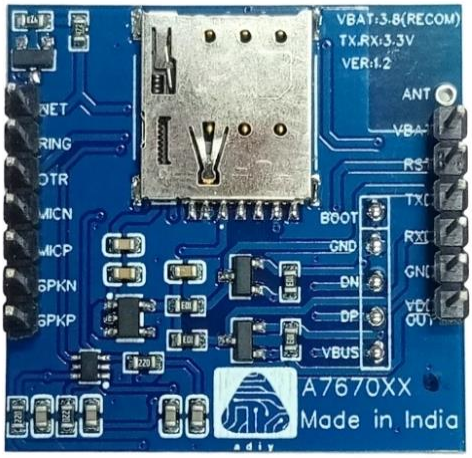
ADIY GSM SIMA7670C 4G Breakout Board with logic level V1.2



Description:

The SIM A7670C 4G LTE breakout Board is a Cat 1 module that supports wireless communication modes of LTE-TDD/LTE-FDD/GSM/GPRS/EDGE. It supports a maximum 10Mbps downlink rate and a 5Mbps uplink rate It supports a maximum 10Mbps downlink rate and a 5Mbps uplink rate. This board features a serial interface and is based on the SIMCOM A7670C LTE modem. The serial interface allows for simple communication with a computer or laptop via a USB to Serial adapter or TTL converter. AT instructions are used to communicate with the A7670C. The SIM A7670C 4G LTE Development Board is designed keeping in mind the requirements of the user. It has various pinouts from the module, such as RING – used to detect incoming calls, DTR – to use the 4G Module in ultra-low power sleep mode, NET LIGHT – in case the developer wants to use external LED to indicate network status, RESET – developer can use this pin to connect with MCU and reset the module if required.

This SIM A7670C 4G breakout Board has a UFL connector, which allows connection of any antenna with this board. Apart from this, the module is very compact in size. It can be easily embedded in any customized PCB.

The SIM A7670C 4G Breakout Board supports multiple built-in network protocols likeTCP, MQTT, HTTP, HTTPS, FTP, FTPS etc., supports drivers for main operation systems (USB driver for Windows, Linux and Android etc.) and software function, AT commands are compatible withSIM7500/SIM7600 series modules.

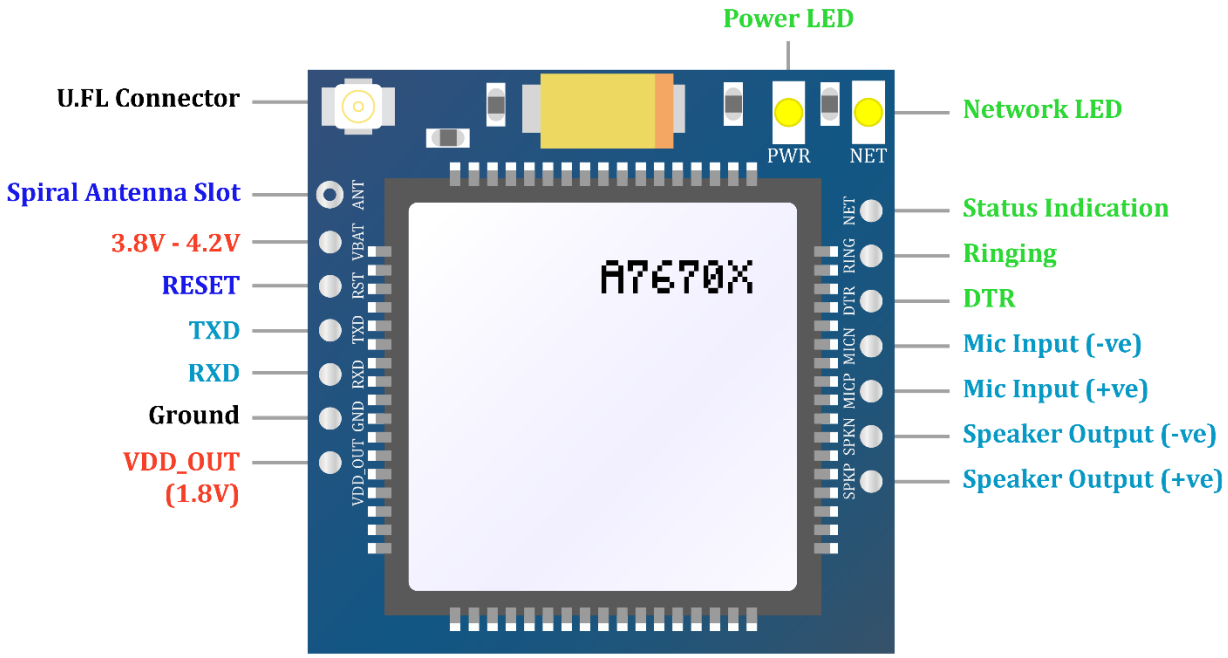
Features:

1. Suitable For: 4G, LTE Networks, Data, SMS, Call
2. Supports: LTE-TDD/LTE-FDD/GSM/GPRS/EDGE
3. Control via: AT commands
4. SIM Holder Type: Nano SIM Card
5. LED Status: Power ON LED and Network Status LED
6. Powerful TCP/IP protocol stack for internet data transfer
7. Onboard Antenna: U.FL Male Connector
8. On board UART logic level conversion
9. Operating temperature: -40 to 85°C
10. Abundant software functions: FOTA, LBS, SSL

Applications:

- IoT applications
- Telematics
- Surveillance devices
- M2M communication
- Industrial routers
- Remote Diagnostics
- Power station monitoring and control.
- Traffic signals monitor and control.
- Water, gas and oil flow metering.
- Parking meter and Taxi Monitor. Telecom equipment supervision (Mobile base station, microwave or optical relay station).

Pin Configuration:



TXD, RXD = 3.3V Operational

ADIY A7670xx 4G LTE Breakout Board pin outs functions:

- V_IN: Input voltage DC 3.8V to 4.2V
- On-board pins Speaker and Microphone for audio or video connection
- NET pin indicate the network status using LED
- DTR Data terminal ready, another form of hardware flow control
- USB Test points for Firmware updated.
- RST it will trigger a Power-on Reset (POR) which is effectively the same reset as a power cycle.

Indicator LED's:

Net-LIGHT (NET) - Network registration status indicator (LED). The NETLIGHT signal is used to control the LED lights that indicate the status of the network.

LTE mode NETLIGHT pin status:

- Always On Searching Network
- 200ms ON, 200ms OFF Data Transmit/Registered
- OFF Power off / Sleep

Power LED: it indicates the power up the board.

USB Interface:

The A7670 contains a USB Test points are mainly used debugging port and software upgrade interface.

A7670 can be used as a USB slave device Because of the high bit rate on USB bus, The detection of USB test pads speed is determined automatically by the USB protocol. The customer does not need to pull up the DP external, other-wise it may affect the device USB enumeration.

UART Interface:

- UART: The UART interface consists of two pins: the Rx and Tx pin. The Rx pin is used to receive data. The Tx pin is used to transmit data. When two devices are connected using a UART, the Rx pin of one device is connected to the Tx pin of the second device. The Tx pin of one device is connected to the Rx pin of the second device.
- One UART Interface, UART full function serial port.
- UART serial port Baud rate support from 300bps to 3686400bps AT command and data can be sent through serial port Support RTS/CTS Hardware flow control Support serial port multiplexing function conforming to GSM07.10 protocol, now we use of triode for logic level shifter circuits. The circuit with dotted line can refer to the circuit with solid line TXD and RXD, and attention shall be paid to the direction of signal.
- The parasitic capacitance of the transistor will affect the edge of the high-speed digital signal. It is not recommended to use this circuit when the signal speed is higher than 115200bps and voltage level matching purpose.

What does a bidirectional level logic converter do?

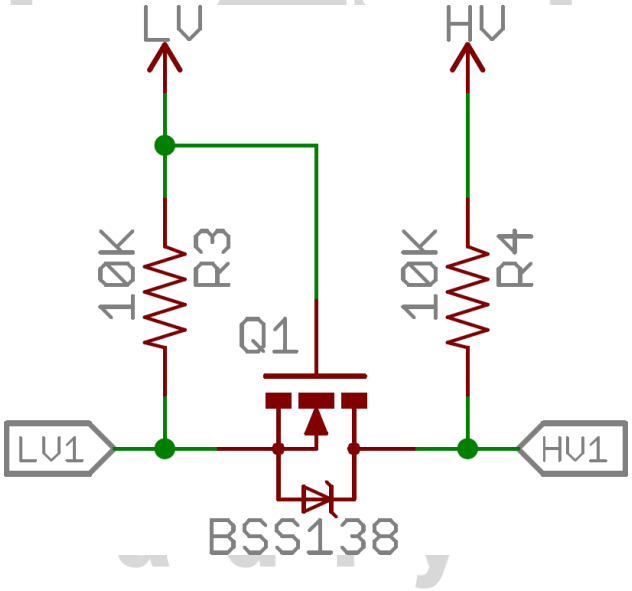
- The bi-directional logic level converter is a small device that safely steps down 5V signals to 3.3V AND steps up 3.3V to 5V at the same time. This level converter also works with 2.8V and 1.8V devices.

Why do we need logic level shifter?

- If I / O with different signal levels is connected, the driver's or devices output voltage level may not satisfy the input voltage specifications of receiver, resulting in malfunction or damage to the receiver. It is convenient to use a level shifter to solve such problems.

Bi-Directional Logic Level Converter Schematic

- An N-channel MOSFET and two resistors can be used to make a bidirectional logic level converter. The positive of the high voltage supply should be connected to the HV node (D), and the low voltage supply should be connected to the LV node(C).
- In the logic level shifter circuit in consider that the MOSFET turns on fully when we supply a Gate-Source voltage (VGS) of 3.3V or 1.8V.



- ***Low-level to high-level conversion:*** When the voltage at point A is at 3.3V or 1.8V, the MOSFET stays in the cut-off region as the voltage difference between the Gate and Source is less than the threshold voltage required for the MOSFET to turn on. The voltage at point B is pulled up to 5V or 3.3V by the R2 resistor. So for less voltage at point A, we get high voltage at point B.
- If the voltage at point A is 0V, the ON resistance of the MOSFET decreases due to a voltage difference between the gate and the source. As the MOSFET almost behaves like a short in this condition, point B now becomes 0V. Hence, for 0V at point A, we get 0V at the point.
- ***High-level to low-level conversion: When*** the voltage at terminal B is at 5V, the MOSFET stays in the cut-off region, and node A is pulled to 3.3V by the pull-up resistor R1. When node B is at 0V, the

intrinsic body diode of the MOSFET starts conducting as it gets forward-biased. This pulls the voltage at point A close to 0V. So in this case too, we get the corresponding voltages on the other side.

- UART2 Debug serial port Support debug usage, UART2 can TX2, RX2 pins are leaving in Test pads,

SIM Interface

- A7670 supports both 1.8V and 3.0V USIM Cards. The interface power of the USIM card is provided by the voltage regulator inside the module, and the normal voltage value is 3V or 1.8V.
- It is recommended to use an ESD protection component such as SMF15C produced by ON SEMI (www.onsemi.com). Note that the USIM peripheral circuit should be close to the USIM card socket.
- USIM_DATA has been pulled up with a 4.7KΩ resistor to USIM_VDD in module. A 100nF capacitor on USIM_VDD is used to reduce interference. For more details of AT commands about USIM, USIM_CLK is very important signal, the rise time and fall time of USIM_CLK.

Antenna tuning:

- To facilitate the antenna tuning and certification test, a RF connector and an antenna matching circuit should be added. The following figure is the recommended circuit.
- In above figure, the components R1, C17, C18 are used for antenna matching, the values of components can only be achieved after the antenna tuning and usually provided by antenna vendor. By default, the R1, are 0Ω resistors, and the C17, C18 are reserved for tuning. It is optional for users according to application environment. The RF test connector is used for the conducted RF performance test, and should be placed as close as to the module's MAIN_ANT pin. The traces impedance between A7670 and antenna must be controlled in 50 Ω.

How to check the board:

- Insert the SIM card on SIM slot
- Power supply 3.8V to 4.2V DC 2A , A7670xx board (check voltage terminals)
- Open the any serial monitor application (ex: QCOM) set all parameters and select the port,
- COM Port: Baud rate: 115200,
  Stop bit: 1
  Parity: None
  Byte Size: 8
  Flow control: No ctrl flow
- check with AT commands operands

HARDWARE DESIGN:

- https://1drv.ms/b/s!An1HSz9lsTbugrkUATYz5wWqn3uaQA?e=tNTwPi

AT Command Manual:

- https://1drv.ms/b/s!An1HSz9lsTbugrkTXs6QfYM_Tvg0rA?e=A93m8B