SPECIFICATION

CUSTOMER : _____

MODULE NO.: **WF70C3TYAB4MNN0#**

APPROVED BY: (FOR CUSTOMER USE ONLY)	
	PCB VERSION:　　　　DATA:

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			周园园
ISSUED DATE: 2022/10/19			

Winstar Display Co., LTD 華凌光電股份有限公司	MODLE NO：

RECORDS OF REVISION	**DOC. FIRST ISSUE**

VERSION	DATE	REVISED PAGE NO.	**SUMMARY**
0	2022/10/19		First issue

Contents

1.Module Classification Information

W	F	70	C3	T	Y	A	B4	M	N	N	0	#
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬

①	Brand：WINSTAR DISPLAY CORPORATION
②	Display Type：F→TFT Type, J→Custom TFT
③	Display Size：7.0" TFT
④	Model serials no.

⑤	Backlight Type：	F→CCFL, White	T→LED, White
		S→LED, High Light White	Z→Nichia LED, White

⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	A→Transmissive, N.T, IPS TFT	Q→Transmissive, Super W.T, 12:00
		C→Transmissive, N. T, 6:00 ;	R→Transmissive, Super W.T, O-TFT
		F→Transmissive, N.T,12:00 ;	V→Transmissive, Super W.T, VA TFT
		I→Transmissive, W. T, 6:00	W→Transmissive, Super W.T, IPS TFT
		K→Transflective, W.T,12:00	X→Transmissive, W.T, VA TFT
		L→Transmissive, W.T,12:00	Y→Transmissive, W.T, IPS TFT
		N→Transmissive, Super W.T, 6:00	Z→Transmissive, W.T, O-TFT

⑦	A：TFT LCD	F：TFT+CONTROL　BOARD
	B：TFT+SCREW HOLES+CONTROL BOARD	G：TFT+ SCREW HOLES
	C：TFT+ SCREW HOLES +A/D BOARD	H：TFT+D/V　BOARD
	D：TFT+ SCREW HOLES +A/D BOARD+CONTROL BOARD	I：TFT+ SCREW HOLES +D/V BOARD
	E：TFT+ SCREW HOLES +POWER　BOARD	J：TFT+POWER BD

⑧ Resolution:

A	128160	B	320234	C	320240	D	480234	E	480272	F	640480
G	800480	H	1024600	I	320480	J	240320	K	800600	L	240400
M	1024768	N	128128	P	1280800	Q	480800	R	640320	S	480128
T	800320	U	8001280	V	176220	W	1280398	X	1024250	Y	1920720
Z	800200	A4	240240	B4	2801424						

⑨	D: Digital　　L：LVDS　M:MIPI

⑩ Interface:

N	Without control board	A	8Bit	B	16Bit	H	HDMI
I	I2C Interface	R	RS232	S	SPI Interface	U	USB

⑪ TS:

N	Without TS		T	Resistive touch panel		C	Capacitive touch panel (G-F-F)
G	Capacitive touch panel (G-G)				C1	Capacitive touch panel (G-F-F)+OCA	
C2	Capacitive touch panel (G-F-F)+OCR				G1	Capacitive touch panel (G-G)+OCA	
G2	Capacitive touch panel (G-G)+OCR				B	CTP+GG+USB	

⑫	Version:　X:Raspberry pi

⑬	Special Code	#:Fit in with ROHS directive regulations

2.Summary

TFT 7.0"is a IPS type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHs.

3.General Specification

Item	Dimension	Unit
Size	7.0	inch
Dot Matrix	280 x RGBx1424(TFT)	dots
Module dimension	38.2(H) x 186.62(V) x 3.5(D)	mm
Active area	33.60 (H) x170.88(V)	mm
Pixel pitch	0.12(H) x 0.12(V)	mm
LCD type	TFT, Normally Black, Transmissive	
Viewing Angle	80/80/80/80	
Aspect Ratio	1:5	
Driver IC	OTA7290B or equivalent	
Interface	4-Lanes MIPI	
Backlight Type	LED, Normally White	
With /Without TP	Without TP	
Surface	Anti-Glare	

*Color tone slight changed by temperature and driving voltage.

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	℃
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℃

5.Electrical Characteristics

5.1. TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Analog Supply voltage	VCC	3.0	3.3	3.6	V	
Analog supply current	I_{VCC}	-	102	120	mA	VCC=3.3V
Logic input voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	

5.2. Backlight Driving Conditions

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	40	--	mA	Ta=25℃
LED Voltage	V_F	21.6	24	27.2	Volt	Ta=25℃
LED Life-Time	N/A	15,000	--	--	Hour	Ta=25℃ 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 ₒC, 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℃. and LED typical current. The LED lifetime could be decreased if operating I_F is larger than LED typical current. The constant current driving method is suggested.

Note (3) LED light bar circuit :

If=40mA，V=21.6~27.2V
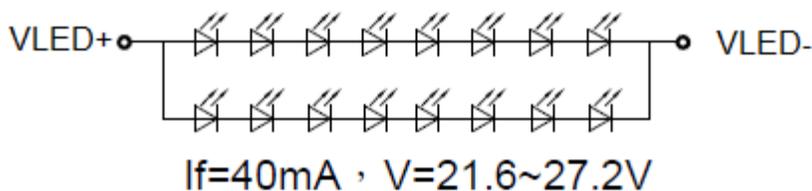
6.Interface Characteristics

6.1. DC characteristics for interface

Parameter	Symbol	Condition	Specification			Unit
Input Common Mode Voltage for Clock	V_CMCLK	CLKP/N Note 2, Note 3	70	-	330	mV
Input Common Mode Voltage for Data	V_CMDATA	DnP/N Note 2, Note 3, Note 5	70	-	330	mV
Common Mode Ripple for Clock Equal or Less than 450MHz	V_CMRCLKL450	CLKP/N Note 4	-50	-	50	mV
Common Mode Ripple for Data Equal or Less than 450MHz	V_CMRDATAL450	DnP/N Note 4, Note 5	-50	-	50	mV
Common Mode Ripple for Clock More than 450MHz (peak sine wave)	V_CMRCLKM450	CLKP/N	-	-	100	mV
Common Mode Ripple for Data More than 450MHz (peak sine wave)	V_CMRDATAM450	DnP/N Note 5	-	-	100	mV
Differential Input Low Level Threshold Voltage for Clock	V_THLCLK-	CLKP/N	-70	-	-	mV
Differential Input Low Level Threshold Voltage for Data	V_THLDATA-	DnP/N Note 5	-70	-	-	mV
Differential Input High Level Threshold Voltage for Clock	V_THHCLK+	CLKP/N	-	-	70	mV
Differential Input High Level Threshold Voltage for Data	V_THHDATA+	DnP/N Note 5	-	-	70	mV
Single-ended Input Low Voltage	V_ILHS	CLKP/N, DnP/N Note 3, Note 5	-40	-	-	mV
Single-ended Input High Voltage	V_IHHS	CLKP/N, DnP/N Note 3, Note 5	-	-	460	mV
Differential Termination Resistor	R_TERM	CLKP/N, DnP/N Note 5	80	100	125	Ω
Single-ended Threshold Voltage for Termination Enable	V_TERM-EN	CLKP/N, DnP/N Note 5	-	-	450	mV
Termination Capacitor	C_TERM	CLKP/N, DnP/N Note 5, Note 6	-	-	60	pF

6.2. AC characteristics for interface
DSI HS mode
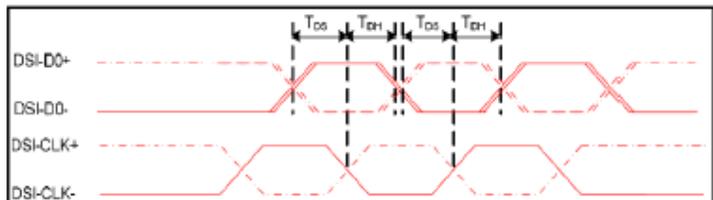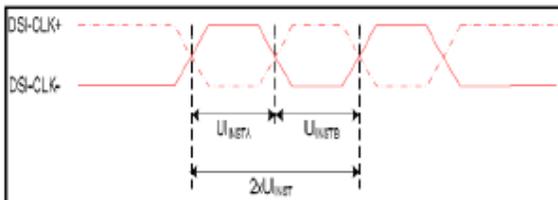
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
DSI-CLK+/-	2xUI_INSTA	Double UI instantaneous	4	25	ns	
DSI-CLK+/-	UI_INSTA UI_INSTB	UI instantaneous halfs	2	12.5	ns	UI = UI_INSTA= UI_INSTB
DSI-Dn+/-	tDS	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	tDH	Data to clock hold time	0.15	-	UI	

DSI LP mode
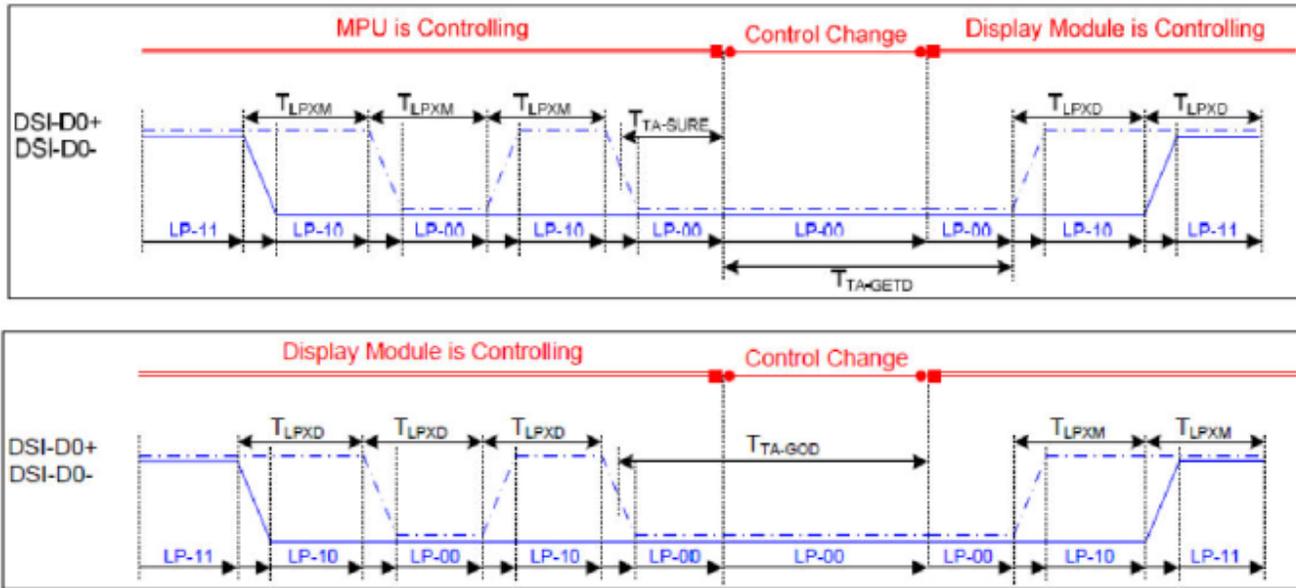
6.3. Input timings for interface

Item	Symbol	Value			Unit
		Min.	Typ.	Max.	
HS low pulse width	HS		1		DCK
Horizontal back porch	HBP		60		DCK
Horizontal front porch	HFP		80		DCK
Horizontal blanking period	HBLK		NA		DCK
Horizontal active area	HDISP	-	280	-	DCK
Pixel Clock	PCLK		36		MHz
Vertical low pulse width	VS		1		Line
Vertical back porch	VBP		25		Line
Vertical front porch	VFP		35		Line
Vertical blanking period	VBK		NA		Line
Vertical active area	-	-	1424	-	Line
Vertical Refresh rate	VRR	-	60	-	Hz

7.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	0.29	0.32	0.35	-	Note 2,5,6
		Wy		0.31	0.34	0.37	-	
Viewing angle	Hor.	ΘR	CR≧10	-	80	-	Deg.	Note 1
		ΘL		-	80	-		
	Ver.	ΦT		-	80	-		
		ΦB		-	80	-		
Brightness		-	-	450	550	-	cd/m²	Center of display
Uniformity		(U)	-	75	80	-	%	Note 5

Ta=25±2℃,
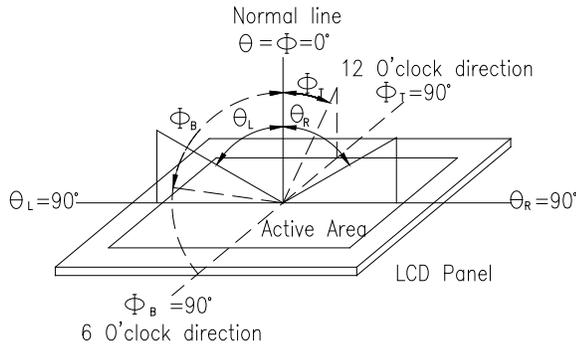
Note 1: Definition of viewing angle range

Fig. 7.1. 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.
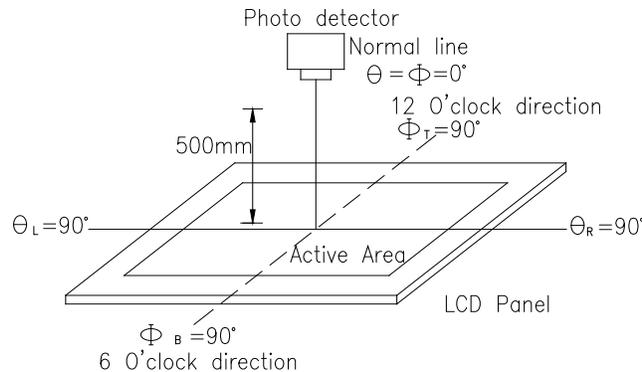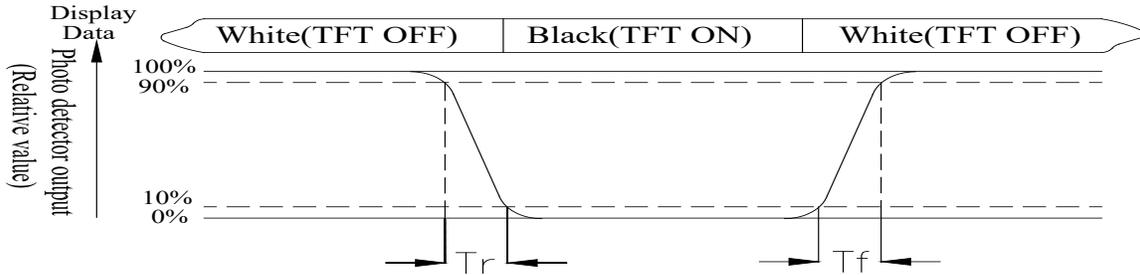

Fig. 7.2. Optical measurement system setup

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%
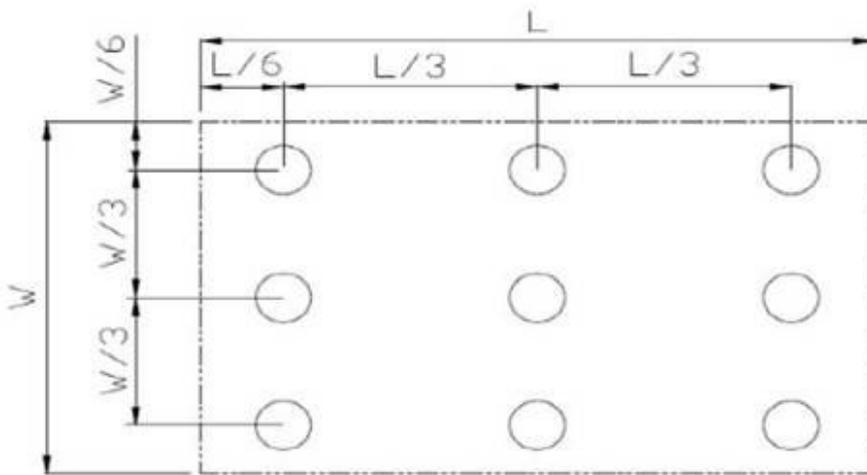L = Active area length
W = Active area width

Fig 7.3. 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.

8.Interface

8.1. LCM PIN Definition

NO.	Symbol	Description
1	GND	Ground
2	D3N	Negative polarity of low voltage differential data signal
3	D3P	Positive polarity of low voltage differential data signal
4	GND	Ground
5	D2N	Negative polarity of low voltage differential data signal
6	D2P	Positive polarity of low voltage differential data signal
7	GND	Ground
8	CLKN	Negative polarity of low voltage differential clock signal
9	CLKP	Positive polarity of low voltage differential clock signal
10	GND	Ground
11	D1N	Negative polarity of low voltage differential data signal
12	D1P	Positive polarity of low voltage differential data signal
13	GND	Ground
14	D0N	Negative polarity of low voltage differential data signal
15	D0P	Positive polarity of low voltage differential data signal
16-17	GND	Ground
18	TE	Tearing effect output pin to synchronize to frame writing. If not used, open this pin
19	RESET	Reset signal pin
20	GND	Ground
21-23	VCC	Power supply
24	GND	Ground
25-26	NC	Not connect
27-28	VLED-	LED cathode
29-30	VLED+	LED anode

9.Reliability

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

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.	70℃ 200hrs	──
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	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 -20℃ 25℃ 70℃ 30min 5min 30min 1 cycle	-20℃/70℃ 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 finished product housing.	TBD	

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.

10.Contour Drawing

TFT FPC

PIN No.	SYMBOL	PIN No.	SYMBOL
1	GND	16	GND
2	D3N	17	GND
3	D3P	18	TE
4	GND	19	RESET
5	D2N	20	GND
6	D2P	21	VCC
7	GND	22	VCC
8	CLKN	23	VCC
9	CLKP	24	GND
10	GND	25	NC
11	D1N	26	NC
12	D1P	27	VLED-
13	GND	28	VLED-
14	D0N	29	VLED+
15	D0P	30	VLED+

The non-specified tolerance of dimension is ¡À0.3 mm .

LCM Sample Estimate Feedback Sheet

winstar

Module Number：_____

1、 <u>Panel Specification</u>：

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、 <u>Mechanical</u>

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、 <u>Relative Hole Size</u>：

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、 <u>Backlight Specification</u>：

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** ＜＜

5、<u>Electronic Characteristics of Module</u>：

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、<u>Summary</u>：

Sales signature：_____
Customer Signature：_____　　　　**Date**：　　　/　　　/_____