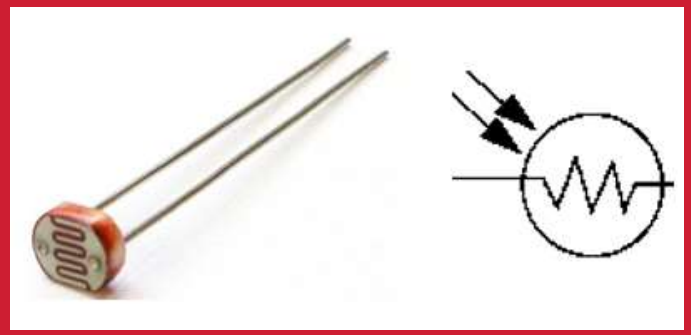
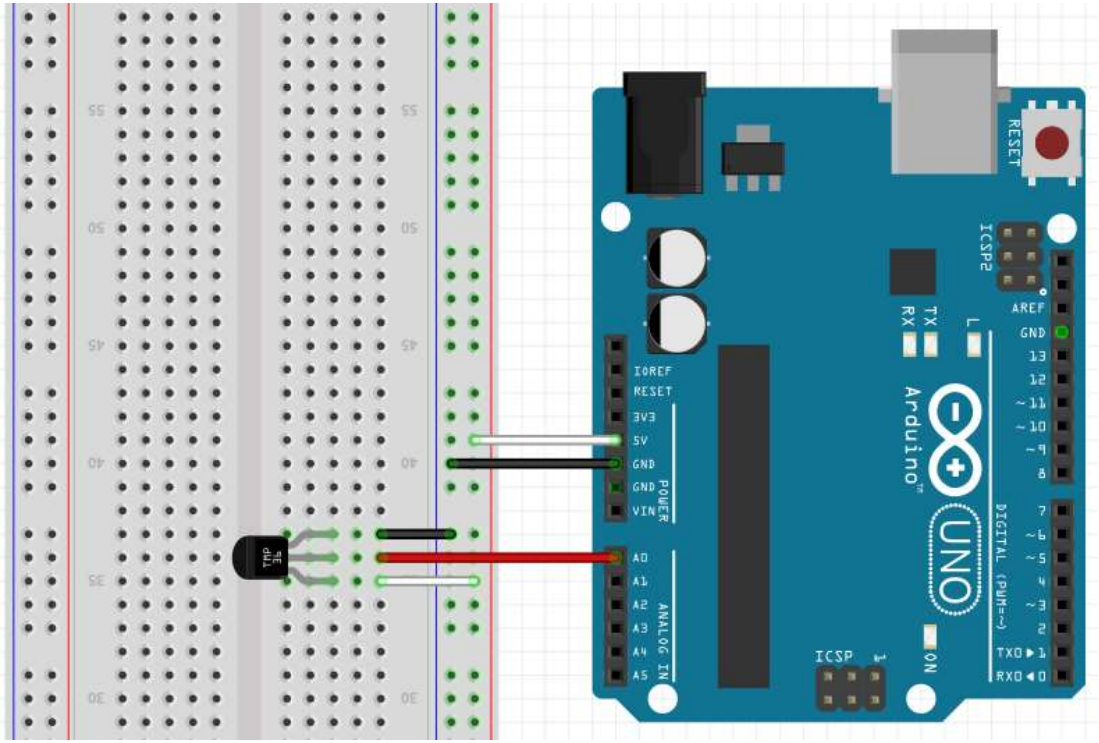
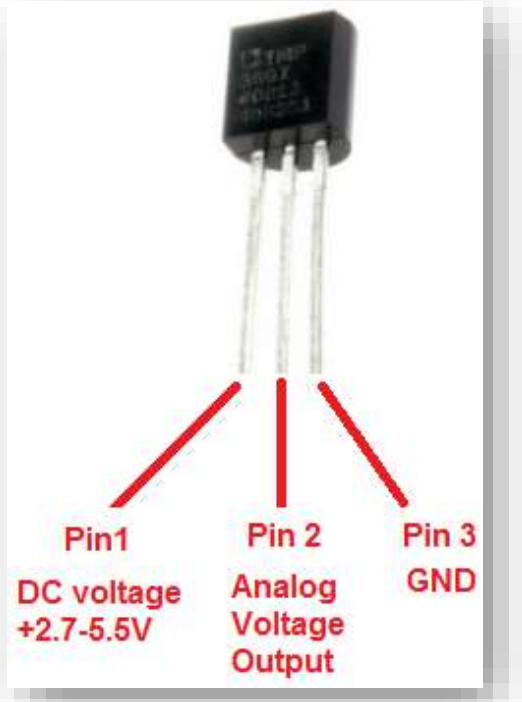
기말: TMP36 + CdS

온도, 조도 센서

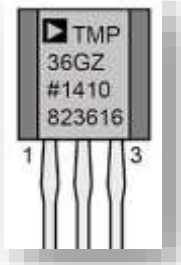


A3.1.1 Temperature sensor [TMP36]





Parts : TMP36



- **Size:** TO-92 package (about 0.2" x 0.2" x 0.2") with three leads
- **Price:** $2.00 at the Adafruit shop
- **Temperature range:** -40°C to 150°C / -40°F to 302°F
- **Output range:** 0.1V (-40°C) to 2.0V (150°C) but accuracy decreases after 125°C
- **Power supply:** 2.7V to 5.5V only, 0.05 mA current draw

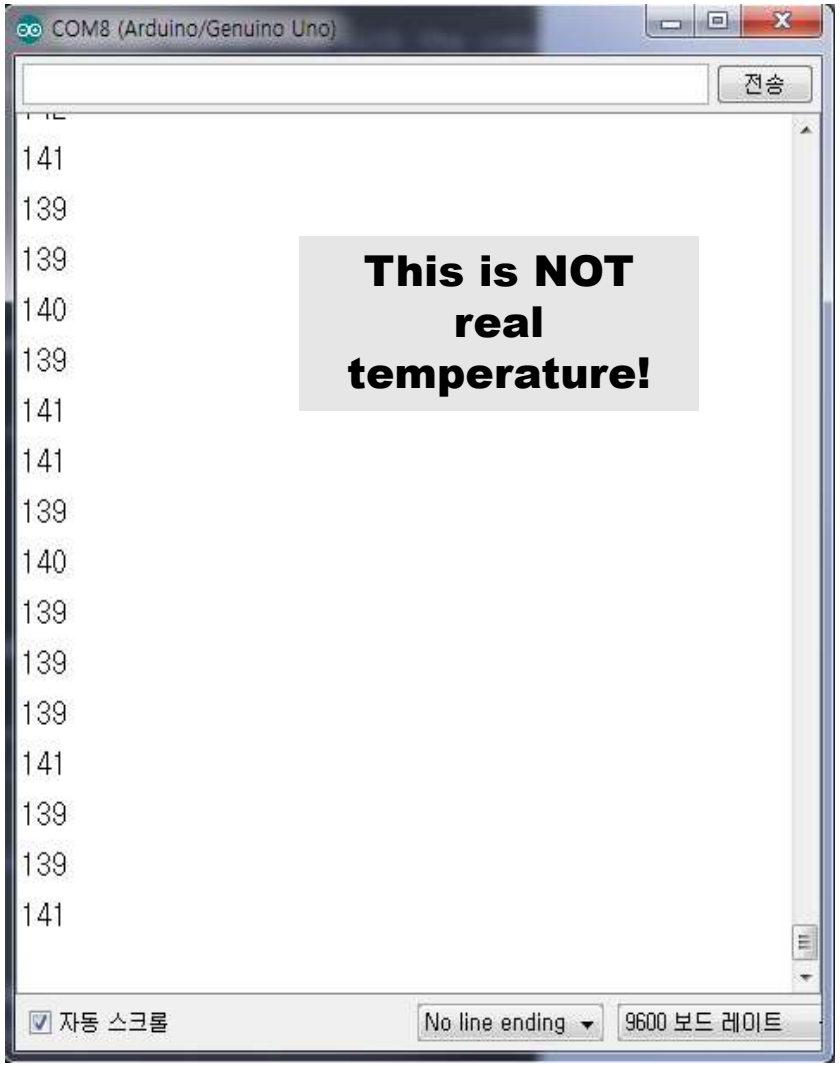
A3.1.2 Temperature sensor [TMP36]

Simple code

TMP36 §

```
1  //
2  //    AR00, TMP36 sensor
3  //
4
5  #define TEMP_INPUT 0
6  // or  int TEMP_INPUT = 0;
7
8  void setup() {
9    Serial.begin(9600);
10 }
11
12 void loop() {
13
14   int value = analogRead(TEMP_INPUT);
15   Serial.println(value);
16
17   delay(1000);
18 }
```

Serial output (0 ~ 1023)



A3.1.3 Temperature sensor [TMP36]

Sensor property

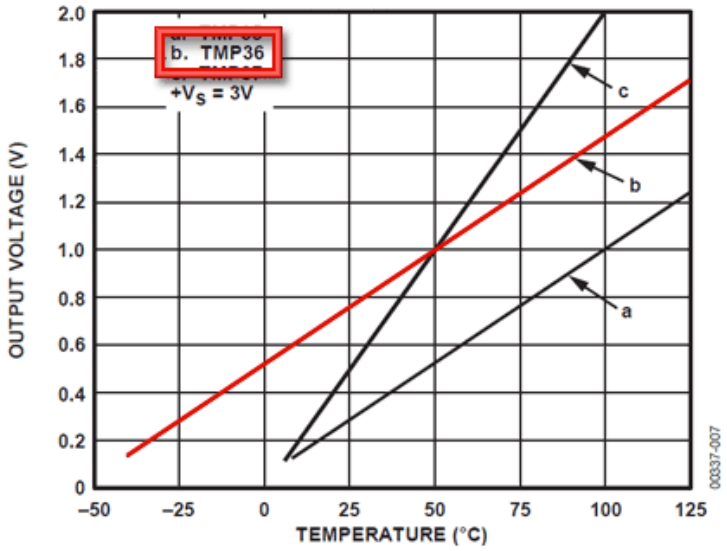


Figure 6. Output Voltage vs. Temperature

Output Voltage (mV) vs. Temperature (°C)			
V	0	500	1000
T	-50	0	50

https://github.com/Redwoods/Arduino/blob/master/ar-iot/py-ml/tmp36_LR.ipynb

Temperature conversion

Temp (° C) = (Vout – 500) / 10

Vout (mV) = value * (5000 / 1023)

(0 <= value <= 1023)

```
// converting that reading to voltage
float voltage = value * 5.0 * 1000;  // in mV
voltage /= 1023.0;
float temperatureC = (voltage - 500) / 10 ;
```

A3.1.4 Temperature sensor [TMP36]

Working code

TMP36

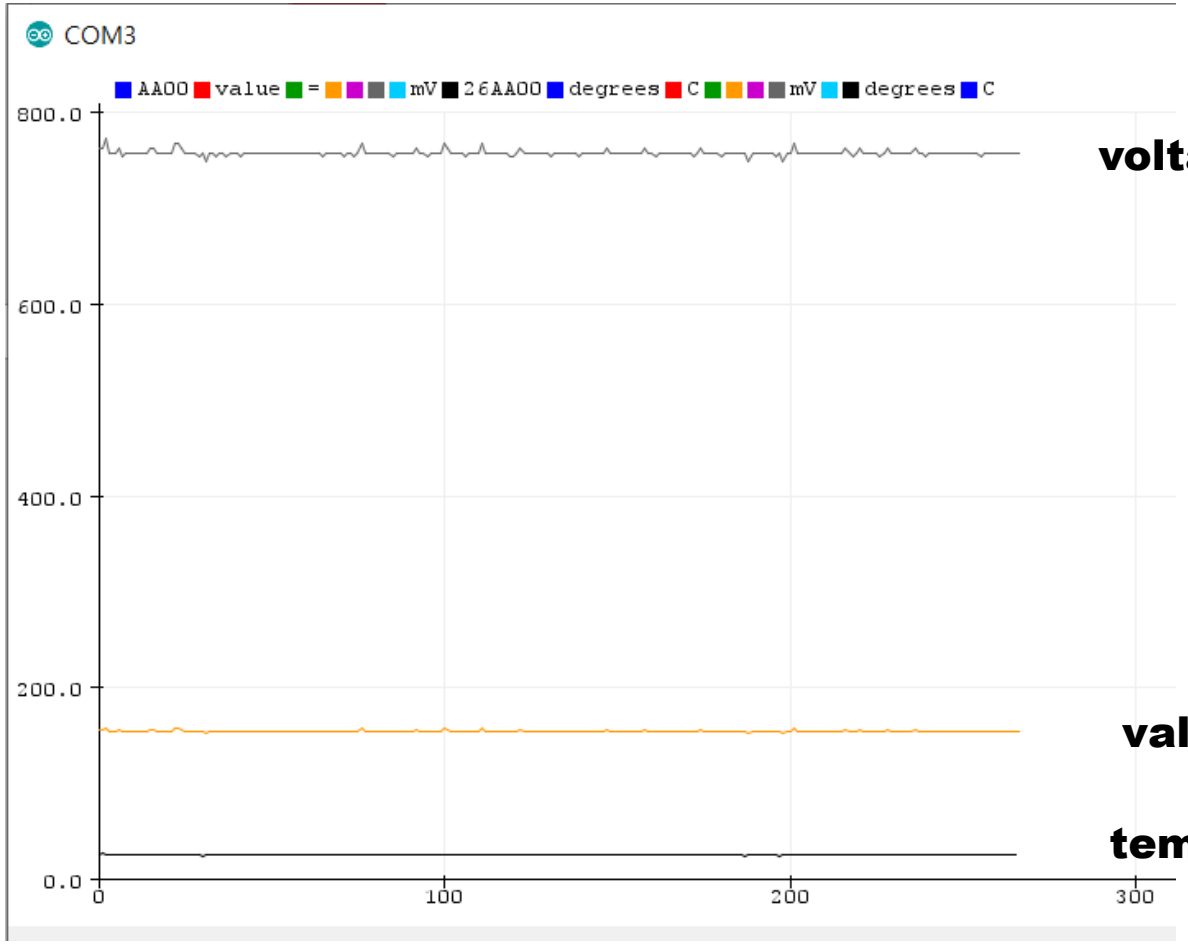
```
10 }
11
12 void loop() {
13   //getting the voltage reading from the temperature sensor
14   int value = analogRead(TEMP_INPUT);
15   Serial.print("AA00, value = ");
16   Serial.print(value);
17   Serial.print(" : ");
18
19   // converting that reading to voltage
20   float voltage = value * 5.0 * 1000;  // in mV
21   voltage /= 1023.0;
22
23   // print out the voltage
24   Serial.print(voltage);
25   Serial.print(" mV, ");
26
27   // now print out the temperature
28   float temperatureC = (voltage - 500) / 10 ;
29   Serial.print(temperatureC);
30   Serial.println(" degrees C");
31
32   delay(1000);
33 }
```

Serial output (˚C)

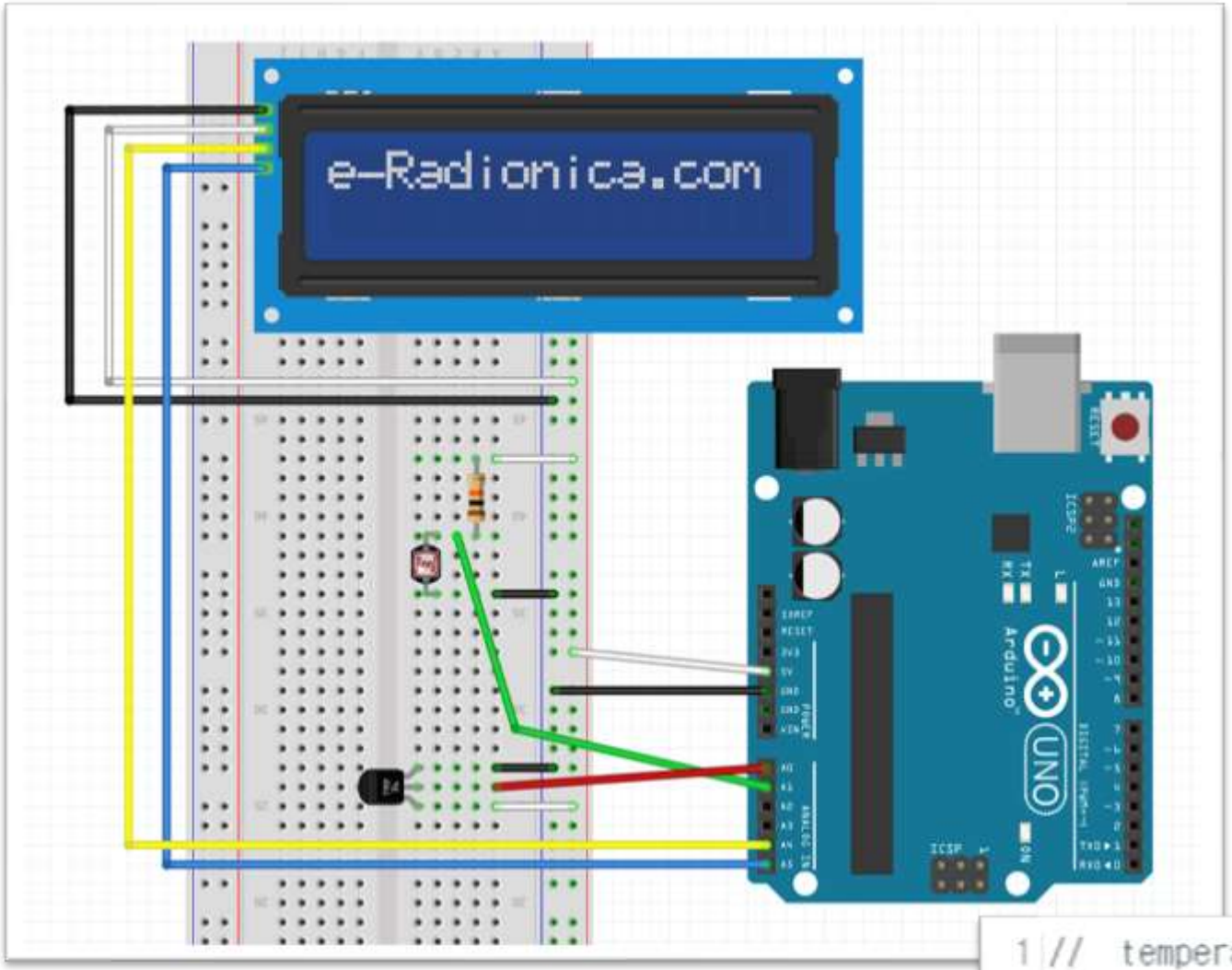
COM4

```
AA00, value = 131 : 640.27 mV, 14.03 degrees C
AA00, value = 130 : 635.39 mV, 13.54 degrees C
AA00, value = 132 : 645.16 mV, 14.52 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 129 : 630.50 mV, 13.05 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 130 : 635.39 mV, 13.54 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 132 : 645.16 mV, 14.52 degrees C
AA00, value = 129 : 630.50 mV, 13.05 degrees C
AA00, value = 132 : 645.16 mV, 14.52 degrees C
AA00, value = 129 : 630.50 mV, 13.05 degrees C
AA00, value = 130 : 635.39 mV, 13.54 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
AA00, value = 128 : 625.61 mV, 12.56 degrees C
```

A3.1.5 Temperature sensor [TMP36]



TMP36 + CdS + LCD : circuit




```
1 //  temperature & lux
2 #define TMP36_INPUT 0
3 #define CDS_INPUT 1
```

TMP36 + CdS + LCD : code

arXX_cds_tmp36.ino

```
1   //  temperature & lux
2   #define TMP36_INPUT 0
3   #define CDS_INPUT 1
4
5   void setup() {
6     Serial.begin(9600);
7   }
8
9   void loop() {
10    // Temperature from TMP36
11    int temp_value = analogRead(TMP36_INPUT);
12    // converting that reading to voltage
13    float voltage = temp_value * 5.0 * 1000;  // in mV
14    voltage /= 1023.0;
15    float tempC = (voltage - 500) / 10 ;
16
17    // Lux from CdS (LDR)
18    int cds_value = analogRead(CDS_INPUT);
19    int lux = int(luminosity(cds_value));
20  //  Serial.print("ARnn,");
21    Serial.print(tempC);
22    Serial.print(",");
23    Serial.println(lux);
24
25    delay(1000);
26  }
```

```
28  //Voltage to Lux
29  double luminosity (int RawADC0){
30    double Vout=RawADC0*5.0/1023.0;
31    double lux=(2500/Vout-500)/10.0;
32    // lux = 500 / Rldr, Vout = Ildr
33    return lux;
34  }
```

아두이노 실기

- TMP36 + CdS + LCD + @
- 온도와 조도를 LCD로 모니터링
- 모니터링 화면을 arnn_project.png로 촬영 및 저장
- led, 부저, 모터 등을 추가해서 온도/조도 변화 효과를 추가
- 최종 동작 상태를 촬영 및 저장: arnn_project2.png

- 시간: 6월 15일 오후 2 시~
- 장소: E323 실습실
- 배점: @@@
- 각자 github에 project 폴더로 업!