

BC95-D EVB User Guide

NB-IoT Module Series

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History

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1 Introduction

In order to help customers to develop applications with Quectel BC95-D module, Quectel supplies a corresponding evaluation board to test the module. This document can help customers quickly understand BC95-D EVB interface specifications, electrical and mechanical details and know how to use it.

1.1. Safety Information

The following safety precautions must be observed during all phases of the operation, such as usage, service or repair of any cellular terminal or mobile incorporating BC95-D module. Manufacturers of the cellular terminal should send the following safety information to users and operating personnel, and incorporate these guidelines into all manuals supplied with the product. If not so, Quectel assumes no liability for the customers' failure to comply with these precautions.



Full attention must be given 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. You must comply with laws and regulations restricting the use of wireless devices while driving.



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, so as to prevent interference with communication systems. Consult the airline staff about the use of wireless devices on boarding the aircraft, if your device offers an Airplane Mode which must be enabled prior to boarding an aircraft.



Switch off your wireless device when in hospitals, clinics or other health care facilities. These requests are designed to prevent possible interference with sensitive medical equipment.



Cellular terminals or mobiles operating over radio frequency signal and cellular network cannot be guaranteed to connect in all conditions, for example no mobile fee or with an invalid (U)SIM card. While you are in this condition and need emergent help, please remember using emergency call. In order to make or receive a call, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.



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



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

2 Product Concept

BC95-D EVB is an evaluation board which integrates a NB-IoT module (BC95-D) and a GPS module (L70). Designed in a 80.0mm × 100.0mm × 1.6mm form factor, BC95-D EVB can be used in conjunction with a PC or an MCU, in order to develop and debug applications based on Quectel NB-IoT and GPS modules.

2.1. Key Features

The following table describes the detailed features of BC95-D EVB.

Table 1: Key Features of BC95-D EVB

Feature	Details
Power Supply	USB interface: Supply voltage: 4.75V~5.25V, typical supply voltage: 5.0V Battery interface: Supply voltage: 3.1V~4.2V, typical supply voltage: 3.6V
Transmitting Power	23dBm±2dBm
Temperature Range	Operation temperature range: -10°C ~ +55°C Storage temperature range: -40°C ~ +90°C
USIM Interface	Support a 1.8V/3.0V external Class B USIM card
USB-UART Interface	Support four UART ports BC95-D Main port (Ch A): <ul style="list-style-type: none"> When used for AT command communication and data transmission, the baud rate supports 4800bps, 9600bps (default) and 115200bps When used for firmware upgrade, the baud rate is 921600bps BC95-D Debug port (Ch B): <ul style="list-style-type: none"> Used for software debugging Only supports 921600bps baud rate BC95-D UART3 port (Ch D): Reserved for future use GPS UART port (Ch C): <ul style="list-style-type: none"> Supports baud rate 4800bps, 9600bps (default) and 115200bps

	<ul style="list-style-type: none"> Used for NMEA message output, MTK proprietary commands input and firmware upgrade
NB-IoT Reset Button	Used to reset BC95-D module
GPS Reset Button	Used to reset GPS module
Physical Characteristics	Size: (80.0±0.15) mm × (100.0±0.15) mm × (1.6±0.15) mm
Firmware Upgrade	<p>For BC95-D module: Firmware upgrade via BC95-D main port (Ch A)</p> <p>For GPS module: Firmware upgrade via GPS UART port (Ch C)</p>
Antenna Interface	<ul style="list-style-type: none"> Support two SMA antenna interface, one used for NB-IoT antenna and the other used for GNSS antenna Connected to antenna pad with 50Ω impedance control

2.2. Functional Diagram

The following figure shows a block diagram of BC95-D EVB.

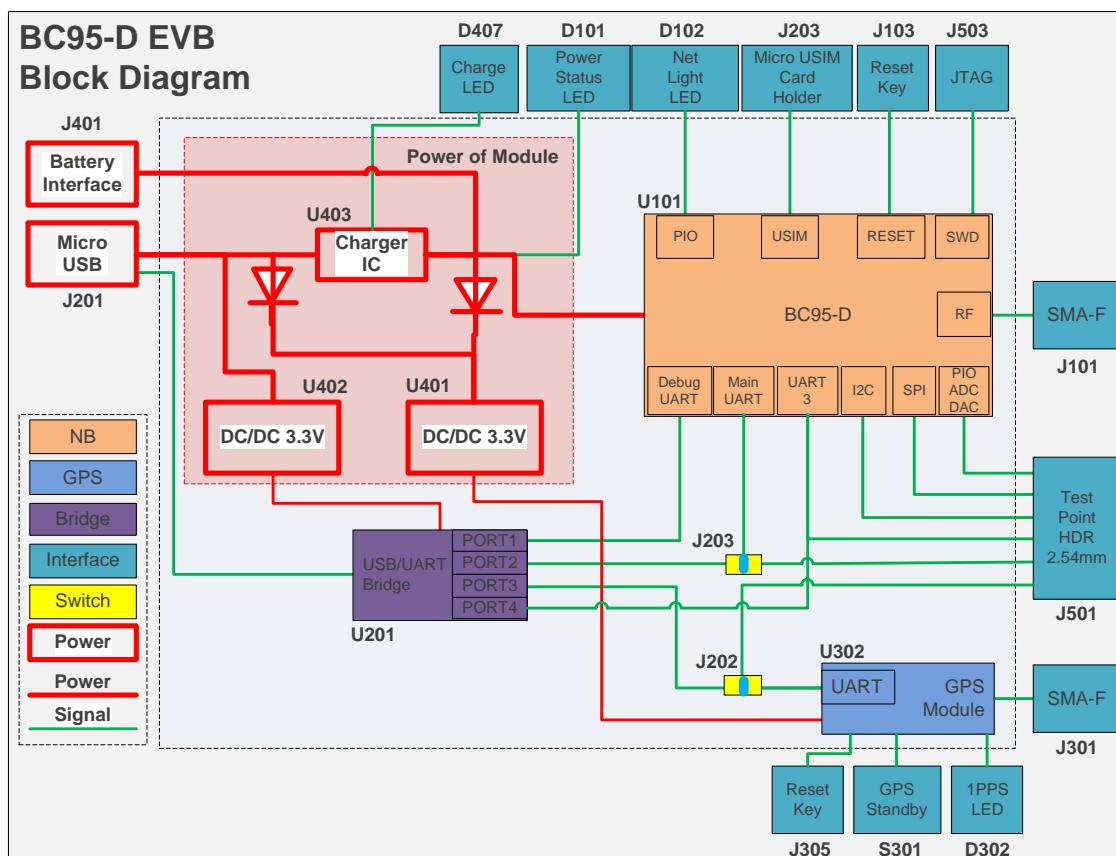


Figure 1: Functional Diagram of BC95-D EVB

2.3. Interface Overview

The following figure shows an interface distribution diagram of BC95-D EVB.

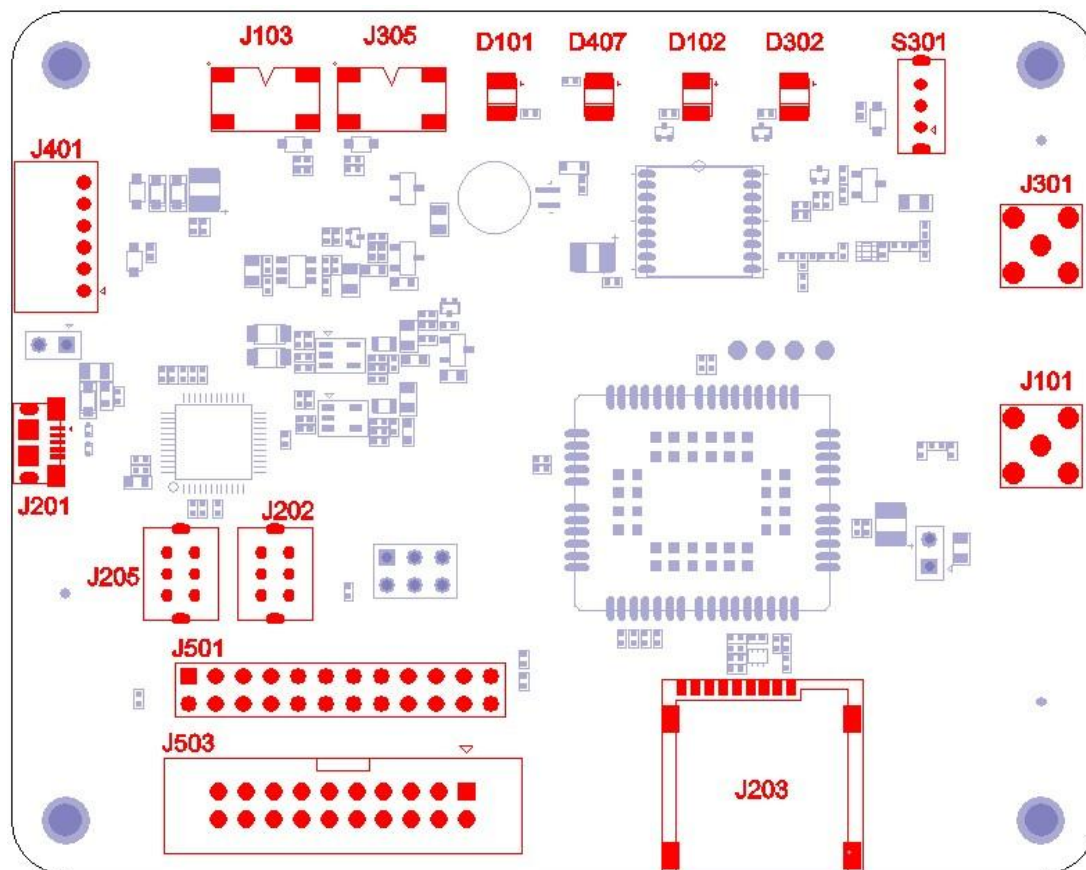


Figure 2: Interface Distribution Diagram of BC95-D EVB

The table below shows the description of BC95-D EVB interfaces.

Table 2: Interfaces of BC95-D EVB

Interface	Designator	Description
Power Supply	J201	Power supply for USB interface
	J401	Power supply for the battery
USB Interface	J201	Support four UART ports
USIM Interface	J203	Micro USIM card connector

RF Antenna Interfaces	J101	NB-IoT antenna SMA connector
	J301	GNSS antenna SMA connector
UART Switches	J205	Switch for connection with USB-UART interface or test point interface for NB-IoT module
	J202	Switch for connection with USB-UART interface or test point interface for GPS module
GPS Standby Switch	S301	Used to control GPS standby mode
Reset Buttons	J103	Used to reset the NB-IoT module
	J305	Used to reset the GPS module
Status Indicators	D101	Used to indicate power ON/OFF status
	D407	Used to indicate charging status
	D102	Used to indicate network connectivity status of the NB-IoT module
	D302	Used to indicate PPS status of the GPS module
JTAG	J503	Debug interface of the NB-IoT module
Test Points	J501	Used to test the basic functionalities of the NB-IoT module and GPS module

2.4. EVB Kit Accessories

All accessories of the BC95-D EVB kit are listed as below.

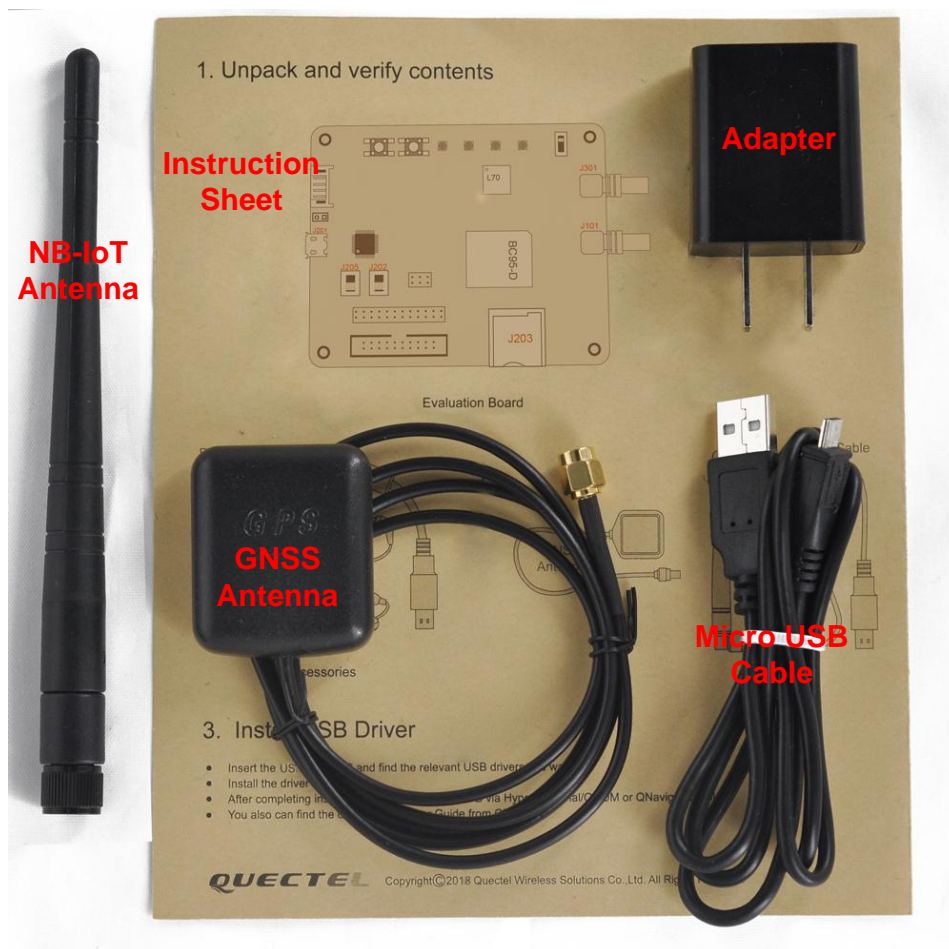


Figure 3: EVB Accessories

Table 3: Accessories List

Items	Description	Quantity
Adapter	Power adapter	1
Cables	Micro USB cable	1
Antennas	NB-IoT antenna	1
	GNSS antenna	1
Instruction Sheet	A sheet of paper giving instructions for EVB connection, details of EVB accessories, etc.	1

3 Interface Application

This chapter describes the interfaces of BC95-D EVB shown as follows:

- Power interface
- USB-UART interface
- USIM interface
- Test Point Interface
- Status Indicators

3.1. Power Interface (J201/J401)

The BC95-D EVB can be powered either by an external power adapter via a USB cable (connecting to J201) or by a battery (connecting to J401). U201 only works when the EVB is powered via J201. An external power adapter can be used to charge the battery through a charger IC.

The following figure shows the power function diagram of the BC95-D EVB.

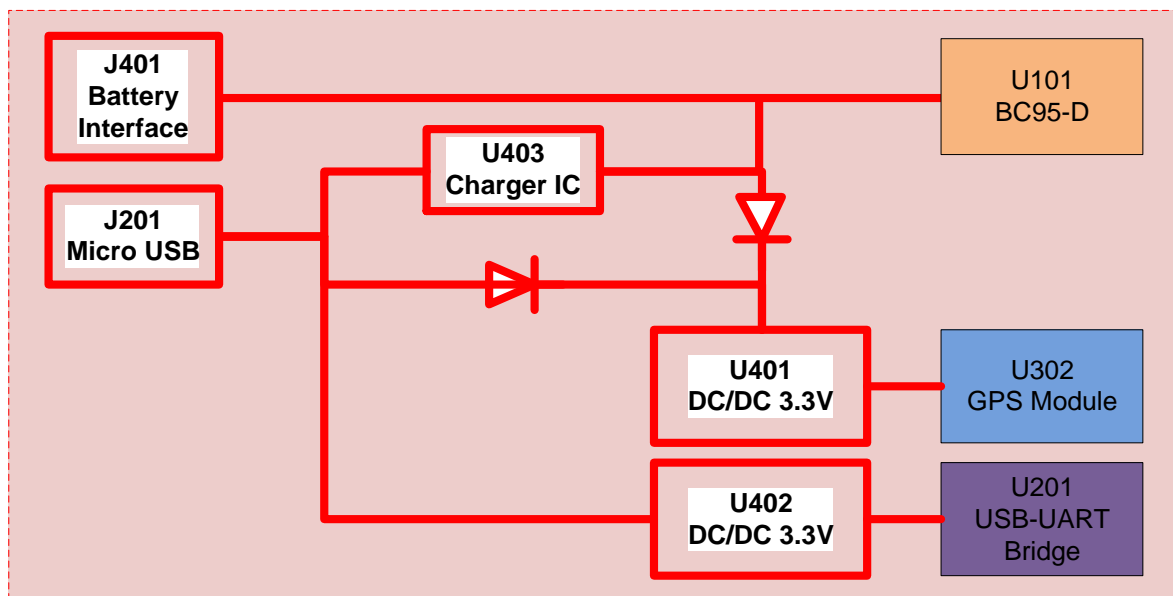


Figure 4: Power Function Diagram

3.2. USB-UART Interface (J201)

BC95-D EVB provides a USB-UART interface, which can map four UART interfaces via a USB-UART bridge chip. The following table shows the details of the mapped UART ports.

Table 4: Information of the UART Ports

UART Port	Channel	Description	Remark
Main UART of BC95-D	CH A	Used for AT command communication, data transmission and firmware upgrade	When it is used, J501 should be kept at “ BRIDGE ” state
Debug UART of BC95-D	CH B	Used for software debugging	
UART of GPS	CH C	Used for NMEA message output, MTK proprietary commands input and firmware upgrade	When it is used, J202 should be kept at “ BRIDGE ” state
UART3 of BC95-D	CH D	Reserved for future use	

If the USB driver has been installed on a PC, UART port information will be displayed on device manager of the PC after connecting the EVB to the PC with a Micro USB cable through USB-UART interface. The following figure shows an example.



Figure 5: UART Ports Displayed on the PC

3.3. USIM Interface (J203)

The BC95-D EVB has a USIM card connector which supports a 3.0V or 1.8V USIM card. The following figure shows the simplified interface schematic of J203.

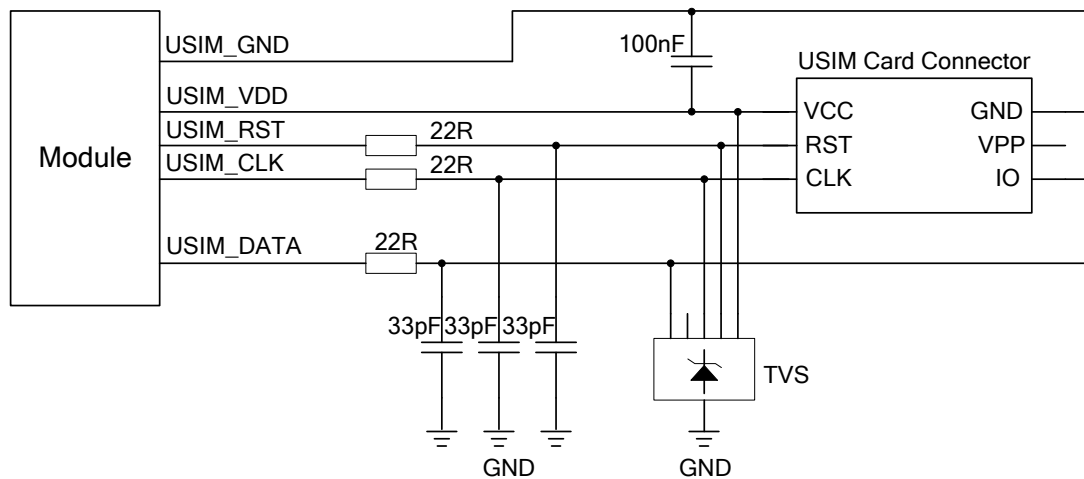


Figure 6: Schematic of Simplified USIM Card Interfaces

3.4. Status Indicators

The BC95-D EVB contains four status indication LEDs (D101, D407, D102 and D302). The following table shows the description of these LED indicators.

Table 5: Description of Status Indicators D101, D102 and D302

Reference No.	Description
D101	Power ON/OFF indicator for NB-IoT module Bright: the module is powered on Extinct: the module is powered off
D102	Network status indicator for NB-IoT module Bright: The module is registered on NB-IoT network Extinct: The module is not working or not registered on NB-IoT network
D302	PPS status indicator for GPS module Flicker at 1Hz frequency by default

Table 6: Description of Status Indicator D407

Charging Status	LED Status
First charge after power applied	Bright
Refresh charge ¹⁾	Extinct

Over voltage protection

Extinct

Sleep

Temperature fault

Bright for first charge

NOTE

¹⁾ When the first charge terminates and the battery is still powered, the voltage of battery drops below the refresh charge threshold, and a new charge cycle will be triggered, this new charge is called refresh charge or recharge.

3.5. Test Point Interface (J501)

BC95-D EVB provides a test point interface J501, which is a pin header with a 2.54mm pitch. It can be used to develop applications on an MCU. The following table shows the pin assignment of the J501. For details, please refer to **document [1]** and **document [2]**.

Table 7: Pin Assignment of J501

Pin No.	Pin Name	Pin No.	Pin Name
1	GND	2	RI
3	ADC	4	VCC_3V3
5	GND	6	RX_BC95_UART3
7	DAC	8	TX_BC95_UART3
9	GND	10	RXD1_L70_TEST
11	PIO1	12	TX1_L70_TEST
13	RIO1	14	RX_BC95_MAIN_TEST
15	PIO2	16	TX_BC95_MAIN_TEST
17	GND	18	SPI_MOSI
19	VDD_EXT	20	SPI_CLK

21	I2C_SCL	22	SPI_MISO
23	I2C_SDA	24	SPI_CS

4 Operation Procedures

BC95-D EVB can be connected to a PC via a USB Type-C cable or connected to an MCU via test point interface to upgrade and debug applications. This chapter mainly illustrates the operation procedures of BC95-D EVB.

4.1. Operation Procedures via a PC

This section elaborates the operation procedures of developing applications via a PC.

1. Install the USB-UART driver, which can be downloaded from the following address:
<https://www.exar.com/product/interface/uarts/usb-uarts/xr21v1414>;
2. Insert a Micro USIM card into J203, please choose an appropriate USIM card according to hardware versions of BC95-D module;
3. Connect the NB-IoT antenna with SMA connector on J101;
4. Connect the GNSS antenna with SMA connector on J301;
5. Switch the “UART_SWITCH” J205 and J202 to “**BRIDGE**” state;
6. Connect the J201 with PC via a Micro USB cable;
7. Use a COM tool to access the NB-IoT module and GPS module for developing. CH A can be used for AT communication, data transmission and firmware upgrade on NB-IoT module, CH C can be used to view NMEA messages, MTK proprietary commands and upgrade firmware for GPS module and CH B can be used to view log information of the NB-IoT module.

NOTE

In this process, J103 can be used to reset the BC95-D module, J305 can be used to reset the GPS module, and S301 can be used to turn on the standby mode of the GPS module.

4.2. Operation Procedures via an MCU

This section elaborates the operation procedures of developing applications via an MCU.

1. Install the USB-UART driver, which can be downloaded from the following address:
<https://www.exar.com/product/interface/uarts/usb-uarts/xr21v1414>;

2. Insert a Micro USIM card into J203, please choose an appropriate USIM card according to hardware versions of BC95-D module;
3. Connect the NB-IoT antenna with SMA connector on J101;
4. Connect the GNSS antenna with SMA connector on J301;
5. Switch the UART_SWITCH J205 and J202 to “**TEST**” state;
6. Connect BC95-D and GPS module to MCU via J501;
7. Connect the J201 with PC via a Micro USB cable;
8. Turn on the MCU board to access the NB-IoT module and GPS module for developing. The MCU can communicate with NB-IoT module via main UART (Pin 14 & Pin 16 of J501), and receive NMEA messages via GPS UART (Pin 10 & Pin 12 of J501). Meanwhile, the CH B can be used to view log information of NB-IoT module, and in such case CH A, CH C are unavailable.

NOTE

In this process, J103 can be used to reset the BC95-D module, J305 can be used to reset the GPS module, and S301 can be used to turn on the standby mode of the GPS module.

5 Electrical and Reliability

5.1. Absolute Maximum Ratings

Absolute maximum ratings for power supply and voltage on digital and analog pins of the BC95 module are listed in the following table.

Table 8: Absolute Maximum Ratings

Parameter	Min.	Max.	Unit
VBUS	-0.3	6	V
VBAT	-0.3	+4.25	V
Current of Power Supply	0	0.8	A
Voltage at Digital Pins	-0.3	+4.25	V
Voltage at Analog Pins	-0.3	+4.25	V
Voltage at Digital/Analog Pins in Power Down Mode	-0.25	+0.25	V

5.2. Operation and Storage Temperatures

The operation and storage temperatures are listed in the following table.

Table 9: Operation and Storage Temperatures

Parameter	Min.	Typ.	Max.	Unit
Operation Temperature Range	-10	+25	+55	°C
Storage Temperature Range	-40		+90	°C

6 Mechanical Dimensions

This chapter describes the mechanical dimensions of BC95-D EVB. All dimensions are measured in mm. The tolerances for dimensions are $\pm 0.15\text{mm}$.

6.1. Mechanical Dimensions of BC95-D EVB

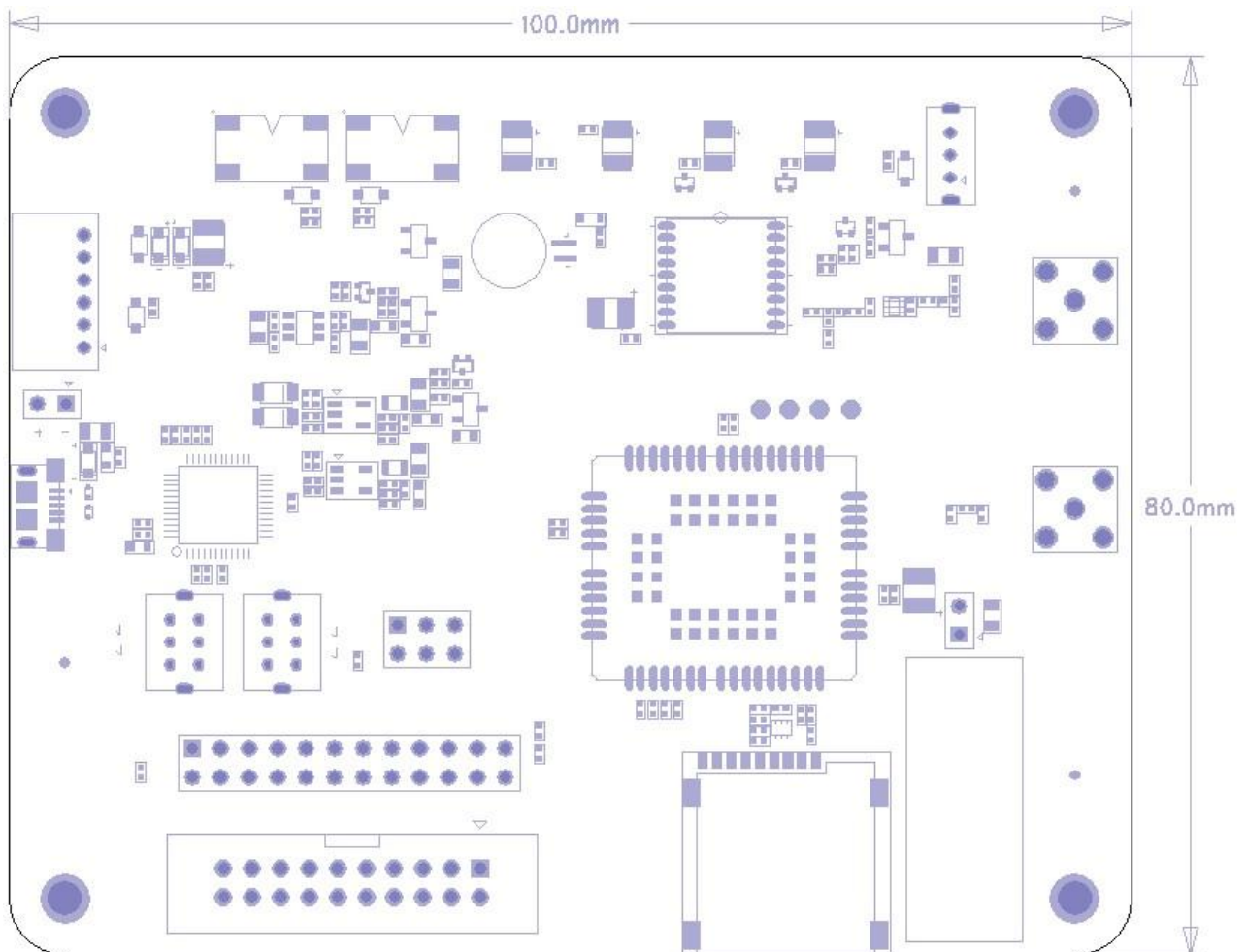


Figure 7: Dimensions of BC95-D EVB (Top View)

6.2. Design Effect Drawings of BC95-D EVB

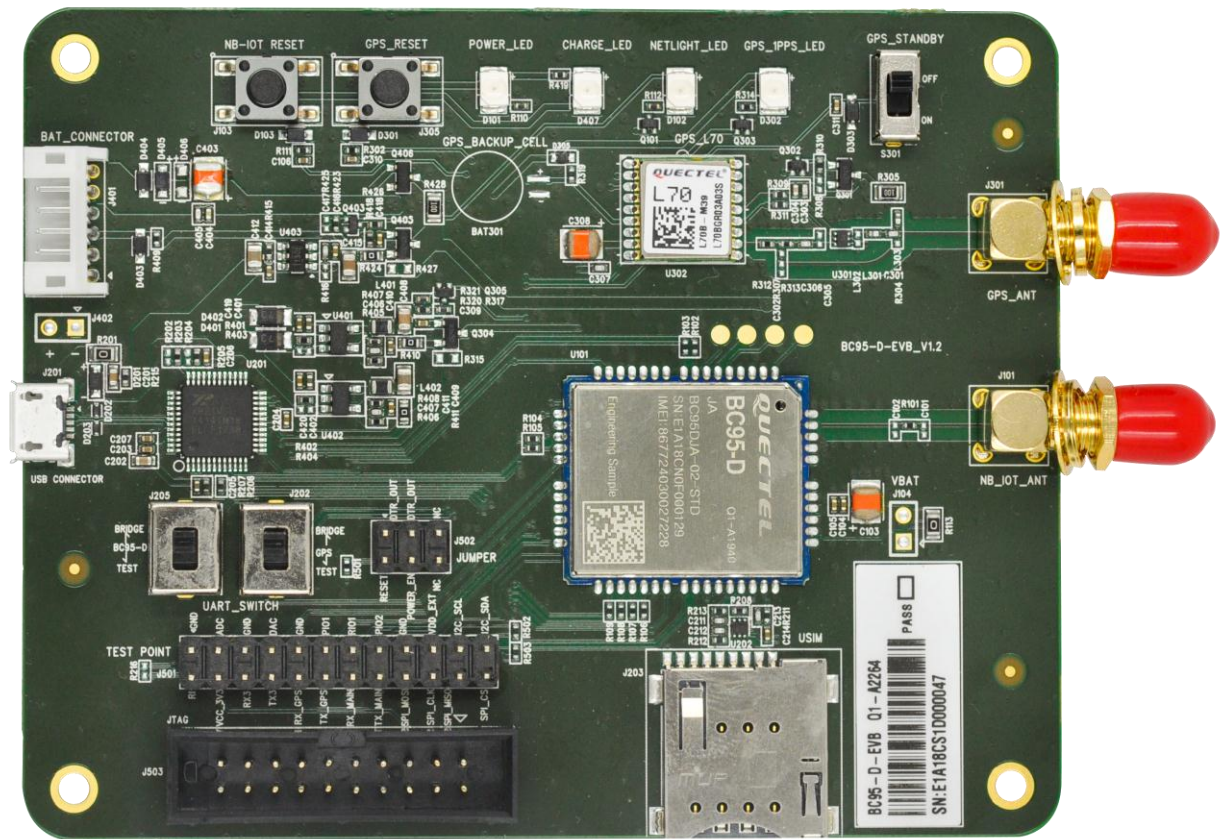


Figure 8: Top View of the BC95-D EVB

NOTE

These are design effect drawings of BC95-D EVB. For more accurate pictures, please refer to the BC95-D EVB supplied by Quectel.

7 Appendix A References

Table 10: Related Documents

No.	Document Name	Remark
[1]	Quectel_BC95-D_Hardware_Design_Datasheet	BC95-D hardware design Datasheet
[2]	Quectel_L70_Hardware_Design	L70 hardware design

Table 11: Terms and Abbreviations

Abbreviation	Description
EVB	Evaluation Board
GPS	Global Positioning System
MCU	Microcontroller Unit
NB-IoT	Narrow Band Internet of Things
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
USIM	Universal Subscriber Identification Module