



SIM7022-EVB

User Guide

NB Module

SIMCom Wireless Solutions Limited.

SIMCom Headquarters Building, Building 3, No. 289 Linhong Road

Changning District, Shanghai P.R.China

Tel: 86-21-31575100

support@simcom.com

www.simcom.com

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SIMCom Wireless Solutions Limited

SIMCom Headquarters Building, Building 3, No. 289 Linhong Road, Changning District, Shanghai P.R. China

Tel: +86 21 31575100

Email: simcom@simcom.com

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1 Introduction

The purpose of this article is to introduce the interface and usage of the development kit.

Based on the SIMCom development kit, developers will quickly become familiar with and verify the software functions of the module.

1.1 Features Overview

The main features of SIM7022 EVB are shown in the table below.

Table 1: Main features

Features	Description
Power supply	USB_VBUS: 5V power supply
(U)SIM card interface	(U)SIM card: Dual voltage 1.8V/3.0V
UART interface	Two USB-to-UART interfaces, Respectively for the main serial port and system log port
Signal indication	Three function indicator LED lights
Switches	Two switches for power supply and software download
Buttons	Two buttons for wake-up and reset functions respectively

1.2 SIM7022 EVB Top and Bottom View

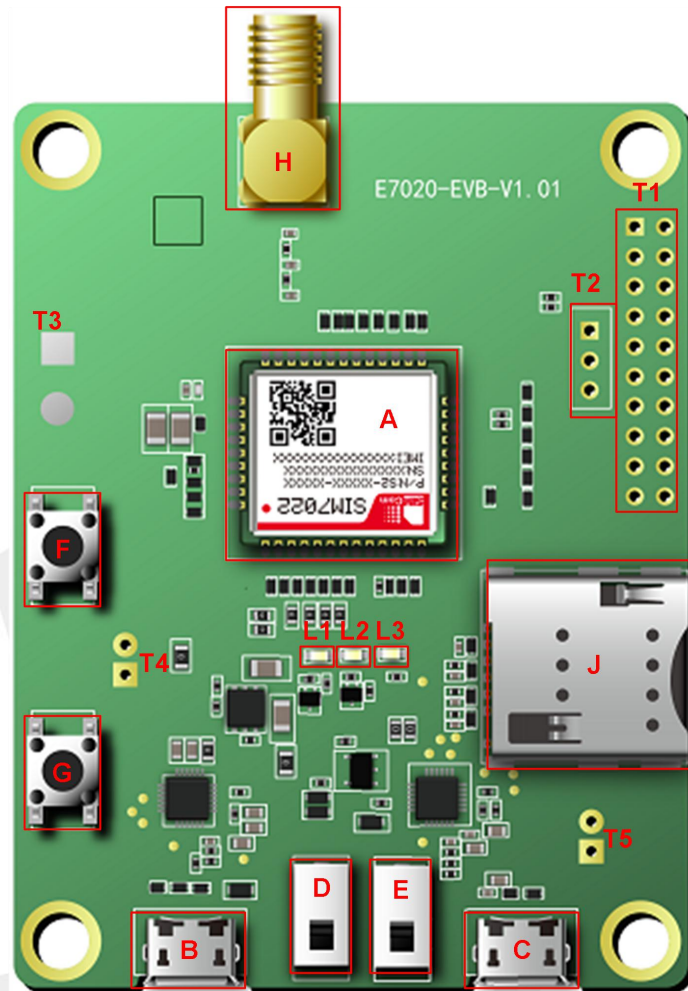


Figure 1: SIM7022 EVB top view

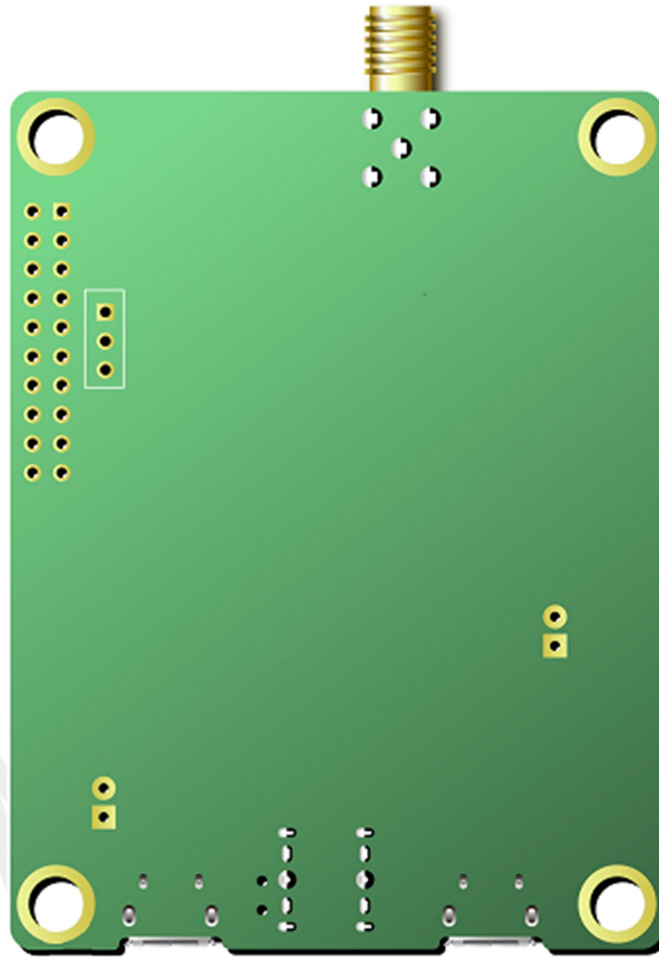


Figure 2: SIM7022 EVB bottom view

Table 2: Label information description

Label information	Description
A	SIM7022 Module
B	Main serial port, used for AT commands and firmware upgrade
C	DBG serial port, used for software LOG capture
D	Power supply switch
E	Firmware upgrade switch
F	WAKEUP button
G	RESET button
H	Main antenna connector
J	SIM card interface
L1	Network status light
L2	Power Indicator light
L3	Power-on indicator light

T1,T2,T3,T4,T5

Test point

NOTE

1. The SIM card of the SIM7022 EVB is shown as the position "J" in the rendering. The module does not support the hot-swappable function. Please insert the SIM card before turning on the module, otherwise the SIM card will not be recognized successfully.

1.3 SIM7022 Evaluation Kit

Evaluation kit includes EVB board and other accessories.

The SIM7022 kit list is as follows, please ensure that all kits are complete.

- 1) SIM7022-EVB board;
- 2) MICRO USB data cable;
- 3) GSM\WCDMA\LTE antenna;

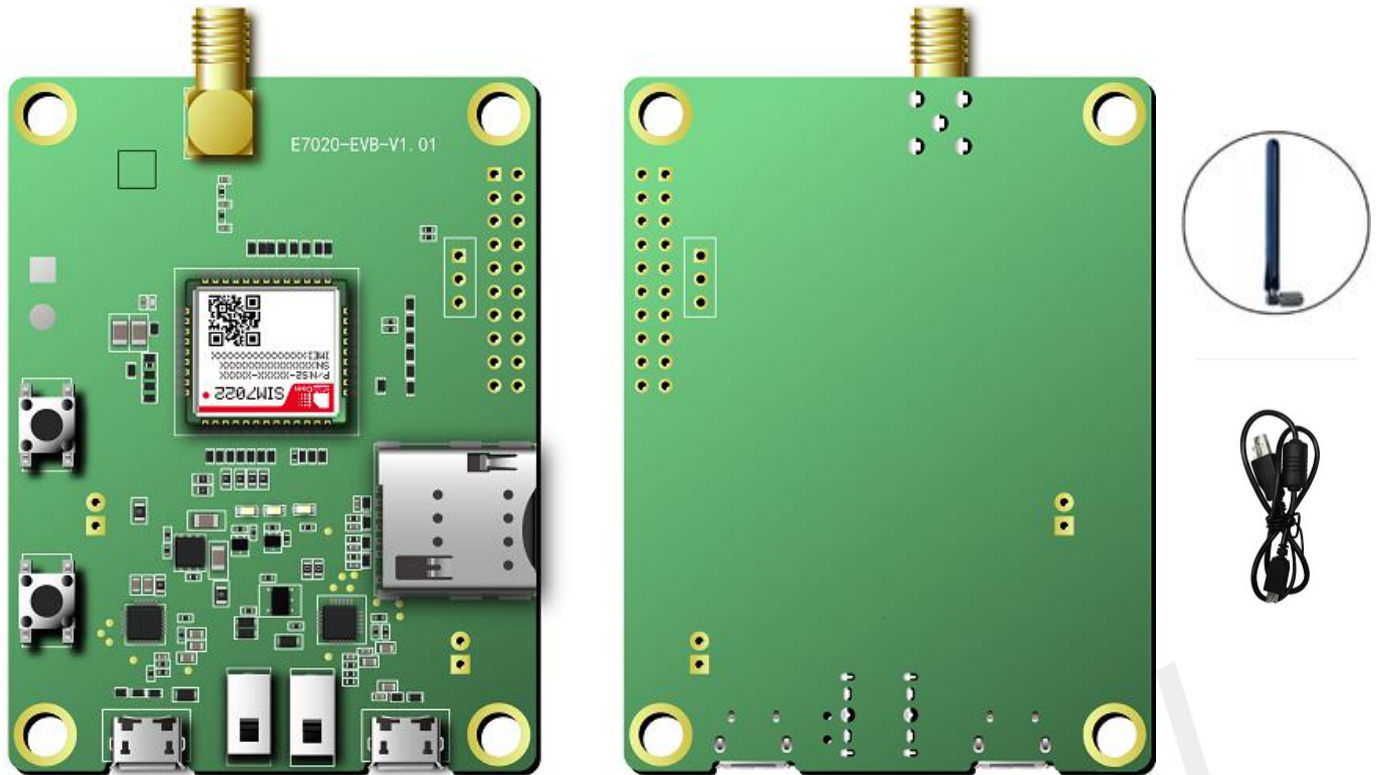


Figure 3: SIM7022 Evaluation kit

Table 3: EVB Kit

EVB Kit	Description	quantity
SIM7022 EVB	EVB board	1
GSM/WCDMA \LTE antenna	GSM/WCDMA \LTE antenna	1
MICRO USB data cable	MICRO USB data cable	1

To ensure that the module can be used normally, it is recommended to use the correct kit model. The part numbers of SIM7022 EVB kit are shown in the table below.

Table 4: EVB Kit

EVB Kit	Part No
8EC000-SIM7022-EVBKIT	S2-109DE

2 Interface Introduction

The interface of SIM7022 EVB is shown in the table below.

Table 5: Interface introduction

Function	Reference number	Description
(U)SIM	J102	(U)SIM card interface
UART	J103	J103 is used for AT command communication, data transmission and firmware upgrade
	J104	J104 is used for software debugging
LEDS	LED101	LED101: Network status indicator light
	LED102	LED102: Power status indicator light
	LED103	LED103: Power-on status indicator light
Switches	SW101	SW101: Power supply switch
	SW1	SW1: Firmware upgrade switch
Buttons	SW102	SW102: RESET button
	SW103	SW103: WAKEUP button
Test points	J101 J105 J106 J107	J101 J105: Power test point J106 J107: Module signal test point

More detailed introductions about the above functions are shown in the next section.

2.1 Power Supply

2.1.1 Power Supply

SIM7022 EVB is powered by micro USB, USB plug-in connection device J103, J104 can achieve 5V power supply effect.

The power supply block diagram of SIM7022 EVB is shown in the figure below.

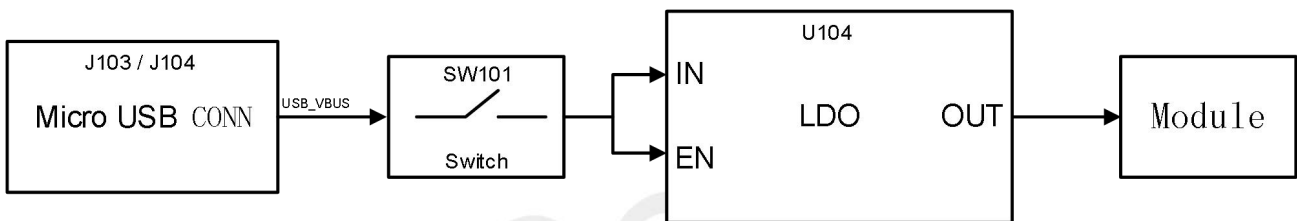


Figure 4: EVB Power supply block diagram

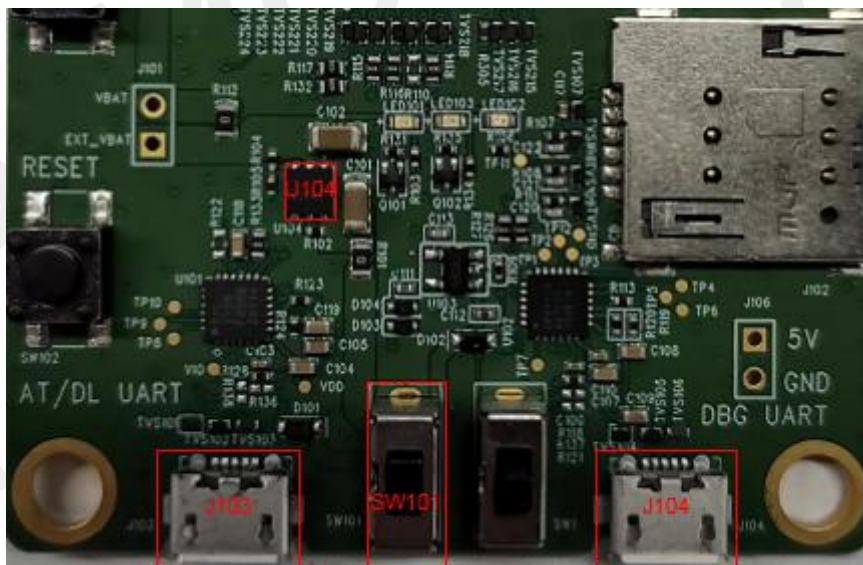


Figure 5: EVB power interface

2.1.2 Separate Power Supply

The module power supply reference design is shown in the figure below.

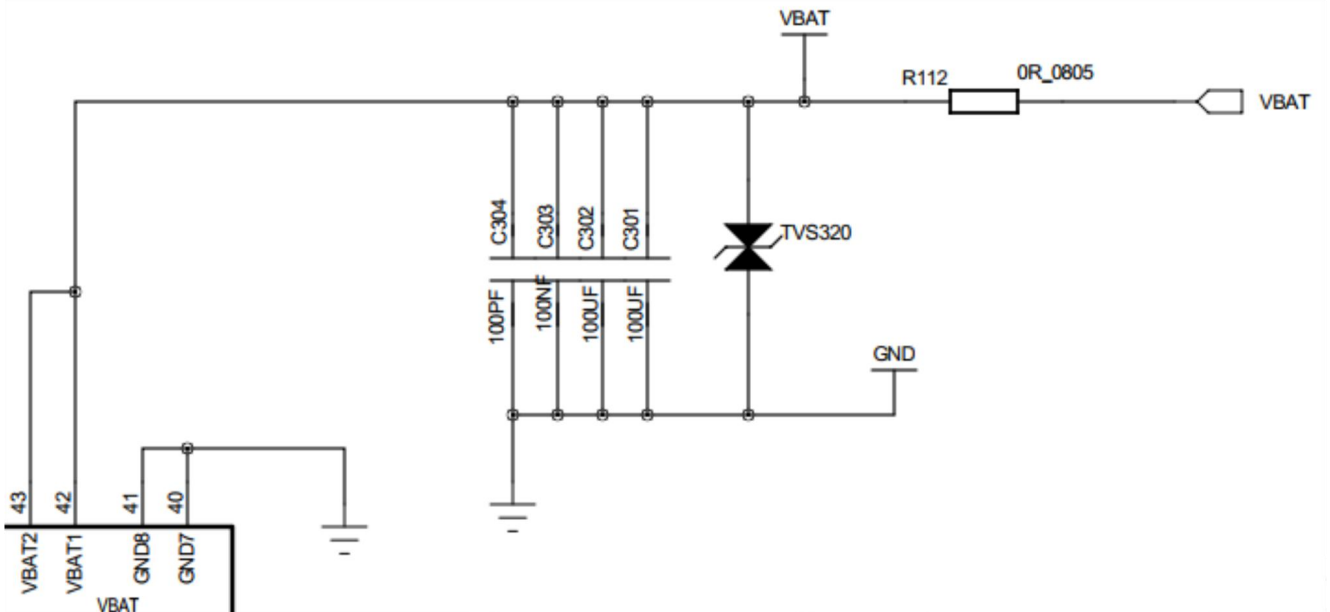


Figure 6: Module power supply reference design

The test points of VBAT and GND of the module are shown in the figure below. If the module needs to be powered separately, the resistance of R112 should be removed first, and then the VBAT and GND test points should be externally supplied with power.

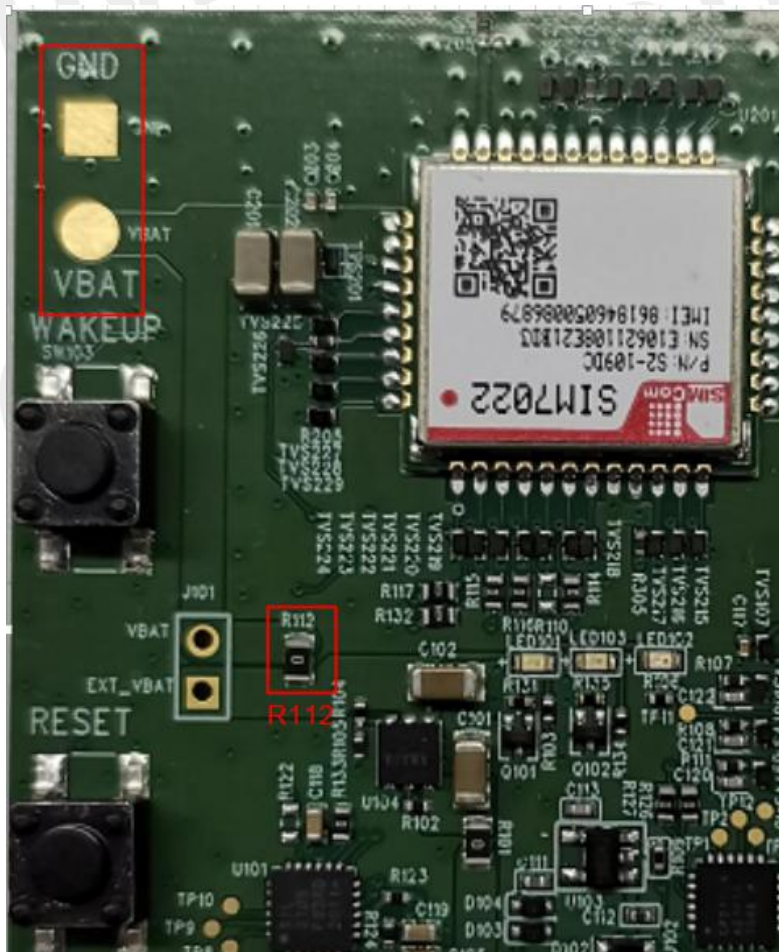


Figure 7: Module power supply separately (VBAT GND)

NOTE

1. The power supply range of the module is 2.2~4.2V, and the recommended power supply voltage is 3.3V. When the power supply voltage is lower than 3V, the radio frequency can work and the performance of a single index may not meet the 3GPP standard.

2.2 (U)SIM card Interface

SIM7022 does not support hot-swappable function. Please make sure to insert the (U)SIM card correctly before powering on, otherwise the card cannot be recognized.

The reference circuit of the (U)SIM card interface is shown in the figure below.

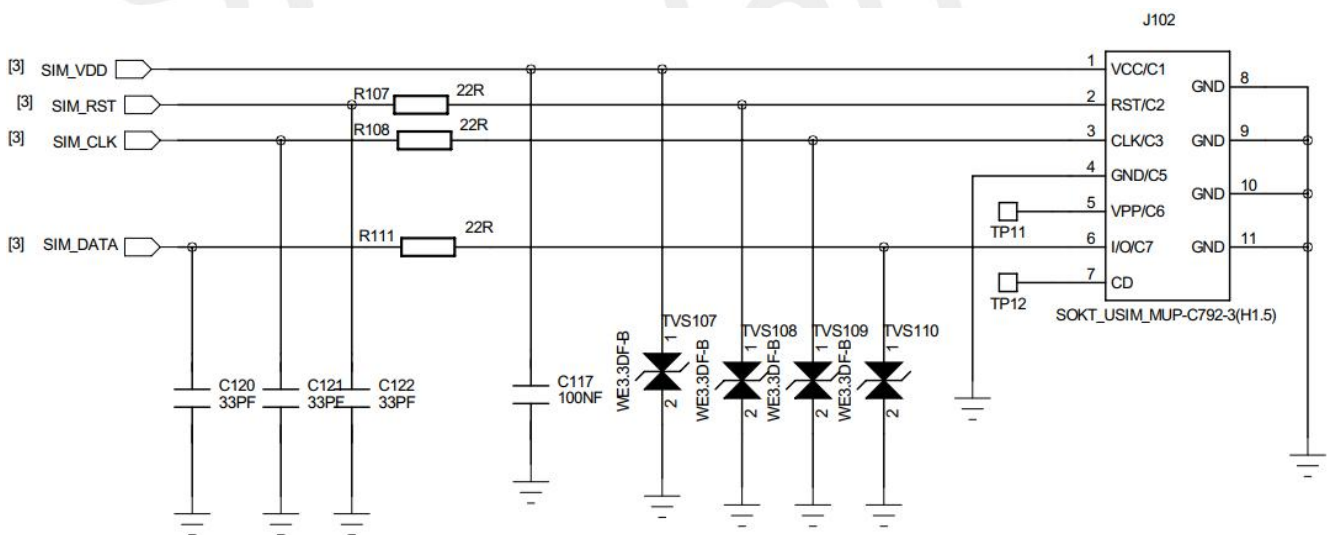


Figure 8: (U)SIM card interface reference design

The pin definition of the (U)SIM card holder is shown in the figure below.

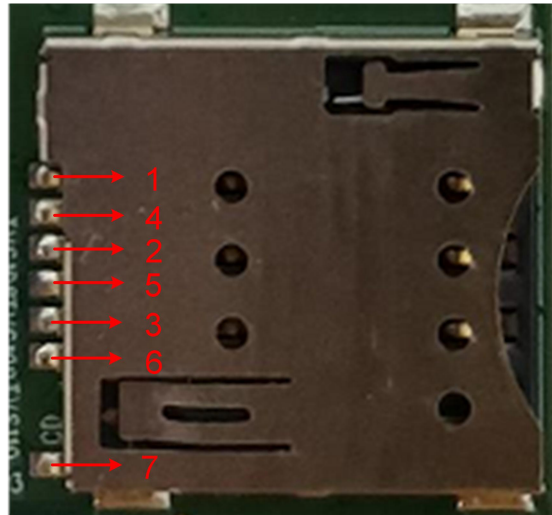


Figure 9: (U)SIM card interface pin definition (J102)

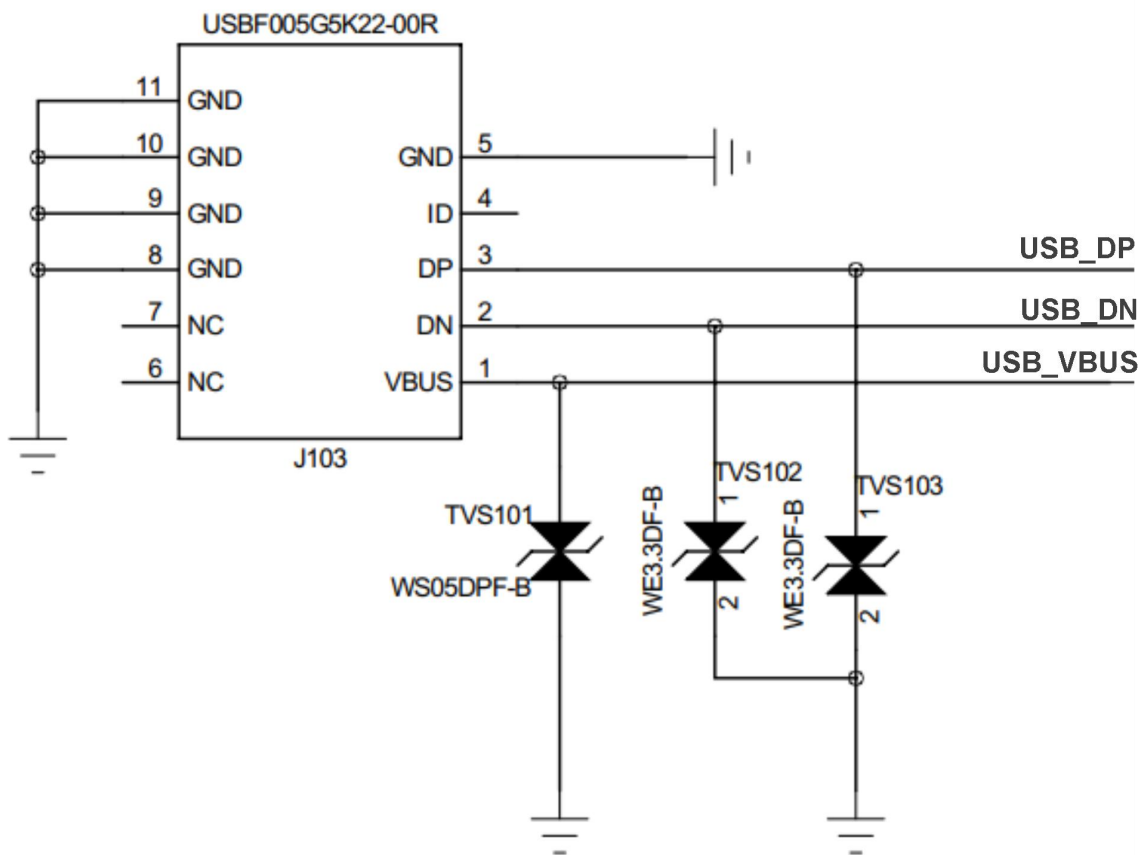
Table 6: (U)SIM card interface pin definition (J102)

Pin number	Pin name	I/O	Describe
1	VCC	O	(U)SIM power supply
2	RST	O	(U)SIM reset signal
3	CLK	O	(U)SIM clock signal
4	GND		GND
5	VPP		Float
6	I/O	I/O	(U)SIM duplex data line
7	CD	I	(U)SIM detect signal

2.3 UART Interface

SIM7022 EVB provides two UART interfaces (J103, J104) by USB to UART. J103 is used as the main serial port for AT commands, data transmission and firmware upgrade, and J104 is used as DEBUG debugging serial port for software DEBUG debugging.

The reference circuit of USB to UART interface is shown in the figure



below.

Figure 10: USB to UART reference design

The pin definition of the Micro USB interface is shown in the figure below.

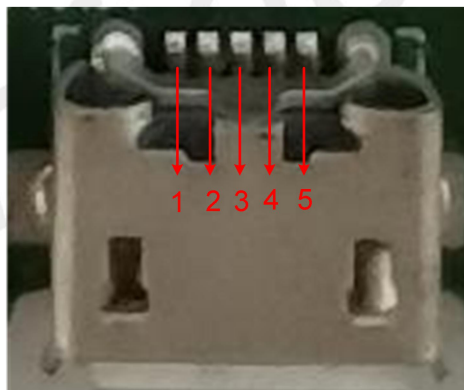


Figure 11: Micro USB interface pin definition (J103)

Table 7: Micro USB interface pin definition (J103)

Pin number	Pin name	I/O	Description
1	VBUS	O	USB power supply
2	USB_DM	I/O	USB differential data negative (USB-to-UART)
3	USB_DP	I/O	USB differential data positive (USB-to-UART)
4	\	\	Float
5	GND		Ground

2.4 Status Indicator Light

There are three status indicator lights LED101, LED102, and LED103 for function indication on SIM7022 EVB.

The status indicators LED101, LED102, and LED103 are as shown in the figure below.

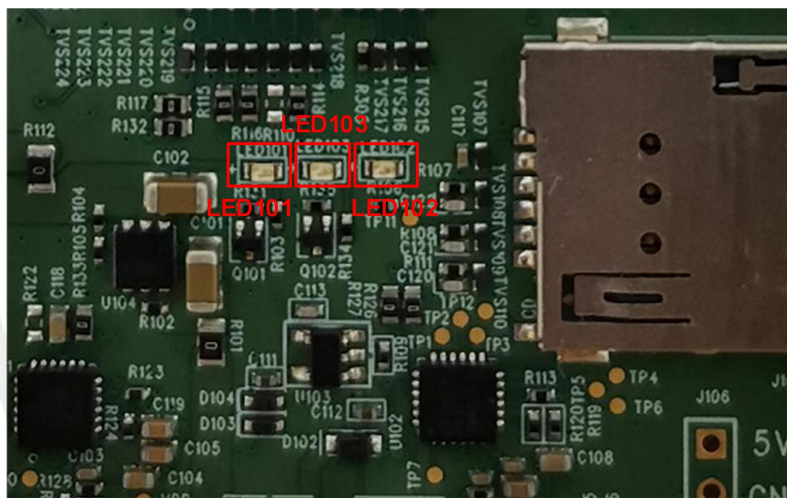


Figure 12: LED status indicator light (LED101、LED102、LED103)

Table 8: Status indicator light description

LEDs number	LEDs colour	Description
LED101	Blue	Module network status indicator light
LED102	Red	VBAT power supply indicator light
LED103	Blue	Module power-on status indicator light

2.5 Switches and Buttons

There are two switches (SW101, SW1) and two buttons (SW102, SW103) on SIM7022 EVB.

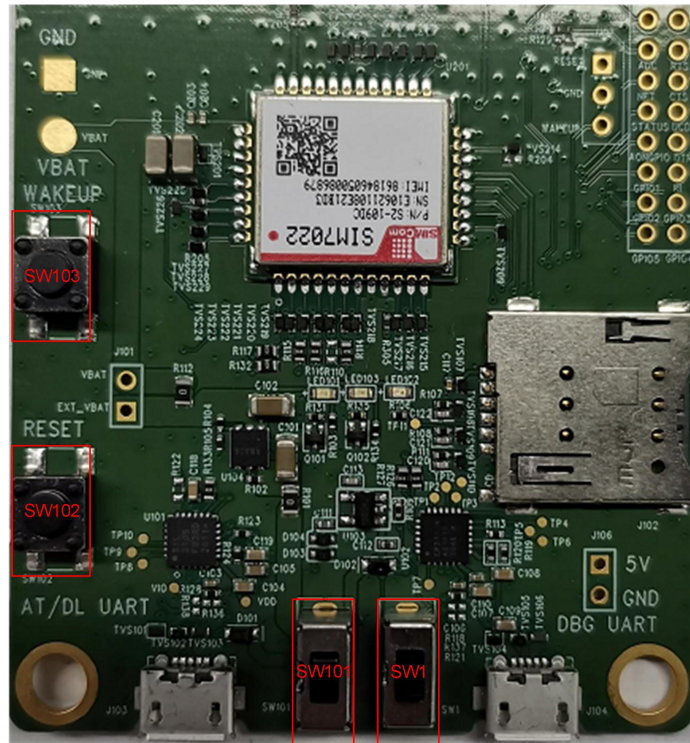


Figure 13: Switches and buttons

Table 9: Switches and buttons

Number	Name	Description
SW101	POWER_KEY	EVB power switch
SW102	RESET	Module reset button
SW103	WAKEUP	Module wake-up button
SW1	DOWNLOAD	Firmware upgrade switch

NOTE

1. When the serial port baud rate is less than or equal to 9600bps, there is no need to use the WAKEUP button of EVB to wake up, and the module can be directly awakened by sending AT commands through UART1. When the baud rate is greater than 9600bps, you need to use the WAKEUP button to pull down WAKEUP to wake up the module. For details, please refer to the document [1].

2.6 Test Points

There are four sets of test points J101, J105, J106, J107 on SIM7022 EVB. The details of the test points are as follows.

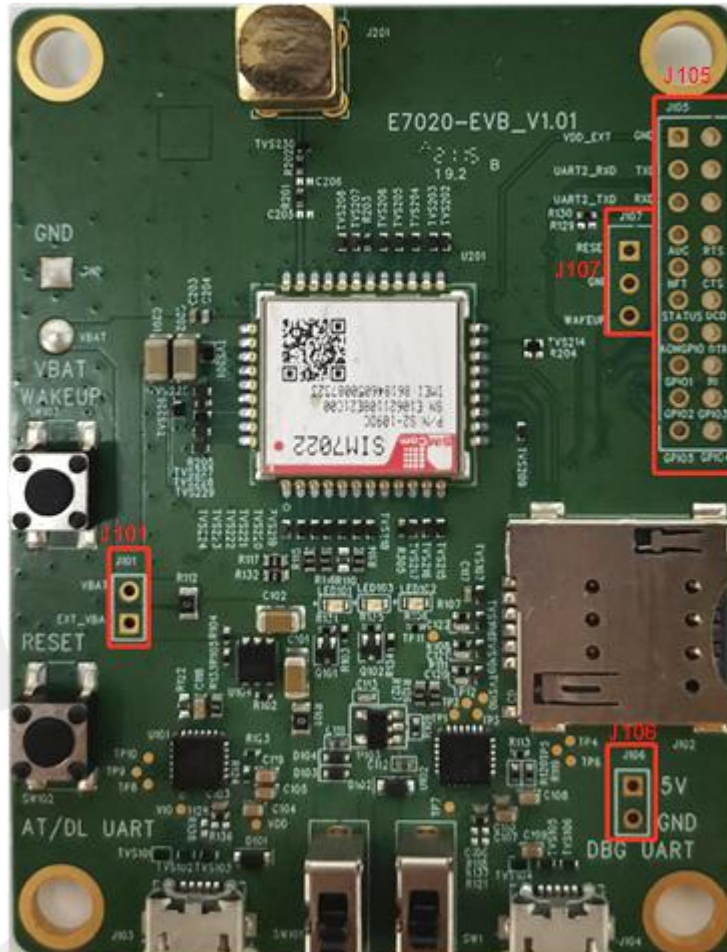


Figure 14: Test point location

The pin definition of position J101 is shown in the figure below.

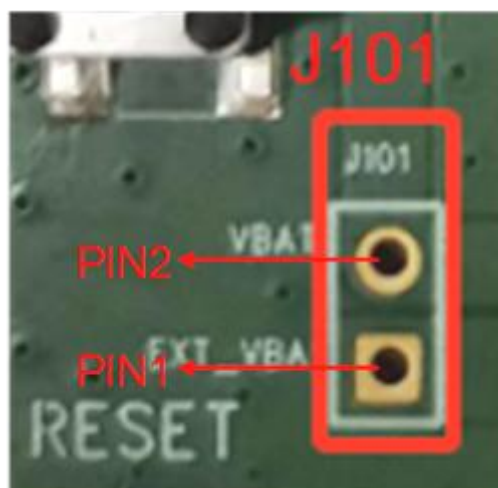


Figure 15: The pin definition of position J101 on EVB

Table 10: Test point description of J101 on EVB

Position	Test point	Signal	Description
J101	J101_PIN1	EXT_VBAT	EVB LDO power supply output voltage test point
	J101_PIN2	VBAT	Module power input voltage test point

The pin definition of position J105 is shown in the figure below.

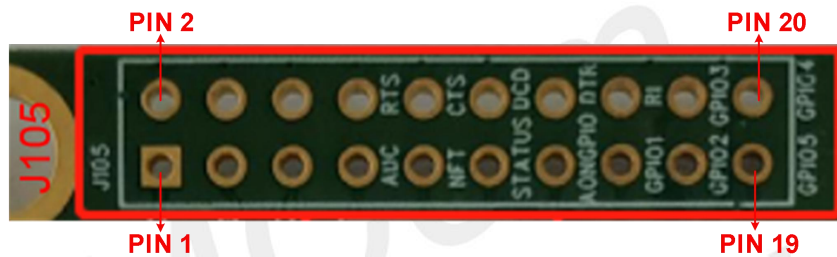


Figure 16: Pin definition of location J105 on EVB

Table 11: Pin description of location J105 on EVB

Position	Test point	Signal description	Pin name
J105	J105_PIN1	VDD_EXT	VDD_EXT
	J105_PIN2	GND	GND
	J105_PIN3	UART2_RXD	UART2_RXD
	J105_PIN4	UART1_TXD	TXD
	J105_PIN5	UART2_TXD	UART2_TXD
	J105_PIN6	UART1_RXD	RXD
	J105_PIN7	ADC	ADC
	J105_PIN8	UART1_RTS	RTS
	J105_PIN9	NETLIGHT	NET
	J105_PIN10	UART1_CTS	CTS
	J105_PIN11	STATUS	STATUS
	J105_PIN12	UART1_DCD	DCD
	J105_PIN13	AON_GPIO	AONGPIO
	J105_PIN14	UART1_DTR	DTR

J105_PIN15	GPIO1	GPIO1
J105_PIN16	UART1_RI	RI
J105_PIN17	GPIO2	GPIO2
J105_PIN18	GPIO3	GPIO3
J105_PIN19	GPIO5	GPIO5
J105_PIN20	GPIO4	GPIO4

The pin definition of J106 is shown in the figure below.

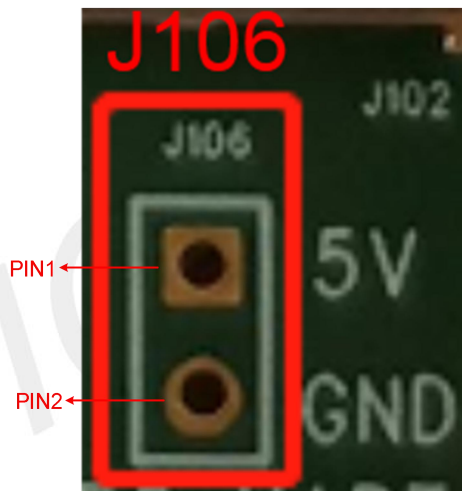


Figure 17: The pin definition of J106 on EVB

Table 12: The pin description of J106 on EVB

Position	Test point	Signal name	Description
J106	J106_PIN1	5V	EVB 5V power supply test point
	J106_PIN2	GND	GND

The pin definition of J107 is shown in the figure below.

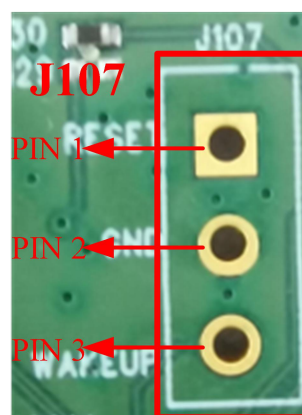


Figure 18: The pin definition of J107 on EVB

Table 13: The pin description of J107 on EVB

Position	Test point	Signal name	Description
J107	J107_PIN1	RESET	Module reset signal
	J107_PIN2	WAKEUP	Module wake-up signal
	J107_PIN3	GND	GND

NOTE

1. For the related functions of each pin of the module, please refer to document [1].

3 Operation Method

3.1 Module Boot

3.1.1 Module Power-on Operation

The module boot method is as follows:

1. Insert the Micro USB into the USB connector J103 (or J104).
2. Turn the switch SW101 up to the on state, and LED101, LED102, and LED103 will light up.
3. If the module is successfully registered to the network, the flashing frequency of LED101 will slow down, otherwise LED101 will keep flashing fast. When the module enters PSM mode or the module is in shutdown state, LED101 will go out.

The module shutdown method is as follows:

1. Turn the switch SW101 down to the off state, the module will automatically shut down, and LED101, LED102, and LED103 will go out.
2. The module can be powered off by the AT command. When the module is in the power-on state, input the AT command "AT+CPOF" and the module will automatically power off. More details. Please refer to SIM7022 series _AT command.

3.2 Driver Installation

3.2.1 USB-to-UART Driver Installation

The following connection can get the USB to UART driver.

<https://www.silabs.com/products/development-tools/software/usb-to-uart-bridge-vcp-drivers>

After the driver is successfully installed, the following virtual serial port will appear, COM95/COM93/COM94.

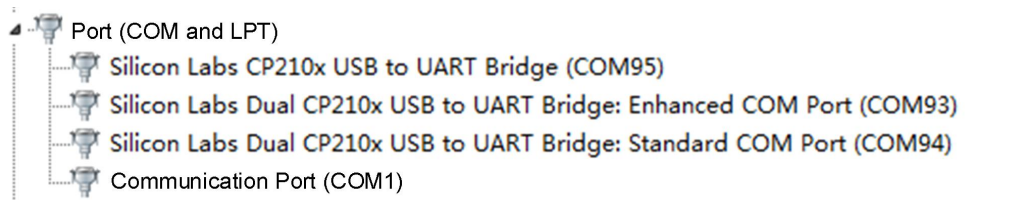


Figure 19: USB to UART ports

Table 14: USB to UART ports

Reference Number	Interface type	Port number	Serial port	Function description
J103	ECI	COM93	Enhance UART	Used for AT communication, data transmission and firmware upgrade
	SCI	COM94	Standard UART	/
J104	/	COM95	USB TO UART Bridge	Used for software DEBUG

3.3 Firmware Upgrade Process

Before updating the firmware, please contact the SIMCom technical support team and the supplier to obtain the correct download tool and firmware upgrade file.

The firmware update method of the module is shown below.

1. Insert the Micro USB into the USB connector J103 (AT/DL UART), turn up SW1 to ON state.
2. Open the "SIM7022_Upgrade_Tool" and follow the steps.
 - (1) Select bootloader/system in turn and load the corresponding bin file.
 - (2) Select Enhanced port.
 - (3) Click the "DL".

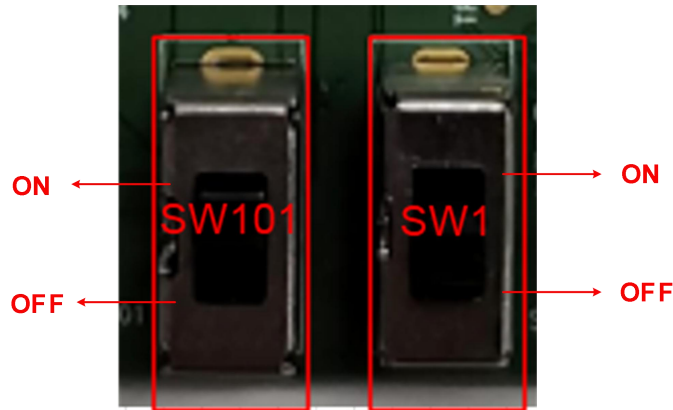


Figure 20: Power switch and download switch status

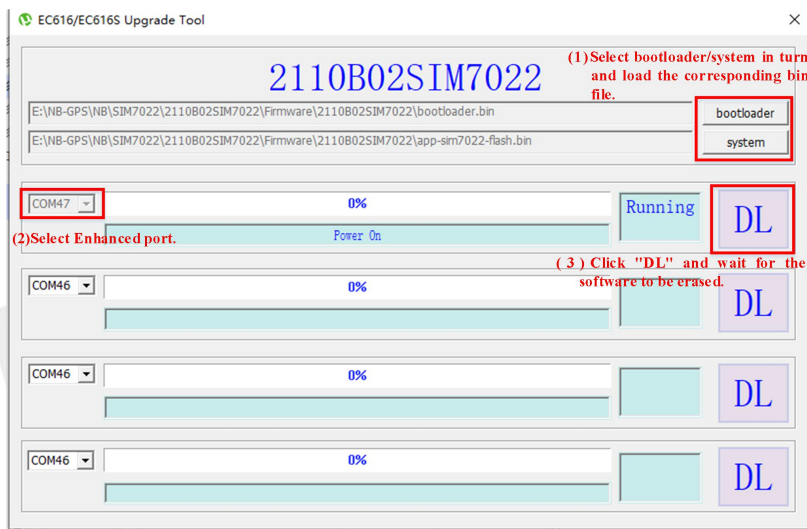


Figure 21: Upgrade tool setting interface

3. Turning up SW101 to ON state and entering the erase software interface.

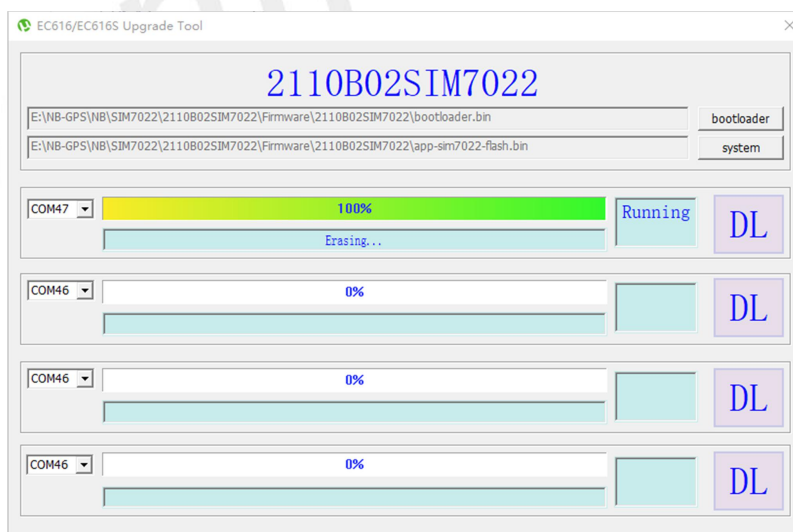


Figure 22: Erased the software

4. After erased the software, and entering the boot loader interface.

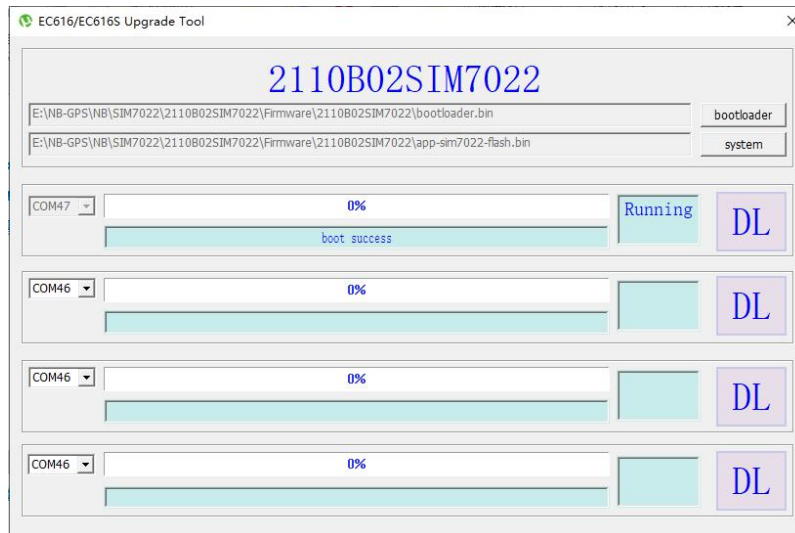


Figure 23: Boot success

5. After entering the system download interface

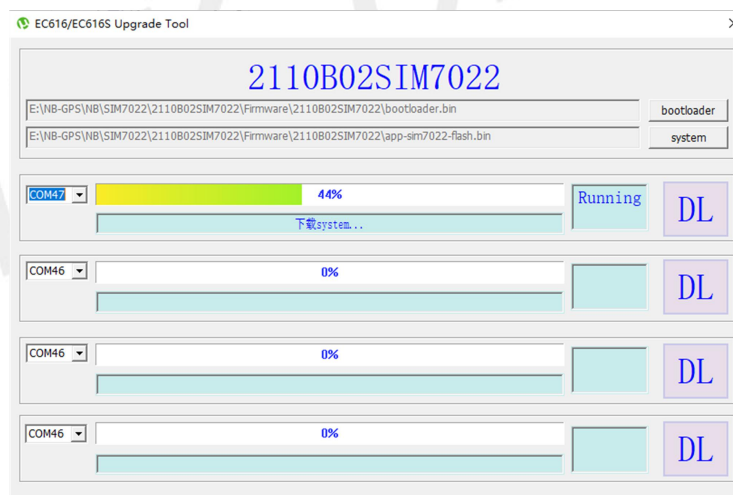


Figure 24: System download interface

7. Waiting for a moment and the upgrade is successful.

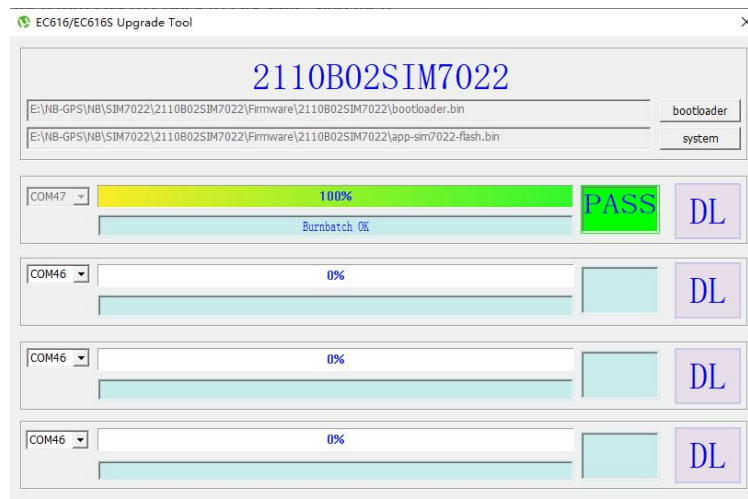


Figure 25: Software download complete

3.4 AT Command Communication

AT commands currently have incomplete functions that need to be continuously updated after subsequent development. The content of this chapter is still being updated based on the actual debugging situation.

3.4.1 UART Serial Communication

The serial data frame format and serial baud rate of the SIM7022 module are as follows.

1. Set the serial data frame format

SIM7022 supports multiple serial data frame formats. The default data frame format is 8 data bits, 1 stop bit, and no parity bit.

Table 15: UART frame format

UART frame format	Supported formats
Data bit	8bit, 7bit
Stop bit	1bit
Parity bit	Odd, Even, None

2. Set the serial port baud rate

SIM7022 supports a variety of common baud rates. The factory default baud rate of the standard module is 115200, and it supports automatic baud rate adaptation. You can use AT+IPR to set the baud rate.

Table 16: UART baud rate support

UART baud rate support	Supported rate
Serial communication baud rate	4800,9600,19200,38400,57600,115200,230400 ,460800,921600 230400,460800,921600
Serial port adaptive baud rate	4800,9600,19200,38400,57600,115200

Common baud rate instructions for serial ports:

Table 17: UART common baud rate operations

UART common baud rate operations	Related instructions
Query the current baud rate	AT+IPR?
Set the boot default baud rate	AT+IPR=
Set temporary baud rate to match automatically	AT+IPR=0

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4 Appendix

4.1 Reference Documents

Table 18: Reference documents

Number	File name	Describe
[1]	SIM7022 Hardware Design	SIM7022 Hardware Design Manual
[2]	SIM7022 Series_AT Command Manual	SIM7022 AT Command Manual

4.2 Terminology and Explanation







Table 19: Terminology and explanation

Terminology	Explanation
LED	Light Emitting Diode
LTE	Long Term Evolution
NC	Not connect
PSM	Power saving mode
RF	Radio Frequency
(U)SIM	(Universal) Subscriber Identity Module
UART	Universal Asynchronous Receiver Transmitter

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4.3 Safety Warning

Table 20: Safety warning

Marks	Requirements
	When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive and not operate normally due to RF energy interference.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forgetting to think much of these instructions may impact the flight safety, or offend local legal action, or both.
	Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.
	Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.
	Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.
	GSM cellular terminals or mobiles operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, especially with a mobile fee or an invalid SIM card. While you are in this condition and need emergent help, please remember to use emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength. Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.