

Model NO 型号	GMT147-03H
Product Name 产品名称	1.47 TFT LCD Module
Version 版本号	V 1.0
Date 日期	2024-01-15

☐ **Preliminary Specification**（规范草案）

☒ **Final Specification**（最终规格）

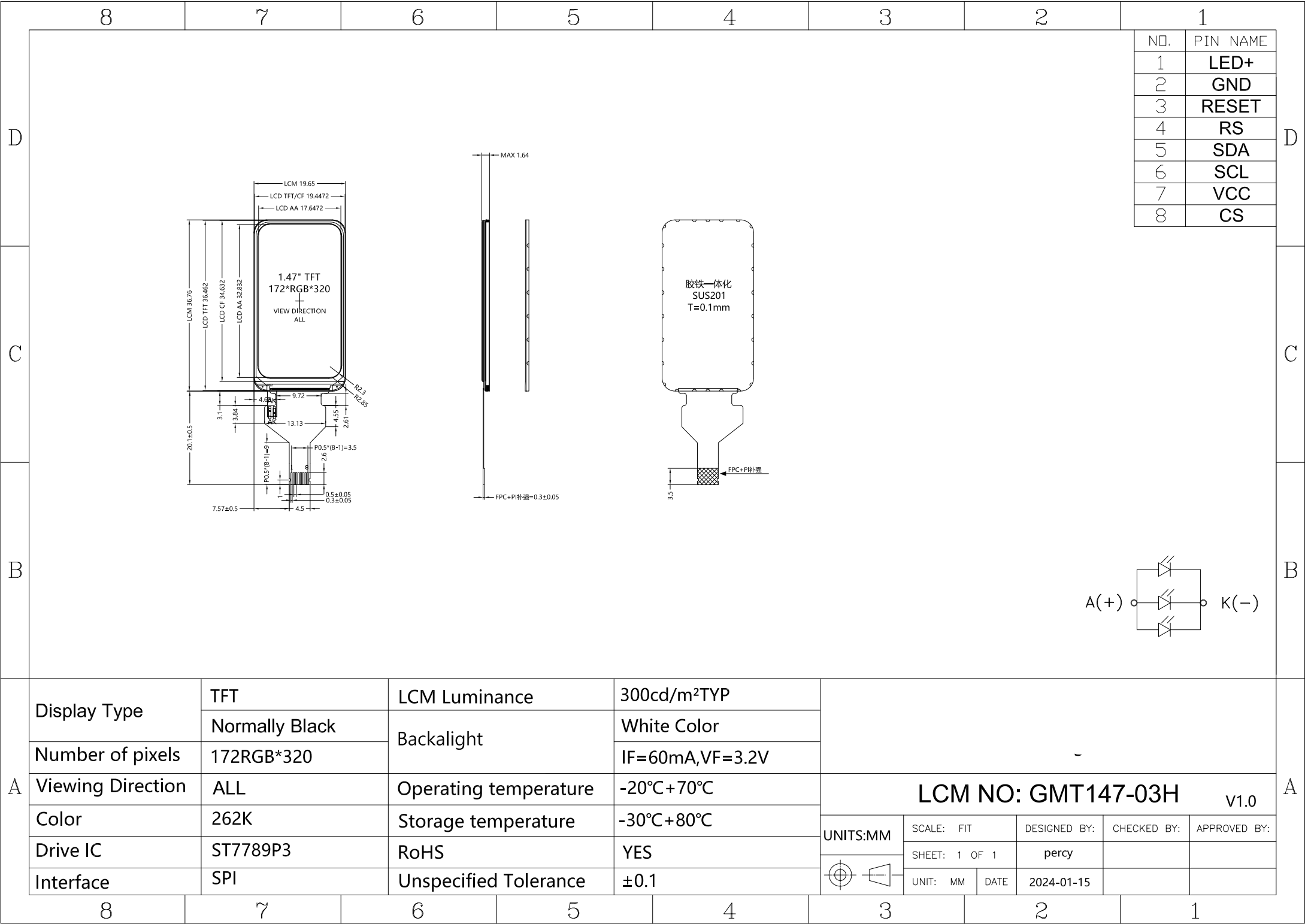
PREPARED 编辑	CHECKED 检查核对	APPROVED 审批人

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1. General Specifications (概况)

Item 项目	Specification 规格	Unit 单位
Display Mode 显示模式	Normally Black, Transmissive	/
Viewing Direction 视角方向	ALL	/
Colors 颜色	262K	/
Drive IC 驱动IC	COG ST7789P3	/
Interface Type 接口类型	SPI	/
Dimensional Outline 模组尺寸	19.65(W) x 36.76(H) x 1.64(T)	mm
LCD Active Area LCD有效区域	17.6472(W) x 32.832(H)	mm
Resolution 分辨率	172 RGB(H) x 320(V)	pixels
Pixel Pitch 像素间距	0.1026(W) x 0.1026(H)	mm



A	Display Type	TFT	LCM Luminance	300cd/m ² TYP	LCM NO: GMT147-03H v1.0				
		Normally Black	Backalight	White Color					
	Number of pixels	172RGB*320		IF=60mA,VF=3.2V					
	Viewing Direction	ALL	Operating temperature	-20°C+70°C	UNITS:MM SCALE: FIT DESIGNED BY: SHEET: 1 OF 1 UNIT: MM DATE 2024-01-15				
	Color	262K	Storage temperature	-30°C+80°C					
	Drive IC	ST7789P3	RoHS	YES					
	Interface	SPI	Unspecified Tolerance	±0.1					

3. Maximum Ratings (极限参数)

Parameter 参数	Symbol 符号	Min 最小	Max 最大	Unit 单位
Logic Supply Voltage 逻辑电源电压	IOVCC	-0.3	4.6	V
Analog Supply Voltage 模拟电源电压	VCC	-0.3	4.6	V
Operating temperature 工作温度	Top	-20	70	°C
Storage temperature 储存温度	Tst	-30	80	°C
Humidity 湿度	RH	--	90%(Max60C)	RH

4. ELECTRICAL CHARACTERISTICS (电气特性)

Parameter 参数	Symbol 符号	Min 最小	Typ 典型	Max 最大	Unit 单位
Logic Supply Voltage 逻辑电源电压	IOVCC	1.65	1.8/2.8	3.3	V
Analog Supply Voltage 模拟电源电压	VCC	2.6	2.8	3.3	--
Input Current 输入电流	Idd	--	20	--	mA

5. BACKLIGHT CHARACTERISTICS (背光特性)

Item 项目	Symbol 符号	Min 最小	Typ 典型	Max 最大	Unit 单位	Condition 条件
Forward Voltage 正向电压	Vf	3.0	3.2	3.4	V	--
Forward Current 正向电流	If	--	60	--	mA	--
Operating Life Time 使用寿命	--	--	10000	--	Hrs	

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C
(LED 电源电压由 Ta=25°C时的 LED 数量定义)

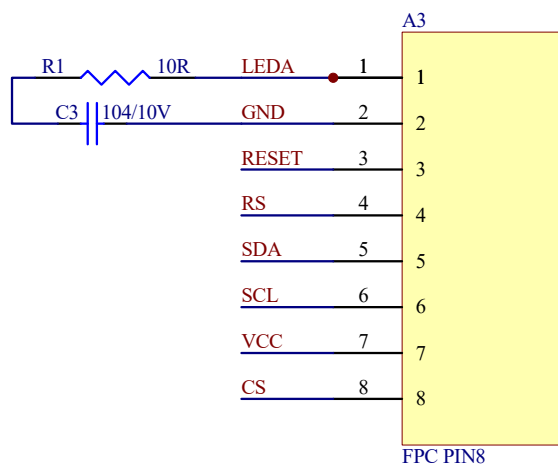
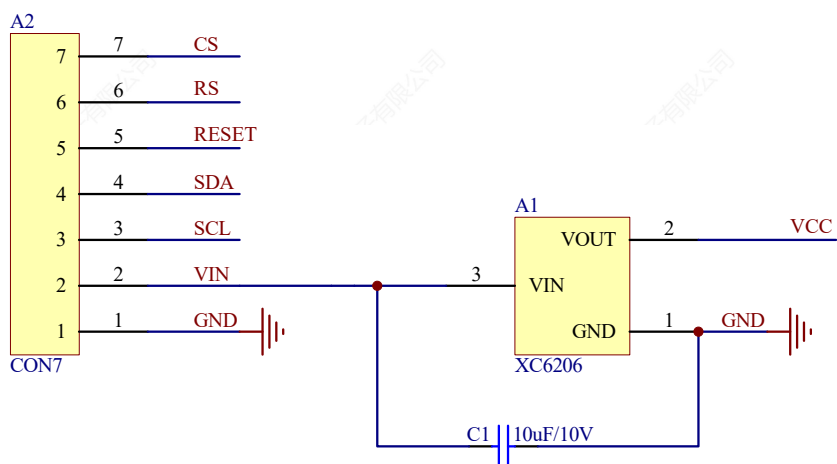
Note 2: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.
(使用寿命意味着亮度降低到初始亮度的 50%。典型的使用寿命是估算数据。)

6. PIN DESCRIPTIONS (PIN 定义)

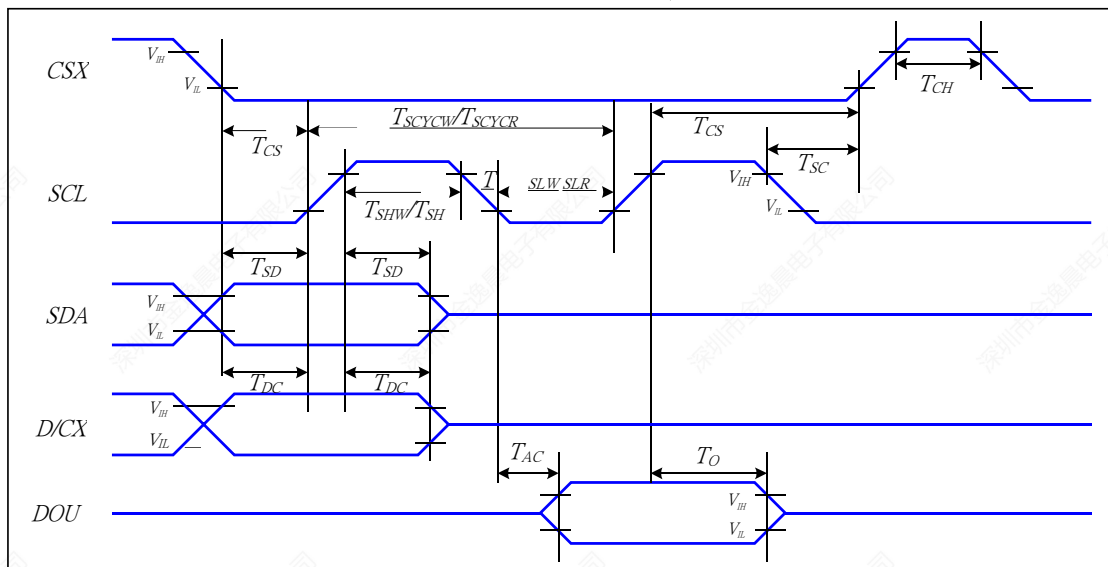
Pin.No 编号	Symbol 符号	Description 说明
1	LED+	Anode of Backlight (3.0V-3.4V) (背光正极供电脚)
2	GND	Ground (接地脚)
3	RESET	LCM Reset pin (屏复位脚)
4	RS	Register select pin (指令/数据寄存器选择脚) RS='1': Display data. (RS='1':选择数据寄存器) RS='0': Command data. (RS='0':选择指令寄存器)
5	SDA	Serial data input / output. (串口数据线)
6	SCL	Serial clock pin. (串口时钟线)
7	VCC	Power supply for Analog (2.8V-3.3V) (系统电压)
8	CS	Chip select pin("Low" enable) (屏驱动芯片片选脚, 低电平有效)

NOTE: The backlight LED can be powered separately or share a set of voltage supply with the VCC.
背光 LED 可以单独供电, 也可以和 VCC 共用一组电压供电)

7. Schematic Diagram (原理图)



8. TIMING CHARACTERISTICS (时序特性)



VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25°C

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

Note1 : The rising time and falling time (T_r , T_f) of input signal are specified at 15 ns or less. Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

Note 2 : In the read sequence of Serial interface, the 500nsec delay time is needed between read command and first read clock.

9. OPTICAL CHARACTERISTICS（光学特性）

9.1 Optical Specification（光学规格）

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (with Polarizer) 透射率（带偏振片）		T (%)	Θ=0 Normal viewing angle	3.2	3.6	—	%	Measuring with normal polarizer, Reference Only Base on Vop=4.3V
Transmittance (without Polarizer) 透射率（不带偏振片）		T (%)		11.6	12.9	—	%	
Contrast Ratio 对比度		CR		1000	1300	—	—	(1)(2)
Response Time 响应时间		T _R +T _F		—	35	40	msec	(1)(3)
Color Gamut 色域	(%)			65	70	—	%	C-light
Color Chromaticity 色度 (CIE1931)	White	W _X		-0.02	0.300	+0.02	—	(1)(4) CF glass C-light
		W _Y			0.341			
	Red	R _X			0.659		—	
		R _Y			0.326			
	Green	G _X	0.277		—			
		G _Y	0.589					
	Blue	B _X	0.136		—			
		B _Y	0.128					
Viewing Angle 视角	Hor.	Θ _L	CR>10	80	85	—	—	(1)(4) Measuring with normal polarizer, Reference Only
		Θ _R		80	85	—		
	Ver.	Θ _U		80	85	—		
		Θ _D		80	85	—		
Optima View Direction		Free						(5)

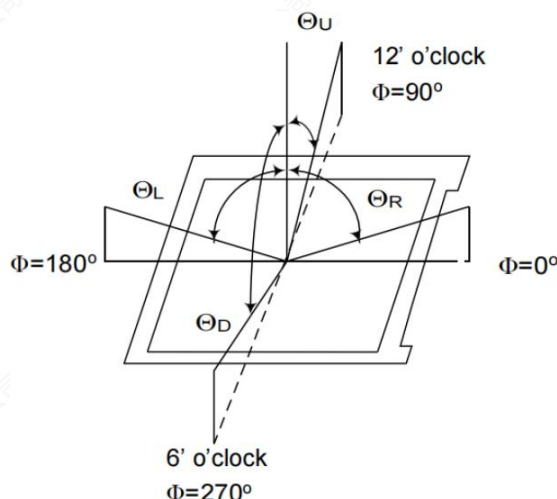
9.2 Measuring Condition（测量条件）

Measuring surrounding : dark room 测量环境：暗室
Ambient temperature : 25±2°C 环境温度：25±2°C
15min. warm-up time. 15 分钟 预热时间

9.3 Measuring Equipment (测量设备)

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics. (Westar Display technologies, INC.的 FPM520, 其利用 SR-3 用于色度和 BM-5A 用于其他光学特性。)

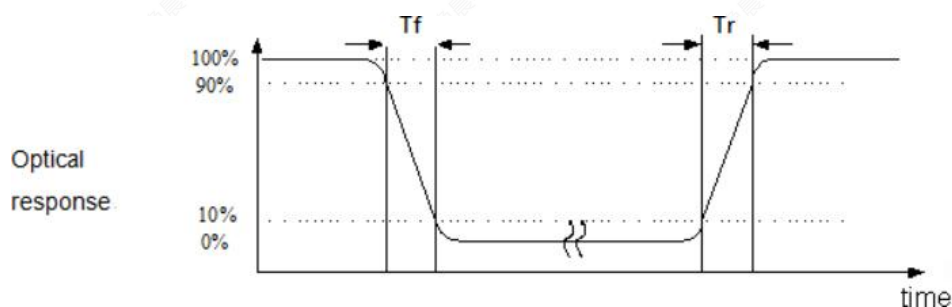
Note 1: Definition of viewing angle (视角的定义)



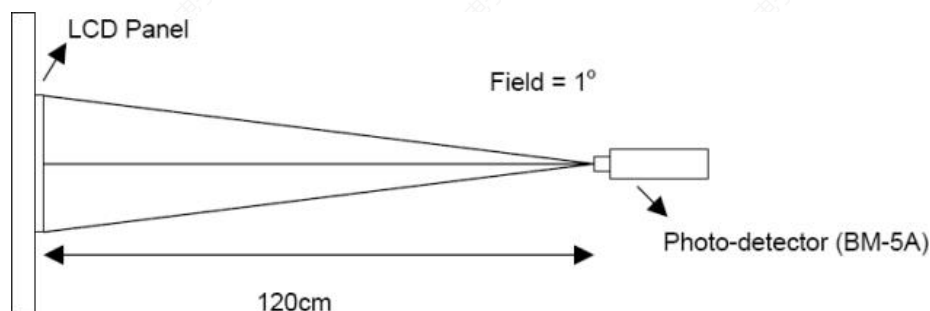
Note 2: Contrast ratio is calculated by the following formula (对比度由以下公式计算):

$$\text{对比度 Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state} \quad \text{“白色”状态下的亮度}}{\text{Brightness on the "black" state} \quad \text{“黑色”状态下的亮度}}$$

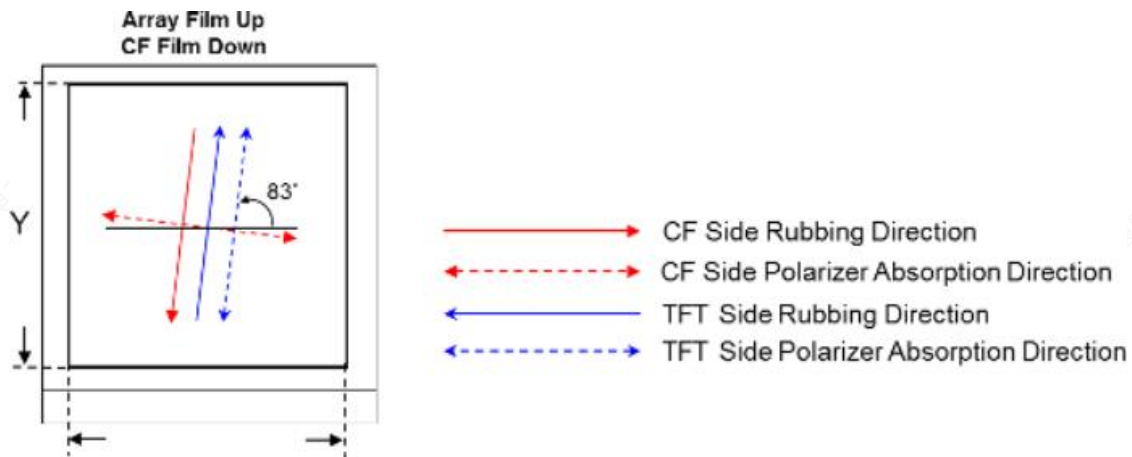
Note 3: 响应 Definition of Response Time : Sum of T_R and T_F (响应时间定义)



Note 4: Definition of optical measurement setup. (光学测量设置的定义)



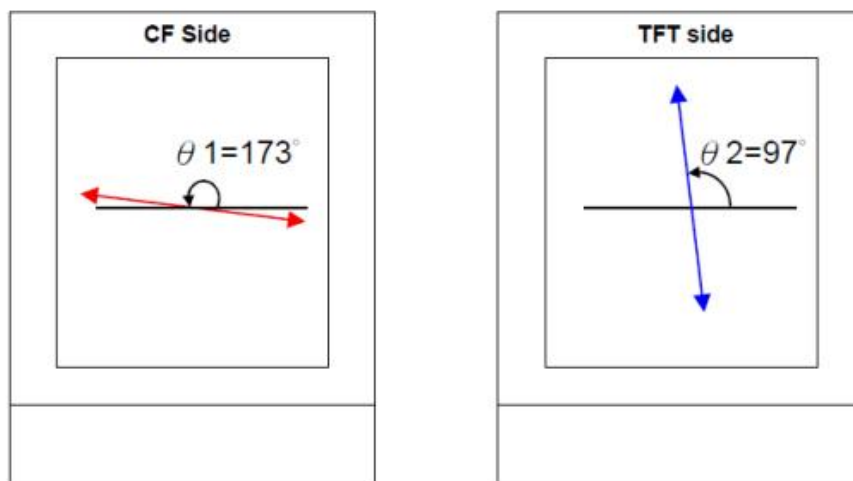
Note 5: Rubbing Direction (The different Rubbing Direction will cause the different optima view direction)



Item 项目	Specifications 规格	Unit 单位	Note 说明
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)



10 Reliability (可靠性)

10.1 MTBF(平均故障间隔时间)

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal.
LCD 模块的设计应满足正常情况下 50000 小时的最小 MTBF 值。

10.2 Test Condition(测试条件)

No	ITEM 测试项目	CONDITION 条件	CRITERION 标准
1	High Temperature Non-Operating Test 高温非操作试验	80℃*240Hrs	.No Defect Of Operational Function In Room Temperature Are Allowable (室温下不允许有操作功 能缺陷)
2	Low Temperature Non-Operating Test 低温非操作试验	-30℃*240Hrs	
3	High Temperature/Humidity Non Operating Test 高温/高湿非操作试验	60℃*90%RH*240Hrs	
4	High Temperature Operating Test 高温运行试验	70℃*240Hrs	.IDD of LCM in Pre-and Post-Test Should Follow Specification (LCM 在测试前和测试后 的 IDD 应遵循规范)
5	Low Temperature Operating Test 低温运行试验	-20℃*240Hrs	
6	Thermal Shock Test 热冲击试验	-20 °C (30Min)<>70 °C (30Min) *10CYCLES	

Notes:

- Judgments should be made after exposure in room temperature for two hours.
应在室温下暴露两小时后做出判断。
- The distill water is used for the high temperature/humidity test.
蒸馏水用于高温/湿度试验。
- The sample above is individually for every reliability tests condition.
上面的样本是针对每种可靠性测试条件单独提供的。

11. Precautions (注意事项)

11.1 Storage Conditions (储存条件)

- (1) Store the panel or module in a dark place where the temperature is $23\pm5^{\circ}\text{C}$ and the humidity is below $45\pm20\%\text{RH}$. (将面板或模块存放在温度为 $23\pm5^{\circ}\text{C}$ 、湿度低于 $45\pm20\%\text{RH}$ 的黑暗处)
- (2) Store in anti-static electricity container. (储存在防静电容器中)
- (3) Store in clean environment, free from dust, active gas, and solvent. (储存在清洁的环境中，没有灰尘、活性气体和溶剂)
- (4) Do not place the module near organics solvents or corrosive gases. (请勿将模块放置在有机溶剂或腐蚀性气体附近)
- (5) Do not crush, shake, or jolt the module. (请勿挤压、摇晃或震动模块)

11.2 Handling Precautions (处理注意事项)

- (1) Avoid static electricity, which can damage the CMOS LSI. (避免静电，因为静电会损坏 CMOS LSI)
- (2) The polarizing plate of the display is very fragile, please handle it very carefully. (LCM 上的偏振片非常脆弱，请小心处理)
- (3) Do not give external shock. (不要进行外部电击)
- (4) Do not apply excessive force on the surface. (不要在表面上施加过大的力)
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate. (不要用干布擦拭偏振片，这样很容易划伤偏振片表面)
- (6) Do not operate it above the absolute maximum rating. (请勿在极限参数以上操作)
- (8) Do not remove the panel or frame from the module. (请勿从模块上拆下面板或框架)