



# LMT070DICFWD-AKE-1

## LCD Module User Manual

Prepared by:  YU  Date: 2019-07-16	Checked by:    Date:	Approved by:    Date:
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Rev.	Descriptions	Release Date
0.1	Preliminary	2019-07-16
0.2	Revise indicator definition	2019-09-26
0.3	Add installation design considerations	2019-10-18

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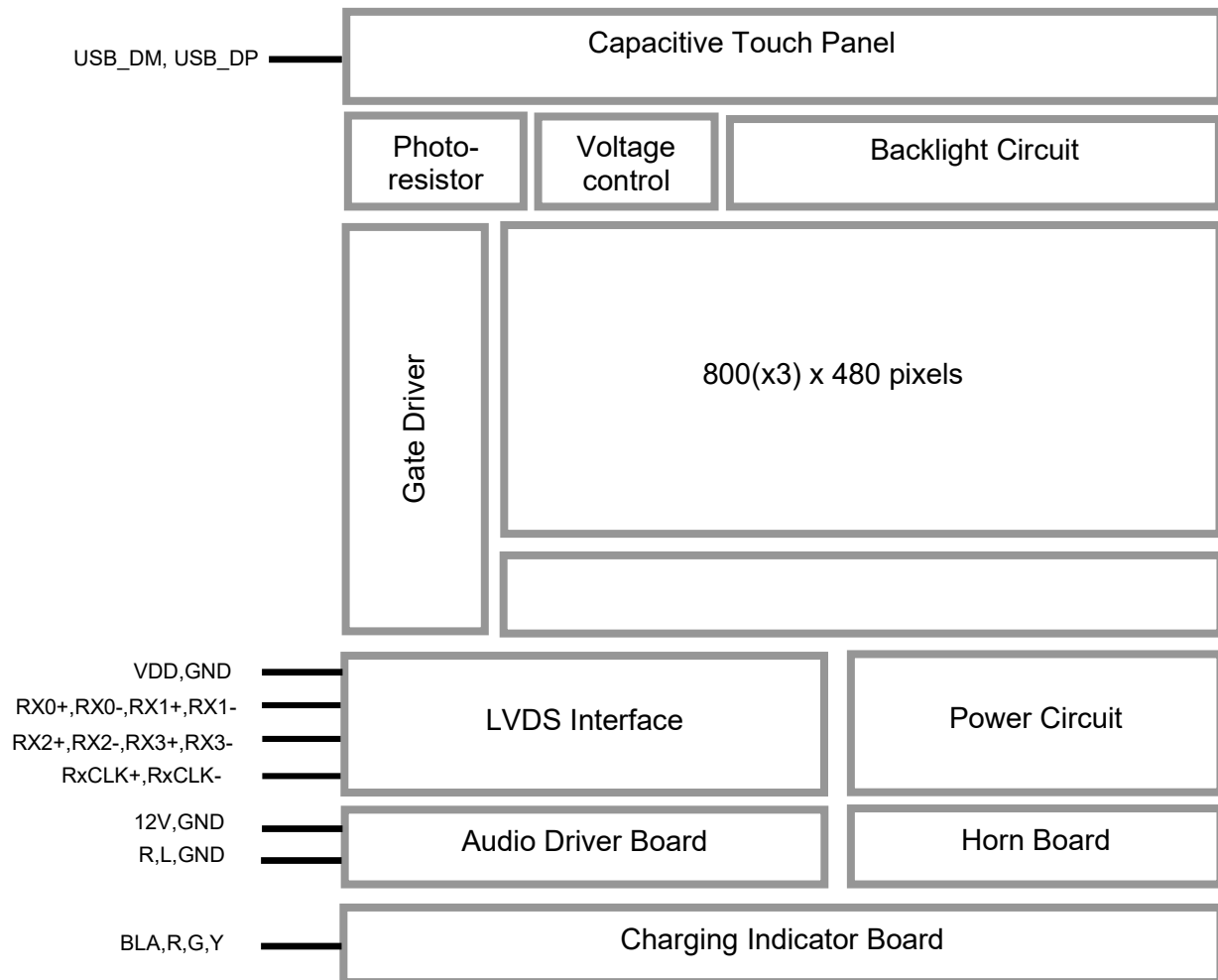
## 1. General Specification

Signal Interface :	LVDS (JEIDA 24 bits)
Display Mode :	Transmissive with Normally White
Screen Size :	7.0 inch
Outline Dimension :	340.0 x 400.0 x 33.0(mm) (see outline drawing for details)
Active Area :	154.80x 85.90(mm)
Number of dots :	800x 3 (RGB) x 480
Dot Pitch :	0.1926x 0.179(mm)
Pixel Configuration :	R.G.B. Vertical Stripe
Touch Panel Type :	Capacitive Touch Panel
Backlight :	White LED
Viewing Direction :	6 o'clock (Gray scale Inversion ) (*1) 12 o'clock (*2)
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-40 ~ +85°C

Note:

- \*1. For saturated color display content (eg. pure-red, pure-green, pure-blue or pure-colors -combinations).
- \*2. For “color scales” display content.
- \*3. Color tone may slightly change by temperature and driving condition.

## 2. Block Diagram



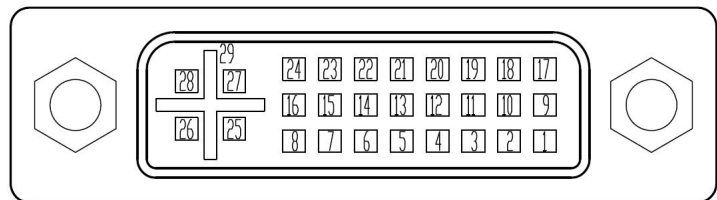
### 3. Terminal Function

#### 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
4	BL_PWM	Input	Backlight dimming control
5	NC	-	No connection
6	VDD	Power	Positive power supply(5.0V)
7	VDD	Power	Positive power supply(5.0V)
8	VDD	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
12	RX3-	Input	LVDS receiver negative signal channel 3
13	RX3+	Input	LVDS receiver positive signal channel 3
14	VDD	Power	Positive power supply(5.0V)
15	GND	Power	Ground
16	GND	Power	Ground
17	RX0-	Input	LVDS receiver negative signal channel 0
18	RX0+	Input	LVDS receiver positive signal channel 0
19	GND	Power	Ground
20	USB_DM	I/O	USB D- signal
21	USB_DP	I/O	USB D+ signal
22	GND	Power	Ground
23	RXCLK+	Input	LVDS receiver positive signal clock
24	RXCLK-	Input	LVDS receiver negative signal clock
25	VDD	Power	Positive power supply(5.0V)
26	VDD	Power	Positive power supply(5.0V)
27	NC	-	No connection
28	NC	-	No connection
29	GND	Power	Ground
--	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)



#### 3.2 K2/K3 Terminal (Charging Indicator Interface (xh-2.54-4F or equivalent))

Pin No.	Pin Name	I/O	Descriptions
1	BLA	Power	LED Positive
2	LED-YELLOW	Power	LED-YELLOW Negative
3	LED-RED	Power	LED-RED Negative
4	LED-GREEN	Power	LED-GREEN Negative

**3.3 K5 Terminal (Power Interface of Audio Drive Board(3.81 terminal))**

Pin No.	Pin Name	I/O	Descriptions
1	12V	Power	Power Supply of Audio Drive Board,12V
2	GND	Power	Power Supply of Audio Drive Board,GND

**3.4 The signal interface of the audio drive board is a 3.5mm headphone jack, with left channel input**

**4. Absolute Maximum Ratings**

Items	Symbol	Min.	Max.	Unit	Condition
Power Supply voltage	VDD	-0.3	5.5	V	
Operating Temperature	T <sub>OP</sub>	-20	70	°C	No Condensation
Storage Temperature	T <sub>ST</sub>	-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<sub>OP</sub>=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<sub>op</sub>=25°C

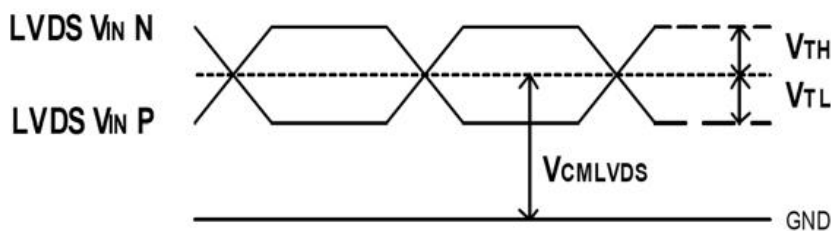
Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Supply Voltage	VDD	4.7	5.0	5.3	V	
VDD Power Consumption	I <sub>dd</sub>	--	0.5	--	A	*1
Backlight Life			50000		Hrs	

Note\*1: Backlight brightness is 100%.

**5.1 DC Characteristics (LVDS)**

VDD=5.0V, GND=0V, T<sub>op</sub>=25°C

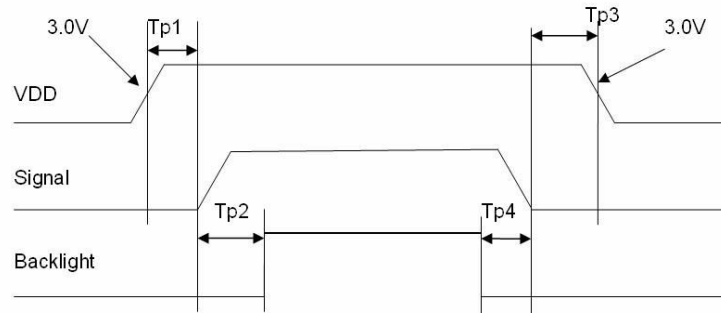
Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Differential Input High Threshold	V <sub>TH</sub>	-	-	100	mV	
Differential Input Low Threshold	V <sub>TL</sub>	-100	-	-	mV	
Input Current	I <sub>IN</sub>			± 10	uA	
Differential Input common Mode voltage	V <sub>CMLVDS</sub>	1.65	-	2.1	V	



**LVDS DC Characteristics**

**5.2 POWER ON/OFF SEQUENCE**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
VDD 3.0V to signal starting	Tp1	0	-	50	ms	
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VDD 3.0V	Tp3	0	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	

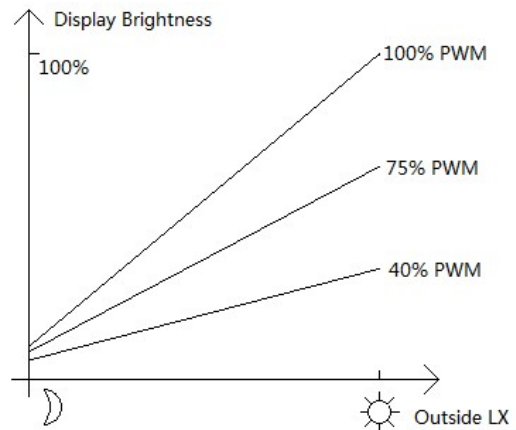


**Interface Power On/Off Sequence**

**6. Function introduction**

**6.1 Automatic Control of Display Brightness**

The module is equipped with a photosensitive circuit which can automatically control the brightness. When the ambient lighting becomes low, the brightness decreases (e.g. at night); Automatic adjustment of light brightness based on PWM adjustment.



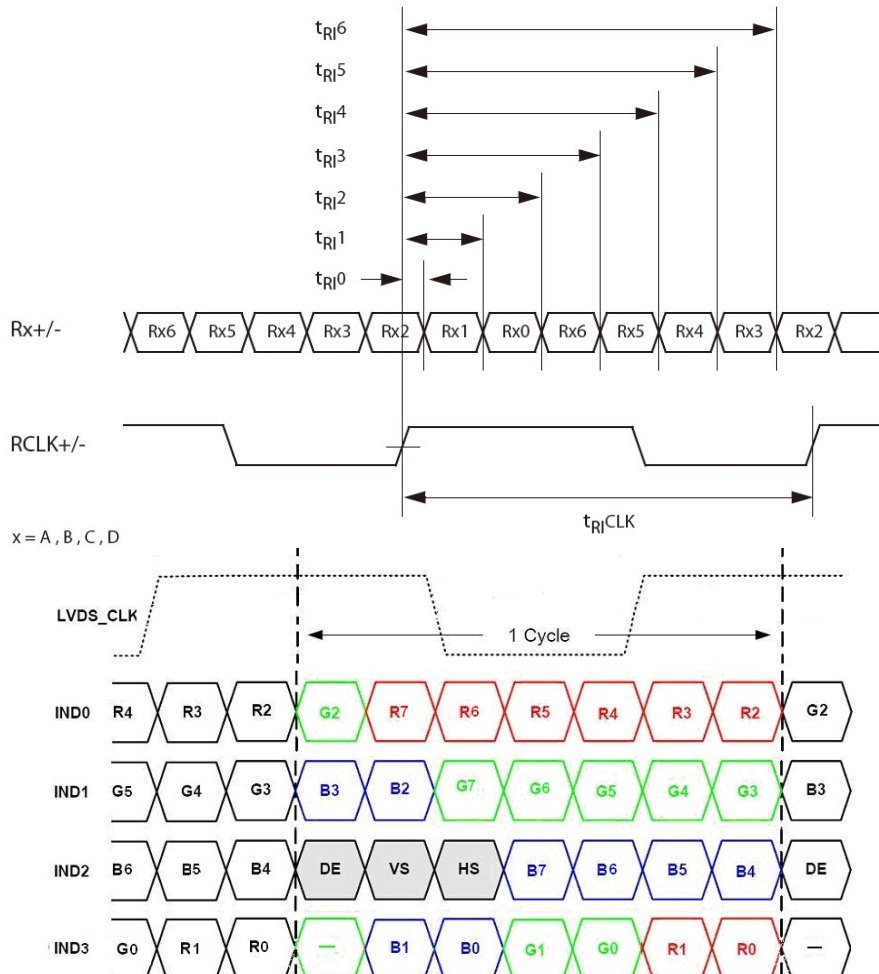
## 7. AC Characteristics

### 7.1 AC Characteristics(LVDS)

VDD=5.0V, GND=0V, Top=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Input CLK period	t <sub>RI</sub> CLK	8.9	-	50	ns	
Input Data Position 0 ( t <sub>RI</sub> CLK = 8.9ns )	t <sub>RI</sub> 0	-0.3	-	+0.3	ns	
Input Data Position 1 (t <sub>RI</sub> CLK = 8.9ns )	t <sub>RI</sub> 1	t <sub>RI</sub> CLK/7-0.3	t <sub>RI</sub> CLK/7	t <sub>RI</sub> CLK/7+0.3	ns	
Input Data Position 2 (t <sub>RI</sub> CLK = 8.9ns )	t <sub>RI</sub> 2	2t <sub>RI</sub> CLK/7-0.3	2t <sub>RI</sub> CLK/7	2t <sub>RI</sub> CLK/7+0.3	ns	
Input Data Position 3 (t <sub>RI</sub> CLK = 8.9ns )	t <sub>RI</sub> 3	3t <sub>RI</sub> CLK/7-0.3	3t <sub>RI</sub> CLK/7	3t <sub>RI</sub> CLK/7+0.3	ns	
Input Data Position 4 (t <sub>RI</sub> CLK = 8.9ns )	t <sub>RI</sub> 4	4t <sub>RI</sub> CLK/7-0.3	4t <sub>RI</sub> CLK/7	4t <sub>RI</sub> CLK/7+0.3	ns	
Input Data Position 5 (t <sub>RI</sub> CLK = 8.9ns )	t <sub>RI</sub> 5	5t <sub>RI</sub> CLK/7-0.3	5t <sub>RI</sub> CLK/7	5t <sub>RI</sub> CLK/7+0.3	ns	
Input Data Position 6 (t <sub>RI</sub> CLK = 8.9ns )	t <sub>RI</sub> 6	6t <sub>RI</sub> CLK/7-0.3	6t <sub>RI</sub> CLK/7	6t <sub>RI</sub> CLK/7+0.3	ns	

Input Clock and Data timing Diagram:



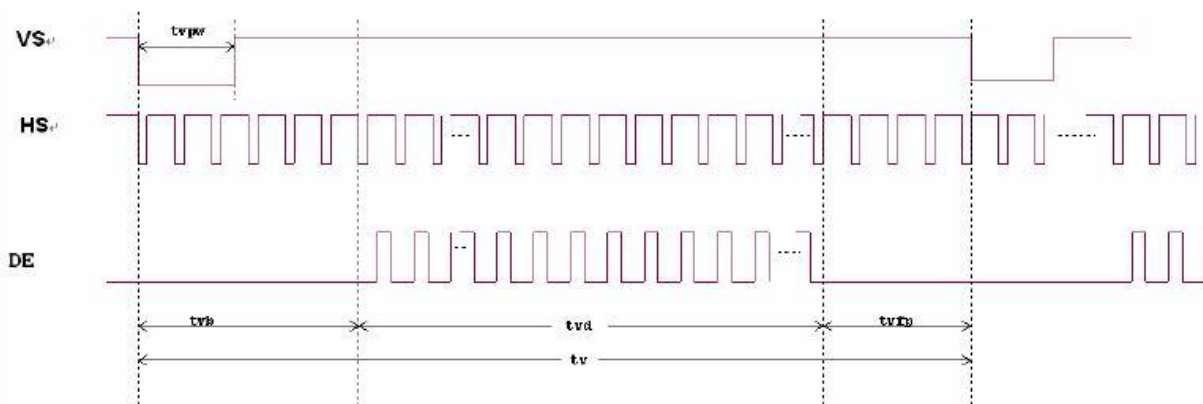
7.2 AC Characteristics(TFT)

Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	MIN.	TYP.	MAX.	Unit	Remark
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	



Horizontal input timing diagram



Vertical input timing diagram



### 8. Optical Characteristics

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Note
Viewing angle (CR≥10)	$\theta_L$	9 o'clock	60	70	-	度数	*2
	$\theta_R$	3 o'clock	60	70	-		
	$\theta_T$	12 o'clock	50	60	-		
	$\theta_B$	6 o'clock	60	70	-		
Response Time	$T_f$	Normal $\theta=0^\circ$	-	10	20	msec	*3
	$T_r$		-	15	30	msec	
Contrast ratio	CR		400	500	-	-	*1
Luminance	L		-	900	-	cd/m <sup>2</sup>	*4
Luminance uniformity	Y <sub>U</sub>		70	75	-	%	*4

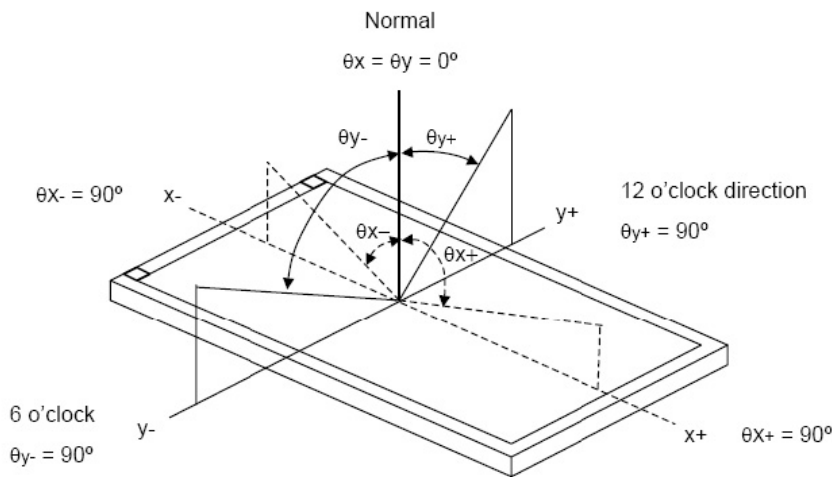
Note:

\*1 Definition of Contrast Ratio

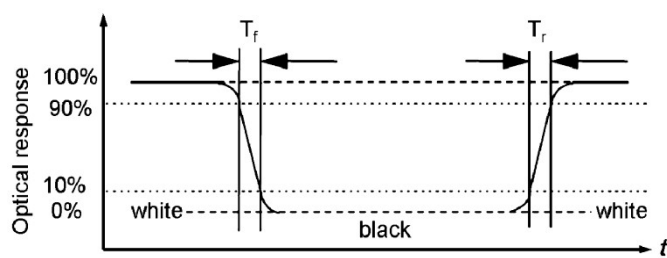
The contrast ratio could be calculate by the following expression:

Contrast Ratio (CR) = Luminanc with all pixels white / Luminance with all pixels black

\*2 Definition of Viewing Angle



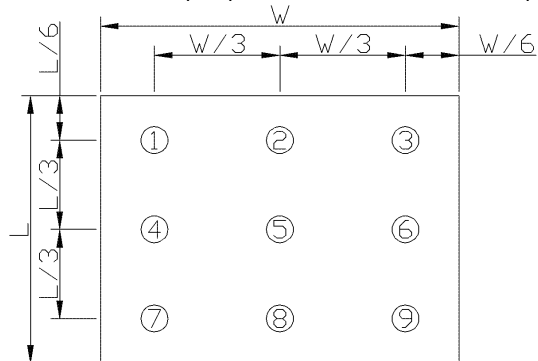
\*3 Definition of response time



\*4 Definition of Luminance Uniformity

Luminance uniformity (Lu)=

Min. Luminance form pt1~pt9 / Max Luminance form Pt1~pt9



## 9. LCD Module Design and Handling Precaution

- 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 com 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.
- LCD panel is made with glass. Any mechanical shock (e.g. dropping from high place) will damage the LCD module.

## 9.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。
- 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
- 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。

- 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。

### 10. Product Mounting Precaution

- Use flange type panel for installation ( Figure 1 )
- It is recommended that the installation panel of the customer's equipment be designed as follows:  
Panel window size:  $W * H \geq 303 * 363$ mm  
M5 screw column is used for the panel
- If the panel accuracy is difficult to guarantee, M4 screw column can be selected.
- See Figure 2 for specific installation panel size.

### 10.产品安装注意事项

- 10.1 采用法兰式面板安装（图 1）
- 建议客户设备安装面板按如下要求设计：  
面板开窗尺寸： $W * H \geq 303 * 363$ mm。  
面板采用种立 M5 螺丝柱。  
若面板精度难以保证时，可选用 M4 螺丝柱。
- 具体安装面板尺寸如图 2。

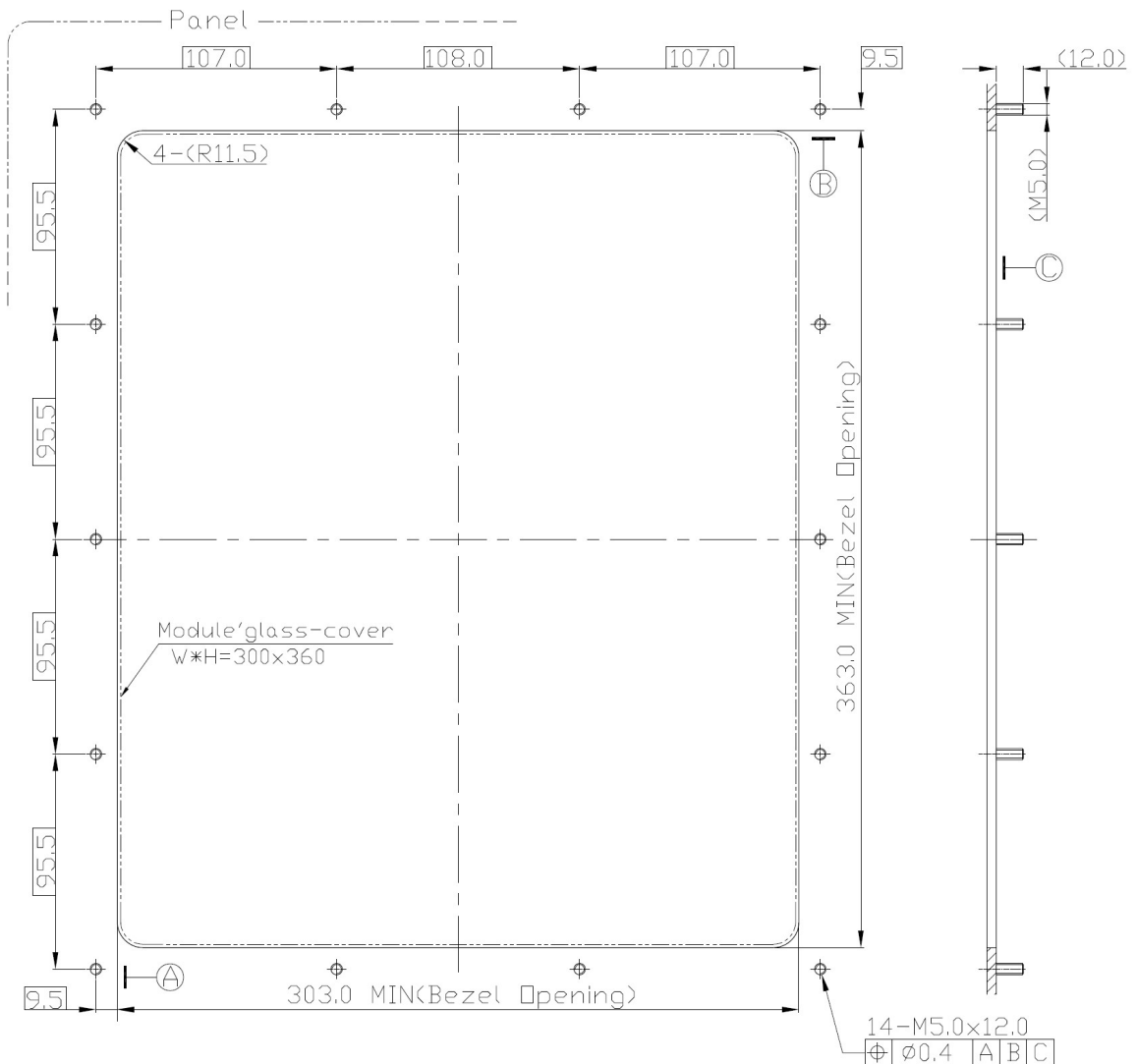
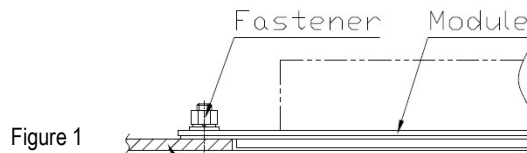


Figure 2

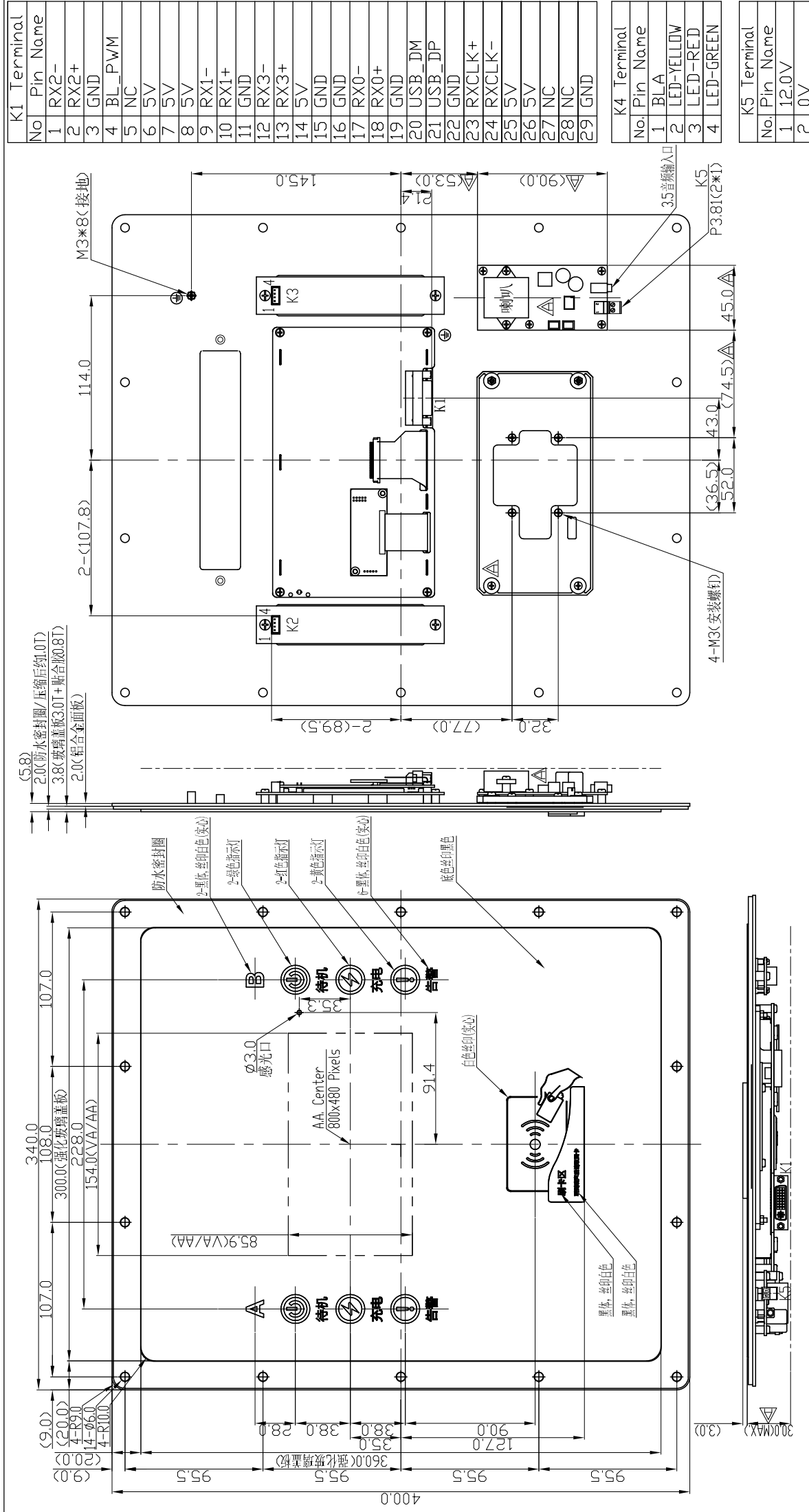
NURL: [www](http://www.topway.com)

- |  |   |
|--|---|
| <ul style="list-style-type: none"><li>- The panel window shall have sufficient rigidity and good flatness to facilitate installation, sealing and waterproof.</li><li>- Adopt conventional tightening methods, that is, use flat washers, elastic washers and nuts to ensure normal installation and locking.</li><li>- Appropriate locking force shall be applied when tightening the nut to prevent from deformation of the module aluminum plate.</li></ul> | <ul style="list-style-type: none"><li>- 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。</li><li>- 采用常规紧固方式，即使用平垫圈、弹性垫圈和螺母紧固，以保证正常安装锁紧。</li><li>- 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</li></ul> |
|--|---|

## **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.

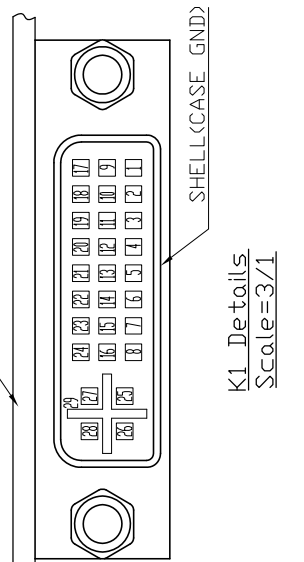


K1 Terminal	
No	Pin Name
1	RX2-
2	RX2+
3	GND
4	BL_PWM
5	NC
6	5V
7	5V
8	5V
9	RX1-
10	RX1+
11	GND
12	RX3-
13	RX3+
14	5V
15	GND
16	GND
17	RX0-
18	RX0+
19	GND
20	USB_DM
21	USB_DP
22	GND
23	RXCLK+
24	RXCLK-
25	5V
26	5V
27	NC
28	NC
29	GND

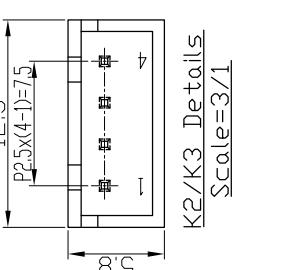
K4 Terminal	
No	Pin Name
1	BLA
2	LED-YELLOW
3	LED-RED
4	LED-GREEN

K5 Terminal	
No	Pin Name
1	12.0V
2	0V

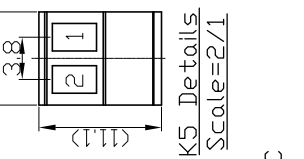
A	Refine Outline	2019-08-19
Rev/Note	HeHongLiang	Date
Dwg Title	LMT070D1CFWD-AKE-1	Outline Dwg
Dwg No.	MK-006689a-1-1	Date
Scale	2/5	Unit
Approved	mm	Paper Size
Checked	A3	Checked
Drawn	HeHongLiang	Drawn



K1\_Details  
Scale=3/1



K2/K3\_Details  
Scale=3/1



K5\_Details  
Scale=2/1

- Note:
- \*1. LCD显示类型： TFT,Transmissive
  - \*2. 像素点排列： RGB条纹格式
  - \*3. 工作电压： 5.0V
  - \*4. 背光： 白色LED
  - \*5. 触摸屏类型： 电容式触摸屏
  - \*6. 插座 K1： DVI Connector (F)
  - \*7. 信号接口类型： LVDS 24bits(JEIDA)
  - \*8. 工作温度： -20°C~70°C
  - \*9. 贮存温度： -40°C~85°C
  - \*10. 白色号Pantone White C ; 黑色号Pantone Black C
  - \*11. Unmarked Tolerance : ≤150,±0.3; >150,±0.5

