



RAYSTAR

RAYSTAR Optronics, Inc.
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RFK1210F-AYH-LNB

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	2024/09/03		First issue

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1.Module Classification Information

R	F	K	121	0F	-	A	Y	H	-	L	N	B
1	2	3	4	5	-	6	7	8	-	9	10	11

Item	Description	
1	R : Raystar Optronics 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 : 12.1" 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 ; 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) B : CTP+GG+USB

2.Summary

TFT 12.1" is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver ICs and a backlight unit.

RAYSTAR OPTRONICS

3.General Specifications

- Size: 12.1 inch
- Dot Matrix: 1280 x RGB. x 800 dots
- Module dimension: 308.0 x 214.1 x 13.0 mm
- Active area: 261.12 x 163.2 mm
- Pixel pitch: 0.204 x 0.204 mm
- LCD type: TFT, Normally Black, Transmissive
- Backlight Type: LED ,Normally White
- Viewing Angle: 85/85/85/85
- TFT Interface: LVDS
- Aspect Ratio: 16:9
- CTP Driver IC: ILI2132 or equivalent
- CTP Resolution: 16384*16384
- CTP Interface: USB (I2C available)
- CTP FW Version: 0x07.0x00.0x00.0x00.0x02.0x00.0x00.0x00
- With /Without TP: With CTP
- Surface Treatment: Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition

Pin No.	Symbol	Function
1	NC	No contact
2	VDD	Power supply VDDIN=3.3V
3	VDD	
4	VDD	
5	NC	No contact
6	GND	Digital power
7	GND	Digital ground
8	RIN0-	LVDS Negative data signal (-)
9	RIN0+	LVDS Negative data signal (+)
10	GND	GND
11	RIN1-	LVDS Negative data signal (-)
12	RIN1+	LVDS Negative data signal (+)
13	GND	GND
14	RIN2-	LVDS Negative data signal (-)
15	RIN2+	LVDS Negative data signal (+)
16	GND	GND
17	LVDS_CLK-	LVDS Negative CLK signal (-)
18	LVDS_CLK+	LVDS Negative CLK signal (+)
19	GND	GND
20	RIN3-	LVDS Negative data signal (-)
21	RIN3+	LVDS Negative data signal (+)
22	GND	GND
23	NC	No contact
24	NC	No contact
25	GND	GND
26	NC	No contact
27	NC	No contact
28	GND	GND
29	NC	No contact
30	NC	No contact
31	GND	GND
32	GND	GND
33	GND	GND
34-40	NC	No contact

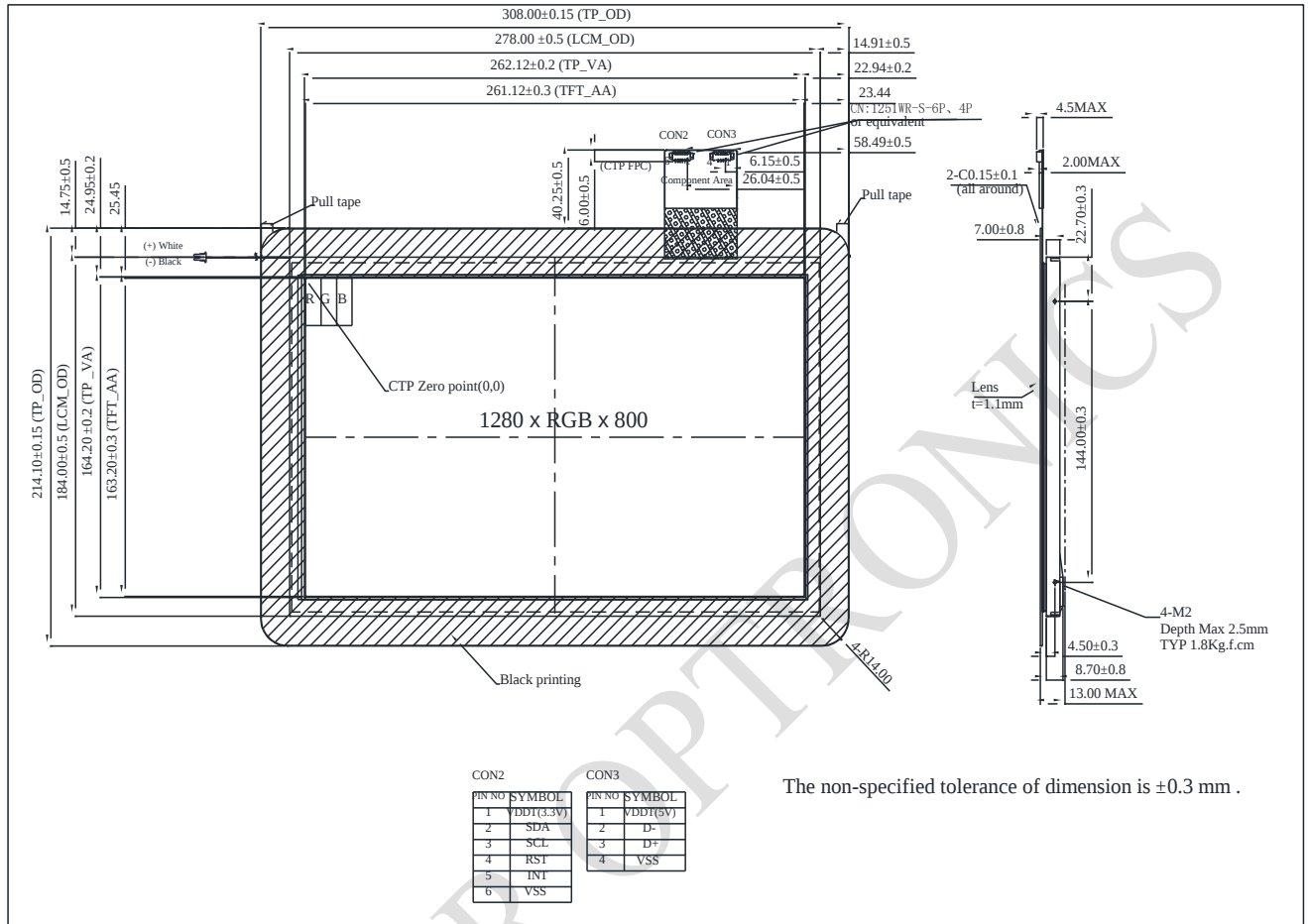
4.2. CON2

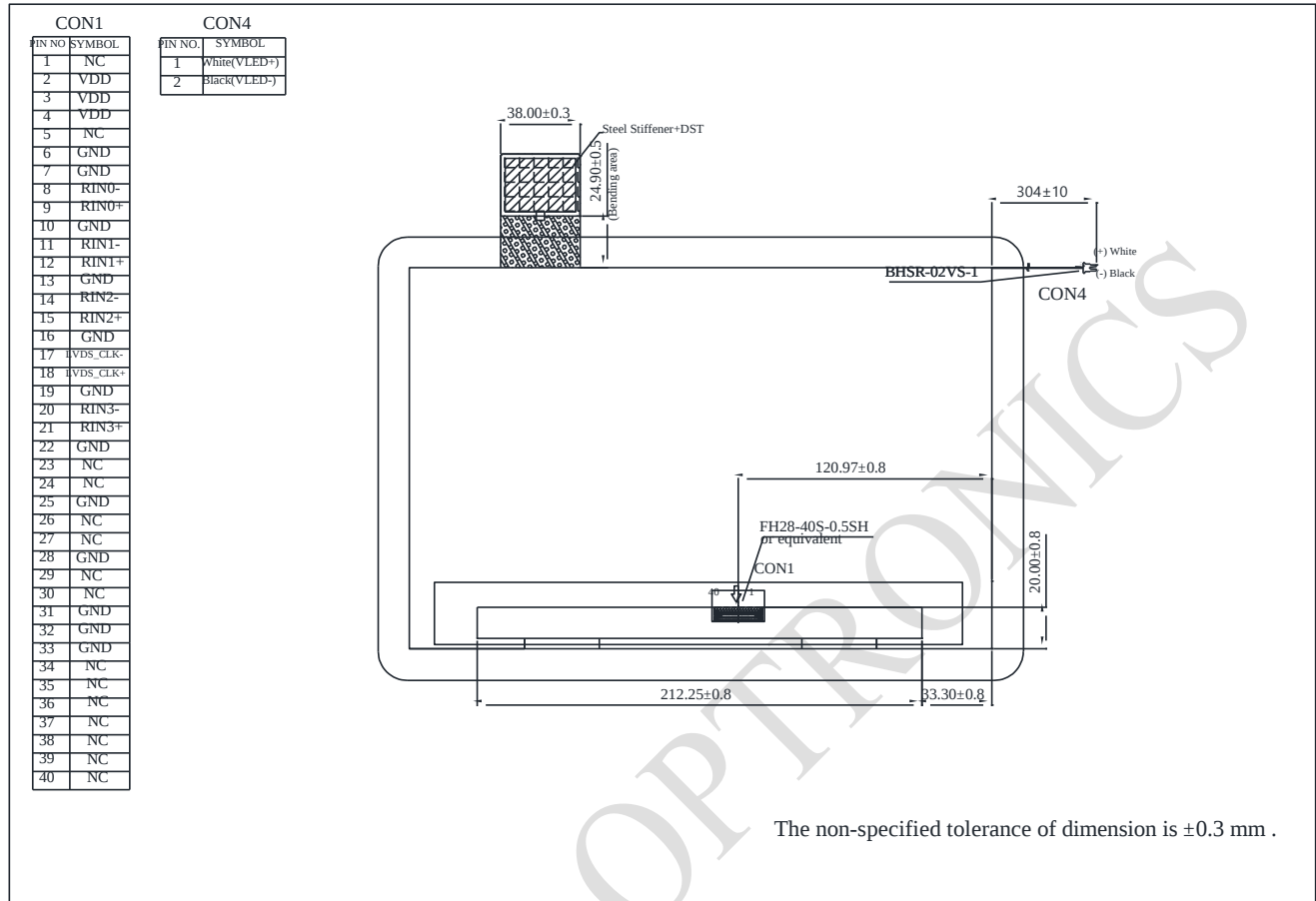
Pin No.	Symbol	Function	Remark
1	VDDT(3.3V)	Power supply	
2	SDA	I2C data input and output	
3	SCL	I2C clock input I2C clock input	
4	RST	External Reset, Low is active	
5	INT	External interrupt to the host	
6	VSS	Ground for analog circuit	

4.3. CON3

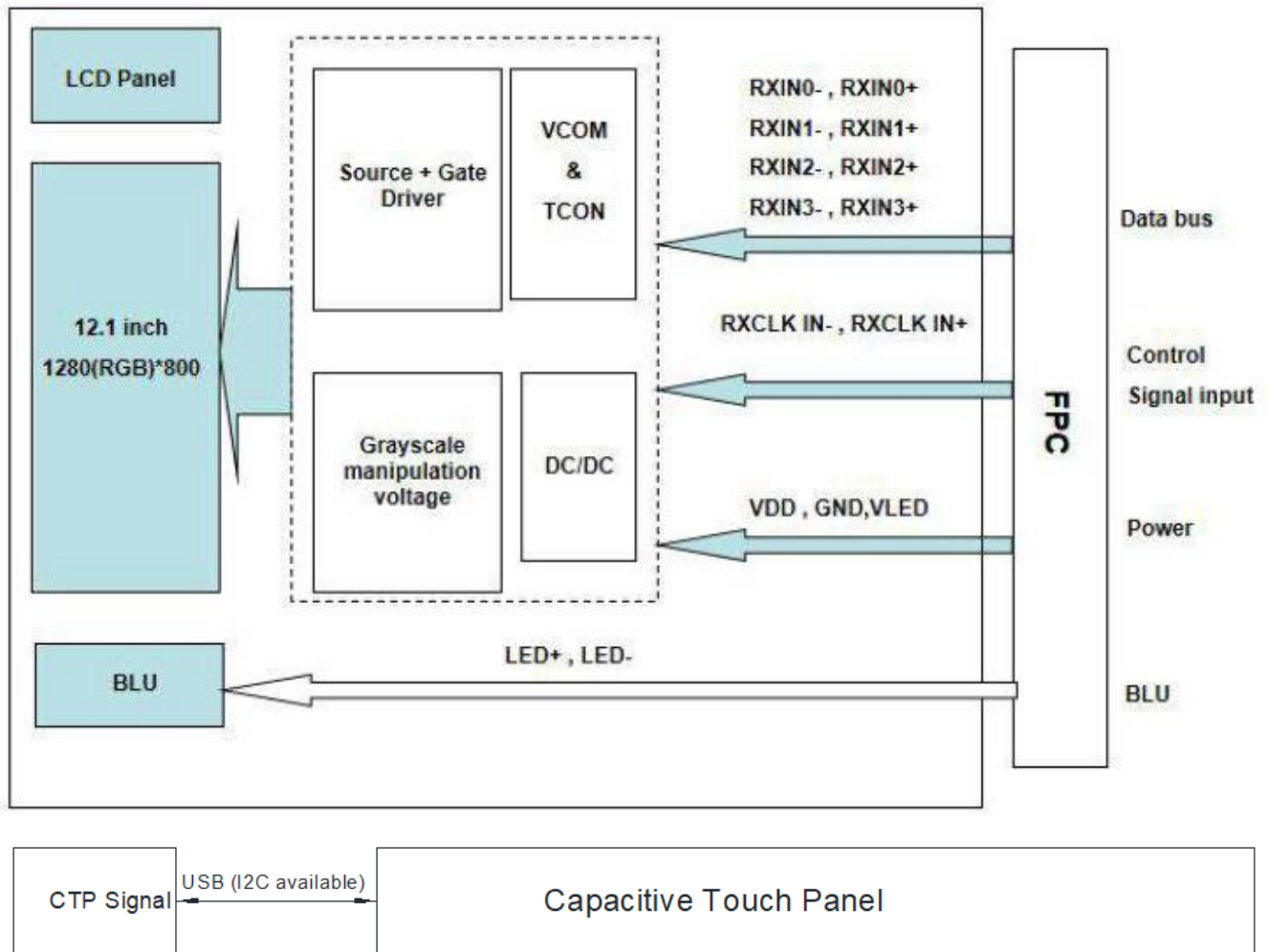
Pin No.	Symbol	Function	Remark
1	VDDT(5V)	Power supply	
2	D-	Data -	
3	D+	Data +	
4	VSS	System ground	

5. Contour Drawing





6. Block Diagram



7. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	°C
Storage Temperature	TST	-30	—	+80	°C

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

- Temp. ≤ 60°C, 90% RH MAX. Temp. > 60°C, Absolute humidity shall be less than 90% RH at 60°C

8. Electrical Characteristics

8.1. Typical Operation Conditions

Items	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	VDD	3.0	3.3	3.6	V
Supply current	IDD	-	340	510	mA
Logic Low input voltage	VIH	0	-	0.2*VDD	V
Logic High input voltage	VIL	0.8*VDD	-	VDD	V
Logic Low output voltage	VOH	-	-	GND+0.4	V
Logic High output voltage	VOL	DVDD-0.4	-	-	V
Supply CTP	VDDT(3.3V)	3.0	3.3	3.6	I2C type
	IDDT(3.3V)	-	87	135	
	VDDT(5V)	-	5.0	-	USB type
	IDDT(5V)	-	92	140	

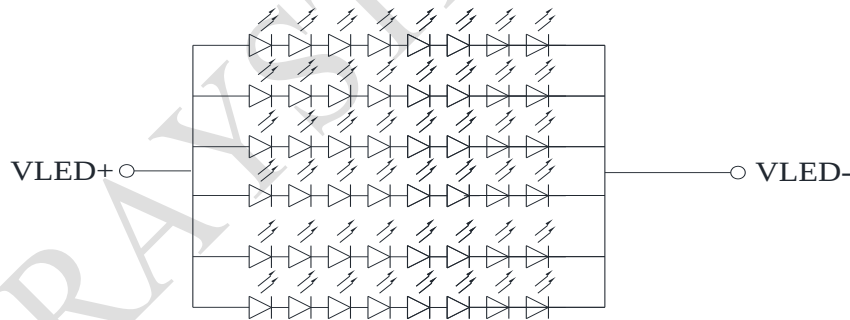
Note 1 : All of voltage listed above are with respect to GND=0V

Note 2 : Device is subject to be damaged permanently if stresses beyond those absolute maximum rating listed above.

Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I _{LED}	-	360	-	mA	
LED voltage	V _{LED+}	22.0	24.0	26.0	V	Note 1
LED Life Time		-	50,000	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Back Light Circuit

Note 2 : Ta = 25 °C

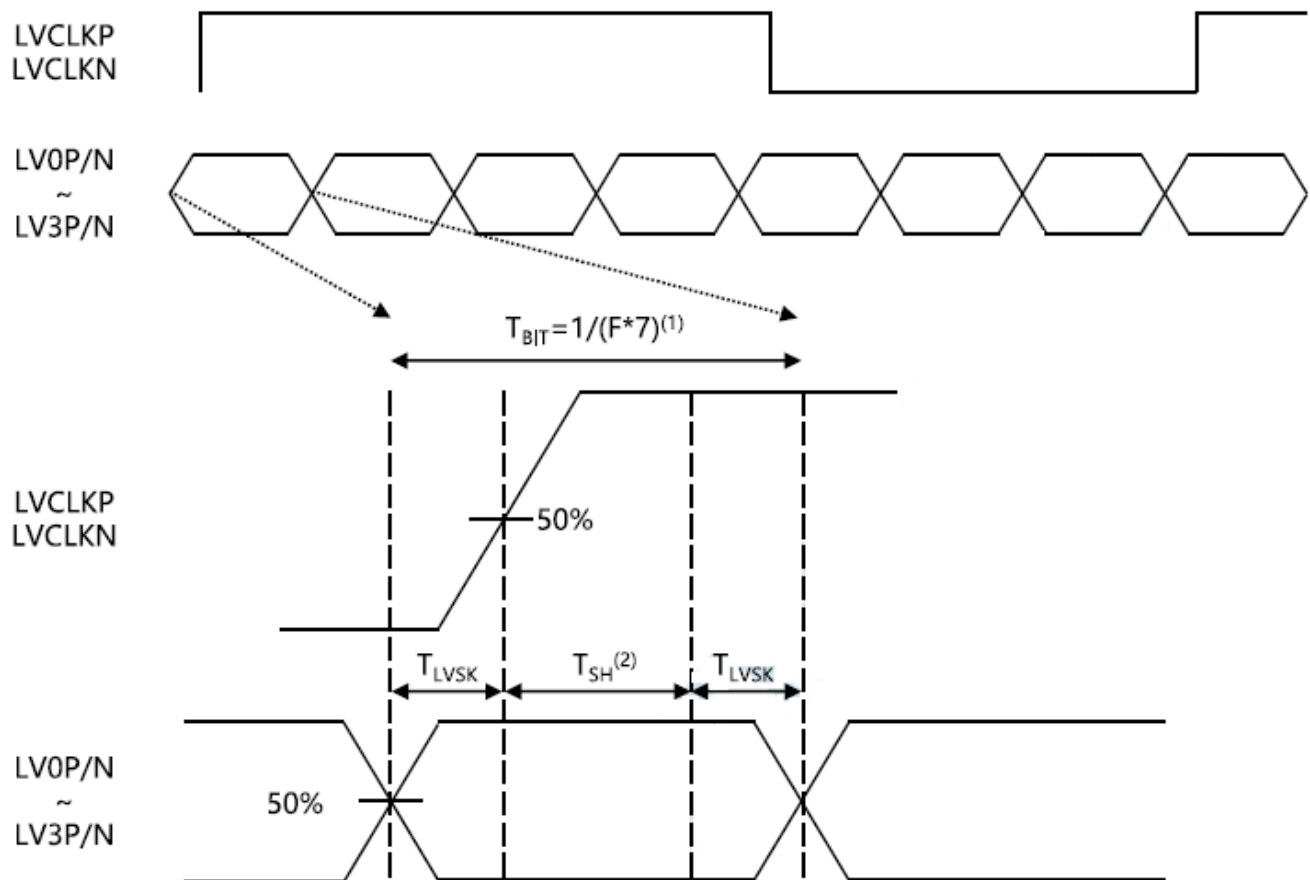
Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

9. Input Signal Timing

9.1. AC Electrical Characteristics

1. LVDS mode AC electrical characteristics



Note:

(1) T_{BIT} : Data period

(2) Internal CLK sampling data window

< LVDS channel to channel skew >

9.2. Interface timing Parameter

Item			Symbol	min	typ	max	Unit
LCD	Frame Rate		-	58	60	62	Hz
	Pixels Rate		-	66.3	72.4	78.9	MHz
Timing	Horizontal	Horizontal total time	tHP	1380	1440	1500	tCLK
		Horizontal Active time	tHadr	1280			tCLK
		Horizontal Back Porch	tHBP	-	78	-	tCLK
		Horizontal Front Porch	tHFP	-	72	-	tCLK
	Vertical	Vertical total time	tvp	824	838	872	tH
		Vertical Active time	tVadr	800			tH
		Vertical Back Porch	tVBP	-	18	-	tH
		Vertical Front Porch	tVFP	-	15	-	tH
Lane			-	1	-	Lane	

10.Power On/Off Sequence

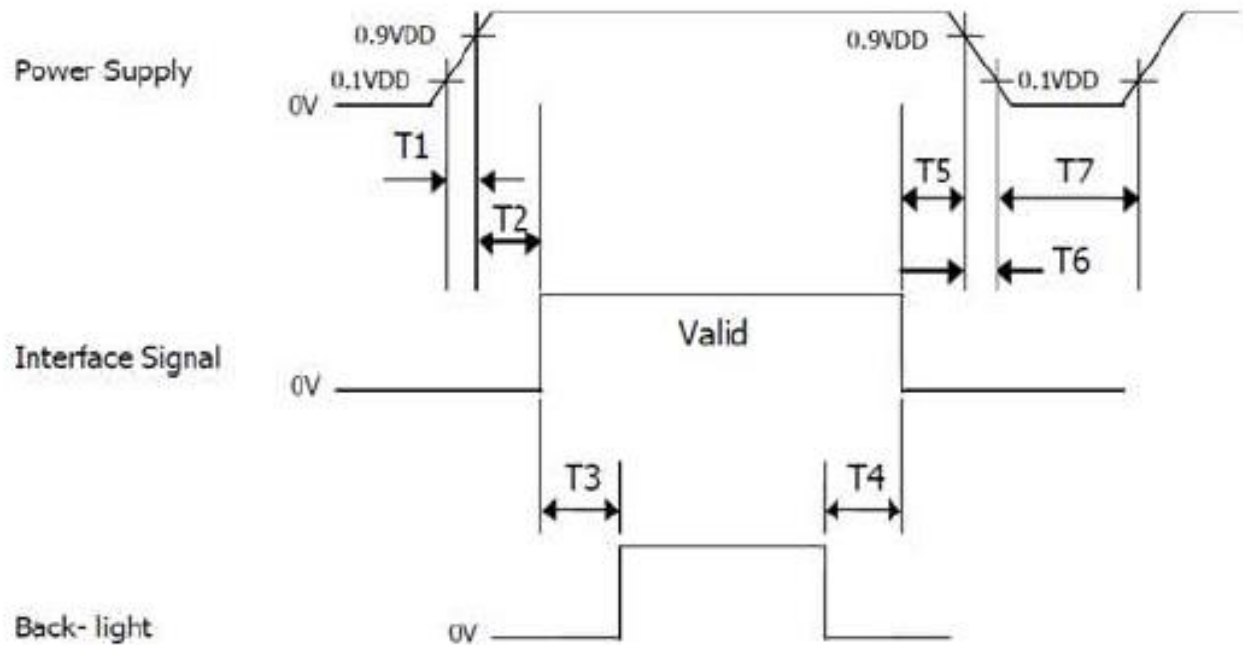


Table 1 Sequence Table

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0	-	10	(ms)
T2	0	-	50	(ms)
T3	200	-	-	(ms)
T4	200	-	-	(ms)
T5	0	-	50	(ms)
T6	0	-	10	(ms)
T7	500	-	-	(ms)

11. Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+ Tf	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	30	35	.ms	Note 3
Contrast ratio		CR	At optimized viewing angle	1000	1200	-	-	Note 4
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.253	0.303	0.353		Note 2,6,7
		Wy		0.299	0.349	0.399		
Viewing angle	Hor.	ΘR	$CR\geq 10$	80	85	-	Deg.	Note 1
		ΘL		80	85	-		
	Ver.	ΦT		80	85	-		
		ΦB		80	85	-		
Brightness		-	-	600	800	-	cd/m ²	Center of display
Uniformity		(U)	-	70	-	-	%	Note 5

Ta=25±2°C

Note 1: Definition of viewing angle range

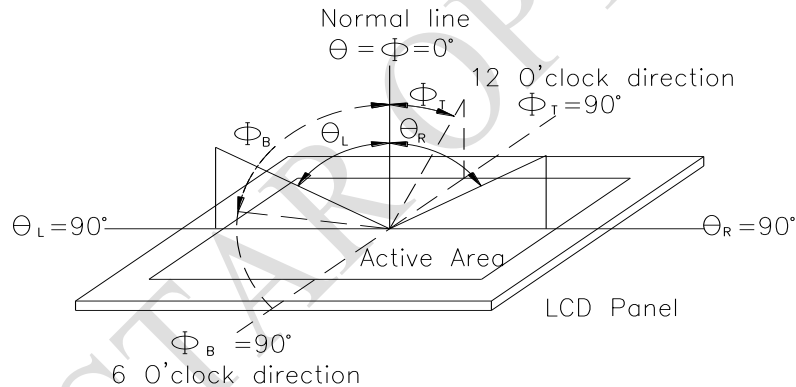


Fig 11.1. Definition of viewing angle

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-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

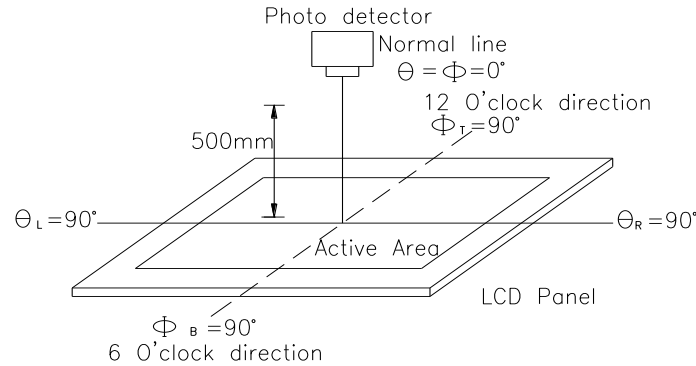
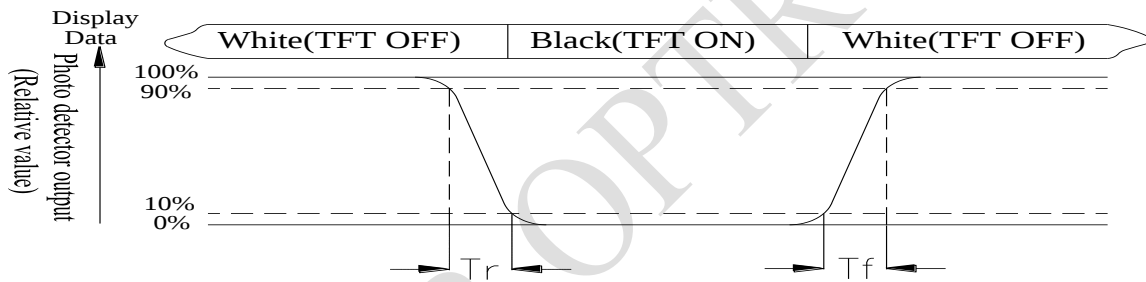


Fig 11.2. Optical measurement system setup

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

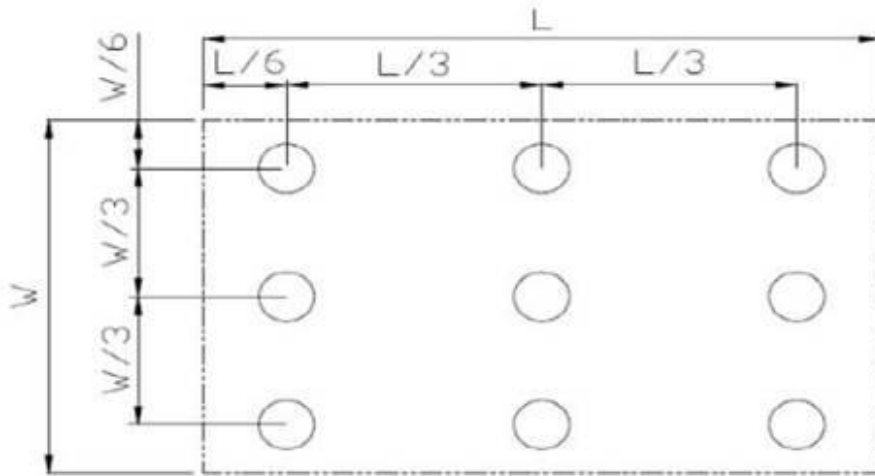


Fig 11.3. Definition of uniformity

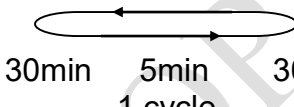
Note 6: Definition of color chromaticity (CIE 1931)

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.

12. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

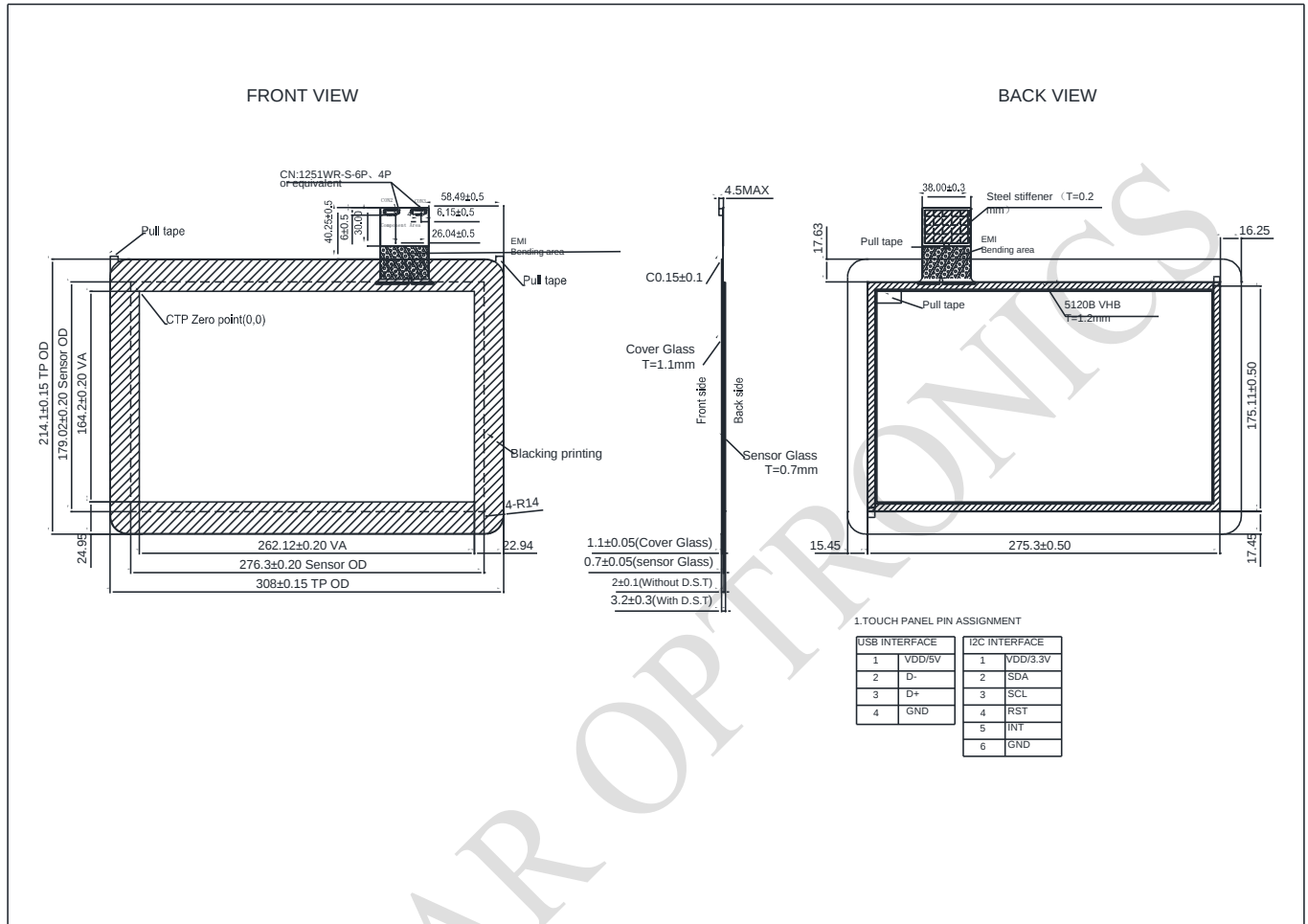
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20°C 25°C 70°C  30min 5min 30min 1 cycle	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±4KV(contact), ±4KV(air), RS=330Ω CS=150pF 10 times	—

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.

13.Touch Panel Information



14. Inspection Specification

1	Electrical Defect (Major defect)	1. About the border line occlusion inspection standard. 1.1 Left border line standard: Allows the left Red dot part to be blocked  1.2 Right border line standard: Allow the right Blue dot part to be blocked.  1.3 In the positive viewing Angle without position deviation, continuous white straight lines can be seen as the judgment standard.  1.4 Top and bottom border line standard: No occlusion problem is not relaxed according to normal standards. 
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Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

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 : / /