GE864-QUAD V2
Product Description

GE864-QUAD V2
80331ST10067a Rev. 0 - 01/07/09

GE864-QUAD V2

Contents

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1   Introduction

1.1   Scope

Scope of this document is giving an overview of the Telit GE864-QUAD V2 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 GE864-QUAD V2.

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 GE864-QUAD 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 V2.

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
- Audio Settings User Guide
- Easy GPRS User Guide

1.7   Document History

Revision	Date	Changes	Location
0	2009-07-01	First issue	Trieste

2   Overview

The Telit GE864-QUAD V2 is small, lightweight, low power consumption and RoHS compliant devices that allow digital communication services wherever a GSM 850, 900, DCS 1800 or PCS 1900 network is present.
The GE864-QUAD V2 is a low cost connector-less best solution for medium to high quantity projects.

The GE864-QUAD V2 model integrate the "**EASY SCRIPT"** The Python, is an engine script interpreter, allowing self controlled operations. With the **EASY SCRIPT** feature the GE864-QUAD V2 become a finite product, just needs your script to be run.

All GE864-QUAD V2 model includes features like GPRS Class 10, Voice, Circuit Switched Data transfer, Fax, Phonebook and SMS support, 'EASY GPRS' embedded TCP/IP stack and battery charging capabilities.

The GE864-QUAD V2 is specifically designed and developed by Telit for OEM usage and dedicated to portable data, voice and telemetric applications such as:

- Telemetry
- Telematics
- Security alarms
- Automated Meter Reading (AMR)
- POS terminals
- PDAs and Mobile Computing
- V2 and Fleet Management applications

2.1   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: ‹ 25 uA
  - Idle (registered, power saving): < 1.8 mA @ DRX=9
  - Dedicated mode: ‹ 270mA @ max power level
  - GPRS cl.10: ‹ 370mA @ max power level

- Serial port multiplexer 3GPP 27.010

- SIM Application Toolkit

- SIM Access Profile

- Extended Supply voltage range: 3.25 – 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 supportDimensions: 30 x 30 x 2,9 mm

- Weight: 6 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

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: 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

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Copyright © 1995–2001 Corporation for National Research Initiatives; All Rights Reserved.
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All Rights Reserved are retained in Python.

3   General Product Description

3.1   Dimensions

3.1.1   GE864-QUAD V2

The Telit GE864-QUAD V2 overall dimension are:

- **Length:**   **30 mm**
- **Width:**   **30 mm**
- **Thickness:**   **2.9 mm**
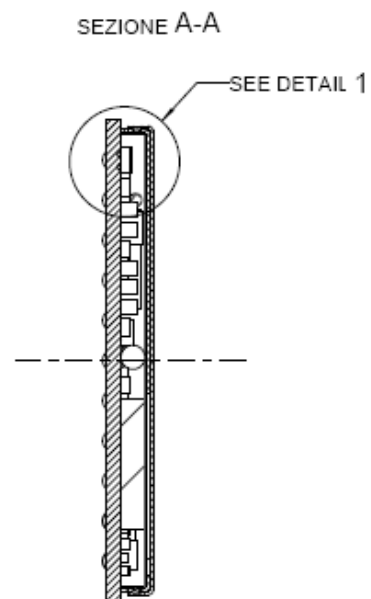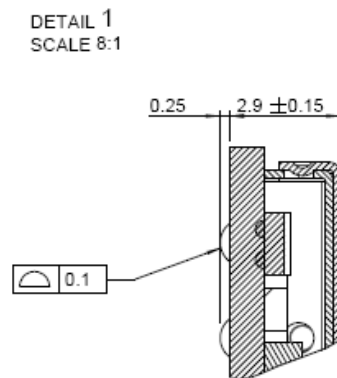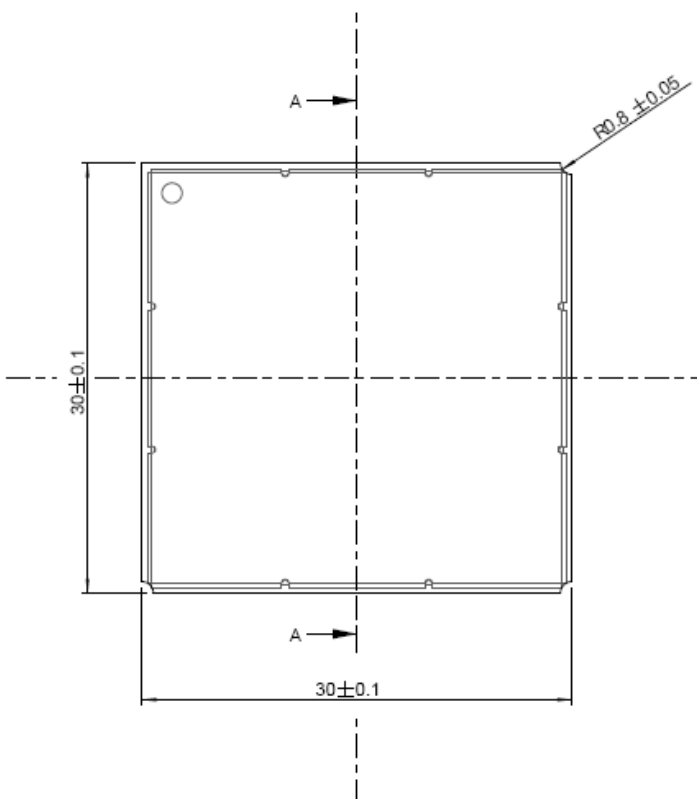
3.2   Weight

weight	
GE864-QUAD V2	**6 gr**

3.3   Environmental requirements

The Telit GE864-QUAD V2 module is compliant with the applicable ETSI reference documentation GSM 05.05 Release1998.

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 ÷ +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 corporate policy regarding environmental protection, the GE864-QUAD V2 comply with 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
850	824.2÷848.8	869.2÷893.8	0 ÷ 124	45 MHz
E-GSM-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

GSM–850/900
The Telit GE864-QUAD V2 transceiver module in GSM–850/900 operating mode are **class 4** in accordance with the specifications which determine the nominal 2W peak RF power (+33dBm) on 50 Ohm.

DCS–1800/PCS–1900
The Telit GE864-QUAD V2 transceiver module in DCS–1800/PCS–1900 operating mode are **class 1** in accordance with the specifications which determine the nominal 1W peak RF power (+30dBm) on 50 Ohm.

3.6   Reference sensitivity

GSM–850/900
The sensitivity of the Telit GE864-QUAD V2 module according to the specifications for the class 4 GSM 850/900 portable terminals are **–107 dBm** typical in normal operating conditions.

DCS–1800/PCS–1900
The sensitivity of the Telit GE864-QUAD V2 module according to the specifications for the class 1 portable terminals DCS-1800/PCS 1900 are **–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 GE864 and GC864 Hardware User Guide.

3.8   Supply voltage

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

Nominal operating voltage	3.7 V
Operating voltage range	3.25 V – 4.2 V

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

3.9   Power consumption

The typical current consumption of the Telit GE864-QUAD V2 are:

Power off current (typical)	< 26 μA;
Stand–by current (GSM Idle)	< 22 mA (< 4 mA using command AT+CFUN=5)
Operating current in voice channel	<200 mA @ worst network conditions
Operating current in GPRS class 10	< 370 mA @ worst network conditions

3.10   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.

3.10.1   Speech Coding

The GE864-QUAD V2 voice codec support the following rates:

- 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 GE864-QUAD V2 support phase 2 GSM11.14 - SIM 1.8V and 3V ONLY with an external SIM connector. For 5V SIM operation an external level translator can be added.

3.10.3   SMS

The GE864-QUAD V2 support 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, memorize in SIM and sending
- Cell Broadcast compatible with CB DRX with signaling of new incoming SMS.

3.10.4   Real Time Clock and Alarm

The Telit GE864-QUAD V2 support the Real Time Clock and Alarm functions through AT commands, furthermore an alarm output pin (GPIO6) 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 to increase the RTC autonomy.

3.10.5   Data/fax transmission

The Telit GE864-QUAD 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 V2 supports asynchronous non-transparent data up to 9.6 Kbps. Moreover, it supports the V.110.

3.10.6   Local security management

The local security management can be done with the lock of Subscriber Identity module (SIM), and security code request 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 embedded memory.

3.10.9   Characters management

The Telit GE864-QUAD V2 supports the IRA characters set (International Reference Alphabet), in TEXT and PDU mode.

3.10.10   SIM related functions

Activation and deactivation of the numbers stored in phone book FDN, ADN and PINs are supported. Extension at the PIN2 for the PUK2 insertion capability for lock condition is supported.

3.10.11   Call status indication

The call status indication by AT commands is supported.

3.10.12   Automatic answer (Voice, Data or FAX)

After a specified number of rings, the module will automatically answer with a beep. The user can set the number of rings by means of the command ATS0=<n>.

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 GE864-QUAD 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.

3.10.15   Buzzer output

The General Purpose I/O pin GPIO7 can be configured to output the BUZZER output signal, with only an external MOSFET/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.

3.10.16   RF Transmission Monitor

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

3.11   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 Telit GE864-QUAD V2 interface circuits please consult the Hardware User Guide.

3.11.1   Reset signal

Signal	Function	I/O	GE864 ball	GC864 pin
RESET	Phone reset	I/O	A2	54

RESET is used to reset the GE864-QUAD V2. Whenever this signal is pulled low, the module is reset. When the device is reset it stops any operation and after the release of the reset it is unconditionally rebooted, without doing any detach operation from the network where it is registered to. This behavior is not like a proper shut down because any GSM device is requested to issue a detach request on turn off. For this reason the Reset signal must not be used to normally shutting down the device, but only as an emergency exit in the rare case the device remains stuck waiting for some network response.
The RESET is internally controlled on start-up to achieve always a proper power-on reset sequence, so there's no need to control this pin on start-up. It may only be used to reset a device already on that is not responding to any command.

NOTE: *do not use this signal to power off the Telit GE864-QUAD V2. Use the ON_OFF* signal to perform this function or the AT#SHDN command.*

3.12   Audio levels specifications

The audio of the GE864-QUAD V2 is organized into two main paths:

- internal path (called also MT)
- external path (called also HF)

These two paths are meant respectively for handset and headset/hands-free use. The GE864-QUAD V2 has a built in echo canceller and a noise suppressor, tuned separately for the two audio paths; for the internal path the echo canceller parameters are suited to cancel the echo generated by a handset, while for the external audio path they are suited for a hands-free use.
For more information on the audio refer to the Hardware User Guide.

3.13   Converters

3.13.1   ADC Converter

The on board ADCs 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.

	Min	Max	Units
Input Voltage range	0	2	Volt
AD conversion	-	11	bits
Resolution	-	< 1	mV
Sampling rate	1 (idle)	60 (on traffic)	sec

Mounting the module on your Board

3.13.2   General

The Telit GE864-QUAD 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 consult Hardware User Guide.

3.14   Packing system

The Telit GE864-QUAD V2 is packaged on trays of 20 pieces each. This is especially suitable for the GE864-QUAD V2 according to SMT processes for pick & place movement requirements.

Section A-A
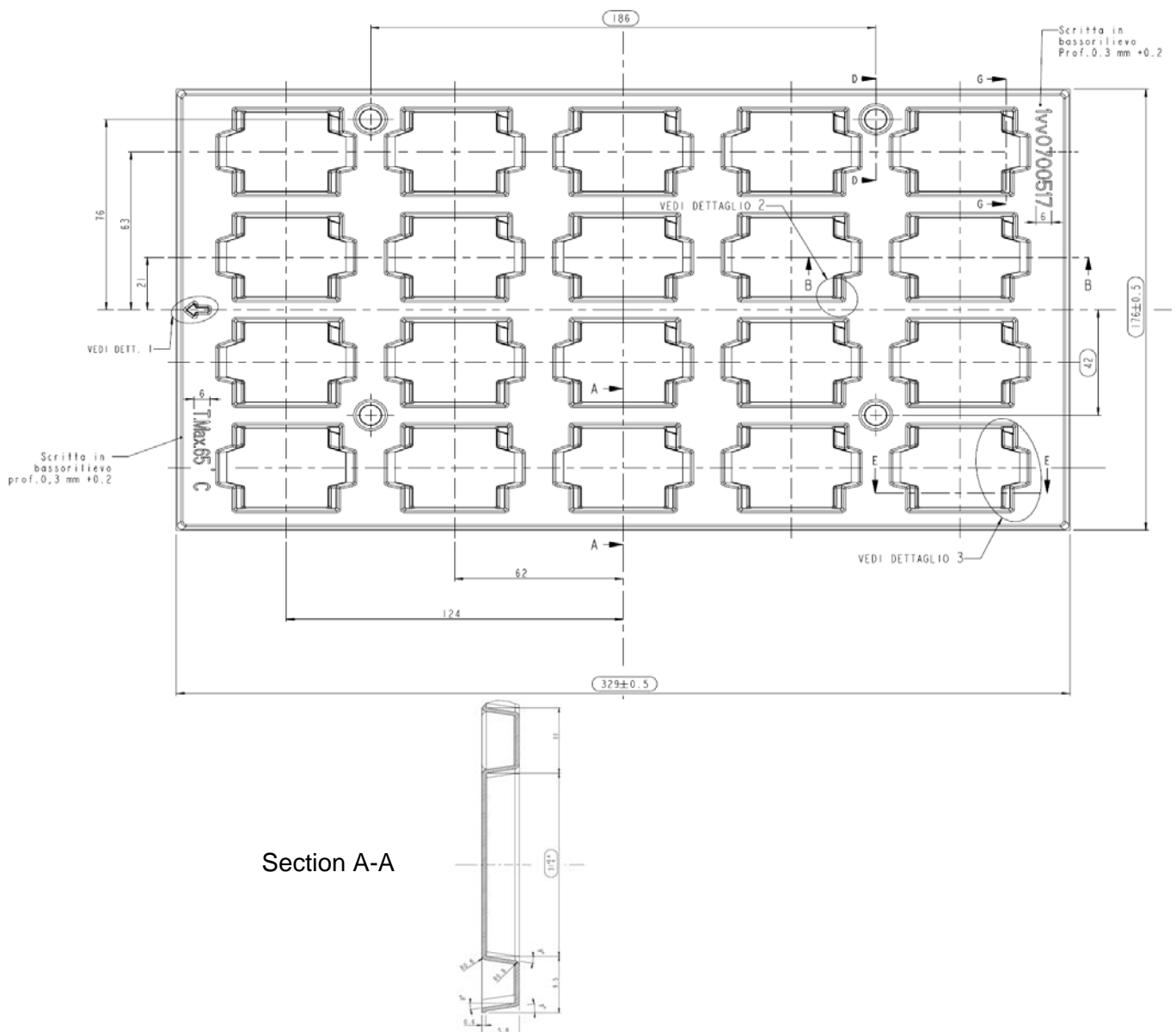
The size of the tray is: 329 x 176mm
NOTE: These trays can withstand at the maximum temperature of 65° C.

Ref. No rounded corner on module's printed circuit board

The modules on the tray are oriented as shown in A and the tray is oriented toward left as shown in B.
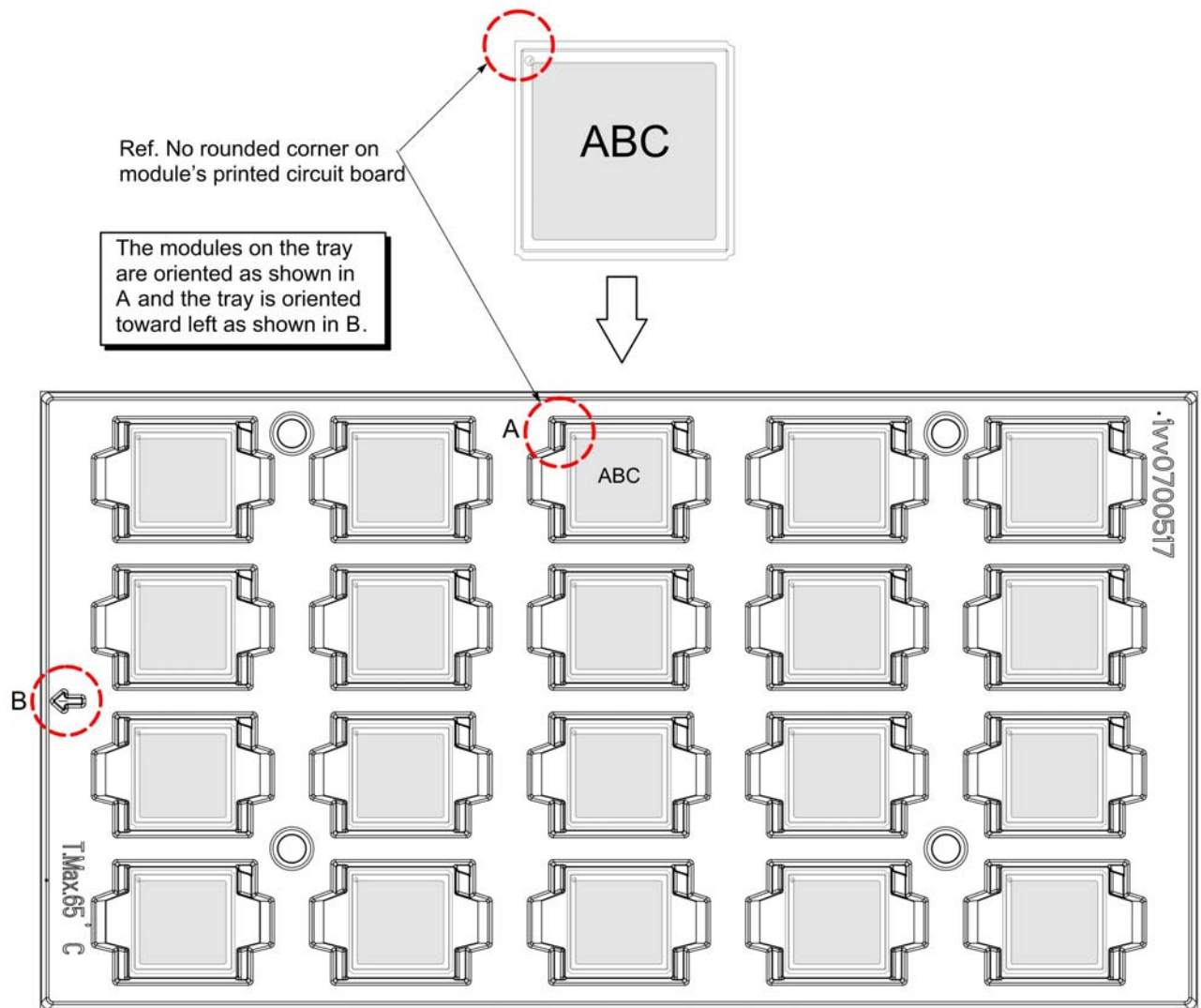
4   Evaluation Kit

In order to assist you in the development of your Telit GE864-QUAD V2 based application, Telit can supply the EVK2 Evaluation Kit with appropriate power supply, SIM card housing, RS 232 serial port level translator, direct UART connection, Handset, Headset and Hands-free (car kit) audio, antenna.
The EVK2 provides a fully functional solution for a complete data/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 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.

GE864 Evaluation Kit

For a detailed description of the Telit Evaluation Kit refer to the documentation provided with the Telit GE864-QUAD V2 Hardware User Guide and EVK2 User Manual.

5   Software Features

5.1   Enhanced Easy GPRS Extension

5.1.1   Overview

The Easy GPRS feature allows the Telit GE864-QUAD 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 V2 module, regardless of all the software stacks underlying.
An example of the protocol stack involved in the devices is reported:
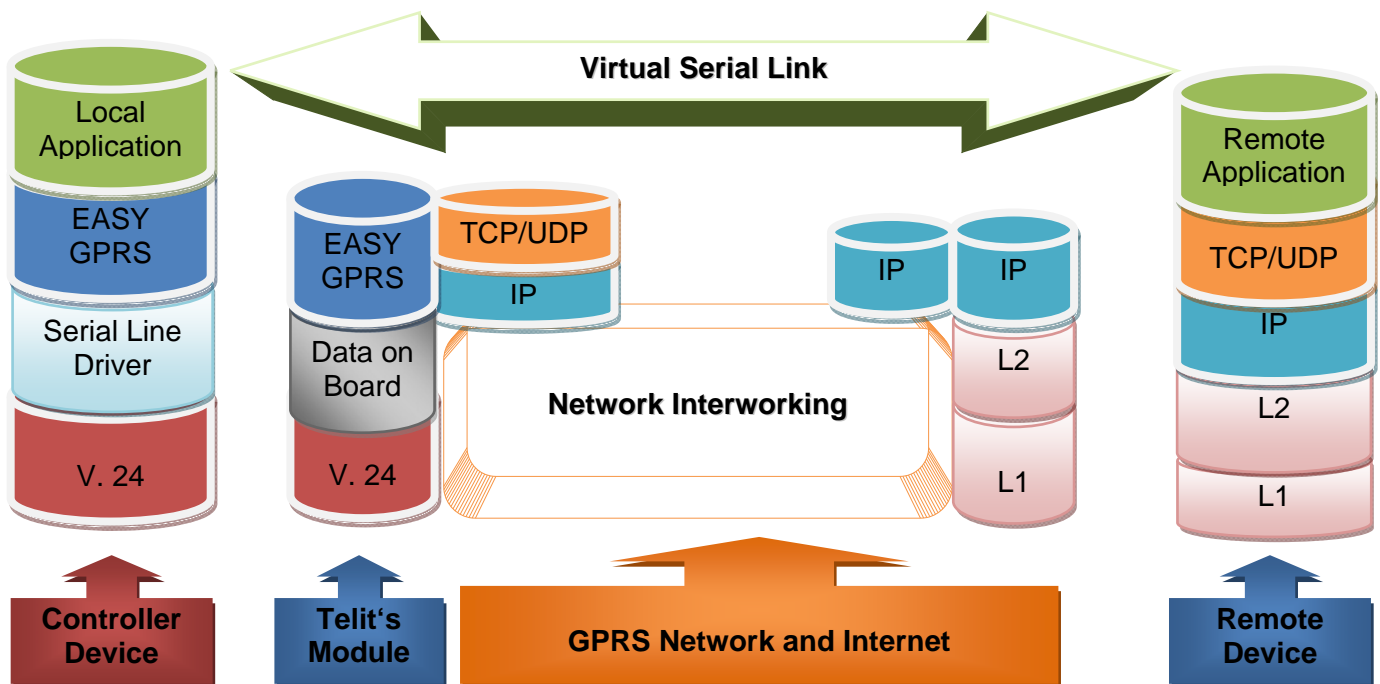
This particular implementation allows to the devices interfacing to the Telit GE864-QUAD V2 module the use of the GPRS and Internet packet service without the need to have an internal TCP/IP stack since this function is embedded inside the module.
Easy GPRS overcomes some of the known limitations of 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.

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 +++.

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).

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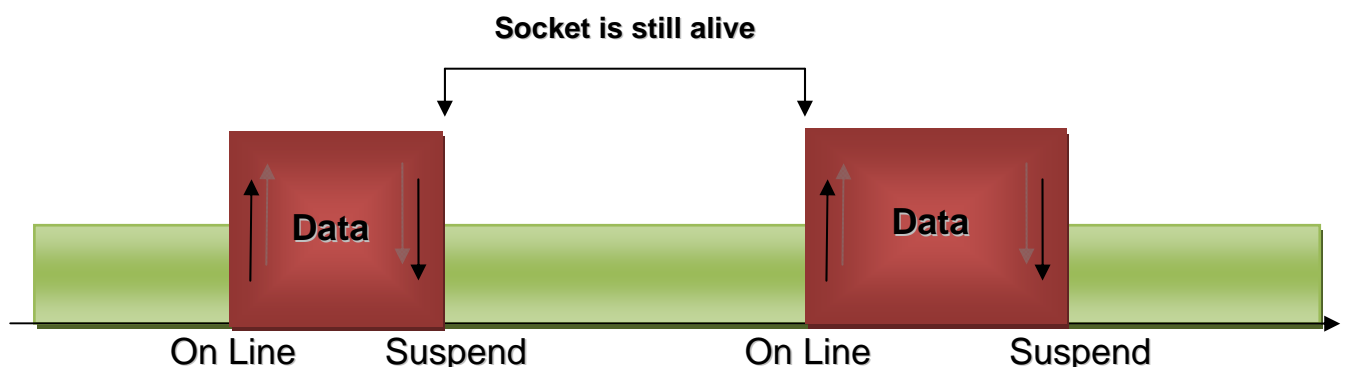
This new feature allows the user to switch between online mode and command mode without closing the connection and eventually opening another socket (or resuming the suspended one) or FTP connection.

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.

5.3   Jammed Detect & Report Extension

5.3.1   Overview

The Jammed Detect & Report feature allows a Telit GE864-QUAD V2 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 Telit module that can be used to send any data, SMS, fax, TCP data.

5.4.1   Product 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.

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

5.4.2   Implementation feature and limitation

- 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.
- In case of GPS product one serial port can be dedicated to NMEA output.
- 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

NOTE: This feature is available only for the Telit GE864-QUAD V2

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 V2** through the AT command interface.

A schematic of such a configuration can be:
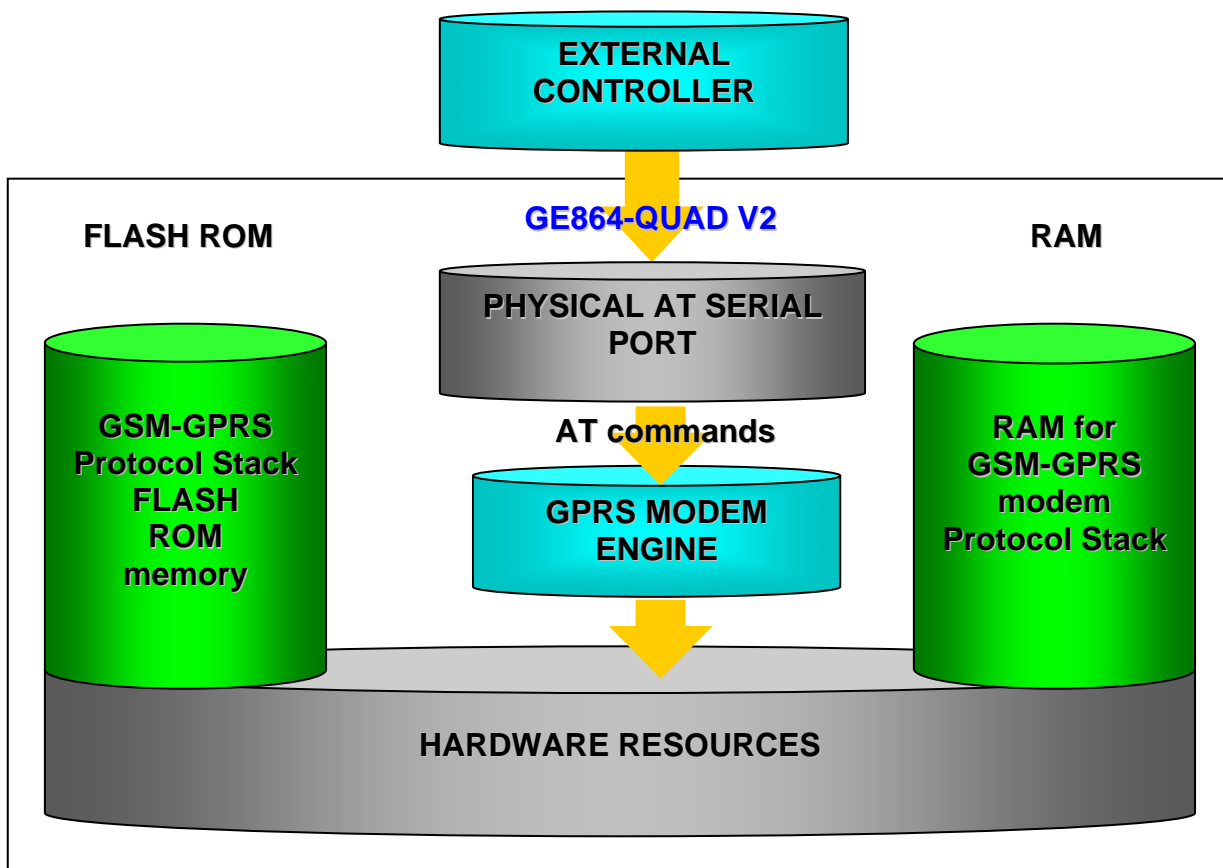
In order to eliminate this external controller, and further simplify the programming of the sequence of operations, inside the **GE864-QUAD V2** it is included:

- **Python script interpreter engine v. 1.5.2+**

- **1.9 MB of Non Volatile Memory room for the user scripts and data**

- **1 MB RAM reserved for Python engine usage**

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:

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5.5.3   Python implementation description

Python scripts are text files stored in NVM inside the **Telit GE864-QUAD V2**. 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.
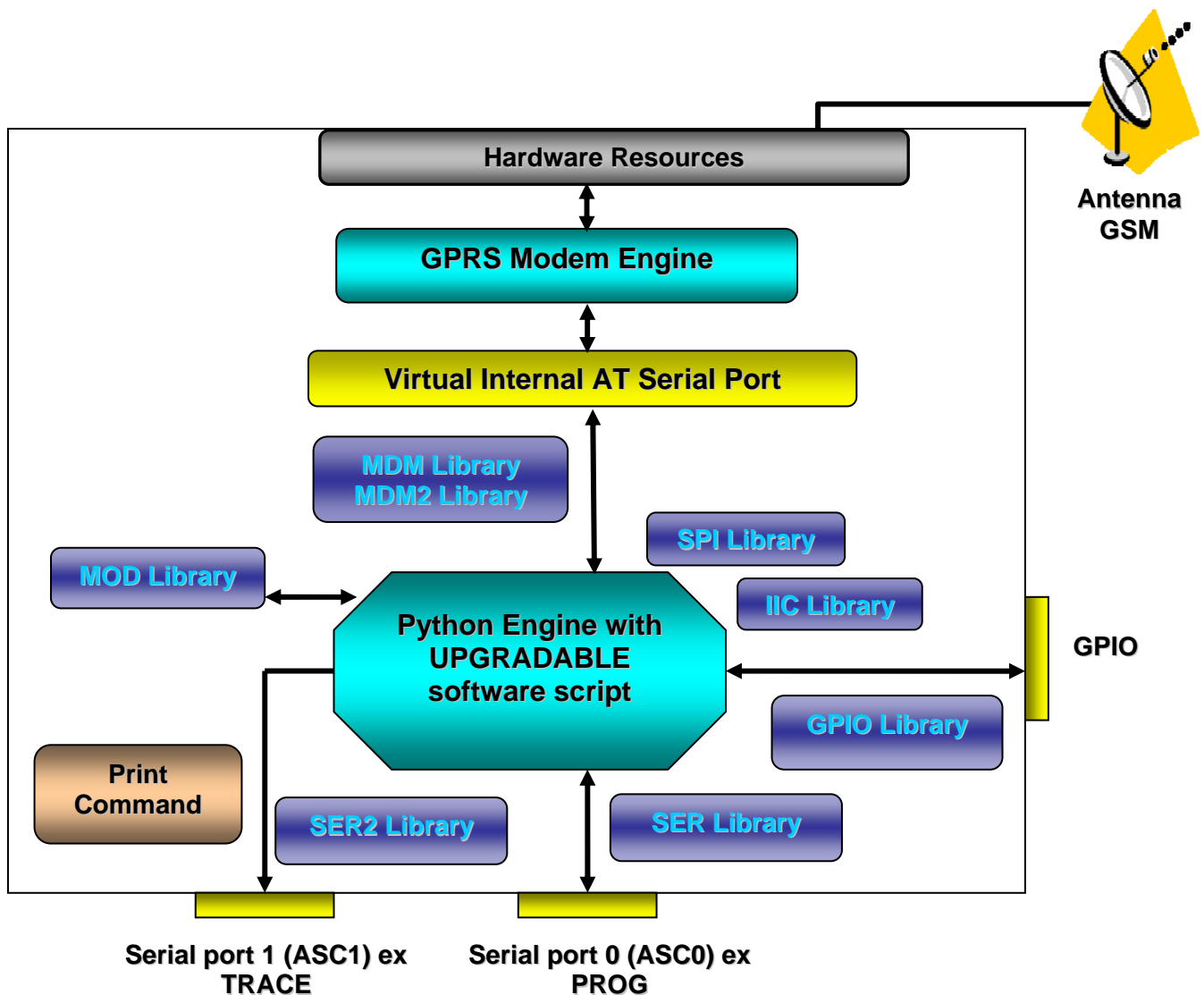
- **The MDM interface** is the most important one. It allows Python script to send AT commands, receive responses and unsolicited indications, send data to the network and receive data from the network during connections. It is quite the same as the usual serial port interface in the **Telit module**. 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 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 EMMI TX pin (second serial port) at baud rate115200bps 8N1.

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.

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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.

5.6   SAP: SIM Access Profile

5.6.1 Product 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 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 sent to the module.

The module satisfies 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 GE864-QUAD V2 module can be driven via the serial interface using the standard AT commands .
The Telit GE864-QUAD 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 V2 module supports also Telit proprietary AT commands for special purposes.
For a more information about AT commands supported by the GE864-QUAD V2 module please refer to document AT Commands Reference Guide.

6   Conformity Assessment Issues

The Telit **GE864-QUAD V2** is 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, 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 **GE864-QUAD V2** 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 **GE864-QUAD V2** 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.

6.1   GE864-QUAD V2 Conformity Assessment

6.2   GE864-QUAD V2 : RoHS certificate

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

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