



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.: WF70A7TIAHLNNO#

<p>APPROVED BY: (FOR CUSTOMER USE ONLY)</p>	<p>PCB VERSION: _____ DATA: _____</p>
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2019/04/10			

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	2019/03/19		First issue
A	2019/04/10		Correct Control IC & Driver IC

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1.Module Classification Information

W F 70 A7 T I A H L 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	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 7.0”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	7.0	inch
Dot Matrix	1024 x RGBx600(TFT)	dots
Module dimension	164.8(W) x 99.8(H) x 5.65(D)	mm
Active area	154.2144 x 85.92	mm
Dot pitch	0.1506 x 0.1432	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Aspect Ratio	16:9	
Control IC	NA	
Driver IC	EK79001HE + EK73215BCGA	
Backlight Type	LED, Normally White	
With /Without TP	Without TP	
Interface	LVDS	
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. Typical Operation Conditions

(Note 1)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	DVDD	3.0	3.3	3.6	V	Note 2
	AVDD	9.4	9.6	9.8	V	
	VGH	17	18	19	V	
	VGL	-6.6	-6.0	-5.4	V	
Input signal voltage	VCOM	3.1	3.3	3.6	V	
Input logic high voltage	VIH	0.7 DVDD	-	DVDD	V	Note 3
Input logic low voltage	VIL	0	-	0.3 DVDD	V	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK, HS, VS, RESET, U/D, L/R, DE, R0~R7, G0~G7, B0~B7, MODE, DITHB.

5.2. Current Consumption

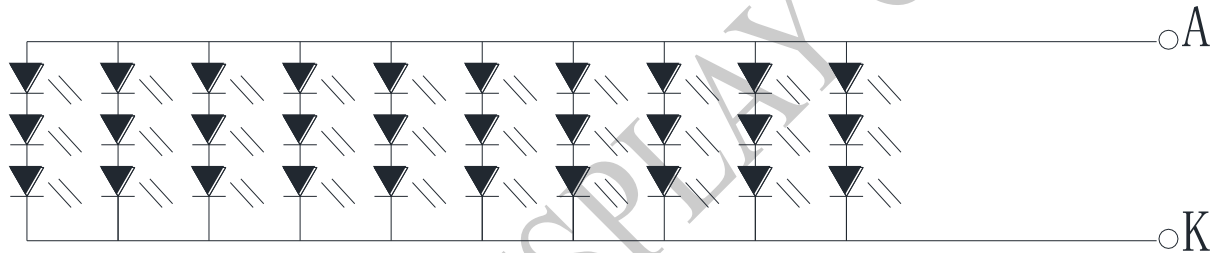
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	IGH	-	0.2	1.0	mA	VGH = 18.0V
	IGL	-	0.2	1.0	mA	VGL = -6.0V
	IDVDD	-	4.0	10	mA	DVDD = 3.3V
	IAVDD	-	20	50	mA	AVDD = 9.6V

5.3. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL	8.4	9.8	10.8	V	Note 1
Current for LED backlight	IL	--	300	--	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 $I_L=300\text{mA}$.

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 $I_L=300\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 300mA.

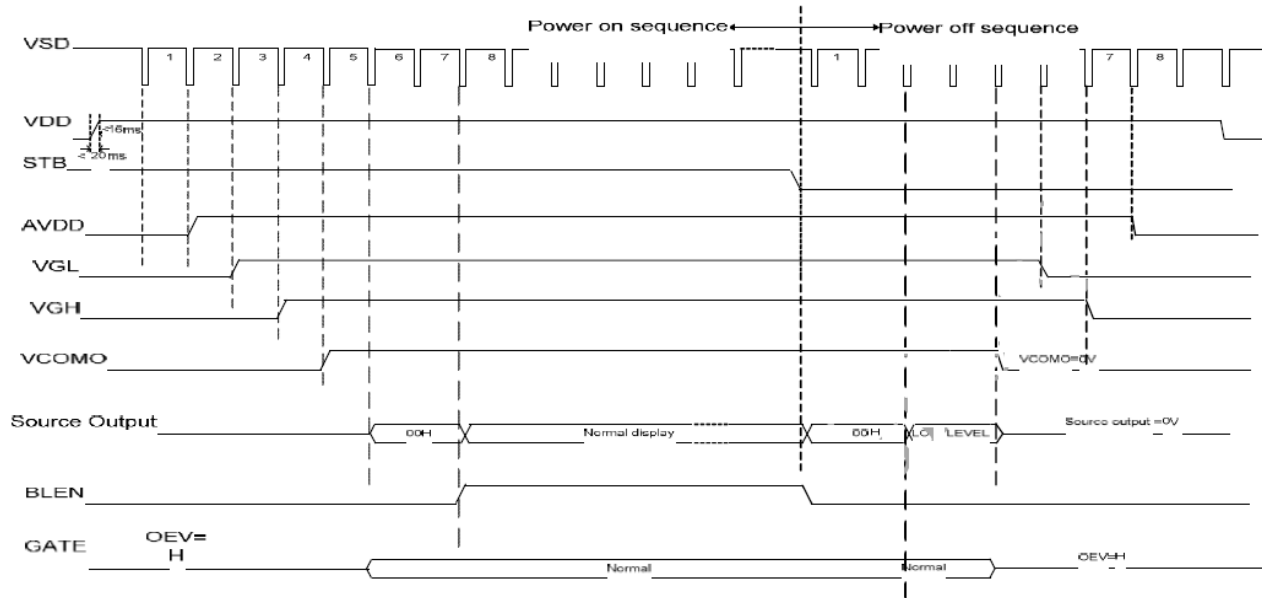


Backlight 30LED Circuit

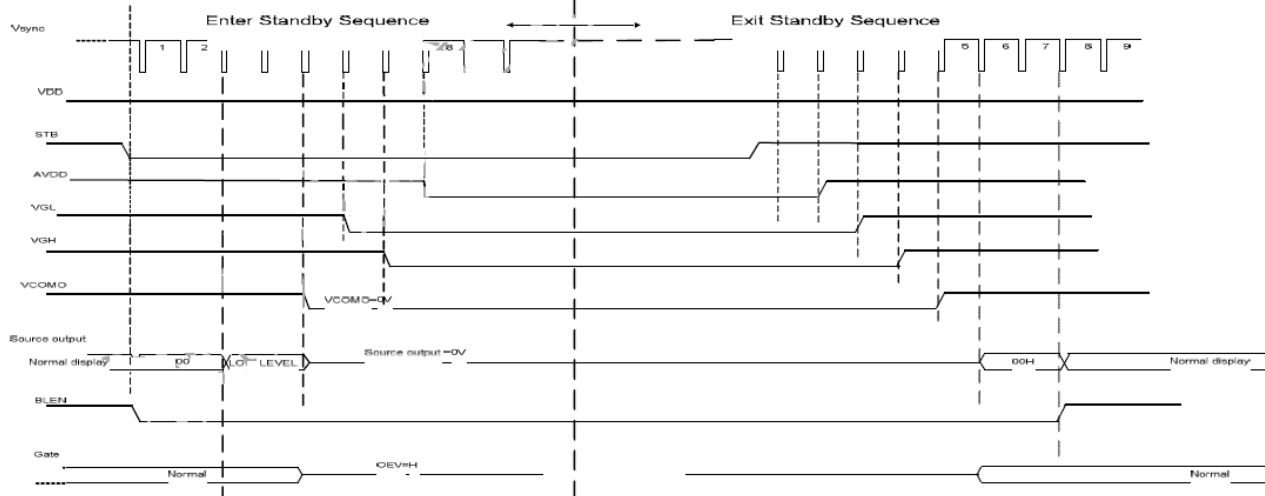
6. Operation Sequence

6.1. Power Sequence

In order to prevent IC from power on reset fail, the time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “AC characteristics” for more detail on timing.



Power on/off timing chart



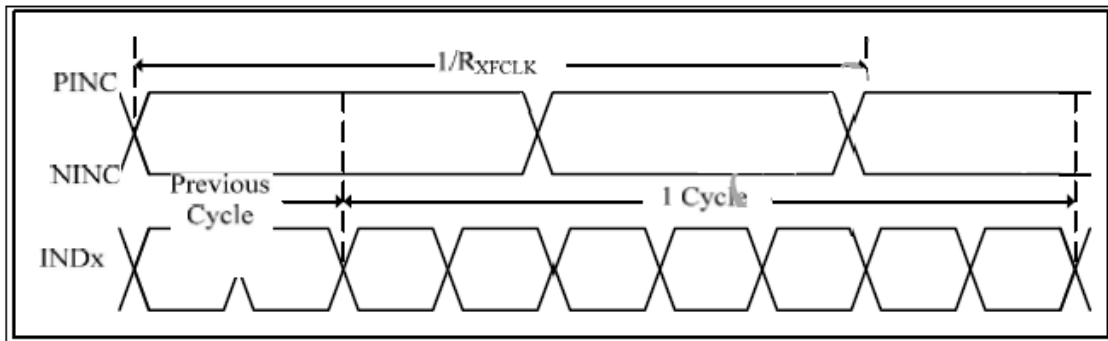
Enter and Exit standby Mode timing chart

Note : Low level=3Fh, when NBW=L (normally white)
 Low level=00h, when NBW=H (normally black)

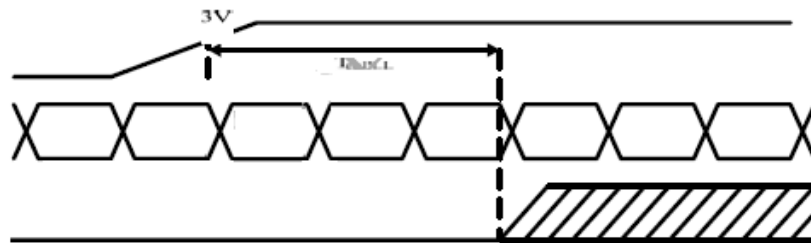
6.2. Timing Characteristics

AC Electrical Characteristics

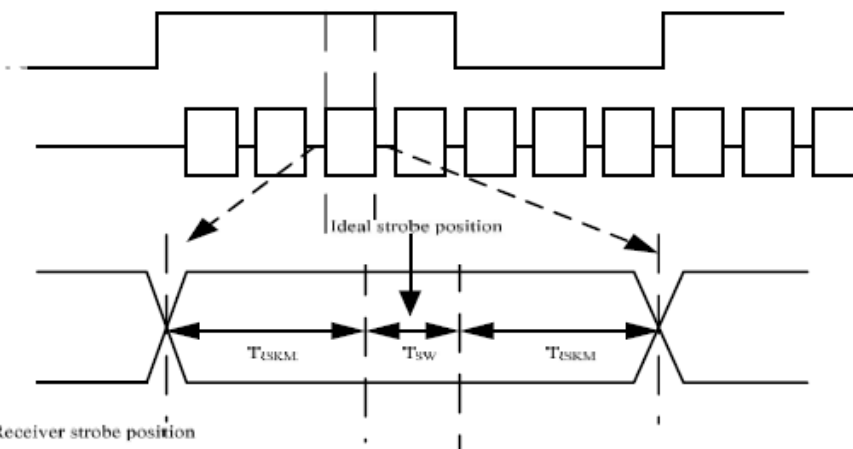
Parameter	Symbol	condition	Min.	Typ.	Max.	Unit
Clock frequency	R _X FCLK		20	-	71	MHz
Input data skew margin	T _{RSKM}	VID =400mV R _X VCM=1.2V R _X FCLK=71MHz	500	-	-	ps
Clock high time	T _{LVCH}		-	4/(7* R _X FCLK)	-	ns
Clock low time	T _{LVCL}		-	3/(7* R _X FCLK)	-	ns
PLL wake-up-time	T _{enPLL}				150	us



LVDS timing(1)

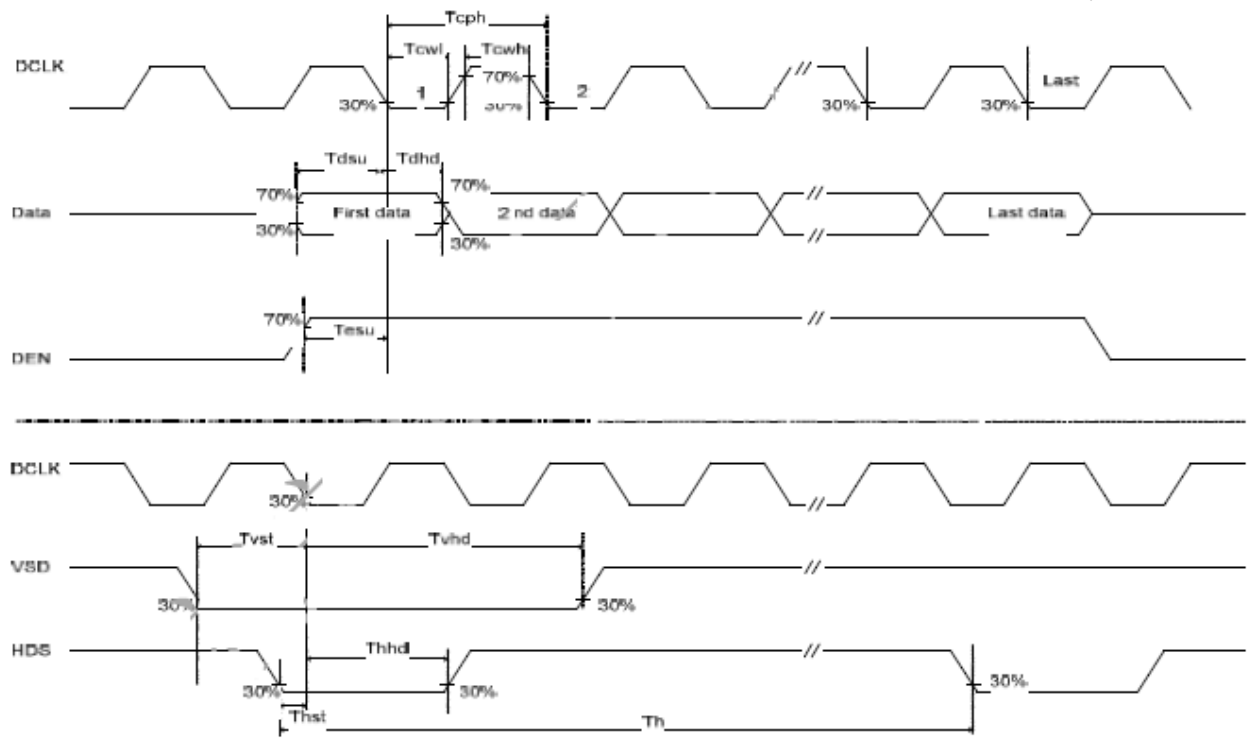
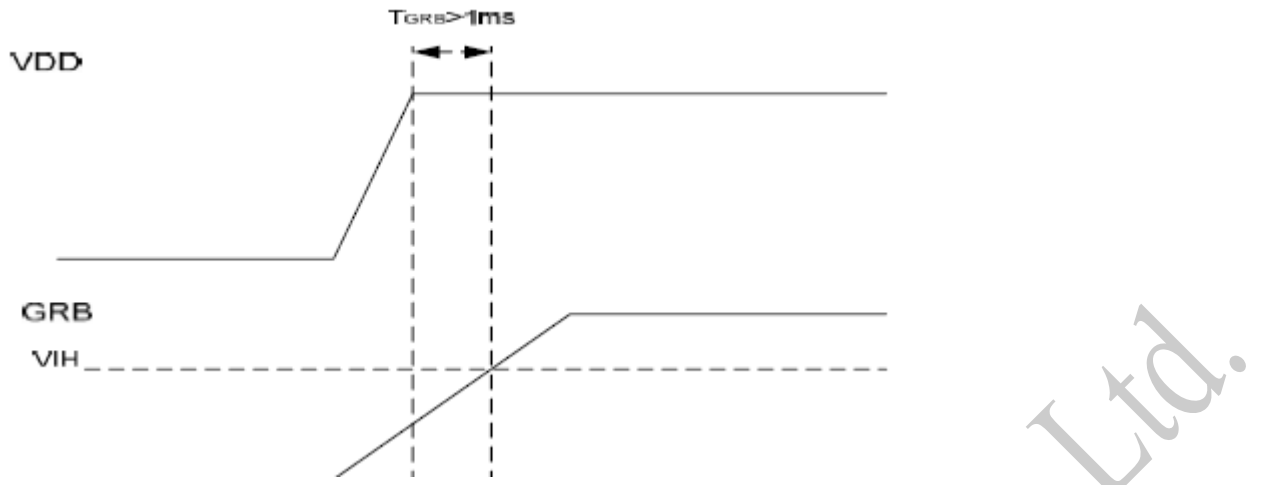


LVDS timing(2)



T_{Sw} : Receiver strobe position
 T_{RSKM} : Receiver strobe margin

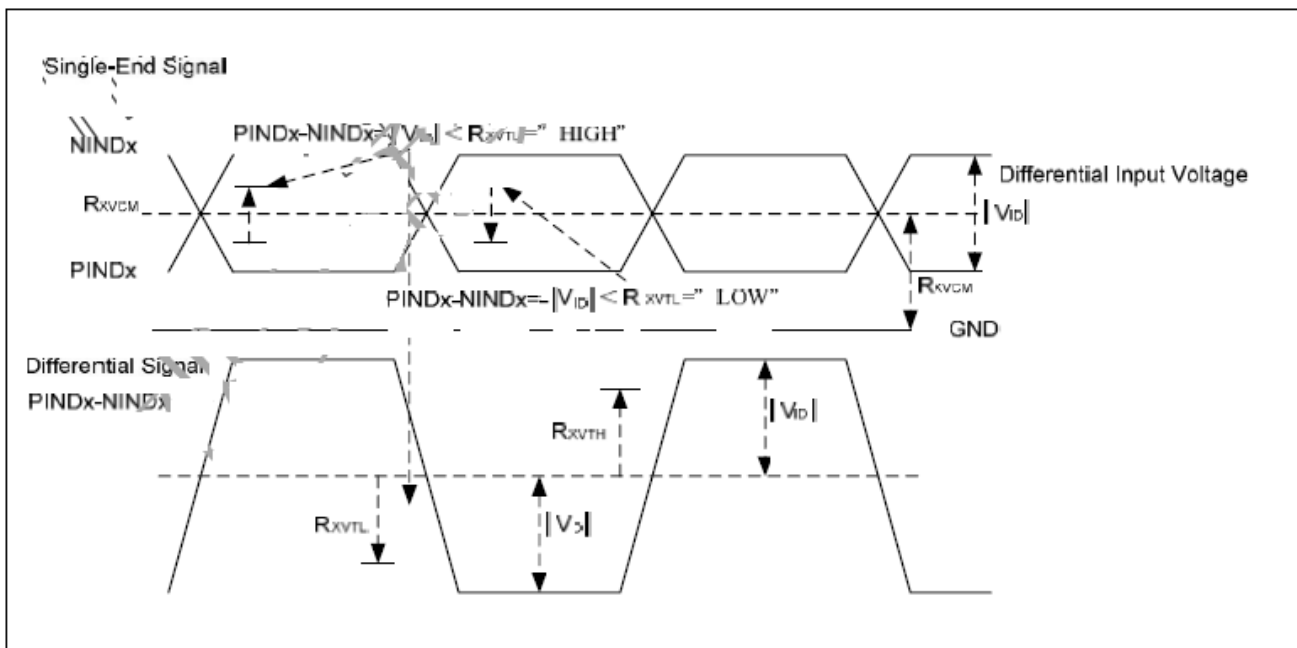
LVDS timing(3)



Parallel Input Clock and Data timing

6.3. LVDS DC Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1		
Differential input low Threshold voltage	R_{xVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	2.4	V	
Differential input common mode voltage	R_{xVCM}	$ VID /2$	-	$2.4- VID /2$	V	
Differential input voltage	$ VID $	0.2	-	0.6	V	
Differential input leakage current	R_{Vxliz}	-10	-	+10	μA	
LVDS Digital operating Current	I_{ddlvsd}	-	40(TBD)	50	mA	Fclk=65Mhz VDD=3.3V
LVDS Digital Standby Current	I_{stlvsd}	--	10(TBD)	50	μA	Clock & all Functions are stop



LVDS DC Characteristics

HV mode(1)

HV mode

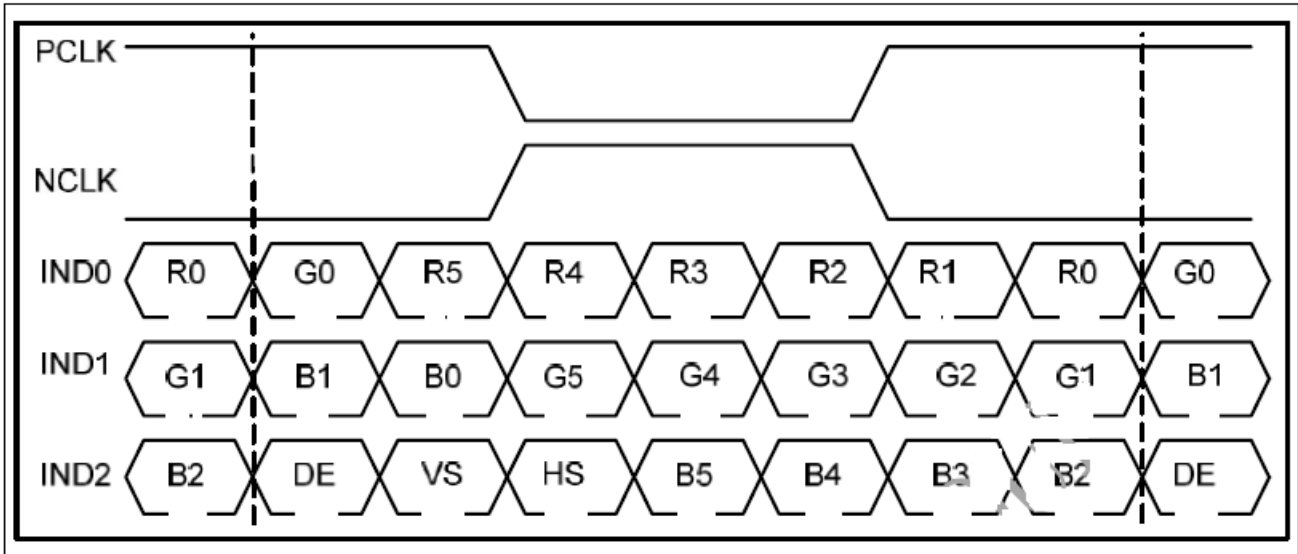
Horizontal input timing

Parameter		Symbol	Value			Unit
Horizontal display area		thn	1024			DCLK
DCLK frequency @ Frame rate=60hz		fclk	Min.	Typ.	Max.	Mhz
			44.9	51.2	63	
1 Horizontal Line		Th	1200	1344	1400	DCLK
HSYNC pulse width	Min.	thpw	1			
	Typ.		-			
	Max.		140			
HSYNC back porch		thbp	160	160	160	
HSYNC front porch		thfp	16	160	216	

HV mode(2)

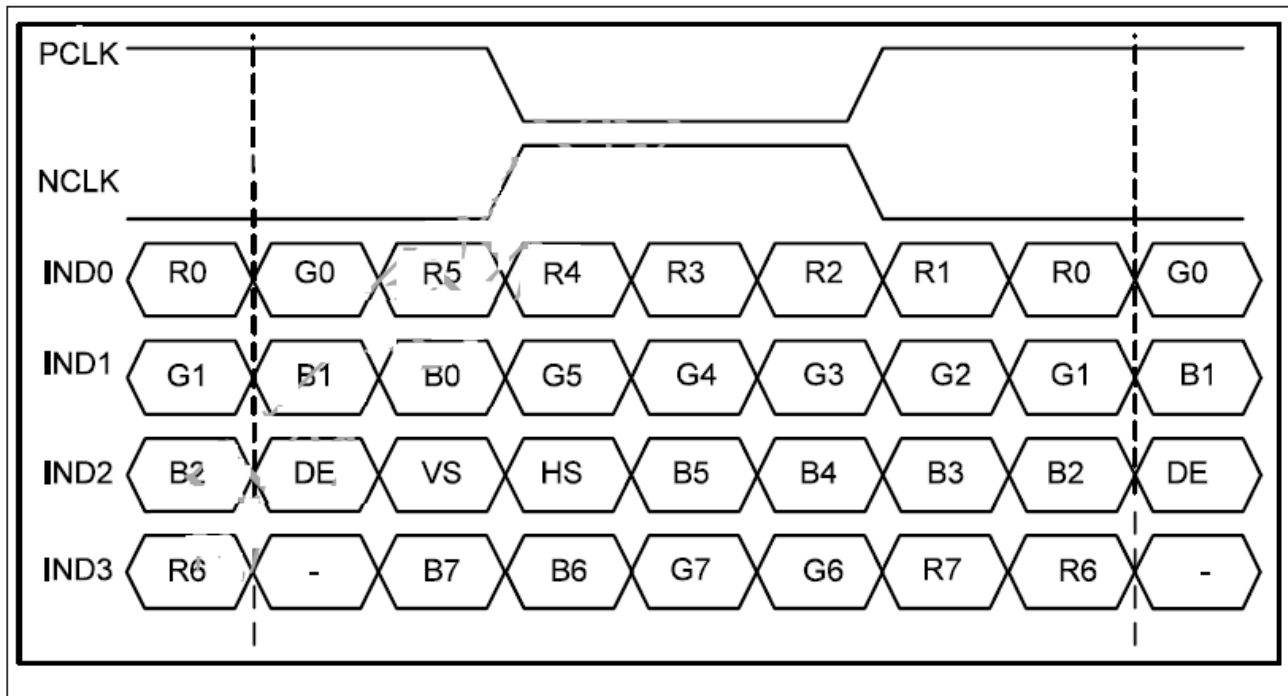
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tvpw	1	-	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

Data Input Format
6bit LVDS input(HSD="H")



6-bit LVDS input timing chart

8bit LVDS input(HSD="L")



8-bit LVDS input timing chart

7. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	25	40	.ms	Note 3
	Tf						
Contrast ratio	CR	At optimized viewing angle	600	800	-	-	Note 4
Color Chromaticity	White	$\theta=0^\circ$ 、 $\phi=0^\circ$	0.26	0.31	0.36	-	Note 2,5,6
Viewing angle (Gray Scale Inversion Direction)	Hor.	$CR \geq 10$	70	80	-	Deg.	Note 1
	ΘL						
	Ver.						
ΦB		60	70	-			
Brightness	-	-	500	600	-	cd/m ²	Center of display
Uniformity	(U)	-	70	-	-	%	Note 5

Ta=25±2°C,

Note 1: Definition of viewing angle range

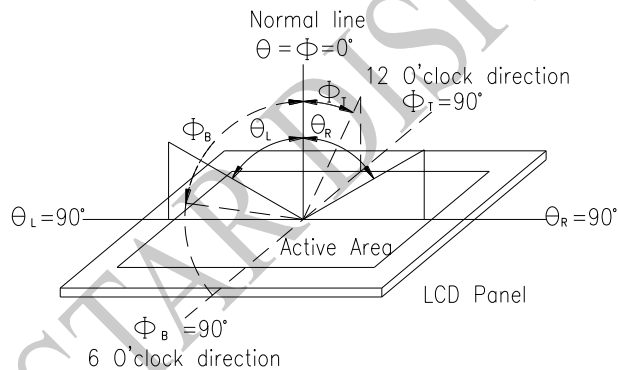


Fig. 7.1. Definition of viewing angle

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

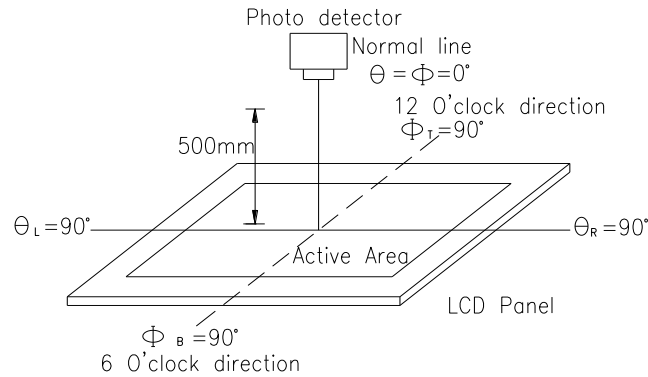
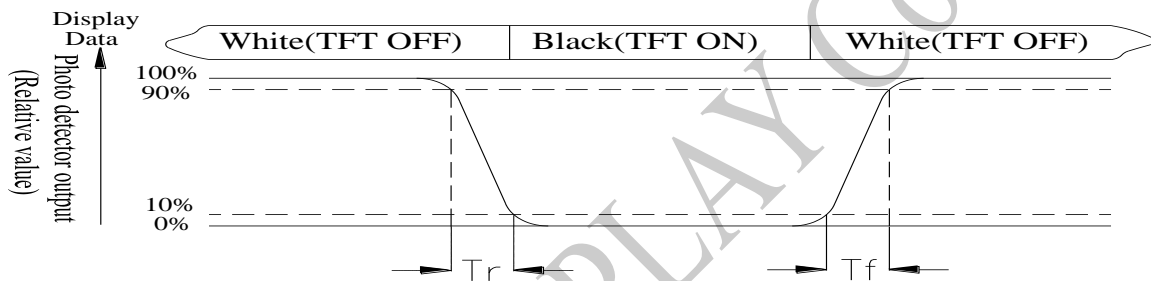


Fig. 7.2. Optical measurement system setup

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

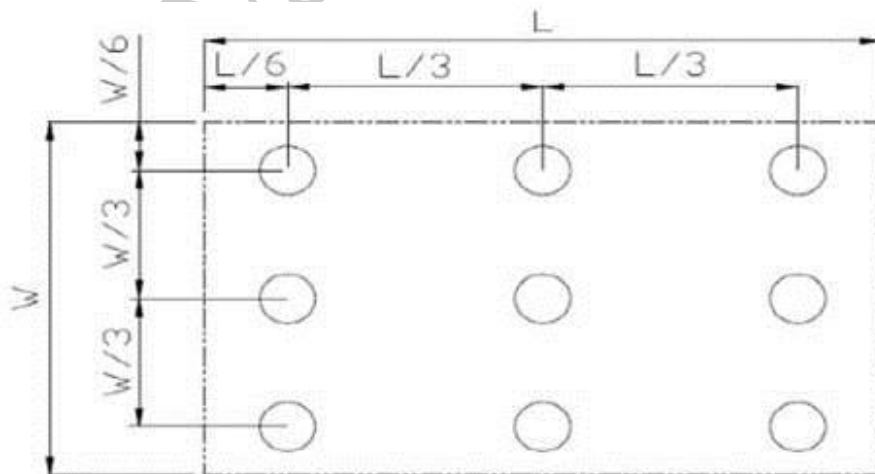


Fig 7.3. Definition of uniformity

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.

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8.Interface

8.1. LCM PIN Definition

FPC Connector is used for the module electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Remark
1	VCOM	P	Common Voltage	
2	VDD	P	Digital circuit	
3	VDD	P	Digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	
6	STBYB	I	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	P	Ground	
8	RXIN0-	I	Negative LVDS differential data input	
9	RXIN0+	I	Positive LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	Negative LVDS differential data input	
12	RXIN1+	I	Positive LVDS differential data input	
13	GND	P	Ground	
14	RXIN2-	I	Negative LVDS differential data input	
15	RXIN2+	I	Positive LVDS differential data input	
16	GND	P	Ground	
17	RXCLKIN-	I	Negative LVDS differential clock input	
18	RXCLKIN+	I	Positive LVDS differential clock input	
19	GND	P	Ground	
20	RXIN3-	I	Negative LVDS differential data input	
21	RXIN3+	I	Positive LVDS differential data input	
22	GND	P	Ground	
23	NC	---	No connection	
24	NC	---	No connection	

25	GND	P	Ground
26	NC	---	No connection
27	DIMO	O	Backlight CABC controller signal output
28	SELB	I	6bit/8bit mode select H:6bit / L:8bit
29	AVDD	P	Power for Analog Circuit
30	GND	P	Ground
31	LED-	P	LED Cathode
32	LED-	P	LED Cathode
33	L/R	I	Horizontal inversion
34	U/D	I	Vertical inversion
35	VGL	P	Negative power for TFT
36	GND	P	Ground
37	GND	P	Ground
38	VGH	P	Positive power for TFT
39	LED+	P	LED Anode
40	LED+	P	LED Anode

I:input ,O:output,P:power

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. Reliability

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

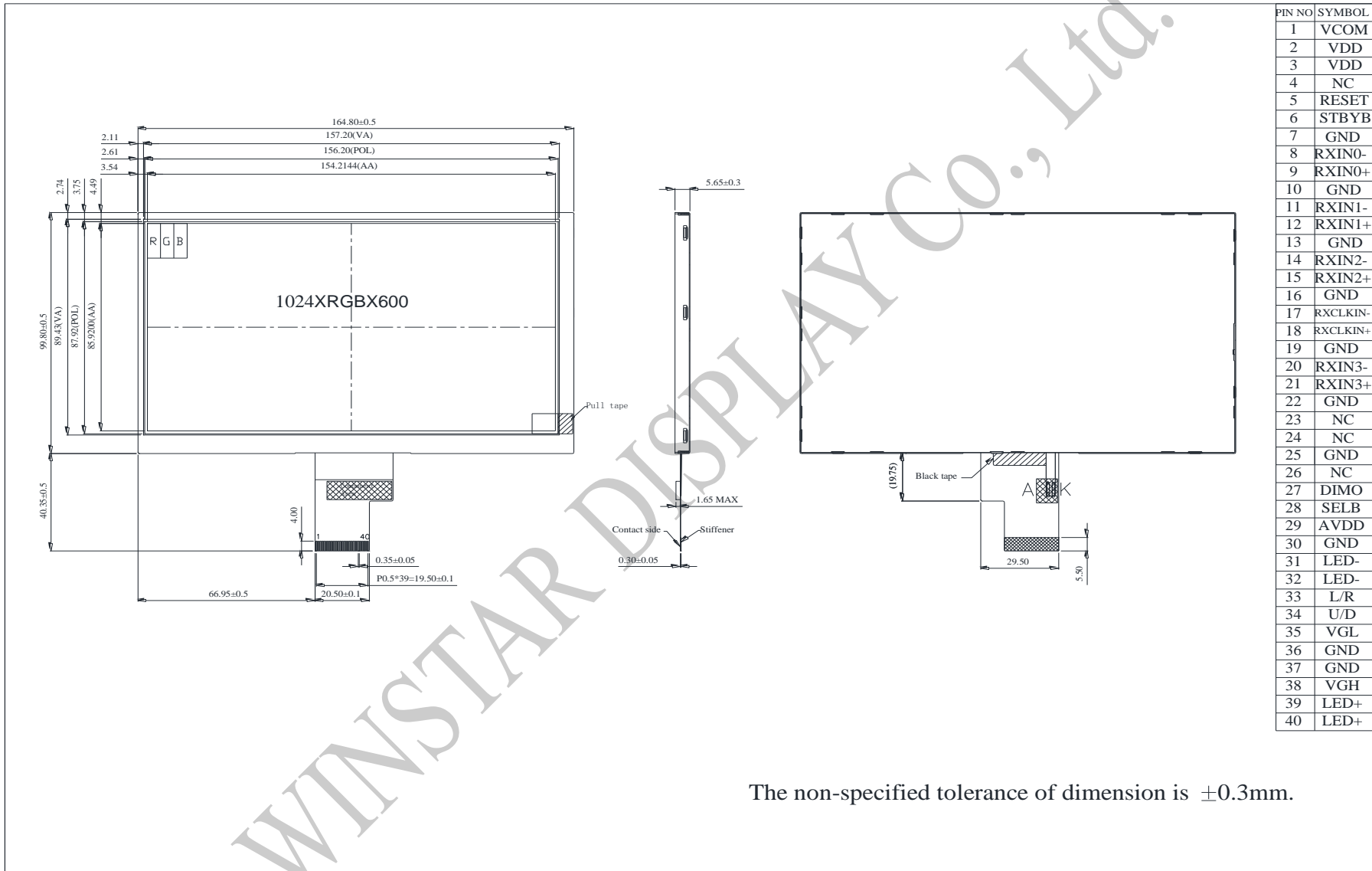
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature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



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



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 : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Supply Current : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Driving Voltage for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Contrast for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. B/L Driving Method : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Negative Voltage Output : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Interface Function : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. LCD Uniformity : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9. ESD test : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

6、Summary :

Sales signature : _____

Customer Signature : _____

Date : / / _____

