深圳市金逸晨电子有限公司

ShenZhen GoldenMorning Electronic Co.,Ltd

Model NO 型号	GMT020-02
Product Name 产品名称	2.0 TFT LCD Module
Version 版本号	V1
Date 日期	2024-01-29

☐**Preliminary Specification**（规范草案）

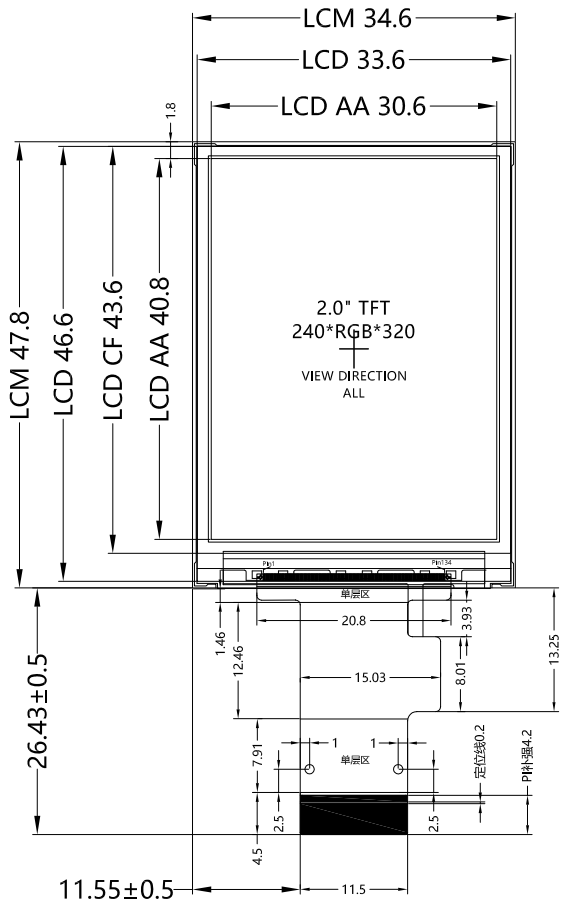
☑**Final Specification**（最终规格）

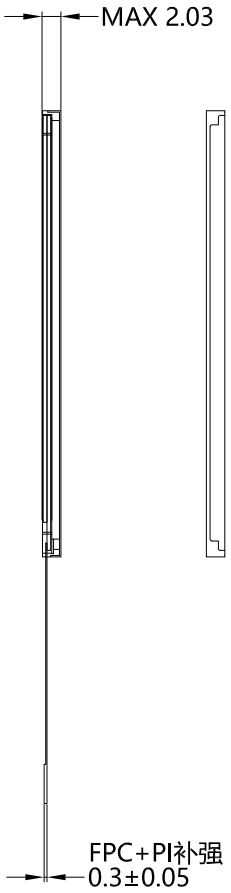
PREPARED 编辑	**CHECKED** 检查核对	**APPROVED** 审批人

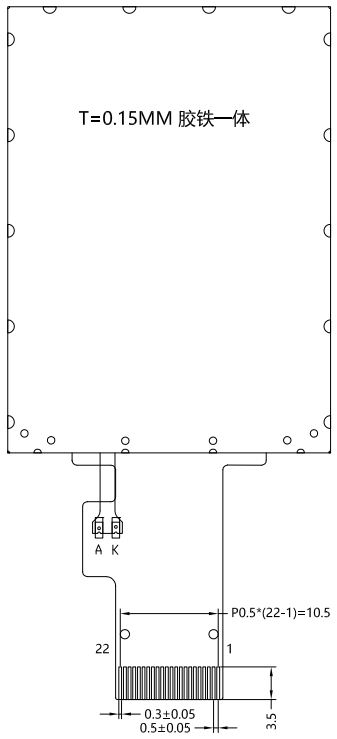
TABLE OF CONTENT

1. General Specifications（概况）

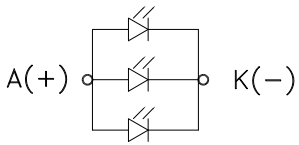
Item 项目	Specification 规格	Unit 单位
Display Mode 显示模式	Normally Black, Transmissive	/
Viewing Direction 视角方向	ALL	/
Colors 颜色	262K	/
Drive IC 驱动IC	COG ST7789	/
Interface Type 接口类型	SPI4W or 8bit Parallel	/
Dimensional Outline 模组尺寸	34.60(W) x 47.80(H) x 2.03(T)	mm
LCD Active Area LCD有效区域	30.60(W) x 40.80(H)	mm
Resolution 分辨率	240 RGB(H) x 320(V)	pixels
Pixel Pitch 像素间距	0.1275(W) x 0.1275(H)	mm







NO.	PIN NAME
1	LED+
2	LED-
3	IM2
4	IM1
5	IM0
6	VCC
7	DB7
8	DB6
9	DB5
10	DB4
11	DB3
12	DB2
13	DB1
14	DB0
15	RD
16	WR
17	RS
18	CS
19	TE
20	RESET
21	SDA
22	GND



Display Type	TFT	LCM Luminance	300cd/m²TYP
	Normally Black	Backalight	White Color
Number of pixels	240RGB*320		IF=60mA,VF=3.2V
Viewing Direction	ALL	Operating temperature	-20℃+70℃
Color	262K	Storage temperature	-30℃+80℃
Drive IC	ST7789	RoHS	YES
Interface	SPI4W/8bit Parallel	Unspecified Tolerance	±0.1

深圳市金逸晨电子有限公司

ShenZhen GoldenMorning Electronic Co.,Ltd

LCM NO: GMT020-02 V1

UNITS:MM	SCALE: FIT		DESIGNED BY:	CHECKED BY:	APPROVED BY:
	SHEET: 1 OF 1		percy		
	UNIT: MM	DATE	2024-01-24		

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	℃
Storage temperature 储存温度	Tst	-30	80	℃
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℃
(LED 电源电压由 Ta=25℃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。)

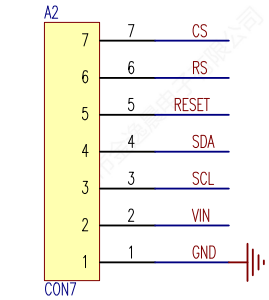
6. PIN DESCRIPTIONS（PIN 定义）

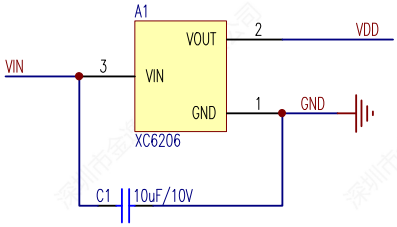
<table>
<tr><th>Pin.No
编号</th><th>Symbol
符号</th><th>Description
说明</th></tr>
<tr><td>1</td><td>LED+</td><td>Anode of Backlight
（背光正极供电脚）</td></tr>
<tr><td>2</td><td>LED-</td><td>Cathode of Backlight
（背光负极供电脚）</td></tr>
<tr><td>3</td><td>IM2</td><td rowspan="3">The interface mode select 接口模式选择
<table><tr><th>IM2</th><th>IM1</th><th>IM0</th><th>Interface 接口类型</th></tr><tr><td>0</td><td>0</td><td>0</td><td>8bit parallel I/F</td></tr><tr><td>1</td><td>1</td><td>0</td><td>4-line 8bit serial I/F</td></tr></table></td></tr>
<tr><td>4</td><td>IM1</td></tr>
<tr><td>5</td><td>IM0</td></tr>
<tr><td>6</td><td>VCC</td><td>Power supply for Analog（2.8V-3.3V）
（系统电压）</td></tr>
<tr><td>7-14</td><td>DB7-DB0</td><td>Parallel data input / output.
(并口数据线)</td></tr>
<tr><td>15</td><td>RD</td><td>Read enable in 8080 MCU parallel interface.
8080 MCU 并行接口中的读使能。</td></tr>
<tr><td>16</td><td>WR</td><td>Write enable in parallel interface.
Display data/command selection pin in 4-line serial interface.
在并行接口中启用写入。
在 4 线串行接口中作为“数据/命令”选择引脚。</td></tr>
<tr><td>17</td><td>RS</td><td>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’:选择命令寄存器）
在 4 线串行接口中作为“时钟（SCL）”引脚。</td></tr>
<tr><td>18</td><td>CS</td><td>Chip select pin(“Low” enable)
（屏驱动芯片片选脚，低电平有效）</td></tr>
<tr><td>19</td><td>TE</td><td>Tearing effect signal is used to synchronize MCU to frame memory</td></tr>
<tr><td>20</td><td>RESET</td><td>LCM Reset pin
（屏复位脚）</td></tr>
<tr><td>21</td><td>SDA</td><td>Serial data input / output.
(串口数据线)</td></tr>
<tr><td>22</td><td>GND</td><td>Ground
（接地脚）</td></tr>
</table>

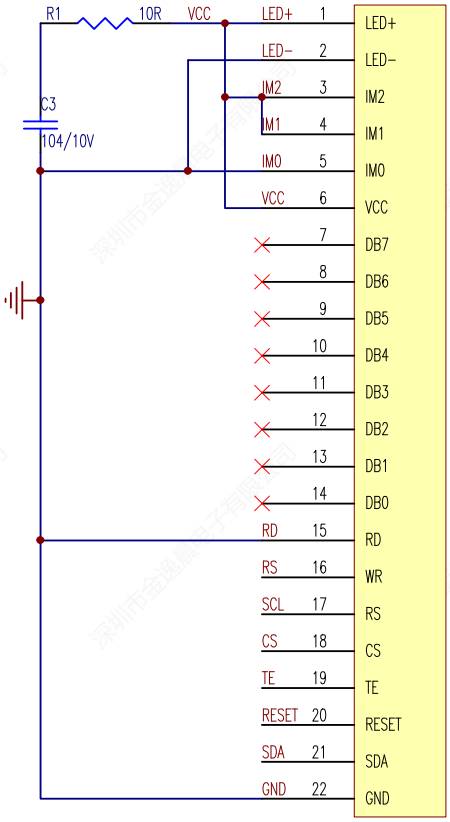
NOTE: The backlight LED can be powered separately or share a set of voltage supply with the VCC.
背光 LED 可以单独供电，也可以和 VCC 共用一组电压供电）

7. Schematic Diagram（原理图）

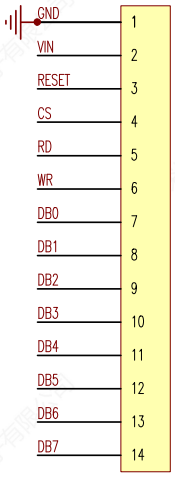
SPI 4-Line

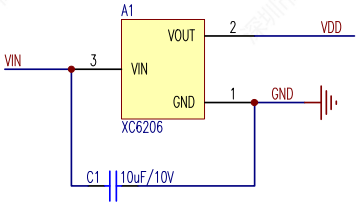


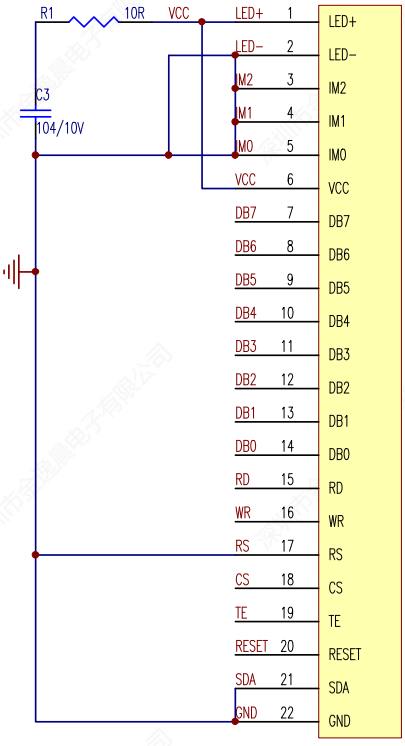




8bit Parallel 并口

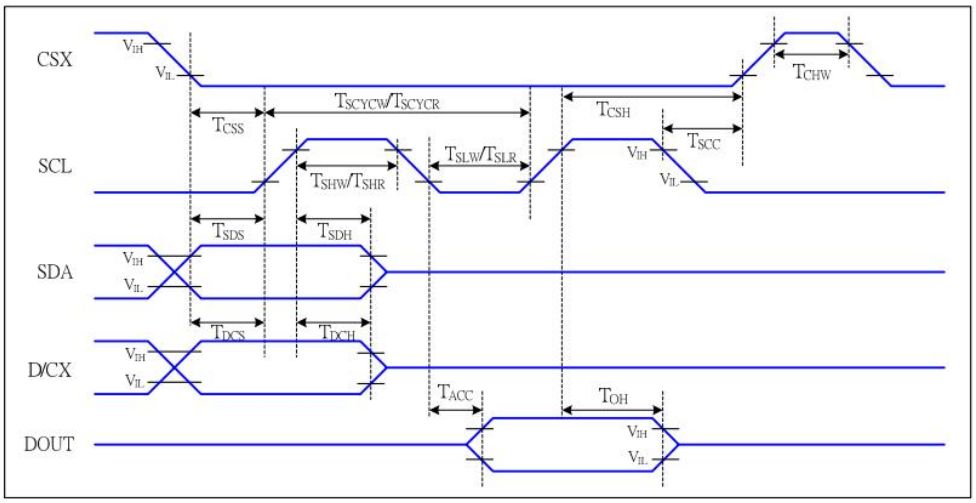






8. Timing Characteristics（时序特性）

8.1 SPI 4-line 8bit serial interface（SPI 4 线 8 位串行接口）



4-line serial Interface Timing Characteristics

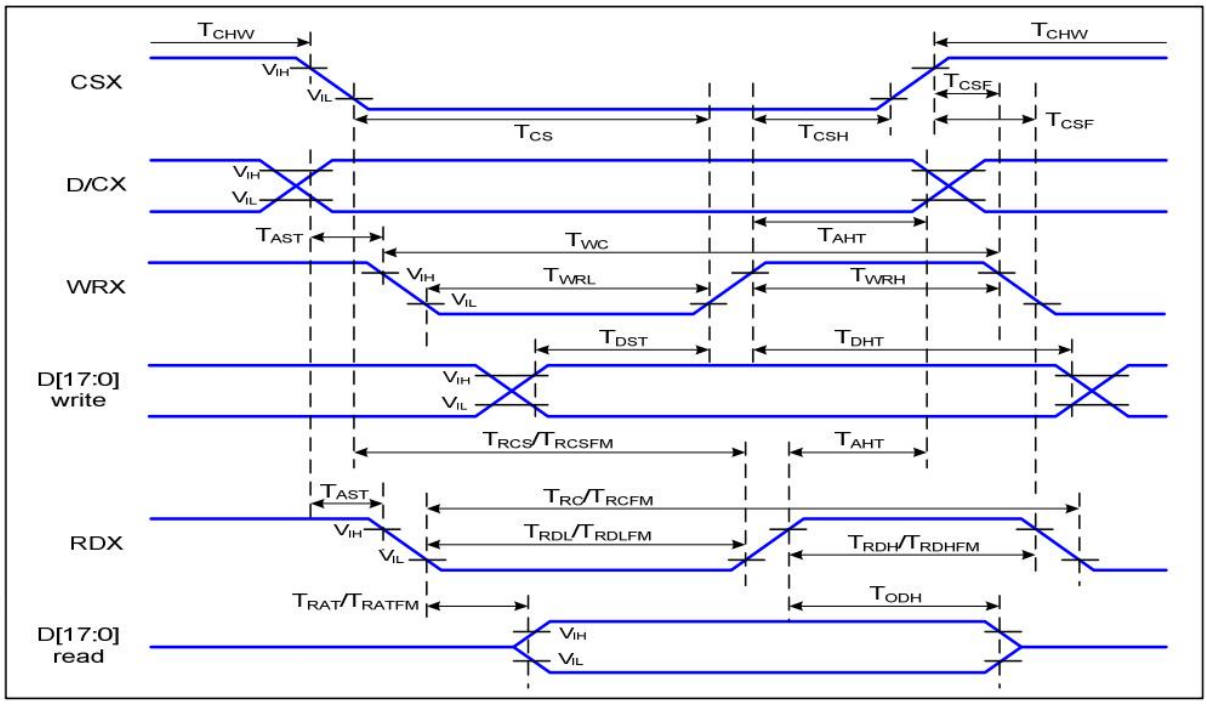
VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=25℃

Signal 信号	Symbol 符号	Parameter 参数	MIN 最小	MAX 最大	Unit 单位	Description 描述
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 For minimum CL=8pF
	T_{OH}	Output disable time	15	50	ns	

4-line serial Interface Characteristics

Note : The rising time and falling time (Tr, Tf) 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.

8.2 Parallel interface 8bit（8位并行接口）



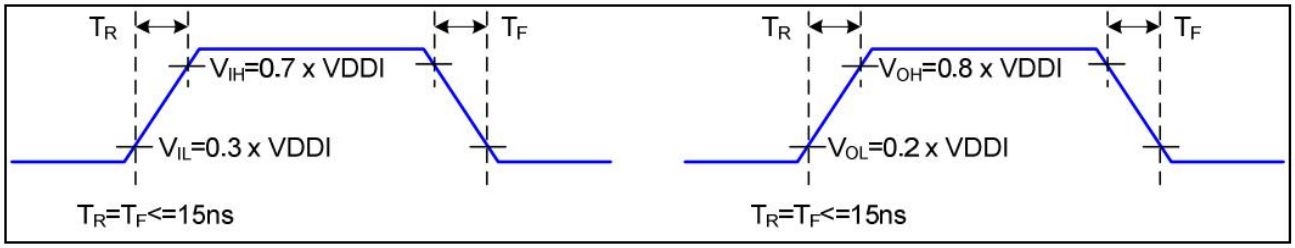
Parallel Interface Timing Characteristics

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

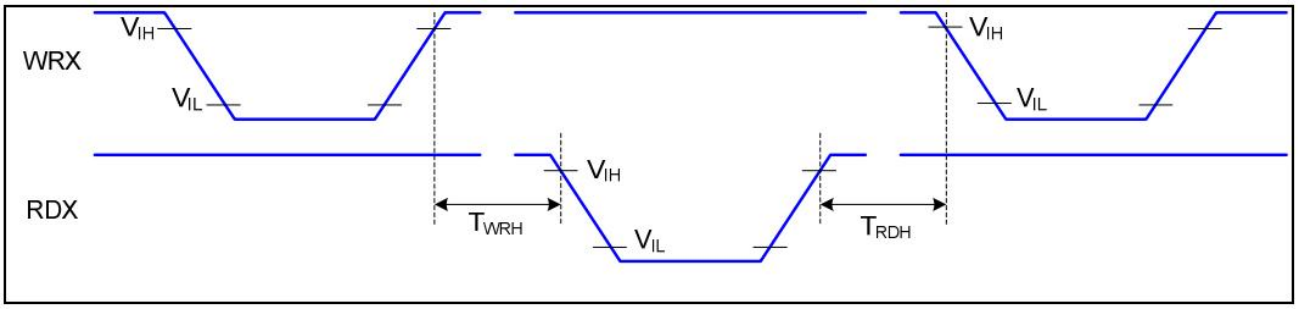
Signal 信号	Symbol 符号	Parameter 参数	MIN 最小	MAX 最大	Unit 单位	Description 描述
D/CX	T_{AST}	Address setup time	0		ns	-
	T_{AHT}	Address hold time (Write/Read)	10		ns	
CSX	T_{CHW}	Chip select “H” pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T_{CSF}	Chip select wait time (Write/Read)	10		ns	
	T_{CSH}	Chip select hold time	10		ns	
WRX	T_{WC}	Write cycle	66		ns	
	T_{WRH}	Control pulse “H” duration	15		ns	
	T_{WRL}	Control pulse “L” duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	*When read ID data*
	T_{RDH}	Control pulse “H” duration (ID)	90		ns	
	T_{RDL}	Control pulse “L” duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	*When read from frame memory*
	T_{RDHFM}	Control pulse “H” duration (FM)	90		ns	
	T_{RDLFM}	Control pulse “L” duration (FM)	355		ns	

Signal 信号	Symbol 符号	Parameter 参数	MIN 最小	MAX 最大	Unit 单位	Description 描述
D[17:0]	T_{DST}	Data setup time	10		ns	*For CL=30pF*
	T_{DHT}	Data hold time	10		ns	
	T_{RAT}	Read access time (ID)		40	ns	
	T_{RATFM}	Read access time (FM)		340	ns	
	T_{ODH}	Output disable time	20	80	ns	

Parallel Interface Characteristics



Rising and Falling Timing for I/O Signal



Write-to-Read and Read-to-Write Timing

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

9. OPTICAL CHARACTERISTICS（光学特性）

9.1 Optical Specifications（光学规格）

Item 项目		Symbol 符号	Condition 条件	Min. 最小	Typ. 典型	Max. 最大	Unit 单位	Note 备注
Transmittance (without Polarizer) 透射率（不带 POL）		T(%)	—	—	(4.50)	—	%	Normal POL 正常 POL
Transmittance (with Polarizer) 透射率（带 POL）		T(%)	—	—	(12.20)	—	%	
Contrast Ratio 对比度		CR	Θ=0 Normal viewing angle	640	800	—	—	(1)(2)
Response Time 响应时间		T_R+T_F		—	30	40	msec	(1)(3)
Color Gamut 色域		S(%)		54	60	—	%	
Color Chromaticity (CIE1931) 色度	White	W_x		+/-0.02	(0.296)	+/-0.02		(1)(4) CF glass
		Wy			(0.325)			
	Red	Rx			(0.647)			
		Ry			(0.329)			
	Green	Gx			(0.279)			
		Gy			(0.550)			
	Blue	Bx			(0.134)			
		By			(0.123)			
Viewing Angle 视角	Hor.	$Θ_L$	CR>10	—	80	—		Viewing Angle base on using Normal Polarizer，Reference Only 基于使用法线偏振镜的视角，仅供参考
		$Θ_R$		—	80	—		
	Ver.	$Θ_U$		—	80	—		
		$Θ_D$		—	80	—		
Optima View Direction 可视方向		ALL						(5)

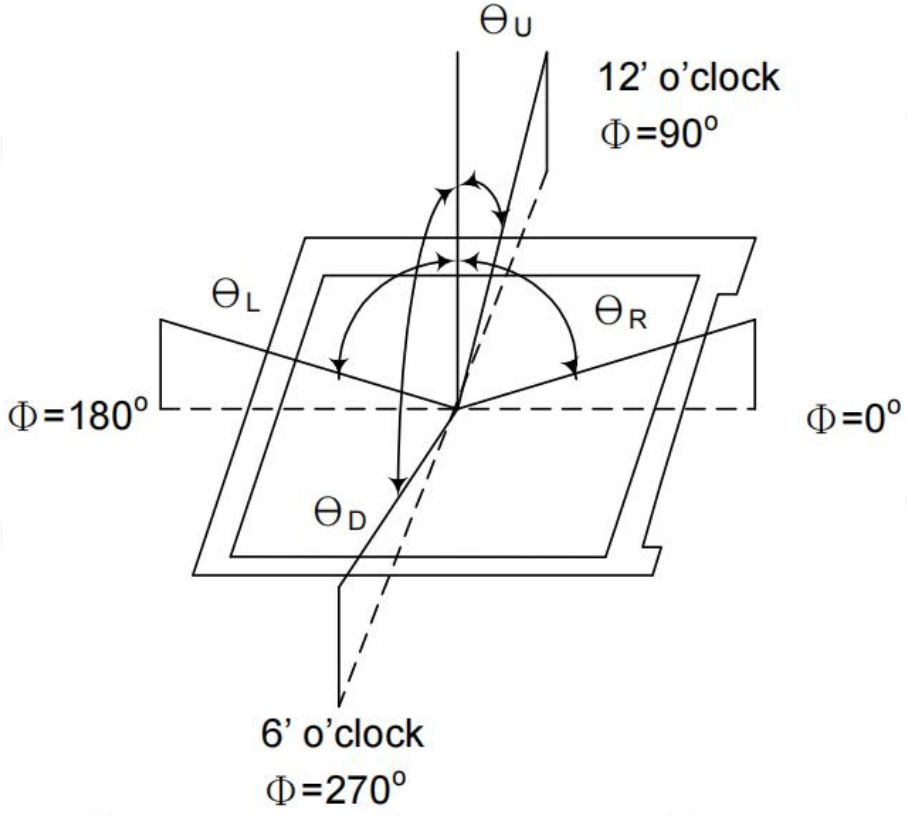
9.2 Measuring Condition（测量条件）

Measuring surrounding : dark room	测量环境：暗室
Ambient temperature : 25±2°C	环境温度：25±2℃
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。）

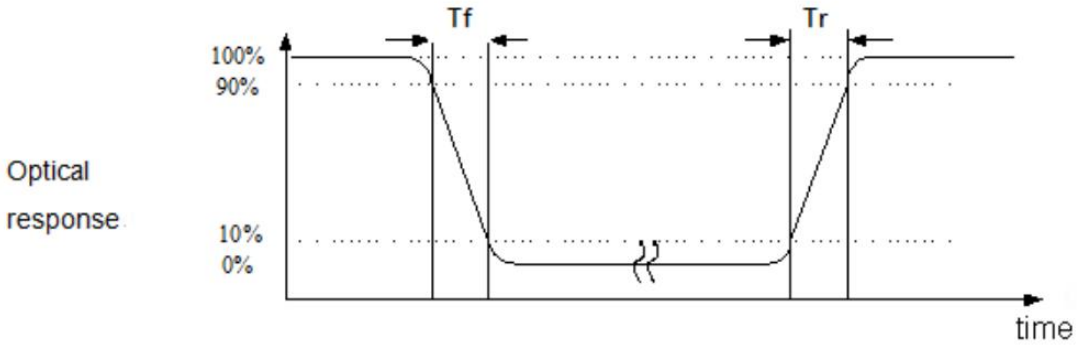
Note (1) Definition of Viewing Angle:



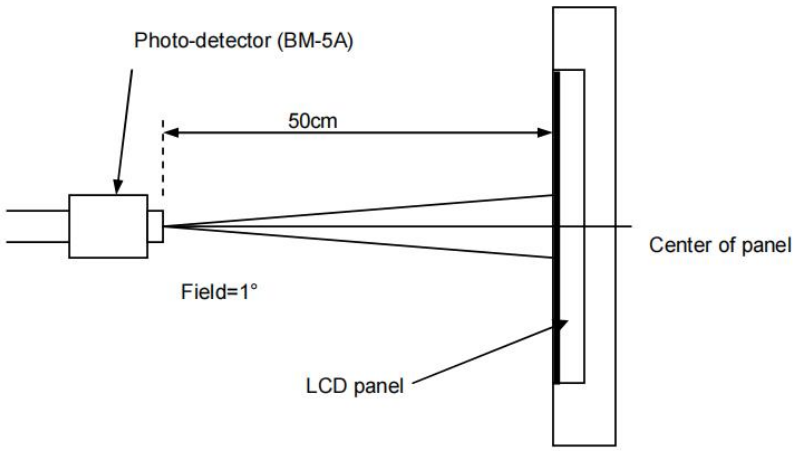
Note (2) Contrast ratio is calculated by the following formula（对比度由以下公式计算）:

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

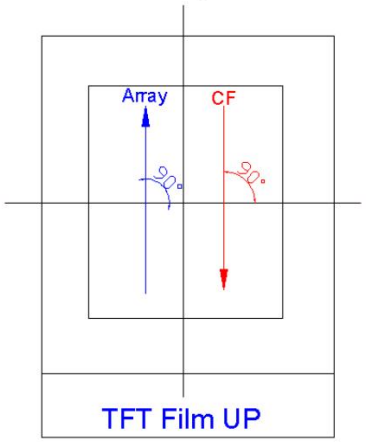
Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Definition of optical measurement setup



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



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) .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)
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	
5	Low Temperature Operating Test 低温运行试验	-20℃*240Hrs	
6	Thermal Shock Test 热冲击试验	-20 ℃(30Min)<>70 ℃(30Min) *10CYCLES	

Notes:

1. 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。
2. The distill water is used for the high temperature/humidity test.
   蒸馏水用于高温/湿度试验。
3. 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±5℃and the humidity is below 45±20%RH.(将面板或模块存放在温度为 23±5℃、湿度低于 45±20%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 if 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）