



# LMT070DICFWD-AKA-2M

## LCD Module User Manual

Prepared by:  <b>Linli</b>  Date: 2018-05-04	Checked by:    Date:	Approved by:    Date:
--	----------------------------------	-----------------------------------

Rev.	Descriptions	Release Date
0.1	Preliminary	2017-09-19
0.2	Update Section 3.1	2017-10-12
0.3	Add Assemble Precaution	2017-10-16
0.4	Update Section 5.1	2018-05-04

**Table of Content**

<b>1. General Specification .....</b>	<b>3</b>
<b>2. Block Diagram.....</b>	<b>3</b>
<b>3. Terminal Function.....</b>	<b>4</b>
3.1 K1 Terminal(DVI Right angle connector).....	4
<b>4. Absolute Maximum Ratings .....</b>	<b>4</b>
<b>5. Electrical Characteristics .....</b>	<b>5</b>
5.1 DC Characteristics .....	5
5.2 DC Characteristics(LVDS) .....	5
5.3 POWER ON/OFF SEQUENCE .....	5
<b>6. Function Specifications.....</b>	<b>5</b>
6.1 Automatic Display Brightness Control .....	5
<b>7. AC Characteristics.....</b>	<b>6</b>
7.1 AC Characteristics(LVDS).....	6
7.2 AC Characteristics(TFT) .....	7
<b>8. Optical Characteristics.....</b>	<b>8</b>
<b>9. Assemble Precaution .....</b>	<b>9</b>
<b>10. Precautions for Use of LCD Modules .....</b>	<b>10</b>
10.1 Handling Precautions .....	错误!未定义书签。
10.2 Storage precautions .....	错误!未定义书签。
10.3 Transportation Precautions .....	错误!未定义书签。

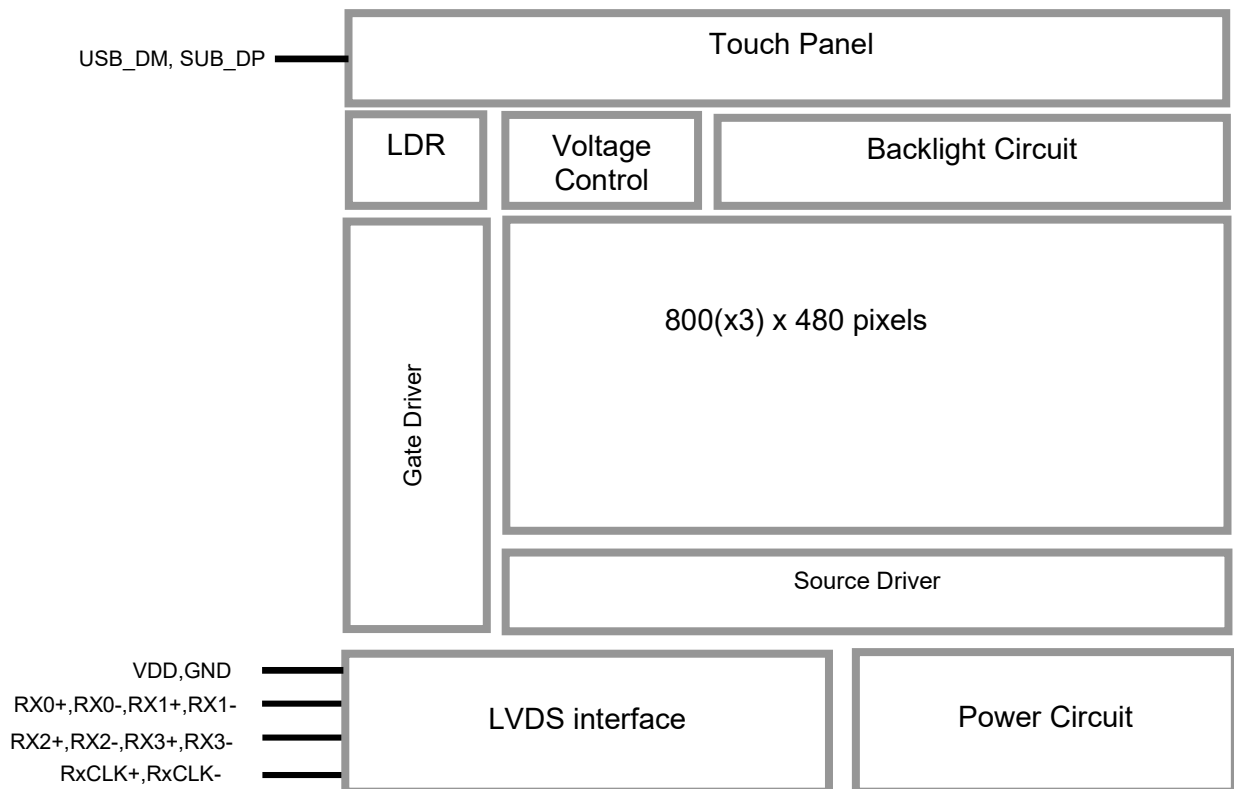
**1. General Specification**

Signal Interface :	LVDS (JEIDA 24 bits)
Display Mode :	Transmissive with Normally White
Screen Size :	7.0 inch
Outline Dimension :	200.0 x 125.0 x 30.0(mm)(with mounting Bezel) (see outline drawing for details)
Active Area :	154.08x 85.92(mm)
Number of dots :	800x 3 (RGB) x 480
Dot Pitch :	0.1926x 0.179(mm)
Pixel Configuration :	R.G.B. Vertical Stripe
Backlight :	White LED
Viewing Direction :	6 o'clock ( Gray scale Inversion ) (*1) 12 o'clock (*2)
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°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**



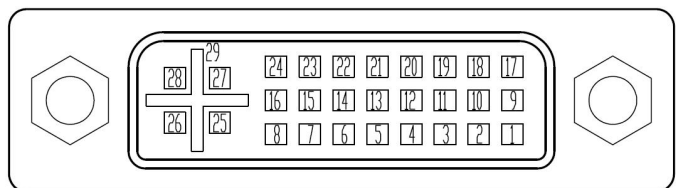
### 3. Terminal Function

#### 3.1 K1 Terminal(DVI Right angle connector)

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 (*1)
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:

- \*1. PWM duty cycle will correspond of the display brightness adjusted by the "Automatic Display Brightness Control" Function (Refer to Chapter 6.1)



### 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

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>a</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>	--	0.6	--	A	*1

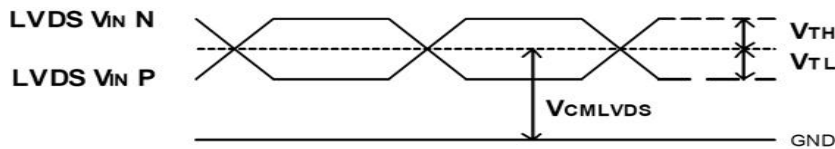
Note1:

\*1. Backlight brightness is 100%.

### 5.2 DC Characteristics(LVDS)

VDD=5.0V,GND=0V,T<sub>a</sub>=25°C

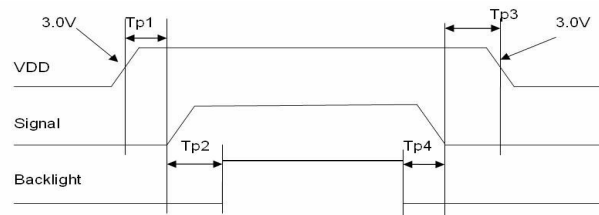
Items	Symbol	MIN.	TYP.	MAX.	Unit	Note
Differential Input High Threshold	V <sub>TH</sub>	-	-	100	mV	
Differential Input Low Threshold	V <sub>TL</sub>	-100	-	-	mV	
Input Current	I <sub>IN</sub>			±10	uA	
Differential Input common Mode voltage	V <sub>CMLVDS</sub>	1.65	-	2.1	V	



LVDS DC timing diagram

### 5.3 POWER ON/OFF SEQUENCE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
VDD 5.0V to signal starting	T <sub>p1</sub>	0	-	50	ms	
Signal starting to backlight on	T <sub>p2</sub>	150	-	-	ms	
Signal off to VDD 3.0V	T <sub>p3</sub>	0	-	50	ms	
Backlight off to signal off	T <sub>p4</sub>	150	-	-	ms	

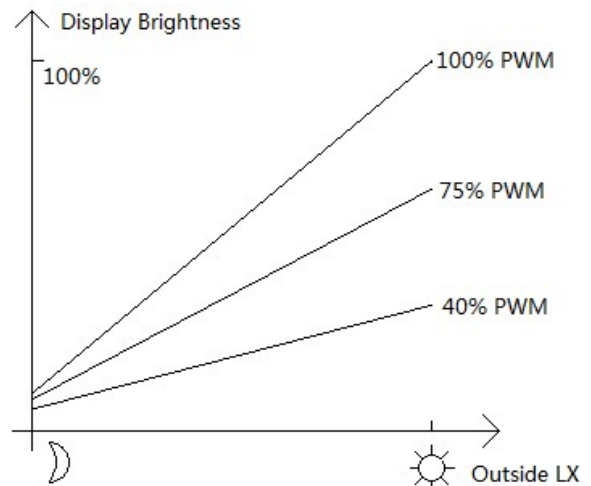


Interface Power On/Off Sequence

## 6. Function Specifications

### 6.1 Automatic Display Brightness Control

LMT070DICFWD-AKA-2M is equipped with a LDR sensing circuit for automatic brightness control. It reduces the brightness while the environment lighting becomes low. (e.g. night time)



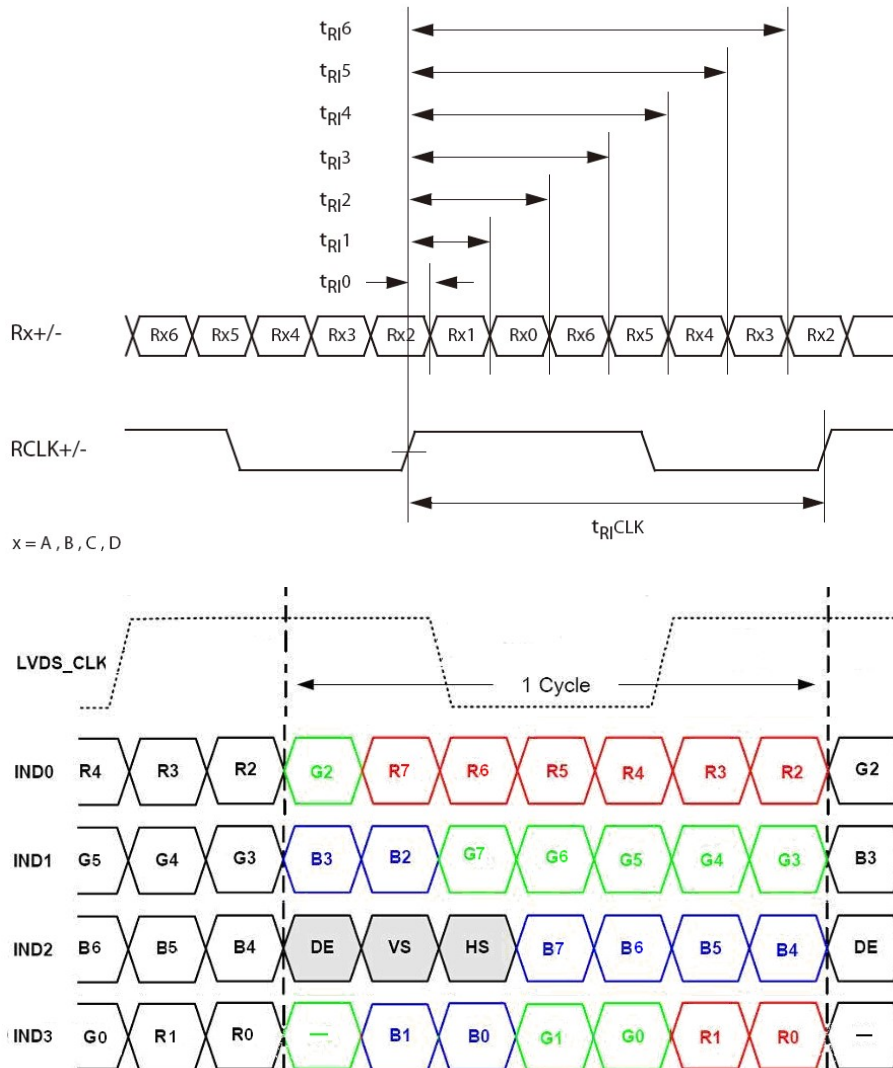
## 7. AC Characteristics

### 7.1 AC Characteristics(LVDS)

VDD=5.0V,GND=0V,T<sub>a</sub>=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:



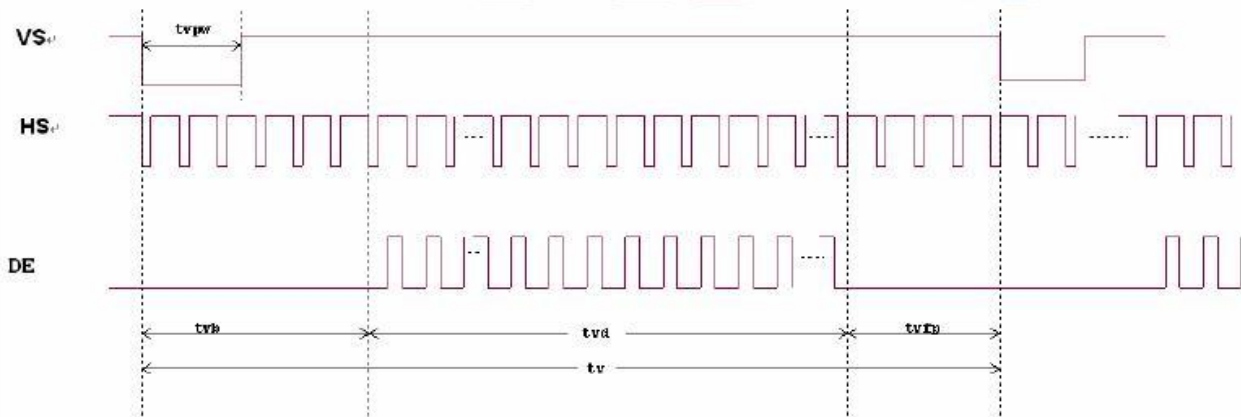
7.2 AC Characteristics(TFT)

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	Values			Unit	Remark
		MIN.	TYP.	MAX.		
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	



1 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	-	degree	*2
	$\theta_R$	3 o'clock	60	70	-		
	$\theta_T$	12 o'clock	40	50	-		
	$\theta_B$	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
Color chromaticlty	$W_x$		0.26	0.31	0.26	-	
	$W_y$		0.28	0.33	0.38	-	
Luminance	L		-	500	-	cd/m <sup>2</sup>	*4
Luminance uniformity	Y <sub>U</sub>		70	75	-	%	*4

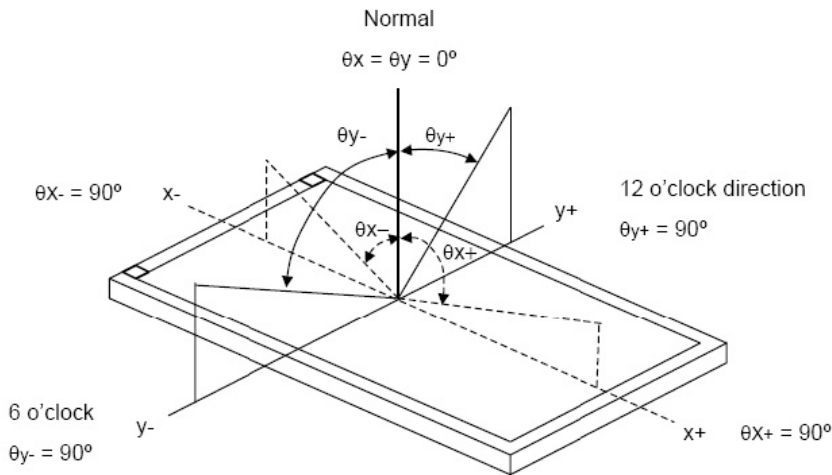
Note:

\*1. Definition of Contrast Ratio

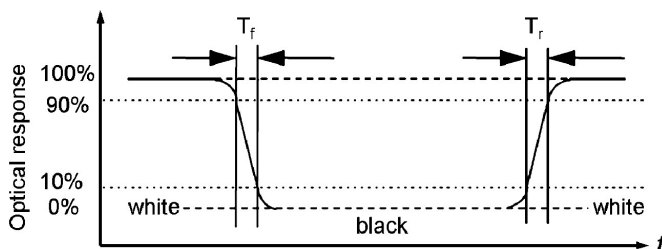
The contrast ratio could be calculate by the following expression:

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

\*2 Definition of Viewing Angle



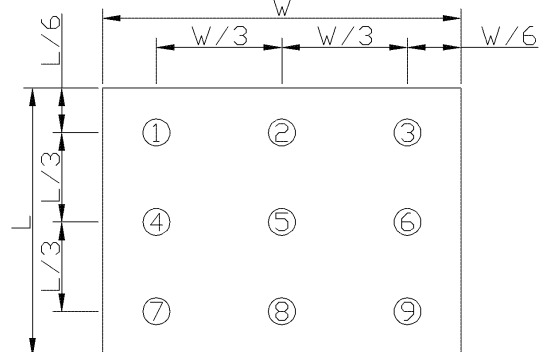
\*3 Definition of response time



\*4 Definition of Luminance Uniformity

Luminance uniformity (Lu)=

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





## 9. Assemble Precaution

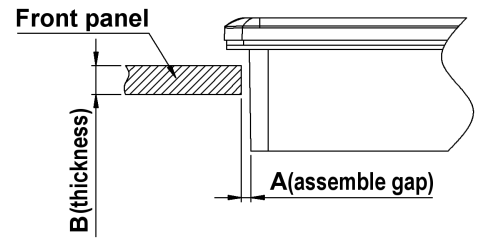
### 安装注意事项

1. Customer front panel opening and thickness for TOPWAY display module should be fit for its assembling and sealing.

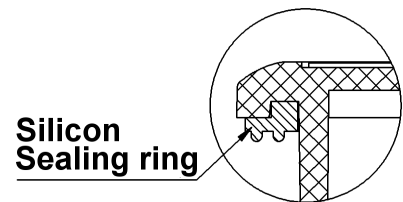
- The suggested assemble gap(A) should be about 0.3~0.5mm on each side.
- The suggested front panel thickness(B) should be about 1.5~4.0mm.

客户面板开窗及厚度应适合 TOPWAY 显示模块的安装及密封.

- 建议每边安装间隙(A)约为 0.3 ~0.5mm.
- 建议面板厚度(B) 约为 1.5~4.0mm.



2. A silicon sealing ring ships with TOPWAY display module. It should be in place before assembling to the front panel. TOPWAY 显示模块上的硅胶密封圈在安装时确保嵌入到位.



3. It should fix the TOPWAY display module into the front panel with two steps.

- **Pre-fixing:** Slightly tighten the screws on beam clamp in sequence as picture on the right side.
- **Final-fixing:** Tighten the fixing screws on beam clamp in sequence as well with twist torque about 6~8kg.cm (\*1) . and put the beam clamp straight.

Note:

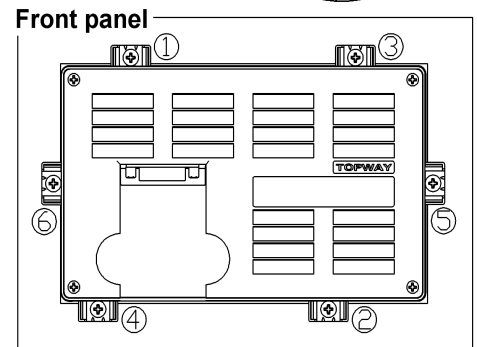
\*1. Over tightening might damage the shell and cause bad sealing result.

应分两步将 TOPWAY 显示模块固定在面板上.

- **预紧:** 将卡扣螺钉按右图所示顺序稍加预紧.
- **紧定:** 再次按顺序用 **6~8kg.cm** 扭力拧紧卡扣螺钉(\* 1), 并注意卡扣置正无歪斜.

注:

\*1. 过度拧紧可能会损坏外壳和影响密封效果.

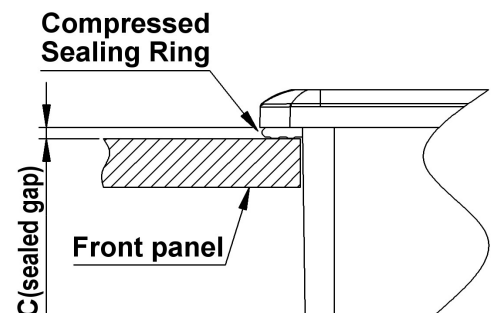


4. It is strongly suggested to check the seal balancing of the four-side of the TOPWAY display module.

- The suggested after assemble sealed gap(C) should be about 1.0~1.5mm.

需注意检查 TOPWAY 显示模块四周在安装后保证平衡密封.

- 建议组装后的密封间隙(C)约为 1.0 ~1.5 mm.



5. Others:

- Never hot plug the device! Power off the device before connect or disconnect the display module.
- Don't forget to remove the cover protective film for normal operation.

其它:

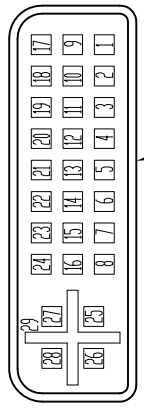
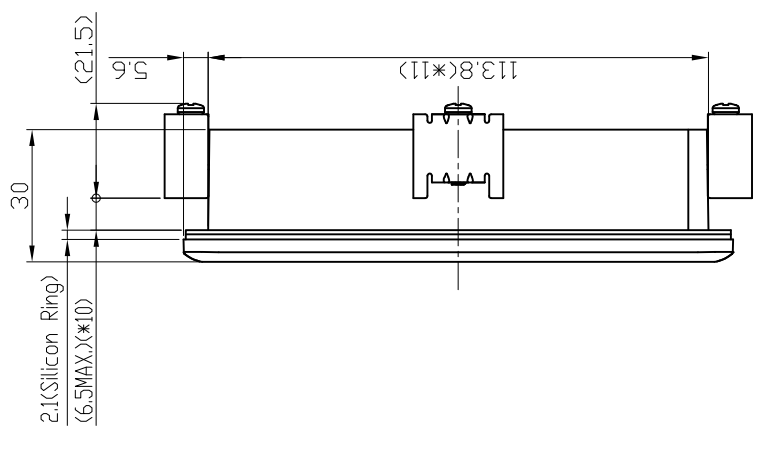
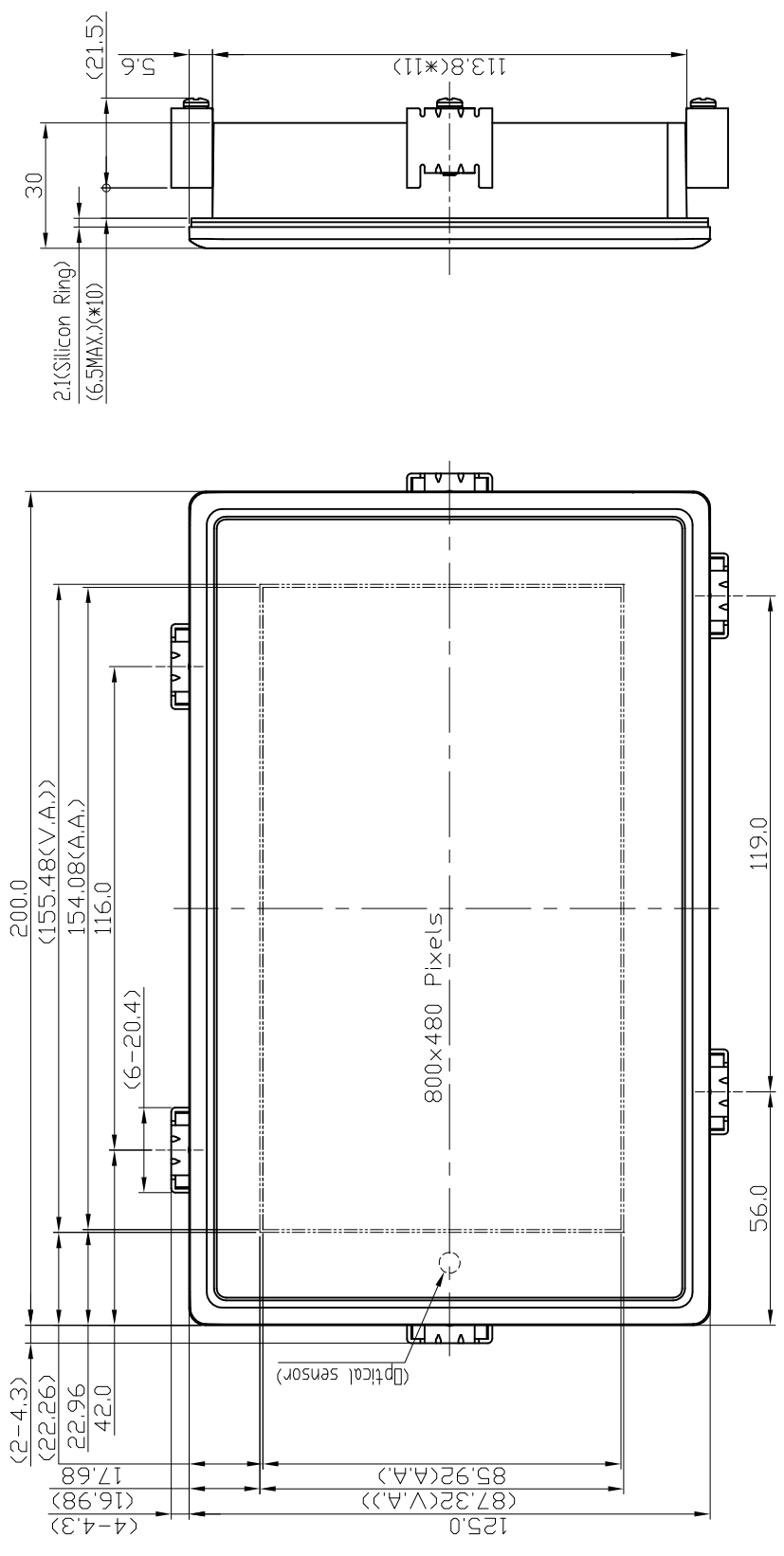
- 视频线禁止带电插拔! 在连接或断开显示模块之前先关闭设备电源.
- 使用前请揭去保护膜.

## 10. Precautions for Use of LCD Modules

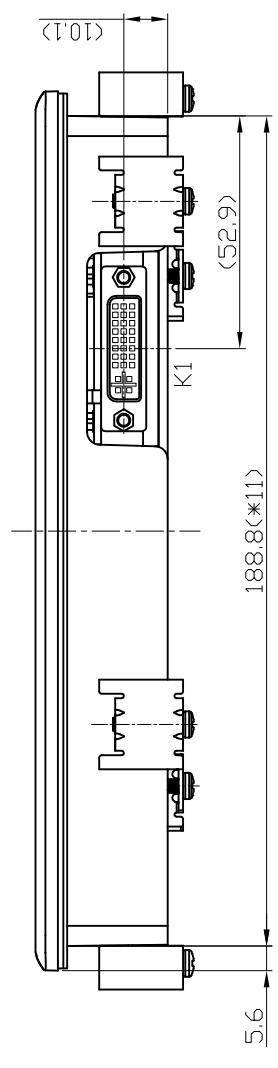
Please refer to "LCD-Module-Design-Handling-Precaution.pdf".

K1 Terminal	
No	Pin Name
1	RX2-
2	RX2+
3	GND
4	NC(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

△



K1 Details  
Scale=3/1  
SHELL(CASE GND)



- Note:
- \*1. LCD Display Type: TFT,Transmissive
  - \*2. Pixel Arrangement: RGB-STRIPE
  - \*3. Operating Voltage : 5.0V
  - \*4. Backlight : White LED
  - \*5. Touch Panel Type: Resistive Touch Panel
  - \*6. Ki: DVI Connector (F)
  - \*7. Signal Interface : LVDS(JEIDA 24bits)
  - \*8. Operating Temperature : -20°C~70°C
  - \*9. Storage Temperature : -30°C~80°C
  - \*10. Applicable assemble panel thickness = 6.5MAX.
  - \*11. Applicable assemble panel Opening(Min)

C	
B	
A	Revise K2 Pin Name
Rev/Note	
Dwg Title LMT070D1CFWD-AKA-2M Outline Dwg	
Dwg No. MK-005605a-1-1	
Date 2017-09-19	
HeHongLiang	
Date	
Scale	Tol. Paper Size
4/5	±0.5 mm A3
Approved	Checked
Drawn	He Hong Liang

**TOPWAY**