CS 241 Lab 07
(PCB Design)

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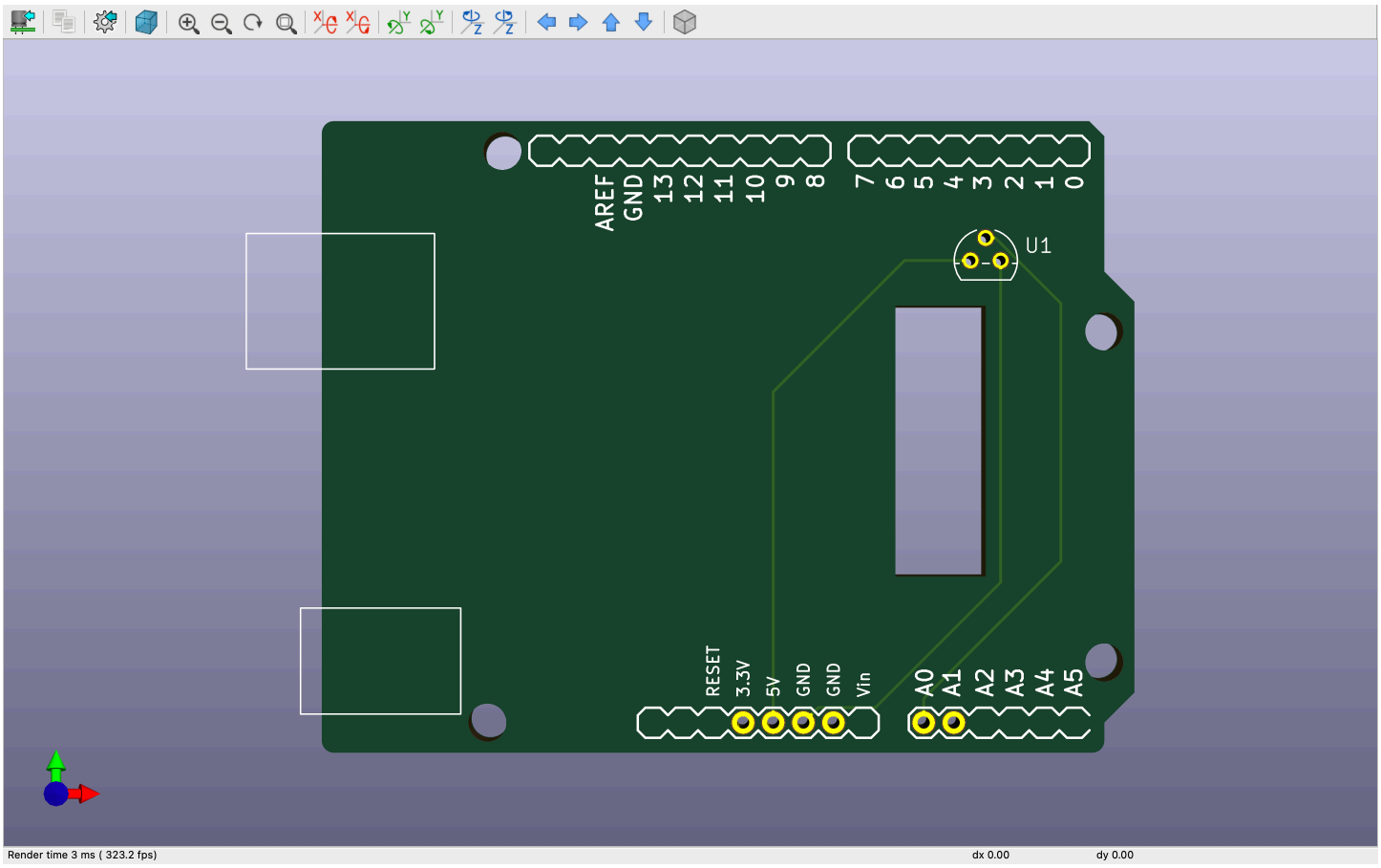
1 Answers to Questions

- *Find a datasheet for this device. Which datasheet did you use?*
- Link to datasheet: `https://www.ti.com/lit/ds/symlink/lm35.pdf`
- (LM35 Precision Centigrade Temperature Sensors)
- *Read the datasheet and figure out how to wire up the device for operation with an Arduino to read indoor temperatures. Which pins need to be connected to what?*
- Power (in) = 5v
- Ground = GND
- Data (out) = A0
- *Simulate the device in TinkerCad. It includes a similar device called a TMP36. Is the pinout the same? Is the voltage the same?*
- Both the TMP36 and LM35 have the same pin order and meanings. Similarly, the voltage is the same on both devices.

- *Write code to extract temperatures (convert via millivolts, remember lab 02.0!). How do you do this conversion?*
- When converting from A0 into Voltage, we divided by 10.230 instead of 1023 because the datasheet gives a conversion rate of around 250 mV = 25 degrees Celsius.
- We conclude that this leads to 10 mV equaling 1 degree Celsius. Instead of dividing by a magnitude of 4, we used a 3 to account for the conversion.
- *Measure the temperature and report via serial prints. Is the room temperature plausible in Celcius? How much noise is there at constant temperature? Does the temperature increase in a reasonable way when you touch the device with warm hands?*
- Yes, room temperature seems plausible in degrees C but might be slightly lower than average. We noticed some variation at a constant temperature, and taking the average temperature over a longer time will minimize the impact of the noise.
- Rubbing hands together and touching the device raises the values to a higher temperature reading.
- *Think about where you want your components to physically exist on the finished board. Where should a thermistor go to avoid the heat of a running Arduino?*
- Put them by the Funduino logo, so it is as far away as possible from the CPU.


AREF
GND
13
12
11
10
9
8
7
6
5
4
3
2
1
0
U1
RESET
3.3V
5V
GND
GND
Vin
A0
A1
A2
A3
A4
A5
Render time 3 ms (323.2 fps)
dx 0.00
dy 0.00

2 Appendix

2.1 Source Code

```
// Benjamin Stream & Solomon Himelbloom

void setup() {
  Serial.begin(9600);
}

void loop() {
  int t = analogRead(A0); // raw 0-1023 analog-to-digital reading
  float V = (t*5.0/10.230); // scale to float Volts
  Serial.print("Temperature: ");
  Serial.print(V); // print voltage / 250 (in volts)
  Serial.println(" °C");
  delay(1000); // wait for 1 second
}
```