Test platform introduction:

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

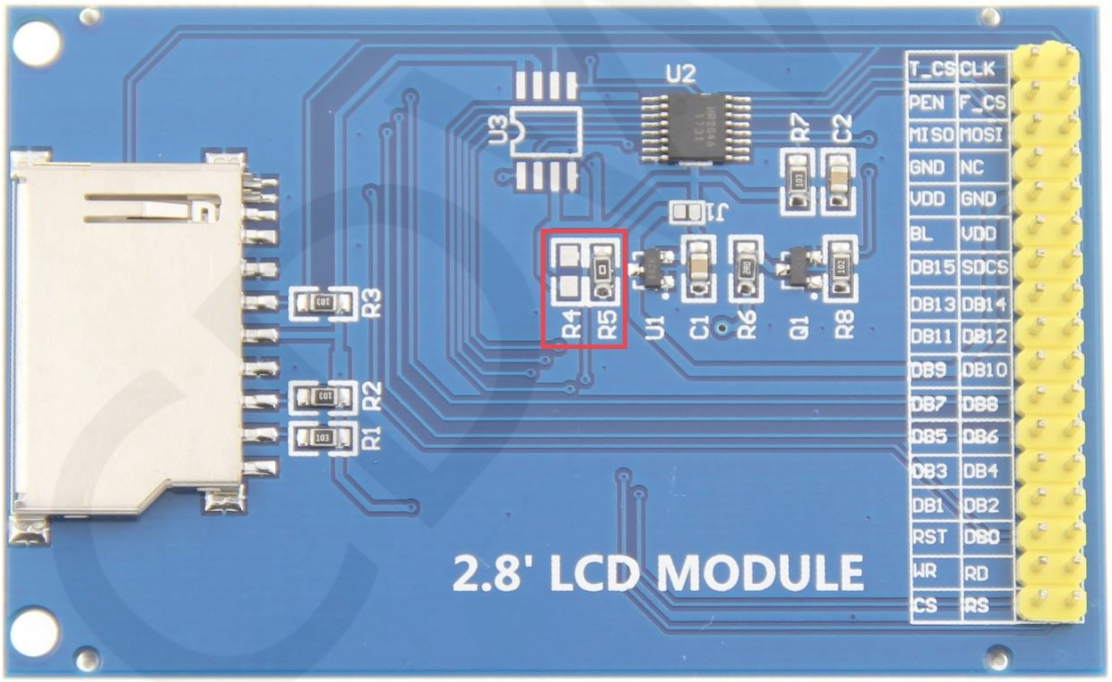
Development board: MiniSTM32, Elite STM32, Explorer STM32F4, Apollo STM32F4/F7

MCU: STM32F103RCT6, STM32F103ZET6, STM32F407ZGT6, STM32F429IGT6, STM32F767IGT6, STM32H743IIT6

Main frequency: 72MHz, 72MHz, 168MHz, 180MHz,216MHz,400MHz (Corresponding to the above MCU)

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

Wiring instructions:



Picture1. Module Pin silk screen picture

Note:

1. **The module hardware supports 8-bit and 16-bit parallel port data bus mode switching (as shown by the red box in Picture 1 above), as**

follows:

A. Solder R5: Select 16-bit parallel port data bus mode, use DB0~DB15 data pins

B. Solder R4: Select 8-bit parallel port data bus mode, use DB8~DB15 data pins

2. This module can be directly inserted into the TFTLCD slot of the punctual atom development board, without manual wiring;

Important Note:

1. The following pin numbers 1~34 are the pin number of Module pin with PCB backplane of our company. If you purchase a bare screen, please refer to the pin definition of the bare screen specification, refer to the wiring according to the signal type instead of directly Wire according to the following module pin numbers. For example: CS is 1 pin on our module. It may be x pin on different size bare screen. The following wiring instructions tell you that the CS signal is plugged into the CS pin of the TFTLCD slot.
2. About VCC supply voltage: If you buy a module with PCB backplane, VCC/VDD power supply can be connected to 5V or 3.3V (module has integrated ultra low dropout 5V to 3V circuit), but it is recommended to connect 3.3V, because connecting 5V will lead to circuit Increased heat generation, affecting module life; if you buy a bare screen LCD, remember to only connect 3.3V.
3. About the backlight voltage: The module with the PCB backplane has integrated the triode backlight control circuit, and only needs to input the high level of the BL pin or the PWM wave to illuminate the backlight. If you are buying a bare screen, the LEDAx is connected to 3.0V-3.3V, and the LEDKx can be grounded.
4. The following internal plug-in pins of the corresponding MCU refer

to the MCU pins directly connected to the TFTLCD slot inside the development board, only for reference.

MiniSTM32 development board TFTLCD socket in-line instructions				
Number	**Module Pin**	**Corresponding TFTLCD socket pin**	**Corresponding to STM32F103RCT6 microcontroller internal connection pin**	**Remarks**
1	**CS**	CS	PC9	LCD reset control pin(low level enable)
2	**RS**	RS	PC8	LCD register / data selection control pin
3	**WR**	WR	PC7	LCD write control pin
4	**RD**	RD	PC6	LCD read control pin
5	**RST**	RST	PC4	LCD reset control pin(low level reset)
6	**DB0**	D0	PB0	LCD data bus low 8-bit pin(If 8-bit mode is selected, the lower 8-bit data pins are not used)
7	**DB1**	D1	PB1	
8	**DB2**	D2	PB2	
9	**DB3**	D3	PB3	
10	**DB4**	D4	PB4	
11	**DB5**	D5	PB5	
12	**DB6**	D6	PB6	
13	**DB7**	D7	PB7	
14	**DB8**	D8	PB8	LCD data bus high 8-bit pin
15	**DB9**	D9	PB9	
16	**DB10**	D10	PB10	
17	**DB11**	D11	PB11	
18	**DB12**	D12	PB12	
19	**DB13**	D13	PB13	
20	**DB14**	D14	PB14	
21	**DB15**	D15	PB15	
22	**SDCS**	Not used	GND	SD card selection control pin

				(used when using the SD card expansion function, this test program is not used)
23	**BL**	BL	PC10	LCD backlight control pin(High level light)
24	**VDD**	3.3	3.3V	Module power positive pin (module has integrated voltage regulator IC, so the power supply can be connected to 5V or 3.3V)
25	**VDD**	3.3	3.3V	
26	**GND**	GND	GND	Module power ground pin
27	**GND**	GND	GND	
28	**NC**	Not used	5V	LCD backlight power positive pin (default shared onboard backlight power supply, this pin can not be connected)
29	**MISO**	MISO	PC2	Touch screen SPI bus data input pin
30	**MOSI**	MOSI	PC3	Touch screen SPI bus data output pin
31	**PEN**	PEN	PC1	Touch screen interrupt detection pin(Low level when a touch occurs)
32	**F_CS**	Not used	NC	Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	**T_CS**	TCS	PC13	Touch screen IC chip select control pin(Low level enable)
34	**CLK**	CLK	PC0	Touch screen SPI bus clock control pin

Elite STM32 development board TFTLCD socket in-line instructions				
Number	**Module Pin**	**Corresponding TFTLCD socket pin**	**Corresponding to STM32F103ZET6 microcontroller internal connection pin**	**Remarks**
1	**CS**	CS	PG12	LCD reset control pin(low level enable)

2	**RS**	RS	PG0	LCD register / data selection control pin
3	**WR**	WR	PD5	LCD write control pin
4	**RD**	RD	PD4	LCD read control pin
5	**RST**	RST	reset pin	LCD reset control pin(low level reset)
6	**DB0**	D0	PD14	LCD data bus low 8-bit pin(If 8-bit mode is selected, the lower 8-bit data pins are not used)
7	**DB1**	D1	PD15	
8	**DB2**	D2	PD0	
9	**DB3**	D3	PD1	
10	**DB4**	D4	PE7	
11	**DB5**	D5	PE8	
12	**DB6**	D6	PE9	
13	**DB7**	D7	PE10	
14	**DB8**	D8	PE11	LCD data bus high 8-bit pin
15	**DB9**	D9	PE12	
16	**DB10**	D10	PE13	
17	**DB11**	D11	PE14	
18	**DB12**	D12	PE15	
19	**DB13**	D13	PD8	
20	**DB14**	D14	PD9	
21	**DB15**	D15	PD10	
22	**SDCS**	Not used	GND	SD card selection control pin (used when using the SD card expansion function, this test program is not used)
23	**BL**	BL	PB0	LCD backlight control pin(High level light)
24	**VDD**	VDD	3.3V	Module power positive pin (module has integrated voltage regulator IC, so the power supply can be connected to 5V or 3.3V)
25	**VDD**	VDD	3.3V	
26	**GND**	GND	GND	Module power ground pin
27	**GND**	GND	GND	
28	**NC**	Not used	5V	LCD backlight power positive pin (default shared onboard backlight power supply, this pin can not be connected)

29	**MISO**	MISO	PB2	Touch screen SPI bus data input pin
30	**MOSI**	MOSI	PF9	Touch screen SPI bus data output pin
31	**PEN**	PEN	PF10	Touch screen interrupt detection pin(Low level when a touch occurs)
32	**F_CS**	Not used	NC	Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	**T_CS**	TCS	PF11	Touch screen IC chip select control pin(Low level enable)
34	**CLK**	CLK	PB1	Touch screen SPI bus clock control pin

WarShip STM32 development board TFTLCD socket in-line instructions					
Number	Module Pin	**Corresponding TFTLCD socket pin**	**Corresponding to STM32F103ZET6 microcontroller internal connection pin**		**Remarks**
			V2	**V3**	
1	**CS**	CS	PG12		LCD reset control pin(low level enable)
2	**RS**	RS	PG0		LCD register / data selection control pin
3	**WR**	WR	PD5		LCD write control pin
4	**RD**	RD	PD4		LCD read control pin
5	**RST**	RST	reset pin		LCD reset control pin(low level reset)
6	**DB0**	D0	PD14		LCD data bus low 8-bit pin(If 8-bit mode is selected, the lower 8-bit data pins are not used)
7	**DB1**	D1	PD15		
8	**DB2**	D2	PD0		
9	**DB3**	D3	PD1		
10	**DB4**	D4	PE7		
11	**DB5**	D5	PE8		

12	**DB6**	D6	PE9		
13	**DB7**	D7	PE10		
14	**DB8**	D8	PE11		LCD data bus high 8-bit pin
15	**DB9**	D9	PE12		
16	**DB10**	D10	PE13		
17	**DB11**	D11	PE14		
18	**DB12**	D12	PE15		
19	**DB13**	D13	PD8		
20	**DB14**	D14	PD9		
21	**DB15**	D15	PD10		
22	**SDCS**	Not used	GND		SD card selection control pin (used when using the SD card expansion function, this test program is not used)
23	**BL**	BL	PB0		LCD backlight control pin(High level light)
24	**VDD**	VDD	3.3V		Module power positive pin (module has integrated voltage regulator IC, so the power supply can be connected to 5V or 3.3V)
25	**VDD**	VDD	3.3V		
26	**GND**	GND	GND		Module power ground pin
27	**GND**	GND	GND		
28	**NC**	Not used	5V		LCD backlight power positive pin (default shared onboard backlight power supply, this pin can not be connected)
29	**MISO**	MISO	PF8	PB2	Touch screen SPI bus data input pin
30	**MOSI**	MOSI	PF9		Touch screen SPI bus data output pin
31	**PEN**	PEN	PF10		Touch screen interrupt detection pin(Low level when a touch occurs)
32	**F_CS**	Not used	NC		Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	**T_CS**	TCS	PB2	PF11	Touch screen IC chip select control pin(Low level enable)

34	**CLK**	CLK	PB1	Touch screen SPI bus clock control pin

Explorer STM32F4 development board TFTLCD socket in-line instructions				
Number	**Module Pin**	**Corresponding TFTLCD socket pin**	**Corresponding to STM32F407ZGT6 microcontroller internal connection pin**	**Remarks**
1	**CS**	CS	PG12	LCD reset control pin(low level enable)
2	**RS**	RS	PF12	LCD register / data selection control pin
3	**WR**	WR	PD5	LCD write control pin
4	**RD**	RD	PD4	LCD read control pin
5	**RST**	RST	reset pin	LCD reset control pin(low level reset)
6	**DB0**	D0	PD14	LCD data bus low 8-bit pin(If 8-bit mode is selected, the lower 8-bit data pins are not used)
7	**DB1**	D1	PD15	
8	**DB2**	D2	PD0	
9	**DB3**	D3	PD1	
10	**DB4**	D4	PE7	
11	**DB5**	D5	PE8	
12	**DB6**	D6	PE9	
13	**DB7**	D7	PE10	
14	**DB8**	D8	PE11	LCD data bus high 8-bit pin
15	**DB9**	D9	PE12	
16	**DB10**	D10	PE13	
17	**DB11**	D11	PE14	
18	**DB12**	D12	PE15	
19	**DB13**	D13	PD8	
20	**DB14**	D14	PD9	
21	**DB15**	D15	PD10	
22	**SDCS**	Not used	GND	SD card selection control pin

				(used when using the SD card expansion function, this test program is not used)
23	**BL**	BL	PB15	LCD backlight control pin(High level light)
24	**VDD**	VDD	3.3V	Module power positive pin (module has integrated voltage regulator IC, so the power supply can be connected to 5V or 3.3V)
25	**VDD**	VDD	3.3V	
26	**GND**	GND	GND	Module power ground pin
27	**GND**	GND	GND	
28	**NC**	Not used	5V	LCD backlight power positive pin (default shared onboard backlight power supply, this pin can not be connected)
29	**MISO**	MISO	PB2	Touch screen SPI bus data input pin
30	**MOSI**	MOSI	PF11	Touch screen SPI bus data output pin
31	**PEN**	PEN	PB1	Touch screen interrupt detection pin(Low level when a touch occurs)
32	**F_CS**	Not used	NC	Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	**T_CS**	TCS	PC13	Touch screen IC chip select control pin(Low level enable)
34	**CLK**	CLK	PB0	Touch screen SPI bus clock control pin

Apollo STM32F4/F7 development board TFTLCD socket in-line instructions				
Number	**Module Pin**	**Corresponding TFTLCD socket pin**	**Corresponding to STM32F429IGT6、STM32F767IGT6、STM32H743IIT6 microcontroller internal connection pin**	**Remarks**

1	**CS**	CS	PD7	LCD reset control pin(low level enable)
2	**RS**	RS	PD13	LCD register / data selection control pin
3	**WR**	WR	PD5	LCD write control pin
4	**RD**	RD	PD4	LCD read control pin
5	**RST**	RST	reset pin	LCD reset control pin(low level reset)
6	**DB0**	D0	PD14	LCD data bus low 8-bit pin(If 8-bit mode is selected, the lower 8-bit data pins are not used)
7	**DB1**	D1	PD15	
8	**DB2**	D2	PD0	
9	**DB3**	D3	PD1	
10	**DB4**	D4	PE7	
11	**DB5**	D5	PE8	
12	**DB6**	D6	PE9	
13	**DB7**	D7	PE10	
14	**DB8**	D8	PE11	LCD data bus high 8-bit pin
15	**DB9**	D9	PE12	
16	**DB10**	D10	PE13	
17	**DB11**	D11	PE14	
18	**DB12**	D12	PE15	
19	**DB13**	D13	PD8	
20	**DB14**	D14	PD9	
21	**DB15**	D15	PD10	
22	**SDCS**	Not used	GND	SD card selection control pin (used when using the SD card expansion function, this test program is not used)
23	**BL**	BL	PB5	LCD backlight control pin(High level light)
24	**VDD**	VDD	3.3V	Module power positive pin (module has integrated voltage regulator IC, so the power supply can be connected to 5V or 3.3V)
25	**VDD**	VDD	3.3V	
26	**GND**	GND	GND	Module power ground pin
27	**GND**	GND	GND	
28	**NC**	Not used	5V	LCD backlight power positive pin

				(default shared onboard backlight power supply, this pin can not be connected)
29	**MISO**	MISO	PG3	Touch screen SPI bus data input pin
30	**MOSI**	MOSI	PI3	Touch screen SPI bus data output pin
31	**PEN**	PEN	PH7	Touch screen interrupt detection pin(Low level when a touch occurs)
32	**F_CS**	Not used	NC	Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	**T_CS**	TCS	PI8	Touch screen IC chip select control pin(Low level enable)
34	**CLK**	CLK	PH6	Touch screen SPI bus clock control pin

Demo function description:

1. This test program is applicable to STM32F103RCT6, STM32F103ZET6, STM32F407ZGT6, STM32F429IGT6, STM32F767IGT6, STM32H743IIT6 six STM32 MCU platforms，The STM32F103RCT6 uses the IO analog test program, and the other microcontrollers use the FSMC bus test program;
2. Please find the corresponding development board for wiring according to the above wiring instructions;
3. This set of test program supports 8-bit and 16-bit data bus mode switching. For details, see the following mode setting instructions;
4. This set of test program supports display switching in four directions. For details, see the following instructions for switching directions;
5. This set of test procedures contains the following test items:
   A. the main interface displays the test;
   B. read ID and color value test;
   C. simple brush test;
   D. rectangular drawing and filling test;

E. circular drawing and filling test;

F. triangle drawing and filling test;

G. English display test;

H. Chinese display test;

I. picture display test;

J. rotating display test;

K. touch screen handwriting test;

Mode switching instructions:

Find the macro definition LCD_USE8BIT_MODEL in lcd.h, as shown below:

```
#define LCD_USE8BIT_MODEL    0    //定义数据总线是否使用8位模式 0,使用16位模式.1,使用8位模式
//////////////////////////////////////////////////////////////////////////////////
```

LCD_USE8BIT_MODEL 0 // Use 16-bit data bus mode

LCD_USE8BIT_MODEL 1 // Use 8-bit data bus mode

Note:

1. **Not every LCD screen supports 8-bit/16-bit mode. Please check with us to see if you have purchased it;**
2. **After the 8/16-bit switch is performed on the software, the hardware also needs to be changed to the corresponding mode to be able to drive normally. Please consult us how to modify the bare screen**

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 //Clockwise 0° Rotate

USE_HORIZONTAL 1 //Clockwise 90° Rotate

USE_HORIZONTAL 2 //Clockwise 180° Rotate

USE_HORIZONTAL 3 //Clockwise 270° Rotate