



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



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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.: **WF0840ATWAMLNBO#**

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: 2022/07/19			

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	2022/03/14		First issue
A	2022/07/19		Modify Reliability

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1.Module Classification Information

W F 0840 A T W A M L N B 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 : 084.0" 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	2	1024324	3	7201280	4	19201200	5	1366768	6	1280320
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 8.4” is color TFT-LCD (Thin Film Transistor Liquid Crystal Display) ODF cell. The 8.4” screen produces a high-resolution image that is composed of 1024*BGR*768 pixel elements in a stripe arrangement.

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3. General Specifications

Item	Dimension	Unit
Screen Diagonal	8.4	inch
Number of Pixels	1024 x 3(BGR) x 768	dots
Module dimension	199.5 x 149.0 x 14.3	mm
Active area	170.8032 (H) x 128.1024(V)	mm
Pixel pitch	0.1668 x 0.1668	mm
Display Mode	Normally Black , Transmissive	
Viewing Angle	80/80/80/80	
TFT Drive IC	ST5821AH+ST5084AA or Equivalent	
TFT Interface	LVDS	
Backlight Type	LED, Normally White	
Aspect Ratio	4:3	
Side screw torque	Typ:0.9 Max:1.3 (Unit,Kgf-cm)	
CTP IC	EXC81W32 or equivalent	
CTP Interface	USB (I2C available)	
CTP FW Version	00_T1_M03	
CTP Resolution	16384x16384	
With /Without TP	With CTP	
Surface	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	-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

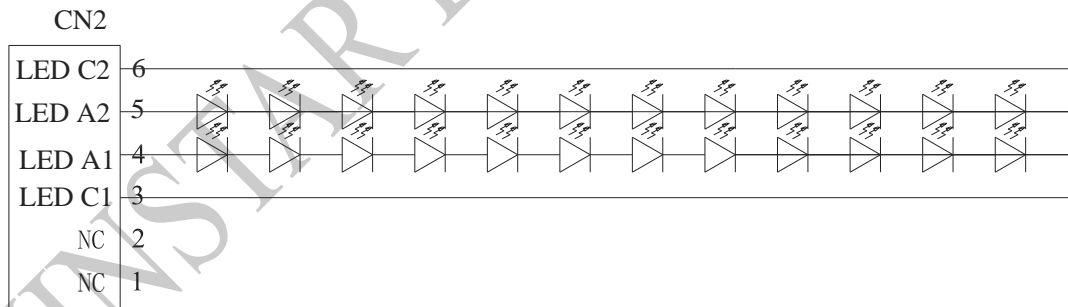
5.1. Operating conditions:

Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage For Logic	V _{DD}	3.0	3.3	3.6	V	—
Power Supply For Current	V _{DD} =3.3V	—	330	495	mA	—
Input Voltage	H level	V _{IH}	0.7V _{DD}	—	V _{DD}	SC.MODE
	L Level	V _{IL}	GND	—	0.3V _{DD}	
Supply CTP	USB_VDD 5V	4.4	5.0	5.5	V	USB type
	I _{VDD 5V}	—	45	68	mA	
	VDDT	2.8	3.3	3.5	V	I2C type
	I _{VDDT}	—	45	68	mA	

5.2. Backlight Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage of white LED backlight	VLED	32.4	36	40.8	V	Note 1
Current for LED backlight	I _{LED}	—	70*2	—	mA	
LED life time	-	—	100,000	—	Hr	Note 3

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM (12X 2=24 DICES)

Note 2 : T_a = 25 °C

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

Note 4 : The single LED lamp case

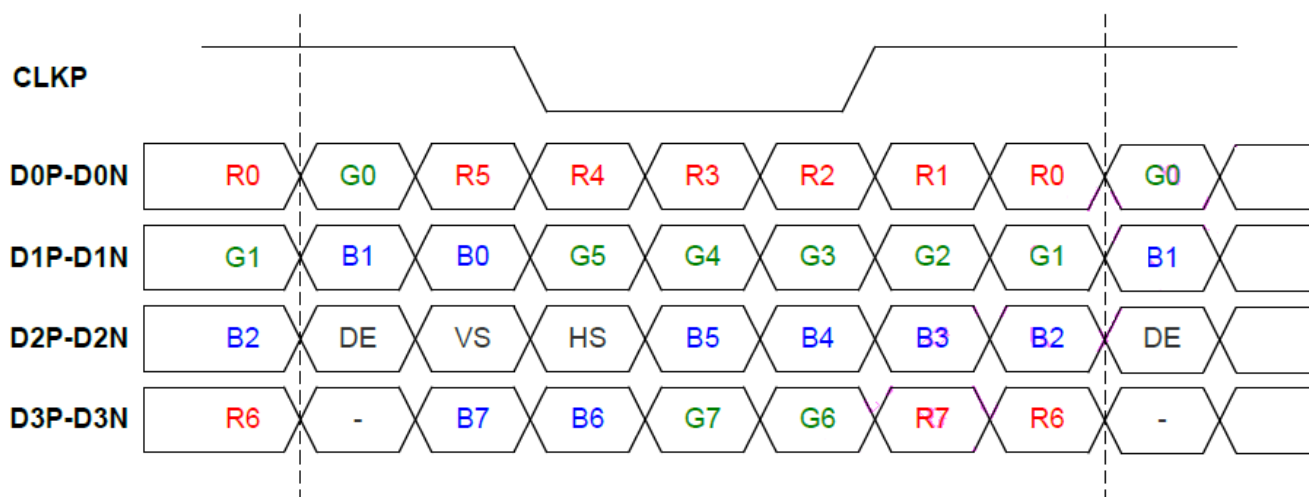
6. Timing characteristics

6.1. LVDS Video timing

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
CLK frequency	t _{CLK}	48.4	52.4	61.5	Mhz	
Horizontal blanking time	t _{HBT}	20	56	180	t _{CLK}	t _{HBP} + t _{HFP}
Horizontal back porch	t _{HBP}	5	5	180 - t _{HFP}	t _{CLK}	
Horizontal display area	t _{HD}	1024	1024	1024	t _{CLK}	
Horizontal front porch	t _{HFP}	15	51	175	t _{CLK}	
Horizontal period	t _H	1044	1080	1204	t _{CLK}	
Horizontal pulse width	t _{HPW}	1	1	256	t _{CLK}	
Vertical blanking time	t _{VBT}	5	40	83	t _H	t _{VBP} + t _{VFP}
Vertical back porch	t _{VBP}	2	2	83 - t _{VFP}	t _H	
Vertical display area	t _{VD}	768	768	768	t _H	
Vertical front porch	t _{VFP}	3	38	81	t _H	
Vertical period	t _V	773	808	851	t _H	
Vertical pulse width	t _{VPW}	1	1	128	t _H	

6.2. TCON mode LVDS interface data mapping

VESA data mapping



Note 1 : for 6 bit mode, MSB are R/G/B[5] and R/G/B[0] are LSB

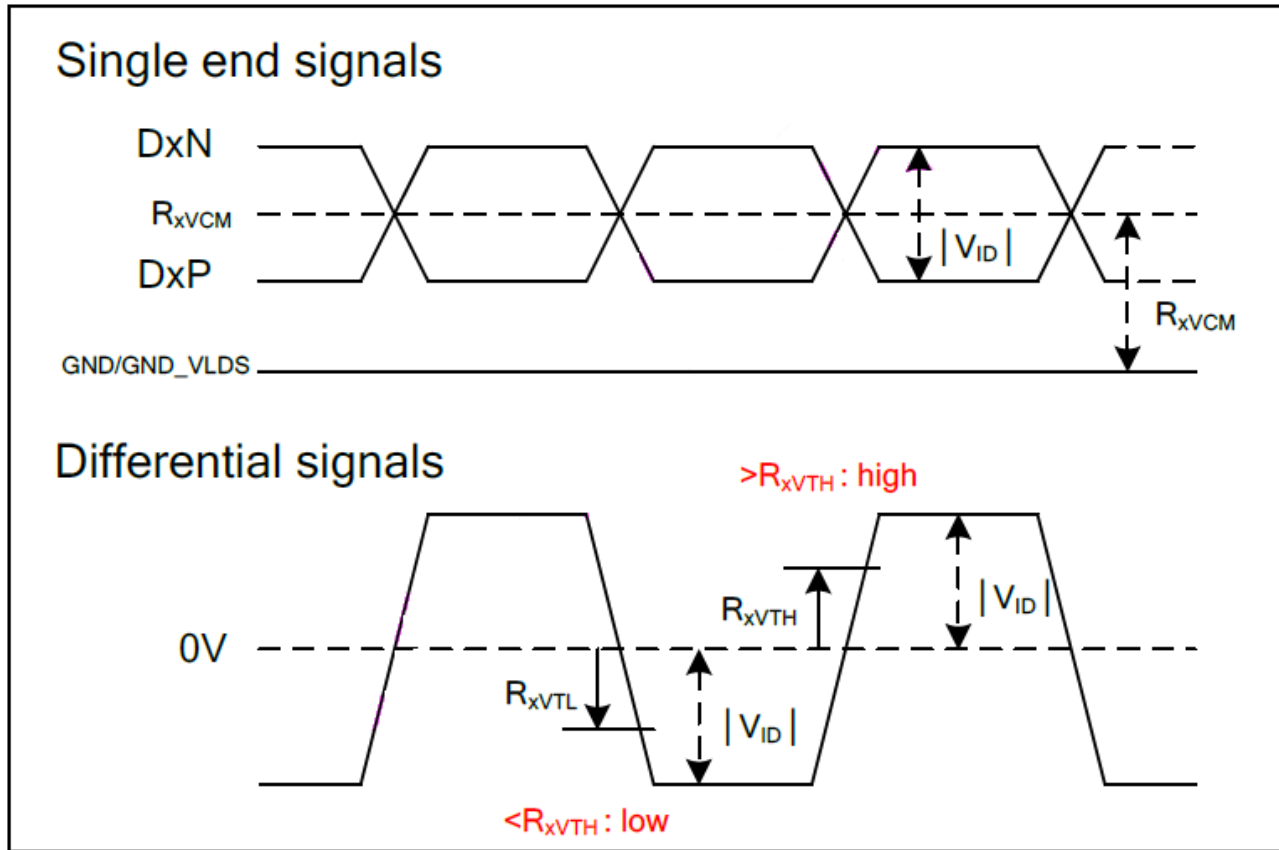
Note 2 : for 8 bit mode, MSB are R/G/B[7] and R/G/B[0] are LSB

6.3. LVDS receiver characteristic

(Receiver Differential Input : D0P~D3P, D0N~D3N, CLKP, CLKN)

(VDD=VDD_LVDS=3.0~3.6V, GND=GND_LVDS=0V, TA=-40~95°C)

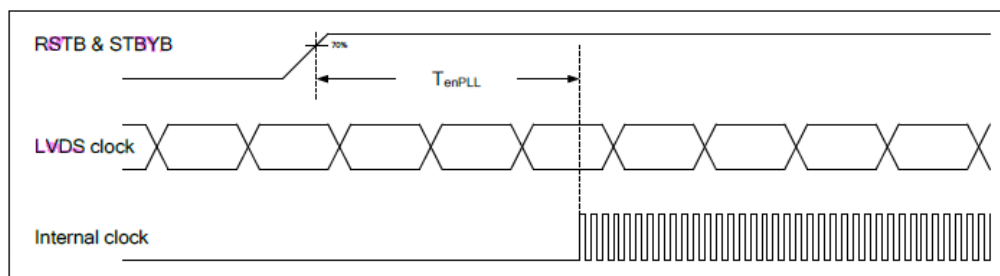
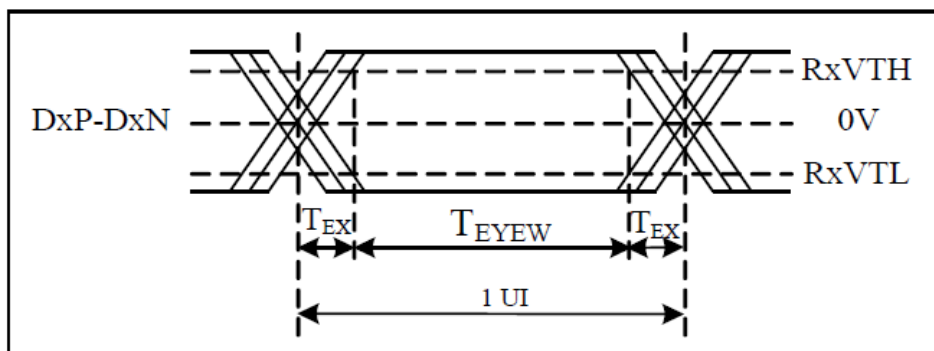
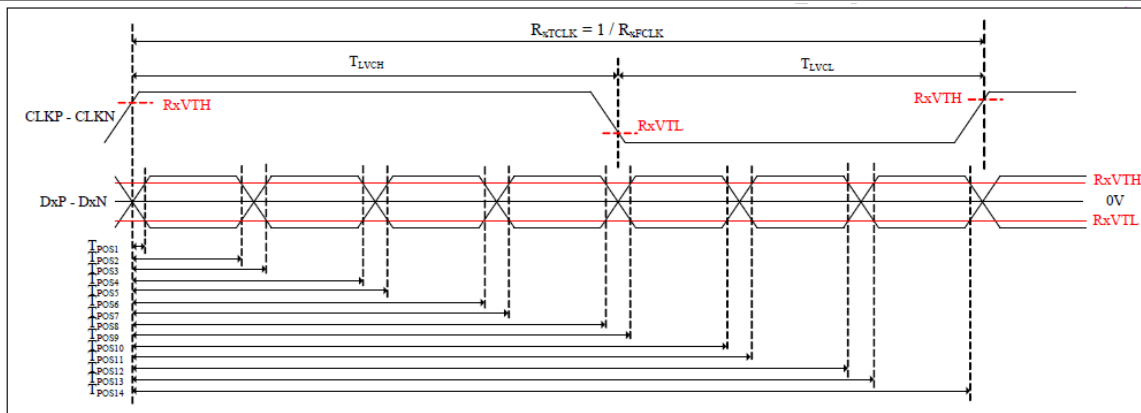
Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Differential input high threshold voltage	R_{xVTH}			0.1	V	$R_{xVCM} = 1.2V$
Differential input low threshold voltage	R_{xVTL}	-0.1			V	
Input voltage range (singled-end)	R_{xVIN}	0		$VDD-1.0$	V	
Differential input common mode voltage	R_{xVCM}	0.6	1.2	$2.4 - V_{ID} / 2$	V	
Differential input voltage	$ V_{ID} $	0.2	0.4	0.6	V	
Differential input leakage current	R_{VxIz}	-10		10	μA	
LVDS Digital Operating Current	I_{VDD_LVDS}	-	25	35	mA	$F_{CLK}=65\text{ MHz}$, $VDD_LVDS=3.3V$ Data pattern=55/H → AA/H (loop)
LVDS Digital Stand-by Current	I_{STBD_LVDS}	-	10	50	μA	$RSTB=0$ or $STBYB=0$ All functions are stopped CLK & D0x connect to GND



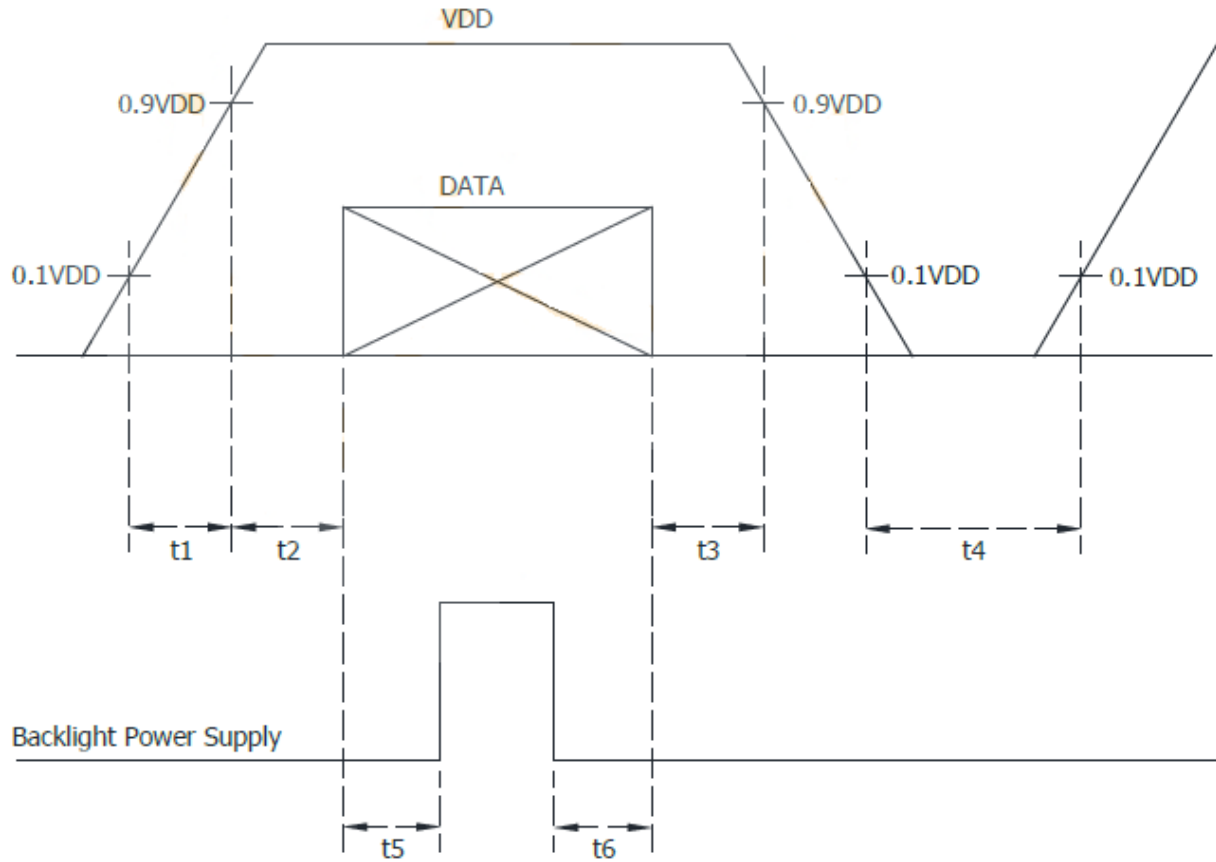
LVDS AC characteristic

(VDD=VDD_LVDS=3.0~3.6V, GND=GND_LVDS=0V, TA=-40~95°C)

Parameter	Symbol	Min	Typ.	Max.	Unit	Conditions
Clock Frequency	R_{XFCLK}	20		80	MHz	
Clock Period	R_{XTCLK}	12.5		50	ns	
1 data bit time	UI	-	1/7	-	R_{XTCLK}	
Clock high time	T_{LVCH}		4		UI	
Clock low time	T_{LVCL}		3		UI	
Position 1	T_{POS1}	-0.25	0	0.25	UI	
Position 2	T_{POS2}	0.75	-	1.25	UI	
Position 3	T_{POS3}	0.75	1	1.25	UI	
Position 4	T_{POS4}	1.75	-	2.25	UI	
Position 5	T_{POS5}	1.75	2	2.25	UI	
Position 6	T_{POS6}	2.75	-	3.25	UI	
Position 7	T_{POS7}	2.75	3	3.25	UI	
Position 8	T_{POS8}	3.75	-	4.25	UI	
Position 9	T_{POS9}	3.75	4	4.25	UI	
Position 10	T_{POS10}	4.75	-	5.25	UI	
Position 11	T_{POS11}	4.75	5	5.25	UI	
Position 12	T_{POS12}	5.75	-	6.25	UI	
Position 13	T_{POS13}	5.75	6	6.25	UI	
Position 14	T_{POS14}	6.75	-	7.25	UI	
Input eye width	T_{EYEW}	0.5	-	-	UI	
Input eye border	T_{EX}	-	-	0.25	UI	
PLL wake-up time	T_{enPLL}			150	us	



6.4. Power Sequence



$1.5\text{ms} < t1 < 3\text{ms}$; $t2 > 100\text{ms}$

$t3 > 100\text{ms}$; $t4 > 200\text{ms}$

$t5 > 500\text{ms}$; $t6 > 500\text{ms}$

DATA : LVDS, MODE ,SC

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7. 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 optimized viewing angle	800	1000	-	-	Note 4
Color Chromaticity	White	Wx	0.244	0.294	0.344	-	Note 2,6,7
		Wy	0.257	0.307	0.357	-	
Viewing angle	Hor.	Θ_R	-	80	-	Deg.	Note 1
		Θ_L	-	80	-		
	Ver.	Φ_T	-	80	-		
		Φ_B	-	80	-		
Brightness	-	-	300	400	-	cd/m ²	Center of display
Uniformity	(U)	-	70	-	-	%	Note 5

Ta=25±2°C

Note 1: Definition of viewing angle range

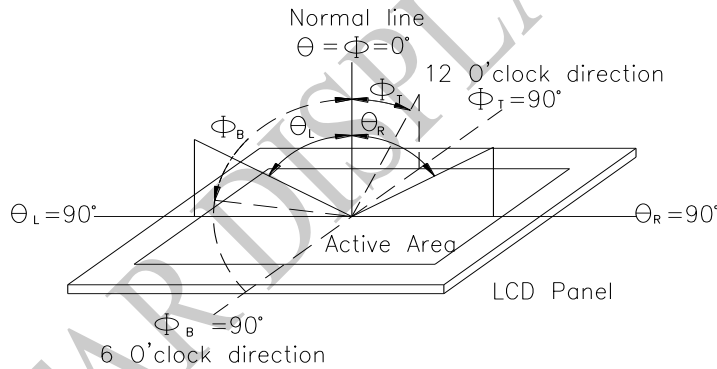


Fig. 7.1. Definition of viewing angle

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.

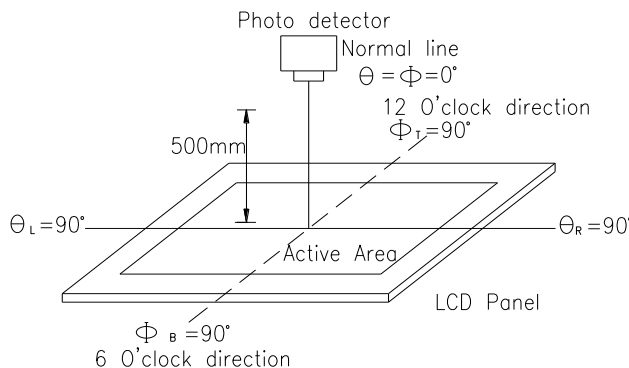
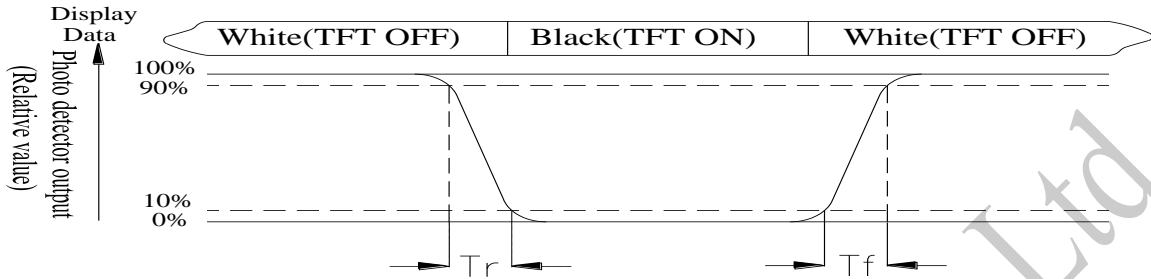


Fig. 7.2. Optical measurement system setup

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.

$$\text{Luminance Uniformity (U)} = \text{Lmin/Lmax} \times 100\%$$

L = Active area length

W = Active area width

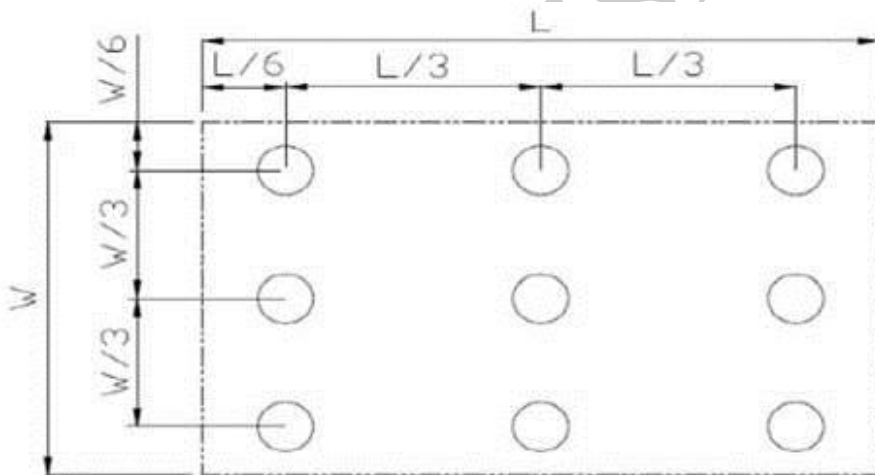


Fig7.3. Definition of uniformity

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

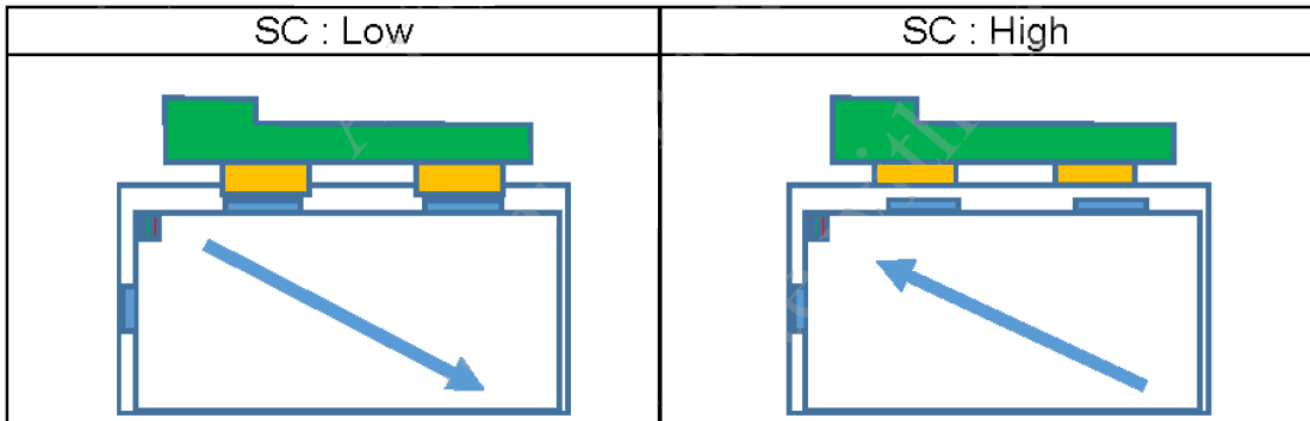
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

8.Interface

8.1. LCM PIN Definition

Pin No.	Symbol	Function	Remark
1	VDD	Power supply	
2	VDD	Power supply	
3	GND	Ground	
4	GND	Ground	
5	Link0-	0- LVDS differential data input (D0N)	
6	Link0+	0+ LVDS differential data input (D0P)	
7	GND	Ground	
8	Link1-	1- LVDS differential data input (D1N)	
9	Link1+	1+ LVDS differential data input (D1P)	
10	GND	Ground	
11	Link2-	2- LVDS differential data input (D2N)	
12	Link2+	2+ LVDS differential data input (D2P)	
13	GND	Ground	
14	CLKIN-	- LVDS differential clock input (CLKN)	
15	CLKIN+	+ LVDS differential clock input (CLKP)	
16	GND	Ground	
17	Link3-	3- LVDS differential data input (D3N)	
18	Link3+	3+ LVDS differential data input (D3P)	
19	MODE	Bit 6/8:Low(6 Bit);High(8 Bit)	
20	SC	Scan direction selector (Low: Normal ;High: Reverse)	

*Scan direction selector(SC):



8.2. CN2

Pin No.	Symbol	Function	Remark
1	NC	No connection	
2	NC	No connection	
3	LED C1	LED_ Cathode 1	
4	LED A1	LED_ Anode 1	
5	LED A2	LED_ Anode 2	
6	LED C2	LED_ Cathode 2	

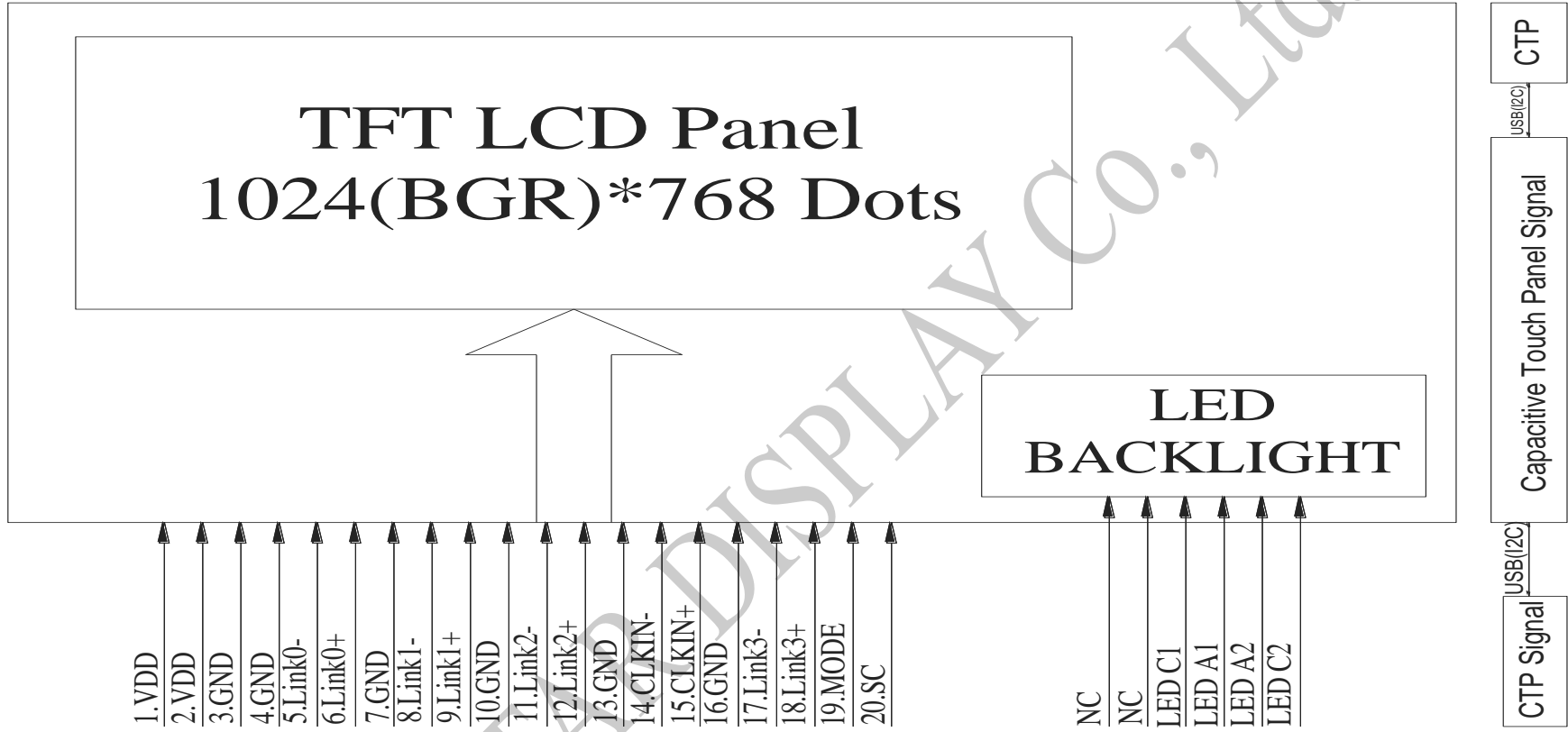
8.3. CTP PIN Definition

Pin	Symbol	Function	Remark
1	USB_VSS	System ground	
2	USB_VDD 5V	Power supply	
3	USB_D+	Data +	
4	USB_D-	Data -	
5	VSS	System ground	
6	SDA	I2C data input and output (Must be pulled high.)	
7	SCL	I2C clock input (Must be pulled high.)	
8	RST	External Reset, Low is active	
9	INT	External interrupt to the host	
10	VDDT 3.3	Power supply	

Note: Interface can support both USB and I2C, **USB is main function**

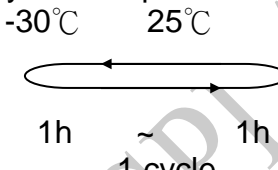
Note 2 : Connect USB_VSS(VSS) of CTP with TFT GND

9. Block Diagram



10. 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.	80°C 240hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 240hrs	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 240hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30°C 240hrs	1
High Temperature/ Humidity storage	The module should be allowed to stand at 40°C,90%RH max	40°C,90%RH 240hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 	-30°C/80°C 100 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.	Contact ±6KV Air ±8KV 10 times	4

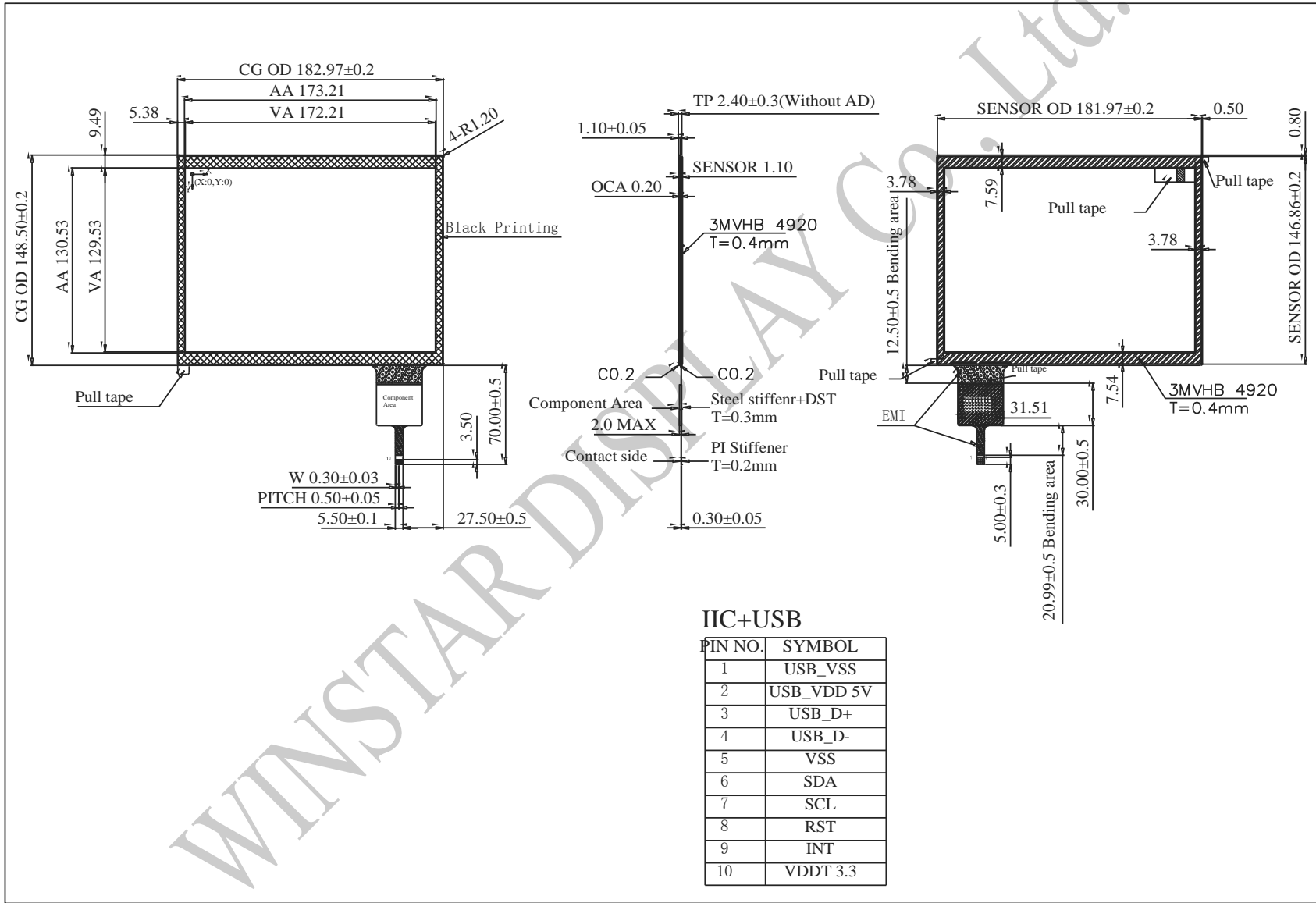
Note1: No dew condensation to be observed.

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.

Note4: Some performance degradation allowed. Need Power off self-recoverable.
No hardware failure.

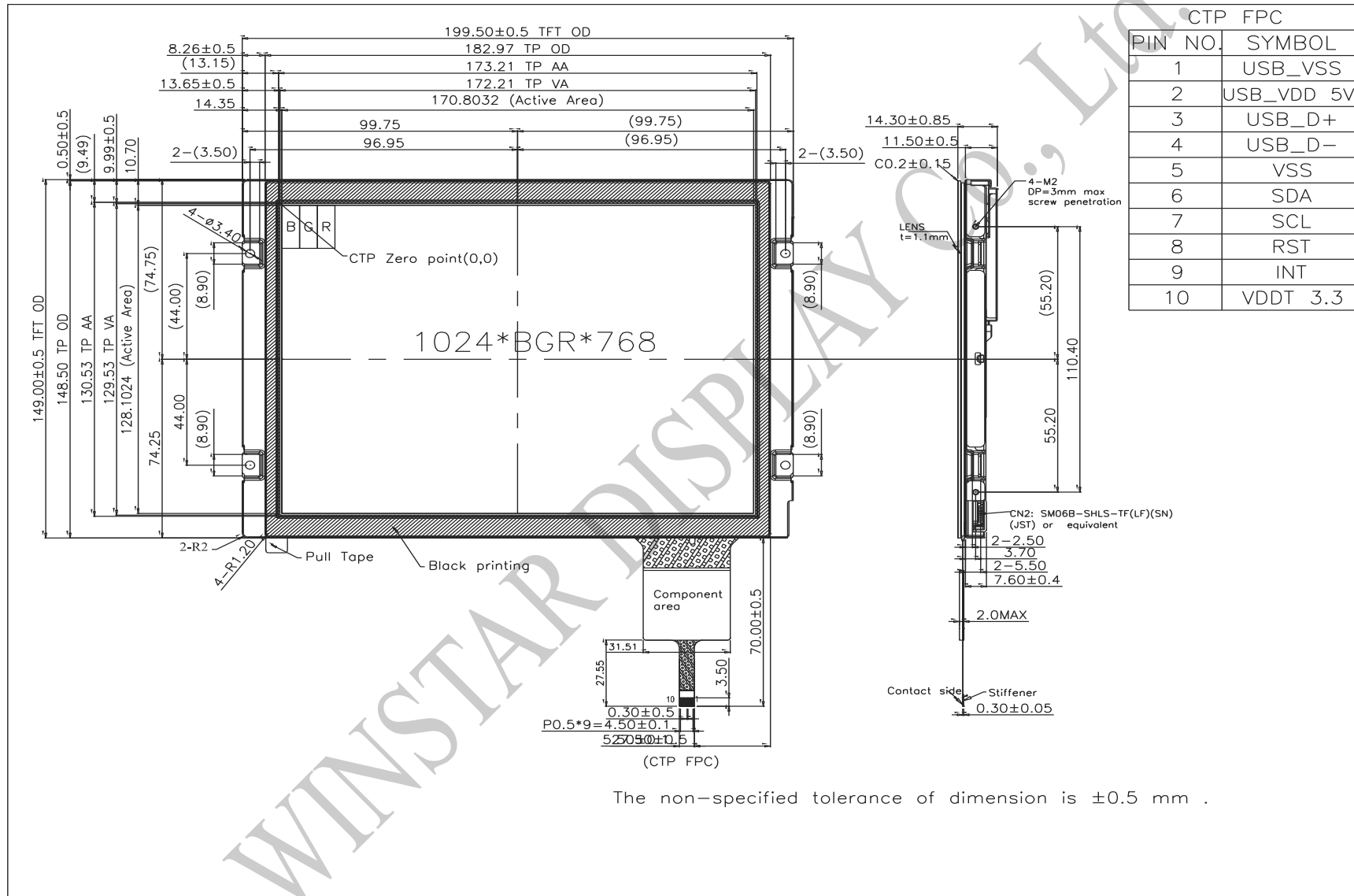
11.Touch Panel Information



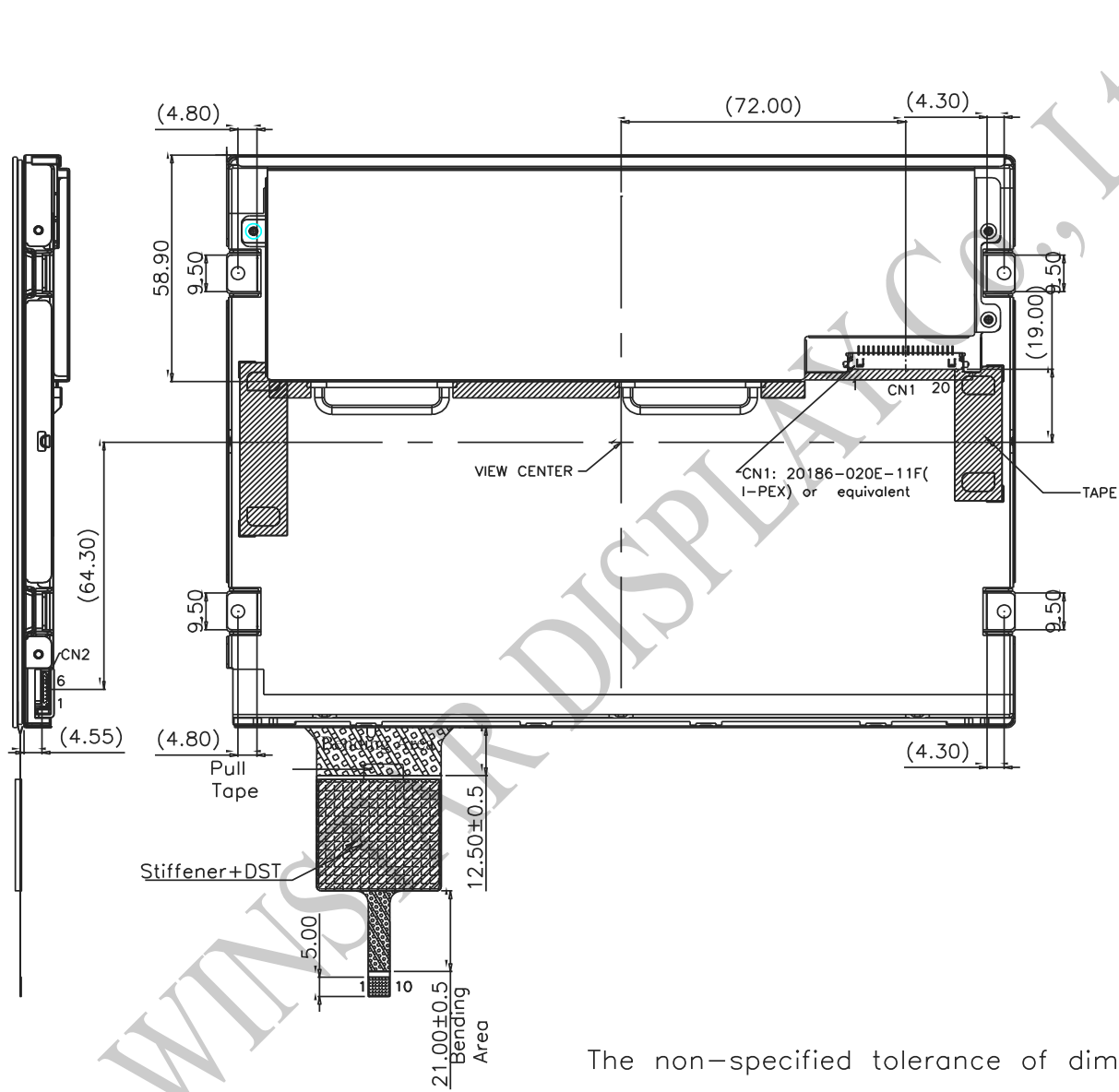
IIC+USB

PIN NO.	SYMBOL
1	USB_VSS
2	USB_VDD 5V
3	USB_D+
4	USB_D-
5	VSS
6	SDA
7	SCL
8	RST
9	INT
10	VDDT 3.3

12. Contour Drawing



The non-specified tolerance of dimension is ±0.5 mm .



CN2	
Pin	Symbol
1	NC
2	NC
3	LED C1
4	LED A1
5	LED A2
6	LED C2

CN1	
Pin	Symbol
1	VDD
2	VDD
3	GND
4	GND
5	Link0-
6	Link0+
7	GND
8	Link1-
9	Link1+
10	GND
11	Link2-
12	Link2+
13	GND
14	CLKIN-
15	CLKIN+
16	GND
17	Link3-
18	Link3+
19	MODE
20	SC

The non-specified tolerance of dimension is ± 0.5 mm .



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 : 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 : / / _____

