

TFT DISPLAY SPECIFICATION

Distributed by:



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



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SPECIFICATION

CUSTOMER : _____

MODULE NO.: **WF70D5SWAHLNG0#**

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: 2024/12/16			

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	2024/12/16		First issue



Contents

1.Module Classification Information

2.Summary

3.General Specifications

4.Absolute Maximum Ratings

5.Electrical Characteristics

6.LVDS Input Timing

7.Power Sequence

8.Optical Characteristics

9.Interface

10.Block Diagram

11.Reliability

12.Touch Panel Information

13.Contour Drawing

14.Other

1.Module Classification Information

W F 70 D5 S W A H L N G 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	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										

2.Summary

The specification WF70D5 is a 7.0" a-Si TFT Liquid Crystal Display ODF cell.

The a-Si TFT-LCD cell will applied to a high transmittance operating in the normally black mode a-Si TFT -LCD product.



3.General Specifications

Item	Dimension	Unit
Size	7.0	inch
Dot Matrix	1024 x RGB x 600(TFT)	dots
Module dimension	169.9(W) x 103.4(H) x 7.3 (D)	mm
Active area	154.2144 x 85.92	mm
Pixel pitch	0.1506x 0.1432	mm
LCD type	TFT, Normally Black, Transmissive	
View Angle	80/80/80/80	
TFT Driver IC	JD9165BA or Equivalent	
Backlight Type	LED, Normally White	
TFT Interface	LVDS	
CTP IC	ILI2130 or Equivalent	
CTP Interface	I2C	
CTP FW Version	0x07.0x00.0x00.0x00.0x65.0x90.0x00.0x01	
CTP Resolution	16384*16384	
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	—	+85	°C
Storage Temperature	TST	-30	—	+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:

Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	
Analog Power	AVDD	-	11	-	V	
TFT Gate ON Voltage	VGH	19.5	20	20	V	Note1
TFT Gate OFF Voltage	VGL	-8.5	-8	-7.5	V	Note2
TFT Common Voltage	Vcom	-	4.9	-	V	Note3
Power Current	IDD	-	18	27	mA	VDD=3.3V
Analog Power Current	IAVDD	-	20.94	-	mA	AVDD=11V
TFT Gate ON Current	IVGH	-	1.5	-	mA	VGH=20V
TFT Gate OFF Current	IVGL	-	1.5	-	mA	VGL=-8V
TFT Common Current	IVCOM	-	1	-	uA	VCOM=4.9V
Supply CTP	VDDT	3.0	3.3	3.6	V	
	I _{CTP}	—	65	98	mA	

Note 1. VGH is TFT Gate operating Voltage.

Note 2. VGL is TFT Gate operating Voltage.

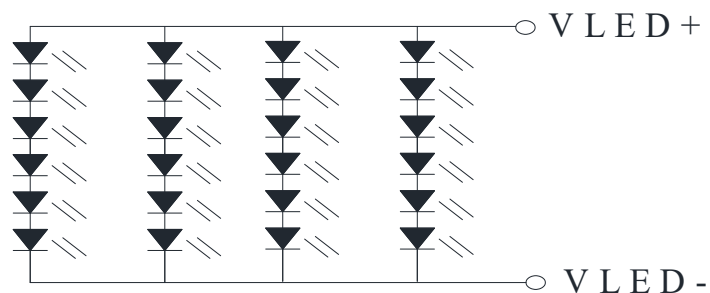
The storage structure of this model is CST (Storage on Common)

Note 3. Vcom must be adjusted to optimize display quality Crosstalk, Contrast Ratio and etc.

5.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	—	—	240	—	mA	-
LED voltage	VLED+	16.2	19.2	21.0	V	Note 1
LED Life Time	—	50,000	—	—	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



B/L C I R C U I T D I A G R A M

Note 2 : $T_a = 25\text{ }^{\circ}\text{C}$

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

Note 4 : The single LED lamp case

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6.LVDS Input Timing

6.1. LVDS data input format

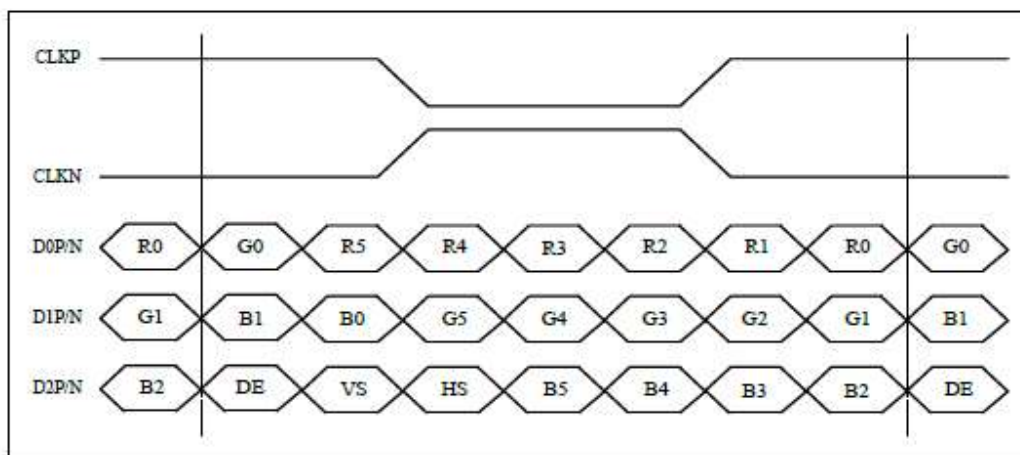


Figure 1: 6-bit LVDS input timing

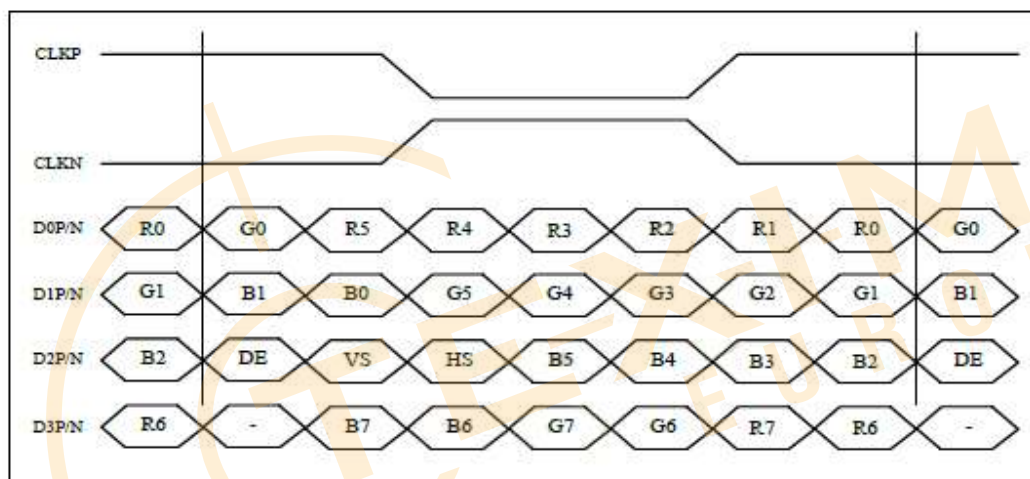


Figure 2: 8-bit LVDS VESA input timing

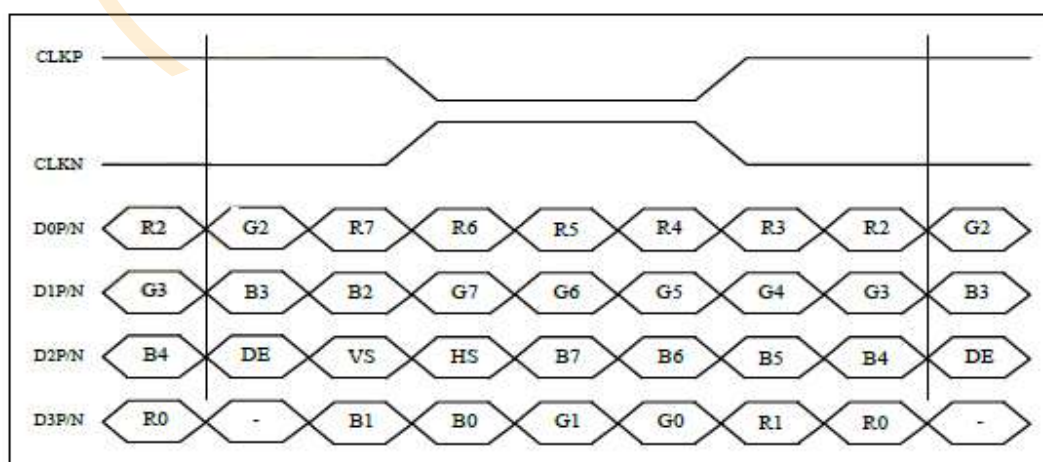


Figure 3: 8-bit LVDS JEIDA input timing

6.2. LVDS timing characteristic

LVDS Input Timing	Symbol	1024RGBx600			Unit
		Min	Typ	Max	
DCLK Frequency	-	41.4	51.2	67.2	MHZ
Horizontal Total	tht	1114	1344	1400	DCLK
Hsync Pulse width	ths	1	24	HBP-1	DCLK
Horizontal Back Porch	thb	60	160	160	DCLK
Horizontal Valid Data	thd	1024			DCLK
Horizontal Front Porch	thfp	30	160	216	DCLK
Vertical Total	vt	620	635	800	THT
Vsync Pulse Width	tv	1	2	VBP-1	THT
Vertical Back Porch	tvb	8	23	100	THT
Vertical Valid Data	tv	600			THT
Vertical Front Porch	tvfp	12	12	100	THT

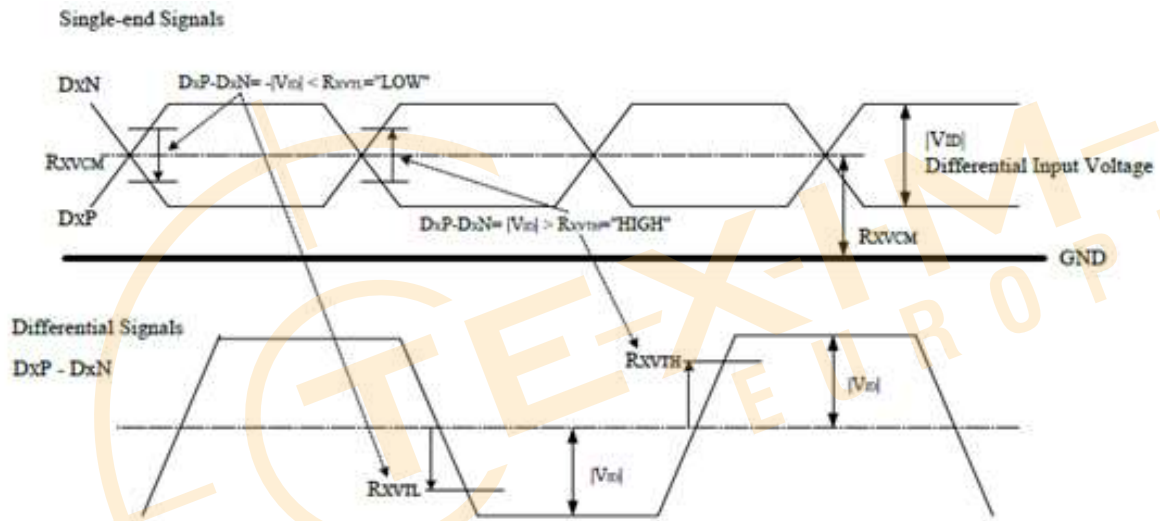


6.3. LVDS DC electrical characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	R_{XVTH}			+37	mV	
Differential input low threshold voltage	R_{XVTL}	-37			mV	
Input voltage range (singled-end)	R_{XVIN}	400	-	1650	mV	1. $R_{XVCM} + 1/2 V_{ID} \leq 1650\text{mV}$. 2. $R_{XVCM} - 1/2 V_{ID} \geq 400\text{mV}$.
Differential input common mode voltage	R_{XVCM}	600	1200	1375	mV	
Differential input voltage	$ V_{ID} $	100	-	400	mV	
Differential input impedance	Z_{ID}	80	100	120	ohm	
Differential input leakage current	I_{LCLVDS}	-10	-	+10	uA	
Low level input voltage	V_{IL}	0		$0.2V_{DD}$		Note1
High level input voltage	V_{IH}	$0.8V_{DD}$	-	V_{DD}		

Note 1: RESET, STBYB, SELB, U/D, L/R

Table 1: LVDS mode DC electrical characteristics



6.4. LVDS AC electrical characteristic

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Clock frequency	R_{xFCLK}	20	-	71	MHz	Refer to input timing table for each display resolution
Input data skew margin	T_{RSKM}	-0.2	-	0.2	UI	$ VID = 200\text{mV}$ $R_{xVCM} = 1.2\text{V}$ $1UI = 1/(R_{xFCLK} \times 7)$
Clock high time	T_{LVCH}	-	$3.5/(7 \times R_{xFCLK})$	-	ns	
Clock low time	T_{LVCL}	-	$3.5/(7 \times R_{xFCLK})$	-	ns	
PLL wake-up time	T_{enPLL}	-	-	150	us	

Table 2: LVDS mode AC electrical characteristics

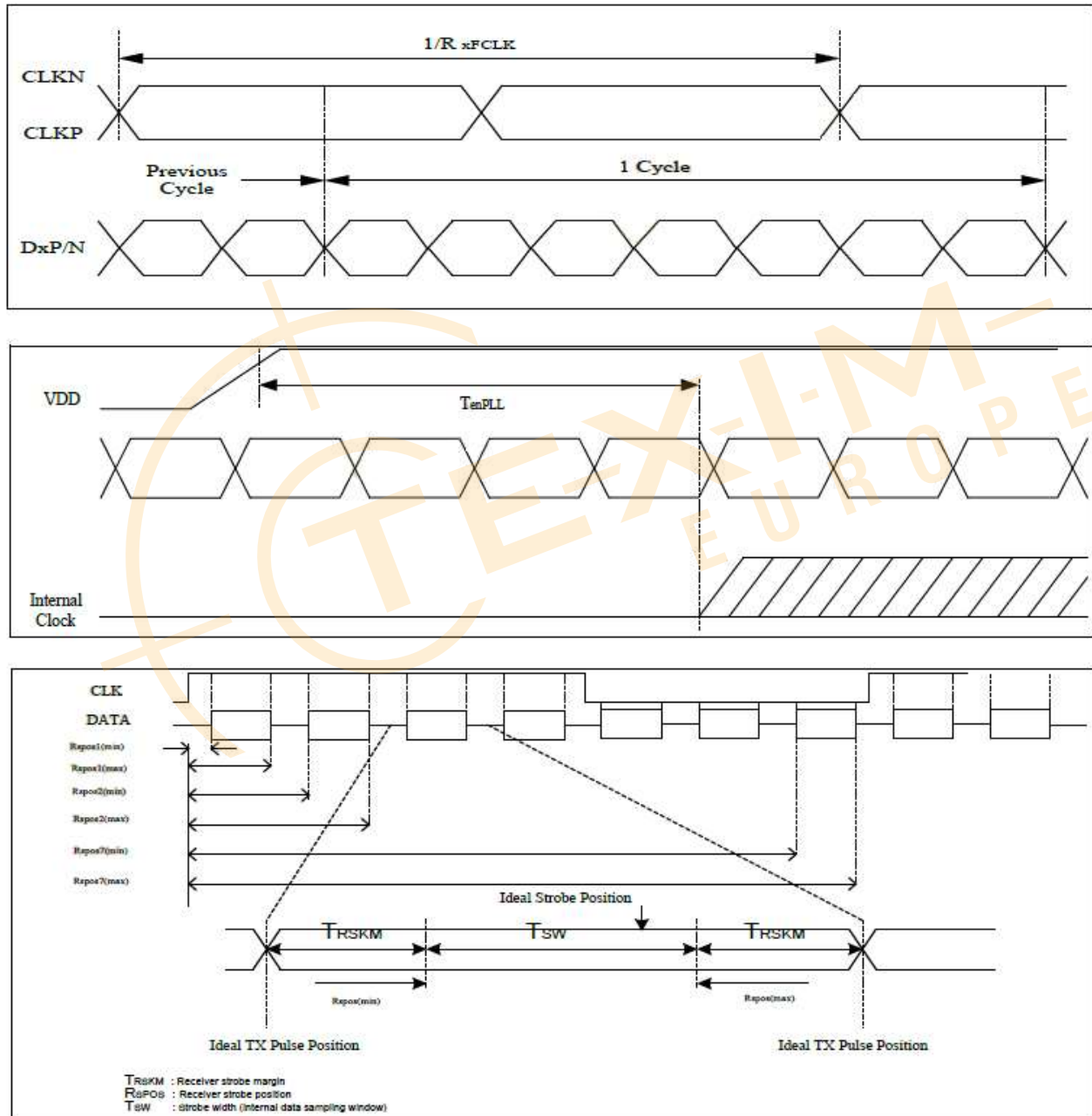


Figure 4: LVDS figure

7.Power Sequence

7.1. Power On Sequence

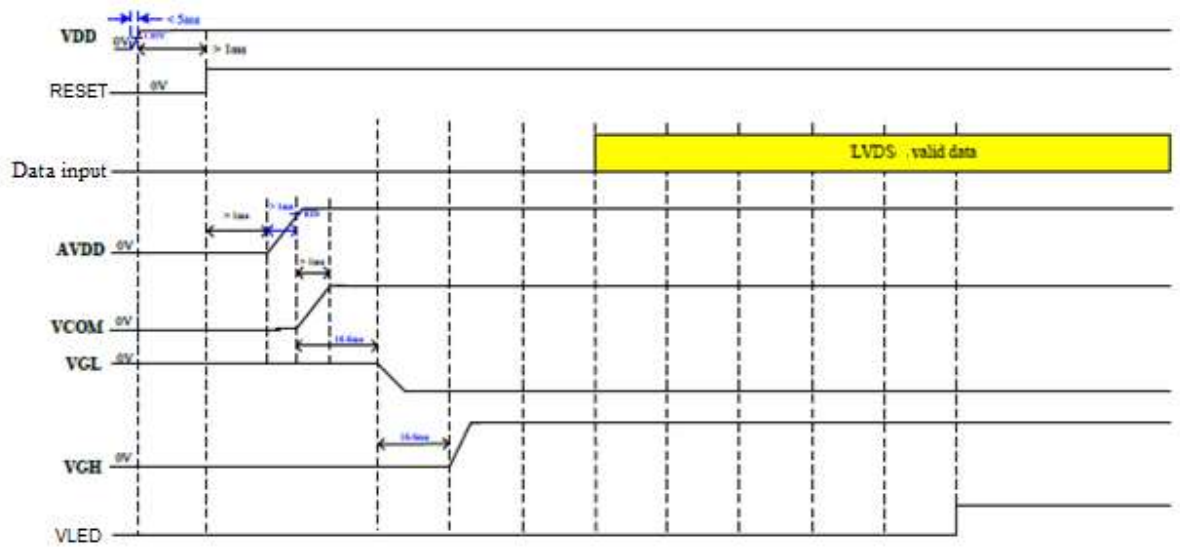


Figure 5: Power On timing chart

7.2. Power Off Sequence

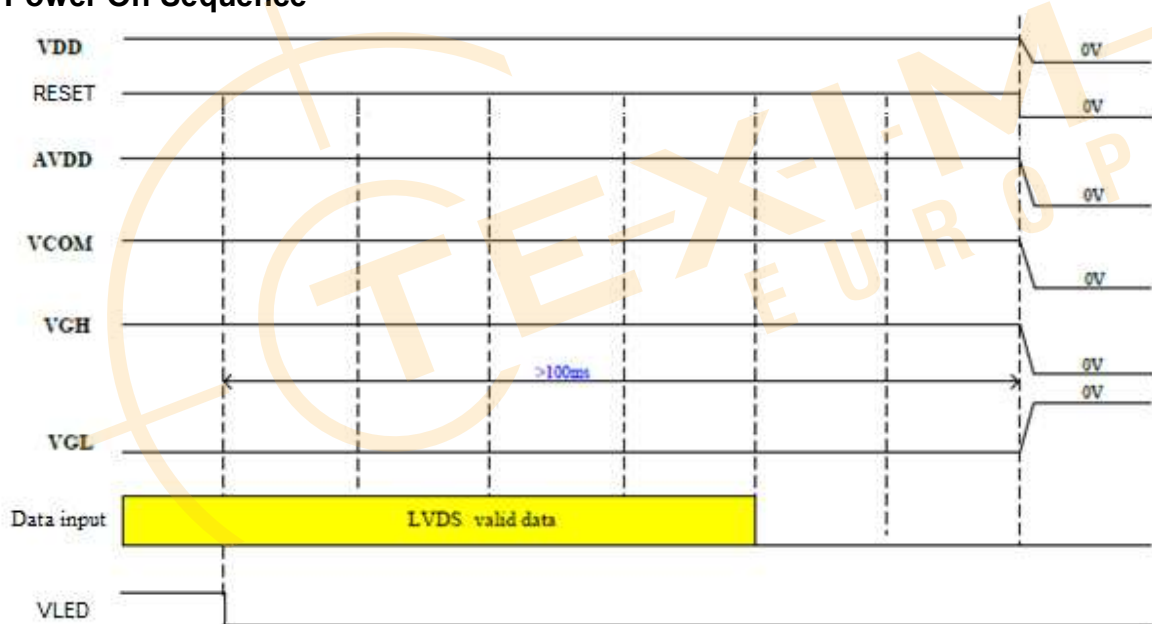


Figure 6: Power Off timing chart

8.Optical Characteristics

TFT LCD characteristic

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+ Tf	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	30	35	.ms	Note 3
Contrast ratio		CR	At optimized viewing angle	700	1000	-	-	Note 4
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.264	0.314	0.364	-	Note 2,6,7
		Wy		0.272	0.322	0.372	-	
Viewing angle	Hor.	Θ R	$CR\geq 10$	70	80	-	Deg.	Note 1
		Θ L		70	80	-		
	Ver.	Φ T		70	80	-		
		Φ B		70	80	-		
Brightness		-	-	950	1000	-	cd/m ²	Center of display
Uniformity		(U)	-	75	-	-	%	Note 5

Ta=25±2°C,

Note 1: Definition of viewing angle range

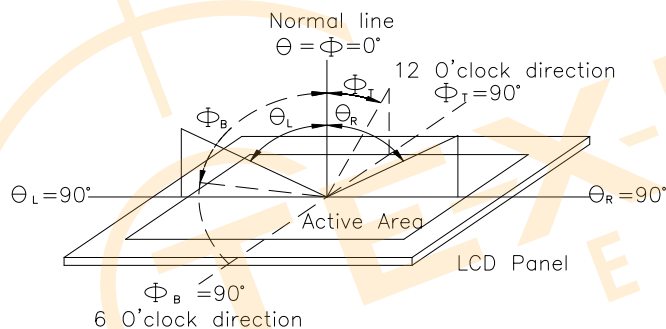


Fig.8.1. Definition of viewing angle

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

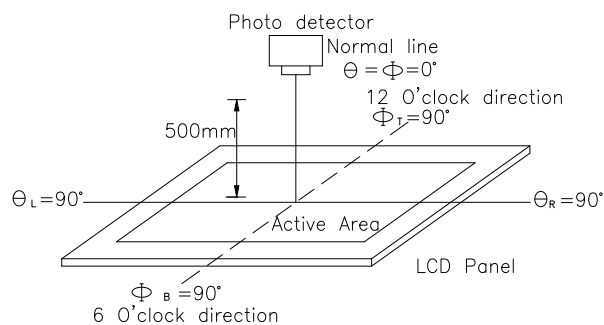
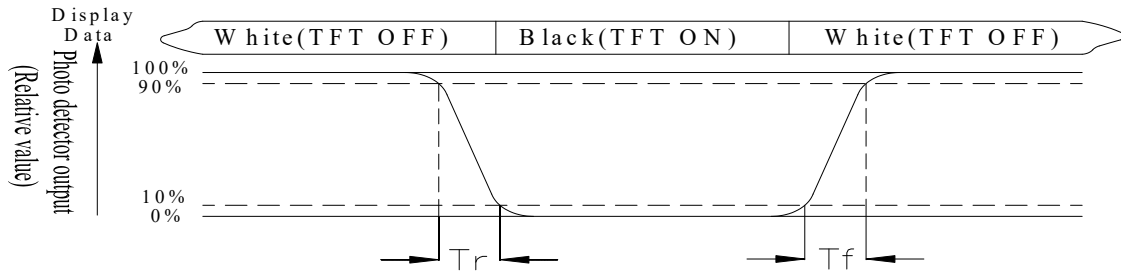


Fig. 8.2. Optical measurement system setup

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, 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

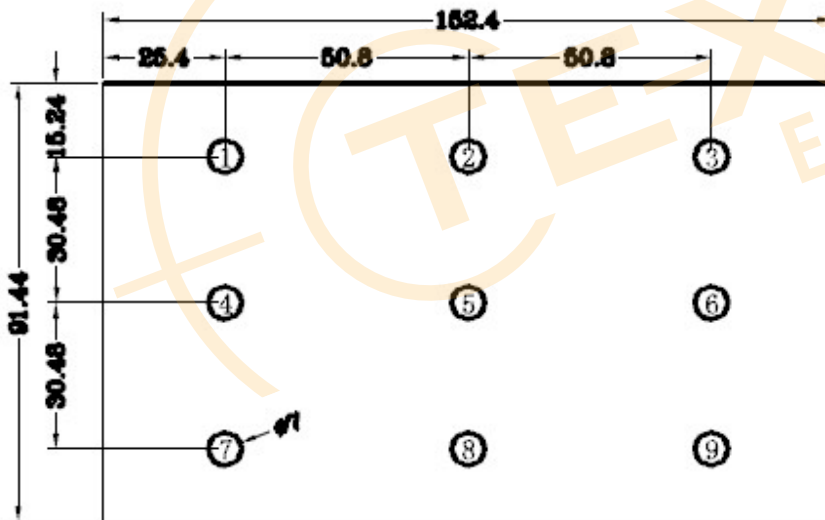


Fig8.3. Definition of uniformity

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.

9.Interface

9.1. LCM PIN Definition

Pin No.	Symbol	Function	Remark
1	VCOM	Common Voltage	
2	VDD	Digital circuit	
3	VDD	Digital circuit	
4	NC	No connection	
5	RESET	Global reset pin	
6	STBYB	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z	
7	GND	Ground	
8	RXIN0-	Negative LVDS differential data input	
9	RXIN0+	Positive LVDS differential data input	
10	GND	Ground	
11	RXIN1-	Negative LVDS differential data input	
12	RXIN1+	Positive LVDS differential data input	
13	GND	Ground	
14	RXIN2-	Negative LVDS differential data input	
15	RXIN2+	Positive LVDS differential data input	
16	GND	Ground	
17	RXCLKIN-	Negative LVDS differential clock input	
18	RXCLKIN+	Positive LVDS differential clock input	
19	GND	Ground	
20	RXIN3-	Negative LVDS differential data input	
21	RXIN3+	Positive LVDS differential data input	
22	GND	Ground	
23	NC	No connection	
24	NC	No connection	
25	GND	Ground	
26	NC	No connection	
27	NC	No connection	
28	SELB	6bit/8bit mode select H:6bit / L:8bit	
29	AVDD	Power for Analog Circuit	

30	GND	Ground	
31	VLED-	LED_ Cathode	
32	VLED-	LED_ Cathode	
33	L/R	Horizontal inversion	Note
34	U/D	Vertical inversion	Note
35	VGL	Negative power for TFT	
36	NC	No connection	
37	NC	No connection	
38	VGH	Positive power for TFT	
39	VLED+	LED_ Anode	
40	VLED+	LED_ Anode	

Note

When L/R="0",set right to left scan direction.

When L/R="1",set left to right scan direction.

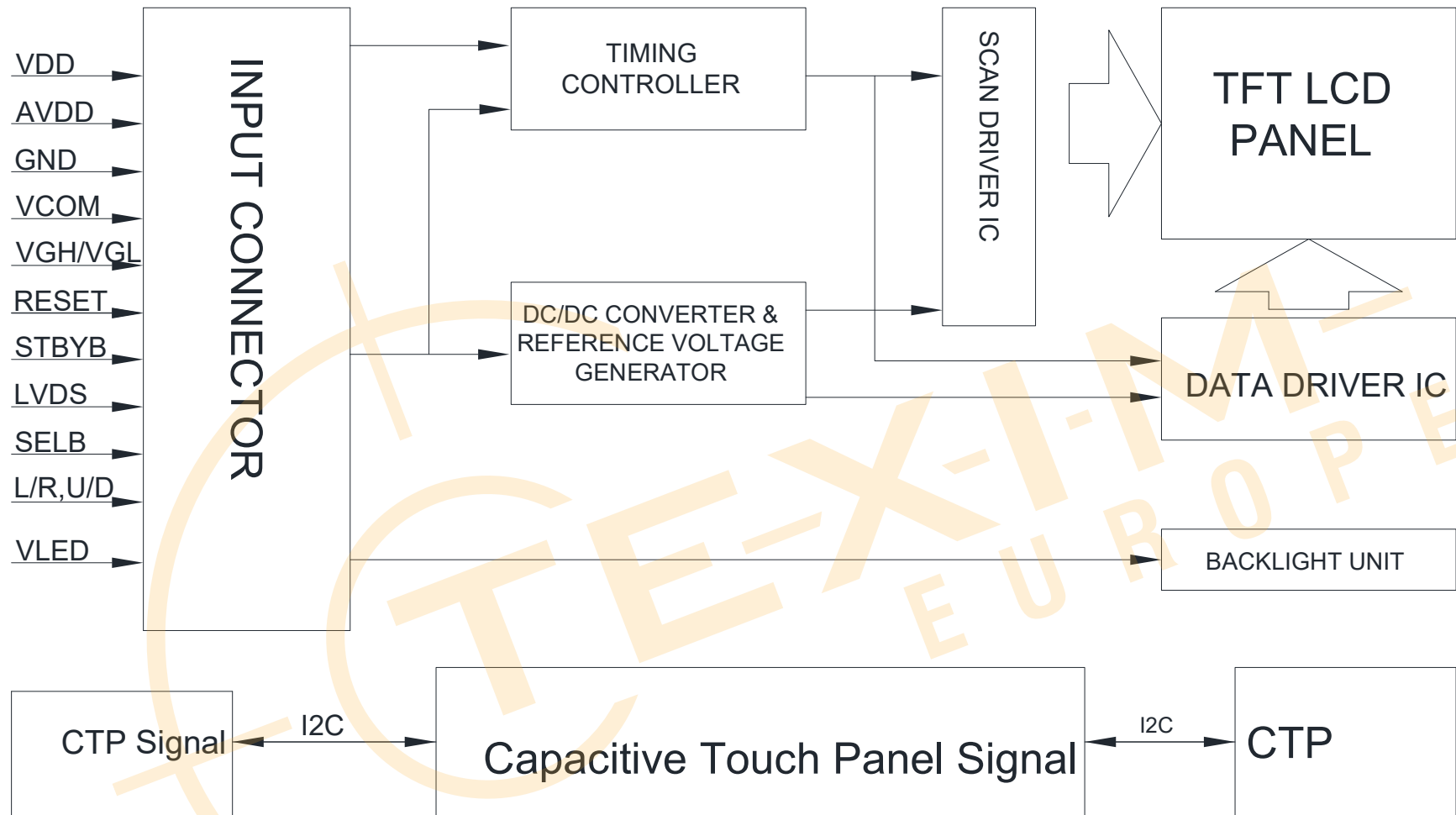
When U/D="0",set top to bottom scan direction.

When U/D="1",set bottom to top scan direction

9.2. CTP PIN Definition

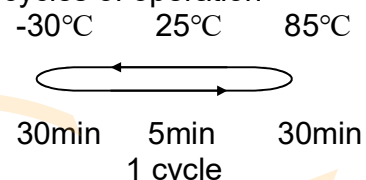
Pin	Symbol	Function	Remark
1	VSS	Ground for analog circuit	
2	VDDT	Power Supply : +3.3V	
3	SCL	I2C clock input	
4	NC	No connect	
5	SDA	I2C data input and output	
6	NC	No connect	
7	/RST	External Reset, Low is active	
8	NC	No connect	
9	/INT	External interrupt to the host	
10	VSS	Ground for analog circuit	

10. Block Diagram



11. Reliability

Content of Reliability Test (Super Wide temperature, -30°C~85°C)

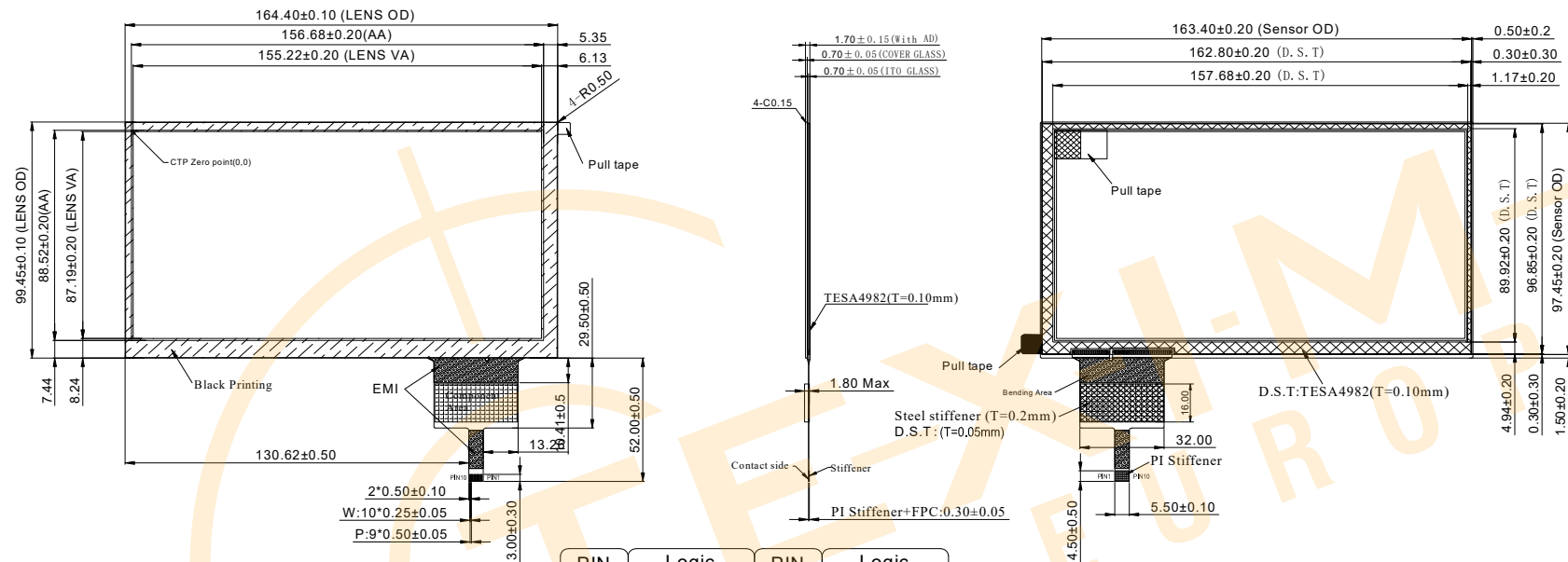
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature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

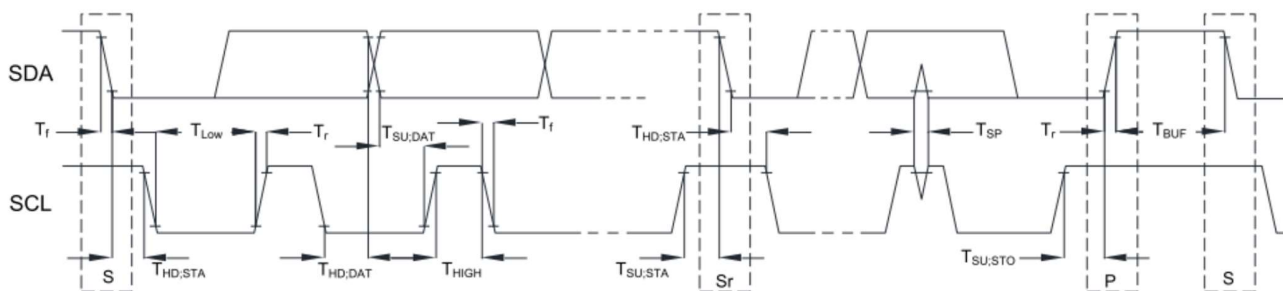
Note3: The packing have to including into the vibration testing.

12.Touch Panel Information



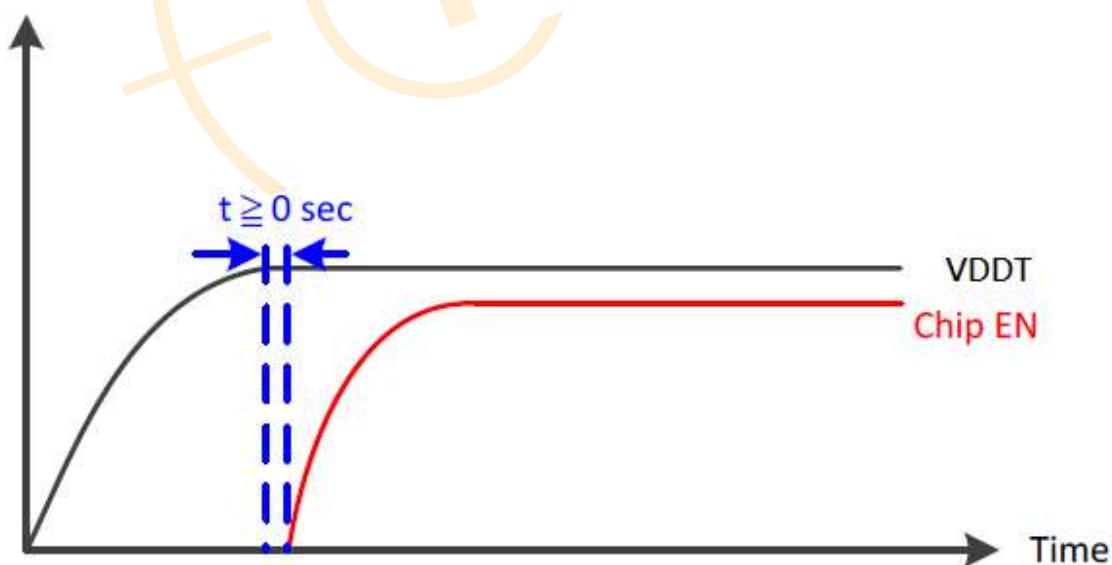
PIN	Logic	PIN	Logic
1	VSS	6	NC
2	VDDT	7	/RST
3	SCL	8	NC
4	NC	9	/INT
5	SDA	10	VSS

12.1. I2C AC Characteristics

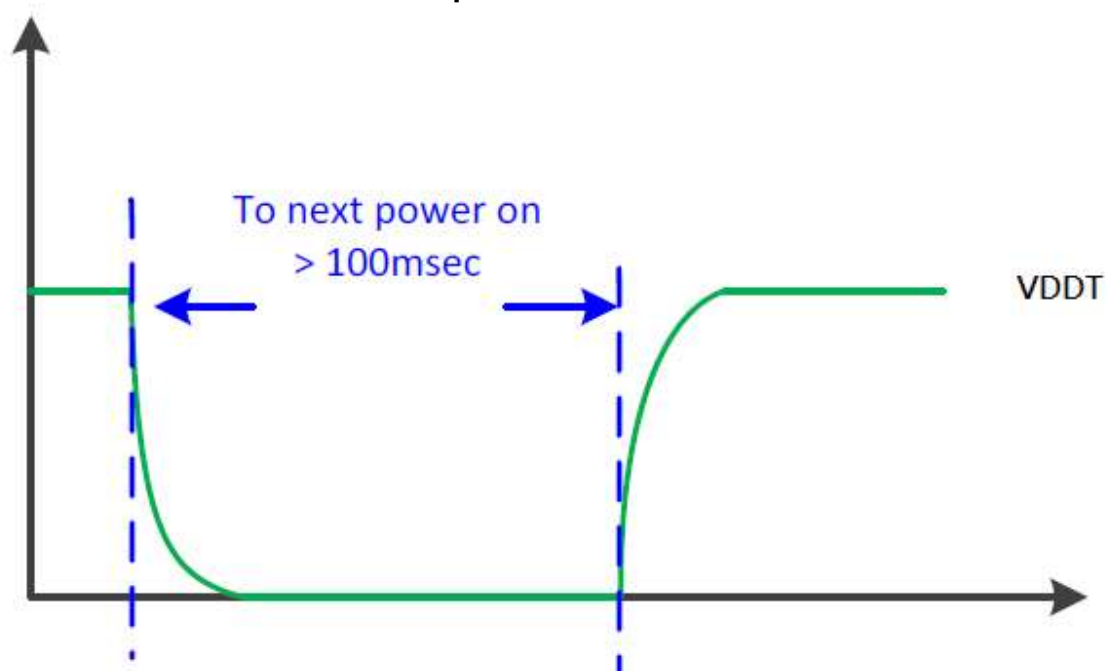


Item	Symbol	100kHz		400kHz		Unit
		Min.	Max.	Min.	Max.	
SCL standard mode clock frequency	F _{SCL}	0	100	0	400	kHz
Hold time (repeated) START condition. After this period, the first clock is generated.	T _{HD;STA}	4	--	0.6	--	us
LOW period of the SCL clock	T _{LOW}	4.7	--	1.3	--	us
HIGH period of the SCL clock	T _{HIGH}	4	--	0.6	--	us
Setup time for a repeat START condition.	T _{SU;STA}	4.7	--	0.6	--	us
Data hold time	T _{HD;DAT}	0	3.45	0	0.9	us
Data setup time	T _{SU;DAT}	250	--	100	--	ns
Rising time of both SDA and SCL signals	T _r	--	1000	--	300	ns
Falling time of both SDA and SCL signals	T _f	--	300	--	300	ns
Setup time for STOP condition.	T _{SU;STO}	4	--	0.6	--	us
Free time between STOP and START condition	T _{BUF}	4.7	--	1.3	--	us
Pulse width of spikes which must be suppressed by input filter	T _{SP}	--	--	0	50	ns

12.2. Power On Sequence

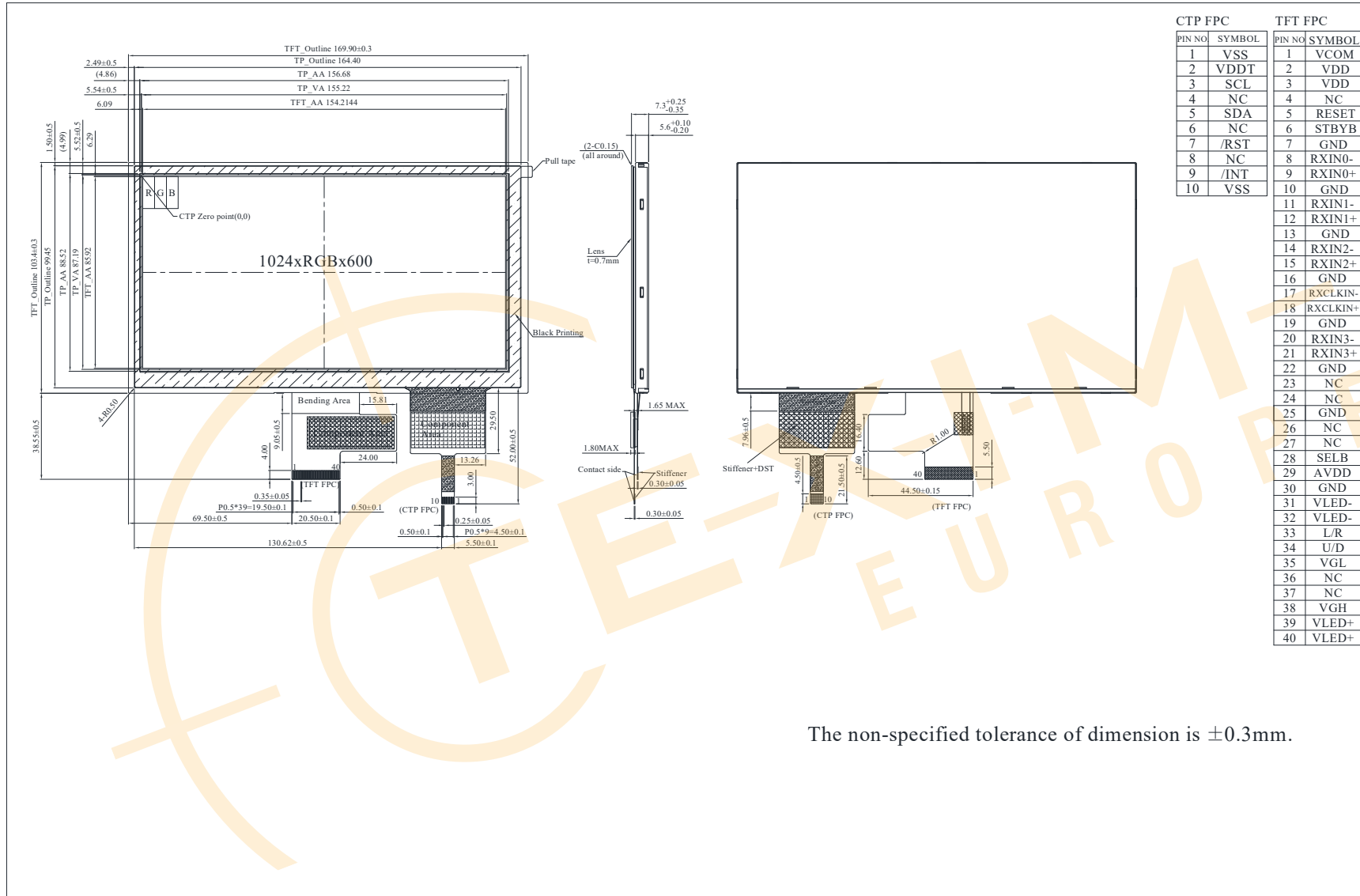


12.3. Power Off to Power On Sequence



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13. Contour Drawing



The non-specified tolerance of dimension is $\pm 0.3\text{mm}$.



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 Temperature) : | ☐ 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 : / /

Disclaimer

ALL PRODUCTS, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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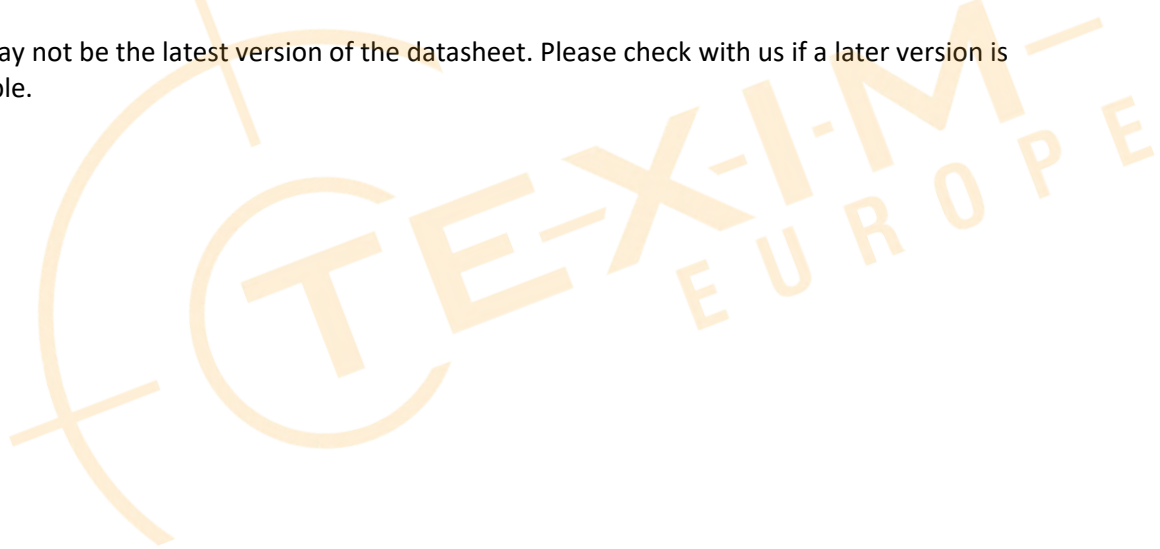
It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application.

Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time.

All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts.

Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.





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