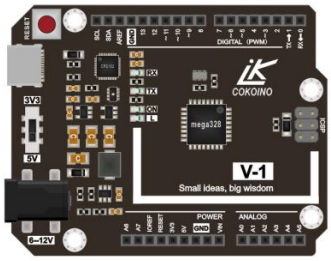
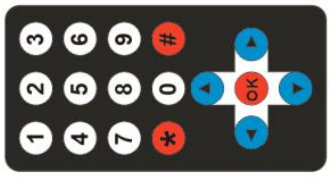
20 Infrared transmitter and receiver

ABOUT THIS PROJECT：

You will learn：

- Infrared communication protocol, how to use infrared remote control.

1 Things used in this project

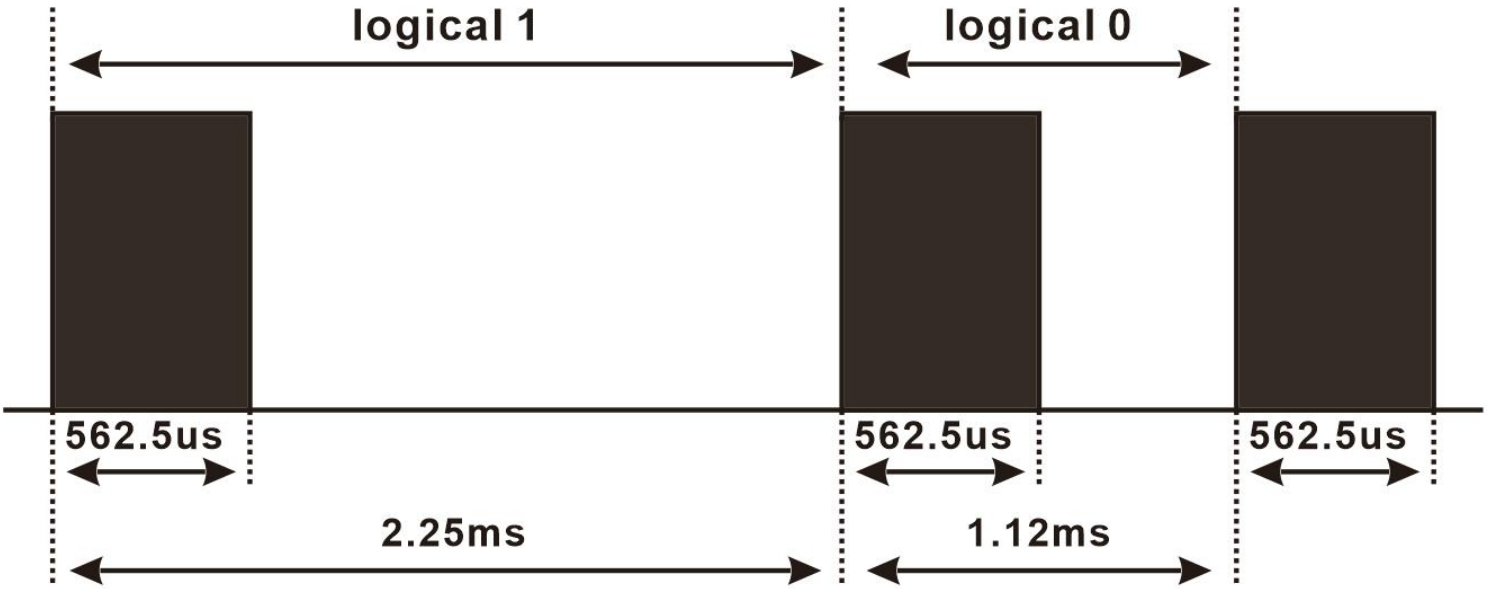
Hardware components	Picture	Quantity
V-1 board		1 PCS
Infrared remote control		1 PCS
Type C USB Cable		1 PCS
Male to female DuPont line		3 PCS
Infrared (IR) Receiver		1 PCS

1.NEC Protocol

The NEC IR transmission protocol uses pulse distance encoding of the message bits. Each pulse burst (mark – RC transmitter ON) is 562.5µs in length, at a carrier frequency of 38kHz (26.3µs). Logical bits are transmitted as follows:

Logical '0' – a 562.5µs pulse burst followed by a 562.5µs space, with a total transmit time of 1.125ms

Logical '1' – a 562.5µs pulse burst followed by a 1.6875ms space, with a total transmit time of 2.25ms



When transmitting or receiving remote control codes using the NEC IR transmission protocol, the WB_IRRC performs optimally when the carrier frequency (used for modulation/demodulation) is set to 38.222kHz.

When a key is pressed on the remote controller, the message transmitted consists of the following, in order:

- a 9ms leading pulse burst (16 times the pulse burst length used for a logical data bit)
- a 4.5ms space
- the 8-bit address for the receiving device
- the 8-bit logical inverse of the address
- the 8-bit command
- the 8-bit logical inverse of the command
- a final 562.5µs pulse burst to signify the end of message transmission.

The four bytes of data bits are each sent least significant bit first. Figure 1 illustrates the format of an NEC IR transmission frame, for an address of 00h (00000000b) and a command of ADh (10101101b).

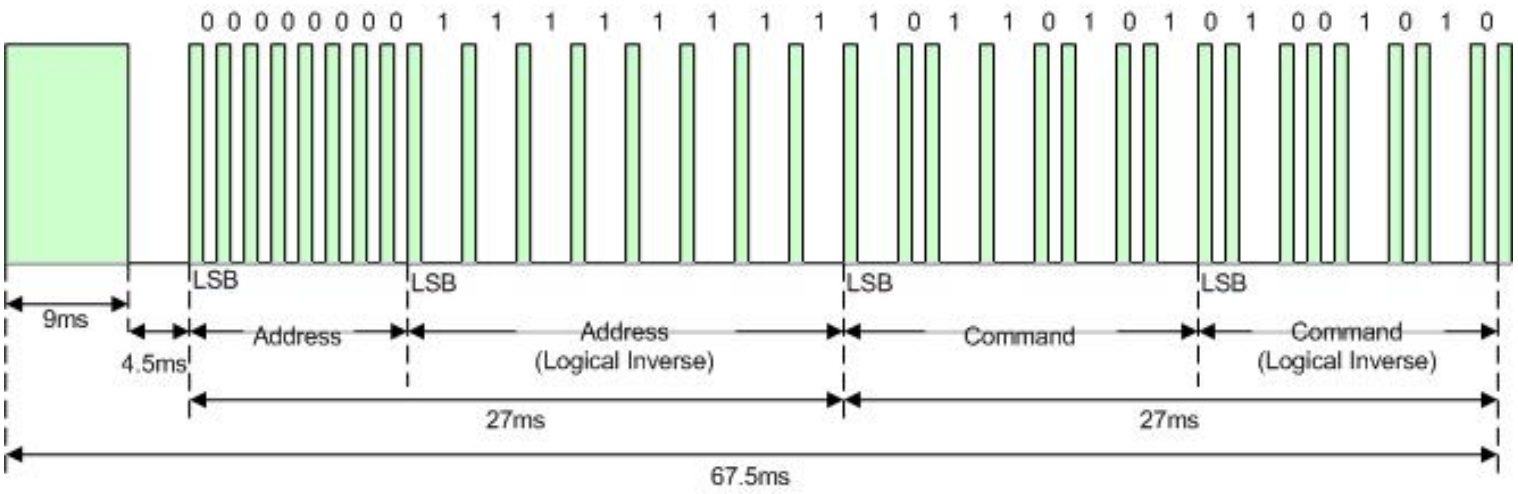


Figure 1. Example message frame using the NEC IR transmission protocol.

Notice from Figure 1 that it takes:

■ 27ms to transmit both the 16 bits for the address (address + inverse) and the 16 bits for the command (command + inverse). This comes from each of the 16 bit blocks ultimately containing eight '0's and eight '1's - giving (8 * 1.125ms) + (8 * 2.25ms).

■ 67.5ms to fully transmit the message frame (discounting the final 562.5µs pulse burst that signifies the end of message).

REPEAT CODES

If the key on the remote controller is kept depressed, a repeat code will be issued, typically around 40ms after the pulse burst that signified the end of the message. A repeat code will continue to be sent out at 108ms intervals, until the key is finally released. The repeat code consists of the following, in order:

■ a 9ms leading pulse burst

■ a 2.25ms space

■ a 562.5µs pulse burst to mark the end of the space (and hence end of the transmitted repeat code).

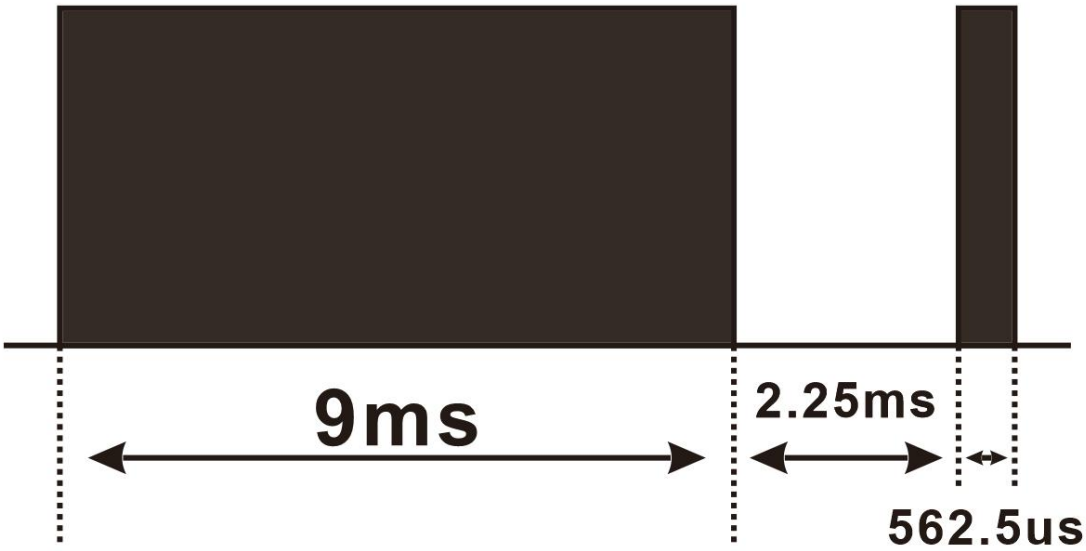


Figure 2 illustrates the transmission of two repeat codes after an initial message frame is sent.

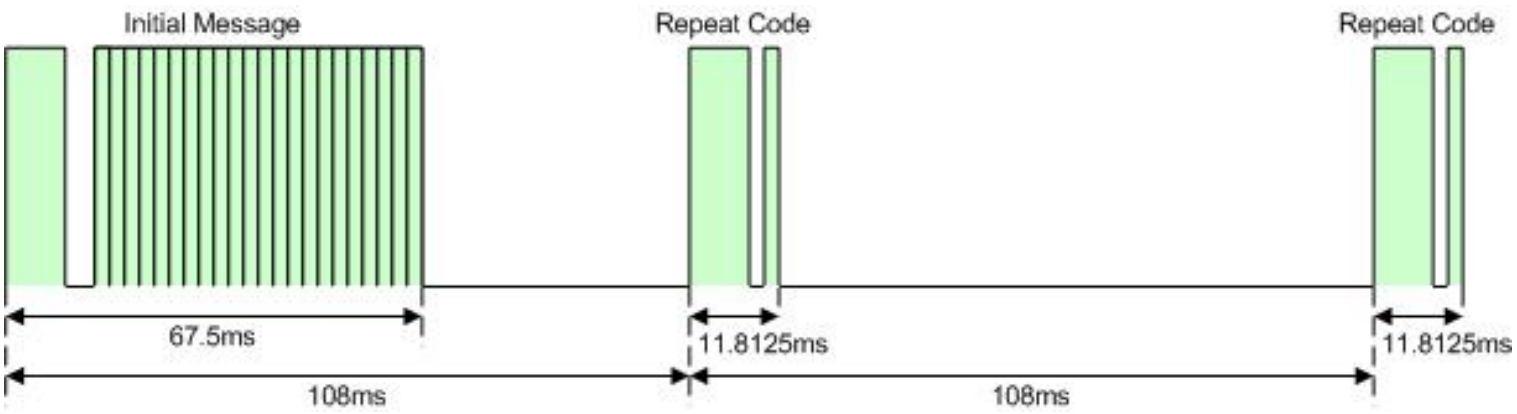


Figure 2. Example repeat codes sent for a key held down on the transmitting remote controller.

2. Infrared receiver

The infrared receiver is mainly composed of the infrared receiving head, which is a device integrating reception, amplification and demodulation. Its internal IC has been completed to understand the modulation, and the output is a digital signal.Can be used in audiovisual equipment, home appliances, etc.

specification parameter

Working voltage：2.7-5.5V（DC）

Output signal：digital signal

Working current：0.8mA

Carrier frequency：38KHz

Receiving angle：±35°

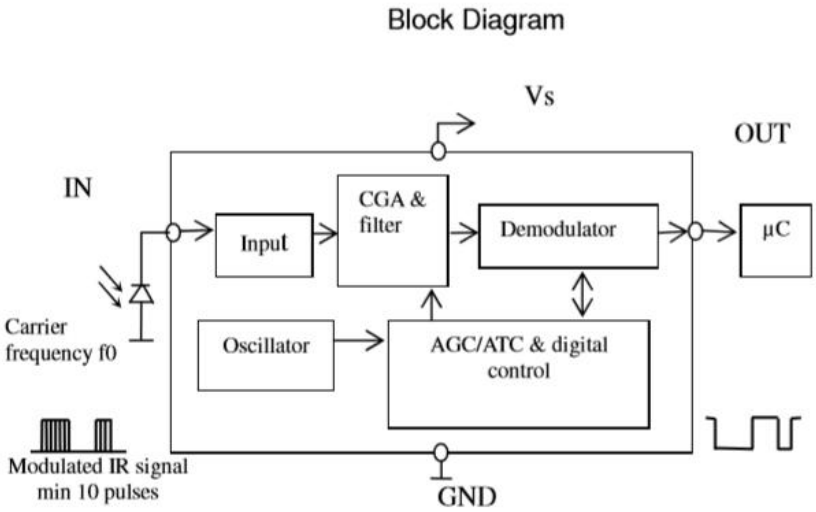
Receiving distance：5-10M

Pin definition

1 2 3

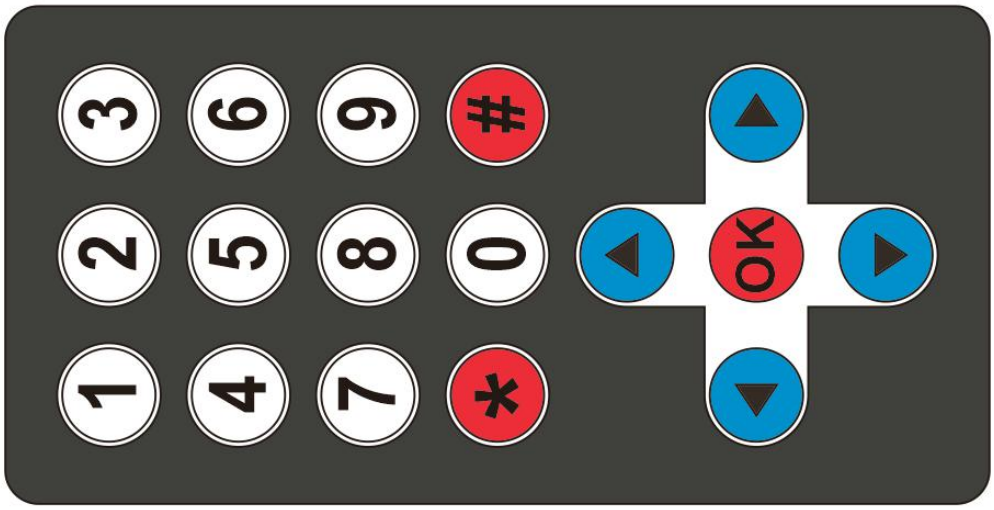
Pin Configuration

1. OUT
2. GND
3. V_{CC}



3. Infrared transmitter

send the key value to the infrared receiver via NEC infrared wireless transmission protocol.



specification parameter

Working voltage：3V

Protocol: NEC protocol

Transmitter distance：5-10M

Key values for the Arduino code

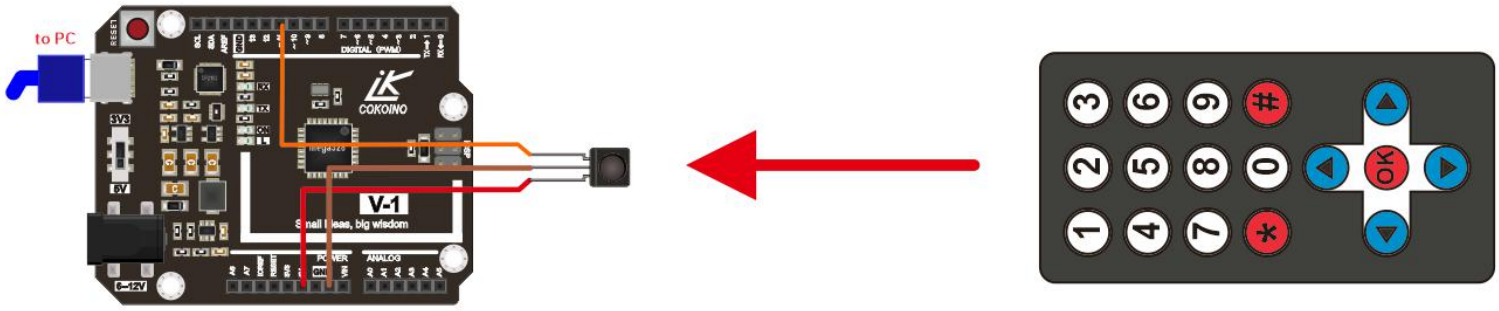
0	1	2	3	4	5	6	7	8
FF9867	FFA25D	FF629D	FFE21D	FF22DD	FF02FD	FFC23D	FFE01F	FFA857

9	*	#	▲	▼	◀	▶	OK
FF906F	FF6897	FFB04F	FF18E7	FF4AB5	FF10EF	FF5AA5	FF38C7

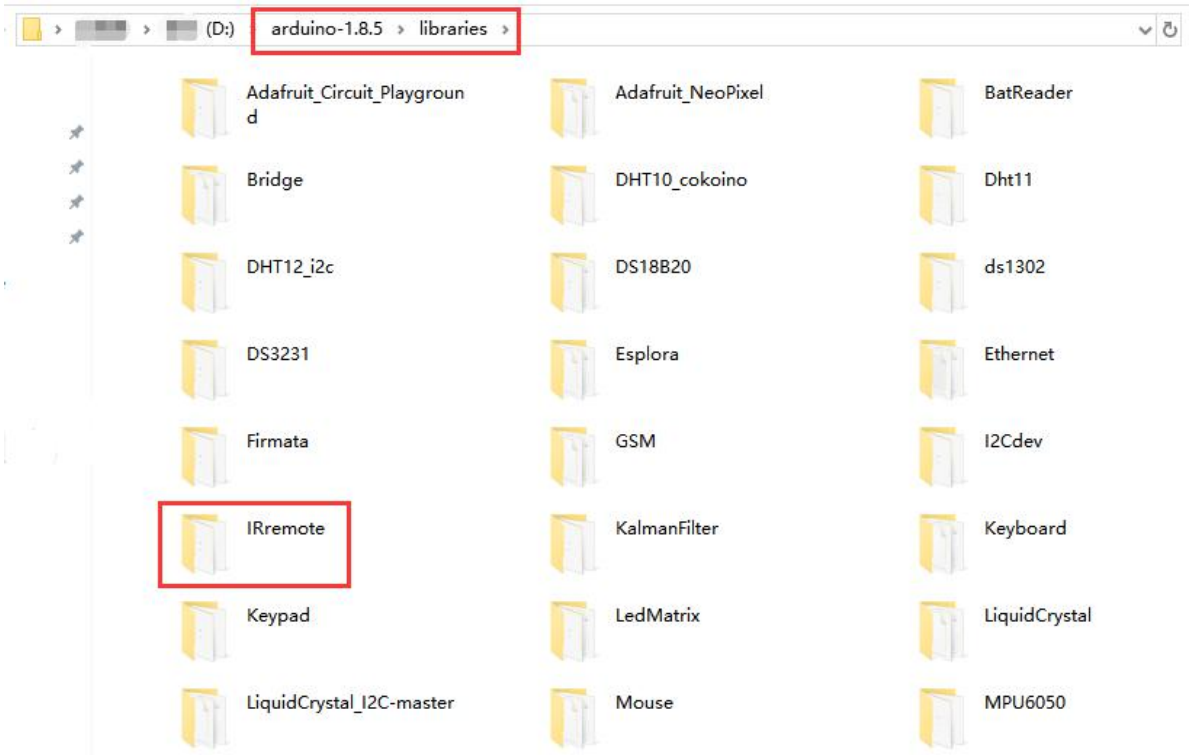
Note: Use the arduino IRremote library to get the above values.

4. How to use infrared transmitter and receiver

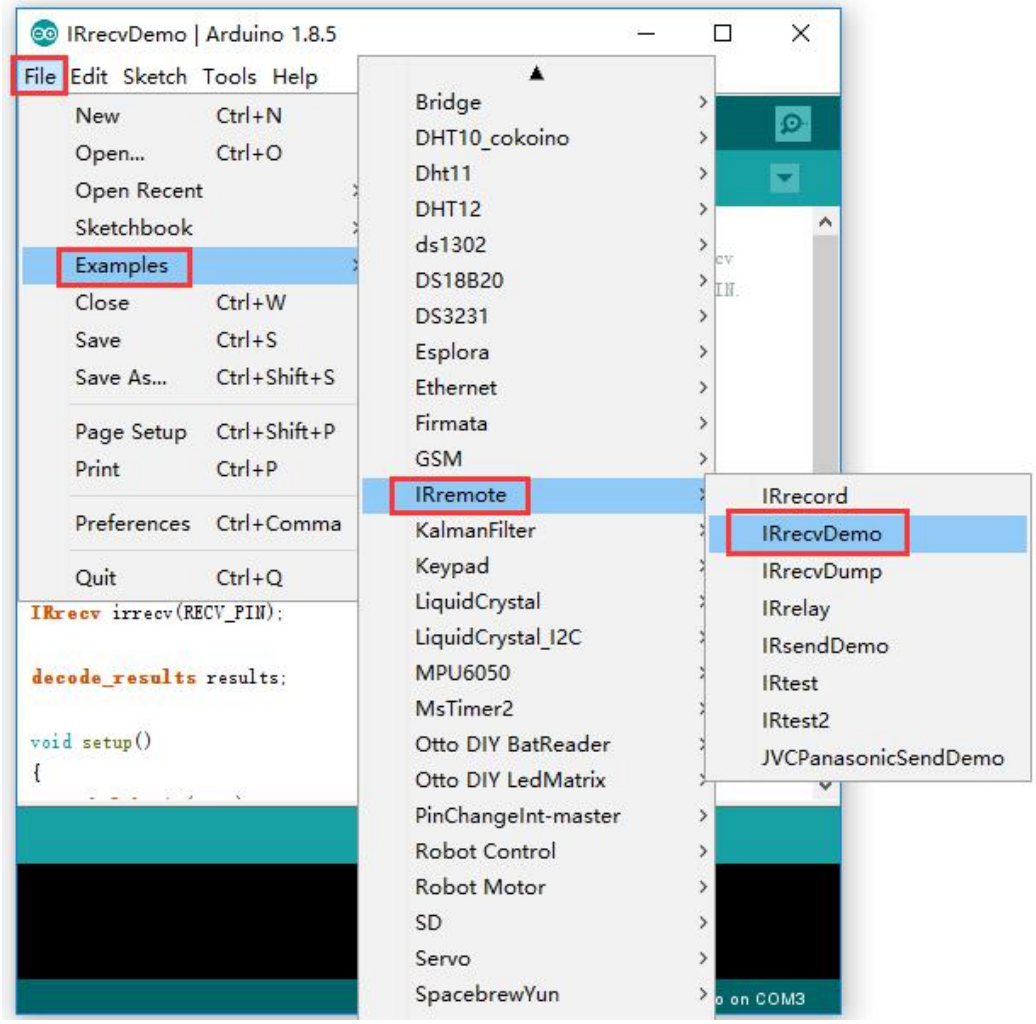
4.1 wiring diagram:



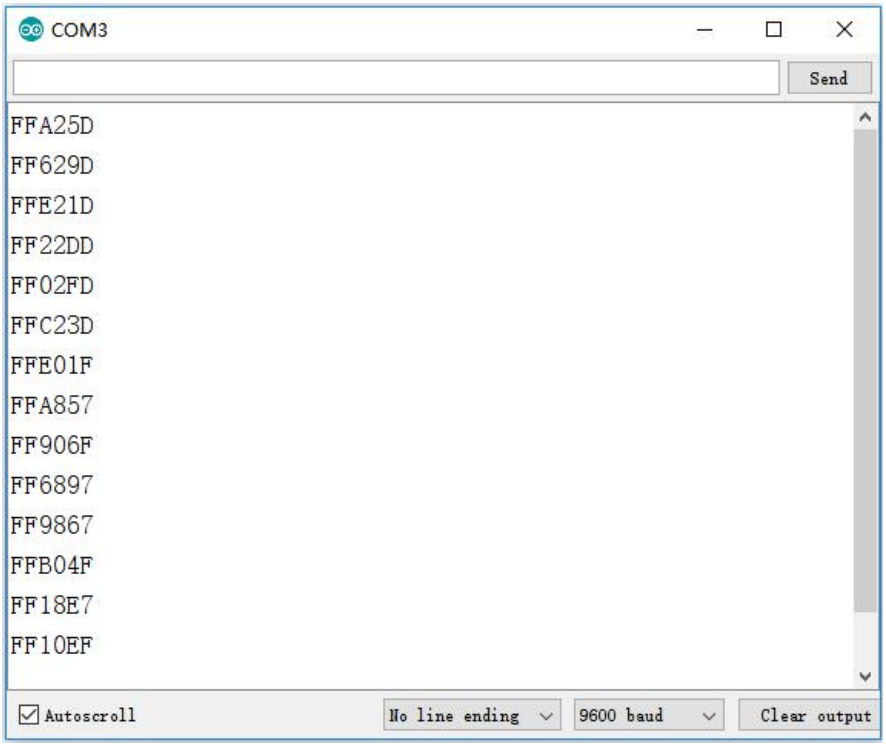
4.2 copy the library files (namely the IRremote folder in the lib folder) into the libraries folder of the Arduino IDE, as shown below.



4.3 Follow the following figure to open the example.



4.4 Upload the code to the V1 control board, open the serial port monitor, and then press the button on the infrared transmission, the key value will be output.



End!