



**Winstar Display Co., LTD**

**華凌光電股份有限公司**



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## SPECIFICATION

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

**MODULE NO.:** WF43MTIBEDRNO#

<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: 2016/06/23</b>			

TFT Display Inspection Specification: <http://www.winstar.com.tw/service.php>

**RECORDS OF REVISION**

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2014/07/24		First issue
A	2014/09/03		Modify Static electricity test.
B	2014/09/19		Add size & Surface. Modify Optical Characteristics & Static electricity test.
C	2014/09/25		Remove Block Diagram. Correct Brightness.
D	2014/10/30		Add SPI Timing Characteristics Modify Instructions Table.
E	2015/01/29		Modify SPI Timing Characteristics.
F	2015/04/27		Modify Reliability.
G	2015/05/04		Modify Interface: RS232 19200 Baud rate/SPI & VDD=>VBUS.
H	2015/12/11		Modify RS232->Uart .
I	2016/01/21		Modify Static electricity test
J	2016/06/23		Modify SPI Timing Characteristics.



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# 1.Module Classification Information

W F 43 M T I B E D R 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 : 4.3" TFT			
④	Model serials no.			
⑤	Backlight Type :	T→LED, White S→LED, High Light White		
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	I→Transmissive, W. T, 6:00 L→Transmissive, W.T,12:00 Z→Transmissive, W.T, O-TFT		
⑦	B : TFT+FR+CONTROL BOARD			
⑧	Resolution:	C:320240	E:480272	G: 800480
⑨	TFT type D: Digital panel			
⑩	Interface : R: Uart S: SPI-4 ( preservation)			
⑪	TS : N : Without TS T : RTP (preservation)			
⑫	Version			
⑬	Special Code	#:Fit in with ROHS directive regulations		

## **2.Summary**

This technical specification applies to 4.3' color TFT-LCD panel. The 4.3' color TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays. This module follows RoHS.

### **3. General Specifications**

<b>Item</b>	<b>Dimension</b>	<b>Unit</b>
Size	4.3	inch
Dot Matrix	480 x RGBx272(TFT)	dots
Module dimension	125.5(W) x 67.2(H) x 7.6 (D)	mm
Active area	95.04 x 53.86	mm
Dot pitch	0.066 x 0.198	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	12 o'clock	
Gray Scale Inversion Direction	6 o'clock	
Backlight Type	LED, Normally White	
Interface	Uart 19200 Baud rate/SPI	
With /Without TP	Without TP	
Surface	Glare	

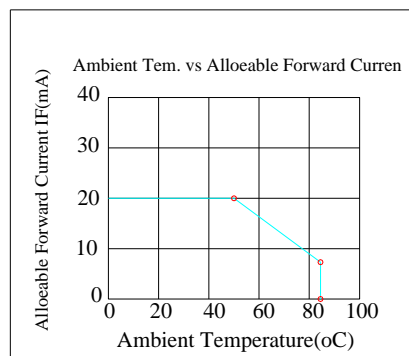
\*Color tone slight changed by temperature and driving voltage

# 4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+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  $60^{\circ}\text{C}$





# 5. Electrical Characteristics

## 5.1. Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VBUS	—	4.5	5	5.5	V	—
Supply Current For LCM	IBUS	—	—	220	240	mA	Note1
Power Consumption	—	VBUS=5V	—	1100	1320	mW	VBUS=5V Note 2

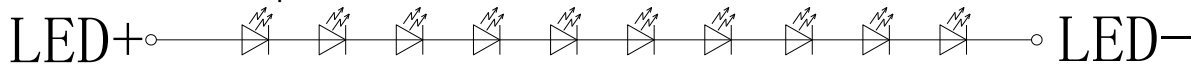
Note 1 : This value is test for VBUS=5V , Ta=25 °C only

Note 2 : Power consumption is include Backlight driver system

## 5.2. LED driving conditions (LED Driver system build in )

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	-	-	20	-	mA	-
Power Consumption	-	-	640	680	mW	-
LED voltage	VBL+	30	32	34	V	Note 1
LED Life Time	-	-	50,000	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25 °C

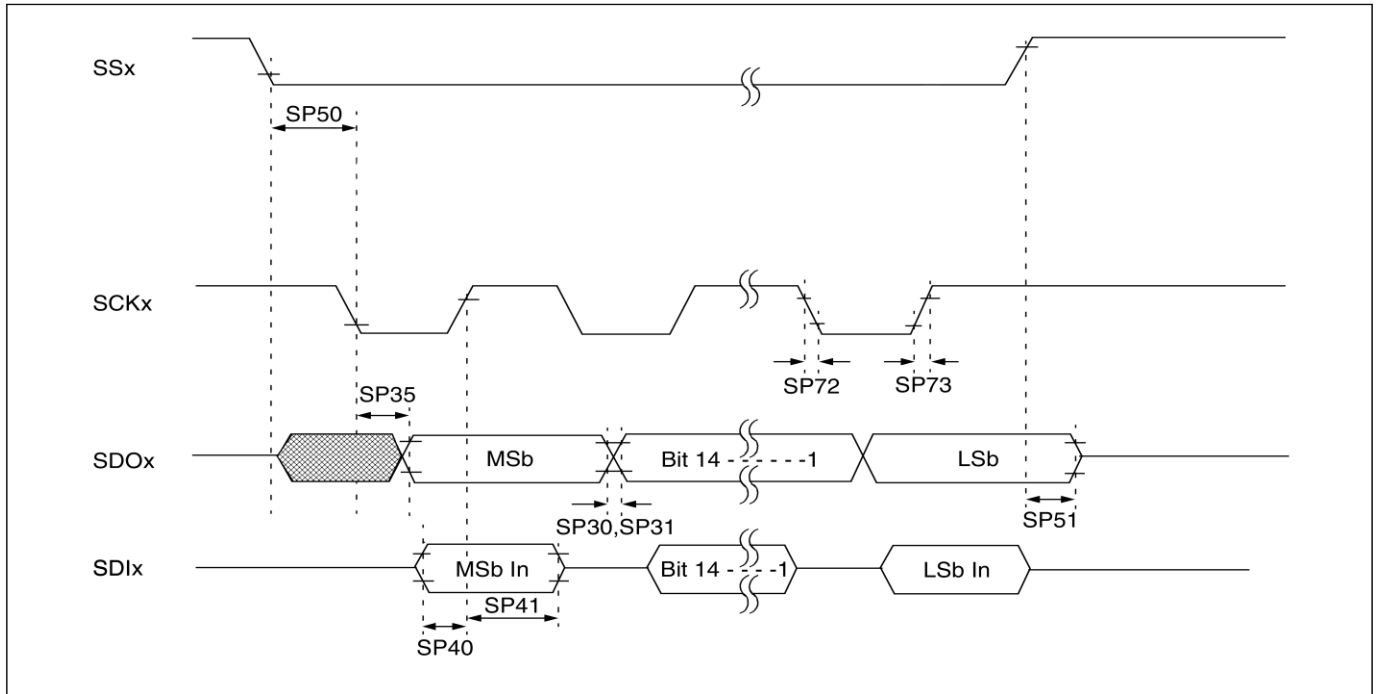
Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

## 6.DC CHARATERISTICS

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

# 7.SPI Timing Characteristics



AC CHARACTERISTICS							
Param No.	Symbol	Characteristic	Min	Typ <sup>(1)</sup>	Max	Units	Conditions
SP70	TscL	SCKx Input Low Time	250	—	—	ns	
SP71	TschH	SCKx Input High Time	250	—	—	ns	
SP72	TscF	SCKx Input Fall Time <sup>(2)</sup>	—	10	25	ns	
SP73	TscR	SCKx Input Rise Time <sup>(2)</sup>	—	10	25	ns	
SP30	TdoF	SDOx Data Output Fall Time <sup>(2)</sup>	—	10	25	ns	
SP31	TdoR	SDOx Data Output Rise Time <sup>(2)</sup>	—	10	25	ns	
SP35	Tsch2doV, TscL2doV	SDOx Data Output Valid after SCKx Edge	—	—	30	ns	
SP40	TdiV2sch, TdiV2scL	Setup Time of SDIx Data Input to SCKx Edge	20	—	—	ns	
SP41	Tsch2diL, TscL2diL	Hold Time of SDIx Data Input to SCKx Edge	20	—	—	ns	
SP50	Tssl2sch, Tssl2scL	$\overline{SSx}$ to SCKx $\uparrow$ or SCKx Input	120	—	—	ns	
SP51	Tssh2doZ	$\overline{SSx}$ $\uparrow$ to SDOx Output High-Impedance <sup>(3)</sup>	10	—	50	ns	
SP52	Tsch2ssH TscL2ssH	$\overline{SSx}$ after SCKx Edge	50	—	—	ns	

# 8. Instructions Table

## 8.1. UART Mode

### Text Mode

Instruction of text mode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
SB 1	PL	SB 2	SB 3	M D	W R	TR	X H	XL	Y H	YL	S R	S G	SB	B R	B G	B B	TA SDA	EB 1	EB 2	EB 3

### Graphic Mode

Instruction of Graphic mode:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SB1	PL	SB2	SB3	MD	RR	XH	XL	YH	YL	PH	PL	EB1	EB2	EB3	SB1

### Pixel Mode

Instruction of Pixel mode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SB1	PL	SB2	SB3	MD	RR	XH	XL	YH	YL	PR	PG	PB	EB1	EB2	EB3

### Geometry Mode

Instruction of geometry mode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
SB 1	PL	SB 2	SB 3	M D	R R	XS H	XS L	YS H	YS L	XE H	XE L	YE H	YE L	LS	LR	LG	LB	EB 1	EB 2	EB 3

### Clean Mode

Instruction of Clean Mode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SB1	PL	SB 2	SB 3	MD	XSH	XSL	YSH	YSL	XEH	XEL	YEH	YEL	EB1	EB2	EB3

### PWM Mode

Instruction of Pixel mode

1	2	3	4	5	6	7	8	9	10	11	12	13
SB1	PL	SB2	SB3	MD	PS	PFH	PFL	PDH	PDL	EB1	EB2	EB3

### Backlight Mode

Instruction of Clean Mode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SB1	PL	SB2	SB3	MD	RR	XH	XL	YH	YL	PR	PG	PB	EB1	EB2	EB3

## 8.2. SPI Mode

### Text Mode

Instruction of text mode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0x31	SB <sub>3</sub>	MD	WR	TR	XH	XL	YH	YL	SR	SG	SB	BR	BG	B B	TA SDA

### Graphic Mode

Instruction of Graphic mode:

1	2	3	4	5	6	7	8	9	10
0x31	SB3	MD	RR	XH	XL	YH	YL	PH	PL

### Pixel Mode

Instruction of Pixel mode

1	2	3	4	5	6	7	8	9	10	11
0x31	SB3	MD	RR	XH	XL	YH	YL	PR	PG	PB

### Geometry Mode

Instruction of geometry mode

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0x31	SB <sub>3</sub>	MD	RR	XS H	XSL	YS H	YSL	XE H	XEL	YE H	YEL	LS	LR	LG	LB

### Clean Mode

Instruction of Clean Mode

1	2	3	4	5	6	7	8	9	10	11
0x31	SB3	MD	XSH	XSL	YSH	YSL	XEH	XEL	YEH	YEL

### PWM Mode

Instruction of Pixel mode

1	2	3	4	5	6	7	8
0x31	SB3	MD	PS	PFH	PFL	PDH	PDL

### Backlight Mode

Instruction of Clean Mode

1	2	3	4	5	6	7	8	9	10	11
0x31	SB3	MD	RR	XH	XL	YH	YL	PR	PG	PB

# 9. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr+ Tf	$\theta = 0^\circ$ 、 $\Phi = 0^\circ$	-	30	45	.ms	Note 3
Contrast ratio	CR	At optimized viewing angle	250	350	-	-	Note 4
Color Chromaticity	White	$W_x$	0.28	0.30	0.33		Note 2,5
		$W_y$	0.31	0.33	0.36		
Viewing angle	Hor.	$\Theta_R$	55	65	-	Deg.	Note 1
		$\Theta_L$	55	65	-		
	Ver.	$\Phi_T$	45	55	-		
		$\Phi_B$	45	55	-		
Brightness	-	-	400	500	-	cd/m <sup>2</sup>	Center of display

Ta=25±2°C

Note 1: Definition of viewing angle range

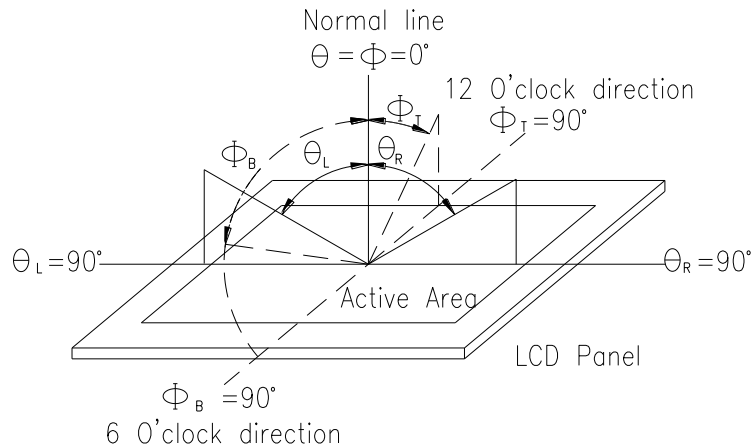


Fig. 9.1. Definition of viewing angle

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.

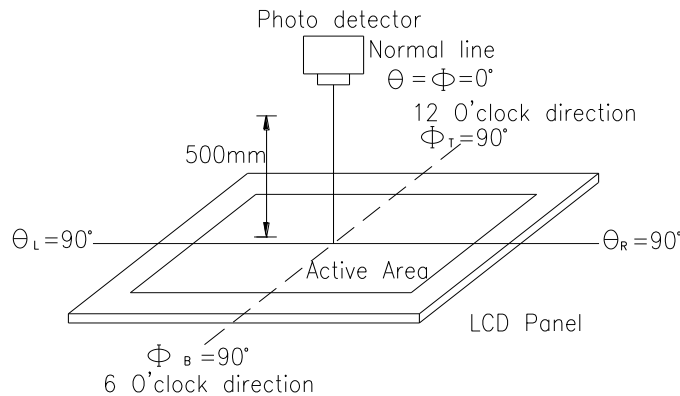
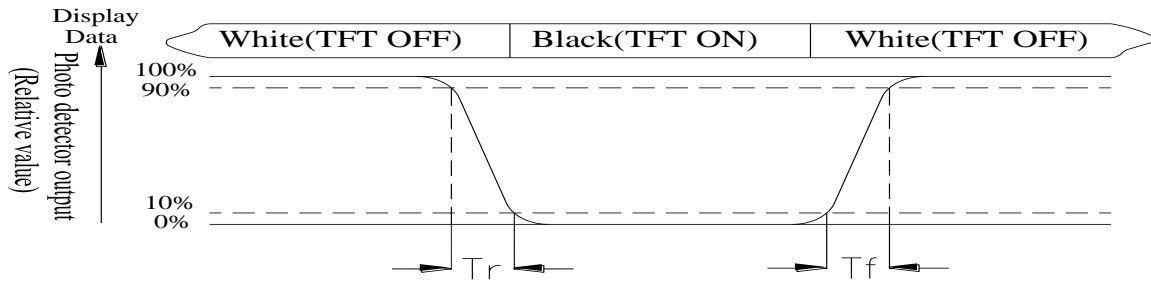


Fig. 9.2. Optical measurement system setup

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,  $T_f$ , 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.

# 10.Interface

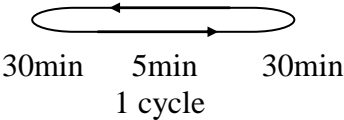
CON 2			
Pin	Symbol	I/O	Function
1	GND	Power Supply	Power Ground
2	TX	O	Uart Transmit pin
3	RX	I	Uart Receive pin
4	VBUS	Power Supply	Power supply : 5V
5	D+	I/O	USB Data +
6	D-	I/O	USB Data -
7	GND	Power Supply	Power Ground
8	/REST	I	Reset (active Low)
9	GND	Power Supply	Power Ground
10	PWM	O	Pulse width modulation
11	GND	Power Supply	Power Ground
12	VBUS	Power Supply	Power supply : 5V

CON 3			
Pin	Symbol	I/O	Function
1	GND	Power Supply	Power Ground
2	SW1	I	Switch ( active low)
3	SW2	I	Switch ( active low)
4	SW3	I	Switch ( active low)
5	SW4	I	Switch ( active low)
6	GND	Power Supply	Power Ground
7	SDI	I	Serial Data Input
8	SDO	O	Serial Data Output
9	SCK	I	Serial Clock
10	CS	I	Serial Chip selection
11	SPI_INT	O	Serial Interrupt
12	VBUS	Power Supply	Power supply : 5V



# 11. Reliability

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

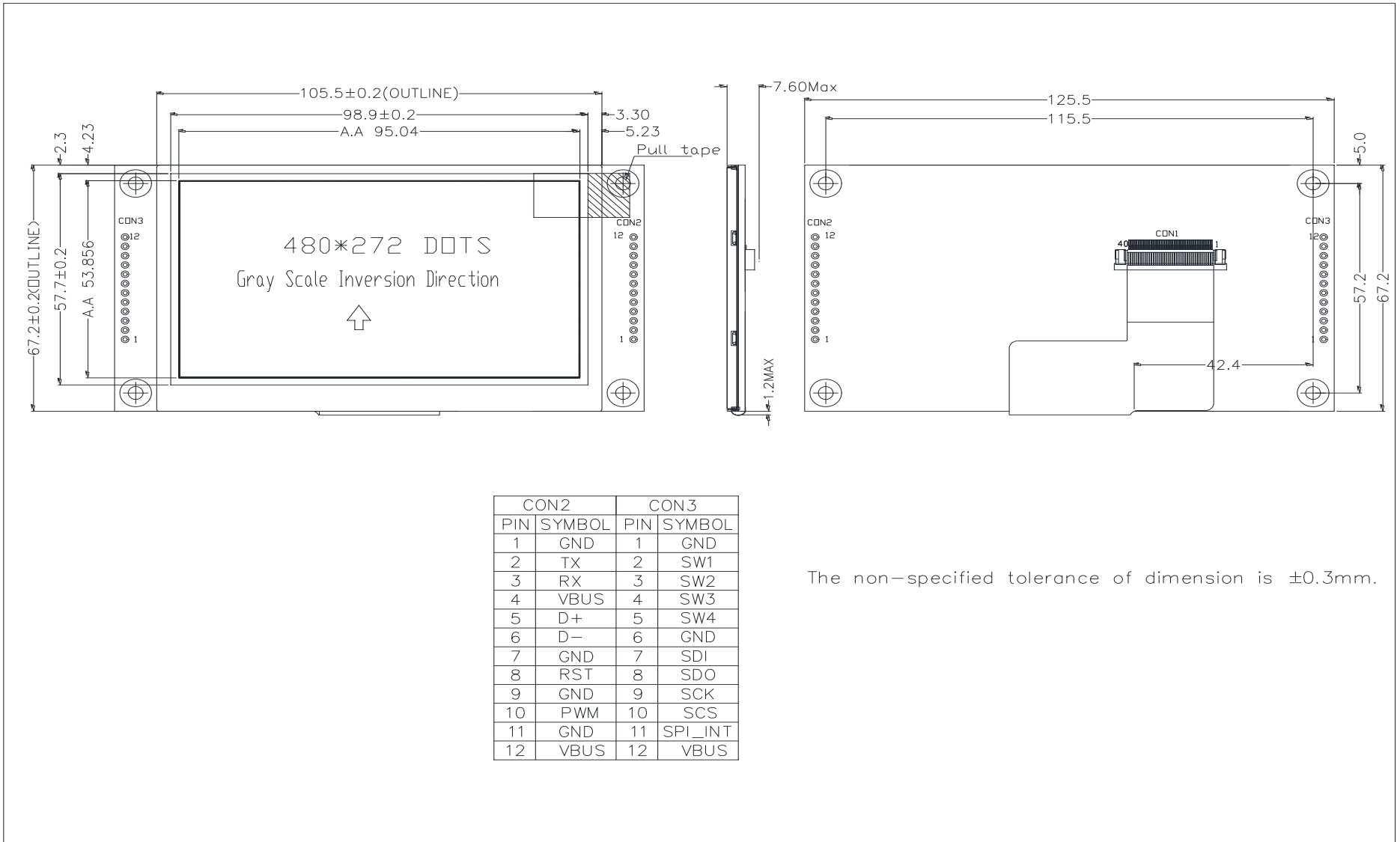
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature 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	<p>The sample should be allowed stand the following 10 cycles of operation</p> <p style="text-align: center;">-20°C    25°C    70°C</p>  <p style="text-align: center;">30min    5min    30min 1 cycle</p>	-20°C /70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm 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



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



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

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 :      /      /      \_\_\_\_\_