1. Introduction of voice module

1.1. Voice Interaction Module Introduction

The CI1302 is a new-generation, high-performance neural network intelligent voice chip developed by Qiyingtailun. It integrates Qiyingtailun's proprietary brain neural network processor, the BNPU V3, and a CPU core. It boasts a system clock speed of up to 220MHz, built-in SRAM of up to 640KB, a power management unit (PMU) and an RC oscillator, a dual-channel, high-performance, low-power audio codec, and multiple peripheral control interfaces such as UART, IIC, IIS, PWM, GPIO, and PDM. Requiring only a small number of peripheral components such as resistors and capacitors, the chip can implement hardware solutions for various intelligent voice products, offering an 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. It enables voice recognition, voiceprint recognition, command word self-learning, voice detection, and deep learning noise reduction. This chip solution also supports multiple global languages, including Chinese, English, and Japanese. It can be widely used in home appliances, lighting, toys, wearable devices, industrial, and automotive products, enabling voice interaction and control, as well as various intelligent voice solutions.

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

1.2 Operating Principle

This module uses a command-based wakeup mode. The user must speak the preset wakeup word to activate the voice interaction module. Once activated, voice recognition will begin. The default wakeup keyword in the factory firmware is "Xiao Ya Xiao Ya." If no voice is recognized after 20 seconds, the module enters sleep mode and must be reactivated upon further use.

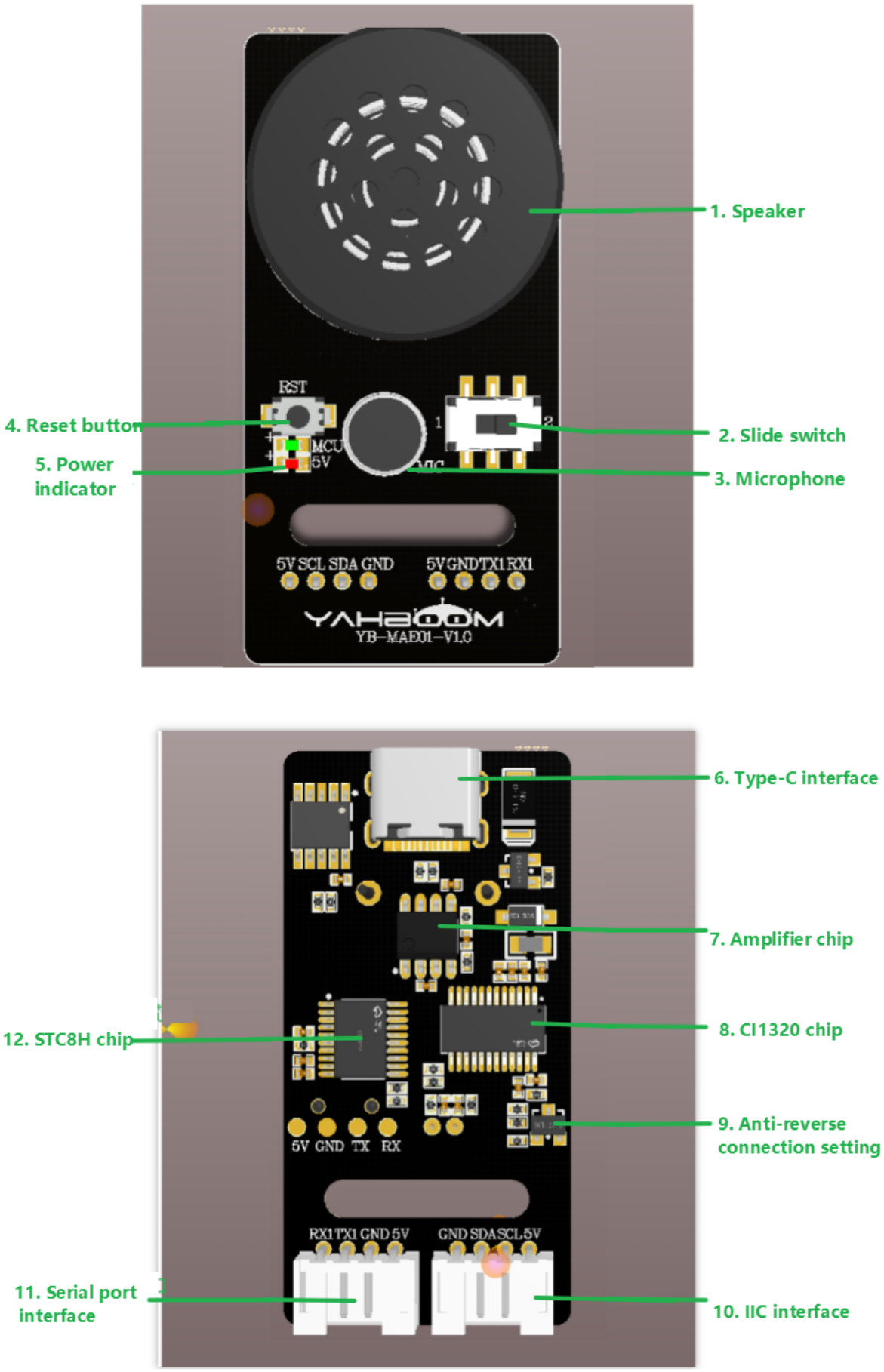
When the CI1302 chip recognizes a corresponding voice entry, it transmits it through the serial port and IIC interface and reports it back. The IIC chip stores the received voice command and transmits it via the IIC slave protocol.

The module supports modifying wake-up words, command words, and customizing entries. Learn how to do this in the tutorials "2. Modifying Wake-Up and Command Words" and "3. Creating Custom Protocol Entry."

1.3. Notes

- Use a 5V power supply. Voltages exceeding 5V will damage the module.
- Use in a quiet environment; noisy environments will affect recognition performance.
- When speaking a term, speak loudly and slowly. It is recommended to stay within 5 meters of the module.

1.4. Hardware Interface Description

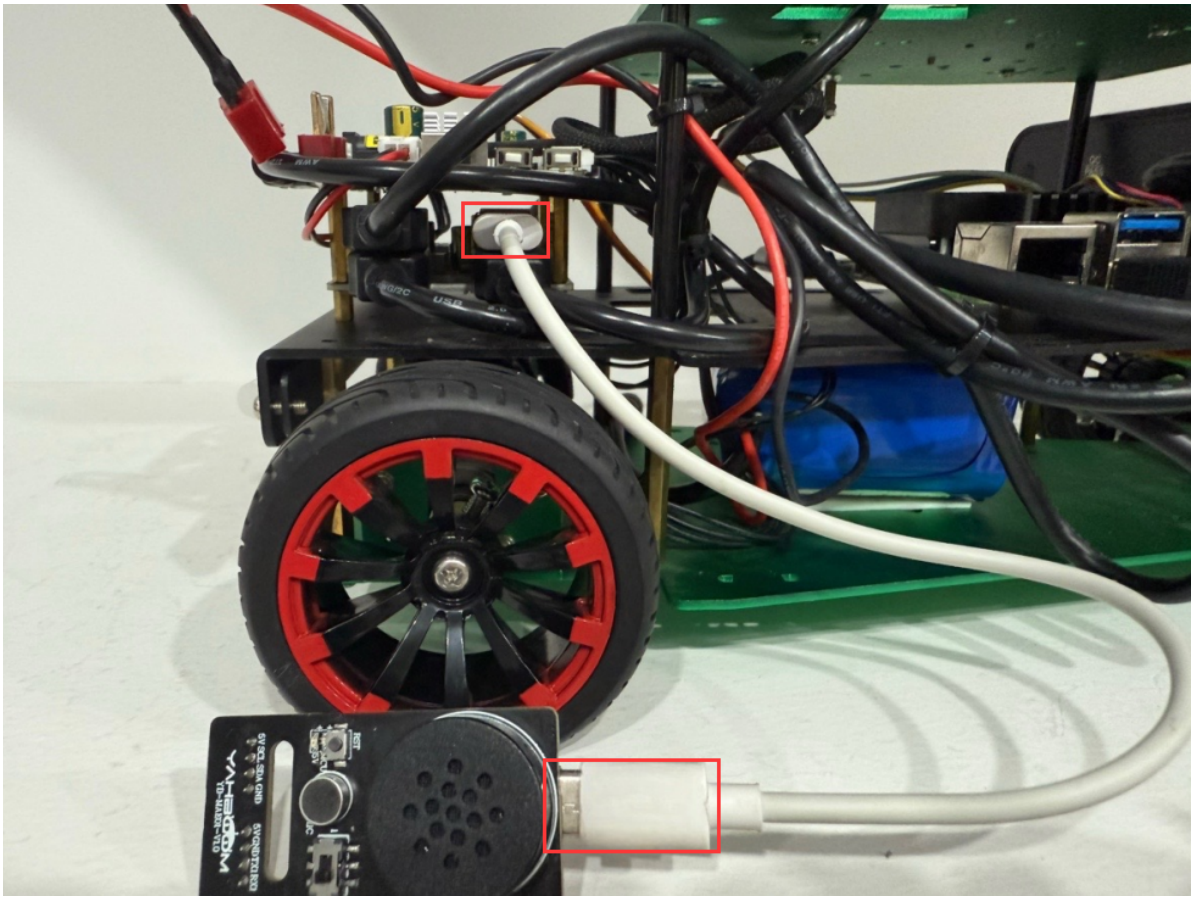


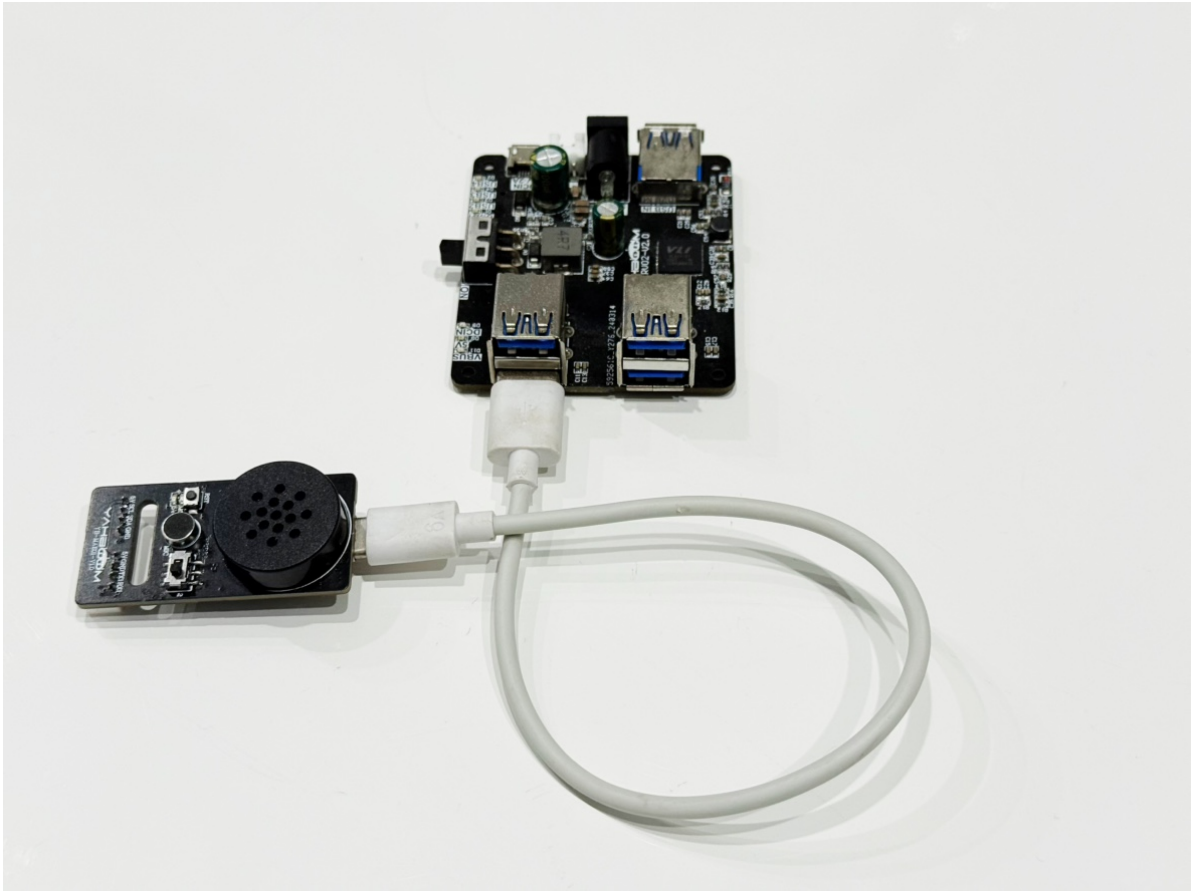
Serial Number	Hardware Name	Description
1	Speaker	Converts analog signals into sound
2	Slide Switch	Switches the serial port for firmware burning
3	Microphone	Converts sound into analog signals
4	RST Button	Reset Button
5	Power Indicator (Red)	Steady on when power is normal
6	Type-C Port	Used for power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

1.5 Using the Voice Module

1.2.1 Wiring

The module connects to the ROSMASTER main control unit (or hub board) via a universal Type-C data cable.





1.2.2 Wake-up Word

The wake-up word is "Hi,yahboom." When waking up, speak slowly; speaking too quickly will prevent the module from recognizing you. Only after waking up the module can it recognize other command words. Within 20 seconds of waking up, there's no need to wake up again; simply speak the command word.

1.2.3 Command Words

1) Voice Control of Car Movement

Voice Recognition Content	Voice Module Sends to Host	Host Sends to Voice Module	Voice Broadcast Content
Car Stop	AA 55 00 01 FB	AA 55 00 01 FB	OK, Stopped
Car Forward	AA 55 00 04 FB	AA 55 00 04 FB	OK, Moving Forward
Car Backward	AA 55 00 05 FB	AA 55 00 05 FB	OK, Moving Backward
Car Turn Left	AA 55 00 06 FB	AA 55 00 06 FB	OK, Turning Left
Car Turn Right	AA 55 00 07 FB	AA 55 00 07 FB	OK, turning right
Car turns left	AA 55 00 08 FB	AA 55 00 08 FB	OK, turning left
Car turns right	AA 55 00 09 FB	AA 55 00 09 FB	OK, turning right

2) Voice Control RGB Light Strip Effect

Voice Recognition Content	Voice Module Sends to Host	Host Sends to Voice Module	Voice Broadcast Content
Turn off lights	AA 55 00 0A FB	AA 55 00 0A FB	OK, lights turned off
Turn on red light	AA 55 00 0B FB	AA 55 00 0B FB	OK, red light is on
Green light on	AA 55 00 0C FB	AA 55 00 0C FB	OK, green light is on
Blue light on	AA 55 00 0D FB	AA 55 00 0D FB	OK, blue light is on
Yellow light on	AA 55 00 0E FB	AA 55 00 0E FB	OK, yellow light is on
Turn on the running light	AA 55 00 0F FB	AA 55 00 0F FB	OK, running light is on
Turn on the gradient light	AA 55 00 10 FB	AA 55 00 10 FB	OK, gradient light is on
Turn on the breathing light	AA 55 00 11 FB	AA 55 00 11 FB	OK, the breathing light is on
Battery level display	AA 55 00 12 FB	AA 55 00 12 FB	OK, the battery level is displayed

3) Voice Control Color Recognition

Voice Recognition Content	Voice Module Sends to Host	Host Sends to Voice Module	Voice Broadcast Content
What color is this?	AA 55 00 3C FB	AA 55 FF 3D FB	This is red
What color is this?	AA 55 00 3C FB	AA 55 FF 3E FB	This is blue
What color is this?	AA 55 00 3C FB	AA 55 FF 3F FB	This is green
What color is this?	AA 55 00 3C FB	AA 55 FF 40 FB	This is yellow

4) Voice Control Color Tracking

Voice Recognition Content	Voice Module Sends to Host	Host Sends to Voice Module	Voice Broadcast Content
Start Tracking Yellow	AA 55 00 48 FB	AA 55 00 48 FB	OK, start tracking yellow
Start Tracking Red	AA 55 00 49 FB	AA 55 00 49 FB	OK, start tracking red
Start Tracking Green	AA 55 00 4A FB	AA 55 00 4A FB	OK, start tracking green
Start Tracking Blue	AA 55 00 4B FB	AA 55 00 4B FB	OK, start tracking blue
Cancel Tracking	AA 55 00 4C FB	AA 55 00 4C FB	OK, tracking canceled

5) Voice-controlled autonomous driving (line patrol)

Voice recognition content	Voice module sends to host	Host sends to voice module	Voice broadcast content
Turn off line patrol	AA 55 00 16 FB	AA 55 00 16 FB	OK, line patrol function turned off
Red line patrol	AA 55 00 17 FB	AA 55 00 17 FB	OK, red line patrol function turned on
Green line patrol	AA 55 00 18 FB	AA 55 00 18 FB	OK, green line patrol function turned on
Blue line patrol	AA 55 00 19 FB	AA 55 00 19 FB	OK, the Blue Line patrol function has been activated
Yellow Line patrol	AA 55 00 1A FB	AA 55 00 1A FB	OK, the Yellow Line patrol function has been activated

6) Voice-controlled multi-point navigation

Voice recognition content	Voice module sends to host	Host sends to voice module	Voice broadcast content
Navigate to location 1	AA 55 00 13 FB	AA 55 00 13 FB	OK, heading to location 1
Navigate to location 2	AA 55 00 14 FB	AA 55 00 14 FB	OK, heading to location 2
Navigate to location 3	AA 55 00 15 FB	AA 55 00 15 FB	OK, heading to position 3
Navigate to position 4	AA 55 00 20 FB	AA 55 00 20 FB	OK, heading to position 4
Return to origin	AA 55 00 21 FB	AA 55 00 21 FB	OK, returning to origin