# BG95&BG96 Series

# Difference Introduction

**LPWA Module Series**

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# About the Document

## Revision History

| Version | Date | Author | Description |
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| - | 2019-02-18 | Army RONG | Initial |
| 1.0 | 2021-07-22 | Army RONG/ Sherlock ZHAO | First official release |

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# 1 Introduction

This document identifies the major differences between Quectel BG95 series and BG96 modules in terms of hardware and software designs, which provides you with references to realize migration from BG96 to BG95 series.

## 1.1. Special Mark

**Table 1: Special Mark**

| Mark | Definition |
|---|---|
| * | Unless otherwise specified, when an asterisk (*) is used after a function, feature, interface, pin name, AT command, or argument, it indicates that the function, feature, interface, pin, AT command, or argument is under development and currently not supported; and the asterisk (*) after a model indicates that the sample of such model is currently unavailable. |

# 2 General Overview

## 2.1. BG95 Series Highlights

- Smaller dimensions
- Lower power consumption
- Higher data rates
- More functions

## 2.2. Key Features Comparison

**Table 2: Key Features of BG95 Series and BG96**

| No. | Parameter | BG95 Series | BG96 |
|---|---|---|---|
| 1 | Dimensions | 23.6 mm × 19.9 mm × 2.2 mm | 26.5 mm × 22.5 mm × 2.3 mm |
| 2 | 3GPP Release | Rel-14 (LTE Cat M1 and LTE Cat NB2) | Rel-13 (LTE Cat M1 and LTE Cat NB1) |

| | | | |
|---|---|---|---|
| 3 | Frequency Bands | ● **BG95-M1 (Power Class 5, 21 dBm):**<br>**Cat M1 Only:**<br>LTE-FDD:<br>B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85<br>● **BG95-M2 (Power Class 5, 21 dBm):**<br>**Cat M1:**<br>LTE-FDD:<br>B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85<br>**Cat NB2:**<br>LTE-FDD:<br>B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B66/B71/B85<br>● **BG95-M3 (Power Class 5, 21 dBm):**<br>**Cat M1:**<br>LTE-FDD:<br>B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85<br>**Cat NB2:**<br>LTE-FDD:<br>B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B66/B71/B85<br>**EGPRS:**<br>850/900/1800/1900 MHz<br>● **BG95-M4 [1]:**<br>**Cat M1:**<br>LTE-FDD: | **BG96 (Power Class 3, 23 dBm)**<br>**Cat M1/Cat NB1**<br>LTE-FDD: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25 [2]/B26*/B28<br>LTE-TDD: B39 (for Cat M1 only)<br>**EGPRS**: 850/900/1800/1900 MHz |

[1] For more detailed power class information of BG95-M4, refer to ***document [1]***.
[2] LTE-FDD B25 is supported on BG96 of R1.2 hardware version.

B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B31/B66/B72/B73/B85

**Cat NB2:**

LTE-FDD:
B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B31/B66/B72/B73/B85

- **BG95-M5 (Power Class 3, 23 dBm):**

**Cat M1:**

LTE-FDD:
B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85

**Cat NB2:**

LTE-FDD:
B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B66/B71/B85

**EGPRS:**

850/900/1800/1900 MHz

- **BG95-M6 (Power Class 3, 23 dBm):**

**Cat M1:**

LTE-FDD:
B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/B85

**Cat NB2:**

LTE-FDD:
B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B66/B71/B85

- **BG95-MF (Power Class 5, 21 dBm):**

**Cat M1:**

LTE-FDD:
B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B27/B28/B66/

| | | | |
|---|---|---|---|
| | | B85<br>**Cat NB2:**<br>LTE-FDD:<br>B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B28/B66/B71/B85<br>**Wi-Fi (For Positioning Only):** 2.4 GHz | |
| 4 | Power Class | **LTE-FDD :**<br>● Class 5 (21 dBm +1.7/-3 dB)<br>● Class 3 (23 dBm ±2 dB)<br>● Class 2* (26 dBm ±2 dB)<br>**GSM:**<br>● Class 4 (33 dBm ±2 dB) for GSM850<br>● Class 4 (33 dBm ±2 dB) for EGSM900<br>● Class 1 (30 dBm ±2 dB) for DCS1800<br>● Class 1 (30 dBm ±2 dB) for PCS1900<br>● Class E2 (27 dBm ±3 dB) for GSM850 8-PSK<br>● Class E2 (27 dBm ±3 dB) for EGSM900 8-PSK<br>● Class E2 (26 dBm ±3 dB) for DCS1800 8-PSK<br>● Class E2 (26 dBm ±3 dB) for PCS1900 8-PSK | **LTE-FDD:**<br>● Class 3 (23 dBm ±2 dB)<br>**LTE-TDD:**<br>● Class 3 (23 dBm ±2 dB)<br>**GSM:**<br>● Class 4 (33 dBm ±2 dB) for GSM850<br>● Class 4 (33 dBm ±2 dB) for EGSM900<br>● Class 1 (30 dBm ±2 dB) for DCS1800<br>● Class 1 (30 dBm ±2 dB) for PCS1900<br>● Class E2 (27 dBm ±3 dB) for GSM850 8-PSK<br>● Class E2 (27 dBm ±3 dB) for EGSM900 8-PSK<br>● Class E2 (26 dBm ±3 dB) for DCS1800 8-PSK<br>● Class E2 (26 dBm ±3 dB) for PCS1900 8-PSK |
| 5 | Supply Voltage | **BG95-M1/-M2:**<br>● Supply voltage [3]: 2.6–4.8 V<br>● Typical supply voltage: 3.3 V<br>**BG95-M3/-M5/-M6/-MF:**<br>● Supply voltage: 3.3–4.3 V<br>● Typical supply voltage: 3.8 V<br>**BG95-M4:**<br>● Supply voltage: 3.2–4.2 V | ● Supply voltage: 3.3–4.3 V<br>● Typical supply voltage: 3.8 V |

[3] For every VBAT transition/re-insertion from 0 V, the minimum power supply voltage of BG95-M1/-M2 should be higher than 2.7 V. After the module starts up normally, the minimum safety voltage is 2.6 V. To ensure full-function mode, the minimum power supply voltage should be higher than 2.8 V.

| | | | |
|---|---|---|---|
| | | • Typical supply voltage: 3.8 V | |
| 6 | Power Consumption | PSM: 4 μA @ BG95-M1<br>PSM: 3.89 μA @ BG95-M2<br>PSM: 3.89 μA @ BG95-M3<br>PSM: 3.94 μA @ BG95-M4<br>PSM: 5.10 μA @ BG95-M5<br>PSM: 4.32 μA @ BG95-M6<br>PSM: 4.04 μA @ BG95-MF | PSM: 8.85 μA |
| 7 | Data Rate | Cat M1: Max. 588 kbps (DL)/1119 kbps (UL)<br>Cat NB2: Max. 127 kbps (DL)/158.5 kbps (UL)<br>EDGE: Max. 296 kbps (DL)/236.8 kbps (UL)<br>GPRS: Max. 107 kbps (DL)/85.6 kbps (UL) | Cat M1: Max. 375 kbps (DL)/375 kbps (UL)<br>Cat NB1: Max. 32 kbps (DL)/70 kbps (UL)<br>EDGE: Max. 296 kbps (DL)/236.8 kbps (UL)<br>GPRS: Max. 107 kbps (DL)/ 5.6 kbps (UL) |
| 8 | Memory Configurations | Integrated RAM and flash<br>(32 MB LPDDR2 and 64 MB NAND with ThreadX OS) | External 64 MB LPDDR2 and 128 MB NAND with ThreadX OS |
| 9 | (U)SIM Interface | Support 1.8 V (U)SIM card only | Support 1.8/3.0 V (U)SIM card |
| 10 | Processor | ARM Cortex A7 @ 800 MHz | ARM Cortex A7 @ 1.3 GHz |
| 11 | Positioning Technologies | • GNSS (GPS, GLONASS, BeiDou, Galileo, QZSS)<br>• Wi-Fi positioning (for BG95-MF only)<br>• Not support concurrent operation of WWAN and GNSS | • GNSS (GPS, GLONASS, BeiDou, Galileo, QZSS)<br>• Support concurrent operation of WWAN and GNSS |
| 12 | Voice | • VoLTE (For Cat M1 Only)<br>• CS voice for GSM (BG95-M3 and BG95-M5) | • VoLTE (For Cat M1 Only) |
| 13 | Security | • Secure Boot with RSA2048 and SHA256<br>• Hardware encryption: General purpose Crypto engine V5.3.3 and Crypto services APIs<br>• Hardware encryption: Random number generator V2.<br>• QSEEv5 (Secure Execution Environment) | • Secure Boot with RSA2048 and SHA256<br>• Hardware encryption: General purpose Crypto engine V5.3.3 and Crypto services APIs<br>• Hardware encryption: Random number generator.<br>• QSEEv4 |

| | | | |
|---|---|---|---|
| | | ● Secure file system<br>● Secure key provisioning with CRI-CM<br>● Certification: FIPS certified; DRBG hardware level 1; GPCE hardware level 2; MISRA compliant.<br>● Secure SPI. Hardware attestation. | ● Secure file system<br>● Secure key provisioning with CRI-CM |
| 14 | GRFC | Support GRFC interface (BG95-M1/-M2/-M3/-M5/-M6/-MF) | - |

# 3 Hardware Differences

This chapter provides a general introduction of hardware interface differences between BG95 series and BG96. For more specific information, refer to ***document [1]*** and ***document [2]***. In ***Chapter 3.9,*** the hardware differences between BG95 series and BG96 in QuecOpen solution are summarized as well.

## 3.1. Pin Assignment

The following figure shows the pin assignment of BG95 series.

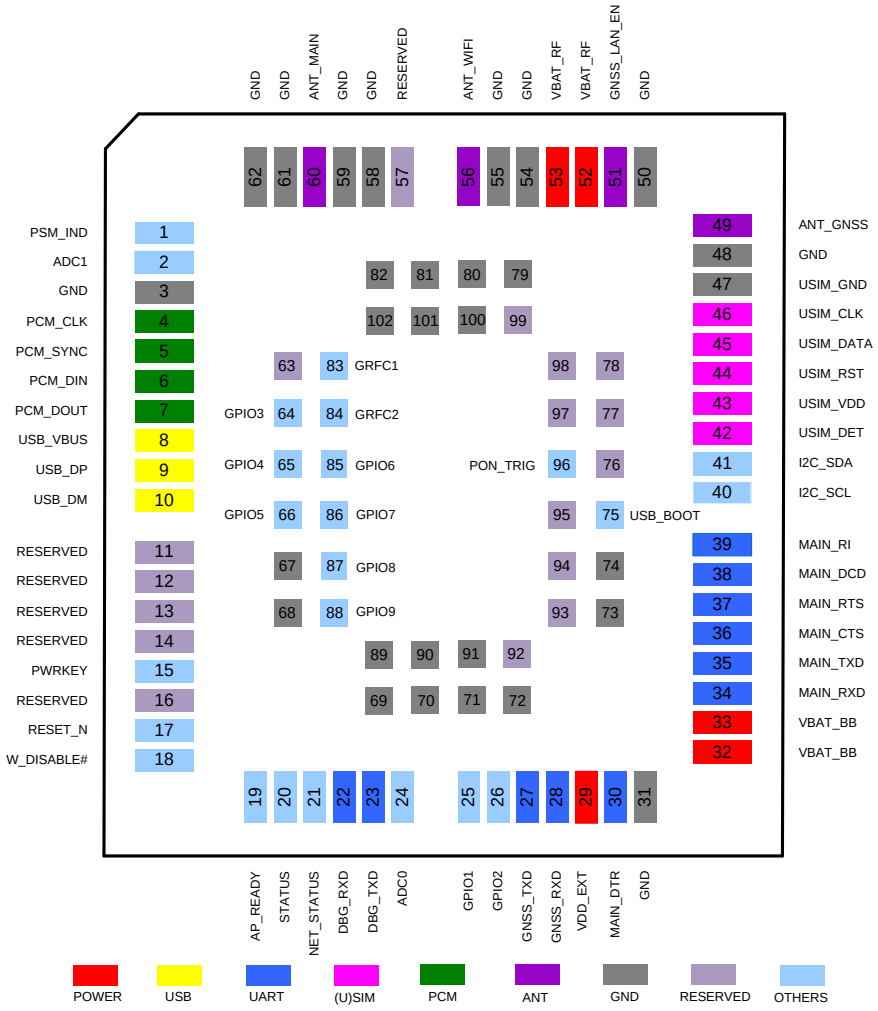


**Figure 1: Pin Assignment of BG95 Series (Top View)**

**NOTE**

1. Only BG95-M4 and BG95-MF support GNSS_LAN_EN (pin 51).
2. Only BG95-MF supports ANT_WIFI (pin 56).
3. BG95-MF does not support GPIO3 and GPIO4 interfaces (pin 64 and pin 65).
4. BG95-M4 does not support GRFC interfaces (pin 83 and pin 84).

The following figure shows the pin assignment of BG96.

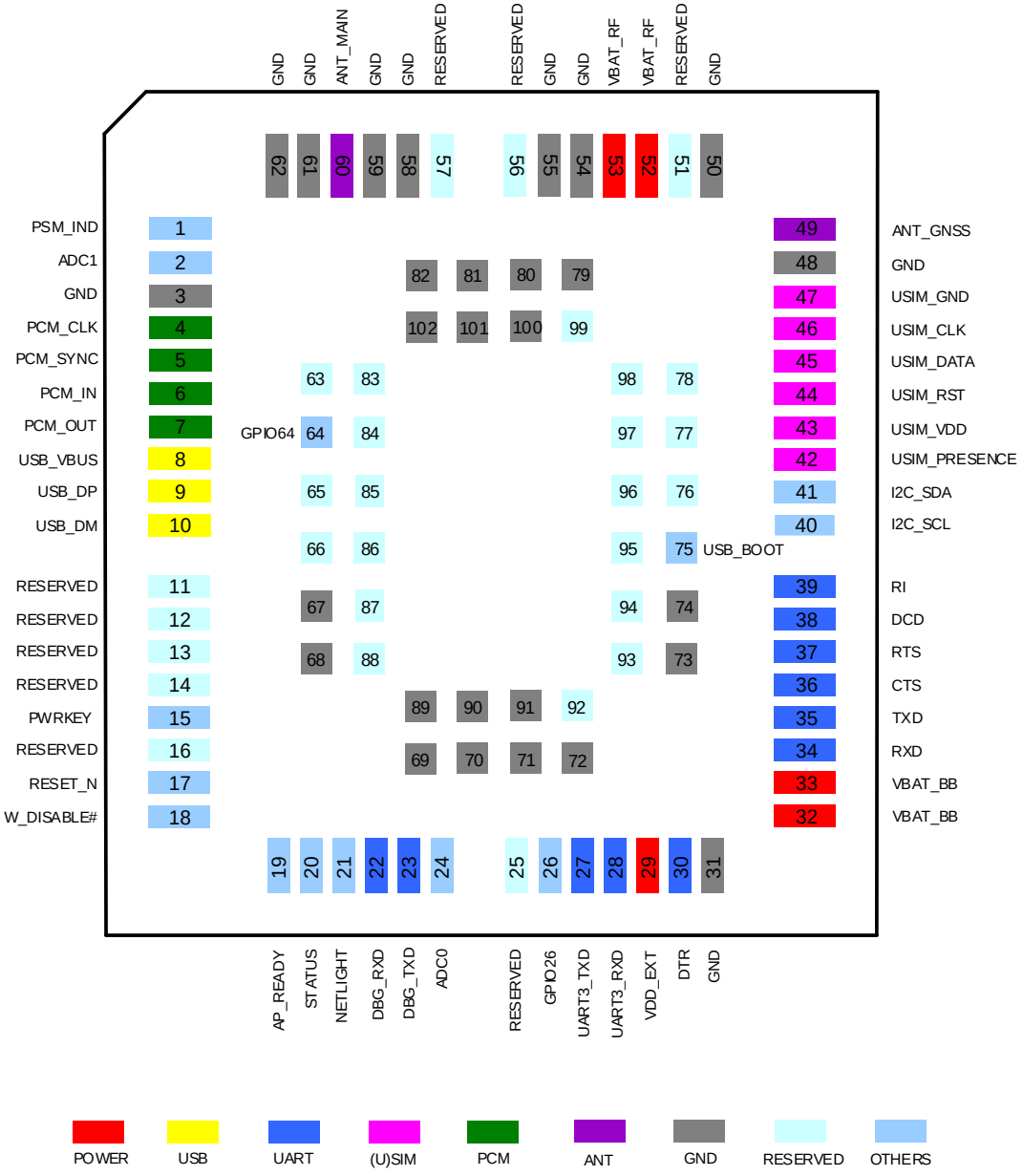


**Figure 2: Pin Assignment of BG96 (Top View)**

## 3.2. ADC Interfaces

BG95 series supports the use of only one ADC interface at a time: either ADC0 or ADC1. The two interfaces cannot be used simultaneously, as ADC1 connects directly to ADC0 inside the module.

BG96 supports two ADC interfaces: ADC0 and ADC1. The two interfaces are independent from each other.

## 3.3. PWRKEY

PWRKEY is used to turn on or off BG95 series and BG96 modules.

When the module is in power-off mode, it can be turned on by driving PWRKEY low for a certain time:

- 500–1000 ms for BG95 series
- 500 ms at least for BG96

For BG95 series module, PWRKEY output voltage is 1.5 V because of the voltage drop inside the chipset. Due to platform limitations, the chipset has integrated the reset function into PWRKEY. Therefore, never pull down PWRKEY to GND permanently.

For BG96 module, PWRKEY output voltage is 0.8 V because of the voltage drop inside the chipset, and PWRKEY can be pulled down to ground through a 10 kΩ resistor.

## 3.4. RESET_N

RESET_N is used to reset BG95 series and BG96 modules. The modules can be reset by driving RESET_N low for a certain time:

- 2–3.8 s for BG95 series
- 150–460 ms for BG96

RESET_N pin of BG95 series connects directly to PWRKEY inside the module, while BG96 provides a dedicated hardware reset pin.

## 3.5. GPIO Interfaces

BG95 series provides 9 GPIO interfaces:

1) Pin 25 (GPIO1)
2) Pin 26 (GPIO2)
3) Pin 64 (GPIO3)
4) Pin 65 (GPIO4)
5) Pin 66 (GPIO5)
6) Pin 85 (GPIO6)
7) Pin 86 (GPIO7)
8) Pin 87 (GPIO8)
9) Pin 88 (GPIO9)

BG96 module provides 2 GPIO interfaces:

1) Pin 26 (GPIO26)
2) Pin 64 (GPIO64)

**NOTE**

BG95-MF does not support GPIO3 and GPIO4 (pin 64 and pin 65).

## 3.6. (U)SIM Interface

Both BG95 series and BG96 modules provide only one (U)SIM interface.

BG95 series supports 1.8 V (U)SIM card only. BG96 supports either 1.8 V or 3.0 V (U)SIM card.

## 3.7. GRFC Interface

BG95 series provides two GRFC interfaces.

1) Pin 83 (GRFC1)
2) Pin 84 (GRFC2)

BG96 does not support GRFC interface.

**NOTE**

BG95-M4 does not support GRFC interfaces (pin 83 and pin 84).

## 3.8. Antenna Interfaces

BG95 series supports one main antenna interface and one GNSS antenna interface. Additionally, BG95-MF supports one Wi-Fi antenna interface.

1) Pin 49 (ANT_GNSS)
2) Pin 56 (ANT_WIFI) (for BG95-MF only)
3) Pin 60 (ANT_MAIN)

BG96 supports two antenna interfaces.

1) Pin 49 (ANT_GNSS)
2) Pin 60 (ANT_MAIN)

## 3.9. QuecOpen Solution Differences

In QuecOpen solution, BG95 series provides 21 GPIOs which can be configured into UART, SPI and I2C interfaces.

In QuecOpen solution, BG96 provides 14 GPIOs which can be configured into UART, SPI and I2C interfaces as well.

The following table shows the differences between the multiplexing functions of BG95 series and BG96 modules in QuecOpen solution.

**Table 3: Multiplexing Functions of BG95 Series and BG96 Modules in QuecOpen Solution**

| Pin No. | Pin Definition of BG95 Series in QuecOpen Solution | | | | | | | | Pin Definition of BG96 in QuecOpen Solution | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pin Name | Function 1 | Function 2 | Function 3 | Function 4 | Reset | Interrupt Wakeup* | Boot | Pin Name | Function 1 | Function 2 | Function 3 | Function 4 | Reset | Interrupt Wakeup* | Boot |
| 4 | GPIO1 | GPIO_24 | - | - | - | PD | - | - | GPIO1 | GPIO_23 | - | SPI1_CLK | - | B-PU | - | BOOT_ CONFIG |
| 5 | GPIO2 | GPIO_21 | - | - | - | PD | Supported | - | GPIO2 | GPIO_20 | UART1_TXD | SPI1_MOSI | - | B-PD | Supported | - |
| 6 | GPIO3 | GPIO_22 | - | - | - | PD | Supported | - | GPIO3 | GPIO_21 | UART1_ RXD | SPI1_MISO | - | B-PD | Supported | - |
| 7 | GPIO4 | GPIO_23 | - | - | | PD | - | - | GPIO4 | GPIO_22 | - | SPI1_CS_N | - | B-PD | Supported | - |
| 18 | GPIO5 | GPIO_3 | - | - | I2C1_SCL | PD | - | - | GPIO5 | GPIO_11 | - | SPI2_CLK | I2C2_SCL | B-PU | Supported | - |
| 19 | GPIO6 | GPIO_2 | - | - | I2C1_SDA | PD | Supported | - | GPIO6 | GPIO_10 | - | SPI2_CS_N | I2C2_SDA | B-PD | - | - |
| 22 | GPIO7 | GPIO_1 | UART1_RXD | | | PD | Supported | - | GPIO7 | GPIO_09 | UART2_ RXD | SPI2_MISO | - | B-PD | Supported | - |
| 23 | GPIO8 | GPIO_0 | UART1_TXD | | | PD | Supported | - | GPIO8 | GPIO_08 | UART2_TXD | SPI2_MOSI | - | B-PD | Supported | - |
| 25 | GPIO9 | GPIO_6 | - | SPI1_CS_N | - | PD | Supported | - | Reserved | - | - | - | - | - | - | - |
| 26 | GPIO10 | GPIO_7 | - | SPI1_CLK | - | PD | - | | GPIO9 | GPIO_15 | - | - | - | B-PD | - | - |
| 27 | GPIO11 | GPIO_4 | UART3_TXD | SPI1_MOSI | - | PD | Supported | BOOT_ CONFIG | GPIO10 | GPIO_12 | UART3_TXD | - | - | B-PD | Supported | - |
| 28 | GPIO12 | GPIO_5 | UART3_RXD | SPI1_MISO | - | PD | Supported | | GPIO11 | GPIO_13 | UART3_ RXD | - | - | B-PD | Supported | - |
| 40 | GPIO13 | GPIO_15 | - | SPI2_CLK | - | PD | - | | GPIO12 | GPIO_19 | | | I2C1_SCL | B-PD | - | - |
| 41 | GPIO14 | GPIO_14 | - | SPI2_CS_N | - | PD | Supported | | GPIO13 | GPIO_18 | - | - | I2C1_SDA | B-PD | - | - |
| 64 | GPIO15 | GPIO_12 | UART2_TXD | SPI2_MOSI | - | PD | - | | GPIO14 | GPIO_07 | | | | B-PD | - | - |
| 65 | GPIO16 | GPIO_13 | UART2_RXD | SPI2_MISO | - | PD | Supported | | Reserved | - | - | - | - | - | - | - |
| 66 | GPIO17 | GPIO_50 | PWM | - | - | PD | Supported | | Reserved | - | - | - | - | - | - | - |
| 85 | GPIO18 | GPIO_52 | - | - | - | PD | Supported | | Reserved | - | - | - | - | - | - | - |
| 86 | GPIO19 | GPIO_36 | - | - | - | PD | Supported | | Reserved | - | - | - | - | - | - | - |
| 87 | GPIO20 | GPIO_40 | - | - | - | PD | - | | Reserved | - | - | - | - | - | - | - |
| 88 | GPIO21 | GPIO_41 | - | - | - | PD | - | | Reserved | - | - | - | - | - | - | - |

**NOTE**

1. The pin functions 1/2/3/4 take effect only after software configuration.
2. In QuecOpen solution, GPIO1 (pin 4) of BG96 and GPIO11 (pin 27) of BG95 series are BOOT_CONFIG. Never pull them up before startup, otherwise the module cannot power on normally.
3. In QuecOpen solution, BG95-MF does not support GPIO15 and GPIO16 interfaces (pin 64 and pin 65).
4. In QuecOpen solution, never pull down PWRKEY of BG95 series to GND permanently.
5. Due to pin multiplexing differences in QuecOpen solution, it is recommended to submit your application design to Quectel Technical Supports to have a design review.

Pay attention to the following differences between BG95 series and BG95 during QuecOpen application design.

### 3.9.1. Pin 4/5/6/7

In QuecOpen solution, pin 4/5/6/7 cannot be configured into UART or SPI interface on BG95 series.

### 3.9.2. Pin 25/26/27/28

In QuecOpen solution, pin 25/26/27/28 can be configured into SPI interface on BG95 series, but they cannot be configured into SPI interface on BG96.

### 3.9.3. Pin 40/41/64/65

In QuecOpen solution, the pin 40/41/64/65 can be configured into UART or SPI interface on BG95 series.

### 3.9.4. Pin 25/65/66/85/86/87/88

In QuecOpen solution, BG95 series provides seven more GPIOs (pin 25/65/66/85/86/87/88) than BG96.

# 4 Software Differences

## 4.1. Differences in Network Commands

See ***documents [5]*** to ***[8]*** for details about the commands listed in this chapter.

### 4.1.1. AT+QNWINFO

As BG95 series supports LTE Cat NB2, the RAT descriptions in the response of the AT command are changed.

| AT+QNWINFO | |
|---|---|
| BG96 | AT+QNWINFO<br>+QNWINFO: "CAT-M1","46000","LTE BAND 20",6300<br><br>OK<br><br>AT+QNWINFO<br>+QNWINFO: "CAT-NB1","46000","LTE BAND 20",6300<br><br>OK |
| BG95 Series | AT+QNWINFO<br>+QNWINFO: "eMTC","46000","LTE BAND 20",6300<br><br>OK<br><br>AT+QNWINFO<br>+QNWINFO: "NBIoT","46000","LTE BAND 20",6300<br><br>OK |

### 4.1.2. AT+QENG

As BG95 series supports LTE Cat NB2, the RAT descriptions in the response of the AT command are changed.

| AT+QENG | |
|---|---|
| BG96 | AT+QENG="servingcell"<br>+QENG: "servingcell","NOCONN","CAT-M","FDD",460,00,1A2D0A6,32,6300,20,3,3,1,-79,-3,-62,24,60<br><br>OK<br><br>AT+QENG="servingcell"<br>+QENG: "servingcell","NOCONN","CAT-NB","FDD",460,00,1A2D001,51,6420,20,0,0,2,-67,-10,-55,18,73<br><br>OK |
| BG95 Series | AT+QENG="servingcell"<br>+QENG: "servingcell","NOCONN","eMTC","FDD",460,00,1A2D0A6,32,6300,20,3,3,1,-79,-3,-62,24,60<br><br>OK<br><br>AT+QENG="servingcell"<br>+QENG: "servingcell","NOCONN","NBIoT","FDD",460,00,1A2D001,51,6420,20,0,0,2,-67,-10,-55,18,73<br><br>OK |

### 4.1.3. AT+QCSQ

As BG95 series supports LTE Cat NB2, the RAT descriptions in the response of the AT command are changed.

| AT+QCSQ | |
|---|---|
| BG96 | AT+QCSQ<br>+QCSQ: "CAT-M1",-66,-86,227,-4<br><br>OK<br><br>AT+QCSQ<br>+QCSQ: "CAT-NB1",-68,-69,169,-3 |

| | |
|---|---|
| | OK |
| BG95 Series | AT+QCSQ<br>+QCSQ: "eMTC",-55,-65,192,-10<br><br>OK<br><br>AT+QCSQ<br>+QCSQ: "NBIoT",-60,-72,197,-10<br><br>OK |

### 4.1.4. AT+QCFG="band"

As BG95 series supports more network bands, there are some changes in the band configuration command.

| AT+QCFG="band" | |
|---|---|
| BG96 | AT+QCFG="band"<br>+QCFG: "band",0xf,0x400b0f189f,0xb0f189f<br><br>OK |
| BG95 Series | AT+QCFG="band"<br>+QCFG: "band",0xf,0x100002000000000F0E389F,0x100042000000000B0E189F<br><br>OK |

**NOTE**

1. BG95 series includes multiple models. The default band configuration depends on the definition of each specific model.
2. See ***document [6]*** for more details about the command for BG95 series.

## 4.2. Differences in Package Switch Commands

See ***documents [9]*** to ***[12]*** for details about the commands listed in this chapter.

### 4.2.1. TCP/UDP/IP

AT+QICFG="ipv6prior" is supported on BG96 only.

| AT+QICFG="ipv6prior" | |
|---|---|
| BG96 | AT+QICFG="ipv6prior",(0,1) |

**AT+QICFG="sack"** is supported on BG95 series only.

| AT+QICFG="sack" | |
|---|---|
| BG95 Series | AT+QICFG="sack",(0,1) |

### 4.2.2. SSL

BG95 series supports more cipher suites than BG96.

| AT+QSSLCFG="ciphersuite" | |
|---|---|
| BG96 | BG96 series modules support below cipher suite:<br>AT+QSSLCFG="ciphersuite",(0-5),(0x0035,0x002F,0x0005,0x0004,0x000A,0x003D,0xC011,0xC012,0xC013,0xC014,0xC027,0xC028,0xC02F,0xFFFF) |
| BG95 Series | AT+QSSLCFG="ciphersuite",(0-5),(0x0035,0x002F,0x0005,0x0004,0x000A,0x003D,0xC002,0xC003,0xC004,0xC005,0xC007,0xC008,0xC009,0xC00A,0xC011,0xC012,0xC013,0xC014,0xC00C,0xC00D,0xC00E,0xC00F,0xC023,0xC024,0xC025,0xC026,0xC027,0xC028,0xC029,0xC02A,0xC02F,0xFFF) |

## 4.3. Differences in LwM2M Commands

BG95 series has more optimizations on LwM2M AT Commands. See ***document [13]*** and ***document [14]*** for details about the commands listed in this chapter.

| LwM2M AT Commands | |
|---|---|
| BG96 | AT+QLWM2M="select"[,(0-5]<br>AT+QLWM2M="cdp",[<server>,<port>]<br>AT+QLWM2M="epns"[,(0,1),<ep_name>] |

| | |
|---|---|
| | AT+QLWM2M="bsmode"[,(0,1)]<br>AT+QLWM2M="mbsps"[,<srvCode>,<seriaNo>,<cnt>,<iccid>,<module>[,<mac>]]<br>AT+QLWM2M="register"[,(0,1)]<br>AT+QLWM2M="update",<ssid>[,(0,1)]<br>AT+QLWM2M="deregister"<br>AT+QLWM2M="lifetime",<ssid>[,(30-86400)]<br>AT+QLWM2M="uldata",<objID>,(1-1460),<Data><br>AT+QLWM2M="ulhex",<objID>,(1-1460),<HexData><br>AT+QLWM2M="dltype"[,(0,1)]<br>AT+QLWM2M="ippref"[,(0,1)]<br>AT+QLWM2M="enable"[,(0,1)]<br>AT+QLWM2M="bootstrap",(0-4)[,<instance>]<br>AT+QLWM2M="qcli_en"[,(0,1)]<br>AT+QLWM2M="psk"[,(0,1)]<br>AT+QLWM2M="apn"[,<apn_name>]<br>AT+QLWM2M="endpoint"[,(4,7),(4,7)]<br>AT+QLWM2M="reset"<br>AT+QLWM2M="clean" |
| BG95 Series | AT +QLWCFG="autostart"[,(0,1)]<br>AT +QLWCFG="pdpcid"[,(0-5),(1-16)],(0,2,3,6,7,10,11)]]<br>AT +QLWCFG="security"[,(0-5)[,(1-65534),<server_addr>,(0,1),(0,2,3)[,<PSK_ID>,<PSK_key>]]]<br>AT +QLWCFG="server"[,(0-5)[,(0-2147483647),(0-2147483647),(0-2147483647),(60-2147483647),(0,1),<binding>]]<br>AT +QLWCFG="epns"[,(0,1),<bs_epname>,<reg_epname>]<br>AT +QLWCFG="transcfg"[,(0-2147483647),(0-2147483647),(0-2147483647)]<br>AT +QLWCFG="version"[,(0,1)]<br>AT +QLWCFG="select"[,(0-6)[,(0,1)]]<br>AT +QLWCFG="host",(0,1)[,(0-3),<host_value>]<br>AT +QLWCFG="device"[,<manufacturer>,<model_no>,<hw_version>,<sw_version>,<fw_version>,<device_type>]<br>AT +QLWCFG="session"[,(0-2147483647),(0-86400)]<br>AT +QLWCFG="dataformat"[,(0,1)]<br>AT +QLWSVC="reg"[,(0,1)]<br>AT +QLWSVC="dereg"[,(0,1)]<br>AT +QLWSVC="lifetime",(1-65534)[,(0-2147483647)]<br>AT +QLWSVC="update",(1-65534)[,(0,1)]<br>AT +QLWSVC="state"[,(0-5)]<br>AT+QLWSVC="uldata",<shortID>,<URI>,<data_len>,<data>[,(0,1),(0,1)] |

## 4.4. Differences in GNSS Commands

As the design of GNSS feature on BG95 series is different from that of BG96, some of the AT commands are changed. See ***document [15]*** and ***document [16]*** for details about the commands listed in this chapter.

| AT+QGPS | |
|---|---|
| BG96 | AT+QGPS=<GNSS_mode>[,<fix_max_time>[,<fix_max_dist>[,<fix_count>[,<fix_rate>]]]] |
| BG95 Series | AT+QGPS=<GNSS_mode>[,<accuracy>[,<fix_count>[,<fix_rate>[,<HEPE>]]]] |

BG95 series provides a new AT command to configure the priority of WWAN and GNSS.

| AT+QGPSCFG=”priority” | |
|---|---|
| BG95 Series | AT+QGPSCFG=”priority”[,<priority_type>[,<save>]] |

## 4.5. Differences in DFOTA Commands

As the DFOTA mechanism is changed on BG95 series, some of the AT commands are changed. See ***document [17]*** and ***document [18]*** for details about the commands listed in this chapter.

### 4.5.1. AT+QFOTADL=<HTTP_URL>

| AT+QFOTADL=<httpURL> Upgrade Firmware When Delta Package is Stored on HTTP(S) Server | |
|---|---|
| BG96 | AT+QFOTADL=<httpURL><br>OK<br>+QIND: "FOTA","HTTPSTART"<br>+QIND: "FOTA","HTTPEND",<http_err><br>+QIND: "FOTA","START"<br>+QIND: "FOTA","UPDATING",<percent><br>+QIND: "FOTA","UPDATING",<percent><br>...<br>+QIND: "FOTA","RESTORE",<percent><br>+QIND: "FOTA","RESTORE",<percent><br>...<br>+QIND: "FOTA","END",<err> |
| BG95 Series | AT+QFOTADL=<HTTP_URL><br>OK |

| | |
|---|---|
| | +QIND: "FOTA","HTTPSTART"<br>+QIND: "FOTA","DOWNLOADING",<percent><br>+QIND: "FOTA","DOWNLOADING",<percent><br>...<br>+QIND: "FOTA","HTTPEND",<HTTP_err><br>+QIND: "FOTA","RESETTING"<br>+QIND: "FOTA","START"<br>+QIND: "FOTA","UPDATING",<percent><br>+QIND: "FOTA","UPDATING",<percent><br>...<br>+QIND: "FOTA","END",<update_err> |

### 4.5.2. AT+QFOTADL=<CoAP_URL>

BG95 series supports downloading the delta firmware package from a CoAP(S) server.

| AT+QFOTADL=<CoAP_URL> Upgrade Firmware When Delta Package is Stored on CoAP(S) Server | |
|---|---|
| BG95 Series | AT+QFOTADL=<CoAP_URL> |

### 4.5.3. AT+QFOTADL="COM:",<file_size>,<timeout>

BG95 series supports uploading a delta firmware package from local host to the NAND flash. If a delta package has existed in the NAND flash, it will be overwritten when a new package is uploaded.

| AT+QFOTADL="COM:", <file_size>,<timeout> Upload a Delta Package to Flash | |
|---|---|
| BG95 Series | AT+QFOTADL="COM:",<file_size>[,<timeout>]<br>CONNECT<br><br>TA switches to the data mode (transparent access mode), and the delta package in the binary form can be inputted. When the total size of the inputted data reaches **<file_size>** (unit: byte), TA returns to the command mode and replies the following codes:<br>**+QFOTADL: <upload_size>,<check_sum>**<br><br>**OK**<br><br>If there is any error:<br>**+CME ERROR: <err>** |

# 5 Appendix References

**Table 4: Related Documents**

| Document Name |
| --- |
| [1] Quectel_BG95_Series_Hardware_Design |
| [2] Quectel_BG96_Hardware_Design |
| [3] Quectel_BG95_Series_QuecOpen_Hardware_Design |
| [4] Quectel_BG96_QuecOpen_Hardware_Design |
| [5] Quectel_BG95&BG77&BG600L_Series_AT_Commands_Manual |
| [6] Quectel_BG95&BG77&BG600L_Series_QCFG_AT_Commands_Manual |
| [7] Quectel_BG96_AT_Commands_Manual |
| [8] Quectel_BG96_QCFG_AT_Commands_Manual |
| [9] Quectel_BG95&BG77&BG600L_Series_TCP(IP)_Application_Note |
| [10] Quectel_BG96_TCP(IP)_Application_Note |
| [11] Quectel_BG95&BG77&BG600L_Series_SSL_Application_Note |
| [12] Quectel_BG96_SSL_Application_Note |
| [13] Quectel_BG95&BG77&BG600L_Series_LwM2M_Application_Note |
| [14] Quectel_BG96_LwM2M_User_Guide |
| [15] Quectel_BG95&BG77&BG600L_Series_GNSS_Application_Note |
| [16] Quectel_BG96_GNSS_Application_Note |
| [17] Quectel_BG95&BG77&BG600L_Series_DFOTA_Application_Note |
| [18] Quectel_BG96_DFOTA_User_Guide |

**Table 5: Terms and Abbreviations**

| Abbreviation | Description |
|---|---|
| ADC | Analog-to-Digital Converter |
| ARM | Advanced RISC Machines |
| API | Application Programming Interface |
| CoAP | Constrained Application Protocol |
| CS | Coding Scheme |
| DCS | Data Coding Scheme |
| DFOTA | Delta Firmware Upgrade Over-The-Air |
| EDGE | Enhanced Data Rates for GSM Evolution |
| EGPRS | Enhanced General Packet Radio Service |
| EGSM | Enhanced GSM |
| FDD | Frequency Division Duplex |
| FTPS | FTP over SSL |
| GLONASS | Global Navigation Satellite System (Russia) |
| GNSS | Global Navigation Satellite System |
| GPIO | General-Purpose Input/Output |
| GPRS | General Packet Radio Service |
| GRFC | Generic RF Control |
| GPS | Global Positioning System |
| GSM | Global System for Mobile Communications |
| HTTP | Hypertext Transfer Protocol |
| IP | Internet Protocol |
| LwM2M | Lightweight M2M |
| LTE | Long-Term Evolution |

| | |
|---|---|
| MQTT | Message Queuing Telemetry Transport |
| NAND | NON-AND |
| OS | Operating System |
| PCS | Personal Communications Service |
| PSK | Pre-Shared Key |
| PSM | Power Saving Mode |
| QZSS | Quasi-Zenith Satellite System |
| QSEEv5 | Secure Execution Environment |
| RAT | Radio Access Technology |
| SPI | Serial Peripheral Interface |
| SSL | Secure Sockets Layer |
| TCP | Transmission Control Protocol |
| UART | Universal Asynchronous Receiver/Transmitter. |
| UDP | User Datagram Protocol |
| URL | Uniform Resource Locator |
| VoLTE | Voice (voice calls) over LTE |
| WWAN | Wireless Wide Area Network |