Test platform introduction:

This set of STM32 test programs use the development board of the ALIENTEK, as follows:

Development board: MiniSTM32, Elite STM32, Explorer STM32F4, Apollo STM32F4/F7

MCU: STM32F103RCT6, STM32F103ZET6, STM32F407ZGT6, STM32F429IGT6

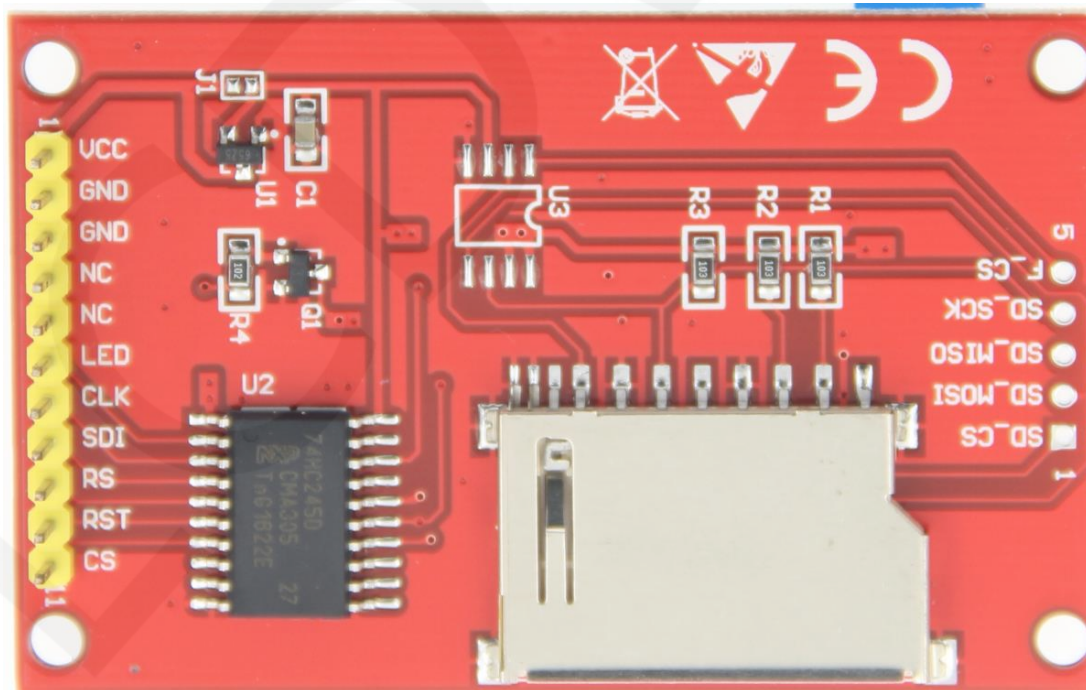(Corresponding to the above development boards)

Main frequency: 72M, 72M, 168M, 180M9 (Corresponding to the above MCU)

Crystal frequency: 8M, 8M, 8M, 25M (Corresponding to the above MCU)

These four types of development boards have similar functions, but there are differences in the main frequency and performance, and have no effect on running the test program.

Wiring instructions:

Because the pin positions of different development boards are different, and the external pins are reserved differently (some development boards do not have externally required pins). In order to facilitate wiring, the wiring pins of each development board are inconsistent. The specific wiring instructions are shown in the table below:

Picture1. Pin silkscreen picture

STM32F103RCT6 microcontroller test program wiring instructions

Number	Module Pin	Corresponding to MiniSTM32 development board wiring pin	Remarks
1	VCC	5V/3.3V	LCD power supply positive pin
2	GND	GND	LCD Power ground pin pin
3	GND	GND	LCD Power ground pin pin
4	NC	no need to connect	Not defined, reserved
5	NC	no need to connect	Not defined, reserved
6	LED	PB9	LCD backlight control signal (high level lighting, if you do not need control, please connect 5V/3.3V)
7	CLK	PB13	LCD SPI bus clock pin
8	SDI	PB15	LCD SPI bus write data pin
9	RS	PB10	LCD data / command selection control pin (low level: command; high level: data)
10	RST	PB12	LCD reset control pin (reset at low level)
11	CS	PB11	LCD chip select control pin (enabled at low level)

STM32F103ZET6 microcontroller test program wiring instructions

Number	Module Pin	Corresponding to Elite STM32 development board wiring pin	Remarks
1	VCC	5V/3.3V	LCD power supply positive pin
2	GND	GND	LCD Power ground pin pin
3	GND	GND	LCD Power ground pin pin
4	NC	no need to connect	Not defined, reserved
5	NC	no need to connect	Not defined, reserved

6	**LED**	PB9	LCD backlight control signal (high level lighting, if you do not need control, please connect 5V/3.3V)
7	**CLK**	PB13	LCD SPI bus clock pin
8	**SDI**	PB15	LCD SPI bus write data pin
9	**RS**	PB10	LCD data / command selection control pin (low level: command; high level: data)
10	**RST**	PB12	LCD reset control pin (reset at low level)
11	**CS**	PB11	LCD chip select control pin (enabled at low level)

STM32F407ZGT6 microcontroller test program wiring instructions			
Number	**Module Pin**	**Corresponding to Explorer STM32F4 development board wiring pin**	**Remarks**
1	**VCC**	5V/3.3V	LCD power supply positive pin
2	**GND**	GND	LCD Power ground pin pin
3	**GND**	GND	LCD Power ground pin pin
4	**NC**	no need to connect	Not defined, reserved
5	**NC**	no need to connect	Not defined, reserved
6	**LED**	PB13	LCD backlight control signal (high level lighting, if you do not need control, please connect 5V/3.3V)
7	**CLK**	PB3	LCD SPI bus clock pin
8	**SDI**	PB5	LCD SPI bus write data pin
9	**RS**	PB14	LCD data / command selection control pin (low level: command; high level: data)
10	**RST**	PB12	LCD reset control pin (reset at low level)
11	**CS**	PB15	LCD chip select control pin (enabled at low level)

STM32F429IGT6 microcontroller test program wiring instructions			
Number	**Module Pin**	**Corresponding to Apollo STM32F4/F7 development board wiring pin**	**Remarks**
1	VCC	5V/3.3V	LCD power supply positive pin
2	GND	GND	LCD Power ground pin pin
3	GND	GND	LCD Power ground pin pin
4	NC	no need to connect	Not defined, reserved
5	NC	no need to connect	Not defined, reserved
6	LED	PD6	LCD backlight control signal (high level lighting, if you do not need control, please connect 5V/3.3V)
7	CLK	PF7	LCD SPI bus clock pin
8	SDI	PF9	LCD SPI bus write data pin
9	RS	PD5	LCD data / command selection control pin (low level: command; high level: data)
10	RST	PD12	LCD reset control pin (reset at low level)
11	CS	PD11	LCD chip select control pin (enabled at low level)

Description:

1. When manually wiring, reduce the occupied IO port of the development board as follows:

    A. When the SPI multiplexed chip is not selected, ground the **CS** pin of the module to save 1 IO port;

    B. When the backlight is not needed, connect the module **LED** pin to 5V or 3.3V, saving 1 IO port;

    C. Connect the **RST** pin of the module to the reset end of the MCU to save 1 IO port;

2. Short-circuit the J1 pad on the PCB backplane, then **VCC** is connected with 3.3V

voltage at this time. Never connect it to 5V, it will burn out;

3. After the module **VCC** and **GND** are connected, the **LED** pin is connected to 3.3V/5V or high level, and the backlight is normally lit to prove that the backlight is normal;

Demo function description:

1. This test program contains four test procedures for STM32 MCU, namely: STM32F103RCT6, STM32F103ZET6, STM32F407ZGT6, STM32F429IGT6;

2. Each MCU test program includes two functional tests: software SPI and hardware SPI;

3. When using the software SPI function or hardware SPI function of each MCU, the wiring pin definition is the same, but the initialization is different;

4. Please follow the above wiring instructions to find the corresponding development board and MCU for wiring;

5. This set of tests supports display switching in four directions. For details, see the display direction switching instructions.

6. This set of test procedures contains the following test items:

    A. the main interface display test

    B. simple brush test;

    C. rectangular drawing and filling test;

    D. circular drawing and filling test;

    E. triangle drawing and filling test;

    F. English display test;

    G. Chinese display test;

    H. picture display test;

    I. rotating display test;

Display direction switching instructions:

Find the macro definition USE_HORIZONTAL in lcd.h as shown below:

```
//////////////////////////////////////用户配置区//////////////////////////////////////
#define USE_HORIZONTAL    0//定义液晶屏顺时针旋转方向  0-0度旋转，1-90度旋转，2-180度旋转，3-270度旋转
```

USE_HORIZONTAL   0   //0°Rotate

USE_HORIZONTAL   1   //90°Rotate

USE_HORIZONTAL   2   //180°Rotate

USE_HORIZONTAL   3   //270°Rotate