GE864-QUAD AUTOMOTIVE V2
Product Description

80331ST10066a Rev.3 – 2013-09-05

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.

Usage and Disclosure Restrictions

License Agreements

The software described in this document is the property of Telit and its licensors. It is furnished by express license agreement only and may be used only in accordance with the terms of such an agreement.

Copyrighted Materials

Software and documentation are copyrighted materials. Making unauthorized copies is prohibited by law. No part of the software or documentation may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, without prior written permission of Telit

High Risk Materials

Components, units, or third-party products used in the product described herein are NOT fault-tolerant and are NOT designed, manufactured, or intended for use as on-line control equipment in the following hazardous environments requiring fail-safe controls: the operation of Nuclear Facilities, Aircraft Navigation or Aircraft Communication Systems, Air Traffic Control, Life Support, or Weapons Systems (High Risk Activities"). Telit and its supplier(s) specifically disclaim any expressed or implied warranty of fitness for such High Risk Activities.

Trademarks

TELIT and the Stylized T Logo are registered in Trademark Office. All other product or service names are the property of their respective owners.

Copyright © Telit Communications S.p.A.

Applicability Table

PRODUCT
GE864-QUAD AUTOMOTIVE V2

Contents

1. Introduction

1.1. Scope

Scope of this document is giving an overview of the Telit GE864-QUAD AUTOMOTIVE V2 module, which is a very small GSM/GPRS module with data and voice capabilities for automotive applications.

1.2. Audience

This document is intended for customers who are evaluating the GE864-QUAD AUTOMOTIVE V2.

1.3. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit 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 GE864-QUAD AUTOMOTIVE V2" gives an overview of the features of the product.

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

"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 GE864-QUAD AUTOMOTIVE V2.

"Chapter 8: "List of Acronyms"

"Chapter 9: "Document history"

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, 1vv0300840
- Software User Guide, 1vv0300784
- AT Command User Guide, 80000ST10025a
- CMUX User Guide, 30268ST10299A
- SAP User Guide, 80000ST10029a
- Python Easy Script User Guide, 80000ST10020a
- Audio Settings Application Note, 80000NT10007a

- Event Monitor Application Note, 80000NT10028a

- Easy IP User Guide, 80000ST10028

- Digital Voice Interface Application Note, 80000nt10004a

- EVK2 User Guide, 1vv0300704

- PFM Application Note, 80000nt10013a

- Telit Solution for eCall Testing, 80000NT10046a

2. The GE864-QUAD AUTOMOTIVE V2

2.1. Product Overview

The new GE864-QUAD AUTOMOTIVE V2 product introduces the smallest GSM/GPRS Ball-Grid-Array (BGA) module in the market.

The GE864-QUAD AUTOMOTIVE V2 extends Telit range of BGA products, incorporating a single-chip solution built on 0.13 μm CMOS technology into a 30 x 30 x 3 mm block.

The low profile and small size of the unique BGA package for the GE864-QUAD AUTOMOTIVE V2 enables 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 GE864-QUAD AUTOMOTIVE V2 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 the functionalities of the application at no additional cost.

The GE864-QUAD AUTOMOTIVE V2 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.

Moreover the GE864-QUAD Automotive V2 is also compliant with eCall European Directive.

The GE864-QUAD AUTOMOTIVE V2 module supports Over-the-Air firmware update by means of Premium FOTA Management. By embedding the RedBend 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 from one firmware version to another.

2.2. Target Market

The GE864-QUAD AUTOMOTIVE V2 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

- Event Monitor engine (ref: Event Monitor Application note)

- Power consumption (typical values)

  - Power off: ‹ 62 uA

  - Idle (registered, power saving): 1.6 mA @ DRX=9

- Serial port multiplexer 3GPP 27.010

- SIM Application Toolkit 3GPP TS 51.014

- SIM Access Profile

- eCall Compliant;

- Extended Supply voltage range: 3.22 – 4.5 V DC (3.8 V DC nominal)

- TCP/IP stack access via AT commands

- Sensitivity:

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

  $\leq$- 106 dBm (typ.) @ 1800 / 1900 MHz

- DARP/SAIC support

- Enhanced Measurement Report support

- Dimensions: 30 x 30 x 3 mm

- Weight: 5 grams

- Extended temperature range

  -40°C to +85°C (operational)

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

- RoHS compliant

- AT interface on both serial ports

- Added PCM voice signal on UART

- Enhanced AT Commands suite (FTP additional commands, Command mode TCP)

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 1200 up to 115.200 bps
- Two wires RS232, CMOS level (ASC1) for PYTHON debug:

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 by means of AT commands (ref.: Audio Settings Application Note)
- 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)

Additional tests

- ISO 16750-1:2003, Road vehicles — Environmental conditions and testing for electrical and electronic equipment :
  - [1] ISO 16750-1:2003, Part 1: General
  - [2] ISO 16750-3:2003, Part 3: Mechanical loads
  - [3] ISO 16750-4:2003, Part 4: Climatic loads
- CISPR 25, 2nd Edition: Radiated Emission ALSE method

PIN Protection

- **ESD protection level 4**
  - Contact up to +-4kV
  - Air up to +-8kV
  - Contact antenna pin up to +-15kV

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 MB RAM for the Python* engine usage
- Over-the-air application SW update
- Script execution speed increased up to 4 times compared to the GE864-QUAD

[*]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 GE864-QUAD AUTOMOTIVE V2 module overall dimensions are:

- Length: 30 mm
- Width: 30 mm
- Thickness: 3 mm
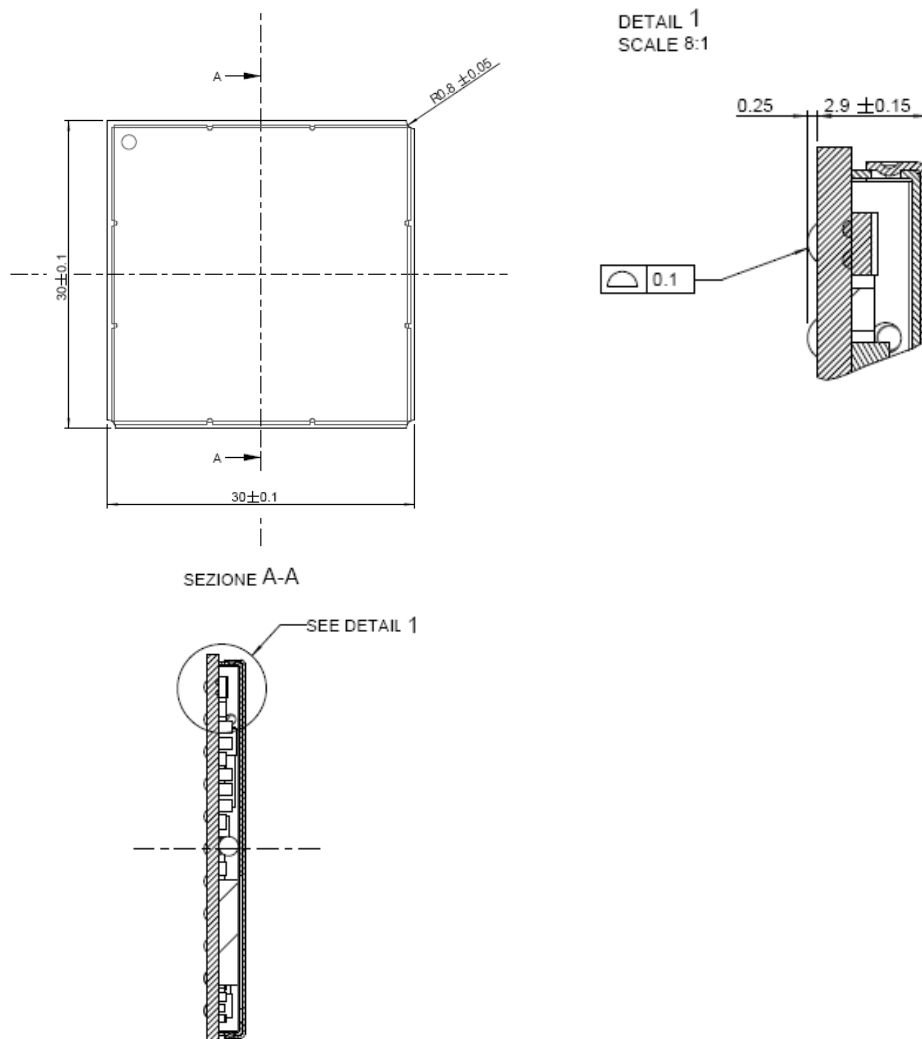
3.2. Weight

The weight of the GE864-QUAD AUTOMOTIVE V2 is 6 grams.

3.3. Environmental requirements

3.3.1. Temperature range

		Note
Operating Temperature Range	–30°C ÷ +85°C	The module is fully functional(*) in all the temperature range, and it fully meets the 3GPP specifications.
	–40°C ÷ +85°C	The module is fully functional (*) in all the temperature range.
Storage and non operating Temperature Range	–40°C ÷ +90°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 GE864-QUAD AUTOMOTIVE V2 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	124 ÷ 251	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
PCS-1900	1850.2 - 1909.8	1930.2 - 1989.8	512 ÷ 810	80 MHz

3.5. Transmitter output power

The GE864-QUAD AUTOMOTIVE V2 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. Receiver sensitivity

Sensitivity of GE864-QUAD AUTOMOTIVE V2 module in GSM 850/900 bands is better than –107 dBm (2.4% BER Class II - static channel) in normal operating conditions.

Sensitivity of GE864-QUAD AUTOMOTIVE V2 module in GSM 1800/1900 bands is better than –106 dBm (2.4% BER Class II - static channel) in normal operating conditions.

The GE864-QUAD AUTOMOTIVE V2 supports also the Downlink Advance Receiver Performance (DARP) feature for single antenna interference cancellation (SAIC).

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 GE864-QUAD AUTOMOTIVE V2 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	3.7 V
Normal Operating Voltage Range	3.4 V – 4.2 V
Extended Operating Voltage Range (*)	3.22 V – 4.5 V

(*) Please refer to the GE864-QUAD AUTOMOTIVE V2 Hardware User Guide for using the product with the extended operating voltage range.

3.9. Power consumption

The current consumptions of the Telit GE864-QUAD AUTOMOTIVE V2 in power-off and idle are:

Power off current typical (RTC running)	< 62 µA;
Idle registered, power saving	< 1.6 mA @DRX=9

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 GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 supports phase2 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 GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 also supports SMS over GPRS

3.14. Real Time Clock and Alarm

The GE864-QUAD AUTOMOTIVE V2 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.

3.15. Enhanced Measurement Report

The GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 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 storing of the telephone numbers in SIM memory. The capability depends on SIM version and its embedded memory.

3.20. Characters management

The GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 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

A general purpose I/O pin can be configured to output the BUZZER output signal. With 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.

3.27. RF Transmission Monitor (RFTXMON)

As alternate function of the GPIO5, the GE864-QUAD AUTOMOTIVE V2 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.

3.28. 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.

3.29. TTY (Telephone Text)

The TTY feature is supported. Please refer to 3GPP TS 26.226 and 3GPP TS 26.231 for details.

3.30. 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 GE864-QUAD AUTOMOTIVE V2, please check with the Hardware User Guide.

3.31. Audio

3.31.1. Analog

The GE864-QUAD AUTOMOTIVE V2 offers one audio line balanced. The GE864-QUAD AUTOMOTIVE V2 has a built-in echo canceller and a noise suppressor. For more details, please refer to the GE864-QUAD AUTOMOTIVE V2 Hardware User Guide.

3.31.2. Digital

The GE864-QUAD AUTOMOTIVE V2 offers the digital voice interface. For more details, please refer to the Digital Voice Interface Application Note.

3.32. Serial Ports

Two serial ports are available on the module:

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

3.33. Converters

3.33.1. ADC Converter

The GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 on your Board

The Telit GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 Hardware User Guide.

3.35. Packing system

The Telit GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 Hardware User Guide and EVK2 User User Guide.

5.   Software Features

5.1.   IP Easy Extension

5.1.1.   Overview

The IP Easy feature allows the Telit GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 module, regardless of all the software stacks underlying.
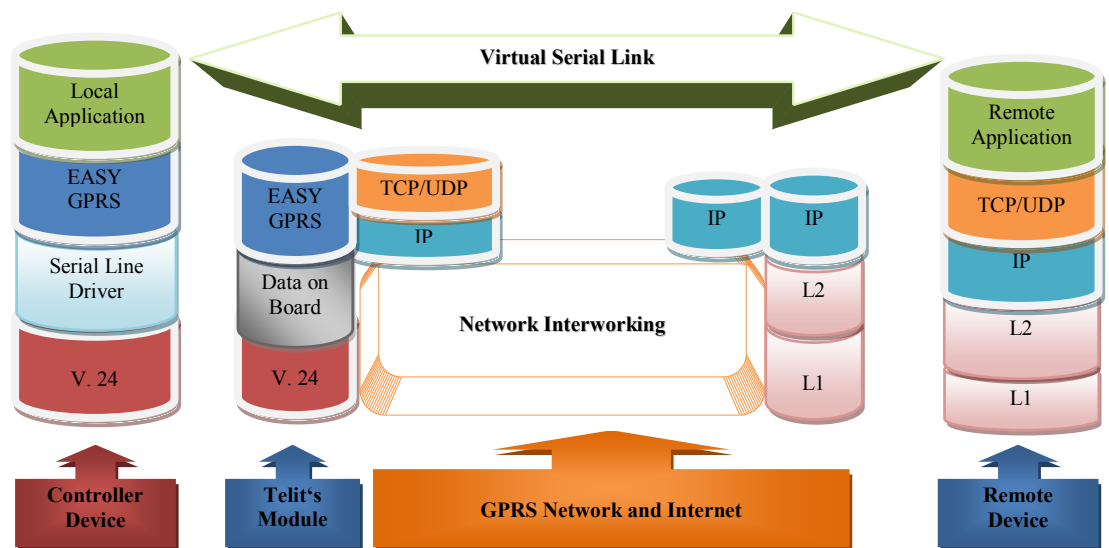
This particular implementation allows to the devices interfacing to the Telit GE864-QUAD AUTOMOTIVE V2 module the use of the GPRS and Internet packet service without the need to have an internal TCP/IP stack since this function is embedded in the module.

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.

5.3. Jamming Detection

5.3.1. Overview

The Jammed Detect feature allows the GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 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:
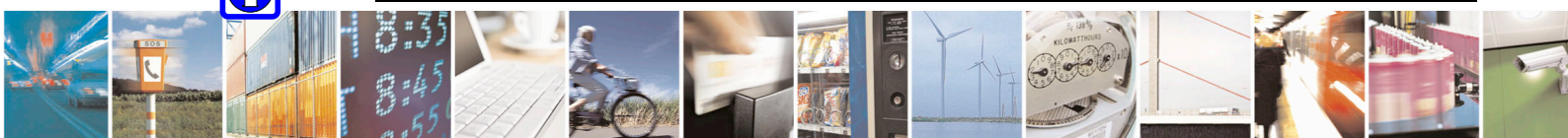
More details about the Multiplexer mode are available in the CMUX User Guide.

5.5. 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 GE864-QUAD AUTOMOTIVE V2 through the AT command interface.

A schematic of such a configuration can be:
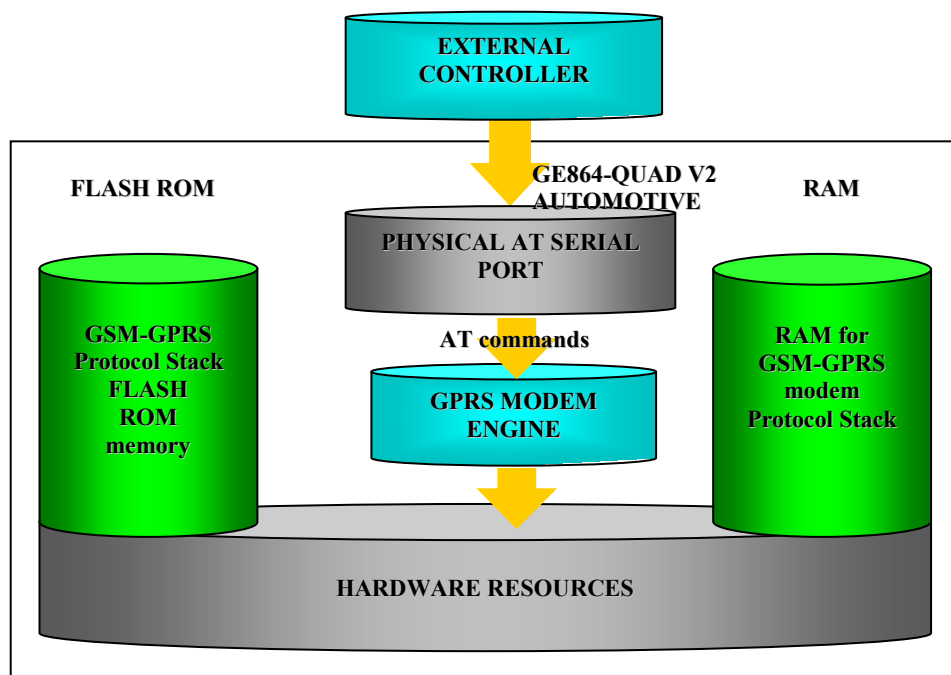
In order to not use any external controller, and further simplify the programming of the sequence of operations, the customer can benefit of these feature already embedded in the GE864-QUAD AUTOMOTIVE V2:

- 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

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 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.

5.6.2. 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 fulfills 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.   Ecall Compliance

eCall is a project of the European Commission intended to bring rapid assistance to motorists involved in a collision anywhere in the European Union. The projects aims to employ a hardware black box installed in vehicles that will wirelessly send vehicle location

information, time stamp, number of passengers, Vehicle Identification Number (VIN), and other relevant accident information to local emergency agencies eCall builds on emergency voice call (E112).

The main actors are the IVS (In-Vehicle System) and the PSAP (Public Safety Answering Point). When a collision happens the IVS sends to PSAP the MSD (Minimum Set of Data) via the speech channel of cellular and PSTN networks.

eCall provides reliable full-duplex data communications between IVS and PSAP in addition to emergency voice call, and can be initiated either automatically or manually. The eCall In-band Modem uses the same voice channel as used for the emergency voice call. eCall allows reliable transmission of MSD alternating with a speech conversation through the existing voice communication paths in cellular mobile phone systems.

Telit, understanding the importance of the eCall standard, developed its own eCall in band modem solution. The extra-rugged GE864-QUAD Automotive V2 is able to act as IVS in-band modem.

IVS in-band modem functionality is completely transparent because user has only to enable it and manage unsolicited messages coming for AT commands interface.

For a complete description of Telit's eCall solution, please refer to TELIT Solution for eCall Testing Application Note, 80000NT10046a.

5.9.   AT Commands

The Telit GE864-QUAD AUTOMOTIVE V2 module can be driven via the serial interface using the standard AT commands .

The Telit GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 module supports also Telit proprietary AT commands for special purposes.

For a more information about AT commands supported by the GE864-QUAD AUTOMOTIVE V2 module please refer to document AT Commands Reference Guide.

6.   Conformity Assessment Issues

The Telit GE864-QUAD AUTOMOTIVE V2 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.

$$CE\ 0889$$

If the module is installed in conformance to the Telit installation manuals, 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 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 GE864-QUAD AUTOMOTIVE V2 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 GE864-QUAD AUTOMOTIVE V2 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.

6.1.   Declaration of Conformity

DECLARATION OF CONFORMITY

We,
Telit Communications S.p.A

Of:
**Via Stazione di Prosecco, 5/b
34010 Sgonico (TRIESTE)
ITALY**

declare under our sole responsibility that the product:

GE864-QUAD Automotive V2

Quad-Band GSM850/EGSM900/DCS1800/PCS1900 GPRS Module

to which this declaration relates is in conformity with all the essential requirements of the European Directive 1999/05/EC (R&TTE).

The conformity with the essential requirements of the European Directive 1999/05/EC has been demonstrated against the following harmonized standard:

RF spectrum efficiency (R&TTE art. 3.2)	EN 301 511 v9.0.2 (2003-03)

The module has also been verified as a module against the following harmonized standards:

EMC (R&TTE art. 3.1b)	EN 301 489-1 v1.6.1 (2005-09); -7 v1.3.1 (2005-11)
Safety (R&TTE art. 3.1a)	EN 60950-1:2006

The conformity assessment procedure referred to in Article 10 and detailed in Annex IV of Directive 1999/5/EC has been followed with the involvement of the following Notified Body for Article 3.2:

RFI Global Services Ltd
Pavilion A, Ashwood Park, Ashwood Way
RG23 8BG BASINGSTOKE
United Kingdom

Identification mark: **0889**

The technical documentation relevant to the above equipment will be held at:

**Telit Communications S.p.A
Via Stazione di Prosecco, 5/b**
34010 Sgonico (TRIESTE)ITALY

Trieste,   **15th December 2009**

EMEA Quality Director
Guido Walcher

6.2. Notified body statement of opinion

NOTIFIED BODY STATEMENT OF OPINION   Opinion No: RFI-NOTA1-SC76506JD02

Notified Body Number: 0889   Issue Date: 17 December 2009

ANNEX

SCOPE OF OPINION

Article	✓/✗	Applied standard(s) (and version) or reference.
Article 3.1a (LVD):	✗	Not assessed
Article 3.1a (EMF):	✗	Not assessed
Article 3.1b (EMC)	✗	Not assessed
Article 3.2 (Radio Spectrum use)	✓	EN 301 511 V9.0.2 referencing 3GPP TS 51.010-1 V7.9..0 and V8.2.0
Article 3.3 a-f (Special Features)	✗	Not applicable

TECHNICAL CONSTRUCTION FILE DETAILS

Title:	Technical Construction File for GE865-QUAD and GE864-QUAD V2 Variants
Reference Number:	TCF76506JD01
Issue Date:	17/12/09
Contact Name:	Mr Fabrizio Druscovich

GENERAL PRODUCT DETAILS

Brand / Trade Name:	Telit
Model Number(s) / Type Designation:	GE865-QUAD, GE864-QUAD V2, GE864-QUAD Automotive V2
Build Version / Revision Level:	1H00 (GE865-QUAD), 0H00 (GE864-QUAD V2, GE864-QUAD Automotive V2)
Software Name and Version:	10.0.2
Operating Frequency	EGSM900 & DCS1800 bands
Declared Output Power (dBm, e.i.r.p or e.r.p)	E-GSM 900:- GSM/GPRS: Class 4 (33 dBm) DCS 1800:- GSM/GPRS: Class 1 (30 dBm)
Additional Information (modulation)	GMSK
Description of Use / Function:	Quad-Band GSM850/EGSM900/DCS1800/PCS1900* GPRS BGA Radio Module

*Only the frequency bands allocated to Europe will be used in Europe |
| Manufacturers Company Name: | Telit Communications S.p.A.

(sub-contracted to SEM - Services for Electronic Manufacturing S.r.l., Via Lecco, 61, Vimercate (MI), 20059 Italy) |
| Manufacturers Address: | Via Stazione di Prosecco 5/B 34010 Sgonico (TS) Italy |

PRODUCT VARIANT DETAILS

Details of Product Variant(s) covered by this Notified Body Opinion:	See General Product Details above

Page 2 of 3   RFI Global Services Ltd

6.3.   IC Certificate

Industry Canada / Industrie Canada

Certification & Engineering Bureau

3701 Carling Avenue
Bldg.94
P.O. Box 11490 Station "H"
Ottawa, Ontario
K2H 8S2

Tel No. (613) 990-4389
Fax No. (613) 990-4752

December 4, 2009

Our File: 46390 -5131
Submission No.: 138602
Radio Cert. No.: 5131A-GE864QA2

TELIT COMMUNICATIONS S.p.A.
Via Stazione Di Prosecco 5/B
Trieste,
34010 Italy

Attention: Andrea Fragiacomo

Dear Sir/Madame,

    I have reviewed the test report and related documents, and am pleased to advise that this device meets our procedural and specification requirements for certification. The field offices have been notified.

    The assigned certification number and the model number must be shown on each equipment model. This certification identification information may be shown on the equipment model identification plate or on a separate label that shall be indelible and tamper proof. The certification number shall be prefixed with the letters "IC:". Radio equipment is certified as described on the attached certification certificate.

Certificate(s) are attached for the following model(s):

        GE864-Quad Automotive V2

A website has been established which includes the status of applications.
The address is http://strategis.ic.gc.ca/certification

Sincerely

Stéphane Picard
Telecom Conformity
Assessment Officer
Certification Section

6.4.   FCC Certificate

GRANT OF EQUIPMENT
AUTHORIZATION

Certification
Issued Under the Authority of the
Federal Communications Commission
By:

RFI Global Services Ltd
Pavilion A Ashwood Park, Ashwood Way
Basingstoke, Hampshire, RG23 8BG
United Kingdom

Date of Grant: 12/03/2009
Application Dated: 12/03/2009

Telit Communications S.p.A.
Viale Stazione di Prosecco 5/b
Trieste, 34010
Italy

Attention: Andrea Fragiacomo , Ing.

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: RI7GE864QA2
Name of Grantee: Telit Communications S.p.A.
Equipment Class: PCS Licensed Transmitter
Notes: Quadband GSM/ GPRS Module
Modular Type: Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	22H	824.2 - 848.8	1.74	27.0 Hz	300KGXW
	24E	1850.2 - 1909.8	0.93	71.0 Hz	300KGXW

Single modular approval. Power Output listed is conducted. This device contains functions that are not operational in U.S. Territories. This filing is only applicable for US operations. The antenna gain, including cable loss, must not exceed 3.0dBi at 1900 MHz / 1.4dBi at 850 MHz as defined in 2.1091 and 1.1307 of the rules for satisfying RF exposure compliance. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter within a host device, except in accordance with FCC multi-transmitter product procedures. OEM integrators and end-users must be provided with specific operating instructions for satisfying RF exposure compliance requirements.

7.   SAFETY RECOMMENDATIONS

<u>READ CAREFULLY</u>

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

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
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

9.   Document History

Revision	Date	Changes	Location
0	2010-01-19	First issue	Trieste
1	2011-07-13	Applied new layout Updated discaimer Added § 5.8 "Ecall Compliance" Added §6.1 "Declaration of Conformity"	Trieste
2	2012-03-12	Edited extended supply voltage values	Trieste
3	2013-09-05	Amended reel quantity	Trieste