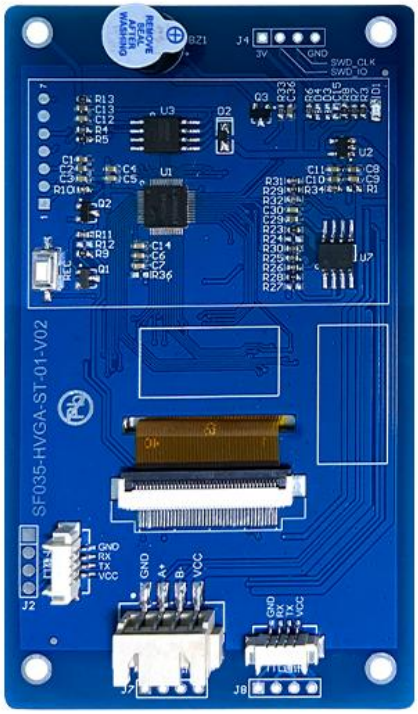
SF3.5 寸串口屏
SF3.5-inch serial port screen

*由于我司会对串口屏模块不定时更新升级，版本号会出现与旧版本不一致，此时硬件软件不会出现不一致的现象，只是升级增强了硬件软件的兼容性。

*** Because our company will update and upgrade the serial port screen module irregularly, the version number will be inconsistent with the old version. At this time, the hardware and software will not be inconsistent, but the upgrade will enhance the compatibility of the hardware and software.**



修订记录

Revision record

版本 Version	发布者 Publisher	修改内容 Modify the content	修改日期 Date of modification
A	Liangyq	初版 First edition	2024/11/15

产品概述

Product overview

3.5 寸 SF 系列串口屏（简称：SFD）的点阵分辨率是 320X480。其支持 UTF-8 的多国语言编码格式，同时开放内部点阵 DDRAM，能够在屏幕上的任意位置显示图片及图形。硬件上它提供 UART 接口方式（支持 TTL 和 485），接线简单。配合我司开发的 sHMI 拖拽编程工具，用户只要几条简单指令就能设计出美观绚丽的用户界面，从此用户不再需要花费高昂的硬件成本及漫长的开发周期来为设备仪器配置 LCD 彩屏，SFD 丰富的片上资源及强大的指令集，是客户项目开发的首选方案。

The dot matrix resolution of the 3.5-inch SF series serial port screen (SFD) is 320X480. It supports the multi-language encoding format of UTF-8, and opens the internal dot matrix DDRAM, which can display pictures and graphics anywhere on the screen. In terms of hardware, it provides UART interface mode (supporting TTL and 485) with simple wiring. With the sHMI drag-and-drop programming tool developed by our company, users can design a beautiful and gorgeous user interface with only a few simple instructions. From then on, users no longer need to spend high hardware costs and a long development cycle to configure LCD color screens for equipment and instruments. SFD's rich on-chip resources and powerful instruction set are the preferred solution for customer project development.

- 外形尺寸
- Overall dimensions

测量类型 Type of measurement	测量数据（±0.2） Measured data（± 0.2）
外观尺寸	59.3mm*101.82mm*11.65mm

Exterior dimensions	

- 显示性能参数
- Displays the performance parameters

参数类型 Parameter type	测量数据 Measurement data	说明 Explain
显示区域(A.A) Display area (A. A)	48.96mm*73.44mm	手工测量存在±0.2 误差 ± 0.2 error in manual measurement
分辨率(ppi) Resolution (PPI)	320*480	/
显示颜色 Display color	65K	/
像素布局 Pixel layout	RGB 垂直条状 RGB vertical strip	/
最佳视角 Best viewing angle	12:00	/
对比度 Contrast	500:1 (Typ.) (透射) 500:1 (Typ.)	/
背光光源类型 Backlight light source type	WHITE LED	高亮白色 LED 灯，调节背光亮度 Highlight white LED, adjust backlight brightness
模块亮度 Module brightness	260cd/m2	/
室内外可视 Visible indoors and outdoors	是 Yes	/
DDRAM	300K 显存 300 K video memory	开放内部 DDRAM Open internal DDRAM
是否带触摸 Whether with touch	是 Yes	/

- 电性能参数
- Electrical performance parameters

参数类型 Parameter type	测试条件 Test conditions	最小值 Minimum value	标准值 Standard value	最大值 Maximum value	单位 Unit
工作电压范围 Operating voltage range	输入电压（VDD:+5.0V/+3.3V）。 Input Voltage (VDD: + 5.0 V/+ 3.3 V).				
工作电流(5V) Operating current (5V)	背光最亮 The backlight is the brightest	-	170	-	mA
	背光最暗 The backlight is the darkest	-	66	-	mA
工作电流 (3.3V) Operating Current (3.3 V)	背光最亮 The backlight is the brightest	-	132	-	mA
	背光最暗 The backlight is the darkest	-	56	-	mA
工作功耗(5V) Power consumption (5V)		330	-	850	mW
工作功耗 (3.3V) Operating Power (3.3 V)		185	-	436	mW

- 工作环境参数
- Working environment parameters

参数类型 Parameter type	测试环境 Test environment	最小值 Minimum value	标准值 Standard value	最大值 Maximum value	单位 Unit
工作温度 Operating temperature	-	-20	-	60	℃

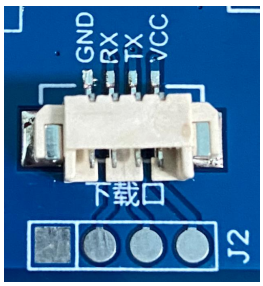
储存温度 Storage temperature	-	-30	-	70	℃
工作湿度 Operating humidity	25℃	10%	60%	90%	RH
出厂老化 Factory aging 测试 Test	-	-	8	-	H
通讯接口 Communication interface	上位机 UART 接口 1.25mm 4Pin 连接器(下载口) Upper computer UART interface 1.25 mm 4 Pin connector (download port) MCU TTL 接口 1.25mm 4Pin 连接器(TTL 通讯口) MCU TTL interface 1.25 mm 4Pin connector (TTL communication port) MCU 485 接口 2.54mm 4Pin 连接器(485 通讯口) MCU 485 interface 2.54 mm 4 Pin connector (485 communication port)				

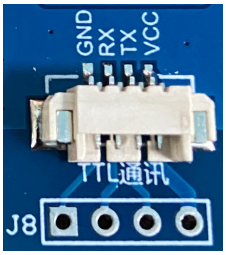
- 接口性能参数：（115200/38400/19200/9600）
- Interface performance parameters: (115200/38400/19200/9600)

	最小值 Minimum value	标准默认值 Standard default value	最大值 Maximum value	单位 Unit
串口波特率 Serial port baud rate	9600	115200	115200	Bps
串口接收电平(RX) Serial port receiving level (RX)	-	3.3V	-	V
串口接收电平(RX) Serial port receiving level (RX)	-	3.3V	-	V

- 接口定义（此接口用于 sHMI 下载工程使用）
- Interface definition (this interface is used for sHMI download project)

上位机通讯口(J2) Communication port of upper computer	引脚名称 Pin name	功能描述 Functional description
	GND	电源接地端

(J2) 		Power supply ground terminal
	RX	主控芯片 UART 数据接收端 Main control chip UART data receiving terminal
	TX	主控芯片 UART 数据发送端 Main control chip UART data sending terminal
	VCC	电源供电端 Power supply terminal

MCU 通讯口 TTL(J8) MCU communication port TTL (J8) 	引脚名称 Pin name	功能描述 Functional description
	GND	电源接地端 Power supply ground terminal
	RX	主控芯片 UART 数据接收端 Main control chip UART data receiving terminal
	TX	主控芯片 UART 数据发送端 Main control chip UART data sending terminal
	VCC	电源供电端 Power supply terminal

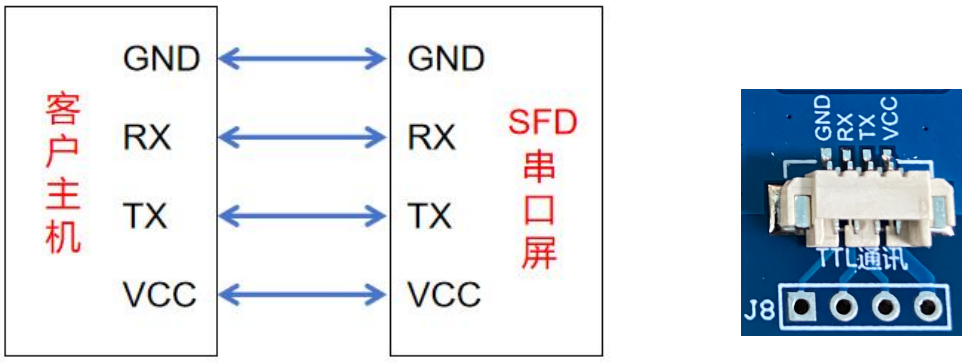
MCU 通讯口 485(J7) MCU communication port 485 (J7) (Graph)	引脚名称 Pin name	功能描述 Functional description
	GND	电源接地端 Power supply ground terminal
	A+	485 通讯 A+口 485 communication A + port
	B-	485 通讯 B-口 485 communication B-port
	VCC	电源供电端 Power supply terminal

- **硬件接口示意图**
- **Hardware interface diagram**

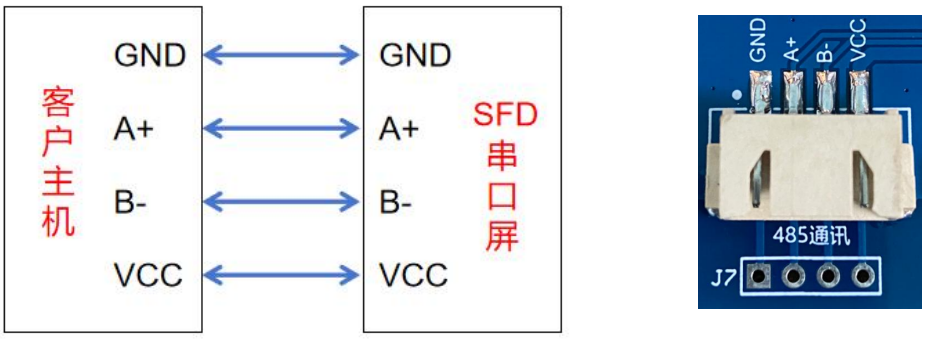
(1)、SFD 支持 UART TTL 串行数据口(TX 和 RX 两根线)或者 UART 485 数据口与主控进行

串口通讯（16 进制格式），如使用 TTL(J8)与 SFD 通讯则 TX 为主控的数据发送端，RX 为主控的数据接收端（注意 TX 和 RX 不需要交叉接线）；如使用 485(J7)与主控通讯，则 A+与 B-直接和主控的 A+与 B- 对应接起来即可。

(1) SFD supports UART TTL serial data port (TX and RX lines) or UART 485 data port for serial communication (hexadecimal format) with the master control. If TTL (J8) is used for communication with SFD, TX is the data sending end of the master control. RX is the data receiving end of the master control (note that TX and RX do not need cross wiring). If 485 (J7) is used to communicate with the master control, A + and B- can be directly connected to A + and B- of the master control.



TTL 接线逻辑示意图
Schematic diagram of TTL wiring logic



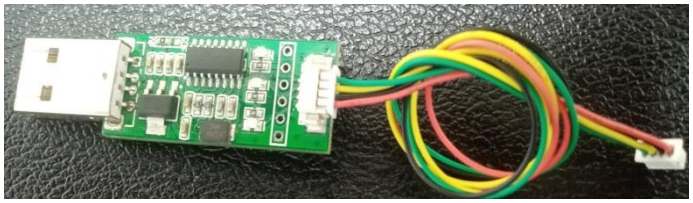
485 接线逻辑示意图
485 wiring logic diagram

(2) 、SFD串口屏支持5V/3.3V的供电电压，通讯电平逻辑为3.3V。

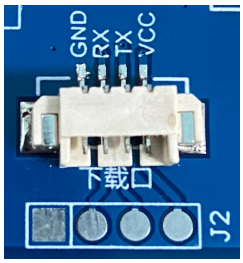
(2) The SFD serial port panel supports 5V/3.3V power supply voltage, and the communication level logic is 3.3V.

(3)、 由于下载工程的时候，需要使用另外的串口与sHMI上位机通信，使用如下TTL转USB的工具与电脑连接，并更新TTL工具的驱动，然后把线直接插入SFD的连接器即可。

(3) When downloading the project, it is necessary to use another serial port to communicate with the sHMI upper computer. Use the following TTL to USB tool to connect with the computer, update the driver of the TTL tool, and then directly insert the cable into the SFD connector.

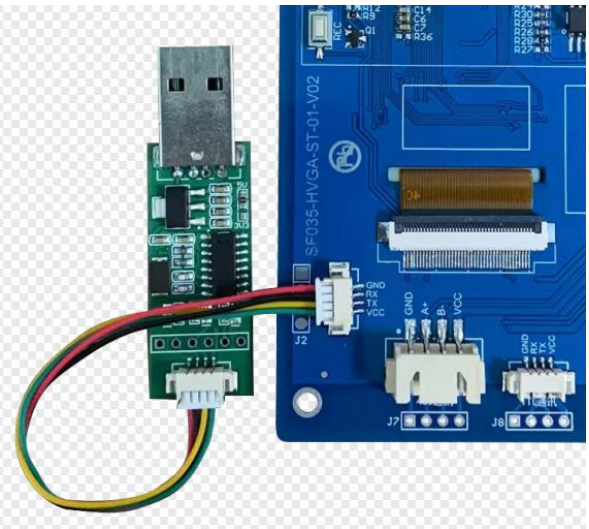


USB 转UART TTL 工具



SFD工程下载串口

USB to UART TTL tool SFD project download serial port



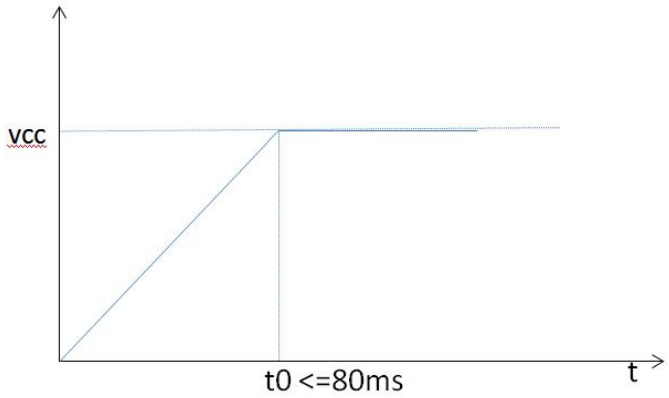
连接方法

Connection method

- 电源上电时序
- Power supply power-up sequence

电源给模块供电时，必须保证电压在 80ms 之内稳定在 5V/3.3V,如果不满足这个条件，模块有可能会出现概率性显示不正常的情况。

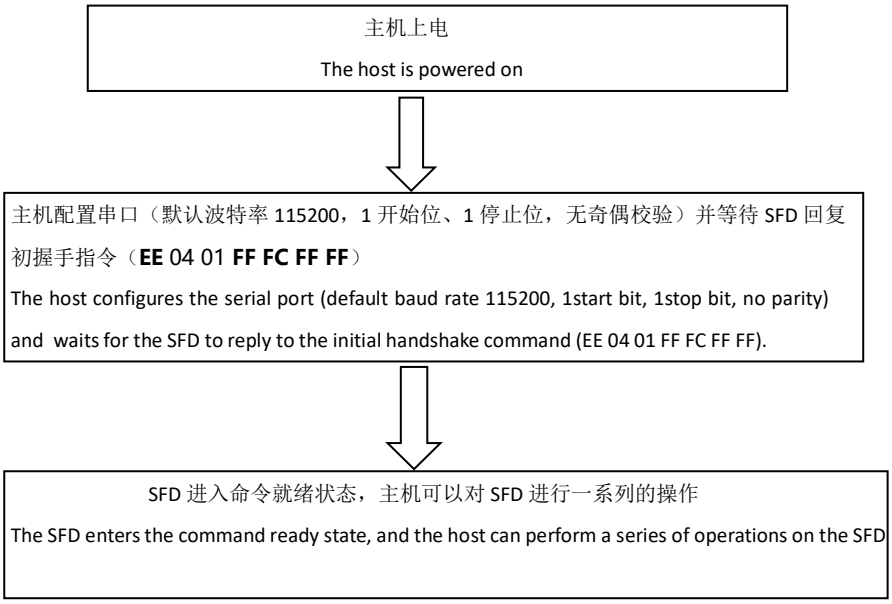
When the power supply supplies power to the module, the voltage must be stabilized at 5V/3.3V within 80ms. If this condition is not met, the module may have abnormal probability display.



- 软件上电流程
- Software power-on process

SFD串口屏上电后自动完成各个功能部件的初始化（LCD、FLASH等），SFD在完成初始化后，会给主控发送启动完成的指令，主控接收到完成指令后即可与SFD进行数据的交互，因此上电流程必须满足如下的条件：

After the SFD serial port screen is powered on, it will automatically complete the initialization of each functional component (LCD, FLASH, etc.). After the SFD completes the initialization, it will send the start completion command to the master control. After receiving the completion command, the master control can interact with the SFD. Therefore, the power-on process must meet the following conditions:



注意：当地址或者 CRC 校验功能被使能时，复位握手指令将是：
Note that when the address or CRC check function is enabled, the reset handshake command will be:
EE addrH addrL 04 01 CRCH CRCL FF FC FF FF

注意：如果上电后没有等待模块回复回来的握手指令，将有可能导致模块工作不正常。
Note: If there is no handshake instruction to wait for the module to reply after power-on, the module may not work properly.

- 存储器特性
- Memory characteristics

存储器类别 Memory class	参数类别 Parameter category	最小值 Minimum value	标准值 Standard value	最大值 Maximum value	单位 Unit
FLASH	字体/图片/其他 Font/Picture/Other	-	14	-	MB
	最大页数 Maximum number of pages	-	-	32	页 Page
	单页控件数量 Number of controls in a single page	-	-	36	个 A
	最大图片数量 Maximum number of pictures	-	-	128	张 Zhang
	最大字库数量 Maximum number of fonts	-	-	4	个 A
	图片可用储存算法 Picture available storage algorithm	裸数据解码 Bare data decoding			
RAM	指令缓冲区 Instruction buffer	-	-	128	字节 Byte
	最大字符数量 Maximum number of characters	-	-	128	字节 Byte

- 内置字体参数
- Built-in font parameters

字体类型 Font type	内置字号参数 Built-in font size parameter
中文字体 Chinese font	UTF-8 的多类型、多尺寸的字体 UTF-8 multi-type and multi-size font
英文字体 English font	
其他 Other	

- 支持软件
- Support Software

类型 Type	功能描述 Functional description	使用方式 How to use
sHMI.exe	界面 UI 生成和编辑、图片下载 Interface UI generation and editing, picture download	参考：SFD 指令集、SFD 应用文档、sHMI 软件使用说明 Reference: SFD instruction set, SFD application document, sHMI software instruction

- 内置功能
- Built-in features

功能类型 Function type	支持 Support	不支持 Not supported	功能类型 Function type	支持 Support	不支持 Not supported
中文字库 Chinese font library	√		超宽视角 Super wide viewing angle	√	
英文字库 English font library	√		图像功能 Image function	√	
横屏选择 Landscape selection	√		真彩显示 True color display	√	
画图功能 Drawing function	√		背光调节 Backlight adjustment	√	
控件功能 Control functionality	√		开机 LOGO Boot LOGO	√	
二维码显示 The QR Code shows	√		开机动画 Boot animation	√	
曲线功能 Curve function	√		蜂鸣器 Buzzer	√	
码表功能 Stopwatch	√		电阻触摸 Resistive	√	

function			touch		
环形进度条 Annular progress bar	√		485 接口 485 interface	√	

- **应用接口**
- **Application interface**

①、应用接口是SFD提供给用户控制及访问SFD内部资源的接口，用户接口有16进制串口指令集和用户函数2种。

① Application interface is the interface provided by SFD for users to control and access the internal resources of SFD. There are two kinds of user interfaces: hexadecimal serial instruction set and user function.

②、用户的主控串口波特率必须与SFD的一致，SFD的波特率可以通过sHMI中的“显示屏设置”菜单进行修改也可以通过应用接口进行修改，可修改的波特率为4800/9600/19200/38400/115200五种，其协议格式均为：1个停止位、8个数据位、无奇偶校验。

② . The baud rate of the main control serial port of the user must be consistent with that of the SFD. The baud rate of the SFD can be modified through the "Display Settings" menu in the sHMI or through the application interface. There are five baud rates that can be modified: 4800/9600/19200/38400/115200. The protocol format is: 1stop bit, 8 data bits, no parity.

③、SFD的串口指令集：

③ SFD serial port instruction set:

3.1 指令说明：

3.1 Instruction description:

3.1.1 SFD的指令有固定的帧头（0xEE）和帧尾（0xFF 0XFC 0xFF 0xFF）,如果帧头或者帧尾不对，SFD将无法正确的解析此指令。

3.1.1 The SFD instruction has a fixed frame header (0xEE) and a fixed frame trailer (0xFF 0xFC 0xFF 0xFF). If the frame header or trailer is incorrect, the SFD will not be able to parse the instruction correctly.

3.1.2 当指令参数大于1个字节，那么高字节在前、 低字节在后。指令允许的最大长度为1024字节(包含帧头和帧尾)。

3.1.2 When the instruction parameter is greater than 1 byte, the high byte comes first and the low byte comes last. The maximum length allowed for an instruction is 1024 bytes (including the header and trailer).

3.1.3 指令可带地址（485模式）、可带CRC_16校验，是否启用485模式和CRC16，将由sHMI在工程下载前设定。

3.1.3 The command can be checked with address (485 mode) and CRC _ 16. Whether to enable 485 mode and CRC16 will be set by sHMI before engineering download.

3.1.4 指令可带2个指令码，第一个码为主指令码、第二个为从指令码，部分控制指令只有主指令码而没有从指令码。

3.1.4 The instruction can have two instruction codes, the first one is the master instruction code, the second one is the slave instruction code, and some control instructions only have the master instruction code but not the slave instruction code.

3.1.5 按照不同的指令类型和地址以及CRC16的要求，有如下8种可能的格式：

3.1.5 There are 8 possible formats according to different instruction types and addresses and the requirements of CRC16:

无地址、无CRC_16校验、无从指令码的指令格式 Instruction format with no address, no CRC _ 16 check, no instruction code			
帧头 Frame header	主指令码 Master Instruction Code	指令参数 Command parameter	帧尾（4字节） Trailer (4 bytes)
0xEE	0xXX	0xXXX~0xYYY	**0xFF 0XFC 0xFF 0xFF**

无地址、有CRC_16校验、有从指令码的指令格式 Instruction format without address, with CRC _ 16 check, with slave instruction code					
帧头 Frame header	主指令码 Master Instruction Code	从指令码 Slave instruction code	指令参数 Command parameter	CRC16(2字节) CRC16 (2 bytes)	帧尾（4字节） Trailer (4 bytes)
0xEE	0xXX	0xYY	0xXXX~0xYYY	0xCCCC	0xFF 0XFC 0xFF 0xFF

无地址、无CRC_16校验、有从指令码的指令格式 Instruction format with no address, no CRC _ 16 check, and slave instruction code				
帧头 Frame header	主指令码 Master Instruction Code	从指令码 Slave instruction code	指令参数 Command parameter	帧尾（4字节） Trailer (4 bytes)
0xEE	0xXX	0xYY	0xXXX~0xYYY	**0xFF 0XFC 0xFF 0xFF**

有地址、无CRC_16校验、无从指令码的指令格式 Instruction format with address, no CRC _ 16 check, no instruction code					
帧头 Frame header	高地址 High address	低地址 Low address	主指令码 Master Instruction Code	指令参数 Command parameter	帧尾（4 字节） Trailer (4 bytes)
0xEE	0xHH	0xLL	0xXX	0xXXX~0xYYY	0xFF 0XFC 0xFF 0xFF

有地址、无CRC_16校验、有从指令码的指令格式 Instruction format with address, without CRC _ 16 check, with slave instruction code						
帧头 Frame header	高地址 High address	低地址 Low address	主指令码 Master Instruction Code	从指令码 Slave instruction code	指令参数 Command parameter	帧尾（4 字节） Trailer (4 bytes)
0xEE	0xHH	0xLL	0xXX	0xYY	0xXXX~0xYYY	0xFF 0XFC 0xFF 0xFF

有地址、有CRC_16校验、无从指令码的指令格式 Instruction format with address, CRC _ 16 check, and no instruction code						
帧头 Frame header	高地址 High address	低地址 Low address	主指令码 Master Instruction Code	指令参数 Command parameter	CRC16(2 字节) CRC16 (2 bytes)	帧尾（4 字节） Trailer (4 bytes)
0xEE	0xHH	0xLL	0xXX	0xXXX~0xYYY	0xCCCC	0xFF 0XFC 0xFF 0xFF

无地址、有CRC_16校验、无从指令码的指令格式 Instruction format with no address, CRC _ 16 check, and no instruction code				
帧头 Frame header	主指令码 Master Instruction Code	指令参数 Command parameter	CRC16(2字节) CRC16 (2 bytes)	帧尾（4字节） Trailer (4 bytes)
0xEE	0xXX	0xXXX~0xYYY	0xCCCC	0xFF 0XFC 0xFF 0xFF

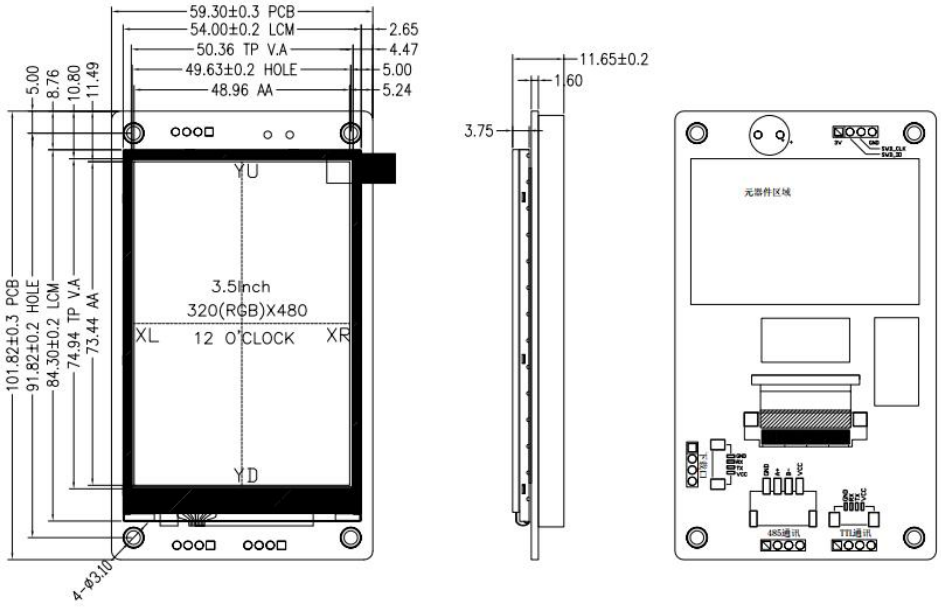
有地址、有CRC_16校验、有从指令码的指令格式 Instruction format with address, CRC _ 16 check and slave instruction code							
帧头 Frame header	高地址 High address	低地址 Low address	主指令码 Master Instruction Code	从指令码 Slave instruction code	指令参数 Command parameter	CRC16(2 字节) CRC16 (2 bytes)	帧尾（4 字节） Trailer (4 bytes)
0xEE	0xHH	0xLL	0xXX	0xYY	0xXXX~0xYYY	0xCCCC	0xFF 0XFC 0xFF 0xFF

3.2 指令详解：（请参照SFD应用文档）。

3.2 Instruction details: (please refer to the SFD application document).

- 可靠性测试
- Reliability testing

序号 Serial number	可靠性内容 Reliability content	数量 Quantity	测试条件 Test conditions	判断标准 Criteria for judgment
1	高温高湿性能 High temperature and high humidity performance	5	温度 70℃、湿度 85%的环境中放置240H，在常温常湿环境下放置2H后测定 It shall be placed for 240h in an environment with a temperature of 70 ℃ and a humidity of 85%, and measured after being placed for 2h in a normal temperature and humidity environment	外观无开裂、无结露、变色、腐蚀、明显变形；功能无缺笔、缺画，输入电流无异常。 The appearance shall be free of cracking, condensation, discoloration, corrosion and obvious deformation; There is no lack of pen and picture in the function, and the input current is normal.
2	高温性能 High temperature performance	5	温度 70℃的环境中放置240H，取出后 Place for 240H in an environment with a temperature of 70 ℃, and then take out 在常温常湿环境下放置2H后测定 Determine after being placed for 2 H in normal temperature and humidity environment	外观无开裂、无结露、变色、腐蚀、明显变形；功能无缺笔、缺画，输入电流无异常。 The appearance shall be free of cracking, condensation, discoloration, corrosion and obvious deformation; There is no lack of pen and picture in the function, and the input current is normal.
3	低温性能 Low temperature performance	5	温度-30℃的环境中放置240H,取出后 Place for 240H at -30 ℃, and take out 在常温常湿环境下放置 2H后测定 Determine after being placed for 2 H in normal	外观无开裂、无结露、变色、腐蚀、明显变形；功能无缺笔、缺画，输入电流无异常。 The appearance shall be free of cracking, condensation, discoloration,

			temperature and humidity environment	corrosion and obvious deformation; There is no lack of pen and picture in the function, and the input current is normal.
4	冷热冲击实验 Cold and hot shock test	5	调节试验槽温度做冷热冲击测试：70℃（30分钟）→温度下降到-20℃（5 分钟）→-30℃（30分钟）→温度上升到70℃（5 分钟）至此温度时间变化为一个循环（如下图）。累计测试 100 个循环， 试验结束后取出，在常温常湿环境下放置2H后测试。 Adjust the temperature of the test tank for cold and hot shock test: 70 ℃ (30 minutes) → the temperature drops to -20 ℃ (5 minutes) → -30 ℃ (30 minutes) → the temperature rises to 70 ℃ (5 minutes), and the time change of the temperature is a cycle (as shown in the figure below). Test for 100 cycles in total, take out after the test, and test after being placed for 2 H in a normal temperature and humidity environment.	外观无开裂、无结露、变色、腐蚀、明显变形；功能无缺笔、缺画，输入电流无异常。 The appearance shall be free of cracking, condensation, discoloration, corrosion and obvious deformation; There is no lack of pen and picture in the function, and the input current is normal.
5	ESD 测试 ESD test	5	空气放电+/-8KV Air discharge +/-8KV 接触放电+/-4KV Contact discharge +/-4KV 方法：四边及中心位置 10 次/点 Method: 10 times/point at four sides and central position	功能无缺笔、缺画，输入电流无异常。 There is no missing pen or picture in the function, and the input current is normal.

- **结构图纸**
- **Structural drawings**