CPE301 – FALL 2019

Design Assignment 5

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Primary Github address: <https://github.com/kirkster96/submission_da>

Directory: <https://github.com/kirkster96/submission_da/tree/master/DesignAssignment/DA5>

1. **COMPONENTS LIST AND CONNECTION BLOCK DIAGRAM w/ PINS**

Atmega328PB

Mutli-function shield

LM35

1. **AVR C DEVELOPED CODE OF TASK 1**

/\*

\* SPI\_loopback.c

\*

\* Created: 2/25/2019 6:12:47 PM

\* Author : VenkatesanMuthukumar

\*/

/\* SPI Test program

\* Designed to be used with a jumper from MOSI to MISO for loopback test

\* uC is Atmel ATmega128

\*/

#define *F\_CPU* 16000000UL

/\*

#define SPCR \_SFR\_IO8(0x2C)

#define SPSR \_SFR\_IO8(0x2D)

#define SPDR \_SFR\_IO8(0x2E)

\*/

#define BAUD\_RATE 9600

#include <avr/io.h>

#include <stdio.h>

#include <util/delay.h>

#include <string.h>

#include <stdlib.h>

char SPI\_transmit(char);

char SPI\_receive(char);

void usart\_init(void);

void usart\_send(char ch);

void USART\_putstring(char \*StringPtr);

char data = 'a'; //0X41;

char ar[]= "hello";

int main() {

unsigned char rxdata, txdata;

DDRB |= (1 << DDRB2) | (1 << DDRB3) | (1 << DDRB5); // SCK, MOSI and SS as outputs

PORTB &= ~(1<<DDRB4);

usart\_init();

SPSR0 |= (0 << SPI2X); // Doubled Clock Frequency: f\_OSC / 2

SPCR0 |= (1<<MSTR);

SPCR0 |= (1<<SPR0)|(1<<SPR1);

SPCR0 |= (1<<SPE);

//setup ADC

ADMUX = (0<<REFS1)| //Reference selection bits

(1<<REFS0)| //AVcc - external cap at AREF

(0<<ADLAR)| //Left adjust most significant bit

(1<<MUX2)| //Analog channel selection bits

(0<<MUX1)| //ADC4 (PC4 PIN27)

(0<<MUX0);

ADCSRA = (1<<ADEN)| // Enable ADC

(0<<ADSC)| //ADC start conversion

(0<<ADATE)| //ADC Autotrigger enable

(0<<ADIF)| //ADC Interrupt Flag

(0<<ADIE)| //ADC Interrupt Enable

(1<<ADPS2)| //ADC prescaler bits

(0<<ADPS1)|

(1<<ADPS0);

char TEMP [4];

while(1) {

ADCSRA |= (1<<ADSC); //start conversion

while((ADCSRA&(1<<ADIF))==0); //wait for conversion to complete

ADCSRA |= (1<<ADIF);

int c = ADCL;

c = c | (ADCH<<8);

c = (c/1024.0)\*5000/10;

*itoa*(c,TEMP,10);

for (int i = 0; i < *strlen*(TEMP); i++)

{

rxdata=SPI\_transmit(TEMP[i]);

USART\_putstring("TX Loopback Complete ... ");

usart\_send(rxdata);

USART\_putstring(" ");

*\_delay\_ms*(1000);

txdata = SPI\_receive(TEMP[i]);

usart\_send(txdata);

USART\_putstring(" ..... RX Loopback Complete");

USART\_putstring("\n");

}

}

return 0;

}

void usart\_init(void) {

UCSR0B = (1 << TXEN0);

UCSR0C = (1 << UCSZ01) | (1 << UCSZ00);

UBRR0L = *F\_CPU* / 16 / BAUD\_RATE - 1;

}

void usart\_send(char ch) {

while (!(UCSR0A & (1 << UDRE0)))

; // wait until UDR0 is empty

UDR0 = ch; // transmit ch

}

void USART\_putstring(char \*StringPtr) {

while (\*StringPtr != 0x00) {

usart\_send(\*StringPtr);

StringPtr++;

}

}

char SPI\_transmit(char data) {

// Start transmission

SPDR0 = data;

// Wait for transmission complete

while (!(SPSR0 & (1 << SPIF)));

data = SPDR0;

return (data);

}

char SPI\_receive(char data) {

SPDR0 = data-32;

while (!(SPSR0 & (1 << SPIF)));

data = SPDR0;

return data;

}

1. **GITHUB LINK OF THIS DA**

<https://github.com/kirkster96/submission_da/tree/master/DesignAssignment/DA5>

**Student Academic Misconduct Policy**

<http://studentconduct.unlv.edu/misconduct/policy.html>

“This assignment submission is my own, original work”.

Cameron Kirk