

GE865-QUAD Product Description

80309ST10054A Rev.7 – 2014-01-07



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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.



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-QUAD extends Telit's range of BGA products, incorporating a single-chip solution built on 0.13 μ m 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
- GSM/GPRS protocol stack 3GPP Release 4 compliant
- Output power
 - Class 4 (2W) @ 850 / 900 MHz



- Class 1 (1W) @ 1800 / 1900 MHz
- Control via AT commands according to 3GPP 27.005, 27.007 and Telit custom AT commands
- Control via Remote AT commands
- Power consumption (typical values)
 - Power off: < 62 uA
 - Idle (registered, power saving): 1.5 mA @ DRX=9
- Serial port multiplexer 3GPP 27.010
- SIM Application Toolkit 3GPP TS 51.014
- SIM Access Profile
- Extended 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
- DARP/SAIC support
- Enhanced Measurement Report support
- 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)
- Digital Voice Interface
- 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 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
- 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
- SMS over GPRS

Circuit switched data transmission

- 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
- GERAN Feature Package 1 support (NACC, Extended TBF)

GSM Supplementary Services

- 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)
- Real Time Clock
- Alarm management
- Network LED support
- IRA, GSM, 8859-1 and UCS2 character sets
- Jamming detection
- Embedded TCP/IP stack, including TCP, IP, UDP, SMTP, ICMP 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: 800 kB of NV memory for the user scripts and 1 MB RAM for the Python* engine usage
- Over-the-air application SW update

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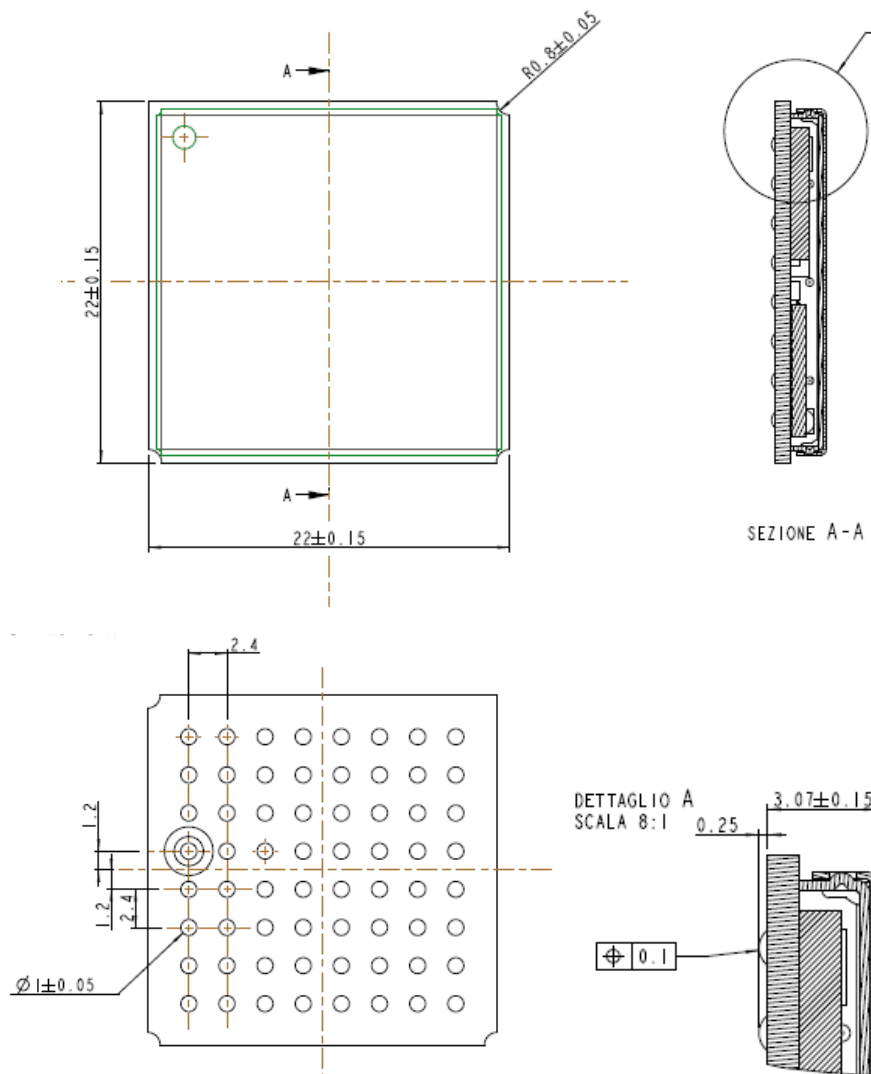


3. Product Description

3.1. Size and 2D mechanical drawing

The Telit GE865-QUAD module overall dimensions are:

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



3.9. Power consumption

The current consumptions of the Telit GE865-QUAD in power-off and idle are:

| | |
|--|----------------------------|
| Power off current typical (RTC running) | < 62 μ A; |
| Idle registered, power saving | 1.5 mA @ DRX=9 (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 GE865-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 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.

3.13. 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.

The GE865-QUAD also supports SMS over GPRS



3.33. Converters

3.33.1. 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.

3.33.2. 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.

3.34. Mounting the GE865-QUAD on your Board

The Telit GE865-QUAD module 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-QUAD Hardware User Guide.

3.35. Packing system

The Telit GE865-QUAD is supplied on trays of 50 pieces each or, in Tape&Reel of 200 pcs per reel.



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-QUAD Hardware User Guide and EVK2 User Manual.



5.3. Jamming Detection

5.3.1. Overview

The Jammed Detect feature allows the GE865-QUAD to detect the presence of a disturbing device such as a Communication Jammer and give indication to the user.

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 to the local system for countermeasure actions.

5.4. CMUX

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

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

5.4.2. Features

- 3GPP 27.010 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.



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:

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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.



5.6.2. Implementation features

- SAP is based on 3GPP 27.010 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



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 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.

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



5.8. AT Commands

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

The Telit GE865-QUAD module is compliant with:

1. Hayes standard AT command set, in order 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 GE865-QUAD module supports also Telit proprietary AT commands for special purposes.

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



6. Conformity Assessment Issues

The Telit GE865-QUAD has been assessed in order to satisfy the essential requirements of the R&TTE Directive 1999/05/EC (Radio Equipment & Telecommunications Terminal Equipments) to demonstrate the conformity against the harmonized standards with the final involvement of a Notified Body.

CE 0889

By using our certified module, the evaluation under Article 3.2 of the R&TTE is considerably reduced, allowing significant savings in term of cost and time in the certification process of the final product.

In all cases the 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.

This Product Description, the Hardware User Guide and Software User Guide contain all the information you may need for developing a product meeting the R&TTE Directive.

Furthermore the GE865-QUAD 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-QUAD is conforming to the following US Directives:

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

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

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 1.4dBi (850MHz) and 3.0dBi (1900MHz) 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.



NOTIFIED BODY OPINION



NOTIFIED BODY STATEMENT OF OPINION

(For Council Directive 1999/5/EC)

This opinion is issued to

Telit Communications S.p.A.

Via Stazione di Prosecco 5/B
34010 Sgonico (TS)
Italy

to state that the equipment known as

GE865-QUAD

(Hardware version 3)

in our opinion, conforms (following an evaluation of its associated Technical Construction File and subject to any restrictions stated in the attached Annex) with the essential requirements of Annex IV of Council Directive 1999/5/EC on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity, in relation to the essential requirements of :

Article 3.2 Radio Spectrum.

Details of the scope of this opinion, standards used, RF parameters of this equipment and other information necessary for the correct interpretation and application, including any remarks, restrictions or observations that are detailed in the attached Annex.

Signed:

John Bellairs on behalf of RFI Global Services Ltd.

Issue Date: 21 June 2010

Notified Body
Opinion No: RFI-NOTA2-SC76937JD10



RFI Global Services Ltd, Pavilion A, Ashwood Park,
Ashwood Way, Basingstoke, Hampshire, RG23 8BG, UK
Tel: +44 (0) 1256 312000 Fax: +44 (0) 1256 312001
Web Address: www.rfi-global.com email: contactus@rfi-global.com

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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 |
| GMSK | Gaussian Minimum Shift Keying |
| 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 |



