Winstar Display Co., LTD
華凌光電股份有限公司
WEB: http://www.winstar.com.tw E-mail: winstar@winstar.com.tw

SPECIFICATION

CUSTOMER : _____

MODULE NO.: WF102ATIAGDNTA#

APPROVED BY: **(FOR CUSTOMER USE ONLY)**	**PCB VERSION: DATA:**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2016/10/05			

TFT Display Inspection Specification: http://www.winstar.com.tw/technology/download.html

MODLE NO：

RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	**SUMMARY**
0	2013/08/16		First issue
A	2014/05/21		Modify Package Specification.
B	2015/04/09		Add size & Surface.
C	2015/04/27		Modify Reliability.
D	2016/01/04		Modify Interface Timing Characteristics , Block Diagram &Touch Panel Information.
E	2016/01/21		Modify Static electricity test
F	2016/08/05		Remove Package Specification
G	2016/08/10		Modify Vibration test.
H	2016/10/05		Modify Summary Add Aspect Ratio

Contents

1.Module Classification Information

W	F	102	A	T	I	A	G	D	N	T	A	#
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：10.2” TFT		
④	Model serials no.		
⑤	Backlight Type：	F→CCFL, White S→LED, High Light White	T→LED, White
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	C→Transmissive, N. T, 6:00 ; I→Transmissive, W. T, 6:00 F→Transmissive, N.T,12:00 ; L→Transmissive, W.T,12:00 N→Transmissive, Super W.T, 6:00 Q→Transmissive, Super W.T, 12:00 X→Transmissive, W.T, VA TFT V→Transmissive, Super W.T, VA TFT R→Transmissive, Super W.T, O-TFT Z→Transmissive, W.T, O-TFT A→Transmissive, N.T, IPS TFT Y→Transmissive, W.T, IPS TFT	
⑦	A：TFT LCD B：TFT+FR+CONTROL BOARD C：TFT+FR+A/D BOARD D：TFT+FR+A/D BOARD+CONTROL BOARD E：TFT+FR+POWER BOARD F：TFT+CONTROL BOARD	G：TFT+FR H：TFT+D/V BOARD I：TFT+FR+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	P :1280800
	S:480128	T:800320					
⑨	D: Digital L：LVDS						
⑩	Interface： N：without control board A：8Bit B：16Bit						
⑪	TS：N：Without TS T：resistive touch panel C：capacitive touch panel (G-F-F) G：capacitive touch panel(G-G)						
⑫	Version						
⑬	Special Code	#:Fit in with ROHS directive regulations					

2.Summary

TFT 10.2” 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.

3.General Specifications

Item	Dimension	Unit
Size	10.2	inch
Dot Matrix	800 x RGBx480(TFT)	dots
Module dimension	235 x 145.8 x 7.6	mm
Active area	222 x 132.48	mm
Dot pitch	0.0925 x 0.2775	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Aspect Ratio	16:9	
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	-30	—	+85	℃
Storage Temperature	TST	-30	—	+85	℃

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. ≦60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

5.Electrical Characteristics

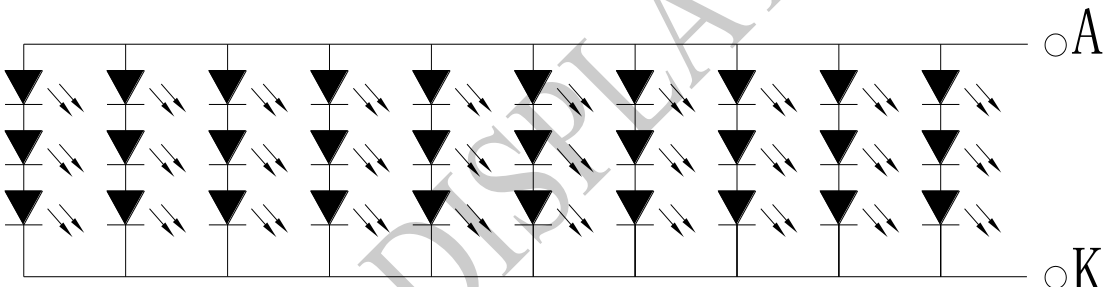
5.1. Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage	VCC	—	3.0	3.3	3.6	V
	AVDD	—	9.0	9.2	9.4	V
	VGH	—	15.3	16	16.7	V
	VGL	—	-7.7	-7.0	-6.3	V
Input signal voltage	VCOM	—	3.65	3.85	4.05	V
	V1~V7	—	0.4 AVDD	—	AVDD-0.1	V
	V8~V14	—	0.1	—	0.6AVDD	V

5.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	-	180	200	220	mA	-
Power Consumption	-	1512	1860	2310	mW	-
LED voltage	-	8.4	9.3	10.5	V	Note 1
LED Life Time	-	20,000	-	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Backlight LED Circuit

Note 2 : Ta = 25 ℃

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

Note 4 : The single LED lamp case

6.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{IL}	0	-	0.3VCC	V	
High level input voltage	V_{IH}	0.7VCC	-	VCC	V	

7.Timing Characteristics

7.1. Timing Conditions

Symbol	Parameter	Min	Typ	Max	Unit
F_{dclk}	DCLK frequency	-	40	45	MHz
T_{cph}	DCLK cycle	22	25	-	ns
T_{cw}	DCLK pulse width	8	-	-	ns
T_{su}	Data set-up time	4	-	-	ns
T_{hd}	Data hold time	2	-	-	ns
T_{ld}	Time that the last data to LD	1	-	-	Tcph
T_{wld}	Pulse width of LD	2	-	-	Tcph
T_{lds}	Time that LD to STHL/R	5	-	-	Tcph
T_{psu}	POL set-up time	6	-	-	ns
T_{phd}	POL hold time	6	-	-	ns
F_{vclk}	CKV frequency	-	-	200	KHz
T_{rck}	CKV rise time	-	-	100	ns
T_{fck}	CKV falling time	-	-	100	ns
P_{WCLK}	CKV pulse width	500	-	-	ns
T_{dh}	Horizontal display timing range	-	800	-	Tcph
T_{h}	Horizontal timing range	-	1056	-	Tcph
T_{suv}	STVU/D setup time	200	-	-	ns
T_{hdv}	STVU/D hold time	300	-	-	ns
T_{dt}	STVU/D delay time	-	-	500	ns
T_{do}	Driver output delay time	-	-	900	ns
T_{tlh}	Output rise time	-	500	1000	ns
T_{thl}	Output falling time	-	400	800	ns
T_{wcl}	OEV pulse width	1	-	-	ns
T_{oe}	OEV to Driver output delay time	-	-	900	us
T_{v}	Horizontal lines per field	512	525	610	Line
T_{vd}	Vertical display timing range	-	480	-	Line

7.2. Timing Diagram1

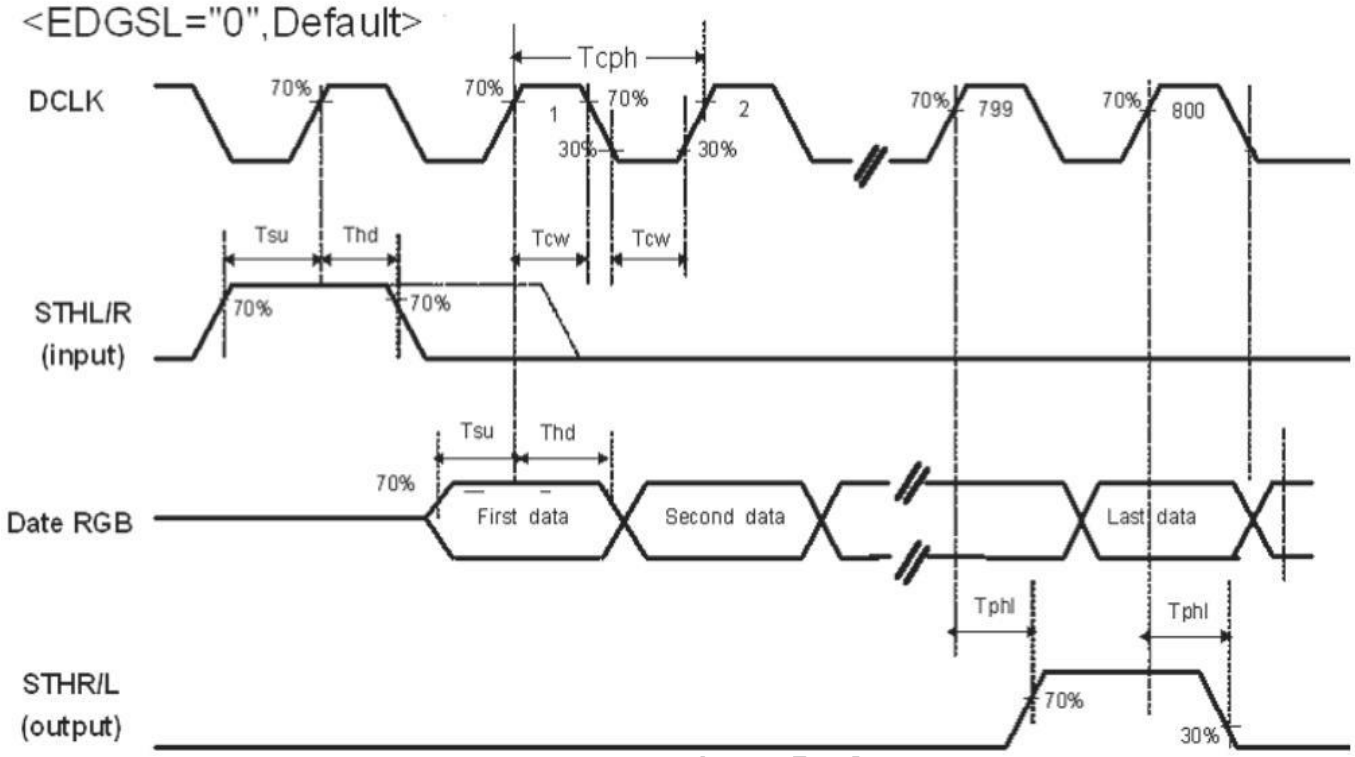


Fig.1 operation model 1

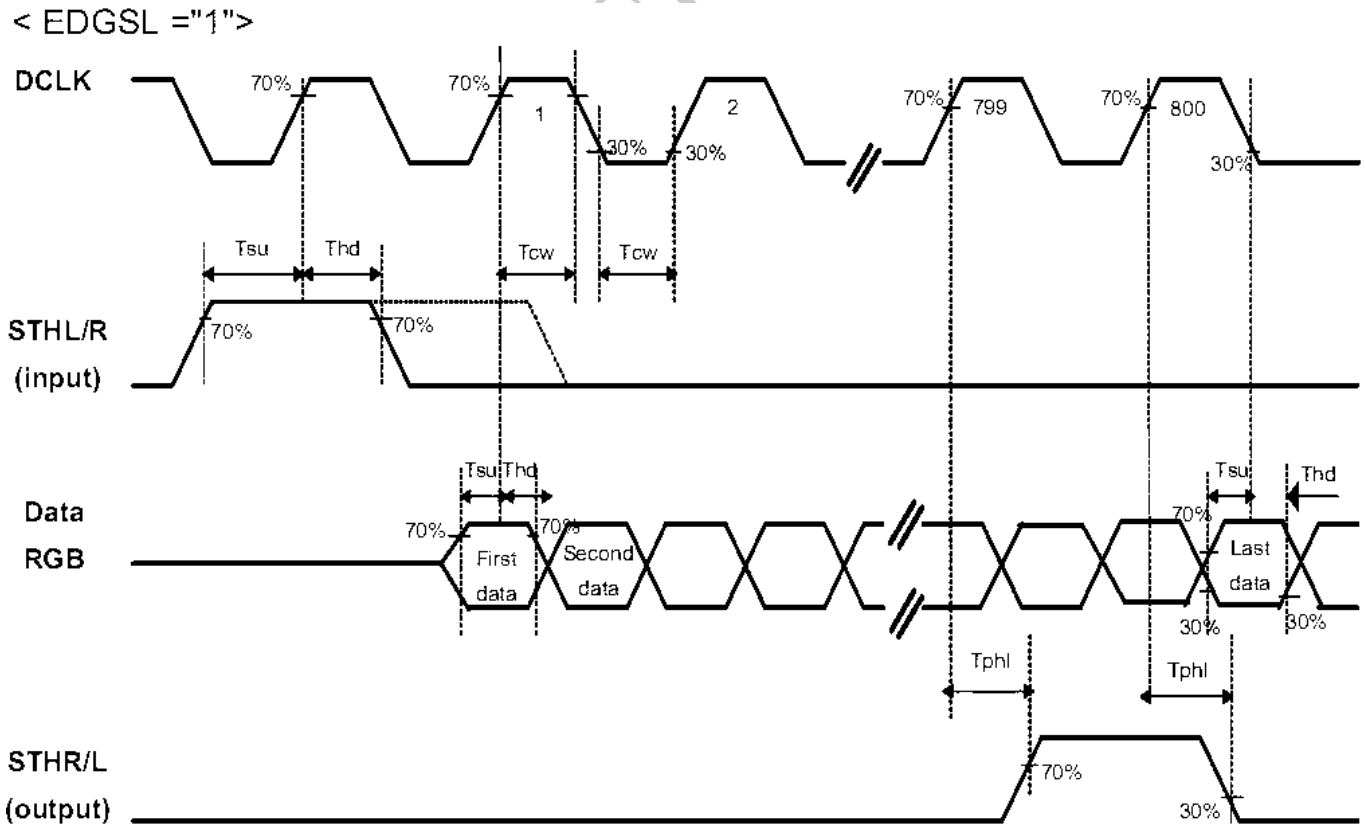


Fig.2 operation model 2

7.3. Timing Diagram2

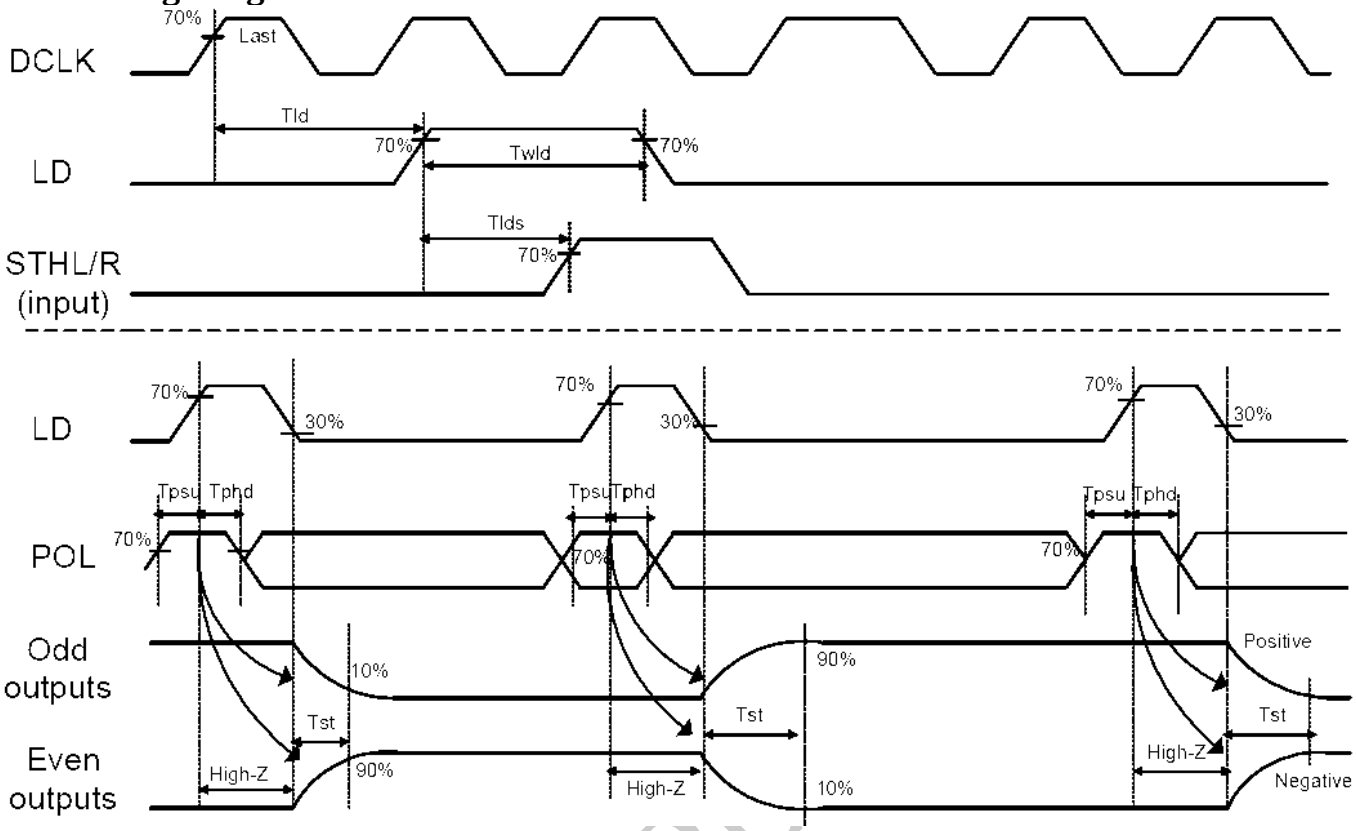


Fig.3 Horizontal timing 1

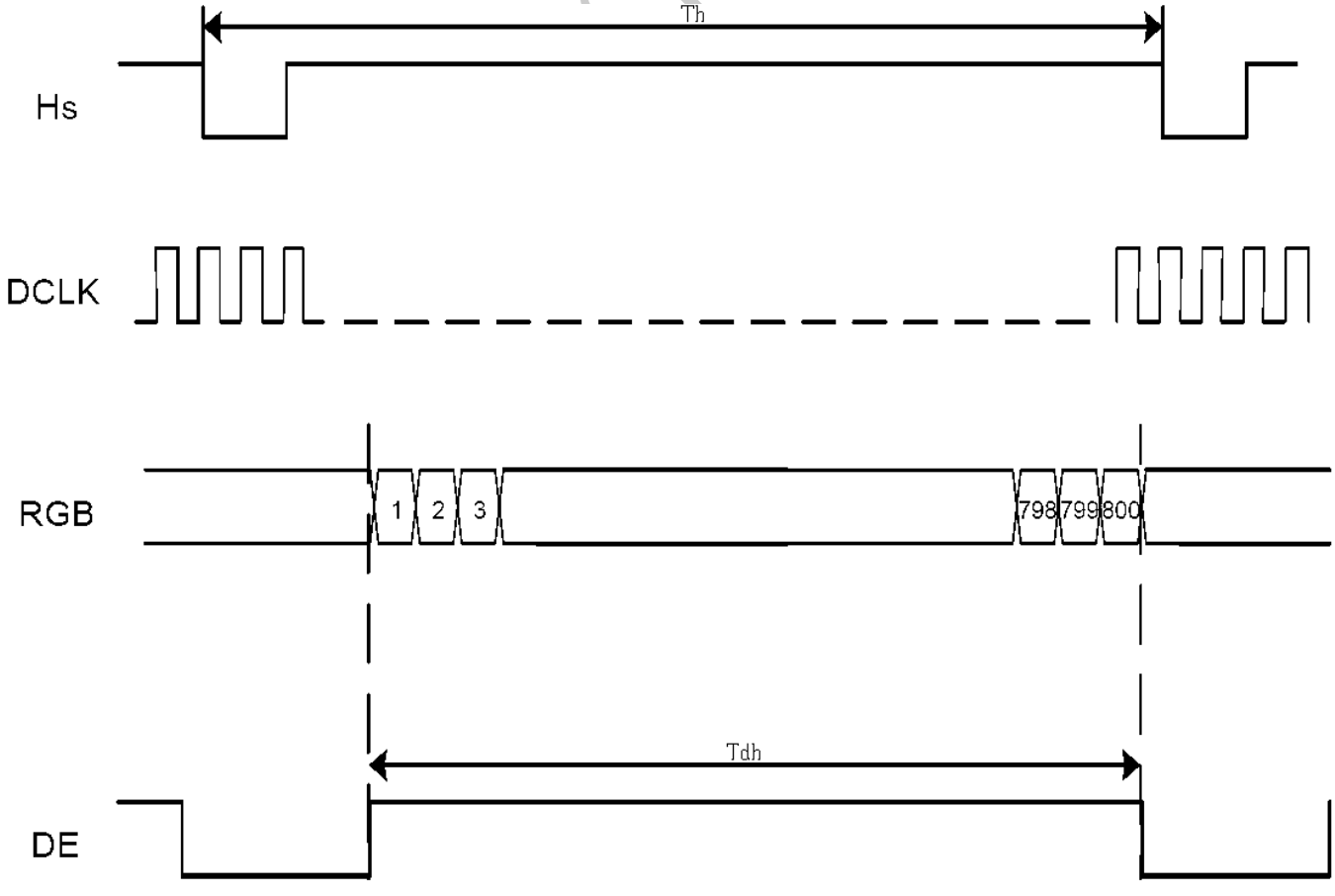


Fig.4 Horizontal timing 2

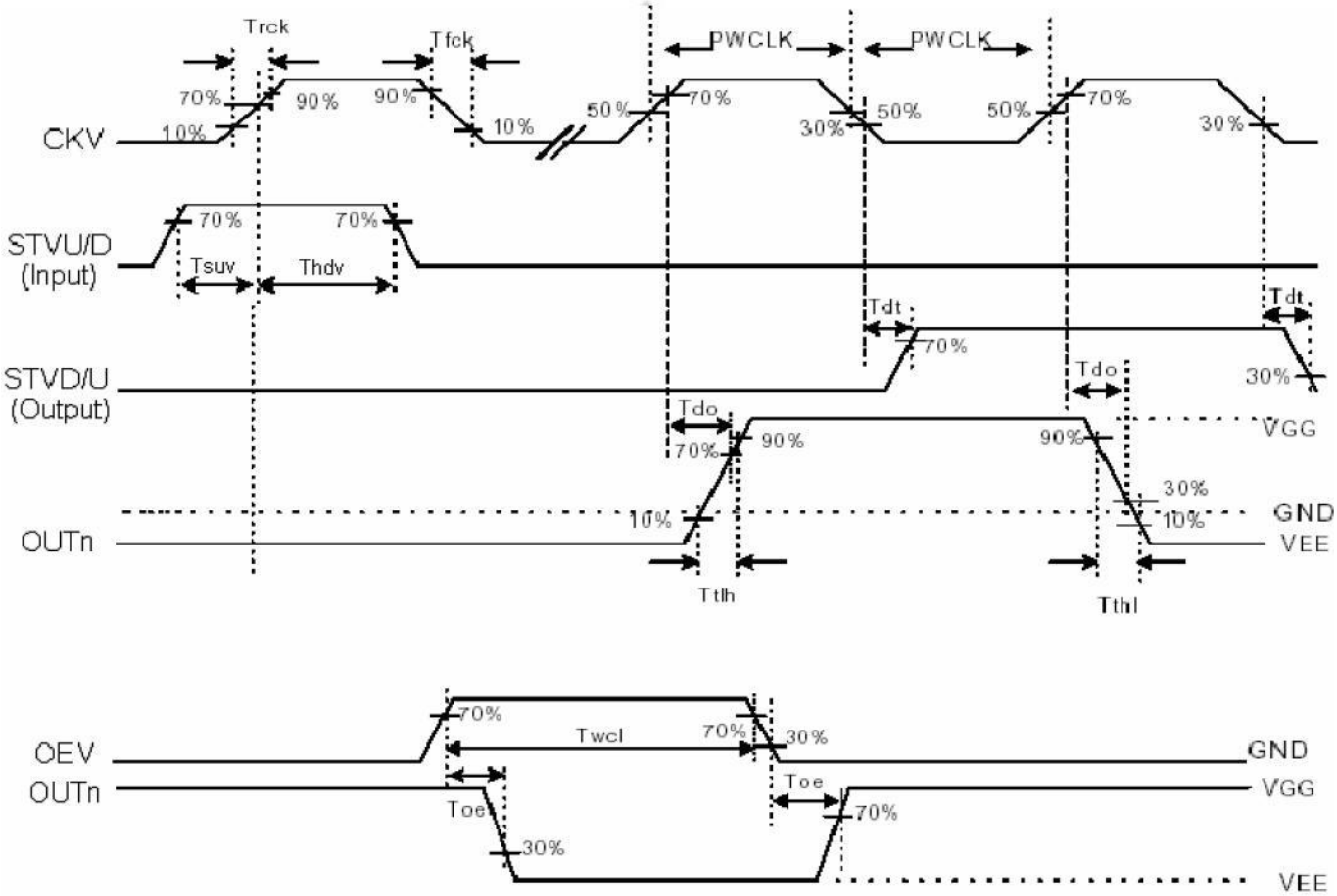


Fig.5 Vertical shift clock timing

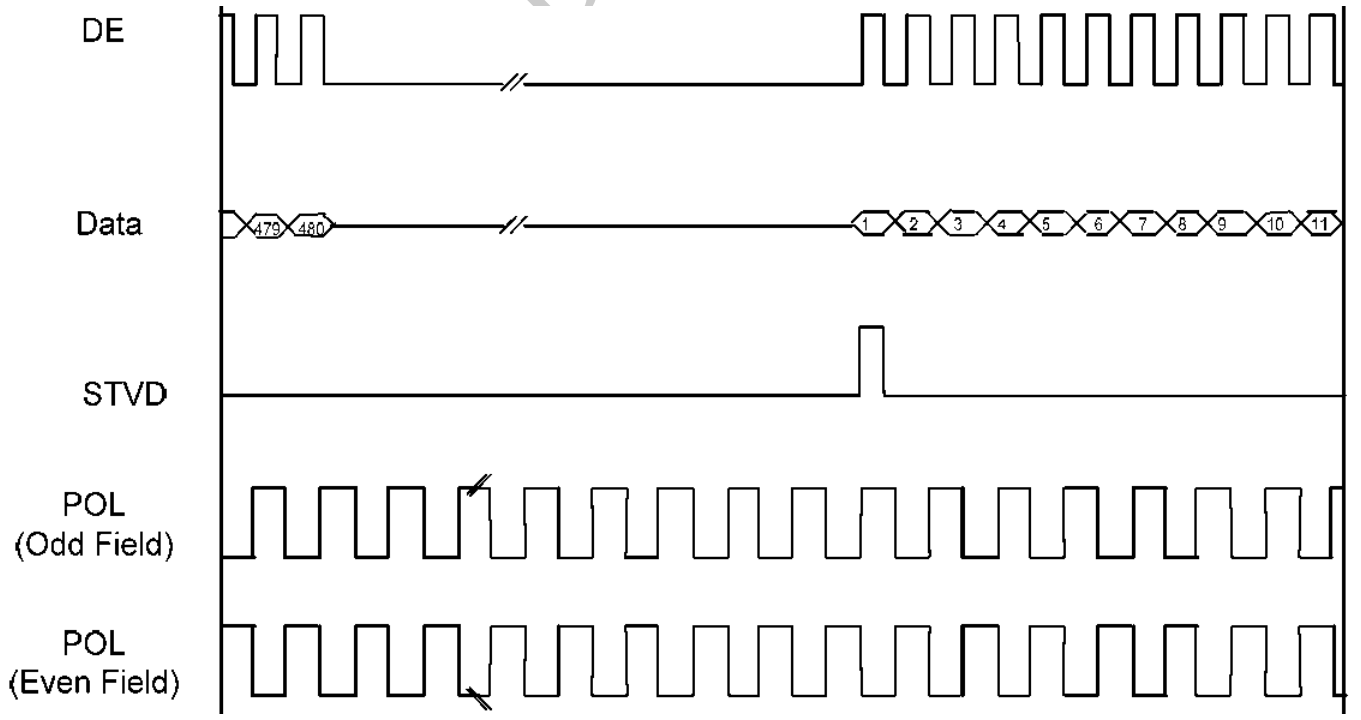


Fig.6 Vertical timing (from up to down)

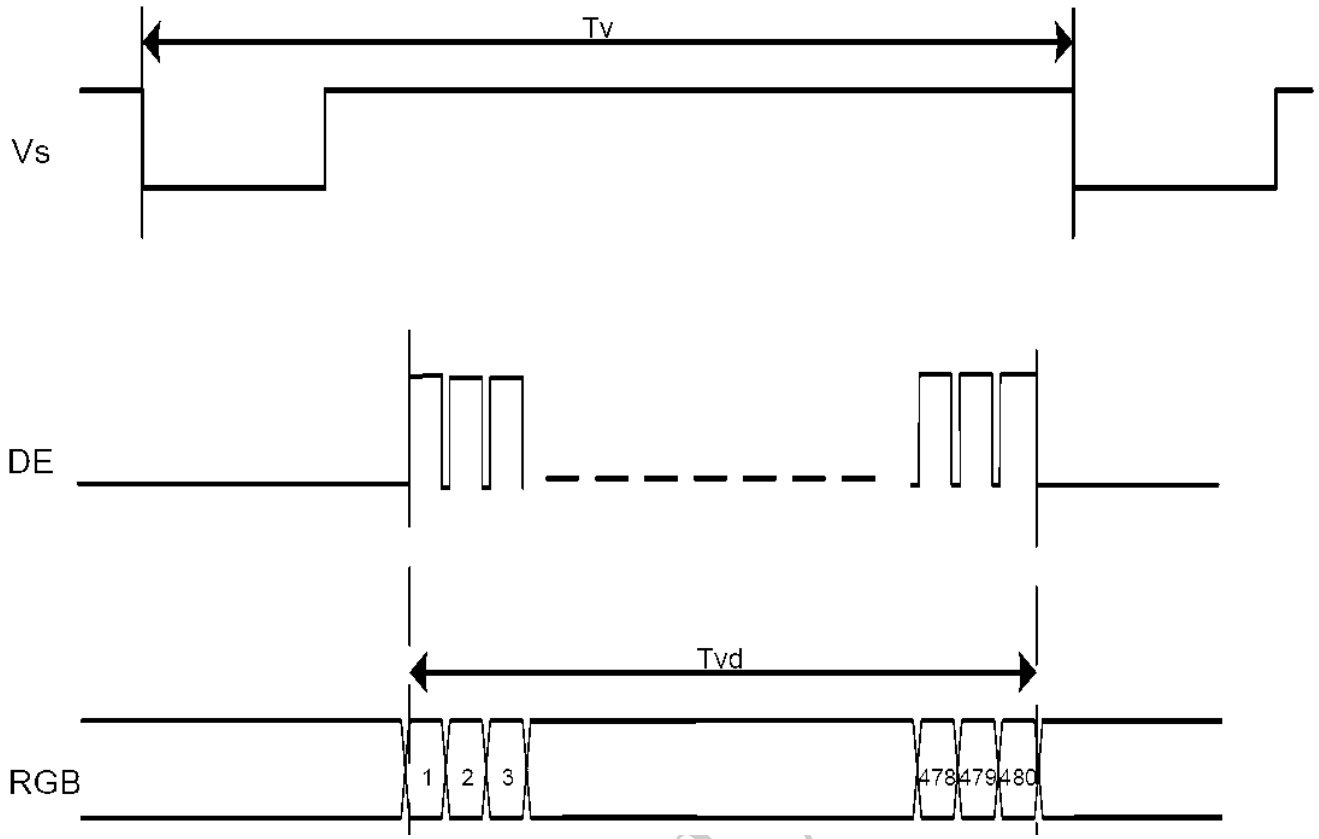


Fig.7 Vertical timing

7.4. TFT-LCD Timing controller

WF102ATIA series needs to add TFT-LCD Timing controller, TFT-LCD timing controller input signal is digital R/G/B with HS(HSYNC),VS(VSYNC) or DE. User can use the MODE pin to select input signal to be either SYNC mode or DE mode

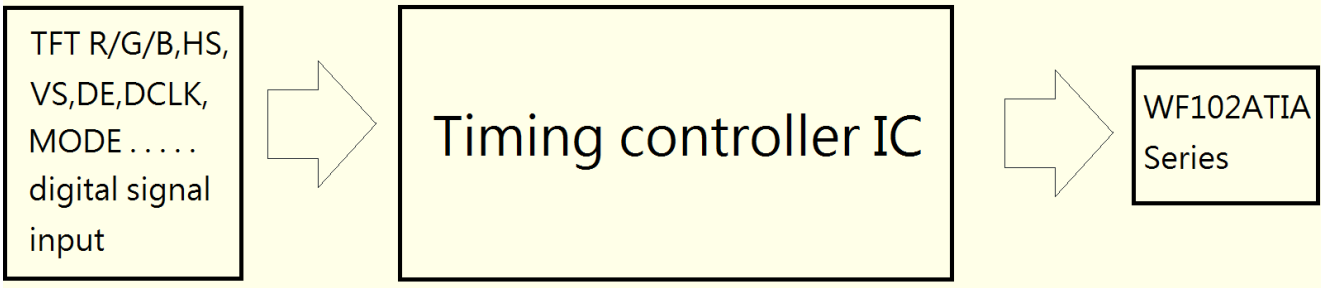


Fig.8 Example of Timing controller IC bloc

8.Optical Characteristics

TFT LCD characteristic (Without Capacitive Touch Panel)

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	θ =0°、Φ=0°	-	15	30	ms	Note 3,5
		Tf		-	20	40	ms	
Contrast ratio		CR	At optimized viewing angle	250	300	-	-	Note 4,5
Color Chromaticity	White	Wx	θ =0°、Φ=0	0.26	0.31	0.36	-	Note 2,6,7
		Wy		0.28	0.33	0.38	-	-
Viewing angle (Gray Scale Inversion Direction)	Hor.	ΘR	CR≧10	55	65	-	Deg.	Note 1
		ΘL		55	65	-		
	Ver.	ΦT		35	45	-		
		ΦB		55	65	-		
Brightness		-	-	200	250	-	cd/㎡	Center of display

Ta=25±2℃, IL=200mA

Note 1: Definition of viewing angle range

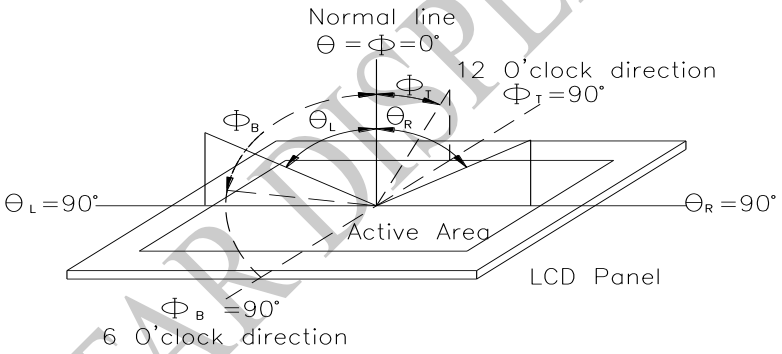


Fig.8.1. Definition of viewing angle

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

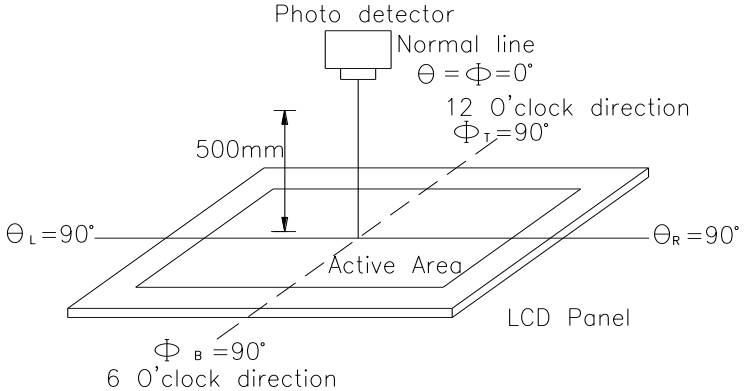
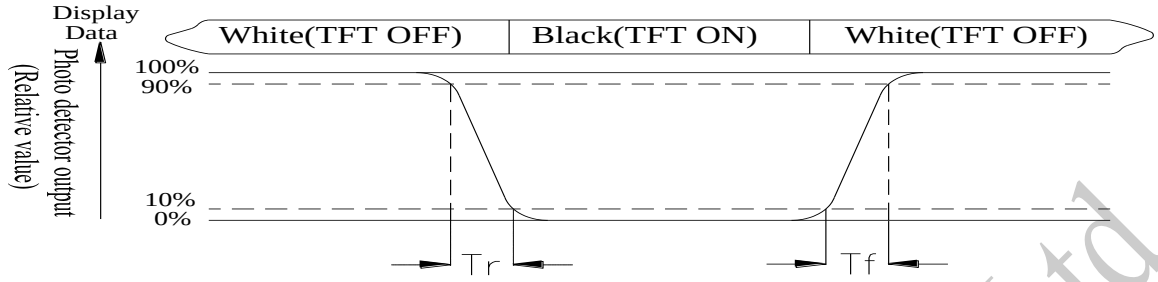


Fig. 8.2. Optical measurement system setup

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, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, 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: White Vi = Vi50 ± 1.5V
Black Vi = Vi50 ± 2.0V
“±” means that the analog input signal swings in phase with VCOM signal.
“±” means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

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. TFT LCD Panel Driving Section

FPC connector is used for the module electronics interface. The recommended model is “AF 730L-A2G1T” manufactured by P-TWO.

Pin No.	Symbol	I/O	Function	Remark
1	POL	I	Polarity selection	
2	STVD	I/O	Vertical start pulse input when U/D= H	Note 1
3	OEV	I	Output enable	
4	CKV	I	Vertical clock	
5	STVU	I/O	Vertical start pulse input when U/D= L	Note 1
6	GND	P	Power ground	
7	EDGSL	I	Select rising edge or rising/falling edge	
8	V_{CC}	P	Power supply for digital circuit	
9	V9	I	Gamma voltage level 9	
10	V_{GL}	P	Gate OFF voltage	
11	V2	I	Gamma voltage level 2	
12	V_{GH}	P	Gate ON voltage	
13	V6	I	Gamma voltage level 6	
14	U/D	I	Up/down selection	Note 1,2
15	V_{COM}	I	Common voltage	
16	GND	P	Power ground	
17	AV_{DD}	P	Power supply for analog circuit	
18	V14	I	Gamma voltage level 14	
19	V11	I	Gamma voltage level 11	
20	V8	I	Gamma voltage level 8	
21	V5	I	Gamma voltage level 5	
22	V3	I	Gamma voltage level 3	
23	GND	P	Power ground	
24	R5	I	Red data(MSB)	
25	R4	I	Red data	
26	R3	I	Red data	
27	R2	I	Red data	
28	R1	I	Red data	
29	R0	I	Red data(LSB)	
30	GND	P	Power ground	

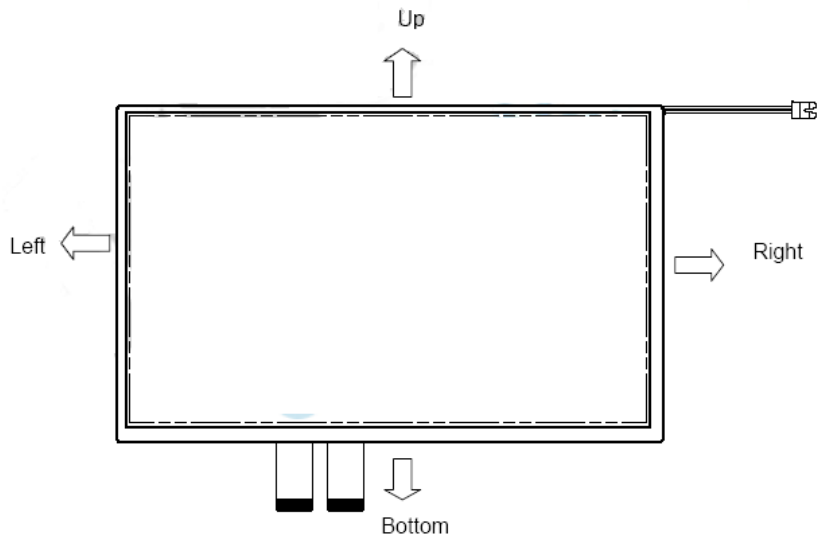
31	GND	P	Power ground	
32	G5	I	Green data(MSB)	
33	G4	I	Green data	
34	G3	I	Green data	
35	G2	I	Green data	
36	G1	I	Green data	
37	G0	I	Green data(LSB)	
38	STHL	I/O	Horizontal start pulse input when R/L = L	Note 1
39	REV	P	Control signal are inverted or not	Note 3
40	GND	I	Power ground	
41	DCLK	I	Sample clock	
42	VCC	P	Power supply for digital circuit	
43	STHR	I/O	Horizontal start pulse input when R/L = H	Note 1
44	LD	I	Latches the polarity of outputs and switches the new data to outputs	
45	B5	I	Blue data (MSB)	
46	B4	I	Blue data	
47	B3	I	Blue data	
48	B2	I	Blue data	
49	B1	I	Blue data	
50	B0	I	Blue data (LSB)	
51	R/L	I	Right/ left selection	Note 1,2
52	V1	I	Gamma voltage level 1	
53	V4	I	Gamma voltage level 4	
54	V7	I	Gamma voltage level 7	
55	V10	I	Gamma voltage level 10	
56	V12	I	Gamma voltage level 12	
57	V13	I	Gamma voltage level 13	
58	AVDD	P	Voltage for analog circuit	
59	GND	P	Power ground	
60	VCOM	I	Common voltage	

I: input, O: output, P: Power

Note 1: Selection of scanning mode

Setting of scan control input		IN/OUT state for start pulse				Scanning direction
U/D	R/L	STVD	STVU	STHR	STHL	
GND	VCC	O	I	I	O	Up to down, left to right
VCC	GND	I	O	O	I	Down to up, right to left
GND	GND	O	I	O	I	Up to down, right to left
VCC	VCC	I	O	I	O	Down to up, left to right

Note 2: Definition of scanning direction.
Refer to the figure as below:



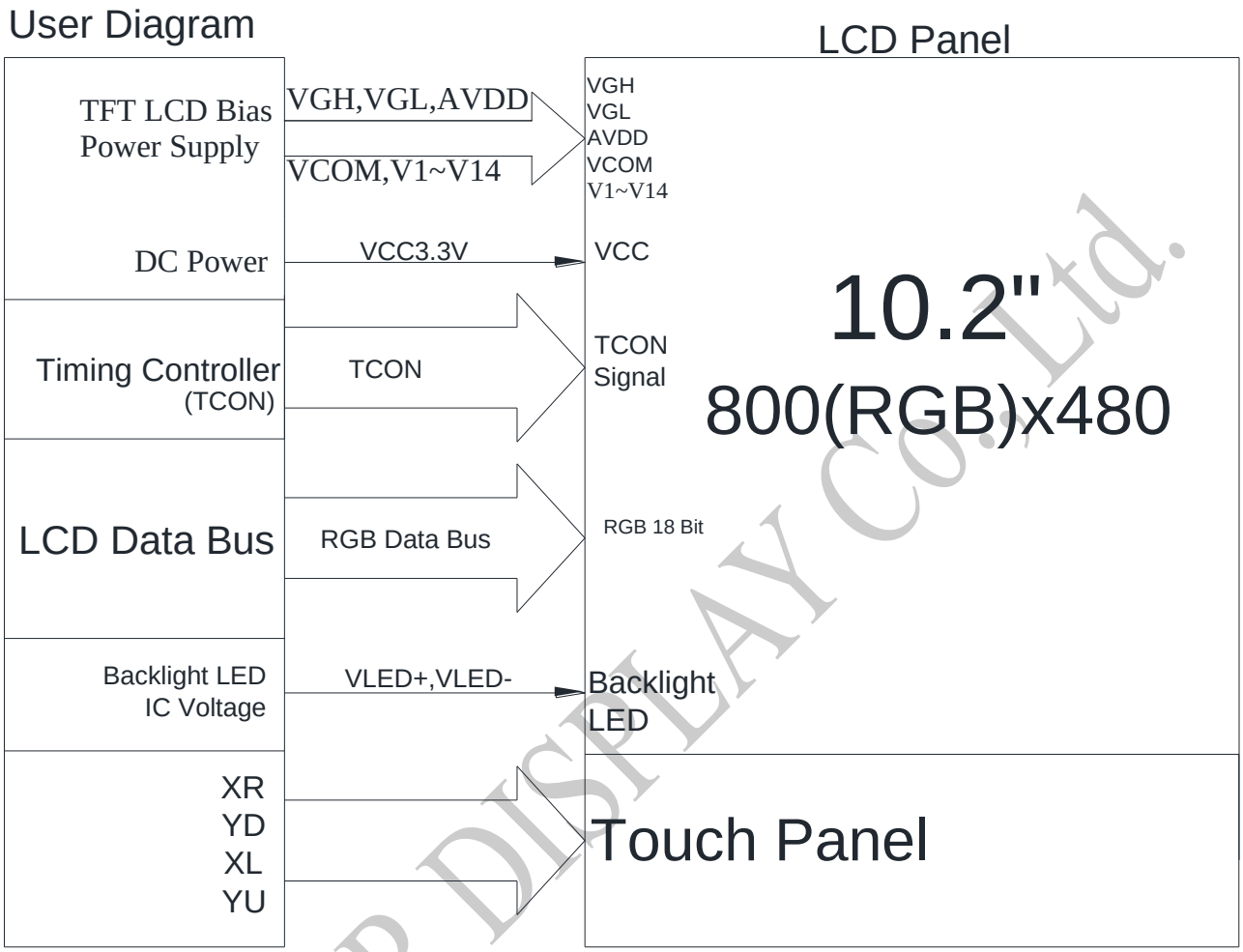
Note 3: When REV="L" , normally REV="H", these data will be inverted.

9.2. Backlight Unit Section

LED Light Bar connector is used for the the integral backlight system. The recommended model is "BHSR-02VS-1" manufactured by JST.

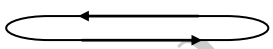
Pin No.	Symbol	I/O	Function	Remark
1	V_{LED+}	P	Power for LED backlight anode	Pink
2	V_{LED-}	P	Power for LED backlight cathode	White

10.Block Diagram



11.Reliability

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

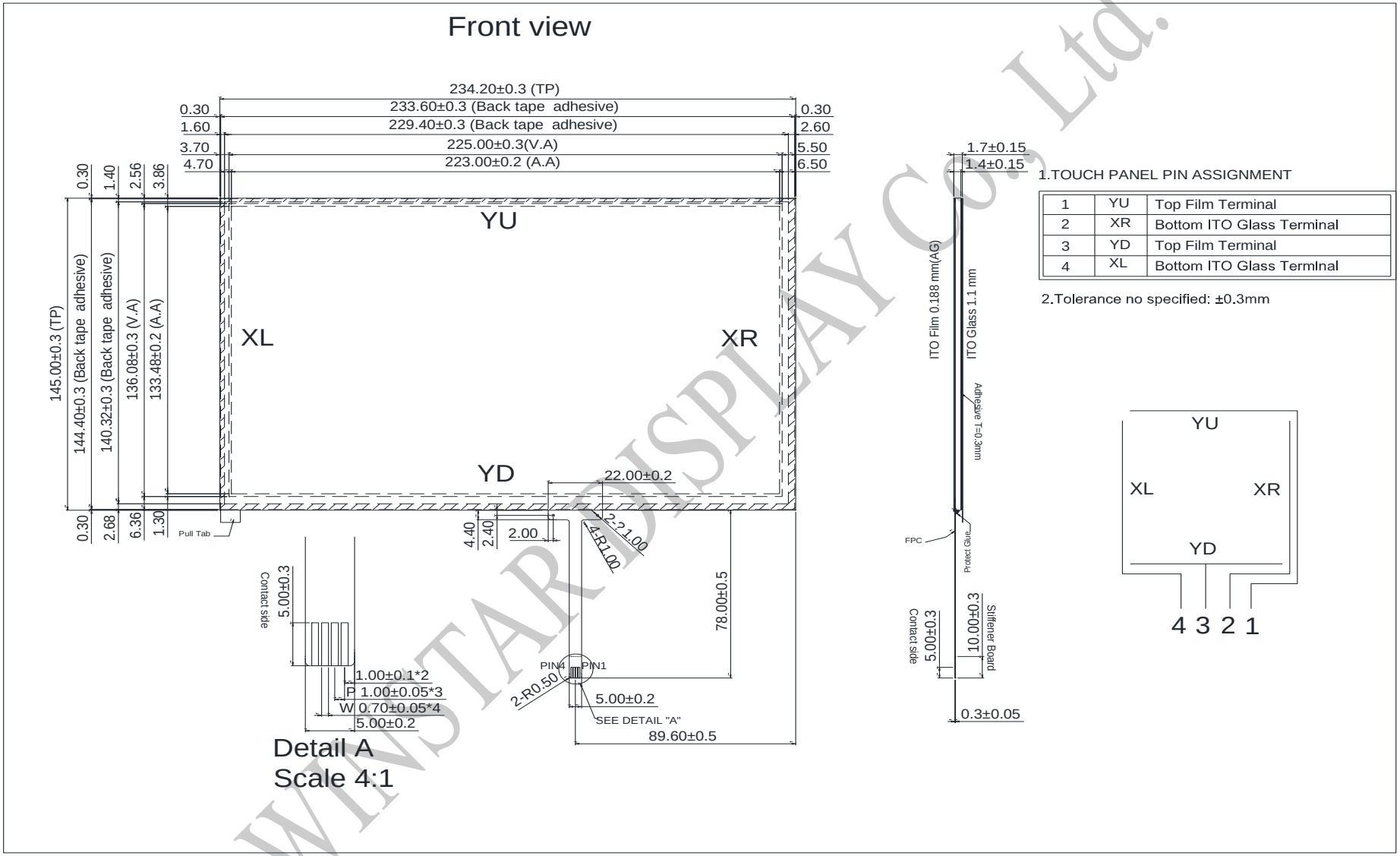
Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	85℃ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30℃ 200hrs	1
High Temperature/ Humidity storage	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -30℃ 25℃ 85℃  30min 5min 30min 1 cycle	-30℃/85℃ 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.

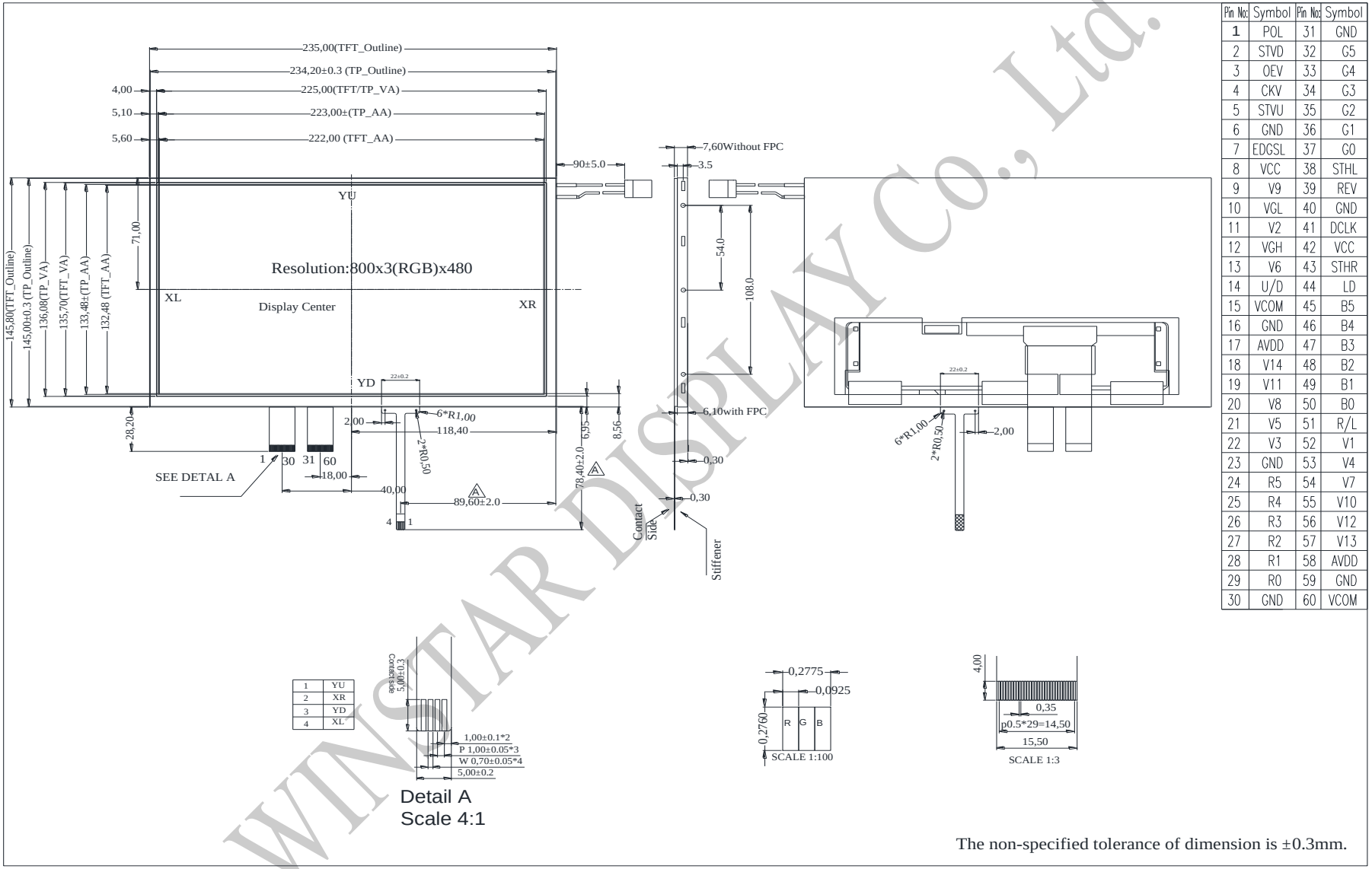
12.Touch Panel Information



12.1. Resistance Touch Panel General Specifications

Item	Description
Driving condition	DC5V
Operating force	50~120g
Linearity max	≤±1.5%
Insulating resistance	＞20MΩ，25V(DC)
Light transparence	70%
Structure type	ITO Film/ITO Glass(F/G)
Surface Hardness	3H typ
Pen Hitting Durability (with the silicon rubber)	＞1000,000 times
X resistance	350~1100Ω
Y resistance	100~750Ω

13.Contour Drawing



Pin No:	Symbol	Pin No:	Symbol
1	POL	31	GND
2	STVD	32	G5
3	OEV	33	G4
4	CKV	34	G3
5	STVU	35	G2
6	GND	36	G1
7	EDGSL	37	G0
8	VCC	38	STHL
9	V9	39	REV
10	VGL	40	GND
11	V2	41	DCLK
12	VGH	42	VCC
13	V6	43	STHR
14	U/D	44	LD
15	VCOM	45	B5
16	GND	46	B4
17	AVDD	47	B3
18	V14	48	B2
19	V11	49	B1
20	V8	50	B0
21	V5	51	R/L
22	V3	52	V1
23	GND	53	V4
24	R5	54	V7
25	R4	55	V10
26	R3	56	V12
27	R2	57	V13
28	R1	58	AVDD
29	R0	59	GND
30	GND	60	VCOM

The non-specified tolerance of dimension is ±0.3mm.

winstar

LCM Sample Estimate Feedback Sheet

Module Number： _____

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 Specification：

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 Type)：	□ 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 <<

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：** **/ /**