



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



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WEB: <https://www.winstar.com.tw> E-mail: sales@winstar.com.tw



SPECIFICATION

CUSTOMER : _____

MODULE NO.: WF0154ASAAA4DSNO#

<p style="text-align: center;">APPROVED BY:</p> <p style="text-align: center;">(FOR CUSTOMER USE ONLY)</p>	<p>PCB VERSION: _____</p> <p>DATA: _____</p>
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2023/05/22			

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>



RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2023/05/22		First issue

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- 3.Absolute Maximum Ratings
- 4.Electrical Characteristics
- 5.AC Characteristics
- 6.Optical Characteristics
- 7.Interface
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- 9.Contour Drawing
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1.Module Classification Information

W F 0154 A S A A A4 D S 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 : 1.54" 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	A4	240240								
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										

2. General Specifications

Item	Dimension	Unit
Size	1.54"	inch
Dot Matrix	240 x RGB x 240	dots
Module dimension	31.52 x 33.72 x 1.94	mm
Active area	27.72 x 27.72	mm
Pixel pitch	0.1155 x 0.1155	mm
LCD type	TFT, Normally Black, Transmissive	
Viewing Angle	80/80/80/80	
Backlight Type	LED, Normally White	
Drive IC	ST7789T3-G4-1 or Equivalent	
TFT Interface	SPI	
With /Without TP	Without TP	
Surface	Anti-Glare	

*Color tone slight changed by temperature and driving voltage.

3. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-10	—	+60	°C
Storage Temperature	TST	-20	—	+70	°C

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

1. Temp. \square 60°C, 90% RH MAX. Temp. $>$ 60°C, Absolute humidity shall be less than 90% RH at 60°C

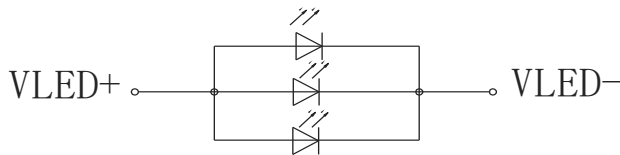
4. Electrical Characteristics

4.1. TFT LCD MODULE

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Analog Supply Voltage	VDD	2.4	2.8	3.3	V	-
Power Supply for I/O System	IOVCC	1.65	1.8	3.3	V	$IOVCC \leq VDD$
Input High Voltage	VIH	0.7 IOVCC	-	IOVCC	V	Digital input pins
Input Low Voltage	VIL	GND	-	0.3 IOVCC	mA	Digital input pins
Output High Voltage	VoH	0.8 IOVCC	-	IOVCC	mA	Digital input pins
Output Low Voltage	VoL	GND	-	0.2 IOVCC	W	Digital input pins
(Panel+LSI) Power Consumption	Black Mode	-	6.0	-	mA	VDD =2.8V
	Sleeping Mode	-	0.015	-	mA	

4.2. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If=60mA	2.8	3.0	3.2	V
Backlight Power Consumption	WBL	If=60mA	-	192	-	mW
LED Life Time	-		-	30,000	-	Hr

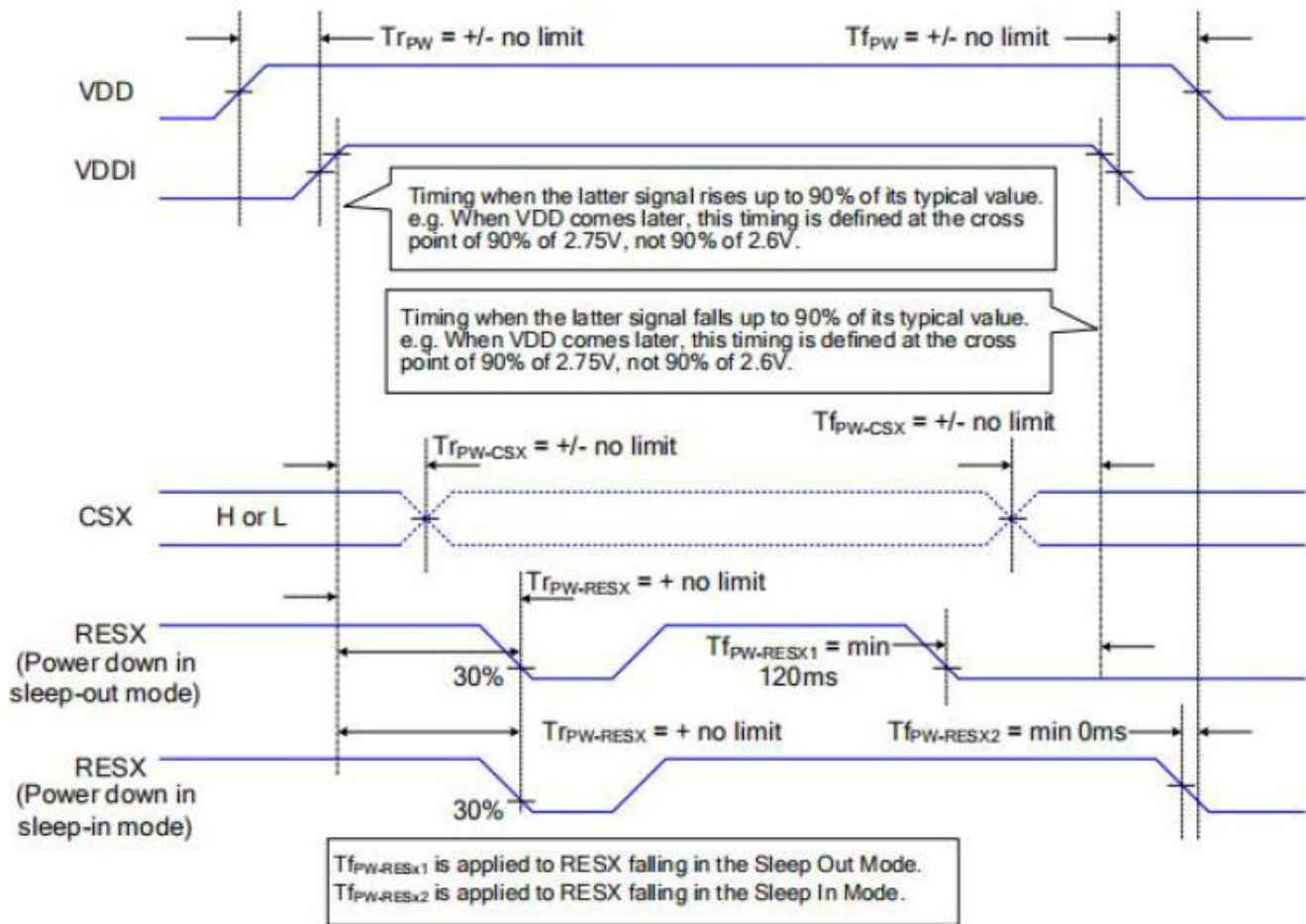


Backlight LED Circuit

5.AC Characteristics

5.1. Power Sequence

The power on/off sequence is illustrated below



5.2. Timing Characteristics (4-line serial)

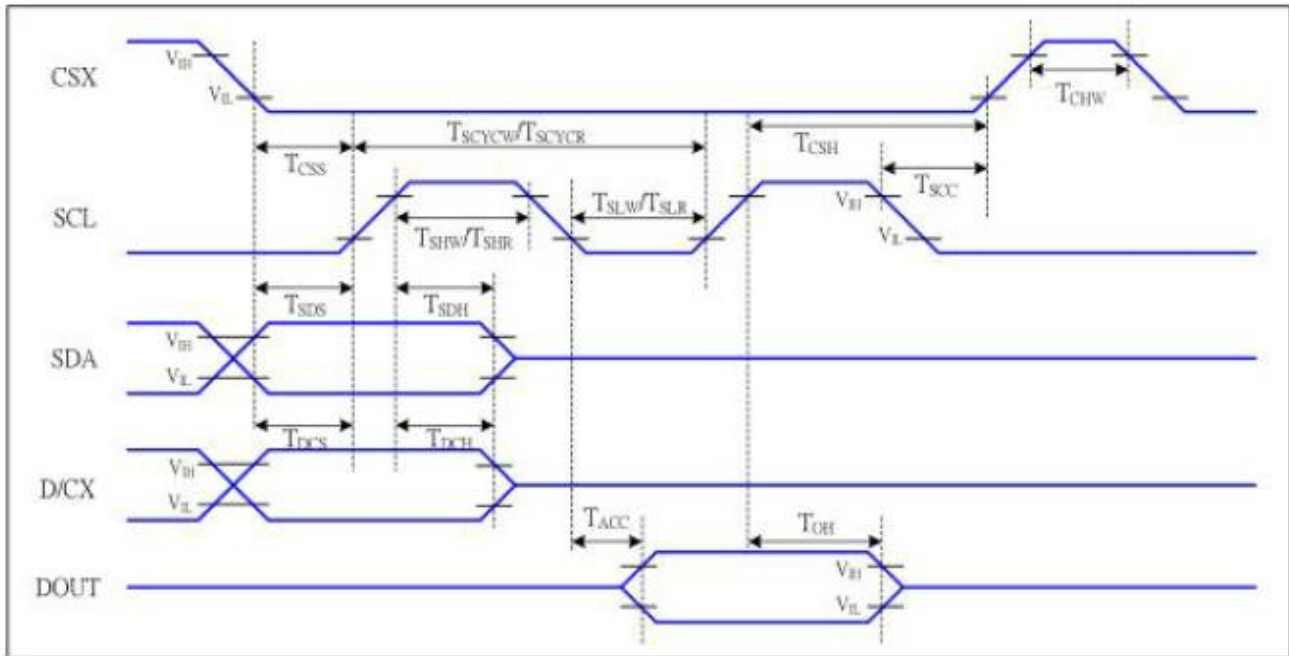


Figure 1 4-line serial interface timing Characteristics

VDDI=1.65 to 3.6V, VDD=2.4 to 3.6V, AGND=DGND=0V, Ta=25°C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	16		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	7		ns	
	T_{SLW}	SCL "L" pulse width (Write)	7		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	7		ns	
	T_{SDH}	Data hold time	7		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

Note :This section is only for reference,Details please refer to the IC specification.

6. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr+ Tf	$\theta=0^\circ$ 、 $\phi=0^\circ$	-	30	40	.ms	Note 3	
Contrast ratio	CR	At optimized viewing angle	700	900	-	-	Note 4	
Color Chromaticity	White	Wx	$\theta=0^\circ$ 、 $\phi=0^\circ$	0.238	0.288	0.338		Note 2,6,7
		Wy		0.259	0.309	0.359		
Viewing angle	Hor.	θ_R	$CR \geq 10$	75	80	-	Deg.	Note 1
		θ_L		75	80	-		
	Ver.	ϕ_T		75	80	-		
		ϕ_B		75	80	-		
Brightness	-	-	800	850	-	cd/m ²	Center of display	
Uniformity	(U)	-	75	-	-	%	Note 5	

Ta=25±2°C

Note 1: Definition of viewing angle range

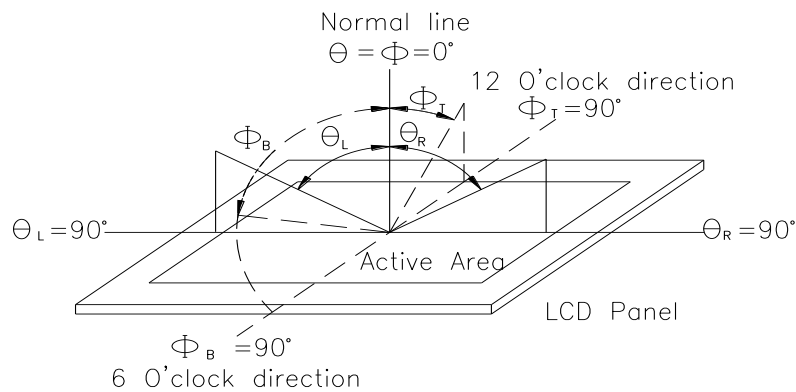


Fig 6.1. Definition of viewing angle

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.

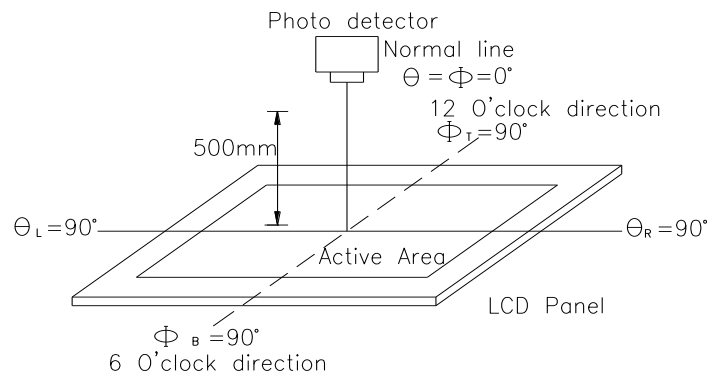
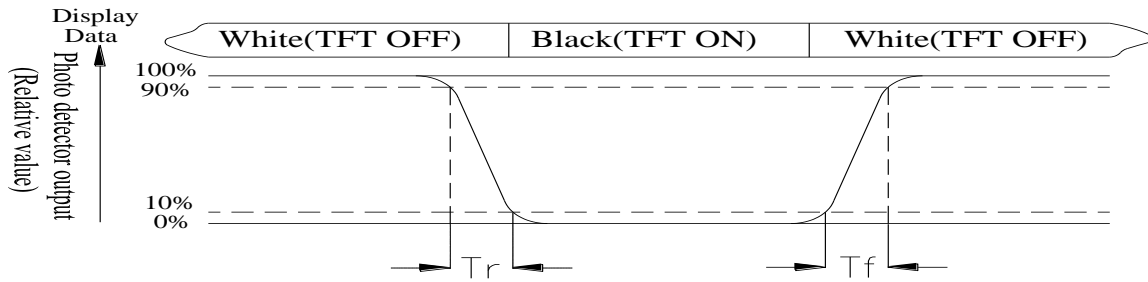


Fig 6.2. Optical measurement system setup

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.

$$\text{Luminance Uniformity (U)} = \text{Lmin/Lmax} \times 100\%$$

L = Active area length

W = Active area width

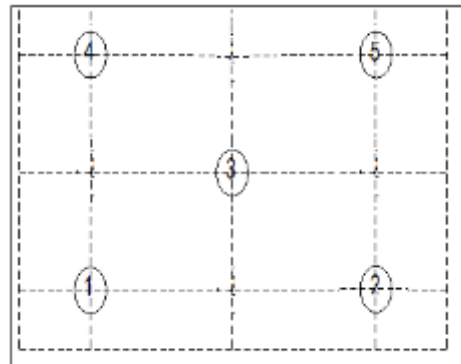


Fig 6.3. Definition of uniformity

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.

7.Interface

7.1. LCM PIN Definition

Pin No.	Symbol	Function
1	GND	Ground.
2	IOVCC	Power Supply for I/O System
3	CS	Chip selection pin
4	RESET	This signal will reset the device
5	RS	Display data/command selection pin in 4-line serial interface
6	GND	Ground.
7	SCL	This pin is used to be serial interface clock
8	SDA	SPI interface input/output pin
9	GND	Ground.
10	VDD	Power Supply for Analog
11	FMARK	Tearing effect signal is used to synchronize MCU to frame memory writing.
12	VLED-	Power Supply For LED Backlight Cathode Input
13	VLED-	Power Supply For LED Backlight Cathode Input.
14	VLED+	Power Supply For LED Backlight Anode Input.
15	VLED+	Power Supply For LED Backlight Anode Input.

8. Reliability

Content of Reliability Test (Wide temperature, -10°C~60°C)

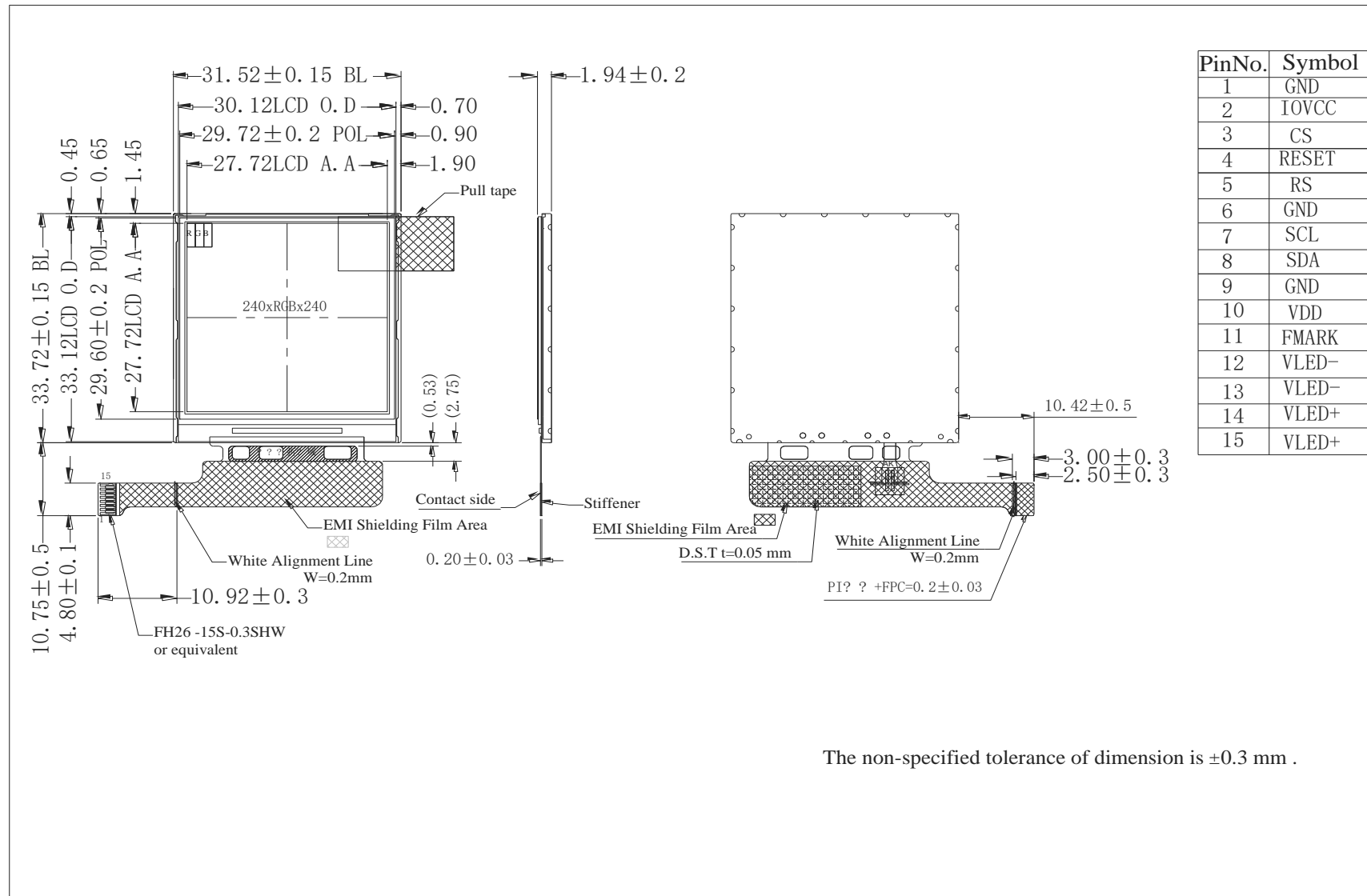
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	70°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-20°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	60°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 <div style="text-align: center;"> <p style="margin: 0;">-10°C 25°C 60°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-10°C/60°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=±4KV(contact), ±8KV(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.

9. 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 , _____

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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 : / / _____