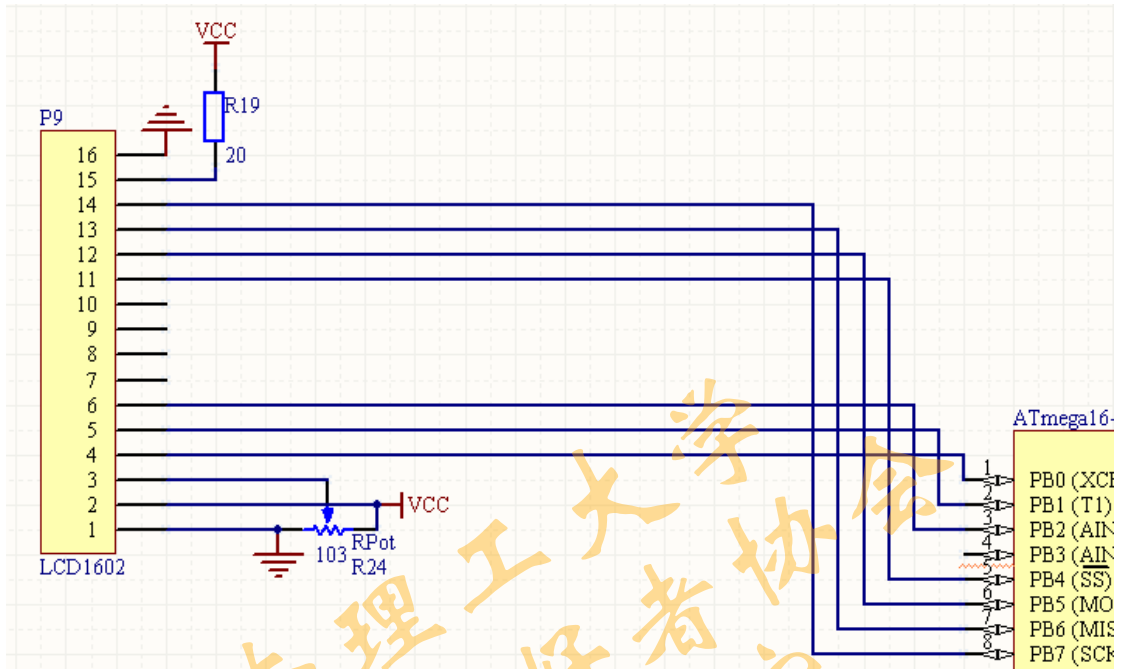


实验十三(1):LCD1602 显示实验

一.实验目的:

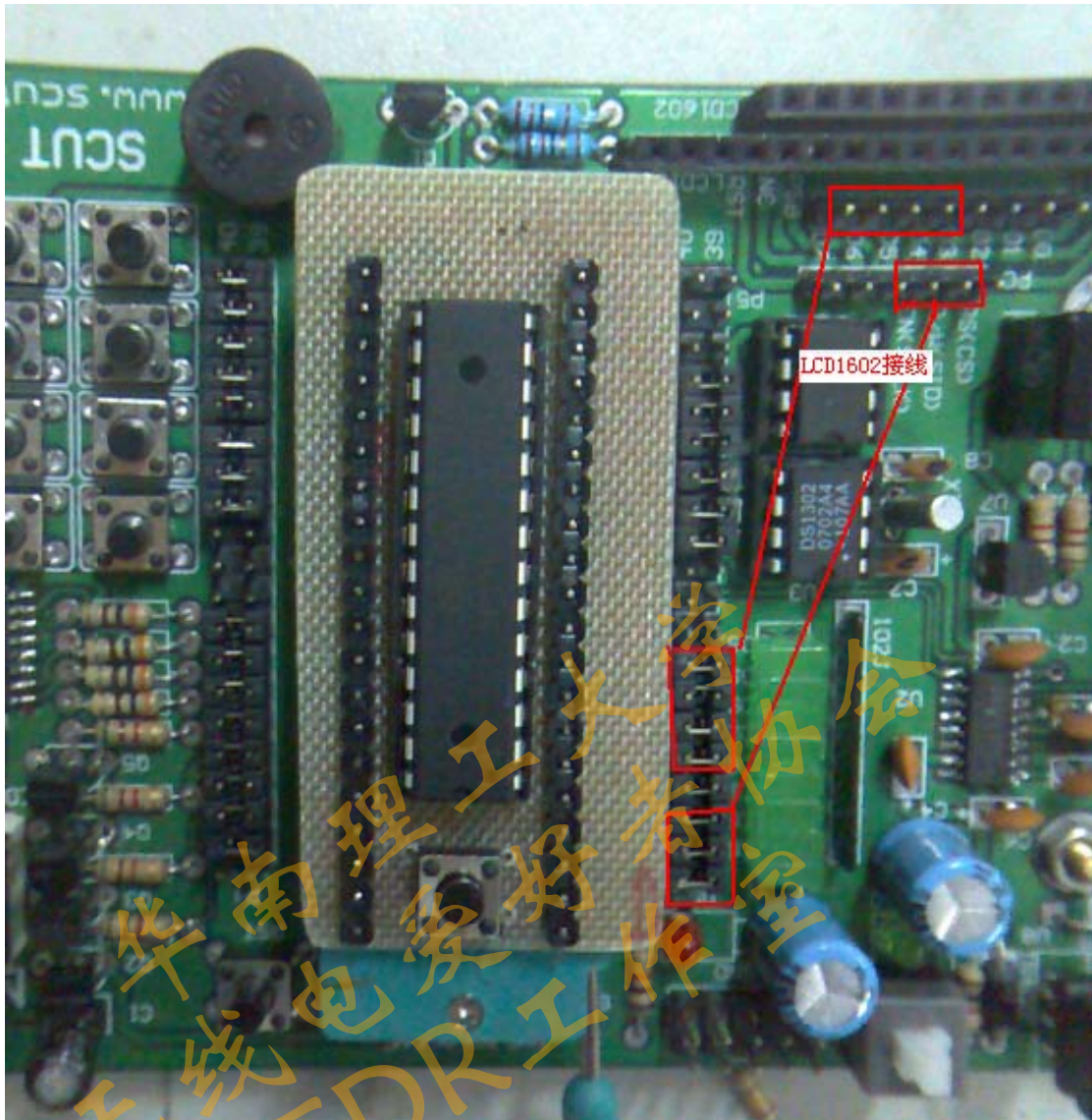
熟悉 LCD1602, 了解最简单的液晶控制方式。

二.实验电路图:



三.硬件连线图:

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无线电爱好者协会
FDR工作室



四.实验原理:

1602 液晶模块是 2 行 16 个字的显示模块,其内部有 80*8 位的 RAM 数据缓冲区。对于液晶来说,最难控制的是初始化部分,在这里我就不多说了,因为附件里的两个文档已经说的很清楚了。在这里我只是简单的用液晶显示一些字符。第一行显示: My QQ:710026108(我的 QQ:710026108),第二行显示: QQgroup: 49865954(QQ 群: 49865954)。

五.实验代码:

```
#include <mega16.h>
#include <lcd1602_4.h>
void main(void)
{
    while (1)
    {
        LCD_init();
        LCD_write_flash(0,0,"My QQ:710026108");//测试 LCD_write_string()
        LCD_write_flash(0,1,"QQgroup:49865954");//测试 LCD_write_string()
```

```
        while(1); //不再变化
    };
}
```

以下是 LCD1602.h 的程序代码:

```
#ifndef    LCD1602_4_H
#define    LCD1602_4_H

#include <delay.h>
#include <stdlib.h>
#define    MSB        0x80
#define    LSB        0x00
#define    TRUE        1
#define    FALSE        0
#define    HIGH        1
#define    LOW        0
/*****
#define    DATA_MODE        0x28
#define    OPEN_SCREEN        0x0C
#define    DISPLAY_ADDRESS        0x80
#define    CLEARSCREEN        LCD_en_com(0x01)
*****/
//change this part at different board
#define    LCDIO        PORTB
#define    LCDIO_DDR    DDRB
#define    LCDIO_PIN    PINB.7
#define    LCD1602_RS        PORTB.0 //RS lcd
#define    LCD1602_RW        PORTB.1//WR lcd
#define    LCD1602_EN        PORTB.2 //EN lcd
#define    LCD1602_BF        DDRB.7
#define    LCD_DRS        DDRB.0 //WR direction define
#define    LCD_DWR        DDRB.1 //RS direction define
#define    LCD_DEN        DDRB.2 //EN direction define
#define    LCD_DATA        0xf0 //DATA PORT
/*****
void LCD_en_com(unsigned char command); //write
command function
void LCD_en_dat(unsigned char temp); //write data
function
void LCD_set_xy(unsigned char x, unsigned char y); //set display
address function
void LCD_write_char(unsigned x,unsigned char y,unsigned char dat); //write lcd a character
function
void LCD_write_string(unsigned char x,unsigned char y,unsigned char *s);//write lcd string
function
```

```
void LCD_init(void); //lcd initialize
function
void LCD_Read_BF(void); //LCD
Read busy flag
/*****
*/
LCD1602.c File

Created by Zhao liang
email: zhaoliang_0801@dl.cn
May 2006

*/
void LCD_Read_BF(void)
{
    LCD1602_BF=0;
    LCD1602_RW=HIGH; //RW 1
    LCD1602_RS=LOW; //RS 0
    LCD1602_EN=HIGH; //EN 1 Read BF
    LCDIO_DDR&=0xf0;
    LCDIO|=0xf0;
    delay_us(2);
    while(LCDIO_PIN);
    LCD1602_EN=LOW;
    LCDIO_DDR|=0xf0;
}
void LCD_en_write(void) //EN 端产生一个高电平脉冲, 写 LCD
{
    LCD1602_EN=HIGH;
    LCD_DEN=1; //使能输出
    LCD1602_EN=HIGH;
    delay_us(10);
    LCD1602_EN=LOW;
}
/*****
void LCD_en_com(unsigned char command)
{
    LCD_Read_BF();
    LCD1602_RS=LOW; //RS 0
    LCD_DRS=1;
    LCD1602_RS=LOW; //RS 0
    LCD1602_RW=LOW; //RW 0
    LCDIO&=0x0F;
    LCDIO=command&0xf0 | LCDIO&0x0f;
}
```

```
LCD_en_write();
command=command<<4;
LCDIO&=0x0F;
LCDIO=command&0xf0 | LCDIO&0x0f;
LCD_en_write();
}
//*****
void LCD_en_dat(unsigned char dat)
{
    LCD_Read_BF();
    LCD_DRS=1;
    LCD1602_RS=HIGH; //RS 1
    LCD1602_RW=LOW; //RW 0
    LCDIO &=0x0F;
    LCDIO=dat&0xf0 | LCDIO&0x0f;
    LCD_en_write();
    dat=dat<<4;
    LCDIO&=0x0F;
    LCDIO=dat&0xf0 | LCDIO&0x0f;
    LCD_en_write();
}
//*****
void LCD_set_xy(unsigned char x,unsigned char y)
{
    unsigned char address;
    x&=0x0f;
    if(!y)
        address=0x80+x;
    else
        address=0xc0+x;
    LCD_en_com(address);
}
//*****
/*void LCD_write_char(unsigned x,unsigned char y,unsigned char dat)
{
    LCD_set_xy(x,y);
    LCD_en_dat(dat);
}*/
//*****
void LCD_write_string(unsigned char x,unsigned char y,unsigned char *s)
{
    LCD_set_xy(x,y);
    while(*s)
    {
```

```
        LCD_en_dat(*s);
        s++;
    }
}
//*****
/*
void LCD_write_flash(unsigned char x,unsigned char y,unsigned char flash *s)
*/
//*****
void LCD_write_flash(unsigned char x,unsigned char y,unsigned char flash *s)
{
    LCD_set_xy(x,y);
    while(*s)
    {
        LCD_en_dat(*s);
        s++;
    }
}
//*****
/*
void LCD_write_int(unsigned char x,unsigned char y,unsigned int intdat)
*/
//*****
void LCD_write_int(unsigned char x,unsigned char y,unsigned int intdat)
{
    unsigned char p[5];
    itoa(intdat,p);
    LCD_write_string(x,y,p);
}
//*****
void LCD_init(void)
{
    delay_ms(4);
    LCDIO_DDR=0x00;
    LCD_DWR=1;
    LCD1602_RW=0;
    LCD1602_EN=1;// set EN out
    LCD1602_RS=1;// set RS out
    LCD_en_com(DATA_MODE);          //set 4 bit data transmission mode
    LCD_en_com(OPEN_SCREEN); //open display (enable lcd display)
    LCD_en_com(DISPLAY_ADDRESS);//set lcd first display address
    CLEARSCREEN;                    //clear screen
    delay_ms(4);
}
```

```
// LCDIO|=0x0f;  
}  
#endif
```

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