

GE864-QUAD ATEX Product Description

GE864-QUAD ATEX
80336ST10052a Rev. 2 - 2010-05-03



Telit GE864-QUAD Atex Product Description
80336ST10052a Rev. 2 – 2010-05-03

This document is relating to the following products:

Product
GE864-QUAD ATEX

PRELIMINARY



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1 Introduction

1.1 Scope

Aim of this document is to give an overview of the GE864-QUAD ATEX module, which main feature is to be ATEX certified, intrinsically safe top rated (ia, group II, category 1).

1.2 Audience

This document is intended for Telit customers evaluating the GE864-QUAD ATEX module features.

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: “Overview” gives an overview of the features of the product.

Chapter 3: “General product Description” describes in details the characteristics of the product, providing information such as operating frequencies, mechanical dimensions and interfaces specifics.

Chapter 4: “Evaluation Kit” provides a brief description of the Telit Evaluation Kit (EVK2) as far as these modules are concerned.

Chapter 5: “Software Features” describes in details concepts involved in the software equipped on the modules.

Chapter 6: “AT Commands” provides specification of the AT commands supported by the modules.

Chapter 7: “Conformity Assessment Issues” provides some fundamental hints about the conformity assessment that the final application might need.

Chapter 8: “Safety Recommendation” provides some safety recommendations that must be followed by the customer in the design of applications that makes use of the modules.

Chapter 9: “list of Acronyms”



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

- GE864-QUAD Atex Hardware User Guide 1w0300879
- Telit_Modules_Software_User_Guide, 1w0300784
- Easy GPRS User Guide, 80000ST10028
- Easy Script in Python, 80000ST10020a
- CMUX User Guide, 30268ST10299a
- SIM Access Profile User Guide, 8000ST10029
- AT Commands Reference Guide, 80000ST10025a
- Telit EVK2 User Guide, 1w0300704



1.7 Document History

Revision	Date [yyyy-mm-dd]	Changes
Preliminary #0	2009-05-15	First preliminary issue
Preliminary#1.	2010-04-01	Applied new layout V2 §2 Overview: Added D/A converter availability §3.3 updated 3GPP reference release to 3GPP 51.010 v9.0.1 §3.10 Updated ATEX Li and Ci parameters
Preliminary#3	2010-05-03	§3.10 Updated ATEX Li and Ci parameters §3.2 updated weight

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2 Overview

The **Telit GE864-QUAD Atex** is small, lightweight, low power consumption, RoHS compliant and ATEX intrinsic safe device that allow digital communication services wherever a GSM 850, 900, DCS 1800 or PCS 1900 network is present.

The **GE864-QUAD Atex** is a low cost connector-less best solution for medium to high quantity ATEX projects. **GE864-QUAD Atex** can be easily integrated in apparatus intended for use in potential explosive atmospheres or associated apparatus electrically connected to others located in such atmospheres.

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

All **GE864-QUAD Atex** models include features like GPRS Class 10, Voice, Circuit Switched Data transfer, Fax, Phonebook and SMS support, ‘Enhanced EASY GPRS’ embedded TCP/IP stack.

The **GE864-QUAD Atex** is specifically designed and developed by Telit for OEM usage and dedicated to portable data, voice and telemetric applications in hazardous areas located on the surface (EU ATEX classification: group II, category 1,2 and 3) such as:

- Telemetry and Telecontrol (SCADA applications)
- Security systems
- PDAs and Mobile Computing
- Automotive and Fleet Management applications
- Applications, where the external application processor can be replaced by the PYTHON engine.

GE864-QUAD Atex supports the following functionalities

- Enhanced EASY GPRS (AT driven embedded TCP/IP protocol stack)
- EASY SCAN (full GSM frequency scanning)
- EASY Script in Python
- JAMMING DETECT & REPORT (detect the presence of disturbing devices)
- CMUX
- SAP (SIM Access Profile)
- Multisocket



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From the interface point of view, the **GE864-QUAD Atex** provides the following:

- Full RS232 UART, CMOS level (ASC0) interface for AT commands:
 - Autobauding from 1.2 up to 115.2 Kbps
 - Fixed baud rate from 300 bauds up to 115.2 Kbps
- Two wires RS232, CMOS level (ASC1) for PYTHON debug:
- SIM card interface, 1.8 / 3 volts with auto-detection, hot insertion
- 9 x GPIO ports (max)
- 2 x A/D and 1 D/A converters
- 1 x buzzer output
- 1 x single led supply output

In order to meet the competitive OEM and vertical market stringent requirements, Telit supports its customers with a dedicated Support Policy with:

- ✓ **Telit Evaluation Kit EVK2** to help you develop you application;
- ✓ A Website with all updated information available;
- ✓ an high level specialist technical support to assist you in your development;

For more updated information concerning product Roadmap and availability, technical characteristics, commercial and other issues, please check on the Telit website www.telit.com > Products > Modules.



NOTE:

Some of the performances of the **Telit modules** depend on SW version installed on the module itself.

The **Telit modules** SW group is continuously working in order to add new features and improve the overall performances.

The **Telit modules** are easily upgradeable by the developer using the **Telit Flash Programmer**.

All the **Telit modules** have the conformity assessment against R&TTE.

Furthermore, **GE864-QUAD Atex** has the conformity assessment against 94/9/CE ATEX directive.

The **GE864-QUAD Atex** is certified as "*intrinsic safe*" component:





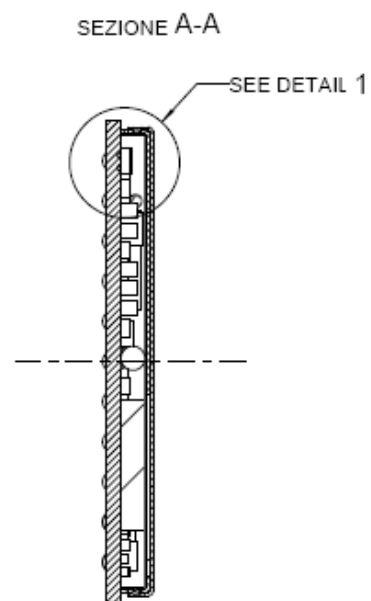
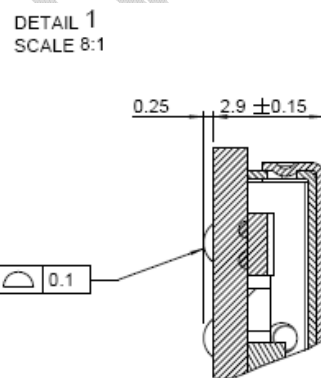
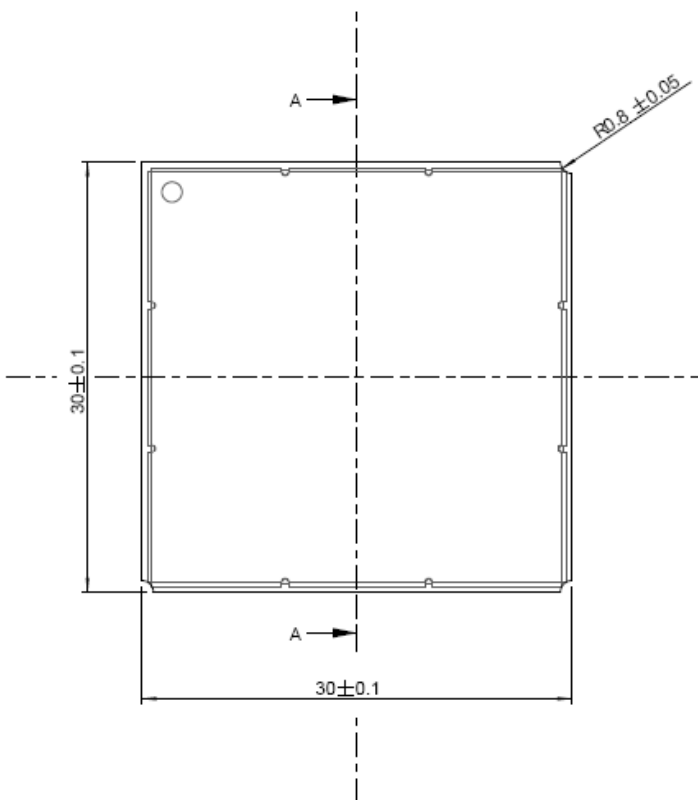
3 General Product Description

3.1 Dimensions

3.1.1 GE864-QUAD Atex

The Telit GE864-QUAD Atex overall dimensions are:

- Length: 30 mm
- Width: 30 mm
- Thickness: 2.8 mm



3.2 Weight

weight	
GE864-QUAD Atex	4.2 gr

3.3 Environmental requirements

The Telit GE864-QUAD Atex module is compliant with the applicable reference documentation 3gpp ts 51.010-1 release v9.0.1.

3.3.1 Temperature range

	GE864-QUAD Atex	Note
Operating Temperature Range	-20°C ÷ +55°C	The module is fully functional (*) in all the temperature range, and it fully meets the ETSI specifications.
	-40°C ÷ +80°C	The module is fully functional (*) in all the temperature range. Temperatures outside the range -20°C ÷ +55°C, might slightly deviate from ETSI specifications.
Storage and Non Operating Temperature Range	-40°C ÷ +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 corporate policy regarding environmental protection, the **GE864-QUAD Atex** complies 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
GSM-850	824.2 ÷ 848.8	869.2 ÷ 893.8	128 ÷ 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

GSM-850/900

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

DCS-1800/PCS-1900

The sensitivity of the Telit GE864-QUAD Atex 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 QUAD Atex 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 Atex are:

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

3.10 Parameters for ATEX integration

In order to integrate the Telit **Telit GE864-QUAD Atex** module in ATEX applications, please refer to GE864-QUAD ATEX HW User Guide. The appropriate ATEX reference standard shall be followed.

Below are listed parameters and useful information to integrate the module in your application:

- Total capacity: 30.2 μ F
- Total inductance: 60.7 nH
- No voltage upper than the supply voltage is present into the module.
- All GPIOs are protected against short circuit.

3.11 User Interface

The user interface is managed by AT commands specified on the ITU-T V.250, GSM 07.07 and 07.05 specifications.

3.11.1 Speech Coding

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

- Half Rate
- Full rate
- Enhanced Full Rate
- Adaptive Multi Rate



3.11.2 SIM Reader

The **GE864-QUAD Atex** 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.

3.11.3 SMS

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

3.11.4 Real Time Clock and Alarm

The **Telit GE864-QUAD Atex** 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.

DRAFT



3.11.5 Data/fax transmission

The Telit GE864-QUAD Atex supports:

- GPRS Class 10, MS Class B
- CSD up to 14.4 Kbps
- Fax service, Class 1 Group 3

3.11.6 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.

3.11.7 Call control

The call cost control function is supported.

3.11.8 Phonebook

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

3.11.9 Characters management

The GE864-QUAD AUTOMOTIVE V2 supports the IRA, GSM, 8859-1 and UCS2 characters sets, in TEXT and PDU mode.

3.11.10 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.



3.11.11 Call status indication

The call status indication by AT commands is supported.

3.11.12 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>`.

3.11.13 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)

3.11.14 Acoustic signaling

The acoustic signaling of the **GE864-QUAD Atex** 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.



3.11.15 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.

3.11.16 RF Transmission Monitor

As alternate function of the GPIO5, the **GE864-QUAD Atex** provides 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.

3.12 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 Atex** interface circuits please consult the Hardware User Guide.

3.12.1 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 Atex**. 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.



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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 Atex. Use the ON_OFF* signal to perform this function or the AT#SHDN command.

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3.13 Audio levels specifications

The audio of the **GE864-QUAD Atex** 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 Atex** 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 **GE864-QUAD ATEX Hardware User Guide** and **Audio Settings Application note**.

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3.14 Converters

3.14.1 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

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3.15 Mounting the module on your Board

3.15.1 General

The **Telit GE864-QUAD Atex** module has been designed in order to be compliant with a standard lead-free SMT process. For detailed information about PCB pad design, conditions to use in SMT process and ATEX compliant mounting, please consult Hardware User Guide.

For this particular application, Telit recommends the customer to involve TTSC (Telit Technical Support Center) in the design phase of the application.

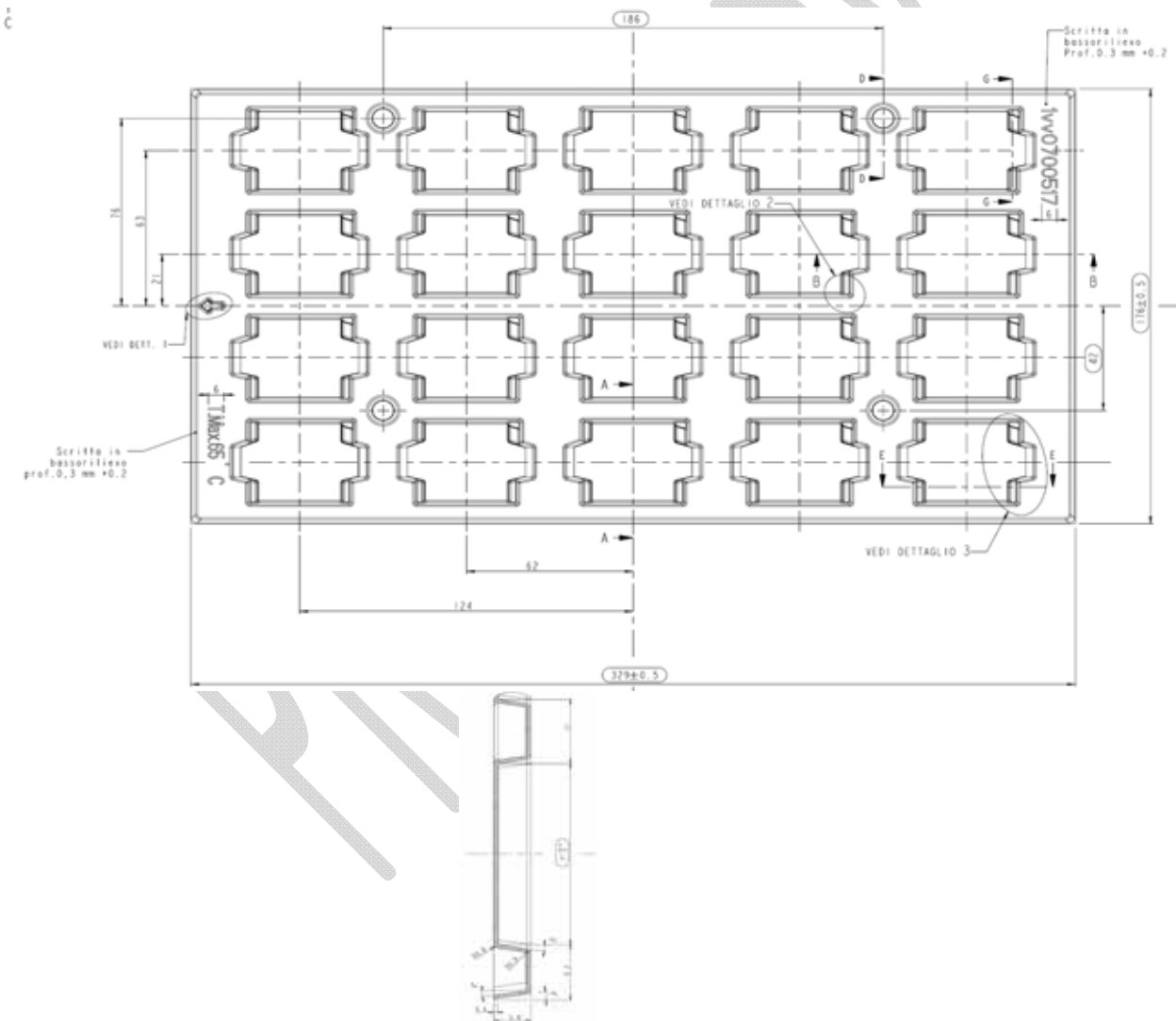
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3.16 Packing system

The Telit GE864-QUAD Atex is packaged on trays of 20 pieces each or 200-pieces reel. This is especially suitable for the GE864-QUAD Atex according to SMT processes for pick & place movement requirements.

TRAY DRAWING

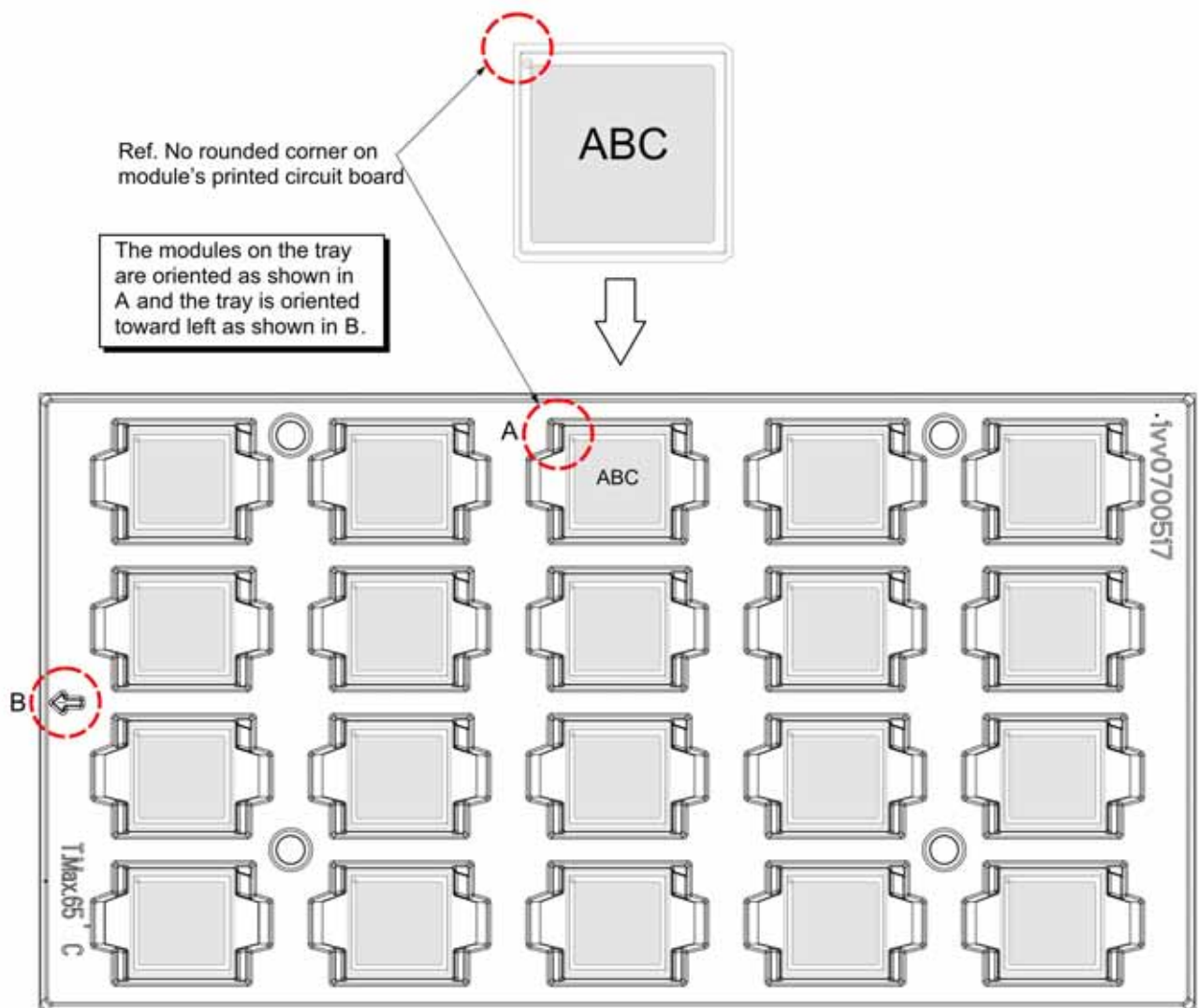


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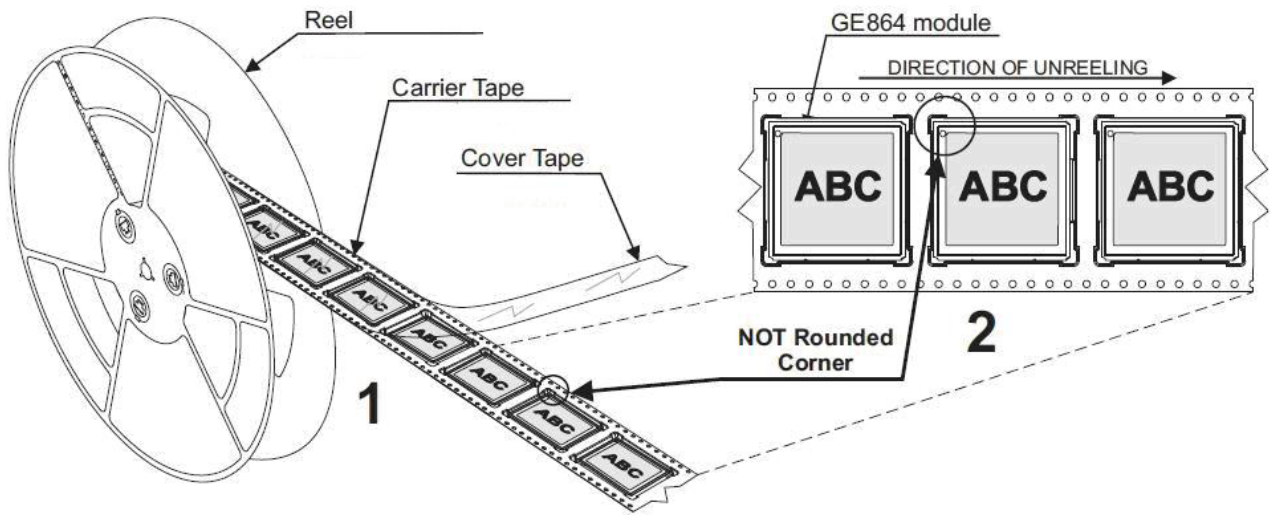
The size of the tray is 329 x 176mm



NOTE:
These trays can withstand at the maximum temperature of 65° C.



Reel Drawing



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4 Evaluation Kit

In order to assist you in the development of your **Telit GE864-QUAD Atex** 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 Atex 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 Atex Hardware User Guide and EVK2 User Manual.

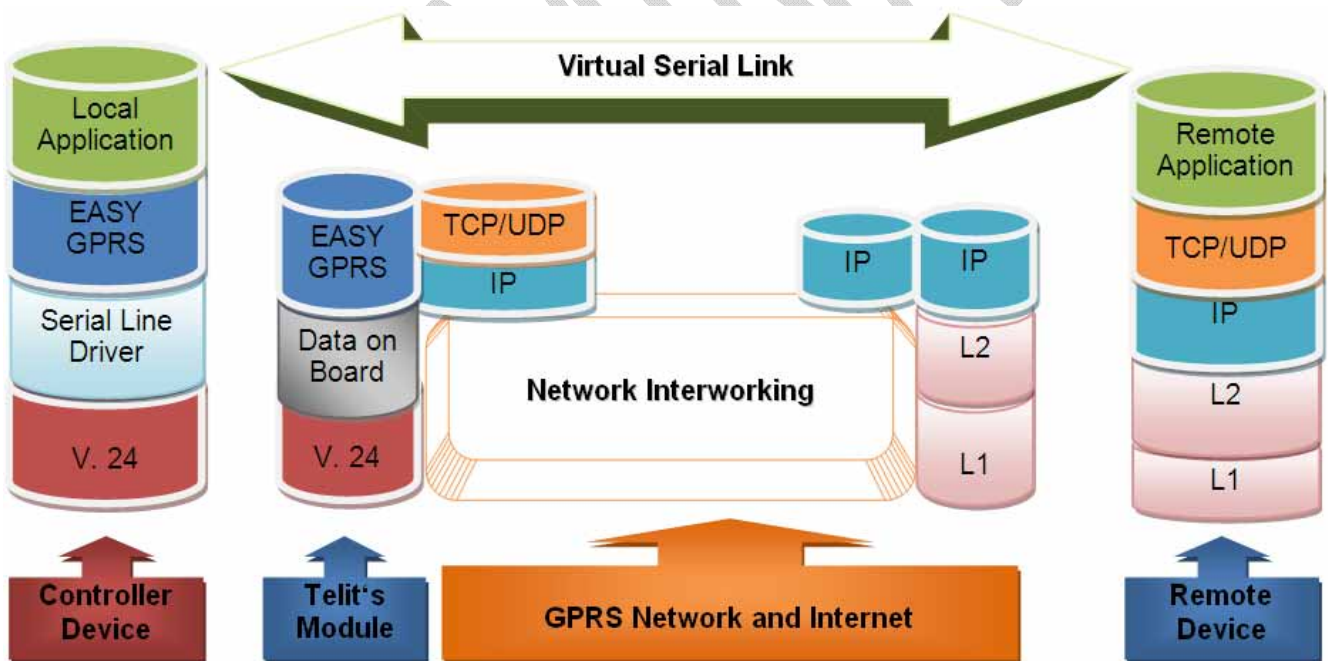


5 Software Features

5.1 Enhanced Easy GPRS Extension

5.1.1 Overview

The Easy GPRS feature allows the **Telit GE864-QUAD Atex** 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 Atex** module, regardless of all the software stacks underlying. An example of the protocol stack involved in the devices is reported:



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This particular implementation allows to the devices interfacing to the **Telit GE864-QUAD Atex** 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).

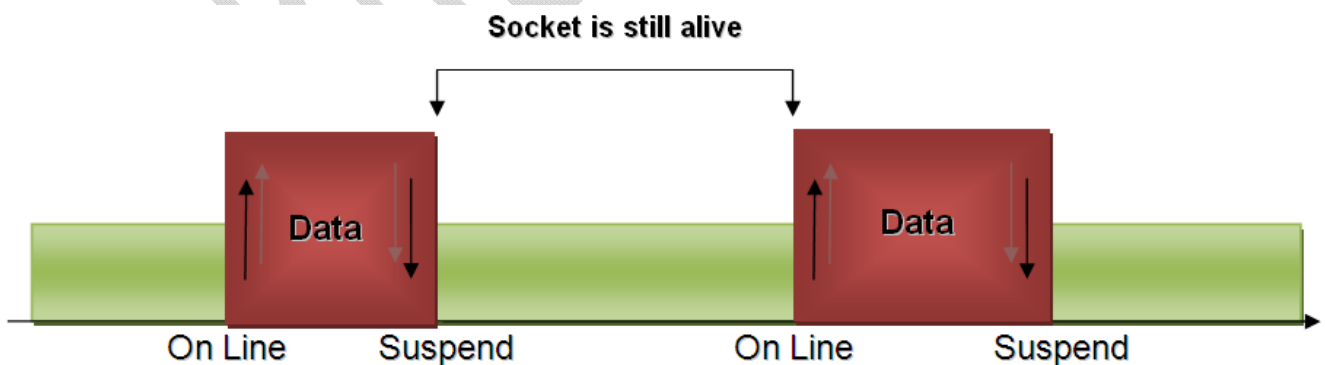


On Line

+++

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:



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

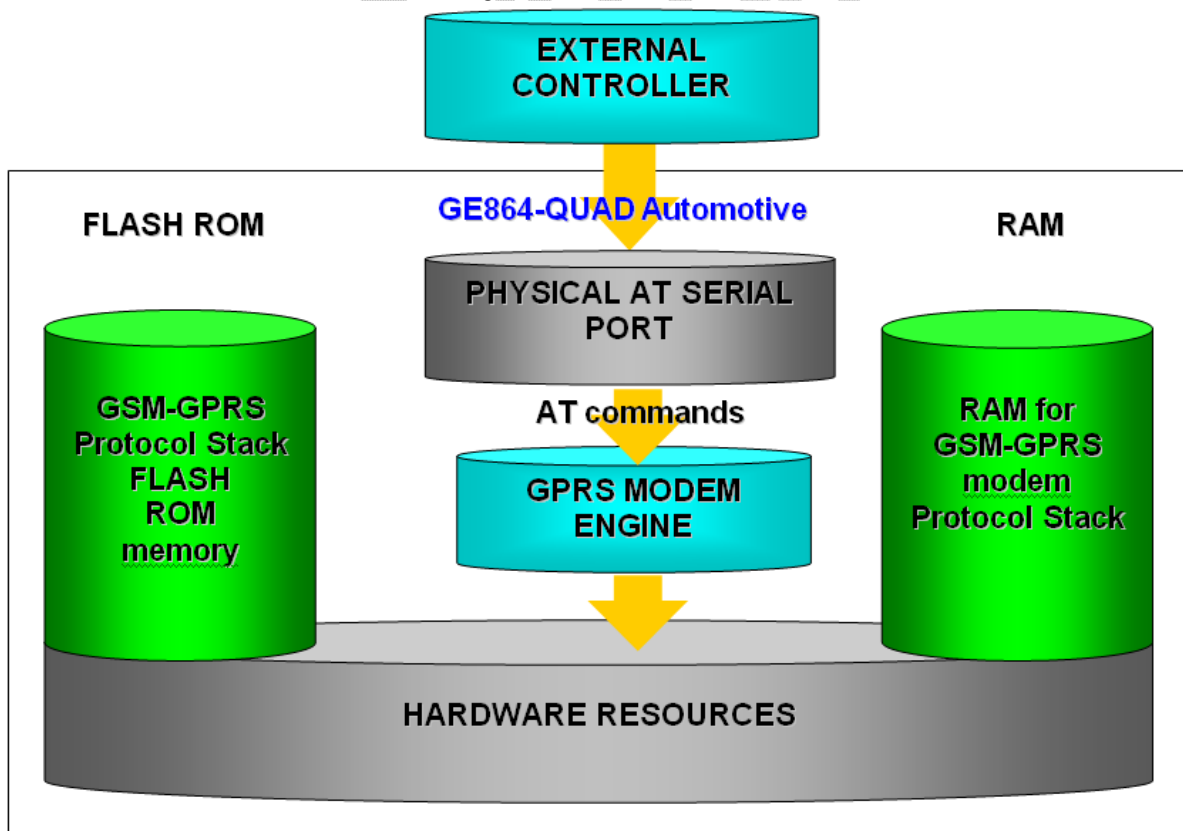
5.5.1 Overview



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

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 Atex through the AT command interface.

A schematic of such a configuration can be:

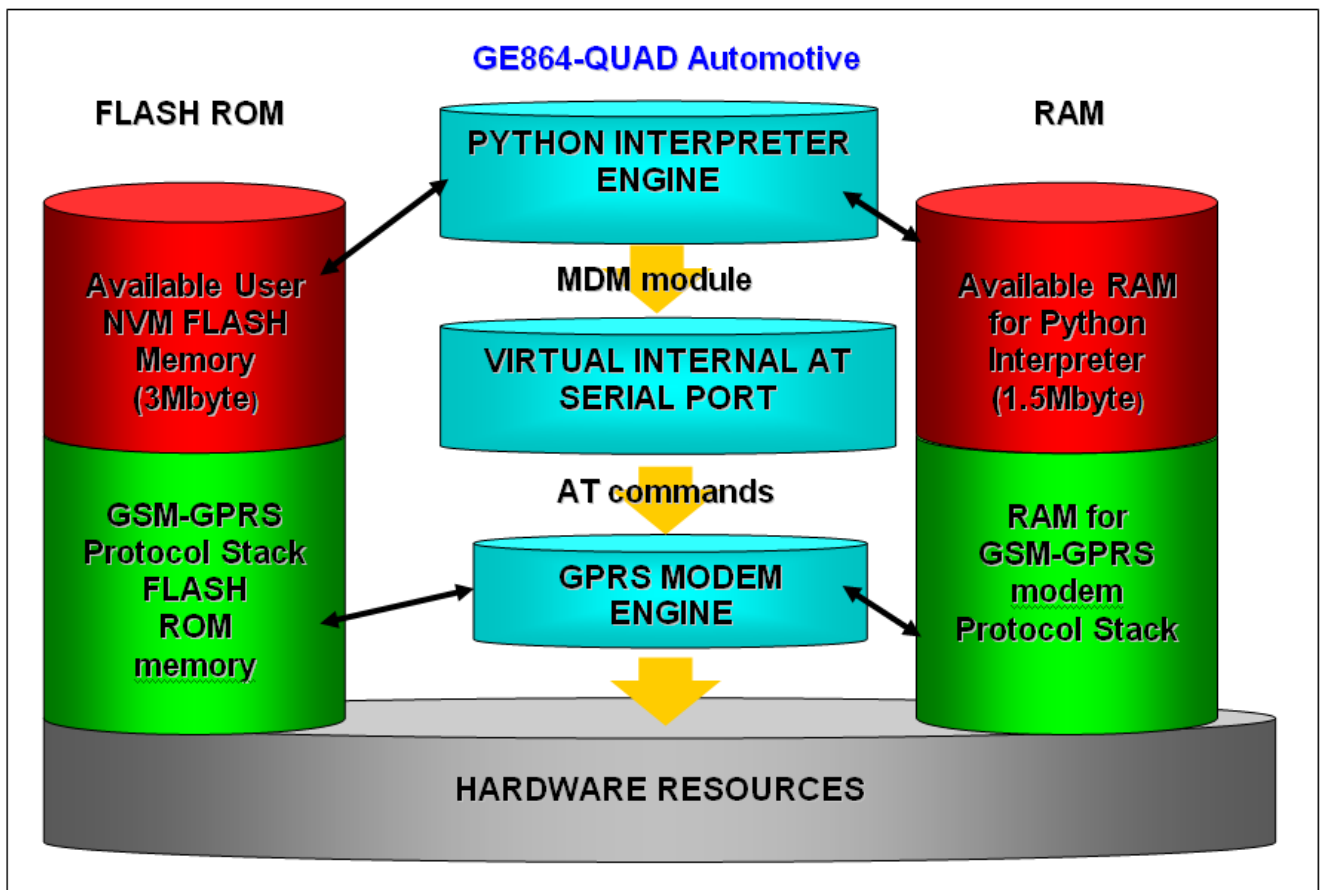


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In order to eliminate this external controller, and further simplify the programming of the sequence of operations, inside the **GE864-QUAD Atex** it is included:

- Python script interpreter engine v. 1.5.2+
- around 3MB 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:

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.

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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>.

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5.5.3 Python implementation description

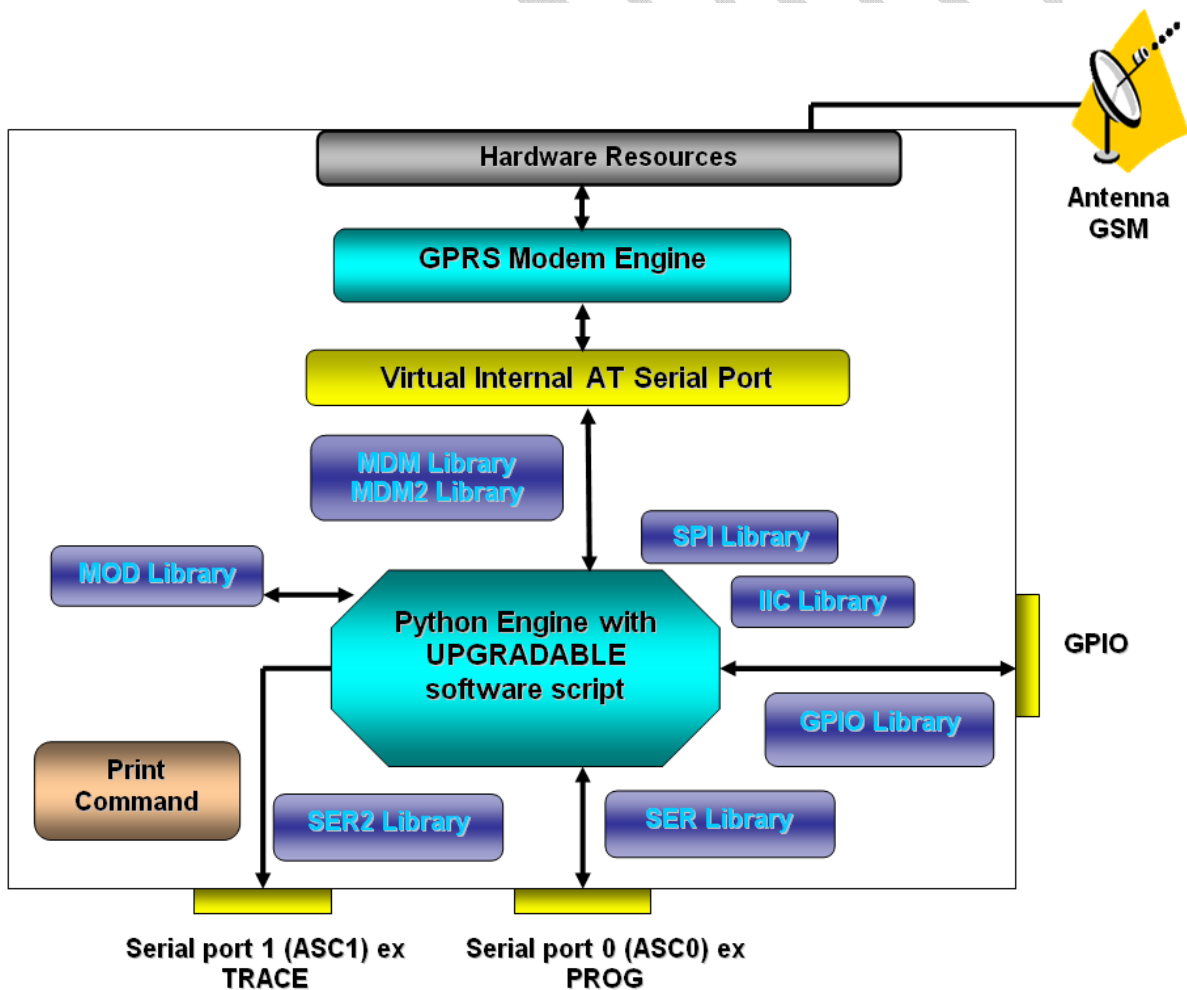
Python scripts are text files stored in NVM inside the **Telit GE864-QUAD Atex**. There's a file system inside the module that allows to write and read files with different names on one single level (no subdirectories are supported).



Warning:

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.



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- **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 is 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 rate 115200bps 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.

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

5.6.3 Remote SIM Message Command Description

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

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

The module satisfies the following feature requirements:

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



6 AT Commands

The **Telit GE864-QUAD Atex** module can be driven via the serial interface using the standard AT commands¹.

The **Telit GE864-QUAD Atex** module is compliant with:

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

Moreover, the **Telit GE864-QUAD Atex** module supports also Telit proprietary AT commands for special purposes.

For a more information about AT commands supported by **GE864-QUAD Atex** module please refer to document AT Commands Reference Guide, code 80000ST10025a.

¹ The AT is an ATTENTION command and is used as a prefix to other parameters in a string. The AT command combined with other parameters can be set up in the communications package or typed in manually as a command line instruction.



7 Conformity Assessment Issues

The Telit GE864-QUAD Atex 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 Atex 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 Atex** 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

Furthermore The Telit GE864-QUAD Atex is assessed to be conform to the ATEX Directive



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Telit **GE864-QUAD Atex** is conforming to the following European Union Directives:



- ATEX Directive 1994/9/EC (Explosive Atmospheres)

In order to satisfy the essential requisite of the ATEX 94/9/EC directive, the **GE864-QUAD Atex** module is compliant with the following standards:

- IEC EN 60079-0 (electrical apparatus for explosive gas atmospheres – general requirements)
- IEC EN 60079-11 (explosive atmospheres: Equipment protection by intrinsic safety “i”)
- IEC EN 60079-26 (explosive atmospheres: Equipment with equipment protection level (EPL) Ga)
- EN13980 (potentially explosive atmosphere- application of quality systems)

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 and ATEX directives is included.

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8 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.



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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

The text of the Directive 94/09/EC regarding electrical equipments in potential explosive atmospheres is available at,

<http://ec.europa.eu/enterprise/atex/direct/newapproach.htm>

PRELIMINARY



9 List of acronyms

ACM	Accumulated Call Meter
ASCII	American Standard Code for Information Interchange
AT	Attention commands
ATEX	ATmosphère EXplosible (explosive atmosphere)
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
EC	European Community
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



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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

