# DIGITAL TEMPERATURE SENSOR USING 8051

**BATCHELORS OF TECHNOLOGY**

**IN**

**ELECTRONICS AND INSTRUMENTATION**

Submitted by


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## INTRODUCTION:

- A temperature sensor is a device used to measure temperature. It can be used to measure temperature of air, liquid and even solid.

- There are different kinds of temperature sensors available and each of them use different technologies and principles to get the temperature measurement.

- Temperature sensors are widely used in electronic equipments to display the temperature. You can see the digital clock displaying the room temperature value. It is due to the temperature sensor embedded in it.

- Temperature sensors are classified into analog and digital based on the output.

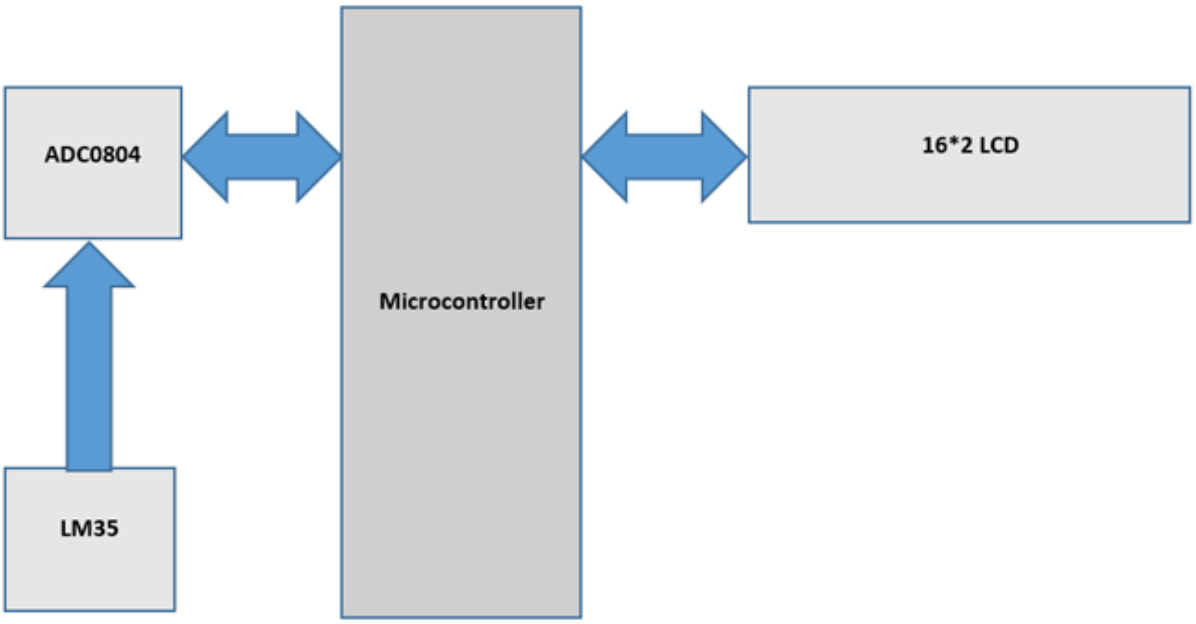
- We can extract much more accurate values from digital temperature sensors than analog temperature sensors as there might be a lot of errors like human errors, linearity errors associated with it.

- That's the reason why we have chosen digital temperature sensor over analog temperature sensor.

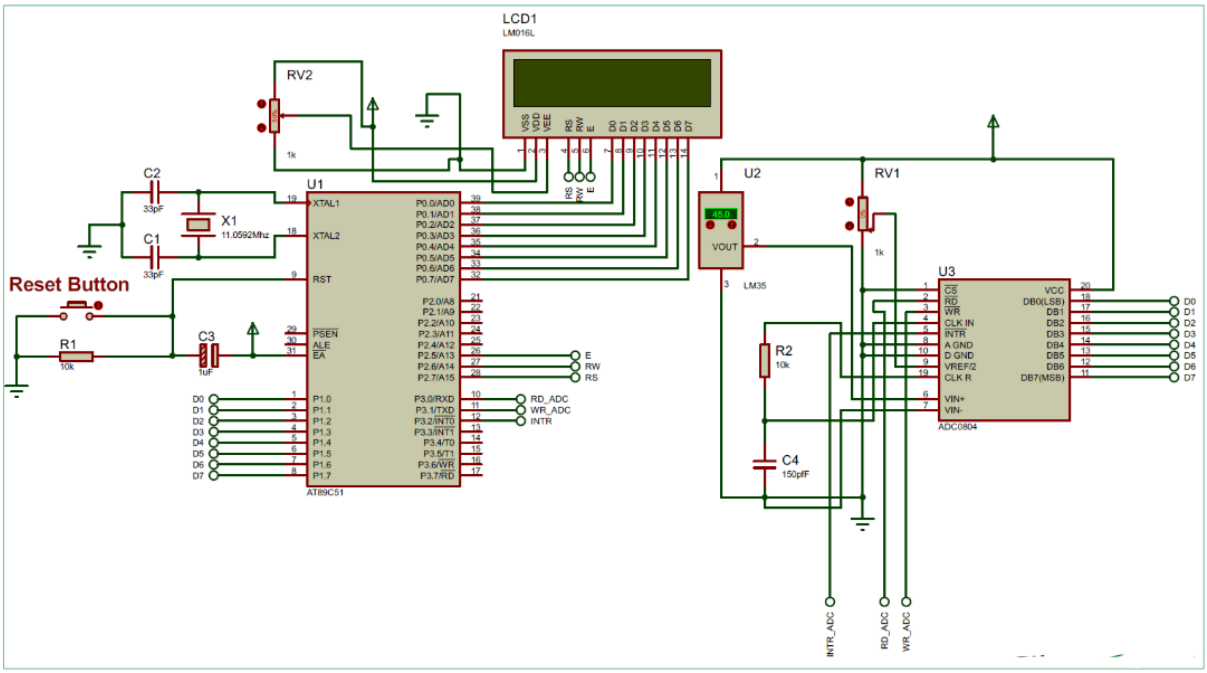
- This project is all about how to design a Digital Temperature Sensor using 8051 microcontroller.

- The value of temperature is analog. Hence, it is converted to digital value using an Analog to Digital converter (ADC) and then it is displayed on an LCD.

# BLOCK DIAGRAM:




# CIRCUIT DIAGRAM:



## PRINCIPLE:

- The main principle of this circuit is to take the analog temperature values as the input, convert them into digital values and display the digital temperature values on LCD Display as the output.

## WORKING:

- First, the temperature is sensed using LM35 sensor and the analog output of the sensor is given as the input to ADC.

- We are using 8051 microcontroller and it doesn't have an in-built analog to digital converter (ADC).

- Hence, we are going to interface an external ADC-IC (ADC0804) with 8051 Microcontroller to convert the Analog temperature values from the sensor to digital values.

- These digital values are given as the input to the microcontroller.

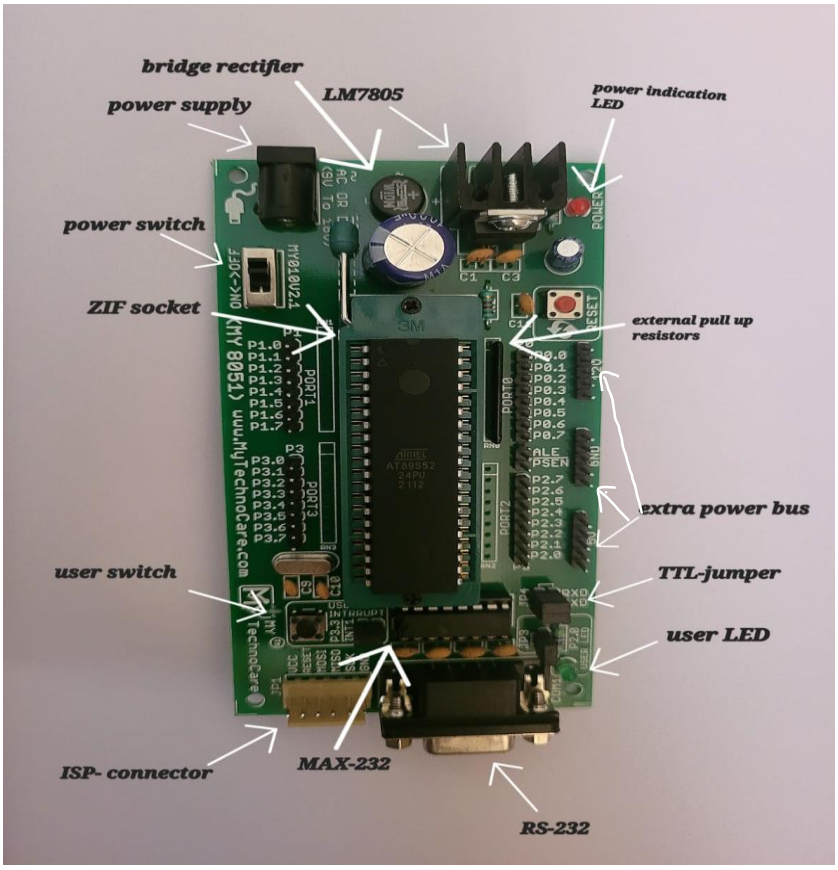
- We are connecting an external programmer to the microcontroller to give the commands.

- Further the microcontroller is connected to the LCD to display the temperature sensed in Degrees Celsius.

## COMPONENTS REQUIRED:

- 8051 development board
- ADC0804 board
- 16*2 LCD display
- LM35 sensor
- Potentiometer
- Jumper wires
- Programmer
- Bread board
- Resistors
- Capacitors

## (1) 8051 DEVELOPMENT BOARD:

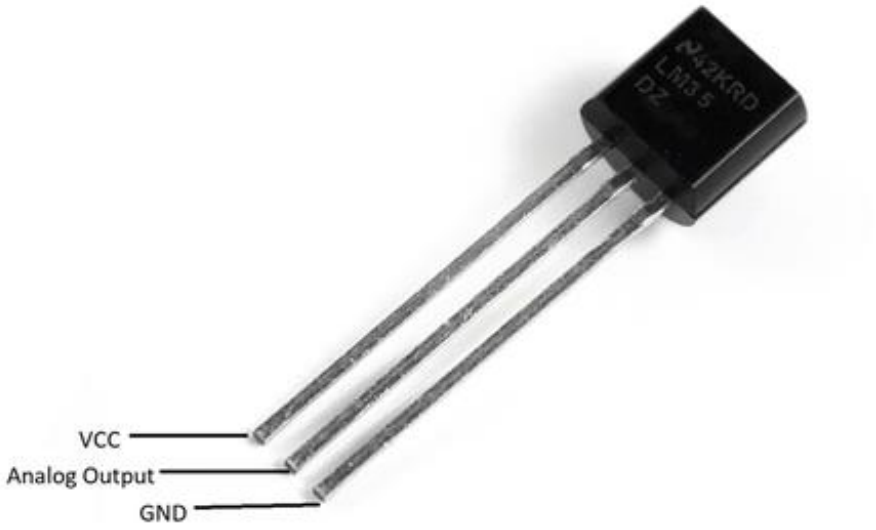



COMPONENTS,

- User switch - used as input switch or used as external interrupt.
- User LED – used as output led.
- Power indication LED.
- LM7805 – 5V voltage regulator.
- Extra power bus – 5V, 12V and ground to power external peripherals.
- RS 232.
- MAX 232 – used as RS 232 driver.
- TTL jumper – connects TXD & RXD pins of microcontroller (TTL pins) to RS 232.
- External pullup resistors.
- Zero insertion force socket (ZIF).
- Reset.

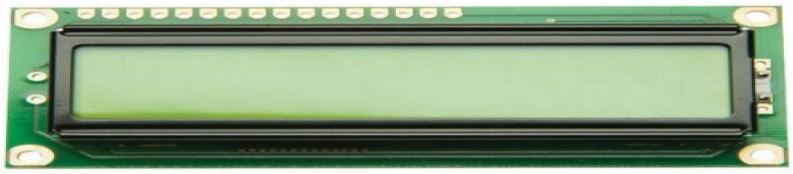
- ISP connector – to connect ISP programmer to board to load hex file into microcontroller IC.
- Power supply.
- Power switch.
- Bridge rectifier – used for rectification of input voltage (both AC & DC inputs can be given).

## (2) LM35 TEMPERATURE SENSOR:



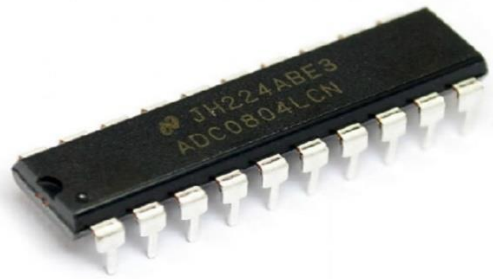

- It’s an inexpensive, high precision temperature sensor widely used in many applications. It gives an analog output voltage proportional to the temperature it measures at the input.
- Its operating range is -55°C to 150°C.
- Supply voltage range is 4-30V.

## (3) 16x2 LCD DISPLAY:



- Its widely used because of its affordable price.
- As it's a 16x2 lcd display, it has 16 columns, 2 rows and can display a total of 32 characters.

## (4) ANALOG TO DIGTAL CONVERTER (0804):




- Supply Voltage = 6.5V.
- Voltage at input = (-0.3 to 0.3).
- Operating temperature range = 0°C to 70°C.
- It's an 8-Bit, successive approximation A/D converters which uses a modified potentiometric ladder for anolag input to digital output.
- In physical world everything is analog but all the electronic devices like computers microcontrollers use dicrete values(digital values) for operation. So, we need some sort of Analog to Digital converter for data acquisition.
- Here the ADC that we are using is 0804 which is an 8bit parallel ADC.

- ADC-0804 pin diagram,