



# VC-02-Kit Specification

Version V1.0.0

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## 1. Product overview

The VC-02-Kit is a development board designed for the VC-02 module, and it is shared the same board with VC-01-Kit.

The development board integrates CH340C serial port to USB chip, providing basic debugging interface and USB upgrade interface, design of wake up light and cold and cooling lamp, provides status indication and control instructions, and easy to debug the simple control function.

VC-02 is a low-cost pure offline speech recognition module developed by Shenzhen Ai-Thinker Technology Co., Ltd. The module uses the voice chip US516P6 launched by Unisound, and continuously optimizes and innovates algorithms in speech recognition technology. The offline recognition algorithm and chip architecture are deeply integrated to provide customers with ultra-low-cost offline speech recognition solutions. It can be widely and quickly applied to smart home, all kinds of smart small household appliances, 86 boxes, toys, lamps and other products that need voice control.

The US516P6 chip uses a 32-bit RSIC architecture core and incorporates a DSP instruction set specifically for signal processing and speech recognition, an FPU arithmetic unit that supports floating-point operations, and an FFT accelerator.

VC-02 supports offline identification of 150 local instructions, RTOS lightweight system, rich peripheral interfaces, and simple and friendly custom tools.

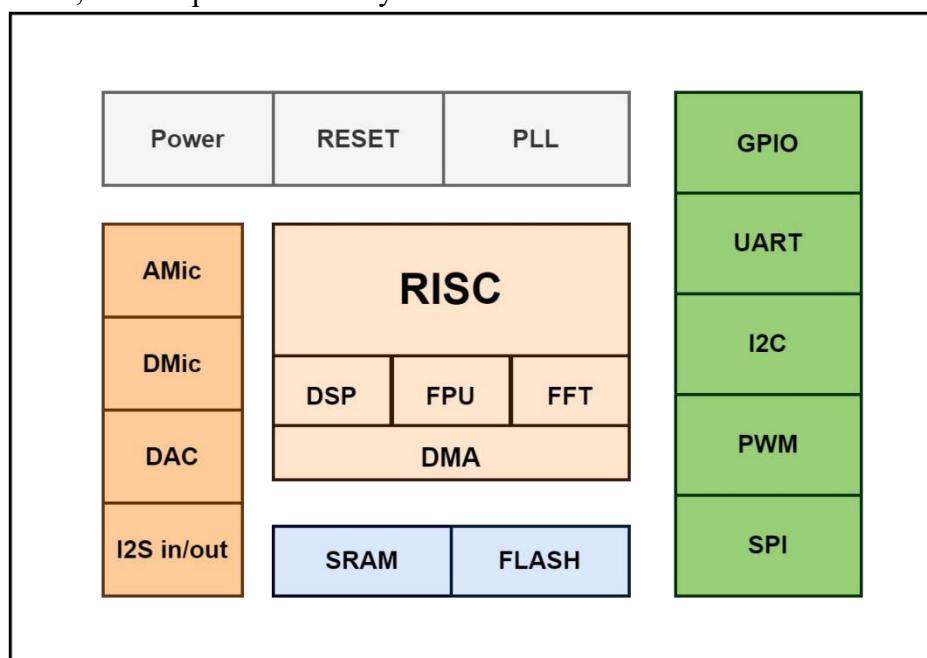


Figure 1 US516P6 chip architecture diagram

## 1.1. Characteristic

### ■ Kernel

- ✓ 32bit RISC core, running at 240MHz
- ✓ Support DSP instruction set and FPU floating point operation unit
- ✓ FFT Accelerator: Support up to 1024-point complex FFT/IFFT operations, or 2048-point real FFT/IFFT operations
- ✓ Unisound customized speech algorithm operator

### ■ Storage

- ✓ Built-in 242KB high-speed SRAM
- ✓ Built-in 2MB FLASH

### ■ Audio input and output

- ✓ Flexible configuration supports 1.8/2.8/3.3V IO
- ✓ Support for a 1 analog Mic input, SNR≥94db
- ✓ Support dual-channel DAC output
- ✓ Support for both Chinese and English voice commands

### ■ Power supply and clock

- ✓ Support 5V power input
- ✓ Built-in 5V to 3.3V, 3.3V to 1.2V LDO to power the chip
- ✓ RC 12MHz clock source and PLL locked loop clock source
- ✓ Built-in POR (Power on Reset), low voltage detection and watchdog

### ■ Peripheral

- ✓ All GPIOs can be configured as external interrupt input and wake-up source
- ✓ One full-duplex UART with the maximum rate of 3Mbps
- ✓ Support I2C, DAC, PWM and multiple interfaces

### ■ SDK

- ✓ Provides complete RTOS SDK
- ✓ Support fast and convenient UART, I2C and other control protocol development

## 2. Main parameters

**Table 1 Description of the main parameters**

<b>Dev-board model</b>	VC-02-Kit
<b>Module</b>	VC-02
<b>Package</b>	DIP-19 (2.54 spatial standard pin header)
<b>Size</b>	42.2*35.6( $\pm 0.2$ )mm
<b>Working temperature</b>	-40 °C ~ 85 °C
<b>Storage environment</b>	-40 °C ~ 125 °C , < 90%RH
<b>Power supply</b>	Supply voltage 5V, current greater than 500mA
<b>Interfaces</b>	UART/I2C/PWM/DAC/GPIO
<b>IO</b>	5 GPIOs
<b>UART rate</b>	UART1 default 115200 bps、UART0( IOB8 ) default 57600
<b>Flash</b>	2MB (built-in)
<b>Support language</b>	Chinese and English (factory default Chinese firmware)

### 2.1. Static requirements

VC-02-Kit development board is an electrostatic sensitive device that requires special precautions during handling.



**Figure 2 ESD anti-static diagram**

## 2.2. Electrical characteristics

**Table 2 Electrical Characteristics Table**

Parameters	Conditions	Min. value	Typical value	Max. value	Unit
Supply voltage	VCC	4.5	5	5.3	V
Analog module power supply	LDO33DO	-	3.3	-	V
Core operating voltage	LDO12O	-	1.2	-	V
IO	US_SPK_MUTE	-0.047	-	3.3	V

## 2.3. Power consumption

The following power consumption data are measured based on a 5V power supply and an ambient temperature of 25°C.

- In the configuration of the speaker and microphone under the measured active state VC-02 power consumption.

**Table 3 Power consumption table**

Mode	Min. value	Typical value	Max. value	Unit
Active (response broadcast), the command word “turn on the air conditioner” and broadcast “The air	56.1	115.1	232	mA
Standby status	55.7	56.1	56.6	mA
Hibernation state	0.6	-	0.7	mA

### 3. Appearance size

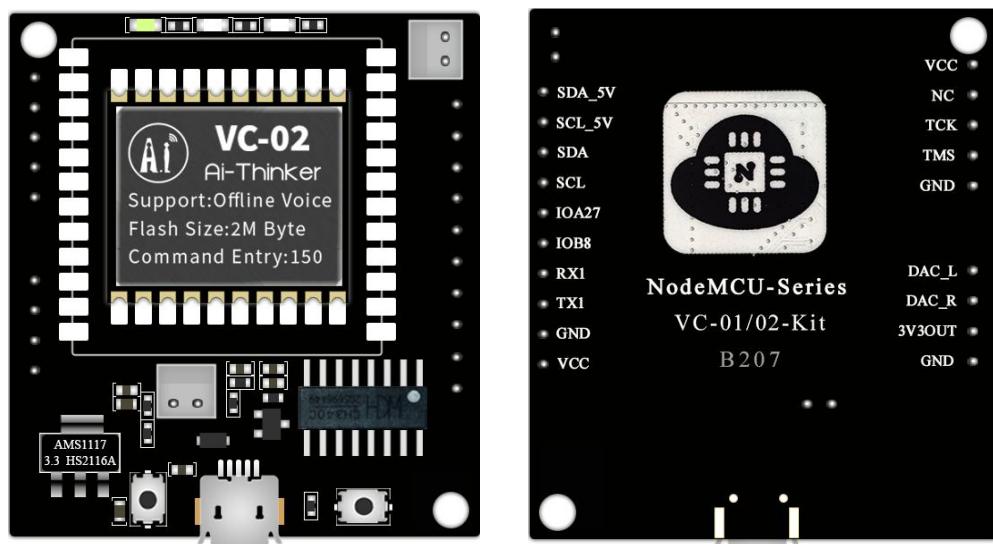


Figure 3 VC-02-Kit appearance diagram (for reference only)

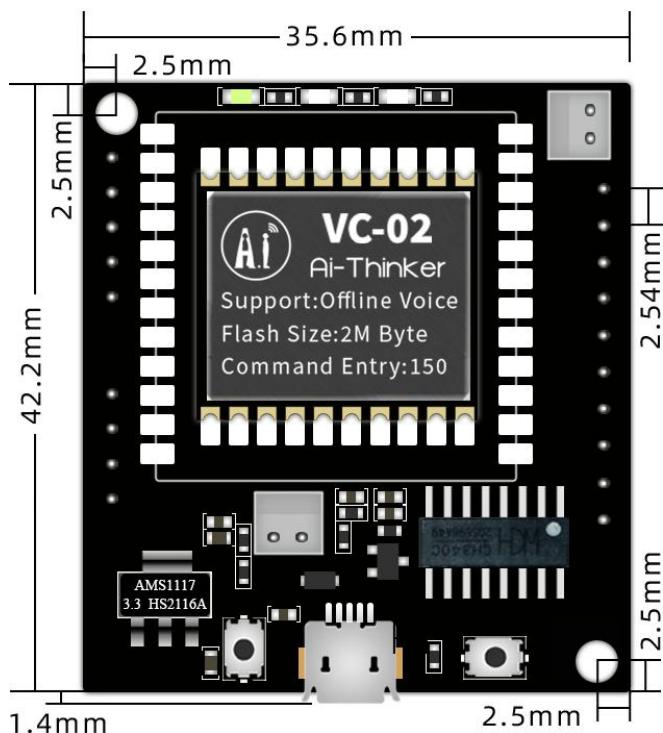
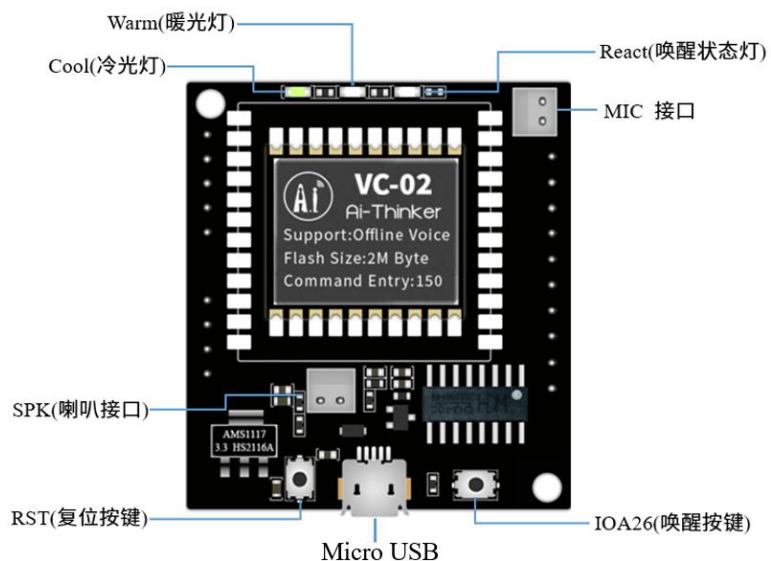


Figure 4 Development board size

## 4. Indicator light and button description

The VC-02-Kit has three LED indicators, namely: React (blue wake up state light), Warm (warm light) and Cool (cool light), and two buttons: RST (reset button) and IOA26 (wake up button).

Except for the reset button, the other LED indicators or keys functions only be carried by the factory firmware of the development board.



**Figure 5 VC-02-Kit indicator light and button position**

**Table 4 indicator light status and key function table**

Indicator light or button	Control action	LED status or key function	Note
React light	Wake up	Put on	This LED is in blue and only the factory firmware has this function
	Wait for wake up	Put out	
Warm light	“Turn on the warm light” command	Put on	This LED is in orange and only the factory firmware has this function
	“Turn off the warm light” command	Put out	
Cool light	“Turn on the light   Turn on the cool light” command	Put on	The LED color is in white, and only the development board factory firmware has this function
	“Turn off the light   Turn off the cool light” command	Put out	
RST button	/	Press reset button	/
IOA26 button	/	Press to wake up	Only the development board factory firmware has this function

## 5. Pin definition

The VC-02-Kit module has a total of 19 pins, As shown in below pin diagram, the pin function definition table is the interface definition.

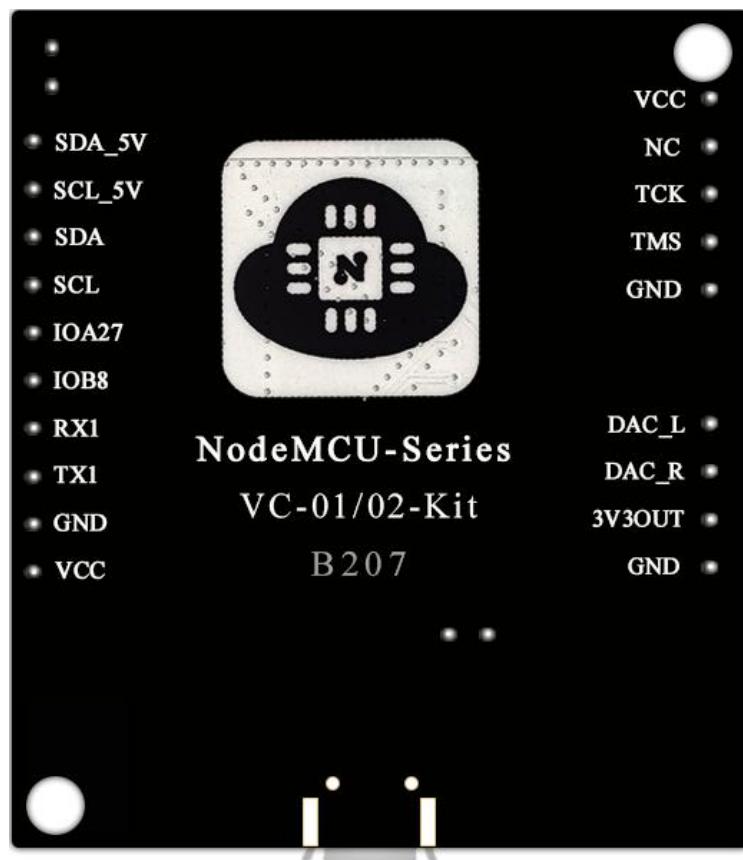


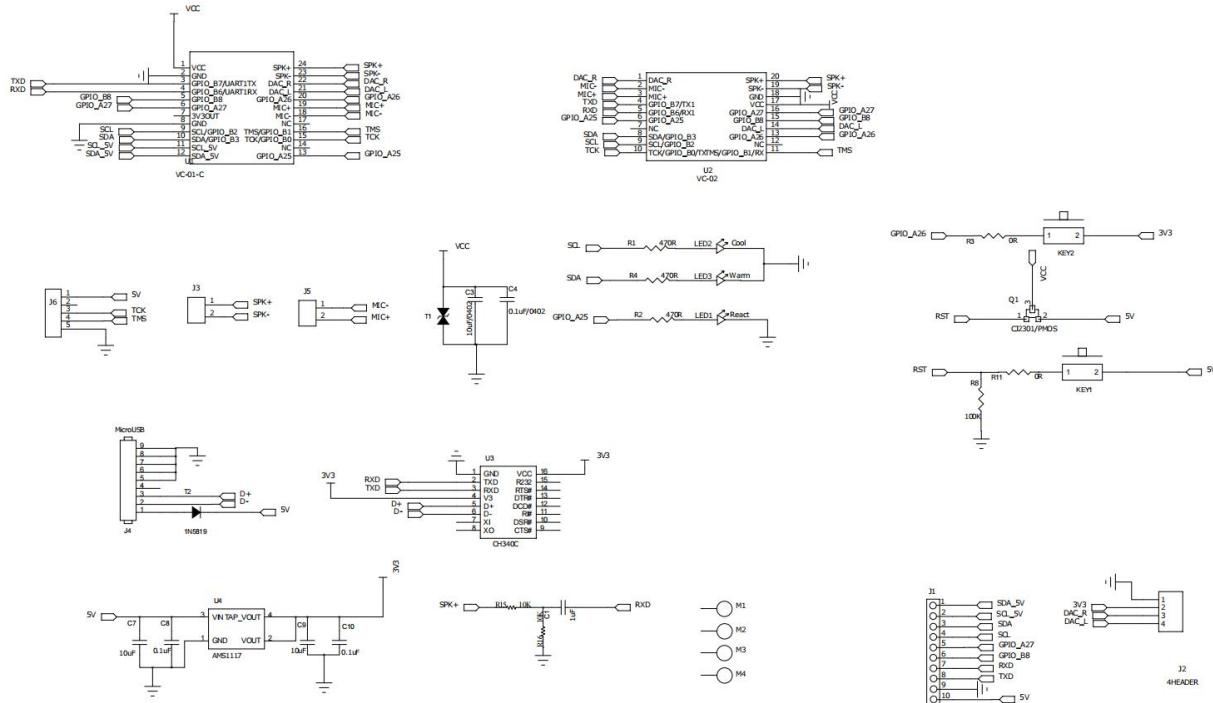
Figure 6 Development board pin diagram (bottom view)

**Table 5 Pin function definition table**

No.	Name	Function description
1	VCC	5V power input
2	NC	No connect
3	TCK	JTAG clock pin
4	TMS	JTAG data pin
5	GND	GND ground
6	DAC_L	Reserve the audio L channel output, which is not supported temporarily
7	DAC_R	Reserve the audio R channel output, which is not supported temporarily
8	3V3OUT	3.3V voltage output
9	GND	GND ground
10	VCC	5V voltage input
11	GND	GND ground
12	TX1	UART1 TXD
13	RX1	UART1 RXD
14	IOB8	UART0 output pin/Log information output
15	IOA27	GPIO_A17 pin
16	SCL	3.3V IIC clock pin / GPIO_B2 / TIM3_PWM (it cannot be used simultaneously with the 5V-level IIC communication port)
17	SDA	3.3V IIC data pin / GPIO_B3 / TIM4_PWM (it cannot be used simultaneously with the 5V-level IIC communication port)
18	SCL_5V	5V IIC clock pin (it cannot be used simultaneous with 3.3V level IIC communication port)
19	SDA_5V	5V IIC data pin (it cannot be used simultaneous with 3.3V level IIC communication port)

## 6. Schematic

VC-02-Kit and VC-01-Kit share a schematic diagram.



**Figure 7 Development board schematic diagram**

## 7. Product related model

Table 6 Product related model list

Model	Power Supply	Package	Size	Default communication interface
VC-01	3.6-5V, I>500mA	SMD-24	25.5*24*3.2(±0.2)mm	UART1
VC-02	3.6-5V, I>500mA	SMD-20	18*17*3.2(±0.2)mm	UART1
VC-01-Kit	5V, I>500mA	DIP-19	42.2*35.6(±0.2)mm	UART1
VC-02-Kit	5V, I>500mA	DIP-19	42.2*35.6(±0.2)mm	UART1

Product related information: <https://docs.ai-thinker.com>

## 8. Description of the firmware program mode

VC-02-Kit has two methods for firmware upgrade , JTAG debugger program and serial port program.

- JTAG debugger uses VC series dedicated JTAG debugger, Jlink series debugger are not supported,The firmware file name being used is:**uni\_app\_release.bin**
- Serial port program is USB program mode (module requires external TTL to USB module access to TX1 and RX1), the firmware file name being used must be:  
**uni\_app\_release\_update.bin** (cannot rename for 'uni\_app\_release.bin'), make sure to use the "build.sh update" instruction to compile.

## 9. Product packaging information

Table 7 Package information table

Packing List	Package	Per Bag (electrostatic bag)	Per Bag (Seal bag)
VC-02-Kit	Foam + electrostatic bag	1pcs	20pcs

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Wechat mini program



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