

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Notice

While reasonable efforts have been made to assure the accuracy of this document, Telit assumes no liability resulting from any inaccuracies or omissions in this document, or from use of the information obtained herein. The information in this document has been carefully checked and is believed to be entirely reliable. However, no responsibility is assumed for inaccuracies or omissions. Telit reserves the right to make changes to any products described herein and reserves the right to revise this document and to make changes from time to time in content hereof with no obligation to notify any person of revisions or changes. Telit does not assume any liability arising out of the application or use of any product, software, or circuit described herein; neither does it convey license under its patent rights or the rights of others.

It is possible that this publication may contain references to, or information about Telit products (machines and programs), programming, or services that are not announced in your country. Such references or information must not be construed to mean that Telit intends to announce such Telit products, programming, or services in your country.

Copyrights

This instruction manual and the Telit products described in this instruction manual may be, include or describe copyrighted Telit material, such as computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and its licensors certain exclusive rights for copyrighted material, including the exclusive right to copy, reproduce in any form, distribute and make derivative works of the copyrighted material. Accordingly, any copyrighted material of Telit and its licensors contained herein or in the Telit products described in this instruction manual may not be copied, reproduced, distributed, merged or modified in any manner without the express written permission of Telit. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit, as arises by operation of law in the sale of a product.

Computer Software Copyrights

The Telit and 3rd Party supplied Software (SW) products described in this instruction manual may include copyrighted Telit and other 3rd Party supplied computer programs stored in semiconductor memories or other media. Laws in the Italy and other countries preserve for Telit and other 3rd Party supplied SW certain exclusive rights for copyrighted computer programs, including the exclusive right to copy or reproduce in any form the copyrighted computer program. Accordingly, any copyrighted Telit or other 3rd Party supplied SW computer programs contained in the Telit products described in this instruction manual may not be copied (reverse engineered) or reproduced in any manner without the express written permission of Telit or the 3rd Party SW supplier. Furthermore, the purchase of Telit products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license under the copyrights, patents or patent applications of Telit or other 3rd Party supplied SW, except for the normal non-exclusive, royalty free license to use that arises by operation of law in the sale of a product.



APPLICABLE PRODUCTS

PRODUCT
GE866-QUAD



Contents

1. Introduction	8
1.1. Scope	8
1.2. Audience.....	8
1.3. Contact Information, Support.....	8
1.4. Document Organization	9
1.5. Text Conventions	9
1.6. Related Documents	9
2. The GE866-QUAD.....	10
2.1. Product Overview.....	10
2.2. Target Market.....	11
2.3. Product Features.....	11
3. Product Description.....	15
3.1. Size and 2D mechanical drawing.....	15
3.2. Weight.....	15
3.3. Environmental requirements	16
3.3.1. Temperature range	16
3.3.2. RoHS compliance	16
3.4. Operating Frequencies.....	16
3.5. Transmitter output power.....	16
3.6. Receiver sensitivity	16
3.7. Antenna	17
3.8. Supply voltage.....	17
3.9. Power consumption	17
3.10. The user interface	17
3.11. Speech CODEC	18
3.12. SIM Reader.....	18
3.13. SMS	18
3.14. Real Time Clock and Alarm.....	18
3.15. Enhanced Measurement Report.....	18
3.16. Data transmission capabilities	18



- 3.17. Local security management 19
- 3.18. Call control 19
- 3.19. Phonebook 19
- 3.20. Characters management..... 19
- 3.21. SIM related functions 19
- 3.22. Call status indication 19
- 3.23. Automatic answer (Voice, Data) 19
- 3.24. Supplementary services (SS) 19
- 3.25. Acoustic signaling 20
- 3.26. Buzzer output..... 20
- 3.27. RF Transmission Monitor (RFTXMON) 20
- 3.28. RF Transmission Control..... 20
- 3.29. TTY (Telephone Text)..... 21
- 3.30. Logic level specifications 21
- 3.31. Audio 21
 - 3.31.1. Analog..... 21
 - 3.31.2. Digital 21
- 3.32. Serial Ports..... 21
- 3.33. Converters..... 21
 - 3.33.1. ADC Converter 21
 - 3.33.2. DAC Converter 21
- 3.34. Mounting the GE866-QUAD on your Board 21
- 3.35. Packing system 22
- 4. Evaluation Kit..... 23**
- 5. Software Features 24**
 - 5.1. IP Easy Extension..... 24
 - 5.1.1. Overview 24
 - 5.2. Multisocket..... 24
 - 5.3. Jamming Detection..... 25
 - 5.3.1. Overview 25
 - 5.4. CMUX..... 25
 - 5.4.1. Architecture..... 25
 - 5.4.2. Features 25



1. Introduction

1.1. Scope

Scope of this document is giving an overview of the Telit GE866-QUAD module, which is a compact GSM/GPRS module with data and voice capabilities.

1.2. Audience

This document is intended for customers who are evaluating the GE866-QUAD.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit's Technical Support Center (TTSC) at:

TS-EMEA@telit.com
TS-NORTHAMERICA@telit.com
TS-LATINAMERICA@telit.com
TS-APAC@telit.com

Alternatively, use:

<http://www.telit.com/en/products/technical-support-center/contact.php>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit's Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.



2. The GE866-QUAD

2.1. Product Overview

The GE866-QUAD is the smallest generation in Telit's 2G module portfolio. With its ultra-compact 15 x 19 mm LGA footprint, it is designed for those m2m applications requiring miniature foot print.

It is a quad-band 850/900/1800/1900 MHz GSM / GPRS communication product based on the market' latest 2G core which allows integrators to plan on availability for even the longest lifecycle applications, highly recommended for new designs specified for 2G coverage worldwide.

It is highly recommended for new designs requiring 2G coverage in an ultra-small and robust LGA package, which implies easy integration and low impact on final application size and costs. Ease of production and small foot print makes it the ideal solution for applications in security alarms, automated meter reading, and pos terminals.

The product is fully voice capable, the analog and digital audio interfaces make it suitable for applications such as voice enabled alarm panels, mHealth patient monitors and specialty phones such as those for the elderly or sensory-impaired.

The GE866-QUAD operates with 1.8 V GPIOs, minimizing power consumption and making it even more ideally suited for battery powered and wearable device applications.

The GE866-QUAD makes it possible to run the customer's application inside the module by means its embedded Python Script Interpreter, thus making it a complete SMT platform for m2m solutions.

All Telit modules, support Over-the-Air firmware update by means Premium FOTA Management. By embedding Red Bend Software vRapid Mobile® agent, a proven and battle-tested technology powering hundreds of millions of cellular handsets world-wide Telit is able to update its products by transmitting only a delta file, which represents the difference between one firmware version and another.



Interfaces

- 7 I/O ports maximum
- Analog audio (balanced)
- Digital audio
- 1 A/D plus 1 D/A converters
- Buzzer output
- ITU-T V.24 serial link through CMOS UART:
 - Baud rate from 300 to 115.200 bps
 - Autobauding up to 115.200 bps

Audio

- Telephony, emergency call
- Half rate, full rate, enhanced full rate and adaptive multi rate voice codecs (HR, FR, EFR, AMR)
- Superior echo cancellation & noise reduction
- Multiple audio profiles pre-programmed and fully configurable
- Embedded DTMF decoder

Approvals

- Fully type approved conforming with R&TTE directive
- GCF
- FCC, IC
- PTCRB
- RoHS compliant

SMS

- Point-to-point mobile originated and mobile terminated SMS
- Concatenated SMS supported
- SMS cell broadcast
- Text and PDU mode
- SMS over GPRS

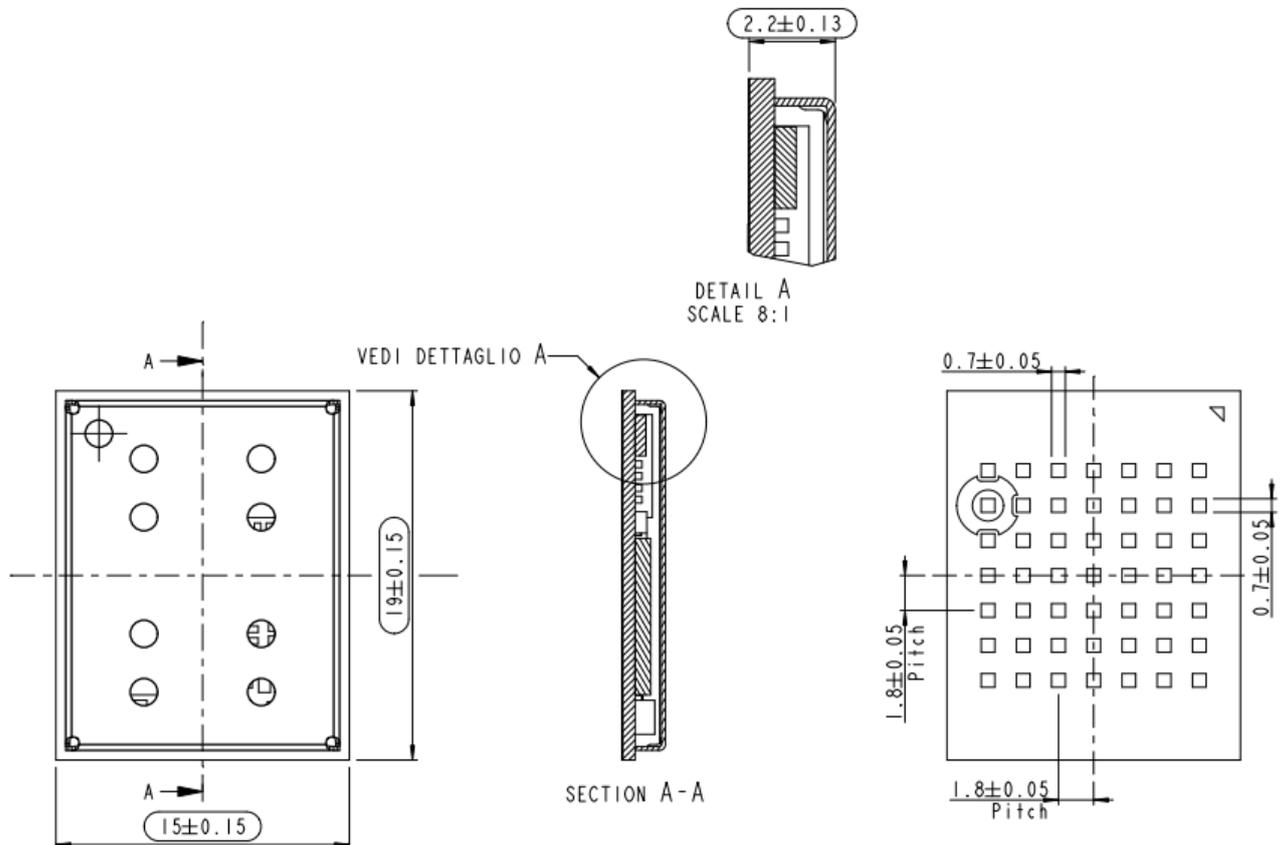


3. Product Description

3.1. Size and 2D mechanical drawing

The Telit GE866-QUAD module overall dimensions are:

- Length: 19 mm
- Width: 15 mm
- Thickness: 2.2 mm



3.2. Weight

The weight of the GE866-QUAD is 1.5 grams.



3.7. Antenna

The antenna and antenna transmission line on PCB for a Telit GE866-QUAD device shall fulfill the following requirements:

Frequency range	Depending by frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s).
Bandwidth	70 MHz in GSM 850, 80 MHz in GSM 900, 170 MHz in DCS and 140 MHz in PCS band

For further information please refer to the GE866-QUAD Hardware User Guide.

3.8. Supply voltage

The external power supply must be connected to VBATT & VBATT_PA signals and must fulfill the following requirements:

Nominal Supply Voltage	3.8 V
Normal Operating Voltage Range	3.40 V – 4.20 V
Extended Operating Voltage Range (*)	3.10 V – 4.50 V

(*) Please refer to the GE866-QUAD Hardware User Guide to use the product with the extended operating voltage range.

3.9. Power consumption

The current consumptions of the Telit GE866-QUAD in power-off and idle modes are:

Switched off current typical (Module power supplied only on VBATT_PA pin, the VBATT pin is not power supplied.)	2 uA
Idle registered, power saving	0.8 mA @ DRX=9 with AT+CFUN=5

Please check the HW User Guide for further details about all other power consumption figures.

3.10. The user interface

The user interface is managed by AT commands according to ITU-T V.250, 3GPP 27.007 and 27.005 specifications. Moreover, custom AT commands are also available. Please refer to the AT Command User Guide for details.



3.11. Speech CODEC

The GE866-QUAD supports the following voice codec:

- HR - Half Rate
- FR - Full Rate
- EFR - Enhanced Full Rate
- AMR-HR, AMR Half Rate
- AMR-FR, AMR Full Rate

3.12. SIM Reader

The GE866-QUAD supports phase 2 SIM at 1.8V and 3V ONLY with an external SIM connector. For 5V SIM, an external level translator can be added.

3.13. SMS

The GE866-QUAD supports the following SMS types:

- Mobile Terminated (MT) class 0 – 3 with signaling of new incoming SMS, SIM full, SMS read
- Mobile Originated class 0 – 3 with writing, saving in SIM and sending
- Cell broadcast compatible with CB DRX with signaling of new incoming SMS.

The GE866-QUAD also supports SMS over GPRS

3.14. Real Time Clock and Alarm

The GE866-QUAD supports the Real Time Clock and Alarm functions through AT commands. An alarm output pin can be configured to indicate the alarm with a hardware line output.

Furthermore the Voltage Output of the RTC power supply is provided so that a backup battery can be added to increase the RTC autonomy during power off of the main battery (power supply).

3.15. Enhanced Measurement Report

The GE866-QUAD supports the Enhanced Measurement Report on SACCH channel according to 3GPP TS 44.018 version 4.22.0 Release 4 (par. 3.4.1.2, 9.1.54, 9.1.55) and 3GPP TS 45.008 version 4.17.0 Release 4 (par. 8.4.8).

3.16. Data transmission capabilities

The Telit GE866-QUAD is a mobile station class B supporting GPRS Class 10, coding schemes 1 to 4 and PBCCH. Moreover, it supports GERAN feature package 1, which consist in supporting the Extended Uplink TBF and Network Assisted Cell Change (NACC).



As for circuit switched data, the GE866-QUAD supports asynchronous non-transparent data up to 9.6 Kbps. Moreover, it supports the V.110.

3.17. Local security management

The local security management can be done with the lock of Subscriber Identity module (SIM). The security code will be requested at power-up.

3.18. Call control

The call cost control function is supported.

3.19. Phonebook

This function allows the storage of the telephone numbers in SIM memory. The capability depends on SIM version and its embedded memory.

3.20. Characters management

The GE866-QUAD supports the IRA, GSM, 8859-1 and UCS2 characters sets, in TEXT and PDU mode.

3.21. SIM related functions

Fixed Dialing Numbers (FDN), Abbreviated Dialing Number (ADN) and PIN insertion are supported.

Extension at the PIN2 for the PUK2 insertion capability for lock condition is supported too.

3.22. Call status indication

The call status indication is supported.

3.23. Automatic answer (Voice, Data)

The automatic answer is supported. The user/application can specify the number of rings after which the module will automatically answer.

The user/application can set the number of rings by means of the command `ATS0=<n>`.

3.24. Supplementary services (SS)

The following supplementary services are supported:

- Call Barring,
- Call Forwarding,
- Calling Line Identification Presentation (CLIP),
- Calling Line Identification Restriction (CLIR),
- Call Waiting, other party call Waiting Indication,



- Call Hold, other party Hold / Retrieved Indication,
- Closed User Group supplementary service (CUG),
- Advice of Charge,
- Unstructured SS Mobile Originated (MO)

3.25. Acoustic signaling

The acoustic signaling of the GE866-QUAD on the selected acoustic device are the following:

- Call waiting;
- Ringing tone;
- SMS received tone;
- Busy tone;
- Power on/off tone;
- Off Hook dial tone;
- Congestion tone;
- Connected tone;
- Call dropped;
- No service tone;
- Alarm tone.

3.26. Buzzer output

The GPIO6 pad, when configured as Buzzer Output, is controlled by the GE866-QUAD module and will drive a Buzzer driver with appropriate square waves.

This permits to your application to easily implement Buzzer feature with ringing tones or melody played at the call incoming, tone playing on SMS incoming or simply playing a tone or melody when needed.

3.27. RF Transmission Monitor (RFTXMON)

The GPIO5 pin, when configured as RFTXMON Output, is controlled by the GE866-QUAD module and will rise when the transmitter is active and fall after the transmitter activity is completed. Please refer to the GE866-QUAD Hardware User Guide for further information.

3.28. RF Transmission Control

The GPIO4 pin, when configured as RF Transmission Control Input, permits to disable the Transmitter when the GPIO is set to Low by the application.

In the design is necessary to add a resistor 47K pull up to 2.8V, this pull up must be switched off when the module is in off condition.



4. Evaluation Kit

In order to assist the customer in the development of the application, Telit offers the EVK2 Evaluation Kit that can be ordered separately. The EVK2 has a SIM card holder, the RS 232 serial port level translator, a direct UART connection, audio and antenna connector.

The EVK2 provides a fully functional solution for a complete data or phone application. The standard serial RS232 9 pin connector placed on the Evaluation Kit allows the connection of the EVK2 system with a PC or other DTE.

The development of the applications utilizing the Telit GE866-QUAD module must present a proper design of all the interfaces towards and from the module (e.g. power supply, audio paths, level translators), otherwise a decrease in the performance will be introduced or, in the worst case, a wrong design can even lead to an operating failure of the module.

In order to assist the hardware designer in his project phase, the EVK2 board presents a series of different solutions, which will cover the most common design requirements on the market, and which can be easily integrated in the OEM design as building blocks or can be taken as starting points to develop a specific one.

For a detailed description of the Telit Evaluation Kit, please refer to the documentation provided with the Telit GE866-QUAD Hardware User Guide and EVK2 User Manual.



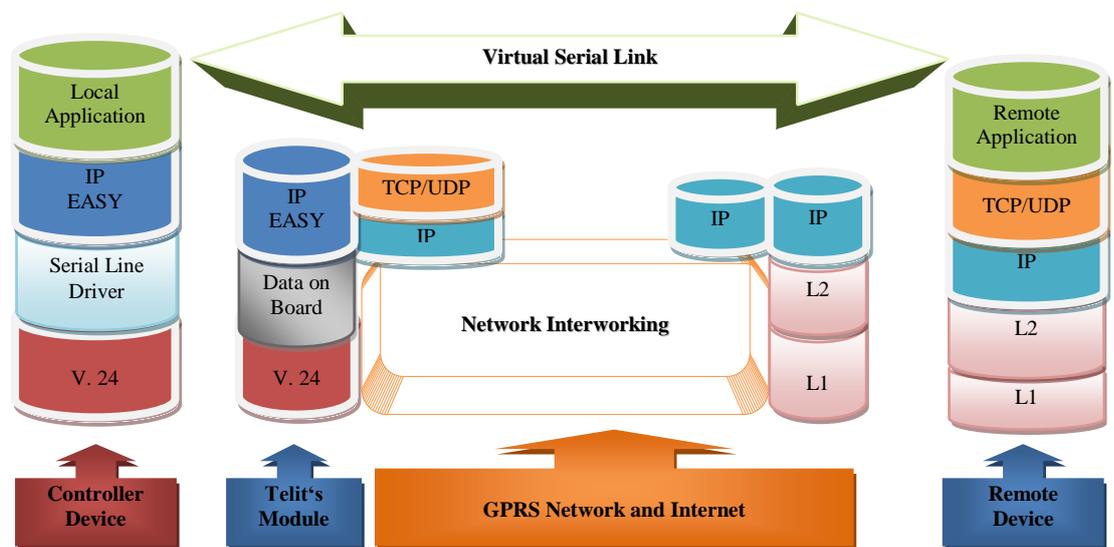
5. Software Features

5.1. IP Easy Extension

5.1.1. Overview

The IP Easy feature allows the Telit GE866-QUAD user to contact a device in internet and establish with it a raw data flow over the GPRS and Internet networks.

This feature can be seen as a way to obtain a "virtual" serial connection between the Application Software on the Internet machine involved and the controller of the Telit GE866-QUAD module, regardless of all the software stacks underlying.



This particular implementation allows to the devices interfacing to the Telit GE866-QUAD module the use of the GPRS and Internet packet service without the need to have an internal TCP/IP stack since this function is embedded in the module.

For more detailed information regarding the use of the IP Easy feature, please consult IP Easy User Guide and AT Commands Reference Guide.

5.2. Multisocket

The multisocket is an extension of Telit IP Easy feature, which allows the user to have two contexts activated (that means two different IP address), more than one socket connection (with a maximum of 6) and simultaneous FTP client service.

For more detailed information please consult the IP Easy User Guide.



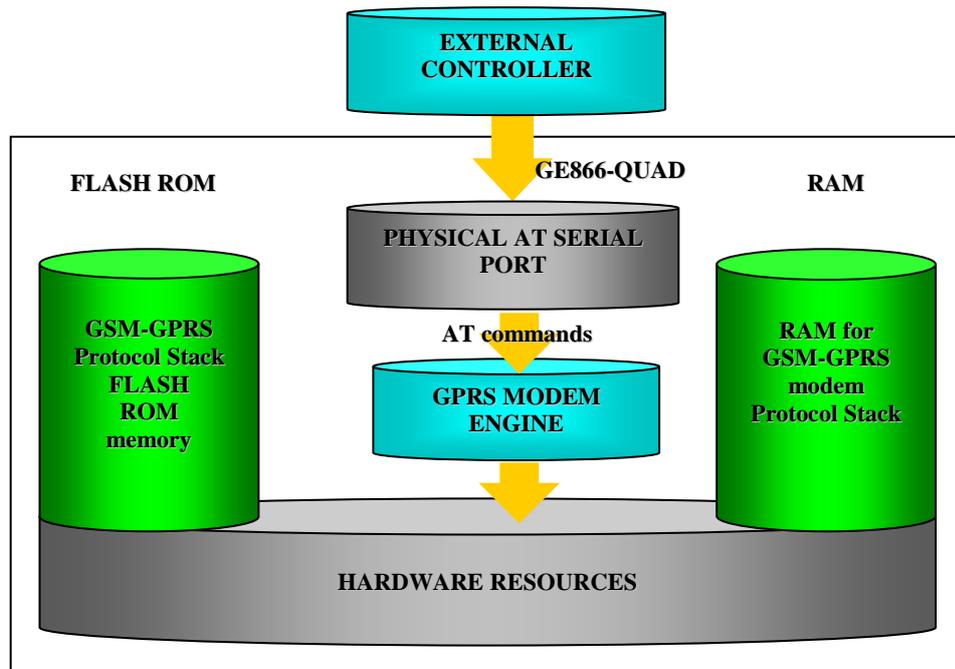
5.5. Easy Script Extension - Python interpreter

5.5.1. Overview

The Easy Script Extension is a feature that allows driving the modem "internally", writing the controlling application directly in a nice high level language: Python.

The Easy Script Extension is aimed at low complexity applications where the application was usually done by a small microcontroller that managed some I/O pins and the GE866-QUAD through the AT command interface.

A schematic of such a configuration can be:



In order to not use any external controller, and further simplify the programming of the sequence of operations, the customer can benefit of the following features:

- Python script interpreter engine v. 1.5.2+
- 800 kB of Non Volatile Memory room for the user scripts and data
- 1 MB RAM reserved for Python engine usage



5.5.2. Python 1.5.2+ Copyright Notice

The Python code implemented in the Telit module is copyrighted by Stichting Mathematisch Centrum, this is the license:

Copyright © 1991-1995 by Stichting Mathematisch Centrum, Amsterdam, The Netherlands.
All Rights Reserved

Copyright (c) 1995-2001 Corporation for National Research Initiatives; All Rights Reserved.

Copyright (c) 2001, 2002, 2003, 2004 Python Software Foundation; All Rights Reserved.

Copyright (c) 2001-2008 Python Software Foundation; All Rights Reserved.

All Rights Reserved are retained in Python.

Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice appear in supporting documentation, and that the names of Stichting Mathematisch Centrum or CWI or Corporation for National Research Initiatives or CNRI not be used in advertising or publicity pertaining to distribution of the software without specific, written prior permission.

While CWI is the initial source for this software, a modified version is made available by the Corporation for National Research Initiatives (CNRI) at the Internet address <ftp://ftp.python.org>.

STICHTING MATHEMATISCH CENTRUM AND CNRI DISCLAIM ALL WARRANTIES WITH REGARD TO THIS SOFTWARE, INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, IN NO EVENT SHALL STICHTING MATHEMATISCH CENTRUM OR CNRI BE LIABLE FOR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES OR ANY DAMAGES WHATSOEVER RESULTING FROM LOSS OF USE, DATA OR PROFITS, WHETHER IN AN ACTION OF CONTRACT, NEGLIGENCE OR OTHER TORTIOUS ACTION, ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THIS SOFTWARE.

NOTE: More details about the Python modules are available in the Easy Script in Python User Guide.

5.6. SAP: SIM Access Profile

5.6.1. Architecture

The SAP feature allows the module to use the SIM of a remote SIM Server. This feature is implemented using special AT Command on a Virtual circuit of the CMUX interface.



5.7. Premium FOTA Management (PFM) Service

The premium FOTA Management Service provides a cost-effective, fast, secure and reliable way for wirelessly reflashing the firmware on mobile devices, ensuring that embedded software is up-to-date with the latest enhancements and features.

Customers, who want to benefit from this service, must pass through the Telit certification program, where Telit will assist the customer in validating the correct implementation of FOTA.

5.7.1. FOTA (Firmware Over The Air)

Telit, which has signed a partnership agreement with the worldwide leader of Firmware OTA technology Red Bend, has integrated its unique vCurrent® Mobile client software in its m2m product portfolio. Telit is therefore able to upgrade its products by transmitting only a delta file, which represents the difference between one firmware version and another.

See “PFM Application Note” for details in www.telit.com > Product > GSM/GPRS > Product Family > Application Notes.

5.8. AT Commands

The Telit GE866-QUAD module can be driven via the serial interface using the standard AT commands.

The Telit GE866-QUAD module is compliant with:

1. Hayes standard AT command set to maintain the compatibility with existing SW programs.
2. 3GPP 27.007 specific AT command and GPRS specific commands.
3. 3GPP 27.005 specific AT commands for SMS (Short Message Service) and CBS (Cell Broadcast Service)

Moreover the GE866-QUAD module supports also Telit proprietary AT commands for special purposes.

For a more information about AT commands supported by the GE866-QUAD module please refer to document AT Commands Reference Guide.



6. SAFETY RECOMMENDATIONS

READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc
- Where there is risk of explosion such as gasoline stations, oil refineries, etc

It is the responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming to the security and fire prevention regulations.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. Same cautions have to be taken for the SIM, checking the instruction for its use carefully. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible for the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force.

Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (20 cm). In case this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

The European Community provides some Directives for the electronic equipment introduced on the market. All the relevant information's are available on the European Community website:

<http://ec.europa.eu/enterprise/rtte/dir99-5.htm>

The text of the Directive 99/05 regarding telecommunication equipment is available, while the applicable Directives (Low Voltage and EMC) are available at:

http://ec.europa.eu/enterprise/electr_equipment/index_en.htm



