

TFT DISPLAY SPECIFICATION



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



Winstar Display Co., LTD

華凌光電股份有限公司



WEB: <https://www.winstar.com.tw> E-mail: sales@winstar.com.tw

SPECIFICATION

CUSTOMER : _____

MODULE NO.: **WF70A9SWAGLNN0**

APPROVED BY: (FOR CUSTOMER USE ONLY)	PCB VERSION: DATA:
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2022/03/16			

TFT Display Inspection Specification: <https://www.winstar.com.tw/technology/download.html>

Precaution in use of TFT module: <https://www.winstar.com.tw/technology/download/declaration.html>

RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2020/11/03		First issue
A	2021/03/31		Modify Contour drawing
B	2021/07/05		Modify Storage Temperature
C	2022/03/16		Remove AC Characteristics & Reset Timing Add LVDS interface

Contents

1.Module Classification Information

2.Summary

3.General Specification

4.Absolute Maximum Ratings

5.Electrical Characteristics

6.DC Characteristics

7.LVDS interface

8.Power Sequence

9.Optical Characteristics

10.Interface

11.Block Diagram

12.Reliability

13.Contour Drawing

14.Other

1.Module Classification Information

W F 70 A9 S W A G L 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 S→LED, High Light White						T→LED, White Z→Nichia LED, White																																																																
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	A→Transmissive, N.T, IPS TFT C→Transmissive, N. T, 6:00 ; F→Transmissive, N.T,12:00 ; I→Transmissive, W. T, 6:00 K→Transflective, W.T,12:00 L→Transmissive, W.T,12:00 N→Transmissive, Super W.T, 6:00						Q→Transmissive, Super W.T, 12:00 R→Transmissive, Super W.T, O-TFT V→Transmissive, Super W.T, VA TFT W→Transmissive, Super W.T, IPS TFT X→Transmissive, W.T, VA TFT Y→Transmissive, W.T, IPS TFT Z→Transmissive, W.T, O-TFT																																																																
⑦	A : TFT LCD B : TFT+SCREW HOLES+CONTROL BOARD C : TFT+ SCREW HOLES +A/D BOARD D : TFT+ SCREW HOLES +A/D BOARD+CONTROL BOARD E : TFT+ SCREW HOLES +POWER BOARD						F : TFT+CONTROL BOARD G : TFT+ SCREW HOLES H : TFT+D/V BOARD I : TFT+ SCREW HOLES +D/V BOARD J : TFT+POWER BD																																																																	
⑧	Resolution: <table><tr><td>A</td><td>128160</td><td>B</td><td>320234</td><td>C</td><td>320240</td><td>D</td><td>480234</td><td>E</td><td>480272</td><td>F</td><td>640480</td></tr><tr><td>G</td><td>800480</td><td>H</td><td>1024600</td><td>I</td><td>320480</td><td>J</td><td>240320</td><td>K</td><td>800600</td><td>L</td><td>240400</td></tr><tr><td>M</td><td>1024768</td><td>N</td><td>128128</td><td>P</td><td>1280800</td><td>Q</td><td>480800</td><td>R</td><td>640320</td><td>S</td><td>480128</td></tr><tr><td>T</td><td>800320</td><td>U</td><td>8001280</td><td>V</td><td>176220</td><td>W</td><td>1280398</td><td>X</td><td>1024250</td><td>Y</td><td>1920720</td></tr><tr><td>Z</td><td>800200</td><td>2</td><td>1024324</td><td>3</td><td>7201280</td><td>4</td><td>19201200</td><td>5</td><td>1366768</td><td>6</td><td>1280320</td></tr></table>												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	2	1024324	3	7201280	4	19201200	5	1366768	6	1280320
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T	800320	U	8001280	V	176220	W	1280398	X	1024250	Y	1920720																																																													
Z	800200	2	1024324	3	7201280	4	19201200	5	1366768	6	1280320																																																													
⑨	D: Digital L : LVDS M:MIPI																																																																							
⑩	Interface: <table><tr><td>N</td><td colspan="3">Without control board</td><td>A</td><td>8Bit</td><td>B</td><td colspan="2">16Bit</td><td>H</td><td colspan="2">HDMI</td></tr><tr><td>I</td><td colspan="3">I2C Interface</td><td>R</td><td>RS232</td><td>S</td><td colspan="2">SPI Interface</td><td>U</td><td colspan="2">USB</td></tr></table>												N	Without control board			A	8Bit	B	16Bit		H	HDMI		I	I2C Interface			R	RS232	S	SPI Interface		U	USB																																					
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I	I2C Interface			R	RS232	S	SPI Interface		U	USB																																																														
⑪	TS: <table><tr><td>N</td><td colspan="4">Without TS</td><td>T</td><td colspan="3">Resistive touch panel</td><td>C</td><td colspan="3">Capacitive touch panel (G-F-F)</td></tr><tr><td>G</td><td colspan="6">Capacitive touch panel (G-G)</td><td>C1</td><td colspan="4">Capacitive touch panel (G-F-F)+OCA</td></tr><tr><td>C2</td><td colspan="6">Capacitive touch panel (G-F-F)+OCR</td><td>G1</td><td colspan="4">Capacitive touch panel (G-G)+OCA</td></tr><tr><td>G2</td><td colspan="6">Capacitive touch panel (G-G)+OCR</td><td>B</td><td colspan="4">CTP+GG+USB</td></tr></table>												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														
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⑫	Version: X:Raspberry pi																																																																							
⑬	Special Code		#:Fit in with ROHS directive regulations																																																																					

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WINSTAR DISPLAY CO., LTD

2.Summary

The WF70 is a 7-inch LCD Cell with thin film transistors as active elements and contains 800 (H) X 480 (V) pixels. Each pixel is divided into red, green and blue dot, which are arranged in vertical stripe. The cell is normally black mode, and can be applied to the transmission type display. Backlight unit (BLU) and circuit board for the cell are not built in.

3.General Specifications

Item	Dimension	Unit
Size	7.0	inch
Dot Matrix	800 x RGB x 480(TFT)	dots
Module dimension	165.8 (W) x 106.61 (H) x 6.5(D)	mm
Active area	152.40 x 91.44	mm
Pixel pitch	0.1905 x 0.1905	mm
LCD type	TFT, Normally Black, Transmissive	
View Direction	80/80/80/80	
TFT Interface	LVDS	
TFT Driver IC	HX8249-A + HX8678-C or Equivalent	
Aspect Ratio	15:9	
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	-30	—	+80	°C
Storage Temperature	TST	-40	—	+85	°C

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

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

5.Electrical Characteristics

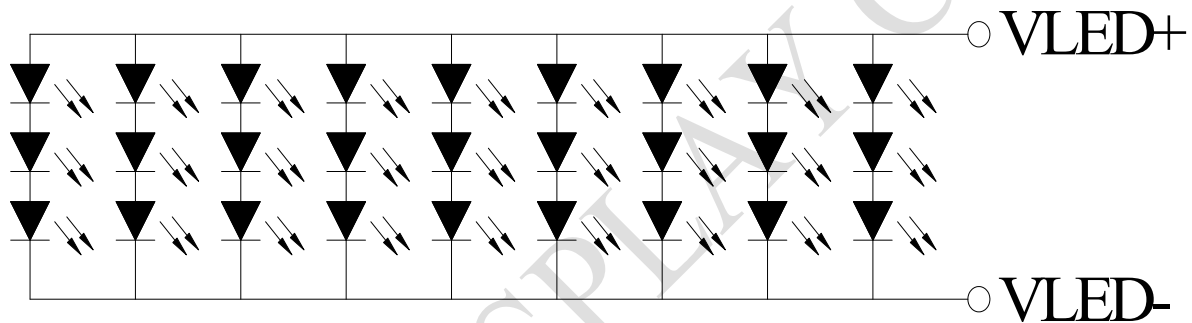
5.1. Operating conditions

Item	Symbol	Min	Typ	Max	Unit	Note
Supply Voltage	Vcc	2.7	3.3	3.6	V	
Current of power supply	Icc	—	133	200	mA	Vcc =3.3V

5.2. LED driving conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED current	—	—	450	—	mA	
LED voltage	A~K	8.1	9.3	10.2	V	Note 1
LED Life Time	—	40000	—	—	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM

Note 2 : Ta = 25 °C

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

Note 4 : The single LED lamp case

6.DC Characteristics

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{tH}	-	-	+0.1	V	$V_{cm}=1.2V$
High level input voltage	V_{tL}	-0.1	-	-	V	

7.LVDS interface

7.1. Input timing table

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK frequency	FDCLK	25.2	27.2	30.5	MHz	
Horizontal line	th	856	860	920	DCLK	
Horizontal valid data	thd	800			DCLK	
Hsync pulse width	thpw	1	2	100	DCLK	
Hsync back width	thbp	5	16	101	DCLK	
Hsync front width	thfp	19	44	115	DCLK	
Vertical valid data	tvd	480			H	
Vsync pulse width	tvpw	1	2	66	H	
Vsync back width	tvbp	5	5	67	H	
Vsync front width	tvfp	5	43	67	H	
Vertical field	tv	490	528	552	H	

7.2. LVDS input timing is described as below

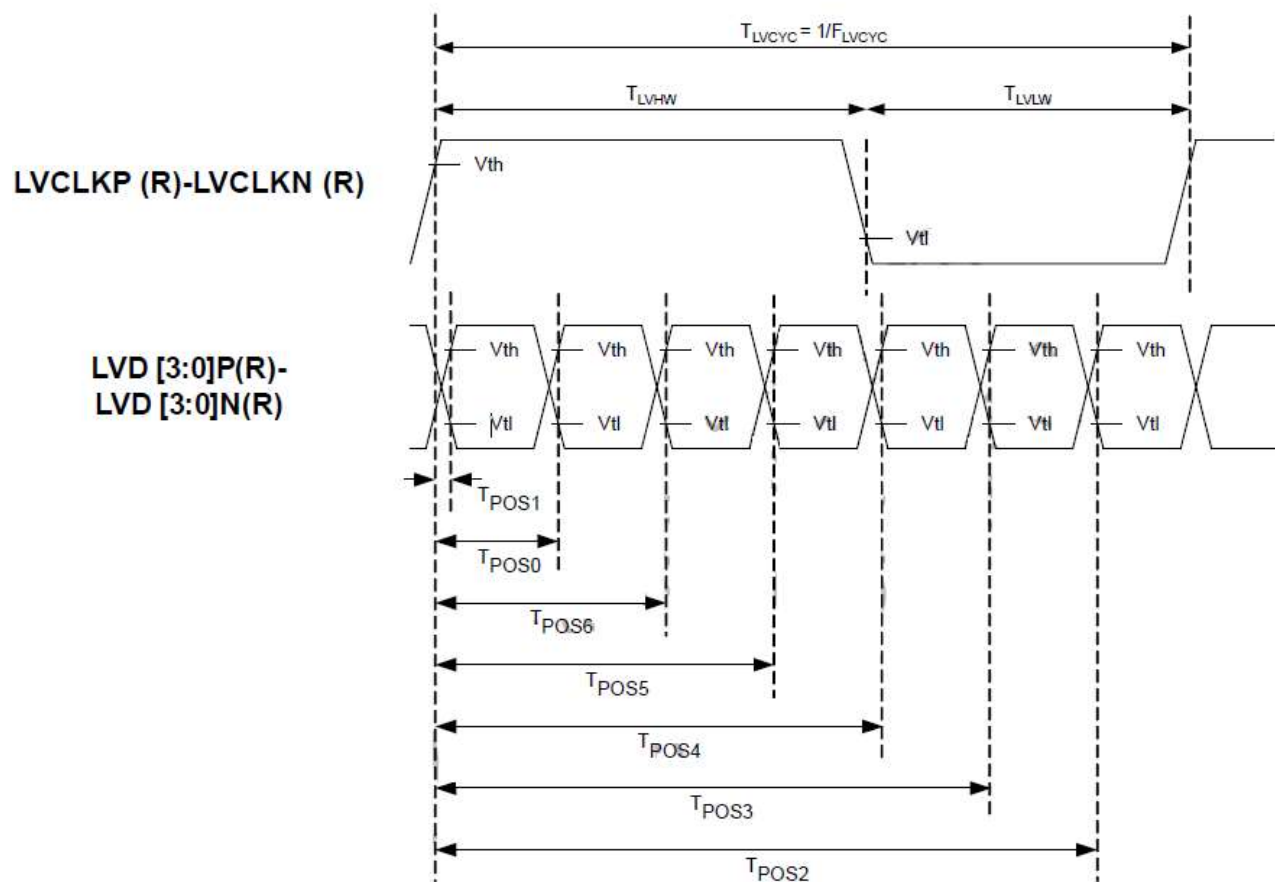


Figure 1: LVDS input timing

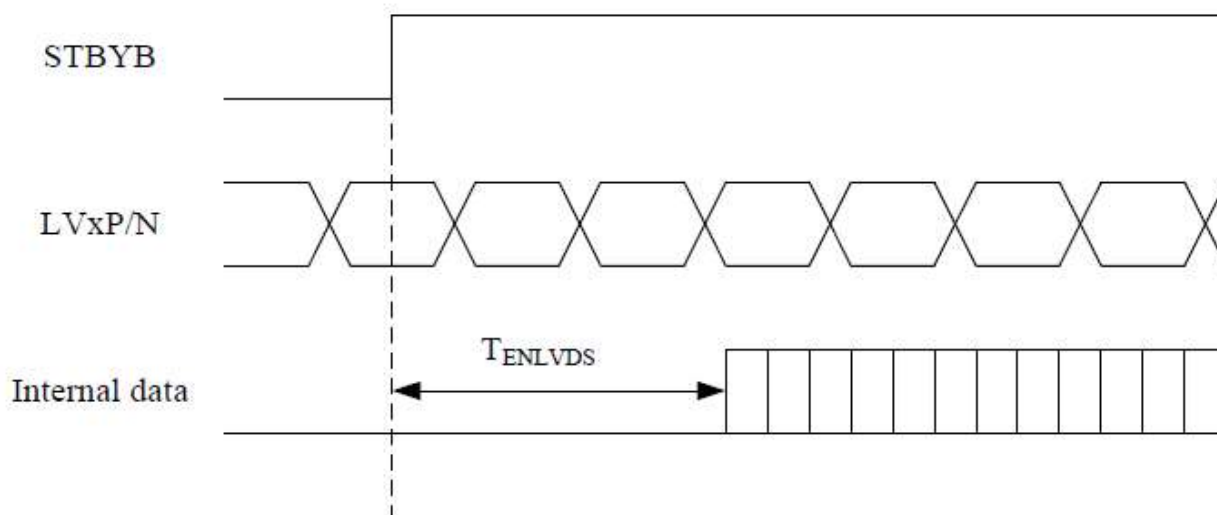
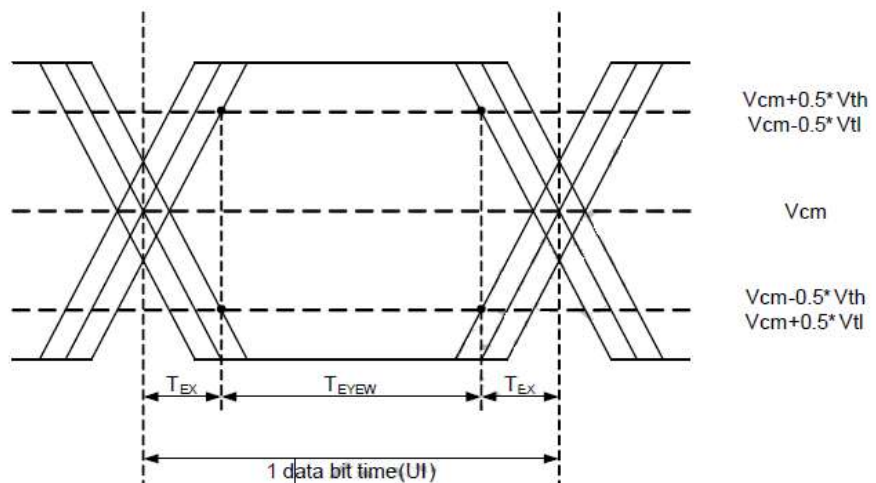


Figure 2: LVDS wake up time

Single-ended:
LVD [3:0]P,
LVD [3:0]N



Differential:
LVD [3:0]P-LVD [3:0]N

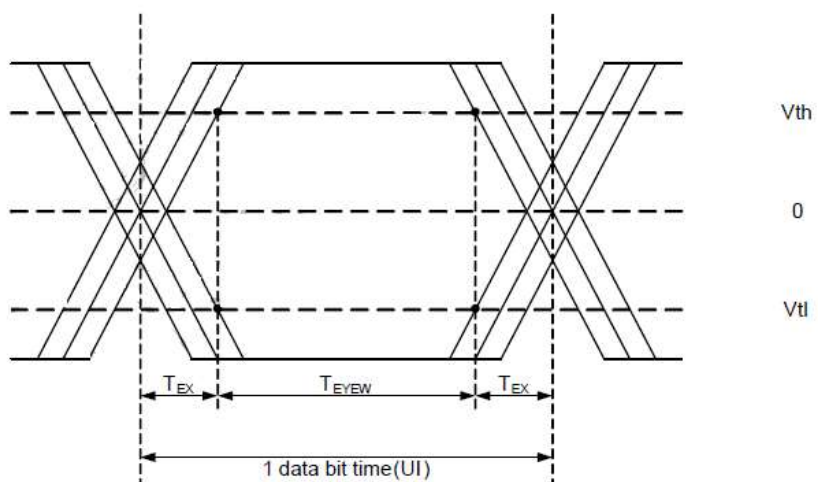


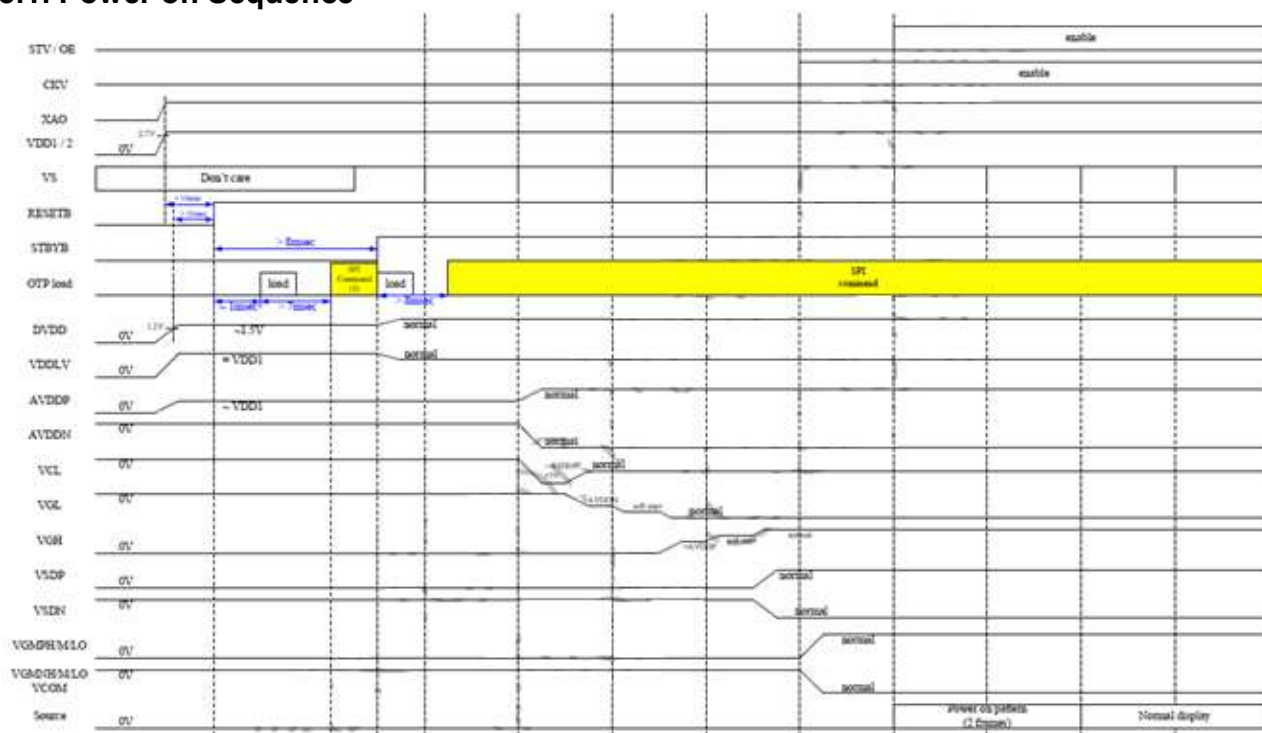
Figure 3: LVDS input eye diagram

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Clock frequency	FLVCYC	10	-	85	MHz
Clock period	TLVCYC	11.76	-	100	nsec
1 data bit time	UI	-	1/7	-	TLVCYC
Clock high time	LVHW	2.9	4	4.1	UI
Clock low time	LVLW	2.9	3	4.1	UI
Position 1	TPOS1	-0.2	0	0.2	UI
Position 0	TPOS0	0.8	1	1.2	UI
Position 6	TPOS6	1.8	2	2.2	UI
Position 5	TPOS5	2.8	3	3.2	UI
Position 4	TPOS4	3.8	4	4.2	UI
Position 3	TPOS3	4.8	5	5.2	UI
Position 2	TPOS2	5.8	6	6.2	UI
Input eye width	TEYEW	0.6	-	-	UI
Input eye border	TEX	-	-	0.2	UI
LVDS wake up time	TENLVDS	-	-	150	μ s

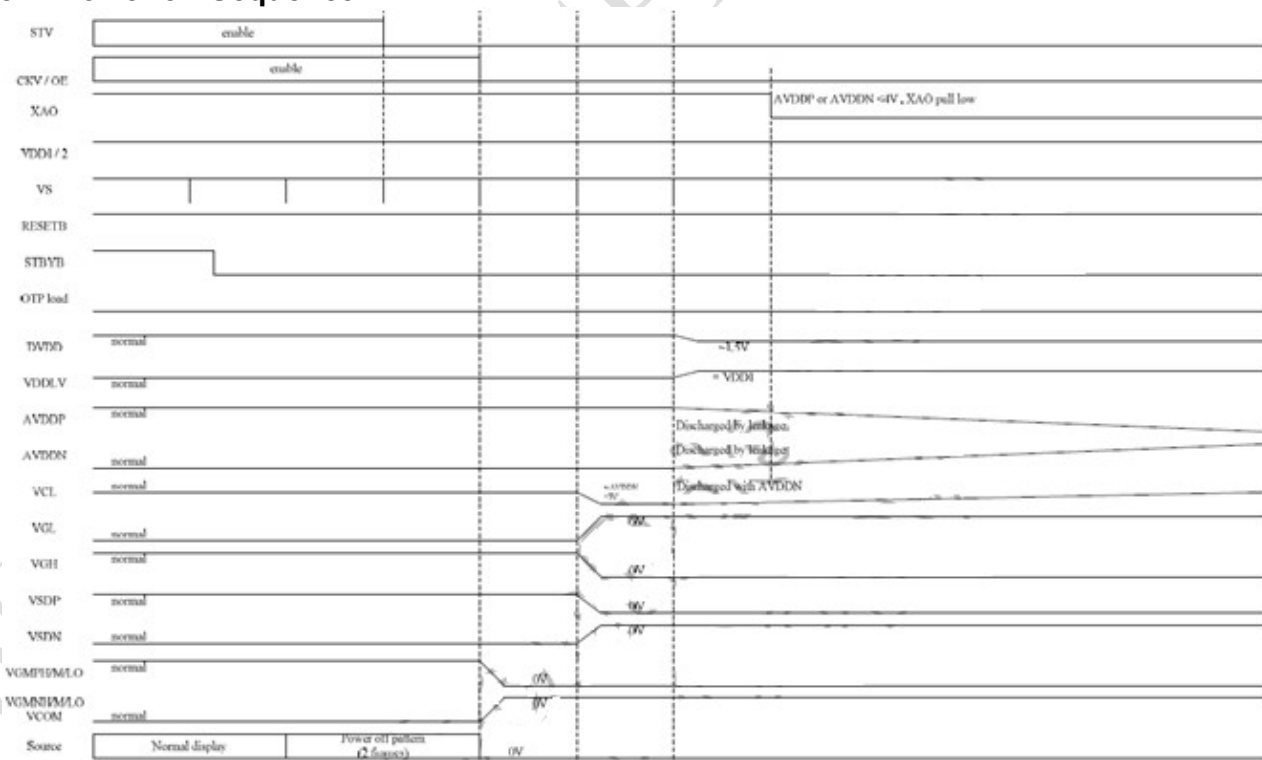
Table 1 LVDS input timing parameters

8.Power Sequence

8.1. Power on Sequence



8.2. Power off Sequence



9. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr+ Tf	$\theta=0^\circ$ 、 $\Phi=0^\circ$	-	25	35	ms	Note 3
Contrast ratio	CR	At the center point of AA	800	1000	-	-	Note 4
Color Chromaticity	White	$\theta=0^\circ$ 、 $\Phi=0^\circ$	0.26	0.31	0.36	-	Note 2,6,7
	Wy		0.28	0.33	0.38	-	
Viewing angle	Hor.	θ_R	70	80	-	Deg.	Note 1
		θ_L	70	80	-		
	Ver.	Φ_T	70	80	-		
		Φ_B	70	80	-		
Brightness	-	-	900	1000	-	cd/m ²	Center of display
Uniformity	(U)		75	-	-	%	Note5

Ta=25±2°C , IL=450mA

Note 1: Definition of viewing angle range

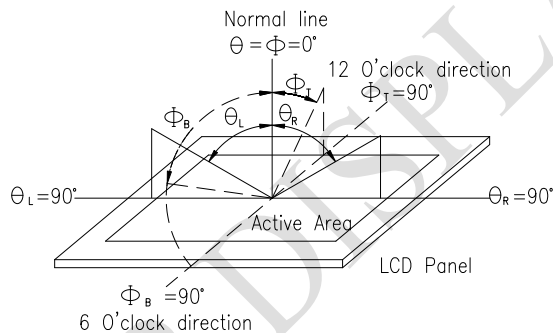


Fig 9.1. Definition of viewing angle

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.

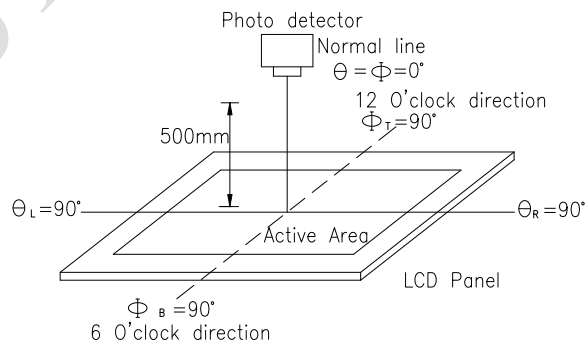
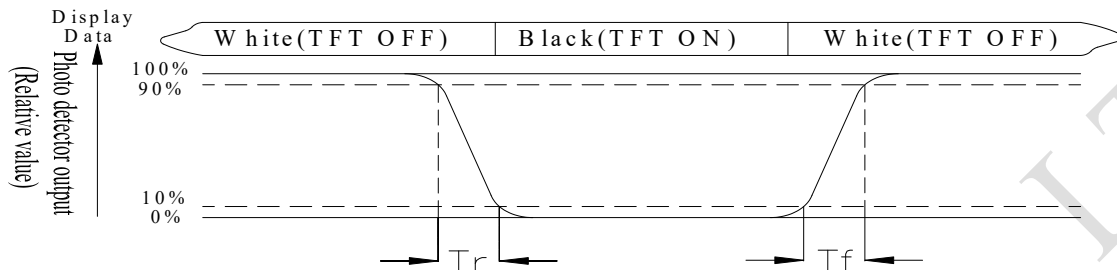


Fig 9.2. Optical measurement system setup

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 (Refer Fig. 8.3). Every measuring point is placed at the center of each measuring area.

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

L = Active area length

W = Active area width

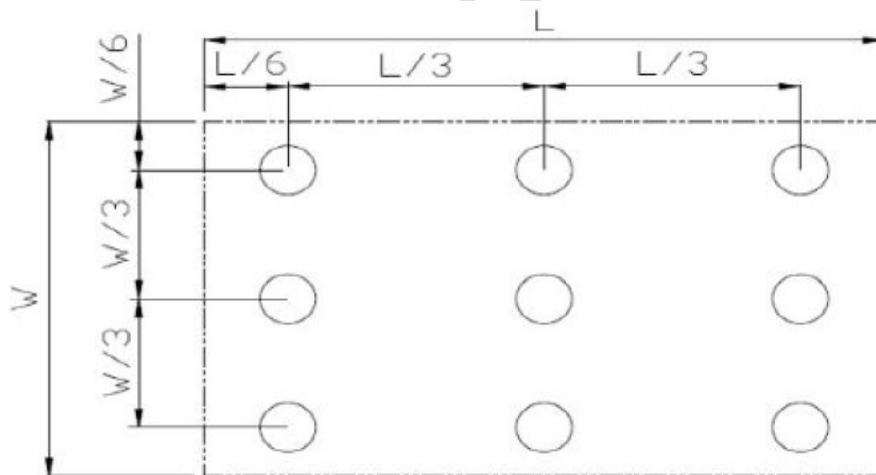


Fig 9.3. Definition of uniformit

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.

10.Interface

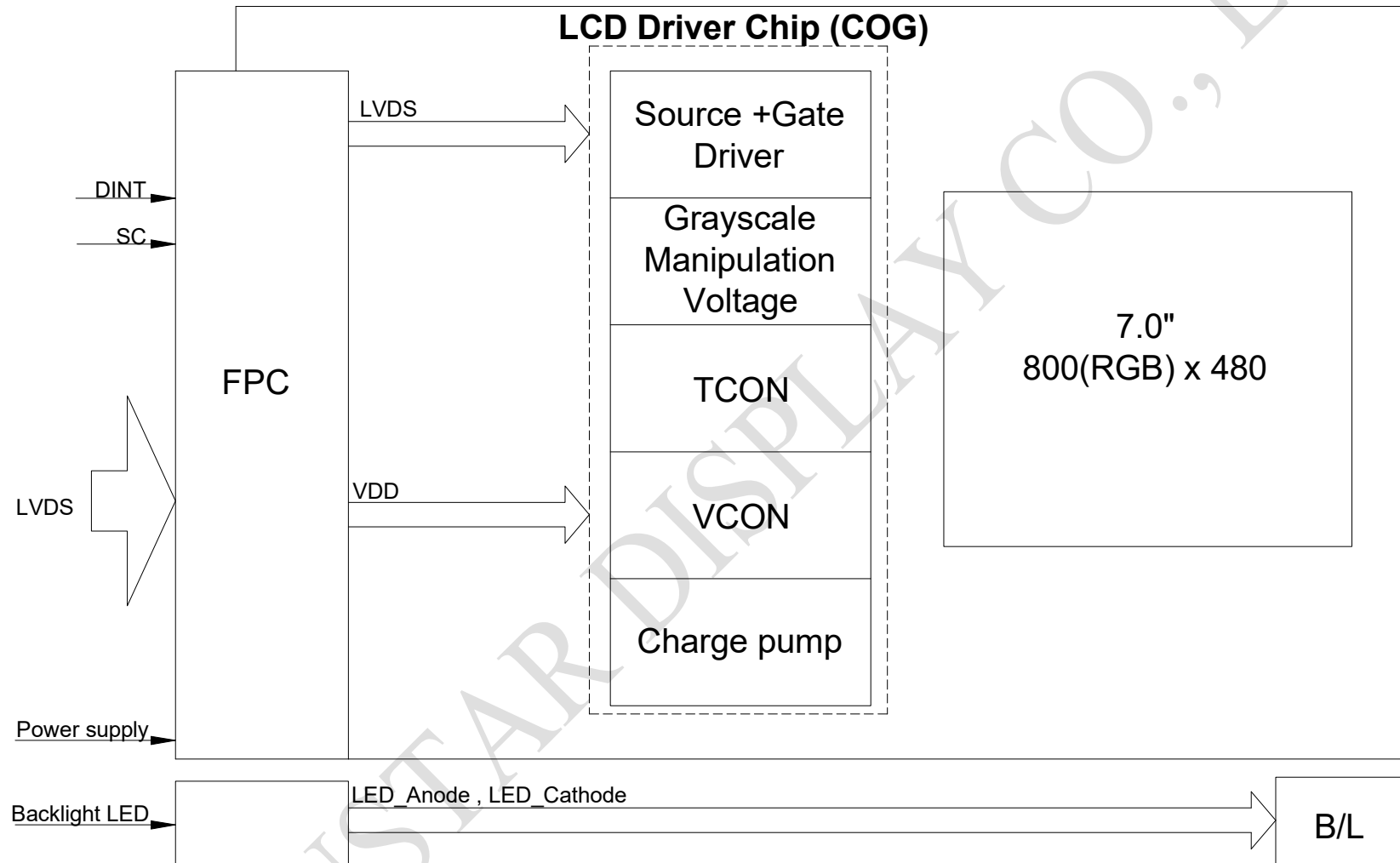
10.1. LCM PIN Definition

Pin	Symbol	Function	Remark
1	VCC	Power voltage	
2	VCC	Power voltage	
3	GND	Power Ground	
4	GND	Power Ground	
5	LVD0N	Input pins without termination resistor for LVDS mode. Keep these pins floating or connect to VSS1 if not used.	
6	LVD0P		
7	GND	Power Ground	
8	LVD1N	Input pins without termination resistor for LVDS mode. Keep these pins floating or connect to VSS1 if not used.	
9	LVD1P		
10	GND	Power Ground	
11	LVD2N	Input pins without termination resistor for LVDS mode. Keep these pins floating or connect to VSS1 if not used.	
12	LVD2P		
13	GND	Power Ground	
14	LVDCKN	Input pins without termination resistor for LVDS mode. Keep these pins floating or connect to VSS1 if not used.	
15	LVDCKP		
16	GND	Power Ground	
17	LVD3N	Input pins without termination resistor for LVDS mode. Keep these pins floating or connect to VSS1 if not used.	
18	LVD3P		
19	DINT	Input data format selection. Effective when FCS=1.	
		DINT	Function
		1	8-bit
		0	6-bit
20	SC	RL & TB Selection 1: Left to Right, Top to Bottom. (Default) 0: Right to Left, Bottom to Left.	

10.2. Backlight PIN Definition

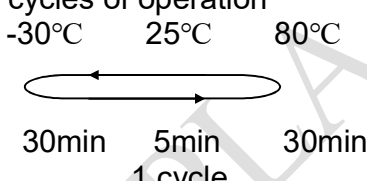
Pin	Symbol	Description
1	VLED+	Red, LED_ Anode
2	VLED-	Black, LED_ Cathode

11. Block Diagram



12. Reliability

Content of Reliability Test (Super Wide temperature, -30°C~80°C)

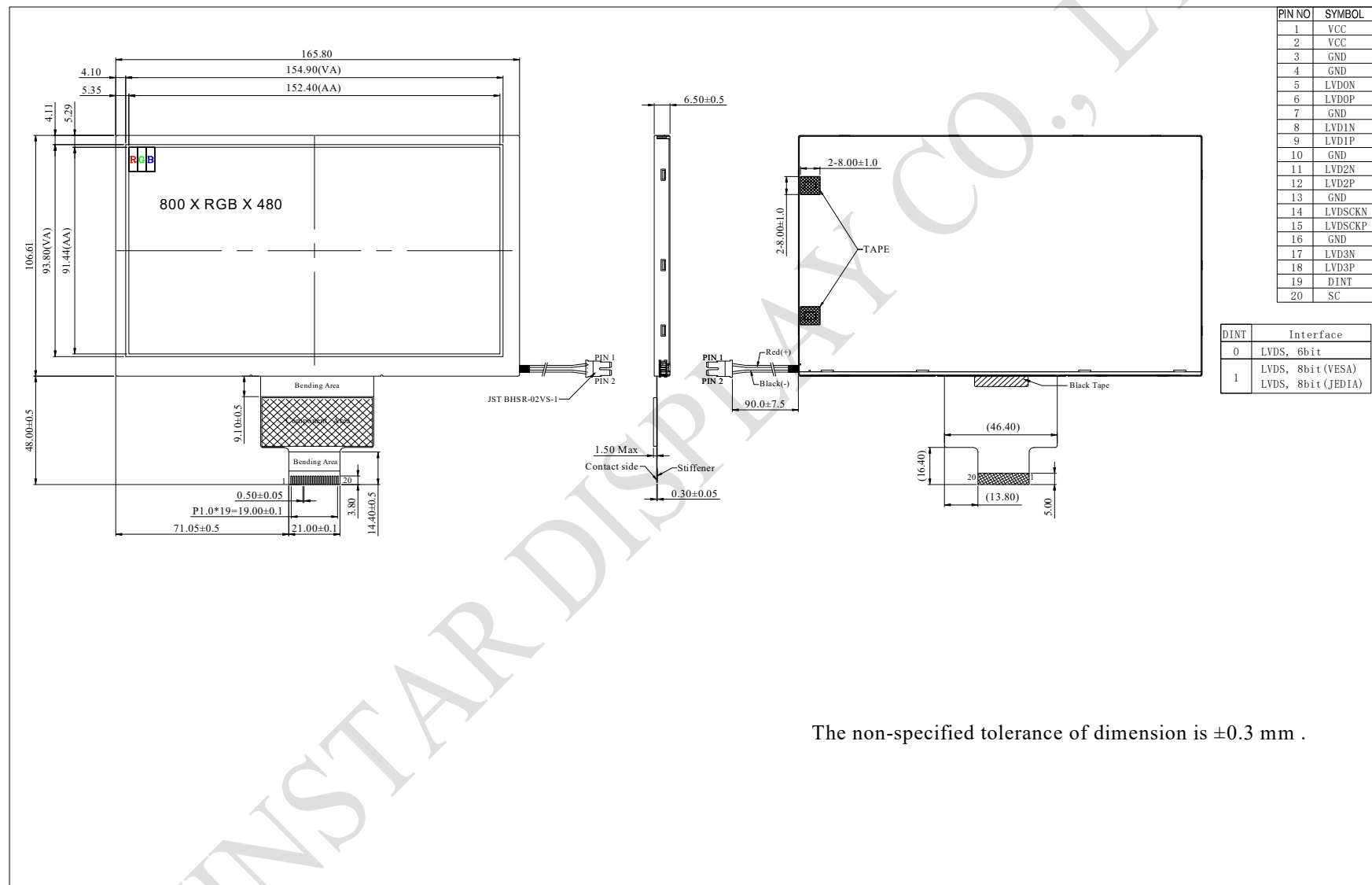
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	80°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30°C 200hrs	1
High Temperature/Humidity storage	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 	-30°C/80°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=±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.

13. Contour Drawing



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



winstar

LCM Sample Estimate Feedback Sheet

Module Number : _____

Page: 1

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

- | | | |
|-----------------------------|-------------------------------|-------------------------------------|
| 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) | ☐ 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 , _____ |



Winstar Module Number : _____

Page: 2

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 : / /