

## 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,

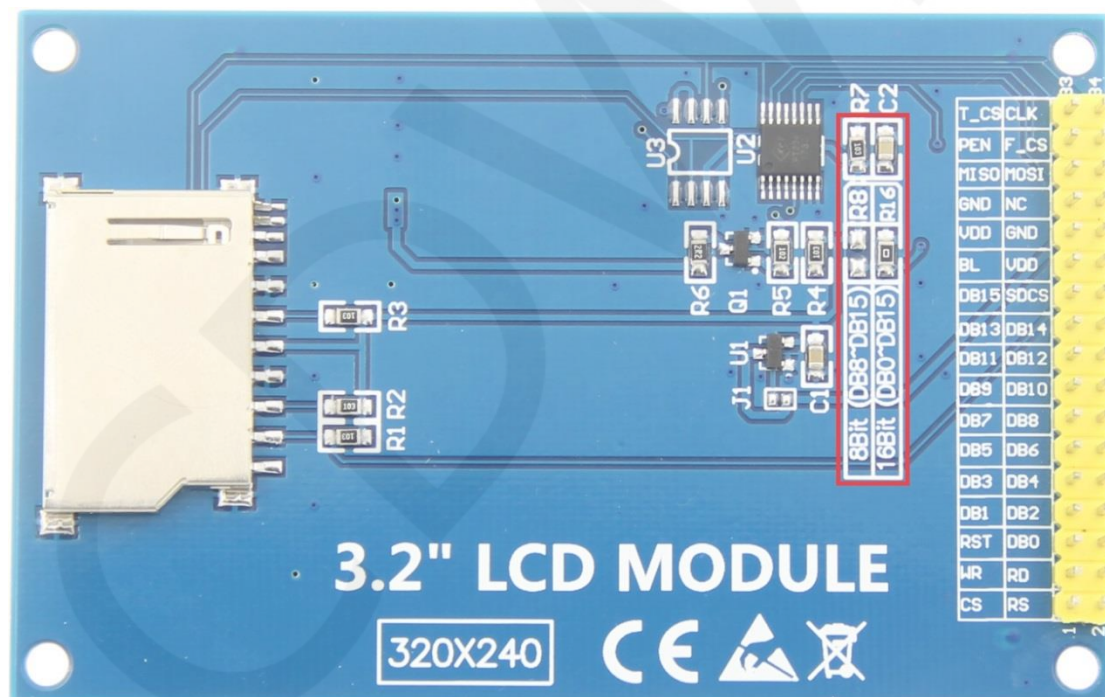
STM32F429IGT6, STM32F767IGT6, STM32H743IIT6

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 R16: Select 16-bit parallel port data bus mode, use DB0~DB15 data pins
  - B. Solder R8: 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	<b>BL</b>	BL	PC10	LCD backlight control pin(High level light)
24	<b>VDD</b>	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	<b>VDD</b>	3.3	3.3V	
26	<b>GND</b>	GND	GND	Module power ground pin
27	<b>GND</b>	GND	GND	
28	<b>NC</b>	Not used	5V	LCD backlight power positive pin (default shared onboard backlight power supply, this pin can not be connected)
29	<b>MISO</b>	MISO	PC2	Touch screen SPI bus data input pin
30	<b>MOSI</b>	MOSI	PC3	Touch screen SPI bus data output pin
31	<b>PEN</b>	PEN	PC1	Touch screen interrupt detection pin(Low level when a touch occurs)
32	<b>F_CS</b>	Not used	NC	Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	<b>T_CS</b>	TCS	PC13	Touch screen IC chip select control pin(Low level enable)
34	<b>CLK</b>	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	<b>CS</b>	CS	PG12	LCD reset control pin( low level enable)

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

29	<b>MISO</b>	MISO	PB2	Touch screen SPI bus data input pin
30	<b>MOSI</b>	MOSI	PF9	Touch screen SPI bus data output pin
31	<b>PEN</b>	PEN	PF10	Touch screen interrupt detection pin(Low level when a touch occurs)
32	<b>F_CS</b>	Not used	NC	Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	<b>T_CS</b>	TCS	PF11	Touch screen IC chip select control pin(Low level enable)
34	<b>CLK</b>	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
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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	<b>BL</b>	BL	PB15	LCD backlight control pin(High level light)
24	<b>VDD</b>	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	<b>VDD</b>	VDD	3.3V	
26	<b>GND</b>	GND	GND	
27	<b>GND</b>	GND	GND	Module power ground pin
28	<b>NC</b>	Not used	5V	LCD backlight power positive pin (default shared onboard backlight power supply, this pin can not be connected)
29	<b>MISO</b>	MISO	PB2	Touch screen SPI bus data input pin
30	<b>MOSI</b>	MOSI	PF11	Touch screen SPI bus data output pin
31	<b>PEN</b>	PEN	PB1	Touch screen interrupt detection pin(Low level when a touch occurs)
32	<b>F_CS</b>	Not used	NC	Flash chip select control pin (used when using the Flash extension function, this test program is not used)
33	<b>T_CS</b>	TCS	PC13	Touch screen IC chip select control pin(Low level enable)
34	<b>CLK</b>	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
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1	<b>CS</b>	CS	PD7	LCD reset control pin( low level enable)
2	<b>RS</b>	RS	PD13	LCD register / data selection control pin
3	<b>WR</b>	WR	PD5	LCD write control pin
4	<b>RD</b>	RD	PD4	LCD read control pin
5	<b>RST</b>	RST	reset pin	LCD reset control pin( low level reset)
6	<b>DB0</b>	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	<b>DB1</b>	D1	PD15	
8	<b>DB2</b>	D2	PD0	
9	<b>DB3</b>	D3	PD1	
10	<b>DB4</b>	D4	PE7	
11	<b>DB5</b>	D5	PE8	
12	<b>DB6</b>	D6	PE9	
13	<b>DB7</b>	D7	PE10	
14	<b>DB8</b>	D8	PE11	LCD data bus high 8-bit pin
15	<b>DB9</b>	D9	PE12	
16	<b>DB10</b>	D10	PE13	
17	<b>DB11</b>	D11	PE14	
18	<b>DB12</b>	D12	PE15	
19	<b>DB13</b>	D13	PD8	
20	<b>DB14</b>	D14	PD9	
21	<b>DB15</b>	D15	PD10	
22	<b>SDCS</b>	Not used	GND	SD card selection control pin (used when using the SD card expansion function, this test program is not used)
23	<b>BL</b>	BL	PB5	LCD backlight control pin(High level light)
24	<b>VDD</b>	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	<b>VDD</b>	VDD	3.3V	
26	<b>GND</b>	GND	GND	Module power ground pin
27	<b>GND</b>	GND	GND	
28	<b>NC</b>	Not used	5V	LCD backlight power positive pin

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