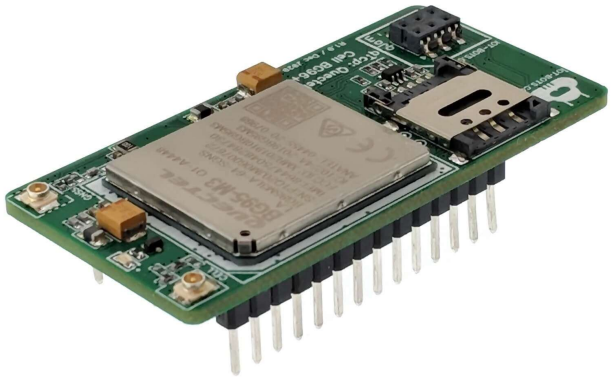


qTop Cell LTE GNSS BG95/BG96 AFC/AMC shield

Data Sheet

Abstract

Data Sheet gives information about the qTop Cell LTE GNSS BG95/BG96 AFC/AMC shield.
Features and device description.

IBT-QTC-AXC-BG9X-DS

www.iot-bots.com

Table of Contents

Revision History

№№	Version	Date	Author	Description
1	1.0	03.01.2021	Iotbotscom	Initial
2				
3				

Overview

qTop BG95/BG96 (BG9x) LTE GNSS AFC/AMC Shields are the easiest way to bring the cellular wireless and GNSS location functionality to your Adafruit Feather Compatible or Arduino MKR Compatible board DIY IOT project.

BG95/BG96 Quectel LTE and GNSS modules based qTop shields to be used together with popular Adafruit Feather Compatible and Arduino MKR Compatible IOT boards to build various DIY IOT projects.

Features

- LTE Cellular and GNSS Navigation all-in-one: Multi-mode LPWA and GNSS Quectel BG95 module based shield;
- Reliable and Optimized Power Management: Integrated High Efficiency Single Inductor Buck-Boost TPS63020 Converter;
- Flexible and compatible interface: All modem UARTs pins are accessible through PCB jumpers and 3,3V translators;
- Flexible antenna options: Two built-in u.FL connectors for Cellular and GNSS antennas to be connected;
- Shield identification feature: Device ID EEPROM chip integrated allows to keep Shield info, version and unique ID of the product;
- Sensor Add-On capability: Built in qJam connector gives opportunity to bring to the system any qJam family device;
- Popular IOT board compatibility: pin-to-pin compatible with popular Arduino MKR / Adafruit Feather IOT boards;
- Shock & Vibration resistant SIM Card Holder: World's smallest hinged nano-SIM Card holder integrated.

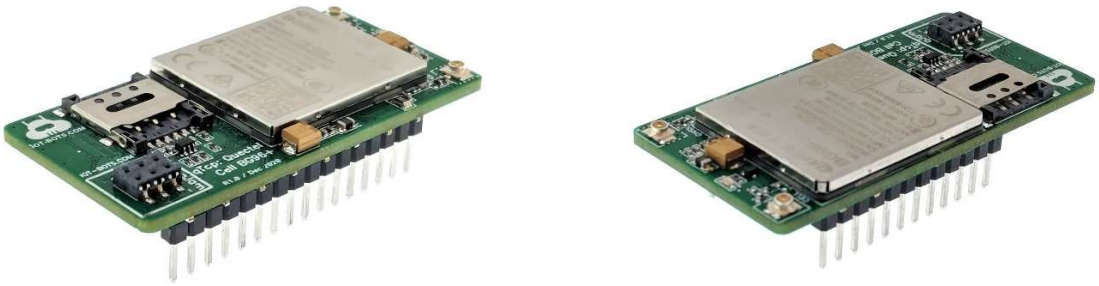
Description

qTop BG9x LTE/GNSS AXC Shields (Products) are Adafruit Feather Compatible / Arduino MKR Compatible PCB shields to be used for DIY IOT project together with

Adafruit Feather Compatible or Arduino MKR Compatible IOT board to get cellular connectivity and GNSS location info for the system to be developed.

Each BG9x Product has two modifications :

- AFC : Adafruit Feather Compatible, to be used with Adafruit Feather Compatible boards;

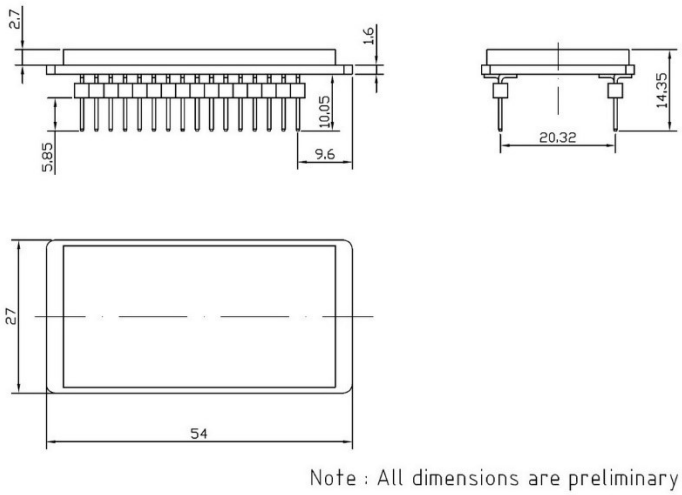


Pic.1. qTop BG96 LTE/GNSS AFC Shield (Adafruit Feather Compatible)

- AMC : Arduino MKR Compatible, to be used with Arduino MKR Compatible boards.

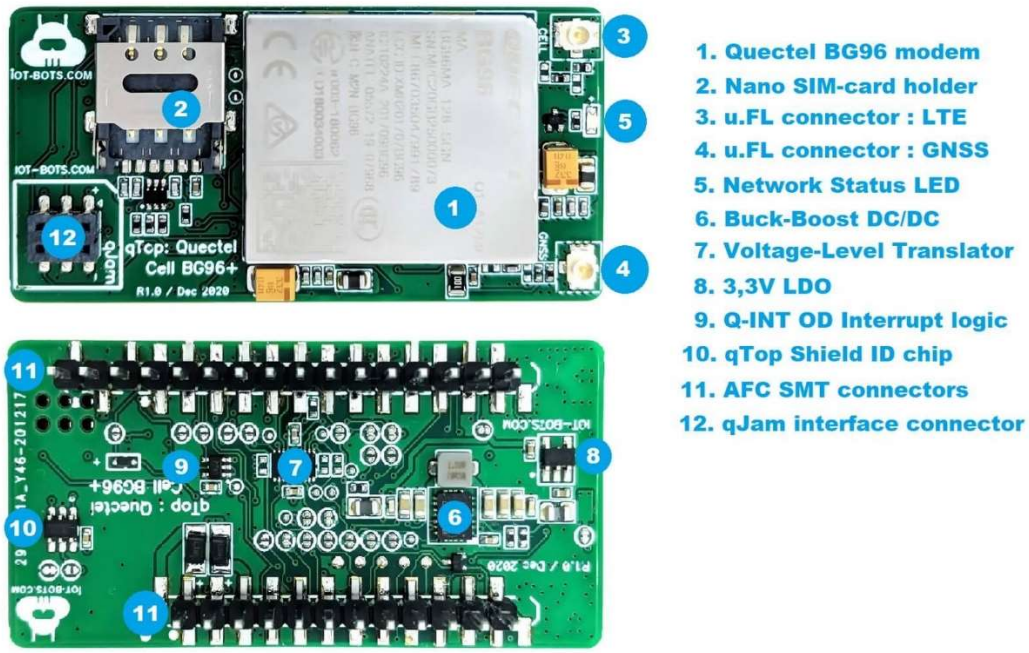
Pic.2. qTop BG95 LTE/GNSS AMC Shield (Arduino MKR Compatible)

High quality four layers FR-4 PCB is used to carry all product components placed at both PCB sides. The product dimensions are shown at picture below.



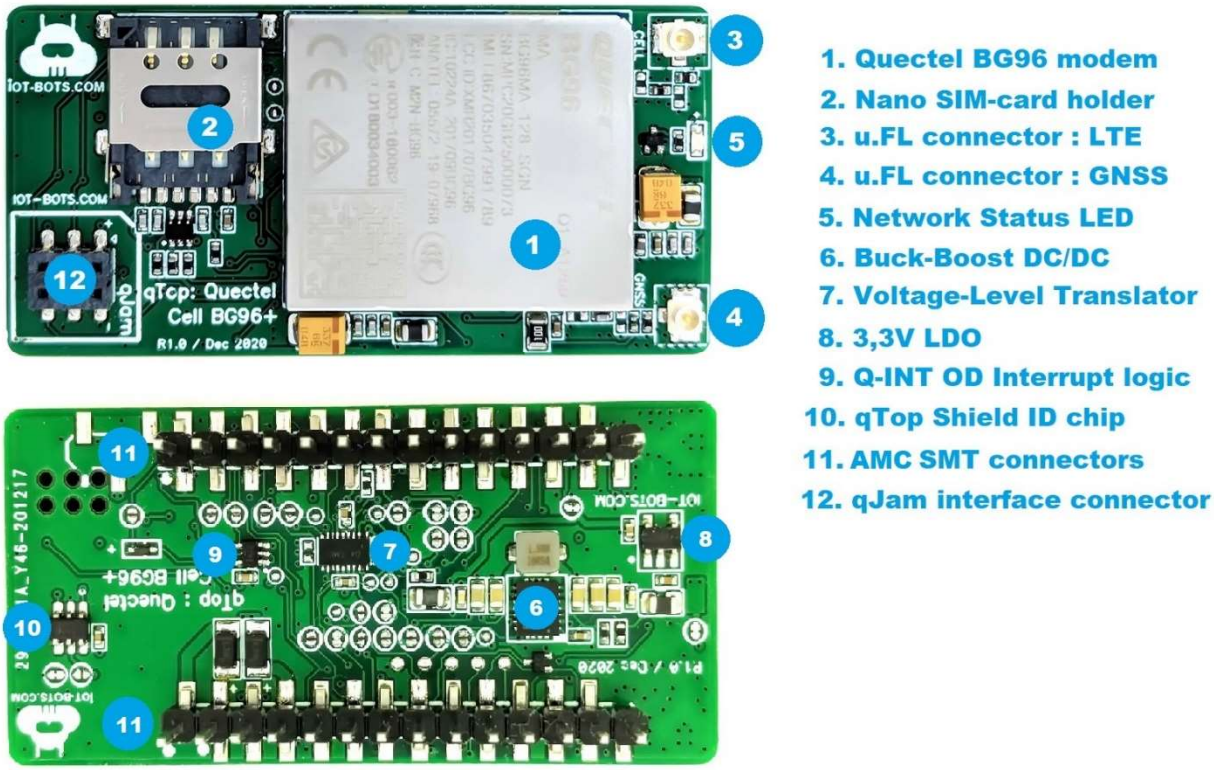
Pic.3. qTop Modem Shield dimensions (mm)

The main qTop BG9x LTE/GNSS AFC Shield components highlighted at picture below.



Pic.4. qTop BG9x LTE/GNSS AFC Shield components

The main qTop BG9x LTE/GNSS AMC Shield components highlighted at picture below.



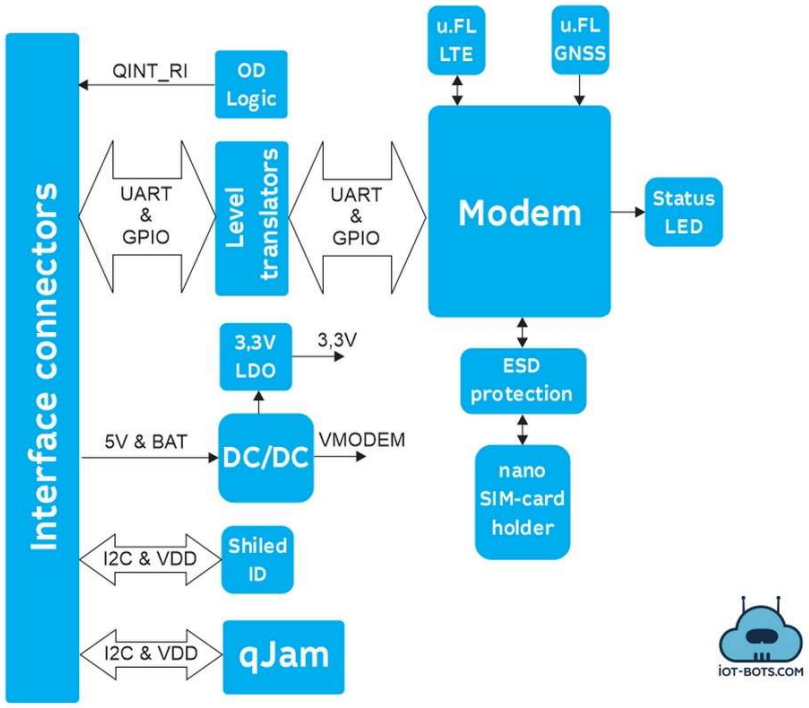
Pic.5. qTop BG9x LTE/GNSS AMC Shield components

Functional diagram

The core part of each shield is BG95 or BG96 Quectel modem.

BG95/BG96 is an embedded IoT (LTE Cat M1, LTE Cat NB1 and EGPRS) wireless communication module. It provides data connectivity on LTE-TDD/LTE-FDD/GPRS/EDGE networks, and supports half-duplex operation in LTE networks. It also provides GNSS functionality to meet customers' specific application demands.

More info about modem itself could be found at Quectel website (https://www.quectel.com/product/bg96.htm).



Pic.6. qTop BG9x LTE/GNSS AXC Shield Functional Diagram

Two u.FL connectors are used for internal or external Antennas (LTE and GNSS). Shield provides 3,3VDC power for active GNSS antenna.

Shield supports nano-SIM card to be inserted into Hinged Lid SIM Card Holder type located at the top of PCB. All SIM-card traces are ESD-protected.

Network indication LED, located in the center of the edge of the board lets observe modem network status.

TPS63020 Buck-Boost Converter is used to power modem, so shield is fully functional even with input voltage drops down to 3.3 V.

DC/DC output voltage (3,9V) is also used to power LDO, which provides 3,3 voltage for the level translators, OD logic IC and active GNSS antenna to be connected.

Level translators are used to shift voltage levels between IOT board with 3,3V signals and 1,8V levels used by modem logic.

All qTop shields has device ID feature - each qTop shield has integrated EEPROM chip with UID feature. EEPROM is preprogrammed by manufacture (IOT-BOTS.COM) with shield type and info, so IOT controller with appropriate FW loaded, at power up time could identify type of the shield and configures FW to work with. So, no needs to re-flash IOT controller with new FW if you want to change shield, for example, to change wireless connectivity from LTE to LoRa : just turn power off, replace a shield and turn power on - system will recognize new HW connected and start working with that device. UID feature could be used by End User as particular device identification (for sure, IMEI could be used as well).

OD logic is simple gate IC used to convert push-pull RI modem signal to open-drain logic to be compatible with Q_INT line of qJam interface - so many different devices (sensors, actuators, modems, etc) interrupt outputs could be connected to single line to be used by IOT controller to react on system or external events.

And finally, to bring more value for our qTop products, each qTop shield (except GNSS shields) supports qJam connectivity system : it is developed by us, tiny 6-pin connecting system, which allows End User to easily bring small I2C devices (sensors, actuators, system devices, memories) to the IOT solution to be developed. Need just put qJam compatible device into qJam connector of the controller board - no cables, soldering or wires required. It has power (3,3V), I2C bus, Q_INT open-drain interrupt line and Q_IO GPIO line to be used by qJam device as additional control or status signal.

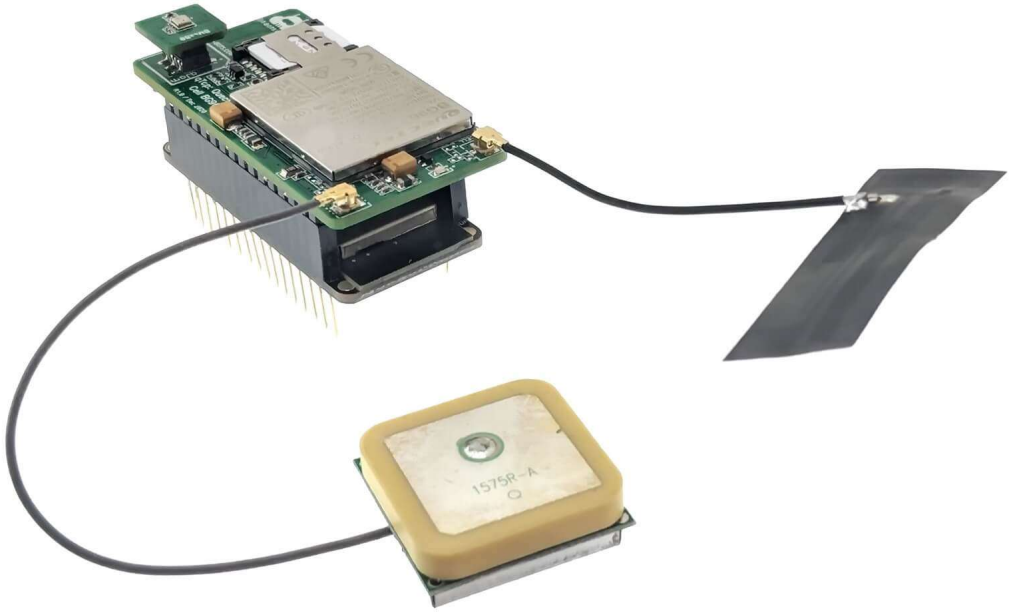
So, any qJam compatible device could be located at the top of the shield to bring more feature to the IOT solution or project you are working on.

Usage

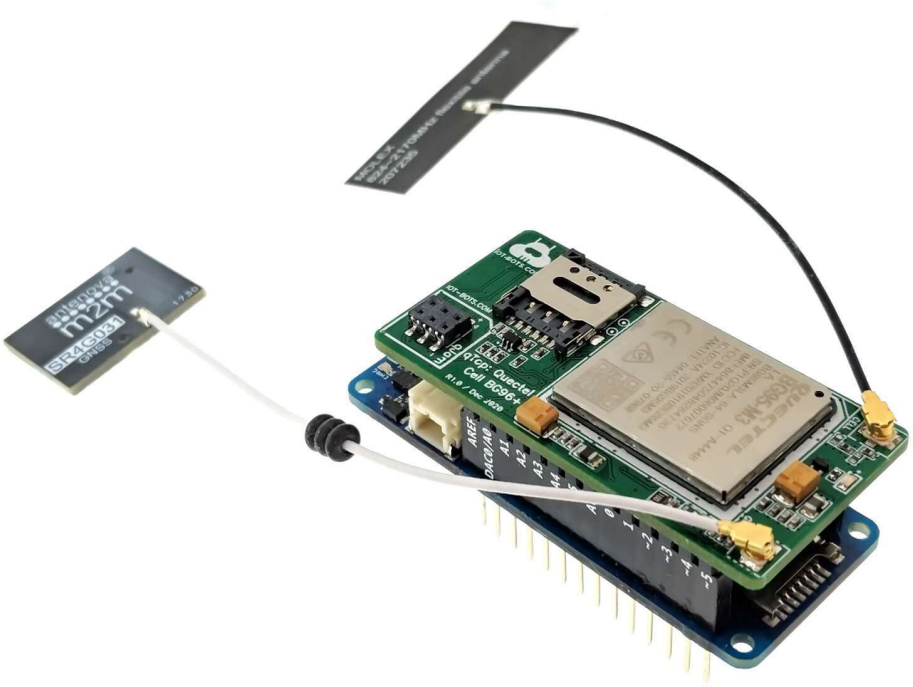
qTop BG9x LTE/GNSS AXC Shields could be used with the most Adafruit Feather Compatible and Arduino MKR Compatible IOT boards (Main Board).

To get boards up and running these steps to be done:

- LTE and GNSS antennas MUST be connected to PCB u.FL connectors (directly or using u.FL-SMA adapter cables);
- SIM Card should be inserted;
- Appropriate FW should be flashed into Main Board;
- qTop Modem Shield should be plugged it to appropriate connectors of IOT board;
- If needed, qJam device could be plugged into Shield qJam connector;
- LiPol Battery or +5VDC 1A power supply should be connected to an IOT board.



Pic.7. qTop BG96 LTE/GNSS AFC Shield Setup (ESP32 Feather Board)



Pic.8. qTop BG95 LTE/GNSS AMC Shield Setup (Arduino MKR Zero Board)

Several examples and Application Notes are provided to get qTop Modem Shields up and running.

Abbreviations

№№	Abbreviation	Explanation
1	AFC	Adafruit Feather Compatible
2	AMC	Arduino MKR Compatible

Trademark notice

All referenced brands, product names, service names, and trademarks are the property of their respective owners.

Ordering info

№№	Item	SKU

1	qTop BG96 LTE/GNSS AFC Shield	IBT-QTC-AFC-BG96
2	qTop BG96 LTE/GNSS AMC Shield	IBT-QTC-AMC-BG96
3	qTop BG95 LTE/GNSS AFC Shield	IBT-QTC-AFC-BG95
4	qTop BG95 LTE/GNSS AMC Shield	IBT-QTC-AMC-BG95