



EC-01-Kit Specification

Version V2.0.1

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Resumed

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1. Product Overview

Ec-01-kit is a development board designed for EC-01 module. The baseboard is shared with EC-01G-Kit. The development board integrates CH340C serial port chip and SIM card holder for easy use by developers.

Ec-01 is a NB module developed by Ai-Thinker. The main chip scheme is EC616S. The NB-IoT chip features ultra-integrated NB-IoT soCs, ultra-low power consumption and full support for the 3GPP Rel14 NB-IoT standard, making it an extremely cost-effective NB-IoT chip.

It has the following characteristics (NB-IoT) :

- Integrated RF transceiver, PA, RF filter, antenna switch and power management
- Excellent communication performance and stability in a variety of wireless environments
- Excellent power consumption performance in various modes (PSM, DRX, eDRX, connected state)
- Unique MCU mode, providing lower operating current and shorter wake up time

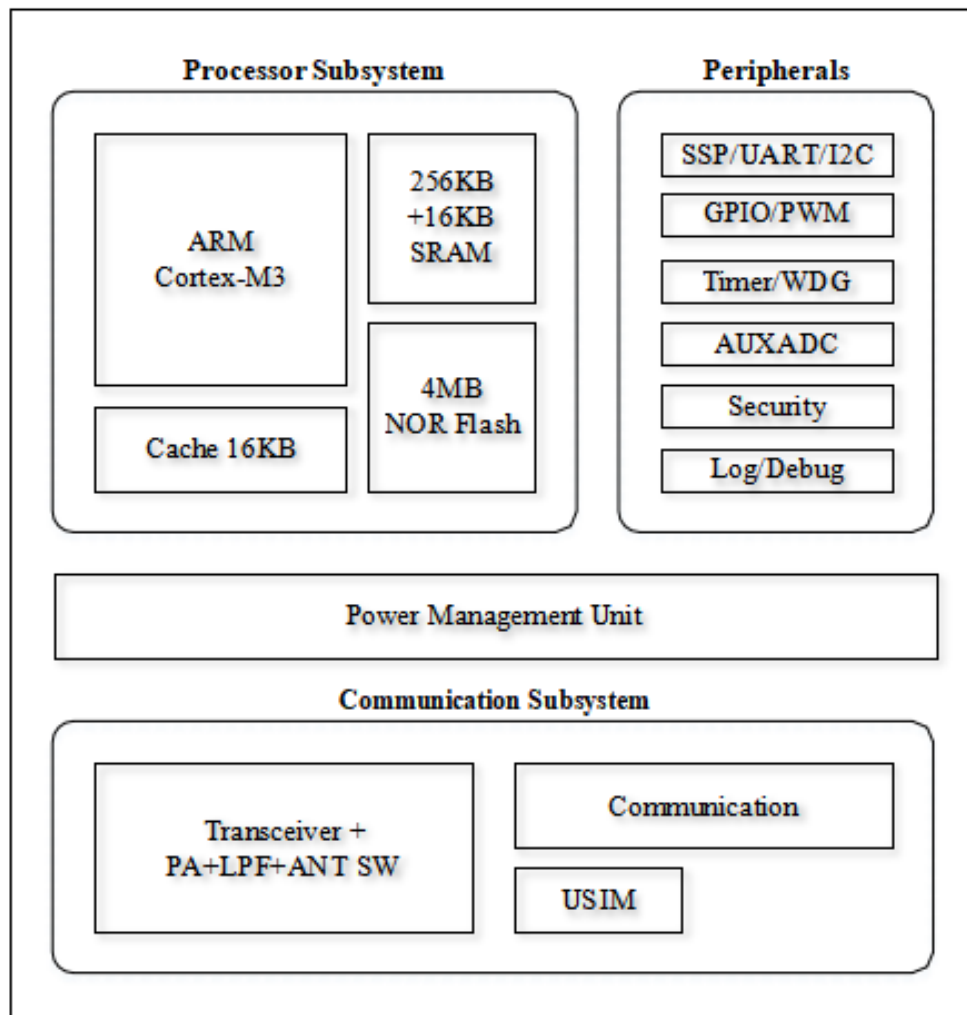


Figure 1 EC616S chip architecture diagram

1.1. Characteristics

- Processor:
 - ✓ Cortex-M3, support MPU
 - ✓ Configurable CPU frequency, Max 204MHz
 - ✓ 8-Channel DMA
- Storer:
 - ✓ 4MB NOR Flash on chip
 - ✓ 272KB WIW SRAM, divided into 256KB and 16KB
 - ✓ 16KB instruct cache
- system
 - ✓ Flexible Configuration Support 1.8/2.8/3.3V IO

- ✓ Clock source: 26MHz TCXO or DCXO, 32.768khz crystal oscillator
- ✓ 1 external wake up source (interrupt)
- ✓ Unique MCU mode, in this mode, internal RC oscillator as the clock, lower power consumption
- ✓ LOG □, UNILog
- ✓ Debug port, SWD
- Peripheral
 - ✓ 12 ↑ GPIO(Include TX0\RX0 AND TX1\RX1)
 - ✓ 2 UART, 2 ADC, 1 I2C
 - ✓ 6 PWM, 6 Timers, 6 GPIO counter, 1 WDG
 - ✓ 32KHz RTC timer
 - ✓ USIM, Support Esim
 - ✓ 1 SIM Booth
- Low power consumption:
 - ✓ Unique low power architecture, level 4 sleep mode PSM: 800nA
 - ✓ DRX (2.56s): typical value 110uA
 - ✓ RX: typical value 10mA
 - ✓ TX: typical value 24mA
- Communication:
 - ✓ Fully support 3GPP R14 NB-IoT
 - ✓ Category NB2, 2-HARQ
 - ✓ Multi-tone NPUSCH
 - ✓ Anchor and non-anchor carrier
 - ✓ In-band same/different PCI, guardband, standalone
 - ✓ Multi-carrier paging, NPRACH
 - ✓ Positioning: OTDOA & ECID
 - ✓ ROHC, RAI, multiple-DRB, RRC connection re-establish
 - ✓ SC-PTM (need SW upgrade)
- Radio frequency:

- ✓ Support the spectrum: Band3、Band5、Band8
- ✓ chip integrates PA and supports APT function
- ✓ chip integrated RF transceiver filter and antenna switch
- ✓ Power level 3
- Safety:
 - ✓ Hardware Encryption and Decryption module (AES, SHA) Secure boot
 - ✓ Secure boot
 - ✓ Flash encryption
 - ✓ True random number generator
- Application:
 - ✓ Support Open-CPU
 - ✓ software conforms to the CMSIS architecture
 - ✓ Supports mainstream cloud services
 - ✓ IPv4, IPv6 and non-IP
 - ✓ UDP, TCP
 - ✓ DTLS, TLS, SSL
 - ✓ MQTT, CoAP, HTTP(S)
 - ✓ LWM2M
 - ✓ Support FOTA
- Power Supply : 5V

2. Main parameters

Table 1 Main Parameters

Development board Model	EC-01-Kit
• Adaptive pattern	EC-01、EC-01G
Packaging	DIP-14 (2.54Spacing standard row needle)
Size	37.6*32.5(±0.2)mm
• Antenna form	NB:External SMA antenna, GPS: external IPEX antenna
Spectral Range	Band3,Band5,Band8

Working Temperature	-40 °C ~ 85 °C
Storage Environment	-40 °C ~ 125 °C , < 90%RH
Supply District	Power supply voltage 5V current greater than 500mA
Support interface	UART/I2C/PWM/ADC/GPIO
IO quantity	12(containTX0\RX0 TX1\RX1)
Series Rate	Support110 ~ 4608000 bps , Default 9600 bps
Bluetooth	Nonsupport
Security	AES/SHA
Flash	4MB NOR Flash
Module Power Consumption	sleep mode(PSM): 0.8uA (Single-mode group) standby mode(DRX): 110uA (Single-mode group) Full load mode (TX: 23dBm) : 240mA

2.1. Power supply selection

You can power the EC-01-Kit using either of the following power supply methods:

- Micro-USB Interface power supply (default)
- 3V3 and GND Fixing pin power supply

Suggest to use the first power supply mode: Micro-USB port.

2.2. Electrostatic requirements

EC-01-Kit Development boards are electrostatic sensitive equipment and special precautions should be taken when handling them.



Figure 2 ESD preventive measures

2.3. Electrical characteristics

Table 2 Electrical characteristics

Parameter		Condition	Minimum	Typical Value	Maximum	Unit
Supply Voltage		VDD	4.5	5	5.3	V
I/O	V_{IL}/V_{IH}	-	-0.3/0.75V _{IO}	-	0.25V _{IO} /4.5	V
	V_{OL}/V_{OH}	-	N/0.8V _{IO}	-	0.1V _{IO} /N	V
	I _{MAX}	-	-	-	24	mA

2.4. NB-IoT Rf performance

Table 3 NB-iot RF performance table

Band	Channel	1 Tone@11(15KHz)				12 Tone(15KHz)			
		Pout (dBm)	EVM RMS (%)	SEM Margin (dB)	ACLR Max (dBc)	Pout (dBm)	EVM RMS (%)	SEM Margin (dB)	ACLR Max (dBc)
3	1201	22.5	0.9	4.9	-39.5	20.5	7	6	-40.8
	1575	22.5	0.9	3.8	-39	20.5	7	6	-41
	1949	22.5	0.9	4	-39	20.5	7	5	-40.5
5	2401	22.6	0.9	8	-42	20.4	7	7	-43
	2525	22.6	0.9	9	-42	20.4	6	6	-42.5
	2649	22.6	0.9	8	-42	20.4	7	7	-42.8
8	3451	22.5	0.9	7.5	-42.5	20.5	6	4	-42.5
	3625	22.5	0.9	8.5	-42	20.4	6	3.5	-41
	3799	22.5	0.9	5	-42	20.4	7	4.5	-40.5

2.5. Module Power Consumption

The following power consumption figures are based on 3.3V power supply,

ambient temperature at 25°C, and using an internal voltage regulator.

Table 4 Module power consumption table

Model	minimum	average value	maximum	Unit
Connect_Tx_23dBm_1Tone(Band3 Channel 1575)	-	120	240	mA
Connect_Tx_23dBm_1Tone(Band5 Channel 2525)	-	110	226	mA
Connect_Tx_23dBm_1Tone(Band8 Channel 2625)	-	108	215	mA
Connect_Rx_Band3	-	10	40	mA
Connect_Rx_Band5	-	16	46	mA
Connect_Rx_Band8	-	10	40	mA
DRX (2.56s)	-		110	μA
PSM	-		<1	μA

3. External dimensions

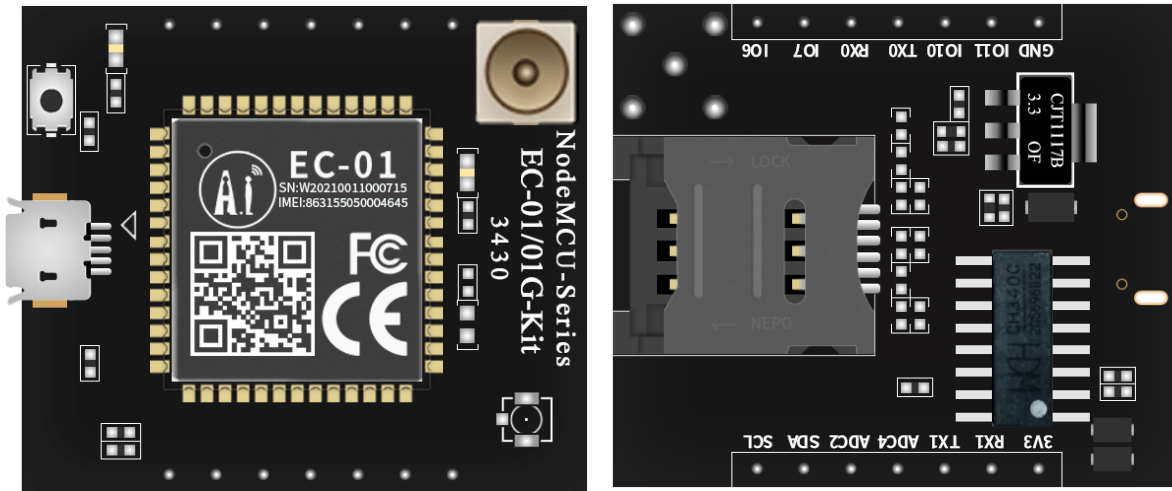


Figure 3 Appearance of development board (picture and silkscreen are for reference only, subject to the real object)

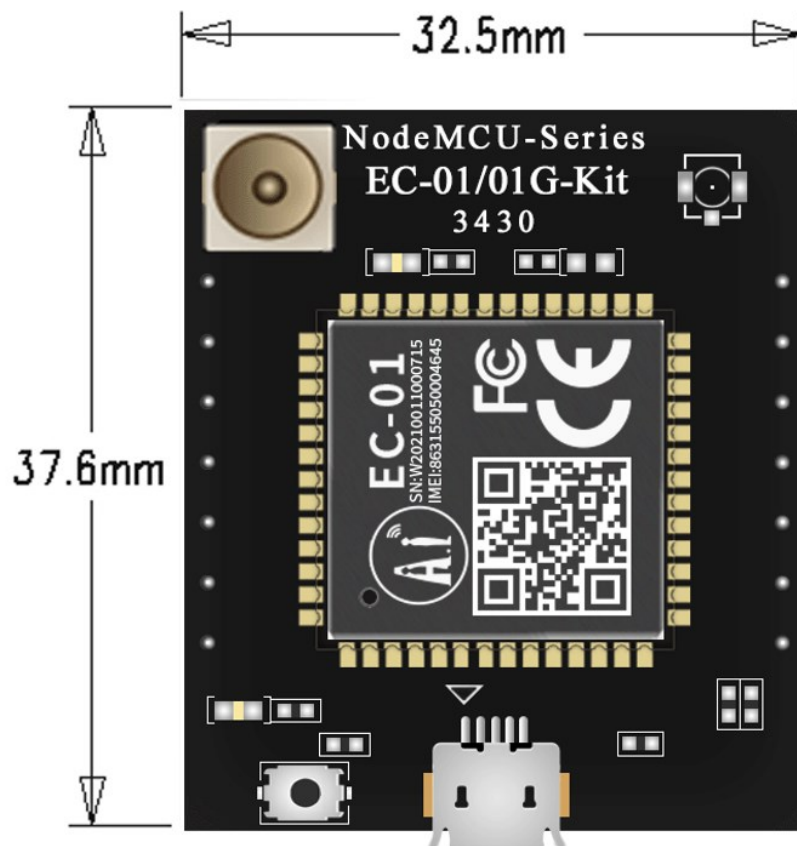


Figure 4 Development board size diagram

4. Description of indicators and buttons

EC-01-Kit there are two indicators: NB indicator and LINK indicator.

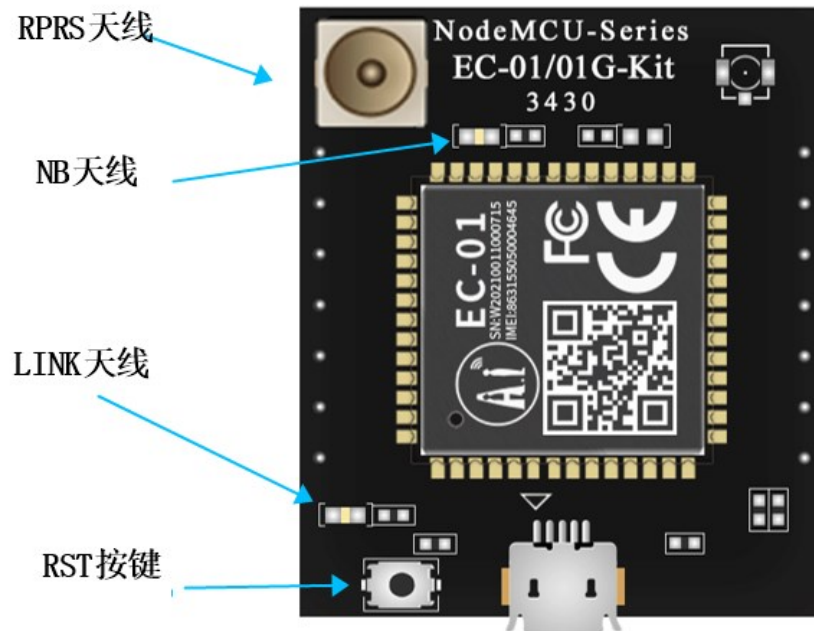


Figure 5 positions of the indicators and buttons on the EC-01G-KIT

Table 5 Indicator status and button functions

Indicator light or button	Network State	LED status or Button Function	Remark
“NB” Indicator (Network status indicator)	connected	1sFlashing once	Turn on the indicator mode (AT+ECLEDM ODE=1)
	search the Internet	0.5sFlashing once (quick flashing)	
	network disconnection	Extinguish	
	ununited	0.5sFlashing once (quick flashing)	
“LINK” Indicator	Failed to connect to server	Extinguish	/
	Connected Server	Lighting Form	Connect to the server and ID=0
RST Key	/	Resetting Key	/

5. Pin definition

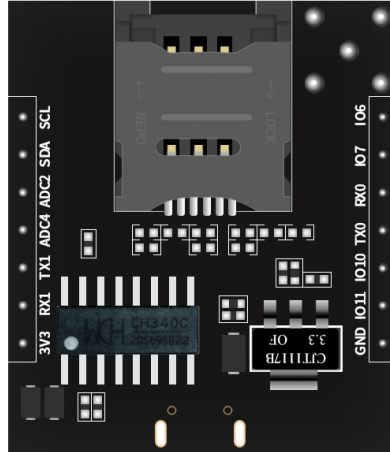


Figure 6 Schematic diagram of development board pins (bottom view)

EC-01-Kit A total of 14 interfaces are connected, such as pin schematic diagram, pin function definition table is the interface definition.

Table 6 Pin function definition table

Foot sequence	Name	Function Declaration
1	IO6	GPIO6
2	IO7	GPIO7
3	RX0	GPIO8/UART0_RXD
4	TX0	GPIO9/UART0_TXD
5	IO10	GPIO10
6	IO11	GPIO11
7	GND	Ground connection
8	3V3	3.3V Power Supply

9	RX1	GPIO14/UART1_RXD
10	TX1	GPIO15/UART1_TXD
11	ADC4	ADC Channel AIO4
12	ADC2	ADC Channel AIO2
13	SDA	GPIO2
14	SCL	GPIO3

6. Schematic diagram

EC-01-Kit and EC-01G-Kit share a schematic.

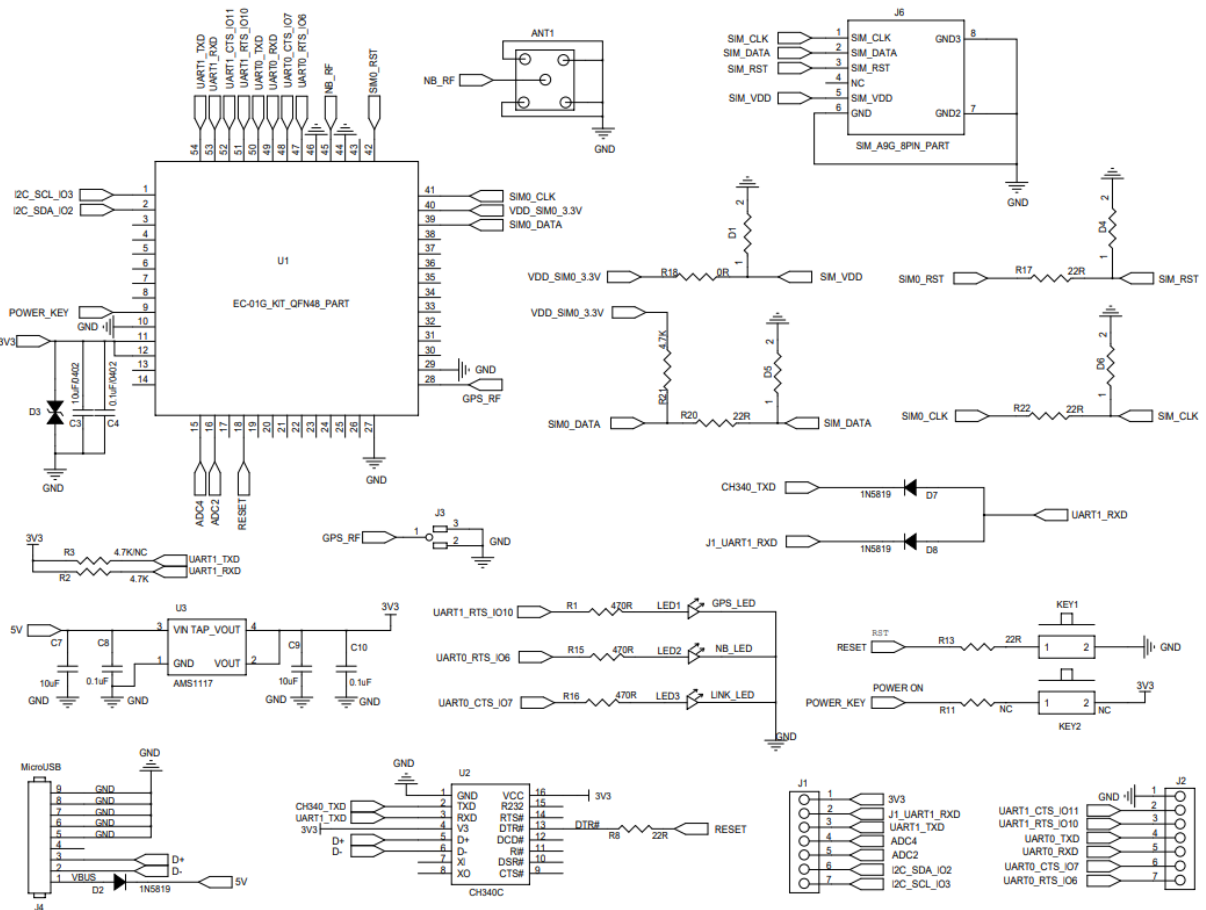


Figure 7 Schematic diagram of development board

7. Product model

Table 7 Product model table

Product Model	Power Supply	Pin TX1 and RX1	Package	Size	GPS
EC-01 Module	3.3V ~ 4.5V, I>500mA	/	SMD-54	19.2*18.8*2.8 (±0.2)MM	No
EC-01G Module	3.3V ~ 4.5V, I>500mA	/	SMD-54	19.2*18.8*2.8 (±0.2)MM	Yes
EC-01F Module	3.3V ~ 4.5V, I>500mA	/	SMD-44	17.7*15.8*2.8 (±0.2)MM	No
EC-01-Kit_V1.0 Development Board	5V, I>500mA	Access not support	DIP-14	37.6*32.5 (±0.2) mm	No
EC-01G-Kit_V1.0 Development Board	5V, I>500mA	Access not support	DIP-14	37.6*32.5 (±0.2) mm	Yes
EC-01F-Kit_V1.0 Development Board	5V, I>500mA	Access not support	DIP-14	33.9*28.4*13 (±0.2)mm	No
EC-01-Kit_V2.0 开发板	5V, I>500mA	Support access	DIP-14	37.6*32.5 (±0.2) mm	No
EC-01G-Kit_V2.0 Development Board	5V, I>500mA	Support access	DIP-14	37.6*32.5 (±0.2) mm	Yes
EC-01F-Kit_V2.0 Development Board	5V, I>500mA	Support access	DIP-14	33.9*28.4*13 (±0.2)mm	No
Product Information: https://docs.ai-thinker.com/nb_module					

8. Product Notes

EC-01-Kit V1.0 Version of the onboard micro-USB port and TX1, RX1 can only use one of them for communication and recording, When the serial port chip as shown in the picture exists, only onboard micro-USB port can be used for communication and recording. If you want to use TX1 and RX1 pin row for communication and burning, you need to remove the serial chip, at this time micro-USB port does not support communication and burning. Figure 10 shows the differences between EC-01-Kit V1.0 and EC-01-Kit V2.0.

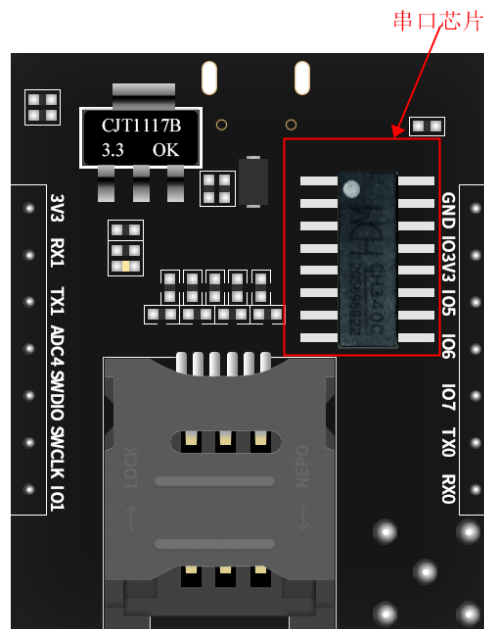


Figure 8 schematic diagram of serial port chip

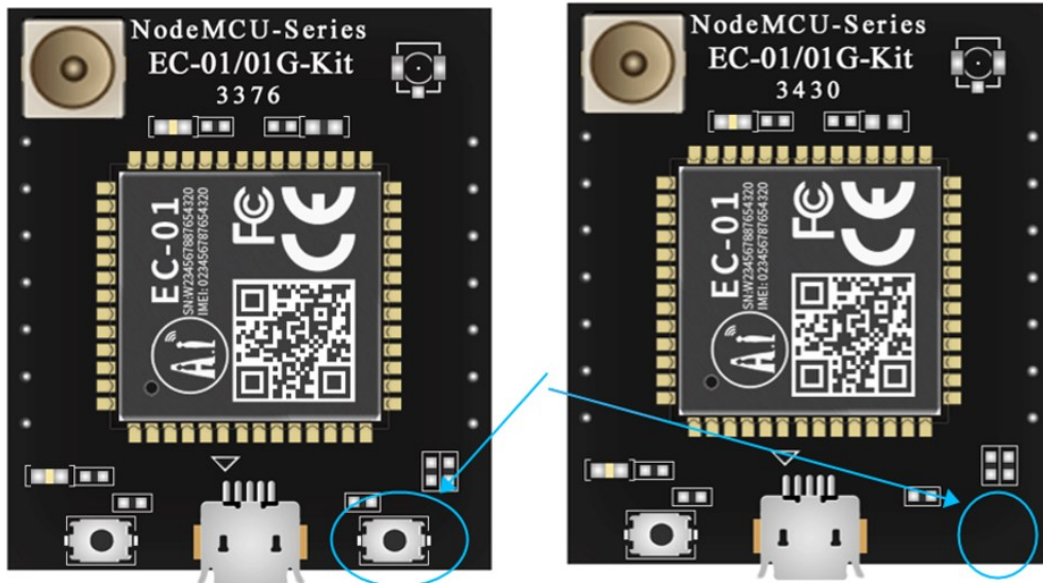


Figure 9 Difference between EC-01-Kit V1.0(left) and EC-01-Kit V2.0(right)

9. Product packaging information

As shown in the figure below, the EC-01-kit development board is packed in electrostatic bags, 1pcs /bag.



Figure 10 Packing diagram of an ESD bag

10. Contact us

Official website: <https://www.ai-thinker.com>

Develop Wiki: <https://docs.ai-thinker.com>

Official forum: <http://bbs.ai-thinker.com>

Sample purchase: <https://aithinker.tmall.com>

<https://anxinke.taobao.com>

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