A7683E-TE Kit
User Guide Manual

LTE Module

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Version History

Date	Version	Description of change	Author
2023-10-18	1.00	Original	Boru Zhou

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1 Introduction

This document describes the interface and usage of the A7683E-TE kit. With the help of this document, customers can quickly use the A7683E-TE Kit.

This document applies to the following product module and TE:

Table 1: Module and TE PN

TE	TE PN	Module
8BAE00-A7682X-TE_V1.02 RO	S2-10DEY	A7683E

1.1 Documentation Overview

Table 2: A7683E Documents Overview

No.	Document	Description
1	A7683E_Hardware_Design_V1.01	Mainly introducing interface functions, Recommend circuit, PCB layout guideline, packaging and other hardware components, as well as the use of AT commands
2	SIMCom_A7683E Reference_Design_V1.00_20231011	Reference circuit applications
3	8BAE00-A7682E-TE _V1.02_DL&PCB	A7683E TE SCH&PCB PDF Document
4	SIMCOM_EVB_DL&PCB	SIMCOM_EVB SCH&PCB PDF Document
5	MOD_A7683E_85	Reference Package (Pads)
6	A1602 & 1606_Series_AT_Command Manual_V1.03	AT Command Manual
7	A7683E_TE kit_User Guide_V1.00 (This document)	The use of TE board, forced download, startup, reset, and the location of other measurement points, as well as the use method in conjunction with EVB

NOTE

This current revision is an early release to support initial product developers. The content is subject to change without advance notice.

2 Assessment Kit

The Assessment Kit includes EVB Kit and TE Kit. The following chapters describe A7683E Assessment Kit.

2.1 A7683E Assessment kit

SIMCom EVB Kits are listed as follows. Please confirm all accessories are complete.

1) SIMCom EVB board;
2) 5V DC power adapter;
3) Micro USB cable;
4) GSM\WCDMA\LTE Antenna;

Table 3: The SIMCom EVB Kits

Items	Description	Quantity
8PYA00-SIMCOM-EVB_V1.02	EVB	1
Adapter	5V/2A DC power adapter	1
Cable	Micro USB cable	1
Antenna	GSM\WCDMA\LTE Antenna	1

A7683E TE Kits are listed as follows. Please confirm all accessories are complete.

Table 4: The TE Kits

Items	Description	Quantity
8BAE00-A7682X-TE_V1.02	TE	1

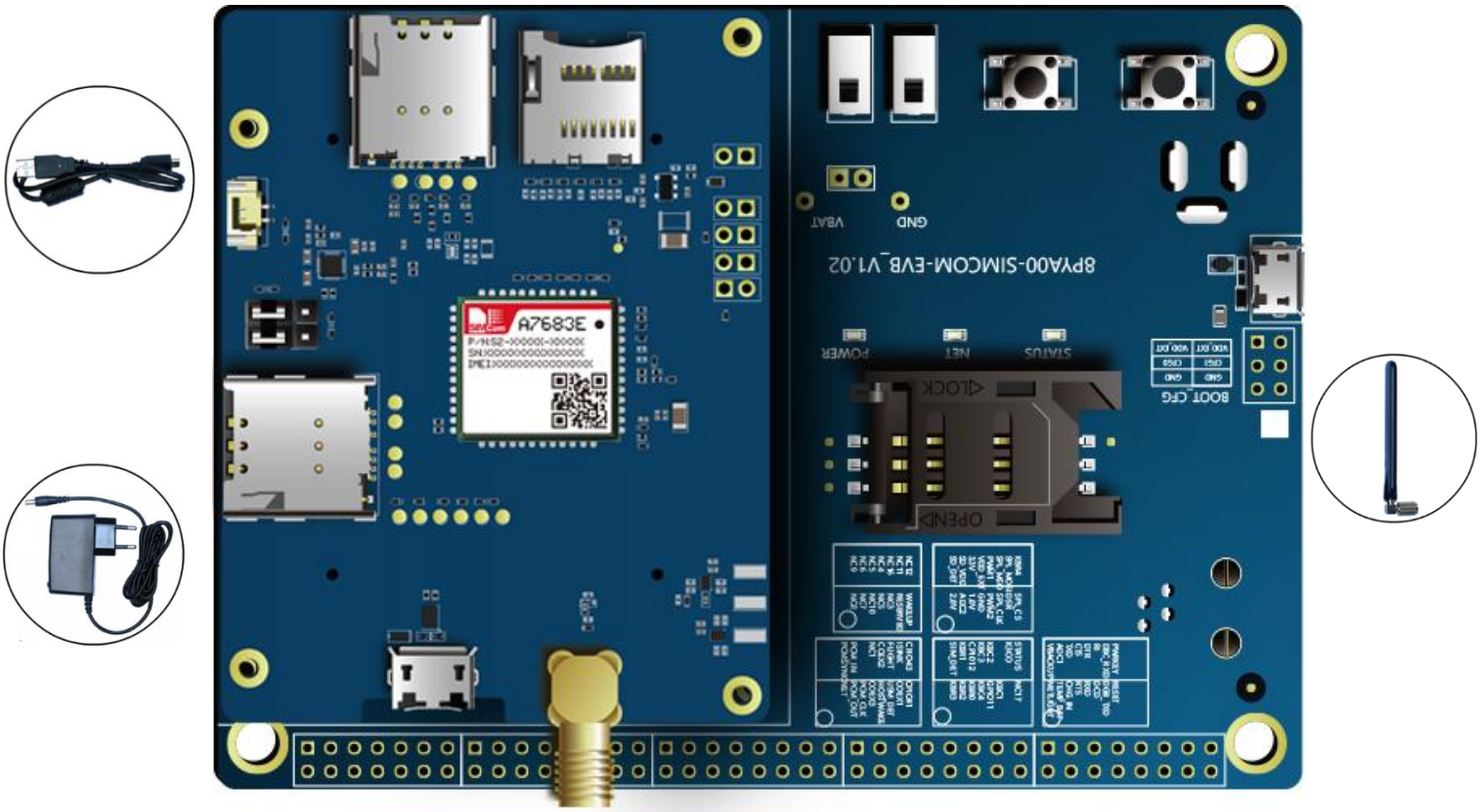

Figure 1: EVB and TE Assessment Kits

The top view and bottom view of the SIMCom EVB board is shown as follows.

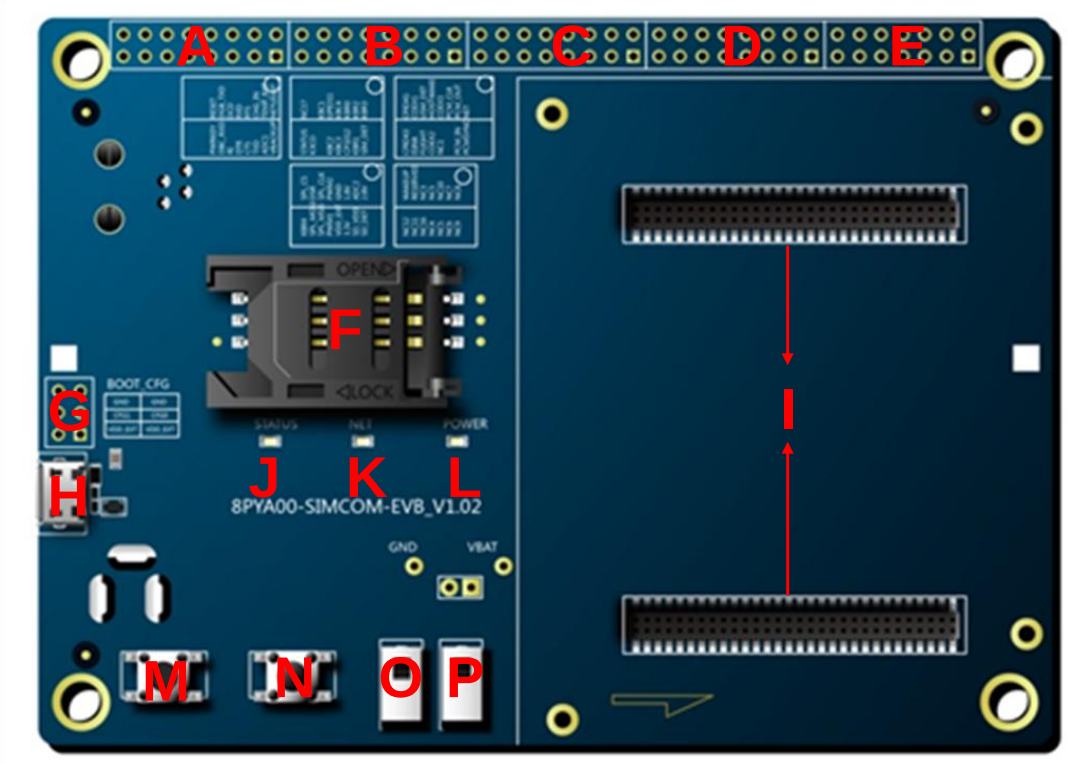

Figure 2: EVB Top View

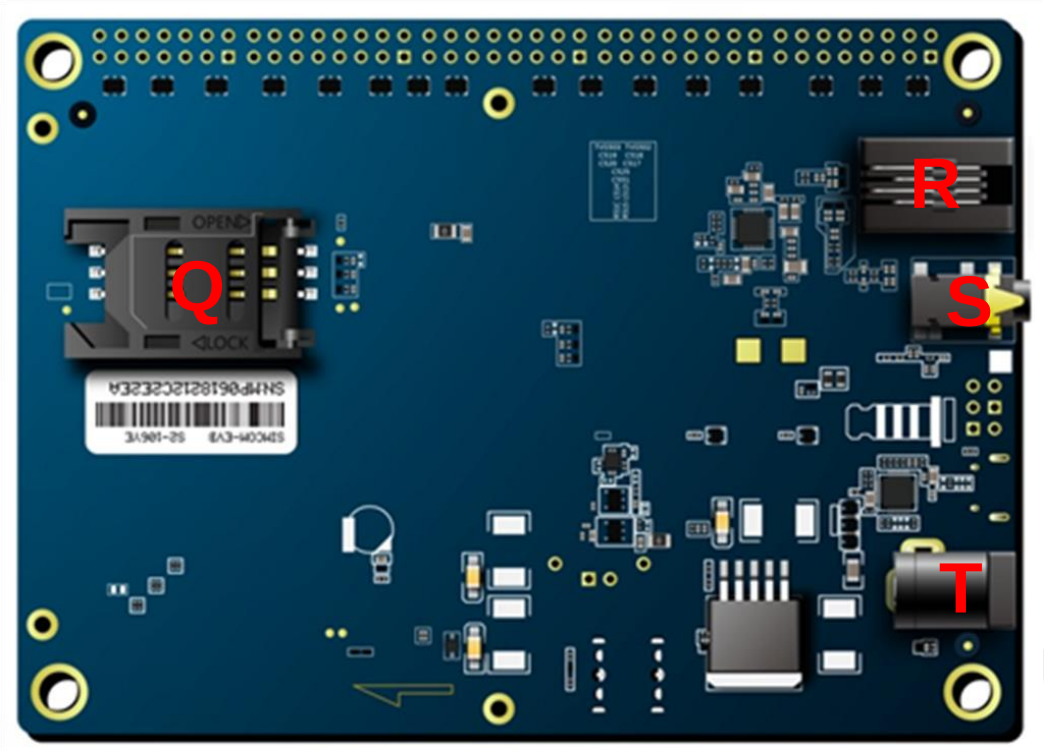

Figure 3: EVB Bottom View

The top view and bottom view of A7683E TE board is shown as follows.

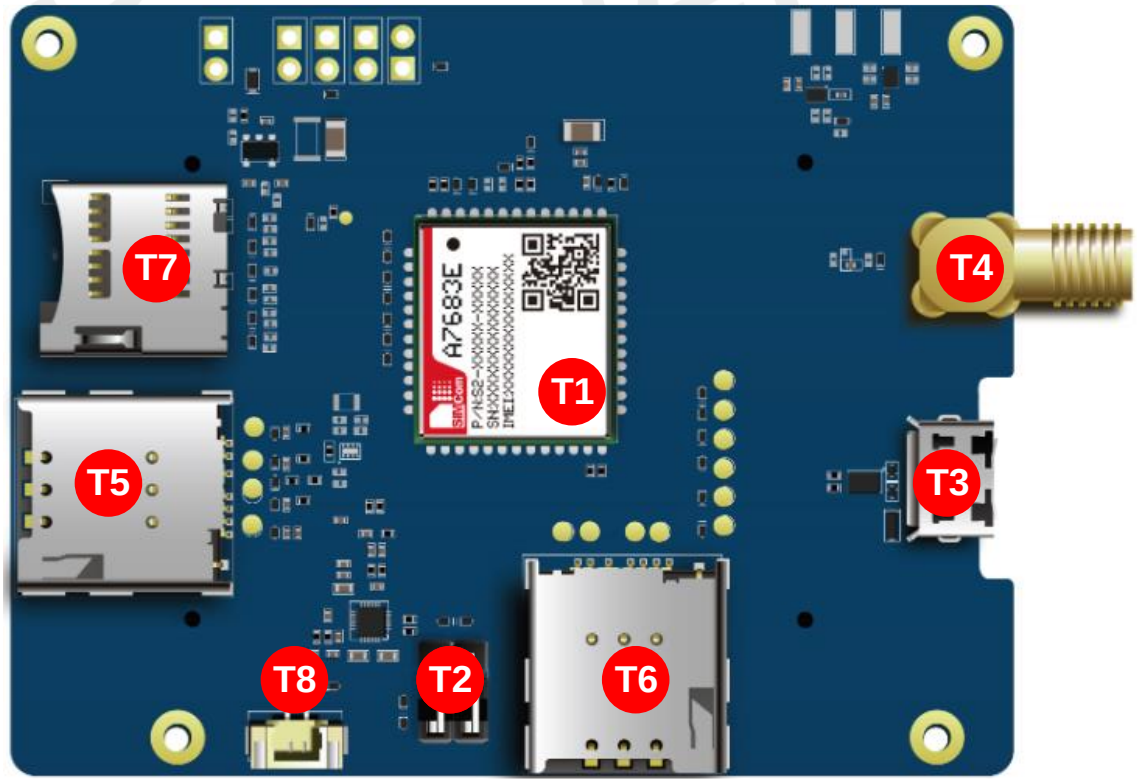

Figure 4: TE Top View

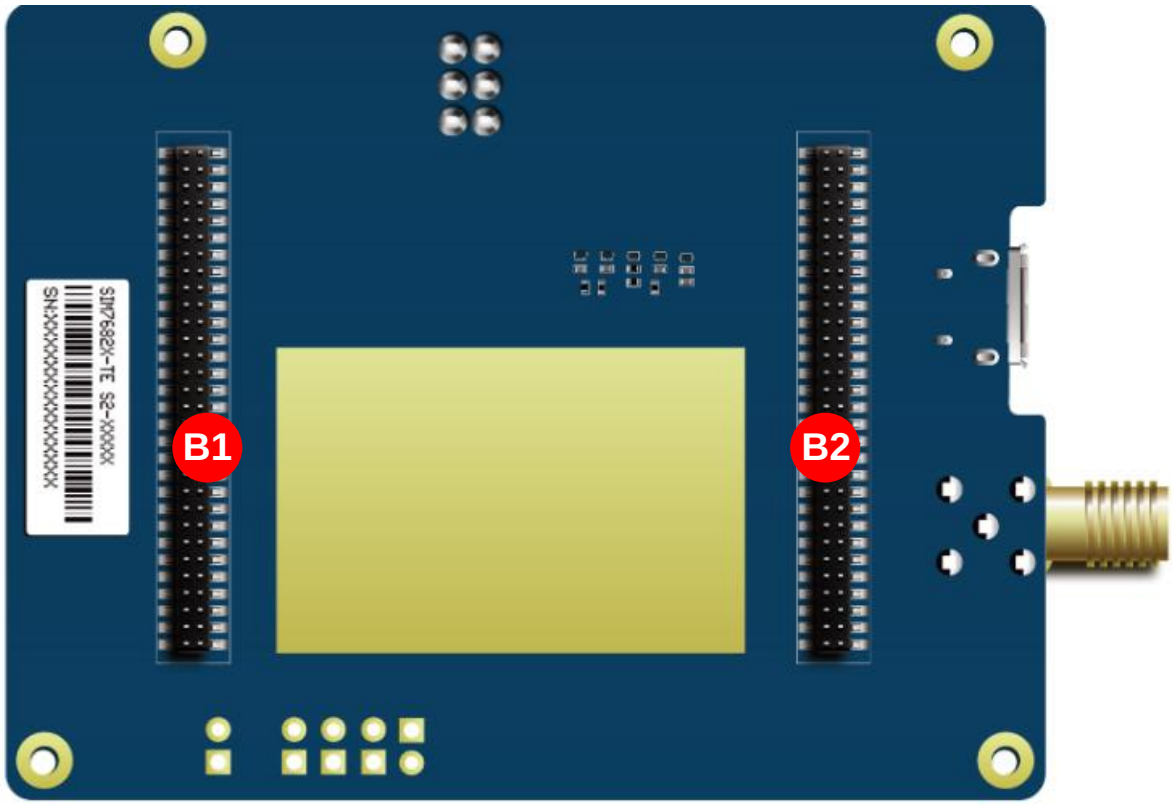

Figure 5: TE Bottom View

Ensure the module normally use, it is recommended to use the correct kit model. The following table shows each kit part number.

Table 5: The Kit part number

Kits	Part Number	Description
SIMCom EVB KIT	S2-106XN	EVB KIT

NOTE

The figures above are the effect diagrams of the module, for reference only. Please refer to the actual product for appearance.

2.2 Interface Description

Through the introduction in the above chapters, we see that there are many signal test points reserved on the EVB and TE board. This chapter mainly introduces the corresponding signals.

The test points on the EVB are listed as follows.

Table 6: The test points on the EVB

Position	Pin	Description
A	J301_PIN_1	PWRKEY
	J301_PIN_2	RESET
	J301_PIN_3	DBG/UART3_RX
	J301_PIN_4	DBG/UART3_TX
	J301_PIN_5	UART1_RI
	J301_PIN_6	UART1_DCD
	J301_PIN_7	UART1_DTR
	J301_PIN_8	UART1_RXD
	J301_PIN_9	UART1_CTS
	J301_PIN_10	UART1_RTS
	J301_PIN_11	UART1_TXD
	J301_PIN_12	NC
	J301_PIN_13	ADC1
	J301_PIN_14	NC
	J301_PIN_15	VRTC
	J301_PIN_16	NETLIGHT
B	J302_PIN_1	STATUS
	J302_PIN_15	SIM_DET
	J302_PIN_X	NC
C	J303_PIN_2	SPI_CS
	J303_PIN_3	SPI_MOSI
	J303_PIN_5	SPI_MISO
	J303_PIN_6	SPI_CLK
	J303_PIN_7	PWM1

Position	Pin	Description
D	J304_PIN_12	PCM_CLK
	J304_PIN_13	PCM_IN
	J304_PIN_14	PCM_OUT
	J304_PIN_15	PCM_SYNC
	J304_PIN_X	NC
E	J305_PIN_1	GPIO_7
	J305_PIN_3	GPIO_6
	J305_PIN_5	GPIO_5
	J305_PIN_8	GPIO_11
	J305_PIN_10	GPIO_10
	J305_PIN_11	GPIO_2
	J305_PIN_13	GPIO_1
	J305_PIN_14	GPIO_8
	J305_PIN_X	NC
F	J202	Main sim slot
G	J401_PIN_1 J401_PIN_2	VDD_EXT
	J401_PIN_3 J401_PIN_4	USB BOOT
	J401_PIN_5 J401_PIN_6	GND
H	J204	USB-2-UART
I	J101 / J102	To TE board
J	D402	Status LED
K	D401	Network LED
L	D201	Power LED
M	SW401	PWRKEY
N	SW402	Reset

	J303_PIN_8	PWM2	**O**	S201	Power switch
	J303_PIN_9	VDD_EXT	**P**	S401	RF switch
	J303_PIN_10	GND	**Q**	J203	Sim slot (n/a)
	J303_PIN_12	VCC_1V8	**R**	J502	Audio jack
	J303_PIN_X	NC	**S**	X501	Audio jack
			T	J103	+5V DC input

Table 7: The test points on the TE.

Attachment Label	Description
T1	Module
T2	UART Switch*
T3	Micro USB Connector
T4	Main Antenna Connector
T5	SIM1 Card Holder
T6	SIM2 Card Holder
T7	SD Card Holder
T8	SPEAKER connector
B1	Connector (Connect to SIMCOM-EVB)
B2	Connector (Connect to SIMCOM-EVB)

NOTE

Customers can connect DEBUG_UART/UART3 to SIMCom_EVB by jumper (T2). By default, DEBUG_UART is connected to SIMCom_EVB.

3 Operation Procedures

3.1 Accessory installation

Install the necessary accessories and perform functional tests.

1) Installing the TE to the EVB board, pay attention to the installation direction to prevent short circuit;
2) Insert the SIM card to the **T5** position of the main card slot on the front;
3) Installing the LTE antenna to the **T4** position;
4) For serial AT communication, grab the debug log and upgrade the software, insert the micro USB cable to the interface **T3** position;
5) Insert the 5V DC power supply to the **T** position of the EVB board.

The picture of TE board installed on EVB board is shown below.

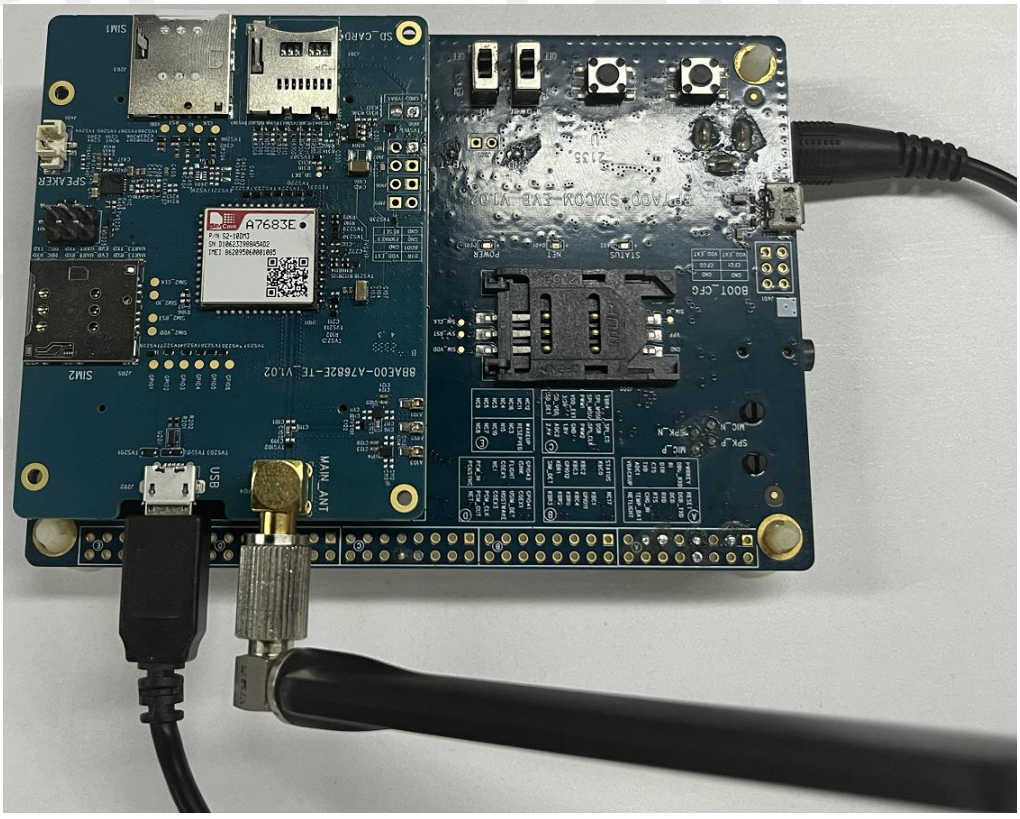

Figure 6: The picture of TE board installed on EVB board

3.2 Power On/Off the Module

3.2.1 Power on the Module

The module power on procedure is shown in the following:
(1) Please assure the EVB board **O** (S201) is **OFF** status.
(2) Connect the DC adapter.
(3) Pull the **O** (S201) to **ON** state, the **L** (D201) and the **J** (STATUS) light will be lighted all time, if the module registers to the net, the **K** (NET) light will be lighted flash, if not, the **J** (NET) light will be lighted all the time.

3.2.2 Power off the Module

(1) Power off the module by pull the **O** (S201) to off status, after the module saving the data, the module will be powered off automatically and all lights will be extinguished. This method is not recommended for customers to use directly.

(2) Power off the module by pressing the POWER_ON (SW401) for 2.5s, after the module saving the data, the module will be powered off automatically and all lights will be extinguished. Then pull the **O** (S201) to off state.

(3) Power off the module by AT command when the module is at power on status. By sending AT command **"AT+CPOF=1"**, the module will be powered off automatically and **J** (STATUS) and **K** (NET) will be extinguished after the module saving the data. Then pull the **O** (S201) to off state. For more details about the AT command, please refer to the AT command manual.

3.3 USB driver Installation

1. Use USB cable to connect the PC to the Micro-USB port on the TE board. Then several SimTech A7683E devices should be listed under other devices in device manager.

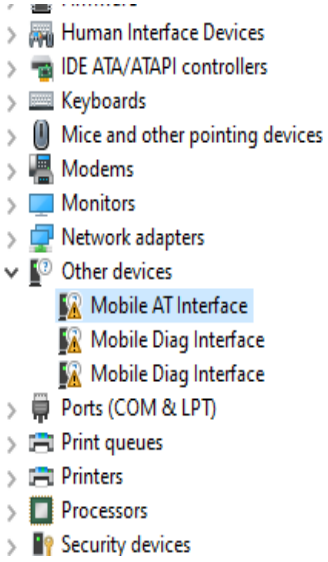

Figure 7: A7683E Devices Recognized by the Operating System

2. Right click the “Mobile AT Interface” devices and selecting “Update driver”.
3. Select “Browse my computer for drivers”.
4. Select “Let me pick from a list of available drivers on my computer”. Click “Browse”, manually search the driver folder, and then click “Next”. Locate the folder where the SIMCom driver is and click OK.

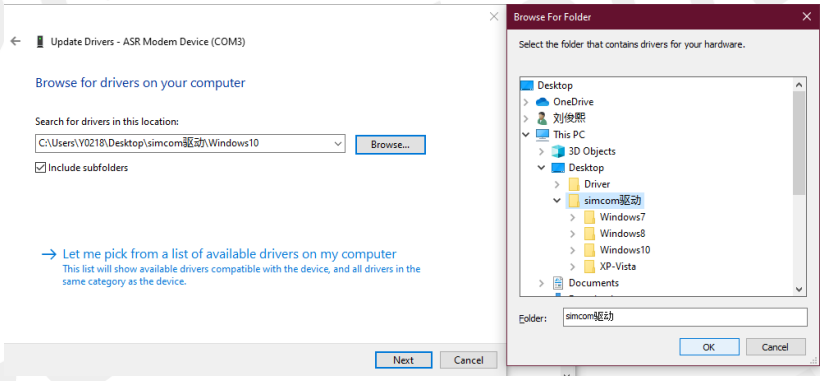

Figure 8: Browse for the drivers

5. Drivers need to be installed in the same way for each device. If you install successfully, you will see one SimTech device under Modems and three SimTech devices under Ports (COM & LPT) as shown in follows.

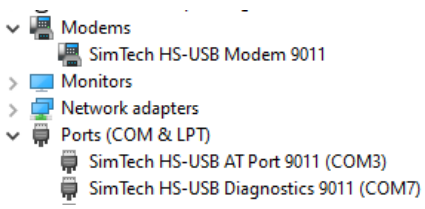

Figure 9: Schematic diagram of drivers’ successful installation

Table 8: SIMCom USB port

USB Ports	Description
SimTech HS-USB AT Port 9011	AT Command Communication Port
SimTech HS-USB Diagnostics 9011	Software Debug and Firmware Update Port

3.4 Firmware Update

Customers can update firmware by USB. The firmware update process of the module is as follows.

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

1. Open the download tool (A76XX_A79XX_MADL V1.21 Only for Update), the interface is shown as follows.

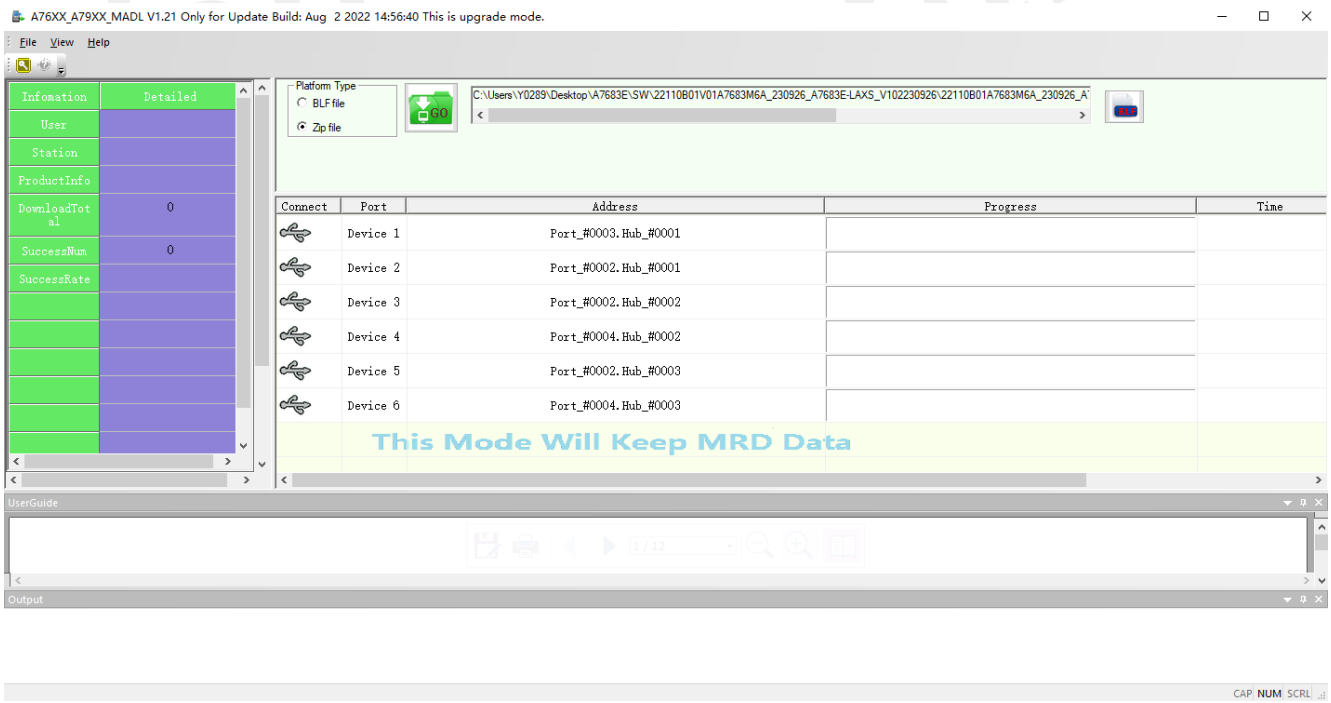

Figure 10: The download tool

2. Select the package and click the “GO”.

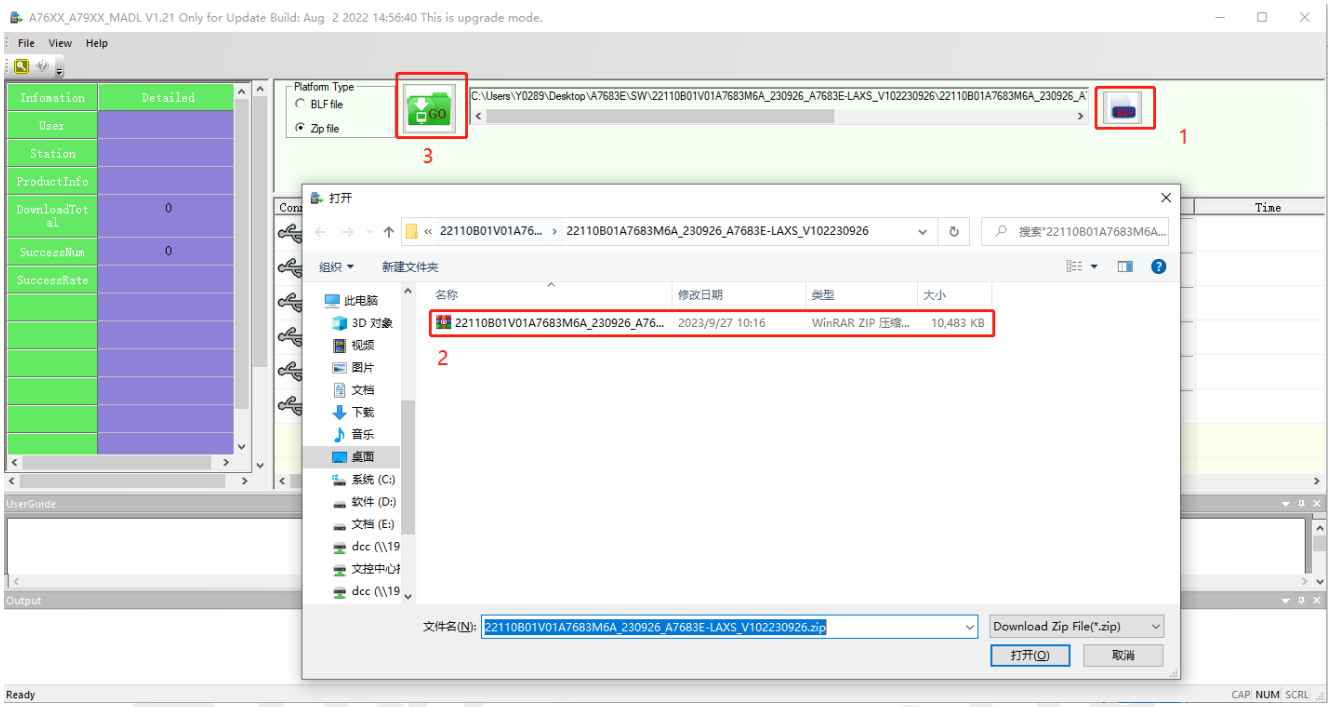

Figure 11: Select the package

3. Connect the Micro USB to the TE board, pull down the BOOT test point to the GND test point, then turn on the Power (**O**) and press the PWRKEY(**M**) button, the module will enter download mode.

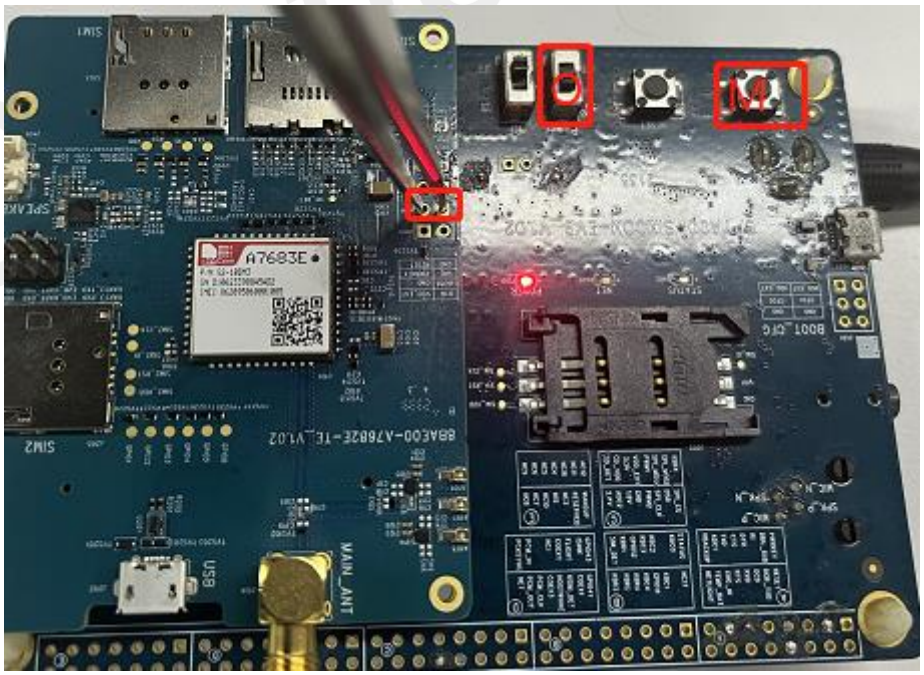

Figure 12: The preparation of Download by USB

4. The download is successful.

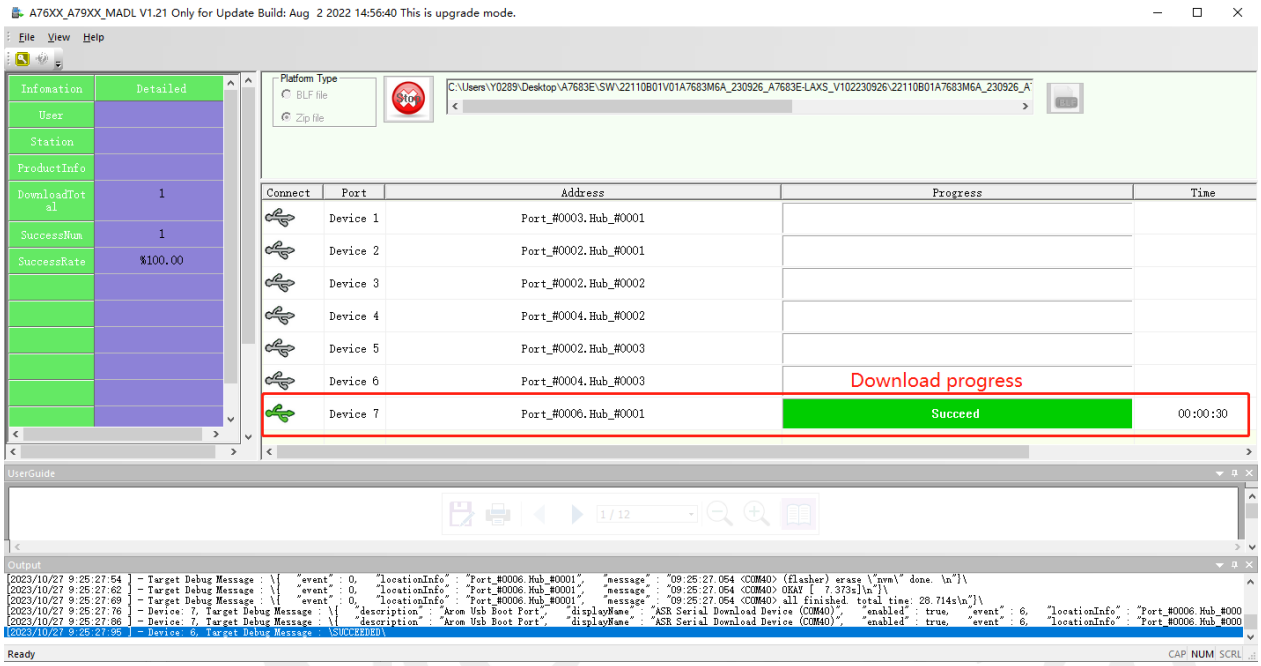

Figure 13: Download successfully

3.5 UART Serial port Communication

The SIMCom_EVB provides a USB-TO-UART interface (**T3**), the chip of USB to UART interfaces is CH342F or CP2105.

Table 9: UART information

Interface Type	Support Baud Rate (bps)	Default Baud Rate (bps)	Function Description
Full function UART	300 600 1200 2400 4800 9600 19200 38400 57600 115200 230400 460800 921600 1842000 and 3686400	115200	Data transmission and AT command transmission
Debug UART	300 600 1200 2400 4800 9600 19200 38400 57600 115200 230400 460800 921600 1842000 and 3686400	115200	Module partial log output
Two-wire UART	9600 115200 230400 and 921600	115200	Used to communicate with peripherals

Table 10: UART port description

EVB-CH342	EVB-CP2105	Module serial port
USB-Enhanced-SERIAL-A CH342	Silicon Labs Dual CP210X USB to UART Bridge: Standard COM Port	DEBUG_UART/UART3
USB-Enhanced-SERIAL-B CH342	Silicon Labs Dual CP210X USB to UART Bridge: Enhanced COM Port	MAIN_UART

DEBUG_UART and UART3 can be switched by jumper **T2** (J101).
The setting of the jumper **T2** (J101) when using DEBUG_UART is shown as follows.

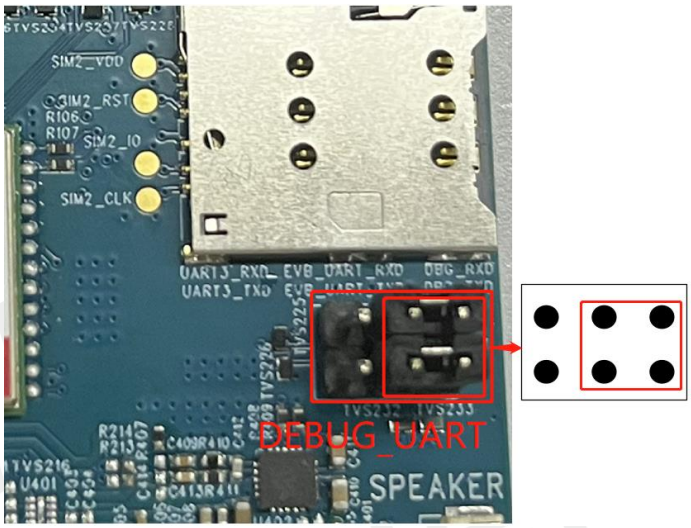

Figure 14: The setting of the jumper when using DEBUG_UART

The setting of the jumper **T2** (J101) when using UART3 is shown as follows.

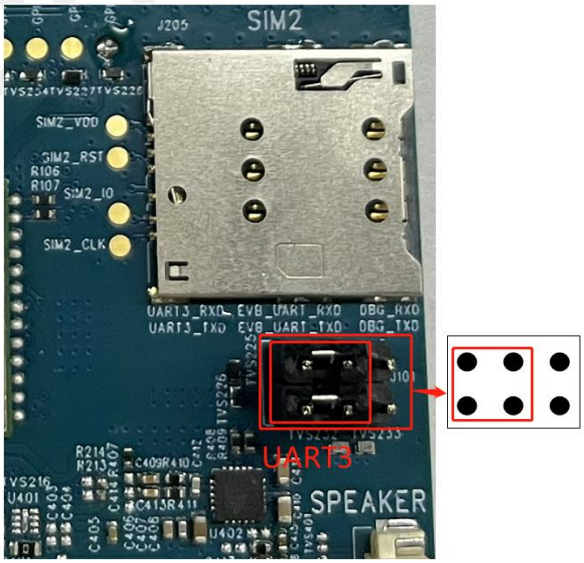

Figure 15: The setting of the jumper when using UART3

3.6 Using SIMCom Serial Port Tool

SIMCom has a serial port tool to test modules with AT Commands. Serial Port Tool can communicate with modules after opening COM Ports on list. On the following figure, every section of serial tool can be seen.

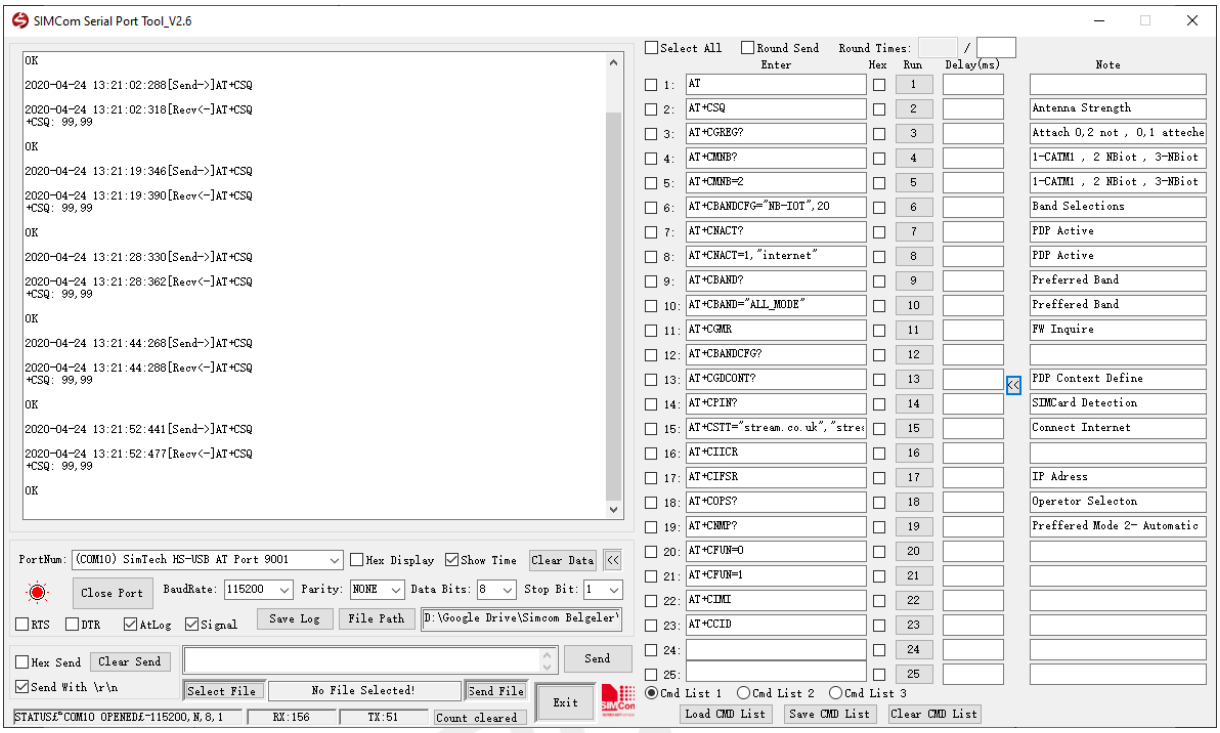

Figure 16: SIMCom Serial Port Tool Introduction

In addition, SIMCom Serial Port Tool may take some log records and save these command lists to use later again. Tool has a 3 CMD List sections and holds AT Commands with their notes and saves under .ini format on PC to import it back.

3.7 AT Command Communication

A7683E provides three serial ports. By default, when used as an ordinary serial port, we can set the data frame format of the serial port and set the baud rate.

1) Set the serial port data frame format

A7683E supports multiple serial data frame formats. The default data frame format is 8 data bits, 1 stop bit,

and no parity bit.

Table 11: The default data frame format

UART frame format	Support format
Data bit	8bits
Stop bit	1bits
Parity bit	None

2) Set the serial port baud rate

A7683E supports a variety of common baud rates; the factory default baud rate of the standard module is 115200. For temporary modification of baud rate, please refer to the command “AT+IPR”.

Table 12: UART baud rate support

UART baud rate support	Support rate
Serial communication baud rate	300 600 1200 2400 4800 9600 19200 38400 57600 115200 230400 460800 921600 1842000 and 3686400

Common methods of using serial port baud rate commands:

Table 13: UART common baud rate operation

UART common baud rate operation	Related command
Query the current baud rate	AT+IPR?
Query module supports baud rate	AT+IPR=?
Set temporary baud rate to 9600	AT+IPR=9600

3.8 (U)SIM Application Guide

Insert the SIM card into the slot and connect the antenna, and the module will automatically register with the network. After the network is registered successfully, the network light will flash continuously.

Table 14: AT command for network and (U)SIM

AT command	Description
AT+CICCID	Read ICCID from SIM card
AT+CPSI	Inquiring UE system information
AT+CSQ	Query signal quality

AT+CPIN	Enter PIN
AT+UIMHOTSWAPON	Enable the SIM card hot swap function
AT+UIMHOTSWAPLEVEL	Set the SIM card detection level

NOTE

1. A7683E supports SIM card hot swap function, this function is disabled by default.
2. For more details of AT commands about USIM, please refer to document [2].

3.9 SD/MMC Application Guide

After inserting the SD card into the slot, the SD/MMC functions can be used normally.

Table 15: AT command for File System

AT command	Description
AT+FSCD	Select directory as current directory
AT+FSMKDIR	Make new directory in current directory
AT+FSRMDIR	Delete directory in current directory
AT+FSLS	List directories/files in current directory

NOTE

For more details of AT commands, please refer to document [2].

3.10 Audio Application Guide

A7683E provides MIC and SPK interface, and supports VoLTE.
The audio amplifier and speaker connector are integrated on the TE board

Table 16: Audio amplifier description

Audio amplifier	Description
PN	BCT8933EGP-TR/AW8733ATQR
Type	Class-K
Output power	2W(8Ω)
Enable gain control	GPIO1 (PIN57), Customer can choose GPIO or other control source at will.

Customers can connect the external phone handle to Audio jack (**R**) on the SIMCom_EVB for VoLTE, and connect loudspeaker to the speaker connector (**T8**) for playing audio.

Figure 17: The connection of phone handle (VoLTE)

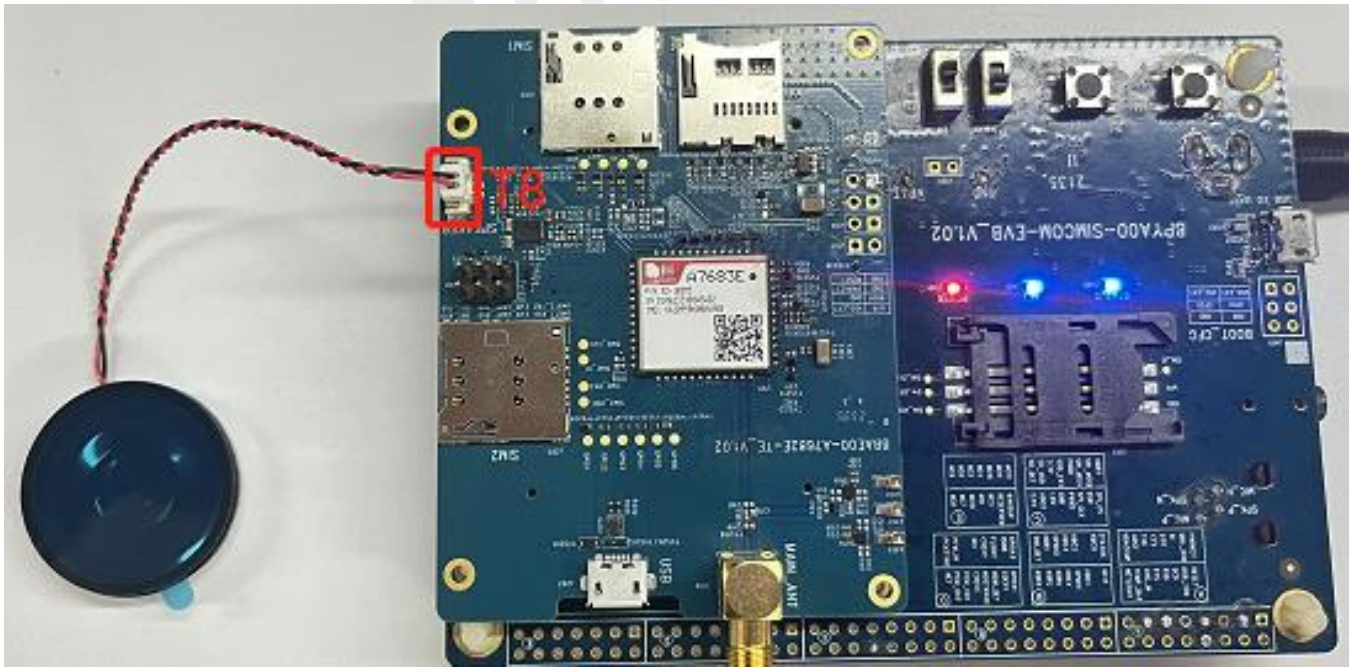

Figure 18: The connection of speaker (Playing audio)

NOTE

If customers need to use the phone handle to make calls, please remove the R410 and R411, and weld the R213 and R214.

4 Current Consumption

4.1 Preparation for test

Firstly, connect the power supply with the “VBAT and GND” on the TE board, connect the TE board with the USB, power on the module, and then send the command “AT+SIMCOMATI” to query valid information such as module version and software version.

```
2023-10-19 09:58:07:276[Send->]AT+SIMCOMATI
2023-10-19 09:58:07:299[Recv<-]
Manufacturer: SIMCOM INCORPORATED
Model: A7683E-LAXS
Revision: 22110B01A7683M6A_230926
A7683M6_B01V01_230926
IMEI: 862095060002257

OK
```

Figure 19: Query version number

Calibrate the module after checking the information of module correctly.

4.2 SLEEP mode current consumption test

1. Insert the SIM card, register the network, and query the network registration status through "AT+CREG?"
2. After the network is registered successfully, turn off functions (such as indicator lights, log, etc.) related to leakage through AT commands.
3. Enable sleep mode by "AT+CSCLK=1", and unplug USB.
4. Measure the current in sleep mode.

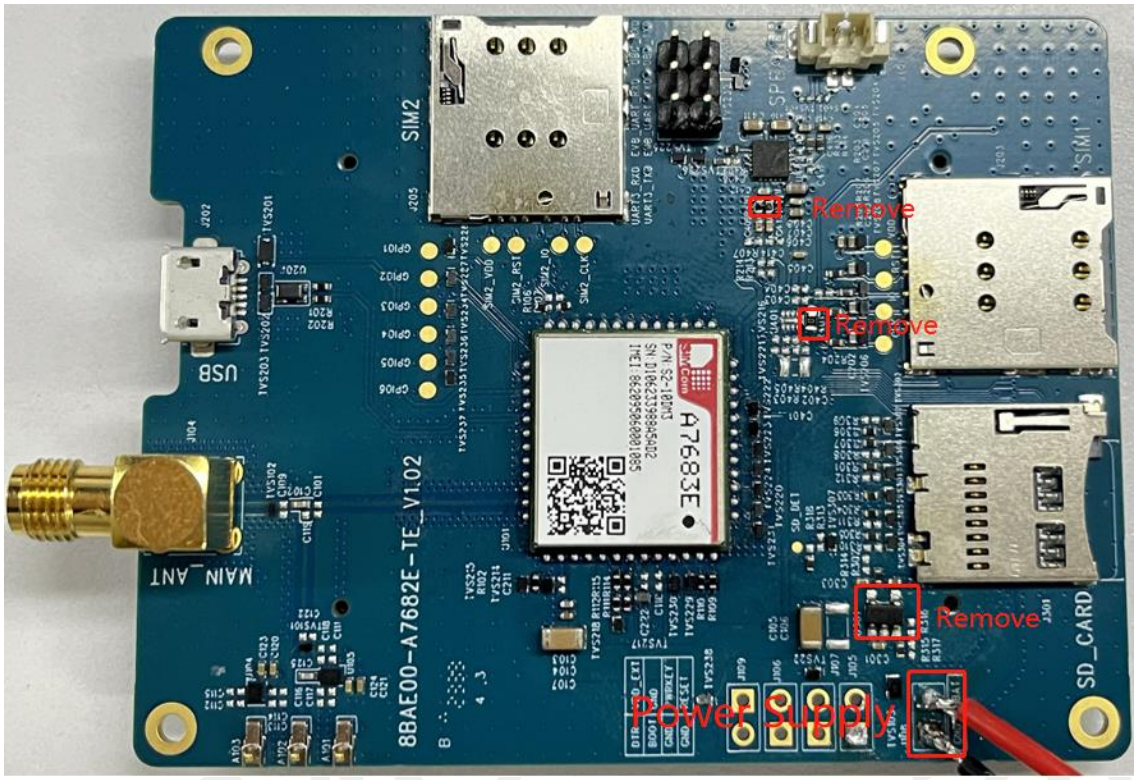

Figure 20: The method of test current consumption

NOTE

1. Before testing the current, please remove the R401/R410/411/U301.
2. If the current waveform is abnormal, start again from Step 1.

5 Appendix

5.1 Related Documents

Table 17: Related documents

No.	Title	Description
[1]	A7683E Hardware Design	A7683E Hardware Design document
[2]	A1602 & 1606_Series_AT_Command Manual_V1.03	A7683E AT Command Manual document
[3]	SIMCOM_EVB KIT_User Guide	SIMCOM EVB User Guide

5.2 Terms and Abbreviations

Table 18: Terms and abbreviations

Abbreviation	Description
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GPS	Global Positioning System
I2C	Inter-Integrated Circuit
IMEI	International Mobile Equipment Identity
LTE	Long Term Evolution
MSB	Most Significant Bit
PCB	Printed Circuit Board
RF	Radio Frequency
SIM	Subscriber Identification Module
SMPS	Switched-Mode Power Supply
NC	Not connect
ZIF	Zero Intermediate Frequency
(U)SIM	Universal Subscriber Identity Module
UART	Universal Asynchronous Receiver Transmitter

5.3 Safety Caution

Table 19: Safety caution

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.