Temperature Controlled DC-Fan

Abstract

Saving electrical energy is an everlasting goal due to various reasons such as the expensive prices electricity is distributed by. In this basic project, a DC fan will be switched on and off with different rotational velocities according to the readings of an LM 35 temperature sensor inputted to an ATTINY 45 microcontroller.

Methodology

This project is divided into three main parts: the electronics design, the electronics production, and the programming of the microcontroller.

1. The Electronic Design

The electronics design consists of two main steps:
   • The electronics components and the connections between them.
   • The printed circuit board (PCB) design.
Following is the schematics of the electronics design:
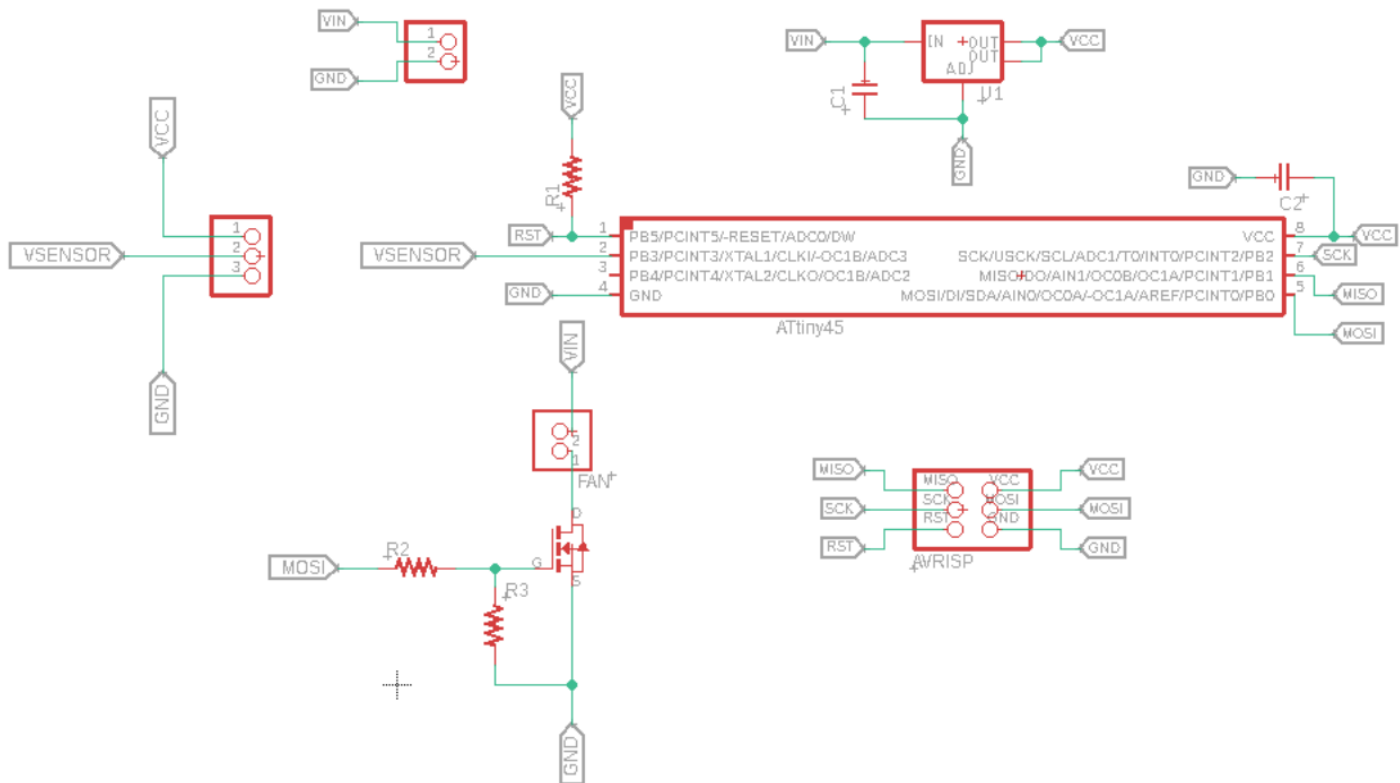
Power with a voltage level that suffices the rating of the Fan is first provided to the board via a two-pinhead terminal. This voltage is then stepped down to 5V using a voltage regulator, this 5V is fed to the VCC pin of the ATTINY 45, the LM 35 temperature sensor and the AVRISP programmer. The LM 35 output is connected to pin 2 of the ATTINY 45 which maps the voltage corresponding to a certain temperature value to a number between 0 and 1023, this number is then mapped to another number between 0 and 255 to control the PWM output in pin 5 which controls the speed of the DC-Fan (modeled as a DC-Motor). A common source MOSFET topology is connected between pin 5 output and the actual DC-Motor to provide a current that's capable of running the DC-Motor at its rated value. Other complementary components such as current limiting resistors and coupling and decoupling capacitors are also used.

Following is the design of the PCB:
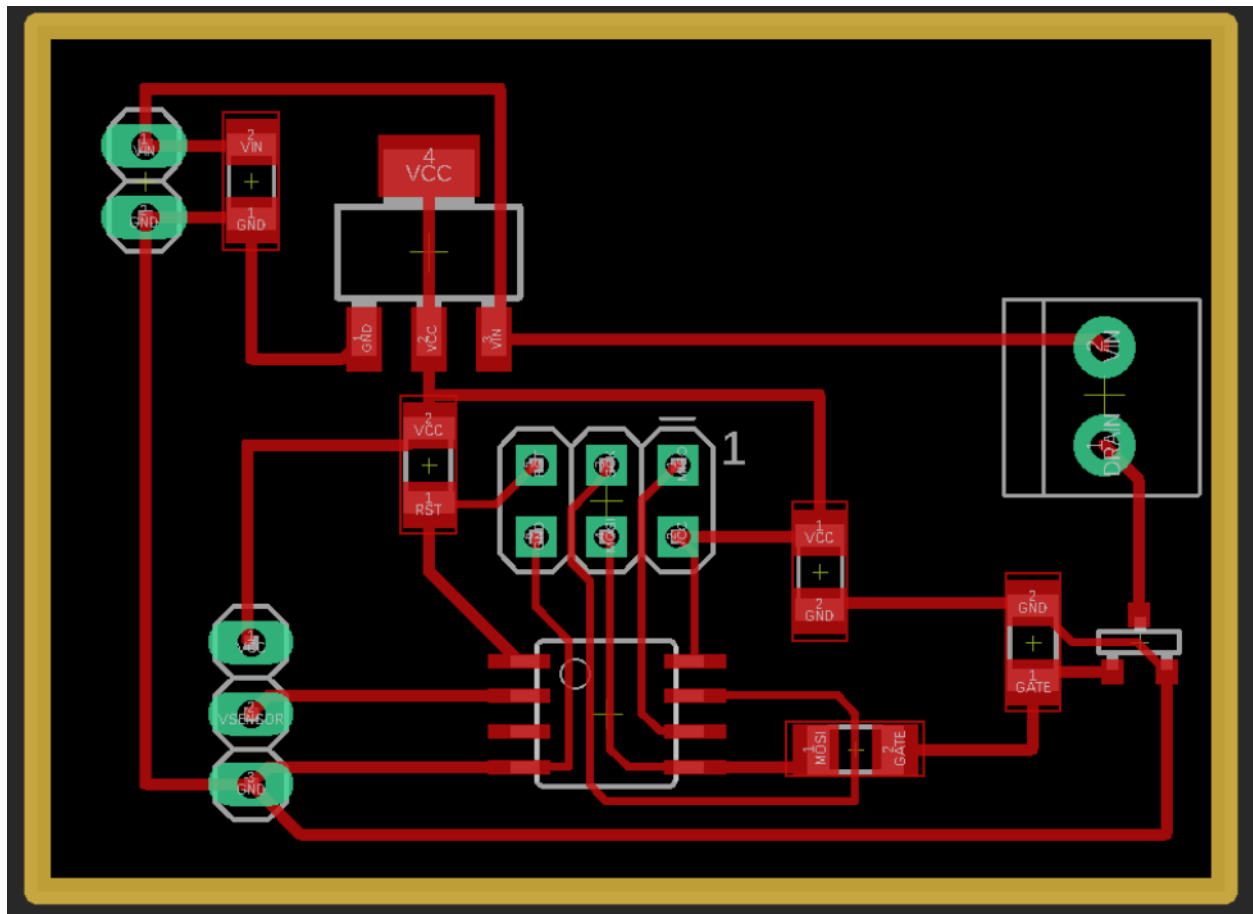
Nothing much to talk about here, limiting manufacturing factors were established and thus the necessary traces were made accordingly.