1. Introduction to Testing Platform

Development board: STM32F103C8T6, MiniSTM32, Elite STM32, Explorer STM32F4,

Apollo STM32F4/F7

MCU: STM32F103C8T6, STM32F103RCT6, STM32F103ZET6, STM32F407ZGT6,

STM32F429IGT6, STM32F767IGT6、STM32H743IIT6

Frequency: 72MHz、72MHz、72MHz、168MHz、180MHz、216MHz、400MHz

(Corresponding to the above MCU)

2. Pin connection instructions

This display module can be directly plugged into the STM32F103C8T6 development

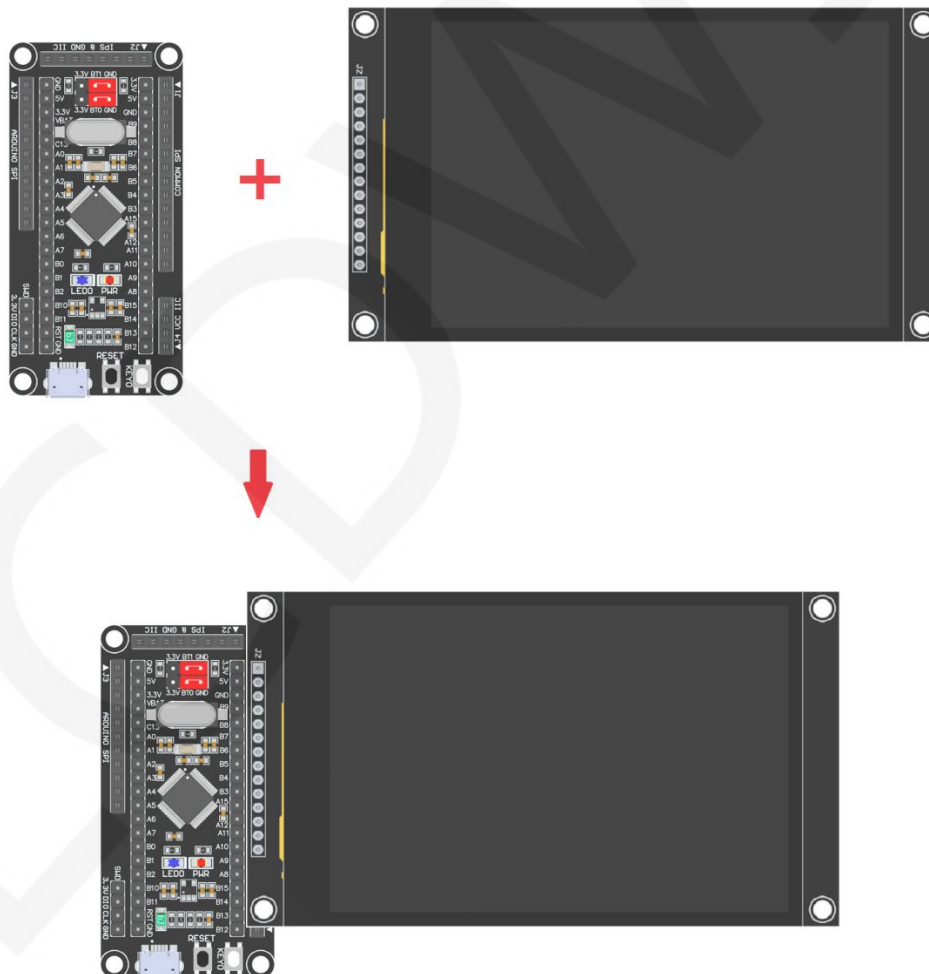board, and can only be connected to other development boards through DuPont cables.

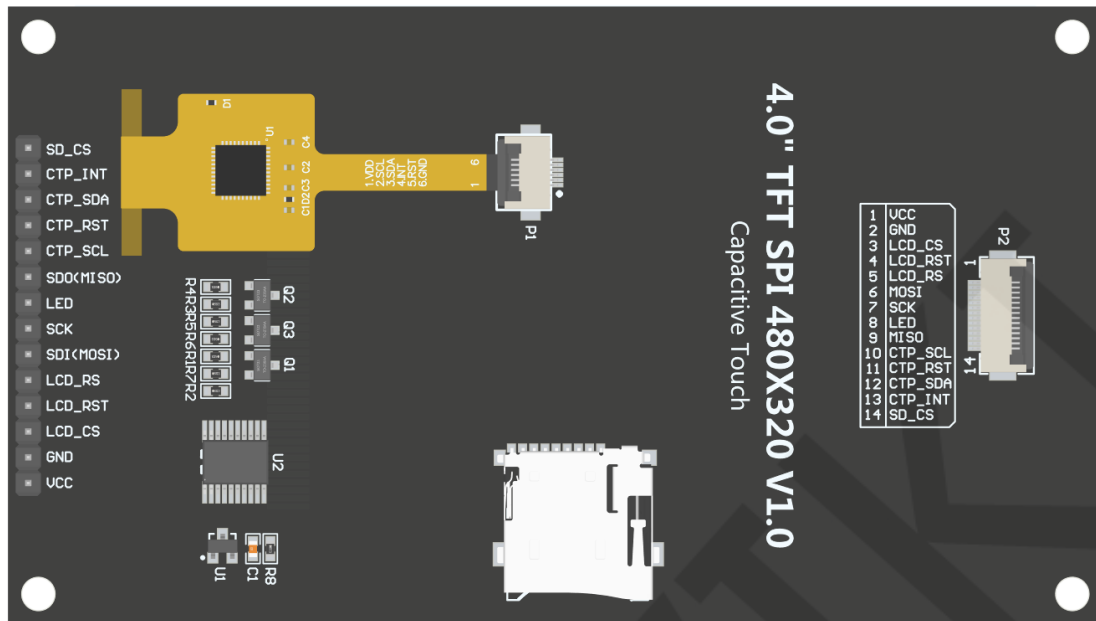**Figure 1: Module Inline STM32F103C8T6 Development Board**

Figure 2 Module Back Pins

Number	Module pins	Corresponding STM32F103 development board wiring pins	Remarks
		STM32F103C8T6 Test Program Pin Direct Insertion Instructions	
1	**VCC**	5V	LCD power positive
2	**GND**	GND	LCD Power ground
3	**LCD_CS**	PB9	LCD selection control signal, Low level active
4	**LCD_RST**	PB8	LCD reset control signal, Low level reset
5	**LCD_RS**	PB7	LCD command / data selection control signal High level: data, low level: command
6	**SDI(MOSI)**	PA7	SPI bus write data signal(SD card and LCD screen used together)
7	**SCK**	PA5	SPI bus clock signal(SD card and LCD screen used together)
8	**LED**	PB6	LCD backlight control signal (If you need control, please connect the pins. If you don't need control, you can skip it)
9	**SDO(MISO)**	PA6	SPI bus read data signal (SD card and LCD screen used together)

10	CTP_SCL	PB5	Capacitive touch screen IIC bus clock signal (modules without touch screens do not need to be connected)
11	CTP_RST	PA10	Capacitor touch screen reset control signal, low-level reset (modules without touch screens do not need to be connected)
12	CTP_SDA	PA9	Capacitive touch screen IIC bus data signal (modules without touch screens do not need to be connected)
13	CTP_INT	PA8	Capacitor touch screen IIC bus touch interrupt signal, when generating touch, input low level to the main control (modules without touch screens do not need to be connected)
14	SD_CS	NC	SD card selection control signal, low level active (without SD card function, can be disconnected)

STM32F103RCT6 microcontroller test program wiring instructions			
Number	**Module Pin**	**Corresponding to MiniSTM32 development board wiring pin**	**Remarks**
1	VCC	5V	LCD power positive
2	GND	GND	LCD Power ground
3	LCD_CS	PB11	LCD selection control signal, Low level active
4	LCD_RST	PB12	LCD reset control signal, Low level reset
5	LCD_RS	PB10	LCD command / data selection control signal High level: data, low level: command
6	SDI(MOSI)	PB15	SPI bus write data signal(SD card and LCD screen used together)
7	SCK	PB13	SPI bus clock signal(SD card and LCD screen used together)
8	LED	PB9	LCD backlight control signal (If you need control, please connect the pins. If you don't need control, you can skip it)
9	SDO(MISO)	PB14	SPI bus read data signal (SD card and

			LCD screen used together)
10	**CTP_SCL**	PC0	Capacitive touch screen IIC bus clock signal (modules without touch screens do not need to be connected)
11	**CTP_RST**	PC13	Capacitor touch screen reset control signal, low-level reset (modules without touch screens do not need to be connected)
12	**CTP_SDA**	PC3	Capacitive touch screen IIC bus data signal (modules without touch screens do not need to be connected)
13	**CTP_INT**	PC10	Capacitor touch screen IIC bus touch interrupt signal, when generating touch, input low level to the main control (modules without touch screens do not need to be connected)
14	**SD_CS**	NC	SD card selection control signal, low level active (without SD card function, can be disconnected)

STM32F103ZET6 microcontroller test program wiring instructions			
Number	**Module Pin**	**Corresponding to Elite STM32 development board wiring pin**	**Remarks**
1	**VCC**	5V	LCD power positive
2	**GND**	GND	LCD Power ground
3	**LCD_CS**	PB11	LCD selection control signal, Low level active
4	**LCD_RST**	PB12	LCD reset control signal, Low level reset
5	**LCD_RS**	PB10	LCD command / data selection control signal High level: data, low level: command
6	**SDI(MOSI)**	PB15	SPI bus write data signal(SD card and LCD screen used together)
7	**SCK**	PB13	SPI bus clock signal(SD card and LCD screen used together)
8	**LED**	PB9	LCD backlight control signal (If you need control, please connect the pins. If you don't need control, you can skip it)

9	SDO(MISO)	PB14	SPI bus read data signal (SD card and LCD screen used together)
10	CTP_SCL	PC0	Capacitive touch screen IIC bus clock signal (modules without touch screens do not need to be connected)
11	CTP_RST	PC13	Capacitor touch screen reset control signal, low-level reset (modules without touch screens do not need to be connected)
12	CTP_SDA	PC3	Capacitive touch screen IIC bus data signal (modules without touch screens do not need to be connected)
13	CTP_INT	PC10	Capacitor touch screen IIC bus touch interrupt signal, when generating touch, input low level to the main control (modules without touch screens do not need to be connected)
14	SD_CS	NC	SD card selection control signal, low level active (without SD card function, can be disconnected)

STM32F407ZGT6 microcontroller test program wiring instructions			
Number	**Module Pin**	**Corresponding to Explorer STM32F4 development board wiring pin**	**Remarks**
1	VCC	5V	LCD power positive
2	GND	GND	LCD Power ground
3	LCD_CS	PB15	LCD selection control signal, Low level active
4	LCD_RST	PB12	LCD reset control signal, Low level reset
5	LCD_RS	PB14	LCD command / data selection control signal High level: data, low level: command
6	SDI(MOSI)	PB5	SPI bus write data signal(SD card and LCD screen used together)
7	SCK	PB3	SPI bus clock signal(SD card and LCD screen used together)
8	LED	PB13	LCD backlight control signal (If you need

|			control, please connect the pins. If you don't need control, you can skip it)
9	SDO(MISO)	PB4	SPI bus read data signal (SD card and LCD screen used together)
10	CTP_SCL	PB0	Capacitive touch screen IIC bus clock signal (modules without touch screens do not need to be connected)
11	CTP_RST	PC5	Capacitor touch screen reset control signal, low-level reset (modules without touch screens do not need to be connected)
12	CTP_SDA	PF11	Capacitive touch screen IIC bus data signal (modules without touch screens do not need to be connected)
13	CTP_INT	PB1	Capacitor touch screen IIC bus touch interrupt signal, when generating touch, input low level to the main control (modules without touch screens do not need to be connected)
14	SD_CS	NC	SD card selection control signal, low level active (without SD card function, can be disconnected)

STM32F429IGT6 microcontroller test program wiring instructions			
Number	Module Pin	Corresponding to Apollo STM32F4/F7 development board wiring pin	Remarks
1	VCC	5V	LCD power positive
2	GND	GND	LCD Power ground
3	LCD_CS	PD11	LCD selection control signal, Low level active
4	LCD_RST	PD12	LCD reset control signal, Low level reset
5	LCD_RS	PD5	LCD command / data selection control signal High level: data, low level: command
6	SDI(MOSI)	PF9	SPI bus write data signal(SD card and LCD screen used together)
7	SCK	PF7	SPI bus clock signal(SD card and LCD screen used together)

8	**LED**	PD6	LCD backlight control signal (If you need control, please connect the pins. If you don't need control, you can skip it)
9	SDO(MISO)	PF8	SPI bus read data signal (SD card and LCD screen used together)
10	**CTP_SCL**	PH6	Capacitive touch screen IIC bus clock signal (modules without touch screens do not need to be connected)
11	**CTP_RST**	PI8	Capacitor touch screen reset control signal, low-level reset (modules without touch screens do not need to be connected)
12	**CTP_SDA**	PI3	Capacitive touch screen IIC bus data signal (modules without touch screens do not need to be connected)
13	**CTP_INT**	PH11	Capacitor touch screen IIC bus touch interrupt signal, when generating touch, input low level to the main control (modules without touch screens do not need to be connected)
14	**SD_CS**	NC	SD card selection control signal, low level active (without SD card function, can be disconnected)

STM32F767IGT6,STM32H743IIT6 microcontroller test program wiring instructions			
Number	**Module Pin**	**Corresponding to Apollo STM32F4/F7 development board wiring pin**	**Remarks**
1	**VCC**	5V	LCD power positive
2	**GND**	GND	LCD Power ground
3	**LCD_CS**	PD11	LCD selection control signal, Low level active
4	**LCD_RST**	PD12	LCD reset control signal, Low level reset
5	**LCD_RS**	PD5	LCD command / data selection control signal High level: data, low level: command
6	**SDI(MOSI)**	PB15	SPI bus write data signal(SD card and LCD screen used together)
7	**SCK**	PB13	SPI bus clock signal(SD card and LCD

			screen used together)
8	**LED**	PD6	LCD backlight control signal (If you need control, please connect the pins. If you don't need control, you can skip it)
9	**SDO(MISO)**	PB14	SPI bus read data signal (SD card and LCD screen used together)
10	**CTP_SCL**	PH6	Capacitive touch screen IIC bus clock signal (modules without touch screens do not need to be connected)
11	**CTP_RST**	PI8	Capacitor touch screen reset control signal, low-level reset (modules without touch screens do not need to be connected)
12	**CTP_SDA**	PI3	Capacitive touch screen IIC bus data signal (modules without touch screens do not need to be connected)
13	**CTP_INT**	PH11	Capacitor touch screen IIC bus touch interrupt signal, when generating touch, input low level to the main control (modules without touch screens do not need to be connected)
14	**SD_CS**	NC	SD card selection control signal, low level active (without SD card function, can be disconnected)

3. Demo Function Description

This testing program includes 7 MCU testing programs including STM32F103C8T6, STM32F103RCT6, STM32F103ZET6, STM32F407ZGT6, STM32F429IGT6, STM32F767IGT6, STM32H743IIT6. Each MCU testing program includes two functions: software SPI and hardware SPI, which are located in **Demo_STM32** directory, as shown in the following figure:
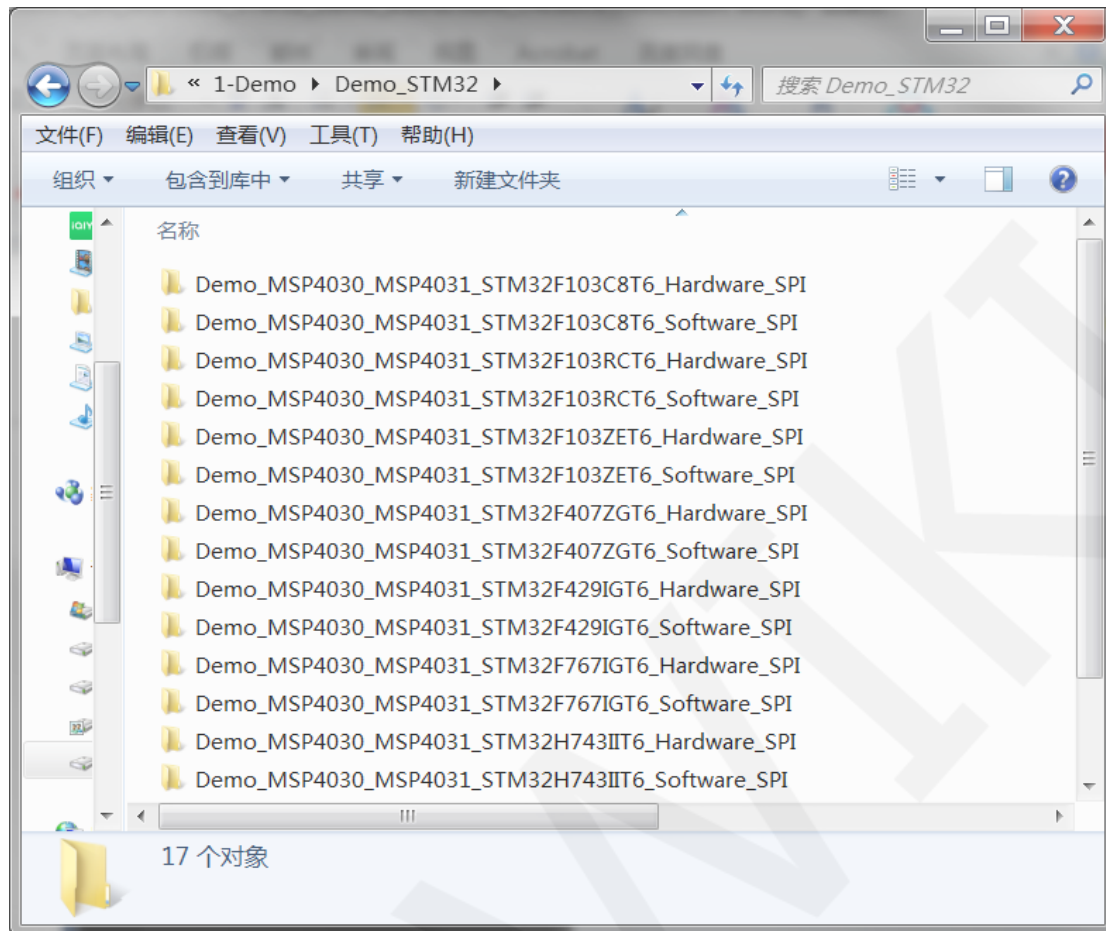
✧ **Description of sample program content**

    A. Main interface display;

    B. Read the display screen ID and GRAM color values;

    C. Simple screen swiping;

    D. Drawing and filling of rectangles;

    E. Draw and fill a circle;

    F. Triangle drawing and filling;

    G. English display;

    H. Chinese display;

    I. Image display;

    J. Dynamic digital display;

    K. Rotating display;

    L. Capacitive touch screen (including touch buttons and handwritten lines);

✧ **Example program display direction switching instructions**

Found macro definition **USE_HORIZONTAL** in **LCD. h**, as shown in the following:

```
/////////////////////////////////////////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

4. Demo Usage Instructions

✧ **Installing development tool software**

Firstly, you need to install the development tool software, which uses Keil5.

Please refer to the online download and installation methods for yourself.

✧ **Installing Device Library**

After the successful installation of the tool software, it is necessary to install

several MCU device libraries, otherwise the project cannot be established, and

compilation and download cannot be carried out. Please consult online for the

installation method of the device library.

✧ **Compiling Programs**

After the library installation is completed, open the **PROJECT** directory under the

sample program, locate the **uvprojx** file, double-click to open the sample project, as

shown in the following figure:
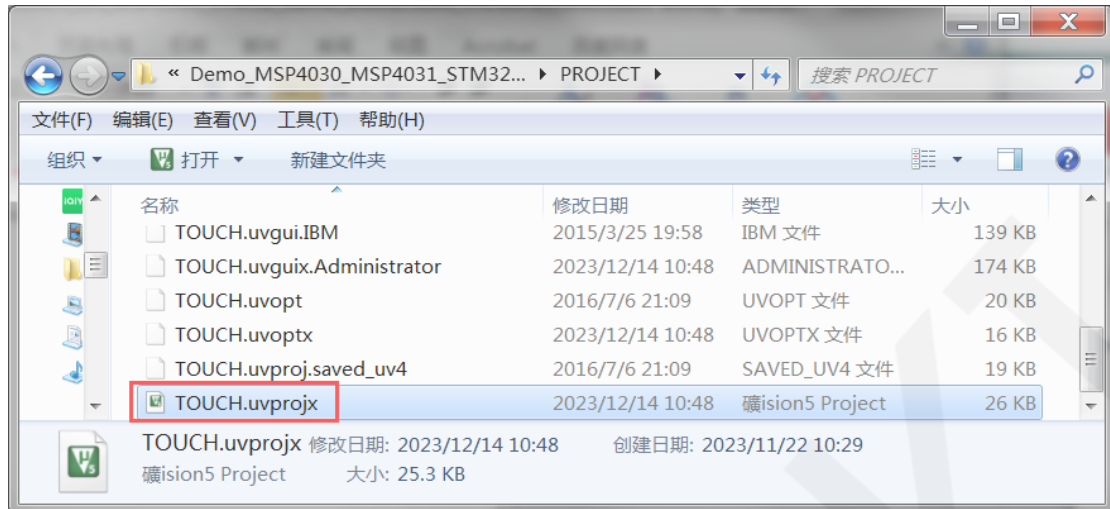
After opening the sample project, you can make modifications to the project code (or not). After the modifications are completed, click the compile button to compile the code. The following prompt appears, indicating successful compilation, as shown in the following figure:
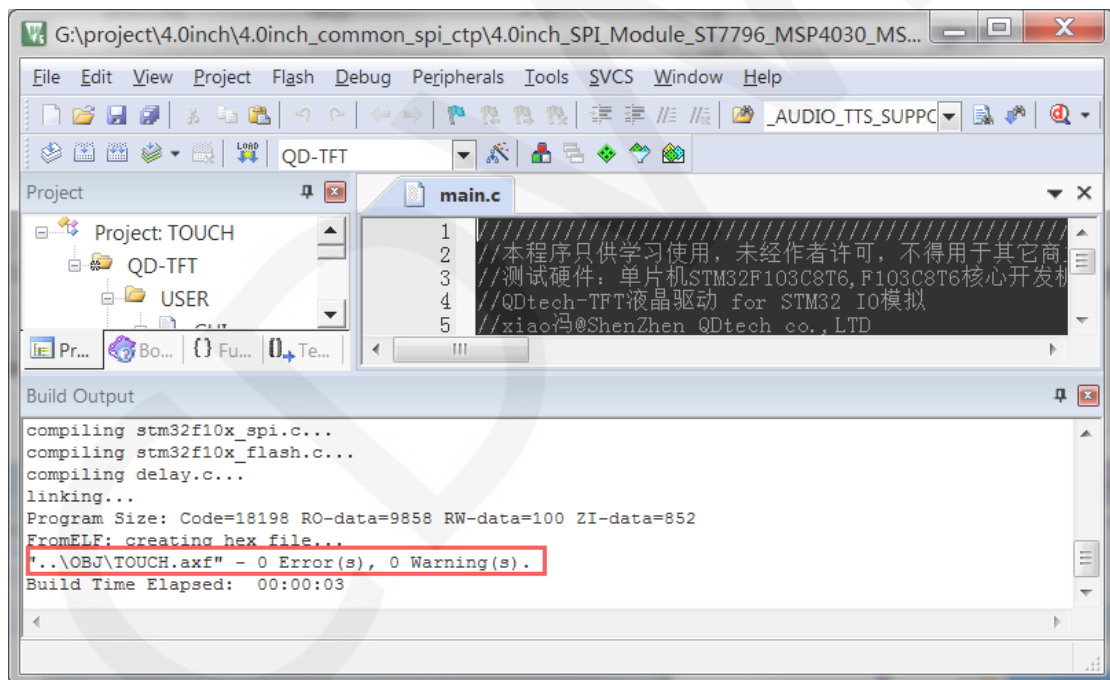

✧ Download and Run Programs

The development board supports SWD download and Jlink download

Here is an introduction to Jlink download. For other download methods, please refer to the documentation in the development board documentation package or consult the internet.

The steps for downloading Jlink are as follows (using the STM32F103RCT6 development board as an example):

A. After the program compilation is completed, proceed with the program download. First, connect **JTAG** to the computer and development board, click on the **magic wand icon** ->**Debug** ->**drop-down menu**, and select **J-LINK/J-TRACE Cortex**, as shown in the following figure:
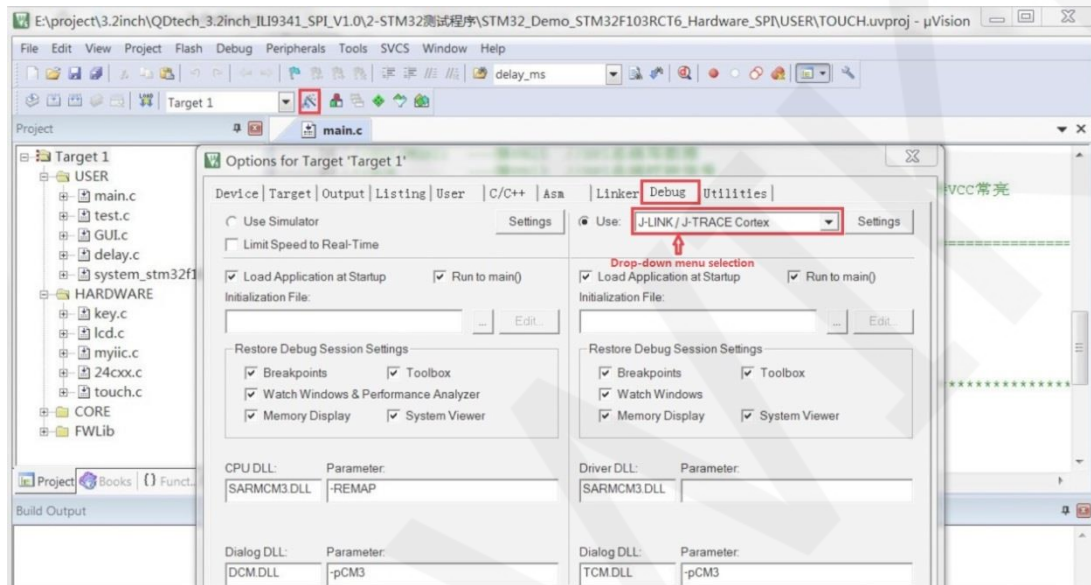
B. Click on **Settings** again, set ort to **SW** and Max to **2MHz**, as shown in the following:
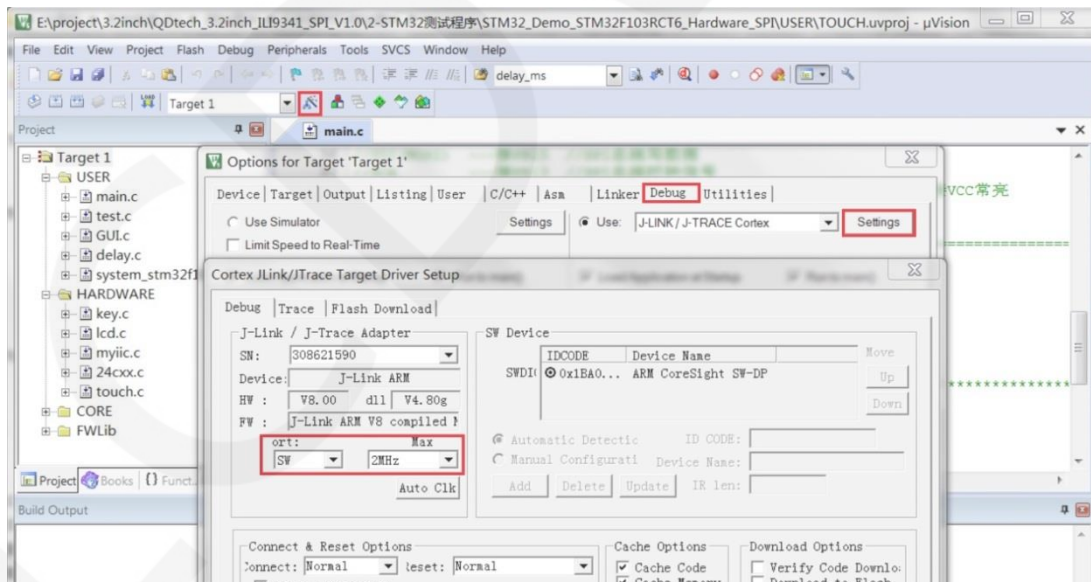
C. Select the microcontroller model, click on the **magic wand icon** ->**Device** ->select the **STM32F103RC** microcontroller model, as shown in the following figure:
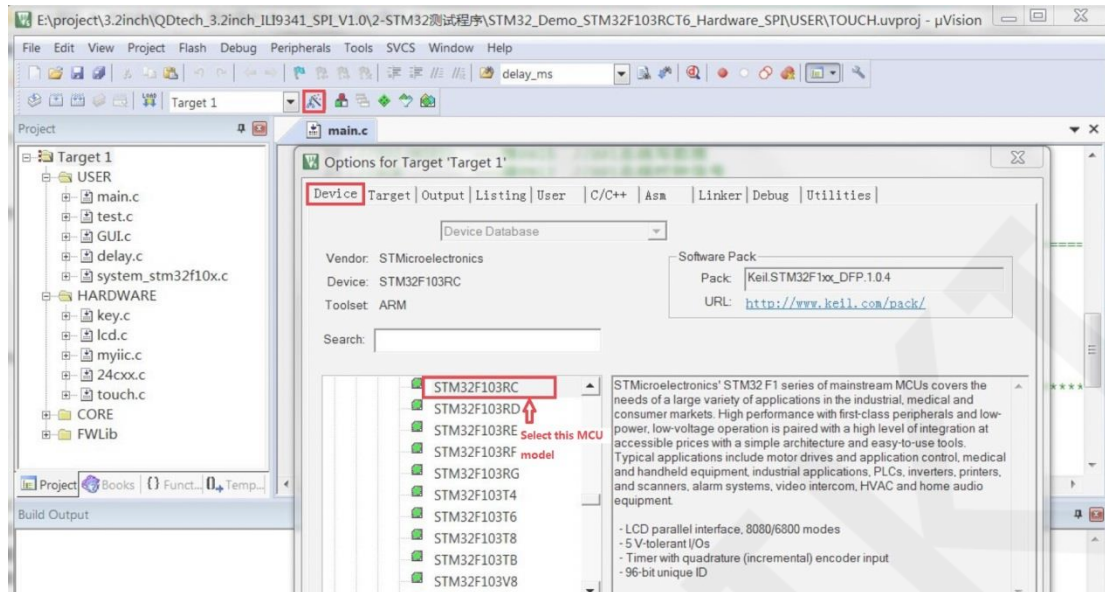
D. Select the flash model (if selected, please ignore it), click

Utilities>**Settings**>**Add**>select **STM32F10x High density Flash** ->**Add**, as

shown in the following figure:
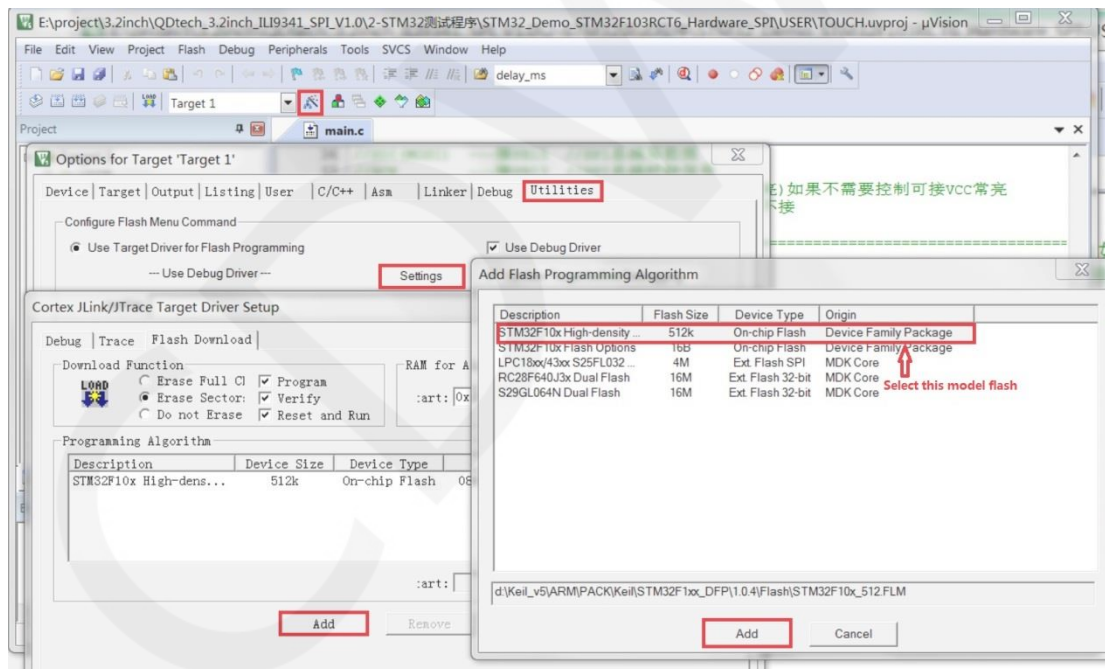
E. After setting up both JTAG and flash, the program can be downloaded. Download

the program, click the **download** button, and download the hex file to the

development board. If the prompt "**Programming Done. Verify OK.**" appears, it

indicates successful download, as shown in the following figure:
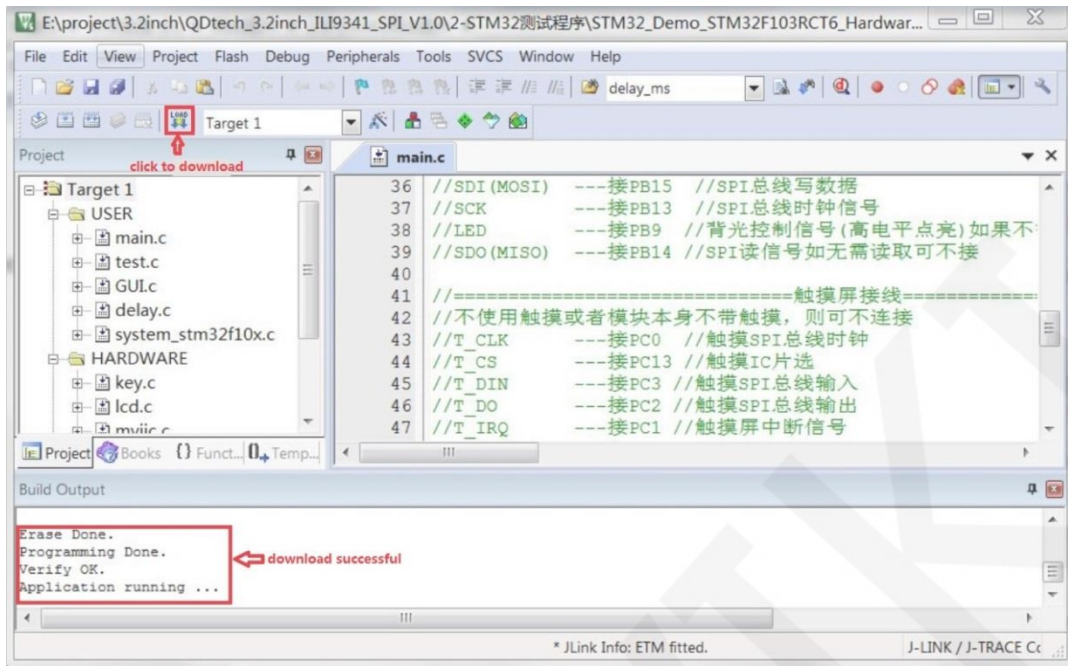
F. After the program is successfully downloaded, if the module does not respond, you need to press the reset button or power off and restart to run normally. If you want the program to automatically run after successful download, you need to press the following settings:

Click on the **magic wand icon** ->**Utilities** ->**Settings** ->check **Reset and run**, as shown in the following figure:
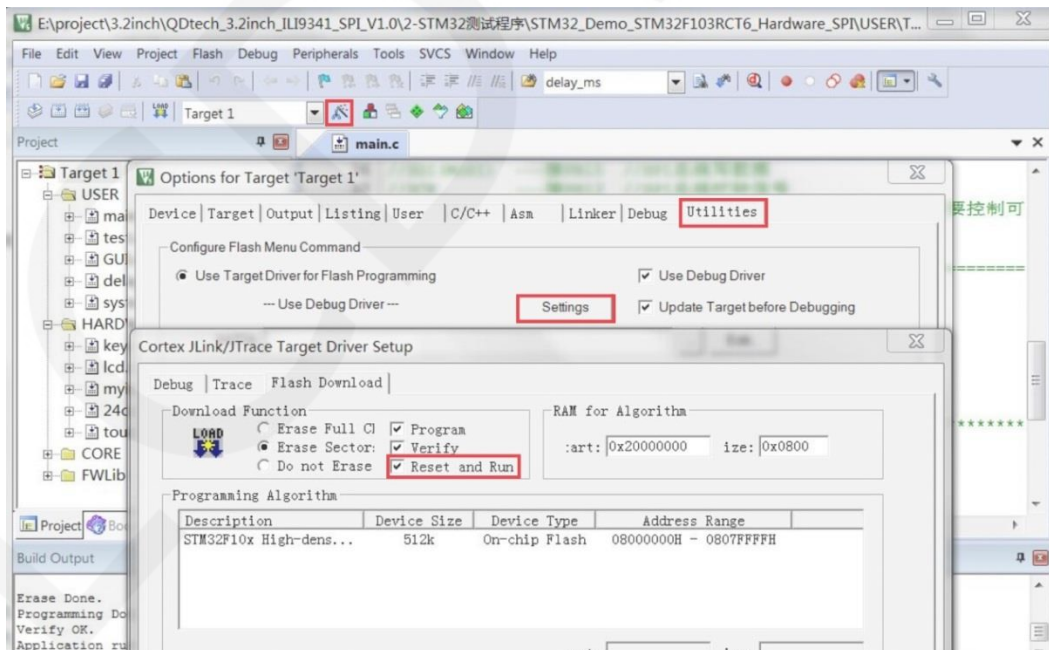
G. If the display module displays characters and graphics normally, it indicates that the program has run successfully.

NOTE:

A. When downloading the program, if the following error occurs, it indicates that the JTAG setting is incorrect. Please follow step B to set it:
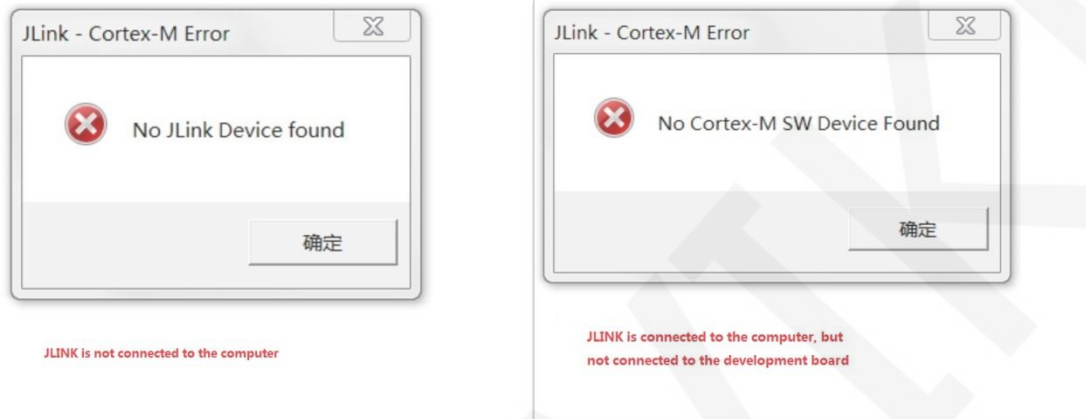
B. If the following error occurs, it indicates that the flash setting is incorrect. Please follow step D to set it: