



深圳市拓普微科技开发有限公司
SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

LMT104ENEFWA-NNC

LCD Module User Manual

Prepared by: Wang Gang Date: 2025-03-10	Checked by: Date:	Approved by: Date:
--	----------------------------------	-----------------------------------

Rev.	Descriptions	Edit	Release Date
0.1	Preliminary	Gong huimei	2023-09-14
0.2	Revise Outline and Typing Correction	Wang Gang	2025-03-10

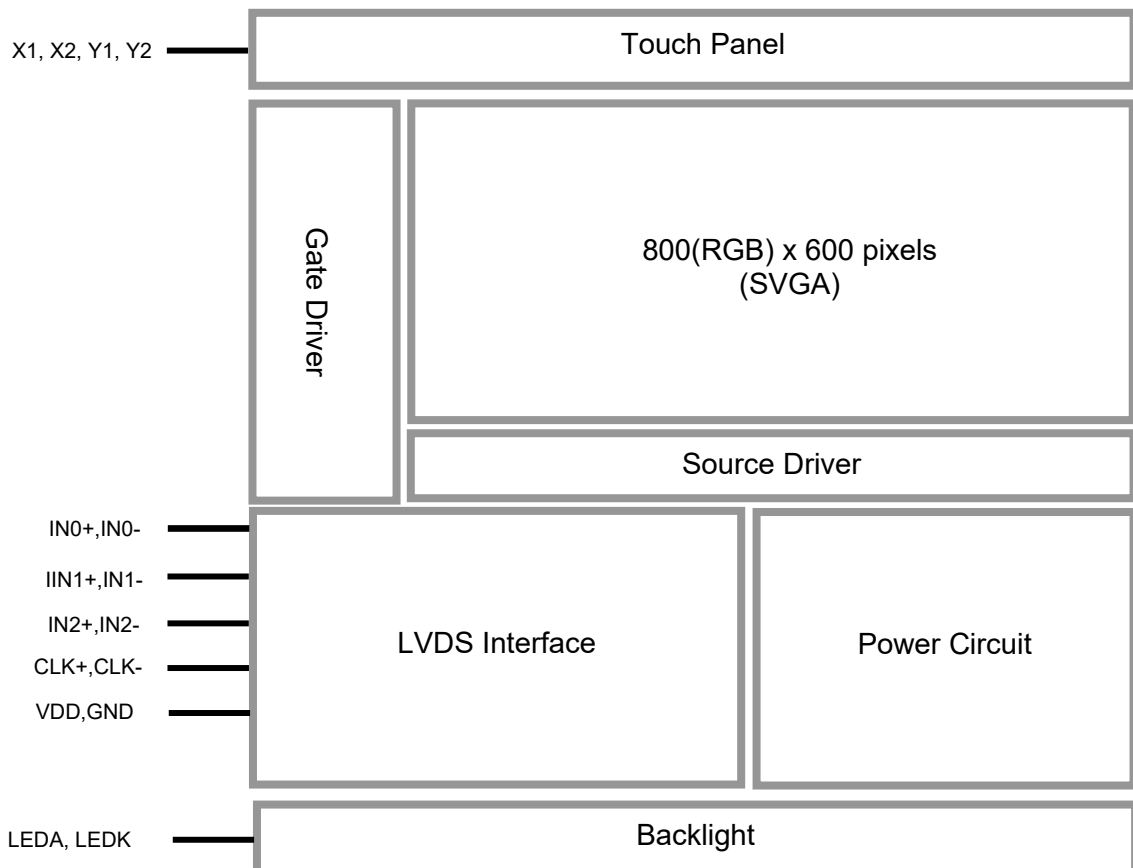
Table of Content

1. General Specification	3
2. Block Diagram	3
3. Input/Output Terminals	4
3.1 K1 (TFT LCD Panel)	4
3.2 K2 (Backlight connector)	4
3.3 K3 (TP FPC)	4
4. Absolute Maximum Ratings	5
5. Electrical Characteristics	6
5.1 Driving TFT LCD Panel	6
5.2 Driving Backlight	7
5.3 Power On/Off Sequence	7
6. AC Characteristics	8
6.1 Timing Conditions	8
6.2 Data Input Timing Parameter Setting	9
6.3 LVDS data mapping	9
7. Optical Characteristics	10
8. LCD Module Design and Handling Precautions	13
9. RTP Mounting Instructions	14
Warranty	15

1. General Specification

Screen Size(Diagonal) :	10.4 "
Active Area :	211.20x158.40 (mm)
Number of dots :	800(RGB) x 600
Dot Pitch :	0.264x0.264 (mm)
Color Depth:	262k colors
Display Technology :	a-Si TFT active matrix
Display Mode :	SFT, Transmissive, Normal Black
Outline Dimension :	236.00x176.90x7.52 (MAX)(mm) (see attached drawing for details)
Display Interface :	LVDS 18 bits
Viewing Direction :	Full
Touch Panel :	Resistive Touch Panel
Surface Treatment :	Anti-Glare
Touch Interface:	Passive 4wires RTP Touch Interface
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

2. Block Diagram



3. Input/Output Terminals

3.1 K1 (TFT LCD Panel)

Pin No.	Pin Name	IO	Descriptions
1	VDD	Power	Power Supply
2			
3	GND	Power	Ground
4			
5	IN0-	Input	LVDS receiver negative signal channel 0
6	IN0+	Input	LVDS receiver positive signal channel 0
7	GND	Power	Ground
8	IN1-	Input	LVDS receiver negative signal channel 1
9	IN1+	Input	LVDS receiver positive signal channel 1
10	GND	Power	Ground
11	IN2-	Input	LVDS receiver negative signal channel 2
12	IN2+	Input	LVDS receiver positive signal channel 2
13	GND	Power	Ground
14	CLK-	Input	LVDS receiver negative signal clock
15	CLK+	Input	LVDS receiver positive signal clock
16	GND	Power	Ground
17	NC	-	No connection
18			
19	GND	Power	Ground
20			

3.2 K2 (Backlight connector)

Pin No.	Pin Name	IO	Descriptions	Wire Color
1	LEDA	Power	LED driving anode (high voltage)	Red
2	LEDK	Power	LED driving cathode (low voltage)	White

3.3 K3 (TP FPC)

No.	Symbol	IO	Descriptions	Remark
1	Y2	I	Down Side sense Terminal	
2	X1	I	Left Side sense Terminal	
3	Y1	I	Up Side sense Terminal	
4	X2	I	Right Side sense Terminal	

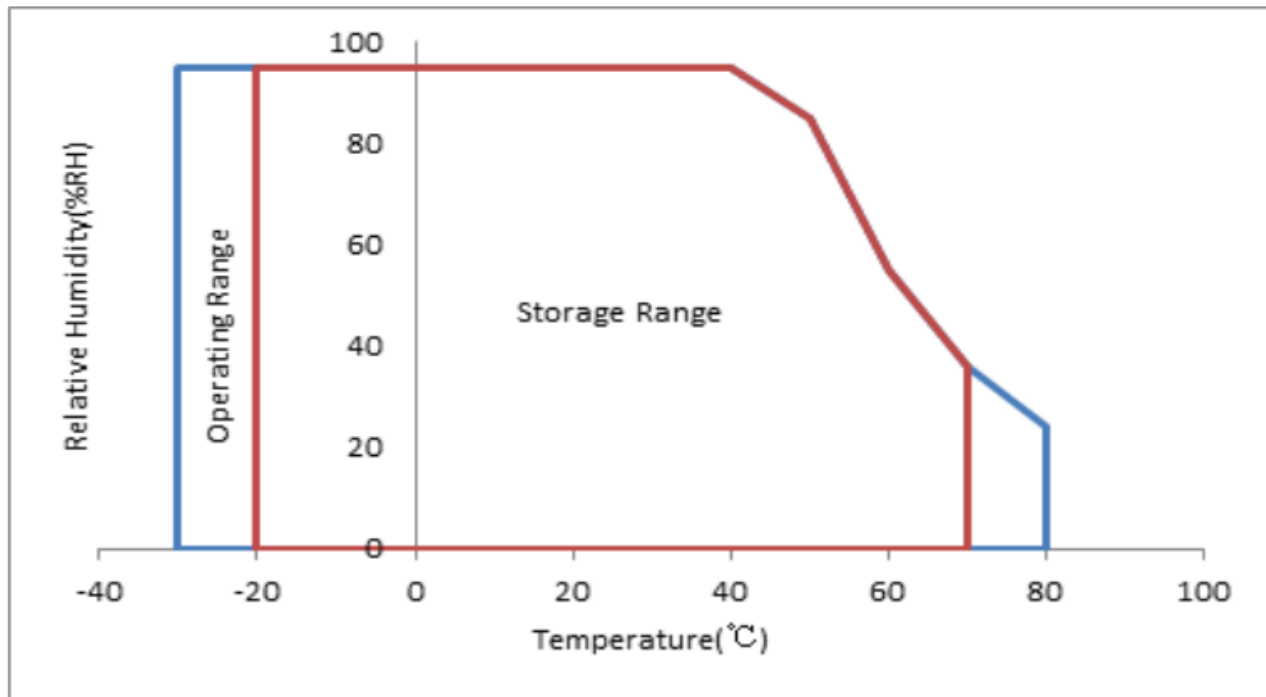
Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: All of the GND pins should be connected to the system ground.

4. Absolute Maximum Ratings

GND=0V, T_{OP}=25°C

Items	Symbol	Min.	Max.	Unit	Condition
Power Voltage	VDD	-0.3	+3.96	V	GND = 0V
Operating Temperature	T _{OP}	-20	+70	°C	No Condensation
Storage Temperature	T _{ST}	-30	+80	°C	No Condensation



Absolute Maximum Ratings chart

Note1: Power voltage include all input data.

Note2: Ta means the ambient temperature. It is necessary to limit the relative humidity to the specified temperature range. Condensation on the module is not allowed.

Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times. A module should be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

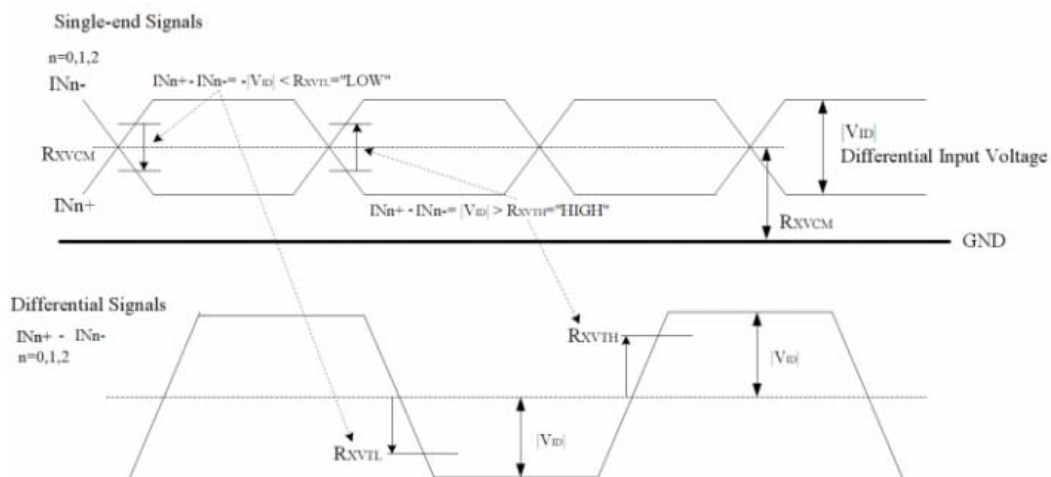
5. Electrical Characteristics

5.1 Driving TFT LCD Panel

GND=0V, V_{DD}=3.3V, T_{OP}=25°C

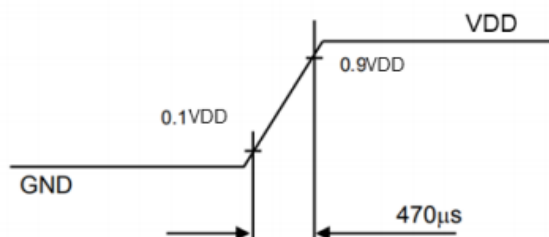
Items		Symbol	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage		VDD	3.0	3.3	3.6	V	Include ripple
LVDS Differential input high threshold		R _{xVTH}	-	-	+37	mV	
LVDS Differential input low threshold		R _{xVTL}	-37	-	-	mV	
Differential input voltage		V _{ID}	0.1	-	0.4	V	
LVDS input common mode voltage		R _{xVCM}	600	1200	1300	mV	R _{xVCM} +1/2* V _{ID} ≤1650mV R _{xVCM} -1/2* V _{ID} ≥400mV
VDD Power Consumption	60Hz	P _{VDD}	-	435	-	mW	white pattern
VDD rush current		I _{rush}	-	-	1.5	A	

Note1: LVDS DC characteristics.



Note2: Inrush current test condition.

VDD rising time is 470μs

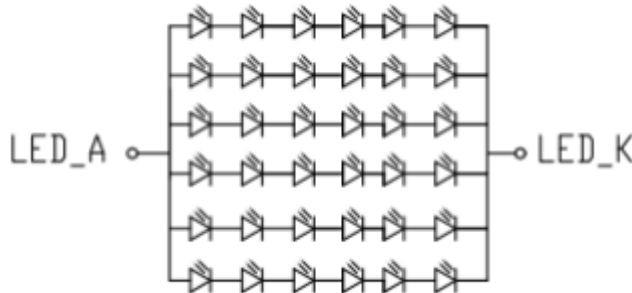


5.2 Driving Backlight

 $T_{OP}=25^{\circ}\text{C}$

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward Current	I_F	-	120	130	mA	
Forward Current Voltage	V_F	16.8	18.0	19.2	V	
Backlight Power Consumption	W_{BL}	-	2160	-	mW	
LED life time	-	30000	50000	-	Hrs	

Note 1: The figure below shows the connection of backlight LED.



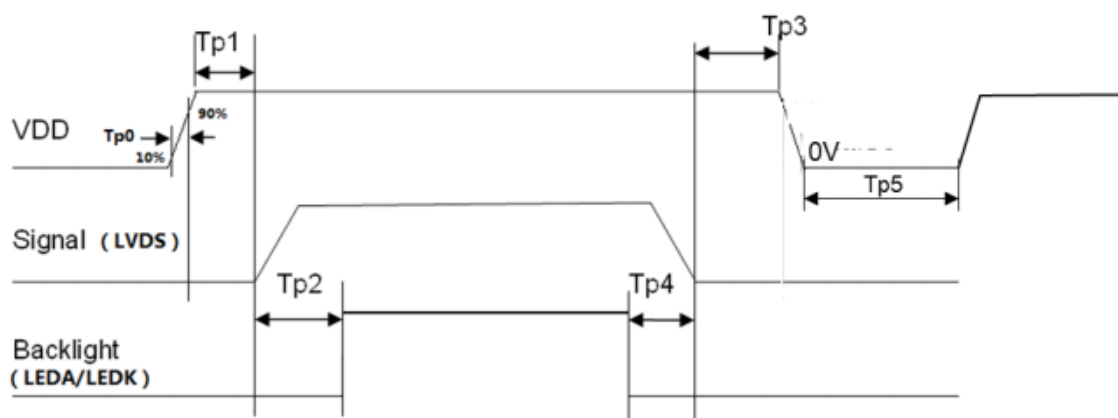
Note2: I_F is defined for total channel. One LED: $I_F(1/6) = 20\text{mA}$.

Note3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.

5.3 Power On/Off Sequence

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
VDD 10% to VDD 90%	Tp0	1	-	5	ms	
VDD to signal starting	Tp1	20	-	50	ms	
Signal starting to backlight on	Tp2	200	-	-	ms	
Signal off to VDD	Tp3	50	-	100	ms	
Backlight off to signal off	Tp4	200	-	-	ms	
To next VDD	Tp5	2	-	-	S	



Power On/Off Sequence

Note1: The low level of these signals and analog powers are GND level.

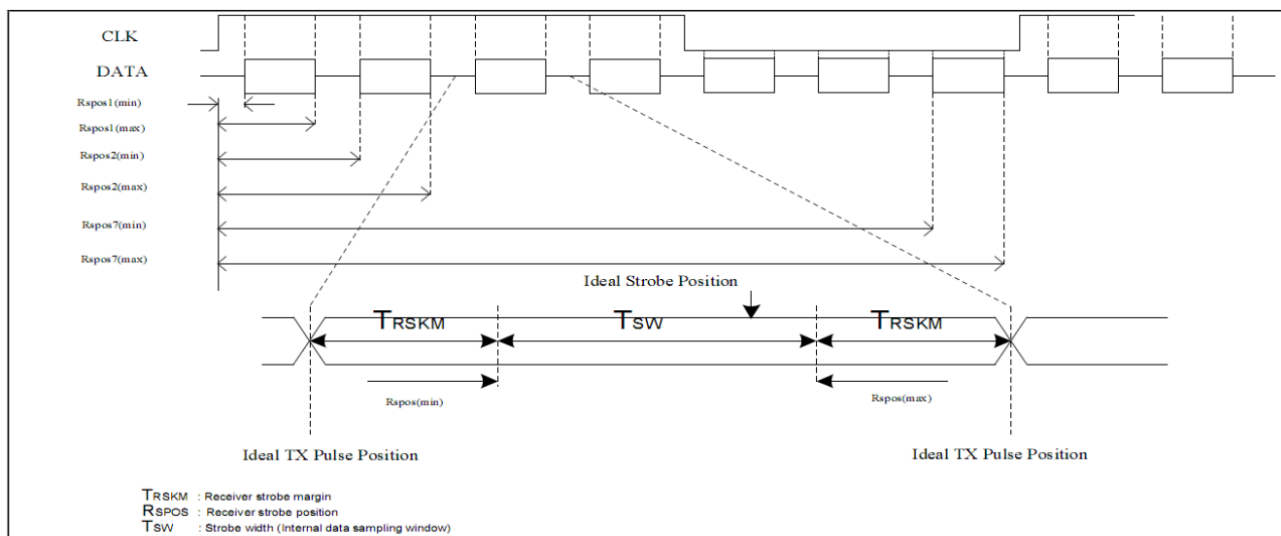
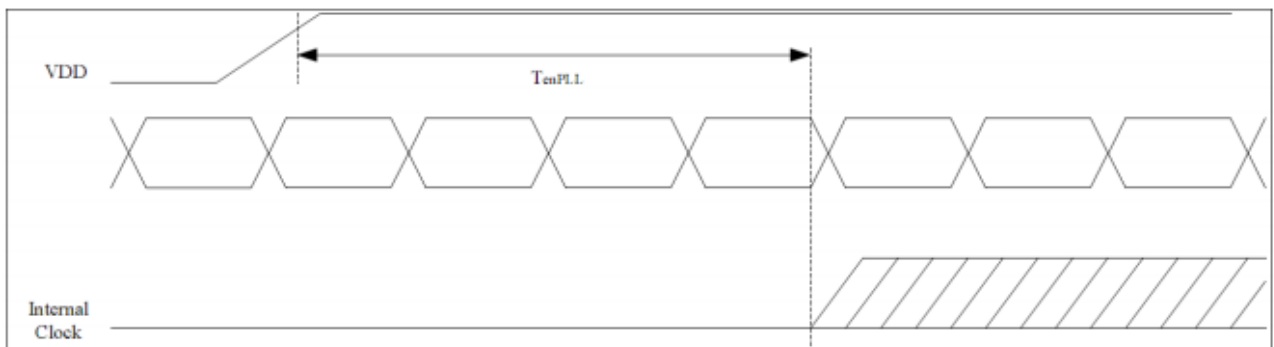
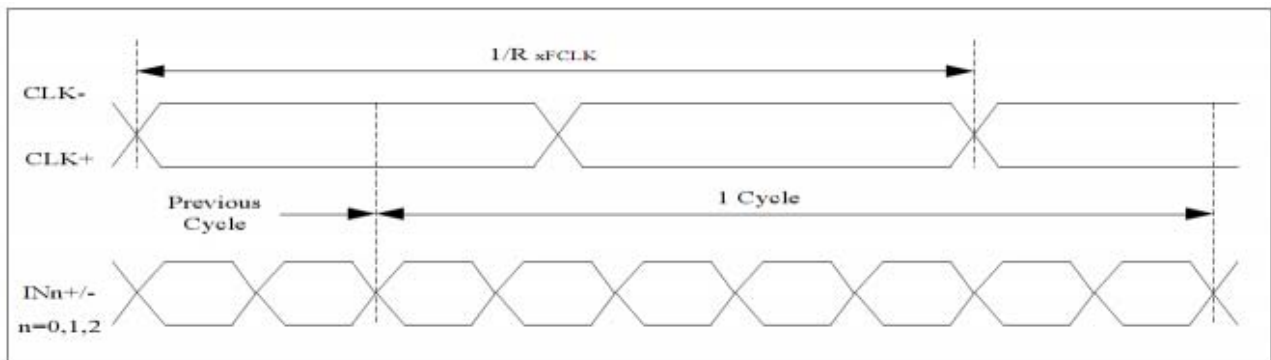
Note2: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.

Note3: LEDA/K is the voltage applied to backlight. Keep it turned off until the display has stabilized.

6. AC Characteristics

6.1 Timing Conditions

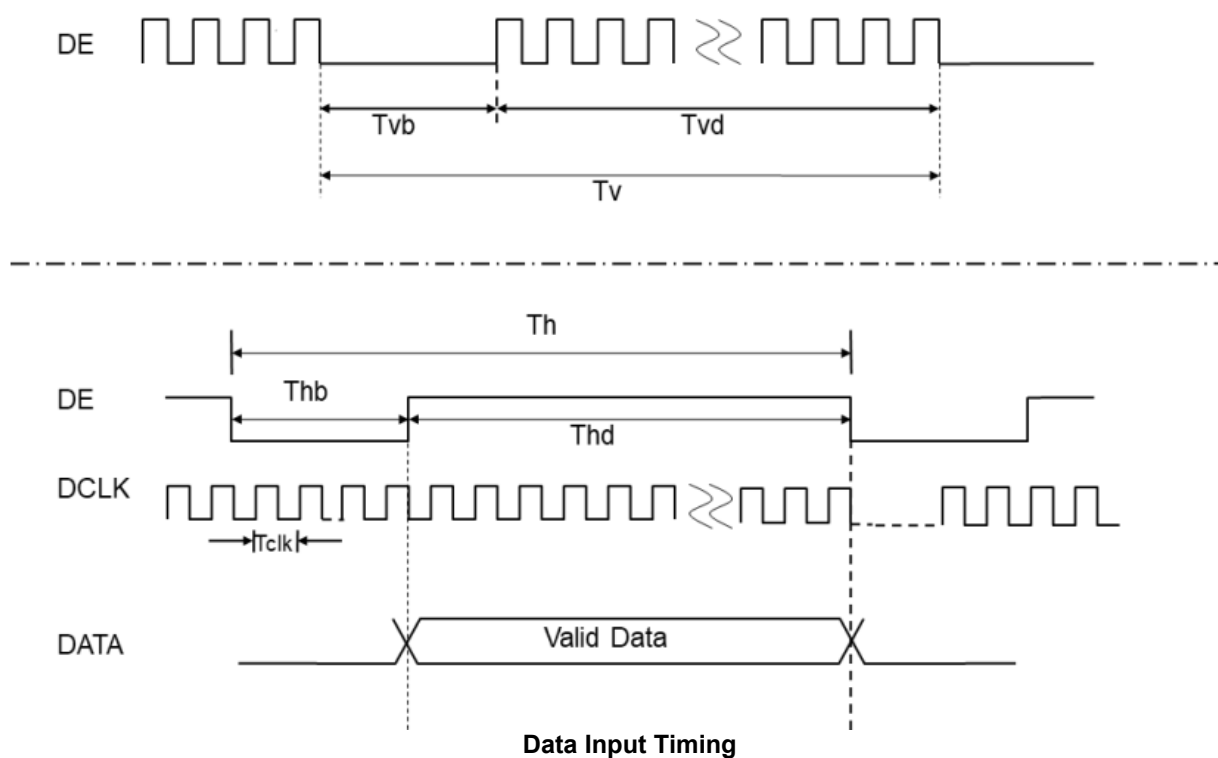
Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Dclk Frequency	RxFCLK	33.1	-	62.4	MHz	
Input Data Skew Margin	TRSKM	-0.2	-	0.2	UI	VID = 200mV RxVCM = 1.2V 1UI=1/(RxFCLKx7)
Clock high time	T _{LVCH}	-	3.5/(7*RxFCLK)	-	ns	
Clock low time	T _{LVCL}	-	3.5/(7*RxFCLK)	-	ns	
PLL wake-up time	T _{emPLL}	-	-	150	us	



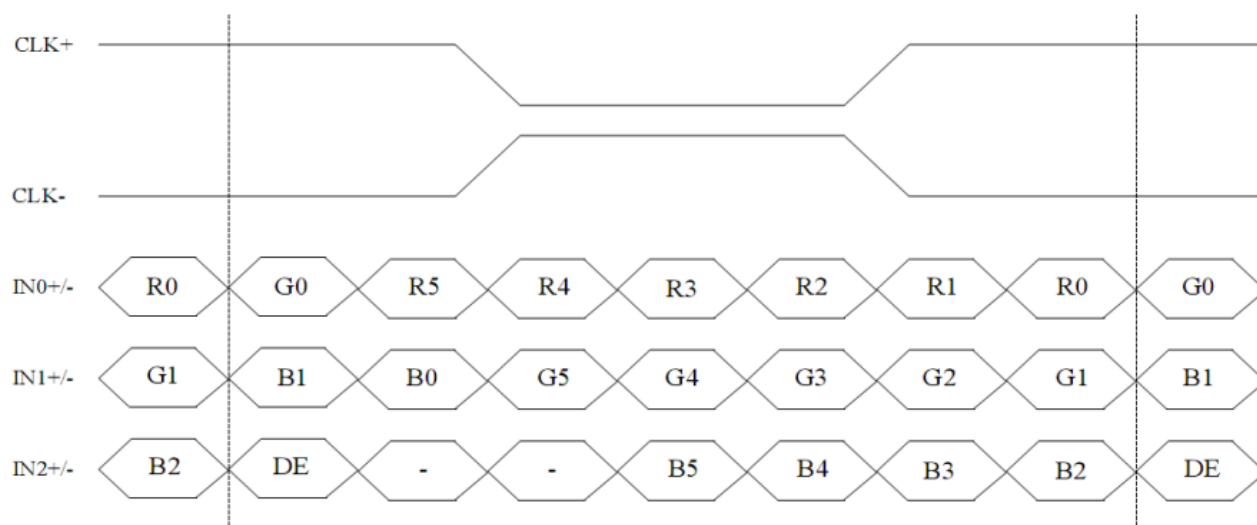
AC characteristics Timing

6.2 Data Input Timing Parameter Setting

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Dclk Frequency	Fclk	33.1	39.6	62.4	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	TH	890	1000	1300	Tclk
	Horizontal blanking	THC	90	200	500	Tclk
	Valid Data Width	THD	800			Tclk
Vertical section	Vertical total	TV	620	660	800	TH
	Vertical blanking	TVC	20	60	200	TH
	Valid Data Width	TVD	600			TH
Frame Rate	F	60			HZ	



6.3 LVDS data mapping



7. Optical Characteristics

Ta=25℃

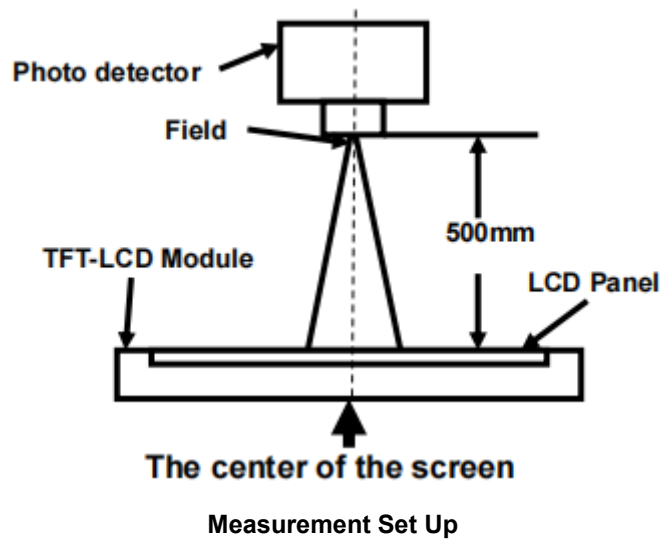
Item		Symbol	Condition	Min	TYP.	MAX.	UNIT	Note.
View Angles		θT	CR≥ 10	78	88	-	Degree	Note 2, 3
		θB		78	88	-		
		θL		78	88	-		
		θR		78	88	-		
Contrast Ratio		CR	θ=0°	700	1000	-	-	Note3
Response Time		T _{ON}	25℃	-	35	45	ms	Note4
		T _{OFF}						
Chromaticity	White	X	Backlight is on	0.255	0.305	0.355		Note1,5
		Y		0.285	0.335	0.385		
	Red	X		0.549	0.599	0.649		
		Y		0.273	0.323	0.373		
	Green	X		0.285	0.335	0.385		
		Y		0.543	0.593	0.643		
	Blue	X		0.102	0.152	0.202		
		Y		0.065	0.115	0.165		
Uniformity		U	-	75	80	-	%	Note6
NTSC		-	-	45	50	-	%	Note 5
Luminance		L	-	-	300	-	cd/m²	Note7

Test Conditions:

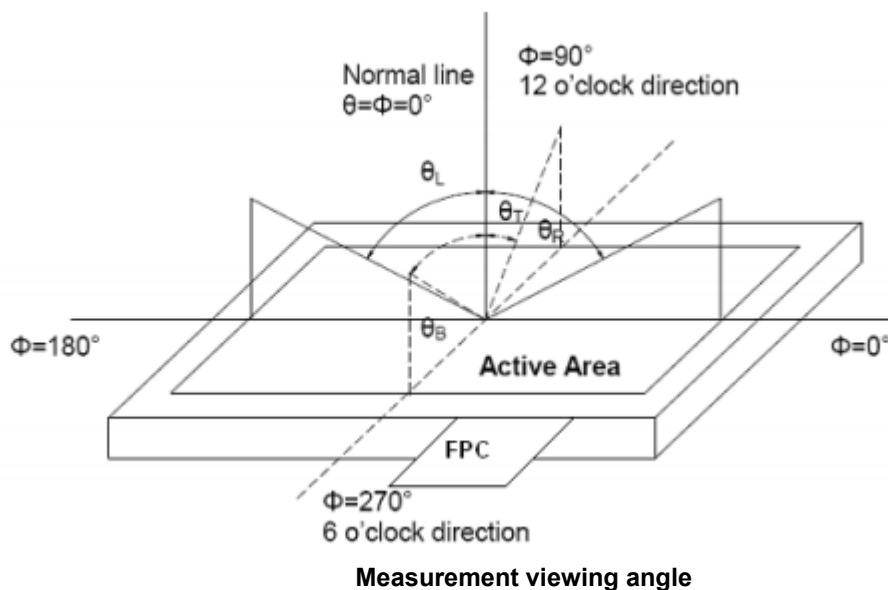
1. I_F= 120mA, and the ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.

Note1: Definition of optical measurement system

The optical characteristics should be measured in dark room. The optical characteristics are measured at the center point of the LCD screen.



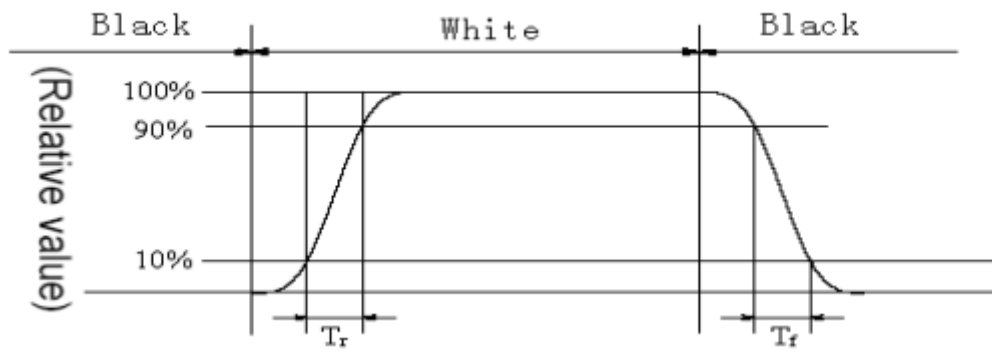
Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD

**Note3: Definition of contrast ratio**

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note4: 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 10% to 90%. And fall time (T_f) is the time between photo detector output intensity changed from 90% to 10%.



Response Time Testing

Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

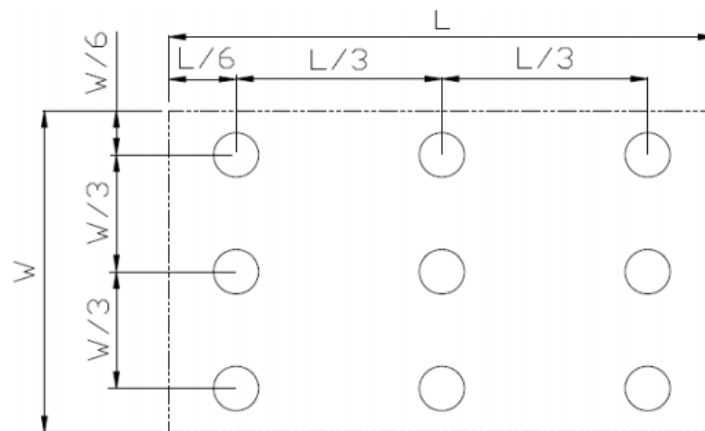
Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = L_{min} / L_{max}

L_{max} : The measured Maximum luminance of all measurement position.

L_{min} : The measured Minimum luminance of all measurement position.

L -----Active area length; W ----- Active area width



Luminance Uniformity Measurement Locations (9 points)

Note7: Definition of Luminance :

Measure the luminance of white state at center point.

8. 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. (No Hot-plugging)
- WARNING! Be aware of (if any) frame grounding of the LCD Module connection with the system which may cause safety issue(e.g. electric shock,etc).
- 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℃~40℃ <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

8. 液晶显示模块设计和使用须知

- 请注意 V0, VCOM 的设置, 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。(禁止热插拔)
- 警告! 使用前需评估液晶显示模块的金属框架/壳体地(如有)与整机关系和安全性(如: 漏电安全性, 等)。
- 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均匀等异常现象。
- 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℃~40℃ <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, 导致显示不均匀等不良现象发生。
- 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

the display color change abnormally.

- 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.

9. RTP Mounting Instructions

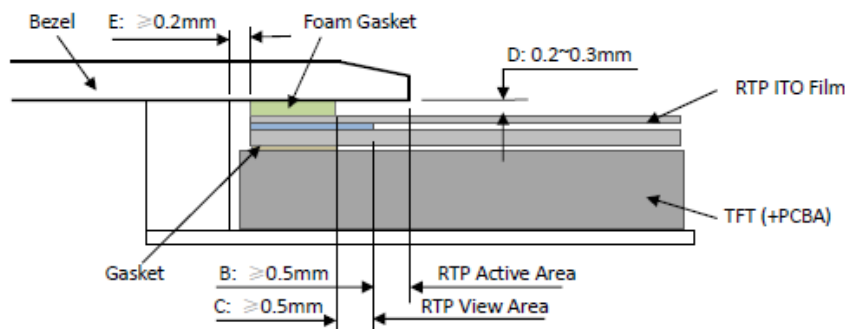
- It should bezel touching the RTP Active Area (A.A.) to prevent abnormal touch. It should left gap $D=0.2\sim0.3\text{mm}$ in between.
- Outer bezel design should take care about the area outside the A.A. Those areas contain circuit wires which is having different thickness. Touching those areas could 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 $B\geq0.50\text{mm}$; $C\geq0.50\text{mm}$.
- The bezel side wall should keep space $E=0.2\sim0.3\text{mm}$ from the RTP.

常。

- 液晶屏由玻璃制作而成，任何机械碰撞(如从高处跌落)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。

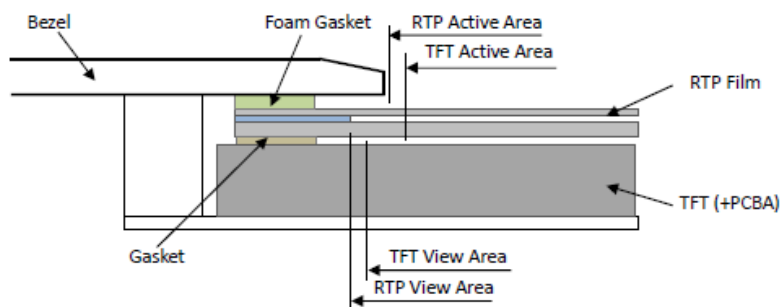
9. 电阻触摸屏安装指导

- 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 $D=0.2\sim0.3\text{mm}$ 之间。
- 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 $B\geq0.50\text{mm}$ ；垫圈内边缘到 V.A. 区的距离 $C\geq0.50\text{mm}$ 。
- 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 $E\geq0.2\text{mm}$ 。



- 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.

- 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.

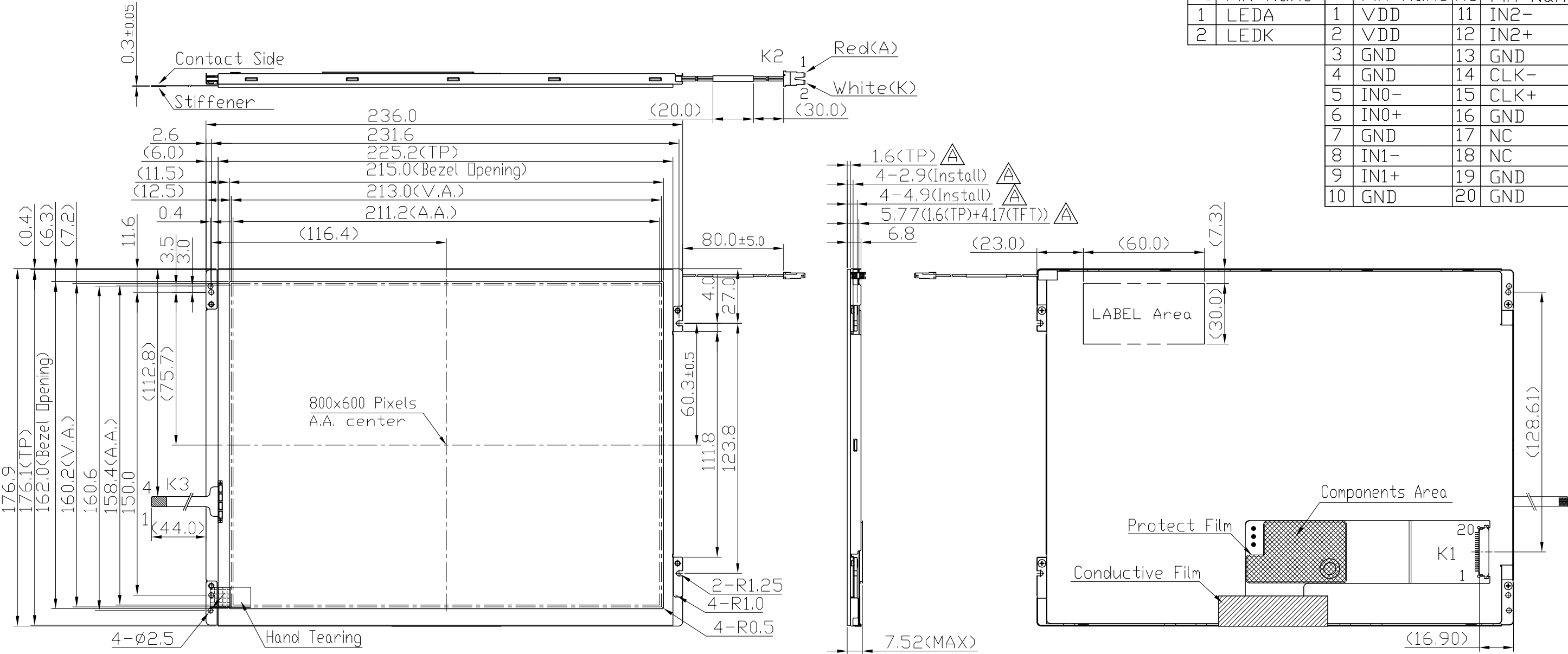


Warranty

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.

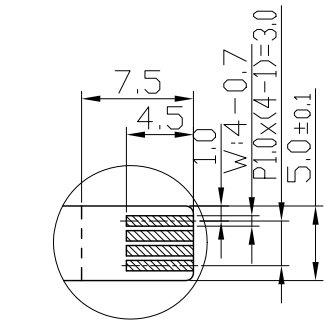
- We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
- We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
- 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.

K2 Terminal			K1 Terminal		
No	Pin	Name	No	Pin	Name
1	LEDA		1	VDD	11 IN2-
2	LEDK		2	VDD	12 IN2+
			3	GND	13 GND
			4	GND	14 CLK-
			5	IN0-	15 CLK+
			6	IN0+	16 GND
			7	GND	17 NC
			8	IN1-	18 NC
			9	IN1+	19 GND
			10	GND	20 GND

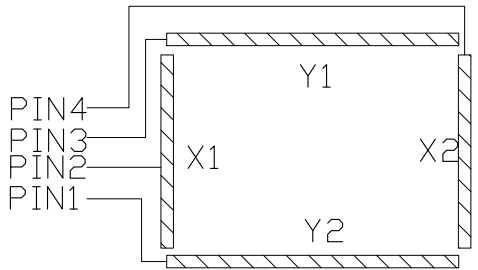


Notes:

- *1. LCD Display Type: TFT, Transmissive (Full view)
- *2. Pixel Arrangement: RGB-STRIP
- *3. Operating Voltage: 3.3V
- *4. Color Depth: 262k Colors
- *5. Backlight: White LED
- *6. Backlight Supply: 120mA (Constant Current VF=18.0V typ.)
- *7. Terminals:
 - K1: DF19K-20P-1H or Equivalent
 - K2: JST BHSR-02VS-1 or Equivalent
 - Mating Connector: JST SM02B-BHSS-1-TB or Equivalent
- *8. Touch Panel Type: Resistance Touch Panel
- *9. Operating Temperature: -20°C~70°C
- *10. Storage Temperature: -30°C~80°C
- *11. Foam Gasket must be assembled outline RTP V.A. by 0.5mm
- *12. Unmarked Tolerance: ≤150, ±0.3; >150, ±0.5



Touch Panel (Contact Side) Scale 2/1



Touch Panel Circuit

C		
B		
A	Revise Outline	WangGang 2025-03-10
RevNote		Date
Dwg Title		LMT104ENEFWA-NNC Outline Dwg
Dwg No.		MK-008195a-1-1
Scale		1/2
Tol.		--
Unit		mm
Paper Size		A3
Approved		Checked
		Drawn WangGang

TOPWAY