SPECIFICATION

CUSTOMER :

MODULE NO.:   **WF88BTYA8MNN0#**

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

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: **2020/03/27**			

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

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	2018/03/15		First issue	
A	2020/03/27		Add Uniformity Interface: 4-Lanes MIPI	

Contents

1.Module Classification Information

W	F	88	B	T	Y	A	8	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：8.8" 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

<table>
<tr><td rowspan="5">⑧</td><td colspan="16">Resolution:</td></tr>
<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><td>G</td><td>800480</td></tr>
<tr><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><td>M</td><td>1024768</td><td>N</td><td>128128</td></tr>
<tr><td>P</td><td>1280800</td><td>Q</td><td>480800</td><td>R</td><td>640320</td><td>S</td><td>480128</td><td>T</td><td>800320</td><td>U</td><td>8001280</td><td>V</td><td>176220</td></tr>
<tr><td>W</td><td>1280398</td><td>X</td><td>1024250</td><td>Y</td><td>1920720</td><td>Z</td><td>800200</td><td>2</td><td>1024324</td><td>3</td><td>7201280</td><td>4</td><td>19201200</td></tr>
<tr><td>5</td><td>1366768</td><td>6</td><td>1280320</td><td>7</td><td>1280480</td><td>8</td><td>4801920</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

⑨	D: Digital　　L：LVDS　　M:MIPI

<table>
<tr><td rowspan="3">⑩</td><td colspan="8">Interface:</td></tr>
<tr><td>N</td><td>Without control board</td><td>A</td><td>8Bit</td><td>B</td><td>16Bit</td><td>H</td><td>HDMI</td></tr>
<tr><td>I</td><td>I2C Interface</td><td>R</td><td>RS232</td><td>S</td><td>SPI Interface</td><td>U</td><td>USB</td></tr>
</table>

<table>
<tr><td rowspan="5">⑪</td><td colspan="5">TS:</td></tr>
<tr><td>N</td><td>Without TS</td><td>T</td><td>Resistive touch panel</td><td>C</td><td colspan="2">Capacitive touch panel (G-F-F)</td></tr>
<tr><td>G</td><td colspan="3">Capacitive touch panel (G-G)</td><td>C1</td><td>Capacitive touch panel (G-F-F)+OCA</td></tr>
<tr><td>C2</td><td colspan="3">Capacitive touch panel (G-F-F)+OCR</td><td>G1</td><td>Capacitive touch panel (G-G)+OCA</td></tr>
<tr><td>G2</td><td colspan="3">Capacitive touch panel (G-G)+OCR</td><td>B</td><td>CTP+GG+USB</td></tr>
</table>

⑫	Version:　　X:Raspberry pi

⑬	Special Code	#:Fit in with ROHS directive regulations

2.Summary

WF88 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 8.8 (1:4) inch diagonally measured active display area with (480 horizontal by 1920 vertical pixel) resolution.

3.General Specifications

Item	Dimension	Unit
Size	8.8	inch
Dot Matrix	480 x R.G.B. x 1920	dots
Module dimension	231.3*64.3*4.8	mm
Active area	218.88 *54.72	mm
Dot pitch	0.114 x 0.114	mm
LCD type	TFT, Normally black, Transmissive	
Viewing angle	85/85/85/85	
Aspect Ratio	1:4	
Backlight Type	LED ,Normally White	
Interface	4-Lanes MIPI	
With /Without TP	Without TP	
Surface	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
Supply Voltage	VDD	3.0	3.3	3.6	V	
	VGH	17.0	18.0	19.0	V	
	VGL	-11	-10	-9	V	
	AVDD	11.8	12	12.2	V	
VCOM	VCOM	4.5	4.88	5.2	V	Note (1)
Input signal voltage	ViH	0.7 VDD	-	VDD	V	Note (2)
	ViL	0	-	0.3 VDD	V	
Current of power supply	IDD	-	-	35	mA	VDD =3.3V
	IADD	-	-	30	mA	AVDD=12V
	IGH	-	-	5	mA	VGH=18V
	IGL	-	-	-5	mA	VGL= -10V
	Ivcom	-	-	0.1	mA	Vcom= 4.88V

Note (1): Please adjust VCOM to make the flicker level minimum.
Note (2) :RESET, STBYB, TP_Sync

5.2. **MIPI DC Characteristics**

HS Receiver DC Specification

Parameter	Symbol	Rating			Unit	Note
		Min.	Typ.	Max.		
Operation voltage	VDD	1.5-10%	1.5	1.5+10%	mV	
Differential Input Voltage	VID	70	200	260	mV	
Common Mode Voltage	VCMRX(DC)	70	-	330	mV	
Differential Input High Threshold Voltage	VTH	-	-	70	mV	
Differential Input Low Threshold Voltage	VTL	-70	-	-	mV	
Singled-ended input high voltage	VIHHS	-	-	460	mV	
Singled-ended input low voltage	VILHS	-40	-	-	mV	
Singled-ended Threshold for HS termination enable	VTERM-EN	-	-	450	mV	
Differential Input impedance	ZID	80	100	125	ohm	
Pin leakage current	ILEAK	-10	-	10	uA	
Common-mode interference beyond 450MHZ	VCMRX(HF)	-	-	100	mV	
Common-mode interference 50MHz-450MHZ	VCMRX(LF)	-50	-	50	mV	
Common-mode termination	CCM	-	-	60	pF	
Embedded Termination	RT	90	100	110	ohm	2bits RT_SEL[1:0] for termination resistor selection 00→200ohm 10,01→150 ohm 11→100 ohm(default) 1bit ERMR_EN for termination resistor enable TERMR_EN=0, termr disable R=(OPEN) TERMR_EN=1, termr enable

Note:
Excluding possible additional RF interference of 100mV peak sine wave beyond 450Mhz.
This table value includes a ground difference of 50mV between the transmitter and the receiver,the static common-mode level tolerance and variations below 450MHz.
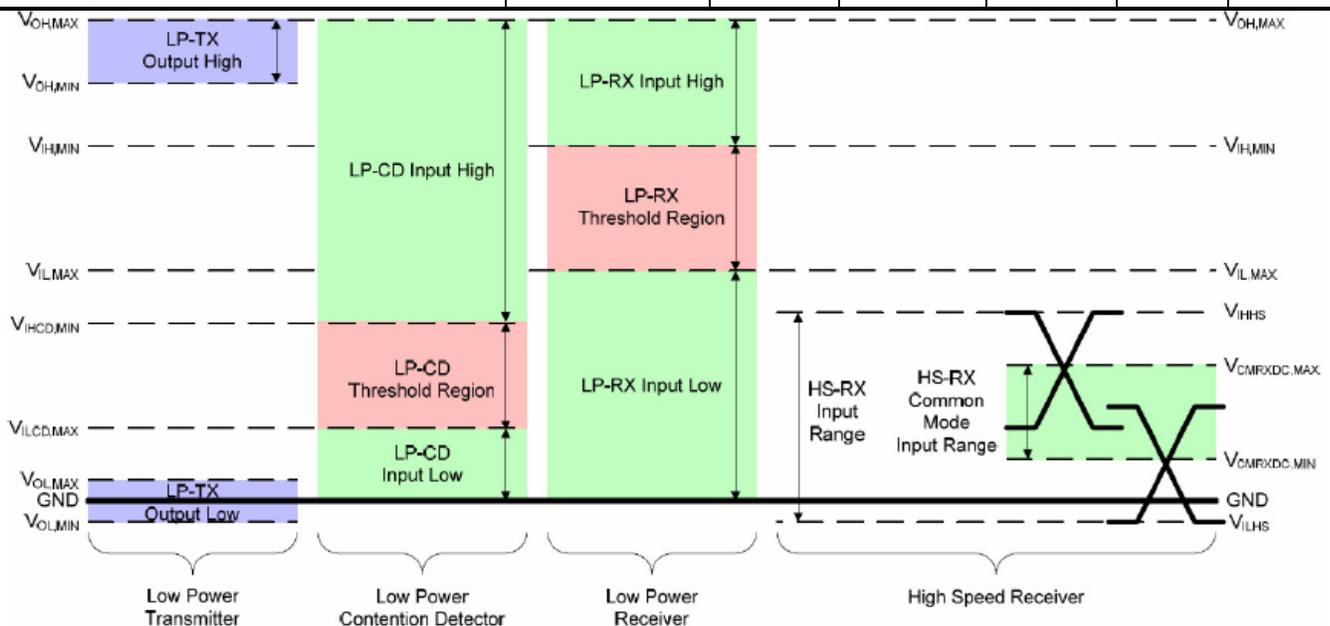
LP Receiver DC Specification

Parameter	Symbol	Rating			Unit	Note
		Min.	Typ.	Max.		
Logic 1 input voltage	VIH	880	-	-	mV	
Logic 0 input voltage, not in ULP State	VIL	-	-	550	mV	
Input hysteresis	VHYST	25	-	-	mV	
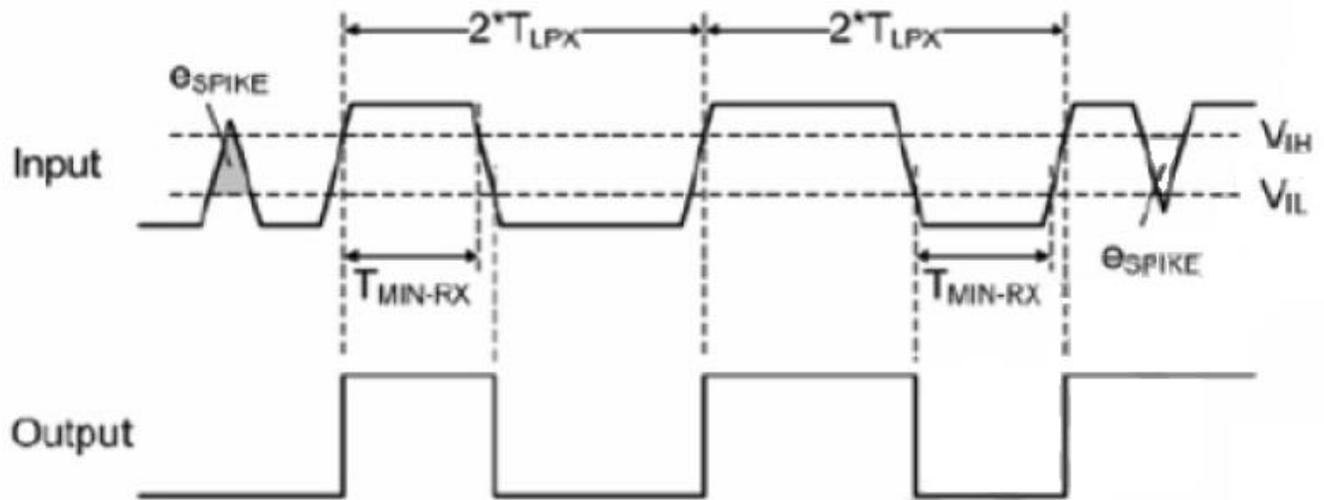
Line Contention Detection

Parameter	Symbol	Rating			Unit	Note
		Min.	Typ.	Max.		
Logic 1 contention threshold	VIHCD	450	-	-	mV	
Logic 0 contention threshold	VILCD	-	-	200	mV	

5.3. Interface Timing

Item	Symbol	Min.	Typ.	Max.	Unit
MIPI Video data rate(4 lane)	-	-	397.7	-	Mbps
PCLK Frequency	FPCLK	-	66.3	-	MHz
Horizontal Synchronization	Hsync	-	30	-	PCLK
Horizontal Back Porch	HBP	-	30	-	PCLK
Horizontal Front Porch	HFP	-	30	-	PCLK
Hsync+HBP+HFP	-	75	90	-	PCLK
HorizontalAddress (Display Area)	Hadr	-	480	-	PCLK
Horizontal cycle	-	555	570	-	PCLK
Vertical Synchronization	Vsync	-	6	-	Line
Vertical Back Porch	VBP	-	6	-	Line
Vertical Front Porch	VFP	-	6	-	Line
Vsync+VBP+VFP	-	15	18	-	Line
Vertical Address(Display Area)	Vadr	-	1920	-	Line
Vertical cycle	-	1935	1938	-	Line
Frame Rate	-	-	60	-	Hz

5.4. Power On / Off Sequence

Power-On/Off Timing Sequence:
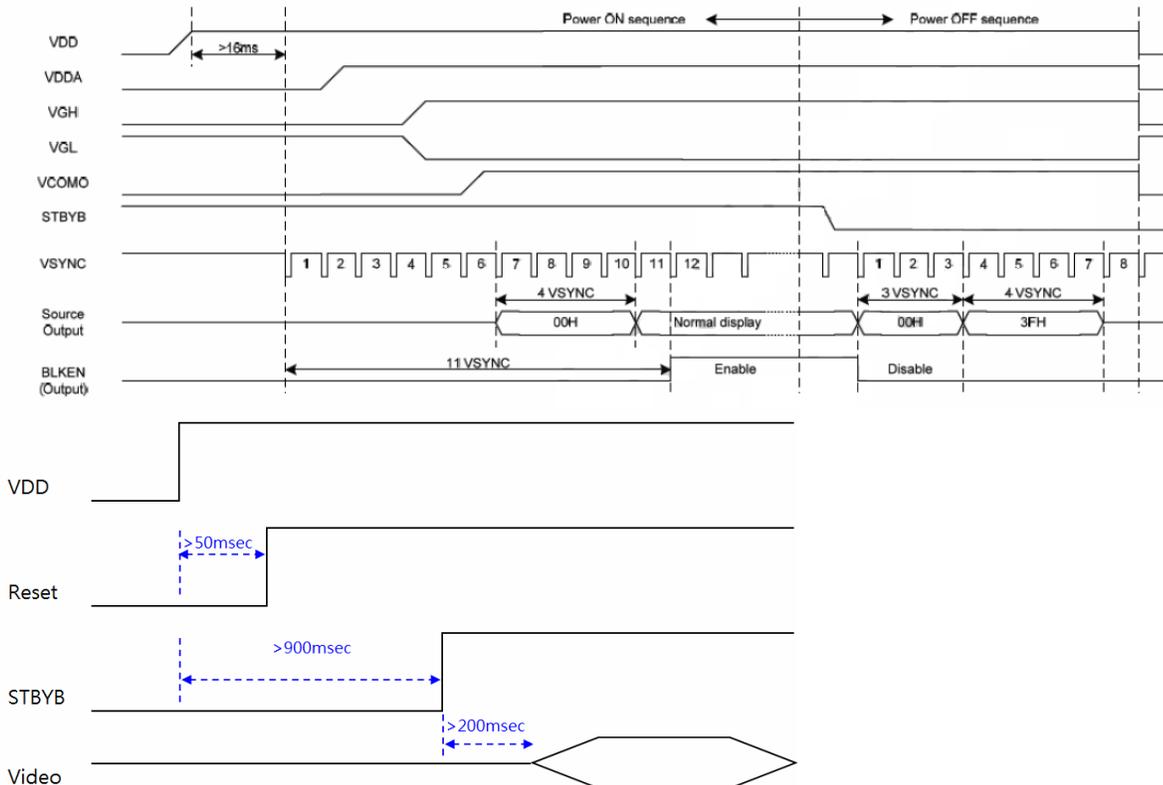
5.5. Backlight Unit

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
LED Current	IF	-	160	-	mA	Ta=25℃
LED Voltage	VF	-	-	17.5	Volt	Ta=25℃
LED Life-Time	N/A		30,000	-	Hour	Ta=25℃ IF=160Ma 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 IL=160mA. The LED lifetime could be decreased if operating IL is larger than 160mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit

6.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	θ=0°、Φ=0°	-	30	40	.ms	Note 3
		Tf						
Contrast ratio		CR	At optimized viewing angle	600	800	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.250	0.300	0.350		Note 2,6,7
		Wy		0.272	0.322	0.372		
Viewing angle	Hor.	ΘR	CR≧10	75	85	-	Deg.	Note 1
		ΘL		75	85	-		
	Ver.	ΦT		75	85	-		
		ΦB		75	85	-		
Brightness		-	-	480	600	-	cd/m²	Center of display
Uniformity		(U)	-	70	-	-	%	Note 5

Ta=25±2℃,

Note 1: Definition of viewing angle range
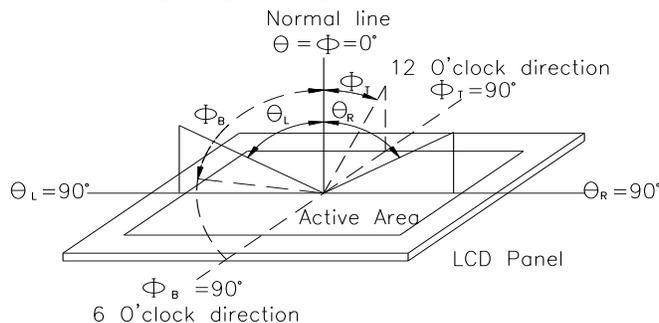
Fig 8.1. Definition of viewing angle

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.
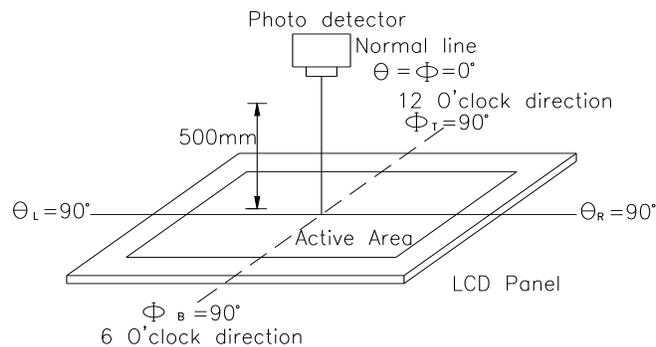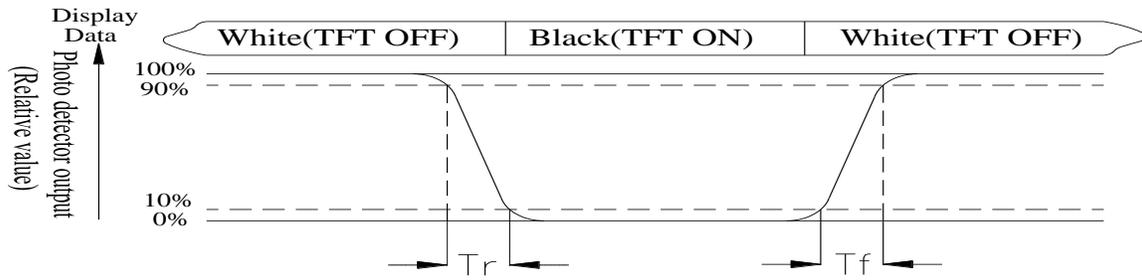

Fig 8.2. Optical measurement system setup

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
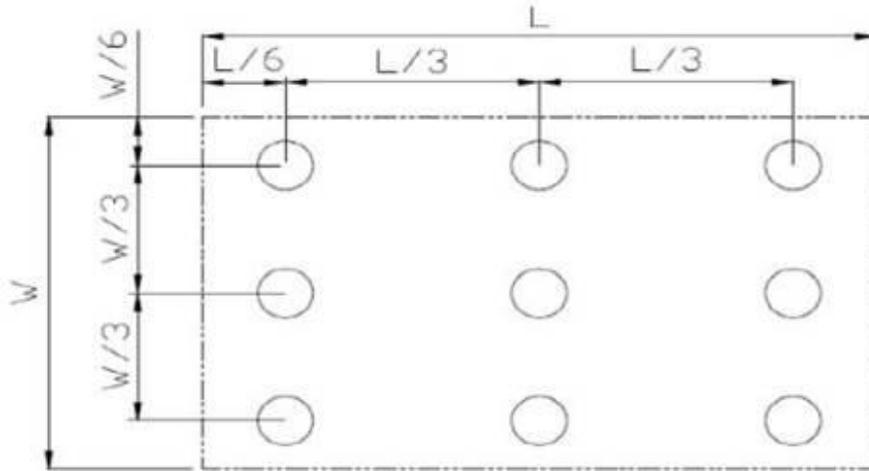
Fig Definition of uniformity

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.

7.Interface

FPC connector is used for electronics interface. The recommended model is Hirose FH34SRJ-40S-0.5SH(50)

Pin No.	Symbol	I/O	Function
1	GND	P	Ground
2	NC	---	No connection
3	LED+	P	LED Anode
4	LED+	P	LED Anode
5	NC	---	No connection
6	LED-	P	LED Cathode
7	LED-	P	LED Cathode
8	NC	---	No connection
9	GND	P	Ground
10	NC	---	No connection
11	AVDD	P	Power supply for analog circuit
12	NC	---	No connection
13	VGH	P	Power supply for analog circuit
14	NC	---	No connection
15	VGL	P	Power supply for analog circuit
16	NC	---	No connection
17	GND	P	Ground
18	VCOM	P	Power supply for common voltage
19	GND	P	Ground
20	GND	P	Ground
21	RESET	I	Global reset
22	VDD	P	Power supply for digital circuits
23	STBYB	I	Standby mode
24	TP_Sync	O	Sync signal for touch panel
25	GND	P	Ground
26	D0P	I	MIPI Data Input Lane0 positive-end
27	D0N	I	MIPI Data Input Lane0 negtive-end
28	GND	P	Ground
29	D1P	I	MIPI Data Input Lane1 positive-end
30	D1N	I	MIPI Data Input Lane1 negtive-end
31	GND	P	Ground

32	CLKP	I	MIPI Clock Input positive-end
33	CLKN	I	MIPI Clock Input negtive-end
34	GND	P	Ground
35	D2P	I	MIPI Data Input Lane2 positive-end
36	D2N	I	MIPI Data Input Lane2 negtive-end
37	GND	P	Ground
38	D3P	I	MIPI Data Input Lane3 positive-end
39	D3N	I	MIPI Data Input Lane3 negtive-end
40	GND	P	Ground

8.Block Diagram

8.1. TFT LCD Module
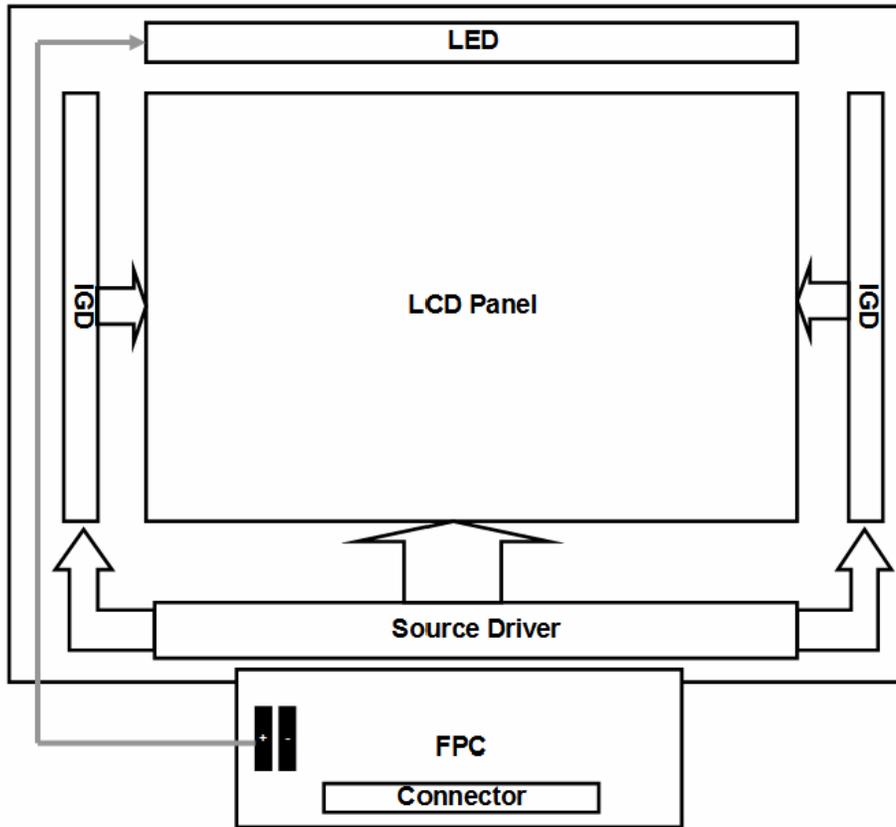
8.2. Pixel Format
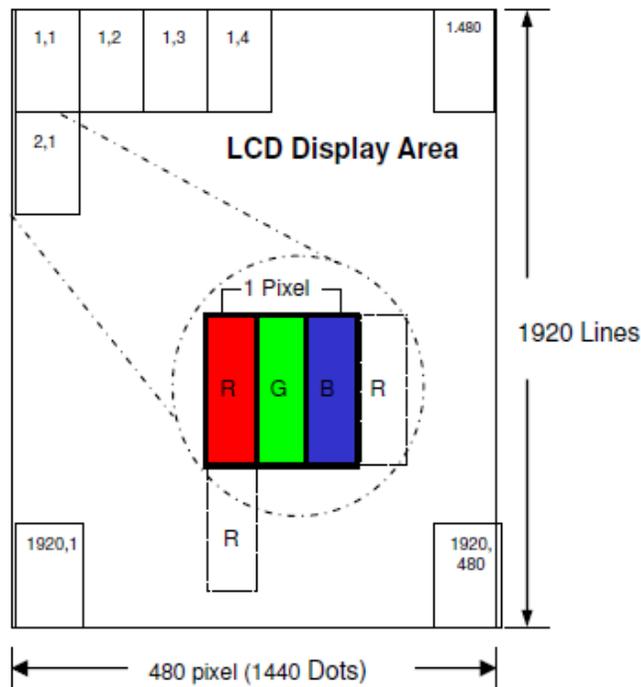
9.Reliability

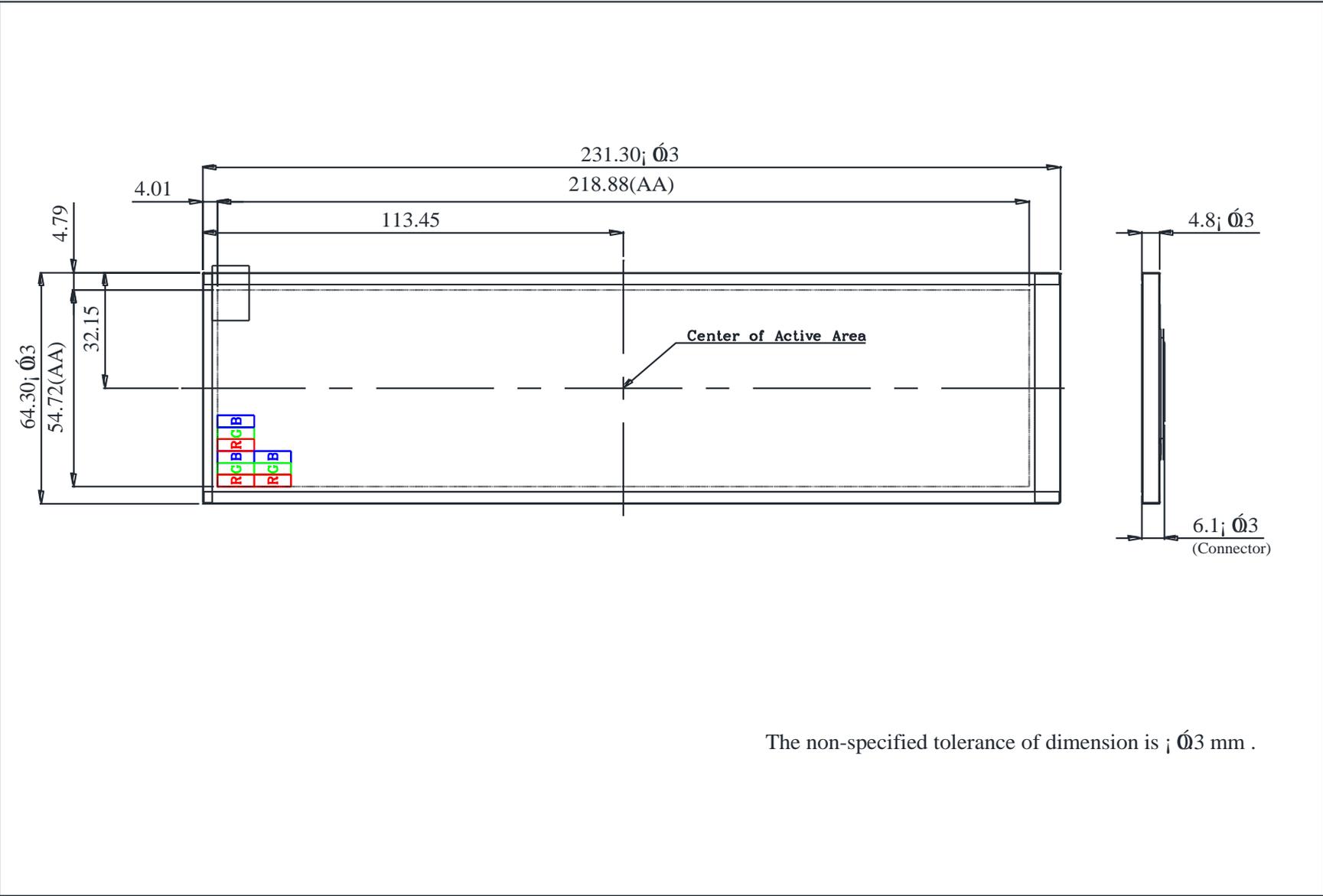Content of Reliability Test (Wide temperature, -20℃~70℃)

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℃
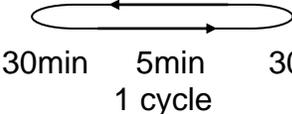	
	     30min 5min 30min
	             1 cycle
		-20℃/70℃ 10 cycles	——

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 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.

10.Contour Drawing

231.30¡Ó3

218.88(AA)

4.01

4.79

113.45

4.8¡Ó3

64.30¡Ó3

54.72(AA)

32.15

Center of Active Area

6.1¡Ó3
(Connector)

The non-specified tolerance of dimension is ¡Ó3 mm .

CN1-FH34SRJ-40S-0.5SH(50)

PIN NO	SYMBOL	PIN NO	SYMBOL
1	GND	21	RESET
2	NC	22	VDD
3	LED+	23	STBYB
4	LED+	24	TP_Sync
5	NC	25	GND
6	LED-	26	D0P
7	LED-	27	D0N
8	NC	28	GND
9	GND	29	D1P
10	NC	30	D1N
11	AVDD	31	GND
12	NC	32	CLKP
13	VGH	33	CLKN
14	NC	34	GND
15	VGL	35	D2P
16	NC	36	D2N
17	GND	37	GND
18	VCOM	38	D3P
19	GND	39	D3N
20	GND	40	GND

Pin40

CN1

Pin1

1.90 ± 0.10

89.35 ± 0.10

22

P0.5*39=19.5

3.8

0.15
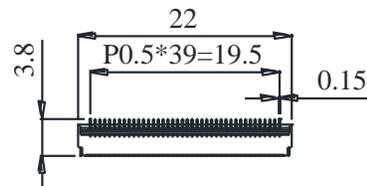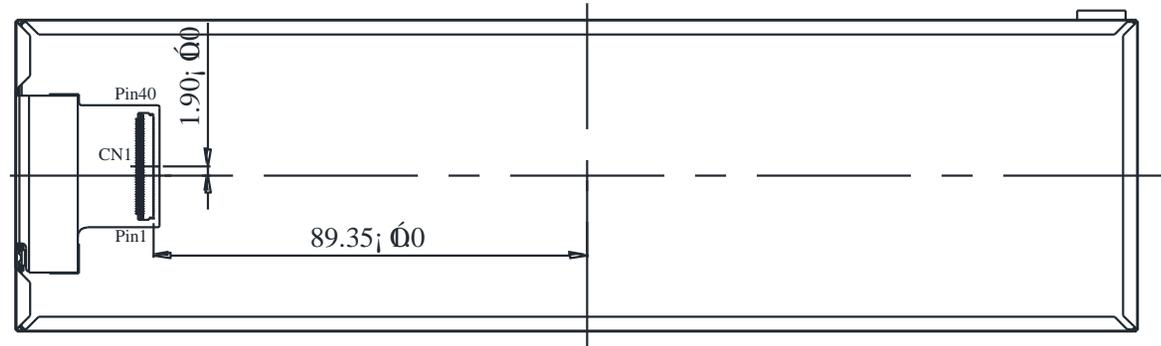
FH34SRJ-40S-0.5SH(50)
SCALE 2/1

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 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** <<

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**：_____/_____/_____