ATMega328 Microcontroller Project
(Digital Temperature Meter)

Description:

Design a digital temperature meter system using ATMega328 microcontroller to read the temperature signal and display the reading in ^{o}C and ^{o}F using three seven segments.

Components required:

Component	Quantity	Notes
Breadboard	1	-
ATMega328P	1	Microcontroller
LM35	1	Temperature Sensor
330 or 510 Ohm	7	Resistor
10 KOhm	1	Resistor
7 Segment	3	Common Cathode
Push Buttons	3	2 Pins Button
Jumpers or wires	Around 40	High Quality Jumpers or telephone wires

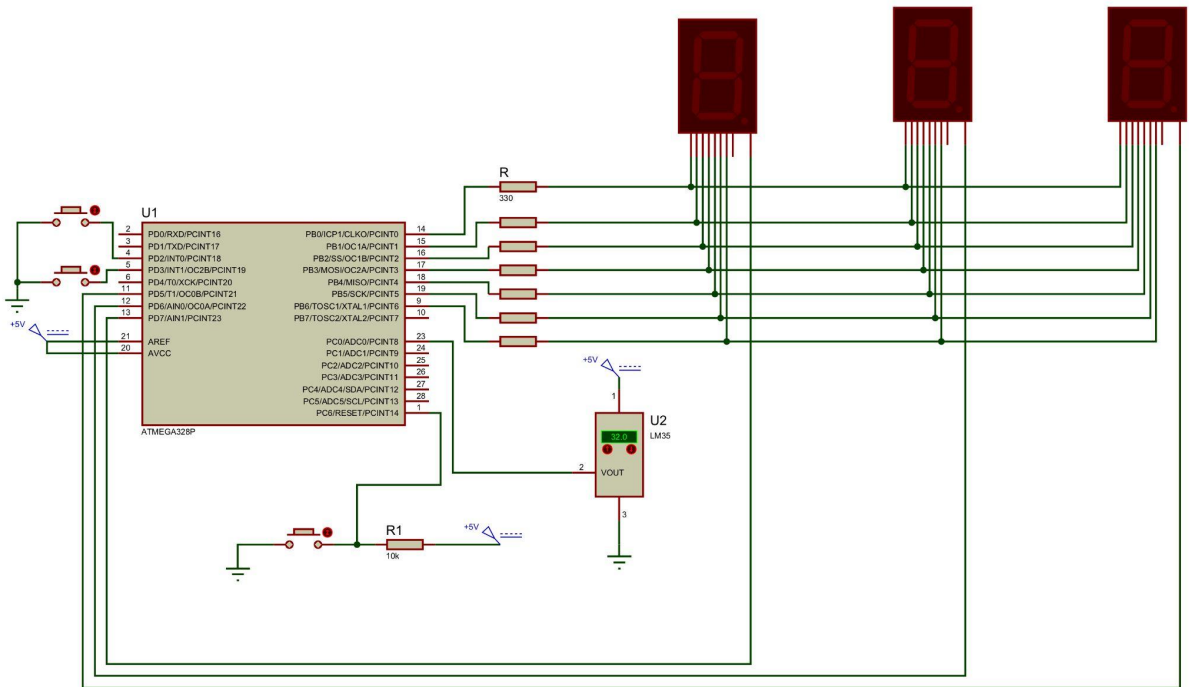

Figure [1]: Full schematic diagram of Digital Temperature Meter based on ATMega328P

ICs' Pin Configurations:

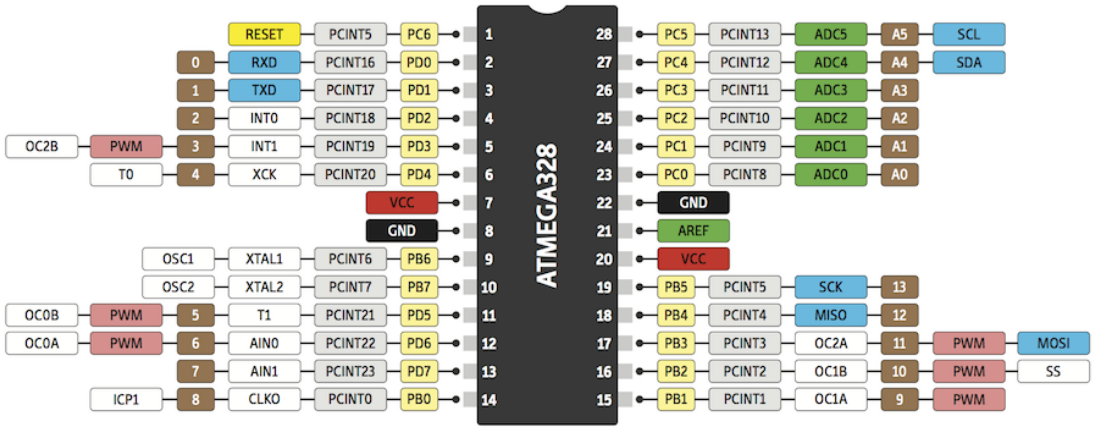

Figure [2]: ATMega328 MC pin configuration

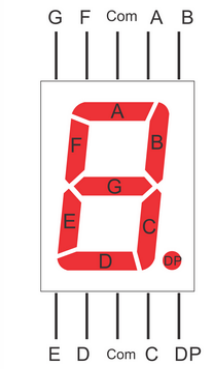

Figure [3]: 7 Segments pin configuration
(It may differ from one to another)

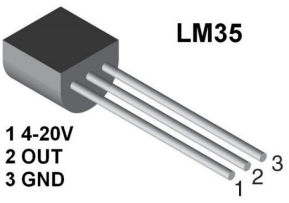

Figure [4]: LM35 pin configuration

Procedures:

1. Construct the digital temperature meter circuit given in figure [1] on a test board.
2. Write a C program using ATMEL Studio to perform the following tasks:
   a. Convert analog signal (LM35 output) using ATMega328 internal ADC in free running mode.
   b. Calculate temperature in ^{O}C and ^{O}F using the following equations:
      i. Temp in ^{O}C = ADC Reading / 2.046
      ii. Temp in ^{O}F = (Temp in ^{O}C × 9/5) + 32
   c. Use external interrupts INT0 and INT1 to switch between ^{O}C and ^{O}F modes.
   d. Use timer0 in CTC mode to display the temperature on three 7 segments using time multiplexing technique.
3. Build the Solution using the Build menu in ATMEL Studio to generate a .hex file.
4. Use Extreme Burner Software to write the .hex file to the Microcontroller using your own programmer or Arduino board.