GE865-QUAD Product Description

80309ST10054A Rev.0– 2009-02-16



Making machines talk.

Disclaimer

The information contained in this document is the proprietary information of Telit Communications S.p.A. and its affiliates (“TELIT”).

The contents are confidential and any disclosure to persons other than the officers, employees, agents or subcontractors of the owner or licensee of this document, without the prior written consent of Telit, is strictly prohibited.

Telit makes every effort to ensure the quality of the information it makes available. Notwithstanding the foregoing, Telit does not make any warranty as to the information contained herein, and does not accept any liability for any injury, loss or damage of any kind incurred by use of or reliance upon the information.

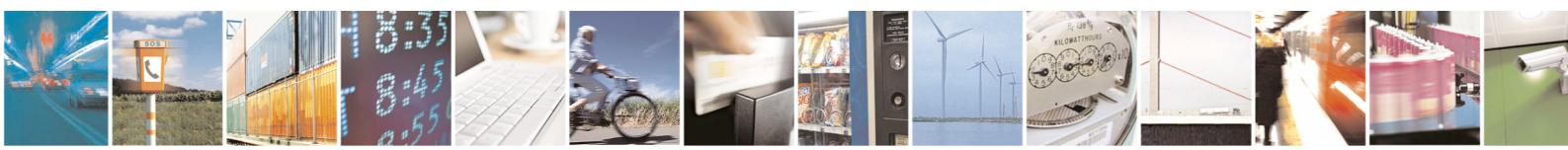
Telit disclaims any and all responsibility for the application of the devices characterized in this document, and notes that the application of the device must comply with the safety standards of the applicable country, and where applicable, with the relevant wiring rules.

Telit reserves the right to make modifications, additions and deletions to this document due to typographical errors, inaccurate information, or improvements to programs and/or equipment at any time and without notice.

Such changes will, nevertheless be incorporated into new editions of this document.

Copyright: Transmittal, reproduction, dissemination and/or editing of this document as well as utilization of its contents and communication thereof to others without express authorization are prohibited. Offenders will be held liable for payment of damages. All rights are reserved.

Copyright © Telit Communications S.p.A. 2009.



Contents

1. Introduction 6
1.1. Scope 6
1.2. Audience 6
1.3. Contact Information, Support 6
1.4. Document Organization 6
1.5. Text Conventions 7
1.6. Related Documents 7
1.7. Document History 7
2. The GE865-QUAD 9
2.1. Product Overview 9
2.2. Target Market 9
2.3. Product Features 9
3. Product Description 13
3.1. Size and 2D mechanical drawing 13
3.2. Weight 14
3.3. Environmental requirements 14
3.3.1. Temperature range 14
3.3.2. RoHS compliance 14
3.4. Operating Frequency 14
3.5. Transmitter output power 15
3.6. Reference sensitivity 15
3.7. Antenna 15
3.8. Supply voltage 15
3.9. Power consumption 16
3.10. The user interface 16
3.10.1. Speech CODEC 16
3.10.2. SIM Reader 16
3.10.3. SMS 16
3.10.4. Real Time Clock and Alarm 17



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

3.10.5. Data/fax transmission 17
3.10.6. Local security management 17
3.10.7. Call control 17
3.10.8. Phonebook 17
3.10.9. Characters management 17
3.10.10. SIM related functions 17
3.10.11. Call status indication 17
3.10.12. Automatic answer (Voice, Data or FAX) 17
3.10.13. Supplementary services (SS) 18
3.10.14. Acoustic signaling 18
3.10.15. Buzzer output 18
3.10.16. RF Transmission Monitor (RFTXMON) 19
3.10.17. RF Transmission Control 19
3.11. Logic level specifications 19
3.12. Audio 19
3.13. Serial Ports 19
3.14. Converters 19
3.14.1. ADC Converter 19
3.14.2. DAC Converter 19
3.15. Mounting the GE865-QUAD on your Board 20
3.15.1. General 20
3.16. Packing system 20

4. Evaluation Kit 21

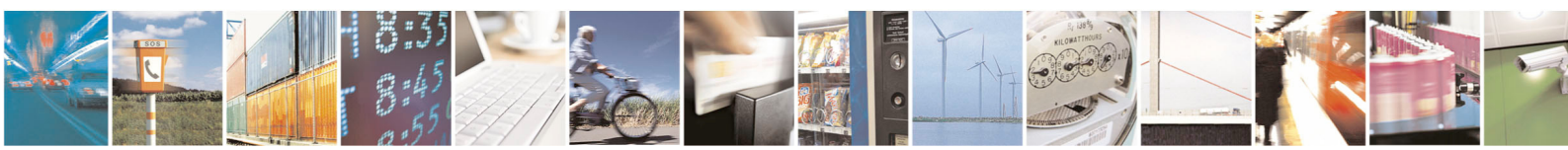
5. Software Features 22

5.1. Easy GPRS Extension 22
5.1.1. Overview 22
5.1.2. Easy GPRS definition 23
5.2. Multisocket 23
5.3. Jammed Detect & Report Extension 25
5.3.1. Overview 25
5.4. CMUX 25
5.4.1. Architecture 25
5.4.2. Feature and limitations 26



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

5.5. Easy Script Extension - Python interpreter 27
5.5.1. Overview 27
5.5.2. Python 1.5.2+ Copyright Notice 28
5.5.3. Python implementation description 30
5.5.4. Python core supported features 32
5.5.5. Python Build-in Custom Modules 32
5.6. SAP: SIM Access Profile 33
5.6.1. Architecture 33
5.6.2. Implementation feature 33
5.6.3. Remote SIM Message Command Description 33
5.7. Premium FOTA Management (PFM) Service 34
5.7.1. FOTA (Firmware Over The Air) 34
5.8. AT Commands 35
6. Conformity Assessment Issues 36
7. SAFETY RECOMMENDATIONS 38
8. List of acronyms 39



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

1. Introduction

1.1. Scope

Scope of this document is giving an overview of the Telit GE865-QUAD module, which is a very small GSM/GPRS module with data and voice capabilities.

1.2. Audience

This document is intended for customers who are evaluating the GE865-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.

1.4. Document Organization

This document contains the following chapters:

"Chapter 1: "Introduction" provides a scope for this document, target audience, contact and support information, and text conventions.

"Chapter 2: "The GE865-QUAD" gives an overview of the features of the product.

"Chapter 3: "Product Description" describes in details the characteristics of the product..



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

"Chapter 4: "Evaluation Kit" provides some basic information about the Evaluation Kit.

"Chapter 5: "Software Features" provides an overview of the software features of the products.

"Chapter 6: "Conformity Assessment Issues" provides some fundamental hints about the conformity assessment that the final application might need.

"Chapter 7: "Safety Recommendation" provides some safety recommendations that must be follow by the customer in the design of the application that makes use of the GE865.

1.5. Text Conventions



Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.



Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.



Tip or Information – Provides advice and suggestions that may be useful when integrating the module.

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

1.6. Related Documents

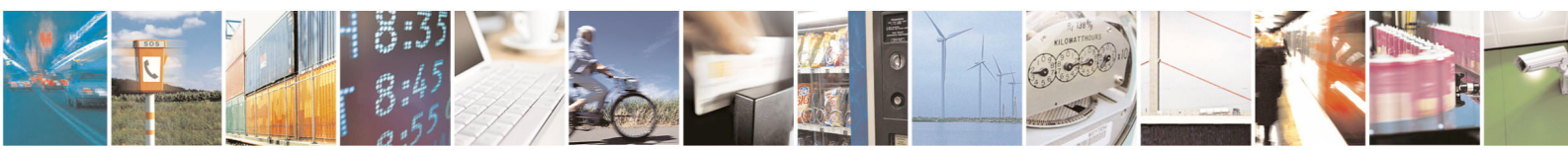
- Hardware User Guide
- Software User Guide
- AT Command User Guide
- CMUX User Guide
- SAP User Guide
- Easy Script User Guide

1.7. Document History



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

Revision	Date	Changes	Location
0	2009-02-16	First issue	Trieste



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

2. The GE865-QUAD

2.1. Product Overview

The new GE865-QUAD product introduces the smallest GSM/GPRS Ball-Grid-Array (BGA) module in the market.

The GE865 extends Telit's range of BGA products, incorporating a single-chip solution built on 0.13 µm CMOS technology into a 22 x 22 x 3 mm block.

The low profile and small size of the unique BGA package for the GE865-QUAD enable the design of extremely compact applications. Since connectors are eliminated, the solution cost is significantly reduced compared to conventional mounting.

With its ultra-compact design and extended temperature range, the Telit GE865-QUAD product is the perfect platform for high-volume m2m applications and mobile data devices. Additional features such as integrated TCP/IP protocol stack and serial multiplexer extend functionality of the application at no additional cost.

The GE865-QUAD makes it possible to run the customer's application inside the module using Python Script Interpreter, thus making it the smallest, complete platform for m2m solutions.

The GE865-QUAD module, support Over-the-Air firmware update by means Premium FOTA Management. By embedding the RedBend's vCurrent 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.

2.2. Target Market

The GE865-QUAD is designed and developed for the usage in applications such as:

- Telemetry
- Telematics
- Security alarms
- Automated Meter Reading (AMR)
- POS terminals
- PDAs and Mobile Computing
- Automotive and Fleet Management applications

2.3. Product Features

- Quad-band EGSM 850 / 900 / 1800 / 1900 MHz
- Output power

  - Class 4 (2W) @ 850 / 900 MHz



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

- Class 1 (1W) @ 1800 / 1900 MHz

- Control via AT commands according to GSM 07.05, 07.07 and Telit enhancements
- Control via Remote AT commands
- Power consumption (typical values)

  - Power off: ‹ 25 uA

  - Idle (registered, power saving): 2 mA @ DRX=9 (preliminary)

  - Dedicated mode: ‹ 200mA @ max power level

  - GPRS cl.10: ‹ 370mA @ max power level
- Serial port multiplexer GSM 7.10
- SIM access profile
- Supply voltage range: 3.22 – 4.5 V DC (3.8 V DC nominal)
- TCP/IP stack access via AT commands
- Sensitivity:

  - 107 dBm (typ.) @ 850 / 900 MHz

  - 106 dBm (typ.) @ 1800 / 1900 MHz
- Dimensions: 22 x 22 x 3 mm
- Weight: 3.2 grams
- Extended temperature range

  -40°C to +85°C (operational)

  -40°C to +85°C (storage temperature)
- RoHS compliant

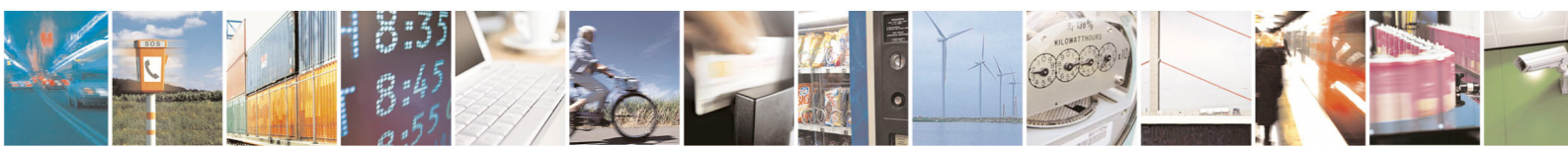
Interfaces

- 10 I/O ports maximum
- Analog audio (balanced)
- 2 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 from 2,400 to 57,600 bps

Audio



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

- 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
- Handset & hands-free operations
- DTMF

Approvals

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

SMS

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

Circuit switched data transmission

- Asynchronous transparent circuit switched data (CSD) up to 14.4 kbps
- Asynchronous non-transparent CSD up to 9.6 kbps
- V.110

GPRS data

- GPRS class 10
- Mobile station class B
- Coding scheme 1 to 4
- PBCCH support

Fax

- Group 3, class 1

GSM Supplementary Services



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

- Call forwarding
- Call barring
- Call waiting & call hold
- Advice of charge
- Calling line identification presentation (CLIP)
- Calling line identification restriction (CLIR)
- Unstructured supplementary services mobile originated data (USSD)
- Closed user group

Additional features

- SIM phonebook
- Fixed dialling number (FDN)
- STAT clock
- Alarm management
- Network LED support
- IRA character set
- Jamming detection & report
- Embedded TCP/IP stack, including TCP, IP, UDP, SMTP and FTP protocols
- EASY SCAN ® automatic scan over GSM frequencies (also without SIM card)

Python* application resources

- Python* script interpreter (module takes the application code directly in the Python* language)
- Memory: 1.9 MB of NV memory for the user scripts and 1.2 MB RAM for the Python* engine usage
- Over-the-air application SW update
- SPI Bus controlled in Python*

[*]Copyright © 1991–1995 by Stichting Mathematisch Centrum, Amsterdam, The Netherlands; All Rights Reserved.

Copyright © 1995–2001 Corporation for National Research Initiatives; All Rights Reserved.

Copyright © 2001–2009 Python Software Foundation; All Rights Reserved.

All Rights Reserved are retained in Python.

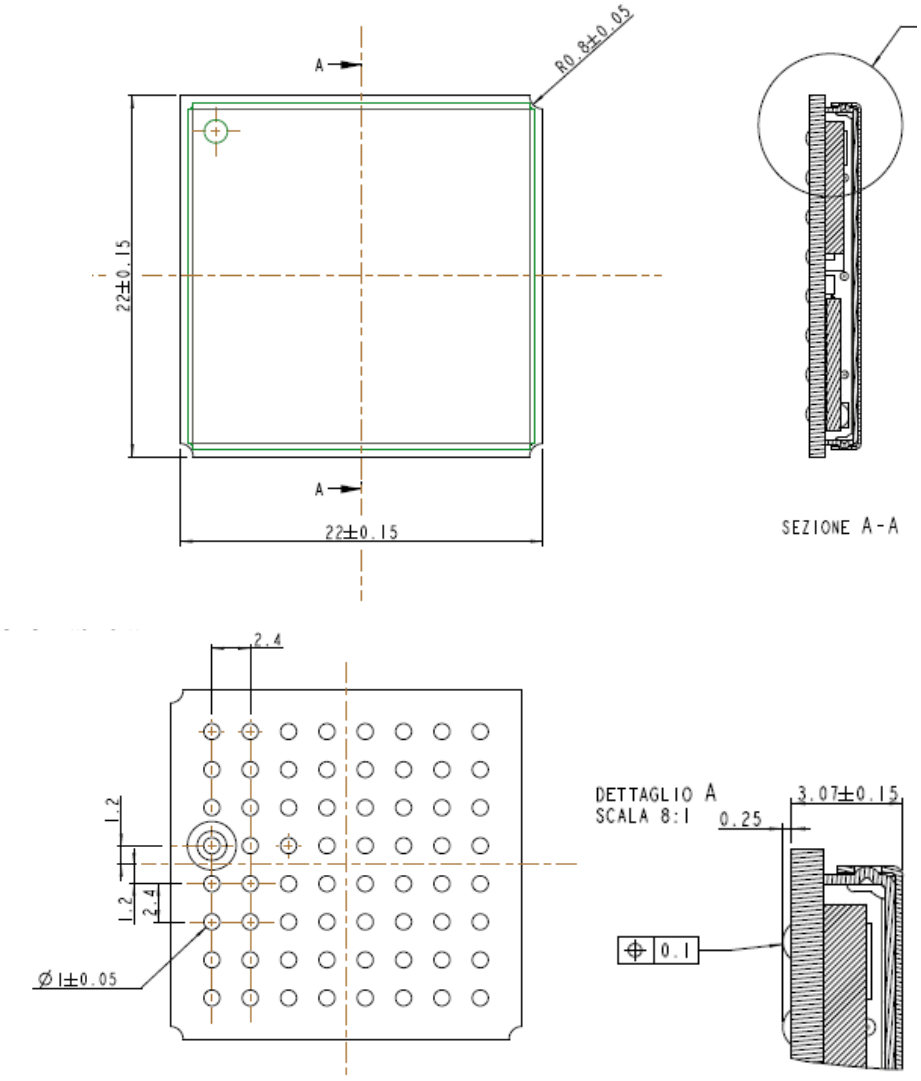


3. Product Description

3.1. Size and 2D mechanical drawing

The Telit GE865-QUAD module overall dimensions are:

- Length: 22 mm
- Width: 22 mm
- Thickness: 3 mm



3.2. Weight

The weight of the GE865-QUAD is 3.2 grams.

3.3. Environmental requirements

3.3.1. Temperature range

		Note
Operating Temperature Range	–20°C ÷ +55°C	The module is fully functional(*) in all the temperature range, and it fully meets the ETSI specifications.
	–40°C ÷ +85°C	The module is fully functional (*) in all the temperature range. Temperatures outside the range –20°C÷+55°C, might slightly deviate from ETSI specifications.
Storage and non operating Temperature Range	–40°C ÷ +85°C	

(*)Functional: the module is able to make and receive voice calls, data calls, SMS and make GPRS traffic.

3.3.2. RoHS compliance

As a part of Telit's corporate policy of environmental protection, the GE865-QUAD product comply to the RoHS (Restriction of Hazardous Substances) directive of the European Union (EU Directive 2002/95/EG).

3.4. Operating Frequency

The operating frequencies in GSM, DCS, PCS modes are conform to the GSM specifications.

Mode	Freq. TX (MHz)	Freq. RX (MHz)	Channels (ARFC)	TX - RX offset
GSM 850	824.2÷848.8	869.2÷893.8	0 ÷ 124	45 MHz
EGSM 900	890.0 - 914.8	935.0 - 959.8	0 ÷ 124	45 MHz
	880.2 - 889.8	925.2 - 934.8	975 ÷ 1023	45 MHz
DCS-1800	1710.2 - 1784.8	1805.2 - 1879.8	512 ÷ 885	95 MHz



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

PCS-1900	1850.2 - 1909.8	1930.2 - 1989.8	512 ÷ 810	80 MHz

3.5. Transmitter output power

The GE865 transceiver modules in GSM–850/900 operating mode is class 4 in accordance with the specifications which determine the nominal 2W peak RF power (+33dBm) on 50 Ohm. In the DCS–1800/PCS–1900 bands, the operating mode is class 1 in accordance with the specifications which determine the nominal 1W peak RF power (+30dBm) on 50 Ohm.

3.6. Reference sensitivity

The sensitivity of the GE865 module in the GSM 850/900 bands is –107 dBm typical in normal operating conditions.

The sensitivity in DCS-1800/PCS-1900 bands is –106 dBm typical in normal operating conditions.

3.7. Antenna

The antenna that the customer chooses to use should 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	80 MHz in EGSM 900, 70 MHz if GSM 850, 170 MHz in DCS, 140 MHz PCS band

For further information please refer to the GE865 Hardware User Guide.

3.8. Supply voltage

The external power supply must be connected to VBATT signal and must fulfill the following requirements:

Nominal Supply Voltage	3.8 volts
Max Supply Voltage	4.5 volts
Min Supply Voltage	3.22 volts

NOTE: Operating voltage range must never be exceeded; care must be taken in order to fulfill Min/Max voltage requirements.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

3.9. Power consumption

The typical current consumption of the Telit GE865 is:

Power off current typical (RTC running)	< 25 µA;
Idle registered	< 24 mA @ DRX=9
Idle registered, power saving	2 mA @ DRX=9 (AT+CFUN=5)
Operating current in voice channel (dedicated mode)	<200 mA @ Max power level
Operating current in GPRS class 10	< 370 mA @ Max power level

3.10. The user interface

The user interface is managed by AT commands according to ITU-T V.250, ETSI 07.07 and 07.05 specifications. Moreover, custom AT commands are also available. Please refer to the AT Command User Guide for details.

3.10.1. Speech CODEC

The GE865 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

3.10.2. SIM Reader

The GE865-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.

3.10.3. SMS

The GE865-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.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

3.10.4. Real Time Clock and Alarm

The GE865-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 capacitor can be added externally to increase the RTC autonomy.

3.10.5. Data/fax transmission

The Telit GE865-QUAD supports:

• GPRS Class 10, MS Class B

• CSD up to 14.4 Kbps

3.10.6. 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.

3.10.7. Call control

The call cost control function is supported.

3.10.8. Phonebook

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

3.10.9. Characters management

The GE865-QUAD supports the IRA characters set (International Reference Alphabet), in TEXT and PDU mode.

3.10.10. SIM related functions

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

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

3.10.11. Call status indication

The call status indication is supported.

3.10.12. Automatic answer (Voice, Data or FAX)

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>.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

3.10.13. 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)

3.10.14. Acoustic signaling

The acoustic signaling of the GE865-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.

3.10.15. Buzzer output

A general purpose I/O pin can be configured to output the BUZZER output signal. With only an external mosfet or transistor and a diode, a buzzer can be directly driven.

The ringing tone and the other signaling tones can be redirected to this buzzer output with a specific AT command.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

3.10.16. RF Transmission Monitor (RFTXMON)

As alternate function of the GPIO5, the GE865-QUAD can provide the RF transmission monitor. When the alternate function is activated, the pin of GPIO5 changes to HIGH every time the module transmits an RF signal and remains HIGH for the duration of the transmission sequence, i.e. it does not change with every GSM signal burst.

3.10.17. RF Transmission Control

As alternate function of the GPIO4 pin, when configured as RF Transmission Control Input, it allows to disable the Transmitter when the GPIO is set to Low by the application.

3.11. Logic level specifications

Where not specifically stated, all the interface circuits work at 2.8V CMOS logic levels. To get more detailed information about the logic level specifications used in the GE865-QUAD, please check with the Hardware User Guide.

3.12. Audio

The GE865-QUAD offers one audio line balanced. The GE865-QUAD has a built-in echo canceller and a noise suppressor. For more details, please refer to the GE865 Hardware User Guide.

3.13. Serial Ports

Two serial ports are available on the module:

- Main serial port (full RS232), auto-bauding from 300 to 115,200 bps
- AUX serial port (RX & TX only), 115,200 bps

3.14. Converters

3.14.1. ADC Converter

The GE865-QUAD has two on board ADC, which are 11-bit converter. They are able to read a voltage level in the range of 0÷2 volts applied on the ADC pin input, store and convert it into 11 bit word.

3.14.2. DAC Converter

The GE865-QUAD has one on board DAC, which is a 10 bit converter, able to generate an analogue value based a specific input in the range from 0 up to 1023. However, an external low-pass filter is necessary. See the HW User Guide for the details.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

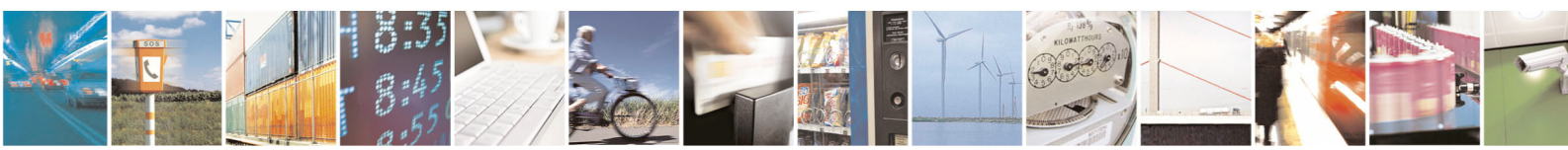
3.15. Mounting the GE865-QUAD on your Board

3.15.1. General

The Telit GE865-QUAD modules has been designed in order to be compliant with a standard lead-free SMT process. For detailed information about PCB pad design and conditions to use in SMT process please check with the GE865 Hardware User Guide.

3.16. Packing system

The Telit GE865-QUAD is supplied on trays of 50 pieces each.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

4. Evaluation Kit

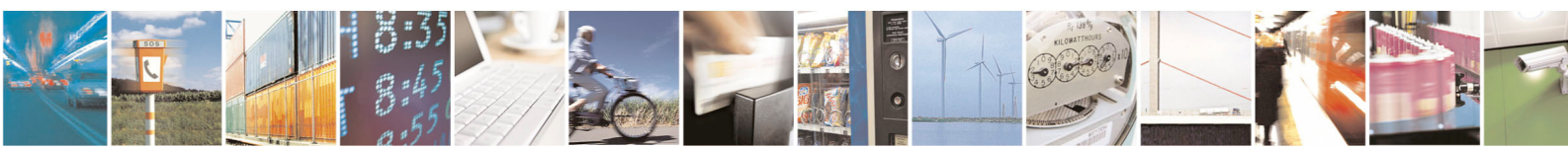
In order to assist the customer in the development of the application, Telit offers the EVK2 Evaluation Kit that can be ordered separately. The EVK2 has a SIM card holder, the RS 232 serial port level translator, a direct UART connection, audio and antenna connector.

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 GE865-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 performances 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 GE865 Hardware User Guide and EVK2 User Manual.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

5. Software Features

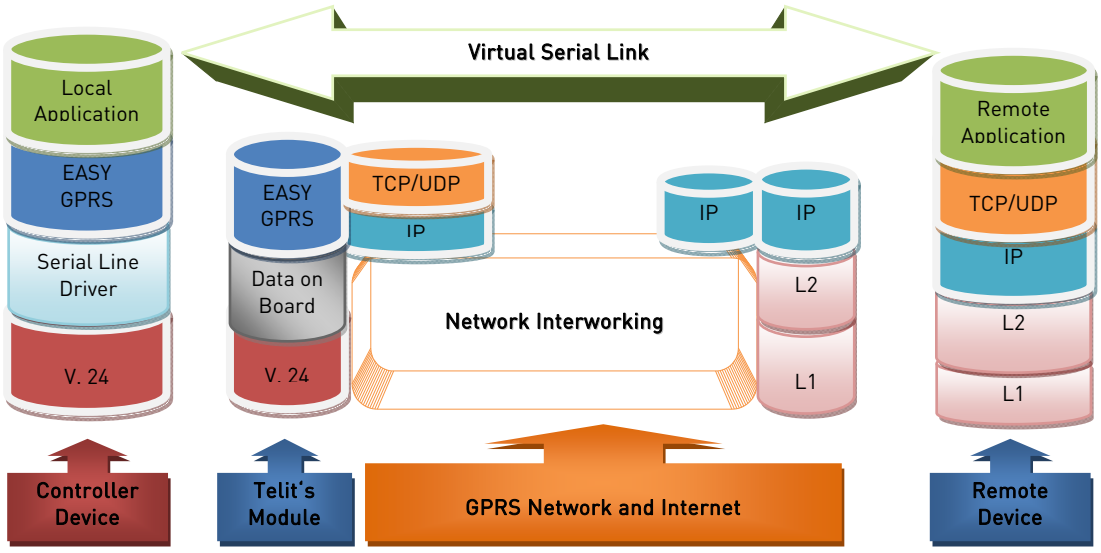
5.1. Easy GPRS Extension

5.1.1. Overview

The Easy GPRS feature allows the Telit GE865-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 GE865 module, regardless of all the software stacks underlying.

An example of the protocol stack involved in the devices is reported:



This particular implementation allows to the devices interfacing to the Telit GE865-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 inside the module.

Easy GPRS overcomes some of the known limitations of the previous implementation and implements some new features such as:

- Keep the GPRS context active even after the closing of a socket, allowing the application to keep the same IP address;
- Also Mobile terminated (incoming) connections can be made, now it is possible to receive incoming TCP connection requests;
- A new internal firewall has been implemented in order to guarantee a certain level of security on internet applications.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

5.1.2. Easy GPRS definition

The Easy GPRS feature provides a way to replace the need of an Internet TCP/IP stack at the terminal equipment side. The steps that will be required to obtain a virtual serial connection (that is actually a socket) to the Internet peer are:

- configuring the GPRS Access
- configuring the embedded TCP/IP stack behavior
- defining the Internet Peer to be contacted
- request the GPRS and socket connections to be opened (host is connected)
- exchange raw data
- close the socket and GPRS context

All these steps are achieved through AT commands.

As for common modem interface, two logical status are involved: command mode and data traffic mode.

- In Command Mode (CM), some AT commands are provided to configure the Data Module Internet stack and to start up the data traffic.
- In data traffic mode (Socket Mode, SKTM), the client can send/receive a raw data stream which will be encapsulated in the previously configured TCP / IP packets which will be sent to the other side of the network and vice versa. Control plane of ongoing socket connection is deployed internally to the module.

For more detailed information regarding GPRS please consult Easy GPRS User Guide and AT Commands Reference Guide.

5.2. Multisocket

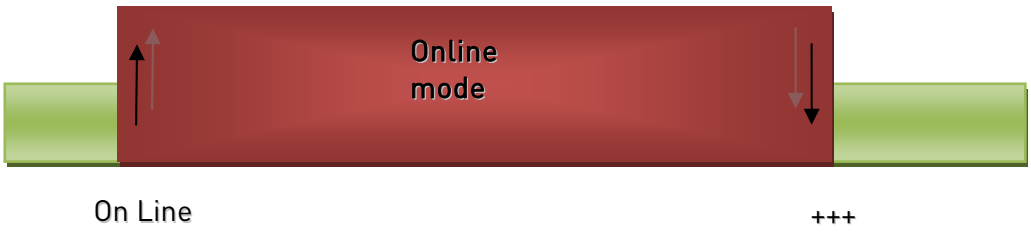
New functionality of the Telit modules, multisocket is an extension of Telit Easy GPRS feature, which allows the user to have two contexts activated (that means two different IP address), more than one socket connection (with a maximum of 6) and simultaneous FTP client service.

The basic idea of multisocket is the possibility of suspend a socket connection with the escape sequence +++.



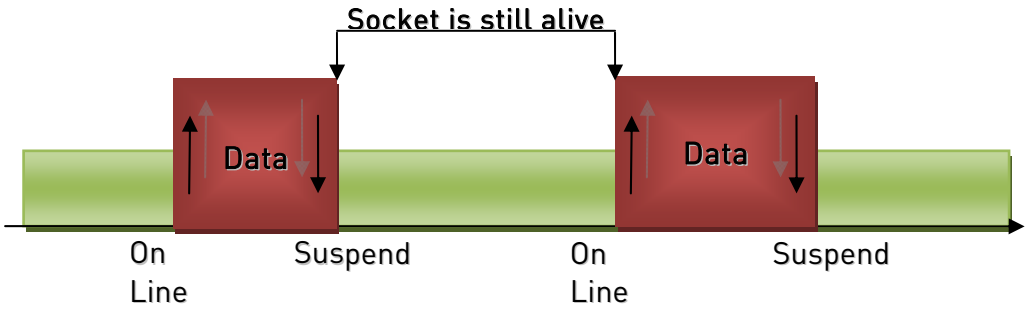
Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

With IP Easy we can use a SKTD to open a socket connection and go online. After online activities we use +++ sequence to close the connection (see the figure below).



The green part in the figure above, represents the module command mode while the red part is the online mode.

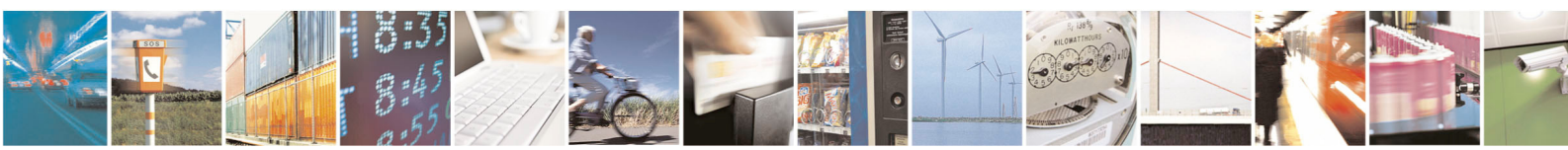
Now, the online mode can be suspended with the escape sequence by using the multisocket feature. During suspend mode the data received by the socket will be buffered. These data will be displayed after socket resumption, as shown in the figure below:



This new feature allows the user to switch between online mode and command mode without closing the connection and eventually opening another socket (or resuming the suspended one) or FTP connection.

Another feature is the possibility to associate any socket connection to a specific context, this means that we can use different IP addresses for the connections (max 2). Socket identifier is called Connection Id (selects which socket we want to use from 1 up to 6) and every Connection Id is associated to a context.

For more detailed information please consult Easy GPRS User Guide.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

5.3. Jammed Detect & Report Extension

5.3.1. Overview

The Jammed Detect & Report feature allows the GE865 to detect the presence of a disturbing device such as a Communication Jammer and give indication to the user and/or send a report of that to the network.

This feature can be very important in alarm, security and safety applications that rely on the module for the communications. In these applications, the presence of a Jammer device can compromise the whole system reliability and functionality and therefore shall be recognized and reported either to the local system for countermeasure actions or to the network providing remote actions.

An example scenario could be an intrusion detection system that uses the module for sending the alarm indication for example with an SMS to the system owner, and a thief income using a Jammer to prevent any communication between the GSM module and the network.

In such a case, the module detects the Jammer presence even before the break in and can trigger an alarm siren, other communication devices (PSTN modem) or directly report this condition to the network that can provide further security services for example sending SMS to the owner or police. Obviously this last service depends also from network infrastructure support and it may not be supported by some networks.

5.4. CMUX

CMUX (Converter-Multiplexer) is a multiplexing protocol implemented in the GE865 that can be used to send any data, SMS, fax, TCP data.

5.4.1. Architecture

The Multiplexer mode enables one serial interface to transmit data to four different customer applications. This is achieved by providing four virtual channels using a Multiplexer (MUX).

This is especially advantageous when a fax/data/GPRS call is ongoing. Using the Multiplexer features, e.g. controlling the module or using the SMS service can be done via the additional channels without disturbing the data flow; access to the second UART is not necessary.

Furthermore, several accesses to the module can be created with the Multiplexer. This is of great advantage when several independent electronic devices or interfaces are used.

To access the three virtual interfaces, both the GSM engine and the customer application must contain MUX components, which communicate over the multiplexer protocol.



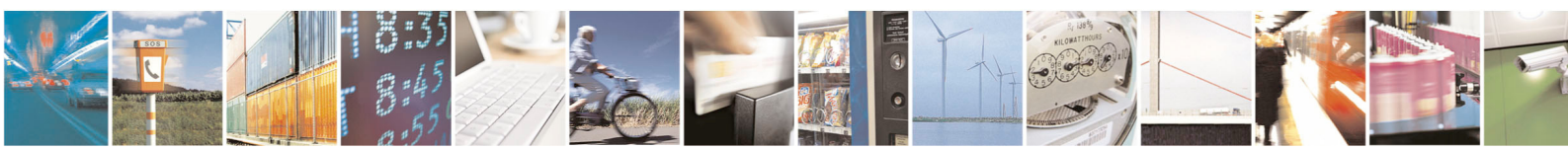
Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

In Multiplexer mode, AT commands and data are encapsulated into packets. Each packet has channel identification and may vary in length.

5.4.2. Feature and limitations

- 7.10 CMUX Basic Option used
- CMUX implementation support four full DLCI (Serial Port)
- Every CMUX instance has its own user profile storage in NVM
- Independent setting of unsolicited message.
- Every CMUX instance has its own independent flow control

NOTE: More details about the Multiplexer mode are available in the CMUX User Guide.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

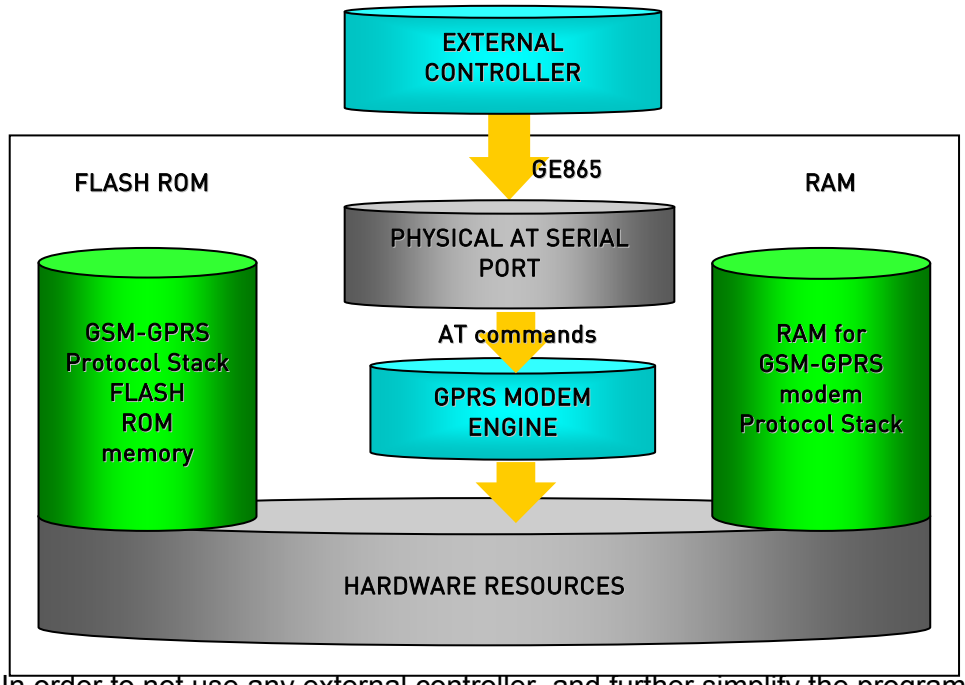
5.5. Easy Script Extension - Python interpreter

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 GE865 through the AT command interface.

A schematic of such a configuration can be:

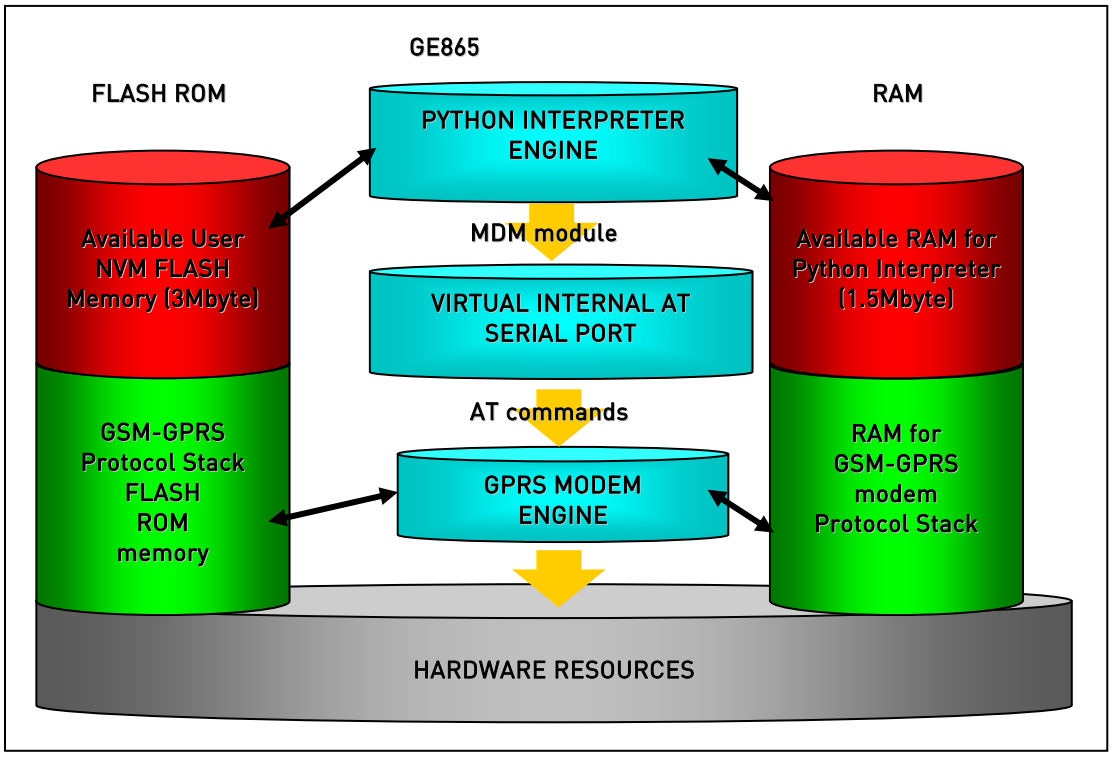


In order to not use any external controller, and further simplify the programming of the sequence of operations, the customer can benefit of these feature already embedded in the GE865:

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

Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

A schematic of this approach is:



5.5.2. Python 1.5.2+ Copyright Notice

The Python code implemented into 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.

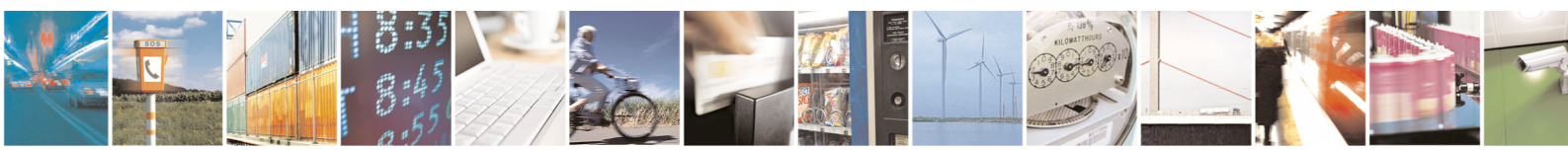
Permission to use, copy, modify, and distribute this software and its documentation for any purpose and without fee is hereby granted, provided that the above copyright notice appear in all copies and that both that copyright notice and this permission notice appear in supporting documentation, and that the names of Stichting Mathematisch Centrum or CWI or Corporation for National Research Initiatives or

Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

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.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

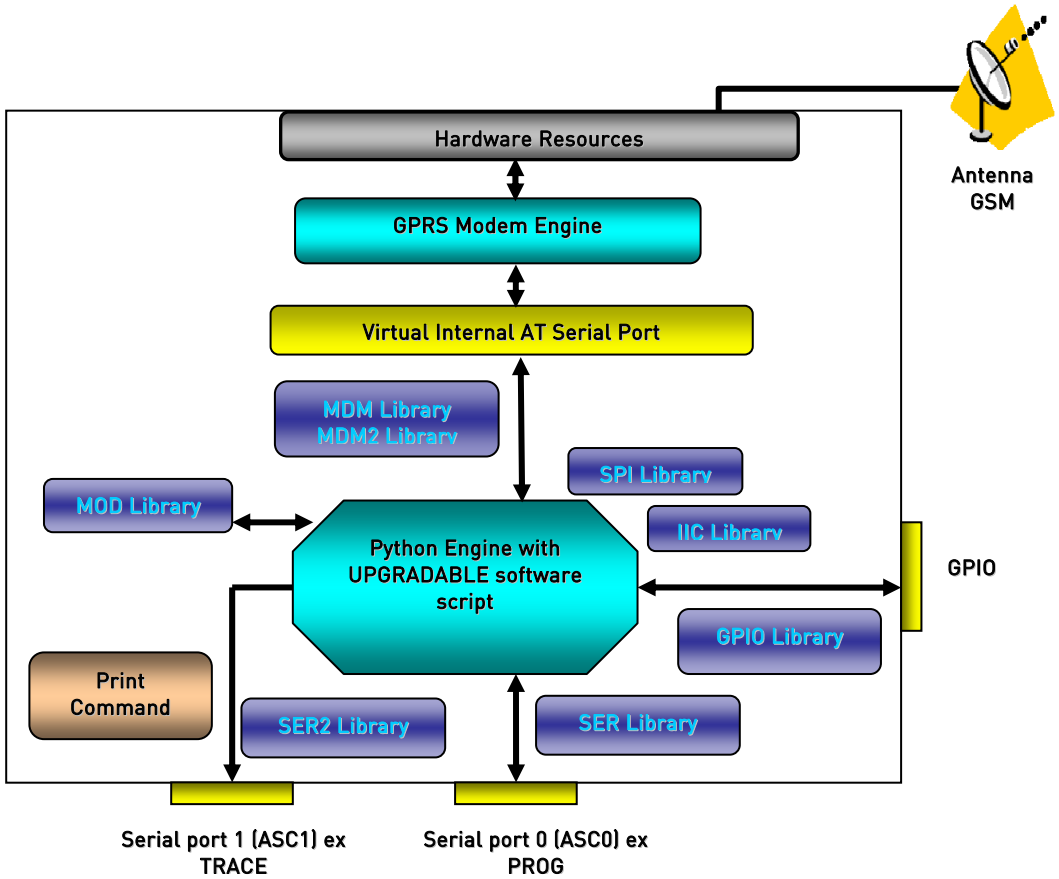
5.5.3. Python implementation description

Python scripts are text files stored in NVM inside the Telit GE865. There's a file system inside the module that allows to write and read files with different names on one single level (no subdirectories are supported).

Attention: it is possible to run only one Python script at the time.

The Python script is executed in a task inside the Telit module at the lowest priority, making sure this does not interfere with GSM/GPRS normal operations. This allows serial ports, protocol stack etc. to run independently from the Python script.

The Python script interacts with the Telit module functionality through four build-in interfaces.



- The MDM interface is the most important one. It allows Python script to send AT commands, receive responses and unsolicited indications, send data to the network and receive data from the network during connections. It is quite the same as the usual serial port interface in the Telit module. The difference is that this interface is not a real serial port but just an internal software bridge between Python and mobile internal AT command handling engine. All AT commands working in the Telit module are working in this software interface

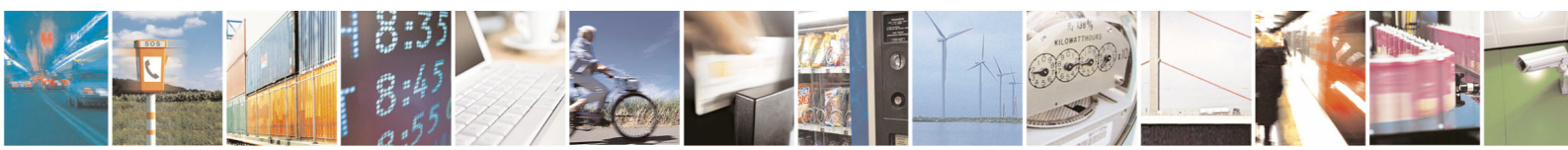


Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

as well. Some of them have no meaning on this interface, such as those regarding serial port settings. The usual concept of flow control keeps its meaning over this interface, but it's managed internally.

- The MDM2 interface is the second interface between Python and mobile internal AT command handling. It is used to send AT commands from Python script to mobile and receive AT responses from mobile to Python script when the classic MDM built in module already in use.
- The SER interface allows Python script to read from and write to the real, physical serial port where usually the AT command interface resides, for example to read NMEA information from a GPS device. When Python is running this serial port is free to be used by Python script because it is not used as AT command interface since the AT parser is mapped into the internal virtual serial port. No flow control is available from Python on this port.
- The SER2 interface allows Python script to read from and write to the real physical serial port ASC1, that is usually available for trace and debug.
- The GPIO interface allows Python script to handle general purpose input output faster than through AT commands, skipping the command parser and going directly to control the pins.
- The MOD interface is a collection of useful functions.
- The IIC interface is an implementation on the Python core of the IIC bus Master. It allows Python to create one or more IIC bus on the available GPIO pins.
- The SPI interface is an implementation on the Python core of the SPI bus Master. It allows Python to create one or more SPI bus on the available GPIO pins.

For the debug, the print command is directly forwarded on the TX pin (auxiliary serial port) at baud rate115200bps 8N1.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

5.5.4. Python core supported features

The Python core version is 1.5.2+ (string methods added to 1.5.2).

You can use all Python statements and almost all Python built-in types and functions.

Built-in types and functions **not** supported	Available modules (all **others** are **not** supported)
complex	marshal
float	imp
long	_main_
docstring	_builtin_
	sys
	md5

5.5.5. Python Build-in Custom Modules

Several build in custom modules have been included in the python core, specifically aimed at the hardware environment of the module.

The build in modules included are:

MDM	interface between Python and mobile internal AT command handling
MDM2	second interface between Python and mobile internal AT command handling
SER	interface between Python and mobile internal serial port ASC0 direct handling
SER2	interface between Python and mobile internal serial port ASC1 direct handling
GPIO	interface between Python and mobile internal general purpose input output direct handling
MOD	interface between Python and mobile miscellaneous functions
IIC	custom software Inter IC bus that can be mapped on creation over almost any GPIO pin available
SPI	custom software Serial Protocol Interface bus that can be mapped on creation over almost any GPIO pin available

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



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

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.

5.6.2. Implementation feature

- SAP is based on 7.10 CMUX Basic Option used
- Only SAP Client features
- Logic HW flow control is recommended on the Virtual instance selected for the SAP command.

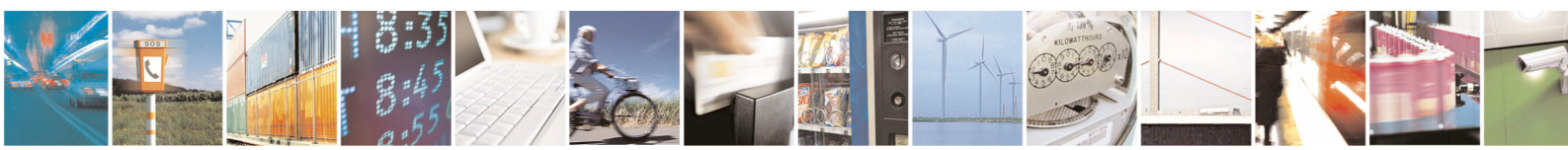
5.6.3. Remote SIM Message Command Description

The module sends request commands to the client application through a binary message that is crowned in the CMUX message. The client application shall extract the message and send it to the SAP server, through the appropriate protocols (e.g. by RFCOMM, that is the Bluetooth serial port emulation entity).

The client application shall extract all the messages sent by SAP server and put them in the CMUX message, to be sent to the module.

The module fulfill the following feature requirements:

- Connection management
- Transfer APDU
- Transfer ATR
- Power SIM on
- Report Status
- Error Handling



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

Every feature needs some procedures support:

Feature	Procedure
Connection Management	Connect
	Report Status
	Transfer ATR
	Disconnection Initiated by the Client
	Disconnection Initiated by the Server
Transfer APDU	Transfer APDU
Transfer ATR	Transfer ATR
Power SIM on	Power SIM on
	Transfer ATR
Report Status	Report Status
Error Handling	Error Response

Report Status, Disconnection Initiated by the Server and Error Response are independent messages sent by server. The other procedures consist of couples of messages, started by client.

NOTE: More details about the SAP are available in the SAP User Guide.

5.7. Premium FOTA Management (PFM) Service

The premium FOTA Management Service (TFUS) 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 for use 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.

All Telit modules, starting from SW version 7.03.x00, support Over-the-Air firmware update. Note that this service will be enabled only after signing specific agreement with Telit.

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



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

5.8. AT Commands

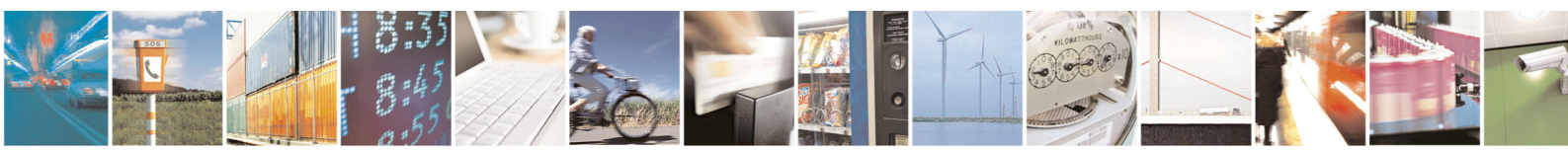
The Telit GE865 module can be driven via the serial interface using the standard AT commands .

The Telit GE865 module is compliant with:

1. Hayes standard AT command set, in order to maintain the compatibility with existing SW programs.
2. ETSI GSM 07.07 specific AT command and GPRS specific commands.
3. ETSI GSM 07.05 specific AT commands for SMS (Short Message Service) and CBS (Cell Broadcast Service)
4. FAX Class 1 compatible commands

Moreover the GE865 module supports also Telit proprietary AT commands for special purposes.

For a more information about AT commands supported by the GE865 module please refer to document AT Commands Reference Guide.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

6. Conformity Assessment Issues

The Telit GE865 has been assessed to be conform to the R&TTE Directive.

If the antenna connected to the module is conforming to the requirements specified under this document and the Hardware User Guide, it requires no further evaluation under Article 3.2 of the R&TTE Directive and do not require further involvement of a R&TTE Directive Notified Body for the final product.

In all other cases, or if the manufacturer of the final product is in doubt then the equipment integrating the radio module must be assessed against Article 3.2 of the R&TTE Directive.

In all cases assessment of the final product must be made against the Essential requirements of the R&TTE Directive Articles 3.1(a) and (b), safety and EMC respectively, and any relevant Article 3.3 requirements.

The Telit GE865 is conforming to the following European Union Directives:

- R&TTE Directive 1999/5/EC (Radio Equipment & Telecommunications Terminal Equipments)
- Low Voltage Directive 73/23/EEC and product safety
- Directive 89/336/EEC for conformity for EMC

In order to satisfy the essential requisite of the R&TTE 99/5/EC directive, the GE865 module is compliant with the following standards:

- GSM (Radio Spectrum). Standard: EN 301 511 and 3GPP 51.010-1
- EMC (Electromagnetic Compatibility). Standards: EN 301 489-1 and EN 301 489-7
- LVD (Low Voltage Directive) Standards: EN 60 950

In this document and the Hardware User Guide, Software User Guide all the information you may need for developing a product meeting the R&TTE Directive is included.

Furthermore the GE865 module is FCC Approved as module to be installed in other devices. This device is to be used only for fixed and mobile applications. If the final product after integration is intended for portable use, a new application and FCC is required.

The GE865 is conforming with the following US Directives:



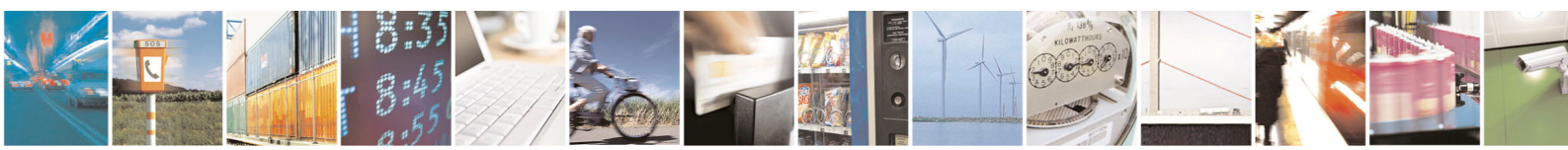
Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

- Use of RF Spectrum. Standards: FCC 47 Part 24 (GSM 1900)
- EMC (Electromagnetic Compatibility). Standards: FCC47 Part 15

To meet the FCC's RF exposure rules and regulations:

- The system antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all the persons and must not be co-located or operating in conjunction with any other antenna or transmitter.
- The system antenna(s) used for this module must not exceed 3 dBi for mobile and fixed or mobile operating configurations.
- Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

7. 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 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 carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of 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 in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the body (20 cm). In case of 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 equipments introduced on the market. All the relevant information's are available on the European Community website:

http://europa.eu.int/comm/enterprise/rtte/dir99-5.htm

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

http://europa.eu.int/comm/enterprise/electr_equipment/index_en.htm



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

8. List of acronyms

ACM	Accumulated Call Meter
ASCII	American Standard Code for Information Interchange
AT	Attention commands
CB	Cell Broadcast
CBS	Cell Broadcasting Service
CCM	Call Control Meter
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CMOS	Complementary Metal-Oxide Semiconductor
CR	Carriage Return
CSD	Circuit Switched Data
CTS	Clear To Send
DAI	Digital Audio Interface
DCD	Data Carrier Detected
DCE	Data Communications Equipment
DRX	Data Receive
DSR	Data Set Ready
DTA	Data Terminal Adaptor
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTR	Data Terminal Ready
EMC	Electromagnetic Compatibility
ETSI	European Telecommunications Equipment Institute
FTA	Full Type Approval (ETSI)
GPRS	General Radio Packet Service
GSM	Global System for Mobile communication
HF	Hands Free
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IRA	International Reference Alphabet
ITU	International Telecommunications Union
IWF	Inter-Working Function
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Linefeed
ME	Mobile Equipment
MMI	Man Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
OEM	Other Equipment Manufacturer
PB	Phone Book
PDU	Protocol Data Unit
PH	Packet Handler
PIN	Personal Identity Number



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.

PLMN	Public Land Mobile Network
PUCT	Price per Unit Currency Table
PUK	PIN Unblocking Code
RACH	Random Access Channel
RLP	Radio Link Protocol
RMS	Root Mean Square
RTS	Ready To Send
RI	Ring Indicator
SCA	Service Center Address
SIM	Subscriber Identity Module
SMD	Surface Mounted Device
SMS	Short Message Service
SMSC	Short Message Service Center
SS	Supplementary Service
TIA	Telecommunications Industry Association
UDUB	User Determined User Busy
USSD	Unstructured Supplementary Service Data



Reproduction forbidden without Telit Communications S.p.A's. written authorization - All Rights Reserved.