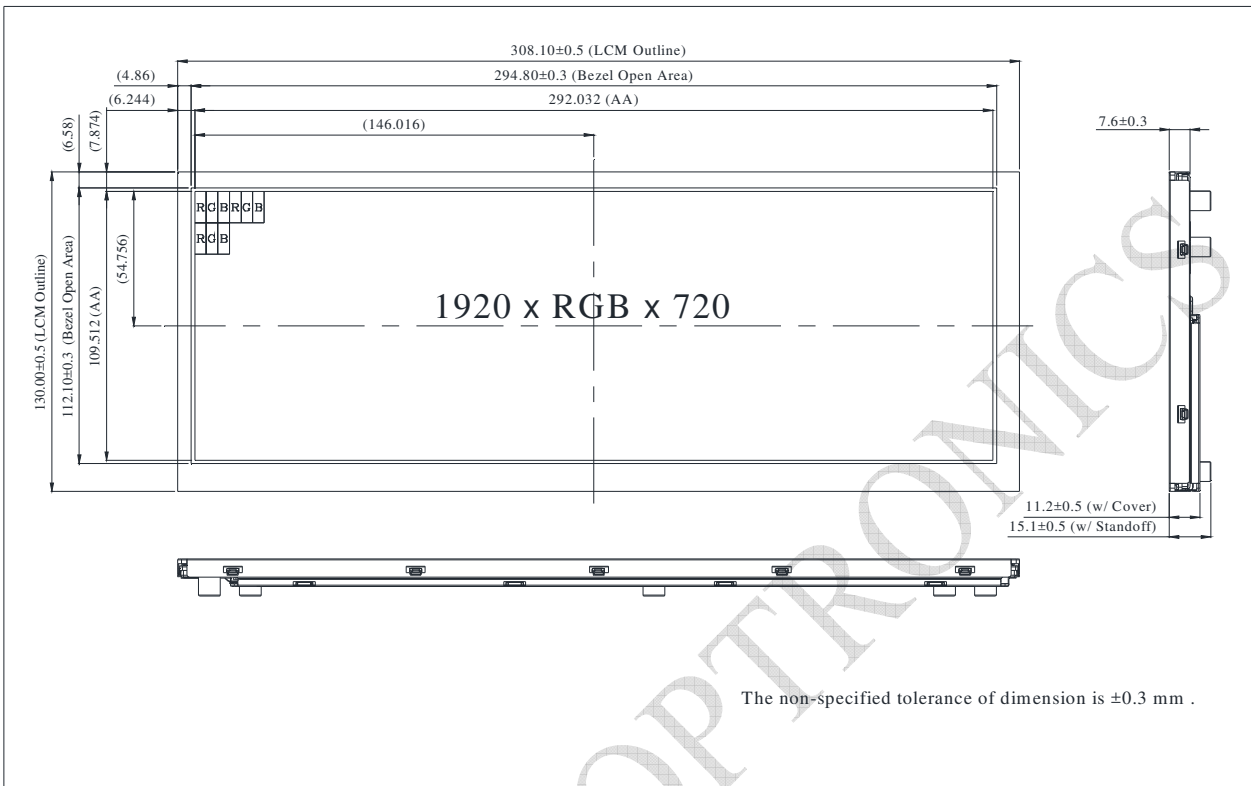
FPC connector is used for electronics interface.

AORORA F31L-1A7H1-21050 , 50PIN

Pin no.	Symbol	Function
1	GND	Power Ground
2	NC	No connector
3	VCC	Digital Power
4	VCC	Digital Power
5	GND	Power Ground
6	GND	Power Ground
7	NC	No connector
8	NC	No connector
9	GND	Power Ground
10	ORXIN0-	Odd pixel negative LVDS differential clock input
11	ORXIN0+	Odd pixel positive LVDS differential clock input
12	ORXIN1-	Odd pixel negative LVDS differential clock input
13	ORXIN1+	Odd pixel positive LVDS differential clock input
14	ORXIN2-	Odd pixel negative LVDS differential clock input
15	ORXIN2+	Odd pixel positive LVDS differential clock input
16	ORXCLKIN-	Odd pixel negative LVDS differential clock input
17	ORXCLKIN+	Odd pixel positive LVDS differential clock input
18	ORXIN3-	Odd pixel negative LVDS differential clock input
19	ORXIN3+	Odd pixel positive LVDS differential clock input
20	ERXIN0-	Even pixel negative LVDS differential clock input
21	ERXIN0+	Even pixel positive LVDS differential clock input
22	ERXIN1-	Even pixel negative LVDS differential clock input
23	ERXIN1+	Even pixel positive LVDS differential clock input
24	ERXIN2-	Even pixel negative LVDS differential clock input
25	ERXIN2+	Even pixel positive LVDS differential clock input
26	ERXCLKIN-	Even pixel negative LVDS differential clock input
27	ERXCLKIN+	Even pixel positive LVDS differential clock input
28	ERXIN3-	Even pixel negative LVDS differential clock input
29	ERXIN3+	Even pixel positive LVDS differential clock input

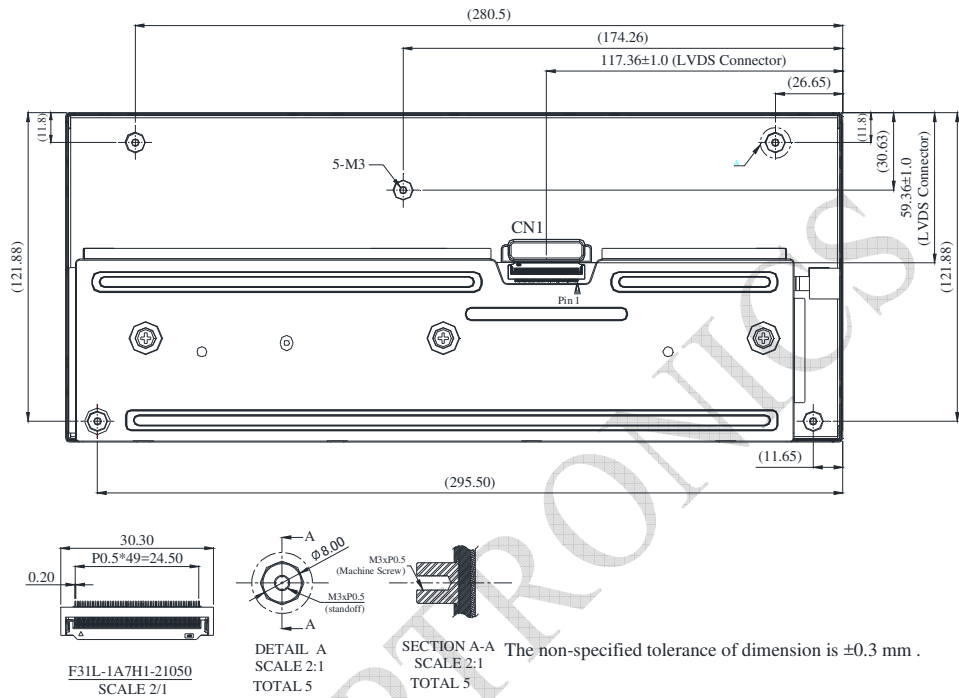
30	GND	Power Ground
31	NC	No connector
32	RESETB	Global reset pin, active low.
33	STBYB	Standby mode, active low.
34	CA3	Cascade signal pin. Abnormal signal detection indicator. Combine HV/DE/Clock/STV/UDP detection result.
35	NC	No connector(Serial interface clock input.SCL)
36	NC	No connector(Serial interface data input/output.CDA)
37	NC	No connector(Serial interface chip enable.CSB)
38	GND	Power Ground
39	GND	Power Ground
40	NC	No connector
41	LEDA	LED power (Anode)
42	LEDA	LED power (Anode)
43	LEDA	LED power (Anode)
44	NC	No connector
45	LEDK1	Cathode 1
46	LEDK2	Cathode 2
47	LEDK3	Cathode 3
48	LEDK4	Cathode 4
49	NTC_A	Thermistor input
50	NTC_K	Thermistor Feedback
Note: NTC Parts: Murata NCP18XH103F03RB		

5. Contour Drawing



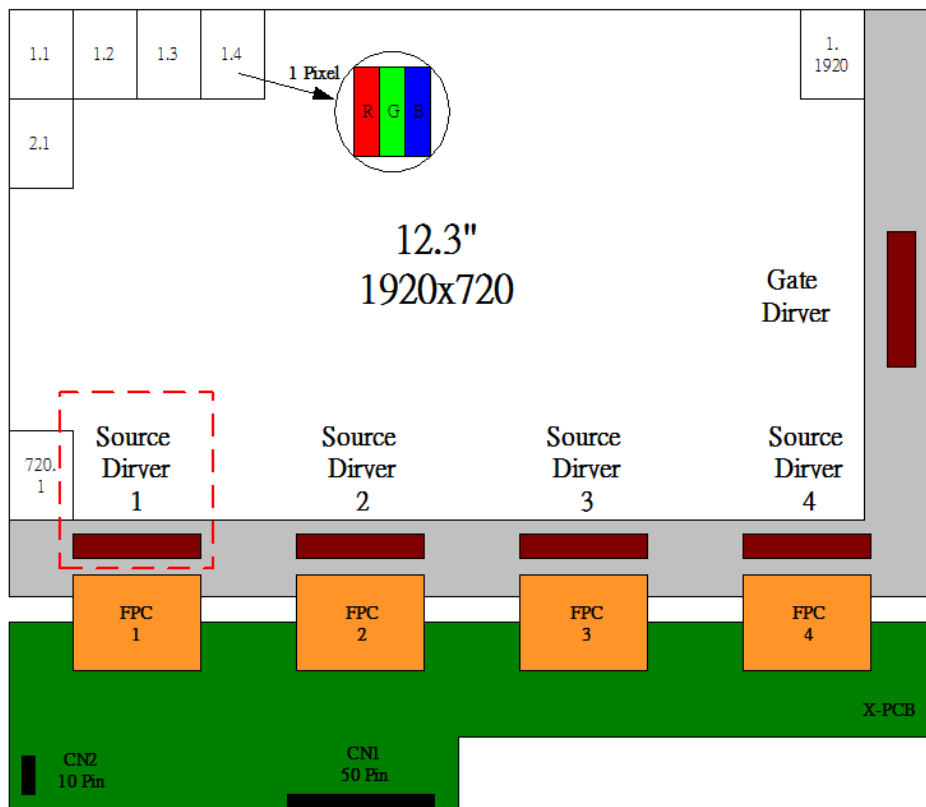
CN1(F31L-1A7H1-21050)

PIN NO	SYMBOL	PIN NO	SYMBOL
1	GND	29	ERXIN3+
2	NC	30	GND
3	VCC	31	NC
4	VCC	32	RESETB
5	GND	33	STBYB
6	GND	34	CA3
7	NC	35	SCL
8	NC	36	SDA
9	GND	37	CSB
10	ORXIN0-	38	GND
11	ORXIN0+	39	GND
12	ORXIN1-	40	NC
13	ORXIN1+	41	LEDA
14	ORXIN2-	42	LEDA
15	ORXIN2+	43	LEDA
16	ORXCLKIN-	44	NC
17	ORXCLKIN+	45	LEDK1
18	ORXIN3-	46	LEDK2
19	ORXIN3+	47	LEDK3
20	ERXIN0-	48	LEDK4
21	ERXIN0+	49	NTC_A
22	ERXIN1-	50	NTC_K
23	ERXIN1+		
24	ERXIN2-		
25	ERXIN2+		
26	ERXCLKIN-		
27	ERXCLKIN+		
28	ERXIN3-		

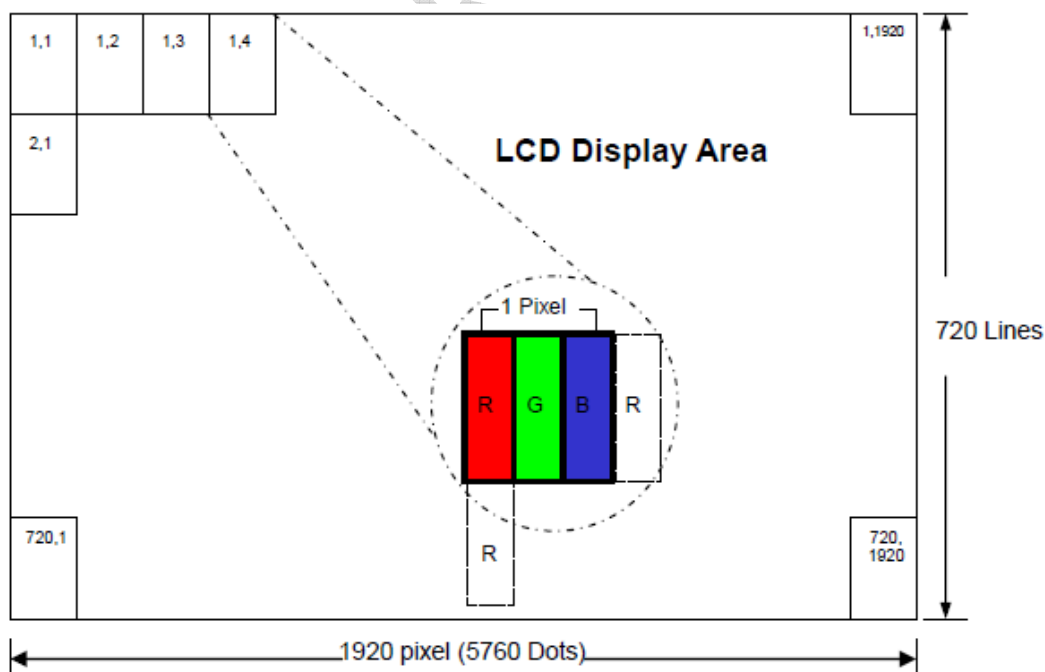


6. Block Diagram

6.1. TFT LCD Module:



6.2. Pixel Format



6.3. Relationship Between Displayed Color and Input

	Display	MSB LSB								MSB LSB								MSB LSB								Gray scale Level
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0	
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:								:								:								L3...L251
	Light	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
		H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:								:								:								L3...L251
	Light	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L252
		L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L253
		L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L254
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:								:								:								L3...L251
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L253
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L254
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2
		:								:								:								L3...L251
	Light	H	H	H	H	H	H	L	L	H	H	H	H	H	L	L	L	H	H	H	H	H	L	L	L	L252
		H	H	H	H	H	H	L	H	L	H	H	H	H	L	H	L	H	H	H	H	H	L	H	L	L253
		H	H	H	H	H	H	H	L	L	H	H	H	H	H	L	L	H	H	H	H	H	H	L	L	L254
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255

Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+85	°C
Storage Temperature	TST	-40	—	+90	°C

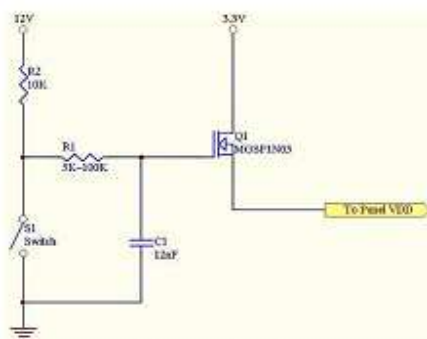
Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. $\leq 65^{\circ}\text{C}$, 90% RH MAX. Temp. $> 65^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 65°C .

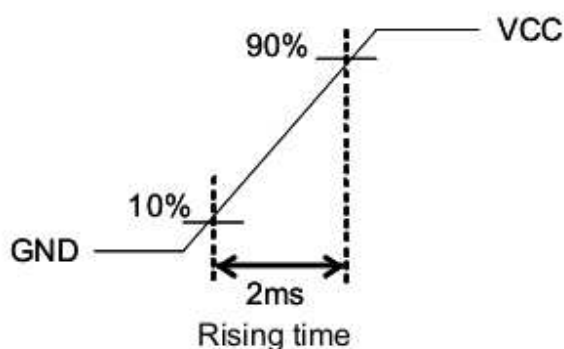
8. Electrical Characteristics

8.1. TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VCC	3	3.3	3.6	V	
Input signal voltage	ViH	VCC * 0.7	-	VCC	V	
	ViL	0	-	VCC * 0.3	V	
Current of power supply	ICC	--	--	500	mA	VCC = 3.3V



Test circuit



8.2. Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	100	—	300	mV	V _{CM} =1.2V
Differential Input Low Threshold	Vtl	-300	—	-100	mV	
Input Current Differential input Voltage	I _{IN} V _{ID}	-10	—	+10	uA	
		0.2	—	0.6	V	
Common Mode Voltage Offset	V _{CM}	1	1.2	1.7-(V _{ID} /2)	V	

8.3. Backlight Unit

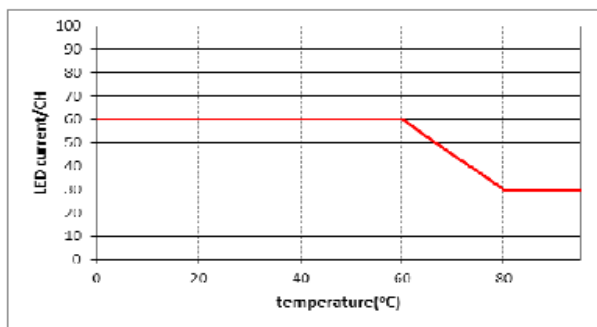
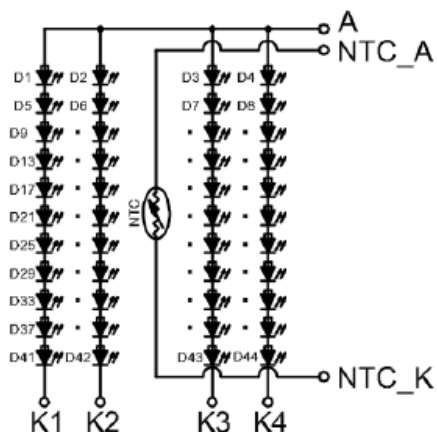
Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	IF	--	280	--	mA	Ta=25°C
LED Voltage	VF	--	--	37.4	Volt	Ta=25°C
LED Life-Time	N/A	30,000	--	--	Hour	Ta=25°C IF=70mA Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL= 280 mA. The LED lifetime could be decreased if operating IL is larger than 300 mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit 11S4P =44pcs LED

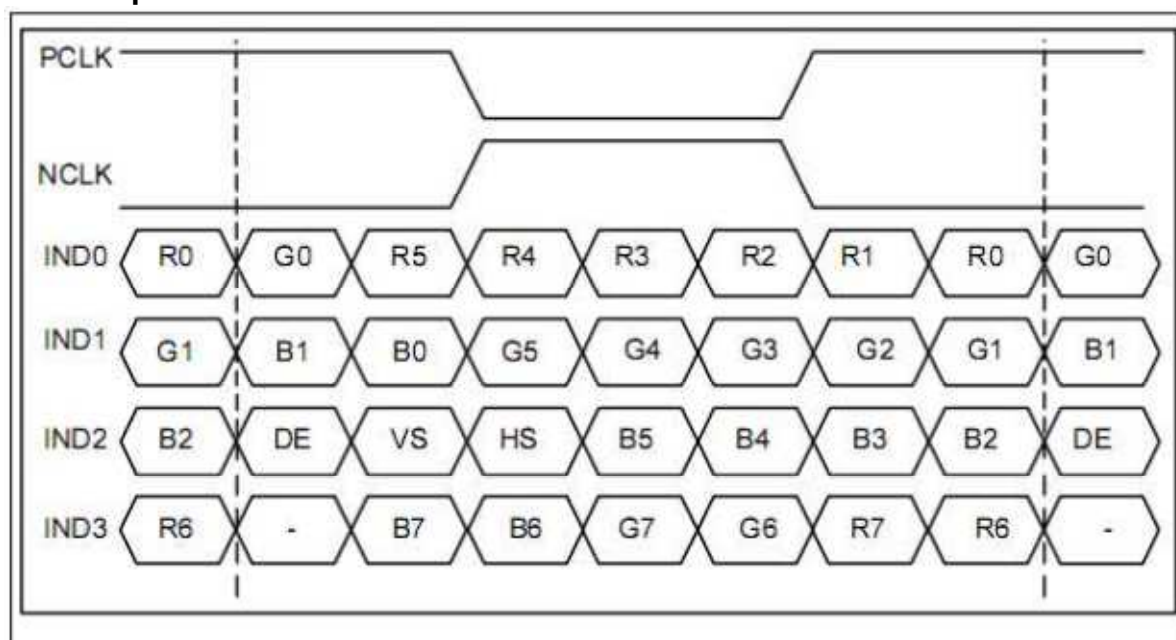
Note (4) LED temperature current curve, The temperature at 60 degrees before the output 70mA / CH, 60 degrees to 80 degrees when the linear drop to 35mA.



9.Bit LVDS input

9.1. Bit LVDS input

8Bit LVDS input

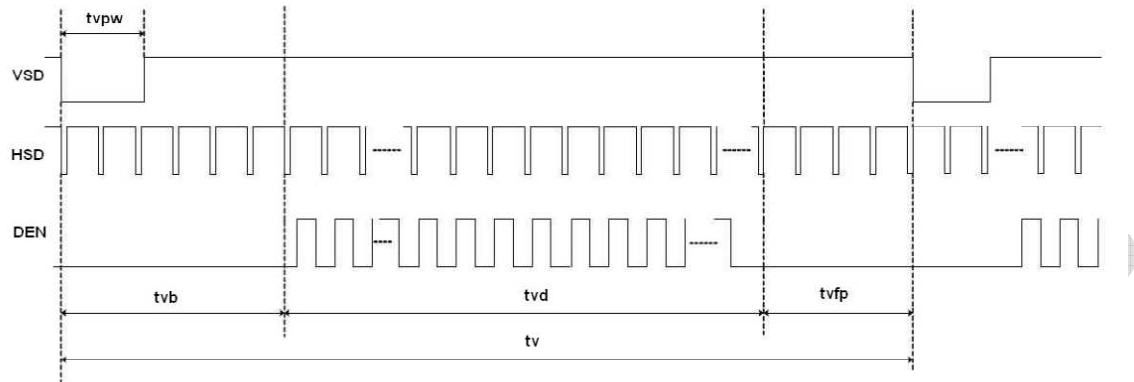


9.2. Interface Timing (DE mode)

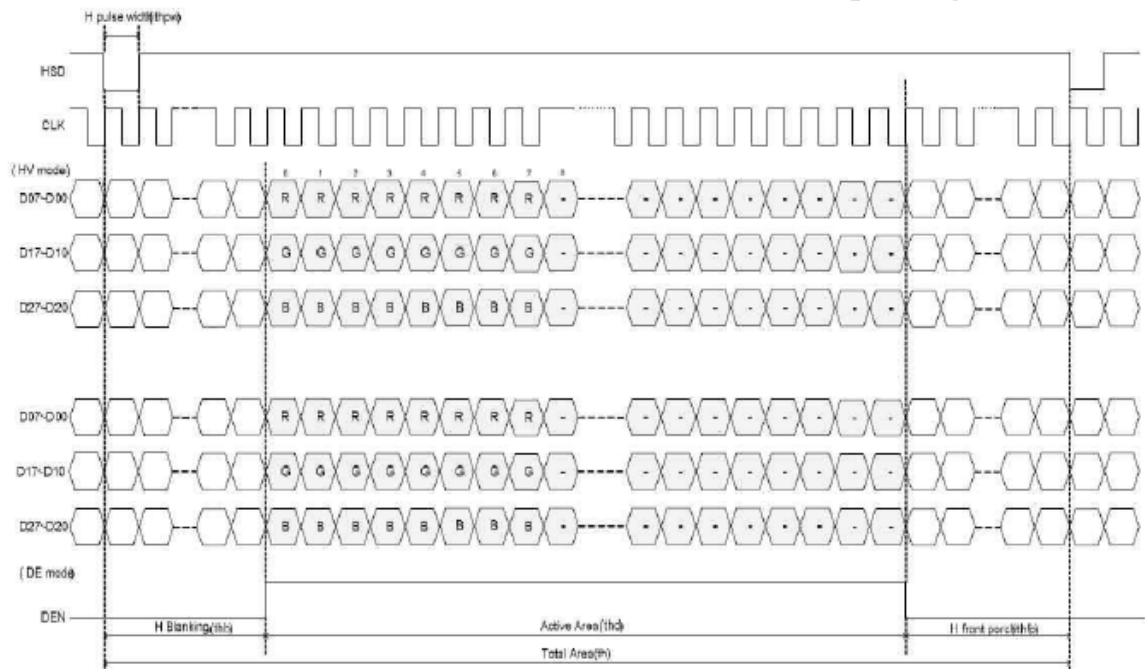
Interface Timing (DE mode)					
Two Port LVDS Timing.(1920xRGBx720)					
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	FR	55	60	65	Hz
Frame Period	T _v	730	792	864	line
Vertical Display Time	T _{vd}	720	720	720	line
Vertical Blanking Time	T _{vb}	10	72	144	line
1 Line Scanning Time	T _h	984	992	1104	clock
Horizontal Display Time	T _{hd}	960	960	960	clock
Horizontal Blanking Time	T _{hb}	24	32	144	clock
Clock Rate	F _{DCLK}	45	47.5	50	MHz

Timing Diagram of Interface Signal (DE mode)

(1) Vertical input timing

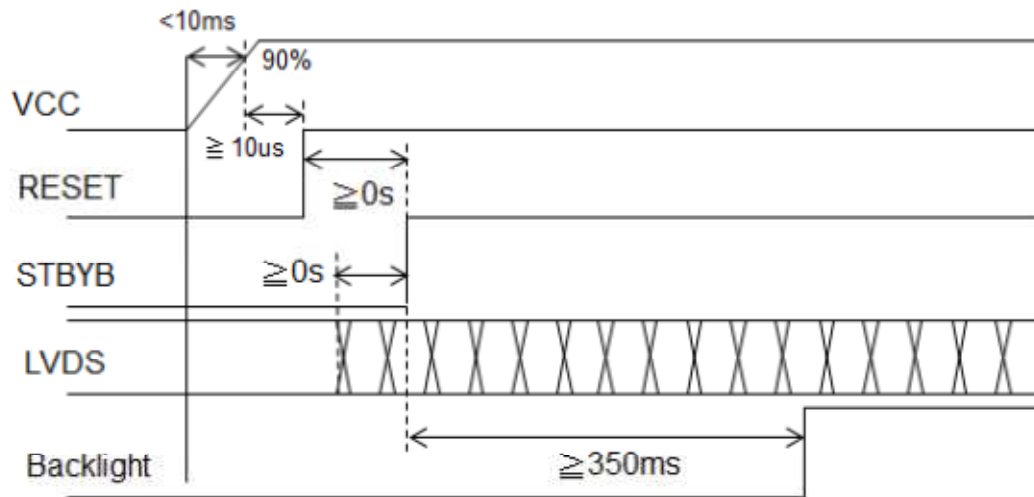


(2) Horizontal Vertical input timing

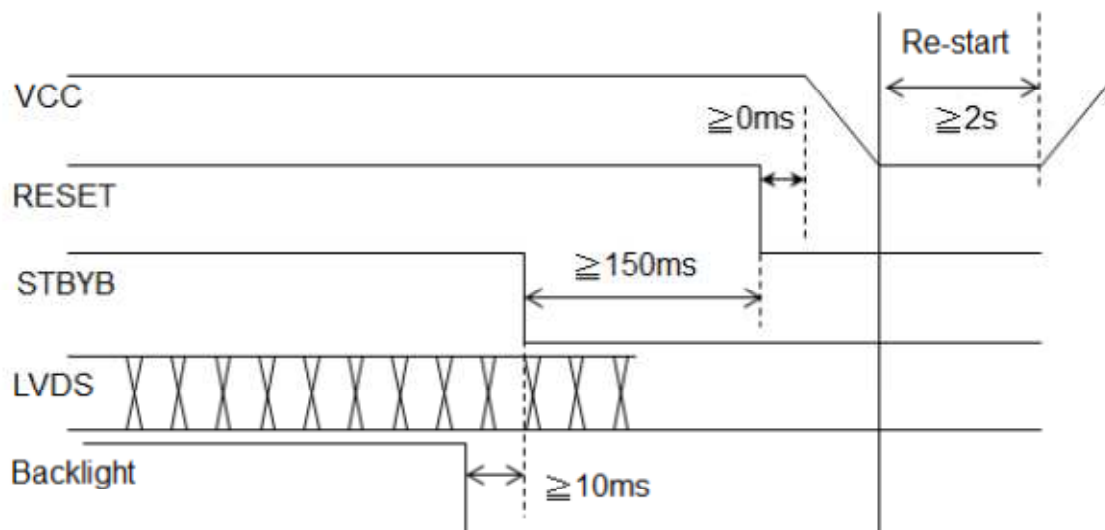


9.3. Power On / Off Sequence

Power ON



Power OFF



10. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta=0^\circ$ 、 $\Phi=0^\circ$	—	—	14	.ms	Note 3
	Tf		—	—	16	.ms	
Contrast ratio	CR	At optimized viewing angle	900	1100	-	-	Note 4
Color Chromaticity	White	$\theta=0^\circ$ 、 $\Phi=0^\circ$	0.256	0.296	0.336		Note 2,6,7
	Wy		0.284	0.324	0.364		
Viewing angle	Hor.	Θ_R	80	85	-	Deg.	Note 1
		Θ_L	80	85	-		
	Ver.	Φ_T	80	85	-		
		Φ_B	80	85	-		
Brightness	-	-	650	800	-	cd/m ²	Center of display
Uniformity	(U)	-	70	80	-	%	Note 5

Note 1:

1.1 Definition of viewing angle range

1.2 Measuring surrounding : dark room

1.3 LED current IL : 280Ma

1.4 Ambient temperature : 25±2℃

1.5 15min. warm-up time.

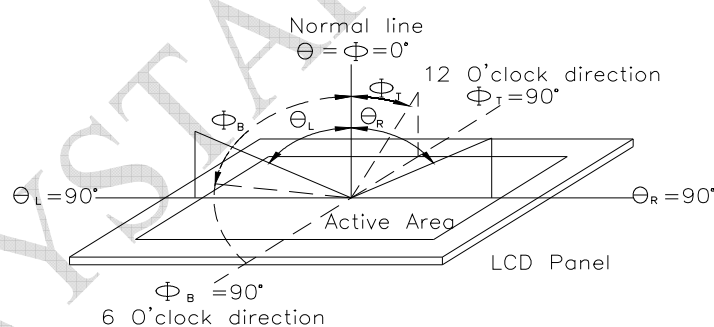


Fig.10.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

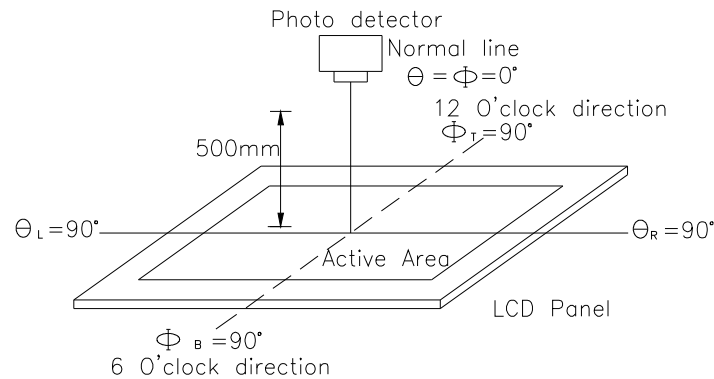
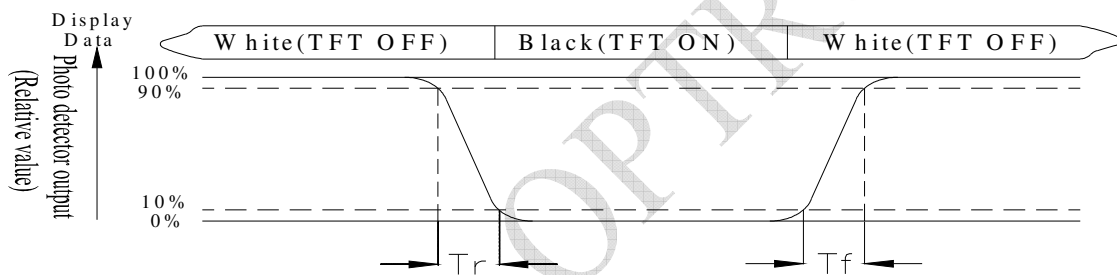


Fig. 10.2. Optical measurement system setup

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_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

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

Note 5: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

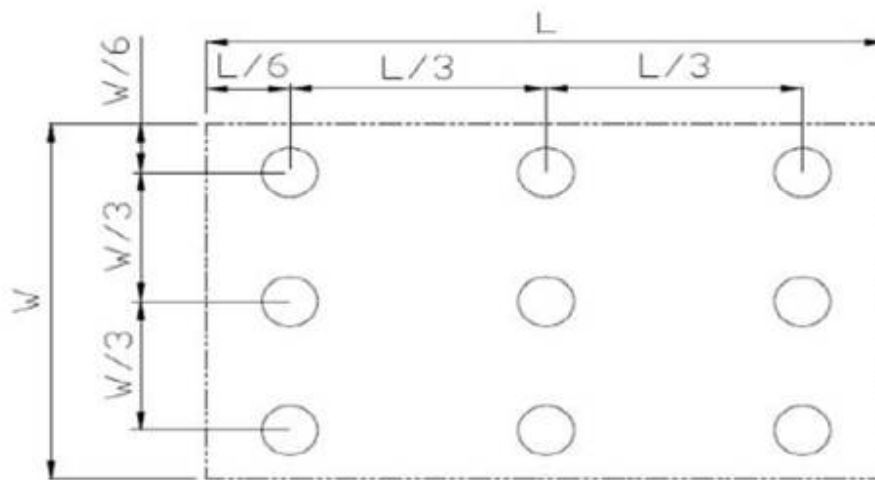


Fig10.3. Definition of uniformity

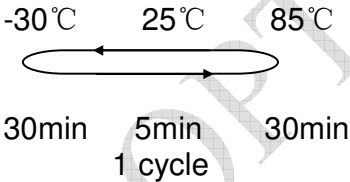
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

11. Reliability

Content of Reliability Test (Super Wide temperature, -30℃~85℃)

Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	90℃ 240hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40℃ 240hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	85℃ 240hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30℃ 240hrs	1
High Temperature/Humidity storage	The module should be allowed to stand at 60℃,90%RH max	65℃,90%RH 240hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 200 cycles of non operation 	-30℃/80℃ 100 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	1. Random: 1.04G, 5~500Hz, XYZ, 30min/each direction 2. Sine: Freq. 8~33.3Hz, Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hrs, Y: 4hrs	3
Static electricity test	Endurance test applying the electric stress to the terminal.	±200V,200pF(0Ω) 1 time/connector	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

LCM Sample Estimate Feedback Sheet

Module Number : _____

1 、 Panel Specification :

1. Panel Type :	☐ Pass	☐ NG , _____
2. View Direction :	☐ Pass	☐ NG , _____
3. Numbers of Dots :	☐ Pass	☐ NG , _____
4. View Area :	☐ Pass	☐ NG , _____
5. Active Area :	☐ Pass	☐ NG , _____
6. Operating Temperature :	☐ Pass	☐ NG , _____
7. Storage Temperature :	☐ Pass	☐ NG , _____
8. Others : _____		

2 、 Mechanical Specification :

1. PCB Size :	☐ Pass	☐ NG , _____
2. Frame Size :	☐ Pass	☐ NG , _____
3. Material of Frame :	☐ Pass	☐ NG , _____
4. Connector Position :	☐ Pass	☐ NG , _____
5. Fix Hole Position :	☐ Pass	☐ NG , _____
6. Backlight Position :	☐ Pass	☐ NG , _____
7. Thickness of PCB :	☐ Pass	☐ NG , _____
8. Height of Frame to PCB :	☐ Pass	☐ NG , _____
9. Height of Module :	☐ Pass	☐ NG , _____
10. Others :	☐ Pass	☐ NG , _____

3 、 Relative Hole Size :

1. Pitch of Connector :	☐ Pass	☐ NG , _____
2. Hole size of Connector :	☐ Pass	☐ NG , _____
3. Mounting Hole size :	☐ Pass	☐ NG , _____
4. Mounting Hole Type :	☐ Pass	☐ NG , _____
5. Others :	☐ Pass	☐ NG , _____

4 、 Backlight Specification :

1. B/L Type :	☐ Pass	☐ NG , _____
2. B/L Color :	☐ Pass	☐ NG , _____
3. B/L Driving Voltage (Reference for LED Type) : ☐ Pass ☐ NG , _____		
4. B/L Driving Current :	☐ Pass	☐ NG , _____
5. Brightness of B/L :	☐ Pass	☐ NG , _____
6. B/L Solder Method :	☐ Pass	☐ NG , _____
7. Others :	☐ Pass	☐ NG , _____

>> **Go to page 2** <<

Module Number : _____

5 、 Electronic Characteristics of Module :

1.Input Voltage :	☐ Pass	☐ NG , _____
2.Supply Current :	☐ Pass	☐ NG , _____
3.Driving Voltage for LCD :	☐ Pass	☐ NG , _____
4.Contrast for LCD :	☐ Pass	☐ NG , _____
5.B/L Driving Method :	☐ Pass	☐ NG , _____
6.Negative Voltage Output :	☐ Pass	☐ NG , _____
7.Interface Function :	☐ Pass	☐ NG , _____
8.LCD Uniformity :	☐ Pass	☐ NG , _____
9.ESD test :	☐ Pass	☐ NG , _____
10.Others :	☐ Pass	☐ NG , _____

6 、 Summary :
Sales signature : _____

Customer Signature : _____

Date : / /