



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

HKT070DMC-5C

LCD Module User Manual

Prepared by: Chenzhonghua Date: 2022-11-30	Checked by: Date:	Approved by: Date:
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Rev.	Descriptions	Edit	Release Date
0.1	- Preliminary Draft release	Chenzhonghua	2022-10-20
0.2	-Update Section 2	chenzhonghua	2022-11-30

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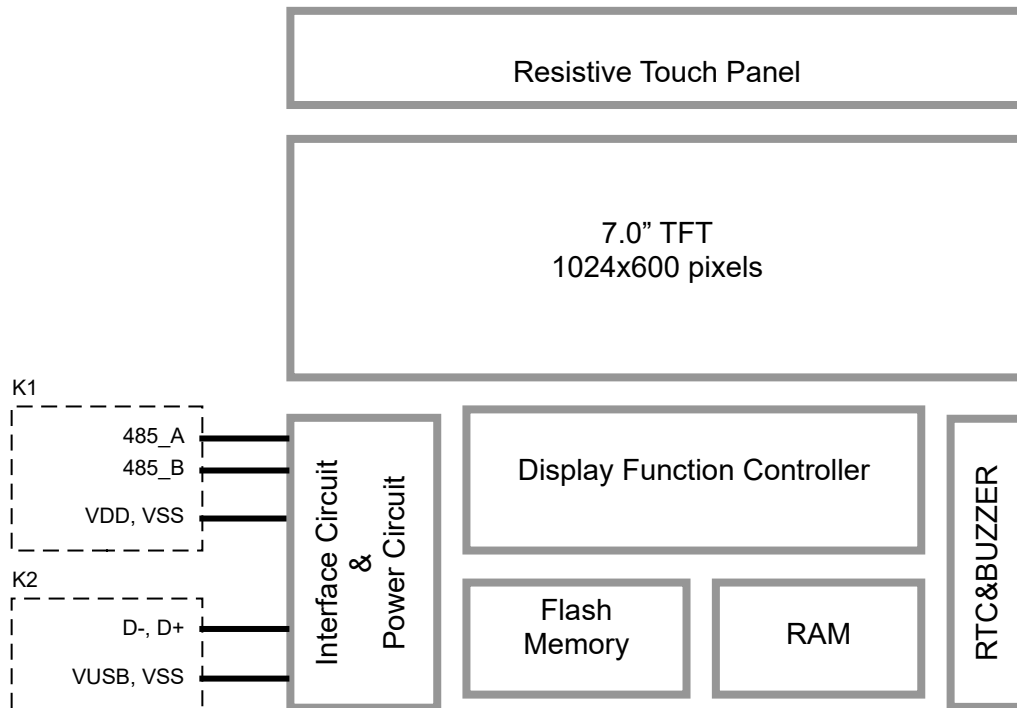
1 Basic Specification

TOPWAY HKT070DMC-5C is a Smart TFT Module with 32bit MCU on board. Its graphics engine provides numbers of outstanding features. It supports TOPWAY TML for preload and pre-design display interface that simplify the host operation and development time. Suitable for industry control, instrumentation, medical electronics, power electric equipment applications.

1.1 General Specification

Screen Size(Diagonal) :	7.0"
Resolution :	1024(RGB) x 600
Color Depth :	65k color (16bit)
Pixel Configuration :	RGB Stripe
Display Mode :	Transmissive / Normal White
Viewing Direction :	Full
Outline Dimension :	200.0 x 125.0 x 30.0 (max) (mm) (see attached drawing for details)
Active Area :	154.21 x 85.92 (mm)
Backlight :	LED
Command I/F:	RS485
Power Supply:	11.0 ~ 26.0V
Project Download:	by PC or by U-Drive (with OTG cable)
Operating Temperature :	-20 ~ +70°C
Storage Temperature :	-30 ~ +80°C

1.2 Block Diagram



1.3 Terminal Function

RS485 Interface Terminal (K1)

Pin No.	Pin Name	I/O	Descriptions
1	VSS	P	Ground, (0 V)
2	485_B	I/O	RS485 Differential Signal B
3	485_A	I/O	RS485 Differential Signal A
4,5	NC	--	No connection, leave open
6	VDD	P	Power supply (11.0~26.0 V)

Note.

- *1. User data and commands transfer through this terminal
- *2. HW hand shake is suggested

USB Interface Terminal (K2)

Pin No.	Pin Name	I/O	Descriptions
1	VUSB	P	Power supply(5.0V)
2	D-	I/O	USB DATA negative signal
3	D+	I/O	USB DATA positive signal
4	ID	I	USB_ID, 1:Client, 0:HOST
5	VSS	P	Ground, (0V)

Note:

- 1.Display files preload through this terminal.
- 2.Connect to U-Drive (with OTG cable), for files transfer

2 Absolute Maximum Ratings

Items	Symbol	Min.	Max.	Unit	Condition
Power Supply voltage	V_{dd}	-0.3	26.0	V	
Operating Temperature	T_{OP}	-20	70	°C	No Condensation
Storage Temperature	T_{ST}	-30	80	°C	No Condensation

Notes:

- *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, $T_{OP}=25^{\circ}C$ Ambient temperature when the backlight is lit (reference value)
- *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.

3 Electrical Characteristics

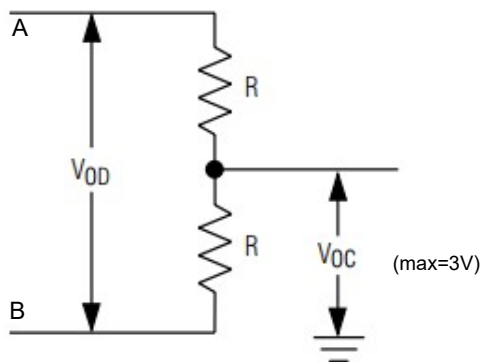
3.1 DC Characteristics

VSS=0V, VDD=12.0V, T_{OP} =25°C

Items	Symbol	MIN.	TYP.	MAX.	Unit	Applicable Pin/FUNC
Operating Voltage	V _{DD}	11.0	12.0	26.0	V	VDD
Differential Driver Output (with load)R=50Ω (*1)	V _{OD}	2	-	3.3	V	A/B
Receiver Differential Threshold Voltage	V _{TH}	-0.2	-	0.2	V	A/B
Operating Current	I _{DD}	-	TBD	-	mA	VDD (*2)
Operating Current (USB)	I _{VUSB}	-	150	-	mA	VUSB (*3)
Battery Supply Current	I _{BAT}	-	0.6	-	uA	

Notes:

*1.

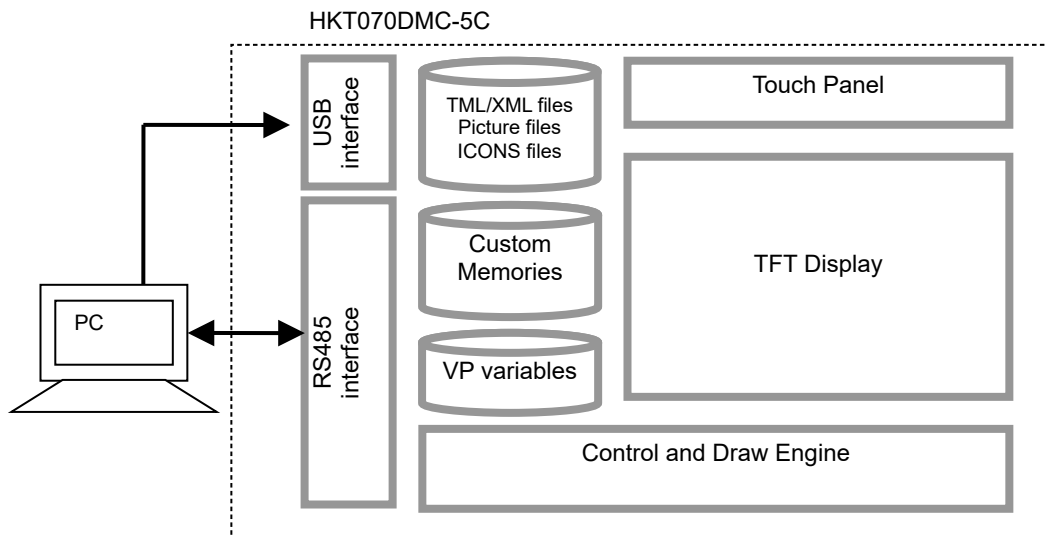


*2.Normal display condition

*3.USB-drive (high-speed)

4 Function Specifications

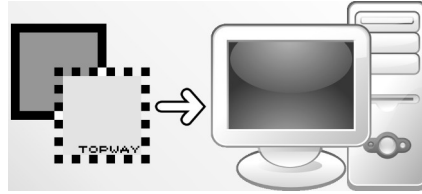
4.1 Basic Operation Function Descriptions



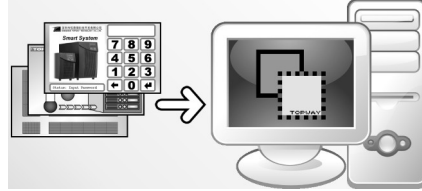
- TML files, images, icons are stored inside the flash memory area. They are pre-loaded into the HKT070DMC-5C via USB.
- The GUI's appearance and responses are based on the preloaded TML files
- The Control- and Drawing- Engine executes RS485 / Modbus RTU commands.

4.2 Quick Start Guide

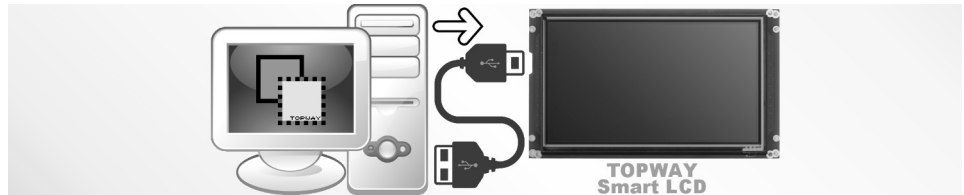
1. Install TOPWAY Graphics Editor



2. Import pictures design UI flow



3. Download to Smart LCD



4. power on & display



5. Connect to Slave Show real time data



4.3 Modbus configuration Descriptions

The HKT070DMC-5C needs to add the configuration file "modbus.xml" to the project generated by the TOPWAY RGTools to describe the relationship between the screen variables and the registers of the Modbus Slave device.

Please refer to Appendix A for "Modbus.xml" formatting.

5 Optical Characteristics

Item	Symbol	Condition	MIN.	TYP.	MAX.	UNIT	Note.
Viewing angle (CR ≥ 10)	θ_L	9 o'clock	70	85	-	degree	*2
	θ_R	3 o'clock	70	85	-		
	θ_T	12 o'clock	70	85	-		
	θ_B	6 o'clock	70	85	-		
Response Time	T_f	25°C	--	25	35	msec	*3
	T_r						
Contrast ratio	CR	Normal $\theta=0^\circ$	600	800	-	-	*1
Color chromaticity	W_x		0.26	0.31	0.36	-	
	W_y		0.28	0.33	0.38	-	
Luminance	L		-	350	-	cd/m ²	*4
Luminance uniformity	Y_U		70	75	-	%	*4

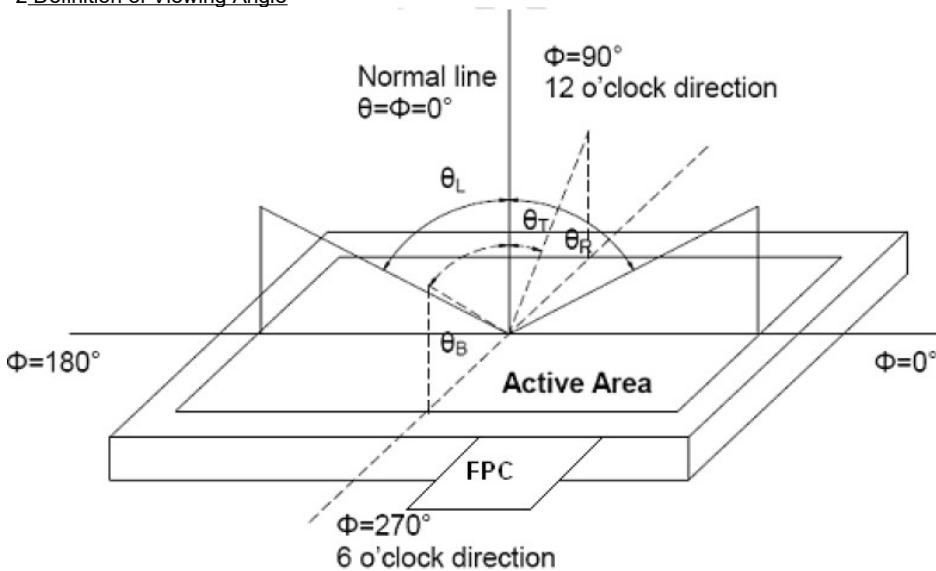
Note:

***1. Definition of Contrast Ratio**

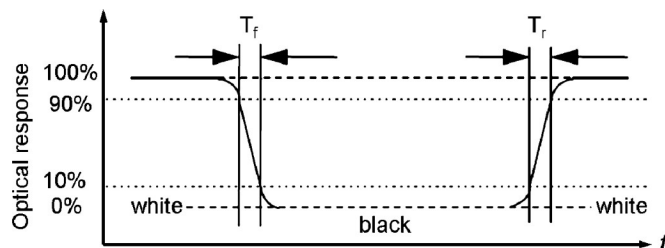
The contrast ratio could be calculate by the following expression:

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

***2. Definition of Viewing Angle**



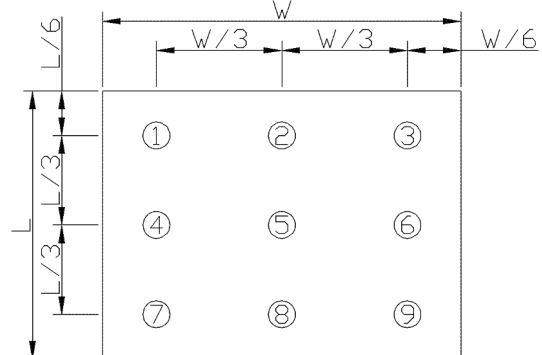
***3 Definition of response time**



***4 Definition of Luminance Uniformity**

Luminance uniformity (Lu)=

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



6 Assemble Precaution

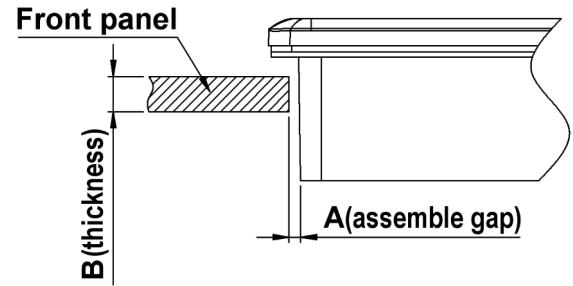
安装注意事项

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

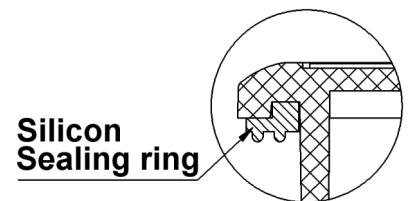
- ☞ The suggested assemble gap(A) should be about 0.3~0.5mm on each side.
- ☞ The suggested front panel thickness(B) should be about 1.5~4.0mm.

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:

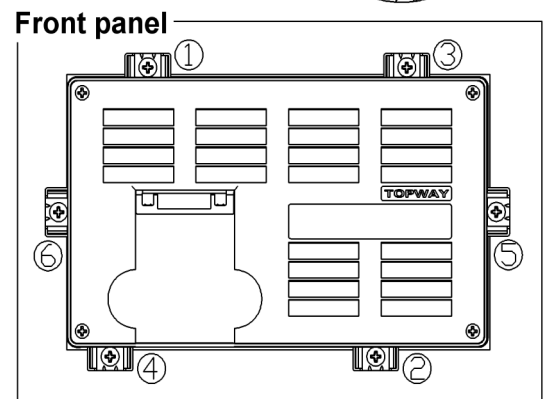
*1. Over tightening might damage the shell and cause bad sealing result.

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.

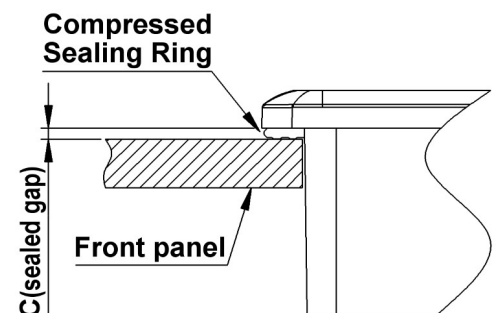


4) It is strongly suggested to check the seal balancing of the four-side of the TOPWAY display module.

- ☞ 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.

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.

Appendix A:

Modbus RTU Master Xml configure v1.01

配置文件 Modbus.xml 文档示例

```

<Modbus>
  <config>
    <relative vpadr="0x080000" vplen="1" slaveID="1" mbaddr="0x40000" mblen="1"/>
    <relative vpadr="0x080002" vplen="1" slaveID="1" mbaddr="0x40001" mblen="1"/>
    <relative vpadr="0x080004" vplen="1" slaveID="1" mbaddr="0x40002" mblen="1"/>
    <relative vpadr="0x020000" vplen="1" slaveID="1" mbaddr="0x40008" mblen="2"/>
    <relative vpadr="0x080034" vplen="1" slaveID="1" mbaddr="0x4000A" mblen="1"/>
  </config>
</global>
  <Read condition = "always" vpadr_condition="0x080004" value_condition="100"
  slaveID="1" mbaddr = "0x40008" mblen= "2" />
  <BLCtrl condition = "==" vpadr_condition="0x080004" value_condition="100"
  value_type="const" vpadr_val = "64" />
  <BeepCtrl condition = "==" vpadr_condition="0x080004" value_condition="100"
  value_type="variable" vpadr_val = "0x80034" />
</global>
<Page PageNo="1">
  <Read condition = "always" vpadr_condition="0x080004" value_condition="100"
  slaveID="1" mbaddr = "0x40000" mblen= "3" />
</Page>
    
```

说明:

配置类	说明	功能
<config>	关系定义	relative - 定义 VP 与 MB 的对应关系 - 当 VP 内容被修改, 模块会同时拷贝相关内容到 MB
<global>	定义全局的周期性操作	Read - 读 MB - 可按条件操作 - 模块会参考<config>, 同时拷贝相关值到 VP (*1) Write - 写 VP - 可按条件操作 - 模块会参考<config>, 同时拷贝相关值到 MB(*1)
< Page PageNo=n>	定页面 n 中的周期性操作	BLCtrl - 背光亮度设定 - 可按条件操作 BeepCtrl - 蜂鸣器控制 - 可按条件操作

注释:

VP=智能模块中的 VP 变量(含 地址)

MB= MODBUS 变量(含 从设备, 从地址)

注:

*1. 相关 MB 关联 VP, 必须在<config>中定义

元素<relative>: 描述屏工程中变量与 modbus 地址变量的映射关系

属性	描述
vpaddr	屏的变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量
vplen	变量个数, 请填入 1
slaveID	操作的 Modbus Slave 设备 ID 号
mbaddr	Modbus 寄存器地址 0x coil : 地址 0x00000~0x0270F 1x input : 地址 0x10000~0x1270F 3x input Register : 地址 0x30000~0x3270F 4x holding Redister : 地址 0x40000~0x4270F
mblen	Modbus 地址数量, 需要使 modbus 和 vpaddr 地址变量比特位相等

元素<Read>: 依条件执行读取 Modbus 地址变量

属性	描述
condition	执行条件 "always", ">", "==" , "<", "!=" , ">=", "<="
vpaddr_condition	条件左值变量地址, 参数为 16 进制数值以 "0x" 开头的屏变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量 仅条件 ">", "==" , "<", "!=" , ">=", "<=" 有效
value_condition	条件右值对比值, 参数为 10 进制数值
slaveID	操作的 Modbus Slave 设备 ID 号
mbaddr	Modbus 寄存器地址 0x coil : 地址 0x00000~0x0270F 1x input : 地址 0x10000~0x1270F 3x input Register : 地址 0x30000~0x3270F 4x holding Redister : 地址 0x40000~0x4270F
mblen	Modbus 地址数量

元素<BLCtrl>: 依条件执行控制屏背光亮度为常量或变量 vpaddr_val 的值

属性	描述
condition	执行条件 "always", ">", "==" , "<", "!=" , ">=", "<="
vpaddr_condition	条件左值变量, 参数为 16 进制数值以 "0x" 开头 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量 仅条件 ">", "==" , "<", "!=" , ">=", "<=" 有效
value_condition	条件右值对比值, 参数为 10 进制数值
value_type	操作值为常量或者变量 参数值可选 "const", "variable"
vpaddr_val	Value_type = "const" 时, 参数为 10 进制数值 Value_type = "variable" 时, 参数为 16 进制数值以 "0x" 开头的屏变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量

元素<BeepCtrl>: 依条件执行控制蜂鸣器是否响, 当常量值或变量 vpaddr_val 非 0 时蜂鸣器响, 否则反之。

属性	描述
condition	执行条件 "always", ">", "==" , "<", "!=" , ">=", "<="

vpaddr_condition	条件左值变量地址, 参数为 16 进制数值以"0x"开头的屏变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量 仅条件">","==","<","!=", ">=", "<=" 有效
value_condition	条件右值对比值, 参数为 10 进制数值
value_type	操作值为常量或者变量 参数值可选"const", "variable"
vpaddr_val	Value_type = "const" 时, 参数为 10 进制数值 Value_type = "variable" 时, 参数为 16 进制数值以"0x"开头的屏变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量

元素<Write>: 依条件执行写操作, 将常量或变量 vpaddr_val 写入 vpaddr 指定的地址中

属性	描述
condition	执行条件 "always", ">","==","<","!=", ">=", "<="
vpaddr_condition	条件左值变量地址, 参数为 16 进制数值以"0x"开头的屏变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量 仅条件">","==","<","!=", ">=", "<=" 有效
value_condition	条件右值对比值, 参数为 10 进制数值
value_type	操作值为常量或者变量 参数值可选"const", "variable"
vpaddr_val	Value_type = "const" 时, 参数为 10 进制数值 Value_type = "variable" 时, 参数为 16 进制数值以"0x"开头的屏变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量
vpaddr	需要写入操作的变量地址, 对应屏变量地址 0x80000: 16 位数据变量 0x20000: 32 位数据变量 0x30000: 64 位数据变量
vplen	VP 地址数量

注:

mbaddr: 指 Modbus 寄存器地址

0x coil : 地址 0x00000~0x0270F

1x input : 地址 0x10000~0x1270F

3x input Register : 地址 0x30000~0x3270F

4x holding Register : 地址 0x40000~0x4270F

vpaddr : 指屏的变量

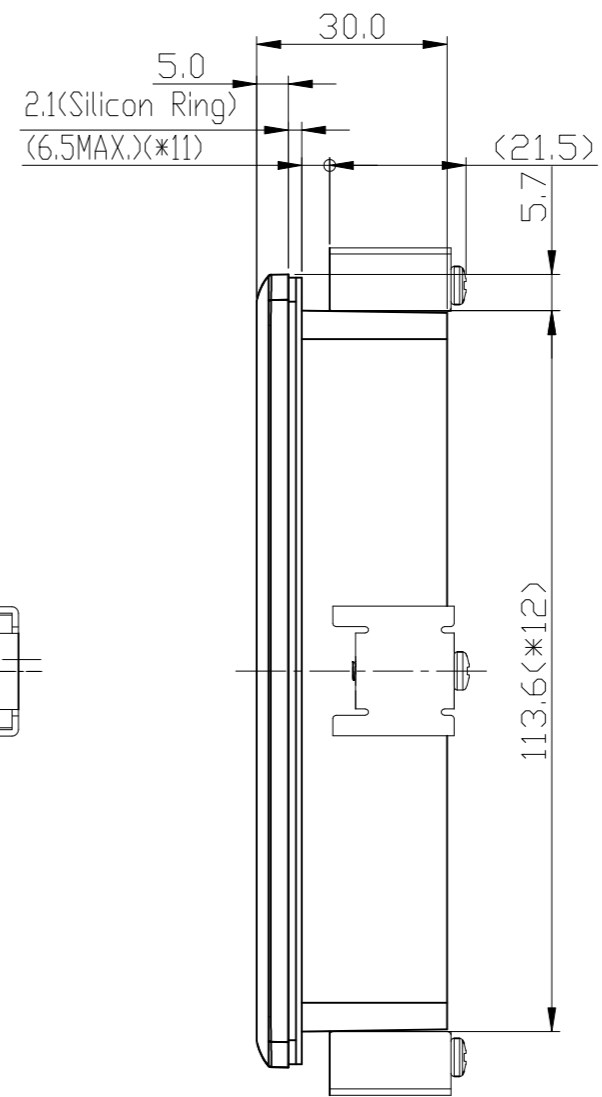
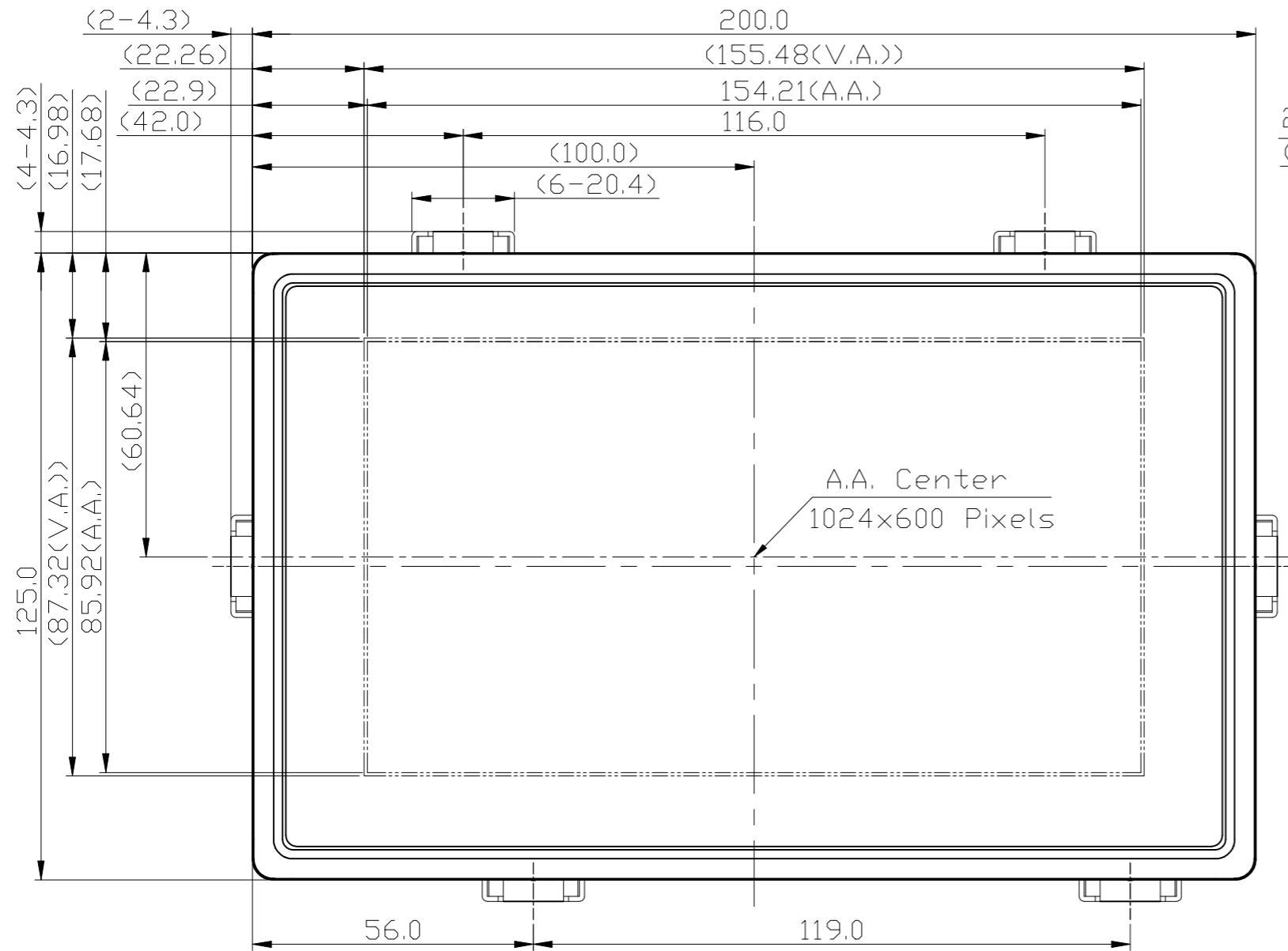
0x80000: 16 位数据变量, 对应 modbus 1 个 3x 和 4x 地址, 16 个 0x 和 1x 地址

0x20000: 32 位数据变量, 对应 modbus 2 个 3x 和 4x 地址, 32 个 0x 和 1x 地址

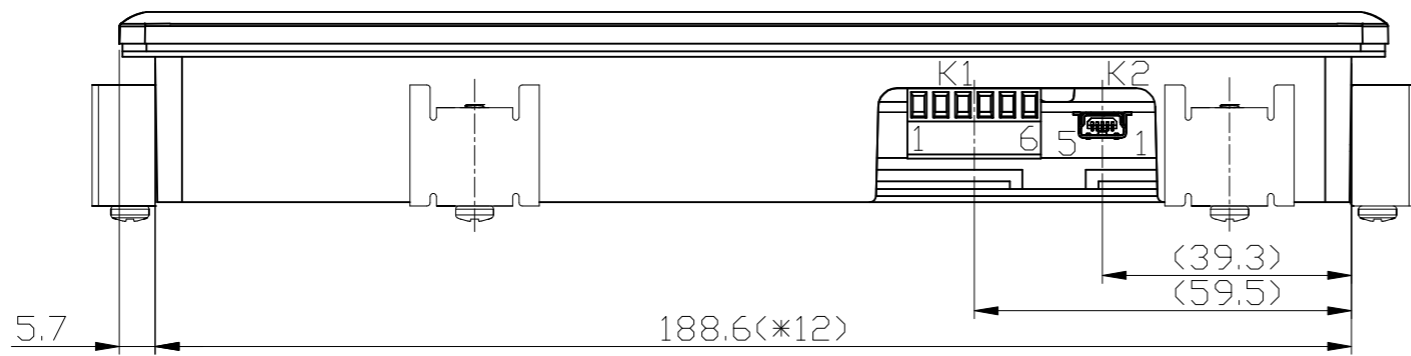
0x30000: 64 位数据变量, 对应 modbus 4 个 3x 和 4x 地址, 64 个 0x 和 1x 地址

屏变量与 modbus 位地址的关系以 16 位变量对应关系为例

16 位变量	Bit15		Bit8	Bit7		Bit0
0x coil	0x0000F		0x00008	0x00007		0x00000
1x input	0x1000F		0x10008	0x10007		0x10000



K1 Terminal	
No	Pin Name
1	VSS
2	485_B
3	485_A
4	NC
5	NC
6	VDD



Note:

- *1. LCD Display Type: TFT, Transmissive
- *2. Pixel Arrangement: RGB-STRIP
- *3. Operating Voltage : 11.0~26.0V
- *4. Backlight : White LED
- *5. Color Depth : 65k Colors
- *6. Touch Panel Type: Resistive Touch Panel
- *7. User Interface : RS-485
- *8. Terminal:
 - K1: 6Pin P3.5 Phoenix MC 1.5/6-ST-3.5 Or Equivalent
 - K2: Mini USB
- *9. Operating Temperature : -20°C~70°C
- *10. Storage Temperature : -30°C~80°C
- *11. Applicable assemble panel thickness = 6.5MAX.
- *12. Applicable assemble panel Opening(Min)
- *13. Unmarked Tolerance : ≤150, ±0.3; >150, ±0.5

C		
B		
A		
Rev	Note	Date
Dwg	Title HKT070DMC-5C Outline Dwg	
Dwg No.	MK-007830-1-1	Date 2022-08-23
Scale 4/5	Tol.	Unit mm Paper Size A3
Approved	Checked	Drawn BiChangLiu

TOPWAY