GPS-easy!

Shield for Arduino

Arduino-Board Duemilanove (Atmega328)
Arduino-Board UNO (Atmega328)
Arduino-Board Mega2560 (Atmega2560)
"Arduino-Clones"

Manual (Rev. 4)

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**General**

*Arduino* is an open-source physical computing platform based on flexible and easy-to-use hardware and software which is used to for the development of prototypes. The *Arduino* board is composed of a microcontroller with several digital and analog inputs and outputs and interfaces. Including JAVA based development environment, based on processing and other open-source software. Developed programs can directly by loaded to the *Arduino* board.

*Arduino* has a great fan community.. and of course their own website with many example applications as well as an extensive forum → [http://www.arduino.cc/](http://www.arduino.cc/)

To extend the functionality of the Arduino board and to control other devices, so-called Shields (extension boards) are plugged to the Arduino board. By using the *GSM-easy! - Shield*, it is possible to use mobile communication . For example, Voicecall, SMS, Internet (TCP/IP, HTTP, PING, etc.). Alarms and measured data can be sent or switching or similar information can be received. The *Arduino* board in combination with the *GSM-easy! - Shield* is used individually and can be customized to your needs. The *Arduino* board communicates with the *GSM-easy! - Shield* over a serial interface.

Please read this manual completely and carefully before initial use. It describes correct use and includes important instructions for the installation of the *GSM-easy! - Shield* with the *Arduino-Board*. The manufacturer accepts no liability for damage resulting from improper use. All guarantee claims are then void.
Scope of delivery

Hardware
Everything there? The delivery of a **GSM-easy! - Shield** unit contains:
- the **GSM-easy! - Shield**
- this manual (as download)
- the *Arduino* board (optional)
- one mobile radio antenna (optional)
- power supply (optional)

Software
Software pack (available for download) containing:
- A library to use the **GSM-easy! - Shield**
- Example programs for using Voice, SMS, E-Mail, HTTP, FTP, Ping, etc.
- Datasheets and "Application Notes" for the wireless module *Quectel M95*
- *Arduino* board / **GSM-easy! - Shield** design and schematics

System requirements

General
- *Arduino* board "Duemilanove" (Atmega328) / *Arduino* board "UNO" (Atmega328) / *Arduino*-Board "Mega2560" (Atmega2560)
- SIM card (pre-paid or contract)

Programming
- *Arduino* development environment
- USB interface
- Windows / Mac OS X / Linux: 32 or 64 bit
Technical specification

General

- Operating voltage: 5VDC ... 9VDC
- 14 (Duemilanove/Uno) or 54 (Mega2560) digital in- and outputs
- 6 (Duemilanove/Uno) or 16 (Mega2560) analogue inputs

GSM

- Integrated GSM module: Quectel-M95
- internal supply voltage: 4V
- can be operated with pre-paid or contract SIM cards of any provider, no SIM lock
- control via the serial interface (TTL/CMOS level)

Antenna

- antennena connector: SMA
- connectivity for stubby antenna (directly attached) or external antenna (for example magnetic mount antenna) see here
Stackability (simultaneous use of multiple Shields)

The **GSM-easy! - Shield** can be used simultaneously with other *antrax Shields*.

When stacked together, all antrax shields can be switched ON/OFF via an own select line. Thus it is possible that multiple shields can share the few interfaces of one Arduino motherboard, without blocking each other.

*antrax* shields with stackability technology:

- GSM/GPRS/GPS-Shield
- **GSM-easy! - Shield**
- Iridium-Shield
- OBD2-Shield

**Firmware update of the wireless module  Quectel-M95**

Use the X24 connector of the **GSM-easy! - Shield** in order to perform and transfer a firmware update to the wireless module.
Installation

Hardware

- Place SIM card in the SIM card holder on the \textit{GSM-easy! - Shield}
- Connect mobile radio antenna
- Plug the \textit{GSM-easy! - Shield} on the \textit{Arduino} board. Because of the RF characteristics the \textit{GSM-easy! - Shield} must be placed as topmost shield.
- Connect the power supply to the \textit{Arduino} board or use an USB cable to connect the \textit{Arduino} board with a PC

\begin{quote}
\textbf{NOTE:} The wireless Quectel-M95 module has a dynamic transmission power control. In poor reception conditions, the transmission power is increased accordingly. In this case, a relatively high current is required from the power supply. Please use a sufficiently sized external power supply. The exclusive use of the USB power supply may result in interruptions when sending or "resetting" the wireless module.
\end{quote}

\textbf{CAUTION:} Before inserting/removing the SIM card please switch OFF (de-energise) the \textit{GSM-easy! - Shield} (e.g. interrupt power supply). Otherwise the complete content of the SIM card can be destroyed, which may lead to a fee for exchange by the provider.

Software

If required please load drivers needed by the \textit{Arduino} board from the directory of the \textit{Arduino} development environment.
Initial operation

Library

To make working with the **GSM-easy! - Shield** as simple as possible, a library was developed for this shield.

Please copy the files *gsm_easy.cpp*, *gsm_easy.h* und *keywords.txt* to the "libraries" file of the Arduino development environment (e.g. "c:\arduino-0022\libraries").

The library can be added to the current open program in just 3 clicks. Of course, this library can be changed or extended to your own needs.
Programming the Arduino-Board

The **GSM-easy! - Shield** is always addressed and controlled by the software used on the **Arduino** board. It is very easy to transfer a software to the **Arduino** board with the **Arduino** development environment. The required steps are described here below:

- connect the **Arduino** board with the already plugged **GSM-easy! - Shield** to the PC via USB interface
- please have the drivers installed already
- open the **Arduino** development environment
  - see: file → "Examples"
  - **GSM-easy!**
  - **Example program**
- since the **Arduino** board (despite USB connection) is shown as serial device to the PC, please choose
  - Tools → Serial Port as used interface
- Changes to the example software needed:
  - SIM-Pin (if available)
  - target telephone number
● use the upload button (highlighted in white in this picture) to directly upload the modified program to the Arduino board

● after the message "done" is shown at the lower end of the window the transfer has been completed successfully

● the program is automatically started

NOTE: The USB connection shall now be disconnected and a power supply can be plugged instead.
Example programs

The following example programs are available via download:

**GSM_easy_dialvoicecall**
- log in to the GSM network
- set up voice call
- send DTMF-tones, as soon as the remote station has answered the call

**GSM_easy_recvvoicecall**
- log in to the GSM network
- wait for an incoming voice call
- pick up incoming voice call
- respond with a DTMF tone
- end voice call

**GSM_easy_sendSMS**
- log in to the GSM network
- send an SMS to a telephone number

**GSM_easy_recvSMS**
- log in to the GSM network
- determine number of existing/stored SMS
- read out latest SMS
- delete all SMS

**GSM_easy_sendmail**
- log in to the GSM / GPRS network
- set/configure all information to the SMTP server
- set/configure all required e-mail information
- send e-mail

**GSM_easy_ping**
- log in to the GSM / GPRS network
- send a PING to a server / an IP address

**GSM_easy_httpget**
- log in to the GSM / GPRS network
- send a HTTP-GET to a specified server (for testing we recommend the antrax - see below)
**GSM_easy_ftp**
- log in to the GSM / GPRS network
- load a FTP test file from a specified server (for testing we recommend the antrax - see below)

**GSM_easy_status**
- display all current states
- GSM logged in?
- GPRS logged in?
- current signal field strength
- number of the used base station
- network used
- number of stored SMS

Please visit our [website](#) for further examples
LEDs

There are two LEDS on the **GSM-easy! - Shield**:

<table>
<thead>
<tr>
<th>LED_POWER</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>permanently OFF</td>
<td><strong>GSM-easy! - Shield</strong> currentless or deactivated</td>
</tr>
<tr>
<td>permanently ON</td>
<td><strong>GSM-easy! - Shield</strong> switched on</td>
</tr>
</tbody>
</table>

**NETLIGHT** (see also "M95_HardwareDesign_V1.2.pdf", page 56)

<table>
<thead>
<tr>
<th>State</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>permanently OFF</td>
<td>wireless module inactive</td>
</tr>
<tr>
<td>64 ms ON / 800 ms OFF</td>
<td>wireless module not yet logged in</td>
</tr>
<tr>
<td>64 ms ON / 2000 ms OFF</td>
<td>wireless module is logged in</td>
</tr>
<tr>
<td>64 ms ON / 600 ms OFF</td>
<td>GPRS data transfer in process</td>
</tr>
</tbody>
</table>
Signals between Arduino and Mainboard

For operating the **GSM-easy! - Shield** a total of 5 single signals plus power supply are required:

<table>
<thead>
<tr>
<th>Connector J1</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>serial interface, direction <strong>GSM-easy! - Shield</strong> ---+ Arduino (default)</td>
</tr>
<tr>
<td>2</td>
<td>serial interface, direction <strong>Arduino</strong> ---+ <strong>GSM-easy! - Shield</strong> (default)</td>
</tr>
<tr>
<td>3</td>
<td>alternatively for Pin 1 when using a software interface</td>
</tr>
<tr>
<td>4</td>
<td>alternatively for Pin 2 when using a software interface</td>
</tr>
<tr>
<td>5</td>
<td>PWRKEY (default)</td>
</tr>
<tr>
<td>6</td>
<td>EMERG (default)</td>
</tr>
<tr>
<td>7</td>
<td>GSM_ON (default)</td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector J2</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Connector J3</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>alternatively for signal PWRKEY</td>
</tr>
<tr>
<td>2</td>
<td>alternatively for signal EMERG</td>
</tr>
<tr>
<td>3</td>
<td>alternatively for signal GSM_ON</td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>+5V</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>Vin</td>
</tr>
</tbody>
</table>
Schematics / Layouts

Please find the schematics und PCB layouts of the module on our website.