



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

LMT215FNQFWEA

LCD Module User Manual

Prepared by: LuoLin Date: 2026-09-16	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Edit	Release Date
0.1	Preliminary	LuoLin	2026-09-16

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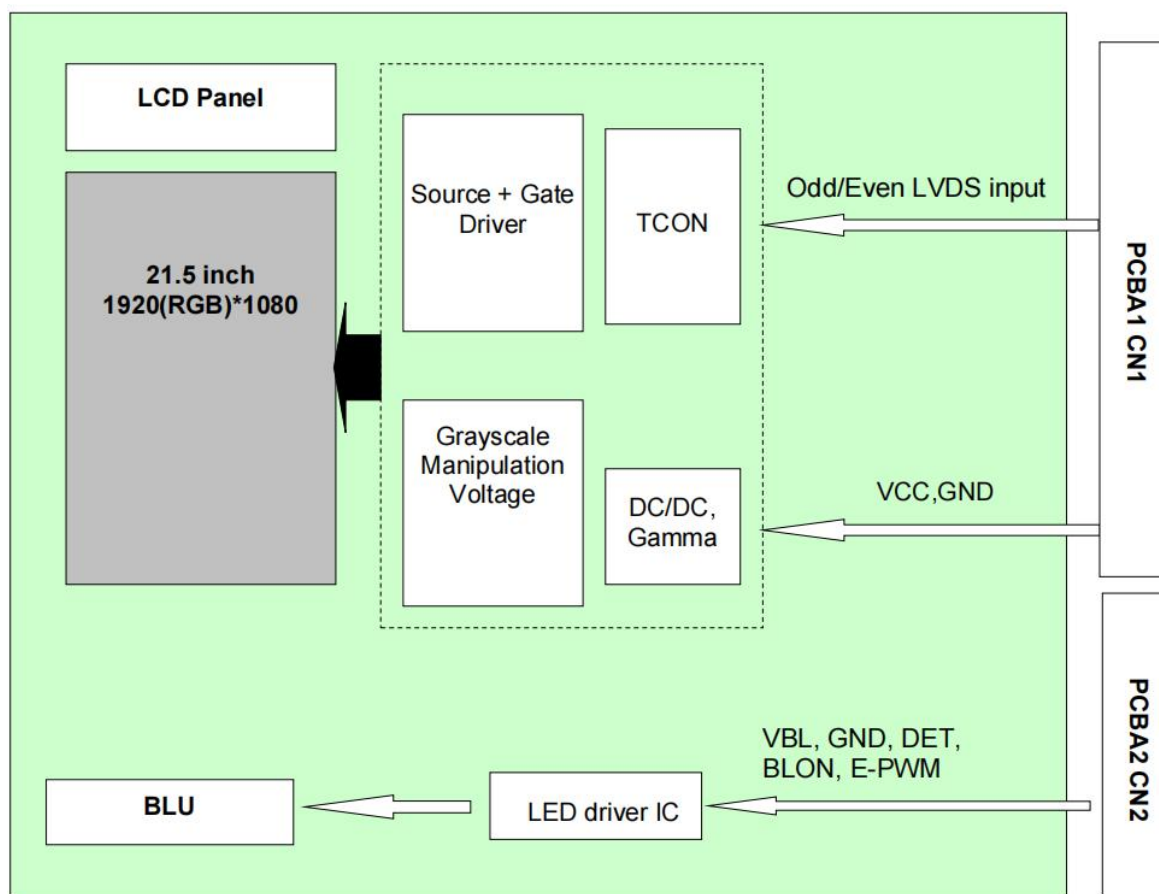
1. General Specification

Screen Size(Diagonal) :	21.5"
Active Area :	476.06x 267.79(mm)
Number of dots :	1920(RGB) x1080
Pixel Pitch:	0.24795x0.24795(mm)
Color Depth:	16.7M
Signal Interface:	2-port LVDS(6/8bit selectable)
Display Mode:	Normal Black, Transmissive
Outline Dimension:	495.6x292.2x13.99(mm) (see outline drawing for details)
Pixel Configuration:	R.G.B. Vertical Stripe
Viewing Direction :	Full
Backlight :	White LEDs
Operating Temperature :	-30 ~ +80°C
Storage Temperature :	-40 ~ +85°C

Note:

- *1. Color tone may slightly change by temperature and driving condition.
- *2. Acquisition product for UL 62368-1, 4th Ed; CAN/CSA C22.2 No. 62368-1:25, 4th Ed
- *3. This product will comply with the European RoHS directive (2011/65/EU) and Delegated Directive (2015/863/EU, Amending Annex II of 2011/65/EU)

2. Block Diagram



3. Terminal Function

3.1 K1 TFT Input Terminal(MSBKT2407P30HB or equivalent)

NO	Symbol	I/O	Description	Comment
1	ORX0-	I	Negative Transmission data of Pixel 0 (ODD)	
2	ORX0+	I	Positive Transmission data of Pixel 0 (ODD)	
3	ORX1-	I	Negative Transmission data of Pixel 1 (ODD)	
4	ORX1+	I	Positive Transmission data of Pixel 1 (ODD)	
5	ORX2-	I	Negative Transmission data of Pixel 2 (ODD)	
6	ORX2+	I	Positive Transmission data of Pixel 2 (ODD)	
7	GND	P	Ground	
8	ORXC-	I	Negative Transmission Clock (ODD)	
9	ORXC+	I	Positive Transmission Clock (ODD)	
10	ORX3-	I	Negative Transmission data of Pixel 3 (ODD)	
11	ORX3+	I	Positive Transmission data of Pixel 3 (ODD)	
12	ERX0-	I	Negative Transmission data of Pixel 0 (EVEN)	
13	ERX0+	I	Positive Transmission data of Pixel 0 (EVEN)	
14	GND	P	Ground	
15	ERX1-	I	Negative Transmission data of Pixel 1 (EVEN)	
16	ERX1+	I	Positive Transmission data of Pixel 1 (EVEN)	
17	GND	P	Ground	
18	ERX2-	I	Negative Transmission data of Pixel 2 (EVEN)	
19	ERX2+	I	Positive Transmission data of Pixel 2 (EVEN)	
20	ERXC-	I	Negative Transmission Clock (EVEN)	
21	ERXC+	I	Positive Transmission Clock (EVEN)	
22	ERX3-	I	Negative Transmission data of Pixel 3 (EVEN)	
23	ERX3+	I	Positive Transmission data of Pixel 3 (EVEN)	
24	GND	P	Ground	Note 1
25	NC	N	No connection	
26	NC	N	No connection	
27	NC	N	No connection	
28	VDD	P	Power Supply: +5V	
29	VDD	P	Power Supply: +5V	
30	VDD	P	Power Supply: +5V	

Note1: This pin should be connected with GND.

3.2 K2 LED Driver Terminal(MS2426P14RHE or equivalent)

NO	Symbol	I/O	Description	Comment
1-5	VBL	P	Power supply +24V	
6-10	GND	P	Ground	
11	DET	O	Fault detect	
12	BLON	I	Backlight on/off control input	
13	NC	N	No connection	
14	E-PWM	I	Brightness control input	

4. Absolute Maximum Ratings

GND=0V

Item	Symbol	Min	Max	Unit	Remark
Power Voltage for LCD	VCC	-0.3	6.0	V	
Input voltage for LCD	V _{IN}	-0.3	6.0	V	Note 1
LED power supply Voltage	VBL	-0.3	26.4	V	
LED Control Signal Voltage 1	BLON	-0.3	3.6	V	
LED Control Signal Voltage 2	E-PWM	-0.3	3.6	V	
Operating Temperature	TOPR	-30	80	℃	Note2、 Note3
Storage Temperature	TSTG	-40	85	℃	
Relative Humidity Note1	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃<Ta≤50℃
		--	≤55	%	50℃<Ta≤60℃
		--	≤36	%	60℃<Ta≤70℃
Absolute Humidity	AH	--	≤70	g/m ³	Ta>70℃

Notes:

1. Input voltage include REVERSE.

2. 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.

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

5. Electrical Specifications

5.1 DC Characteristics for Panel Driving

GND=0V, Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power supply voltage	VCC	4.5	5.0	5.5	V	
Input Signal Voltage	Low Level	V _{IL}	0	--	0.2×VCC	V
	High Level	V _{IH}	0.7×VCC	--	VCC	V
Power supply current	I _{VCC}	--	TBD	--	mA	Note1
Power Consumption	60Hz	P	--	TBD	mW	

Notes :

1. Tested with all white pattern.

5.2 BackLight

GND=0V, Ta = 25℃

Item	Symbol	Min	TYP	MAX	Unit	Remark
Power supply voltage	VBL	22	24	26	V	LED driver
Forward Current Voltage	I_{VBL}	-	TBD	-	mA	
Power Consumption	P_{VBL}	-	TBD	-	W	
Input voltage for BLON、E-PWM signal	High	VDFH1	1.6	-	3.6	V
	Low	VDFL1	0	-	0.7	V
PWM frequency	Fpwm	200	-	20K	Hz	
PWM duty cycle	-	0.5	-	100	%	Dim setting must be more than minimum always
LED lifetime	--	50000	-	-	Hrs	

Note:

1.Optical performance should be evaluated at Ta=25℃ only.

6. Signal Timing Specification

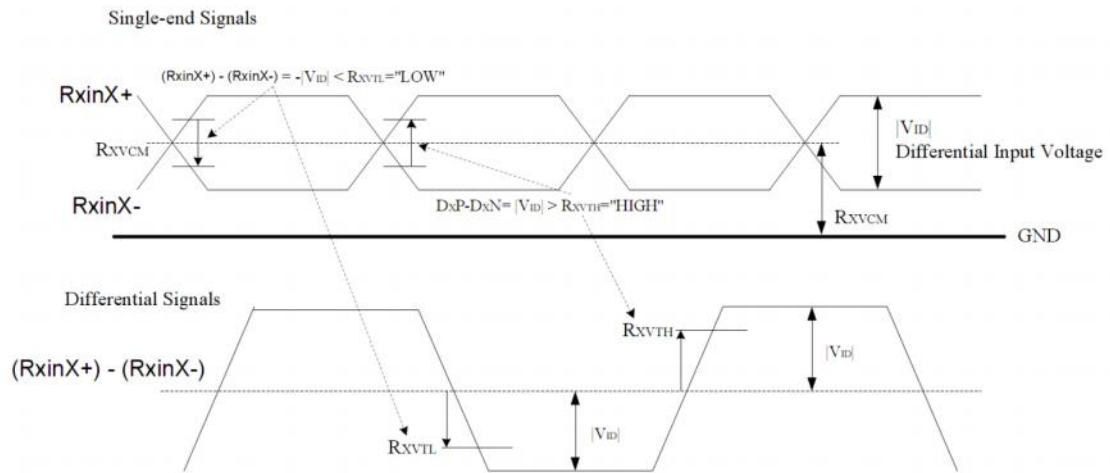
6.1 Timing (DE mode only)

VCC=3.3V, GND=0V, Ta=25℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Dclk frequency		Fclk	71.25	74.25	77.25	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	th	1080	1100	1120	Tclk	
	Horizontal blanking	thb	100	140	160	Tclk	
	Valid Data Width	thd	960			Tclk	
Vertical section	Vertical total	tv	1120	1125	1150	TH	
	Vertical blanking	tvb	40	45	70	TH	
	Valid Data Width	tvd	1080			TH	
Frame rate			60			Hz	

6.2 LVDS DC characteristics

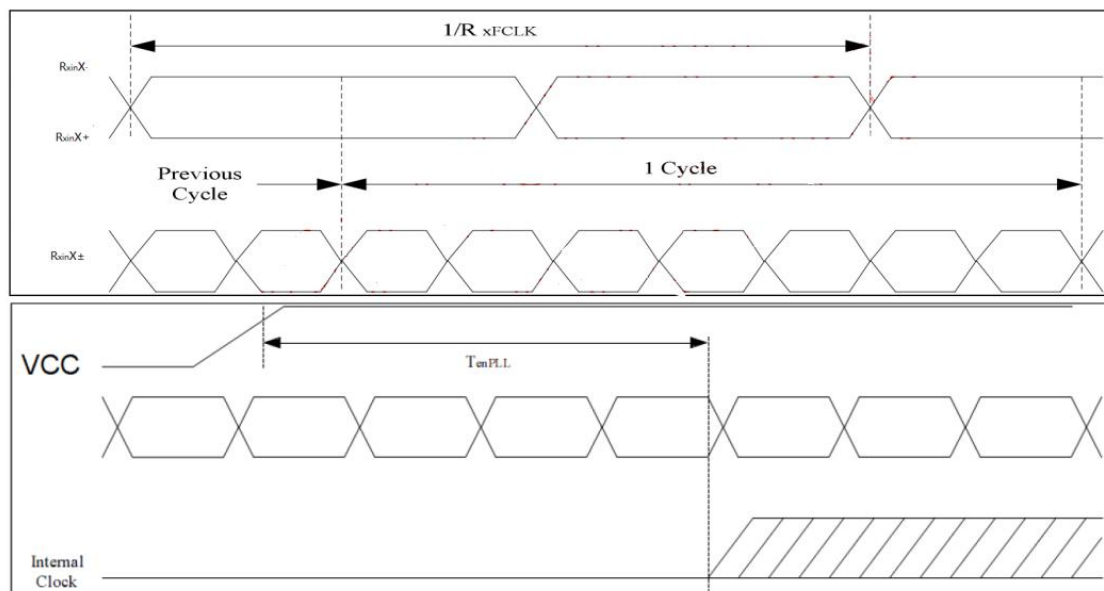
Parameter	Symbol	Min	Typ	Max	Unit	Remark
Differential input high threshold voltage	R_{XVTH}		-	100	mV	
Differential input low threshold voltage	R_{XVTL}	-100	-		mV	
Input voltage range (singled-end)	R_{XVIN}	400		1650	mV	1. $R_{XVCM} + 1/2 V_{ID} \leq 1650\text{mV}$. 2. $R_{XVCM} - 1/2 V_{ID} \geq 400\text{mV}$.
Differential input common mode voltage	R_{XVCM}	600	1200	1375	mV	
Differential input voltage	$ V_{ID} $	200	-	400	mV	

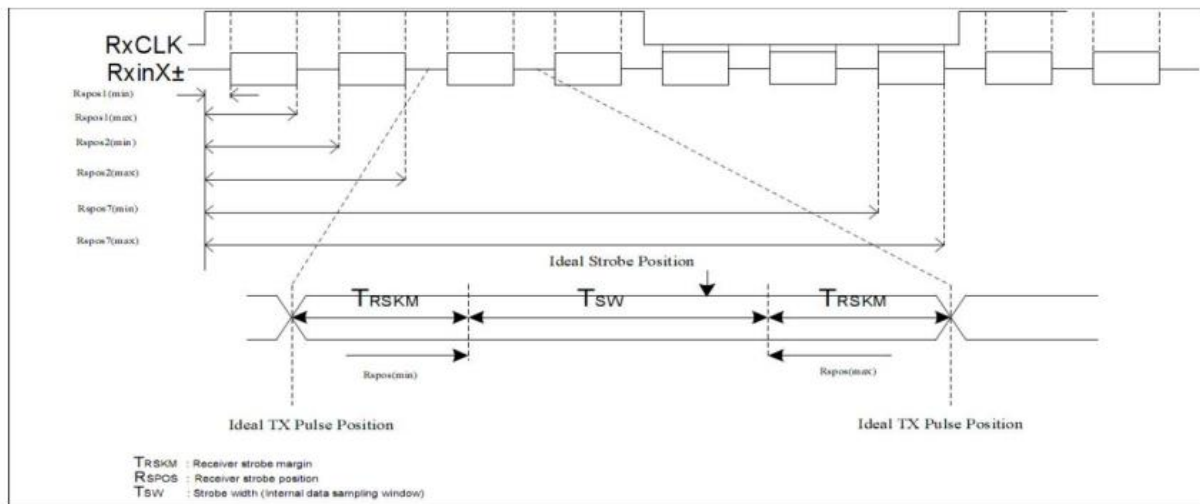


6.3 LVDS AC characteristics

VCC=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Dclk Frequency	RxFCLK	71.25	74.25	77.25	MHZ	
Input Data Skew Margin	TRSKM	-0.2	-	0.2	UI	$ V_{ID} =200\text{mV}$ $R_{XVCM}=1.2\text{V}$ $1\text{UI}=1/(R_{x\text{FCLK}}\times 7)$
Clock High Time	TLVCH	-	$4/(7 \times R_{x\text{FCLK}})$	-	ns	
Clock Low Time	TLVCL	-	$3/(7 \times R_{x\text{FCLK}})$	-	ns	
PLL wake-up time	TenPLL	-	-	150	us	
Position 1	Rspos1	-0.2	0	0.2	UI	
Position 2	Rspos2	0.8	1	1.2	UI	
Position 3	Rspos3	1.8	2	2.2	UI	
Position 4	Rspos4	2.8	3	3.2	UI	
Position 5	Rspos5	3.8	4	4.2	UI	
Position 6	Rspos6	4.8	5	5.2	UI	
Position 7	Rspos7	5.8	6	6.2	UI	





6.4 LVDS data mapping

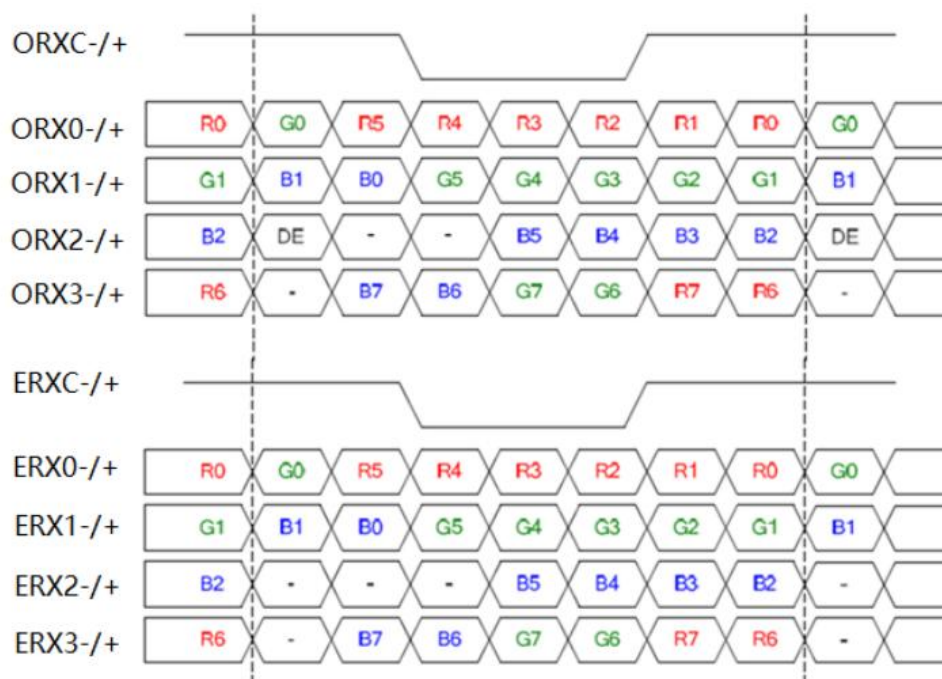
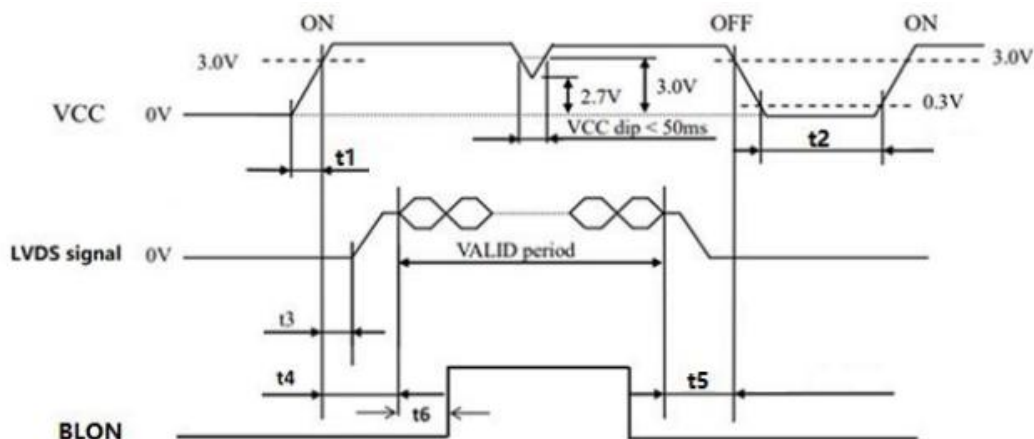


Figure 6.4.1 LVDS 8bit data mapping

6.5 Recommended Power ON/OFF Sequence

Description	Parameter	Min	Typ	Max	Unit
Rise time of VCC	t1	0.2	-	50	ms
VCC OFF to next VCC ON	t2	500	-	-	ms
VCC to LVDS signal ON	t3	0	-	-	ms
VCC to LVDS signal stable	t4	200	-	-	ms
Signal OFF to VCC OFF	t5	0	-	-	ms
LVDS signal stable to BL ON	t6	300	-	-	ms



Note:

1. The low level of these signals and analog powers are GND level.
2. 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.
3. Keep backlight turned off until the display has stabilized.
4. LED driver input signal should follow VBL→E-PWM→BLON sequence.

7. Optical Characteristics

Ta=25℃

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	CR ≥ 10	80	89	-	Degree	Note2,3
	θB		80	89	-		
	θL		80	89	-		
	θR		80	89	-		
Contrast Ratio	CR	θ=0°	1200	1500			Note 3
Response Time	T _{ON}	25℃	-	30	40	ms	Note 4
	T _{OFF}						
Chromaticity	White	x	0.265	0.315	0.365		Note 1,5
		y	0.287	0.337	0.387		
	Red	x	0.602	0.652	0.702		Note 1,5
		y	0.261	0.311	0.361		
	Green	x	0.263	0.313	0.363		Note 1,5
		y	0.556	0.606	0.656		
	Blue	x	0.111	0.161	0.211		Note 1,5
		y	0.009	0.059	0.109		
Uniformity	U		75	80	-		Note 6
NTSC	-		67	72	-	-	Note 5
Luminance	L		1300	1500	-	cd/m ²	Note 7

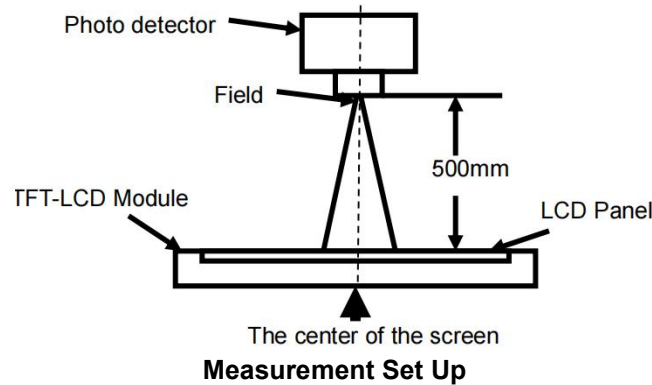
Test Conditions:

1. The ambient temperature is 25℃.
2. The test systems refer to Note1 and Note2.

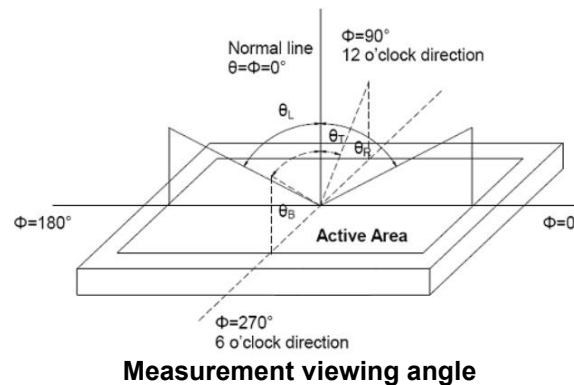
Note1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, 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 .

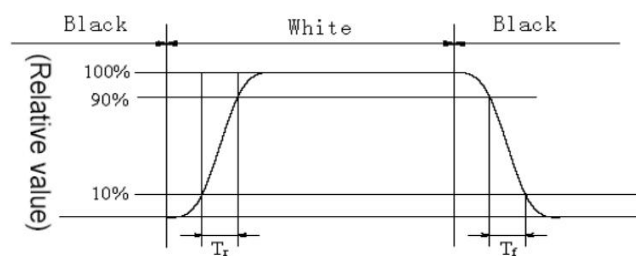


Note3: Definition of contrast ratio

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

Note4: Definition of Response time

For SFT LCM, 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%.



Note5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note6: Definition of Luminance Uniformity

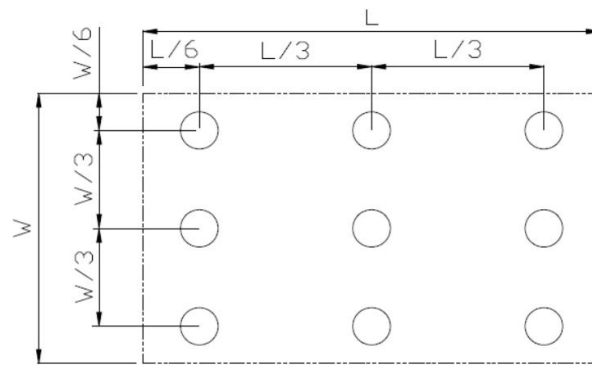
Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

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



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.

8. 液晶显示模块设计和使用须知

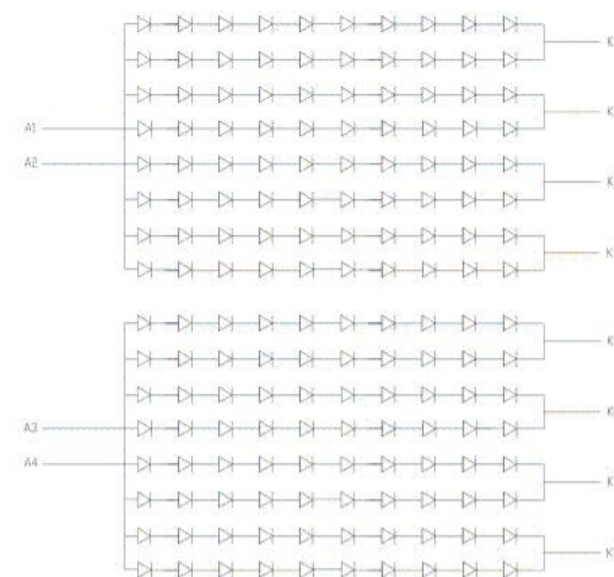
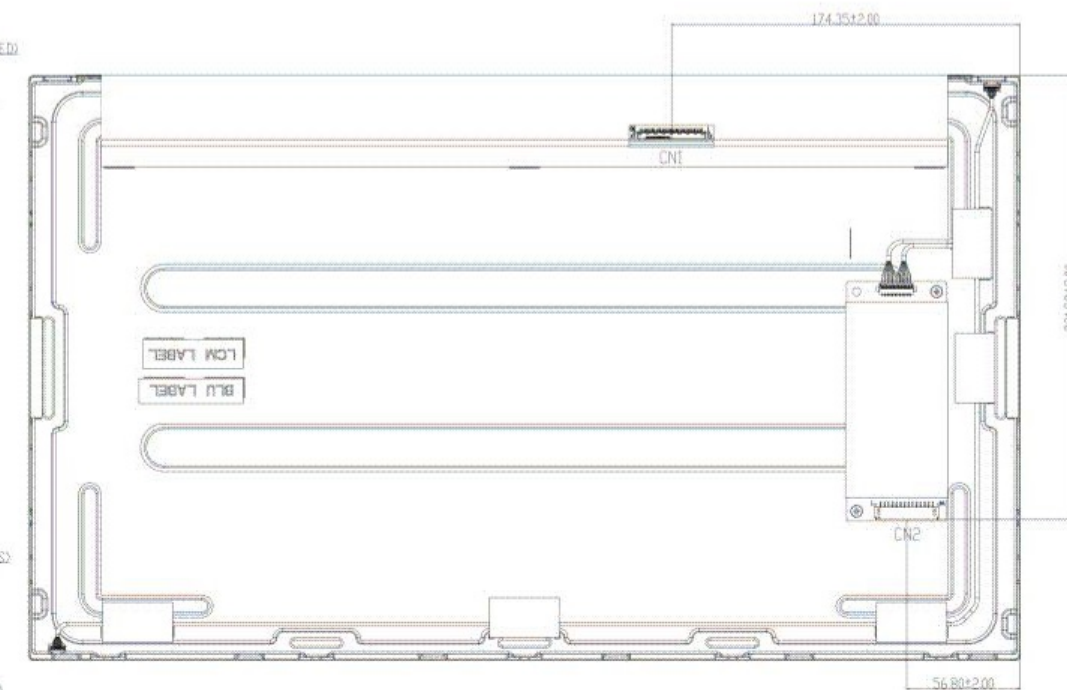
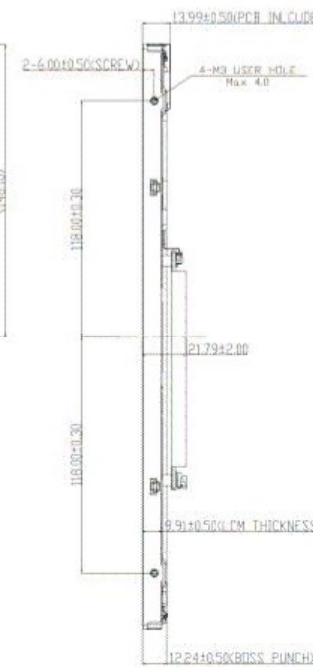
- 请注意 V0, VCOM 的设置, 以确保液晶显示模块在不同的使用温度下以及在不同的视角和位置观察模块显示, 均能达到最佳对比度, 请务必将应用电路上设置为对比度可调。
- 请注意液晶显示模块的显示品质判定是指在正常对比度下以及视窗 (V. A) 范围内进行的, 非正常对比度下液晶可能会出现非预期的显示不良, 应注意区分。
- 请勿在最大额定值以外使用液晶显示模块。
- 请勿在没有接通电源的条件下, 给液晶显示模块输送信号。(禁止热插拔)
- **警告!** 使用前需评估液晶显示模块的金属框架/壳体地(如有)与整机关系和安全性(如: 漏电安全性, 等)。
- 请尽可能缩短信号线的连接, 以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°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

- 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.
- 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.
- 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。

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.



LED 80PCS
32~33V
640mA

CN2	
PIN NO.	SYMBOL
1	VBL
2	VBL
3	VBL
4	VBL
5	VBL
6	GND
7	GND
8	GND
9	GND
10	GND
11	DET
12	BLON
13	NC
14	E-PWM

CONTROL DIMENSION			2D Rev.	00		
REFERENCE DIMENSION		()	3D Rev.	NA		
APPROVED		2026-08-06	PRODUCT NUMBER		3 rd ANGLE	
CHECKED		2026-08-06	PART NAME		UNIT	mm
			DRAWING NUMBER		SCALE	1:1
DESIGNED		2026-08-06	MATERIAL NUMBER		PAGE	1/1