



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT040EATFWA

LCD Module User Manual

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Rev.	Descriptions	Edit	Release Date
0.1	Preliminary	LiKeke	2020-08-05
0.2	Add TFT QA Standard	WangGang	2025-06-25

Table of Content

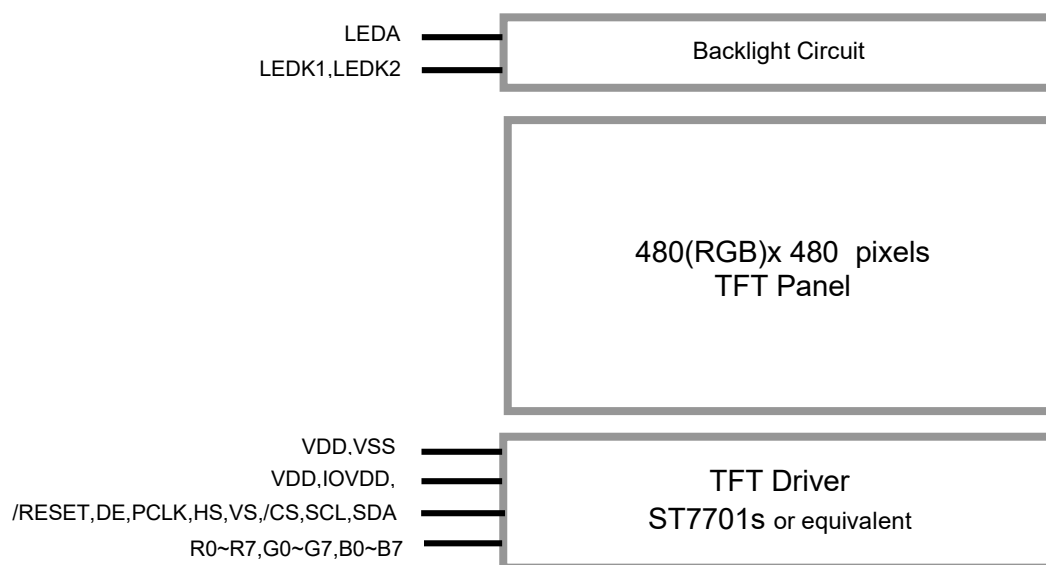
1. General Specification	3
2. Block Diagram	3
3. Terminal Functions	4
3.1 Interface	4
4. Absolute Maximum Ratings	5
5. Electrical Characteristics	5
5.1 DC Characteristics (MCU terminal)	5
5.2 LED Backlight Circuit Characteristics	5
5.3 Block Diagram	6
5.4 Timing Chart	6
5.4.1 DE Mode Timing Diagram	7
5.4.2 HV Mode Timing Diagram	8
5.4.3 Reset timing	8
5.4.4 Power ON/OFF Sequenc	9
6. Optical Characteristics	10
7. LCD Module Design and Handling Precautions	12
8. CTP Mounting Instructions	13
9. RTP Mounting Instructions	14
10. TFT QA Standard	15
10.1 INSPECTION CONDITION 检验条件	15
10.2 Display Pattern 显示缺陷	15
10.3 Quality Level and Sampling 抽样方法	17
10.4 Handling Precaution 使用注意事项	17
Warranty	18

1. General Specification

Screen Size(Diagonal) :	4.0 inch
Resolution :	480(RGB) x 480
Signal Interface :	24bit parallel RGB interface
Color Depth :	16.7M color (24bit)
Dot Pitch :	0.1497 x 0.1462 (mm)
Pixel Configuration :	RGB Vertical Stripe
Display Mode :	Transmissive (normal Black)
Surface Treatment :	Glare Treatment
Viewing Direction :	Full View
Outline Dimension :	77 x 79x 2.18(mm) (exclude FPC, see attached drawing for details)
Active Area :	71.865x 70.176 (mm)
Backlight :	White LED
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

Note:1 Color tune may slightly changed by temperature and driving voltage.

2. Block Diagram



3. Terminal Functions

3.1 Interface

Pin No. (K1)	Pin Name	I/O	Descriptions
1	LEDA	P	Backlight LED Anode supply
2	LEDK1	P	Backlight LED Cathode supply
3	LEDK2	P	
4	NC	-	-
5	VDD	P	Positive Power Supply
6	IOVDD		
7	GND		Power Ground (0V)
8	/RESET	I	Initializes the chip with a low input. Be sure to execute a power-on reset after supplying power.
9	DE	I	Data Enable Signal Input .(If not using, pull low)
10	PCLK	I	Clock signal; latching data at the falling edge
11	HS	I	Horizontal sync signal; negative polarity
12	VS	I	Vertical sync signal; negative polarity
13	GND	P	Power Ground (0V)
14	/CS	I	A chip select signal Low: the chip is selected and accessible High: the chip is not selected and not accessible
15	SCL	I	SCL: Serial clock input for SPI interface.
16	SDA	I	SDA: Serial data input pin for SPI Interface.
17~24	R0~R7	I	Red color data input
25~32	G0~G7	I	Green color data input
33~40	B0~B7	I	Blue color data input
41~43	GND	P	Power Ground (0V)
44~49	NC	-	-
50	GND	P	Power Ground (0V)

4. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+3.6	V	GND = 0V
Operating Temperature	T_{OP}	-20	+70	°C	No Condensation
Storage Temperature	T_{ST}	-30	+80	°C	No Condensation

Cautions:

Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

5. Electrical Characteristics

5.1 DC Characteristics (MCU terminal)

GND=0V, $T_{OP} = 25^{\circ}\text{C}$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin
Operating Voltage	V_{DD}	2.6	2.8	3.6	V	VDD
Logic operating voltage	V_{DDI}	1.65	1.8	3.6	V	VDD
Input High Voltage	V_{IH}	0.7VDDI	-	VDDI	V	Input pins
Input Low Voltage	V_{IL}	GND	-	0.3VDDI	V	Input pins
Frame Freq	F_{FRAME}	-	60	-	Hz	
Dot Data Clock	f_{DOTCLK}	-	15	30	MHz	
Operating Current (*1)	I_{DD}	-	21	-	mA	VDD

Note.

*1. test image is Black Mode, Frame Freq=15Hz

*2. DISP=0

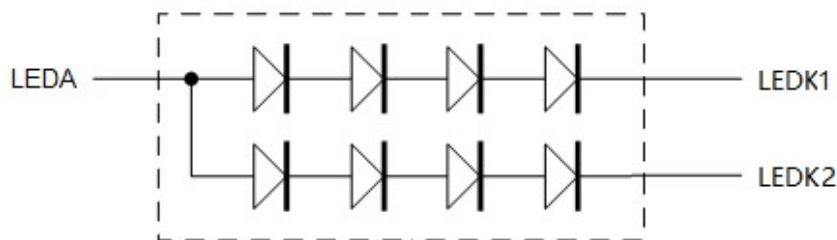
5.2 LED Backlight Circuit Characteristics

$I_{fLEDA} = 40\text{mA}$, $T_{OP} = 25^{\circ}\text{C}$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Voltage	V_f	-	12.8	-	V	
Forward Current	I_{fLEDA}	-	40	-	mA	
Life Time	L	20,000	(30,000)	-	hr	

Cautions:

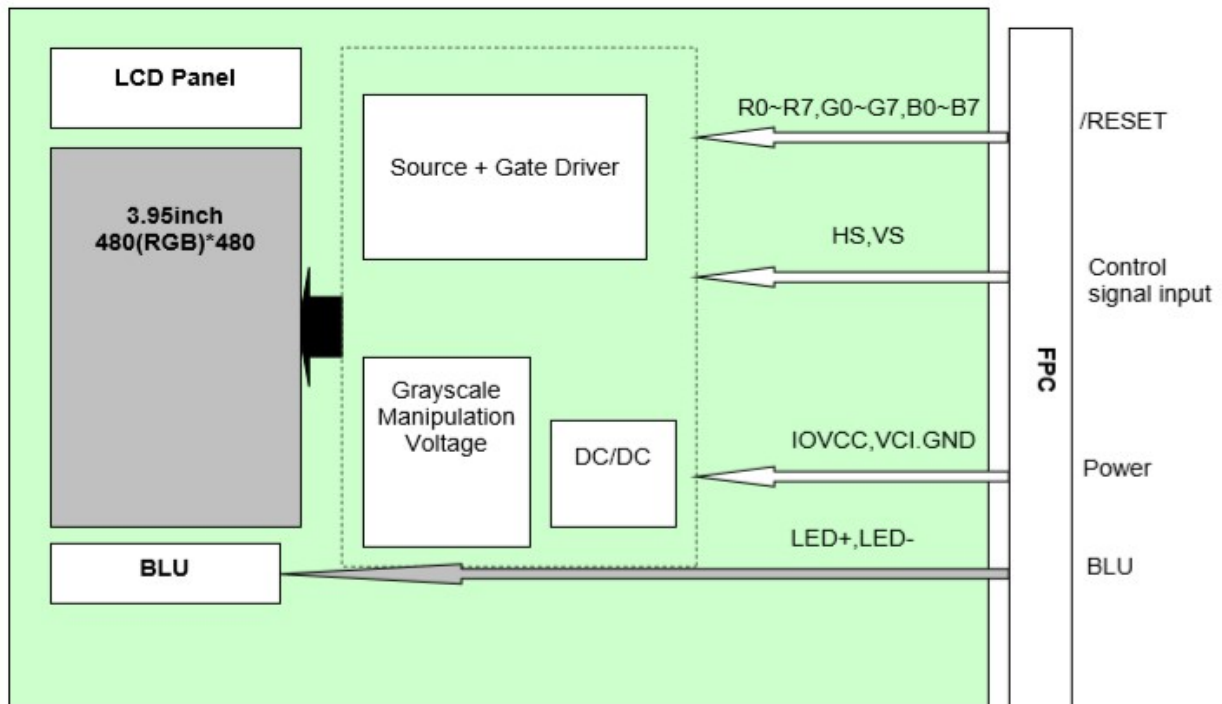
Exceeding the recommended driving current could cause substantial damage to the backlight and shorten its lifetime.



No. of LEDs = 2x4 pcs

5.3 Block Diagram

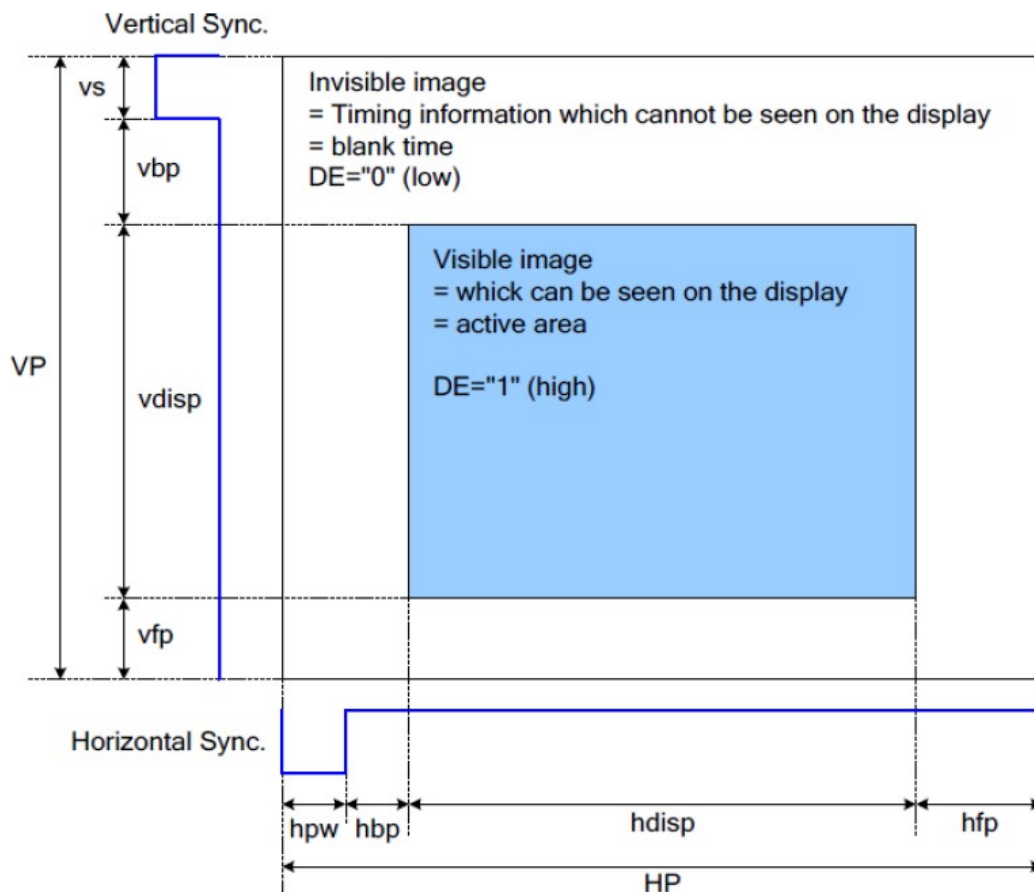
LCD module diagram



5.4 Timing Chart

RGB Interface timing

Note: Please refer to IC: ST7701S data sheet for more details



Parameter	Symbol	MIN.	TYP.(*)1	MAX.	Unit	Remark
Horizontal Sync. Width(*3)	hpw	2	2	255	DCLK	
Horizontal Sync. Back Porch(*3)	hbp	2	8	255	DCLK	
Horizontal Sync. Front Porch(*3)	hfp	2	22	-	DCLK	
Vertical Sync. Width(*4)	vs	2	2	254	Line	
Vertical Sync. Back Porch(*4)	vbp	2	11	254	Line	
Vertical Sync. Front Porch	vfp	2	2	90	Line	

Note:

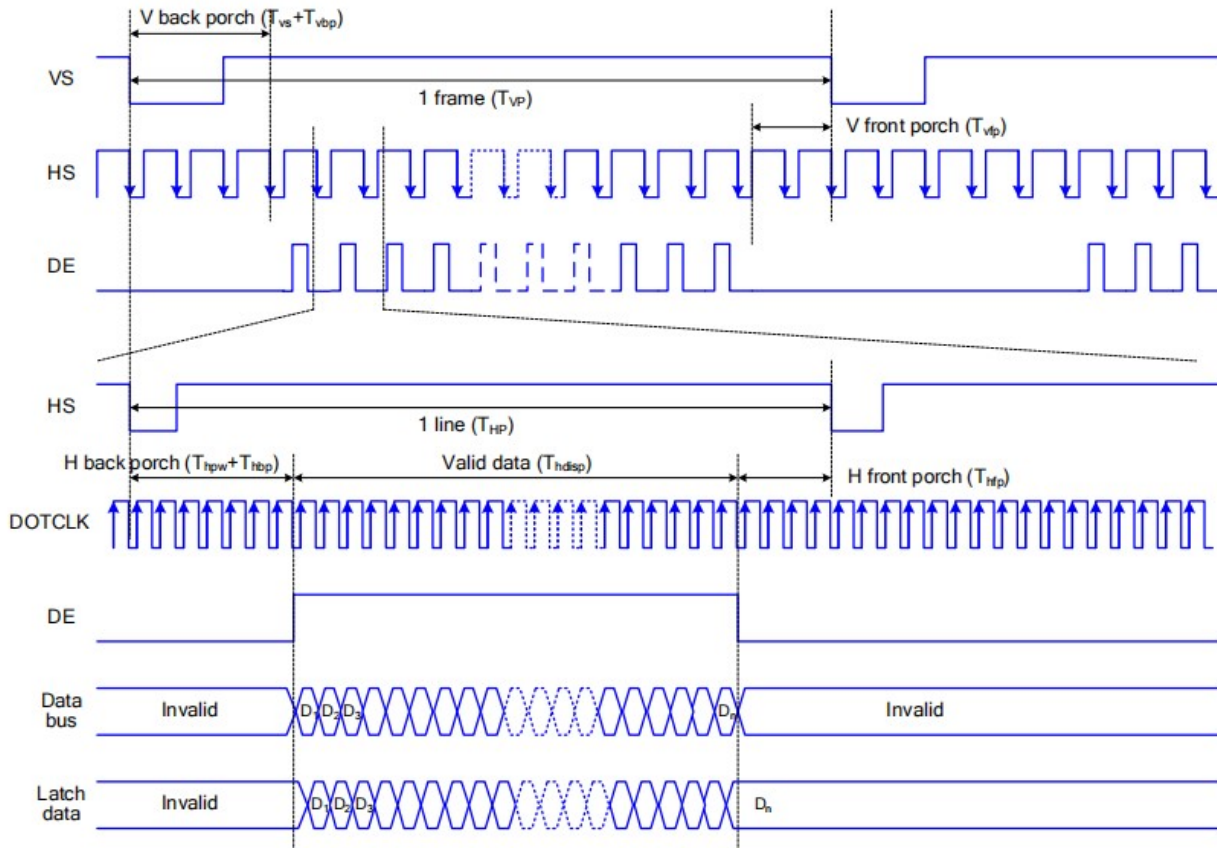
*1.DCLK=15MHZ(TYP),DCLK=30MHZ(MAX).

*2.frame<=60HZ.

*3.hpw+hbp+hfp>=600 clock.

*4.Vs+Vbp<=255 Line.

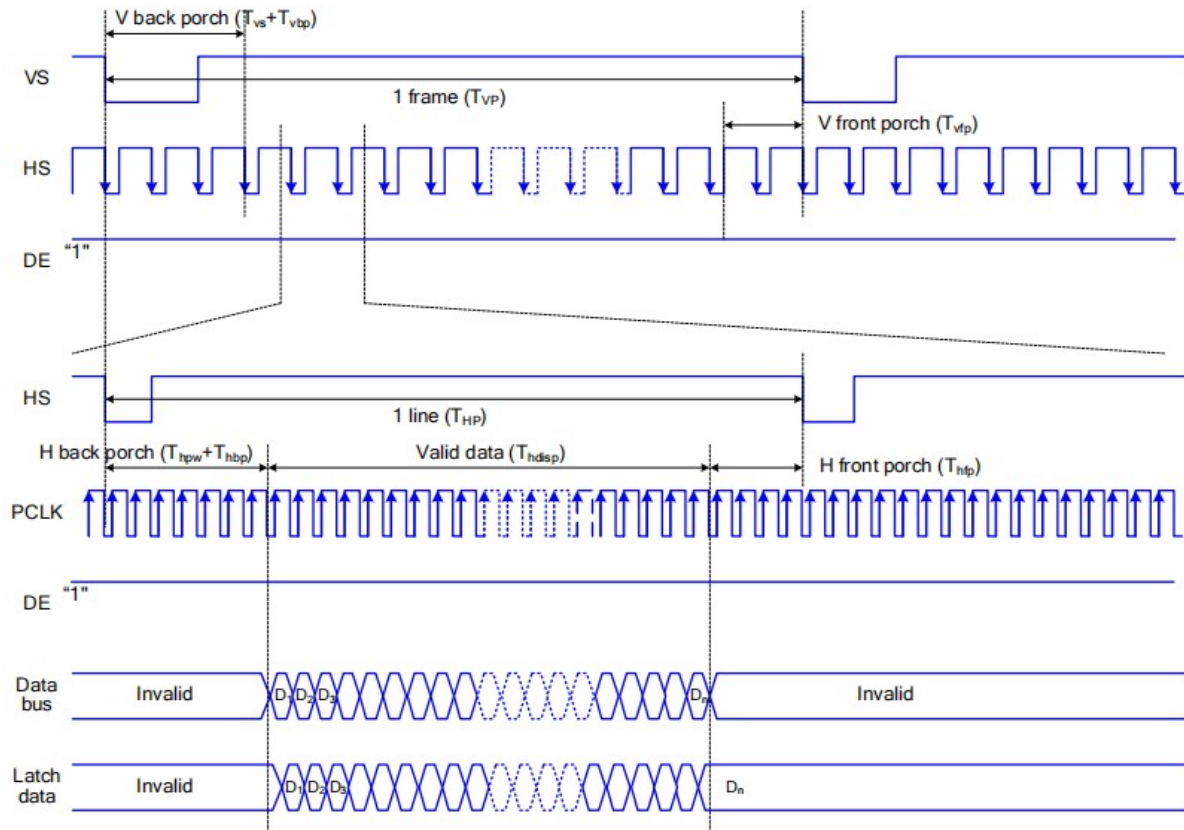
5.4.1 DE Mode Timing Diagram



Note: The setting of front porch and back porch in host must match that in IC as this mode.

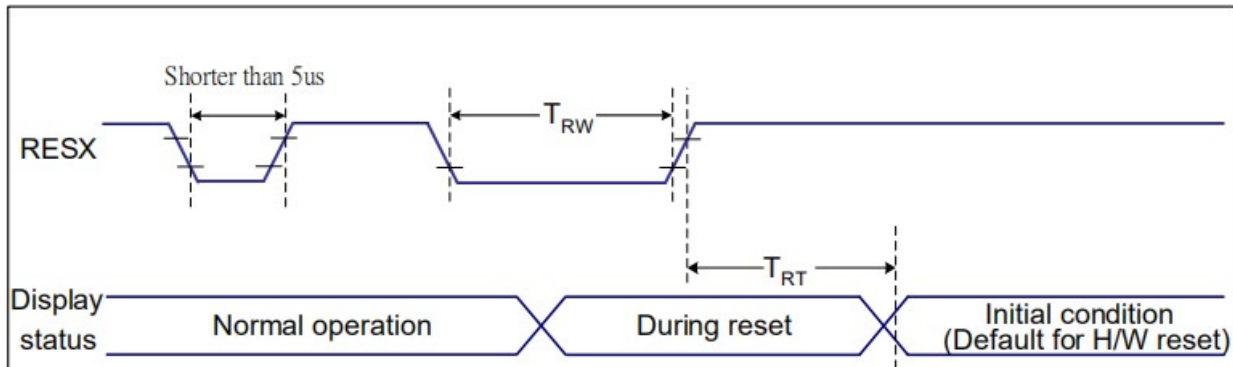
5.4.2 HV Mode Timing Diagram

The timing chart of RGB interface HV mode is shown as follows.



Note: Please refer to IC: ST7701S data sheet for more details.

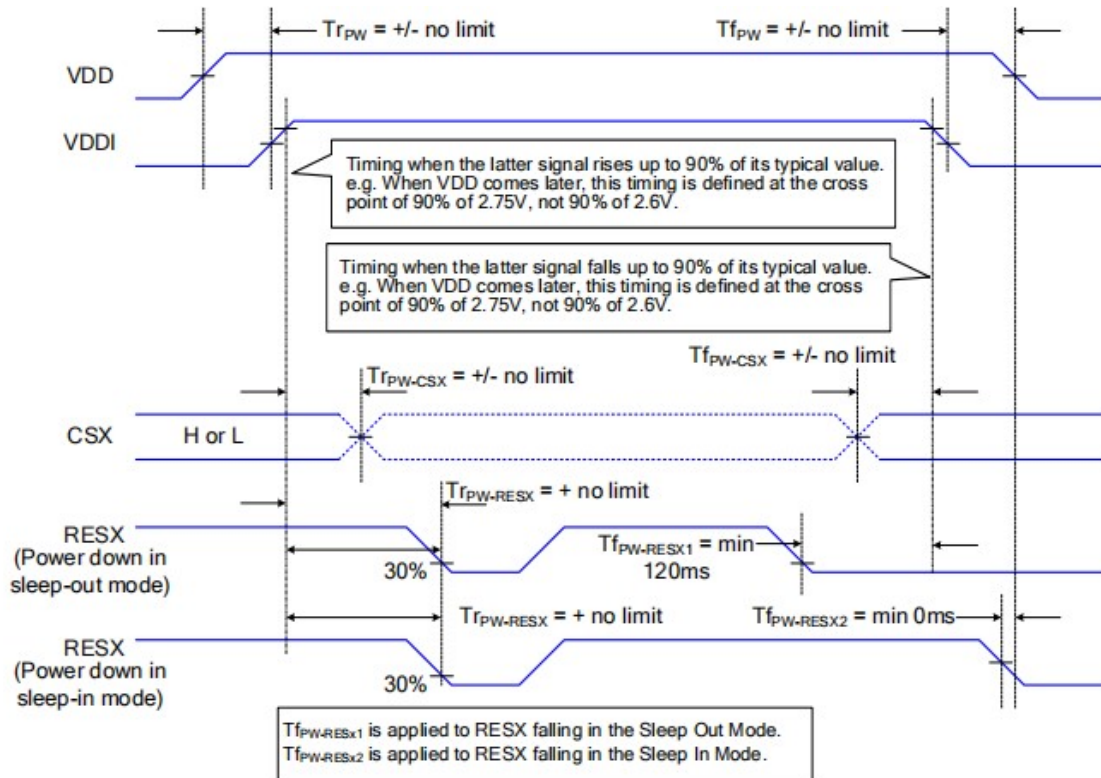
5.4.3 Reset timing



Item	Symbol	MIN.	TYP.	MAX.	Unit
Reset LOW pulse width	t_{RW}	10	-	-	us
Reset time	T_{RT}	-	-	120	ms

Note: Please refer to IC: ST7701S data sheet for more details.

5.4.4 Power ON/OFF Sequenc



Note: Please refer to IC: ST7701S data sheet for more details.

6. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	70	80	-	Degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ =0°	640	800	-		Note 3
Response Time		T _{ON}	25℃	-	25	35	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.290	0.320	0.350		Note 1,5
		y		0.321	0.351	0.381		
	Red	x		0.590	0.620	0.650		Note 1,5
		y		0.330	0.360	0.390		
	Green	x		0.302	0.332	0.362		Note 1,5
		y		0.566	0.596	0.626		
	Blue	x		0.117	0.147	0.177		Note 1,5
		y		0.063	0.093	TBD		
Uniformity		U		80	-	-	%	Note 6
NTSC				55	60	-	%	Note 5
Luminance		L		300	350	-	cd/m²	Note 7

1. If $I_{LED A} = 40$ mA, and the ambient temperature is $25^\circ C$.

2. The test systems refer to Note 1 and Note 2.

Note 1:

The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment SR-3A (1°)

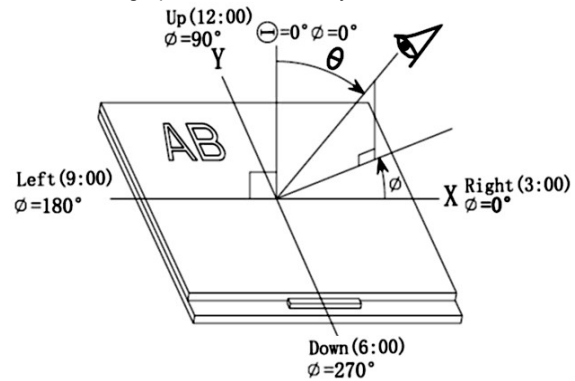
Measuring condition:

- Measuring surroundings: Dark room
- Measuring temperature: $T_a=25^{\circ}\text{C}$.
- Adjust operating voltage to get optimum contrast at the center of the display.

Note 2:

The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



Note 3:

The definition of contrast ratio (Test LCM using SR-3A (1°)):

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

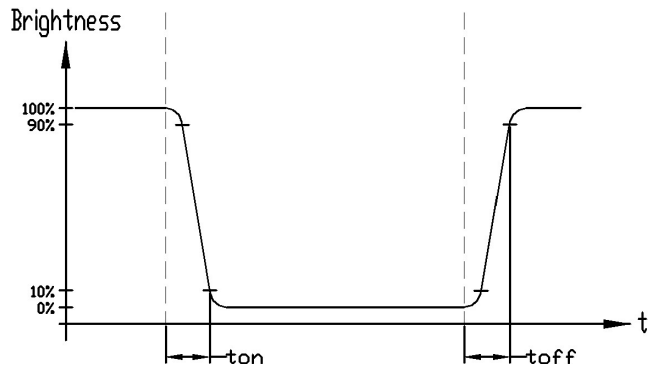
(Contrast Ratio is measured in optimum common electrode voltage)

Note 4:

Definition of Response time. (Test LCD using BM-7A(2°)):

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

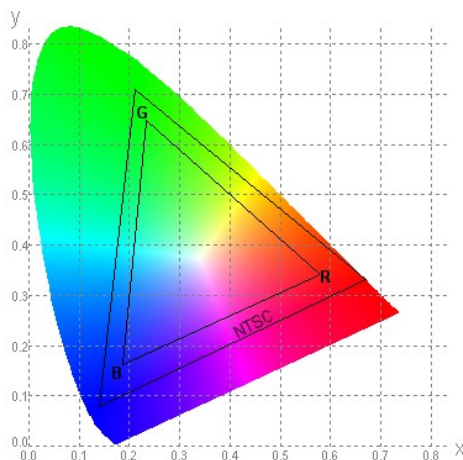


Note 5:

Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

$$S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$



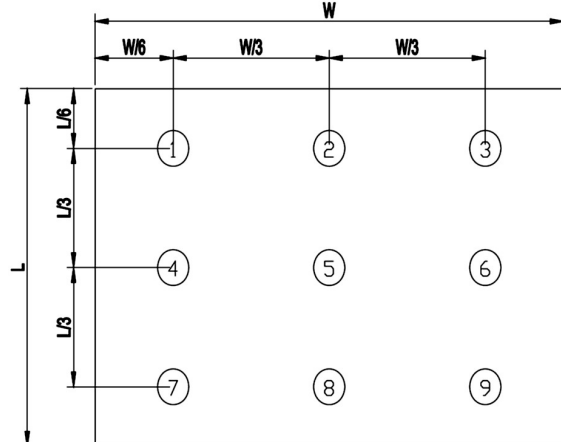
Note 6:

The luminance uniformity is calculated by using following formula.

$$\Delta B_p = B_p (\text{Min.}) / B_p (\text{Max.}) \times 100 (\%)$$

$B_p (\text{Max.})$ = Maximum brightness in 9 measured spots

$B_p (\text{Min.})$ = Minimum brightness in 9 measured spots.



Note 7:

Measured the luminance of white state at center point

7. LCD Module Design and Handling Precautions

- Please ensure V0, VCOM is adjustable, to enable LCD module get the best contrast ratio under different temperatures, view angles and positions.
- Normally display quality should be judged under the best contrast ratio within viewable area. Unexpected display pattern may come out under abnormal contrast ratio.
- Never operate the LCD module exceed the absolute maximum ratings.
- Never apply signal to the LCD module without power supply.
- Keep signal line as short as possible to reduce external noise interference.
- IC chip (e.g. TAB or COG) is sensitive to light. Strong light might cause malfunction. Light sealing structure casing is recommended.
- Make sure there is enough space (with cushion) between case and LCD panel, to prevent external force passed on to the panel; otherwise that may cause damage to the LCD and degrade its display result.
- Avoid showing a display pattern on screen for a long time (continuous ON segment).
- LCD module reliability may be reduced by temperature shock.
- When storing and operating LCD module, avoids exposure to direct sunlight, high humidity, high or low temperature. They may damage or degrade the LCD module.
- Never leave LCD module in extreme condition (max./min storage/operate temperature) for more than 48hr.
- Recommend LCD module storage conditions is 0 C~40 C <80%RH.
- LCD module should be stored in the room without acid, alkali and harmful gas.
- Avoid dropping & violent shocking during transportation, and no excessive pressure press, moisture and sunlight.
- LCD module can be easily damaged by static electricity. Please maintain an optimum anti-static working environment to protect the LCD module. (eg. ground the soldering irons properly)
- Be sure to ground the body when handling LCD module.
- Only hold LCD module by its sides. Never hold LCD module by applying force on the heat seal or TAB.
- When soldering, control the temperature and duration avoid damaging the backlight guide or diffuser which might degrade the display result such as uneven display.
- Never let LCD module contact with corrosive liquids, which might cause damage to the backlight guide or the electric circuit of LCD module.
- Only clean LCD with a soft dry cloth, Isopropyl Alcohol or Ethyl Alcohol. Other solvents (e.g. water) may damage the LCD.
- Never add force to components of LCD module. It may cause invisible damage or degrade the module's reliability.
- When mounting LCD module, please make sure it is free from twisting, warping and bending.
- Do not add excessive force on surface of LCD, which may cause the display color change abnormally.

7. 液晶显示模块设计和使用时须知

- 请注意 V0, VCOM 的设定, 以确保液晶显示模块在不同的使用温度下以及在不同的视角和位置观察模块显示, 均能达到最佳对比度, 请务必将应用电路上设置为对比度可调。
- 请注意液晶显示模块的显示品质判定是指在正常对比度下以及视窗 (V. A) 范围内进行的, 非正常对比度下液晶可能会出现非预期的显示不良, 应注意区分。
- 请勿在最大额定值以外使用液晶显示模块。
- 请勿在没有接通电源的条件下, 给液晶显示模块输送信号。
- 请尽可能缩短信号线的连接, 以避免对液晶显示模块的信号干扰。
- 集成电路因 IC 芯片 (如 TAB 或 COG) 对紫外线极为敏感, 强光环境下可能会引起液晶显示模块功能失效, 故应采用不透光的外壳。
- 请在液晶显示模块与外壳之间保留足够的空间 (可使用衬垫), 以缓冲外力对液晶显示模块的损坏或因受力不均而产生的显示不匀等异常现象。
- 避免液晶显示屏在某一画面下长时间点亮, 否则有出现残影的风险; 请通过软件每隔一段时间改变一次画面。
- 液晶显示模块的可靠性可能因温度冲击而降低。
- 请勿在阳光直射、高湿、高温或低温下储存和使用液晶显示模块, 这将造成液晶显示模块的损坏或失效。
- 请勿在极限环境 (最大/最小存储/工作温度) 下使用或放置液晶显示模块超过 48 小时以上。
- 液晶显示模块建议存储条件为: 0 C~40 C <80%RH。
- 请勿让液晶显示模块存储于带有 酸性, 碱性, 有害气体环境之中。
- 在运输过程中, 请勿让液晶显示模块跌落与猛烈震动, 同时避免 异常挤压, 高湿度, 与阳光照射。
- 液晶显示模块极易受静电损坏, 请务必保证液晶显示模块在防静电的工作环境中使用或保存。(如: 烙铁正确接地, 等)
- 拿取液晶显示模块时需注意操作人员的接地情况。
- 请手持液晶显示模块的边沿取放模块, 防止热压纸或 TAB 部位受力。
- 焊接液晶模块时, 请注意控制烙铁的温度、焊接时间, 以免烫坏导光板或偏光片, 导致显示不匀等不良现象发生。
- 请勿使用洗板水等腐蚀性液体接触液晶模块, 以免腐蚀导光板或模块电路。
- 仅可使用柔软的干布, 异丙醇或乙醇清洁液晶屏表面, 其他任何溶剂 (如: 水) 都有可能损坏液晶模块。
- 请勿挤压液晶显示模块上的元器件, 以避免产生潜在的损坏或失效而影响产品可靠性。
- 装配液晶显示模块时, 请务必注意避免液晶显示模块的扭曲或变形。
- 请勿挤压液晶显示屏表面, 这将导致显示颜色的异常。
- 液晶屏由玻璃制作而成, 任何机械碰撞 (如从高处跌

- LCD panel is made with glass. Any mechanical shock (e.g. dropping from high place) will damage the LCD module.
- Protective film is attached on LCD screen. Be careful when peeling off this protective film, since static electricity may be generated.
- Polarizer on LCD gets scratched easily. If possible, do not remove LCD protective film until the last step of installation.
- When peeling off protective film from LCD, static charge may cause abnormal display pattern. The symptom is normal, and it will turn back to normal in a short while.
- LCD panel has sharp edges, please handle with care.
- Never attempt to disassemble or rework LCD module.
- If display panel is damaged and liquid crystal substance leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes promptly wash it off using soap and water.

落)均有可能损坏液晶显示模块。

- 液晶屏表面带有保护膜, 揭除保护膜时需要注意可能产生的静电。
- 因液晶显示屏表面的偏光片极易划伤, 安装完成之前请尽量不要揭下保护膜。
- 请缓慢揭除保护膜, 在此过程中液晶显示屏上可能会产生静电, 此为正常情况, 可在短时间内消失。
- 请注意避免被液晶显示屏的边缘割伤。
- 请不要试图拆卸或改造液晶显示模块。
- 当液晶显示屏出现破裂, 内部液晶液体可能流出; 相关液体不可吞吃, 绝对不可接触嘴巴, 如接触到皮肤或衣服, 请使用肥皂与清水彻底清洗。

8. CTP Mounting Instructions

8.1 Bezel Mounting (Figure 1)

- The bezel window should be bigger than the CTP active area. It should be $\geq 0.5\text{mm}$ each side.
- Gasket should be installed between the bezel and the CTP surface.
- The final gap should be about $0.5\sim 1.0\text{mm}$.
- It is recommended to provide an additional support bracket for backside support when necessary (e.g. slim type TFT module without moulding structure). They should only provide appropriate support and keep the module in place.
- The mounting structure should be strong enough to prevent external uneven force or twist act onto the module.

8. 电容触摸屏安装指导

8.1 面框安装 (附图 1)

- 客户面框窗口应大于 CTP 动作区域, 各边离动作区应 $\geq 0.5\text{mm}$.
- 面框与 CTP 面板间应垫有胶垫, 其最终间隙约为 $0.5\sim 1.0\text{mm}$.
- 建议必要时在背面提供附加支架 (例如无安装结构的薄型 TFT 模块), 应仅利用适当支撑以保持模块位置。
- 安装结构应具有足够的强度, 以防止外部不均匀力或扭曲力作用到模块上。

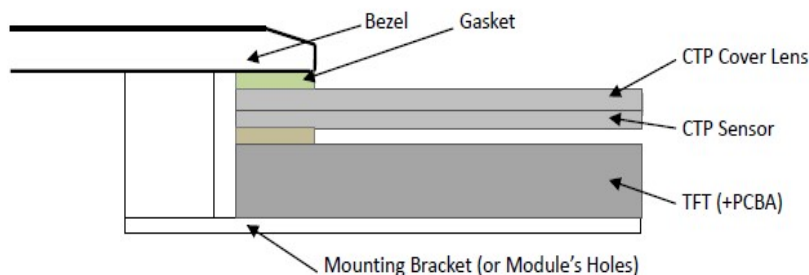


Figure 1

8.2 Surface Mounting (Figure 2)

- As the CTP assembling on the countersink area with double side adhesive.
- The countersink area should be flat and clean to ensure the double side adhesive installation result.
- The Bezel is recommend to keep a gap ($\geq 0.3\text{mm}$ each side) around the cover lens for tolerance.
- It is recommended to provide an additional support bracket with gasket for backside support when necessary (e.g. TFT module without moulding structure). They should only provide appropriate support and keep the module in place.
- The mounting structure should be strong enough to prevent external uneven force or twist act onto the module

8.2 嵌入安装 (附图 2)

- 客户面框应具有使用双面胶粘贴 CTP 的结构沉台面, 其粘贴面要求平整且洁净无污染以保证粘贴牢靠。
- 考虑到制作误差, 建议面框与 CTP 盖板之间四周留有 $\geq 0.3\text{mm}$ 间隙。
- 建议必要时在背面提供垫有胶垫附加支架 (例如无安装结构的 TFT 模块), 应仅利用适当支撑以保持模块位置。
- 安装结构应具有足够的强度, 以防止外部不均匀力或扭曲力作用到模块上。

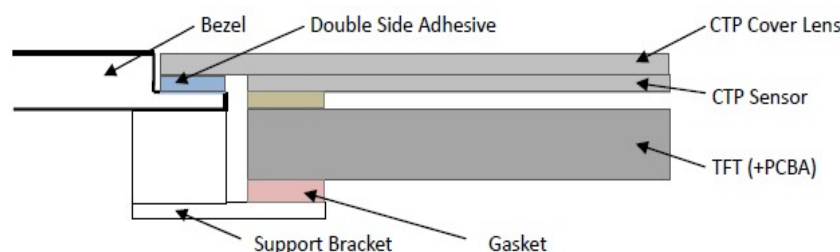


Figure 2

8.3 Additional Cover Lens Mounting (Figure 3)

- For the case of additional cover Lens mounting, it is necessary to recheck with the CTP specification about the material and thickness to ensure the functionality.
- It should keep a 0.2~0.3mm gap between the cover lens and the CTP surface..
- The cover lens window should be bigger than the active area of the CTP. It should be $\geq 0.5\text{mm}$ each side.
- It is recommended to provide an additional support bracket for backside support when necessary (e.g. slim type TFT module without mounding structure). They should only provide appropriate support and keep the module in place.
- The mounting structure should be strong enough to prevent external uneven force or twist act onto the module.

8.3 覆加盖板 (附图 3)

- 需要覆加玻璃盖板的安装, 为确保其功能, 有必要查看产品规格书中有关盖板材料和厚度的说明。
- 玻璃盖板与 CTP 表面之间应留有 0.2~0.3mm 间隙。
- 玻璃盖板视窗应大于 CTP 动作区域, 各边离动作区应 $\geq 0.5\text{mm}$ 。
- 建议必要时在背面提供附加支架 (例如无安装结构的薄型 TFT 模块), 应仅利用适当支撑以保持模块位置。
- 安装结构应具有足够的强度, 以防止外部不均匀力或扭曲力作用到模块上。

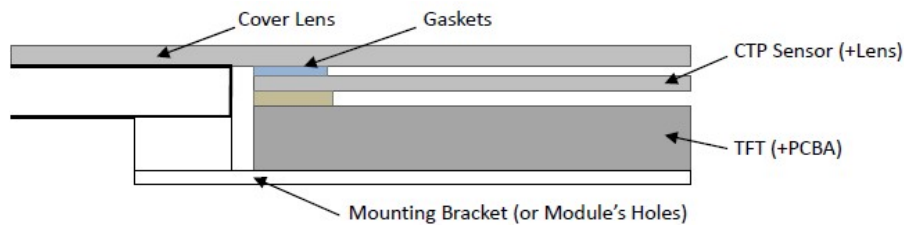


Figure 3

9. RTP Mounting Instructions

- It should bezel touching the RTP Active Area (A.A.) to prevent abnormal touch. It should left gap $D=0.2\sim 0.3\text{mm}$ in between. (Figure 4)
- Outer bezel design should take care about the area outside the A.A. Those areas contain circuit wires which is having different thickness. Touching those areas could de-form the ITO film. As a result bezel the ITO film be damaged and shorten its lifetime.
- It is suggested to protect those areas with gasket (between the bezel and RTP). The suggested figures are $B \geq 0.50\text{mm}$; $C \geq 0.50\text{mm}$. (Figure 4)
- The bezel side wall should keep space $E = 0.2 \sim 0.3\text{mm}$ from the RTP. (Figure 4)

9. 电阻触摸屏安装指导

- 为避免面框直接压在动作区 (A. A.) 上造成误动作, 面框与电阻触摸屏 (RTP) 之间应留有一定的空隙 $D=0.2\sim 0.3\text{mm}$ 之间. (附图 4)
- 设计面框时, 要注意用面框保护触摸屏四周的非保证操作区域, 因为布线区域在此处形成一台阶, 在此区域附近操作时 ITO Film 变形较大, 容易导致 ITO 损坏而降低寿命。为保护 RTP 和避免误操作, 在 RTP 与面框之间垫缓冲物 (Gasket), 我们建议设计面框应覆盖动作区的边缘, 面框边缘到 V. A. 区的距离 $B \geq 0.50\text{mm}$; 垫圈内边缘到 V. A. 区的距离 $C \geq 0.50\text{mm}$. (附图 4)
- 在设计面框与 RTP 组装时, 应考虑到面框内侧与 RTP 外侧的间距 $E \geq 0.2\text{mm}$. (附图 4)

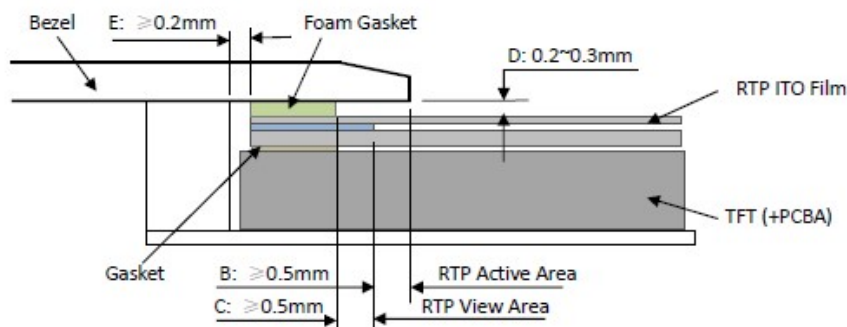


Figure 4

- In general design,
- RTP V.A. should be bigger than the TFT V.A.
- and RTP A.A. should be bigger than the TFT A.A. (Figure 5)

- 通常设计时:
- RTP 的可视区 V. A. 应不小于 TFT 的可视区 V. A.
- 及 RTP 的动作区 A. A. 应不小于 TFT 的动作区 A. A. (附图 5)

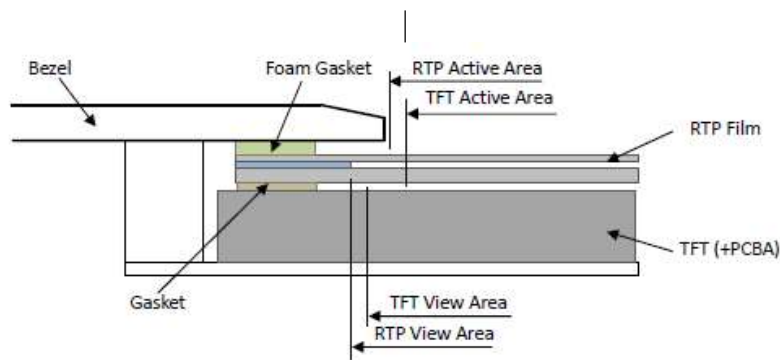


Figure 5

10. TFT QA Standard

10.1 INSPECTION CONDITION 检验条件

Unless otherwise stated, all the inspections are carryout under the following condition

除非有特别的规定，检验条件按以下执行。

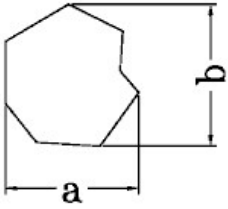
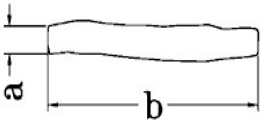
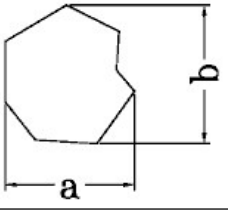
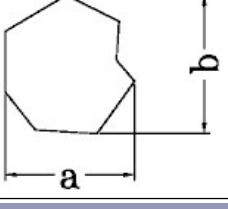
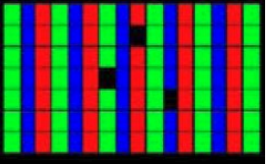
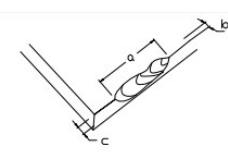
The following standards only apply to the visible area. As long as function good non-visual area appearance can be ignored. Available deerskin with petroleum ether, a clean stains do not apply to the exterior standard. If debris in a certain direction is perpendicular to the direction of three times the length of that line debris; the insulation as granular debris; the silver carbon glue as a rejection of defects.

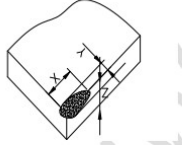
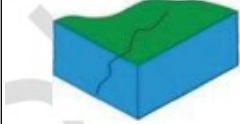
以下标准只适用于可视区。只要功能良好非可视区的外观可忽略。可用鹿皮沾石油醚，擦干净的污渍不适用于该外观标准。如果杂物某方向的长度是垂直方向的 3 倍则认为是线状杂物；多出的绝缘点看作粒状杂物；多出的 银碳胶视为拒收缺陷。

No.	Items 项目	Conditions 条件
1	Lighting 照明	Illumination: Appearance 700-1200Lux 环境亮度在 700~1200LUX
2	Inspection Distance 检验距离	30~50cm form the test sample, within normal viewing angle 眼睛距显示器表面 30~50cm
3	Temperature 环境温度	Room Temperature (23 °±3%), no condensation 室温 (23 度±3%)，无凝水
4	Viewing Angle 视角	U/D: 45°/45°, L/R: 45°/45° 前后 45 度角范围内，左右 45 度角范围内
5	Inspection Time 检验时间	10 seconds 10 秒内
6	Defect Allowance 缺陷总数	6 max 允许 6 个

10.2 Display Pattern 显示缺陷

No.	Items /Contents 检查项目	Type 类别		Standard 标准	Judgment 判定
		MA	MI		
1	No Display 无显示	√		--	Not Allowed 不允许
2	Line defect 缺少行或列	√		--	Not Allowed 不允许
3	Display abnormally 错误的显示	√		--	Not Allowed 不允许
4	Function Defective 缺少功能	√		--	Not Allowed 不允许
5	Glass Crack 玻璃破碎	√		--	Not Allowed 不允许

6	Spot Defect Including (Inside AA) : Black spot, White spot, Foreign particle, Polarizer dirt, Cell particle 黑点/白点(AA内)			√	$(a+b)/2 \leq 0.15$	Allowed 允许
					$0.15 < (a+b)/2 \leq 0.3$	2 max. 允许 2 个
					$(a+b)/2 > 0.3$	Not Allowed 不允许
7	Line Defect Including: Black line, White line, Scratch 线			√	$a \leq 0.05$	Allowed 允许
					$0.05 < a \leq 0.08$ and $b \leq 3.0$	2 max. 允许 2 个
					$a > 0.08$ or $b > 3.0$	Not Allowed 不允许
8	Polarizer Dent/Bubble (Inside AA) 偏光片气泡(AA内)			√	$(a+b)/2 \leq 0.15$	Allowed 允许
					$0.15 < (a+b)/2 \leq 0.3$	2 max. 允许 2 个
					$(a+b)/2 > 0.3$	Not Allowed 不允许
9	Polarizer Dent/Bubble (Inside AA) 偏光片凹点(AA内)			√	$(a+b)/2 \leq 0.25$	Allowed 允许
					$0.25 < (a+b)/2 \leq 0.35$	3 max. 允许 3 个
					$(a+b)/2 > 0.35$	Not Allowed 不允许
10	Bright dot defect 亮点 (在全黑屏下多像素点)			√		1 max. 允许 1 个
					1 consecutive dots 1 个以上连续的点	Not Allowed 不允许
11	Dark dot defect 暗点 (在全红或全绿或全蓝屏下缺像素点)			√	Random	3 max. 允许 3 个
					3 consecutive dots 3 个以上连续的点	Not Allowed 不允许
12	Bright dot defect + Dark dot defect 亮点 + 暗点			√	--	4 max. 允许 4 个
13	Backlight 背光			√	If there is no Backlight or Dark Backlight, the display is Rejected. 如果背光不亮或者背光发暗, 判定 NG Backlight is not homogeneous Rejected. By 5% ND Filter, if still visible, Rejected 背光不均匀, 使用 5% 的 ND Filter 进行检查, 如果依然可见, 则判定为 NG	
14	Glass breakage 玻璃破损	Edge broken loss 边破损 	--	--	$a \leq 3\text{mm}; b \leq 3\text{mm}, c \leq t$ (t = glass thickness) without affecting the function of the product, it is disregard. $a \leq 3$ 毫米; $b \leq 3$ 毫米; $c \leq t$ (t = glass thickness)	

		Corner broken loss 角破损 	--	--	$x \leq 2\text{mm}; y \leq 2\text{mm}, z \leq t$ (t = glass thickness) without affecting the function of the product, it is disregard. $X \leq 2$ 毫米; $Y \leq 2$ 毫米; $Z \leq t$ (t = glass thickness)	Ignore 忽略
		Crack 裂痕 	--	--	--	Not allowed: 不允许
15	FPC or FFC FPC/FFC		√		Broken 损坏	Not Allowed 不允许
			√		naked wire、hole 裸线、孔洞	Not Allowed 不允许
				√	FPC kink、indentation Top wound、scratch FPC 折痕、顶伤	Ignore 忽略
16	PCBA defect PCBA 缺陷		--	--	Refer to IPC-A-610 按照 IPC-A-610	--
17	Bezel scratches,pits,bumps,Don't try dirt 外框划痕,凹点,凸点,脏物			√	Do not affect display,assembly,ignore 不影响显示,组装则忽略	

10.3 Quality Level and Sampling 抽样方法

Items 项目	Standard 标准
Sampling Standard 引用标准	MIL-STD-105E
Sampling Level 抽样等级	II
AQL level 合格判定水平	MA: AQL=0.65 MI: AQL=1.0

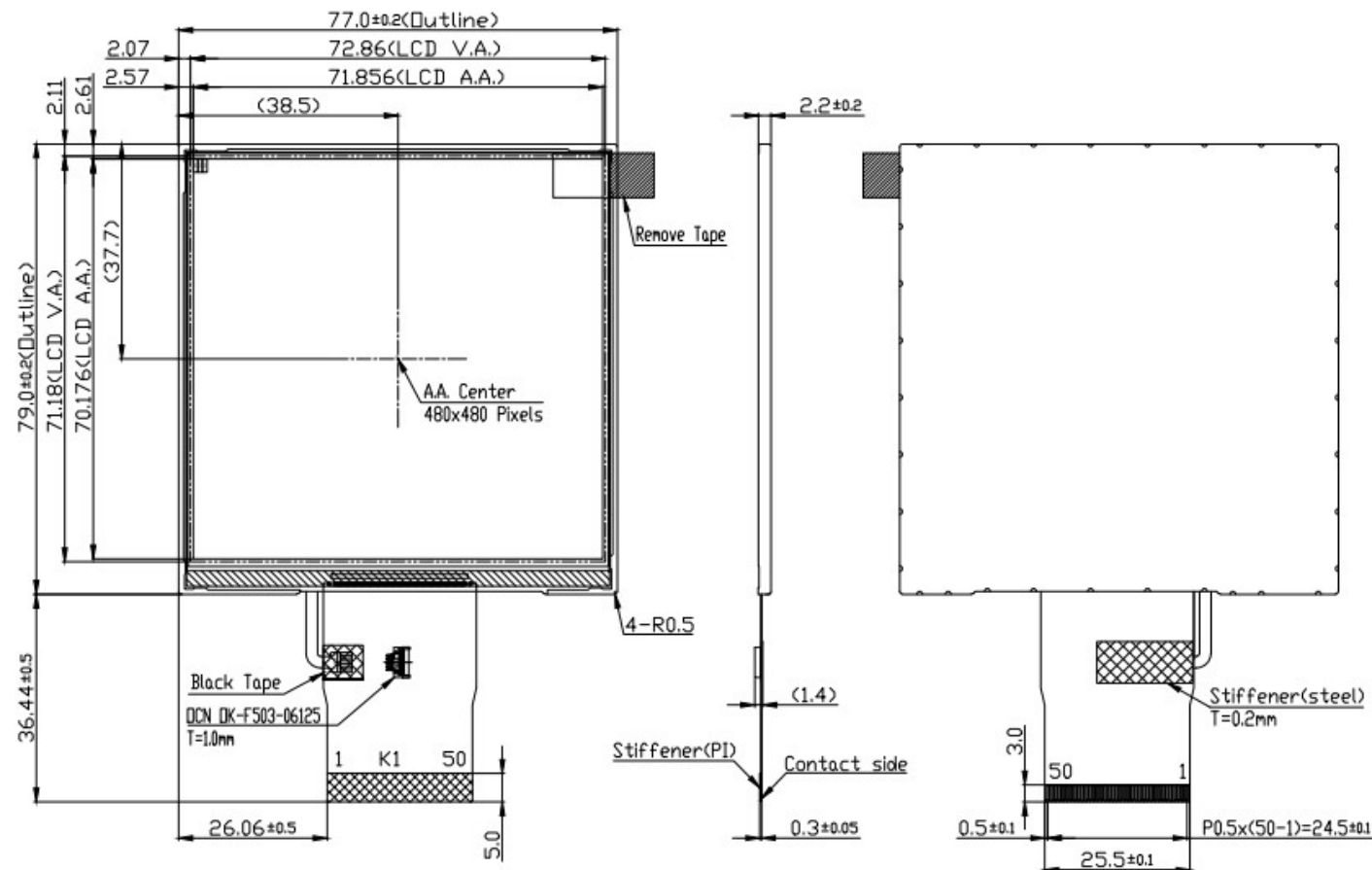
10.4 Handling Precaution 使用注意事项

- Never attempt to disassemble or rework LCD module
禁止拆卸或改造显示模块
- Never let LCD module contact with liquids
禁止液体接触
- LCD module can be easily damaged by electrostatic charge.
Please maintain an optimum anti-static working environment.
请在静电防护环境下打开包装使用
- LCD panel is made with glass.
Any mechanical shock (eg. Vibration, distortion, extrusion, impact, drop) will damage the LCD module.
振动、扭曲、挤压、碰撞、跌落等会造成损失或破裂
- Avoid showing a display pattern on screen for a long time (continuous ON segment)
长时间画面停留会造成影像残留
- The color and evenness of the display may slightly vary with the temperature
显示颜色和显示均匀度会因外界温度而有所变化
- Signal and Power supply excess the operation range may damage the LCD module
错误的输入电压(电流)或电信号会造成电路或元器件烧坏
- Avoid touching the LCD surface to prevent any scratch on its surface
避免手指和其他物品接触液晶屏表面

Warranty

This product has been manufactured to our company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

- We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
- We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
- We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed our company's acceptance inspection procedures.
- When the product is in CCFL models, CCFL service life and brightness will vary according to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.
- We cannot accept responsibility for intellectual property of a third part, which may arise through the application of our product to our assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.

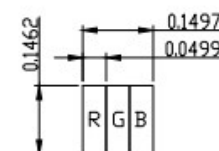


Terminal K1		Terminal K1	
1	LED1	26	G1
2	LEDK1	27	G2
3	LEDK2	28	G3
4	NC	29	G4
5	VDD	30	G5
6	IOVDD	31	G6
7	GND	32	G7
8	/RESET	33	B0
9	DE	34	B1
10	PCLK	35	B2
11	HS	36	B3
12	VS	37	B4
13	GND	38	B5
14	/CS	39	B5
15	SCL	40	B7
16	SDA	41	GND
17	R0	42	GND
18	R1	43	GND
19	R2	44	NC
20	R3	45	NC
21	R4	46	NC
22	R5	47	NC
23	R6	48	NC
24	R7	49	NC
25	G0	50	GND

Note:

- *1. LCD Display Type : TFT, Transmissive (Full View)
- *2. Operating Voltage : 2.8V
- *3. Backlight Color : White LEDs
- *4. Pixel Arrangement : RGB-STRIPE
- *5. Color Depth : 16.7M Colors
- *6. Interface :
K1 RGB_24bit (P0.5x50pin FFC Socket or equivalent)
- *7. Operating Temperature : $-20^{\circ}\text{C} \sim 70^{\circ}\text{C}$
- *8. Storage Temperature : $-30^{\circ}\text{C} \sim 80^{\circ}\text{C}$

LED CIRCUIT DIAGRAM



Pixel Details
Scale=100/1

C		
B		
A		
Rev	Note	Date
Dwg Title	LMT040EATFWA Outline Dwg	
Dwg No.	MK-007000-1-1	Date
Scale	5/4	2020-08-05
Tol.	± 0.3	
Unit	mm	
Paper Size	A3	
Approved	Checked	Drawn
		Qiu Shaping

TOPWAY