



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

LMT101DNLFWD-FKD

LCD Module User Manual

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Rev.	Descriptions	Edit	Release Date
0.1	Preliminary	Chenzhonghua	2023-02-20
0.2	Revise K2 Terminal & Mounting Instructions	WangGang	2023-03-04
0.3	Update Outline Dwg	Zhangwenbo	2023-10-19
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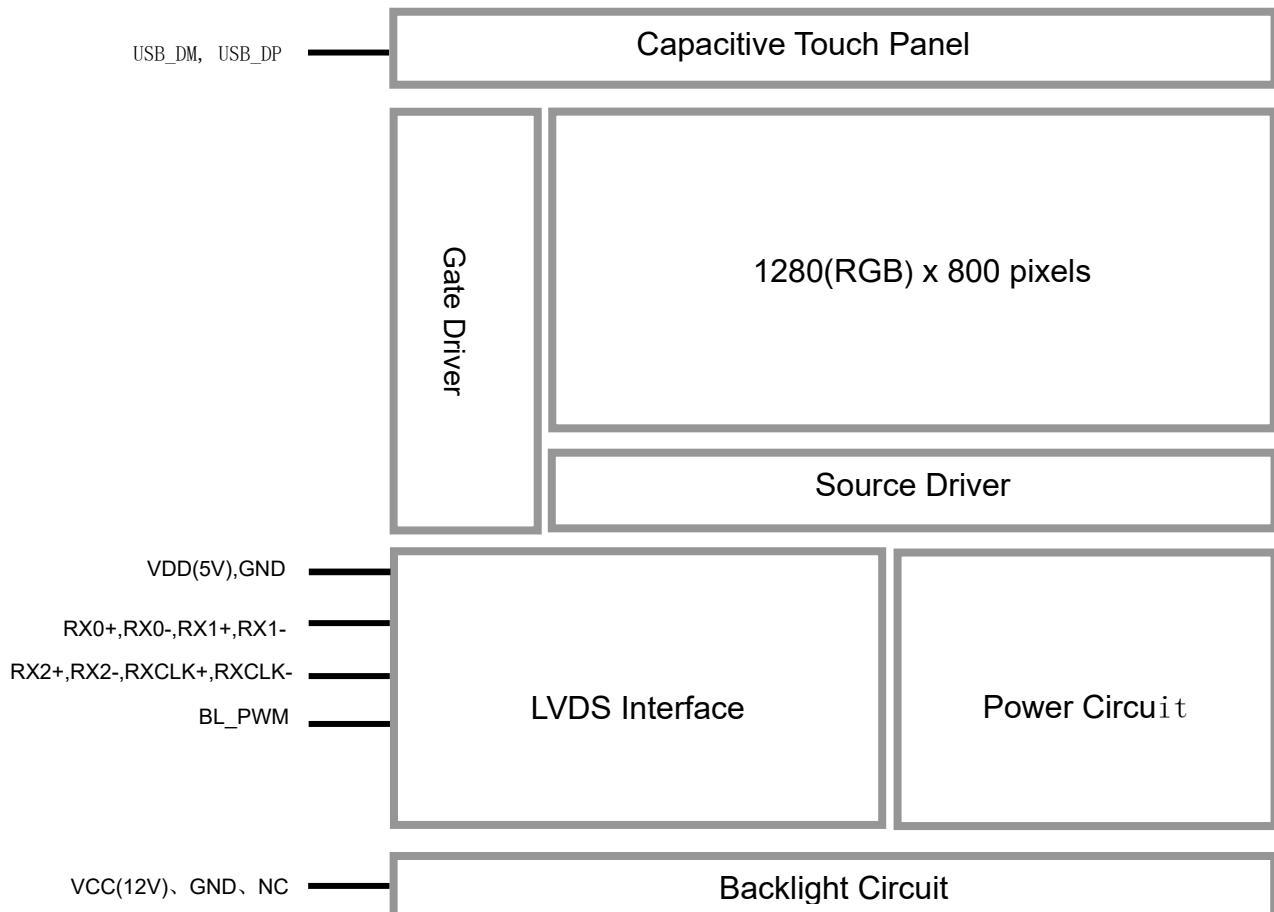
1. General Specification

Screen Size(Diagonal) :	10.1"
Active Area :	216.96 x 135.6(mm)
Number of dots :	1280(RGB) x 800
Pixel Pitch:	0.1695x0.1695(mm)
Color Depth:	262k colors
Display Technology :	a-Si TFT active matrix
Signal Interface:	LVDS (18 bits)
Display Mode:	Normal Black, Transmissive
Outline Dimension:	308.0x 228.0 x 45.8(mm) (see outline drawing for details)
Pixel Configuration:	R.G.B. Vertical Stripe
Viewing Direction :	Full
Touch Panel Type:	Capacitive Touch Panel
Touch Interface:	USB
Backlight :	White LEDs
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C
Highlight :	IK08 (Cover Lens) IPX5 (Front Cover Lens after installation)

Note:

*1. Color tone may slightly change by temperature and driving condition.

2. Block Diagram



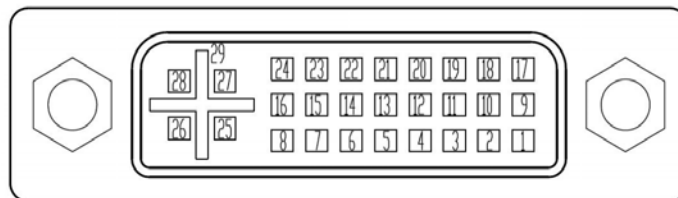
3. Terminal Function

3.1 K1 Terminal (DVI FEMALE (24+5))

Pin No.	Pin Name	IO	Descriptions
1	RX2-	Input	LVDS receiver negative signal channel 2
2	RX2+	Input	LVDS receiver positive signal channel 2
3	GND	Power	Ground(0V)
4	BL_PWM	Input	Backlight dimming control (Active High)
5	NC	-	No connection
6	5V	Power	Positive power supply(5.0V)
7	5V	Power	Positive power supply(5.0V)
8	5V	Power	Positive power supply(5.0V)
9	RX1-	Input	LVDS receiver negative signal channel 1
10	RX1+	Input	LVDS receiver positive signal channel 1
11	GND	Power	Ground(0V)
12	NC	-	No connection
13	NC	-	No connection
14	5V	Power	Positive power supply(5.0V)
15	GND	Power	Ground(0V)
16	GND	Power	Ground(0V)
17	RX0-	Input	LVDS receiver negative signal channel 0
18	RX0+	Input	LVDS receiver positive signal channel 0
19	GND	Power	Ground(0V)
20	USB_DM	I/O	USB D- signal for CTP
21	USB_DP	I/O	USB D+ signal for CTP
22	GND	Power	Ground(0V)
23	RXCLK+	Input	LVDS receiver positive signal clock
24	RXCLK-	Input	LVDS receiver negative signal clock
25	5V	Power	Positive power supply(5.0V)
26	5V	Power	Positive power supply(5.0V)
27	NC	-	No connection
28	NC	-	No connection
29	GND	Power	Ground(0V)
--	SHELL	--	Case ground

Note:

The PWM duty cycle will adjust the brightness of the display accordingly through "automatic control "Display brightness "function (refer to chapter 6.1), internal pull up at 10K



3.2 K2 Terminal (3Pin P5.08 Phoenix Or Equivalent)

Pin No.	Pin Name	I/O	Descriptions
1	VCC	Power	Backlight Positive power supply(12V)
2	GND	Power	Ground(0V)
3	PE	Power	Protecting Earthing

4. Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Power Supply voltage	VDD	-0.3	5.5	V	
Power Supply voltage	VCC	-0.3	12.5	V	
Operating Temperature	T _{OP}	-20	70	°C	No Condensation
Storage Temperature	T _{ST}	-30	80	°C	No Condensation
Relative humidity	HR	5%	95%		No Condensation

Note:

- *1. This rating applies to all parts of the module. And should not be exceeded.
- *2. The operating temperature only guarantees operation of the circuit. The contrast, response speed, and the other specification related to electro-optical display quality is determined at the room temperature, T_{OP}=25°C
- *3. 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

VDD=5.0V, GND=0V, T_{op}=25°C

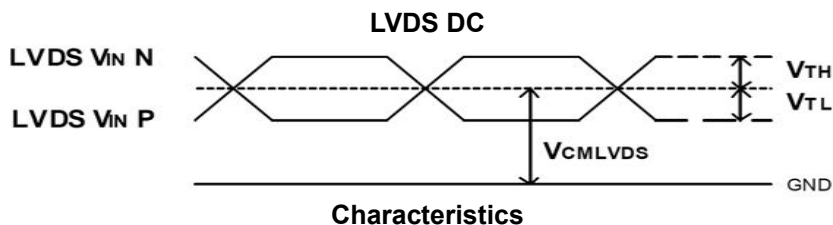
Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage	VDD	4.7	5.0	5.3	V	
VDD Power Consumption	I _{VDD}	--	250	--	mA	*1
Supply Voltage	VCC	11.5	12.0	12.5	V	
VCC Power Consumption	I _{VCC}	--	550	-	mA	
Backlight Life	-		50000		Hrs	
VLED_PWM frequency	F _{PWM}	200	-	10K	HZ	
VLED_PWM duty	D	0.2	-	100	%	

Note*1: Backlight brightness is 100%.

5.2 DC Characteristics (LVDS)

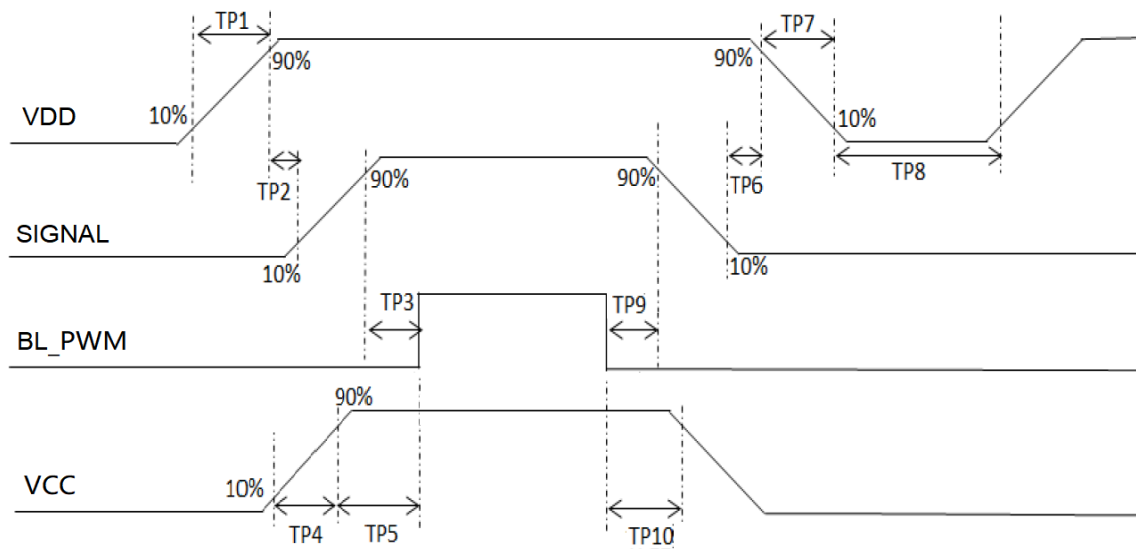
VDD=5.0V, GND=0V, T_{op}=25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Differential Input High Threshold	V _{TH}	-	-	100	mV	
Differential Input Low Threshold	V _{TL}	-100	-	-	mV	
Input Current	I _{IN}	-	-	100	mA	
Differential Input common Mode voltage	V _{CMLVDS}	-	1.2	-	V	



5.3 Power on/off Sequence

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
VDD on to VDD stable	TP1	0	-	1.6	ms	
VDD stable to signal on	TP2	10	-	50	ms	
Signal on to BL_PWM on	TP3	200	-	-	ms	
VCC on to VCC stable	TP4	0.5	-	10	ms	
VCC to PWM on	TP5	10	-	-	ms	
Signal off before VDD off	TP6	1	-	-	ms	
VDD off time	TP7	1	-	5	ms	
VDD off to next VDD on	TP8	500	-	-	ms	
BL_PWM off before signal off	TP9	200	-	-	ms	
BL_PWM off before VCC off	TP10	10	-	-	ms	



Interface Power On/Off Sequence

6. AC Characteristics

6.1 AC Characteristics(LVDS)

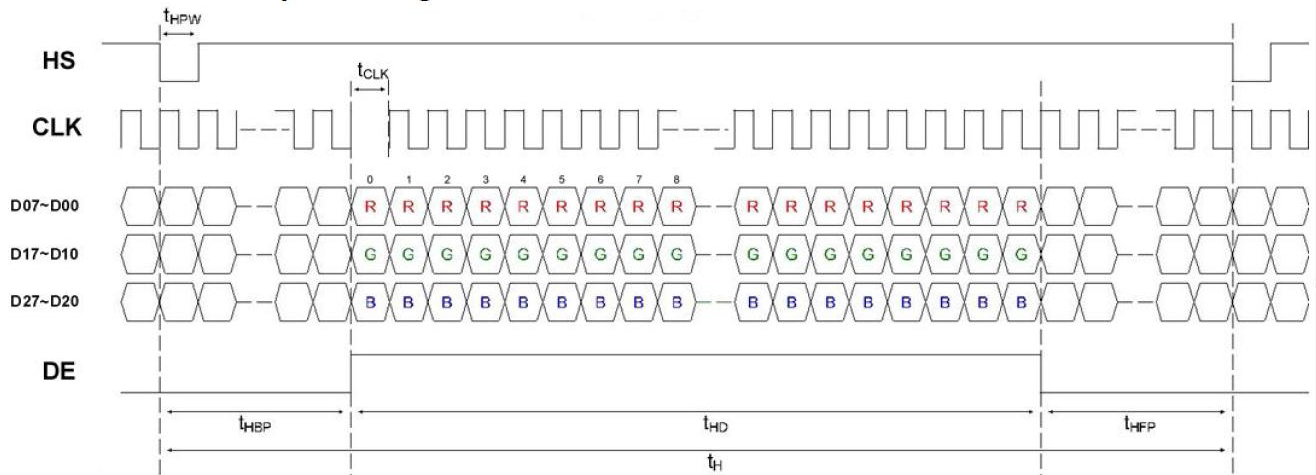
VDD=5.0V, GND=0V, T_{op}=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remark
CLK frequency	1/tclk	62.6	68.2	78.1	MHz	
Horizontal blanking time	tHBT	20	69	164	tclk	thbp + tHFP
Horizontal back porch	tHBP	-	5	164- tHFP	tclk	
Horizontal display area	tHD	-	1280	-	tclk	
Horizontal front porch	tHFP	15	64	159	tclk	
Horizontal period	tH	1300	1349	1444	tclk	
Horizontal pulse width	tHPW	-	1	256	tclk	
Vertical blanking time	tVBT	5	42	101	tH	tVBP + tVFP
Vertical back porch	tVBP	-	2	101- tVFP	tH	
Vertical display area	tVD	-	800	-	tH	
Vertical front porch	tVFP	3	40	99	tH	
Vertical period	tV	803	842	901	tH	
Vertical pulse width	tVPW	-	1	128	tH	
Frame Rate	F	-	60	-	HZ	

Table 6.1 timing parameter

6.2 Input Clock and Data timing Diagram:

Horizontal input timing



Vertical input timing

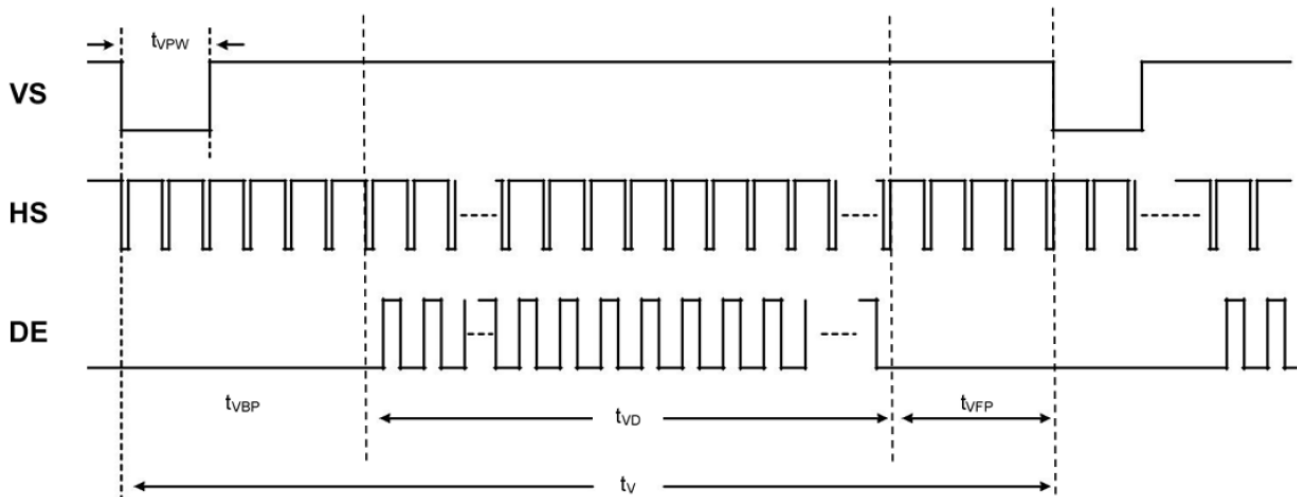
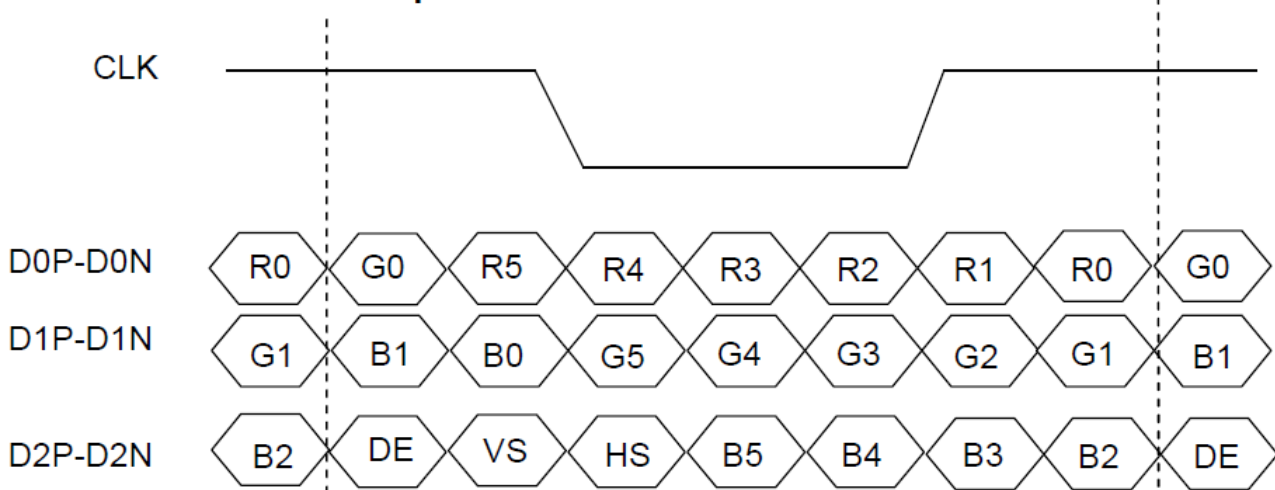


Figure 6.2 Input signal data timing

6.3 LVDS data input format

6-bit mode data input



7. Optical Characteristics

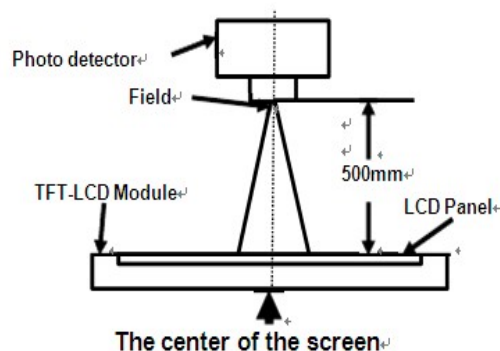
Item		Symbol	Condi	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥ 10	75	85	-	Degree	Note 2
		θB		75	85	-		
		θL		75	85	-		
		θR		75	85	-		
Contrast Ratio		CR	θ=0°	600	800	-	-	Note1 Note3
Response Time		TON+TOFF	25℃	-	25	40	ms	Note1 Note4
Chromaticity	White	x	Backlight is on	0.252	0.302	0.352	-	Note5 Note1
		y		0.277	0.327	0.377		
	Red	x		0.532	0.582	0.632		
		y		0.274	0.324	0.374		
	Green	x		0.300	0.350	0.400		
		y		0.532	0.582	0.632		
	Blue	x		0.104	0.154	0.204		
		y		0.044	0.094	0.144		
Uniformity		U	-	75	80	-	%	Note1 Note6
NTSC		-	-	45	50	-	%	Note 5
Luminance		L	-	700	850	-	cd/m²	Note1 Note7

Test Conditions:

1. The ambient temperature is $25 \pm 2^\circ\text{C}$. humidity is $65 \pm 7\%$
2. The test systems refer to Note 1 and Note 2.

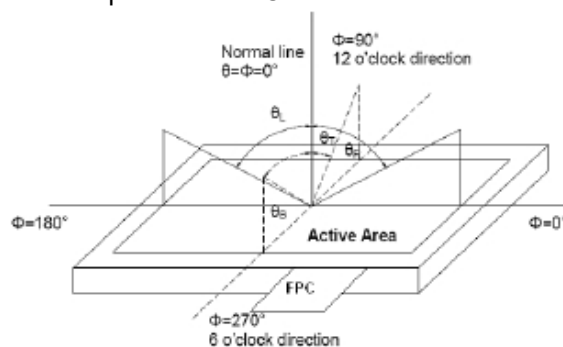
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD.



Note 3: Definition of contrast ratio

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

"White state": The state is that the LCD should driven by V_{white} .

"Black state": The state is that the LCD should driven by V_{black} .

V_{white} : To be determined

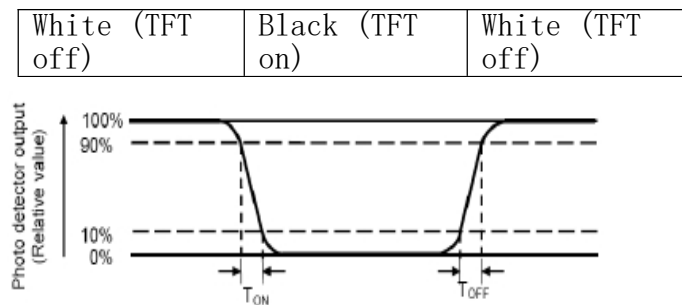
V_{black} : To be determined.

Note 4: 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_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time

(T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

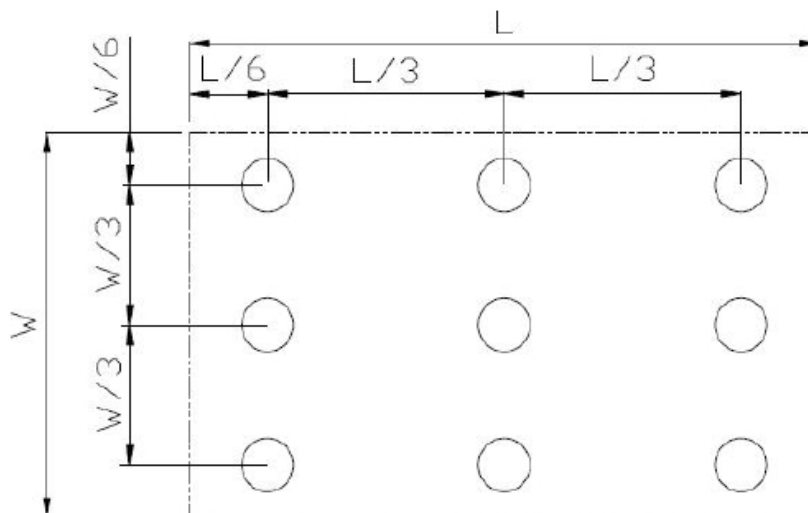
Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

L -----Active area length

W ----- Active area width

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



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

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

Note 7: 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°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.

8. 液晶显示模块设计和使用须知

- 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。(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, 导致显示不均等不良现象发生。
- 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。

- 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.

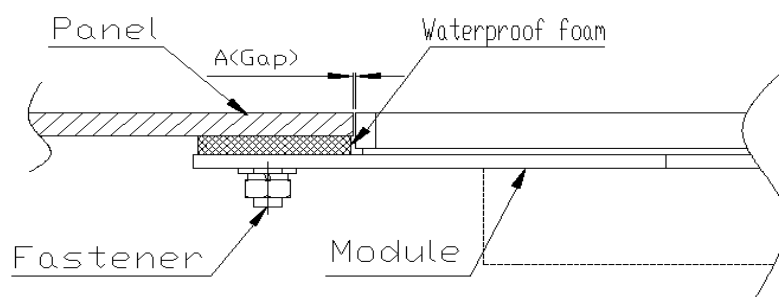
- 请勿挤压液晶显示屏表面，这将导致显示颜色的异常。
- 液晶屏由玻璃制作而成，任何机械碰撞(如从高处跌落)均有可能损坏液晶显示模块。
- 液晶屏表面带有保护膜，揭除保护膜时需要注意可能产生的静电。
- 因液晶显示屏表面的偏光片极易划伤，安装完成之前请尽量不要揭下保护膜。
- 请缓慢揭除保护膜，在此过程中液晶显示屏上可能会产生静电，此为正常情况，可在短时间内消失。
- 请注意避免被液晶显示屏的边缘割伤。
- 请不要试图拆卸或改造液晶显示模块。
- 当液晶显示屏出现破裂，内部液晶液体可能流出；相关液体不可吞吃，绝对不可接触嘴巴，如接触到皮肤或衣服，请使用肥皂与清水彻底清洗。

9. Bezel Panel Assemble Design Precaution

- Application panel opening: The suggested assemble gap(A) should be about 0.8~1.2mm on each side.
- Install the TFT module on strong flat surface for securing water and sealing.
- Fix the TFT module with washers, spring-washers and nuts.
- Be aware over tightened the TFT module which may deform the structure and not good for securing water and sealing.
- Suggested installation torque on the fixing : (7.0~10.0kgf.cm, the sealing will be compressed to about 4mm)

9. 面板安装设计注意事项

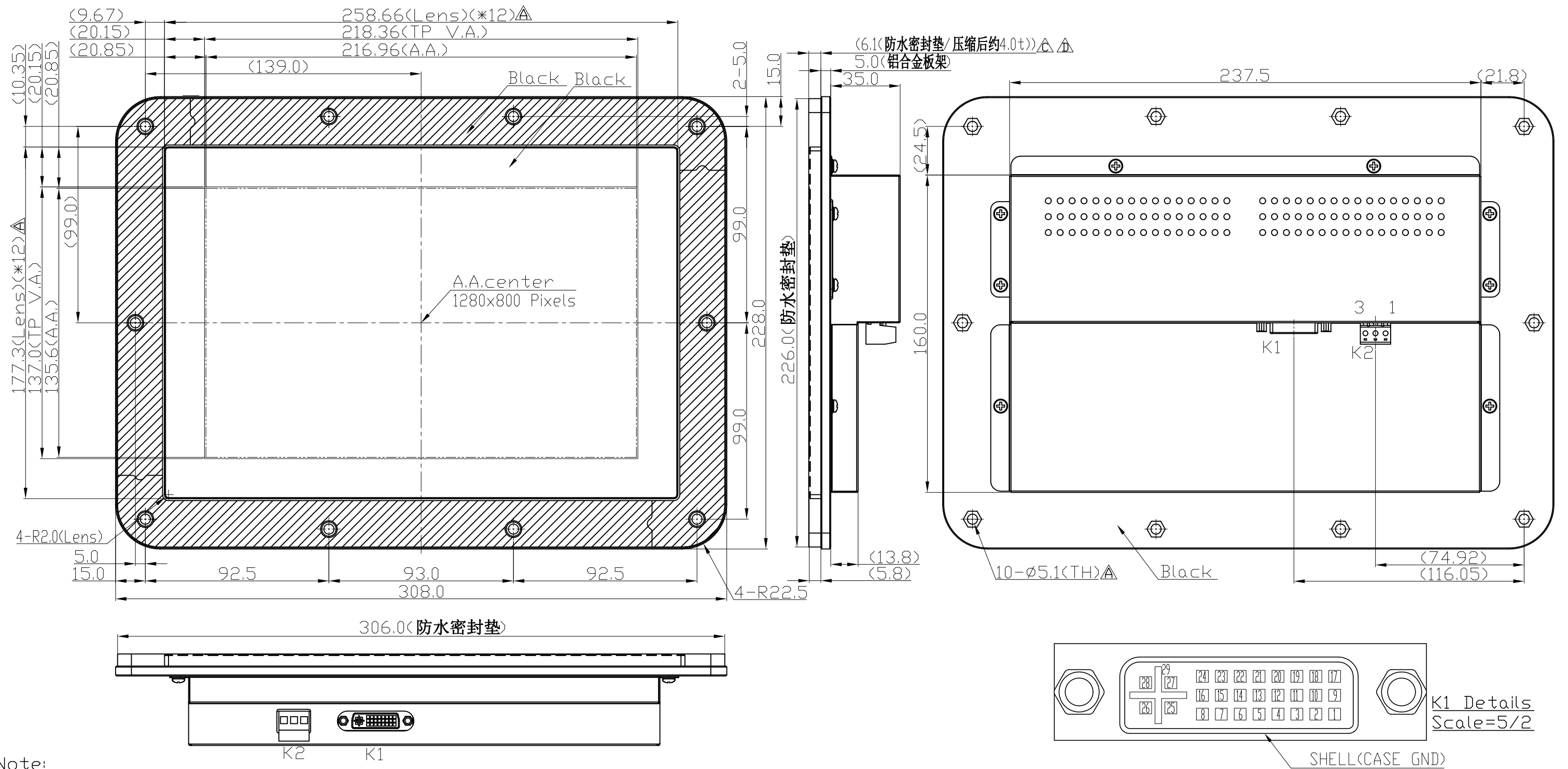
- 应用面板开窗尺寸：建议每边安装间隙(A) 约为 0.8~1.2mm
- 面板开窗部分要有足够的刚度和良好的平整度，以利安装及密封防水。
- 采用常规紧固方式平垫圈、弹性垫圈和螺母，以保证正常安装锁紧。
- 在确保防水密封的同时，应防止模组铝板产生较大变形，因此在紧固螺母时应施加适当的锁紧力。
- 建议客户安装模块时拧螺母的扭矩范围：
(7.0~9.0kgf.cm，防水密封垫厚度压缩至 4mm)。



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 party, 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.



Note:

- *1. LCD Display Type: TFT, Transmissive (Full view)
- *2. Pixel Arrangement: RGB-STRIP
- *3. Color Depth: 262k Colors
- *4. Interface: LVDS 18bit
- *5. Terminal:
 - K1: DVI Connector (F)
 - K2: 3Pin P5.08 Phoenix Or Equivalent
- *6. Operating Voltage: 5.0V
- *7. Backlight: White LEDs
- *8. Backlight Supply: 12.0V
- *9. Touch Panel Type: Capacitive Touch Panel
- *10. Operating Temperature: -20°C~70°C
- *11. Storage Temperature: -30°C~80°C
- *12. Applicable Assemble Opening (Min)
- *13. Waterproof: IPX5 (Cover Lens)
- *14. Impact: IK08 (Cover Lens)
- *15. Unmarked Tolerance: $\leq 150, \pm 0.3$; $> 150, \pm 0.5$

K2 Terminal	
No	Pin Name
1	VCC(12V)
2	GND
3	PE

K1 Terminal			
No	Pin Name	No	Pin Name
1	RX2-	16	GND
2	RX2+	17	RX0-
3	GND	18	RX0+
4	BL_PWM	19	GND
5	NC	20	USB_DM
6	5V	21	USB_DP
7	5V	22	GND
8	5V	23	RXCLK+
9	RX1-	24	RXCLK-
10	RX1+	25	5V
11	GND	26	5V
12	NC	27	NC
13	NC	28	NC
14	5V	29	GND
15	GND		

E	Add Impact level	WangGang
D	Revise foam thickness & shape	Zhangwenbo
C	Revise K2 Terminal & foam thickness	WangGang
B	Refine foam shape	WangGang
A	Revise fixing TH, Refine Outline	WangGang
Rev	Note	Date
Dwg	Title	
LMT101DNLFWDF-KD Outline Dwg		
Dwg No.	MK-007967e-1-1	Date
Scale	1/2	2023-01-12
Tol.		
Unit	mm	
Paper Size	A3	
Approved	Checked	Drawn
		WangGang

TOPWAY