

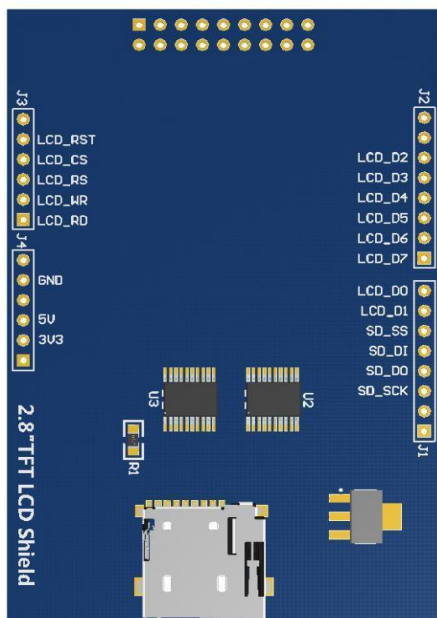
Introduction

TFT LCD Shield is a 2.4-inch TFT LCD screen module which has 320x240 HD resolution, it supports touch function, ArduinoUNO and Mega2560 straight in, no wiring. It's not just an ordinary LCD module, because it also includes touch function and SD slot which make it a powerful display extension module. The TFT module refreshes faster and more smoothly with 8-bit parallel bus than the SPI, we can use the STM32, Arduino, 8051 microcontroller to control it. The HY-TFT320 includes a touch control IC (XPT2046), the touch interface is included in the 40 pins on the screen which also contains the corresponding SD card interface. So the function of this TFT module is relatively rich.

Module parameters

SKU	60240861328
Screen Size	2.4-inch
Resolution	320*240(pixel)
Display Size	48.96mm*36.72mm
Outline Dimension	72.20mm*52.7mm
Screen Colour	RGB, 65K, multi-colour
Screen Interface	8-bit parallel interface
Driver	ILI9341

Module interface definition



标识	描述
LCD_RST	LCD bus reset signal
LCD_CS	LCD bus Chip Select signal
LCD_RS	LCD Command/Data selection signal
LCD_WR	LCD bus Write signal
LCD_RD	LCD bus read signal
GND	Ground
5V	5V power
3V3	Not connected
LCD_D0	LCD 8 Bit0
LCD_D1	LCD 8 Bit1
LCD_D2	LCD 8 Bit2
LCD_D3	LCD 8 Bit3
LCD_D4	LCD 8 Bit4
LCD_D5	LCD 8 Bit5
LCD_D6	LCD 8 Bit6
LCD_D7	LCD 8 Bit7
SD_SS	SD card SPI bus Chip Select signal
SD_DI	SD card SPI bus MOSI signal
SD_DO	SD card SPI bus MISO signal
SD_SCK	SD card SPI bus clock signal

Component List

- ◆ Arduino UNO R3
- ◆ 2.4inch TFT LCD Shield *1
- ◆ USB wired *1

Wiring of Circuit

TFT LCD Shield	Arduino UNO
LCD_RST	A4
LCD_CS	A3
LCD_RS	A2
LCD_WR	A1
LCD_RD	A0
GND	GND
5V	5V
3V3	3.3V/NC
LCD_D0	8
LCD_D1	9
LCD_D2	2
LCD_D3	3
LCD_D4	4
LCD_D5	5
LCD_D6	6
LCD_D7	7
SD_SS	10
SD_DI	11
SD_DO	12
SD_SCK	13

This experiment directly uses the TFT display module, SD card.

Experiment 1 String Display

Experiment Purpose

Display “Hello World” on the TFT screen!

Character display function description

tft.fillScreen (parameter); fill the screen with color, and the parameter is 16-bit color value

tft.setTextSize (parameter); set text font size

tft.setTextColor (parameter); set font color parameter to 16-bit color value

tft.println (parameter); display font content

Code

```
#include "MCUFRIEND_kbv.h"
#include "Adafruit_GFX.h" // Core graphics library

#define LCD_RESET A4 // Can alternately just connect to Arduino's reset pin
#define LCD_CS A3 // Chip Select goes to Analog 3
#define LCD_CD A2 // Command/Data goes to Analog 2
#define LCD_WR A1 // LCD Write goes to Analog 1
#define LCD_RD A0 // LCD Read goes to Analog 0

// Assign human-readable names to some common 16-bit color values:
#define BLACK 0x0000
#define BLUE 0x001F
#define RED 0xF800
#define GREEN 0x07E0
#define CYAN 0x07FF
#define MAGENTA 0xF81F
#define YELLOW 0xFFE0
#define WHITE 0xFFFF

MCUFRIEND_kbv tft;

void setup(void) {
  Serial.begin(9600);
  Serial.println(F("TFT LCD test"));

  tft.reset();

  uint16_t identifier = tft.readID();
  if(identifier == 0x9325) {
    Serial.println(F("Found ILI9325 LCD driver"));
  } else if(identifier == 0x9328) {
    Serial.println(F("Found ILI9328 LCD driver"));
  } else if(identifier == 0x4535) {
    Serial.println(F("Found LGDP4535 LCD driver"));
  } else if(identifier == 0x7575) {
    Serial.println(F("Found HX8347G LCD driver"));
  } else if(identifier == 0x9595) {
    Serial.println(F("Found HX8347-I LCD driver"));
  } else if(identifier == 0x4747) {
    Serial.println(F("Found HX8347-D LCD driver"));
  } else if(identifier == 0x8347) {
    Serial.println(F("Found HX8347-A LCD driver"));
  } else if(identifier == 0x9341) {
    Serial.println(F("Found ILI9341 LCD driver"));
  } else if(identifier == 0x7783) {
    Serial.println(F("Found ST7781 LCD driver"));
  }
```

```

}else if(identifier == 0x8230) {
    Serial.println(F("Found UC8230 LCD driver"));
}else if(identifier == 0x8357) {
    Serial.println(F("Found HX8357D LCD driver"));
} else if(identifier==0x0101){identifier=0x9341;
    Serial.println(F("Found 0x9341 LCD driver"));
}else if(identifier==0x7793){
    Serial.println(F("Found ST7793 LCD driver"));
}else if(identifier==0xB509){
    Serial.println(F("Found R61509 LCD driver"));
}else if(identifier==0x9486){
    Serial.println(F("Found ILI9486 LCD driver"));
}else if(identifier==0x9488){
    Serial.println(F("Found ILI9488 LCD driver"));
}else {
Serial.print(F("Unknown LCD driver chip: "));
Serial.println(identifier, HEX);
Serial.println(F("If using the Adafruit 2.8\" TFT Arduino shield, the line:"));
Serial.println(F("  #define USE_ADAFRUIT_SHIELD_PINOUT"));
Serial.println(F("should appear in the library header (Adafruit_TFT.h)."));
Serial.println(F("If using the breakout board, it should NOT be #defined!"));
Serial.println(F("Also if using the breakout, double-check that all wiring"));
Serial.println(F("matches the tutorial."));
identifier=0x9341;
}
    tft.begin(identifier);
}

void loop(void) {
    tft.fillScreen(BLACK);
    unsigned long start = micros();
    tft.setCursor(0, 0);

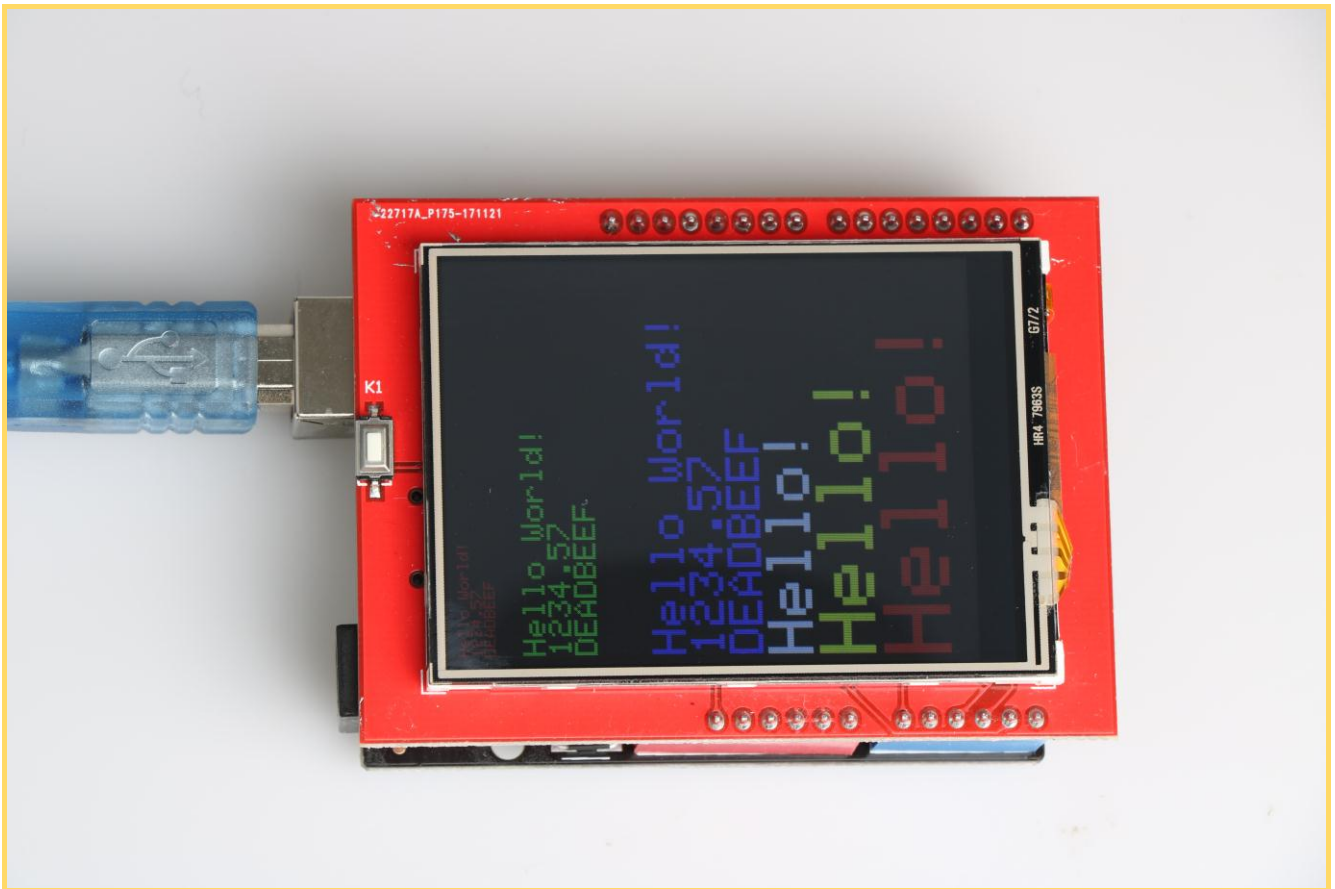
    tft.setTextColor(RED); tft.setTextSize(1);
    tft.println("Hello World!");
    tft.println(01234.56789);
    tft.println(0xDEADBEEF, HEX);
    tft.println();
    tft.println();
    tft.setTextColor(GREEN); tft.setTextSize(2);
    tft.println("Hello World!");
    tft.println(01234.56789);
    tft.println(0xDEADBEEF, HEX);
    tft.println();
    tft.println();

    tft.setTextColor(BLUE); tft.setTextSize(3);
    tft.println("Hello World!");
    tft.println(01234.56789);
    tft.println(0xDEADBEEF, HEX);

    tft.setTextColor(WHITE); tft.setTextSize(4);
    tft.println("Hello!");
    tft.setTextColor(YELLOW); tft.setTextSize(5);
    tft.println("Hello!");
    tft.setTextColor(RED); tft.setTextSize(6);
    tft.println("Hello!");
    tft.println();
    tft.println();
    delay(1000);delay(1000);delay(1000);delay(1000);delay(1000);
}

```

Result



Experiment 2 Picture Display

Experiment Purpose

Display logo1.bmp and logo2.bmp on TFT screen

Picture Display Function

`tft.setRotation (rotation);`

Rotation: 1 from top to bottom, 2: from right to left, 3: from bottom to top, 4: from left to right

`tft.drawBitmap (x, y, buffer, width, high, color);`

X and y are the starting position of display, width and high are the width and high of logo pixel , color is the display color.

Experimental Procedure

Step1:

Arduino uno3 raw has limited resources, so it can only be loaded once and display a monochrome bmp

picture at the same time.

A 320x240 picture that displays horizontally is loaded with Image2Lcd first.



Save as a picture source code into the logo1.h, so that the LCD Screen can draw the corresponding picture.

If you want to display a vertical screen picture, you should prepare a 240x320 picture first.



Code

```
#include "Adafruit_GFX.h" // Hardware-specific library
#include "MCUFRIEND_kbv.h"

#define LCD_CS A3 // Chip Select goes to Analog 3
#define LCD_CD A2 // Command/Data goes to Analog 2
#define LCD_WR A1 // LCD Write goes to Analog 1
#define LCD_RD A0 // LCD Read goes to Analog 0
#define LCD_RESET A4 // Can alternately just connect to Arduino's reset pin

#define BLACK    0x0000
#define BLUE     0x001F
#define RED      0xF800
#define GREEN    0x07E0
#define CYAN     0x07FF
#define MAGENTA  0xF81F
#define YELLOW   0xFFE0
#define WHITE    0xFFFF

Adafruit_TFTLCD tft(LCD_CS, LCD_CD, LCD_WR, LCD_RD, LCD_RESET);

static const unsigned char PROGMEM logo1[] =
{
    #include "logo1.h"
};
static const unsigned char PROGMEM logo2[] =
{
    #include "logo2.h"
};
void setup(void)
{
    Serial.begin(115200);
    Serial.println(F("TFT LCD test"));
    tft.reset();
    uint16_t identifier = tft.readID();
    if(identifier == 0x9325) {
        Serial.println(F("Found ILI9325 LCD driver"));
    } else if(identifier == 0x9328) {
        Serial.println(F("Found ILI9328 LCD driver"));
    } else if(identifier == 0x4535) {
        Serial.println(F("Found LGDP4535 LCD driver"));
    } else if(identifier == 0x7575) {
        Serial.println(F("Found HX8347G LCD driver"));
    }
}
```

```

}
else if(identifier == 0x9595) {
    Serial.println(F("Found HX8347-I LCD driver"));
} else if(identifier == 0x4747) {
    Serial.println(F("Found HX8347-D LCD driver"));
} else if(identifier == 0x8347) {
    Serial.println(F("Found HX8347-A LCD driver"));
} else if(identifier == 0x9341) {
    Serial.println(F("Found ILI9341 LCD driver"));
} else if(identifier == 0x7783) {
    Serial.println(F("Found ST7781 LCD driver"));
} else if(identifier == 0x8230) {
    Serial.println(F("Found UC8230 LCD driver"));
} else if(identifier == 0x8357) {
    Serial.println(F("Found HX8357D LCD driver"));
} else if(identifier==0x0101){
    identifier=0x9341;
    Serial.println(F("Found 0x9341 LCD driver"));
} else if(identifier==0x7793){
    Serial.println(F("Found ST7793 LCD driver"));
} else if(identifier==0xB509){
    Serial.println(F("Found R61509 LCD driver"));
} else if(identifier==0x9486){
    Serial.println(F("Found ILI9486 LCD driver"));
} else if(identifier==0x9488){
    Serial.println(F("Found ILI9488 LCD driver"));
} else {
    Serial.print(F("Unknown LCD driver chip: "));
    Serial.println(identifier, HEX);
    Serial.println(F("If using the Adafruit 2.8\" TFT Arduino shield, the line:"));
    Serial.println(F("  #define USE_ADAFRUIT_SHIELD_PINOUT"));
    Serial.println(F("should appear in the library header (Adafruit_TFT.h)."));
    Serial.println(F("If using the breakout board, it should NOT be #defined!"));
    Serial.println(F("Also if using the breakout, double-check that all wiring"));
    Serial.println(F("matches the tutorial."));
    identifier=0x9341;
}
tft.begin(identifier);

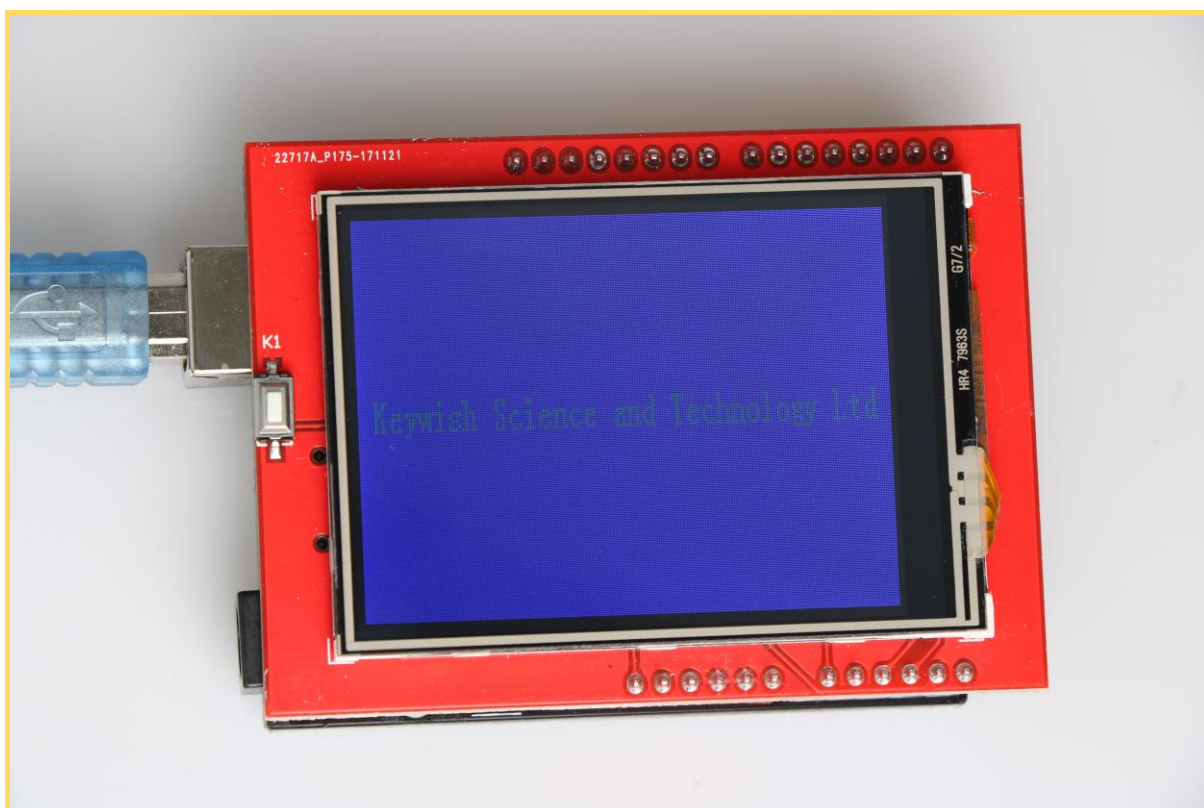
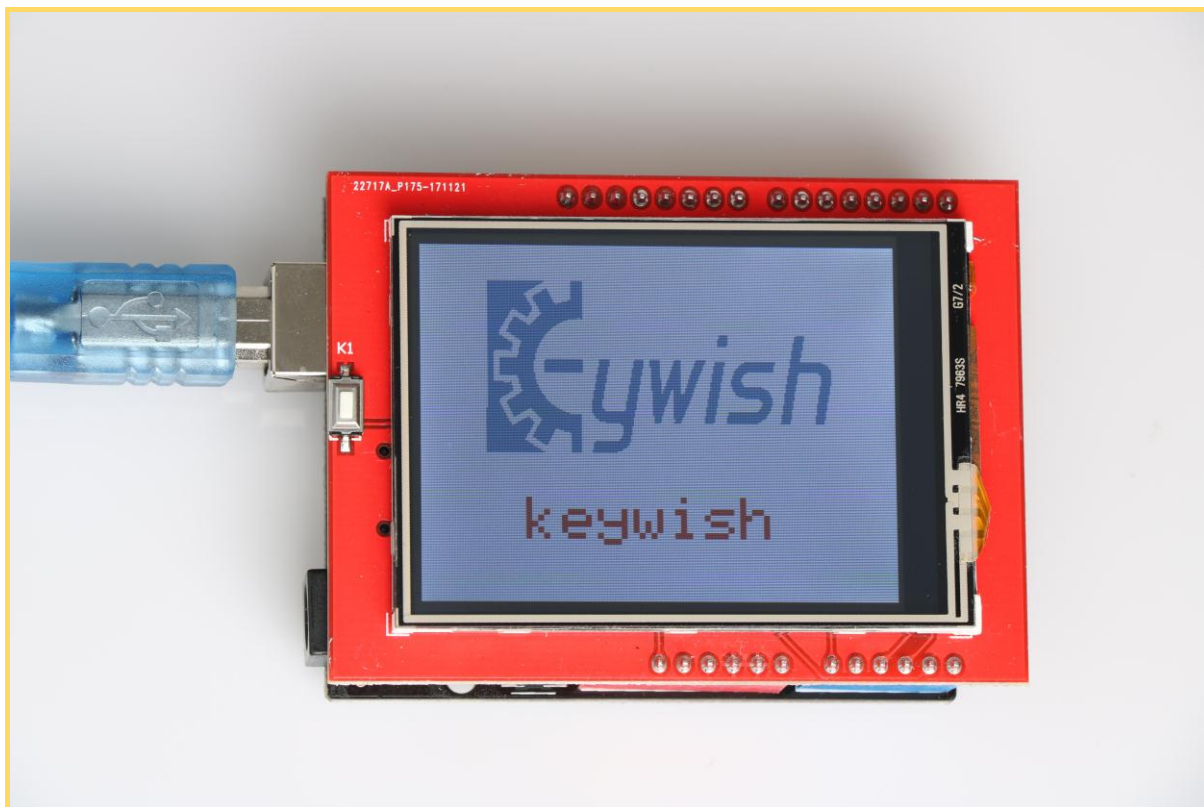
}

void loop(void) {
    tft.setRotation(1);
    tft.fillScreen(WHITE);
    tft.drawBitmap(40,20,logo1,240,120,1500);
    tft.setCursor(70, 170);
    tft.setTextColor(RED);
    tft.setTextSize(4);
    tft.println("keywish");

    delay(2000);
    tft.setRotation(4);
    tft.fillScreen(BLUE);
    tft.drawBitmap(0,0,logo2,240,320,1500);
    delay(2000);
}

```


Result



Experiment 3 Display Picture with SD Card

Experiment Purpose

Read and display the BMP format pictures inside the SD card

Function Introduction

bmpReadHeader: read the header information of the bmp format file, analyze the size, color and width of the image file

bmpFile.seek (): jumps to the picture data information region

The number of RGB shown in the picture is 5bit (red) +6bit (green) +5bit (blue)

```
__color[k] = sdbuffer[bufidx+2]>>3; // red
```

```
__color[k] = color[k]<<6 | (sdbuffer[bufidx+1]>>2); // green
```

```
__color[k] = color[k]<<5 | (sdbuffer[bufidx+0]>>3); // blue
```

```
tft.drawPixel (m+offset_x, I, color[m]): x and y mean the color color[m]
```

Result



Experiment 4 Touch Experiment

Experiment Purpose

TFT Screen displays touch tracks based on fingers' movements.

Introduction of Touch Function

Code

.....

Result

