

## Ultrasonic experiment

一： First of all, what's an ultrasound?

Answer: the acoustic frequency range is very big (more than from zero to more than several million), and the people hearing sensitivity is limited, so the scientists will hearing sensitivity low 20 hz defined as sound, the sound waves of the defined more than 20 KHZ sound wave ultrasonic; The sound wave range (20Hz -- 20KHz) is defined as audio sound wave (the highest frequency is 1KHz). Ultrasonic wave is highly intentionality (the higher the frequency, the closer to the light wave), so the ultrasonic flaw detection and b-super application are invented by people using ultrasound.

二： The principle of ultrasonic ranging

Ultrasonic emission devices emit ultrasonic waves, which can be known by the time difference between the receiver and the ultrasonic wave. This is similar to radar ranging. Emit ultrasonic transmitter to a certain direction, in the moment of timing starts at the same time, the ultrasonic wave in air, run into obstacles on the way to return immediately, ultrasonic receiver receive the reflected wave will immediately stop timing. (the speed of the ultrasound in the air is 340m/s. According to the time of the timer, it can calculate the distance of the launching point from the obstacle (s), i.e.,  $s = 340t / 2$ ).

This module is stable and accurate. Can be compared with the overseas SRF05, SRF02 and other ultrasonic ranging models. The module is high precision, blind area (2cm) is very close, and the steady ranging is a strong basis for the success of this product to market.

三： Characteristics of ultrasonic wave:

Ultrasonic direction is strong and the distance is far away from the medium, so ultrasonic is often used for distance measurement, such as rangefinder and object measuring instrument can be realized by ultrasonic wave. Using the ultrasonic detection tend to be more quick, convenient, simple calculation, easy to do real-time control, and in terms of measurement accuracy can meet the requirements of industrial practical, so on the development of the mobile robot is also widely used.

In order to enable mobile robot to avoid obstacle avoidance, it is necessary to equip the range system to get the distance information (distance and direction) of the obstacle. The three directions (front, left, right) ultrasonic ranging system in this paper provides a motion distance information for the robot to understand its front, left and right environment.

四： Main technical parameters of this module:

1. Voltage: DC5V 2: static current: less than 2mA

3: level output: high 5V 4: level output: base 0V

5: induction Angle: no greater than 15 degrees 6: detection distance: 2cm-450cm

7: high accuracy can reach 0.2cm

五： Working principle of module:

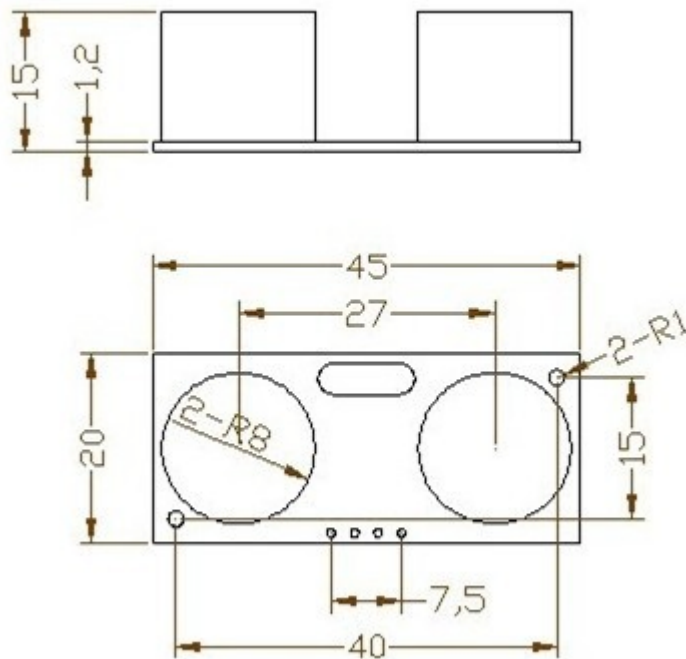
(1) use IO to trigger ranging, to give at least 10us high level signal;

(2) the module automatically sends a square wave of 8 40khz automatically to detect whether the signal is returned;

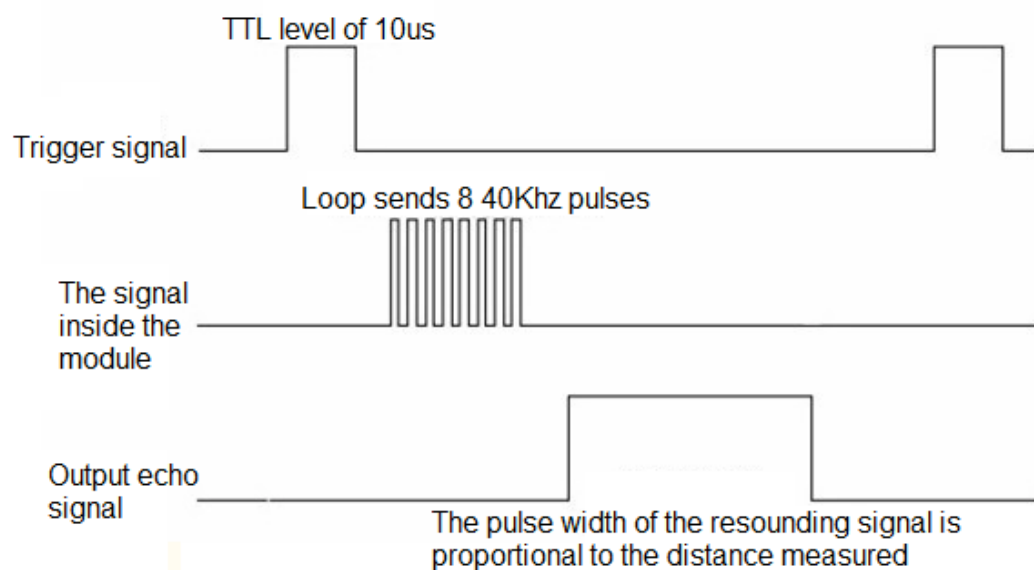
(3) there is a signal to return, and the output of the high level is high by IO. The duration of the high level is the time of the ultrasonic wave from launch to return.

Our company tests are mainly tested with arduino uno and hy-srf05 link. The effect is still very good, the company just provides simple test procedure, if need to undertake other development please own in-depth study, thank the cooperation!

六： Physical specifications:



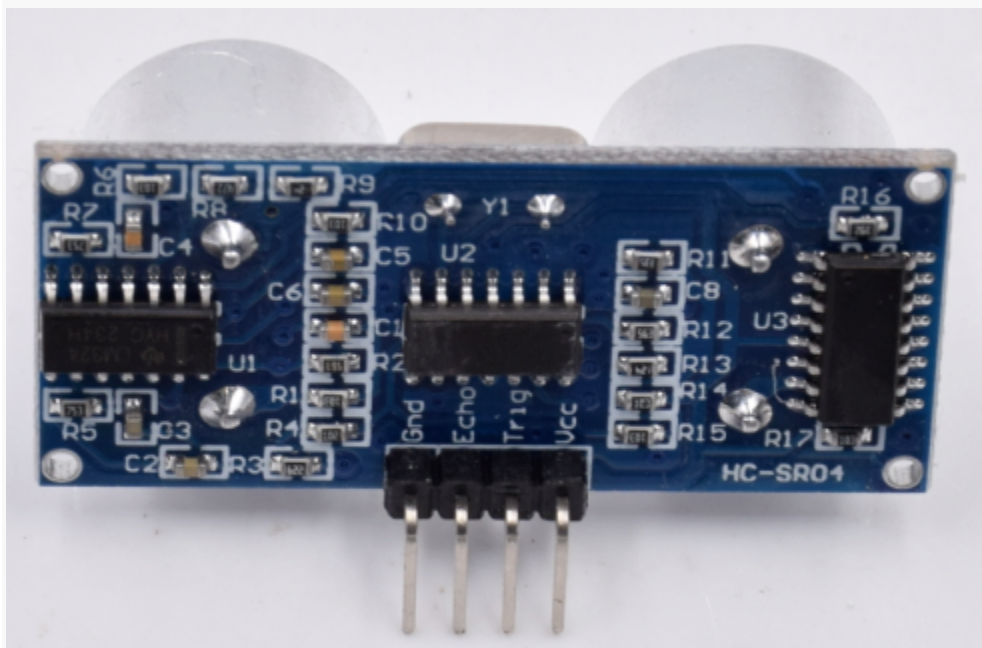
七： Ultrasonic timing diagram:



The above sequence diagram shows that you only need to provide a 10uS pulse trigger signal, which will issue 8 40kHz cycles and detect echoes inside the module. Once detected, echo signals are detected. The pulse width of the resounding signal is proportional to the distance measured. The distance can be calculated by transmitting the signal to the received response time interval. Formula:  $\mu\text{S} / 58 = \text{cm}$  or  $\mu\text{S} / 148 = \text{inch}$ ; Or: distance = high level time \* sound speed (340M/S) / 2; The recommended measurement period is over 60ms to prevent the effect of transmitting signal on the echo signal.

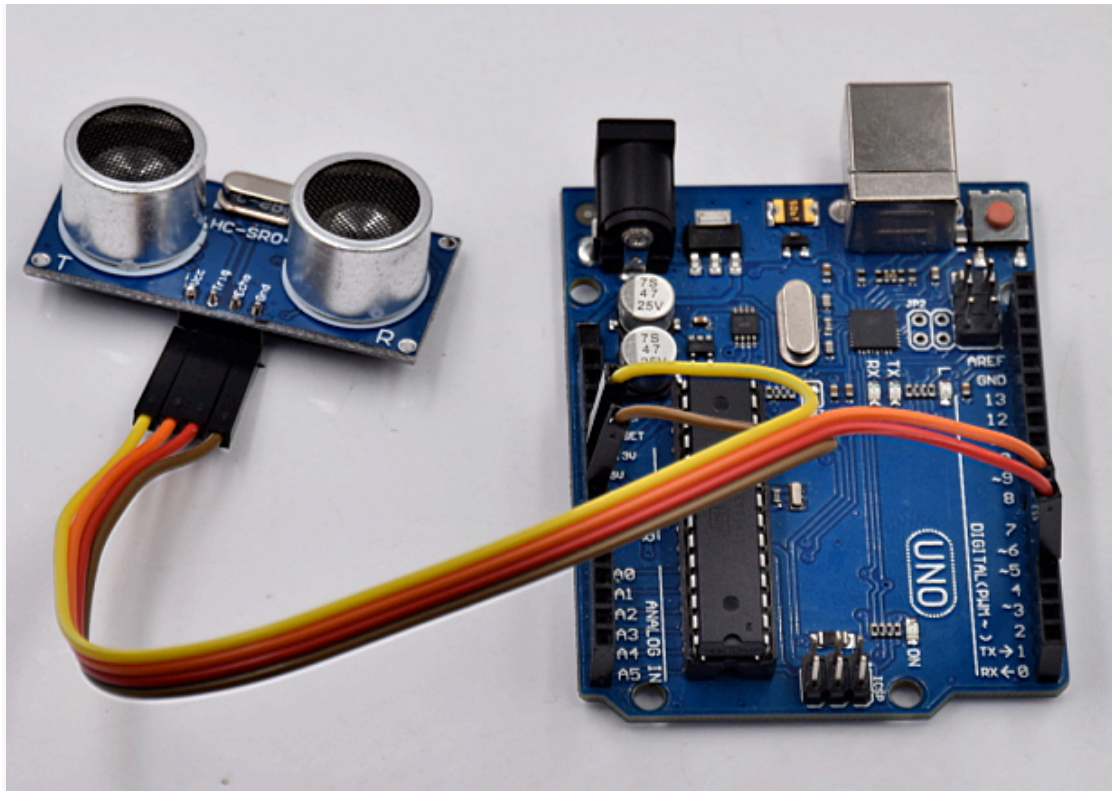
Note: 1. This module is not suitable for electric connection. If the connection is to be charged, the GND end of the module will be connected first, otherwise it will affect the normal work of the module. 2. When measuring the distance, the area of the object being measured is not less than 0.5 square meter and the plane shall be as flat as possible, otherwise the results of the measurement will be affected.

八： Take a look at what this module looks like.



九： Experimental connection diagram

Ultrasonic ranger	Arduino Uno
ECHO	D4
TRIG	D5
VCC	5V
GND	GND



+:

## Code

/\*This is our website [www.weikedz.com](http://www.weikedz.com)

For bulk orders, please feel free to contact

[sophie@weikedz.com](mailto:sophie@weikedz.com). If any question, for orders,

for technical problems, pls contact us.

We will response you fastest time. \*/

```
int inputPin=4; // define ultrasonic signal receiver pin ECHO to D4

int outputPin=5; // define ultrasonic signal transmitter pin TRIG to D5

void setup()

{

  Serial.begin(9600);

  pinMode(inputPin, INPUT);
```

```
pinMode(outputPin, OUTPUT);

}

void loop()
{
    digitalWrite(outputPin, LOW);
    delayMicroseconds(2);
    digitalWrite(outputPin, HIGH); // Pulse for 10µs to trigger ultrasonic detection
    delayMicroseconds(10);
    digitalWrite(outputPin, LOW);
    int distance = pulseIn(inputPin, HIGH); // Read receiver pulse time
    distance= distance/58; // Transform pulse time to distance
    Serial.println(distance); //Ourput distance
    delay(50);
}
```

**We can see the distance of the ultrasonic infrared ranging module in front of the obstacle.**



**In this case, we need to debug the potter-rate of serial port and the selection of the program.**