



**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**

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## SPECIFICATION

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

**MODULE NO.:** WF70DTAAHMNNY#

<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: 2017/07/07</b>			

MODLE NO :

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2016/06/30		First issue
A	2016/10/05		Modify Summary Add Aspect Ratio
B	2017/07/07		Modify temperature and Brightness.

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# 1.Module Classification Information

W F 70 D T A A H M N N Y #  
 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 X→Transmissive, W.T, VA TFT Y→Transmissive, W.T, IPS TFT Z→Transmissive, W.T, O-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	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							
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)												
⑫	Version												
⑬	Special Code	#:Fit in with ROHS directive regulations											

## **2.Summary**

TFT 7.0”is a IPS transmissive type color active matrix TFT liquid crystal display . In-Plane Switching (IPS) was one of the first refinements to produce significant gains in the light-transmissive characteristics of TFT panels. It is a technology that addresses the two main issues of a standard twisted nematic (TN) TFT display: colour and viewing angle.

### **3. General Specifications**

<b>Item</b>	<b>Dimension</b>	<b>Unit</b>
Size	7.0	inch
Dot Matrix	1024 x RGBx600(TFT)	dots
Module dimension	164.1(W) x 97.0(H) x 2.6(D)	mm
Active area	154.21 x 85.92	mm
Dot pitch	0.1506 x 0.1432	mm
LCD type	TFT, Normally Black, Transmissive	
View Direction	Full	
Aspect Ratio	16:9	
Backlight Type	LED, Normally White	
With /Without TP	Without TP	
Surface	Glare	

\*Color tone slight changed by temperature and driving voltage.

## 4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+55	°C
Storage Temperature	TST	-30	—	+60	°C

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

1. Temp.  $\leq 40^{\circ}\text{C}$ , 90% RH MAX. Temp.  $> 60^{\circ}\text{C}$ , Absolute humidity shall be less than 40% RH at  $60^{\circ}\text{C}$



# 5. Electrical Characteristics

## 5.1. Typical operation conditions (Note 1)

Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Power Voltage	DVDD	1.79	1.80	1.89	V	
	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	3.15	3.2	3.25	V	
Input logic high voltage	VIH	0.7DVDD	-	DVDD	V	
Input logic low voltage	VIL	0		0.3DVDD	V	

Note \*1. VCOM must be optimized according to each LCM. Be sure to use VR and OP buffer on VCOM output. Please adjust VCOM to make the flicker level be minimum for getting excellent image.

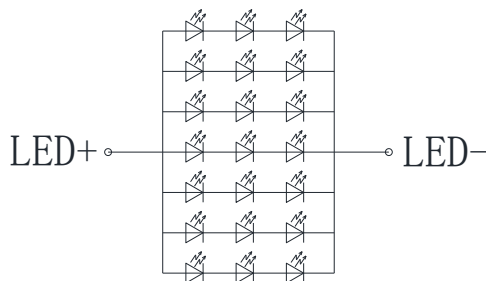
## 5.2. Current consumption

Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	IGH	-	0.7	1.5	mA	$V_{GH}=18.0V$
	IGL	-	0.7	1.5	mA	$V_{GL}=6.0V$
	IDVDD	-	65	70	mA	DVDD=1.8V
	IAVDD	-	40	50	mA	AVDD=9.6V

## 5.3. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage of white LED backlight	VL	8.7	9.6	10.5	V	Note 1
Current for LED backlight	IL	105	140	175	mA	
Luminance		180	200	-	Lux	
LED life time	-	50000	-	-	Hr	Note 1

Note 1 : There are 1 Groups LED



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

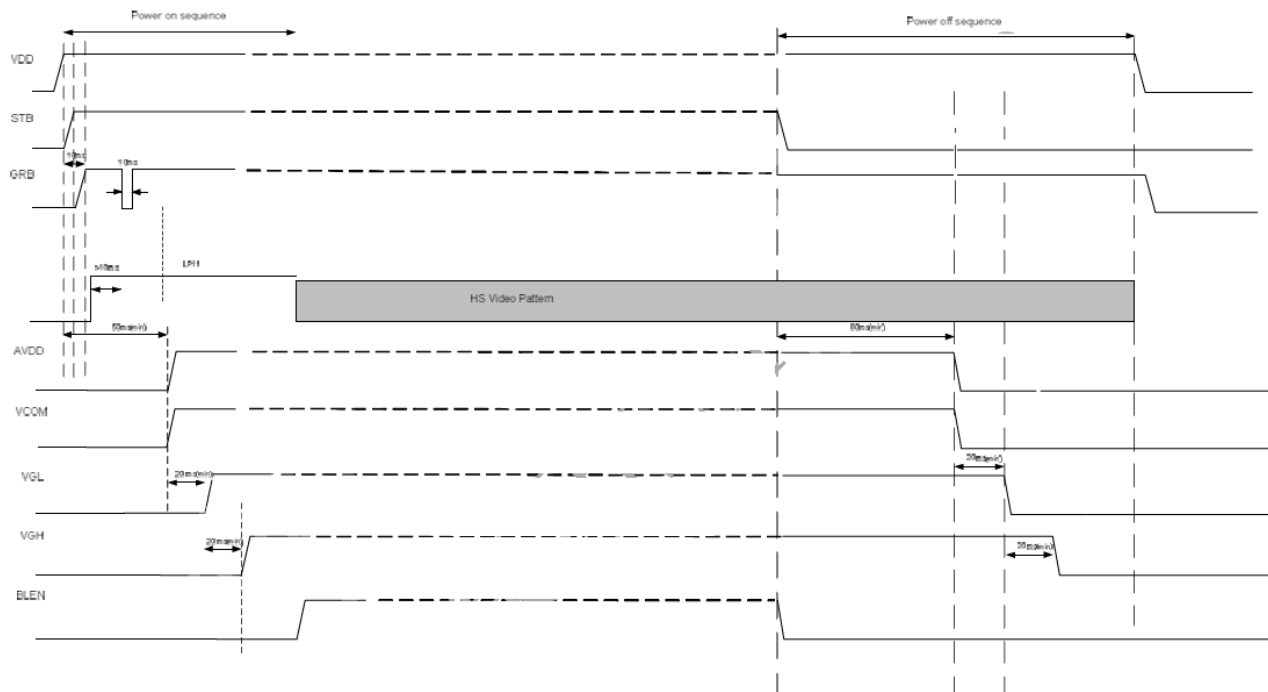
Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

## 5.4. Power Sequence

In order to prevent IC from power on reset fail. The rising 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 sequence



Note : CLK and Data Lanes should keep in LP11(stop state) before GRB.

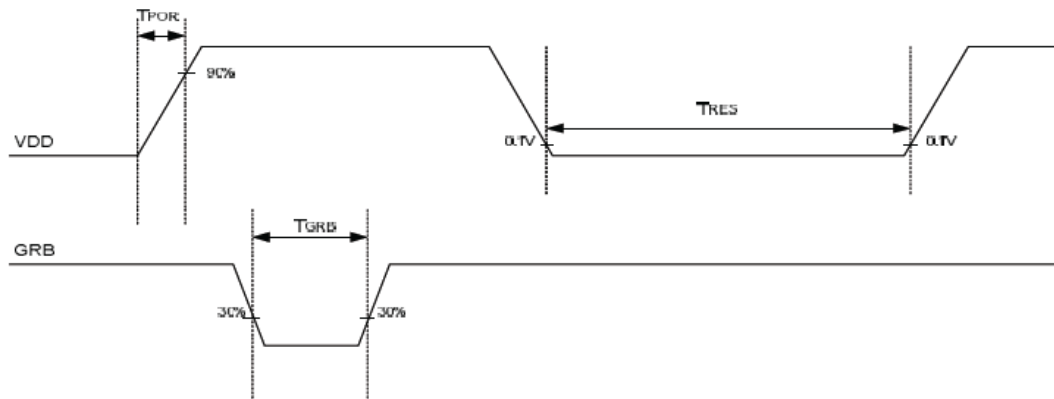
# 6. Timing characteristics (MIPI)

## 6.1. Basic AC characteristic

(VDD=VDD IF=1.8V, AVDD=8 to 13.5V, GND=AGND=GND IF=0V, TA=-20 to +85°C)

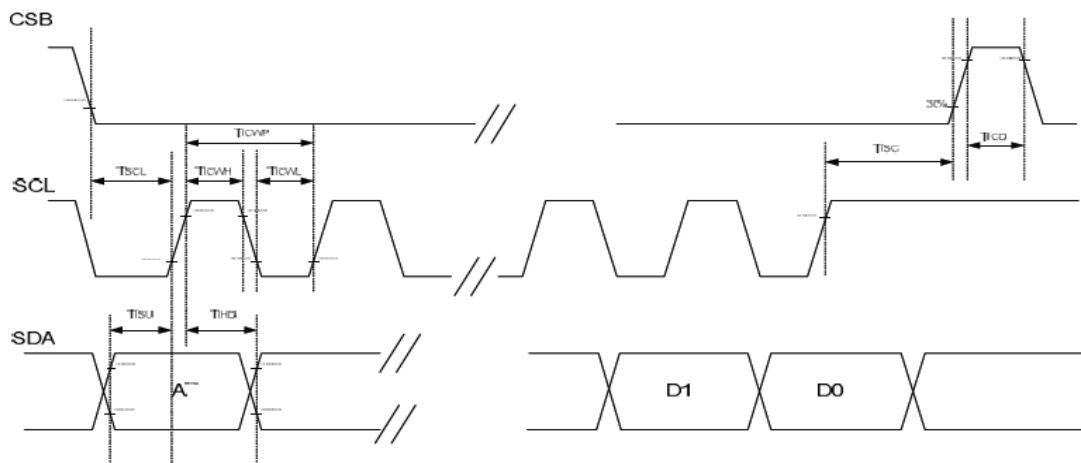
VDD/GRB AC characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
VDD power slew rate	T <sub>POR</sub>	-	-	20	ms	From 0 to 90% VDD
GRB active pulse width	T <sub>GRB</sub>	1	-	-	ms	VDD=VDD IF=1.8V
VDD resettle time	T <sub>RES</sub>	1	-	-	s	



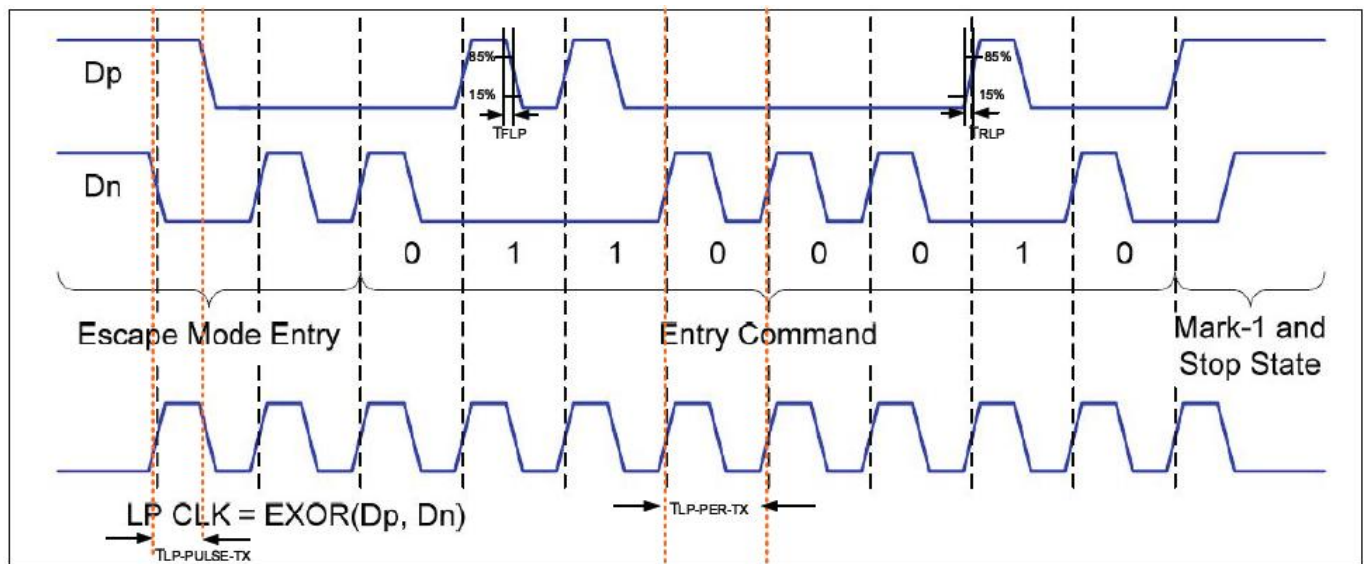
Wire interface AC characteristic:

Parameter	Symbol	Min.	Typ.	Max.	Unit
CSB falling to SCL rising time	T <sub>SCL</sub>	200	-	-	ns
SCL pulse high period	T <sub>ICWH</sub>	100	-	-	ns
SCL pulse low period	T <sub>ICWL</sub>	100	-	-	ns
SCL pulse width	T <sub>ICWP</sub>	250	-	-	ns
SDA data input setup time	T <sub>ISU</sub>	100	-	-	ns
SDA data input hold time	T <sub>IHD</sub>	100	-	-	ns
SCL to CSB rising time	T <sub>ISC</sub>	250	-	-	ns
CSB rising to falling time	T <sub>ICD</sub>	1	-	-	us



## 6.2. LP transmitter AC specification

Parameter		Symbol	Min.	Typ.	Max.	Unit	Notes
15%-85% rising time and falling time		TRLP/TFLP	-	-	25	ns	-
30%-85% rising time and falling time		TREOT	-	-	35	ns	-
Pulse width of LP exclusive-OR clock	First LP EXOR clock pulse after STOP state or last pulse before stop state	TLP-PULSE-TX	40	-	-	ns	-
	All other pulses		20	-	-	ns	-
Period of the LP EXOR clock		TLP-PER-TX	90	-	-	mv/ns	-
Slew rate @CLOAD=0pF		$\delta V / \delta t_{SR}$	30	-	500	mv/ns	-
Slew rate @CLOAD=5pF			30	-	200	mv/ns	-
Slew rate @CLOAD=20pF			30	-	150	mv/ns	-
Slew rate @CLOAD=70pF			30	-	100	mv/ns	-
Load Capacitance		TRLP	-	-	70	pF	-



# 7. Optical Characteristics

## TFT LCD characteristic (Without Capacitive Touch Panel)

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr	$\theta = 0^\circ$ 、 $\Phi = 0^\circ$	-	25	40	ms	Note 3,5	
	Tf							
Contrast ratio	CR	At optimized viewing angle	600	800	-	-	Note 4,5	
Color Chromaticity	White	$\theta = 0^\circ$ 、 $\Phi = 0$	Wx	0.270	0.290	0.310		Note 2,6,7
			Wy	0.311	0.331	0.351		
Viewing angle (Gray Scale Inversion Direction)	Hor.	$\Theta R$	CR $\geq 10$	80	85	-	Deg.	Note 1
		$\Theta L$		80	85	-		
	Ver.	$\Phi T$		80	85	-		
		$\Phi B$		80	85	-		
Brightness	-	-	210	250	-	cd/m <sup>2</sup>	Center of display	

Ta=25±2°C, ILED = 140mA

Note 1: Definition of viewing angle range

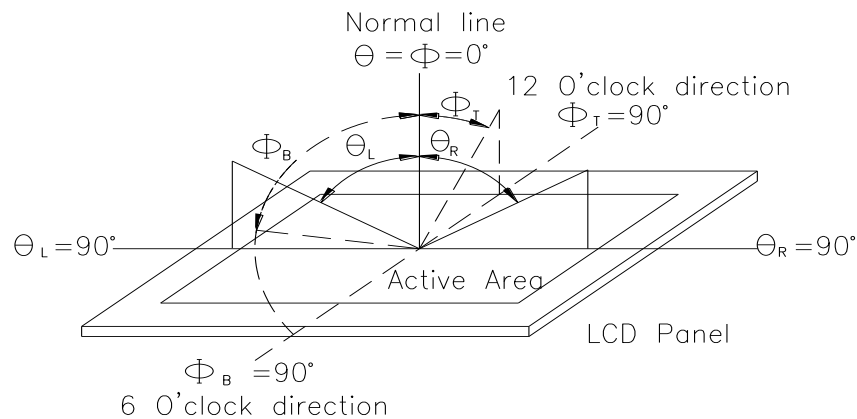


Fig.7.1. Definition of viewing angle

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.

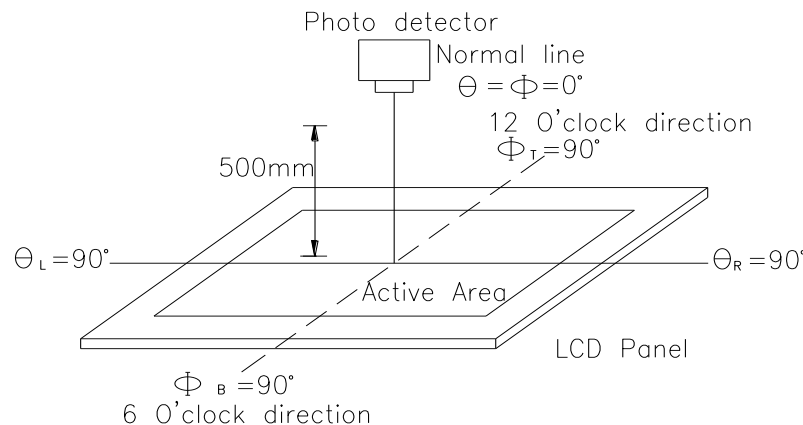
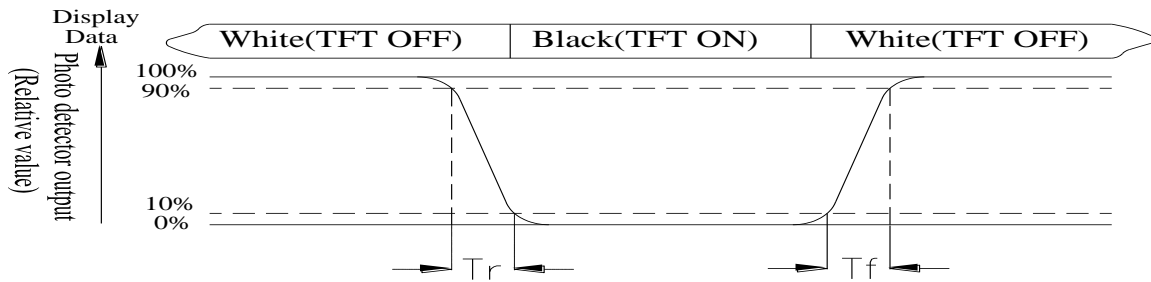


Fig. 7.2. Optical measurement system setup

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

FPC connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose

Pin No.	Symbol	I/O	Function	Remark
1	LED+	P	LED Anode	
2	LED+	P	LED Anode	
3	VGH	P	Gate ON Voltage	
4	VGL	P	Gate OFF Voltage	
5	UPDN	I	Gate Up or Down scan control	
6	SHLR	I	Source Right or Left sequence	
7	LED-	P	LED Cathode	
8	LED-	P	LED Cathode	
9	AVDD	P	Power for Analog Circuit	
10	GND	P	Power Ground	
11	MIPI_TDP3	I	MIPI Data lane3 input	
12	MIPI_TDN3	I	MIPI Data lane3 input	
13	GND	P	Power Ground	
14	MIPI_TDP2	I	MIPI Data lane2 input	
15	MIPI_TDN2	I	MIPI Data lane2 input	
16	GND	P	Power Ground	
17	MIPI_TCP	I	MIPI CLK input	
18	MIPI_TCN	I	MIPI CLK input	
19	GND	P	Power Ground	
20	MIPI_TDP1	I	MIPI Data lane1 input	
21	MIPI_TDN1	I	MIPI Data lane1 input	
22	GND	P	Power Ground	
23	MIPI_TDP0	I	MIPI Data lane0 input	
24	MIPI_TDN0	I	MIPI Data lane0 input	
25	GND	P	Power Ground	
26	STBYB	I	Standby mode	

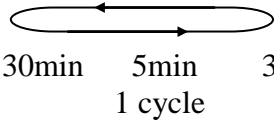
27	RESET	I	Global reset pin	
28	VDD	P	Power Supply (1.8V)	
29	VDD	P	Power Supply (1.8V)	
30	VCOM	P	Common Voltage	

I: input    O: output    P: power



# 9. Reliability

Content of Reliability Test (Wide temperature, -20°C ~55°C)

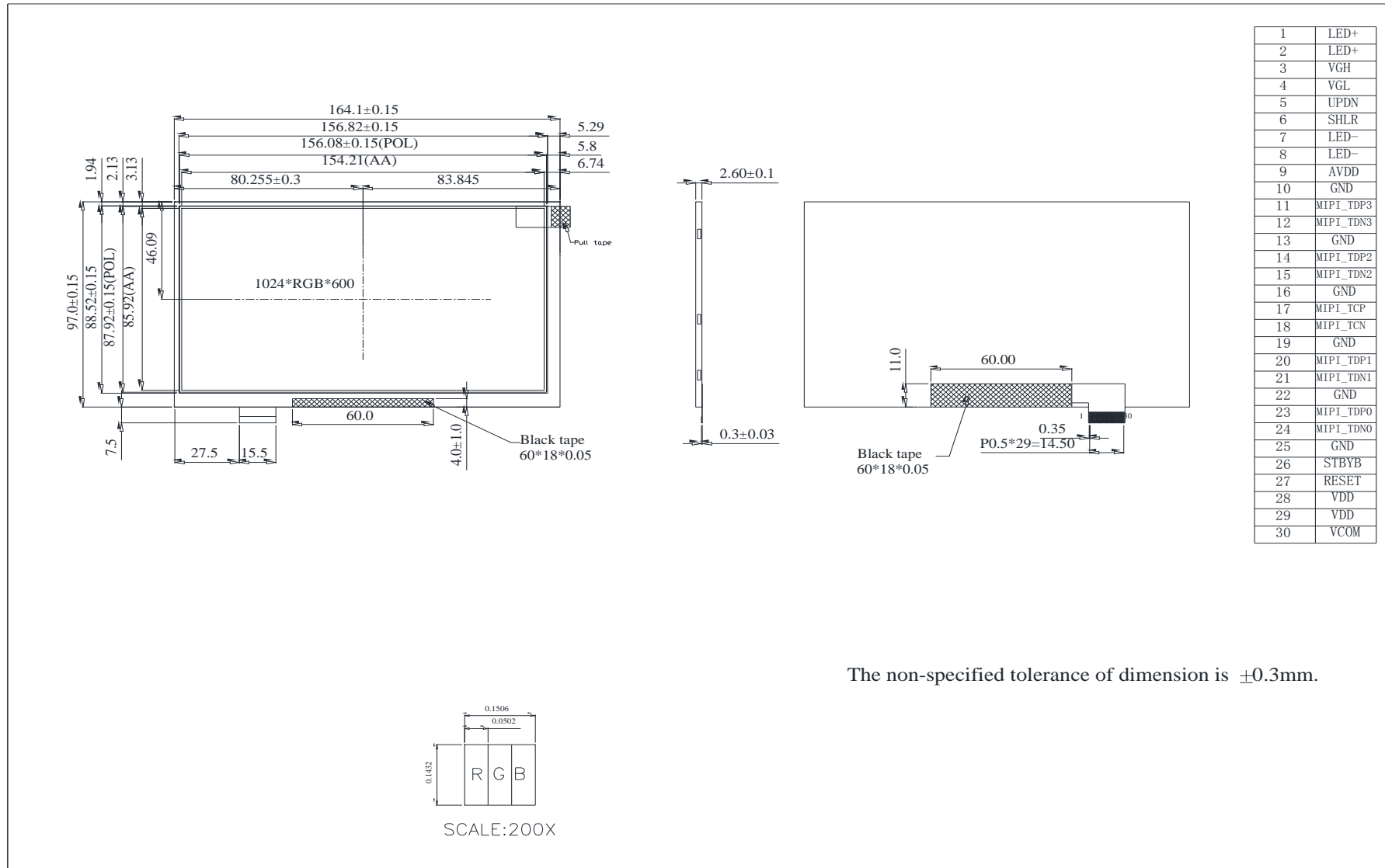
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	60°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	55°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 40 °C, 90%RH max	40°C, 90%RH 96hrs	1,2
Thermal shock resistance	<p>The sample should be allowed stand the following 10 cycles of operation</p> <p style="text-align: center;">-20°C    25°C    55°C</p>  <p style="text-align: center;">30min    5min    30min 1 cycle</p>	-20°C/55°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  $\pm 0.3$ 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 , \_\_\_\_\_

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Winstar      Module Number : \_\_\_\_\_

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**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 :**        /        /        \_\_\_\_\_