

SIM7080G Cat-M/NB-IoT HAT

From Waveshare Wiki

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Introduction

NB-IoT/Cat-M(eMTC)/GNSS HAT for Raspberry Pi, based on SIM7080G, globally applicable.

More ()

Features

- Standard Raspberry Pi 40PIN GPIO extension header, supports Raspberry Pi series boards.
- Supports communication protocols such as TCP/UDP/HTTP/HTTPS/TLS/DTLS/PING/LWM2M/COAP/MQTT.
- Supports GNSS positioning (GPS, GLONASS, BeiDou, and Galileo).
- Onboard USB interface, to test AT Commands, get GPS positioning data, and so on.
- Breakout UART control pins, to connect with host boards like Arduino/STM32.
- Onboard voltage translator, 3.3V by default, allows being switched to 5V via onboard jumper.
- SIM card slot, supports ONLY 1.8V SIM card (3V SIM card is not available).
- 3 x LED indicators, easy to monitor the working status.
- Baudrate: 300~3686400 bps.
- Common baudrate auto-negotiation: 9600/19200/38400/57600/115200 bps.
- Comes with online development resources and manual (examples for Raspberry Pi/Arduino/STM32).

Communication Parameters

- Frequency Band
 - NB-IoT: B1/B2/B3/B4/B5/B8/B12/B13/B18/B19/B20/B25/B26/B28/B66/B71/B85
 - Cat-M: B1/B2/B3/B4/B5/B8/B12/B13/B14/B18/B19/B20/B25/B26/B27/B28/B66/B85
- Transmitting power
 - Class 5 (0.125W@LTE)
- Data transmission
 - NB-IoT
 - $UL \leq 150\text{kbps}$
 - $DL \leq 136\text{kbps}$
 - Cat-M
 - $UL \leq 1119\text{kbps}$

SIM7080G Cat-M/NB-IoT HAT

Compatible with Raspberry Pi 2B/3B/Zero/Zero W



- $DL \leq 589\text{kbps}$

GNSS Parameters

- Receiving
 - 16 channels
 - C/A Code
- Operating Frequency
 - GNSS L1: $1575.42 \pm 1.023\text{MHz}$
 - GLONASS: $1597.5 \sim 1605.8\text{ MHz}$
 - BeiDou: $1559.05 \sim 1563.14\text{ MHz}$
 - Galileo L1: $1575.42 \pm 1.023\text{MHz}$
- Refreshing frequency: 1 Hz (by default)
- GNSS data format: NMEA-0183
- GNSS antenna: active antenna

Other Parameters

- Power supply: 5V
- Logic level: 5V/3.3V (Switchable via jumper caps)
- Overall current (idle mode): 39mA
- Module sole current (VBAT=3.8V)
- Idle mode: 10mA
- Sleep mode: 1.2mA
- PSM mode: 3.2uA
- eDRX mode: 0.59mA (eDRX=81.92s)
- Operating temperature: $-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$
- Storage temperature: $-45^{\circ}\text{C} \sim 90^{\circ}\text{C}$
- Dimension: 30.5mm x 65mm

User Guide

Testing it in Windows PC

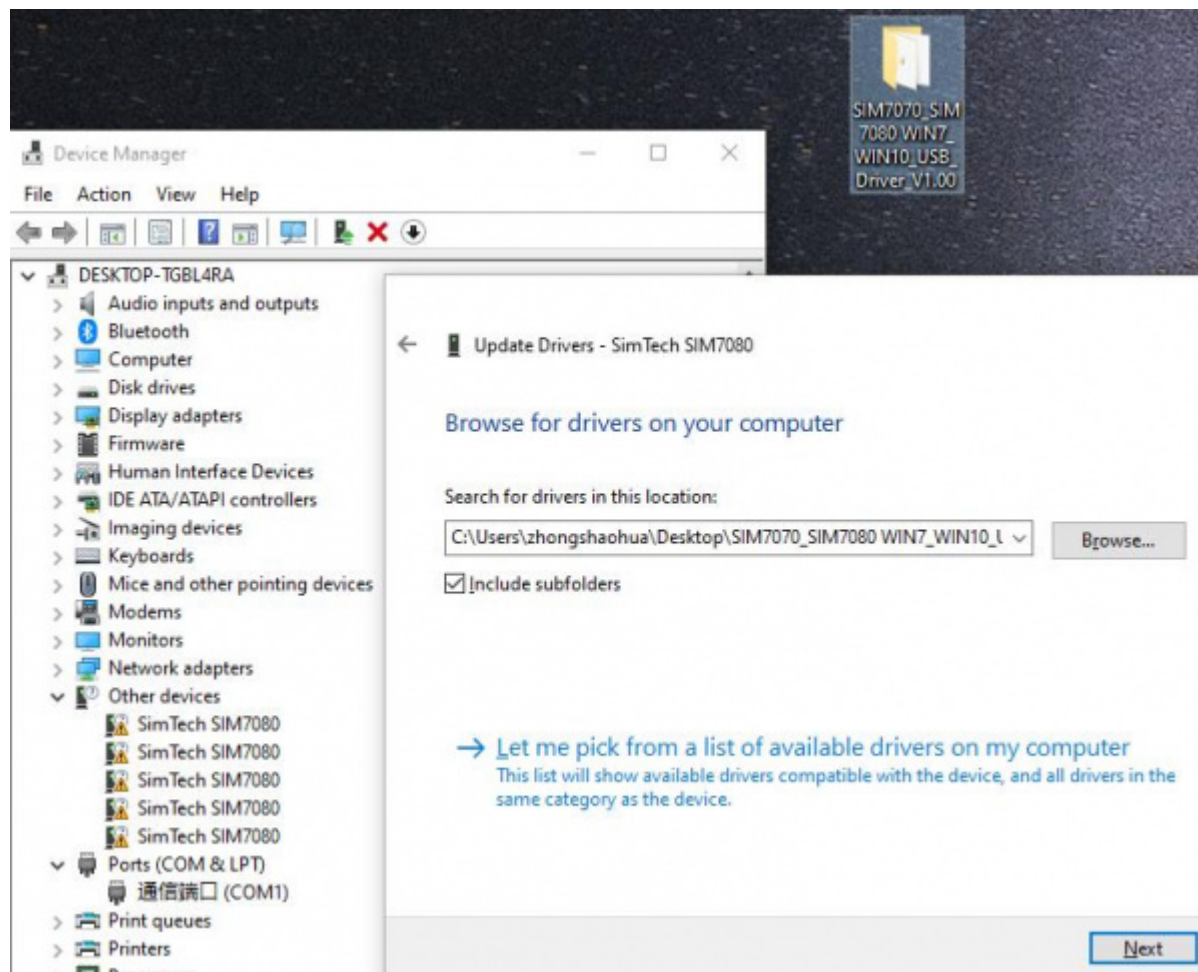
1. Hardware connection and driver installation

- Before testing, you should prepare
 - A Micro USB cable
 - LTE and GPS Antennas
 - The SIM7070G Cat-M/NB-IoT/GPRS HAT
 - An NB-IoT SIM card.
- Insert the SIM card into the SIM7070 board, and connect the LTE antenna and the GPS antenna. Connect the micro USB of the SIM7070G board to the PC by USB cable.
- Hold the PWRKEY button for about 1s to power on the module. After powering on, the STA indicator lights on, NET indicator quick-blinks first and then slow-blinks.

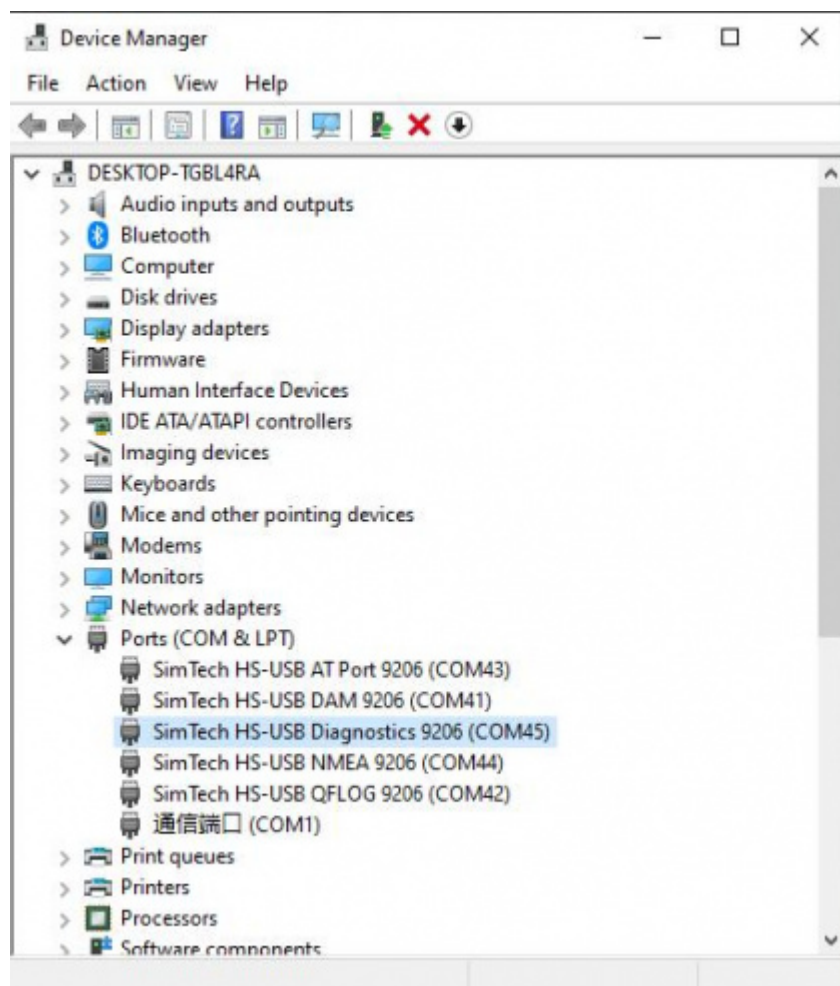
- Download the driver file (https://files.waveshare.com/upload/2/2f/SIM7070_SIM7080_WIN7_WIN10_USB_Driver_V1.00.rar), unzip it. Then update the driver by Devices Manager.
- USB has enumerated three devices. Choose AT Port COM31 as the communication serial port. Users can check the port number enumerated by the PC.
- Note: The SIM7080G supports global frequency bands, so there may be delays when registering on the network. Users in different countries and regions should consult local mobile service providers. About LTE-M or LTE-NB usage, or wait for the SIM7080G to automatically lock onto the local frequency band after registering on the network. You can use the command "AT+CPSI?" to query network information from the SIM7080G.



(/wiki/File:SIM7070G-Cat-M-NB-IoT-GPRS-HAT-004.jpg)



(/wiki/File:SIM7080G_Cat-M_NB-IoT_HAT_002.jpg)



(/wiki/File:SIM7080G_Cat-M_NB-

IoT_HAT_033.jpg)

Test network

For more information about the AT commands, you can refer to

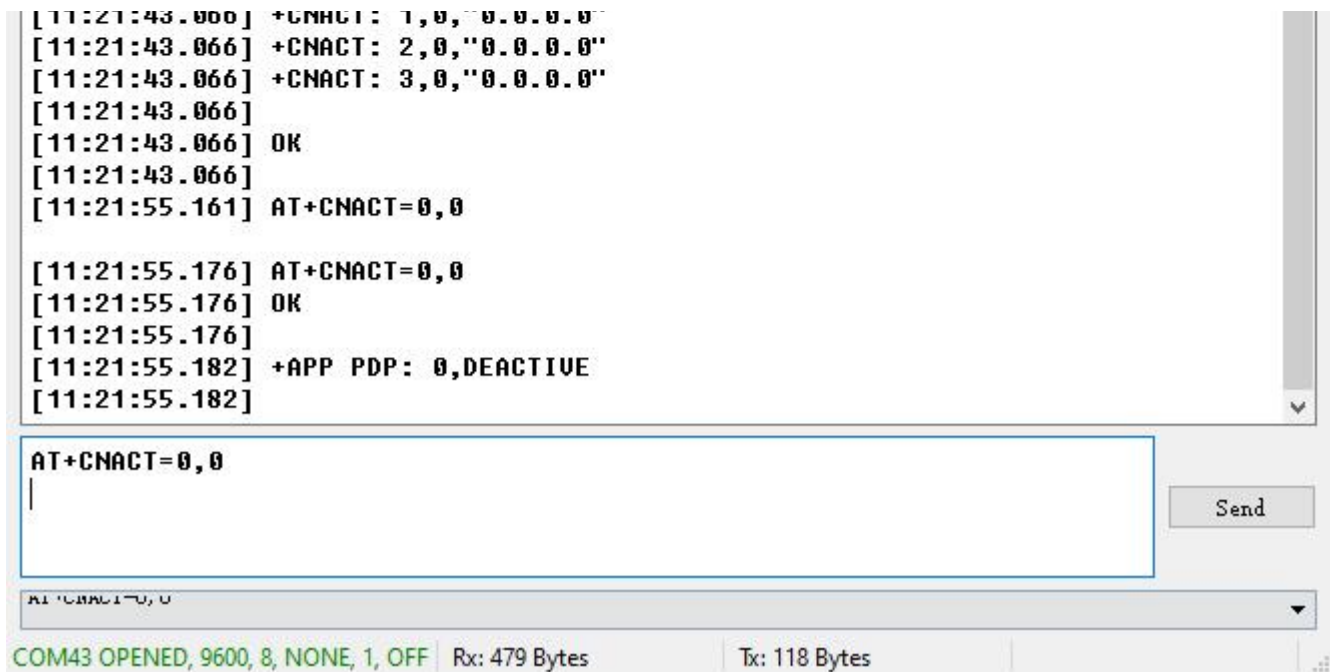
Command	Descrption	Return
AT	Test command	OK
AT+CPIN?	Check SIM card	OK
AT+CNMP=38	Choose LTE mode	OK
AT+CMNB=2	Choose NB network	OK
AT+CSQ	Check signal intensity	OK
AT+CGREG?	Check netwok status	OK
AT+CGNAPN	Query APN	OK
AT+CPSI?	Request UE system information	OK
AT+CNACT=0,1	Activate application network	OK
AT+CNACT?	Check network IP	OK
AT+CNCAT=0,0	Close application network	OK

Serial Port Utility

File Edit View Tools Help

SimTech HS-USB AT Port 9206 (COM43)

```
[11:19:30.756] AT+CPIN?  
[11:19:30.760] AT+CPIN?  
[11:19:30.760] +CPIN: READY  
[11:19:30.760] OK  
[11:19:30.760] OK  
[11:19:49.147] AT+CNMP=38  
[11:19:49.152] AT+CNMP=38  
[11:19:49.152] OK  
[11:19:49.152] OK  
[11:19:58.252] AT+CMNB=2  
[11:19:58.255] AT+CMNB=2  
[11:19:58.265] OK  
[11:19:58.265] OK  
[11:20:19.795] AT+CSQ  
[11:20:19.799] AT+CSQ  
[11:20:19.799] +CSQ: 26,99  
[11:20:19.799] OK  
[11:20:19.799] OK  
[11:20:33.062] AT+CGREG?  
[11:20:33.066] AT+CGREG?  
[11:20:33.066] +CGREG: 0,1  
[11:20:33.066] OK  
[11:20:33.066] OK  
[11:20:54.019] AT+CGNAPN  
[11:20:54.024] AT+CGNAPN  
[11:20:54.024] +CGNAPN: 1,"cmnbiot"  
[11:20:54.024] OK  
[11:20:54.024] OK  
[11:21:09.012] AT+CPSI?  
[11:21:09.016] AT+CPSI?  
[11:21:09.016] +CPSI: LTE NB-IOT,online,460-00,0x1D30,54139061,211,EUTRAN-  
BAND8,3686,0,0,-7,-73,-65,12  
[11:21:09.016] OK  
[11:21:09.016] OK  
[11:21:22.124] AT+CNACT=0,1  
[11:21:22.131] AT+CNACT=0,1  
[11:21:22.143] OK  
[11:21:22.143] OK  
[11:21:22.143] +APP PDP: 0,ACTIVE  
[11:21:22.143] OK  
[11:21:43.059] AT+CNACT?  
[11:21:43.066] AT+CNACT?  
[11:21:43.066] +CNACT: 0,1,"100.101.99.255"
```

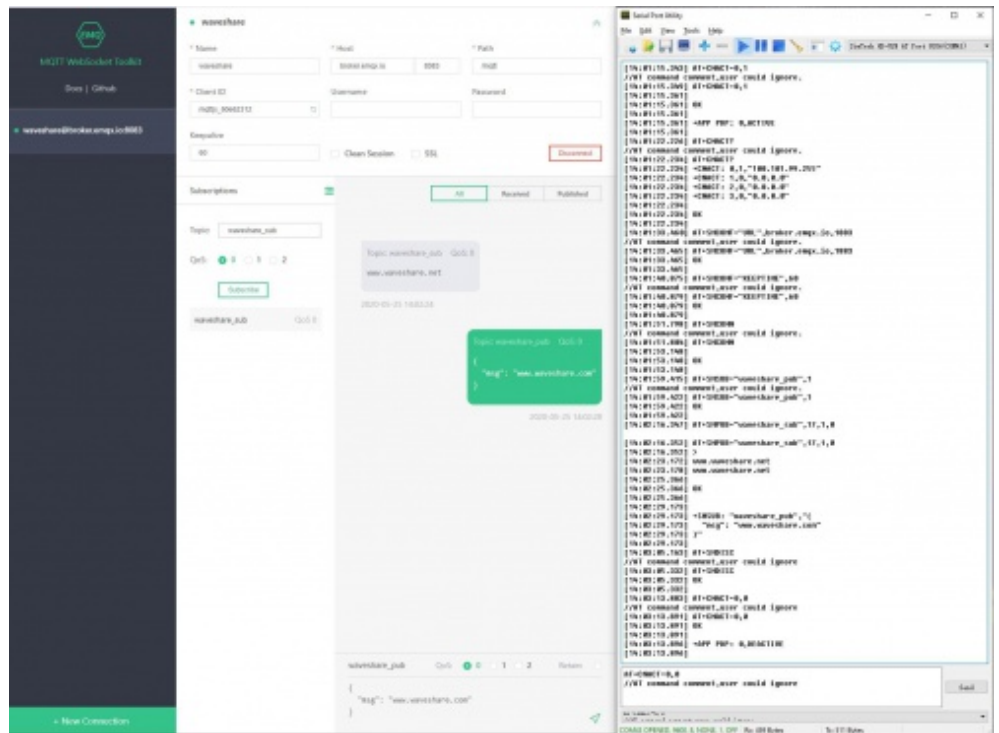


(/wiki/File:SIM7070G-Cat-M-NB-IoT-GPRS-HAT-007.jpg)

Test MQTT

For more information about the MQTT, please refer to SIM7070_SIM7080_SIM7090 Series_MQTT(S)_Application Note_V1.02 ([https://files.waveshare.com/wiki/SIM7070G%20Cat-MNB-IoT-GPRS-HAT/SIM7070_SIM7080_SIM7090_Series_MQTT\(S\)_Application_Note_V1.02.pdf](https://files.waveshare.com/wiki/SIM7070G%20Cat-MNB-IoT-GPRS-HAT/SIM7070_SIM7080_SIM7090_Series_MQTT(S)_Application_Note_V1.02.pdf))

Please test Web by clicking here (<https://www.emqx.io/mqtt/mqtt-websocket-toolkit>). Please check the TCP port and domain name when testing, for details, please refer to here (<https://www.emqx.io/mqtt/public-mqtt5-broker>)



(/wiki/File:SIM7070G-Cat-M-NB-IoT-GPRS-HAT-008.jpg)

MQTT Test

Command	Description	Return
AT+SMCONF	Set MQTT	OK
AT+CSSLCFG	SSL configuration	OK
AT+SMSSL	Select SSL setting	OK
AT+SMCONN	MQTT connection	OK
AT+SMPUB	Send data packet	OK
AT+SMSUB	Subscribe to topics	OK
AT+SMUNSUB	unsubscribe	OK
AT+SMSTATE	Request MQTT connection status	OK
AT+SMPUBHEX	Set data format to hexadecimal	OK
AT+SMDISC	Disconnecting MQTT	OK

HTTP(S) Test

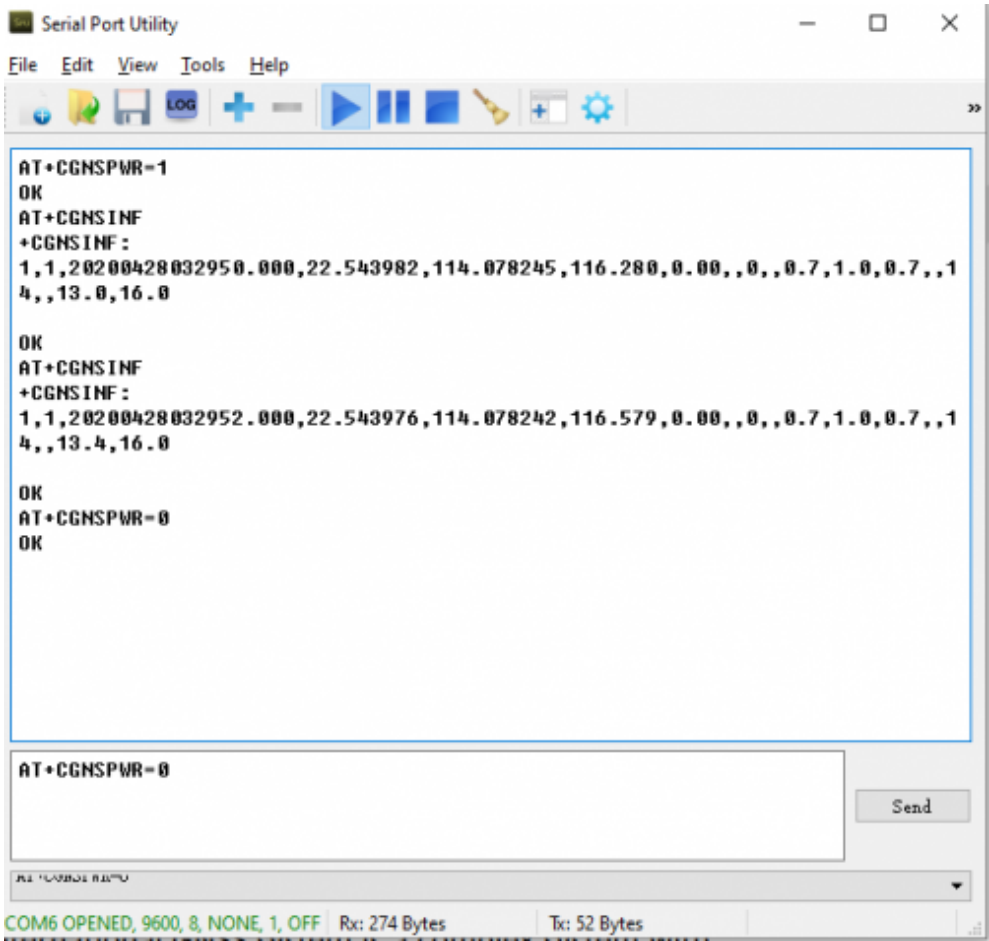
The following table is the HTTP(S) test command, the test results are shown in the figure on the right, please refer to the detailed description of the SIM7070_SIM7080_SIM7090 Series_HTTP(S)_Application Note_V1.02 ([https://files.waveshare.com/wiki/SIM7070G%20Cat-M-NB-IoT-GPRS-HAT/SIM7070_SIM7080_SIM7090_Series_HTTP\(S\)_Application_Note_V1.02.pdf](https://files.waveshare.com/wiki/SIM7070G%20Cat-M-NB-IoT-GPRS-HAT/SIM7070_SIM7080_SIM7090_Series_HTTP(S)_Application_Note_V1.02.pdf))

Command	Description	Return
AT+CACID	Set TCP/UDP index	OK
AT+CASSLCFG	Set SSL parameters	OK
AT+CAOPEN	Open a TCP/UDP connection	OK
AT+CASEND	Send data	OK
AT+CARECV	Receive data	OK
AT+CACLOSE	Cose TCP/UDP connection	OK
AT+CACFG	Set transparent parameters	OK
AT+CASWITCH	Enable transparent mode	Ok

Test GNSS

For more information, please refer to SIM7080 Series_GNSS_Application Note_V1.00 (https://files.waveshare.com/wiki/SIM7070G%20Cat-MNB-IoT-GPRS-HAT/SIM7070_SIM7080_SIM7090_Series_GNSS_Application_Note_V1.02.pdf)

When testing GNSS, you should set the GPS antenna in the open area. You can also use u-center software for locating.



(/wiki/File:SIM7070G-Cat-M-NB-IoT-GPRS-HAT-010.png)

Test GNSS

Commands	Description	Return
AT+CGNSPWR	Open/close GNSS power	OK
AT+CGNSINF	GNSS information	OK
AT+CGNSCOLD	GNSS cold starting	OK
AT+CGNSWRAM	GNSS warm starting	OK
AT+CGNSHOT	GNSS hot starting	OK
AT+CGNSMOD	GNSS workign mode setting	OK
AT+CGNSXTRA	Open GNSS XTRA	OK
AT+CGNSCPY	Copyt GNSS XTRA file	OK
AT+SGNSCFG	GNSS NMEA output setting	OK
AT+SGNSCMD	AT port output GNSS NMEA data	OK

Use it with Raspberry Pi

Initialize IO and install software

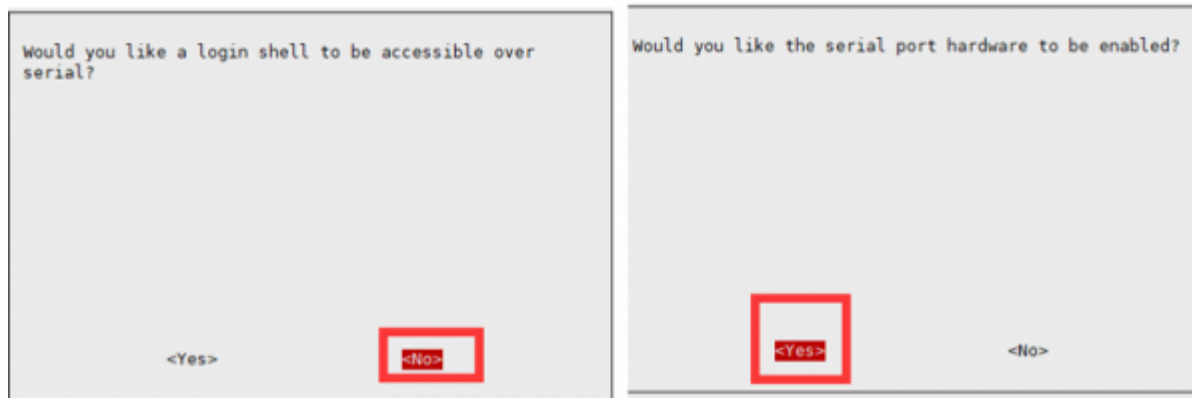
The PWRKEY pin is connected to P7 (wiringPi number) of Raspberry Pi by jumper. To let the SIM7080G board work normally, you should firstly initialize the P7 pin. Download codes and run by the following commands.

```
sudo apt-get update
sudo pip install RPi.GPIO
sudo apt-get install python-serial
wget -P ~/Documents/ https://files.waveshare.com/upload/4/4a/SIM7080G_Cat_M_NB_IoT_HAT_Code.tar.gz
cd ~/Documents
tar -xzf SIM7080G_Cat_M_NB_IoT_HAT_Code.tar.gz
sh ~/Documents/SIM7080G_Cat_M_NB_IoT_HAT_Code/RaspberryPi/pi_gpio_init.sh
```

Enable UART and hardware connection.

Open raspi-config by following commands, and choose Interfacing Options -> Serial, close login shell and open the hardware serial port.

```
sudo rapsi-config
```



(/wiki/File:L76X_GPS_Module_rpi_serial.png)

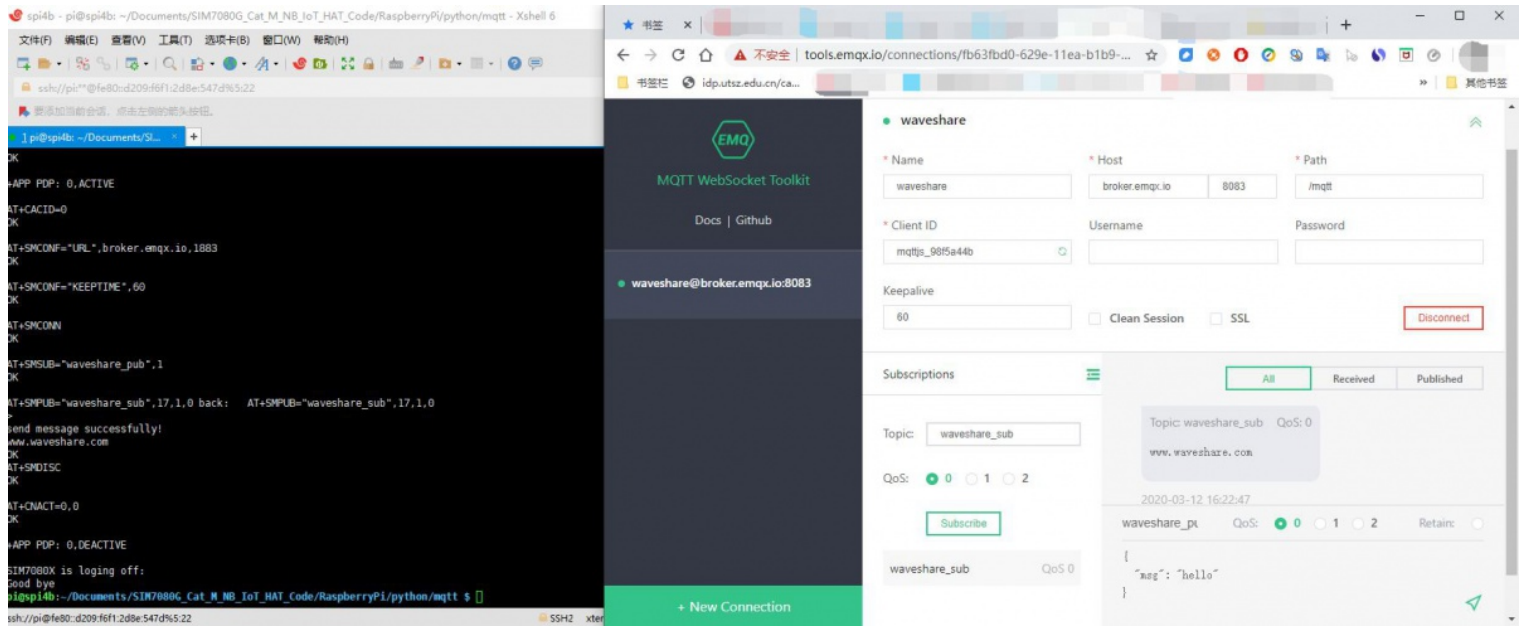


(/wiki/File:SIM7070G-Cat-M-NB-IoT-GPRS-HAT-003.jpg)

Python codes

The python codes is provided for MQTT function.

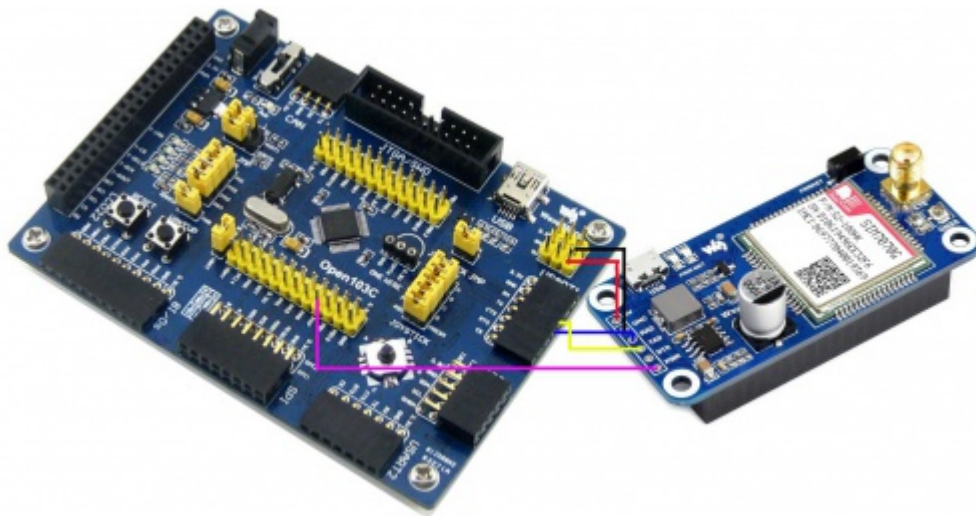
```
cd ~/Documents/SIM7080G_Cat_M_NB_IoT_HAT_Code/RaspberryPi/python/mqtt/  
sudo python mqtt.py
```



(/wiki/File:SIM7080G_Cat-M_NB-IoT_HAT_012.jpg)

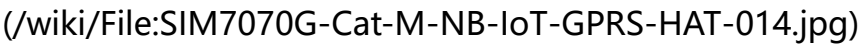
Use it with STM32

The demo codes provided is based on Waveshare Open103C, it is use for TCP connecting.

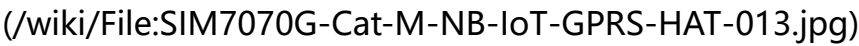


(/wiki/File:SIM7070G-Cat-M-NB-

IoT-GPRS-HAT-012.jpg)



The demo codes provide is based on Arduino UNO. The D10 (RX) and D11 (TX) is used for software serial.





(/wiki/File:SIM7080G_Cat-M_NB-IoT_HAT_015.jpg)

Resources

Document

- Schematic (/wiki/File:SIM7080X-Cat-M-NB-IoT-HAT-Schematic.pdf)
- Source code (https://files.waveshare.com/upload/e/e6/SIM7080G_Cat_M_NB_IoT_HAT_Code.tar.gz)
-

Related Resources

- Pisugar case (<https://github.com/PiSugar/pisugar-case-pihat-cap>)

Tools

- sscm (/wiki/File:Sscm_sim7000_atcmd.zip)
- SIMCom GPS (/wiki/File:SIMCom_GPS_DEMO.7z)
- NetAssist (/wiki/File:NetAssist.7z)

SIM7000 Related

Datasheets

-
-
-
-
-

-

- More... (<https://www.simcom.com/product/SIM7080G.html>)

FAQ

Question: Can SIM7080G use ordinary mobile phone cards?

Answer:

Ordinary mobile phone cards are not supported. Please use NB SIM cards or SIM cards that support EMTC. It needs local network coverage of the corresponding frequency band to use.

Question:How to configure apn?

Answer:

You can using the following commands to configure apn:

```
AT+CGDCONT=1,"IP","Your_apn"
```

Question:Can the SIM7080G use a regular SIM card?

Answer:

It does not support regular SIM cards. Please use an NB SIM card or a SIM card that supports eMTC. The corresponding network coverage with the appropriate frequency bands in your area is required to use it.

Question: Can SIM7080G use cellular network and GPS positioning at the same time?

Answer:

SIM7080X and SIM7070X series cannot connect to cellular network and GPS positioning at the same time.

Question: Why SIM7080G has no signal?

Answer:

- Fixed NB-IOT or CAT-M to get the signal easier

```
AT+CMNB=2 //Fix NB-IOT
AT+CMNB=1 //fix CAT-M
```

- Fixed LTE mode can register to the network faster

```
AT+CNMP=38
```

For specific instructions, please refer to the following manuals:

Support

Technical Support

If you need technical support or have any feedback/review, please click the **Submit Now** button to submit a ticket, Our support team will check and reply to you within 1 to 2 working

Submit Now ()

days. Please be patient as we make every effort to help you to resolve the issue.

Working Time: 9 AM - 6 PM GMT+8 (Monday to Friday)
