PRODUCT SPECIFICATION

Model No	**T147HG-C16-13-TP**
Product Name	**1.47 TFT LCD Module**
Version	**V1.0**
Date	**2024-03-09**

☐ Preliminary Specification
☑ Final Specification

PREPARED BY	CHECKED BY	APPROVED BY

Revision History

Version	Date	Page	Revise record	Remarks
V1.0	2024-03-08	-	First issued	-

TABLE OF CONTENT

NO.Contents **Page**

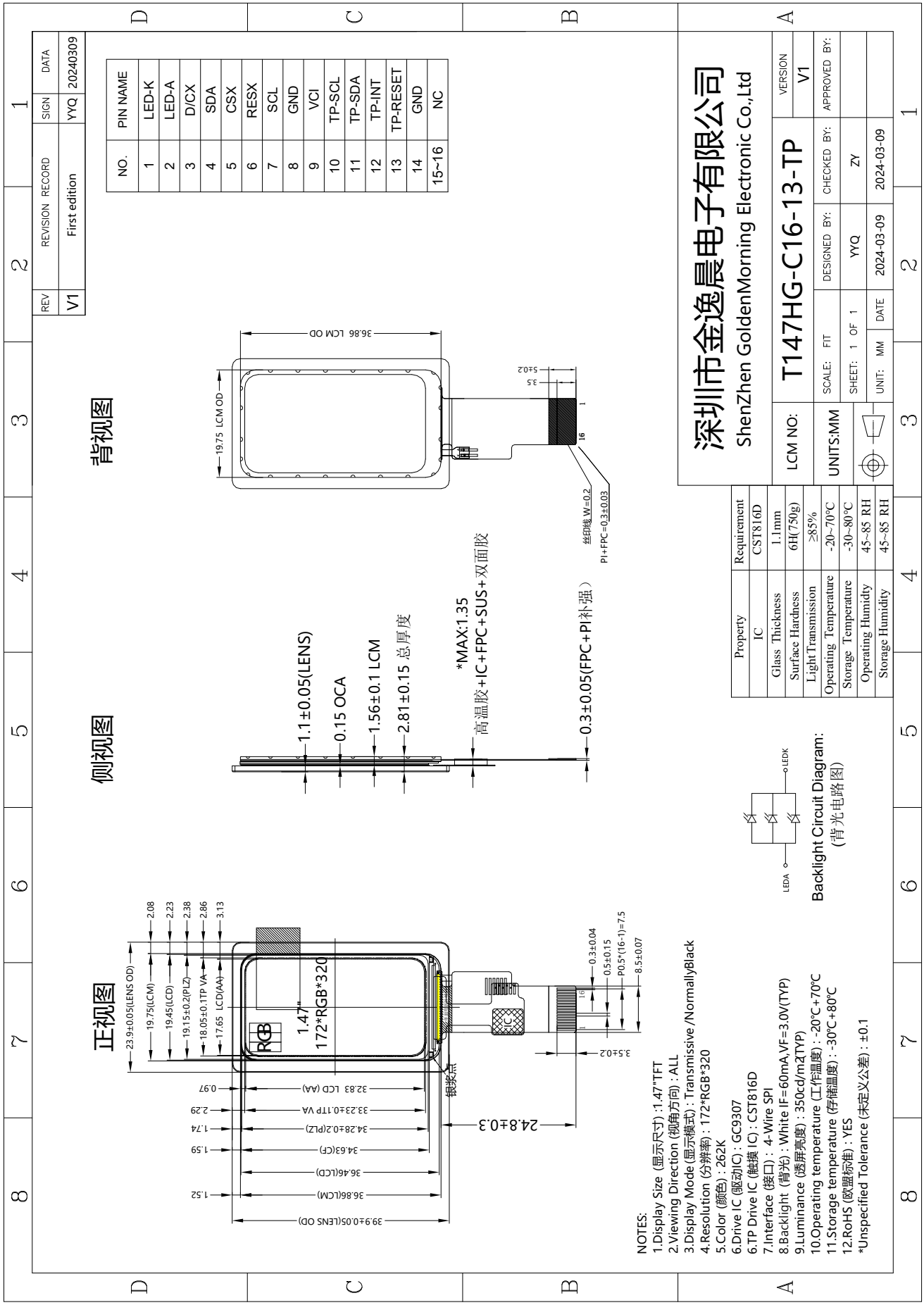
1. General Parameter

NO.	Features	Details	Unit
1	Display Size(Diagonal)	1.47''	Inch
2	LCD type	IPS TFT	-
3	Display Mode	Transmissive/Normally black	-
4	Resolution	172RGB(H) x 320(V)	Pixels
5	Viewing Direction	ALL	-
6	Module size	23.90(W) x 39.90(H) x 2.81(T)	mm
7	Active Area	17.65(W) x 32.83(H)	mm
8	Pixel Size	0.1026(W) x 0.1026(H)	mm
9	Color arrangement	RGB Vertical stripe	-
10	Interface	4 Line SPI	-
11	Display Colors	262K	-
12	Driver IC	ST7789	-
13	TP Driver IC	CST816D	-
14	With or Without Touch Panel	Tape touch	-
15	Operating Temperature	-20℃~70℃	℃
16	Storage Temperature	-30℃~80℃	℃
17	Weight	5.0	g

Note 1: Please refer to the mechanical drawing.

2. Physical drawing

3. Mechanical Dimension



4. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCI	-0.3	4.6	V
Operating temperature	Top	-20	70	℃
Storage temperature	Tst	-30	80	℃

Note 1: If Ambient temperature below 50ºC, the maximal humidity is 90%RH, if Ambient temperature over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10℃, and the back ground will become darker at high temperature operating.

Note 3: If one of the above items is exceeded its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range.

5. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VCI	2.5	2.8	3.3	V
Input high voltage	V_{IN}	0.7*VCI	-	VCI	V
Input low voltage	V_{IL}	GND	-	0.3*VCI	V
Output high voltage	V_{OH}	0.8*VCI	-	VCI	V
Output low voltage	V_{OL}	GND	-	0.2*VCI	V
Input Current	I_{IN}	-	20	-	mA

6. Backlight Characteristic

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	V_F	-	3.0	-	V	-
Forward Current	I_F	-	60	-	mA	-
Power dissipation	Pd	-	180	-	mW	-
LED Life Time(25 ºC)	-	-	10000	-	Hrs	-

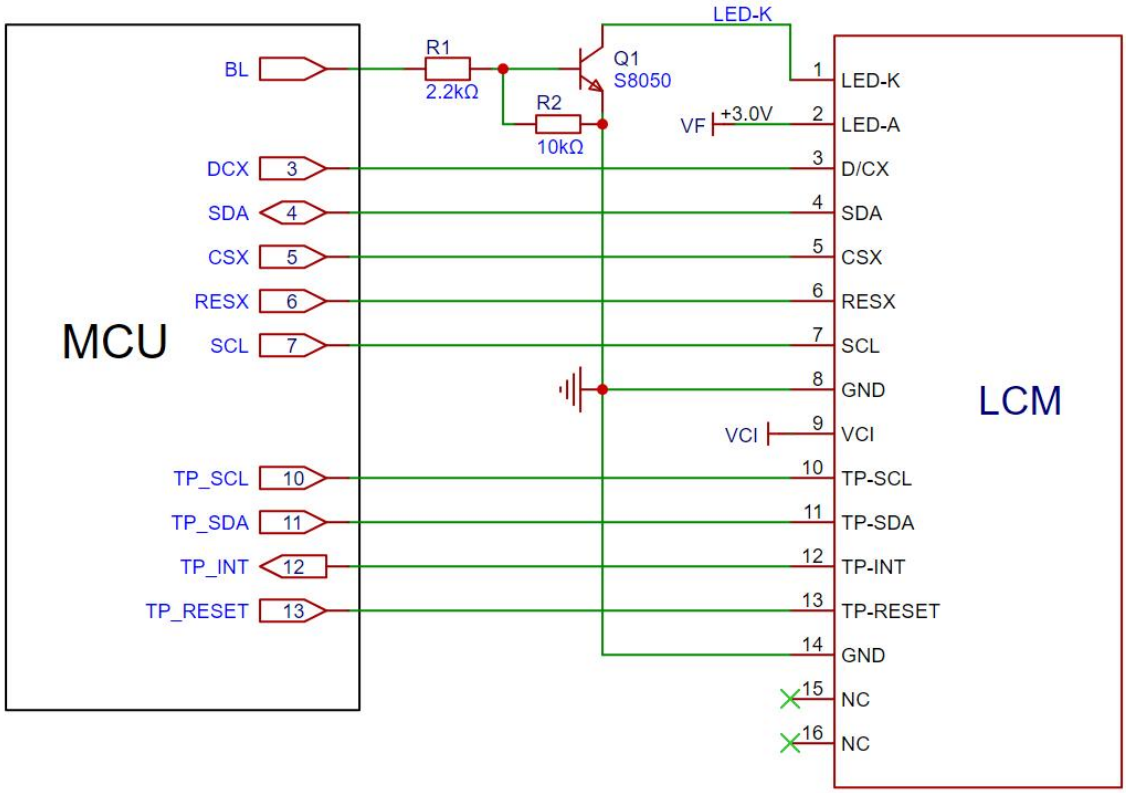
Note: LED life time defined as follows: The final brightness is at 50% of original brightness.Typical operating life time is estimated data.

7. Pins Definitions.

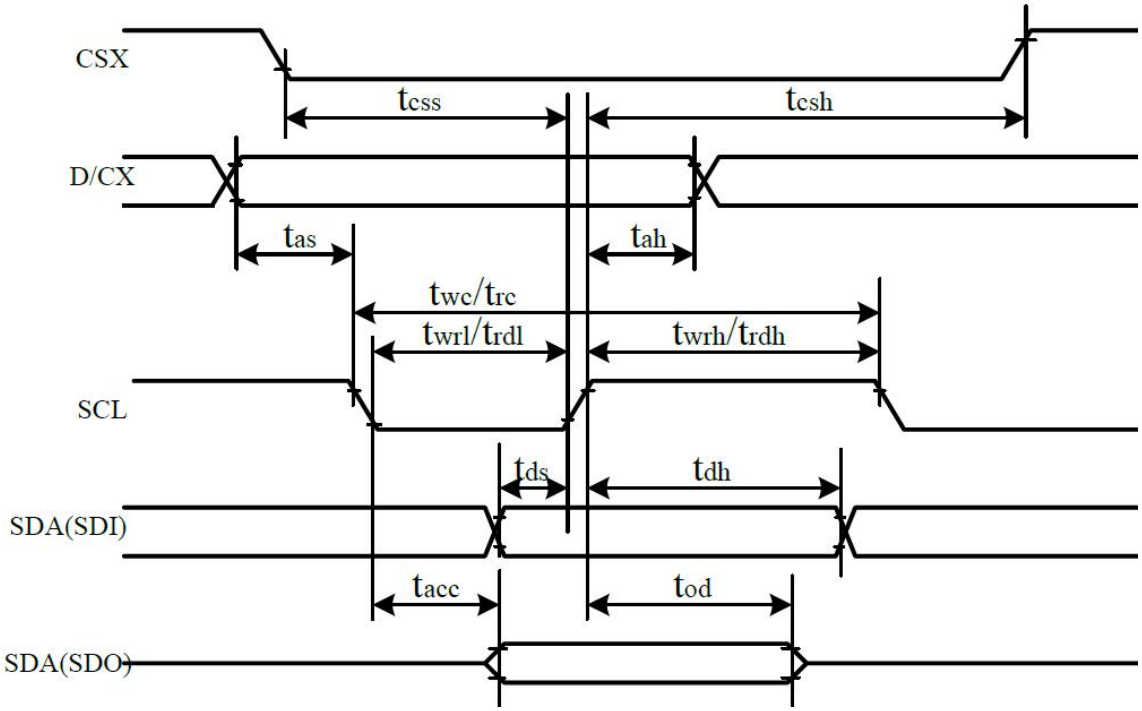
Pin.No	Symbol	Description
1	LED-K	Backlight cathode.
2	LED-A	Backlight anode.
3	D/CX	Display data/command selection (RS) pin. D/CX='1': display data or parameter. D/CX='0': register index / command.
4	SDA	- SPI interface input pin. - The data is latched on the rising edge of the SCL signal.
5	CSX	Chip selection pin. Low-active.
6	RESX	This signal will reset the device and must be applied to properly initialize the chip.
7	SCL	Serial interface clock.
8	GND	Ground.
9	VCI	Supply Voltage(2.5-3.3V)
10	TP-SCL	TP Serial clock pin.
11	TP-SDA	TP Serial data input / output.
12	TP-INT	Touch interrupt input pin
13	TP-RESET	TP Reset pin
14	GND	Ground.
15	NC	No connect.
16	NC	No connect.

NOTE: The backlight LED can be powered separately or share a set of voltage supply with the VCI.

8. Schematic Diagram.



9. Timing Characteristics.



4-SPI Serial Data Transfer Interface Characteristics

Note: Ta = 25 °C, IOVCC=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V

Signal	Symbol	Parameter	min	max	Unit	Description
CSX	tcss	Chip select time (Write)	20	-	ns	
	tcsh	Chip select hold time (Read)	40	-	ns	
SCL	twc	Serial Clock Cycle (Write)	10	-	ns	
	twrh	SCL "H" Pulse Width (Write)	5	-	ns	
	twrl	SCL "L" Pulse Width (Write)	5	-	ns	
	trc	Serial Clock Cycle (Read)	150	-	ns	
	trdh	SCL "H" Pulse Width (Read)	60	-	ns	
	trdl	SCL "L" Pulse Width (Read)	60	-	ns	
D/CX	tas	D/CX setup time	10	-	ns	
	tah	D/CX hold time (Write/Read)	10	-	ns	
SDA/SDI (Input)	tds	Data setup time (Write)	5	-	ns	
	tdh	Data hold time (Write)	5	-	ns	
SDA/SD0 (Output)	tacc	Access time (Read)	10	-	ns	

10. Optical Characteristics.

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (with Polarizer)		T (%)	Θ=0 Normal viewing angle	3.2	3.6	—	%	Measuring with normal polarizer， Reference Only Base on Vop=4.3V
Transmittance (without Polarizer)		T (%)		11.6	12.9	—	%	
Contrast Ratio		CR		1000	1300	—	—	(1)(2)
Response Time		TR+TF		—	35	40	msec	(1)(3)
Color Gamut	(%)			65	70	—	%	C-light
Color Chromaticity (CIE1931)	White	Wx		-0.02	0.300	+0.02	—	(1)(4) CF glass C-light
		Wy			0.341			
	Red	Rx			0.659		—	
		RY			0.326			
	Green	Gx			0.277		—	
		GY			0.589			
	Blue	Bx			0.136		—	
		BY			0.128			
Viewing Angle	Hor.	ΘL	CR>10	80	85	—	—	(1)(4) Measuring with normal polarizer， Reference Only
		ΘR		80	85	—		
	Ver.	ΘU		80	85	—		
		ΘD		80	85	—		
Optima View Direction		Free						(5)

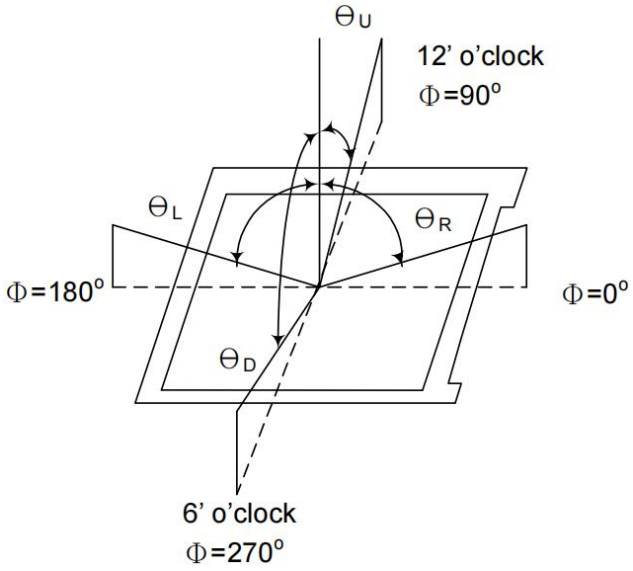
Measuring Condition

- Measuring surrounding：dark room
- Ambient temperature：25±2^{O}C
- 15min. warm-up time.

Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

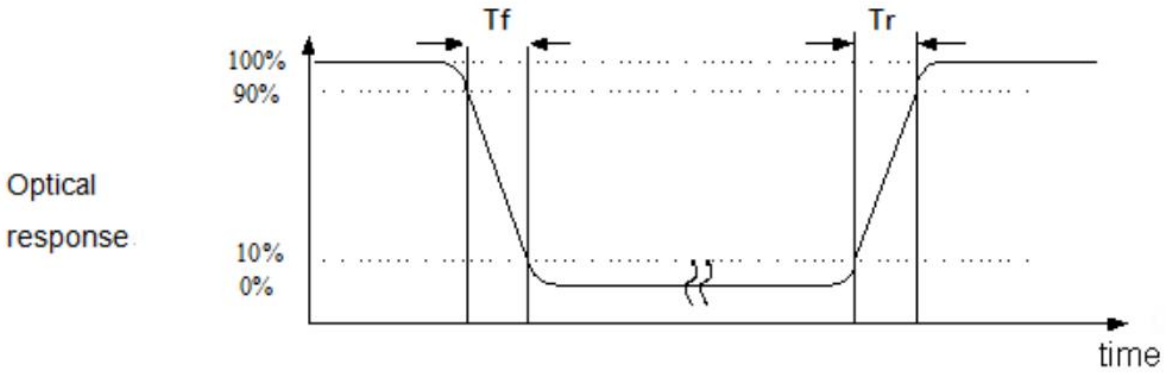
Note (1) Definition of Viewing Angle:



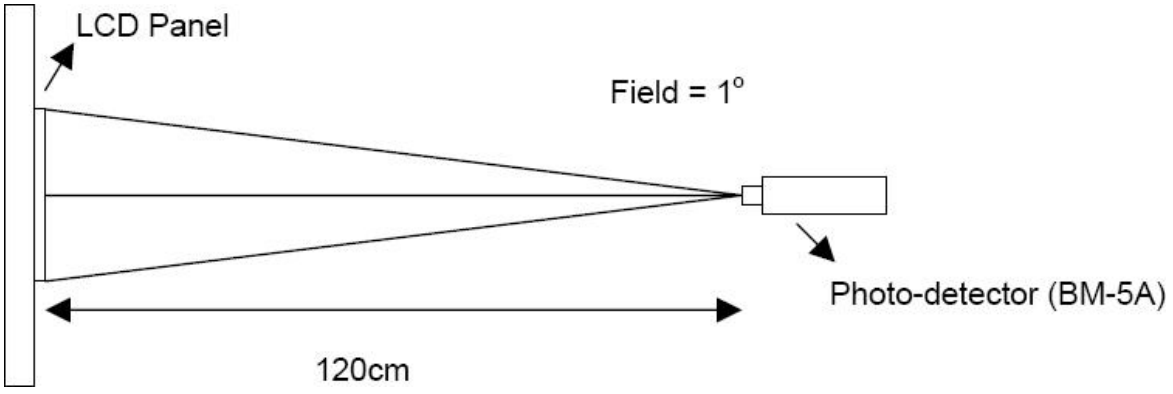
Note (2) Contrast ratio is calculated by the following formula:

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

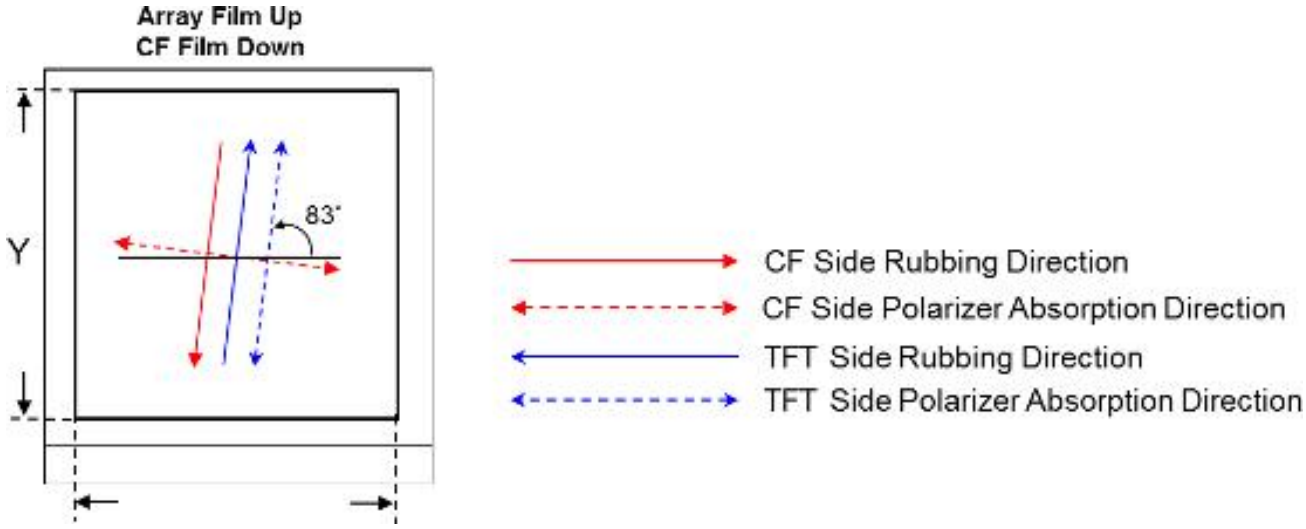
Note (3) Definition of Response Time: Sum of TR and TF



Note (4) Definition of optical measurement setup



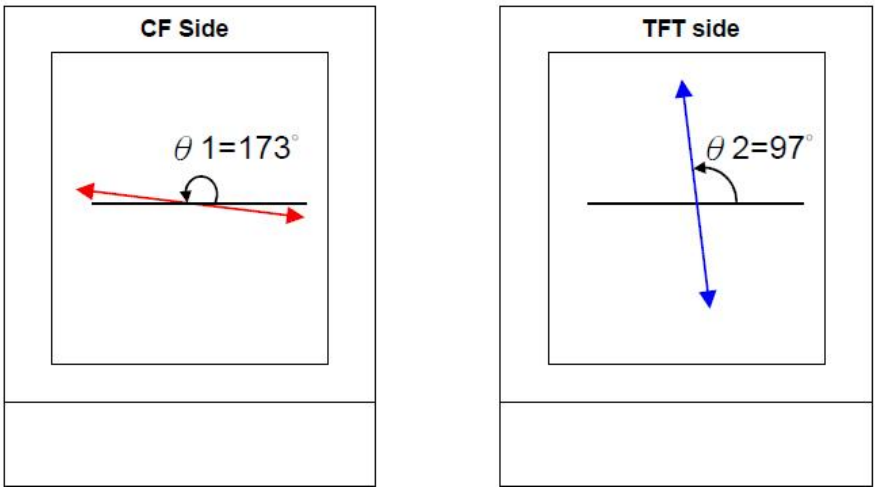
Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)



Item	*Specifications*	Unit	Note
Rubbing Direction	*83° (TFT) / 263° (CF)*	degree	1-domain IPS-pro
Absorption axis of Polarizer	*83° (TFT) / 173° (CF)*	degree	Array Film Up CF Film Down

CF side polarizing absorption angle $\theta 1=173^{\circ}$ (Protective film on top, glue layer face down)

TFT side polarizing absorption angle $\theta 2=97^{\circ}$ (Protective film on top, glue layer face down)



11. Reliability

11.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal.

11.2. Test Condition

No	Item	Condition	Criteria
1	High Temperature Operating	60℃*24Hrs	1. No Defect Of Operational Function In Room Temperature Are Allowable. 2. IDD of LCM in Pre-and Post-Test Should Follow Specification.
2	Low Temperature Operating	-20℃*24Hrs	
3	High Humidity Storage	50℃*90%RH*24Hrs	
4	High Temperature Storage	70℃*24Hrs	
5	Low Temperature Storage	-30℃*24Hrs	
6	Thermal Cycling Test Storage	-	
7	Packing vibration	-	
8	Electrical Static Discharge	-	
		-	
9	Drop Test (Packaged)	-	

Note1. The test samples should be applied to only one test item.

Note2. Sample size for each test item is 2pcs.

Note3. No defection function allowable.

12. Precautions

12.1. Storage Conditions

12.1.1. Store the panel or module in a dark place where the temperature is 23±5℃and the humidity is below 45±20%RH.

12.1.2. Store in anti-static electricity container.

12.1.3. Store in clean environment, free from dust, active gas, and solvent.

12.1.4. Do not place the module near organics solvents or corrosive gases.

12.1.5. Do not crush, shake, or jolt the module.

12.1.6. Strong light exposure causes degradation of polarizer and color filter.

12.2. Handling Precautions

12.2.1. Avoid static electricity, which can damage the CMOS LSI.

12.2.2. The polarizing plate of the display is very fragile, please handle if very carefully.

12.2.3. Do not give external shock.

12.2.4. Do not apply excessive force on the surface.

12.2.5. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

12.2.6. Reverse and use within ratings in order to keep performance and prevent damage

12.2.7. Do not remove the panel or frame from the module.

12.2.8. Except for soldering the interface, do not make any alterations or modifications with a soldering iron; Ensure welding temperature at 320 ° C to 350 ° C, the welding timecontrol within the 10 s, welding note don't stay too long in the same place to avoid scald FPC.

12.3. Limited Warranty

12.3.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss. (我们的保证责任仅限于修理和/或更换。我们将不负责任何相应的损失。)

12.3.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used. (如果可能，我们建议客户在6 个月内用完所有模块。如果模块存放时间超过 12 个月，我们建议在使用模块前重新检查。)

12.3.3. The warranty period is twelve months from the date of delivery. Buyer shall complete the assembly of all processes within twelve months of validity. During the warranty period, if the product quality problems, our company will be responsible for repair and replacement. All products must be stored and handled in accordance with regulations. Under warranty. When the goods do not comply with the above terms, we do not provide warranty services.（保修期为交货之日起十二个月。买方应在 12 个月内完成所有流程的组装。在保修期内，如果产品出现质量问题，我公司将负责维修和更换。所有产品必须按照规定储存和处理。在保修期内。当货物不符合上述条款时，我们不提供保修服务。）