



**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.:** WF18HSLAADNNO#

<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: 2023/01/09</b>			

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>



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MODLE NO :

**RECORDS OF REVISION**

**DOC. FIRST ISSUE**

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2023/01/09		First issue

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# 1.Module Classification Information

W F 18 H S L A A D 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 : 1.8" 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**

WF18F is a color active matrix thin film transistor (TFT) liquid crystal display with polarizer.

This model is composed of amorphous silicon TFT as a switching device. It is a transmissive type display operating in the normally white mode.

This TFT LCD has a 1.77-inch diagonally measured active display area with 384 x 160 dot (128 vertical by 160 horizontal pixel) resolution. Each pixel is divided into Red, Green, Blue dots which are arranged in vertical stripes.

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### **3. General Specifications**

<b>Item</b>	<b>Dimension</b>	<b>Unit</b>
Size	1.77	inch
Dot Matrix	128 x RGB x 160(TFT)	dots
Module dimension	34.0(W) x 45.83(H) x 2.75(D)	mm
Active area	28.03 x 35.04	mm
Dot pitch	0.073 x 0.219	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	6 o'clock	
Gray Scale Inversion Direction	12 o'clock	
Aspect Ratio	Portrait	
TFT IC	ST7735S or Equivalent	
TFT Interface	SPI	
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

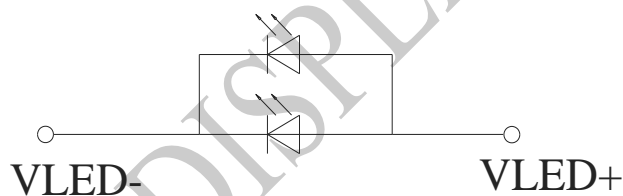
## 5.1. Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Analog	VCC	—	2.5	2.75	3.7	V
Supply LCM current	ICC	—	—	0.9	2	mA

## 5.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	—	—	40	—	mA	—
Power Consumption	—	—	124	—	mW	—
LED voltage	VBL+	2.9	3.1	3.4	V	Note 1
LED Life Time	—	—	50,000	—	Hr	Note 2,3,4

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

# 6.Data Color Coding

## 6.1. 3-line Serial Interface

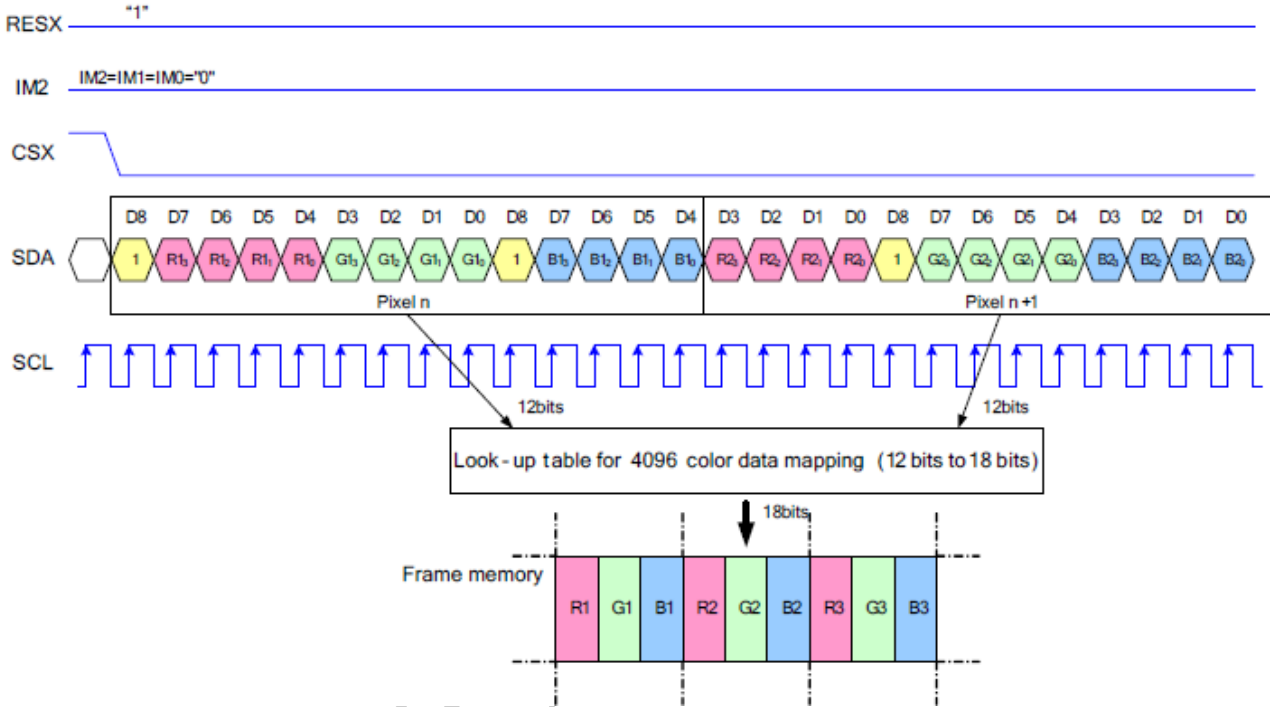
Different display data formats are available for three colors depth supported by the LCM listed below.

4k Colors, RGB 4-4-4-bit Input

65k Colors, RGB 5-6-5-bit Input

262k Colors, RGB 6-6-6-bit Input

### Write Data for 12-bit/Pixel (RGB 4-4-4-bit Input), 4K-Colors, 3AH="03h"

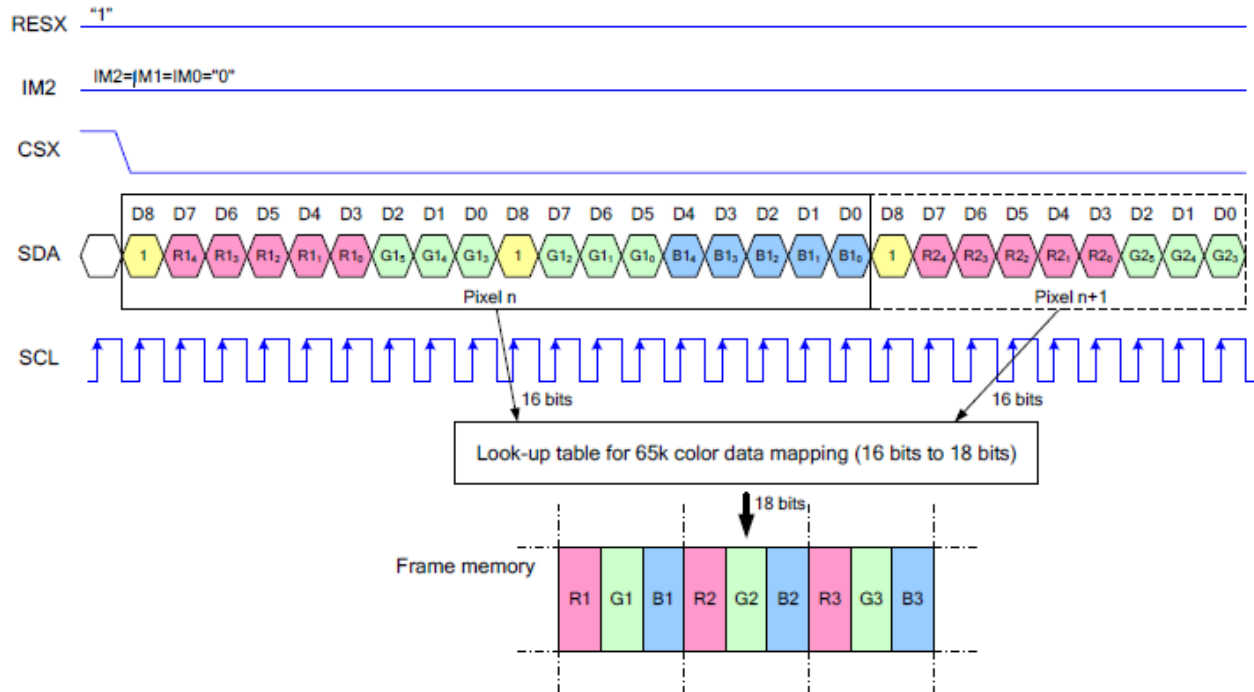


Note 1: Pixel data with the 12-bit color depth information

Note 2: The most significant bits are: Rx3, Gx3 and Bx3

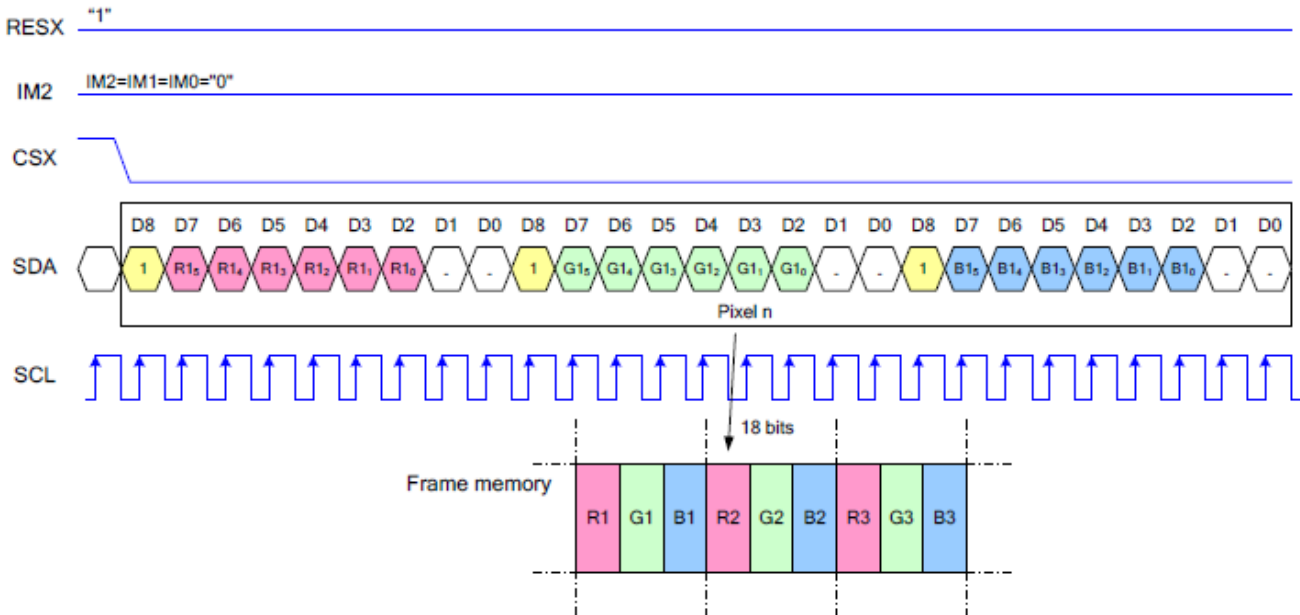
Note 3: The least significant bits are: Rx0, Gx0 and Bx0

### Write Data for 16-bit/Pixel (RGB 5-6-5-bit Input), 65K-Colors, 3AH="05h"



- Note 1: Pixel data with the 16-bit color depth information
- Note 2: The most significant bits are: Rx4, Gx5 and Bx4
- Note 3: The least significant bits are: Rx0, Gx0 and Bx0

### Write Data for 18-bit/Pixel (RGB 6-6-6-bit Input), 262K-Colors, 3AH="06h"



- Note 1: Pixel data with the 18-bit color depth information
- Note 2: The most significant bits are: Rx5, Gx5 and Bx5
- Note 3: The least significant bits are: Rx0, Gx0 and Bx0

## 6.2. 4-line Serial Interface

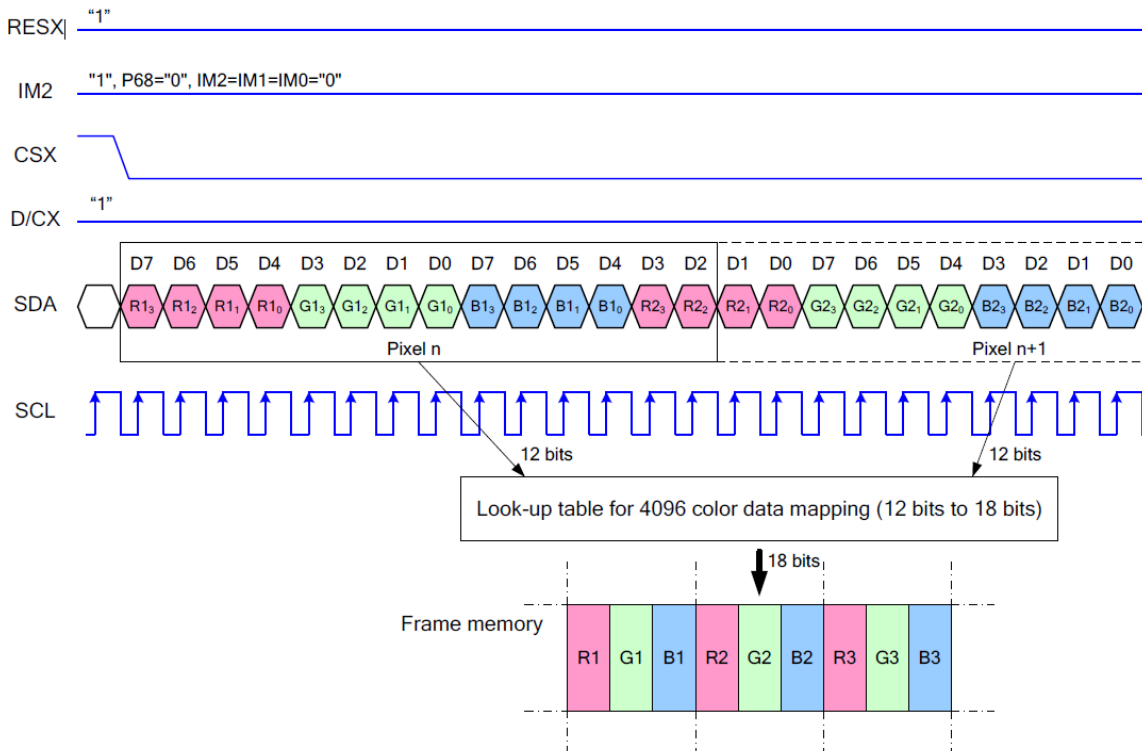
Different display data formats are available for three colors depth supported by the LCM listed below.

4k Colors, RGB 4-4-4-bit Input

65k Colors, RGB 5-6-5-bit Input

262k Colors, RGB 6-6-6-bit Input

### Write Data for 12-bit/Pixel (RGB 4-4-4-bit Input), 4K-Colors, 3AH="03h"

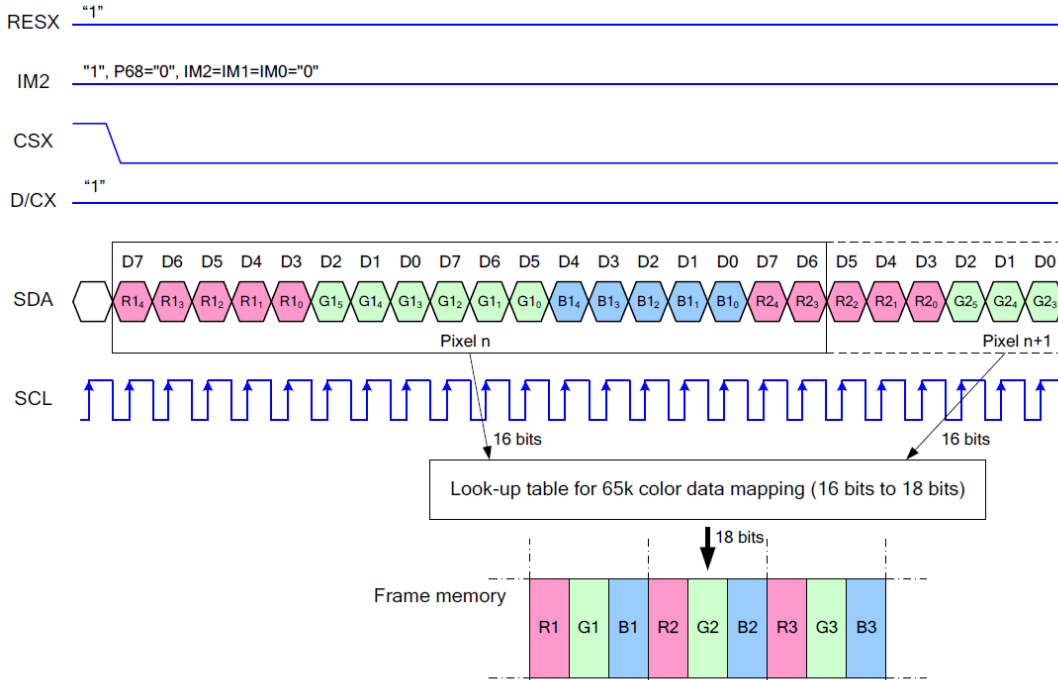


Note 1. pixel data with the 12-bit color depth information

Note 2. The most significant bits are: Rx3, Gx3 and Bx3

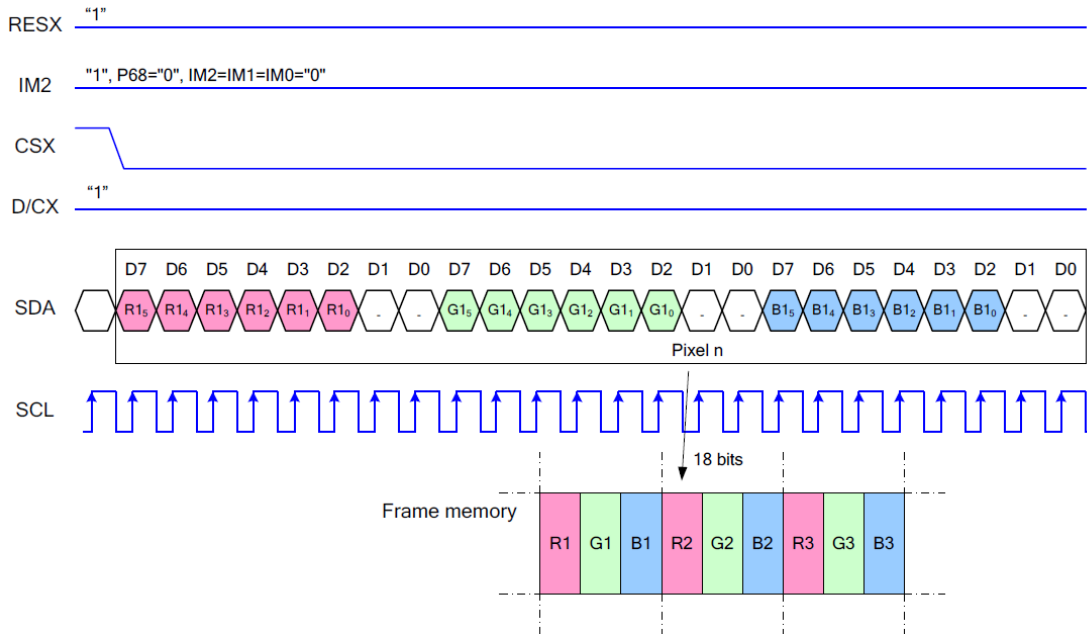
Note 3. The least significant bits are: Rx0, Gx0 and Bx0

## Write Data for 16-bit/Pixel (RGB 5-6-5-bit Input), 65K-Colors, 3AH="05h"



- Note 1. pixel data with the 16-bit color depth information
- Note 2. The most significant bits are: Rx4, Gx5 and Bx4
- Note 3. The least significant bits are: Rx0, Gx0 and Bx0

## Write Data for 18-bit/Pixel (RGB 6-6-6-bit Input), 262K-Colors, 3AH="06h"



- Note 1. pixel data with the 18-bit color depth information
- Note 2. The most significant bits are: Rx5, Gx5 and Bx5
- Note 3. The least significant bits are: Rx0, Gx0 and Bx0

# 7. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	2	4	.ms	Note 3,5	
	Tf			6	12	.ms		
Contrast ratio	CR	At optimized viewing angle	400	500	-	-	Note 4,5	
Color Chromaticity	White	$\theta=0^\circ$ 、 $\phi=0^\circ$	Wx	0.26	0.31	0.36		Note 2,6,7
			Wy	0.28	0.33	0.38		
Viewing angle (Gray Scale Inversion Direction)	Hor.	$CR \geq 10$	$\Theta_R$	35	45		Deg.	Note 1
			$\Theta_L$	35	45			
	Ver.		$\Phi_T$	35	45			
			$\Phi_B$	10	20			
Brightness	-	-	800	900	-	cd/m <sup>2</sup>	Center of display	
Uniformity	(U)	-	75	-	-	%	Note 5	

Ta=25±2°C

Note 1: Definition of viewing angle range

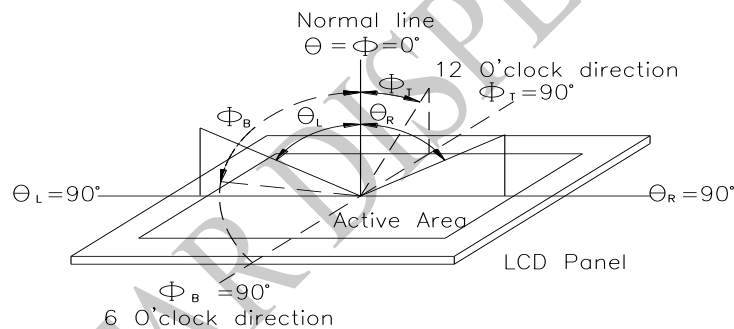


Fig.7.1. Definition of viewing angle

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.

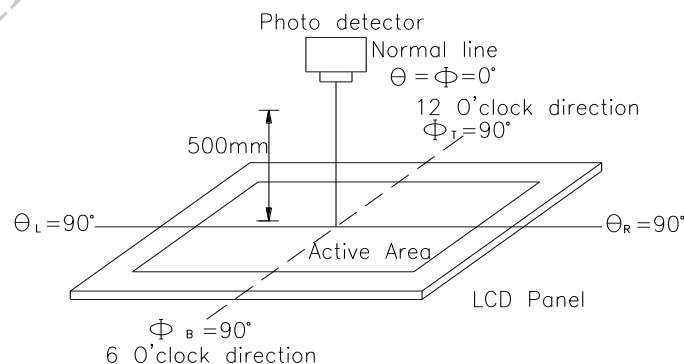
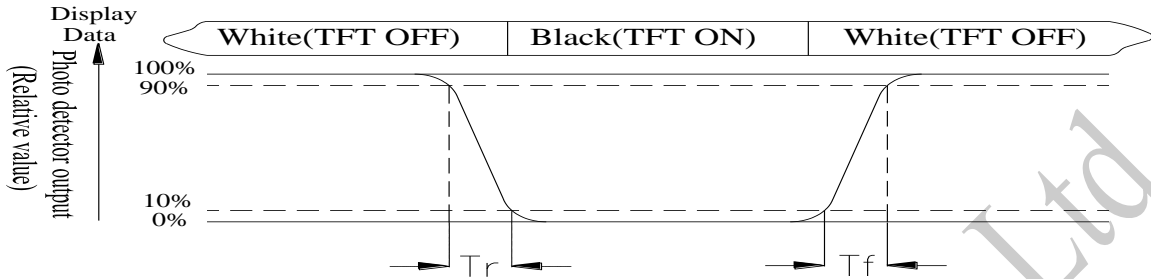


Fig. 7.2. Optical measurement system setup

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.

Luminance Uniformity (U) =  $L_{\min}/L_{\max} \times 100\%$

L = Active area length

W = Active area width

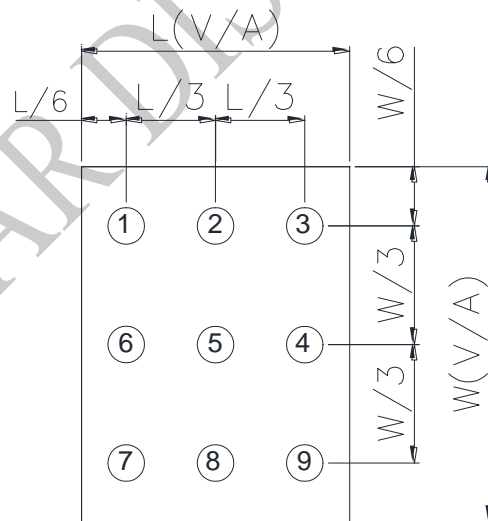


Fig7.3. Definition of uniformity

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.



# 8.Interface

## 8.1. LCM PIN Definition

Pin	Symbol	I/O	Function	Remark
1	LED+	P	Back light anode	
2	LED-	P	Back light cathode	
3	SPI4W (VCC=4 WIRE)	I	- SPI4W='0', 3-line SPI Enable. - SPI4W='1', 4-line SPI Enable.	
4	VCC	P	Power Supply.	
5	GND	P	Ground	
6	CS	I	Chip enable (CSX)	
7	RST	I	Reset signal (RESX)	
8	SDA	I/O	Serial input/output signal in serial interface mode.	
9	SCL	I	In Serial Interface, this is used as SCL.	
10	D/C	I	Data/ command selection. (D/CX)	

# 9. Reliability

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

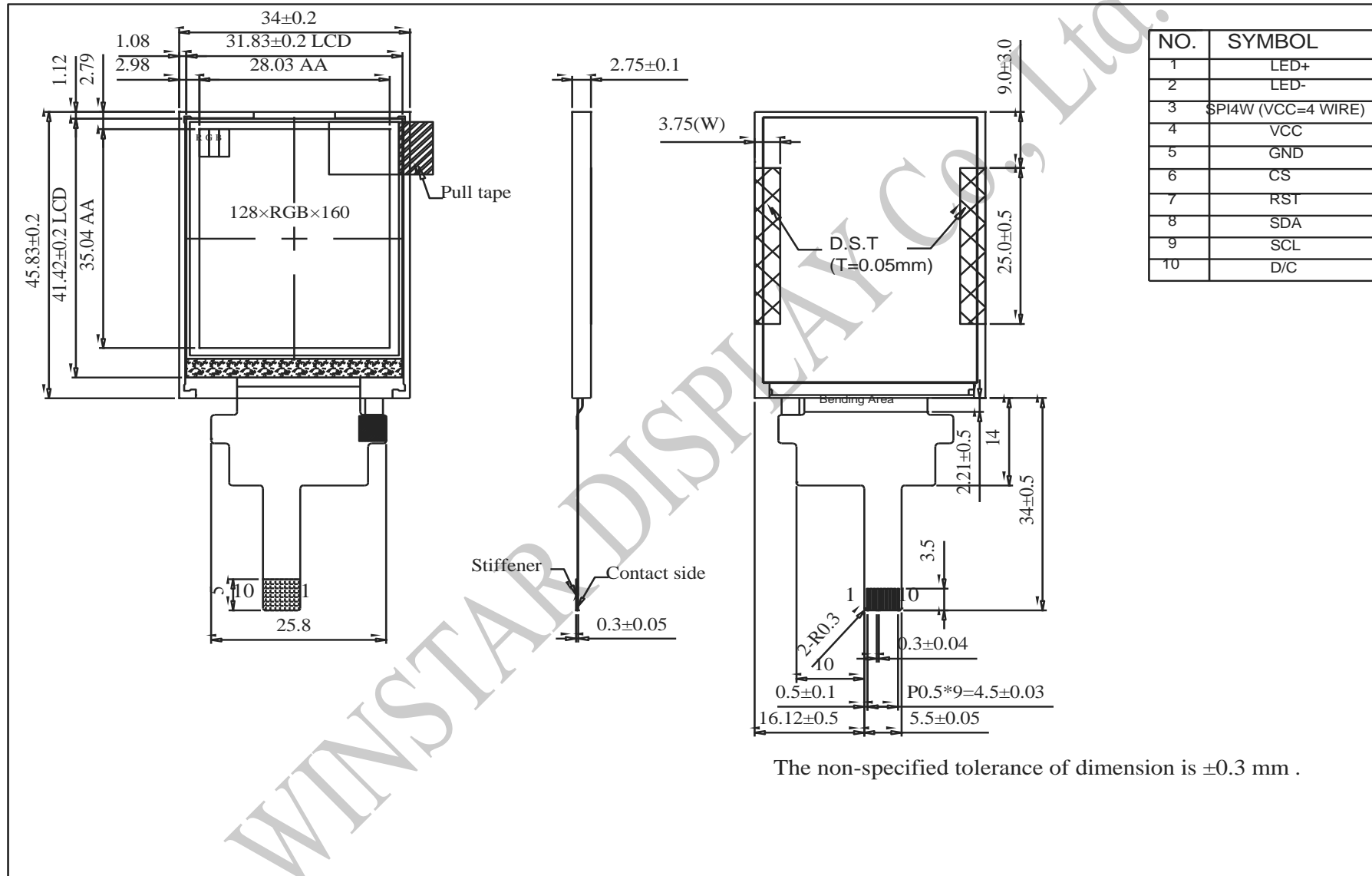
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature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





**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 :     /     /     \_\_\_\_\_

