

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.: **WF50BTIAGDNT0#**

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: 2021/07/05			

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	2016/07/04		First issue
A	2016/08/10		Modify Vibration test.
B	2016/10/04		Modify Summary.
C	2016/12/01		Modify VDD.
D	2017/02/08		Modify HS/VS=NC/HS & NC/VS
E	2017/10/03		Modify interface information.
F	2017/12/13		Add Note (Interface)
G	2019/06/24		Add Uniformity
H	2021/07/05		Add TFT Interface Correct Aspect Ratio

Contents

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3.General Specification

4.Absolute Maximum Ratings

5.Electrical Characteristics

6.Optical Characteristics

7.Interface

8.Reliability

9.Touch Panel Information

10.Contour Drawing

11.Other

1.Module Classification Information

W F 50 B T I A G D N T 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 : 5.0” 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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⑨	D: Digital L : LVDS M:MIPI																																																																							
⑩	Interface: <table><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>												N	Without control board	A	8Bit	B	16Bit	H	HDMI	I	I2C Interface	R	RS232	S	SPI Interface	U	USB																																												
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⑪	TS: <table><tr><td>N</td><td>Without TS</td><td>T</td><td>Resistive touch panel</td><td>C</td><td>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>												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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2.Summary

TFT 5.0" is a TN transmissive 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 Specifications

Item	Dimension	Unit
Size	5.0	inch
Dot Matrix	800× 3(RGB) × 480	dots
Module dimension	120.7(W) ×75.8(H) ×4.3	mm
Active area	108(W) ×64.8 (H)	mm
Pixel pitch	0.135(W) ×0.135(H)	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
TFT Interface	24-bit RGB	
Aspect Ratio	5:3	
Backlight Type	LED ,Normally White	
With /Without TP	With RTP	
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

5. Electrical Characteristics

5.1. Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	
Current for Driver(Black)	IDD	-	110	170	mA	VDD=3.3V
Input logic high voltage	VIH	0.7 VDD	-	VDD	V	Note 1
Input logic low voltage	VIL	0	-	0.3 VDD		

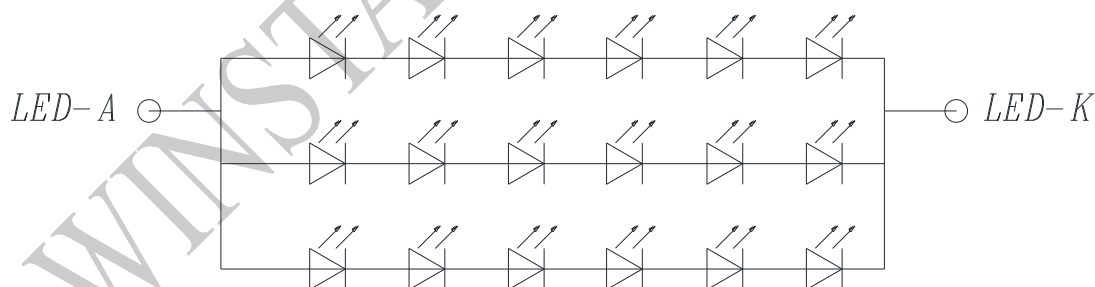
Note1: CLK,DE,R0~R7, G0~7, B0~7.

5.2. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL	18	19.2	20	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 $T_a=25^{\circ}\text{C}$ and $I_L=20\text{mA/pcs}$.

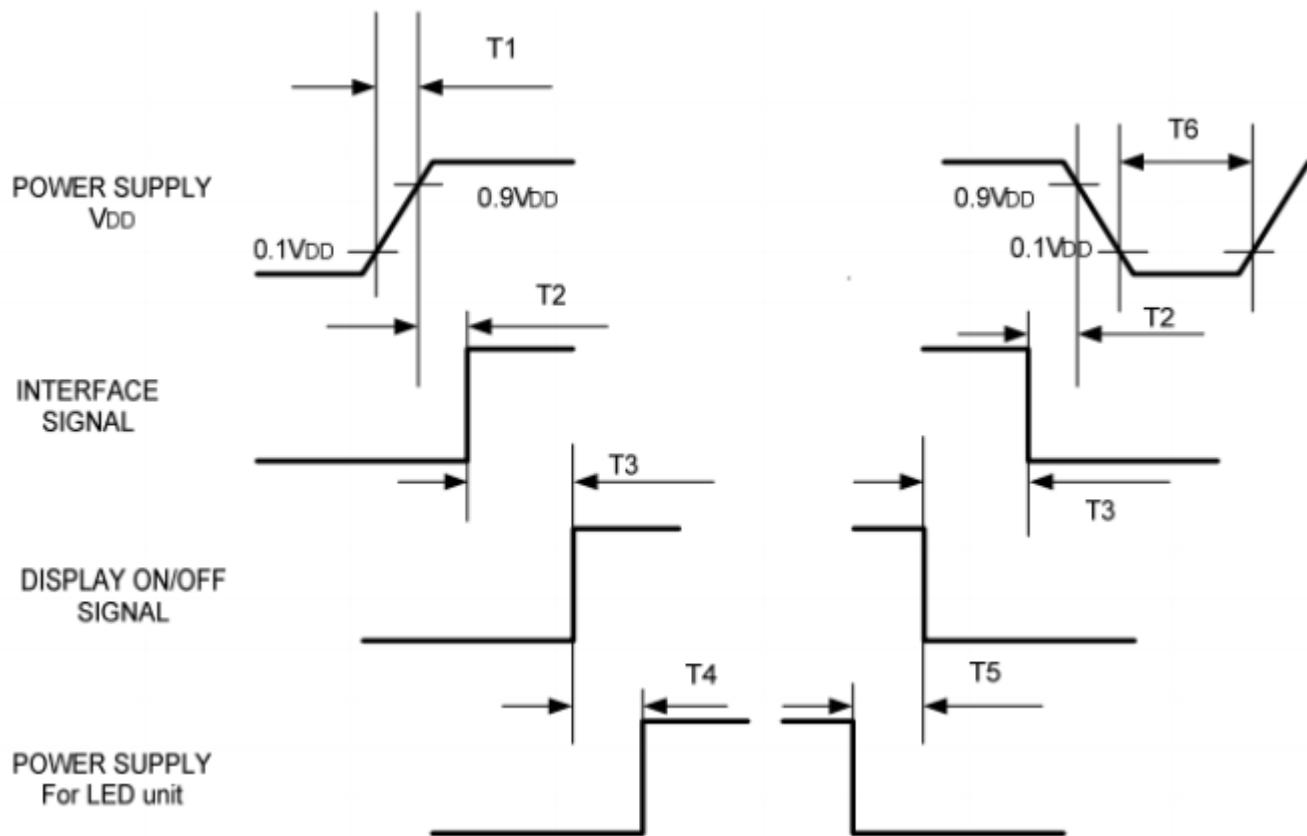
Note 2: The "LED life time" is defined as the module brightness decrease to 50% Original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=20\text{mA/pcs}$. The LED lifetime could be decreased if operating I_L is larger than 25mA/pcs .



CIRCUIT DIAGRAM : 6*3 Dice

5.3. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Symbol	Specification	Symbol	Specification
T1	$0 \leq T1 \leq 10 \text{ msec}$	T4	$200 \text{ msec} \leq T4$
T2	$16 \leq T2 \leq 100 \text{ msec}$	T5	$100 \text{ msec} \leq T5$
T3	$0 \leq T3 \leq 200 \text{ msec}$	T6	$16 \text{ msec} \leq T6$

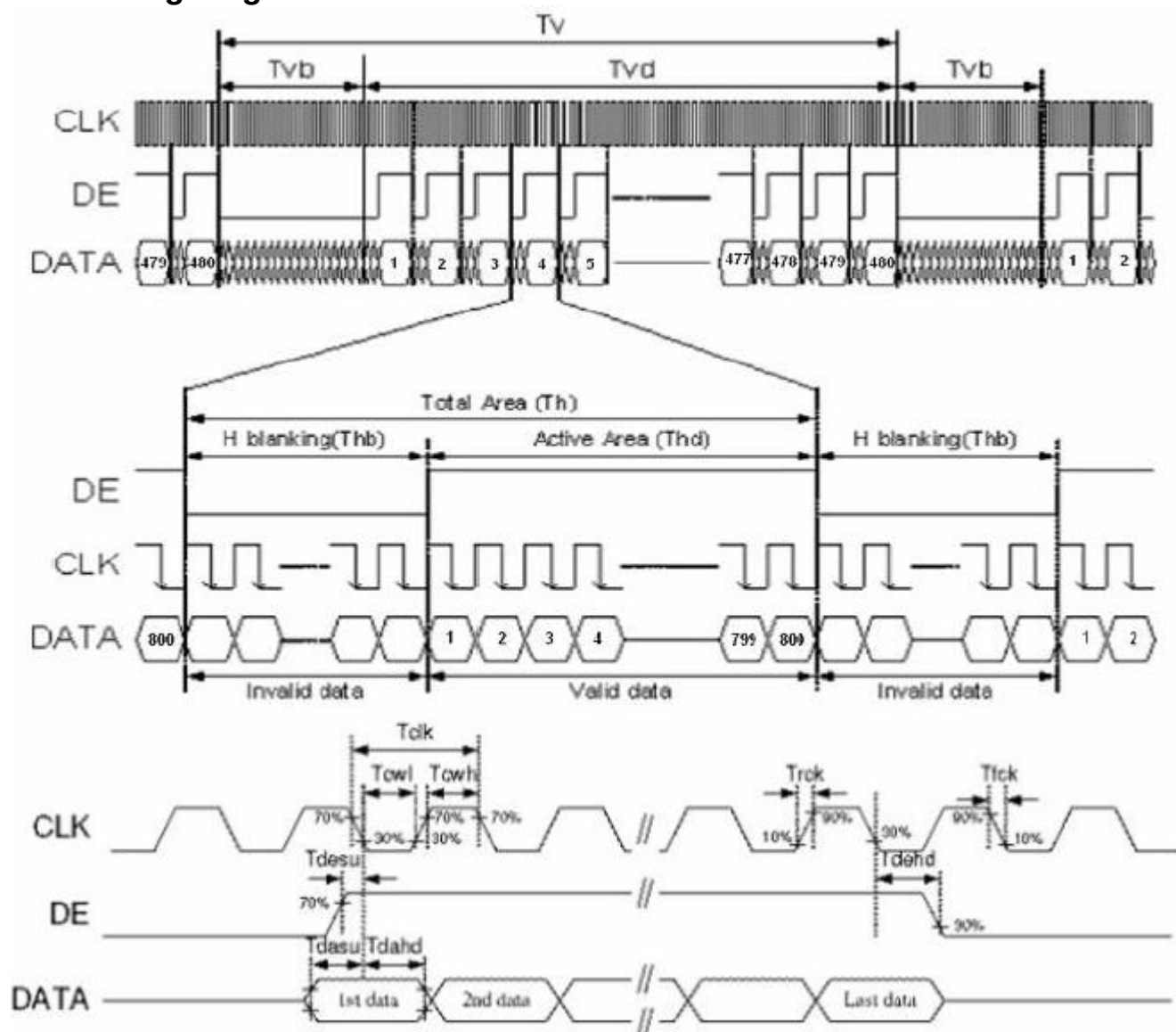
5.4. Timing Characteristics

Timing conditions

Parallel DE mode RGB input timing table

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
CLK frequency	Fclk	26.4	33.3	46.8	MHz	
DEV period time	Tv	510	525	650	H	
DEV display area	Tvd	480			H	
DEV blanking	Tvd	30	45	170	H	
DEH period time	Th	862	1056	1200	CLK	
DEH display area	Thd	800			CLK	
DEH blanking	THb	62	256	400	CLK	
CLK cycle time	Tclk	21.3	30	37.8	ns	
Clock width of high level	Tcwh	40	50	60	%	
Clock width of low level	Tcwl	40	50	60	%	
Clock rising time	Trck	8	-	-	ns	
Clock falling time	Tfck	8	-	-	ns	
Data Setup Time	Tdasu	8	-	-	ns	
Data Hold Time	Tdahd	8	-	-	ns	
DE Setup Time	Tdesu	8	-	-	ns	
DE Hold Time	Tdehd	8	-	-	ns	

5.5. Timing diagram



6. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	10	20	.ms	Note 3
	Tf		-	15	30	.ms	
Contrast ratio	CR	At optimized viewing angle	400	500	-	-	Note 4
Color Chromaticity	White	$\theta=0^\circ$ 、 $\phi=0^\circ$	0.26	0.31	0.36		Note 2,6,7
			0.28	0.33	0.38		
Viewing angle (Gray Scale Inversion Direction)	Hor.	θ_R	60	70	-	Deg.	Note 1
		θ_L	60	70	-		
	Ver.	ϕ_T	40	50	-		
		ϕ_B	60	70	-		
Brightness	-	-	250	350	-	cd/m ²	Center of display
Uniformity	(U)	-	75	-	-	%	Note5

Ta=25±2°C

Note 1: Definition of viewing angle range

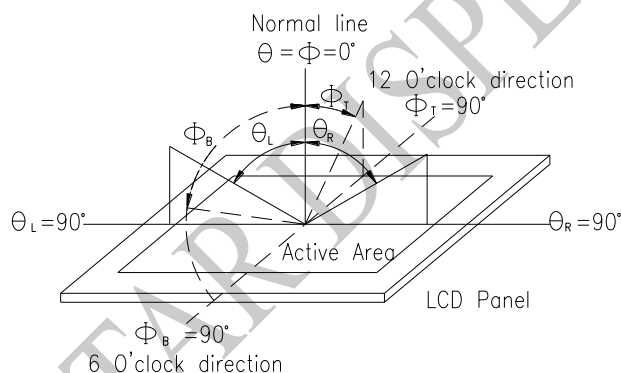


Fig. 6.1. Definition of viewing angle

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.

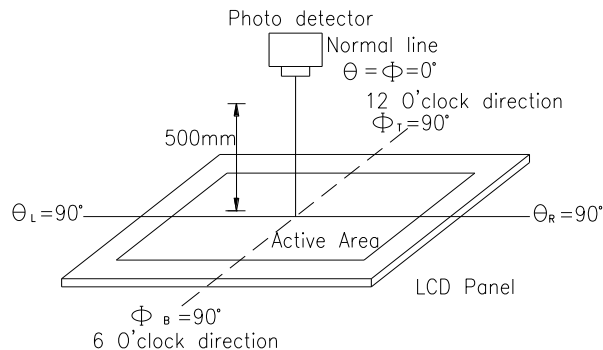
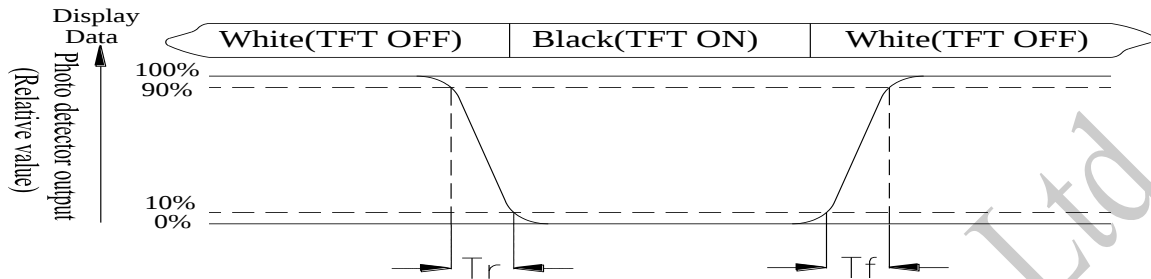


Fig. 6.2. Optical measurement system setup

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

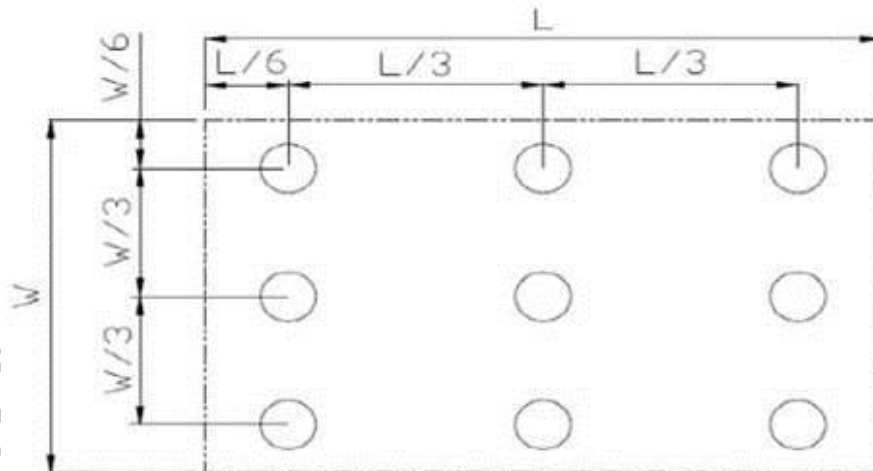


Fig6.3. . Definition of uniformity

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.

7.Interface

7.1. LCM PIN Definition

FPC Connector is used for the module electronics interface.

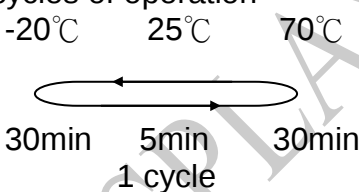
Pin	Symbol	Function	Remark
1	VLED-	Power for LED backlight (Cathode)	
2	VLED+	Power for LED backlight (Anode)	
3	GND	Power Ground	
4	VDD	Power voltage	
5	R0	Red data (LSB)	
6	R1	Red data	
7	R2	Red data	
8	R3	Red data	
9	R4	Red data	
10	R5	Red data	
11	R6	Red data	
12	R7	Red data(MSB)	
13	G0	Green data(LSB)	
14	G1	Green data	
15	G2	Green data	
16	G3	Green data	
17	G4	Green data	
18	G5	Green data	
19	G6	Green data	
20	G7	Green data(MSB)	
21	B0	Blue data(LSB)	
22	B1	Blue data	
23	B2	Blue data	
24	B3	Blue data	
25	B4	Blue data	
26	B5	Blue data	
27	B6	Blue data	
28	B7	Blue data(MSB)	
29	GND	Power Ground	

30	CLK	Sample clock	
31	DISP	Display on/off	
32	NC/HSync	No connection /Horizontal sync input	(Note)
33	NC/VSynC	No connection /Vertical sync input	(Note)
34	DE	Data input enable	
35	NC	No connection	
36	GND	Power Ground	
37	XR	Right electrode	
38	YD	Down electrode	
39	XL	Left electrode	
40	YU	Top electrode	

Note : This module default function is for DE mode, if this module want change to use SYNC mode , the FPC have to modify resistive jumper .

8. Reliability

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

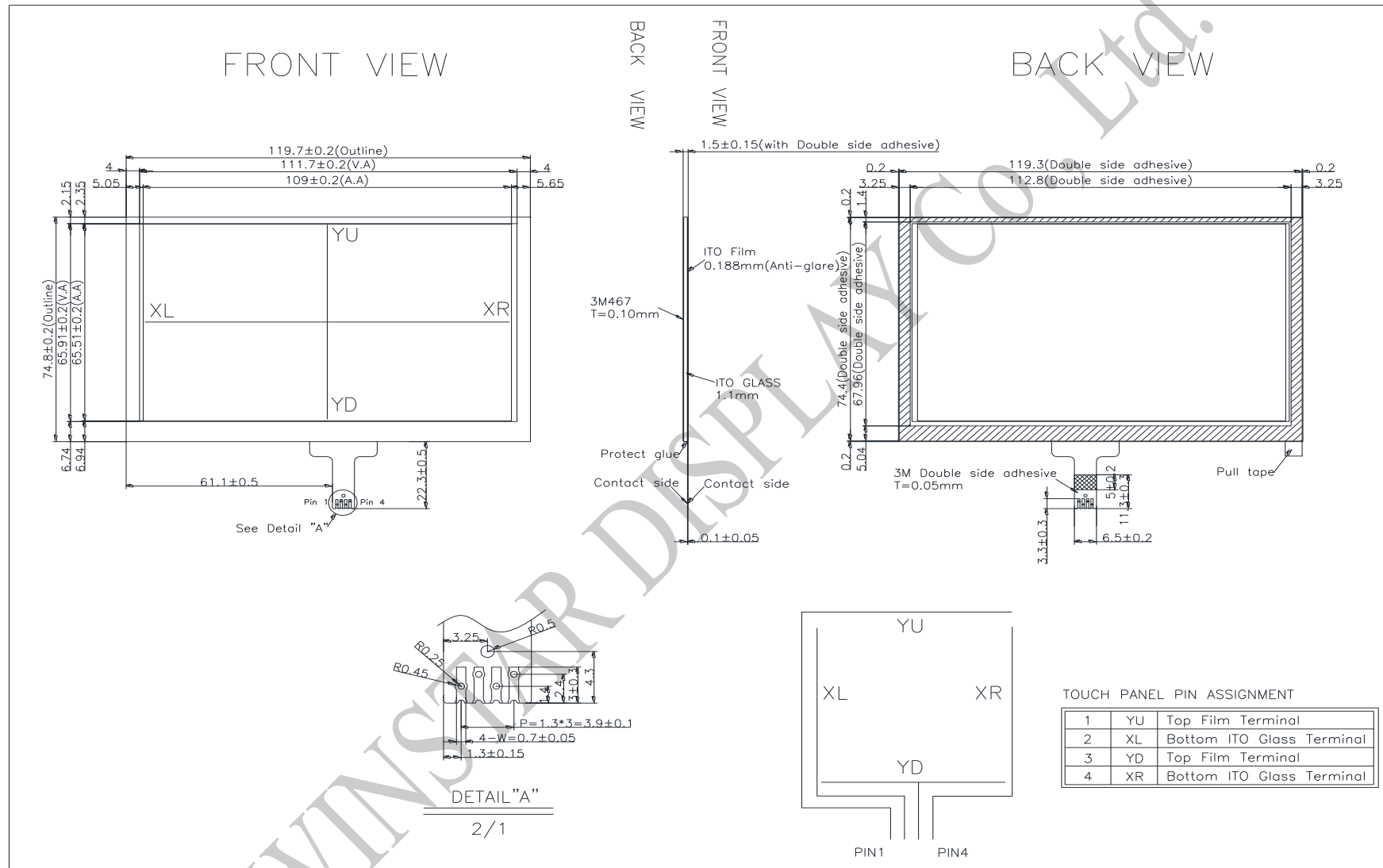
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature 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 	-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 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.

9.Touch Panel Information

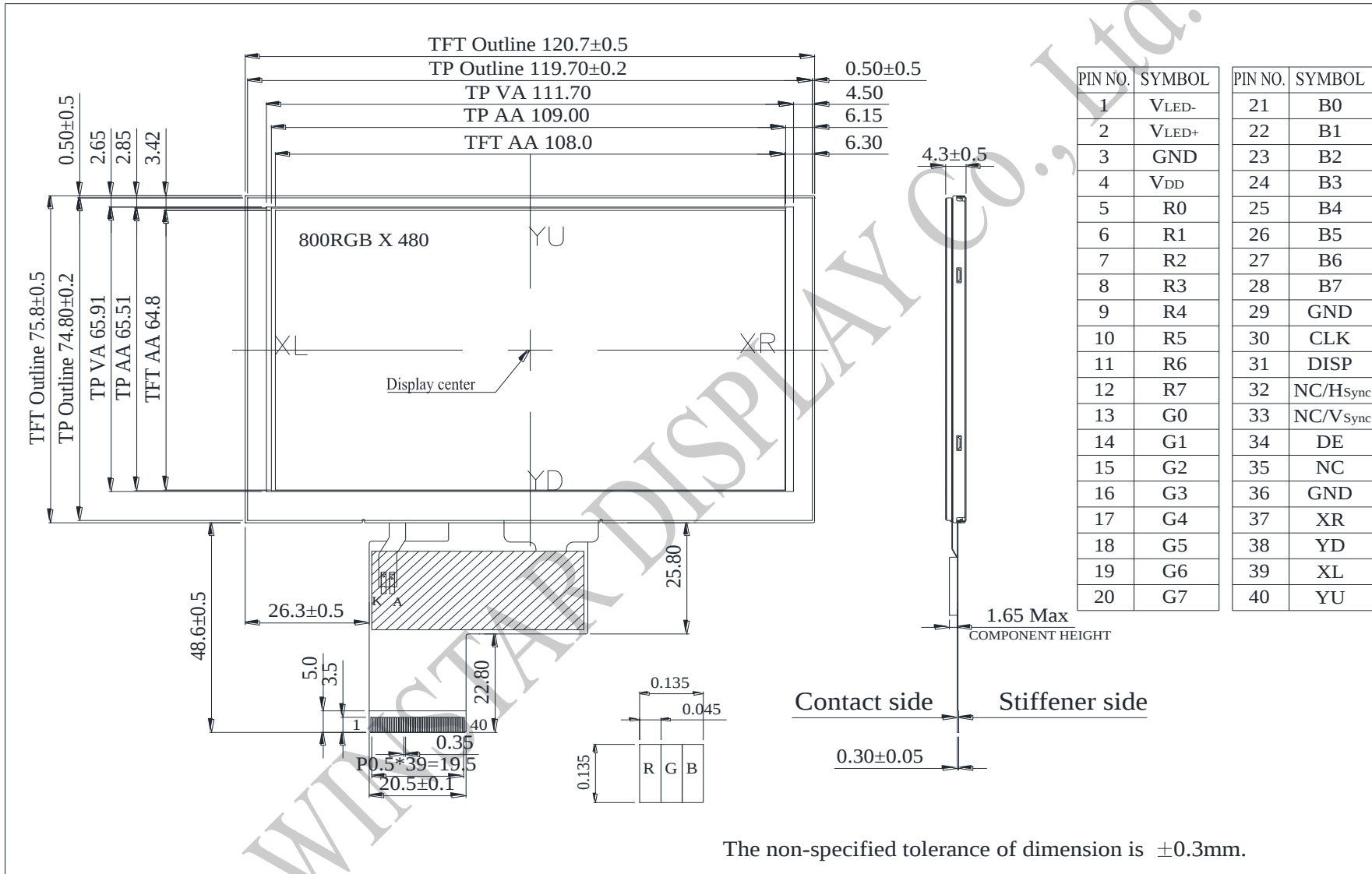


9.1. Resistance Touch Panel General Specifications

Item	Description
Insulating resistance	$>20\text{M}\Omega$, 25V(DC)
Light transparence	Min 70%
Structure type	Anti-Glare
X resistance	200~1200 Ω
Y resistance	100~900 Ω

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10. Contour Drawing



**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 : / /