

2014

# GSM SHIELD

## COMPATIBLE WITH ARDUINO

### GSM SHIELD USING SIMCOMM (SIM900A)



# ATRIM

Electronics

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# GSM Shield

## 1 Description:

The GSM shield by Arduino is used to send/ receive messages and make/receive calls just like a mobile phone by using a SIM card by a network provider. We can do this by plugging the GSM shield into the Arduino board and then plugging in a SIM card from an operator that offers GPRS coverage.

The shield employs the use of a radio modem by SIMComm. We can communicate easily with the shield using the **AT** commands. The **GSM library** contains many methods of communication with the shield.

This GSM Modem can work with any GSM network operator SIM card just like a mobile phone with its own unique phone number. Advantage of using this modem will be that its RS232 port can be used to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily using this.

The modem can either be connected to PC serial port directly or to any microcontroller through MAX232. It can be used to send/receive SMS and make/receive voice calls. It can also be used in GPRS mode to connect to internet and run many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging

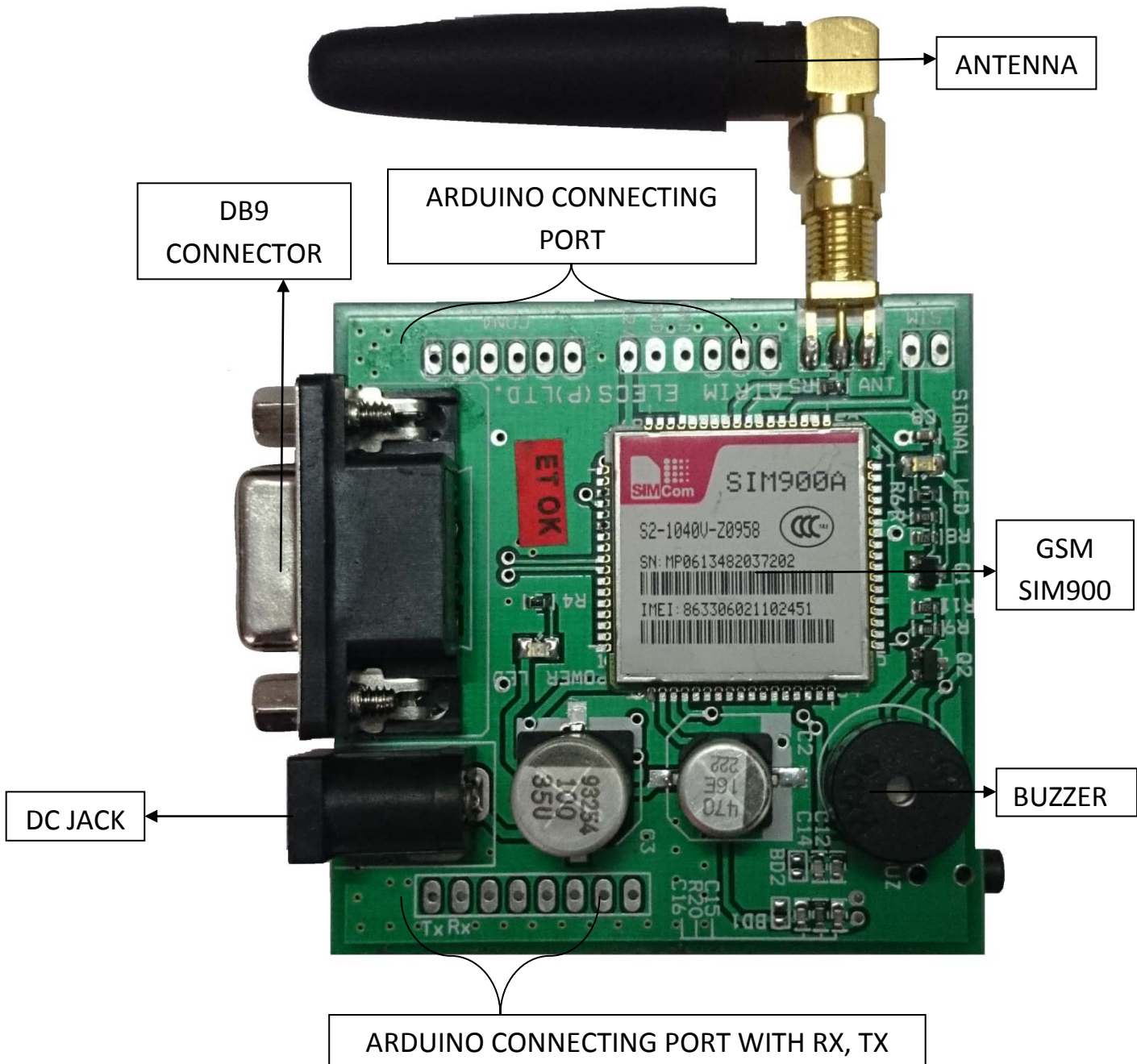
This GSM modem is a highly flexible plug and play quad band **SIM900A** GSM modem for direct and easy integration to RS232 applications. It Supports features like **Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack.**

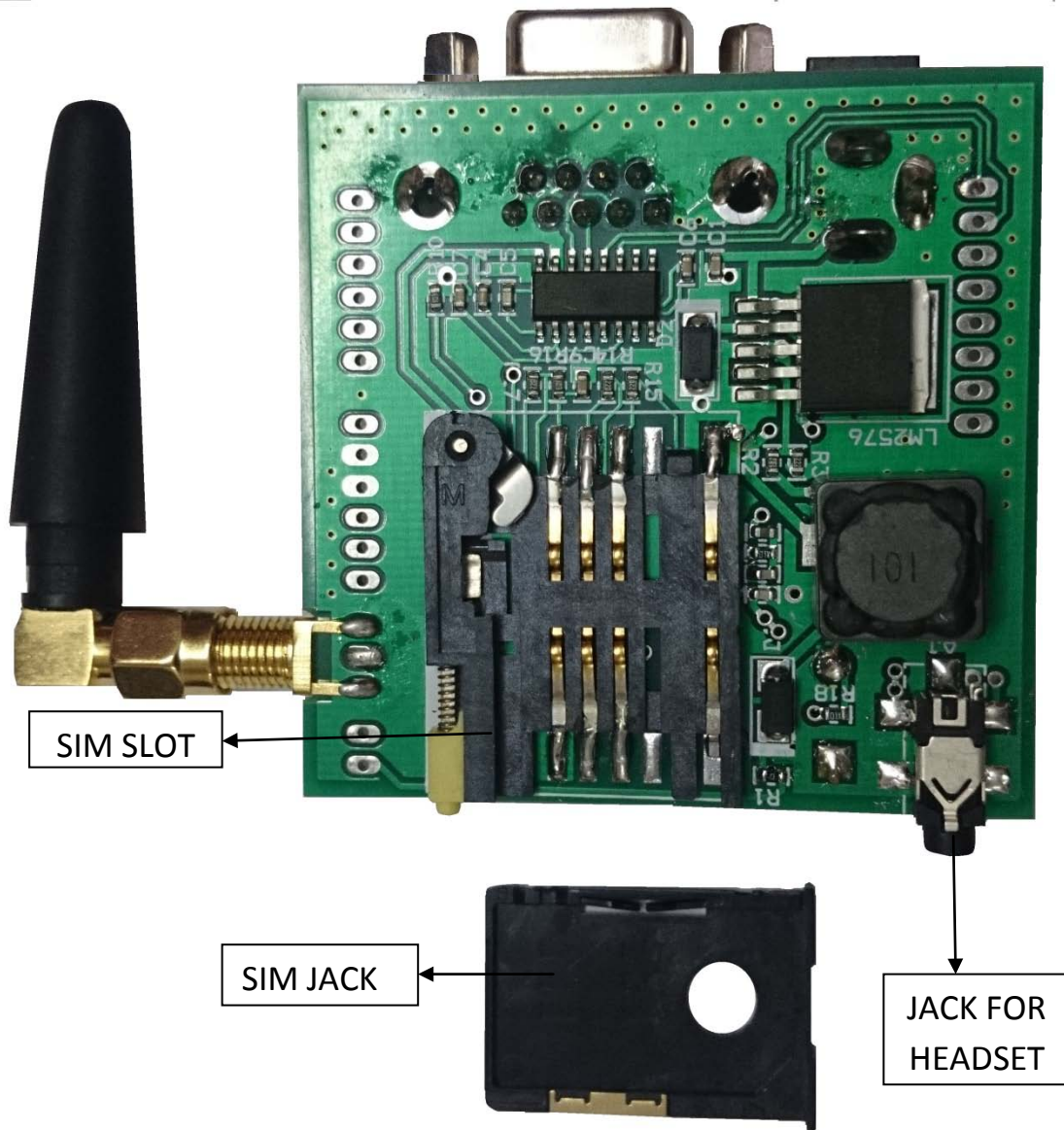
**To be connected to a cellular network, the shield requires a SIM card provided by a network provider.**

Most recent revision of the board makes the connection of the shield with the Arduino Uno board by connecting its **TX** to **pin 0** of Arduino and **pin 1** of Arduino to **RX** of shield.

For different components of the GSM shield, consult **figure 1** and **figure 2**:

FIGURE 1





**FIGURE 2**

**1.1 SIM900A:**

This is an ultra compact and reliable wireless module. The SIM900A is a complete Dual-band GSM/GPRS solution in a SMT module which can be embedded in the customer applications allowing you to benefit from small dimensions and cost-effective solutions. Featuring an industry-standard interface, the SIM900A delivers GSM/GPRS 900/1800MHz performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm x

24mm x 3 mm, SIM900A can fit in almost all the space requirements in your applications, especially for slim and compact demand of design.

## 1.2 **Features:**

- ❖ Dual-Band 900/ 1800 MHz
- ❖ GPRS multi-slot class 10/8
- ❖ GPRS mobile station class B
- ❖ Compliant to GSM phase 2/2+
  - Class 4 (2 W @900 MHz)
  - Class 1 (1 W @ 1800MHz)
- ❖ Dimensions: 24\*24\*3 mm
- ❖ Weight: 3.4g
- ❖ Control via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands)
- ❖ SIM application toolkit
- ❖ Supply voltage range: 3.1- 4.8V
- ❖ Low power consumption: 1.5mA(sleep mode)
- ❖ Operation temperature: -40° C to +85°C

## 1.3 **Specifications for Fax:**

- ❖ Group 3, class 1
- ❖ Specifications for Data
- ❖ GPRS class 10: Max. 85.6 kbps (downlink)
- ❖ PBCCH support
- ❖ Coding schemes CS 1, 2, 3, 4
- ❖ CSD up to 14.4 kbps
- ❖ USSD
- ❖ Non transparent mode
- ❖ PPP-stack

## 1.4 **Specifications for SMS via GSM/GPRS:**

- ❖ Point to point MO and MT
- ❖ SMS cell broadcast
- ❖ Text and PDU mode

## 1.5 **Software features:**

- ❖ 0710 MUX protocol



- ❖ Embedded TCP/UDP protocol
- ❖ FTP/HTTP

### **1.6 Enhanced version has following features:**

- ❖ FOTA
- ❖ MMS
- ❖ Embedded AT

### **1.7 Specifications for Voice:**

- ❖ Tricodec
- ❖ Half rate (HR)
- ❖ Full rate (FR)
- ❖ Enhanced Full rate (EFR)
- ❖ Hands-free operation (Echo suppression)
- ❖ AMR
- ❖ Half rate (HR)
- ❖ Full rate (FR)

### **1.8 Compatibility:**

- ❖ AT cellular command interface

It can communicate with controllers via AT commands (GSM 07.07, 07.05 and SIMCOM enhanced AT Commands).

## **2 POWER REQUIREMENTS:**

The board should be powered with an external power supply that can provide current between 700mA and 1000mA. Powering an Arduino and the GSM shield from a USB connection is not recommended, as USB cannot provide the required current when the modem is in heavy use.

**So instead we have to use 12V adapter.**

The modem can pull up to 2A of current at peak usage, which can occur during data transmission.

### **3 APPLICATIONS:**

- SMS based Remote Control and Alerts
- Security Applications
- Sensor Monitoring
- GPRS Mode Remote Data logging

### **4 ON BOARD INDICATORS:**

The shield contains a number of status LEDES:

- **ON:** It shows that the shield is getting power and is switched on.
- **NET:** This LED blinks when the modem is communicating with the radio network.

### **5 NETWORK LED:**

The Network LED indicates the various states of the GSM module i.e. **POWER ON, NETWORK REGISTRATION** and **GPRS CONNECTIVITY**. When the modem is powered up, this NETWORK LED will blink every second. After the Modem registers in the network (it takes 10-60 seconds), this LED will blink in step of 3 seconds at slow rate. At this stage we can start using the modem for our application. This shows that the modem is registered with the network.



## 6 AT Commands for using the shield

❖ CHECKING THE OPERATION AND CONNECTION OF GSM SHIELD:

**AT Press ENTER**

This would print OK which signifies of working connection and operation of the GSM shield.

❖ MAKING A VOICE CALL:

**ATD+(country code)mobile number; Press ENTER.**

❖ DISCONNECTING THE ACTIVE CALL:

**ATH Press ENTER.**

❖ RECEIVING THE CALL:

**ATA Press ENTER.**

❖ SENDING A MESSAGE:

For sending SMS in text Mode:

**AT+CMGF=1 Press ENTER**

**AT+CMGS="mobile number" Press ENTER**

Once the AT commands is given ' > ' prompt will be displayed on the screen. Type the message to be sent via SMS. After this, Press CTRL+Z to send the SMS. If the SMS sending is successful, "OK" will be displayed along with the message number.

❖ RECEIVING A MESSAGE:

For reading SMS in the text mode:

**AT+CMGF = 1 Press ENTER**

**AT+CMGR = num.**

Number (num.) is the message index number stored in the SIM card. For new SMS, URC will be received on the screen as + CMTI: SM 'num'. After this

**AT+CMGR=1 Press ENTER**

This displays the message on the screen along with sender details, number and timing too.

## **7 How to Interface the GSM shield with ARDUINO UNO**

- First we connect our Arduino Uno to the Computer or Laptop to see which COM port will be used to burn the program from the computer or laptop. This also provides power to the Arduino Uno
- Next we supply power to the GSM shield (supply only 12V to the GSM shield from the power jack using the adapter) which is going to be used for our program
- For GSM programs, only 2 pins, RX and TX are to be used mainly. So we require only these two pins of the Arduino Uno. These pins are pins 0 and 1 of the Arduino Uno
- Next burn the required program in The Arduino Uno using the software
- Then connect the GSM shield to Arduino such that RX, TX of the shield is connected to the TX, RX of the Arduino Uno.
- Your interfacing is completed.