The Design of TFT Driver Based on STM32

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Abstract. This paper expounds the working principle of STM32 driving TFT true color screen, and provides the hardware connection diagram based on SPI interface. In software programming, we can use the hardware SPI driver mode or software simulation SPI timing driven mode. The design realizes the drive of true color screen. The method can be used to drive other color screen. It has a certain practical value.

Introduction

In the STM32 system design, there is not only the input device, but also designs the output device. Commonly used output devices are digital tube, LDC1602 LCD screen, 12864 LCD screen. The digital tube in each tube can only display 0 ~ F a total of 16 characters. If you want to display multiple, you must have a number of digital tube. This hardware circuit design will become very complex, to use at least 16 IO port. LDC1602 can display 2 lines of a total of 32 English characters. The Chinese characters can be displayed in 12864. But the clarity of the display is affected. In order to display characters or Chinese characters better, with a 1.44 inch TFT true color screen, there is 128*64 dot matrix, and can generate Chinese characters graphics with subtitle generation software. The definition and resolution will be very high, and can display graphics, using SPI interface, can improve the refresh speed.

STM32 Introduction

The STM32 pin diagram is shown in figure 1. An embedded microprocessor based on Cortex-M3 technology generated by ST. Because of its low price, good performance, after the listing it's soon gained popularity. STM32F103RBT6 is one of its 1 series of products. STM32F103RBT6 has a total of 64 pins, of which there are 51 IO ports. There are 4 timers, namely, TIMER1, TIMER2, TIMER3, TIMER4, 16 channel, SPI hardware interface, the 2 hardware IIC interface ADC. In the system design, it uses a hardware SPI interface TFT true color.
TFT True Color Driving Principle Diagram

TFT LCD driver schematic is shown in figure 2. Figure STM32F103RBT6 with the SPI1 interface to drive the LCD screen. PA15 (SPI1_NSS) CS signal is connected with the LCD screen. PB3 (SPI1_SCLK) is connected with the liquid crystal screen clock signal lines SC. PB5 (SPI1_MOSI) RST reset signal is connected with the LCD screen data input line DI. RST connected with the LCD screen, LCD screen of the RS signal PG4 connection. The SC and DI pins in the figure are to be connected to the pull-up resistor to improve communication capability.
Software Program

In this design, KEIL 5 is under the C programming language. First, the SPI interface is initialized, and then programming is performed according to the write timing of the SPI shown in figure 3.

![Figure 3. SPI Write Timing.](image)

Part of codes:

```c
void lcd_initial()
{
    Reset();
    Lcd_WriteData(0x0E);
    Lcd_WriteIndex(0x36);
    Lcd_WriteIndex(0xe0);
    Lcd_WriteData(0x0f);
    Lcd_WriteData(0x1a);
    Lcd_WriteData(0x0f);
    Lcd_WriteData(0x18);
    Lcd_WriteData(0x2f);
    Lcd_WriteData(0x28);
    Lcd_WriteData(0x20);
    Lcd_WriteData(0x22);
}
```

The above code to achieve the main LCD screen initialization.

Summary

This paper describes the working principle of the STM32 driver TFT true color screen, and gives the hardware circuit design and software program design, according to the SPI reading and writing timing of the preparation of the corresponding program. The realization of true color screen display and driver has a certain practical value.

Reference


