



**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.:** WF46ATIATDNNA#

<p><b>APPROVED BY:</b></p> <p>( FOR CUSTOMER USE ONLY )</p>	<p><b>PCB VERSION:</b> _____</p> <p><b>DATA:</b> _____</p>
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
<b>ISSUED DATE: 2018/02/07</b>			



**RECORDS OF REVISION**

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2016/09/05		First issue
A	2016/09/21		Modify Timing.
B	2016/10/05		Modify Summary Add Aspect Ratio
C	2017/11/10		Modify Electrical Characteristics,AC CHARATERISTICS,Color Chromaticity & Contour Drawing
D	2018/02/07		Modify Contour Drawing.

# Contents

- 1.Module Classification Information
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- 3.General Specification
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- 5.Electrical Characteristics
- 6.DC Characteristics
- 7.AC Characteristics
- 8.Optical Characteristics
- 9.Interface
- 10.Block Diagram
- 11.Reliability
- 12.Contour Drawing
- 13.Other

# 1.Module Classification Information

W F 46 A T I A T D N N 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 : 4.6" 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 4.6” 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	4.6	inch
Dot Matrix	800 x RGBx320(TFT)	dots
Module dimension	120.7(W) x 56.16(H) x 3.1(D)	mm
Active area	108 x 43.2	mm
Dot pitch	0.045(W)x 0.135(H)	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Aspect Ratio	Bar Type	
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. Operating conditions

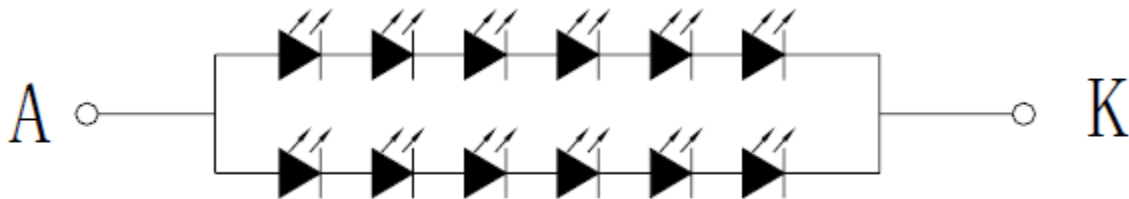
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VCC	—	3.0	3.3	3.6	V	
Supply Current For LCM	ICC	VCC=3.3V	—	50	70	mA	Note 1

Note 1 : This value is test for VCC =3.3V , Ta=25 °C only

## 5.2. LED driving conditions

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I <sub>LED</sub>	-	40	50	mA	Note 1,2,3,4
Forward Voltage	V <sub>LED+</sub>	-	19.2	21	V	
Backlight life time		-	30000	-	hr	

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

## 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	

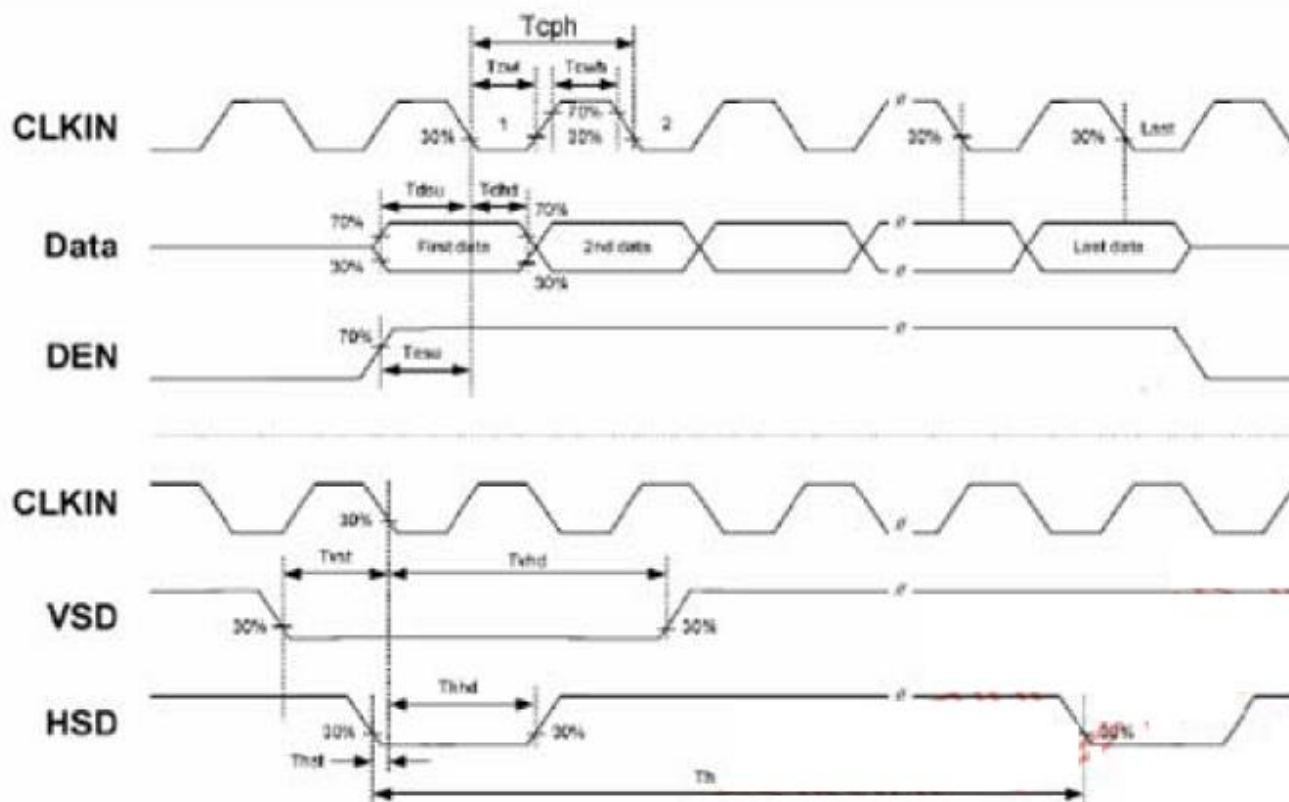
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# 7.AC CHARATERISTICS

## 7.1. Timing Conditions

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
HS setup time	Thst	8	-	-	ns	
HS hold time	Thhd	8	-	-	ns	
VS setup time	Tvst	8	-	-	ns	
VS hold time	Tvhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	
Data hold time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DE hold time	Tehd	8	-	-	ns	
VCC power on slew rate	Tpor	-	-	20	ms	From 0 to 90% VCC
RESET pulse width	Trst	1	-	-	ms	
DCLK cycle time	Tcoh	20	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	

## 7.2. Timing Diagram



### 7.3. Timing

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Horizontal Display Area	thd	-	800	-	DCLK.	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	OCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	lfp	16	210	354	OCLK.	

Item	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Vertical Display Area	thd	-	320	-	TH	
VS period time	fclk	510	525	650	TH	
VS pulse width	th	1	-	20	TH	
VS back Porch	thb	23	23	23	TH	
VS Front Porch	thfp	7	22	147	TH	

### 7.4. Data Input Format (SYNC-DE mode)

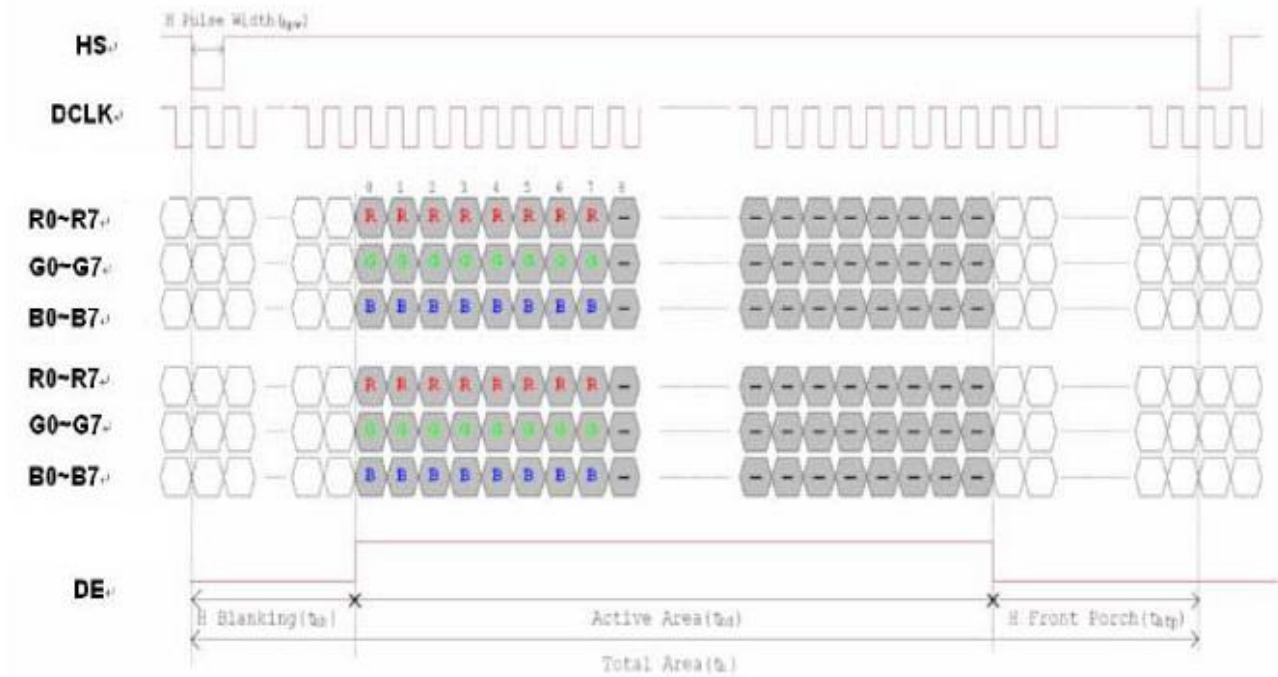


Figure 1 Horizontal input timing diagram.

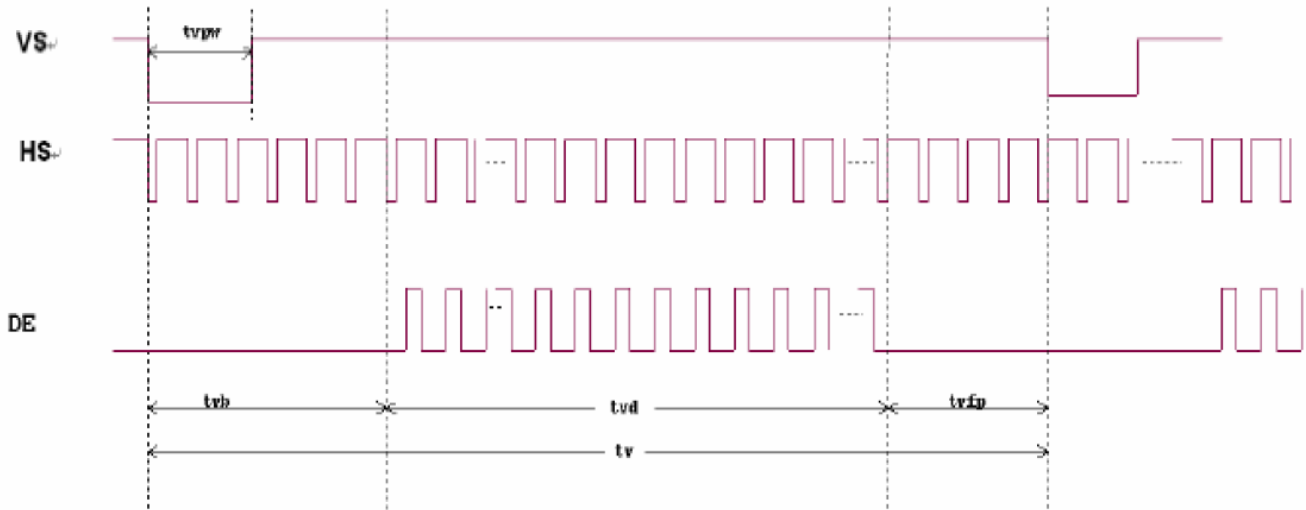


Figure 2 Vertical input timing diagram.

# 8. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr	$\theta=0^\circ, \phi=0^\circ$	-	20	30	ms	Note 3	
	Tf		-	20	30			
Contrast ratio	CR	At optimized viewing angle	500	600	-	-	Note 4	
Color Chromaticity	White	Wx	$\theta=0^\circ, \phi=0^\circ$	0.26	0.31	0.36	-	Note 2,5
		Wy		0.28	0.33	0.38		
Viewing angle (Gray Scale Inversion Direction)	Hor.	$\Theta_R$	$CR \geq 10$	60	70	-	Deg	Note 1
		$\Theta_L$		60	70	-		
	Ver.	$\Phi_T$		40	50	-		
		$\Phi_B$		60	70	-		
Brightness	-	-	350	400	-	cd/m <sup>2</sup>	Center of display	

Ta=25±2°C,

Note 1: Definition of viewing angle range

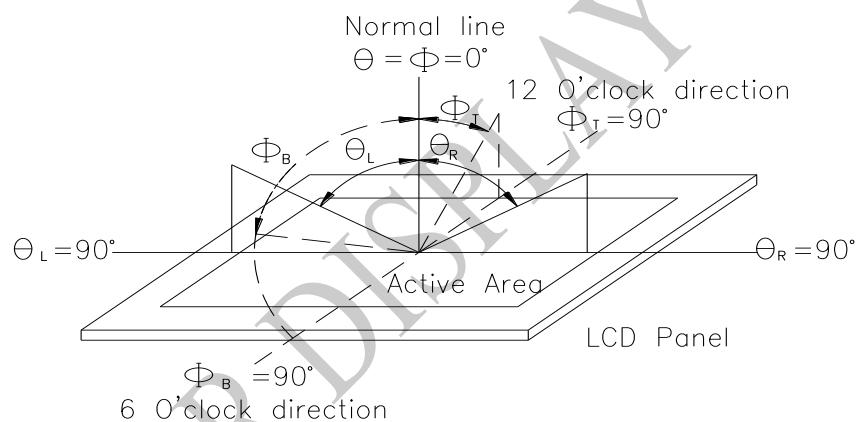


Fig. 8.1. Definition of viewing angle

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.

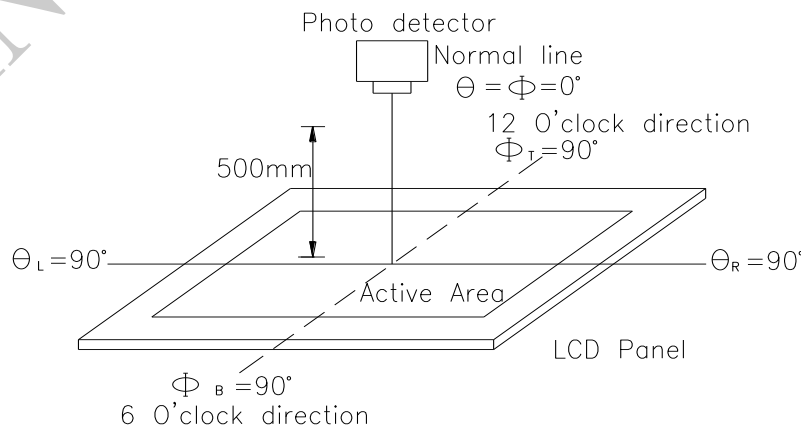
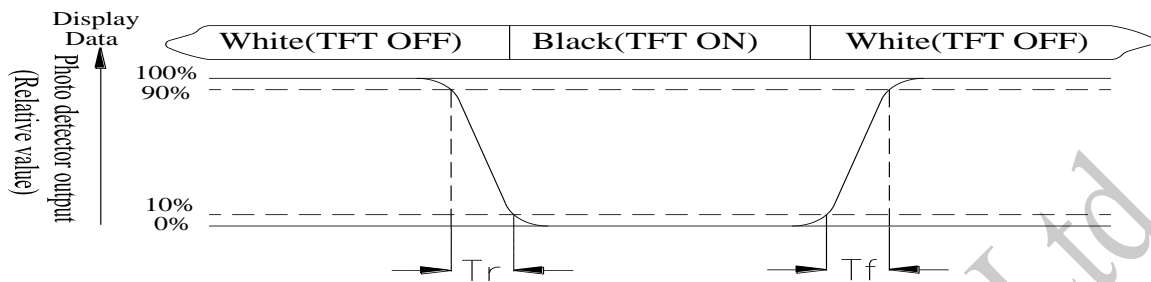


Fig. 8.2. Optical measurement system setup

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: 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.

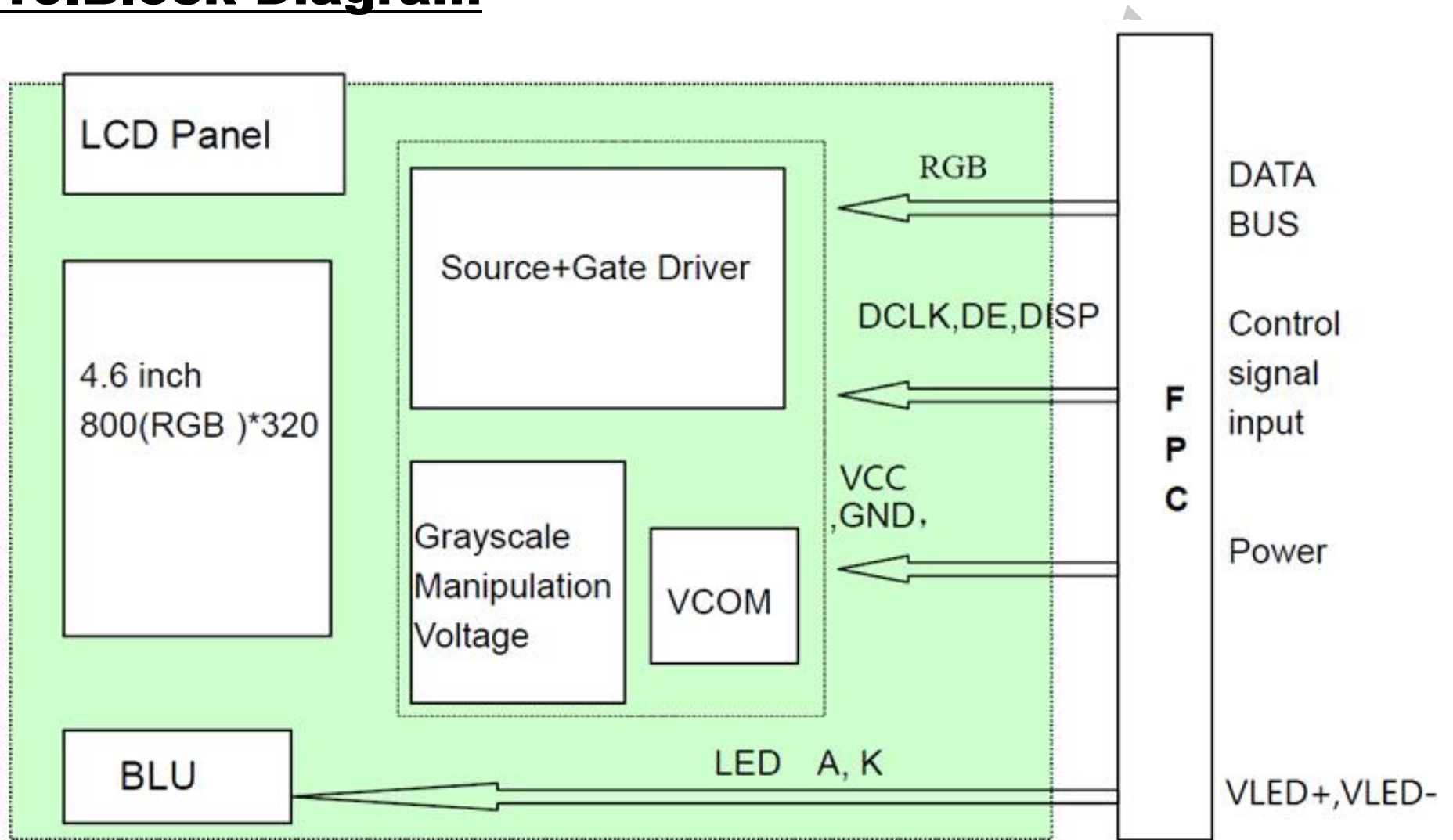


# 9. Interface

## 9.1. LCM PIN Definition

No.	Symbol	Description
1	VLED-	Backlight LED Cathode
2	VLED+	Backlight LED Anode.
3	GND	System Ground
4	VCC	Power supply for logic operation
5~12	R0~R7	Data bus
13~20	G0~G7	Data bus
21~28	B0~B7	Data bus
29	GND	System Ground
30	DCLK	Pixel clock signal
31	DISP	Display on/off control
32	HSYNC	Horizontal Sync signal
33	VSYNC	Vrtical Sync signal
34	DE	Data Enable
35	NC	No connect
36	GND	System Ground
37	NC	No connect
38	NC	No connect
39	NC	No connect
40	NC	No connect

# 10. Block Diagram



# 11. Reliability

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

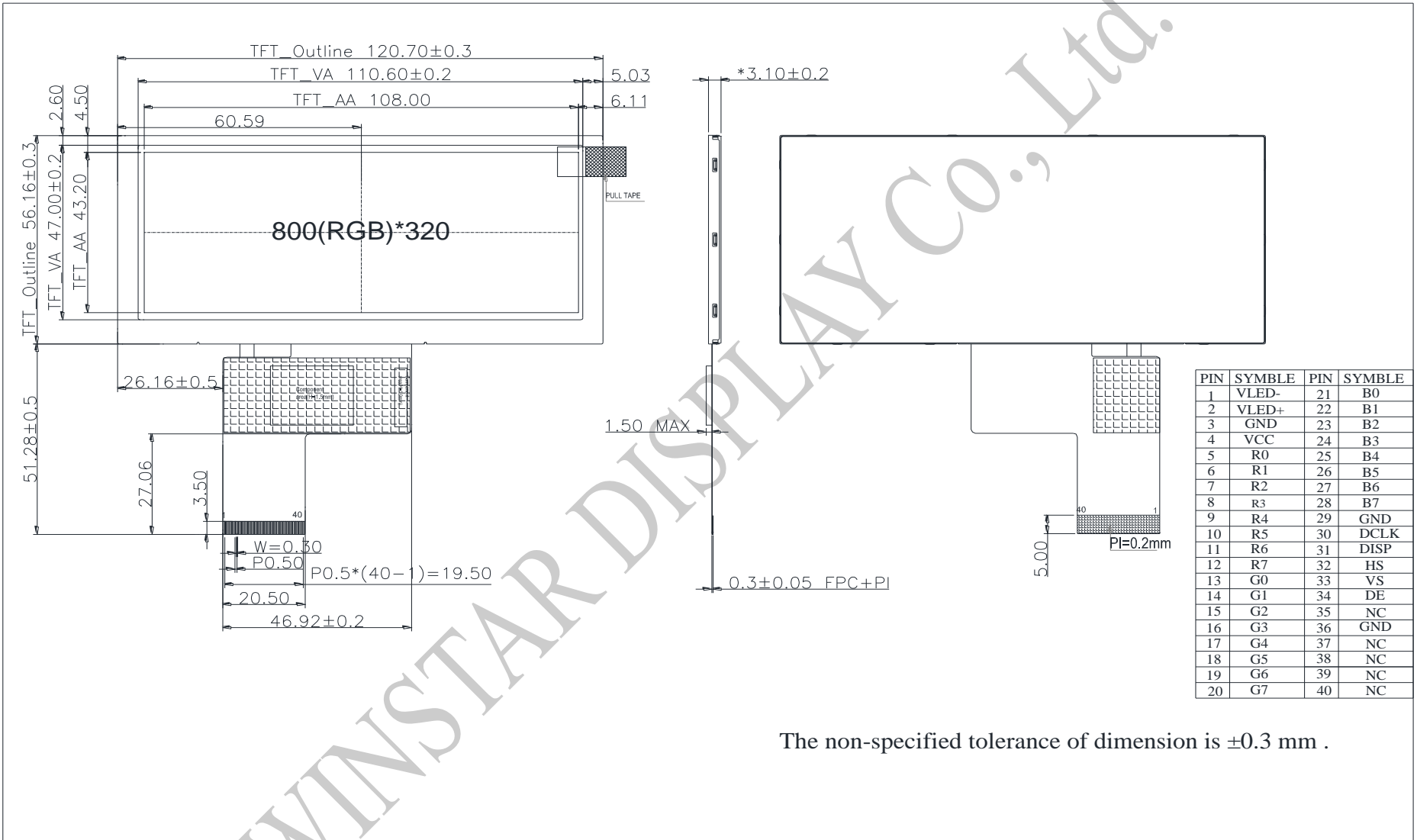
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature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

# 12. Contour Drawing





**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 :  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 :     /     /     \_\_\_\_\_

