

Voice interaction module communication

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I. Software-Hardware

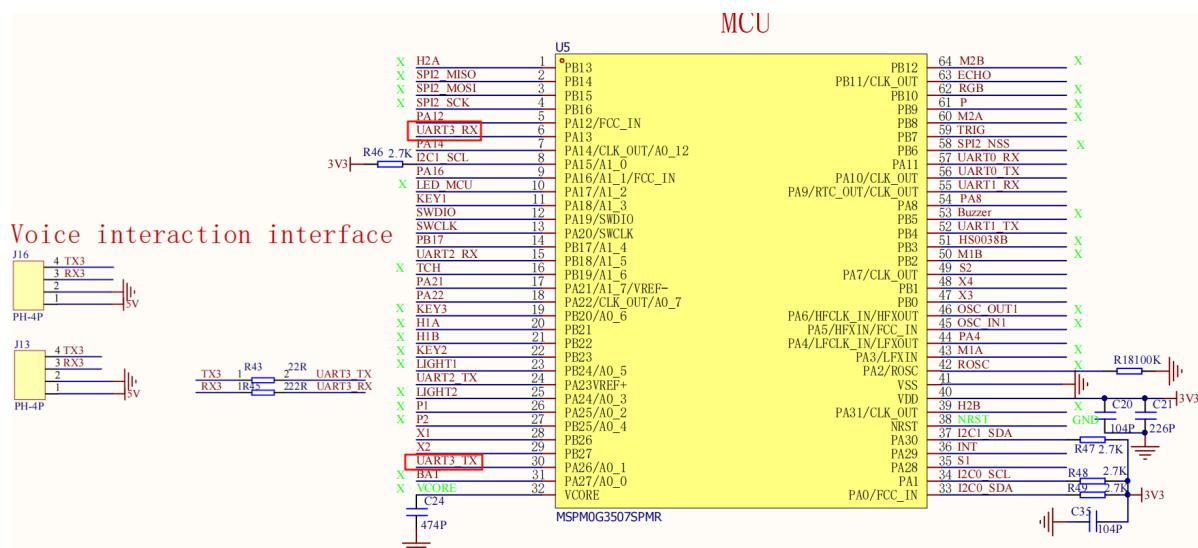
- KEIL
- MSPM0G3507 Development Board
- Type-C Data Cable or DAP-Link

Download or simulate the program on the development board

- Voice Interaction Integrated Module

II. Brief Principles

1. Hardware Schematic Diagram



2. Introduction to the Voice Interaction Module

1. Introduction to the Voice Interaction Module

The CI1302 is a new generation of high-performance neural network intelligent voice chip developed by Qiying Tailun. It integrates Qiying Tailun's self-developed brain neural network processor BNPU V3 and CPU core. The system main frequency can reach 220MHz, with a built-in SRAM of up to 640KByte, an integrated PMU power management unit and RC oscillator, and an integrated dual-channel high-performance low-power audio codec. It features multiple peripheral control interfaces including UART, IIC, IIS, PWM, GPIO, and PDM. The chip requires only a few external components such as resistors and capacitors to implement hardware solutions for various intelligent voice products, offering extremely high cost-effectiveness.

Utilizing third-generation hardware BNPU technology, it supports neural networks such as DNN, TDNN, RNN, and CNN, as well as parallel vector operations, enabling functions such as speech recognition, voiceprint recognition, command word self-learning, speech detection, and deep learning noise reduction. This chip solution also supports multiple global languages, including Chinese, English, and Japanese, and can be widely used in home appliances, lighting, toys, wearable devices, industrial products, and automobiles to achieve voice interaction and control, and various intelligent voice solutions.

The CI1302 chip features a Brain Neural Processing Unit (BNPU), supporting offline NN acceleration operations and hardware acceleration for speech signal processing. The CPU clock speed can reach 220MHz, enabling offline far-field speech recognition. It has 2MB of built-in FLASH storage and supports 300 command words.

2. Working Principle

This module uses a voice command wake-up mode. The user needs to say the pre-set wake-up word to activate the voice interaction module. After activation, voice recognition can begin. The default wake-up keyword in the factory firmware is "Hi,yahboom". If no voice is recognized after 20 seconds, the module will enter sleep mode and needs to be woken up again for subsequent use.

When the CI1302 chip recognizes the corresponding voice command, it will send it out via the serial port and IIC interface and provide feedback. The IIC chip stores the received voice command and sends it out via the IIC slave protocol.

The module supports wake-up word modification, command word modification, and custom entries. You can refer to the following tutorials to learn how to operate: [AI Voice Interaction Module](#) [2. Modify the wake-up word and command word], [3. Customized protocol entry creation]

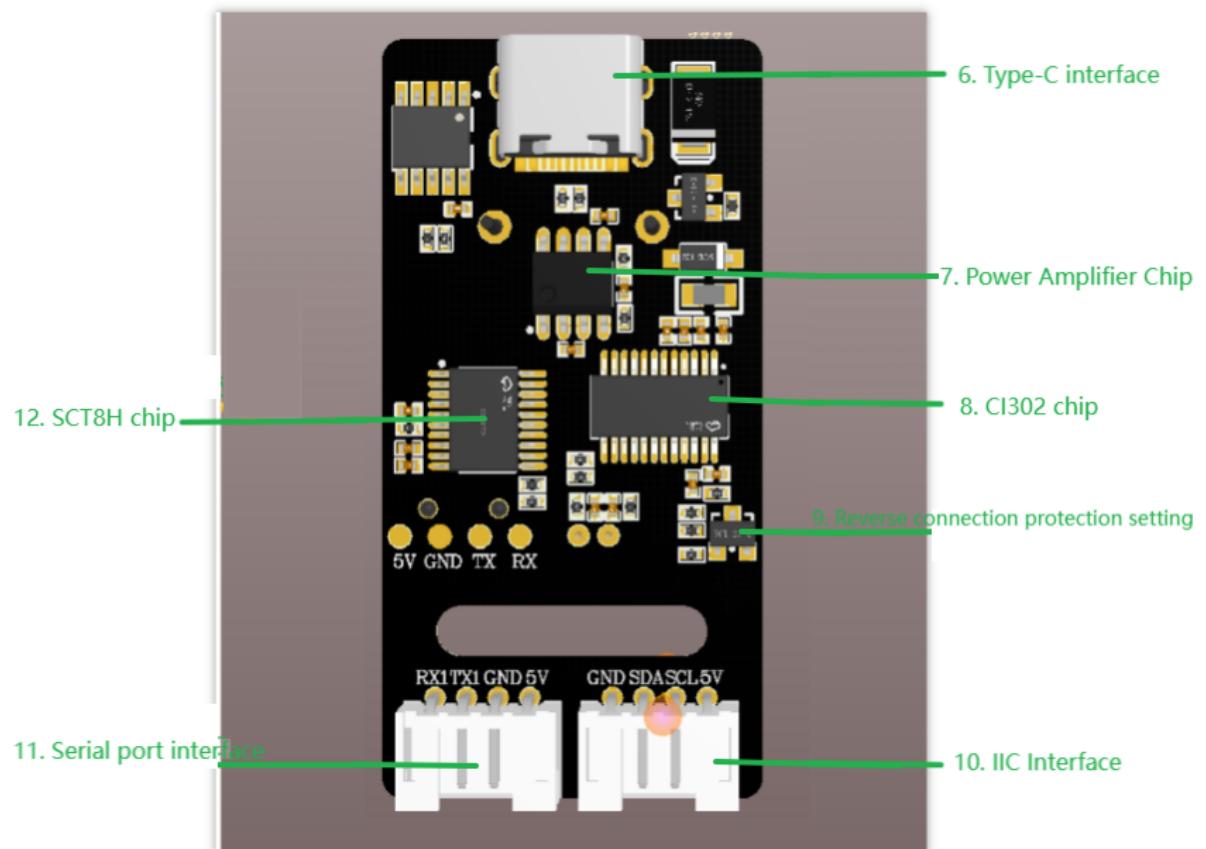
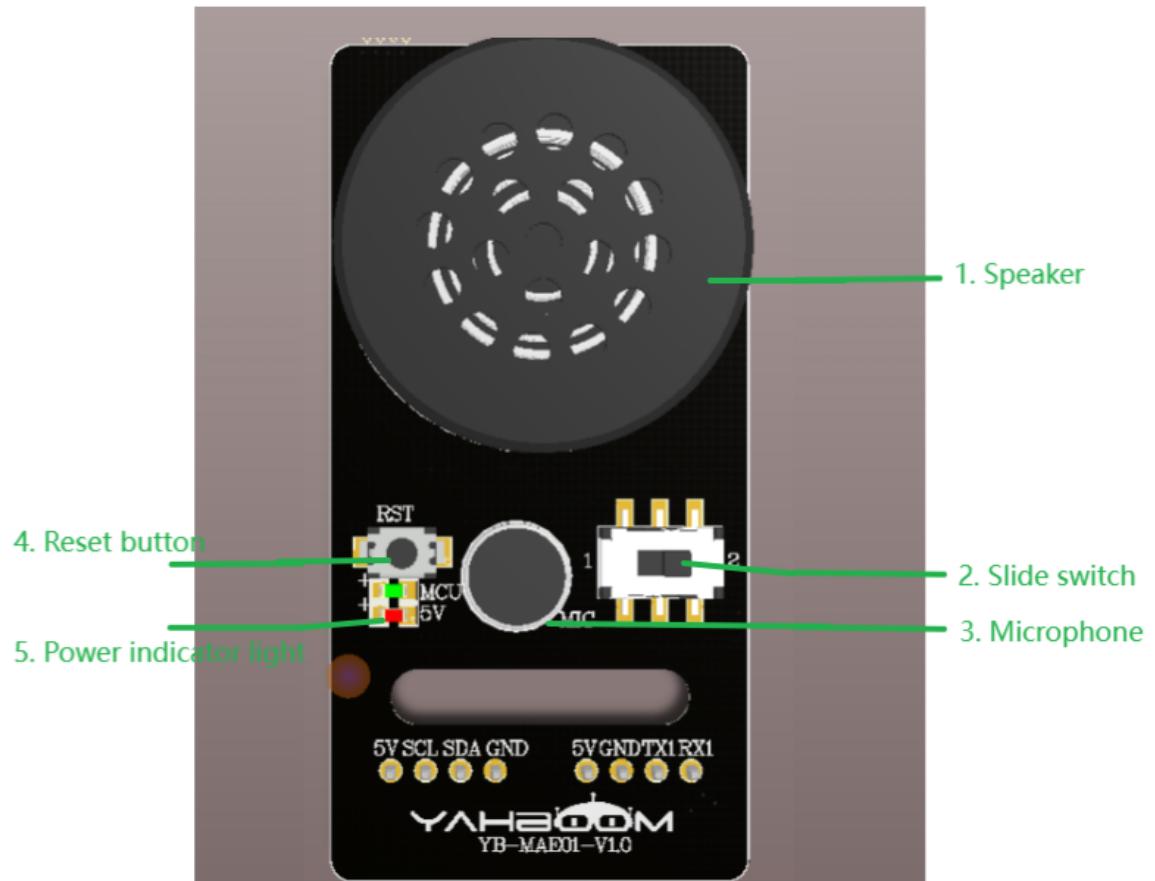
3. Precautions

Use 5V power supply. Voltage exceeding 5V will damage the module.

The usage environment should be quiet. Noisy environments will affect recognition performance.

When speaking the words, speak loudly and at a moderate pace. It is recommended to maintain a distance of no more than 5 meters from the module.

4. Hardware Interface Description



Number	Hardware Name	Description
1	Speaker	Converts analog signals to sound
2	Slide Switch	Switches between serial ports for firmware burning
3	Microphone	Converts sound to analog signals
4	RST Button	Reset Button
5	Power Indicator (Red)	Always on when power supply is normal
6	Type-C Interface	Used for power supply and CI1302 chip/SCT8 firmware update download
7	Power Amplifier Chip	Converts digital signals into analog signals to drive the speaker
8	CI1302 Chip	High-performance voice recognition chip, recognizes voice and outputs signals
9	Reverse Connection Protection	5V/GND reverse connection protection
10	IIC Interface	Used as a slave device for power supply and communication with the host device
11	Serial Port Interface	Provides an external serial port for protocol-controlled playback
12	STC8H Chip	Converts voice chip commands into IIC protocol commands and serial port commands

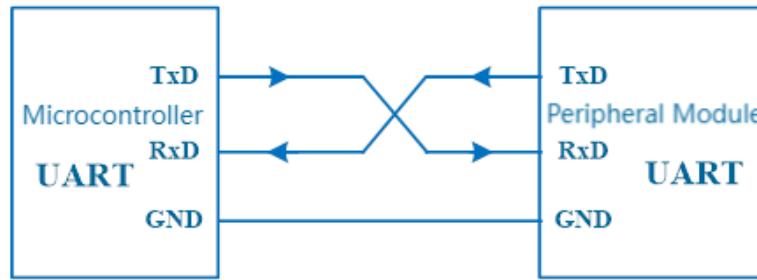
5. Control Principle

(Schematic Diagram Name)	Control Pin	Specific Meaning
TX3	PA26	Serial Transmitter
RX3	PA13	Serial Receiver

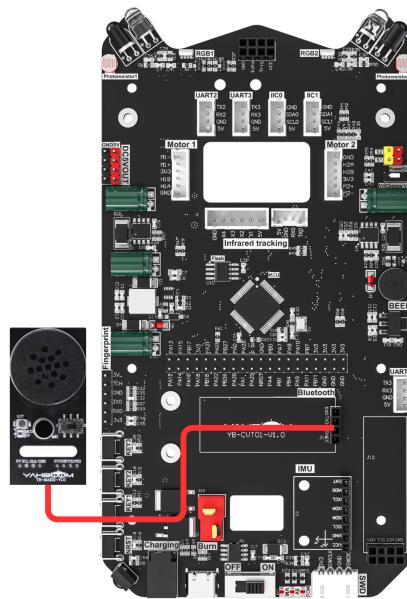
Serial Communication:

UART (Universal Asynchronous Receiver Transmitter) is a full-duplex universal asynchronous serial transceiver module, mainly used for printing program debugging information, communication between host and slave computers, and ISP program downloading. UART requires at least two data lines for bidirectional simultaneous data transmission between communicating parties. The simplest UART interface consists of three lines: TxD, RxD, and GND. TxD is used for transmitting data, RxD for receiving data, and GND is the ground line. Serial communication between the two chips is achieved through cross-connection.

- RxD: Data input pin, for receiving data.
- TxD: Data output pin, for transmitting data.



3. Physical Connection Diagram



Wiring Pins

Voice Module Wiring (Note: The wiring diagram below is for reference only. Our products come with a dual-ended PH2.0 4-pin all-black cable for the voice module, featuring a foolproof design. No need to worry about wiring issues.)

Intelligent Voice Interaction Module	MSPM0G3507
RX1	TX3
TX1	RX3
GND	GND
5V	5V

III. Main Functions

This section mainly introduces the user-written functional code. **For detailed code, please open the project file we provided and view the source code in the Bsp folder.**

1. User Functions

Function: Write_Data

Function Prototype	void Write_Data(uint8_t dat)
Function Description	Sends data to the voice module
Input Parameters	The data frame sent
Output Parameters	None

Function: Processing_Data

Function Prototype	void Processing_Data(uint8_t RXdata)
Function Description	Receives data from the voice module
Input Parameters	The data frame received
Output Parameters	None

IV. Experimental Phenomena

- The broadcast content can be selected by modifying the code in the program, as shown in the following images:

```
//播报词 Active broadcast content
#define This_red 0x5F
#define This_blue 0x60
#define This_green 0x61
#define This_yellow 0x62
#define Recognize_yellow 0x63
#define Recognize_green 0x64
#define Recognize_blue 0x65
#define Recognize_red 0x66
#define init 0x67

int main(void)
{
    SYSCFG_DL_init();
    //清除串口中断标志 Clear the serial port interrupt flag
    NVIC_ClearPendingIRQ(UART_0_INST_INT IRQN);
    //使能串口中断 Enable serial port interrupt
    NVIC_EnableIRQ(UART_0_INST_INT IRQN);

    Write_Data(init); // Boxed line

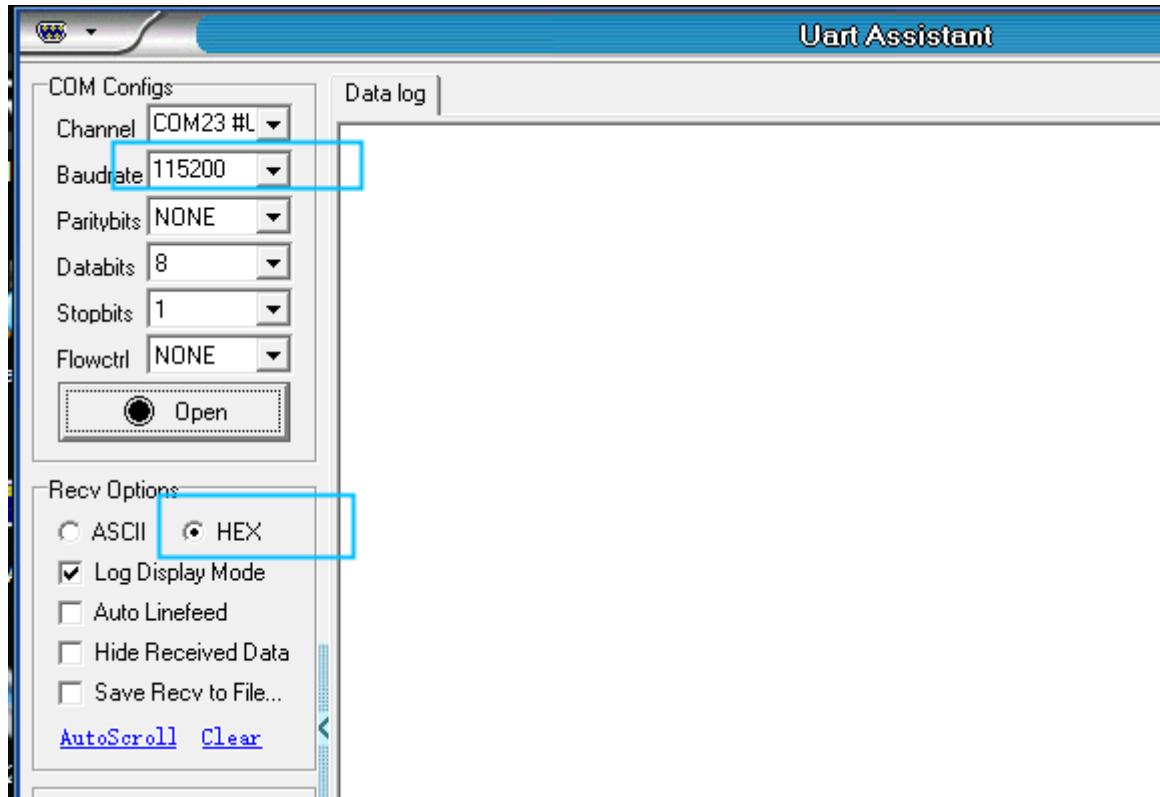
    while (1)
    {
        ;
    }
}
```

- The broadcast content can be viewed according to the **Command word broadcasting word protocol list V3--MSPM0.xlsx** file provided in the attachment,

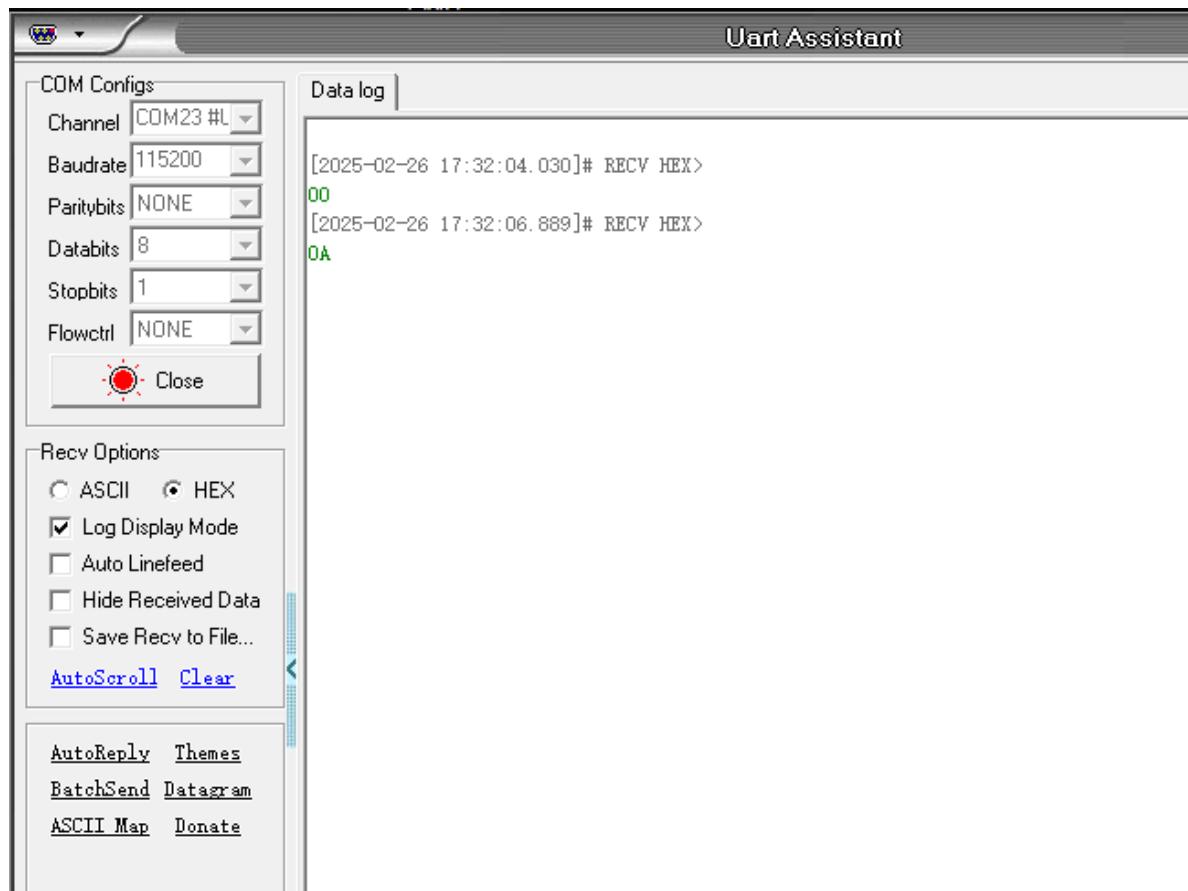
where the first and second bytes AA 55 represents the protocol frame header. The third byte, FF, indicates the broadcast function. The fourth byte is the ID of the broadcast content; here we can see that "**I-AM-READY**" is hexadecimal 67, so sending 0x67 to register 0x03 in the program will broadcast the corresponding content. The fifth byte is the end frame.

80	77	THIS-IS-RED	命令词	this is red	被	AA 55 FF 5F FB	AA 55 FF 5F FB
81	78	THIS-IS-BLUE	命令词	this is blue	被	AA 55 FF 60 FB	AA 55 FF 60 FB
82	79	THIS-IS-GREEN	命令词	this is green	被	AA 55 FF 61 FB	AA 55 FF 61 FB
83	80	THIS-IS-YELLOW	命令词	this is yellow	被	AA 55 FF 62 FB	AA 55 FF 62 FB
84	81	THERE-IS-YELLOW	命令词	there is yellow	被	AA 55 FF 63 FB	AA 55 FF 63 FB
85	82	THERE-IS-GREEN	命令词	there is green	被	AA 55 FF 64 FB	AA 55 FF 64 FB
86	83	THERE-IS-BLUE	命令词	there is blue	被	AA 55 FF 65 FB	AA 55 FF 65 FB
87	84	THERE-IS-RED	命令词	there is red	被	AA 55 FF 66 FB	AA 55 FF 66 FB
88	85	I-AM-READY	命令词	I am ready	被	AA 55 FF 67 FB	AA 55 FF 67 FB

- Open the serial port debugging assistant provided in the attachment, select the corresponding port, and set the baud rate to 115200. Set the receive mode to hexadecimal.



- Open the serial port, say the wake-up word, and after waking up, say "**Car lights off**". The debugging assistant will then reply with a 0A response.



- At this point, you can open the attached **Command Word Broadcast Protocol List V3_Chinese** file to view the protocol for "Car lights off".

21	19	THE-CAR-TURNED-RIGHT-IN-PLACE	命令词	OK the car is turning right in place	主	AA 55 00 09 FB	AA 55 00 09 FB
22	20	CAR-LIGHTS-OFF	命令词	OK the lights are off	主	AA 55 00 0A FB	AA 55 00 0A FB

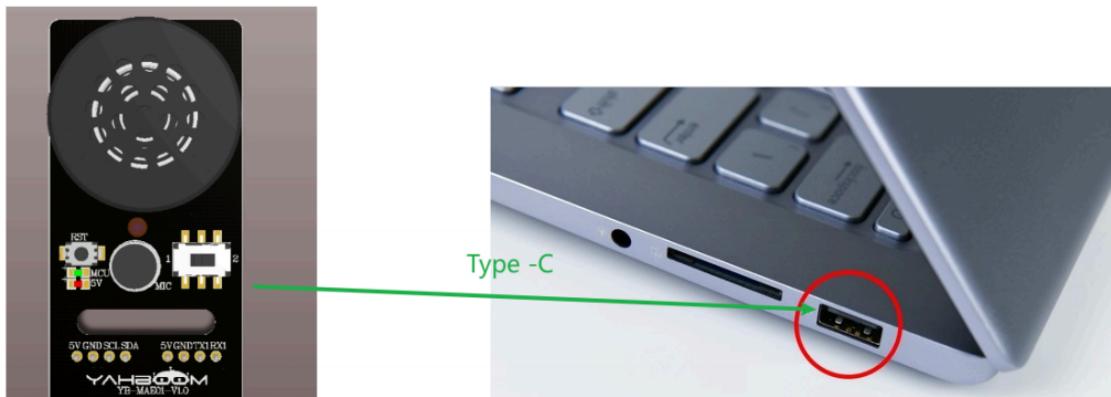
The first and second bytes, AA 55, represent the protocol frame header. The third byte represents the ID of the chip's ten function words. The fourth byte is the command word ID; here, you can see that **Car lights off** is hexadecimal 0A. The fifth byte is the end frame.

- Speaking other command words will also print the corresponding command word ID in the serial port debugging assistant; you can try them yourself.

V. Voice Module Firmware Burning

The voice module needs to be burned into the firmware file CI1302_EN_Single_V00916_UART1_115200_2M(MSPM0).bin provided in the download area. This will enable the intelligent voice interaction module for this car, without the need for multiple burning attempts.

- Download the provided voice module firmware
CI1302_EN_Single_V00916_UART1_115200_2M(MSPM0).bin
- Connect the voice module's Type-C port to your PC and push the slider on the voice module towards pin 1.



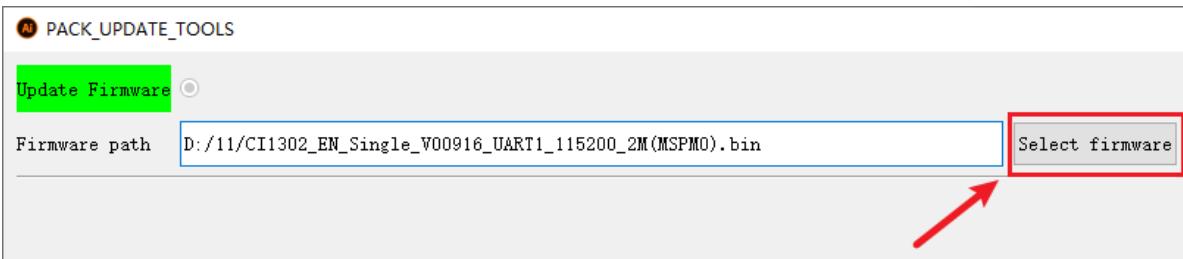
- Open the voice chip firmware flashing tool.

authentication_file	2025/6/16 20:23	文件夹	
build-tools	2025/6/16 20:23	文件夹	
ci-tool-1.1.2.vsix	2025/2/6 17:22	VSIX 文件	150 KB
ci-tool-kit	2025/2/6 17:22	文件	7,756 KB
ci-tool-kit.exe	2025/2/6 17:22	应用程序	10,320 KB
code_program.exe	2025/2/6 17:22	应用程序	139 KB
common.lds	2025/2/6 17:22	LDS 文件	1 KB
config.ini	2025/6/13 18:17	配置设置	1 KB
generate_makefile.lua	2025/2/6 17:22	Lua 源文件	4 KB
lame	2025/2/6 17:22	文件	497 KB
lame.exe	2025/2/6 17:22	应用程序	803 KB
libmp3lame.dll	2025/2/6 17:22	应用程序扩展	671 KB
libmpg123-0.dll	2025/2/6 17:22	应用程序扩展	539 KB
MediaInfo.dll	2025/2/6 17:22	应用程序扩展	5,241 KB
PACK_UPDATE_TOOL.exe	2025/2/6 17:22	应用程序	8,760 KB

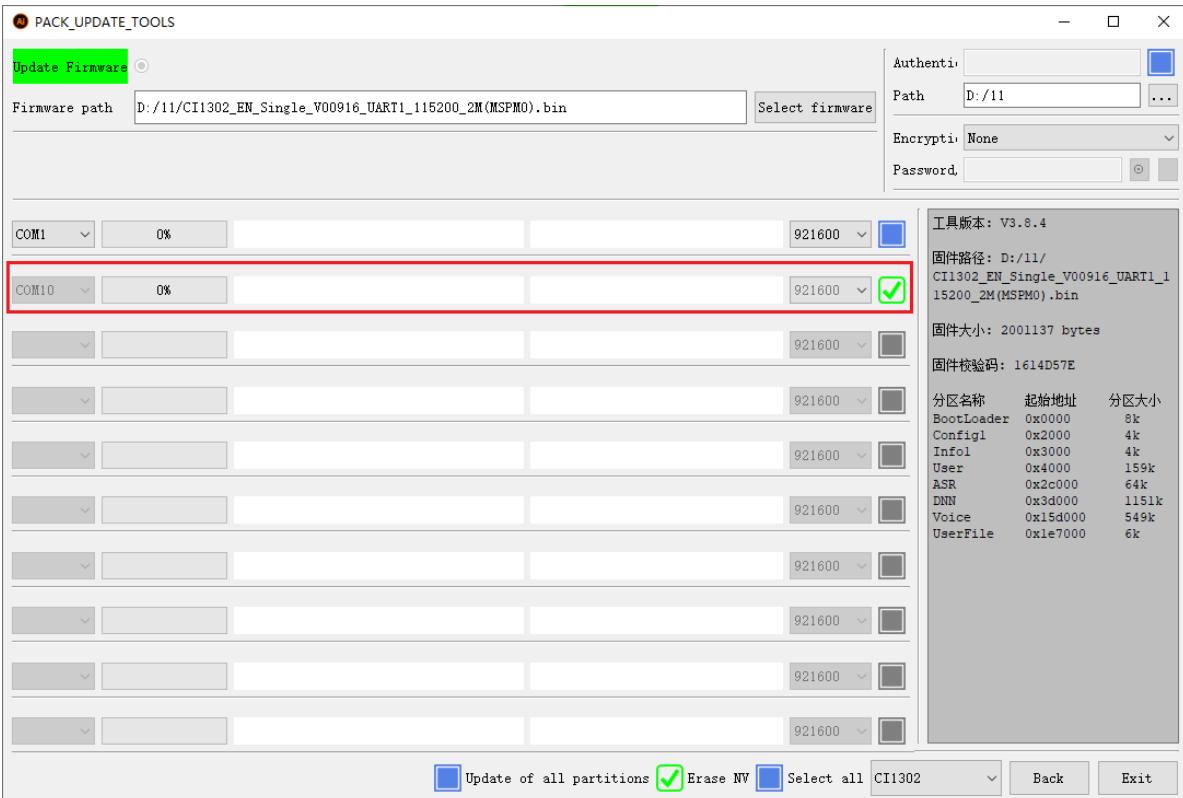
4. Select the CI1302 chip and click "Firmware Upgrade".



5. Locate the factory firmware CI1302_EN_Single_V00916_UART1_115200_2M(MSPM0).bin, select the corresponding firmware



6. Go to the corresponding serial port number, baud rate 921600, and check the box next to it.



7. Press the RST button on the board, and the firmware will be automatically downloaded to the voice module.