



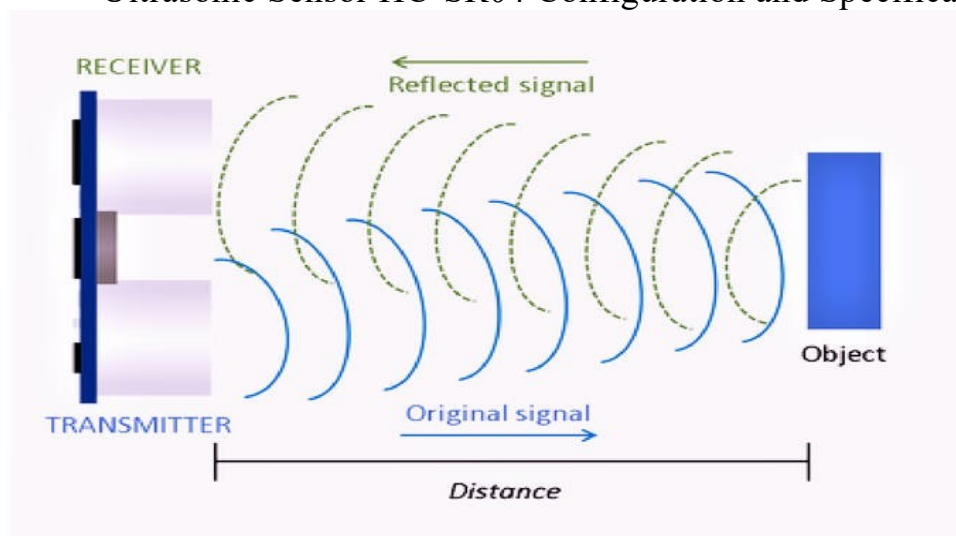
## Ultrasonic Sensor HC-SR04

Ultrasonic Sensor HC-SR04 is a sensor that can measure distance. It emits an ultrasound at 40 000 Hz (40kHz) which travels through the air and if there is an object or obstacle on its path It will bounce back to the module. Considering the travel time and the speed of the sound you can calculate the distance.

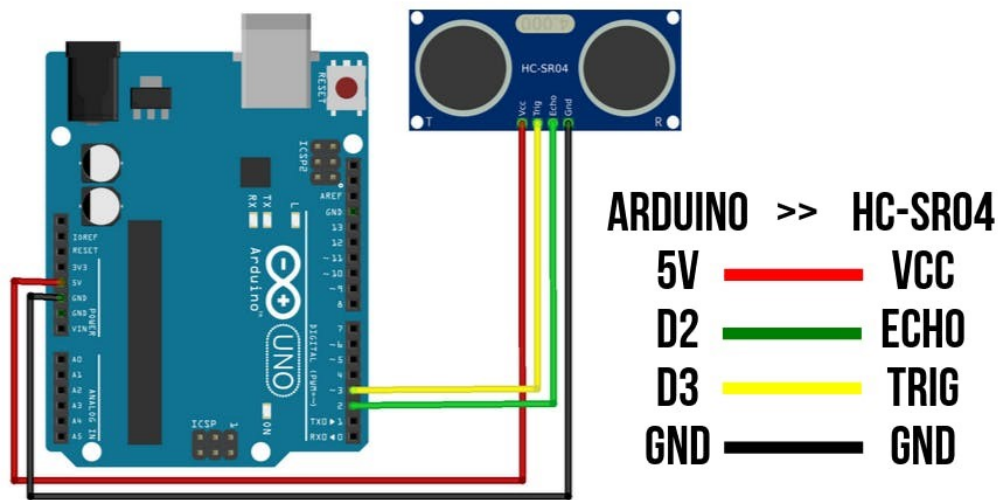
The configuration pin of HC-SR04 is VCC (1), TRIG (2), ECHO (3), and GND (4). The supply voltage of VCC is +5V and you can attach TRIG and ECHO pin to any Digital I/O in your Arduino Board.



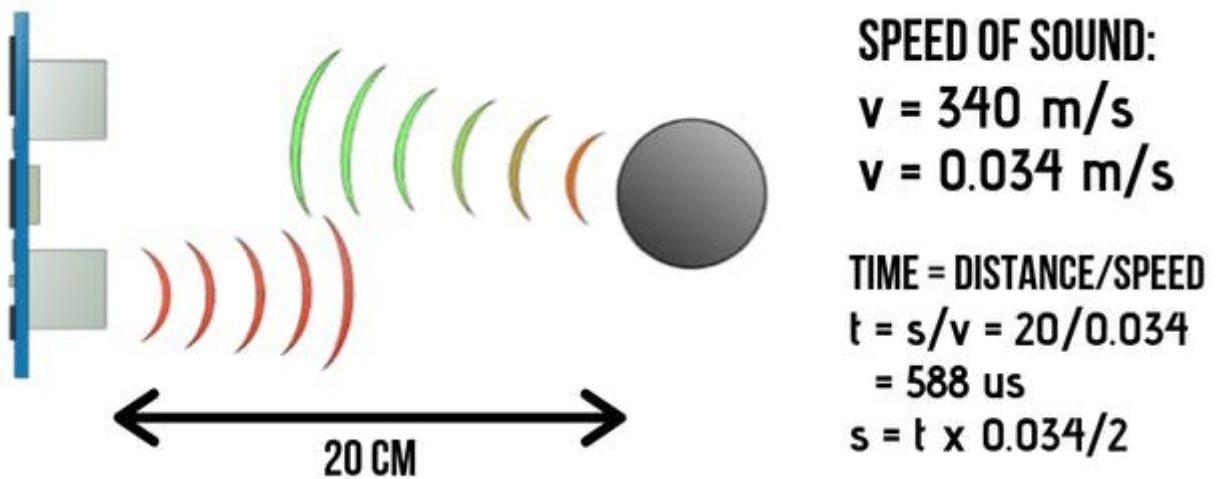
### Ultrasonic Sensor HC-SR04 Configuration and Specification



### Ultrasonic Sensor HC-SR04 Principle



For example, if the object is 20 cm away from the sensor, and the speed of the sound is 340 m/s or 0.034 cm/ $\mu$ s . But what you will get from the Echo pin will be double that number because the sound wave needs to travel forward and backward. So in order to get the distance in cm we need to multiply the received travel time value from the echo pin by 0.034 and divide it by 2.



Distance calculating



```
#define echoPin 2 // attach pin D2 Arduino to pin Echo of HC-  
SR04  
#define trigPin 3 //attach pin D3 Arduino to pin Trig of HC-  
SR04  
  
// defines variables  
long duration; // variable for the duration of sound wave  
travel  
int distance; // variable for the distance measurement  
  
void setup() {  
  pinMode(trigPin, OUTPUT); // Sets the trigPin as an OUTPUT  
  pinMode(echoPin, INPUT); // Sets the echoPin as an INPUT  
  Serial.begin(9600); // // Serial Communication is starting  
with 9600 of baudrate speed  
  Serial.println("Ultrasonic Sensor HC-SR04 Test"); // print  
some text in Serial Monitor  
}  
  
void loop() {  
  // Clears the trigPin condition  
  digitalWrite(trigPin, LOW);  
  delayMicroseconds(2);  
  // Sets the trigPin HIGH (ACTIVE) for 10 microseconds  
  digitalWrite(trigPin, HIGH);  
  delayMicroseconds(10);  
  digitalWrite(trigPin, LOW);  
  // Reads the echoPin, returns the sound wave travel time in  
microseconds  
  duration = pulseIn(echoPin, HIGH);  
  // Calculating the distance  
  distance = duration * 0.034 / 2; // Speed of sound wave  
divided by 2 (go and back)  
  // Displays the distance on the Serial Monitor  
  Serial.print("Distance: ");  
  Serial.print(distance);  
  Serial.println(" cm");  
}
```



Department of Computer Engineering Techniques (Stage: 3)  
Real time system design/ lab.



M.s.c Hawraa Neama Jasim

