TFT DISPLAY SPECIFICATION

曜凌光電股份有限公司
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RFF500F-AWW-LNG

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 A B	2021/04/21 2021/04/27 2021/07/05		First issue Modify Brightness Correct Aspect Ratio

Contents

1.Module Classification Information

R	F	F	50	0F	-	A	W	W	-	L	N	G
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：5.0” 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 5.0” is a is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This TFT LCD has a 5.0 inch diagonally measured active display area with 800x480 (800 horizontal by 480 vertical pixel) resolution.

3.General Specifications

- Size: 5.0 inch
- Dot Matrix: 800× 3(RGB) × 480 dots
- Module dimension: 120.7(W) ×75.8(H) ×4.475 mm
- Active area: 108(W) ×64.8 (H) mm
- Pixel pitch: 0.135(W) ×0.135(H) mm
- LCD type: TFT, Normally Black, Transmissive
- View Direction: 80/80/80/80
- Aspect Ratio: 5:3
- Driver IC: ST7262 or equivalent
- Interface: LVDS
- Backlight Type: LED ,Normally White
- CTP IC: ILI2130 or Equivalent
- CTP Interface: I2C
- CTP FW Version: 0x07.0x00.0x00.0x00.0xA1.0x25.0x50.0x00
- CTP Resolution: 16384*16384
- With /Without TP: With CTP
- Surface: Glare

*Color tone slight changed by temperature and driving voltage.

4.Interface

4.1. LCM PIN Definition

FPC Connector is used for the module electronics interface.

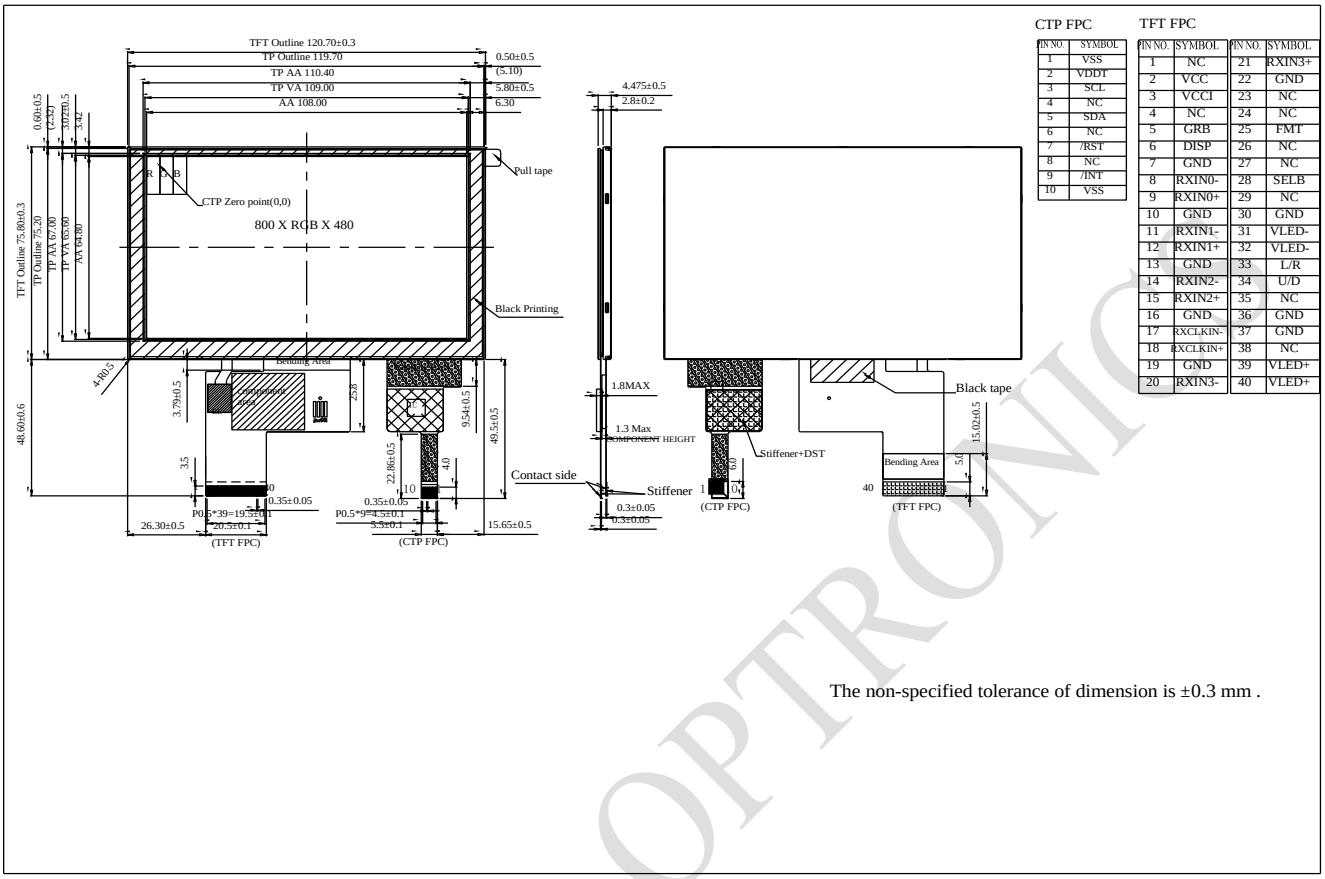
Pin	Symbol	Function	Remark
1	NC	No connection	
2	VCC	Power voltage	
3	VCCI	Power supply for digital I/O pins.	
4	NC	No connection	
5	GRB	Global reset pin. When GRB is “L”, internal initialization procedure is executed	
6	DISP	Display on/off	
7	GND	Power Ground	
8	RXIN0-	LVDS input lane: RX0-/ RX0+ (RX0N/RX0P)	
9	RXIN0+		
10	GND	Power Ground	
11	RXIN1-	LVDS input lane: RX1-/ RX1+(RX1N/RX1P)	
12	RXIN1+		
13	GND	Power Ground	
14	RXIN2-	LVDS input lane: RX2-/ RX2+(RX2N/RX2P)	
15	RXIN2+		
16	GND	Power Ground	
17	RXCLKIN-	LVDS input lane, detail pin define please refer to LVDS Input Pin Mapping Table. (DCLKN/ DCLKP)	
18	RXCLKIN+		
19	GND	Power Ground	
20	RXIN3-	LVDS input lane: RX3-/ RX3+(RX3N/RX3P)	
21	RXIN3+		
22	GND	Power Ground	
23-24	NC	No connection	
25	FMT	LVDS_FMT sets LVDS data format. LVDS_FMT: L = VESA Mode (Default); H = JEIDA Mode LVDS_FMT is not used in RGB interface and should be connected to “L”.	

<table>
<tr><td>26-27</td><td>NC</td><td>No connection</td><td></td></tr>
<tr><td>28</td><td>SELB</td><td>SELB sets VSYNC polarity in RGB interface and sets LVDS 3- / 4- lane in LVDS interface.
<table>
<tr><th>MCU Type</th><th>VDPOL</th><th>Function Description</th></tr>
<tr><td rowspan="2">RGB interface</td><td>L</td><td>VSYNC polarity: positive</td></tr>
<tr><td>H</td><td>VSYNC polarity: negative(Default)</td></tr>
<tr><td rowspan="2">LVDS interface</td><td>L</td><td>LVDS 3 lane</td></tr>
<tr><td>H</td><td>LVDS 4 lane(Default)</td></tr>
</table></td><td></td></tr>
<tr><td>29</td><td>NC</td><td>No connection</td><td></td></tr>
<tr><td>30</td><td>GND</td><td>Power Ground</td><td></td></tr>
<tr><td>31-32</td><td>VLED-</td><td>Power for LED backlight (Cathode)</td><td></td></tr>
<tr><td>33</td><td>L/R</td><td>Horizontal scan direction control pin. This pin must be connected to “H” or “L” according to system application
<table>
<tr><th>HDIR</th><th>Function Description</th></tr>
<tr><td>L</td><td>From right to left</td></tr>
<tr><td>H</td><td>From left to right(Default)</td></tr>
</table></td><td></td></tr>
<tr><td>34</td><td>U/D</td><td>Vertical scan direction control pin. This pin must be connected to “H” or “L” according to system application.
<table>
<tr><th>VDIR</th><th>Function Description</th></tr>
<tr><td>L</td><td>From down to up.</td></tr>
<tr><td>H</td><td>From up to down. (Default)</td></tr>
</table></td><td></td></tr>
<tr><td>35</td><td>NC</td><td>No connection</td><td></td></tr>
<tr><td>36-37</td><td>GND</td><td>Power Ground</td><td></td></tr>
<tr><td>38</td><td>NC</td><td>No connection</td><td></td></tr>
<tr><td>39-40</td><td>VLED+</td><td>Power for LED backlight (Anode)</td><td></td></tr>
</table>

4.2. CTP PIN Definition

Pin	Symbol	Function	Remark
1	VSS	Ground for analog circuit	
2	VDDT	Power Supply : +3.3V	
3	SCL	I2C clock input I2C clock input	
4	NC	No connect	
5	SDA	I2C data input and output	
6	NC	No connect	
7	/RST	External Reset, Low is active	
8	NC	No connect	
9	/INT	External interrupt to the host	
10	VSS	Ground for analog circuit	

5.Contour Drawing



CTP FPC

PIN NO	SYMBOL
1	VSS
2	VDDT
3	SCL
4	NC
5	SDA
6	NC
7	/RST
8	NC
9	/INT
10	VSS

TFT FPC

PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	NC	21	RXIN3+
2	VCC	22	GND
3	VCCI	23	NC
4	NC	24	NC
5	GRB	25	FMT
6	DISP	26	NC
7	GND	27	NC
8	RXIN0-	28	SELB
9	RXIN0+	29	NC
10	GND	30	GND
11	RXIN1-	31	VLED-
12	RXIN1+	32	VLED-
13	GND	33	L/R
14	RXIN2-	34	U/D
15	RXIN2+	35	NC
16	GND	36	GND
17	RXCLKIN-	37	GND
18	RXCLKIN+	38	NC
19	GND	39	VLED+
20	RXIN3-	40	VLED+

The non-specified tolerance of dimension is ±0.3 mm .

6.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+80	□
Storage Temperature	TST	-30	—	+80	□

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

1. Temp. □60□, 90% RH MAX. Temp.＞60□, Absolute humidity shall be less than 90% RH at 60□

7.Electrical Characteristics

7.1. Typical Operation Conditions

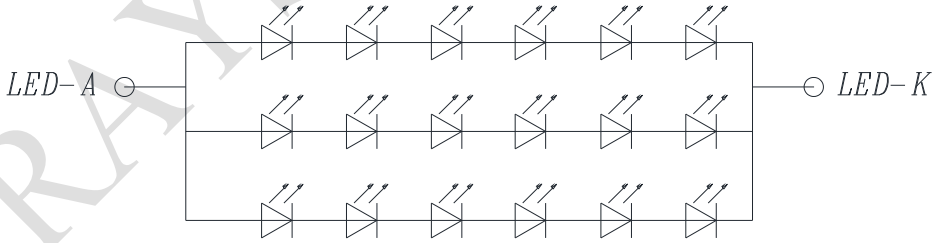
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VCC	3.1	3.3	3.6	V	
Power voltage	VCCI	3.1	3.3	3.6	V	
Current for Driver(Black)	ICC	-	67.6	102	mA	Vcc=3.3V
Supply CTP	VDDT	3.0	3.3	3.6	V	
	I_{CTP}	—	51	77	mA	

7.2. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL	16.8	19.2	20.4	V	Note 1
Current for LED backlight	IL	--	60	--	mA	
LED life time	-	--	50,000	-	Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and IL =20ma/pcs.

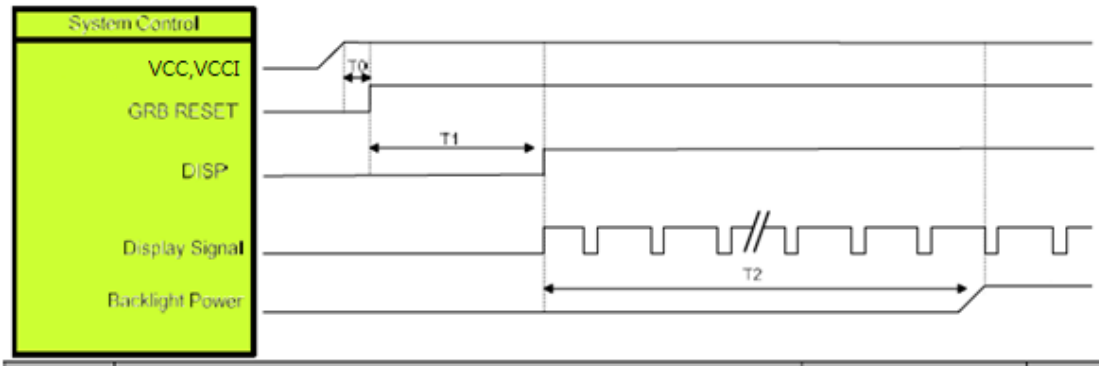
Note 2: The “LED life time” is defined as the module brightness decrease to 50% Original brightness at Ta=25℃ and IL =20mA/pcs. The LED lifetime could be decreased if operating IL is lager than 25mA/pcs.



CIRCUIT DIAGRAM(LED 3*6=18 DIES)

8.Power ON/OFF Sequence

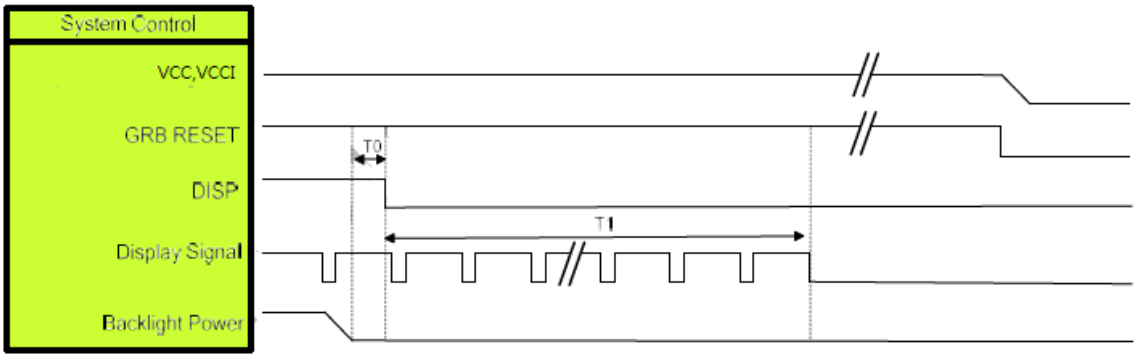
8.1. Power On Sequence



Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note :
1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures .Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
2: LVDS interface Display signal: DCLK P/N; RX[3:0] P/N

8.2. Power Off Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	100	ms

Note :
1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures. Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.
2. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N

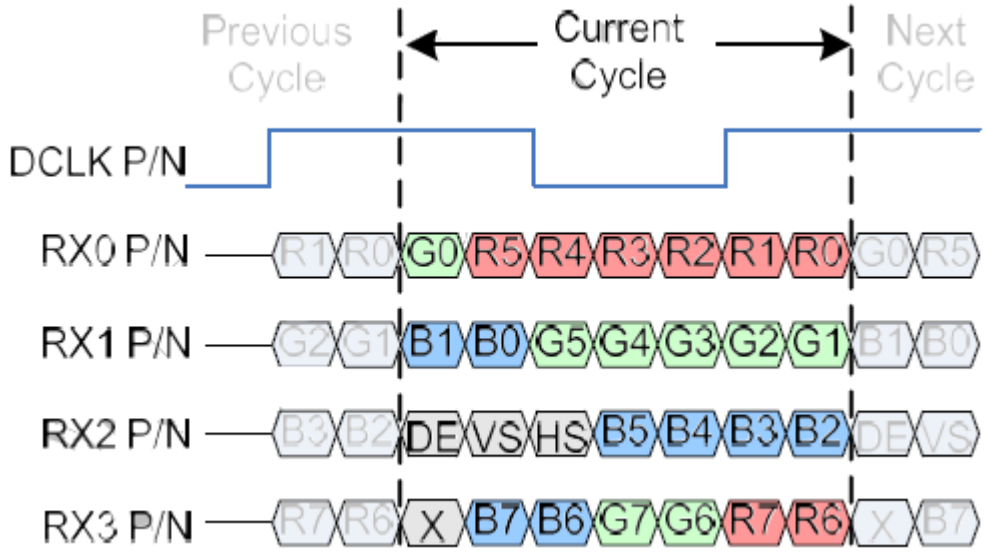
9.LVDS Interface

9.1. LVDS Input Pin Mapping Table

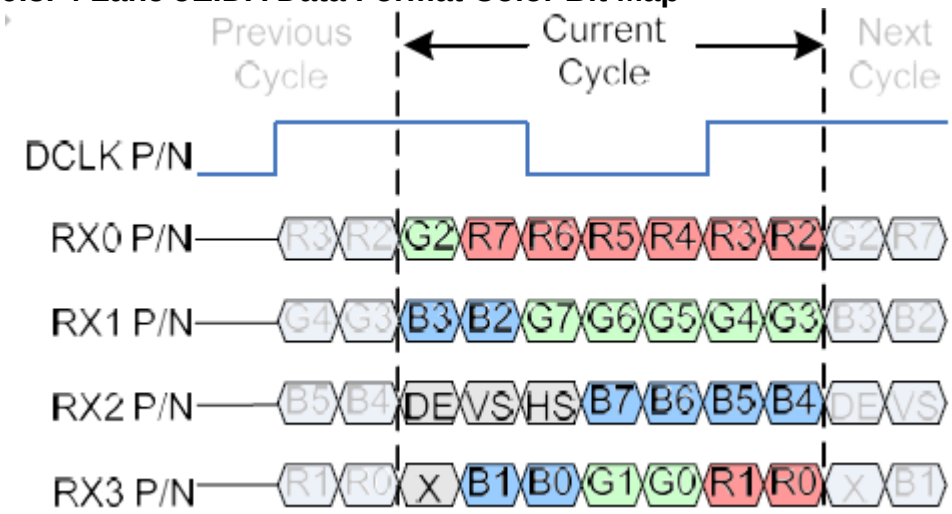
Pin Name RGB (LVDS)	LVDS 3 lane	LVDS 4 Lane
DCLKN	DCLKN	DCLKN
DCLKP	DCLKP	DCLKP
DB0	RX0P	RX0P
DB1	RX0N	RX0N
DB2	RX1P	RX1P
DB3	RX1N	RX1N
DB4	RX2P	RX2P
DB5	RX2N	RX2N
DB6	-	RX3P
DB7	-	RX3N

Note: Symbol "-" means reserve pin and should fix to "L" by DGND.

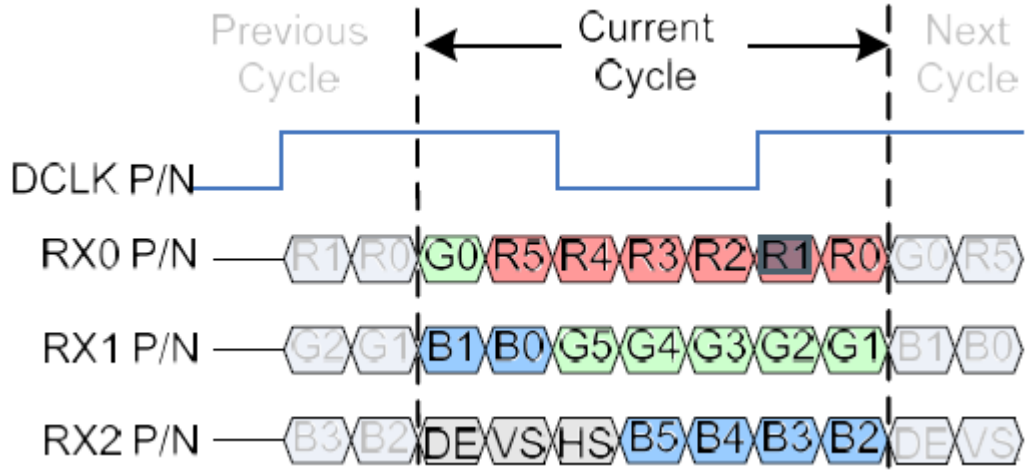
9.2. 4 Lane VESA Data Format Color Bit Map



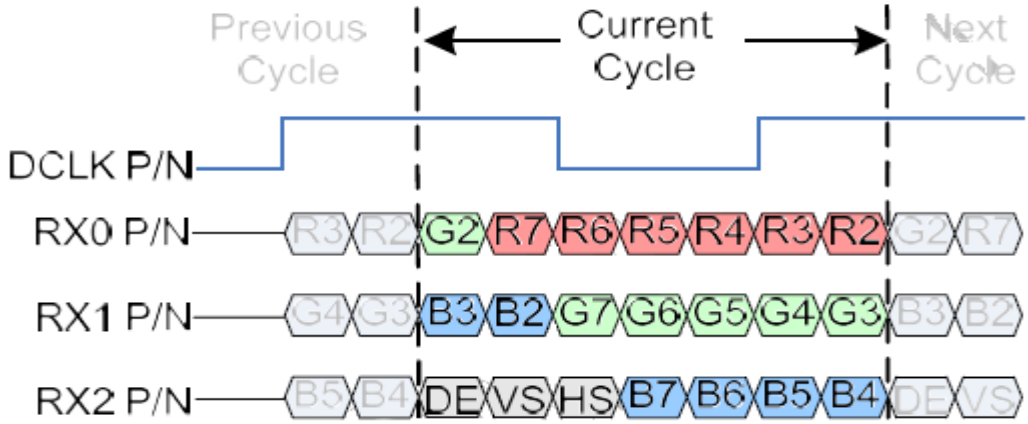
9.3. 4 Lane JEIDA Data Format Color Bit Map



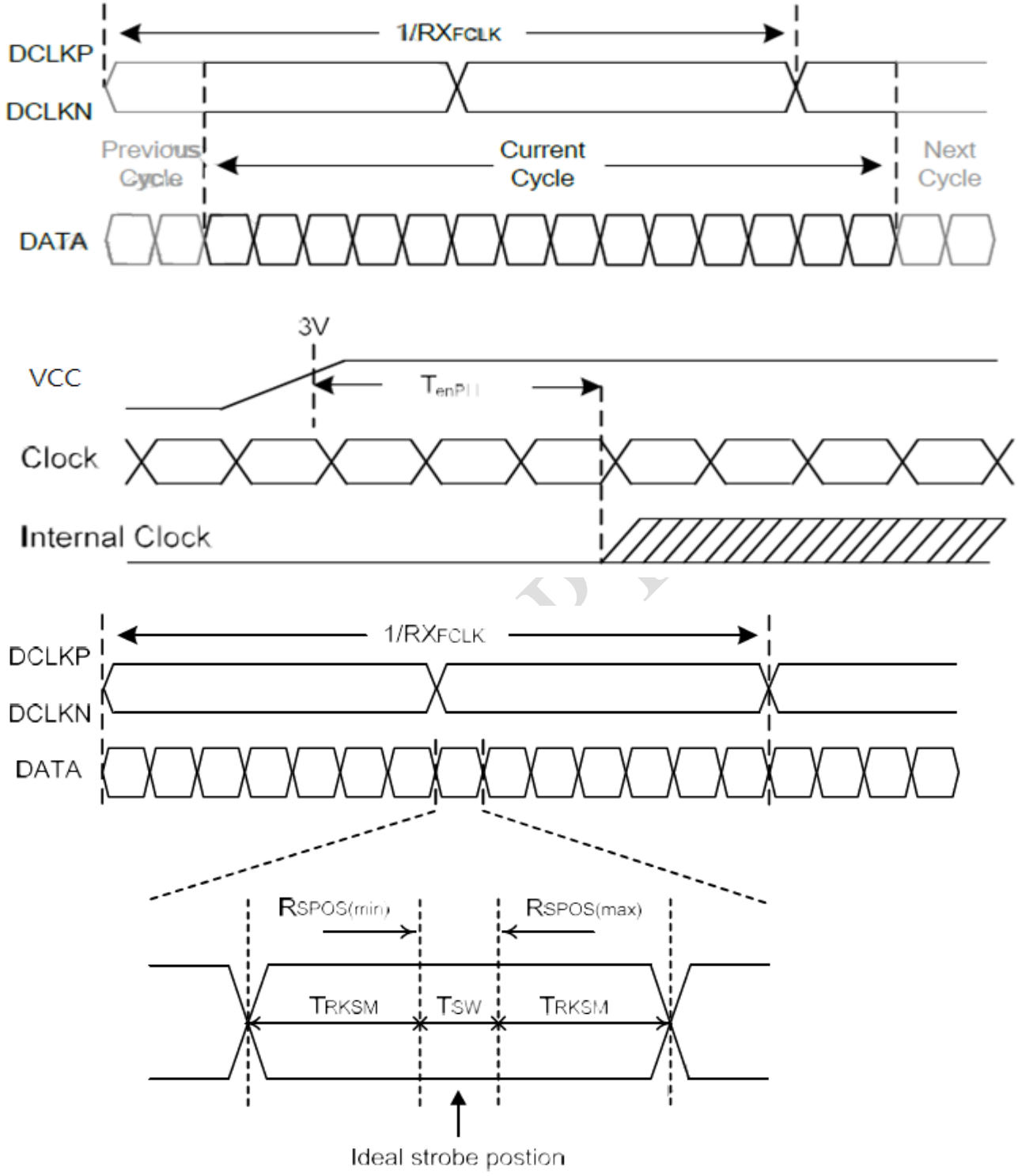
9.4. 3 Lane VESA Mode Color Bit Map



9.5. 3 Lane JEIDA Mode Color Bit Map



9.6. LVDS Input Timing Table



RRKSM : Receiver strobe margin
RSPOS : Receiver strobe position
TSW : Strobe width (internal DATA sampling window)

LVDS Input Timing (VCC=VCCI= 3.3V, GND= 0V, TA=25 C)

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Clock Frequency	RX_{FCLK}	23	25	27	MHz	
Input Data Skew Margin	T_{RSKM}	400			ps	
Clock High Time	T_{LVCH}	4/(7 x RX_{FCLK})			ns	
Clock Low Time	T_{LVCL}	3/(7 x RX_{FCLK})			ns	
PLL Wake-up Time	T_{enPLL}			150	us	
LVDS Spread Spectrum Clocking (SSC) Tolerance of LVDS Receiver						
Modulation Frequency	SSC_{MF}			100	KHz	
Modulation Rate	SSC_{MR}			+/-3	%	

10.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+Tf	θ=0°、Φ=0°	-	30	40	.ms	Note 3
Contrast ratio		CR	At optimized viewing angle	800	1000	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.27	0.32	0.37		Note 2,6,7
		Wy		0.295	0.345	0.395		
Viewing angle	Hor.	ΘR	CR≧10	70	80	-	Deg.	Note 1
		ΘL		70	80	-		
	Ver.	ΦT		70	80	-		
		ΦB		70	80	-		
Brightness		-	-	300	400	-	cd/m^2	Center of display
Uniformity		(U)	-	75	-	-	%	Note5

Ta=25±2℃

Note 1: Definition of viewing angle range

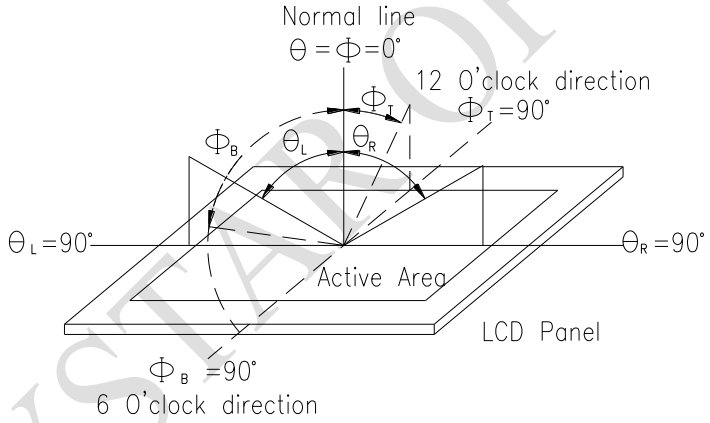


Fig. 10.1. Definition of viewing angle

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

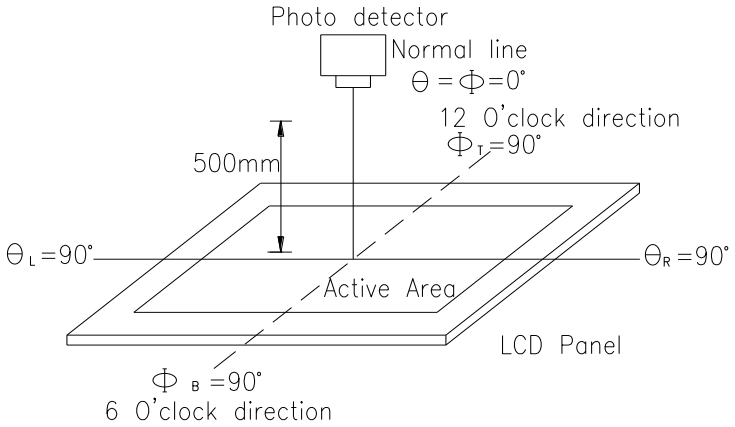
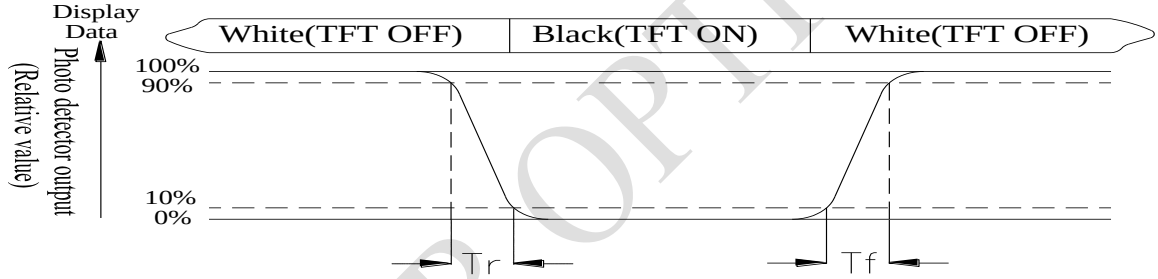


Fig. 10.2. Optical measurement system setup

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, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, 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) = Lmin/Lmax x100%
L = Active area length
W = Active area width

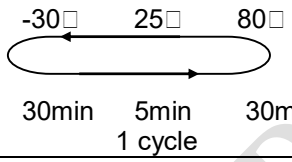
Fig10.3. . Definition of uniformity

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□~80□)

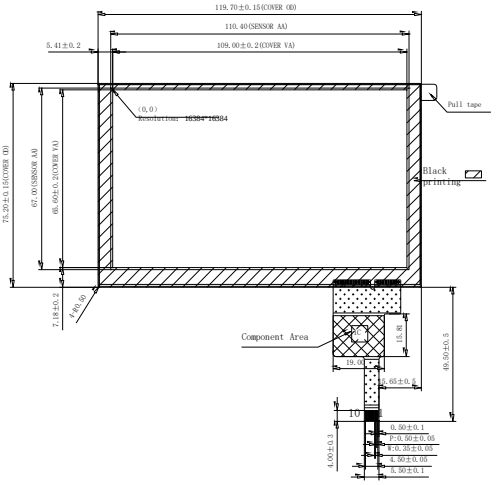
Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80□ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30□ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80□ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30□ 200hrs	1
High Temperature/ Humidity storage	The module should be allowed to stand at 60□,90%RH max	60□,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation  	-30□/80□ 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=±600V(contact) ,±800v(air), RS=330Ω CS=150pF 10 times	——

Note1: No dew condensation to be observed.

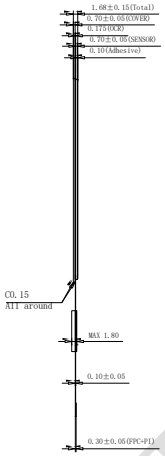
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

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

12.Touch Panel Information

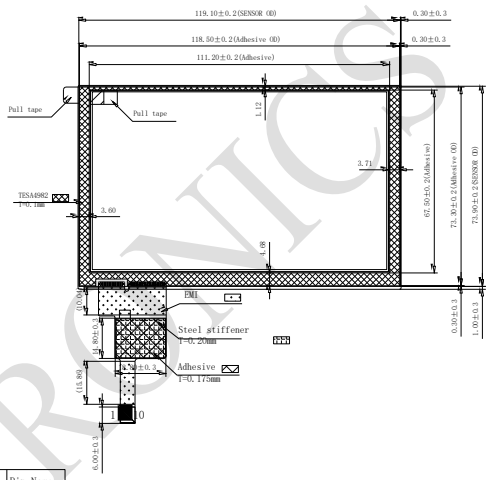


Front view



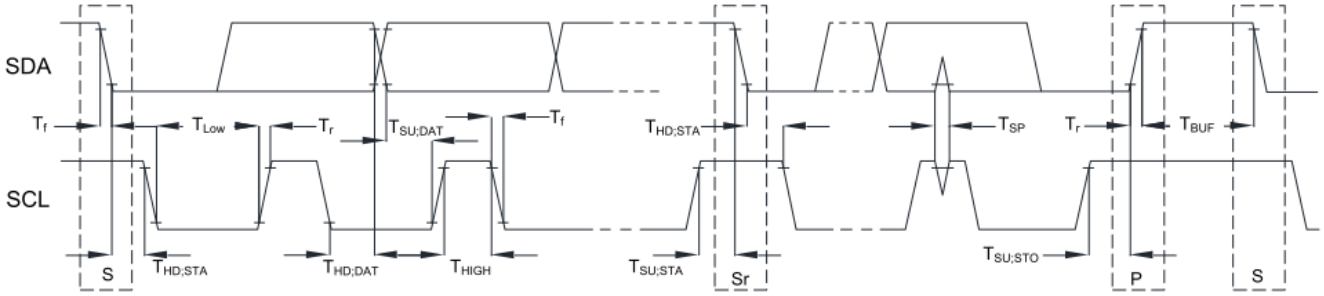
Side view

PIN No.	Pin Name
1	VSS
2	VDDT
3	SCL
4	NC
5	SDA
6	NC
7	RST
8	NC
9	INT
10	VSS



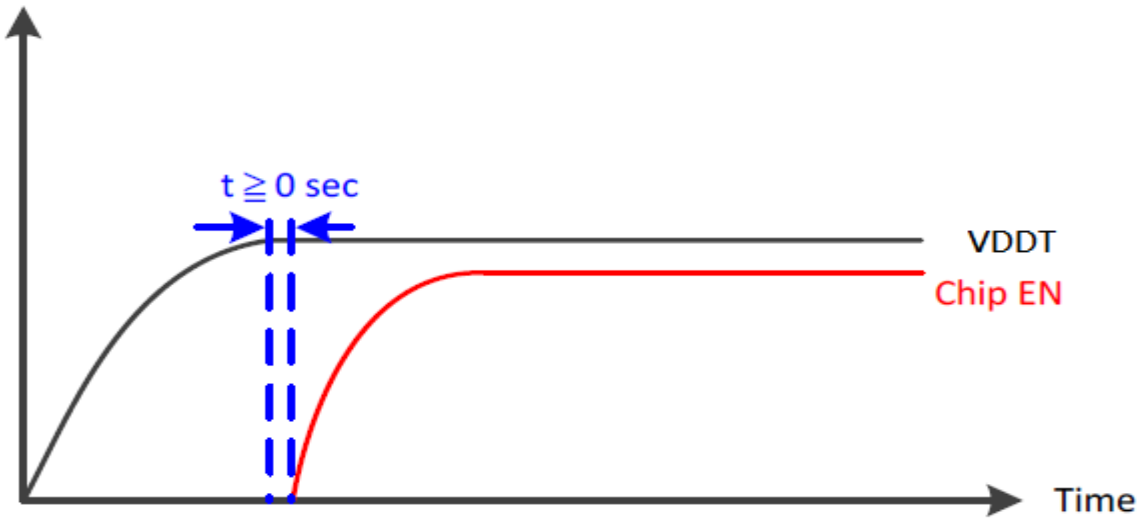
Back view

12.1. I2C AC Characteristics

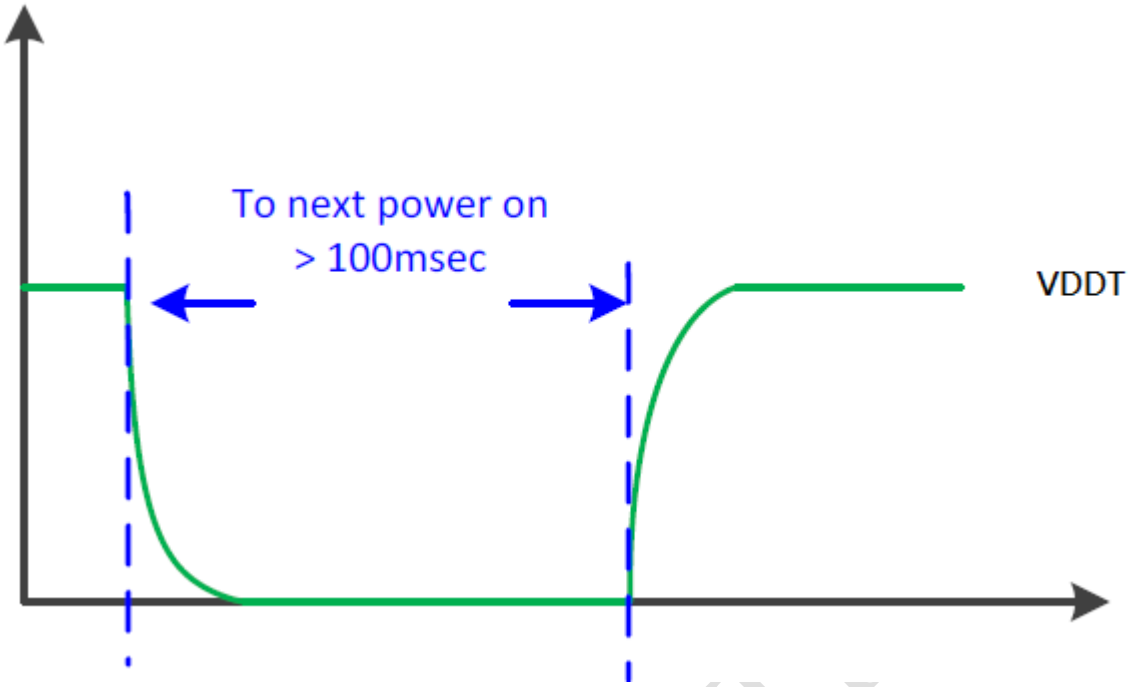


Item	Symbol	100kHz		400kHz		Unit
		Min.	Max.	Min.	Max.	
SCL standard mode clock frequency	FSCL	0	100	0	400	kHz
Hold time (repeated) START condition. After this period, the first clock is generated.	THD;STA	4	--	0.6	--	us
LOW period of the SCL clock	TLOW	4.7	--	1.3	--	us
HIGH period of the SCL clock	THIGH	4	--	0.6	--	us
Setup time for a repeat START condition.	TSU;STA	4.7	--	0.6	--	us
Data hold time	THD;DAT	0	3.45	0	0.9	us
Data setup time	TSU;DAT	250	--	100	--	ns
Rising time of both SDA and SCL signals	Tr	--	1000	--	300	ns
Falling time of both SDA and SCL signals	Tf	--	300	--	300	ns
Setup time for STOP condition.	TSU;STO	4	--	0.6	--	us
Free time between STOP and START condition	TBUF	4.7	--	1.3	--	us
Pulse width of spikes which must be suppressed by input filter	TSP	--	--	0	50	ns

12.2. Power On Sequence



12.3. Power Off to Power On Sequence



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.Materal 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 ,_____

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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**： / /