



**Winstar Display Co., LTD**  
**華凌光電股份有限公司**



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**SPECIFICATION**

**CUSTOMER :** \_\_\_\_\_

**MODULE NO.:** WF102DTIAHLNNO#

<p><b>APPROVED BY:</b>  ( FOR CUSTOMER USE ONLY )</p>	<p><b>PCB VERSION:</b> _____ <b>DATA:</b> _____</p>
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
<b>ISSUED DATE: 2016/10/05</b>			



**RECORDS OF REVISION**

**DOC. FIRST ISSUE**

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2016/05/27		First issue
A	2016/08/10		Modify Vibration test.
B	2016/10/05		Modify Summary Add Aspect Ratio

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# 1.Module Classification Information

W F 102 D 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 : 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.

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### **3.General Specifications**

<b>Item</b>	<b>Dimension</b>	<b>Unit</b>
Size	10.2	inch
Dot Matrix	1024 x RGB x 600(TFT)	dots
Module dimension	235.0(W) x 145.8(H) x5.3(D)	mm
Active area	222.72 x 130.5	mm
Dot pitch	0.2175 x 0.2175	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Aspect Ratio	4:3	
Backlight Type	LED,Normally White	
With /Without TP	Without TP	
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  $60^{\circ}\text{C}$

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# 5. Electrical Characteristics

## 5.1. TFT LCD Power Voltage

Ta=25°C

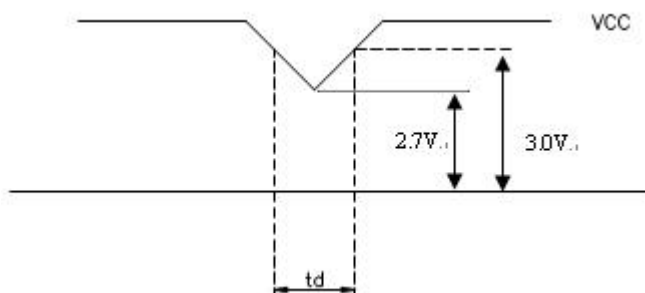
ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE	
Power Supply Voltage For LCD	V <sub>CC</sub>	3.0	3.3	3.6	V	[Note1]	
Power Supply Voltage For LED	V <sub>LED</sub>	11.5	12	12.5	V		
Logic Input Voltage (LVDS:IN+,IN-)	Input Voltage	V <sub>IN</sub>	0	-	V <sub>CC</sub>	V	[Note2]
	Common Mode Voltage	V <sub>CM</sub>	1.08	1.2	1.32	V	[Note2]
	Differential Input Voltage	V <sub>ID</sub>	250	350	450	mV	[Note2]
	Threshold Voltage(high)	V <sub>TH</sub>	-	-	100	mV	[Note2]
	Threshold Voltage(low)	V <sub>TL</sub>	-100	-	-	mV	[Note2]
ADJ Input Voltage	Input Voltage(high)	V <sub>IH</sub>	3.0	-	3.3	V	
	Input Voltage(low)	V <sub>IL</sub>	GND	-	0.3	V	

Remarks :

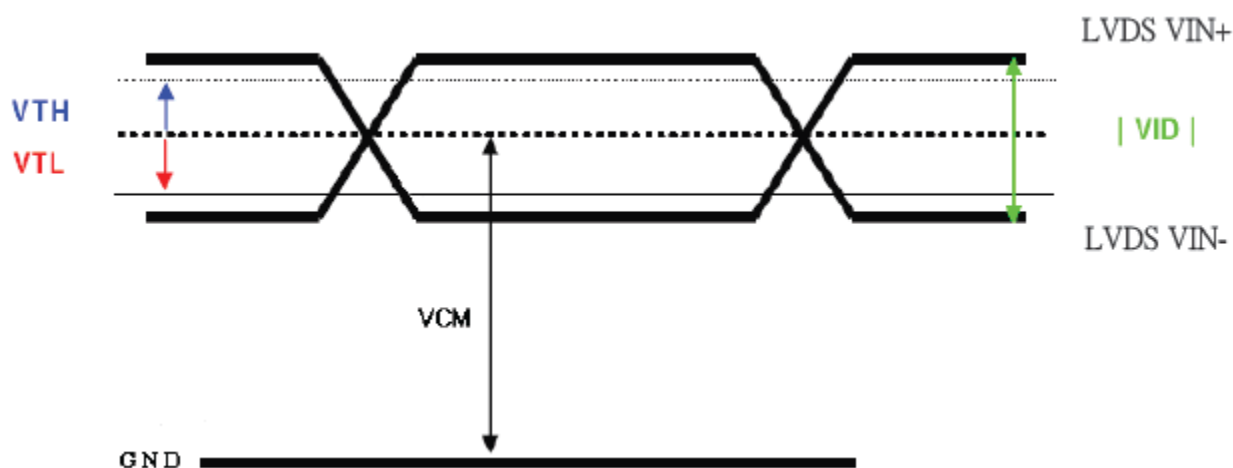
[Note1] VCC -dip condition:

1) When  $2.7\text{ V} \leq V_{CC} < 3.0\text{ V}$  ,  $t_d \leq 10\text{ ms}$ .

2)  $V_{CC} > 3.0\text{ V}$  , VCC-dip condition should be same as VCC-turn-on condition.



[Note2] LVDS signal





## 5.2. TFT-LCD Current Consumption

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LCD Power Current	$I_{CC}$	--	250	350	mA	[Note1]

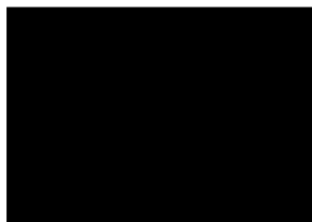
[Note1] (Frame rate = 60 Hz)

Typical: Under 64 gray pattern @  $V_{CC} = 3.3\text{ V}$

Maximum: Under black pattern @  $V_{CC} = 3.0\text{ V}$

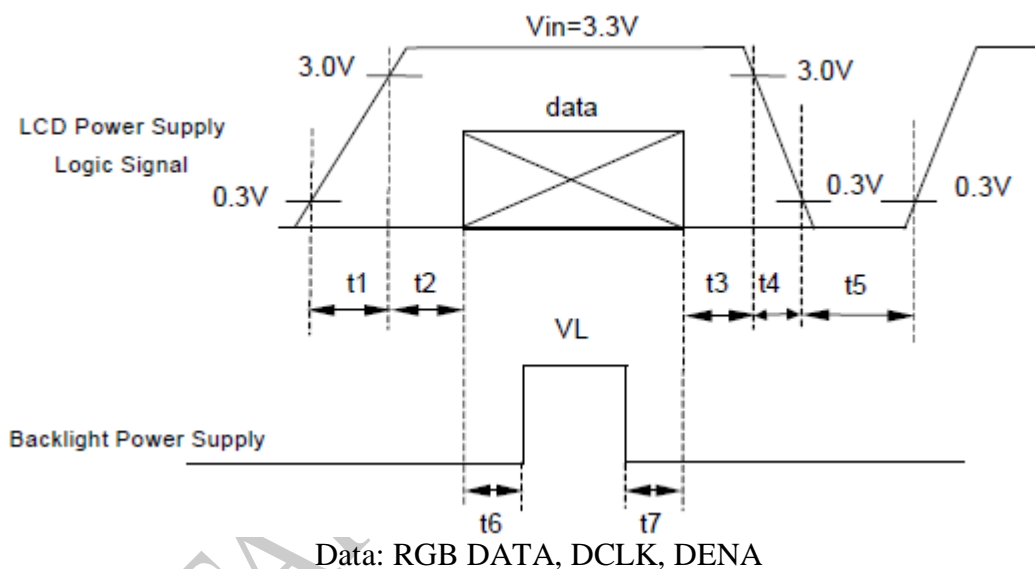


(a) 64 Gray Pattern



(b) Black Pattern

## 5.3. Power & Signal Sequence



$$0.5 < t1 \leq 10\text{ms} \quad 200\text{ms} \leq t5$$

$$0 < t2 \leq 50\text{ms} \quad 200\text{ms} \leq t6$$

$$0 < t3 \leq 50\text{ms} \quad 200\text{ms} \leq t7$$

$$0 < t4 \leq 10\text{ms}$$

#### 5.4. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current		-	300	450	mA	
Power Consumption		-	3600	5625	mW	
LED voltage	VBL+	11.5	12.0	12.5	V	Note 1
LED Life Time		-	20,000	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED

Note 2 : Ta = 25 °C

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

Note 4 : The single LED lamp case

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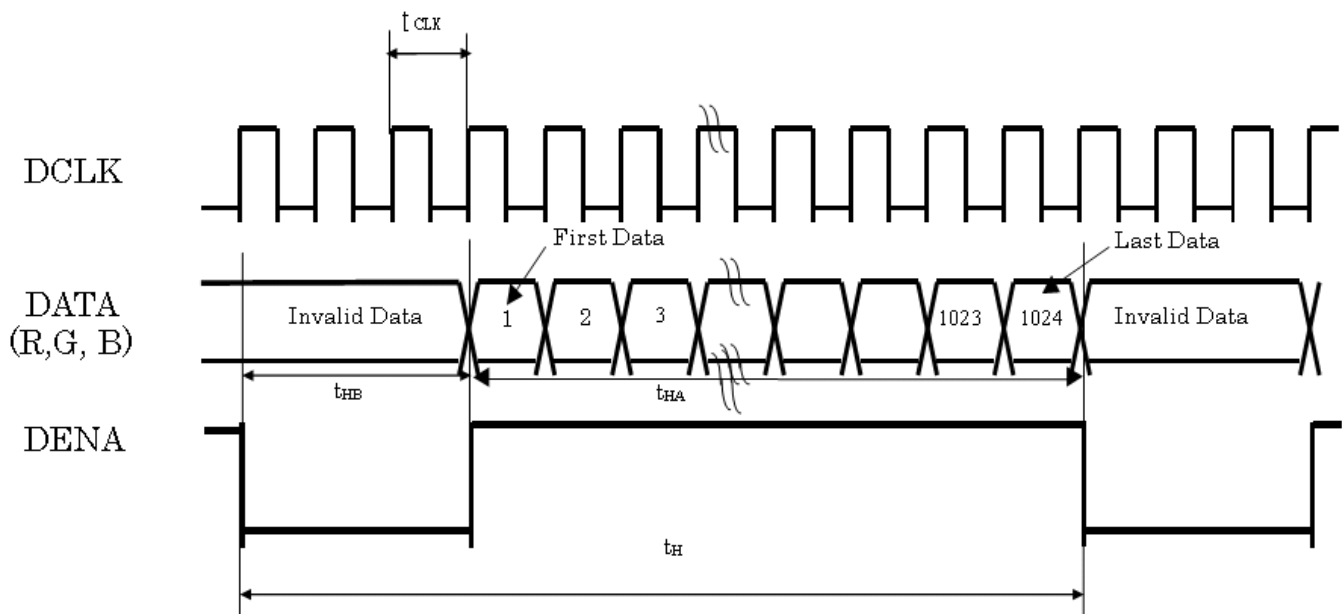
# 6. Input Signal

## 6.1. Timing Specification

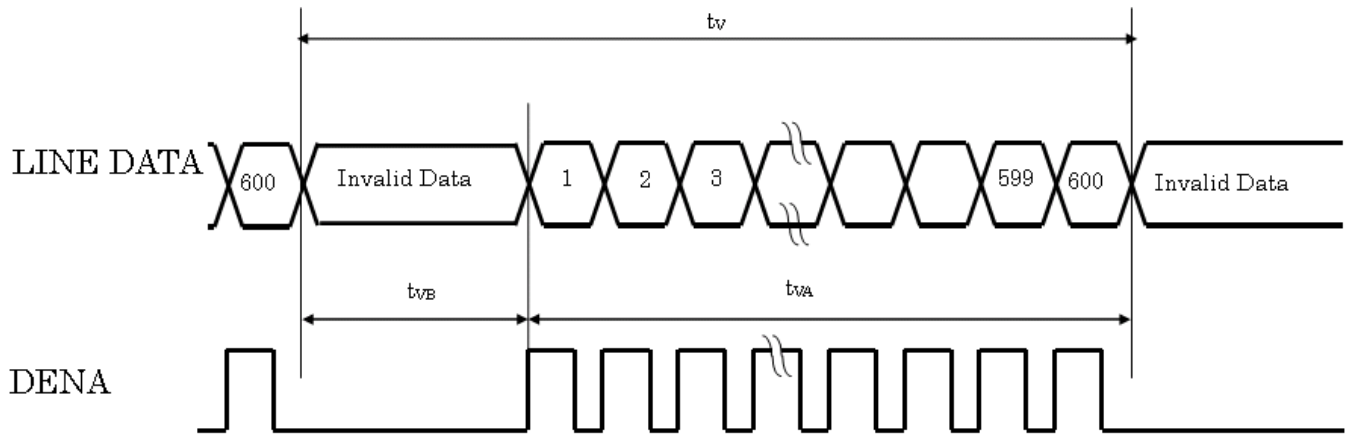
ITEM				SYMBOL	MIN.	TYP.	MAX.	UNIT
LVDS input signal sequence	CLK Frequency			tCLK	41	45	50	MHz
	CLK Period			tCLK	24.39	22.22	20.00	ns
LCD input timing	DENA	Horizontal	Horizontal Period	t <sub>H</sub>	1194	1200	1240	tCLK
			Horizontal Valid	t <sub>HA</sub>	1024	1024	1024	tCLK
			Horizontal Blank	t <sub>HB</sub>	170	176	216	tCLK
	Vertical	Frame	f <sub>V</sub>	55	60	65	H <sub>z</sub>	
		Vertical Period	t <sub>V</sub>	624	625	638	t <sub>H</sub>	
		Vertical Valid	t <sub>VA</sub>	600	600	600	t <sub>H</sub>	
		Vertical Blank	t <sub>VB</sub>	24	25	38	t <sub>H</sub>	

## 6.2. Timing Sequence (Timing Chart)

### Horizontal Timing Sequence

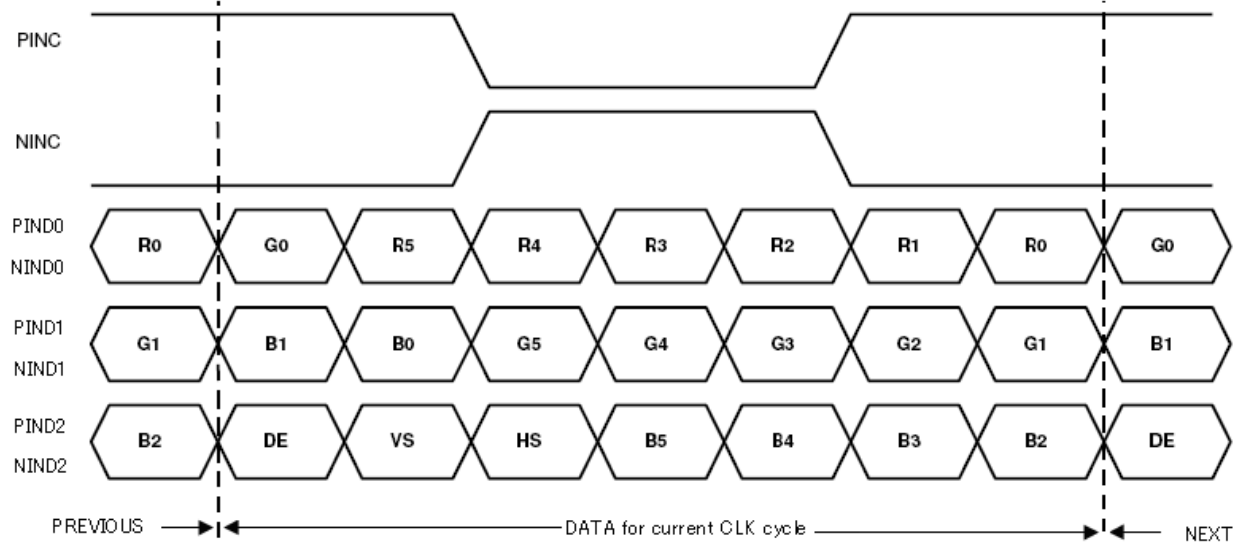


## Vertical Timing Sequence

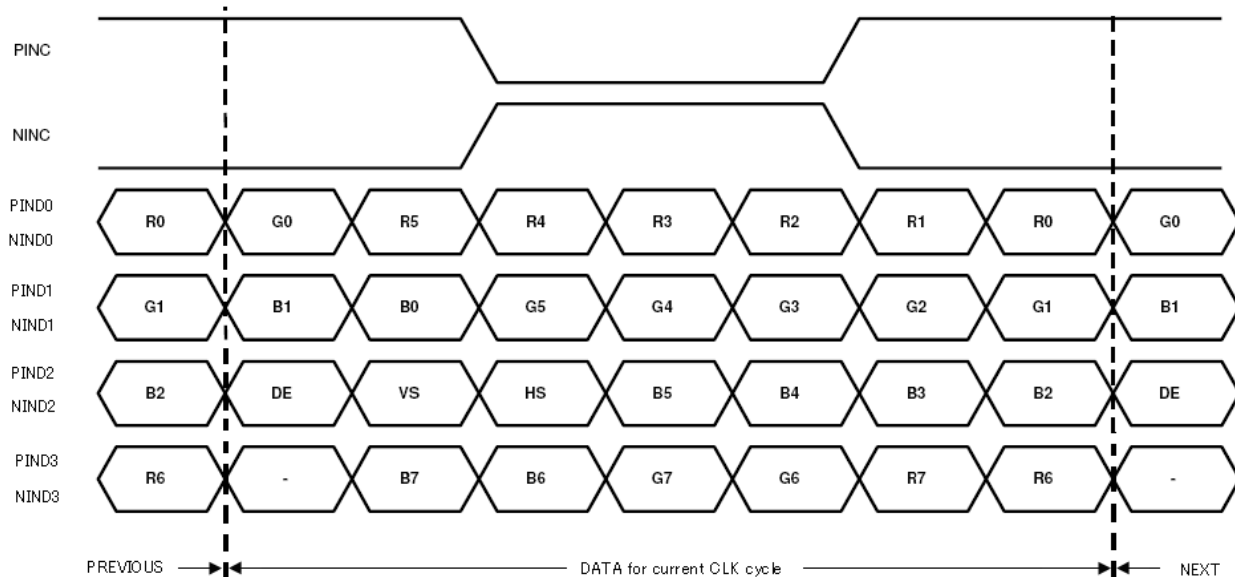


## LVDS Input Data Mapping

6bits LVDS input



8bits LVDS input



### 6.3. Color Data Assignment

COLOR	INPUT	R DATA						G DATA						B DATA					
	DATA	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENT	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

[Note1] Definition of Gray Scale

color(n) : n is series of Gray Scale. The more n value is, the bright Gray Scale.

[Note2] Data: 1-High, 0-Low

# 7. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr	$\theta=0^\circ$ 、 $\Phi=0^\circ$	-	25	30	ms	Note 3	
	Tf					ms		
Contrast ratio	CR	At optimized viewing angle	500	700	-	-	Note 4	
Color Chromaticity	White	$\theta=0^\circ$ 、 $\Phi=0^\circ$	0.273	0.313	0.353	-	Note 2,5	
						0.289		0.329
Viewing angle (Gray Scale Inversion Direction)	Hor.	$\Theta_R$	$CR \geq 10$	60	70	-	Deg.	Note 1
		$\Theta_L$		60	70	-		
	Ver.	$\Phi_T$		45	55	-		
		$\Phi_B$		55	65	-		
Brightness	-	-	360	400	-	cd/m <sup>2</sup>	Center of display	

Ta=25±2°C,

Note 1: Definition of viewing angle range

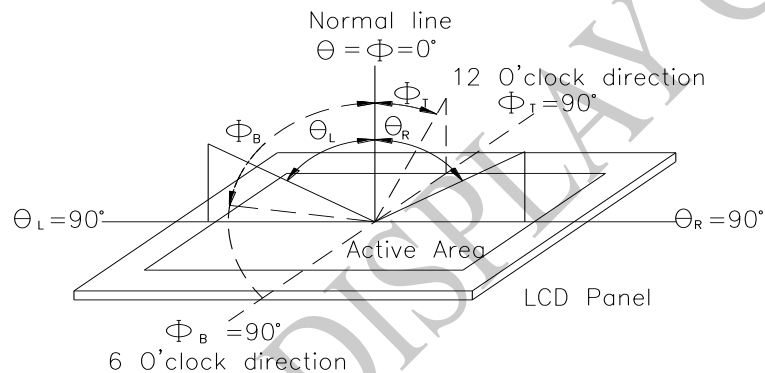


Fig. 7.1. Definition of viewing angle

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.

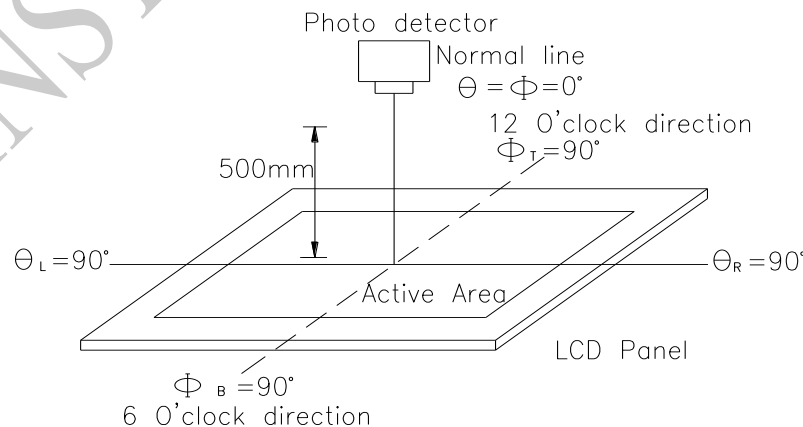
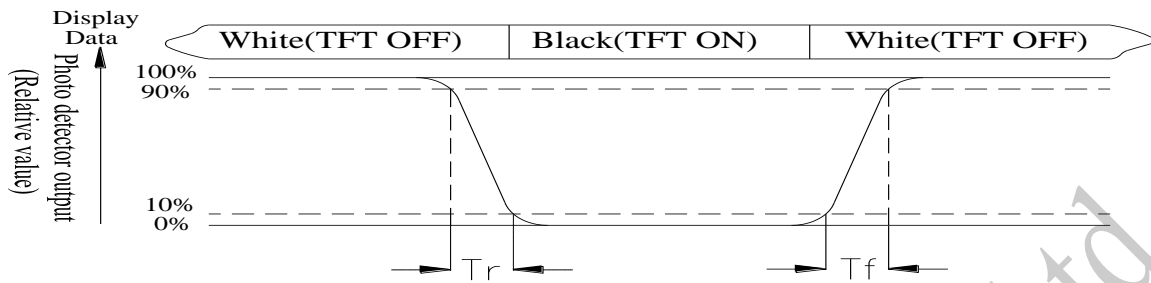


Fig. 7.2. Optical measurement system setup

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: White  $V_i = V_{i50} \pm 1.5V$

Black  $V_i = V_{i50} \pm 2.0V$

“±” 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.

# 8.Interface

## 8.1. LCM PIN Definition

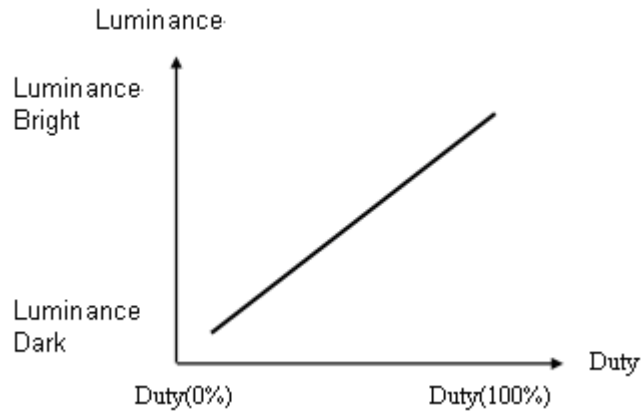
CN1 : Connector type : MSBK2407P30D (STM) or compatible.

Pin No.	SYMBOL	FUNCTION
1	GND	Ground
2	VCC	+3.3V Power
3	VCC	+3.3V Power
4	NC	NC
5	ADJ	Adjust for LED brightness
6	SELB	6bit/8bit mode select
7	NC	NC
8	RXIN0-	LVDS Signal(-)—channel 0
9	RXIN0+	LVDS Signal(+)—channel 0
10	GND	Ground
11	RXIN1-	LVDS Signal(-)—channel 1
12	RXIN1+	LVDS Signal(+)—channel 1
13	GND	Ground
14	RXIN2-	LVDS Signal(-)—channel 2
15	RXIN2+	LVDS Signal(+)—channel 2
16	GND	Ground
17	RXCLKIN-	LVDS Clock Signal(-)
18	RXCLKIN+	LVDS Clock Signal(+)
19	GND	Ground
20	RXIN3-	LVDS Signal(-)—channel 3
21	RXIN3+	LVDS Signal(+)—channel 3
22	GND	Ground
23	GND	Ground
24	VLED	Power Supply for LED(VLED =12.0±0.5)
25	VLED	Power Supply for LED(VLED =12.0±0.5)
26	VLED	Power Supply for LED(VLED =12.0±0.5)
27	NC	NC
28	NC	NC
29	NC	NC
30	NC	NC



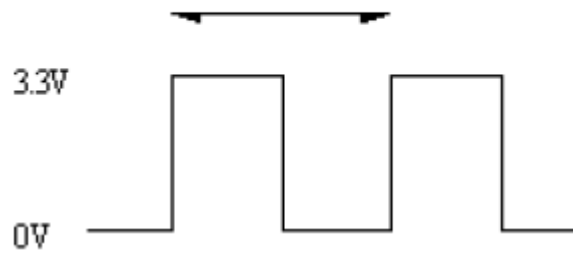
[Note]

1) ADJ adjust brightness to control Pin , Pulse duty the bigger the brighter.



2) ADJ signal=0~3.3V , operation frequency :  $25\text{KHz} \pm 5\text{KHz}$ , ADJ pin should not connect to GND, it should pull-high if not adjust brightness.

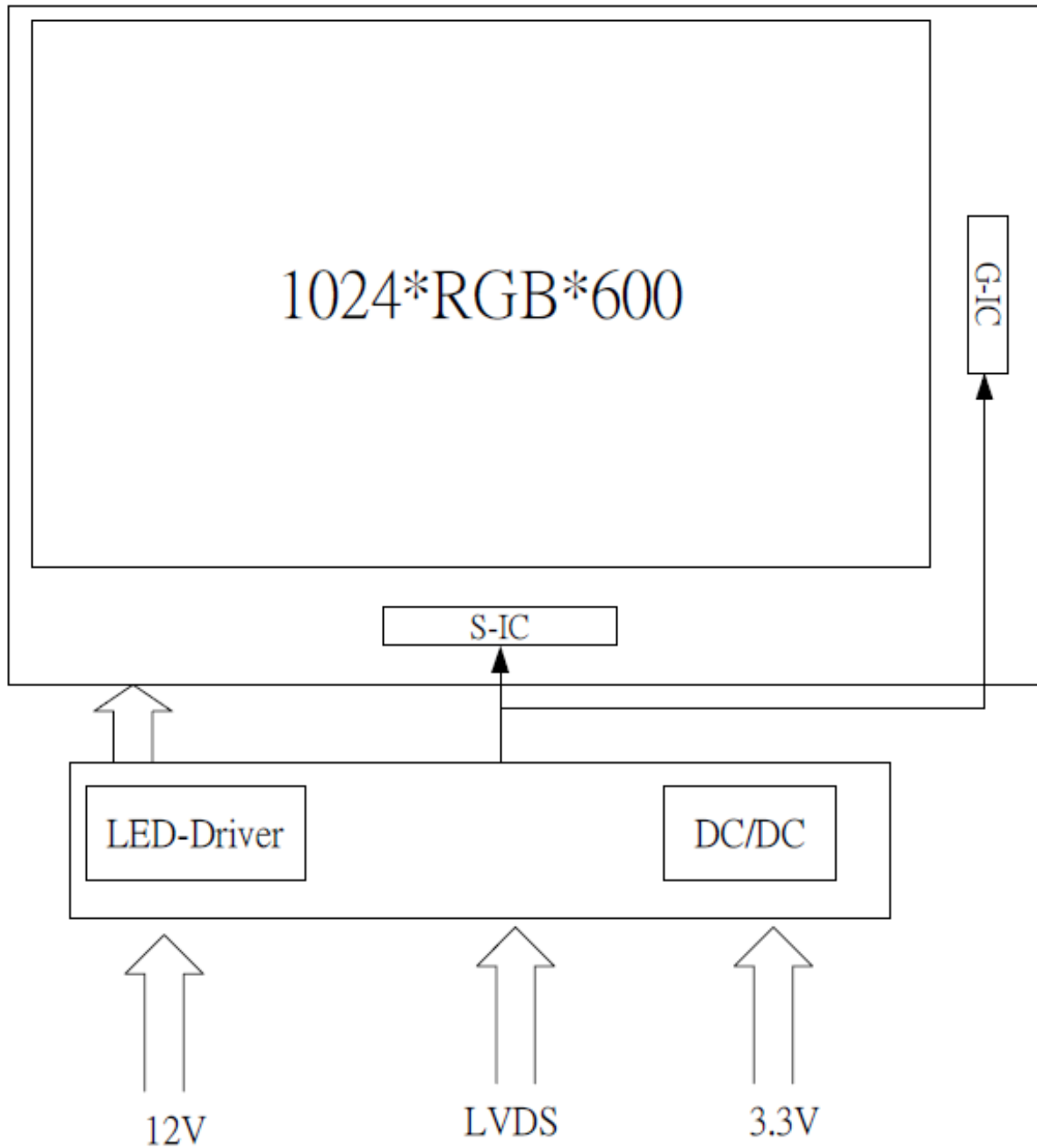
$$F = 25\text{KHz} \pm 5\text{KHz} , \\ T = 0.05\text{ms}$$



3) GND Pin must ground contact , can not be floating.

4) if LVDS input data is 6bits, SELB must be set to High  
if LVDS input data is 8bits, SELB must be set to Low

## 9. Block Diagram



# 10. Reliability

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

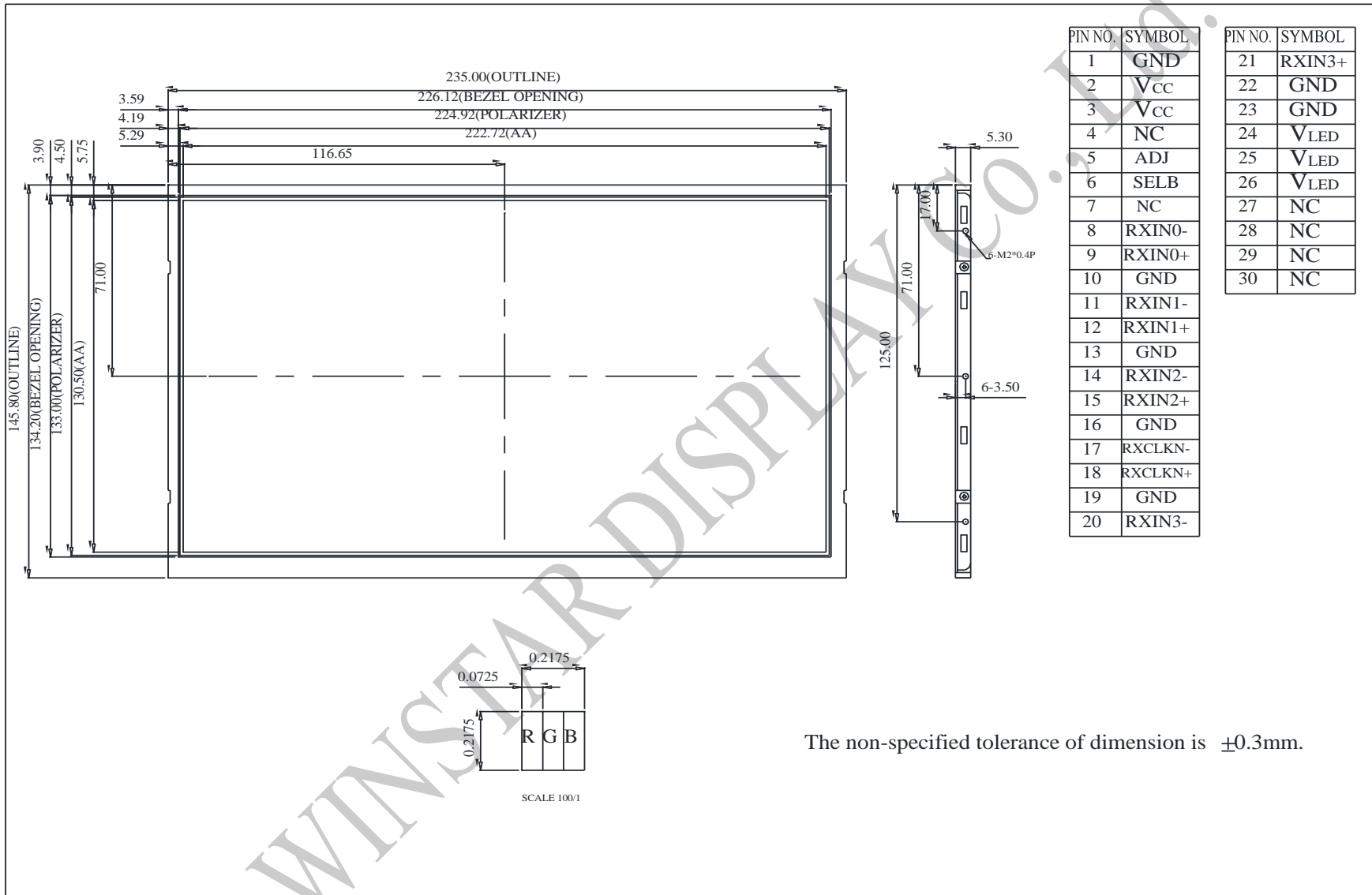
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature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

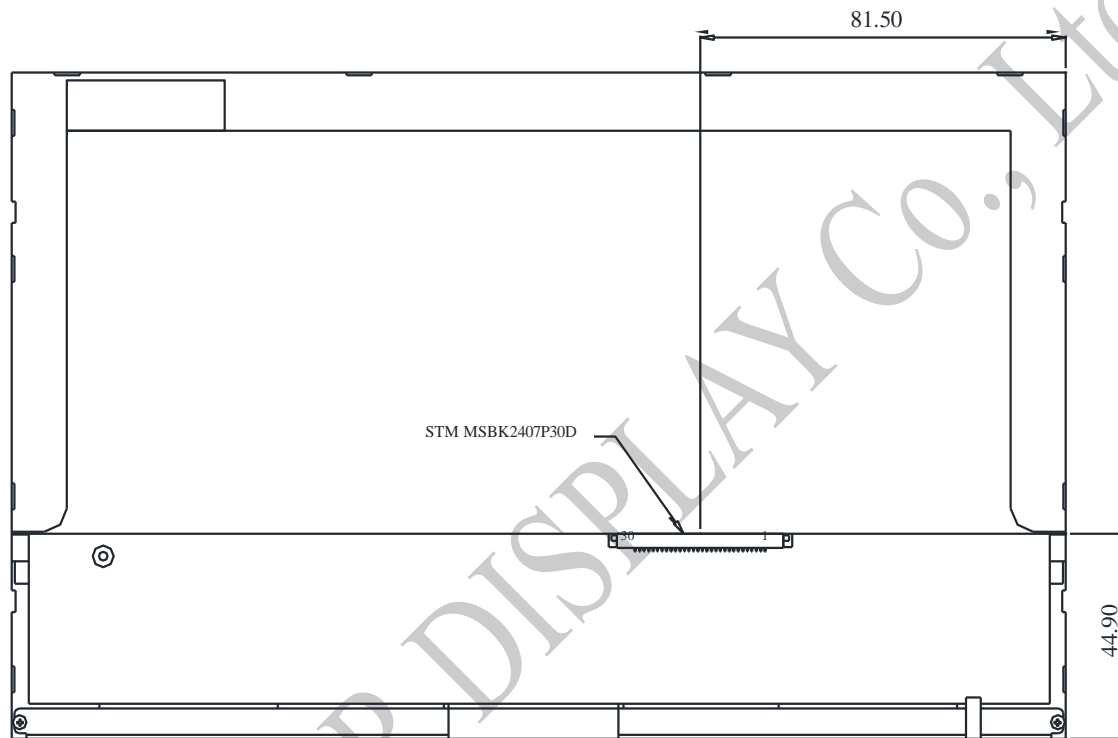
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

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

# 11. Contour Drawing



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



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 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 , \_\_\_\_\_



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 :      /      /      \_\_\_\_\_

