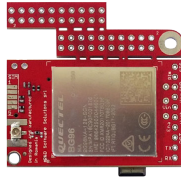
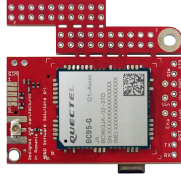




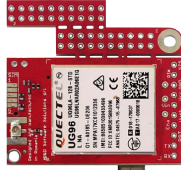
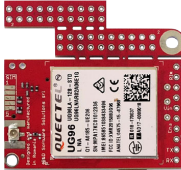
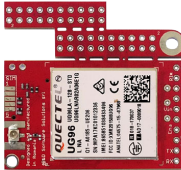




PN – category	Description	Image	Usage
UGSM219-BG96#UFL SKU: ITBP-3009  <i>Low Power LTE</i>	LTE CATM1 + NB IoT + EGPRS + GNSS - Quectel BG96 3GPP E-UTRA Release 13  Bands: FDD LTE - B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B26/B28 TDD LTE - B39 [CAT M1 only] GSM - 850/900/1800/1900 MHz  Speeds: CAT M1 - up to Max 300Kbps (DL), Max. 375Kbps (UL) NB IoT - up to Max. 32Kbps (DL), Max. 70Kbps (UL) EDGE/GPRS - up to Max. 296Kbps (DL), Max. 236.8Kbps (UL) / Max. 107Kbps (DL), Max. 85.6Kbps (UL)  GNSS: Galileo, GPS, GLONASS, BeiDou/Compass, QZSS  equipped with u.FL connector - GSM, u.FL connector - GNSS		Global
UGSM219-BG96#SMA SKU: ITBP-3010  <i>Low Power LTE</i>	Same as above, but with SMA F connector – GSM and u.FL connector - GNSS		Global
UGSM219-BC95G#UFL SKU: ITBP-3011  <i>Low Power LTE</i>	NB IoT only - Quectel BC95G  Bands: LTE - B1/B3/B8/B5/B20/B28**  Speeds: NB IoT Single Tone / Multi Tone** - Max. 25.2Kbps (DL), Max. 15.625 / 54 Kbps (UL)  equipped with u.FL connector		Global
UGSM219-BC95G#SMA SKU: ITBP-3012  <i>Low Power LTE</i>	Same as above, but with SMA F connector		Global
UGSM219-EG95E#UFL SKU: ITBP-3001  <i>LTE / 4G</i>	LTE / 4G LTE IoT/M2M-optimized CAT4 - Quectel EG95E 3GPP E-UTRA Release 11  Bands: FDD LTE - B1/B3/B7/B8/B20/B28A** WCDMA - B1/B5/B8 GSM - B1/B8  Speeds: LTE-FDD - up to Max 150Mbps (DL)/Max 50Mbps (UL) DC-HSDPA: - Max 42Mbps (DL); HSUPA: Max 5.76Mbps (UL); WCDMA: Max 384Kbps (DL)/Max 384Kbps (UL) EDGE/GPRS - up to Max. 296Kbps (DL), Max. 236.8Kbps (UL) / Max. 107Kbps (DL), Max. 85.6Kbps (UL)  equipped with u.FL connector		Europe*
UGSM219-EG95E#SMA SKU: ITBP-3002  <i>LTE / 4G</i>	Same as above, but with SMA F connector		Europe*
UGSM219-EG95NA#UFL SKU: ITBP-3005  <i>LTE / 4G</i>	LTE / 4G LTE IoT/M2M-optimized CAT4 - Quectel EG95NA 3GPP E-UTRA Release 11  Bands: FDD LTE - B2/B4/B5/B12/B13 WCDMA - B2/B4/B5  Speeds: LTE-FDD - up to Max 150Mbps (DL)/Max 50Mbps (UL) DC-HSDPA: - Max 42Mbps (DL); HSUPA: Max 5.76Mbps (UL); WCDMA: Max 384Kbps (DL)/Max 384Kbps (UL)  GNSS: Galileo, GPS, GLONASS, BeiDou/Compass, QZSS  equipped with u.FL connector - GSM, u.FL connector - GNSS		N. America
UGSM219-EG95NA#SMA SKU: ITBP-3006  <i>LTE / 4G</i>	Same as above, but with SMA F connector - GSM, u.FL connector - GNSS		N. America
UGSM219-EG91E#UFL SKU: ITBP-3003  <i>LTE / 4G</i>	LTE / 4G LTE IoT/M2M-optimized CAT1 - Quectel EG91E 3GPP E-UTRA Release 11  Bands: FDD LTE - B1/B3/B7/B8/B20/B28A** WCDMA - B1/B5/B8 GSM - B1/B8  Speeds: LTE-FDD - up to Max 10Mbps (DL)/Max 10Mbps (UL) DC-HSDPA: - Max 42Mbps (DL); HSUPA: Max 5.76Mbps (UL); WCDMA: Max 384Kbps (DL)/Max 384Kbps (UL) EDGE/GPRS - up to Max. 296Kbps (DL), Max. 236.8Kbps (UL) / Max. 107Kbps (DL), Max. 85.6Kbps (UL)  equipped with u.FL connector		Europe*
UGSM219-EG91E#SMA SKU: ITBP-3004  <i>LTE / 4G</i>	Same as above, but with SMA F connector		Europe*

PN – category	Description	Image	Usage
UGSM219-EG91NA#UFL SKU: ITBP-3007  <i>LTE / 4G</i>	LTE / 4G LTE IoT/M2M-optimized CAT1 - Quectel EG91NA 3GPP E-UTRA Release 11  Bands: FDD LTE - B2/B4/B5/B12/B13 WCDMA - B2/B4/B5  Speeds: LTE-FDD - up to Max 10Mbps (DL)/Max 10Mbps (UL) DC-HSDPA: - Max 42Mbps (DL); HSUPA: Max 5.76Mbps (UL); WCDMA: Max 384Kbps (DL)/Max 384Kbps (UL)  GNSS: Galileo, GPS, GLONASS, BeiDou/Compass, QZSS  equipped with u.FL connector - GSM, u.FL connector - GNSS		N. America
UGSM219-EG91NA#SMA SKU: ITBP-3008  <i>LTE / 4G</i>	Same as above, but with SMA F connector - GSM, u.FL connector - GNSS		N. America
UGSM219-UG96#UFL SKU: ITBP-3013  <i>3G + GSM GLOBAL</i>	3G [UMTS/HSPA]- Quectel UG96  UMTS - 800/850/900/1900/2100 Mhz GSM - 850/900/1800/1900 MHz  Speeds: HSUPA/HSPDA - Max 5.76Mbps / Max 7.2Mbps UMTS - Max. 384Kbps (DL), Max. 384Kbps EDGE/GPRS - up to Max. 296Kbps (DL), Max. 236.8Kbps (UL) / Max. 107Kbps (DL), Max. 85.6Kbps (UL)  equipped with u.FL connector		Global
UGSM219-UG96#SMA SKU: ITBP-3014 <i>3G + GSM GLOBAL</i>	Same as above, but with SMA F connector		Global
UGSM219-UG95E#UFL SKU: ITBP-3015  <i>3G + GSM European</i>	3G [UMTS/HSPA]- Quectel UG95E  UMTS - 900/2100 Mhz GSM - 900/1800 MHz  Speeds: HSUPA/HSPDA - Max 5.76Mbps / Max 7.2Mbps UMTS - Max. 384Kbps (DL), Max. 384Kbps EDGE/GPRS - up to Max. 296Kbps (DL), Max. 236.8Kbps (UL) / Max. 107Kbps (DL), Max. 85.6Kbps (UL)  equipped with u.FL connector		Europe*
UGSM219-UG95E#SMA SKU: ITBP-3016 <i>3G + GSM European</i>	Same as above, but with SMA F connector		Europe*
UGSM219-M95FA#UFL SKU: ITBP-3017  <i>GSM/GPRS GLOBAL</i>	2G [GSM/GPRS/EDGE]- Quectel M95FA  GSM - 850/900/1800/1900 MHz  Speeds: EDGE/GPRS - up to Max. 296Kbps (DL), Max. 236.8Kbps (UL) / Max. 107Kbps (DL), Max. 85.6Kbps (UL)  equipped with u.FL connector		Global
UGSM219-M95FA#UFL SKU: ITBP-3018 <i>GSM/GPRS GLOBAL</i>	Same as above, but with SMA F connector		Global

Part number	Accessories description
ihatGSM3G101B	<b>Raspberry PI [Zero, B+, II, II, 3, 3B, 3B+, 4] HAT adapter board</b> - connect u-GSM shield, via ITBPMM interface, with Raspberry PI without wires [not using embedded Raspberry PI interface]
j328GSM3GLader102B	<b>Arduino Micro / Arduino Mini / Arduino Nano adapter board</b> - connect u-GSM shield, via ITBPMM interface, with Arduino Micro / Arduino Nano USB / ArduinoPro Mini (or other compatible boards) without wires
gSPS101#4V(DDRV)	<b>g-SPS 4V adapter board</b> external plug-able switching power supply, 5-19V input, 4V output, 650mA sustained and max 2A pulse. 20.3x34.29mm. Use in "without LiPol/stand-alone" u-GSM boards configuration.
gSPS101#5V(LiPOL)	g-SPS 5V adapter board external plug-able switching power supply, 6-19V input, 5V output, 650mA sustained and max 2A pulse. 20.3x34.29mm. Use in "with LiPol battery" u-GSM boards configuration, when main power supply voltage is bigger than 5V.
ITBP-EMB2-UFL#100	embedded GSM antenna, 850Mhz->2250Mhz, u.FL connector and 100mm cable
ITBP-UFL-SMAF#100	u.FL to SMA female panel 100mm pigtail
ITBP-UFL-SMAF#085	u.FL to SMA female panel 85mm pigtail
ITBP-GSM-ANT-SMA90D#001	mini GSM/UMTS antenna, 0-1db, rod type, SMA F, 90 degree, no cable
SCAP1F5V#001	super capacitor for itbrainpower modular modems - 1F, 5V, ESR 150 mOhm
ITBP-LiPOL-CON#TP01	Lithium Polymer battery connector

\* EUROPE and other countries having compatible frequency networks

\*\* under development

## FEATURES:

*Unique modem form factor* that supports ALL existing GSM protocols [LTE CAT M1, NB IoT, LTE CAT 4, LTE CAT 1, 3G/UMTS and 2G/GSM], depending on embedded module variant.

Being a master piece of design, u-GSM is the unique world-wide modem shield that can be directly plugged to Raspberry PI or to BeagleBone Black and covers all GSM standards:

- [Low Power LTE] CAT M1 + NB IoT + 2G + GNSS - having embedded Quectel BG96 module
- [Low Power LTE] NB IoT - having embedded Quectel BC95G module
- LTE CAT 4 + 3G/UMTS + GSM - having embedded Quectel EG95x module
- LTE CAT 1 + 3G/UMTS + GSM - having embedded Quectel EG91x module
- 3G/UMTS + GSM - having embedded Quectel UG96 or UG95x module
- 2G / GSM / GPRS / EDGE - having embedded Quectel M95FA module

Info about available versions and modem performances [bands, transfer speeds, protocols supported], please read previous table.

**Raspberry PI embedded interface:** Plug directly the u-GSM shield into *Raspberry PI having 40pins GPIO interface[B like GPIO]*. Raspberry PI 4, 3B+, 3A+, 3, II, B+, Zero and Zero W are supported.

**BeagleBone Black embedded interface:** Plug directly the u-GSM shield into *BeagleBone Black P9 GPIO interface*.

**u-GSM shield can be powered directly from RPI / BBB 5V PINs!!** - thanks to integrated LiPO / LiIoN battery charger.

**GNSS [GPS + GLONASS] engine:** High performances GNSS engine embedded having parallel GALILEO, GPS and Glonass satellites interpolation for best sensitivity and accuracy. GNSS service it is available only for u-GSM versions equipped with BG96, EG91NA and EG95NA.

**Embedded USB adapter** - with mini-USB type B socket and *USB soldering pads*. Raspberry PI and BeagleBone Black Linux [DEBIAN] and Windows drivers support.

**ITBPM\* interface having 3-5V auto voltage support** for UART [TX, RX] and control GPIOs [ENA, RST, STS and RI]

- 0.1"(2.54mm) BIG SIZE soldering pads.
- u-GSM may be wired directly (without the need for any level adapter board) with any 3/5V Arduino shield or any version of RASPBERRY PI, BEAGLEBONE, other SBC or any other 3V-5V microcontroller.

Multiple powering configurations - the u-GSM shield can run in configurations with or without Lithium Polymer battery, depending on chosen powering schema.

SIM support: 1 x NANO SIM/USIM socket + 1 x external SIM interface.

**Very compact and light weight:** 27 x 45mm [main partition -wo RPI&BBB interfaces] / around 10g.

Arduino, BeagleBone and RaspberryPI code examples support files: - 4G, LTE, 3G, UMTS, GSM, SMS, DTMF, TCP/UDP, HTTPS and HTTP over 4G/3G/GPRS\*, smart features like RAM DISK SYSTEM for FILE STORAGE and other.

RaspberryPI and BeagleBone PPP, TCPIP routing support (Debian distribution based) and modem control scripts.

\* ITBPMI - itbrainpower.net modular modem interface - compatible with any of our previous modular modems



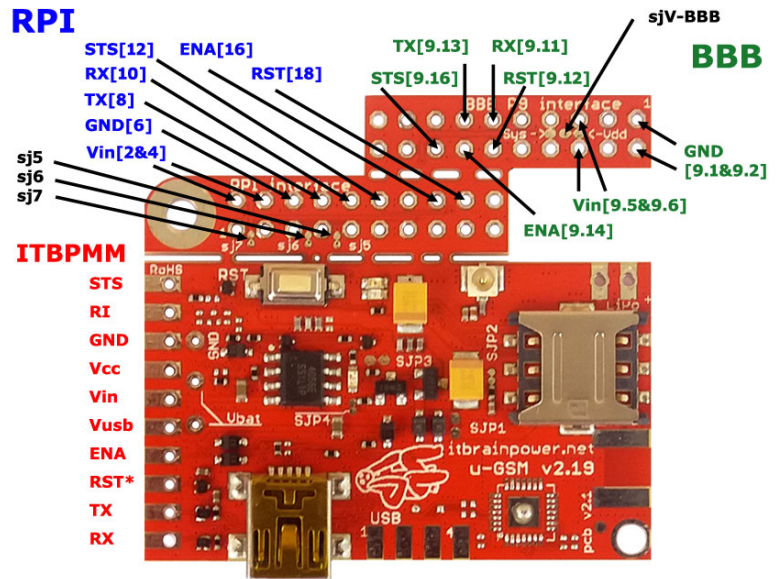
# INTERFACES, SWITCHES and CONNECTORS:

## ITBPM INTERFACE

In the left edge of the top PCB side, bottom to top:

1. RX[TXD] - modem TX - output
2. TX[RXD] - modem RX - input
3. RST - MODEM RESET - input, active HIGH\*
4. ENA - ENABLE MODEM POWER - input, active HIGH\*\*
5. Vusb - POWER PIN - output +5V (USB +5V)
6. Vin - POWER PIN - input +5V for LiPol charger only
7. Vcc - POWER PIN - input/output +4V\*\*
8. GND - POWER and DIGITAL GROUND
9. RI - RING INDICATOR - output
10. STATUS - STATUS - output

\* min. 250msec. pulse [HIGH level] will RESET the modem, excepting BG96 variant. RST pin have alternate functionality, as POWER ON / POWER OFF / exit PSM mode, for BG96 variants.  
 \*\* HIGH level will enable modem power. All u-GSM variants, excepting BG96, will be waked [POWERED ON]  
 \*\* LOW level disconnects the modem power. All u-GSM variants will shut-down.  
 \*&\*\* To wake BG96 variant, keep ENA pin to HIGH level and then apply 250ms HIGH level pulse to RST pin.



## Raspberry PI embedded interface

In the PCB top side left hand, from left to right:

- RPIO2 - Vin <--> RPI 5V\*
- RPIO4 - Vin <--> RPI 5V\*
- RPIO6 - GND <--> RPI GND
- RPIO8 - TX[RXD] <--> RPI SERIAL TX\*\*
- RPIO10 - RX[TXD] <--> RPI SERIAL RX\*\*
- RPIO12 - STS <--> RPI GPIO18
- RPIO16 - ENA <--> RPI GPIO23
- RPIO16 - RST <--> RPI GPIO24

\* Read about sjp7 functionality below.  
 \*\* Read about sjp5 and sjp6 functionality below.

## BeagleBone Black embedded interface

In the PCB top side right hand, from right to left:

- P9.01 - GND <--> BBB GND
- P9.02 - GND <--> BBB GND
- P9.05 - Vin <--> VDD 5V\* \*\*\*
- P9.06 - Vin <--> VDD 5V\* \*\*\*
- P9.11 - RX[TXD] <--> GPIO\_30[UART4\_RXD]\*\*
- P9.12 - RST <--> GPIO\_60
- P9.13 - TX[RXD] <--> GPIO\_31[UART4\_TXD]\*\*
- P9.14 - ENA <--> GPIO\_50
- P9.16 - STS <--> GPIO\_51

\* Read about sjp7 functionality below.  
 \*\* Read about sjp5 and sjp6 functionality below.

### u-GSM shield signals description:

RX - TXD - to be wired to MCU RX pin  
 TX - RXD - to be wired to MCU TX pin  
 RST - RESET modem, active HIGH level \*\*  
 ENA - Enable modem power, active HIGH level  
 Vusb - 5V out, export USB 5V power  
 Vin - 5V input for Lithium Polymer battery charger  
 Vcc - 4V in/out, internally connected to LIPO + pad  
 GND - Ground  
 RI - Ring Indicator  
 STS - STATUS indicator, HIGH level if the modem is ON  
 \*\* alternate functionality [ON / OFF / exit PSM mode] for BG96 variants

### Solder jumpers description:

sjp5 - disconnect RX from RPI/BBB [default connected]\*\*\*  
 sjp6 - disconnect TX from RPI/BBB [default connected]\*\*\*  
 sjp7 - disconnect Vin from RPI/BBB 5V [default connected]  
 \*\*\* read about u-GSM to BBB/RPI USB connection !!

*RX/TX/RST/ENA/RI/STS signals are 3->5V auto level compliant*

## u-GSM shield v 2.19 pinout

Image 1

### Raspberry PI interface:

PIN 02 - 5V RPI - wired to Vin  
 PIN 04 - 5V RPI - wired to Vin  
 PIN 06 - GND - wired to GND  
 PIN 08 - GPIO14[UART TX] - wired to TX  
 PIN 10 - GPIO15[UART RX] - wired to RX  
 PIN 12 - GPIO18 - wired to STS  
 PIN 16 - GPIO23 - wired to ENA  
 PIN 18 - GPIO24 - wired to RST

### Beagle Bone Black interface:

P9.01 - GND - wired to GND  
 P9.02 - GND - wired to GND  
 P9.05 - VDD 5V - wired to Vin  
 P9.06 - VDD 5V - wired to Vin  
 P9.11 - GPIO\_30[UART4\_RXD] - wired to RX  
 P9.12 - GPIO\_60 - wired to RST  
 P9.13 - GPIO\_31[UART4\_TXD] - wired to TX  
 P9.14 - GPIO\_50 - wired to ENA  
 P9.16 - GPIO\_51 - wired to STS

### BBB option pins:

\*P9.07 - SYS 5V - Vin [config via sjp-VBBB]  
 \*P9.09 - SYS 5V - Vin [config via sjp-VBBB]

## Solder jumpers

*sjp1\** - RESERVED - default circuit closed.

*sjp2* - Active GNSS antenna powering - default, the active GNDD antenna power is enabled [circuit closed]. Relevant only for BG96 variant.

*sjp3* - disable LEDs powering - default, LEDs power is enabled [circuit closed]. STS [STATUS] signal is disabled if LEDs power is disabled.

*sjp4* - bypass modem power separation - default disabled [circuit open]. If enabled, ENA input will lose its role.

*sjp5* and *sjp6* - connect modem UART to RPI and BBB embedded interfaces - default connected [circuits closed]. If disconnect, RPI/BBB RX and TX GPIOs will be released. You may like to use this option if modem is connected to RPI/BBB via USB.

*sjp7\** - connect Vin to BBB/RPI 5V - default connected - u-GSM us as power supply 5V from RPI / BBB [circuit closed]. If disconnect, u-GSM may be powered independent.

*BBB voltage selector\** - use BBB Vdd 5V / SYS 5V as power source - default Vdd 5V is used as power source. Relevant if u-GSM is connected with BBB.

*sjp5*, *sjp6*, *sjp7* and BBB voltage selector are relevant only if u-GSM is connected to BBB/RPI via embedded interfaces.

\* consult u-GSM block schema >> [https://itbrainpower.net/downloadables/u-GSM\\_v2\\_19\\_block\\_schema\\_rev1\\_21.pdf](https://itbrainpower.net/downloadables/u-GSM_v2_19_block_schema_rev1_21.pdf)

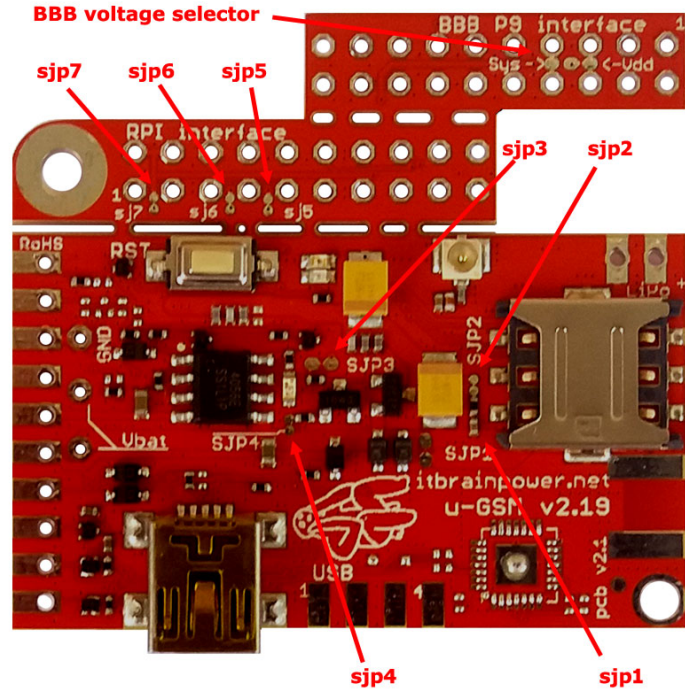


Image 2

## External SIM CARD port, antenna connector

### External SIM card interface

1. SIM VDD
2. SIM DATA
3. SIM RESET
4. SIM GND
5. SIM CLOCK

- if not used, leave them not connected  
- if used, in order to avoid interferences, keep the wires as short as possible and take in to account the routing.

### GSM side antenna connector

u-GSM shield may be ordered with u.FL connector or with SMA F connector - see above the Part number table. Read about antenna wiring guidelines here: <https://itbrainpower.net/a-gsm/u-GSM-Raspberry-Pi-antenna-notes>

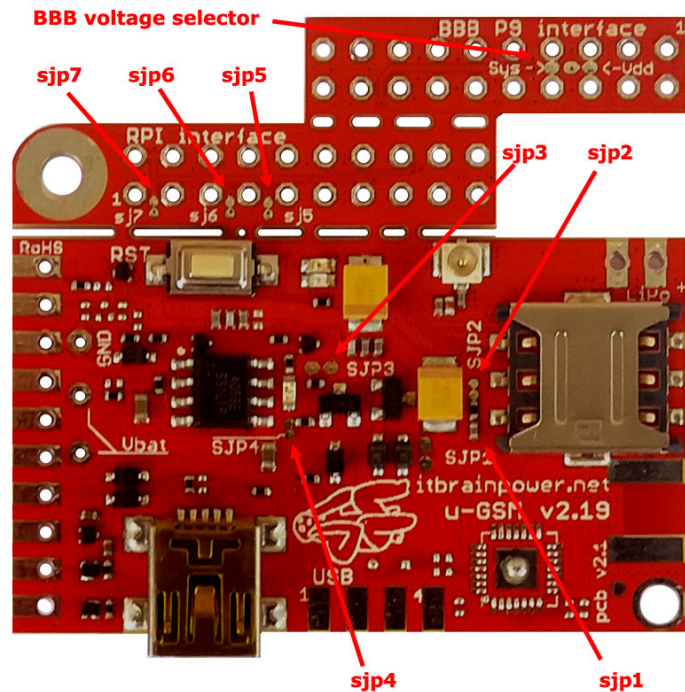


Image 3

### PCB breaking lines

If required, the u-GSM PCB may be trimmed across the breaking lines. We recommend to you to trim the u-GSM PCB only if you intend to fit your Raspberry PI & u-GSM shield assembly into one RPI case.

Guidelines here: <https://itbrainpower.net/a-gsm/u-GSM-Raspberry-PI-BeagleBone-Black-howto#trim>

## Arduino / Raspberry PI logical interfacing [using ITBPMM interface]

u-GSM shield PIN NAME	UNO / MINI / NANO / (Mega328)	MEGA2560 via software serial	DUE / MEGA2560 via hardware serial	Raspberry PI B+, Raspberry PI II, Raspberry PI 3, Pi3+
1. RX(TXD)	D2 (RX soft)	D10 (RX soft)	D19(RX1)	PIN10 (RX) *
2. TX(RXD)	D3 (TX soft)	D3 (TX soft)	D18(TX1)	PIN08 (TX) *
3. RST	D6	D6	D6	PIN18
4. ENA	D7	D7	D7	PIN16
6. Vin (5V LiPol)**	+5V	+5V	+5V	PIN02 or 04
8. GND	GND	GND	GND	PIN04 or 14
10. STS	D5	D5	D5	PIN 12

\* Raspberry PI: do not wire 1 and 2 (serial TX and RX) if USB communication is used!

\*\* WITH Lithium Polymer batteries configuration: wire 6 (Vin) OR do not wire it and use via USB powering placing a jumper between PIN5 (Vusb) and PIN6 (Vin). Read notes about u-GSM powering configuration on:

- u-GSM v2.19 shield block schema - [https://itbrainpower.net/downloadables/u-GSM\\_v2\\_19\\_block\\_schema\\_rev1\\_21.pdf](https://itbrainpower.net/downloadables/u-GSM_v2_19_block_schema_rev1_21.pdf)
- ITBP modular modem shields how to start - [https://itbrainpower.net/a-gsm/c-uGSM\\_d-u3G\\_how\\_to\\_start\\_tutorial](https://itbrainpower.net/a-gsm/c-uGSM_d-u3G_how_to_start_tutorial)
- gSPS adapter board - <https://itbrainpower.net/3G-GSM-shield-switching-power-supply/features>

**Raspberry PI interfacing schema using ITBPMM interface:** <https://itbrainpower.net/images/RPI-logical-wiring-u-GSM.png>

**Raspberry PI interfacing using i-HAT adapter how to:** [https://itbrainpower.net/a-gsm/i-hatGSM3G\\_d-u3G\\_c-uGSM\\_shield\\_howto\\_start\\_tutorial](https://itbrainpower.net/a-gsm/i-hatGSM3G_d-u3G_c-uGSM_shield_howto_start_tutorial)

### Arduino Zero or xyz-mIoT modem-less shield interfacing:

1. RX(TXD)	←---→	RX0
2. TX(RXD)	←---→	TX1
3. RST	←---→	D6
4. ENA	←---→	D7
6. Vin	←---→	5V power supply
8. GND	←---→	GND
10. STS	←---→	D5

## Raspberry PI logical interfacing [using RPI embedded interface]

Apply the directives described in: [u-GSM SHIELD RASPBERRY PI HARDWARE HOWTO](#).

### HINTS:

- due to mechanical reasons, this variant cannot be used for u-GSM shield with SMA integration.
- we recommend to you to trim the u-GSM PCB only if you intend to fit your Raspberry PI & u-GSM shield assembly into one RPI case.



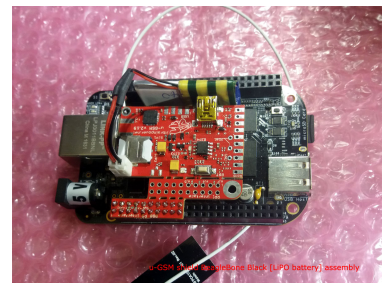
## BeagleBone Black logical interfacing

Variant a. **Interfacing using BeagleBone Black P9 embedded interface.**

Apply the directives described in: [u-GSM SHIELD BEAGLEBONE BLACK HARDWARE HOWTO](#).

Variant b. **Interfacing using ITBPMM interface.**

Apply the directives described in: [BeagleBone Black and ITBP modular modem interfacing how to](#).



## **SOFTWARE SUPPORT**

**Arduino code [C]:** kickstart for Arduino [interactive application], IoT REST [transparent socket] support library, NB IOT [UDP mode] support library and other.

**Raspberry PI and BeagleBone [PYTHON and shell script]\*:** PYTHON examples, UTILITIES [PPP and modem control] and *RaspberryPI DEBIAN image patched for ITBP modems*.

\* Linux Debian based

<http://itbrainpower.net/downloads#u-GSM>

Resources marked with "#", requires for download the following information: your name, email address and the modem IMEI. The modem IMEI can be found printed on the Quectel GSM module, or run AT+GMGS command.

## **DOCUMENTATION, DRIVERS, DATASHEETS and additional info**

[https://itbrainpower.net/downloads#u-GSM\\_documentation](https://itbrainpower.net/downloads#u-GSM_documentation)

<https://itbrainpower.net/FAQ/>

## **HOW TO and PROJECTS**

<https://itbrainpower.net/projects>

## **WHERE TO BUY**

<https://itbrainpower.net/distributors>