DIGITAL TEMPERATURE SENSOR USING ATMEGA32

Introduction:

In this project we use Atmega32 microcontroller and Lm35 temperature sensor and 16\*2 lcd display panel. This project is mainly used to measure and display temperature on lcd display panel.

Software Required:

Visual Studio Code, Simulide

Components Used:

* Atmega32 Microcontroller
* Lm35 Temperature Sensor (Potentiometer)
* 16\*2 lcd display panel

Explanation:

Lm35 has 3 pins

1)VCC 2) output 3) GND

Lm35 receives analog signals as per environment and it sends signals to atmega 32 microcontroller. In Atmega32 microcontroller it converts analog signal to digital signal by using ADC pins and it transmits signal to the lcd display panel to print the output temperature.

We can write our code using Visual Studio code

Programming Explanation:

#include <avr/io.h> //header to enable data flow control over pins

#define F\_CPU 1000000  //telling controller crystal frequency attached

#include <util/delay.h> //header to enable delay function in program

#define    E   5 //giving name “enable”  to 5th pin of PORTD, since it Is connected to LCD enable pin

#define RS  6 //giving name “registerselection” to 6th pin of PORTD, since is connected to LCD RS pin

void send\_a\_command(unsigned char command);

void send\_a\_character(unsigned char character);

void send\_a\_string(char \*string\_of\_characters);

int main(void)

{

DDRB = 0xFF; //putting portB and portD as output pins

DDRD = 0xFF;

\_delay\_ms(50);//giving delay of 50ms

DDRA = 0;//Taking portA as input.

ADMUX |=(1<<REFS0)|(1<<REFS1);//setting the reference of ADC

ADCSRA |=(1<<ADEN)|(1<<ADATE)|(1<<ADPS0)|(1<<ADPS1)|(1<<ADPS2);

//enabling the ADC, setting free running mode, setting prescalar 128

int16\_t COUNTA = 0;//storing digital output

char SHOWA [3];//displaying digital output as temperature in 16\*2 lcd

send\_a\_command(0x01); //Clear Screen 0x01 = 00000001

\_delay\_ms(50);

send\_a\_command(0x38);//telling lcd we are using 8bit command /data mode

\_delay\_ms(50);

send\_a\_command(0b00001111);//LCD SCREEN ON and courser blinking

ADCSRA |=(1<<ADSC);//starting the ADC conversion

while(1)

{

COUNTA = ADC/4; //since the resolution (2.56/2^10 = 0.0025) is 2.5mV there will be an increment of 4 for every 10mV input, that means for every degree raise there will be increment of 4 in digital value. So to get the temperature we have to divide ADC output by four.

send\_a\_string ("TEMPERATURE ");//displaying name

send\_a\_command(0x80 + 0x40 + 0); // shifting cursor  to 1st  shell  of second line

send\_a\_string ("Temp(C)=");// displaying name

send\_a\_command(0x80 + 0x40 + 8); // shifting cursor  to 9st  shell  of second line

itoa(COUNTA,SHOWA,10); //command for putting variable number in LCD(variable number, in which character to replace, which base is variable(ten here as we are counting number in base10))

send\_a\_string(SHOWA); //telling the display to show character(replaced by variable number) of first person after positioning the courser on LCD

send\_a\_string ("      ");

send\_a\_command(0x80 + 0);//retuning to first line first shell

}

}

void send\_a\_command(unsigned char command)

{

PORTA = command;

PORTD &= ~ (1<<RS); //putting 0 in RS to tell lcd we are sending command

PORTD |= 1<<E; //telling lcd to receive command /data at the port

 \_delay\_ms(50);

PORTD &= ~1<<E;//telling lcd we completed sending data

PORTA= 0;

}

void send\_a\_character(unsigned char character)

{

PORTA= character;

PORTD |= 1<<RS;//telling LCD we are sending data not commands

PORTD |= 1<<E;//telling LCD to start receiving command/data

\_delay\_ms(50);

PORTD &= ~1<<E;//telling lcd we completed sending data/command

PORTA = 0;

}

void send\_a\_string(char \*string\_of\_characters)

{

while(\*string\_of\_characters > 0)

{

send\_a\_character(\*string\_of\_characters++);

}

}

CIRCUIT DESIGN:

We can design circuit using simulide software

After designing a circuit we need to load the circuit with hex file then the output generates.

Learning outcomes:

* I have learned about ATmega32 microcontroller
* I have learned about Simulide, visual studio code software
* I have learned about Lm35 Sensor, ADC.