Ultrasonic Ranging Module

# HC - SR04

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work: (1) Using IO trigger for at least 10us high level signal, (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back. (3) IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning. Test distance = (high level time×velocity of sound (340M/S) / 2,

# Wire connecting direct as following:

5V - Supply

Trigger Pulse - Input

Echo Pulse - Output

0V – Ground

# Timing diagram

You only need to supply a short 10uS pulse to the trigger input to start the ranging, and then the module will send out an 8 cycle burst of ultrasound at 40 kHz and raise its echo. The Echo is a distance object that is pulse width and the range in proportion .You can calculate the range through the time interval between sending trigger signal and receiving echo signal. Formula: uS / 58 = centimeters or uS / 148 =inch; or: the range = high level time \* velocity (340M/S) / 2; we suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo s

Functions used in arduino code

# digitalWrite()

# [Digital I/O]

Description

Write a HIGH or a LOW value to a digital pin.

If the pin has been configured as an OUTPUT with pinMode(), its voltage will be set to the corresponding value: 5V (or 3.3V on 3.3V boards) for HIGH, 0V (ground) for LOW.

If the pin is configured as an INPUT, digitalWrite() will enable (HIGH) or disable (LOW) the internal pullup on the input pin. It is recommended to set the pinMode() to INPUT\_PULLUP to enable the internal pull-up resistor. See the digital pins tutorial for more information.

# pinMode()

# [Digital I/O]

Description

Configures the specified pin to behave either as an input or an output. See the description of ([digital pins](http://arduino.cc/en/Tutorial/DigitalPins)) for details on the functionality of the pins.

As of Arduino 1.0.1, it is possible to enable the internal pullup resistors with the mode INPUT\_PULLUP. Additionally, the INPUT mode explicitly disables the internal pullups.

# pulseIn()

# [Advanced I/O]

Description

Reads a pulse (either HIGH or LOW) on a pin. For example, if **value** is **HIGH**, pulseIn() waits for the pin to go **HIGH**, starts timing, then waits for the pin to go **LOW** and stops timing. Returns the length of the pulse in microseconds. Gives up and returns 0 if no pulse starts within a specified time out.

The timing of this function has been determined empirically and will probably show errors in longer pulses. Works on pulses from 10 microseconds to 3 minutes in length.

## delay()

## [Time]

Description

Pauses the program for the amount of time (in milliseconds) specified as parameter. (There are 1000 milliseconds in a second.)

## delayMicroseconds()

## [Time]

Description

Pauses the program for the amount of time (in microseconds) specified as parameter. There are a thousand microseconds in a millisecond, and a million microseconds in a second.

Currently, the largest value that will produce an accurate delay is 16383. This could change in future Arduino releases. For delays longer than a few thousand microseconds, you should use delay() instead.

# Serial.println()

Description

Prints data to the serial port as human-readable ASCII text followed by a carriage return character (ASCII 13, or '\r') and a newline character (ASCII 10, or '\n'). This command takes the same forms as [Serial.print()](https://www.arduino.cc/reference/en/language/functions/communication/serial/print).