Lab Experiment - 2

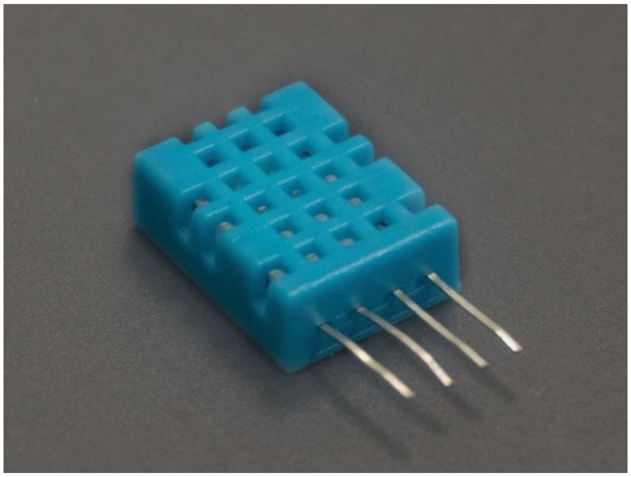
Experiment Title: Interface a temperature and humidity sensor with an Arduino Uno and display the readings.

Description:

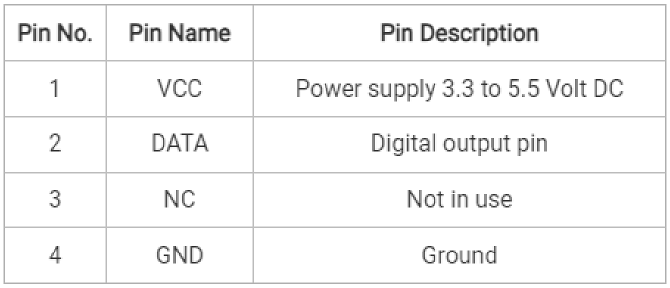
DHT11 Humidity and Temperature Sensor

The DHT11 is a basic, low cost digital temperature and humidity sensor.

- DHT11 is a single wire digital humidity and temperature sensor, which provides humidity and temperature values serially with one-wire protocol.
- DHT11 sensor provides relative humidity value in percentage (20 to 90% RH) and temperature values in degree Celsius (0 to 50 °C).
- DHT11 sensor uses resistive humidity measurement component, and NTC temperature measurement component.

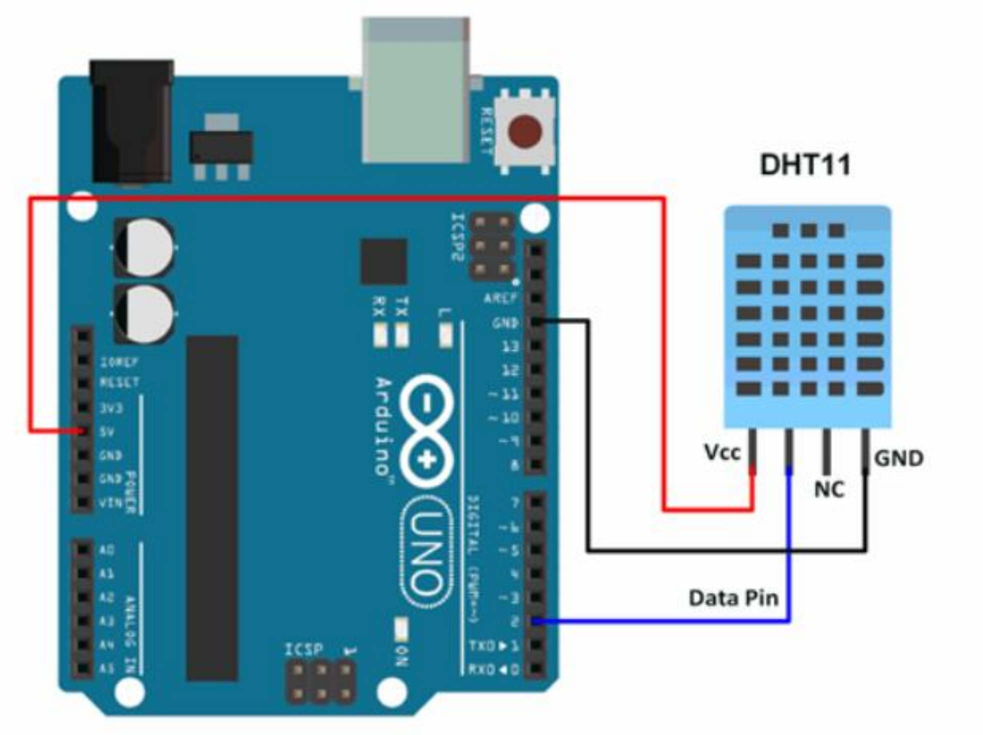


Pin Description:



Pin No.	Pin Name	Pin Description
1	VCC	Power supply 3.3 to 5.5 Volt DC
2	DATA	Digital output pin
3	NC	Not in use
4	GND	Ground

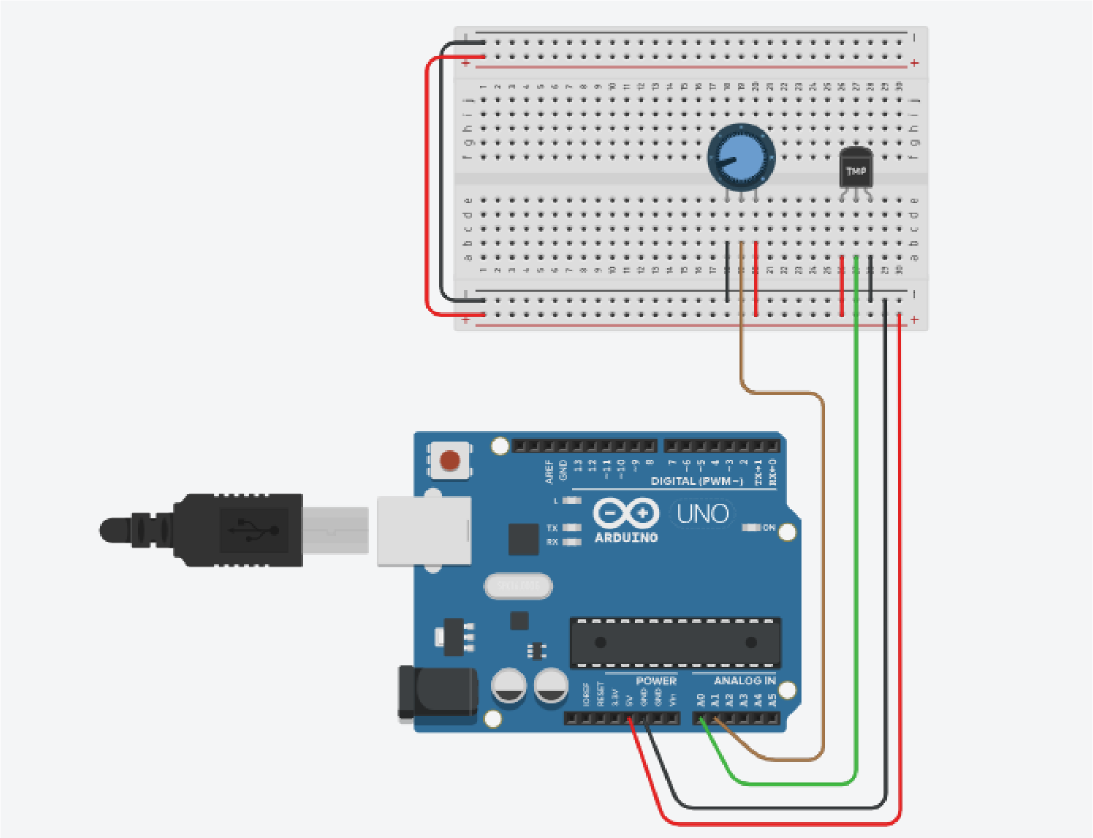
DHT11 Interfacing with Arduino



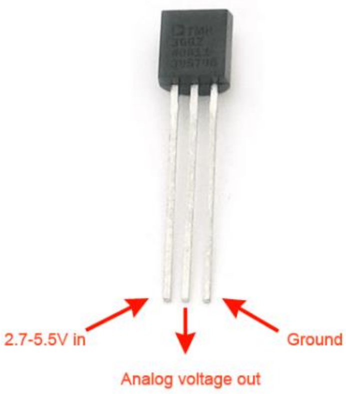
Temperature and Humidity Measurement Code using DHT11 for Arduino

```
# include"DHT.h"

DHT dht;

voidsetup()
{
 Serial.begin(9600);
 Serial.println();
 Serial.println("Status\tHumidity (%)\tTemperature (C)\t(F)");
 dht.setup(2);   /* set pin for data communication */
}

voidloop()
{
 delay(dht.getMinimumSamplingPeriod());  /* Delay of amount equal to sampling period
*/

  float humidity = dht.getHumidity();          /* Get humidity value */
  float temperature = dht.getTemperature();     /* Get temperature value */

 Serial.print(dht.getStatusString());        /* Print status of communication */
 Serial.print("\t");
  Serial.print(humidity, 1);
 Serial.print("\t\t");
 Serial.print(temperature, 1);
 Serial.print("\t\t");
 Serial.println(dht.toFahrenheit(temperature), 1);  /* Convert temperature to
Fahrenheit units */
}
```

DHT 11 temperature and humidity sensor at Tinker cad



TMP 36 sensor



Voltage calculation formula:

Voltage at pin in milliVolts = (*reading from ADC***) * (5000/1024)** // This formula converts the number 0-1023 from the ADC into 0-5000mV (= 5V)

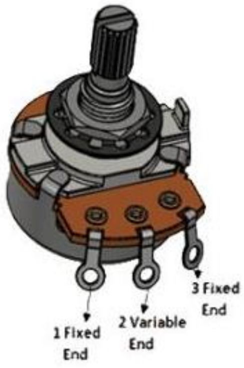
Voltage at pin in milliVolts = (*reading from ADC***) * (3300/1024)** // This formula converts the number 0-1023 from the ADC into 0-3300mV (= 3.3V)

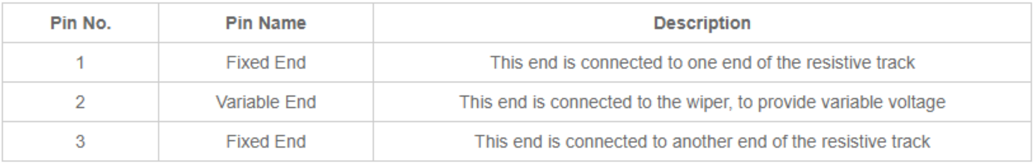
Centigrade temperature (tempC) = [(analog voltage in mV) - 500] / 10

Fahrenheit temperature = (tempC * 1.8) + 32

Potentiometer

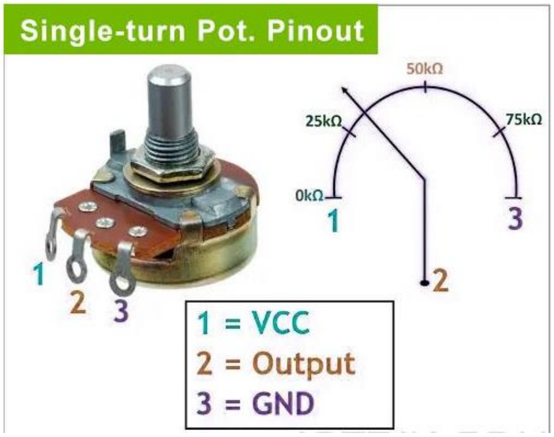
Potentiometers serve as adjustable resistors within circuits, finding application in various scenarios such as volume control in amplifiers, brightness adjustment in lighting systems, and more.

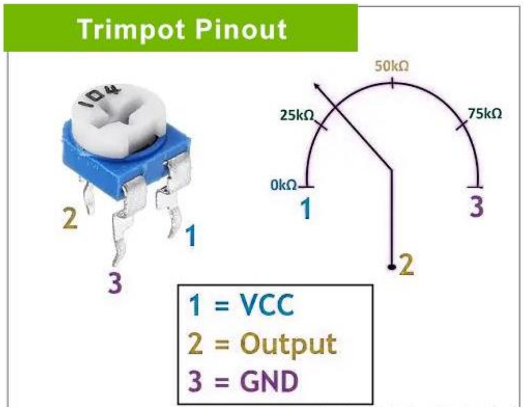




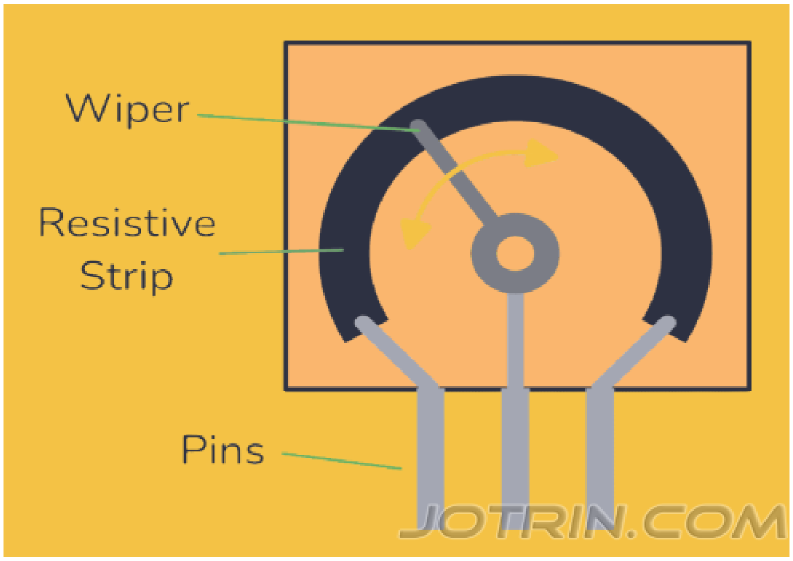
Pin No.	Pin Name	Description
1	Fixed End	This end is connected to one end of the resistive track
2	Variable End	This end is connected to the wiper, to provide variable voltage
3	Fixed End	This end is connected to another end of the resistive track

Single-turn potentiometer Pinout and Trimpot Pinout





How Potentiometers are Made?



Code

```
/*

const int analogIn = A0;

int humiditysensorOutput = 0;

// Defining Variables

int RawValue= 0;

double Voltage = 0;

double tempC = 0;

double tempF = 0;


void setup(){

  Serial.begin(9600);

  pinMode(A1, INPUT);

}


void loop(){


  RawValue = analogRead(analogIn);

  Voltage = (RawValue / 1023.0) * 5000; // 5000 to get millivots.

  tempC = (Voltage-500) * 0.1; // 500 is the offset

  tempF = (tempC * 1.8) + 32; // convert to F

  Serial.print("Raw Value = " );

  Serial.print(RawValue);
  Serial.print("\t milli volts = ");

  Serial.print(Voltage,0); //

  Serial.print("\t Temperature in C = ");

  Serial.print(tempC,1);

  Serial.print("\t Temperature in F = ");

  Serial.println(tempF,1);

  humiditysensorOutput = analogRead(A1);

  Serial.print("Humidity: "); // Printing out Humidity Percentage

  Serial.print(map(humiditysensorOutput, 0, 1023, 10, 70));

  Serial.println("%");


  delay(5000);  //iterate every 5 seconds


}
```

Lab Task 1:

1. Temperature Monitoring and Display Using Arduino and LCD in Tinkercad