



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.: **WF70MTABHLRNO#**

APPROVED BY: (FOR CUSTOMER USE ONLY)	PCB VERSION:	DATA:
--	---------------------	--------------

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2020/07/27			

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>



Winstar Display Co., LTD
華凌光電股份有限公司

MODLE NO :

RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2020/07/27		First issue

Contents

1.Module Classification Information

2.Summary

3.General Specification

4.Absolute Maximum Ratings

5.Electrical Characteristics

6.DC Characteristics

7.SPI Timing Characteristics

8.Instructions Table

9.Optical Characteristics

10.Interface

11.Reliability

12.Contour Drawing

13.Initial Code For Reference

14.Other

1.Module Classification Information

W F 70 M T A B H L 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 : 7.0" 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		A→Transmissive, N.T, IPS TFT 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	H :1024600	
⑨	TFT type D: Digital panel				
⑩	Interface : R: Uart S: SPI-4 (preservation)				
⑪	TS : N : Without TS T : RTP (preservation)				
	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 that use amorphous silicon TFT as switching devices. This module is composed of a TFT LCD module, It is usually designed for industrial application and this module follows RoHs.

WINSTAR DISPLAY Co., Ltd.

3. General Specifications

Item	Dimension	Unit
Size	7.0	inch
Dot Matrix	1024XRGBX600 (TFT)	dots
Module dimension	170.3(W) x 103.8 (H) x 20.15 (D)	mm
Active area	154.2144 x 85.92	mm
Dot pitch	0.1506 x 0.1432	mm
LCD type	TFT, Normally Black, Transmissive	
Viewing Angle	85/85/85/85	
Aspect Ratio	16:9	
Backlight Type	LED, Normally White	
Interface	Uart 19200 Baud rate/SPI	
With /Without TP	Without TP	
Surface	Anti-Glare	
Operating mode	Slave mode	
Flash Memory Size	32M bits	
SD card format	FAT, exFAT	

*Color tone slight changed by temperature and driving voltage

*SD format does not support NTFS

4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-10	—	+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°C

5. Electrical Characteristics

5.1. Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	+5V	—	4.5	5	5.5	V	—
Supply Current For LCM	—	—	—	1.46	2.19	A	Note1
Power Consumption	—	+5V	—	7.3	12.045	W	Note 2

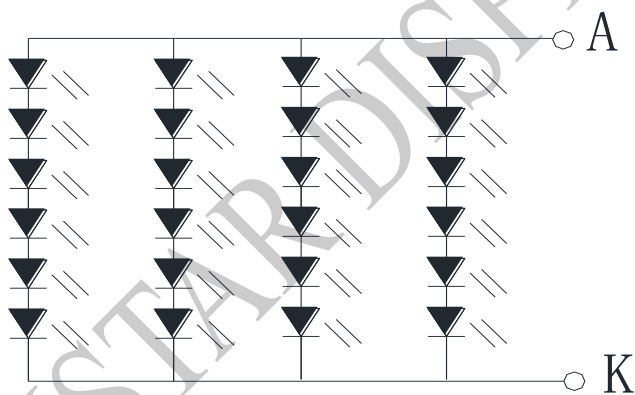
Note 1 : This value is test for VBUS=5V , Ta=25 °C only

Note 2 : Power consumption is include Backlight driver system

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

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	VL	16.8	19.2	21.0	V	Note 1
Current for LED backlight	IL	--	240	--	mA	
LED life time	-	-	50,000	-	Hr	Note 2

Note 1 : There are 1 Groups LED



Backlight 24LED Circuit

Note 2 : Ta = 25 °C

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

Note 4 : The single LED lamp case

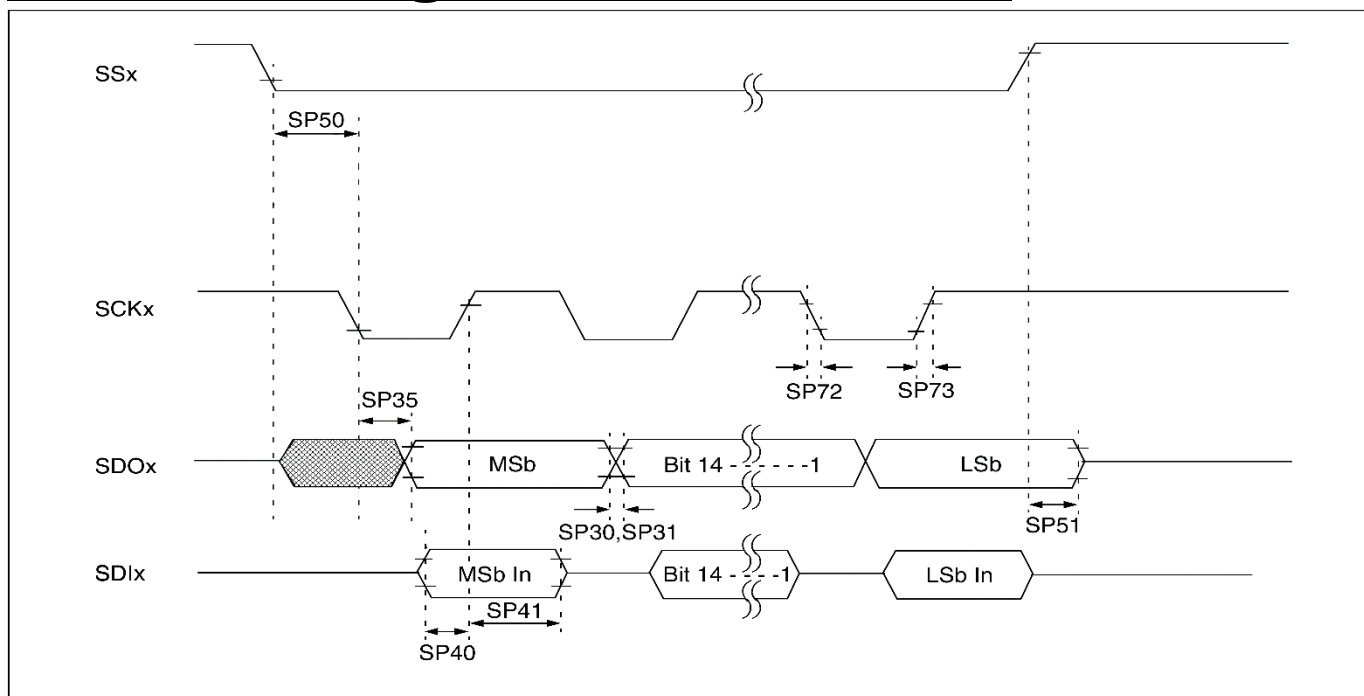
6.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	VIL	0	-	0.3VDD	V	
High level input voltage	VIH	0.7 VDD	-	VDD	V	

Note1:

VBUS is 5V and it will generate 3.3V (VDD) by themselves to support all system ,so all the other control signal is 3.3V level, including SPI, UART, SW and PWM.

7.SPI Timing Characteristics



AC CHARACTERISTICS							
Param No.	Symbol	Characteristic	Min	Typ ⁽¹⁾	Max	Units	Conditions
SP70	TscL	SCKx Input Low Time	250	—	—	ns	
SP71	TscH	SCKx Input High Time	250	—	—	ns	
SP72	TscF	SCKx Input Fall Time ⁽²⁾	—	10	25	ns	
SP73	TscR	SCKx Input Rise Time ⁽²⁾	—	10	25	ns	
SP30	TdoF	SDOx Data Output Fall Time ⁽²⁾	—	10	25	ns	
SP31	TdoR	SDOx Data Output Rise Time ⁽²⁾	—	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 ⁽³⁾	10	—	50	ns	
SP52	Tsch2ssH TscL2ssH	$\overline{SSx}$ after SCKx Edge	50	—	—	ns	

8. Instructions Table

UART and SPI Mode

8.1. Unicode Mode

SB1	PL	SB2	SB3	CM D	Se1	Set2	X		Y		TC			BC			Tex t N Byt e	EB1	BCC	EB3
0x0 1	0xX X	0x0 2	0x0 4	0x4 8	0xX X	0xX X	X H	X L	Y H	Y L	R	G	B	R	G	B	N Byt e	0x0 A	0xX X	0x0 D
Byte0																		ByteN		

8.2. QR code Mode

SB1	PL	SB2	SB3	CM D	Set1	M	X		Y		QC			BC			Dat a N Byt e	EB1	BCC	EB3
0x0 1	0xX X	0x0 2	0x0 4	0x4 7	0xX X	0xX X	X H	X L	Y H	Y L	R	G	B	R	G	B	N Byt e	0x0 A	0xX X	0x0 D
Byte0																		ByteN		

8.3. Image Mode

SB1	PL	SB2	SB3	CMD	Set1	X		Y		Name ⁽¹⁾	color			EB1	BCC	EB3
0x01	0xXX	0x02	0x04	0x3B	0xXX	XH	XL	YH	YL	N Byte	R	G	B	0x0A	0xXX	0x0D
Byte0															ByteN	

8.4. Erase Mode

SB1	PL	SB2	SB3	CMD	SX		SY		EX		EY		EB1	BCC	EB3
0x01	0x10	0x02	0x04	0xXX	XH	XL	YH	YL	XH	XL	YH	YL	0x0A	0xXX	0x0D
Byte0 Byte15															

8.5. Pixel Mode

SB1	PL	SB2	SB3	CMD	Set1	X		Y		color			EB1	BCC	EB3
0x01	0x10	0x02	0x04	0x33	0xXX	XH	XL	YH	YL	R	G	B	0x0A	0xXX	0x0D
Byte0														Byte15	

8.6. Line Mode

SB1	PL	SB2	SB3	CM D	Set1	SX		SY		EX		EY		Rev	color			EB1	BCC	EB3
0x0 1	0x1 5	0x0 2	0x0 4	0x3 4	0xX X	X H	X L	Y H	Y L	X H	X L	Y H	Y L	0x0 0	R	G	B	0x0 A	0xX X	0x0 D
Byte0																			Byte20	

8.7. Square Mode

SB1	PL	SB2	SB3	CM D	Set1	SX		SY		EX		EY		Full	color			EB1	BCC	EB3
0x0 1	0x1 5	0x0 2	0x0 4	0x3 5	0xX X	X H	X L	Y H	Y L	X H	X L	Y H	Y L	0xX X	R	G	B	0x0 A	0xX X	0x0 D
Byte0																			Byte20	

8.8. Circle Mode

SB1	PL	SB2	SB3	CMD	Set1	X		Y		Radius		Full			color			EB1	BCC	EB3
0x01	0x13	0x02	0x04	0x3C	0xXX	XH	XL	YH	YL	H	L	0xXX	R	G	B	0x0A	0xXX	0x0D		
Byte0																		Byte18		

8.9. Ellipse Mode

SB1	PL	SB2	SB3	CMD	Set1	X		Y		X Radius		Y Radius		Full	color			EB1	BCC	EB3
0x01	0x15	0x02	0x04	0x3D	0xXX	XH	XL	YH	YL	H	L	H	L	0xXX	R	G	B	0x0A	0xXX	0x0D
Byte0																		Byte20		

8.10. Paint Virtual Mode

SB1	PL	SB2	SB3	CMD	Set1	SX		SY		EX		EY		EB1	BCC	EB3
0x01	0x11	0x02	0x04	0x3E	0xXX	XH	XL	YH	YL	XH	XL	YH	YL	0x0A	0xXX	0x0D
Byte0															Byte16	

8.11. Operating Mode

SB1	PL	SB2	SB3	CMD1	CMD2	Set1	EB1	BCC	EB3
0x01	0x0A	0x02	0x04	0x38	0x23	0xXX	0x0A	0xXX	0x0D
Byte0								Byte9	

8.12. PWM Mode

SB1	PL	SB2	SB3	CMD	Set1	Freq		Duty		EB1	BCC	EB3
0x01	0x0D	0x02	0x04	0x37	0x1X	FH	FL	DH	DL	0x0A	0xXX	0x0D
Byte0											Byte12	

8.13. Backlight Mode

SB1	PL	SB2	SB3	CMD	BL		EB1	BCC	EB3
0x01	0x0A	0x02	0x04	0x39	H	L	0x0A	0xXX	0x0D
Byte0								Byte9	

8.14. TP Compensation Mode

SB1	PL	SB2	SB3	CMD	EB1	BCC	EB3
0x01	0x08	0x02	0x04	0x7E	0x0A	0x97	0x0D
Byte0							Byte7

9. Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	$\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$	-	13	20	.ms	Note 3
		Tf		-	15	25		
Contrast ratio		CR	At optimized viewing angle	600	800	-	-	Note 4
Color Chromaticity	White	Wx	$\theta=0^{\circ}$ 、 $\Phi=0$	0.269	0.319	0.369	-	Note 2,5,6
		Wy		0.291	0.341	0.391	-	
Viewing angle	Hor.	ΘR	$CR\geq 10$	80	85	-	Deg.	Note 1
		ΘL		80	85	-		
	Ver.	ΦT		80	85	-		
		ΦB		80	85	-		
Brightness		-	-	500	600	-	cd/m ²	Center of display
Uniformity		(U)	-	75	-	-	%	Note 5

Ta=25±2℃

Note 1: Definition of viewing angle

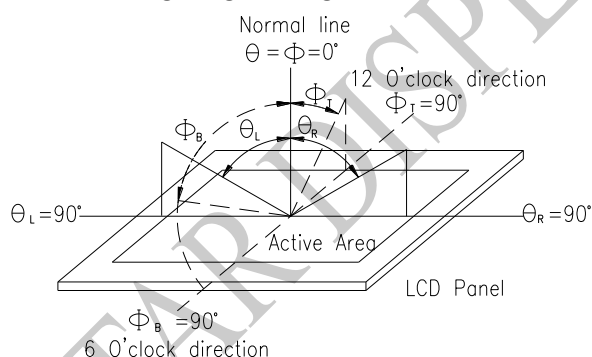


Fig. 9.1. Definition of viewing angle

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.

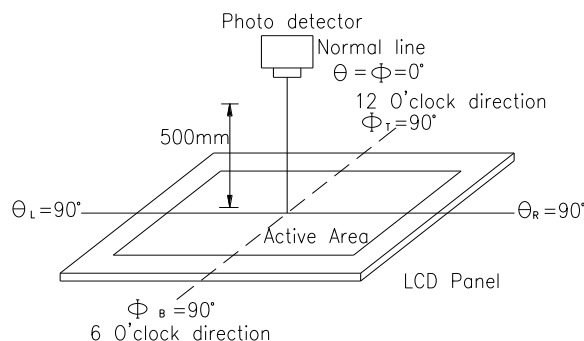
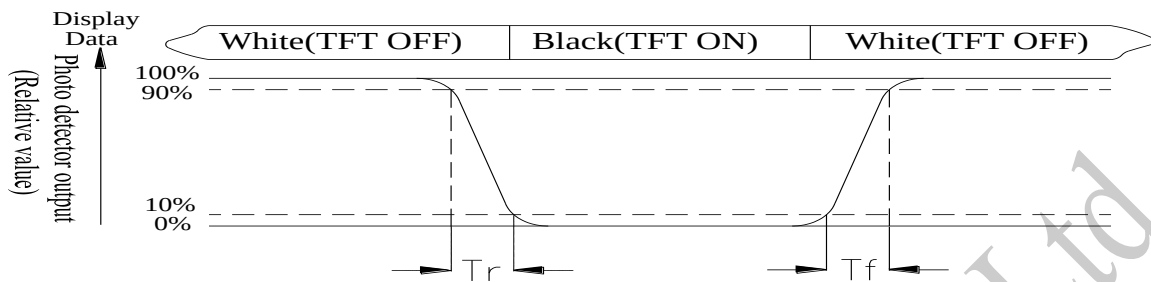


Fig. 9.2. Optical measurement system setup

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, 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

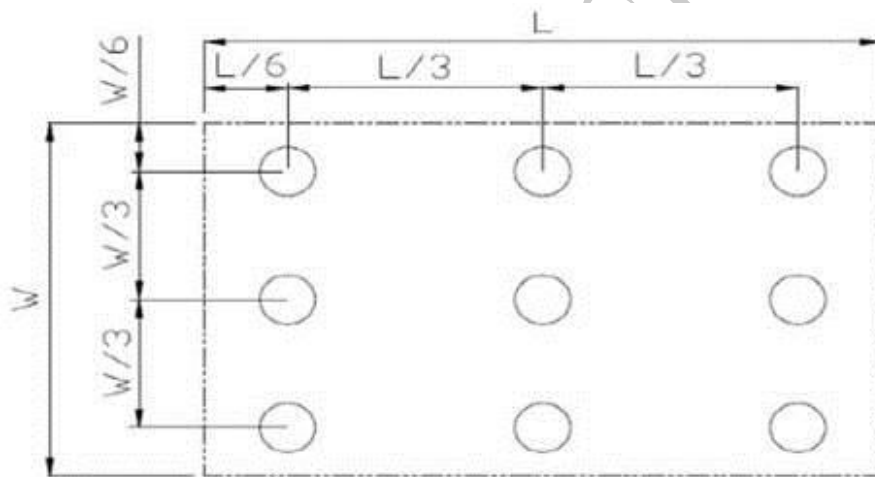


Fig9.3. Definition of uniformity

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.

10.Interface

10.1. 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	5V	Power Supply	Power supply : 5V
5	D+	I/O	USB Data +
6	D-	I/O	USB Data -
7	GND	Power Supply	Power Ground
8	RST	I	Reset (active Low)
9	GND	Power Supply	Power Ground
10	PWM	O	Pulse width modulation
11	GND	Power Supply	Power Ground
12	5V	Power Supply	Power supply : 5V

10.2. 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	O	Master Input Slave Output (MISO)
8	SDO	I	Master Output Slave Input (MOSI)
9	SCK	I	Serial Clock
10	SCS	I	Serial Chip selection
11	SPI_INT	O	Serial Interrupt
12	5V	Power Supply	Power supply : 5V

10.3. USB_D

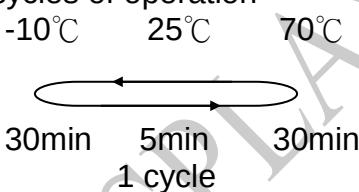
Pin	Symbol	Function	Remark
1	NC	No connection	
2	D-	Data line -	
3	D+	Data line +	
4	NC	No connection	
5	GND	Power Ground	

10.4. POWER JACK

Pin	Symbol	Function	Remark
1	5V	Power Supply (5V)	
2	GND	Ground	
3	NC	No connection	

11. Reliability

Content of Reliability Test (Wide temperature, -10°C~70°C)

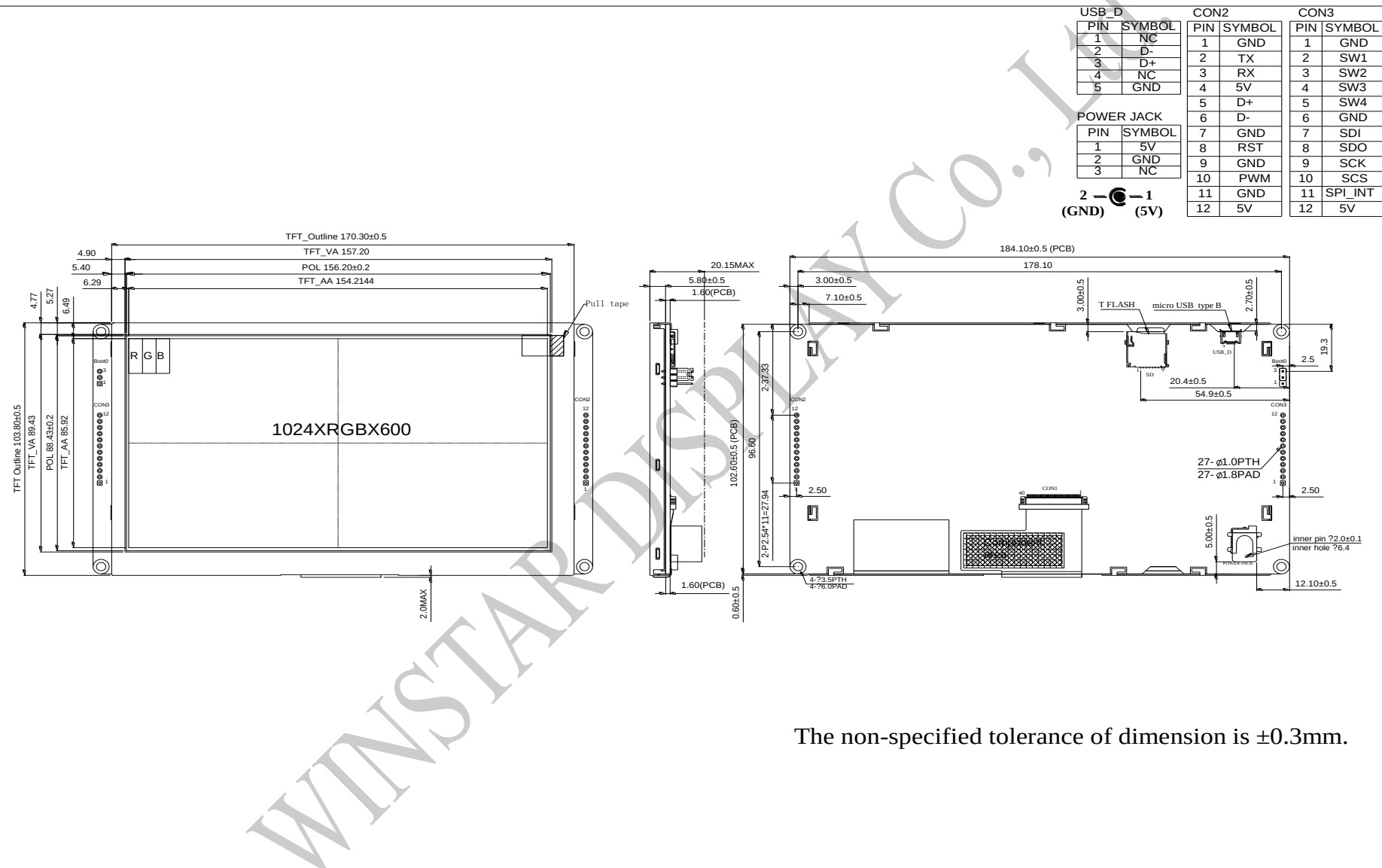
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature 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.	-10°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 	-10°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



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

13.Relationship

13.1. Commands Reference Guide

If you want to know the details of how to use the command, you can see the PDF named M-series TFT Commands Reference Guide.

13.2. User Guide

If you want to learn more about how to use UI software, you can see the PDF named M-Series User Guide.

WINSTAR DISPLAY Co., Ltd.

**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

- | | | |
|-----------------------------|-------------------------------|-------------------------------------|
| 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 : / /