

# BC680Z-EU TE-B

# User Guide

**NB-IoT Module Series**

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## Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any terminal or mobile incorporating the module. Manufacturers of the terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals of the product. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.



Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving.



Switch off the terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft.



Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities.



Terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances.



The terminal or mobile contains a transmitter and receiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV set, radio, computer or other electric equipment.



In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other terminals. Areas with explosive or potentially explosive atmospheres include fueling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders.

# About the Document

## Revision History

Version	Date	Author	Description
-	2024-01-03	Mango HUANG	Creation of the document
1.0	2024-02-19	Mango HUANG	First official release

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# 1 Introduction

To help you to develop applications with Quectel BC680Z-EU TE-B conveniently, Quectel supplies corresponding development board (BC680Z-EU TE-B) to test the module. This document can help you quickly understand BC680Z-EU TE-B interface specifications, RF characteristics, electrical and mechanical details and know how to use it.

## 1.1. Special Mark

**Table 1: Special Mark**

Mark	Definition
*	Unless otherwise specified, an asterisk (*) after a function, feature, interface, pin name, command, argument, and so on indicates that it is under development and currently not supported; and the asterisk (*) after a model indicates that the model sample is currently unavailable.

# 2 Product Overview

BC680Z-EU TE-B is a development board that supports a series of interfaces. It can be used to test basic functionality or further development of the module.

## 2.1. Top and Bottom Views

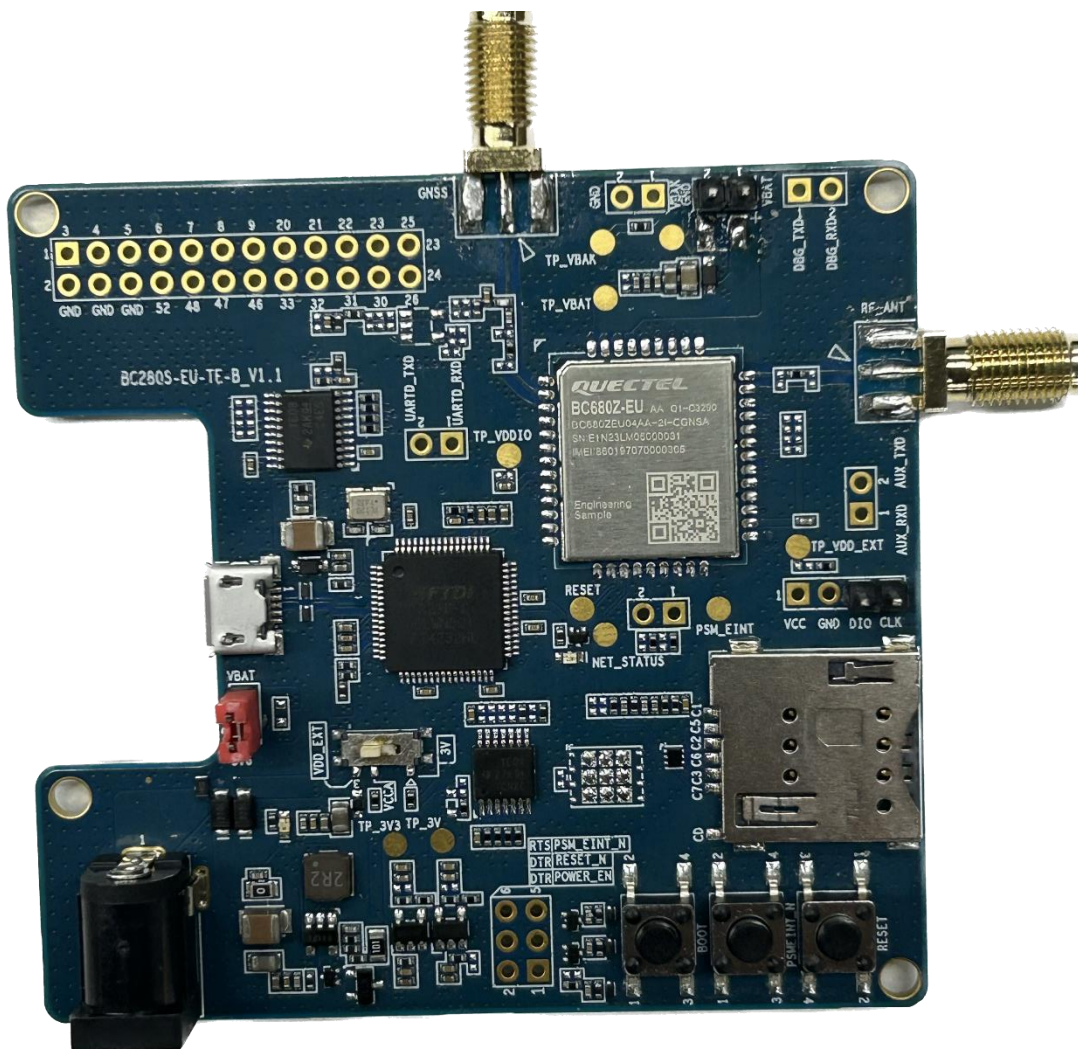


Figure 1: Top View

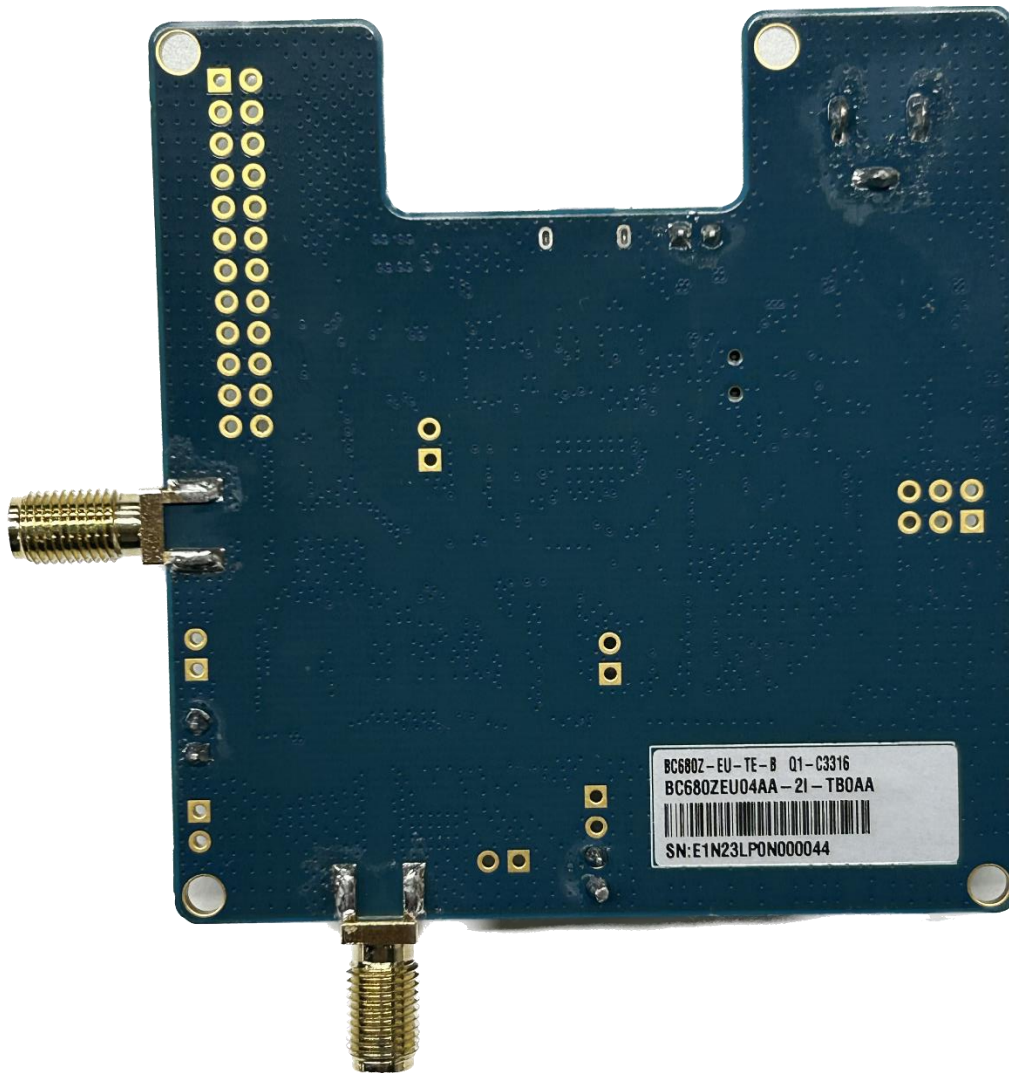


Figure 2: Bottom View

## 2.2. Component Placement

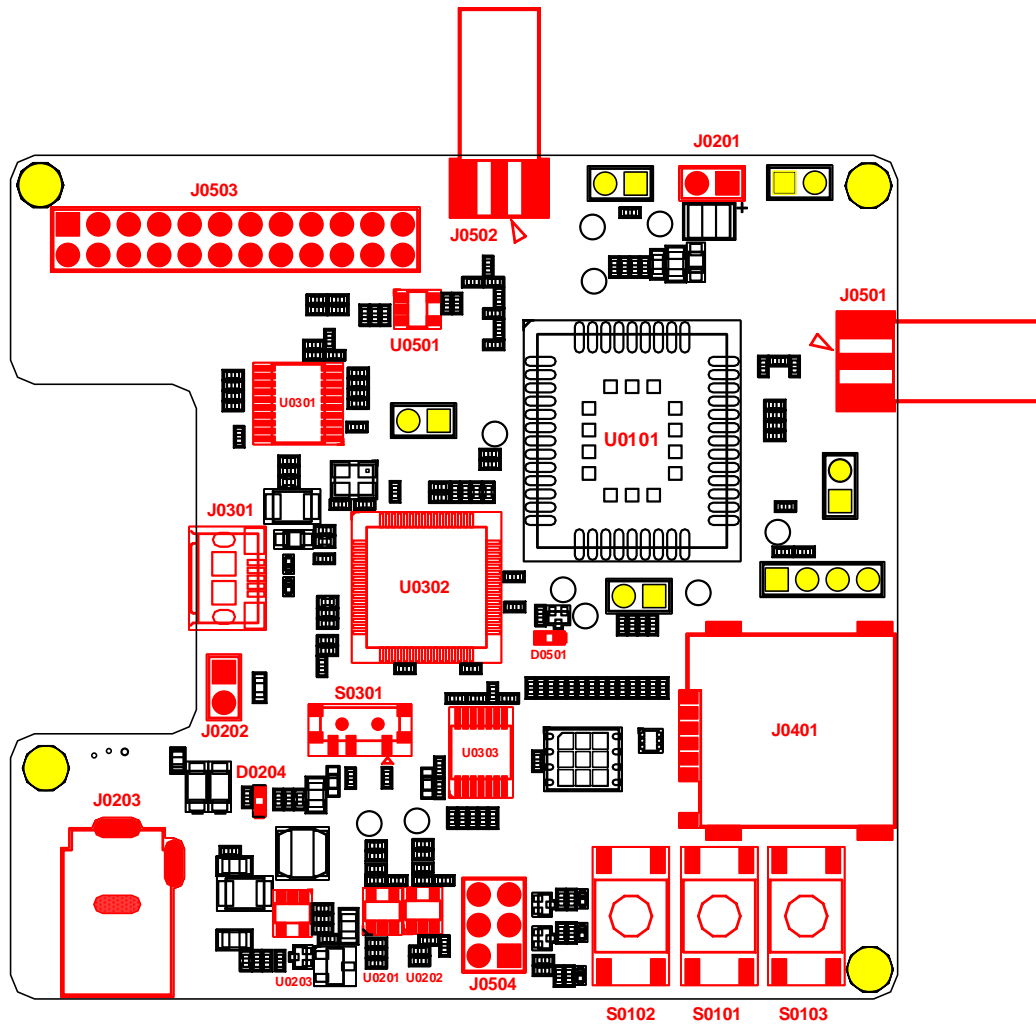


Figure 3: Component Placement

Table 2: Components Information

Components	RefDes.	Description
BC680Z-EU	U0101	BC680Z-EU module
Power Supply Interfaces	J0301	Micro-USB power supply interface
	J0201	External power supply interface
	J0203	Power adapter power supply interface
LDO	U0201, U0202, U0501	Low dropout voltage linear regulators

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DC-DC	U0203	DC-DC converter
USB-to-UART Interface	J0301	Supports 2 UART interfaces
USB-to-UART Bridge	U0302	USB-to-UART bridge controller
Voltage-level Translators	U0301, U0303	Bidirectional voltage-level translators
Micro-SIM Interface	J0401	Micro-SIM card connector
RF Antenna Interface	J0501	RF SMA connector
GNSS Antenna Interface	J0502	GNSS SMA connector
Pin Header	J0202	Used with jumper cap
Switch	S0301	Selects VDD_EXT or 3 V to the voltage-level translator
BOOT Button	S0102	Controls the module to enter the download mode
RESET_N Button	S0103	Resets the module
PSM_EINT Button	S0101	Wakes up the module from deep sleep/light sleep mode
Power Indicator	D0204	Indicates the power up/off status
NETLIGHT	D0501	Network connection status indication
Test Points	J0503, J0504	Tests the basic function of the module

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## 2.3. Key Features

Table 3: Key Features of TE-B

Parameter	Details
Power Supply	<p><b>USB power supply interface:</b></p> <ul style="list-style-type: none"> <li>● Supply voltage range: 4.75–5.25 V</li> <li>● Typical supply voltage: 5.0 V</li> </ul> <p><b>Power adapter power supply interface:</b></p> <ul style="list-style-type: none"> <li>● Supply voltage range: 4.75–5.25 V</li> <li>● Typical supply voltage: 5.0 V</li> </ul> <p><b>External power supply interface:</b></p> <ul style="list-style-type: none"> <li>● Supply voltage range: 2.2-4.5 V</li> <li>● Typical supply voltage: 3.6 V</li> </ul>
Transmitting Power	23 dBm $\pm$ 2 dB
Temperature Range	<ul style="list-style-type: none"> <li>● Operating temperature range: -35 °C to +75 °C <sup>1</sup></li> <li>● Extended temperature range: -40 °C to +85 °C <sup>2</sup></li> <li>● Storage temperature range: -40 °C to +90 °C</li> </ul>
USIM Interface	Support 1.8/3.0 V external USIM card
Switch	Select VDD_EXT or 3 V to the voltage-level translator
USB-to-UART Interface	<p>Support two UART interfaces:</p> <p><b>Main UART (USB Serial Converter A):</b></p> <ul style="list-style-type: none"> <li>● Used for AT command communication and data transmission, supports 9600 bps by default.</li> </ul> <p><b>Debug UART (USB Serial Converter C):</b></p> <ul style="list-style-type: none"> <li>● Used for software debugging and firmware upgrade, supports 921600 bps by default.</li> </ul>
RESET_N Button	Resets the module
BOOT Button	Controls the module enter the download mode
PSM_EINT Button	Wakes up the module from deep sleep/light sleep mode
Size	(70.0 $\pm$ 0.15) mm $\times$ (74.0 $\pm$ 0.15) mm $\times$ (1.6 $\pm$ 0.2) mm
Firmware Upgrade	Upgrade firmware via debug UART or DFOTA*
Antenna Interface	50 $\Omega$ characteristic impedance

<sup>1</sup> Within operating temperature range, the module is 3GPP compliant.

<sup>2</sup> Within extended temperature range, the module remains the ability to establish and to maintain functions such as SMS\* and data transmission, without any unrecoverable malfunction. Radio spectrum and radio network will not be influenced, while one or more specifications, such as P<sub>out</sub>, may exceed the specified tolerances of 3GPP. When the temperature returns to the normal operation temperature levels, the module will meet 3GPP specifications again.

## 2.4. Functional Diagram

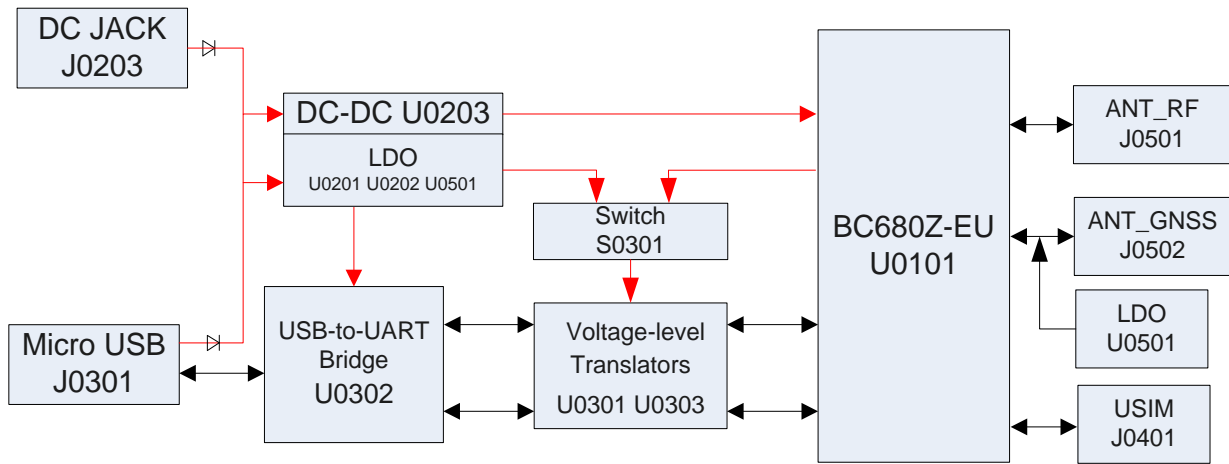


Figure 4: Functional Diagram of TE-B

# 3 Kit Accessories & Assembly

## 3.1. Accessories Assembly

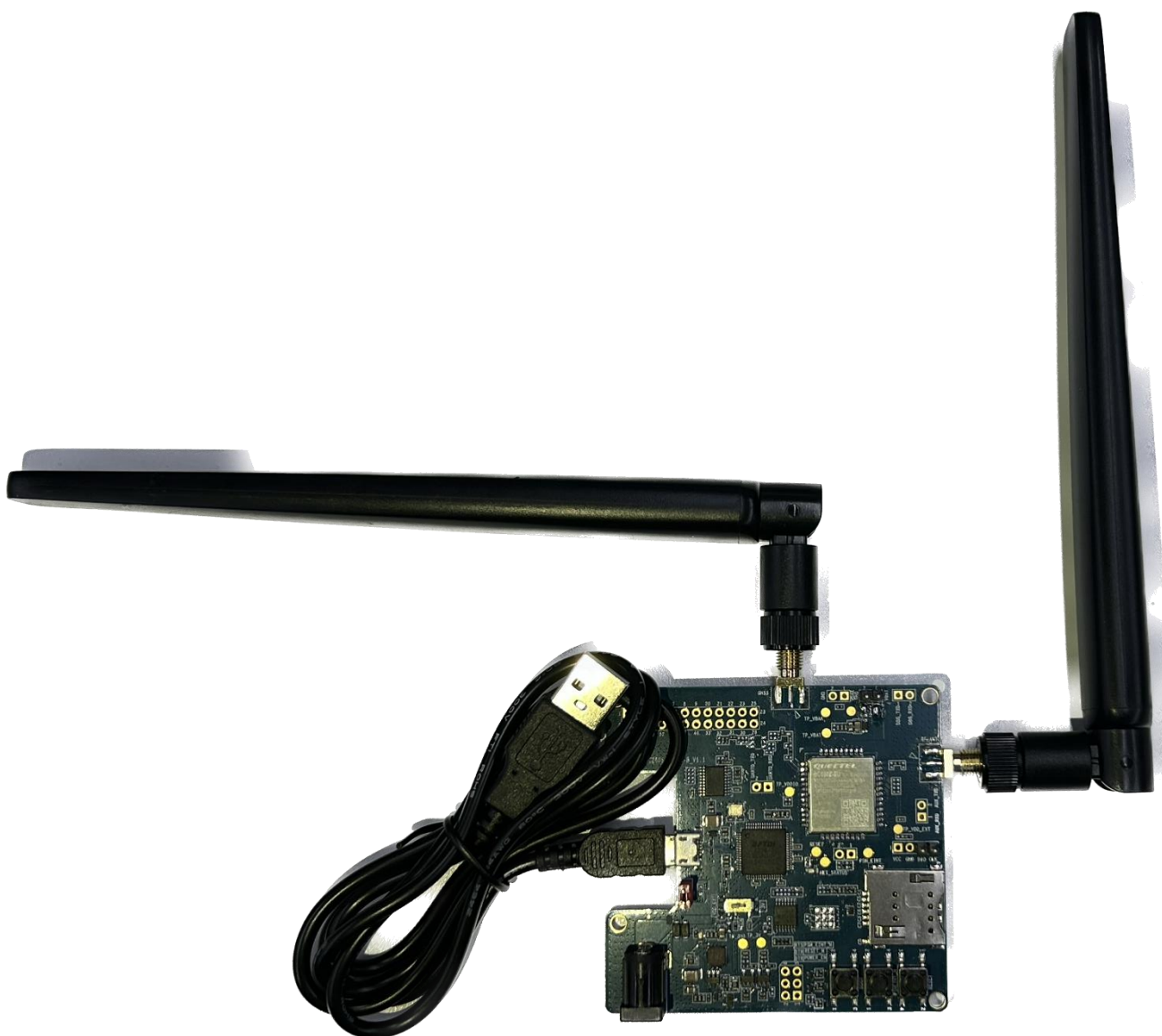


Figure 5: TE-B Kit Accessories Assembly



### 3.2. Accessories List

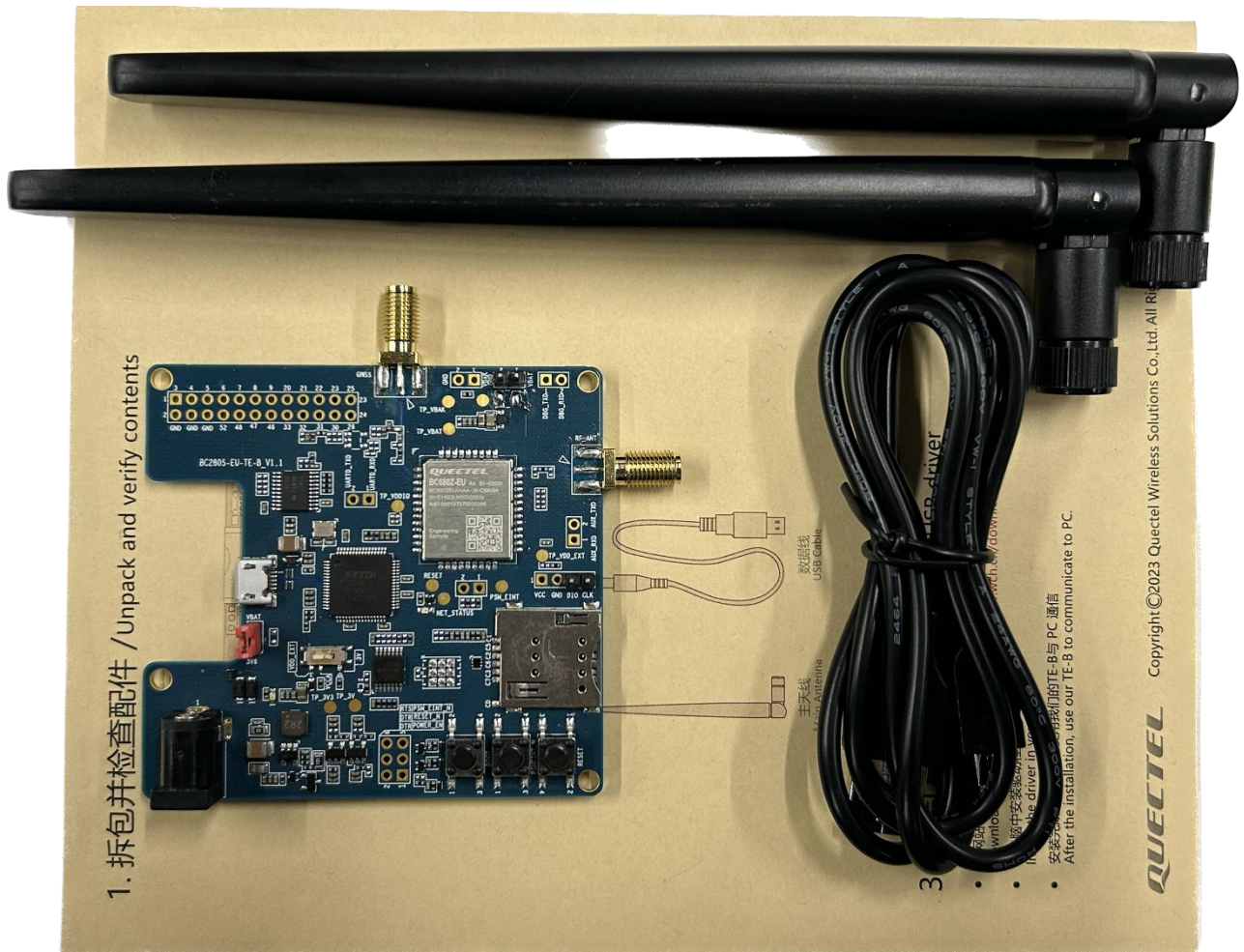


Figure 6: TE-B Kit Accessories

Table 4: Accessories List

Item	Description	Quantity (pcs)
Antenna	NB-IoT antennas with SMA connector	2
Cable	Micro USB cable	1
Instruction Sheet	A sheet of paper giving instructions for TE-B connection, details of accessories, etc.	1

# 4 Operation Procedures

BC680Z-EU TE-B can be used alone to upgrade firmware and to debug applications based on BC680Z-EU. The following describes the operation procedures of TE-B in different operation modes.

## 4.1. Operation Procedure with Single Board

### 4.1.1. Interface Diagram of Using TE-B Alone

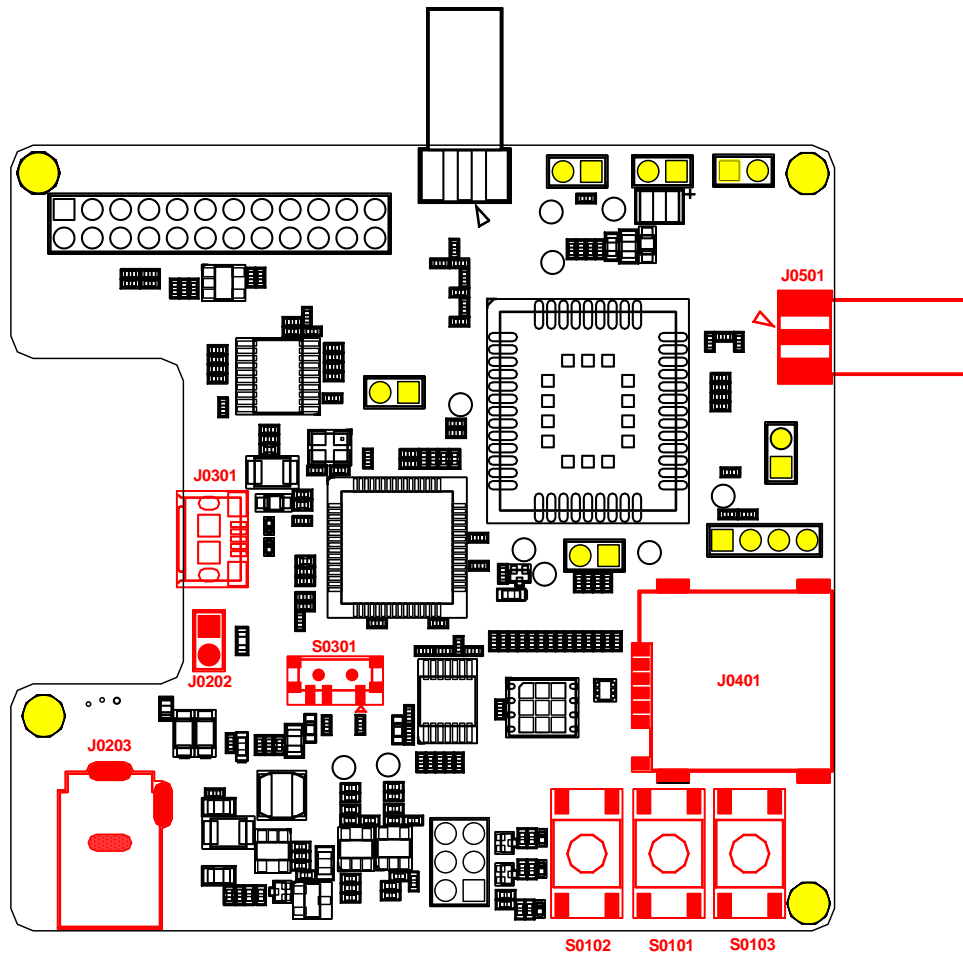
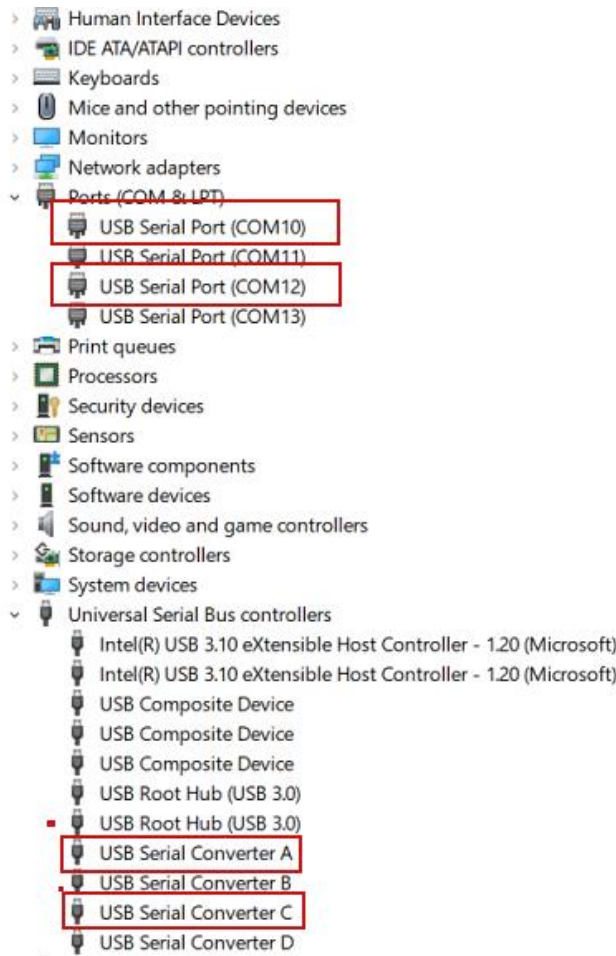


Figure 7: Interface Diagram of Using TE-B Alone

**4.1.2. Operation Procedures of Using TE-B Alone**

1. Install USB-to-UART driver which can be downloaded from the following link:  
<https://www.ftdichip.com/Drivers/VCP.htm>;
2. Insert a Micro-SIM card into J0401 (USIM interface), and please note that a NB-IoT USIM card should be selected.
3. Connect the rod antenna with SMA connector on J0501 (ANT\_RF).
4. Connect the J0301 (USB-to-UART interface) with PC via Micro-USB cable. After turning on TE-B, serial port information will be shown on “**Device Manager**” of PC. Among them, “**USB Serial Port (COM10)**” (corresponding to “**USB Serial Converter A**”) is connected to the main UART of BC680Z-EU TE-B, which can be used for AT command communication and data transmission; “**USB Serial Port (COM12)**” (corresponding to **USB Serial Converter C**) is connected to the debug UART of BC680Z-EU TE-B, which can be used for software debugging and firmware upgrade. For details of UART configuration, see *document [1]*.



**Figure 8: USB-to-UART Interface Displayed on PC**

**NOTE**

In the procedure, S0103 can be used to reset the module, and S0101 can be used to wake up the module from deep sleep/light sleep mode.

## 4.2. Power Consumption Test Guide

### 4.2.1. Test Tools

The following are the equipment and tools needed for the power consumption test:

- BC680Z-EU TE-B
- DC power analyzer
- Wire, soldering iron, tin wire, and wire stripping pliers, etc. to weld the power supply cord on TE-B.

This power consumption test guide is based on Keysight's N6705C DC power analyzer for testing.

### 4.2.2. Modify TE-B

If you use the TE-B to test the power consumption of the BC680Z-EU, you need to modify the TE-B as follows:

1. Remove the jumper cap on J0202 to disconnect the module from other parts.
2. Solder two wires to the two pins (VBAT, GND) of J0201 (external power supply interface), one wire is used as VBAT, and the other is used as GND, so that the external power supply can supply power to the module separately.
3. Switch S0301 to the VDD\_EXT side.

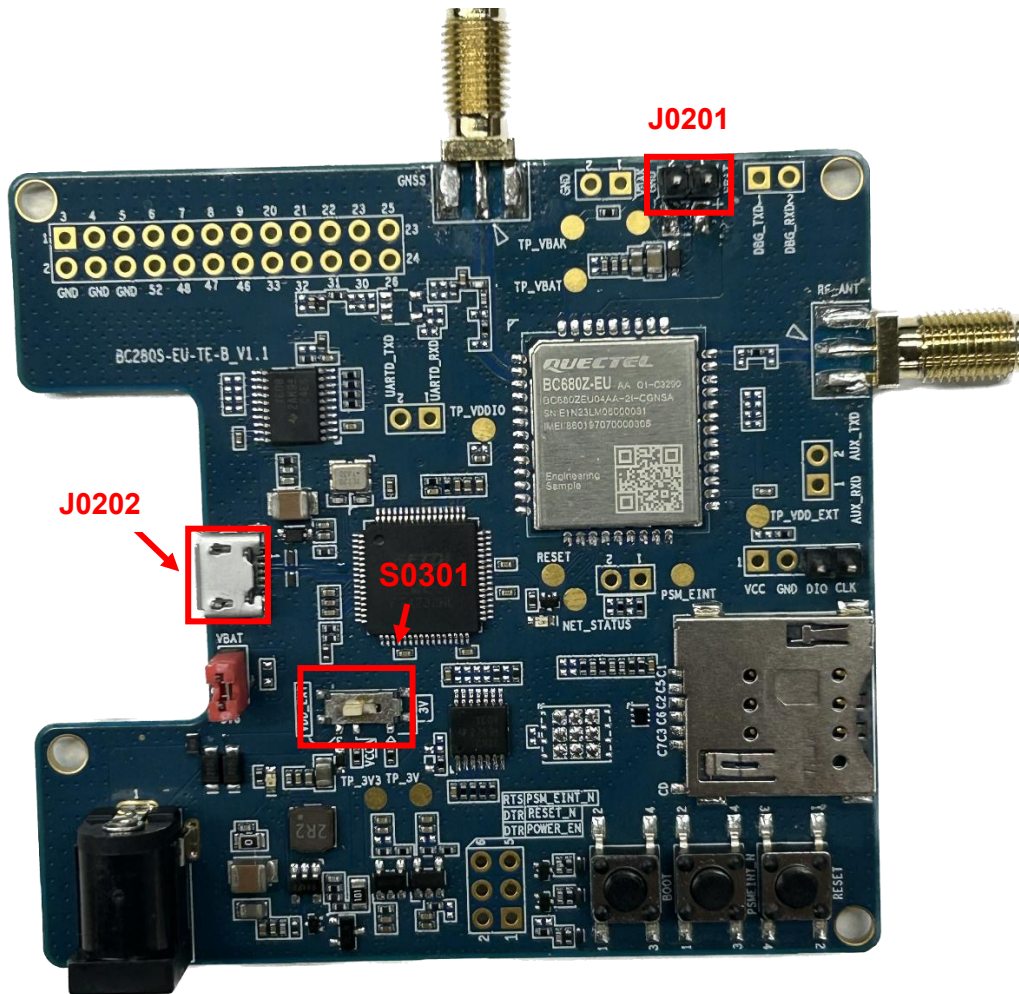


Figure 9: Schematic Diagram of TE-B Before Modification

### 4.2.3. Power Consumption Test Steps

Please refer to the following steps to test the power consumption of the module on the modified TE-B:

1. Insert the USIM card;
2. Plug in the USB cable into TE-B;
3. Switch S0301 to the VDD\_EXT side. When the jumper cap on J0202 has been removed, set the output voltage on N6705C to 3.6 V, and connect the positive and negative wires of N6705C to the two wires (VBAT, GND) welded on J0201 (external power supply interface) to supply the module separately;
4. Turn on the output voltage set by DC power analyzer N6705C, and the module will automatically turn on after power up;

- 5. Conduct power consumption tests in different operation modes.

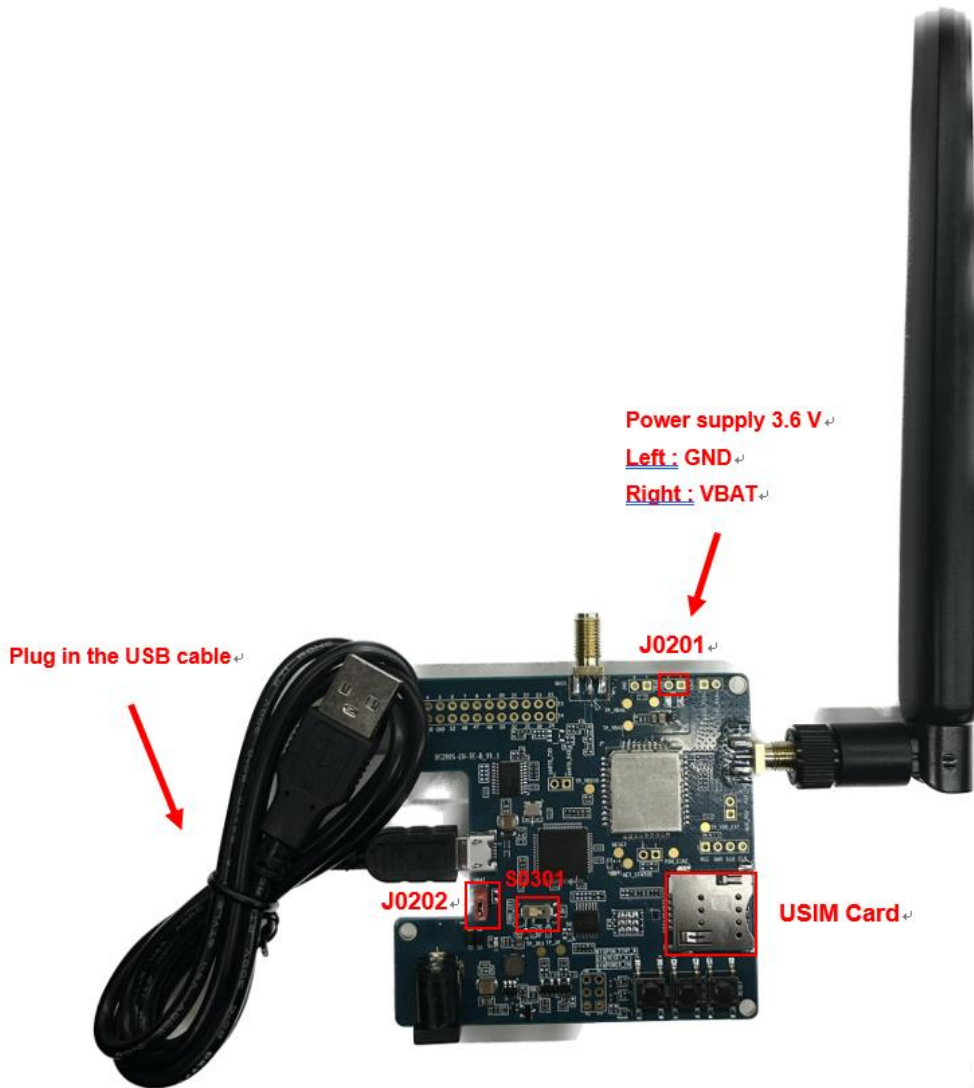


Figure 10: TE-B Wiring Diagram

# 5 Appendix References

**Table 5: Related Documents**

Document Name
[1] Quectel_BC680Z-EU_Hardware_Design

**Table 6: Terms and Abbreviations**

Abbreviation	Description
bps	Bits Per Second
DC	Direct Current
DFOTA	Delta Firmware Upgrade Over-the-Air
GND	Ground
GNSS	Global Navigation Satellite System
LDO	Low-dropout Regulator
NB-IoT	Narrowband Internet of Things
RF	Radio Frequency
SMA	Sub Miniature Version A
SMS	Short Message Service
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
USIM	Universal Subscriber Identification Module
VBAT	Voltage at Battery (Pin)