



5G NB-IOT & GNSS USB KIT

USB Dongle BG77 Technical Specifications & User Manual



Purpose of the Document

The purpose of this document is to explain the technical specifications and manual for using the 5G NB-IoT & GNSS USB Dongle.

Document History

Version	Author	Date	Description
A	5G HUB	09.02.2022	Initial Document

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1 Package contents:

1.1 Cat NB2 NB-IoT USB Dongle Package:

- Cat NB2/Cat M USB dongle with LTE & GNSS antenna connectors.

1.2 Download

Arduino software can be downloaded from the following website:

[5G-NB-IoT/KitSketches at master · 5ghub/5G-NB-IoT \(github.com\)](https://github.com/5ghub/5G-NB-IoT)

To use the board with Windows:

Download and Install LTE&GNSS modem driver for Windows OS:

<https://github.com/5ghub/5G-NB-IoT/tree/master/Driver>

Download and Install QNavigator and QCOM tools for Quectel BG95 here:

<https://github.com/5ghub/5G-NB-IoT/tree/master/Tools>

All the following software can be installed from the GitHub location here:

<https://github.com/5ghub/5G-NB-IoT>

2 General Description

2.1 Overview

The NB-IoT & GNSS USB dongle is a cellular and GPS USB stick form factor based on Quectel BG77 chipset. The BG77 is the world smallest modem integrating Cat NB2 LTE and GNSS.

The USB dongle has on-board LTE & GNSS antennas. It features a wireless modem. The wireless modem is BG77 which is an embedded IoT (LTE Cat-M1, LTE Cat-NB2 and EGPRS and GNSS) wireless communication module. BG77 wireless modem provides a maximum data rate of 589Kbps downlink and 1.12Mbps uplink. It features ultra-low power consumption, provides data connectivity on LTE-TDD/LTE-FDD/GPRS/EDGE networks, and supports half-duplex operation in LTE networks. It also provides GNSS to meet customers' specific application demands

The USB dongle provides rich sets of Internet protocols, industry-standard interfaces (USB/I²C/SPI/ADC/Status Indicator) and abundant functionalities. The board offer a high integration level and enables integrators and developers to easily design their applications and take advantage of the board low power consumption, many functionalities, and USB drivers for Windows 7/8/8.1/10, Linux and Android.

The USB dongle is a rich hardware board that can be used for the 4G LTE wireless technology and enables a variety of smart applications for devices. It enables large number of applications such as wireless POS, smart metering, tracking, smart transportation, smart buildings, smart city, and smart homes.

2.2 Key Features

- Quectel BG77 NB-IoT & GNSS module
- Data rate of 589Kbps downlink and 1.12Mbps uplink
- On-board LTE & GPS antenna
- Supports LTE NB-IoT and Machine Type Communications (MTC)
- Supports EGPRS
- Global Frequency Band B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28/B39 (B39 for Cat.M1 only) for LTE and 850/900/1800/1900MHz for EGPRS
- Supports the protocols TCP/UDP/PPP/SSL/TLS/FTP(S)/HTTP(S)/NITZ/PING/MQTT
- Supports SMS
- Supports GNSS technology (GPS, GLONASS, BeiDou/Compass, Galileo, QZSS)
- Compact board size of 59mm x 25mm
- Nano USIM card slot
- Works with Windows, Linux, or Android
- Ready for smart wearables, smart applications, and development (smart home, smart city, smart transportation, smart metering, smart farming, smart waste management, asset tracking, location, navigation, mapping, and timing applications). Application such as Gas Detector, Soil PH Tester, Optical Sensor, Machinery Alarm System, Irrigation Controller, Elevator, Asset Tracking Electronics, Person/Pet Tracking, Water/Gas Metering, Smart Parking System, Fire Hydrant, Smoke Alarm, Trash Bin, Street Lighting
- The board is powered via the USB connector
- Interfaces with external sensors through I2C or SPI. Each of the general purpose I/O pins on the board can be used for digital input or digital output.

2.3 Overview Diagrams

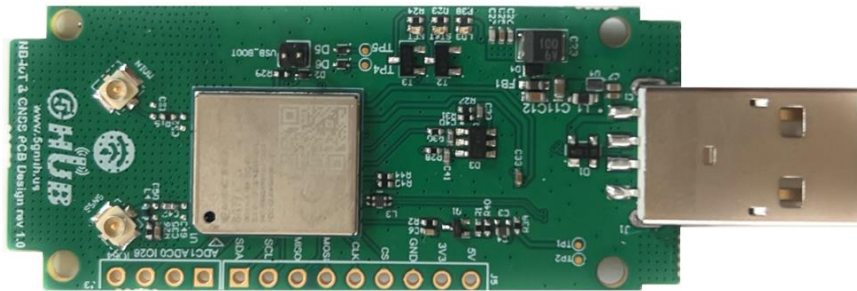


Figure 1. USB Dongle Overview Diagram – Top View

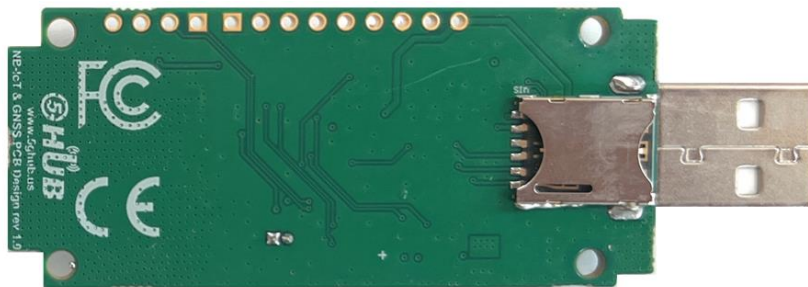


Figure 2. USB Dongle Overview Diagram – Bottom View

2.4 Physical Characteristics

The width and length of the USB dongle is 25 mm (width) by 59 mm (length). The board has four screw holes in opposite corners that allow it to be used inside an enclosure or to be attached to a surface or case.

The size of the BG77 module is also shown below, which is the world's smallest size for a LTE&GNSS modem.

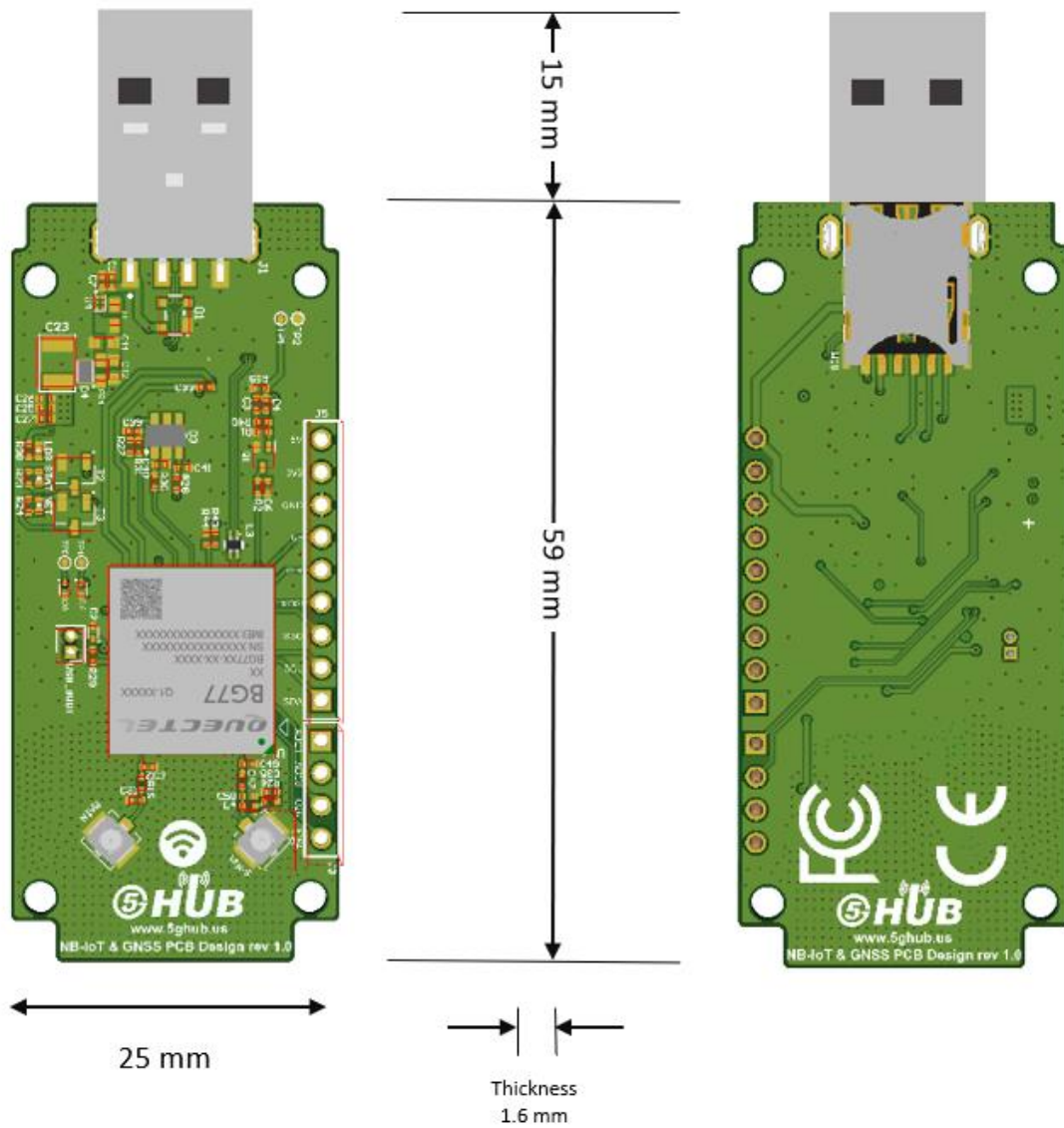


Figure 3. Physical Characteristics.

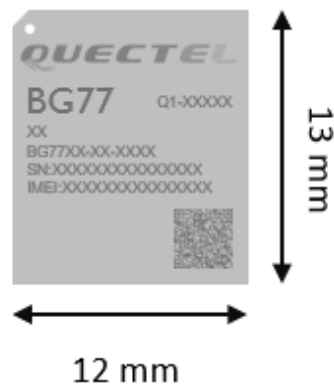


Figure 4. BG77 Modem (World Smallest LTE&GNSS modem).

2.5 Peripherals – IO Connections

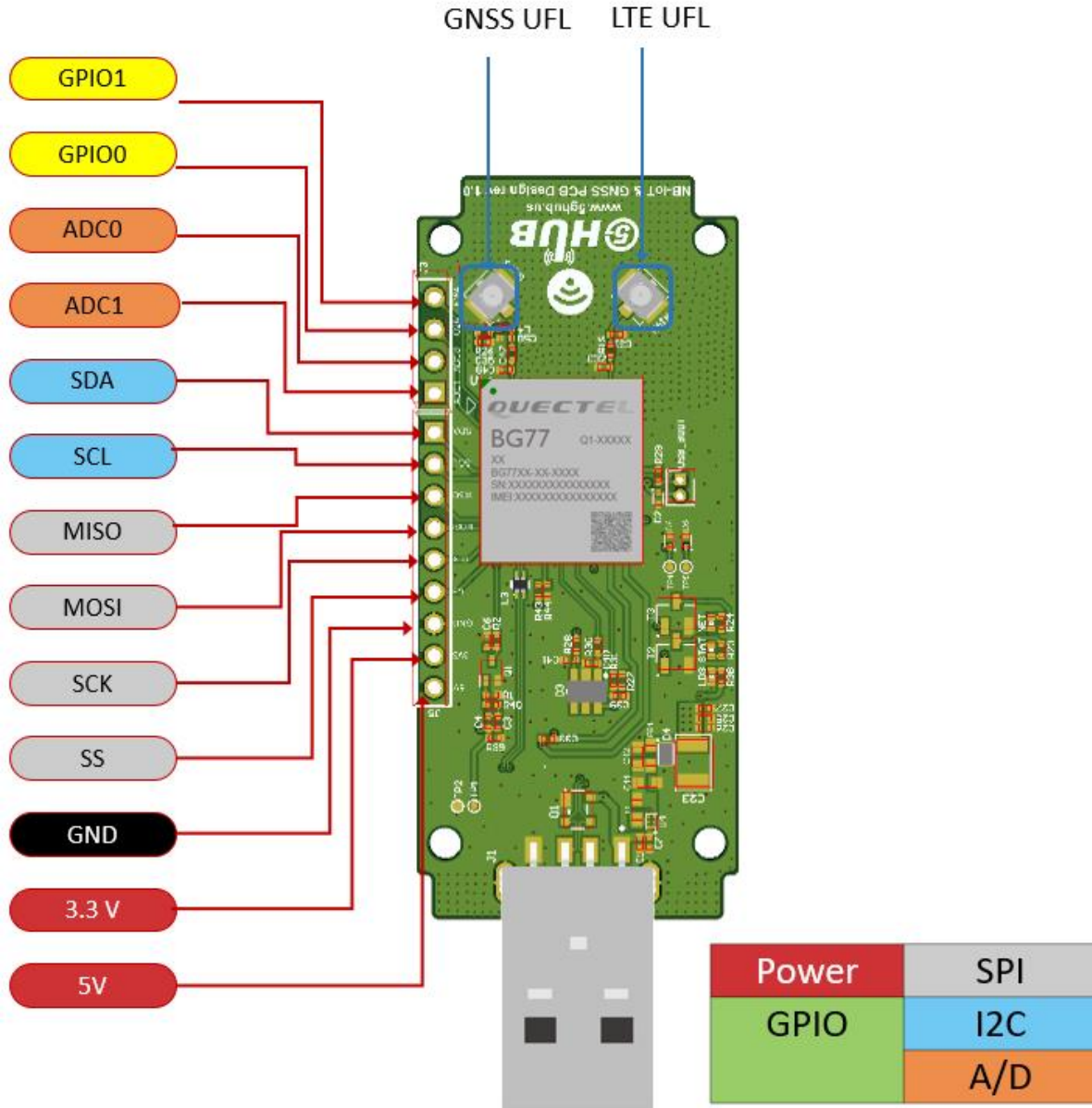


Figure 5. USB Dongle Connectors

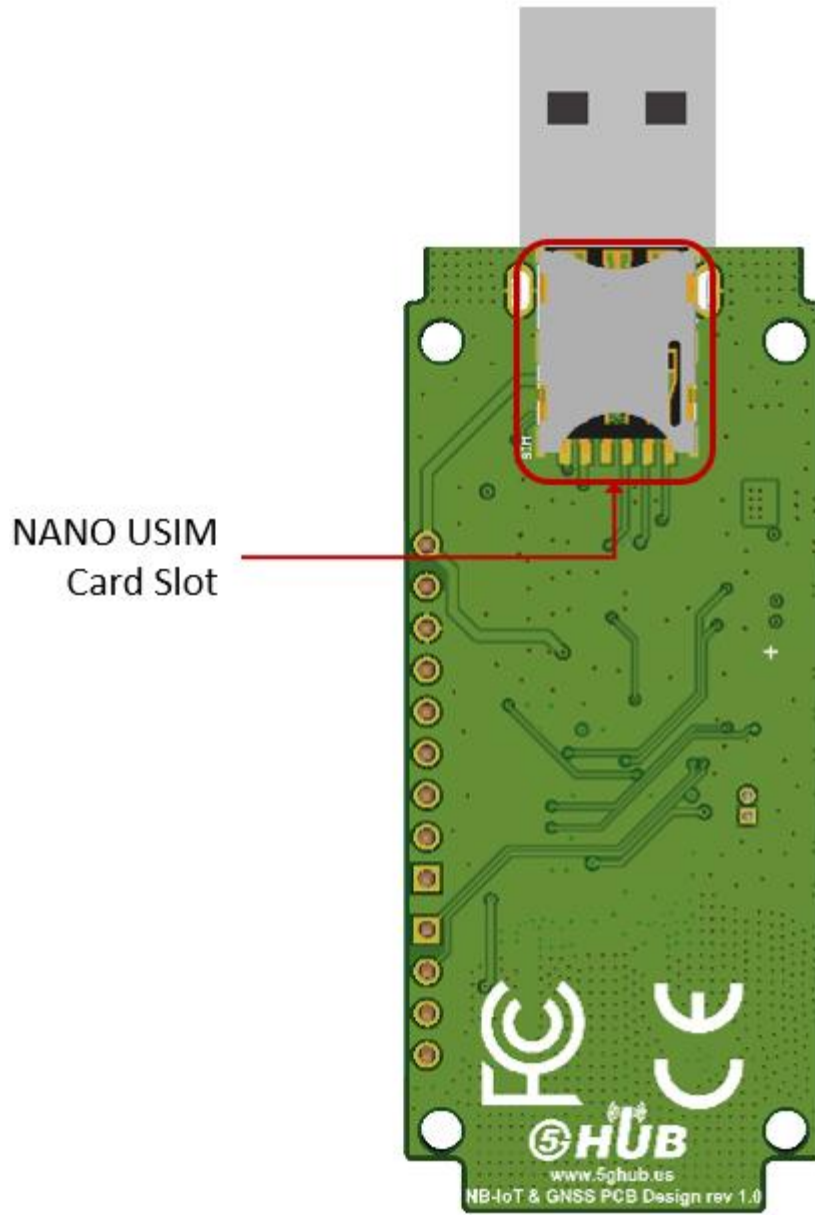


Figure 6. USB Dongle Bottom Side – Key Components

2.6 Hardware Specification

Technical Specification	
NB-IoT Module	Quectel BG77
Dimension	25 mm (width) by 59 mm (length)
Weight	18 grams
Power Supply	USB (5V)
LED	LED1, Status LED, Netlight LED
Interfacing Logic Voltage Level (Operating Voltage)	3.3V
Voltage output	5V, 3.3V
General-purpose digital I/O Pins	8 (A0-A5, PA6, PA7, SS, MOSI, MISO, SCK, SDA, SCL)
GPIO	2 connected to BG77
ADC	2 connected to BG77
USB	1
I ² C	1 connected to BG77
SPI	1
JTAG Debug	Cortex Debug Connector (Single Wire Debug)
USIM	Nano
GNSS	GPS, GLONASS, BeiDou/Compass, Galileo, QZSS
Antenna	1 main antenna and 1 GNSS antenna
Band	LTE-FDD, B1/B2/B3/B4/B5/B8/B12/ B13/B18/B19/B20/B26/B28 LTE-TDD: B39 (for Cat M1 only)
Certification	FCC, CE
Mobile Operator Certification	Verizon and currently for AT&T

2.7 PIN Description

PIN	DIRECTION	Description
USB Connector	I	The USB dongle is powered from the USB port (3.8V-5V)
LED1 (Power)	O	LED on powering on the USB
LED (NET)	O	Indicate the BG77 operation status
LED (STAT)	O	Indicate the BG77 network activity status
3.3V	O	3.3V generated by the on-board regulator. Maximum current drawn is 3A. The regulator also provides power to the MCU and BG77
5V	O	5V generated from the board. The board is supplied with power from USB connector (typical 5V)
GND		Ground
SCL	IO	I ² C. The SCL (clock line). Can be used as GPIO
SDA	IO	I ² C. The SDA (data line). Can be used as GPIO
Cortex Debug Connector	IO	Using Single Wire Debug to burn bootloader and debug the board
ADC0	I	Connected to BG77. General purpose analogue to digital converter
ADC1	I	Connected to BG77. General purpose analogue to digital converter
GPIO0	IO	Connected to BG77. General purpose IO
GPIO1	IO	Connected to BG77. General purpose IO
SPI	IO	Connected to BG77.
USIM	I	Used to insert a Nano USIM. Connected to BG77

2.8 BG77 chipset

All functionality of the BG77 chipset shall be implemented excluding the following features. That is, the following features are not supported **Error! Reference source not found.****Error! Reference source not found.**
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- Audio, Earphone, and Codes are not supported.
- PCM and I²C are not supported
- PSM_IND and AP_READY are not supported