



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.: WF70C3TYAB4MNNO#

<p>APPROVED BY:</p> <p>(FOR CUSTOMER USE ONLY)</p>	<p>PCB VERSION: _____</p> <p>DATA: _____</p>
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			周园园
ISSUED DATE: 2023/04/13			

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	2022/10/19		First issue
A	2023/03/15		Add Inspection Specification
B	2023/04/13		Modify Static electricity test & Contour Drawing Modify bending area.

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Contents

1.Module Classification Information

2.Summary

3.General Specifications

4.Absolute Maximum Ratings

5.Electrical Characteristics

6.Interface Characteristics

7.Optical Characteristics

8.Interface

9.Reliability

10.Contour Drawing

11.Inspection Specification

12.Other

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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 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:											
	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									

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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.

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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	°C
Storage Temperature	TST	-30	—	+80	°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

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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	ICC	-	102	120	mA	VCC=3.3V
Logic input voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	

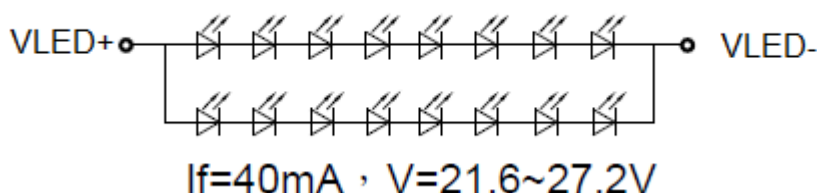
5.2. Backlight Driving Conditions

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

Note (3) LED light bar circuit :

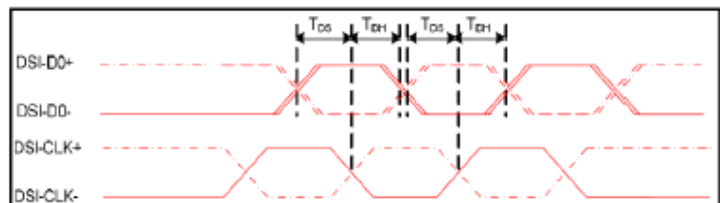
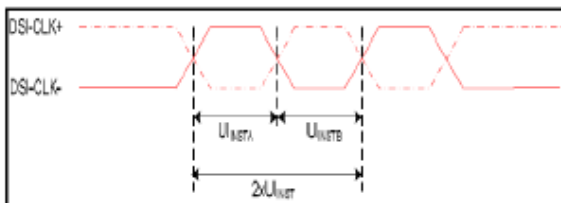


6. Interface Characteristics

6.1. DC characteristics for interface

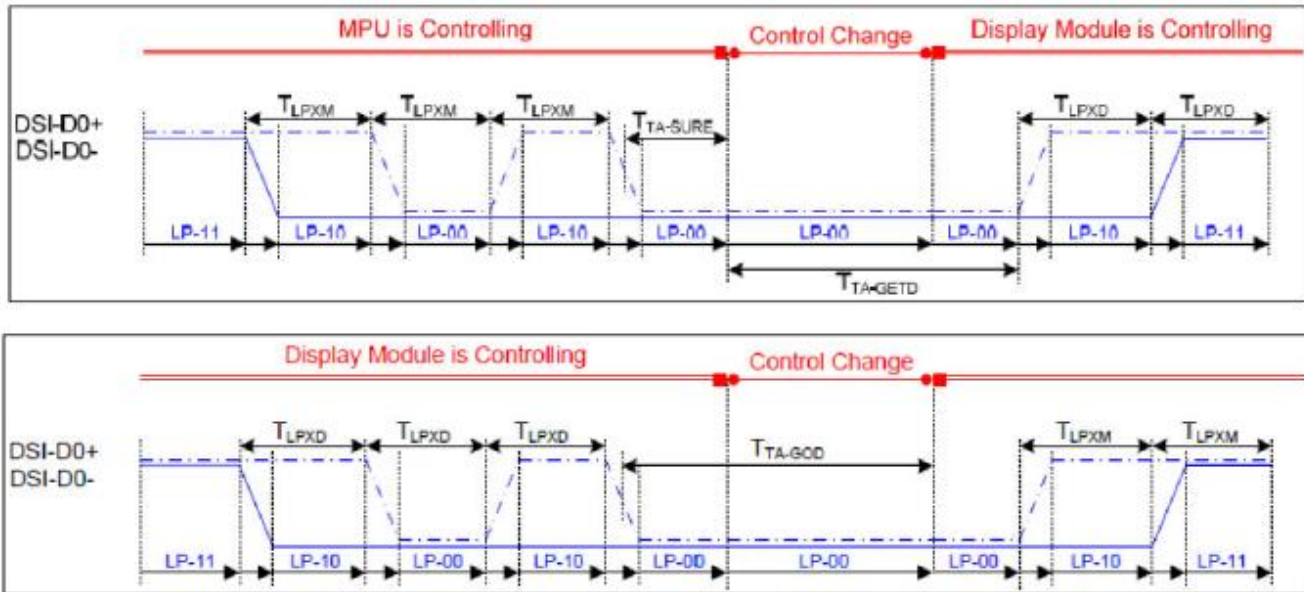
Parameter	Symbol	Condition	Specification			Unit
Input Common Mode Voltage for Clock	V_{CMCLK}	CLKP/N Note 2, Note 3	70	-	330	mV
Input Common Mode Voltage for Data	V_{CMDATA}	DnP/N Note 2, Note 3, Note 5	70	-	330	mV
Common Mode Ripple for Clock Equal or Less than 450MHz	$V_{CMRCLK450}$	CLKP/N Note 4	-50	-	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_{THCLK-}	CLKP/N	-70	-	-	mV
Differential Input Low Level Threshold Voltage for Data	$V_{THDATA-}$	DnP/N Note 5	-70	-	-	mV
Differential Input High Level Threshold Voltage for Clock	V_{THCLK+}	CLKP/N	-	-	70	mV
Differential Input High Level Threshold Voltage for Data	$V_{THDATA+}$	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_{TERMEN}	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+/-	$2xU_{INSTA}$	Double UI instantaneous	4	25	ns	
DSI-CLK+/-	U_{INSTA} U_{INSTB}	UI instantaneous halves	2	12.5	ns	$UI = U_{INSTA} = U_{INSTB}$
DSI-Dn+/-	t_{DS}	Data to clock setup time	0.15	-	UI	
DSI-Dn+/-	t_{DH}	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	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	30	40	.ms	Note 3	
Contrast ratio	CR	At optimized viewing angle	800	1000	-	-	Note 4	
Color Chromaticity	White	Wx	$\theta=0^\circ$ 、 $\phi=0$	0.29	0.32	0.35	-	Note 2,5,6
		Wy		0.31	0.34	0.37	-	
Viewing angle	Hor.	Θ_R	$CR \geq 10$	-	80	-	Deg.	Note 1
		Θ_L		-	80	-		
	Ver.	Φ_T		-	80	-		
		Φ_B		-	80	-		
Brightness	-	-	450	550	-	cd/m ²	Center of display	
Uniformity	(U)	-	75	80	-	%	Note 5	

Ta=25±2°C,

Note 1: Definition of viewing angle range

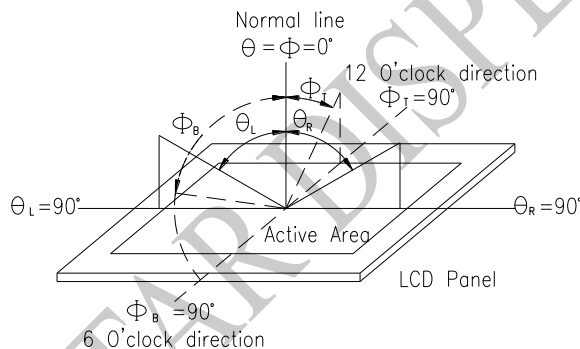


Fig. 7.1. Definition of viewing angle

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

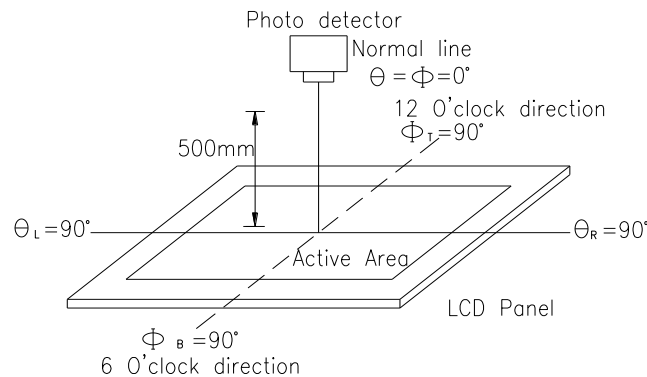
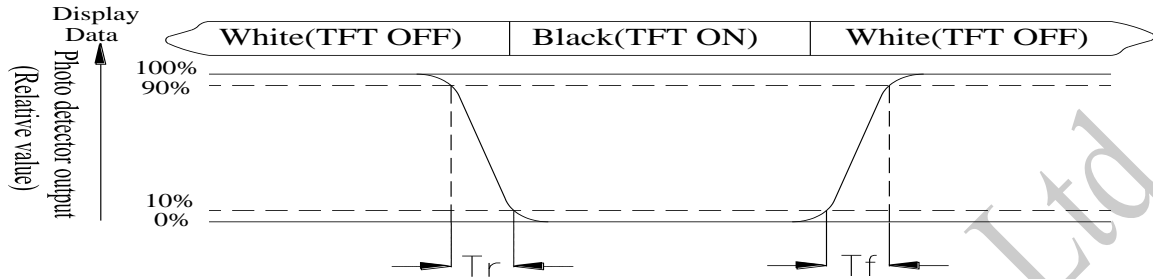


Fig. 7.2. Optical measurement system setup

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, 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

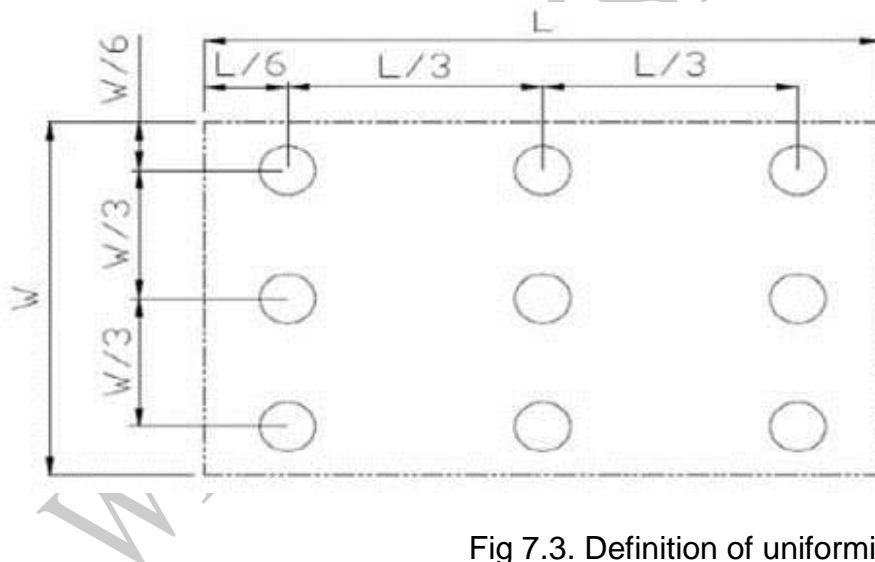


Fig 7.3. Definition of uniformity

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°C~70°C)

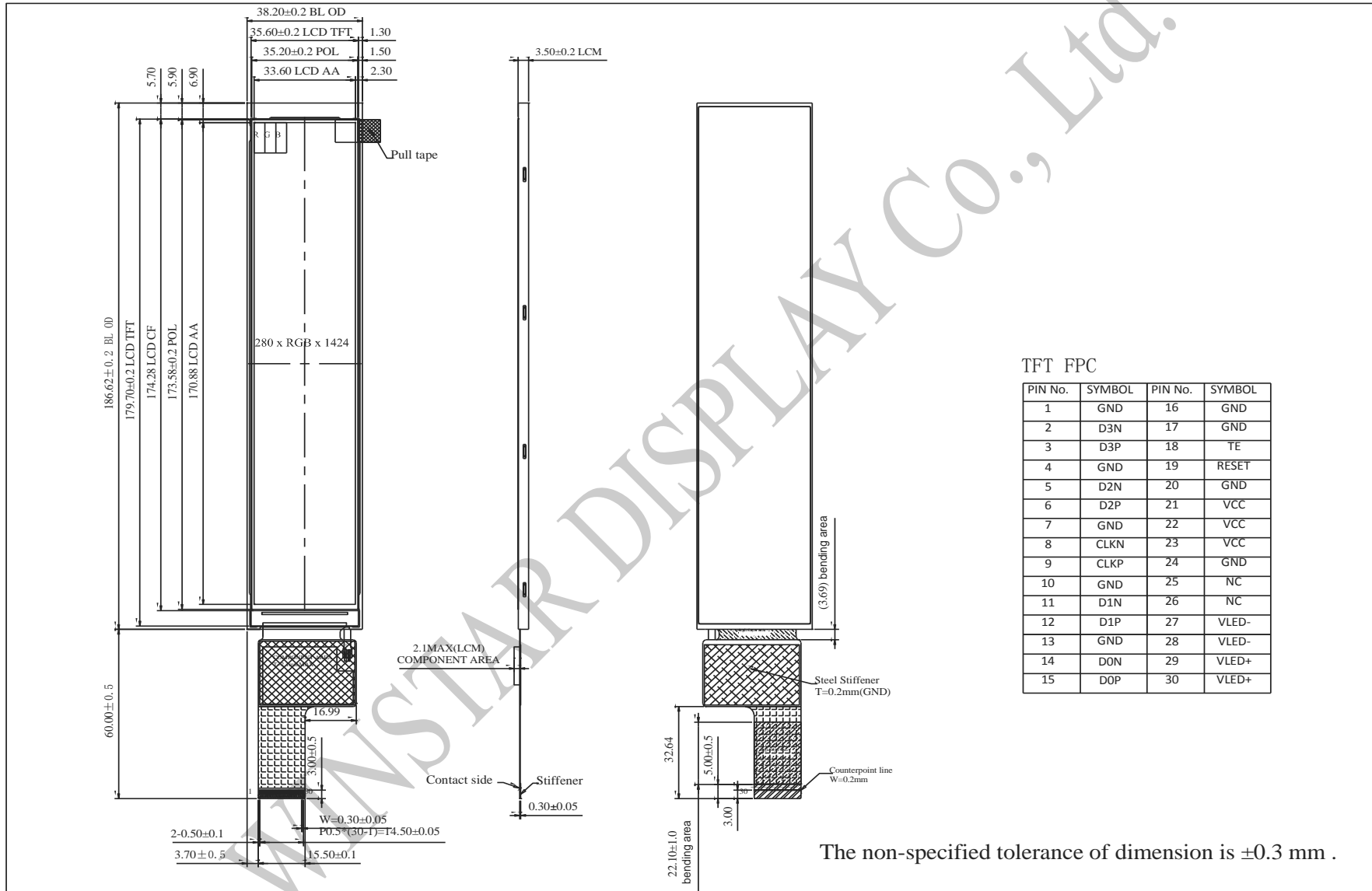
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature 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 <div style="text-align: center;"> <p style="margin: 0;">-20°C 25°C 70°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-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 finished product housing.	VS=±6KV(contact), ±8KV(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



11. Inspection Specification

11.1. Purpose:

This Incoming Inspection Standards shall be apply to TFT-LCD Module

11.2. Visual Inspection Criteria

1. Inspection condition is as followings

- Viewing distance is approximately 35±5 cm.
- Viewing angle is normal to the LCD panel.
- Ambient temperature is in the room temperature.
- Humidity : 60 ± 10% RH.
- Ambient illumination is 500±50 Lux.


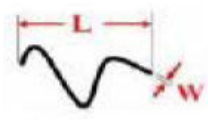
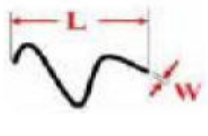
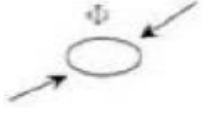
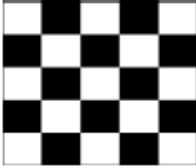
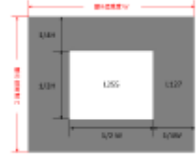
		Defect type	Criteria
Electrical defect	Area (Note 1)		All
	Bright Dots (Note 2)		$N \leq 0$
	Dark Dots (Note 3)		$N \leq 4$
	Bright Dot- 2 Adjacent		$N \leq 0$
	Dark Dots- 2 Adjacent (Note 4)		$N \leq 0$
	Dark or Bright Dots- 3 and More Adjacent		$N \leq 0$
	Total Bright and Dark Dots		$N \leq 4$
	Minimum Distance Between Bright Dots		-
	Minimum Distance Between Dark Dots (Note 5)		≥ 5 mm
Visual defect	Foreign Material	Circular Foreign Material Dark/ Bright Spot (Note 6)	 <p>1. $D \leq 0.15$mm: No count 2. 0.15mm $< D \leq 0.3$mm, $N \leq 4$. 3. $D > 0.3$mm: Not allowable</p>
		Linear Foreign Material : Bright or Dark Line	 <p>1. $W \leq 0.05$mm: No count 2. 0.05mm $< W \leq 0.1$mm, 0.3mm $< L \leq 2$mm, $N \leq 4$ 3. $W > 0.1$mm, $L > 2$mm; Not allowable</p>
	Polarizer	Linear Scratch	 <p>1. BM: No count 2. $W \leq 0.05$mm: No count 3. 0.05mm $< W \leq 0.2$mm, 0.3mm $\leq L \leq 3.0$mm, $N \leq 4$ 4. $W > 0.2$mm, $L > 3$mm; Not allowable</p>
		Bubble/ Peeling (Note 6)	 <p>1. BM: No count 2. Pixel area $D \leq 0.15$mm: No count 0.15mm $< D \leq 0.3$mm, $N \leq 4$ 3. $D > 0.3$mm; Not allowable</p>

	Image Sticking		Light on 5x5 checkerboard for 3 seconds, switch to L127 screen disappears within 1 second without image residue.
	Crosstalk		Judgment according to the Mura judgment specification.
	Mura & Leak (Note 7)		ND 5%

D: diameter , N: number , W: horizontal width , L: vertical height

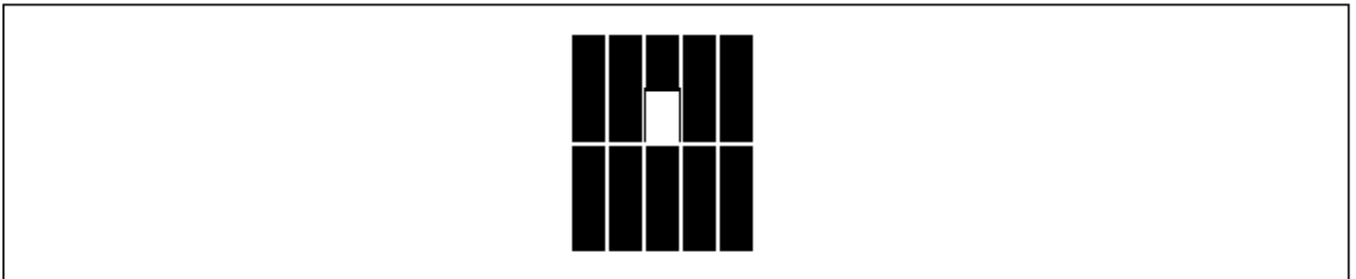
2.Others

Note(1)

- Every dot herein means sub-pixel(Each Red, Green, Blue Color).
- Damaged less than half size of sub-pixel is not counted as defect.
- Extraneous substances which can be wiped out are not considered as defect.
- Defects which is on the Black Matrix(Outside of Active Area) are not considered as defect.

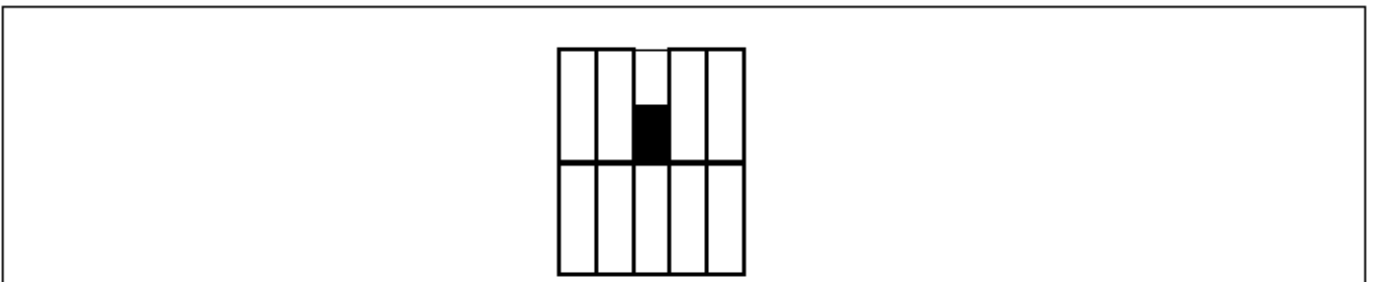
Note (2) Bright dot defect definition

-bright area is more than 50% of one dot.



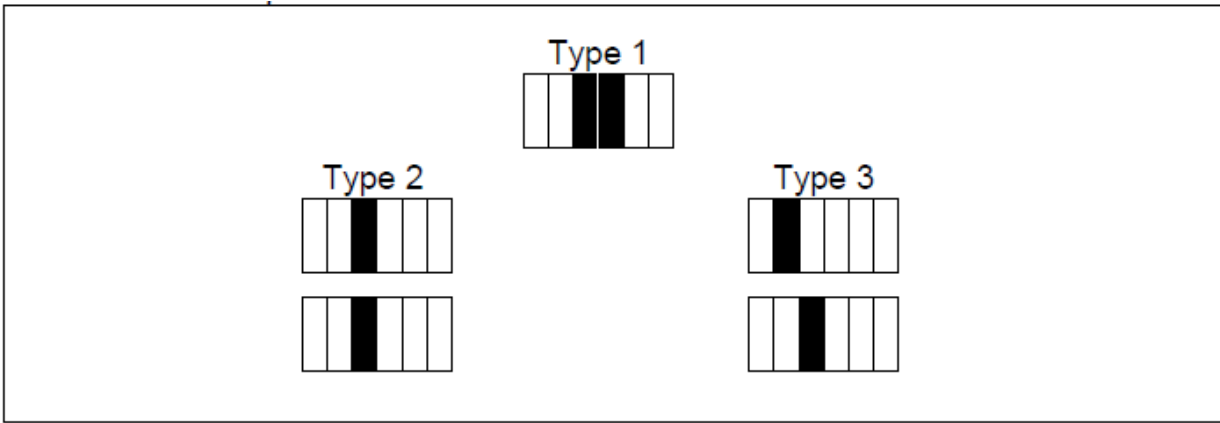
Note (3) Dark dot defect definition

-Dark area is more than 50% of one dot.

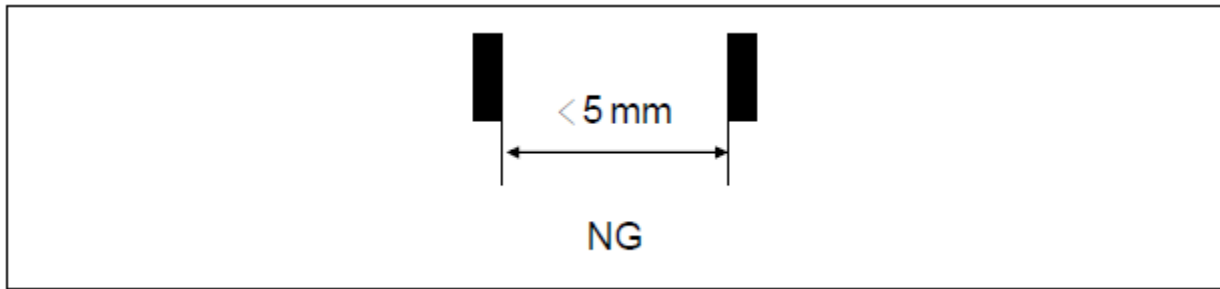


Note (4) Dark dot defect description

- Two adjacent

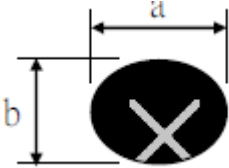


Note (5) Minimum distance between dot defects
Dark dot to dark dot



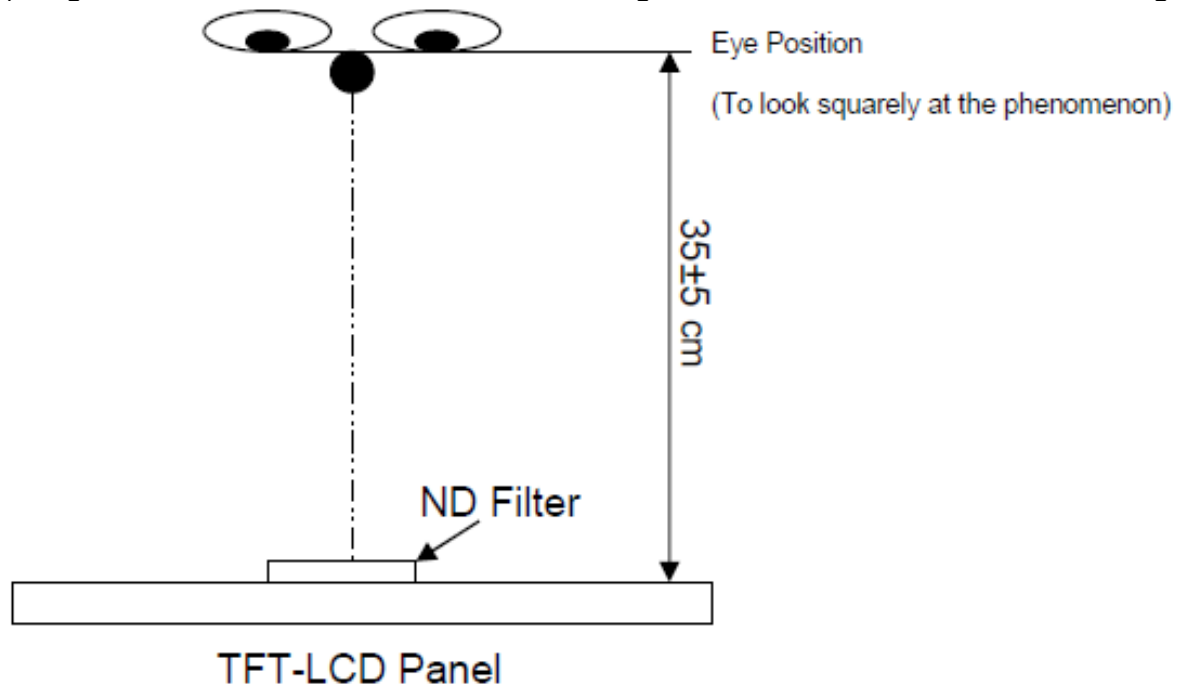
Note (6) "Average Diameter" description

Average Diameter = $(a+b)/2$



The defect that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

Note (7) Bright dot, mura and leak are defined through transmission ND Filter as following.



Note (8). Life time and storage condition.

To prevent quality problem caused by external environment, this product should Be stored below storage condition and Winstar 12 month.

Storage temperature range : $25 \pm 5^{\circ}\text{C}$

Storage humidity range: $50 \pm 20\% \text{RH}$



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 , _____

>> **Go to page 2** <<



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 : / / _____