GE863-PRO³ Product Description

80285ST10036a Rev. 2 - 04/11/08

Making machines talk.

GE863-PRO3   GE863PR3***-***

The suffix "***-***" depends on the module HW/SW
configuration. Please contact your Telit representative for
details

Contents

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1   Overview

The GE863-PRO[3] is the Telit latest product generation deriving from the top reliable BGA GE863 product family now including a quad-band GSM/GPRS class 10 engine as well as a dedicated ARM9 application processor (the ATMEL standard microcontroller AT91SAM9260) and FLASH & RAM memories.

GE863-PRO[3]

External Interconnections between ARM processor and GSM/GPRS baseband

Supply ARM

Supply GSM
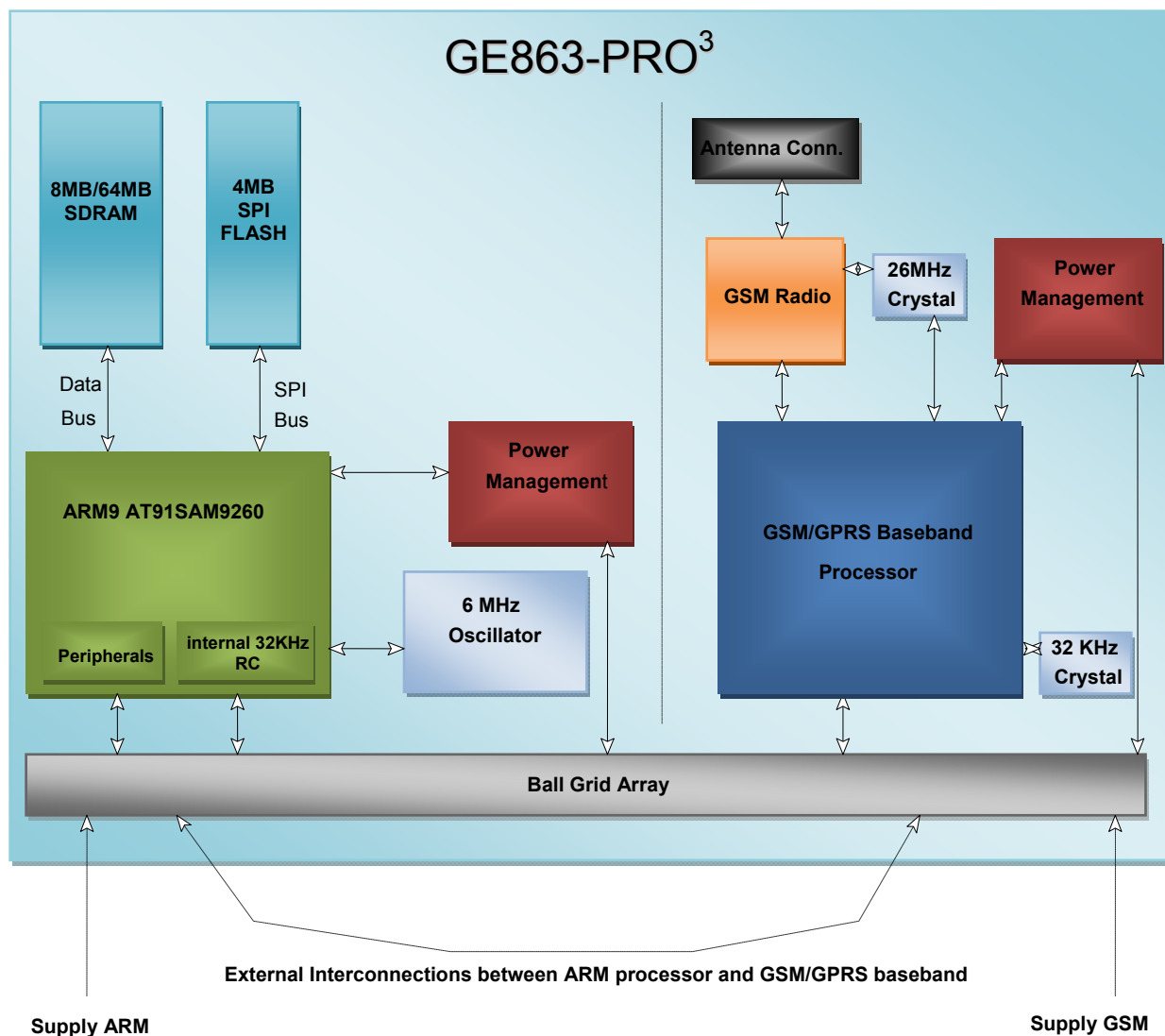
This innovative dual core architecture allows one consistent product for all global GSM networks that is also capable of managing complex and demanding customer applications, giving impressive advantages in terms of

- ☑ final application time-to-market
- ☑ final application cost reduction by saving R&D, approvals & certifications, logistic & production costs
- ☑ production yield by BoM part count reduction
- ☑ optimization of final application total cost of ownership (increased reliability of integrated architecture compared to the discrete one)
- ☑ final application overall dimension (exploiting the compact Telit design)

The proven unique Telit Ball-Grid-Array (BGA) package concept enables a very low profile and a small product size to design extremely compact applications using location technology. Since all connectors are eliminated, the solution cost is significantly reduced compared to conventional mounting concepts.

Furthermore thanks to the successful cooperation with ATMEL, the dimensions of the ARM package have been considerably decreased so that our clients can reduce the dimensions of the entire system that integrates GPRS, the additional processor and the memories, giving a competitive advantage in comparison to a non integrated architecture and maintaining at the same time the flexibility of a standard ATMEL ARM9 product (AT91SAM9260)

With its low profile design and extended programming capabilities in C++ and/or Python, fast ROM and RAM plus power management, 4MB serial flash and 8MB SDRAM (standard) expandable up to 64MB for custom designs, the Telit GE863-PRO³ is the perfect and complete hardware platform for all compact complex and individual customer solutions.

Interfaces such as SPI, IIC, SD/MMC and USB give connectivity to external peripherals (camera, keyboard, display), complementary short range wireless technologies (Wi-Fi, Bluetooth, ZigBee) and position location technology (GPS) for which Telit can offer you complete reference designs.

The ARM core also includes real-time OS (LINUX), multitasking and fully available 220MIPS, fundamental for complex and demanding real-time applications. However Telit can also provide products without operating system giving with these an unlimited possibility for clients who want to use their own system environment on our modules.

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

Apart than the above mentioned features, the Telit dual-core GE863-PRO³ maintains the following functionalities:

- **EASY GPRS (AT driven embedded TCP/IP protocol stack, including FTP client)**
- **EASY SCAN (full GSM frequency scanning)**
- **JAMMING DETECT & REPORT (detect the presence of disturbing devices)**

- **CMUX**
- **SAP (SIM Access Profile)**
- **Multisocket**

From the interface point of view, the GE863-PRO³ provides the following:

- **1 Full GSM engine RS232 UART, CMOS level (ASC0) interface for AT commands:**
  - **Auto-bauding from 2.4 up to 57.6 Kbps**
  - **Fixed baud rate up to 115.2 Kbps**
- **1 FULL ARM9 RS232 USART, CMOS level (UART0) interface for AT command drive**
- **3 Four wires ARM9 RS232 USART, CMOS level**
- **2 Two wires ARM9 RS232 UART, CMOS level**
- **2 ARM9 SPI interfaces for up to 18 slaves**
- **1 ARM9 Image Sensor Interface ITU-B 601/656**
- **1 ARM9 IIC bus**
- **1 ARM9 ISO7816 T0/T1 SAM/Smartcard interface**
- **1 ARM9 SD/MMC Multimedia Card Interface**
- **1 ARM9 Synchronous Serial Controller (I2S) interface for digital audio**
- **1 ARM9 Ethernet controller**
- **4 ARM9 ADC with ADC trigger input**
- **6 ARM9 DAC (PWM)**
- **1 ARM9 USB Device port**
- **2 ARM9 USB Host port**
- **2 ARM9 clock output pins**
- **1 ARM9 Debug Trace Serial port**
- **1 ARM9 JTAG debug port**
- **2 analog GSM audio path**
- **SIM card interface, 3 volts and 1.8 volts**
- **88 ARM9 + 9 GSM GPIO ports (max)**
- **1 GSM buzzer output**
- **1 GSM alarm output**
- **1 GSM led status output indicator**

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

- Telit GE863-PRO³ Evaluation Kit to help you to develop your application;
- a Website with all updated information available;

- a high level 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 GE863-PRO^3 modules** depend on the SW version installed on the module itself.

The **Telit GE863-PRO^3 SW** group is continuously working in order to add new features and improve the overall performances.

The **Telit GE863-PRO^3 modules** are easily upgradeable by the developer using the **Telit GE863-PRO^3 module** Flash Programmer.

2   General Product Description

The **Telit GE863-PRO[3] module** includes the GSM/GPRS engine plus a dedicated ARM9 application processor and memories.
The two processors [GSM/GPRS engine & Application processor] are kept as much as possible distinct: they have different power sources but with the same voltage range, so that, either power management can be optimized, by splitting GSM and application supplies, or cost can be optimized, by using the same power source to supply the two parts.
Furthermore in order to give the maximum flexibility the two engines can be operated independently each other.

NOTE: The illustrations in this Product Description are only schematic and do not assure fidelity to construction or layout details, finishes, writings or colors.

2.1   Dimensions

The **Telit GE863-PRO[3] module** overall dimensions are:

- **Length:**   **41,4 mm**
- **Width:**   **31,4 mm**
- **Thickness:**   **3,6 mm**

The layout of the **Telit GE863-PRO[3] module** is shown in the following figure:

SEZIONE A-A
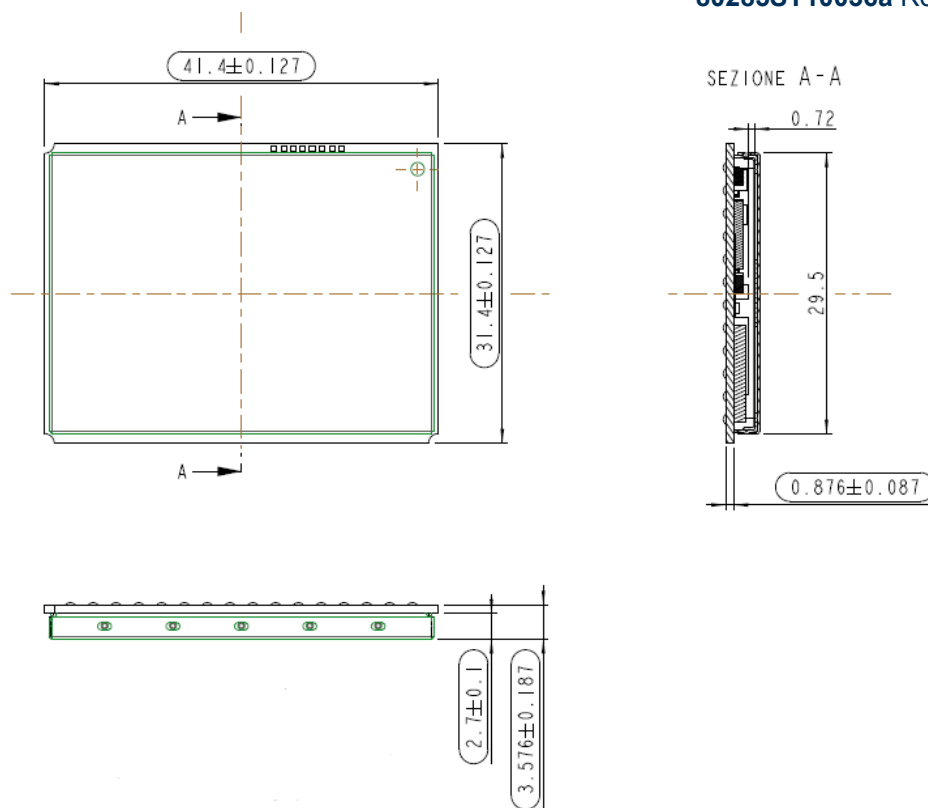
Top View
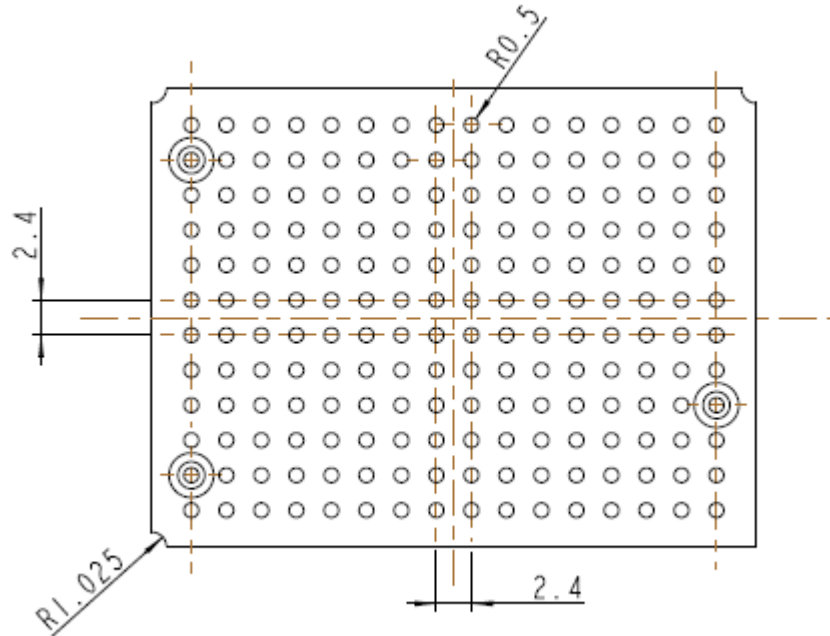
Bottom View

2.2   Weight

The **Telit GE863-PRO³** module weight is 9 gr.

2.3   Environmental requirements

The **Telit GE863-PRO³ module** is compliant to the applicable ETSI reference documentation GSM 05.05 Release1998.

2.3.1 Temperature range

	GE863-PRO³	**Note**
Operating Temperature Range	–20°C ÷ +55°C	The module is fully functional(*) in all the temperature range, and it fully neets the ETSI specification
	–30°C ÷ +85°C	The module is fully functional (*) in all the temperature range. Temperatures outside the range –20°C ÷ +55°C, might slightly deviate from ETSI specifications.
Storage and Non Operating Temperature Range	–40°C ÷ +85°C	

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

2.3.2 Vibration Test (non functional)

- 10 ÷12Hz   ASD = 1.92m 2 /s 3
- 12 ÷ 150Hz   –3dB/oct

2.3.3 RoHS compliance

The Telit GE863-PRO³ module family is fully compliant to EU regulation on RoHS.

3   GSM/GPRS Engine

3.1   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
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	45MHz
GSM-850	824.2 - 848.8	869.2 - 893.8	128 - 251	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

3.2   Transmitter output power

GSM–850 / 900

The Telit GE863-PRO[3] modules in GSM–850 / 900 operating mode are of **class 4** in accordance with the specification which determine the nominal **2W** peak RF power (**+33dBm**) on 50 Ohm.

DCS–1800 / PCS–1900

The Telit GE863-PRO[3] modules in DCS–1800/PCS–1900 operating mode are of **class 1** in accordance with the specifications, which determine the nominal **1W** peak RF power (**+30dBm**) on 50 Ohm.

3.3   Reference sensitivity

GSM–850 / 900

The sensitivity of the Telit GE863-PRO[3] modules 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 GE863-PRO**[3] modules according to the specifications for the class 1 portable terminals DCS-1800 / PCS-1900 is **–106 dBm** typical in normal operating conditions.

3.4   Antenna

3.4.1 GSM 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	70 MHz in GSM 850, 80 MHz in GSM 900, 170 MHz in DCS, 140 MHz PCS band

For further information please refer to the GE863-PRO[3] Hardware User Guide.

3.5   Supply voltage

The external power supply must be connected to VBATT signal pin (see Hardware User Guide) and must fulfill the following requirements:

Nominal operating voltage	3.8 V
Operating voltage range	3.4 V – 4.2 V
Absolute Minimum voltage	3.30V
Absolute Maximum voltage	4.50 V

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

3.6   Power consumption

The typical current consumption of the GSM/GPRS part of the **Telit GE863-PRO**[3] **module** is:

Power off current (typical)	< 28 μA;
Stand–by current (GSM Idle)	< 17 mA (< 4 mA using command AT+CFUN)
Operating current in voice channel	< 200 mA @ worst network conditions
Operating current in GPRS class 10	< 370 mA @ worst network conditions

The total power consumption of GE863-PRO[3] is the sum of the consumptions of GSM and ARM9 processor part.

3.7   Embodied Battery charger

The battery charger is suited for a 3.7V Li-Ion rechargeable battery (suggested capacity 500-1000mAh). The Charger needs only a CURRENT LIMITED power source input and charges the battery directly through VBATT connector pins.

Battery charger input pin	CHARGE
Battery pins	VBATT, GND
Battery charger input voltage min	5.0 V
Battery charger input voltage typical	5.5 V
Battery charger input voltage max	7.0 V
Battery charger input current max	400mA
Battery type	Li-Ion rechargeable

NOTE: If embodied battery charger is used, then a LOW ESR capacitor of at least 100μF must be mounted in parallel to VBATT pin.
NOTE: when power is supplied to the CHARGE pin, a battery must always be connected to the VBATT pins of the GE863-PRO[3].

3.8   User Interface

The user interface of the Telit GE863-PRO[3] GSM/GPRS engine is managed by AT commands specified on the ITU-T V.250, GSM 07.07 and GSM 07.05 specifications.

3.9   Speech Coding

The Telit GE863-PRO[3] modules voice codec supports the following rates:

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

3.10   SIM Reader

The **Telit GE863-PRO**[3] **modules** support phase 2 GSM11.14 - SIM 1.8V and 3V. For 5V SIM cards, an external level translator can be added. All models need an external SIM card holder.

3.11   SMS

The **Telit GE863-PRO**[3] **modules** support the following SMS types, in text and PDU mode:

- 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.

3.12   Real Time Clock and Alarm

The **Telit GE863-PRO**[3] **modules** GSM/GPRS engine support the Real Time Clock and Alarm functions through AT commands; furthermore anyone of the GSM/GPRS GPIO available can be configured as alarm output pin to indicate the alarm with a hardware line output.
The Voltage Output of the RTC power supply is provided on a pin so that a backup capacitor can be added to increase the RTC autonomy.

3.13   Data/fax transmission

The **Telit GE863-PRO³ modules** support:

- Packed Data transfer GPRS Class 10, Multi-slot Class B
- CSD up to 14.4 Kbps
- Fax service, Class 1 Group 3

3.14   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.

3.15   Call control

The call cost control function is supported.

3.16   Phonebook

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

3.17   Characters management

The **Telit GE863-PRO³ modules** support the IRA character set (International Reference Alphabet), in TEXT mode and IRA/UCS2/GSM/ISO-8859-1/PCCP437 in PDU mode.

3.18   SIM related functions

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

3.19   Call status indication

The call status indication by AT commands is supported.

3.20   Automatic answer (Voice, Data or FAX)

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

3.21   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)

3.22   Acoustic signalling

The acoustic signals of Telit GE863-PRO³ modules 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.

3.23   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.

3.24   RF Transmission Monitor

As alternate function of the GPIO5, the GE863-PRO³ 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.

3.25   EMC

Compliant to EN301-489-1 and EN301-489-7 and all applicable GSM Specifications. Compliant to Directive 1999/05/CE.

3.26   Logic level specifications

Where not specifically stated, all the interface circuits of the GSM/GPRS engine work at 2.8V CMOS logic levels. To get more detailed information about the logic level specifications used in the Telit GE863-PRO³ interface circuits please consult the Hardware User Guide.

3.27   Reset signal

The RESET is used to reset the GSM/GPRS engine of the Telit GE863-PRO³ modules. Whenever this signal is pulled low, the GSM/GPRS engine is rebooted. When the device is reset it stops any operation. After the release of the reset the GSM/GPRS engine 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 be used only as an emergency exit in the rare case the device remains stucked waiting for some network response.

NOTE: do not use this signal to power off the Telit GE863-PRO³ module. Use the ON/OFF signal to perform this function or the AT#SHDN command.

3.28   RTC Bypass out

The VRTC pin brings out the Real Time Clock supply, which is separate from the rest of the digital part, allowing having only RTC going on when all the other parts of the device are off.
To this power output a backup capacitor can be added in order to increase the RTC autonomy during power off of the battery. NO Devices must be powered from this pin.

3.29   VAUX1 power output

A regulated power supply output is provided in order to supply small devices from the module.
This output is active when the module is ON and goes OFF when the module is shut down.
The operating range characteristics of the supply are:

Operating Range – VAUX1 power supply

	Min	Typical	Max
Output voltage	2.75V	2.85V	2.95V
Output current			100mA / 50mA
Output bypass capacitor			2.2μF

3.30   Audio levels specifications

The audio of the **Telit GE863-PRO**[3] **modules** 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 **Telit GE863-PRO**[3] **modules** have 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 Audio Settings Application Note 80000NT10007a.

3.31   Software Features

3.31.1   Enhanced Easy GPRS Extension

The Easy GPRS feature allows a **Telit GE863-PRO**³ **modules** 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 GE863-PRO**³ **modules**, regardless of all the software stacks underlying.

An example of the protocol stack involved in the devices is reported:
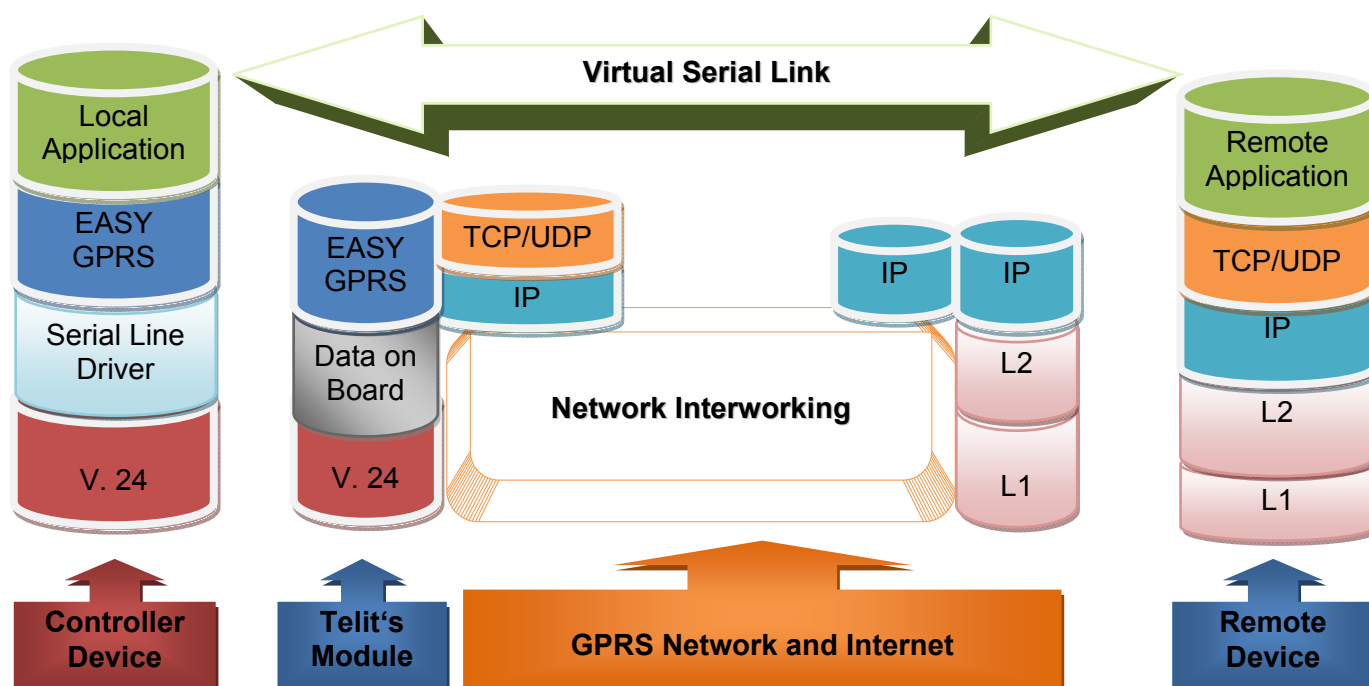
This particular implementation allows to the devices interfacing to the **Telit GE863-PRO**³ **modules** the use of the GPRS and Internet packet service without the need to have an internal TCP/IP stack since this function is embedded inside the module.

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.

3.31.2   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 statuses 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.

3.32   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).

Online mode

Data Traffic

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:

Socket is still alive

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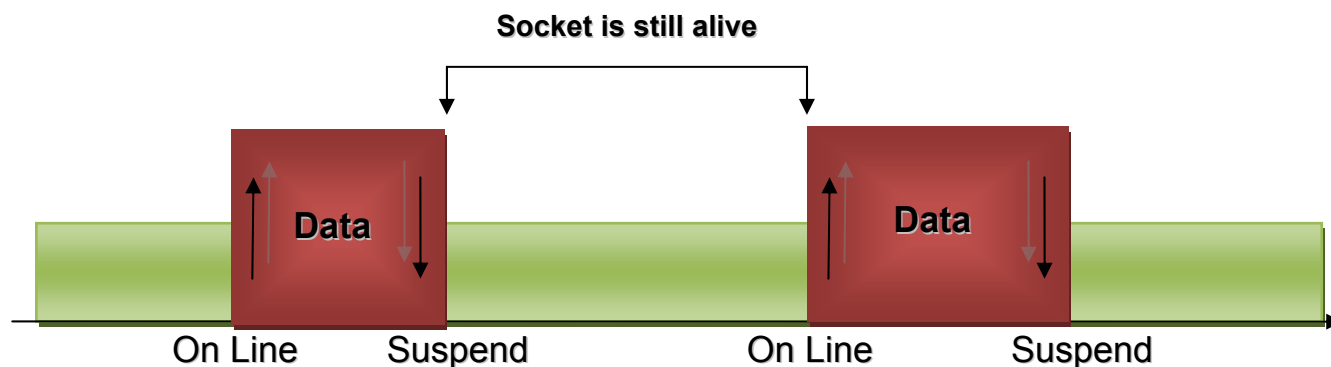
This new feature allows the user to switch between online mode and command mode without closing the connection and eventually opening another socket (or resuming the suspended one) or FTP connection.

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.

3.33   Jammed Detect & Report Extension

3.33.1   Overview

The Jammed Detect & Report feature allows a **Telit GE863-PRO³ module** 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 thief incomes 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.

3.34   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.

3.34.1   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.

3.34.2   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 Product Specification

3.35   SAP: SIM Access Profile

3.35.1   Product architecture

The SAP feature allow 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.

3.35.2   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.

3.35.3   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.

3.35.4   AT Commands

The Telit GE863-PRO^3 modules can be driven via the serial interface using the standard AT commands[1].

The Telit GE863-PRO^3 modules are compliant with:

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

Moreover the Telit GE863-PRO^3 modules support also Telit proprietary AT commands for special purposes.
For a detailed description of GE863 modules AT Commands refer to document AT Commands Reference Guide, code 80000ST10025a.

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[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.

4   ARM9 Application Engine

4.1   General Description

The Application engine is an ATMEL AT91SAM9260 and comprises an ARM926EJ-S processor with fast ROM and RAM plus power management and 8/64[2] Mbyte SDRAM 100MHz and a 4Mbyte serial flash.

The ARM926EJ-S has a full set of peripherals ranging from several USART to the USB Host controller, allowing almost any connectivity to be achieved.

The ARM has two clock sources, a 6MHz crystal oscillator clock source providing the main clock that can be multiplied up to 200MHz and the internal RC slow clock source providing 32KHz. If more accuracy in the 32KHz clock is needed, then an external 32KHz crystal can be added.

4.2   Supply voltage

The external power supply must be connected to VBATT2 signal pin (see Hardware User Guide) and must fulfill the following requirements:

Nominal operating voltage	3.8 V
Operating voltage range	3.4 V – 4.2 V
Absolute Minimum voltage	3.30V
Absolute Maximum voltage	4.50 V

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

4.3   Power consumption

The typical current consumption of the ARM9 part of the **Telit GE863-PRO**[3] **module** is:

Power off current (typical)	2 μA
Stand–by current @ slow clocking	< 1 mA
Operating current typical @ 200MHz	87 mA

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[2] Depends of the configuration that client chooses

The power consumptions reported are measured with all GPIO unloaded.

The total power consumption of GE863-PRO^3 is the sum of the consumptions of GSM and ARM9 processor part.

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4.4   USARTs

The Application processor has 1 Full (9 wires) RS232 USART , 3 USART with Hardware Flow Control, 2 two wire UARTs.

4.5   SPI bus

The Application processor has 2 set of Serial Peripheral Interfaces buses, SPI0 and SPI1. Each of these SPI bus has four Chip Select lines, that can be encoded to provide access to 15 peripherals [with external CS decoding].
The CS1 of the SPI0 bus is internally connected to the Serial Flash, hence SPI0 cannot use encoded CS and therefore only 3 other devices can be connected to the SPI0 interface. SPI1 bus can use the encoding.
The SPI busses support Master, Multiple Master or Slave mode.

The SPI bus consists of two data lines and two control lines:

- Master Out Slave In (MOSI): This data line supplies the output data from the master shifted into the input(s) of the slave(s).
- Master In Slave Out (MISO): This data line supplies the output data from a slave to the input of the master. There may be no more than one slave transmitting data during any particular transfer.
- Serial Clock (SPCK): This control line is driven by the master and regulates the flow of the data bits. The master may transmit data at a variety of baud rates; the SPCK line cycles once for each bit that is transmitted.
- Chip Select (NPCS): This control line allows slaves to be turned on and off by hardware.

All combinations of Clock Polarity (CPOL) and Clock Phase (CPHA) is supported by the bus.

4.6   Image Sensor Interface

The Image Sensor Interface (ISI) connects a CMOS-type image sensor to the processor and provides image capture in various formats. It does data conversion, if necessary, before the storage in memory through DMA.
The ISI supports color CMOS image sensor and grayscale image sensors with a reduced set of functionalities.

It supports two modes of synchronization:
- Hardware with ISI_VSYNC and ISI_HSYNC signals
- International Telecommunication Union Recommendation ITU-R BT.656-4 Startof-Active-Video (SAV) and End-of-Active-Video (EAV) synchronization sequence.

Using EAV/SAV for synchronization reduces the pin count (ISI_VSYNC, ISI_HSYNC are not used). The polarity of the synchronization pulse is programmable to comply with the sensor signals.

4.7   IIC bus

The IIC bus interconnects components on a two-wire bus, made up of one clock line and one data line with speeds of up to 400 Kbits per second, based on a byte-oriented transfer format.
The IIC is programmable as a master or a slave with sequential or single-byte access. Multiple master capability is supported. Arbitration of the bus is performed internally and puts the IIC in slave mode automatically if the bus arbitration is lost.
A configurable baud rate generator permits the output data rate to be adapted to a wide range of core clock frequencies.

4.8   ISO7816 T0/T1 Interface

The ARM9 USART can be used according to ISO7816 T0/T1 operating mode. This mode permits interfacing with Smart cards and Security Access Modules (SAM) communicating through an ISO7816 link. Both T = 0 and T = 1 protocols defined by the ISO7816 specification are supported.

4.9   MultiMedia Card interface

The Application processor provides a full MCI interface.
The MultiMedia Card Interface (MCI) supports the MultiMedia Card (MMC) Specification V3.11, the SDIO Specification V1.1 and the SD Memory Card Specification V1.0. The MCI operates at a rate of up to 100 MHz and supports the interfacing of 2 slot(s).
Each slot may be used to interface with a MultiMediaCard bus (up to 30 Cards) or with a SD Memory Card. Only one slot can be selected at a time (slots are multiplexed).
The SD Memory Card communication is based on a 9-pin interface (clock, command, four data and three power lines) and the MultiMedia Card on a 7-pin interface (clock, command, one data, three power lines and one RFU).
The SD Memory Card interface also supports MultiMedia Card operations.

4.10   Sinchronous Serial Controller

The application processor provides a Sinchronous serial controller that can support several serial synchronous communication protocols such as: I2S, Short Frame Sync, Long Frame Sync.
With this peripheral the processor can be interfaced with Audio Codecs, Fast DAC, Fast ADC.

4.11   Ethernet controller

The Application processor provides an Ethernet controller compatible with the 10Mb/s -100Mb/s IEEE 802.3 standard that can be used to interface the Telit GE863-PRO^3 to a LAN. It fully supports Media Independent Interface (MII) or Reduced Media Independent Interface (RMII) standards to PHY transceivers with MDIO controlling interface.

4.12   ADC with ADC trigger

The application processor provides an Analog Digital Converters with an ADC trigger input and a
 4-to-1 analog multiplexer, making possible the conversion of up to 4 analog lines.
The characteristic of the ADC are:

	Min	Max	Units
Voltage range	3.0	3.1	Volt
AD conversion	8	10	bits
ADC clock frequency	0	5	MHz
Max sampling rate		312	kS per second

4.13 DAC Converter

The Application processor is able to generate a PWM signal based on a specific percentage of duty cycle decided by the user. An external filter is necessary to convert the PWM signal into a constant voltage.

	Min	Max	Units
Voltage range	3.0	3.1	Volt
Duty Cycle range	0	100	%
Resolution	1	1	%

4.14 USB Device port

The application Processor provides one USB Device port compliant to the Universal Serial Bus (USB) V2.0 full-speed device specifications.

4.15 USB Host port

The application Processor provides two USB Host ports compliant to the Universal Serial Bus (USB) V2.0 full-speed and low speed specifications and to the Open Host Controller Interface (OHCI) standard.
The USB Host Port integrates a root hub and transceivers on downstream ports. It provides several high-speed half-duplex serial communication ports at a baud rate of 12 Mbit/s.
Up to 127 USB devices and the USB hub can be connected to the USB host in the USB "tiered star" topology.

4.16 Clock outputs

The Application processor provides two programmable clock outputs that can output:

- Slow clock
- Main Clock
- PLLA clock

- PLLB clock

With a prescaler that can divide the source clock by a factor ranging from 1 to 64.

4.17 GPIO ports

The Application processor provides 88 General Purpose I/O multiplexed with the peripheral pins.
This pins can be moved with the Parallel I/O (PIO) controller in blocks of 32 pins or manually one by one.
Each IO pin can be fully configured as Input, Output, Open Drain or not, with or without internal Pull-ups, with or without Input Glitch filter.

4.18 JTAG Debug Interface

The application processor provides a JTAG interface for debugging compatible with IEEE1149.1 JTAG Boundary-scan protocol.

4.19 Debug UART

The application processor supports also a debug UART that can support the Debug Communication Channel (DCC) protocol.

5   Mounting the GE863-PRO³ on the Application Board

5.1.1 General

The Telit GE863-PRO³ 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.

5.1.2 Packing system

According to SMT processes for pick & place movement requirements, Telit GE863-PRO³ modules are packaged on trays, each tray contains 20 pieces. Tray dimensions are:
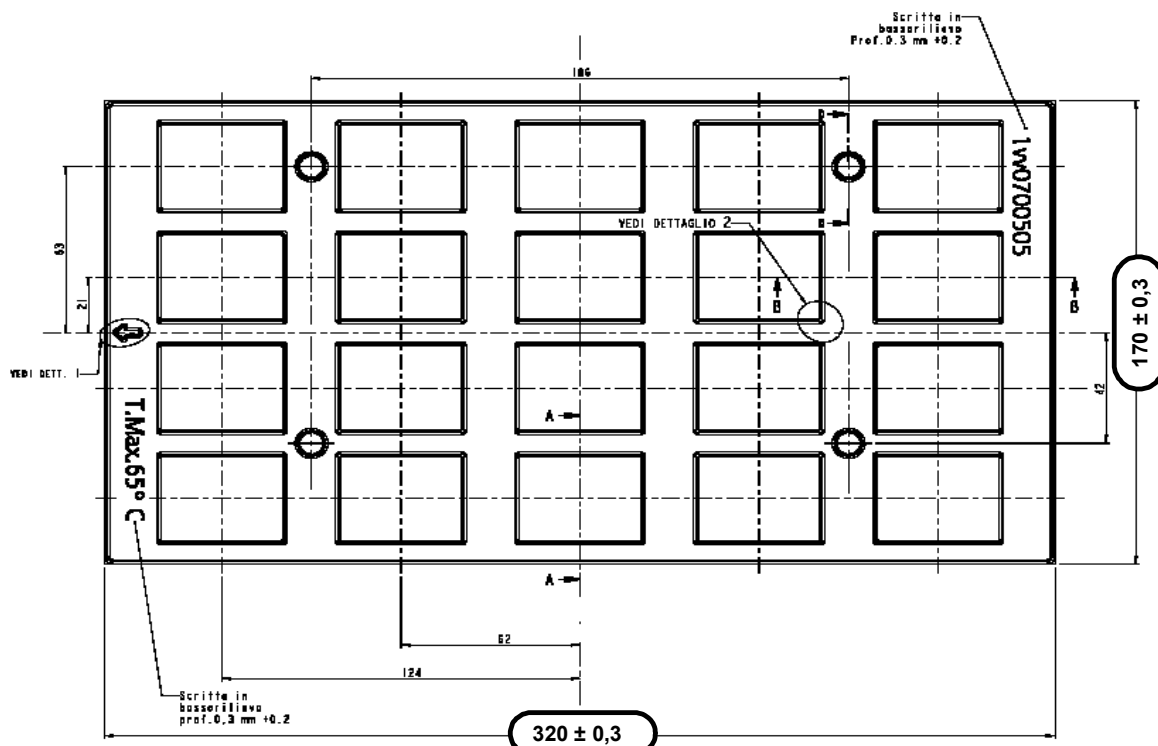
All quotes are in mm, general tolerance ± 0.1
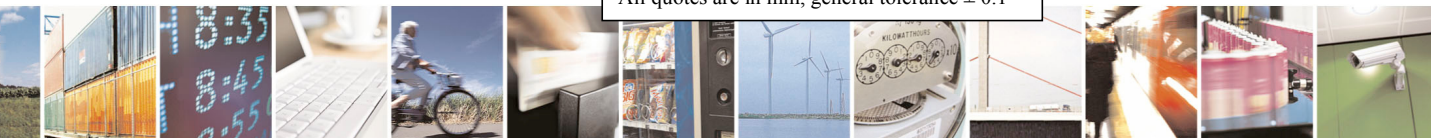
Note that trays can withstand a maximum temperature of 65° C.

Section A-A

6.1
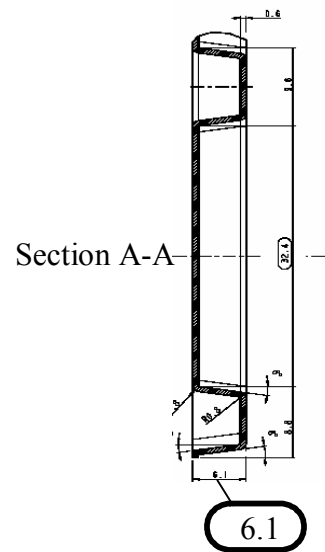
Modules orientation on tray:

Ref. Not rounded corner of module's printed board indicates pin A1 corner.

The modules in the tray are oriented as shown in **A** and the tray is oriented toward left as shown in **B**.
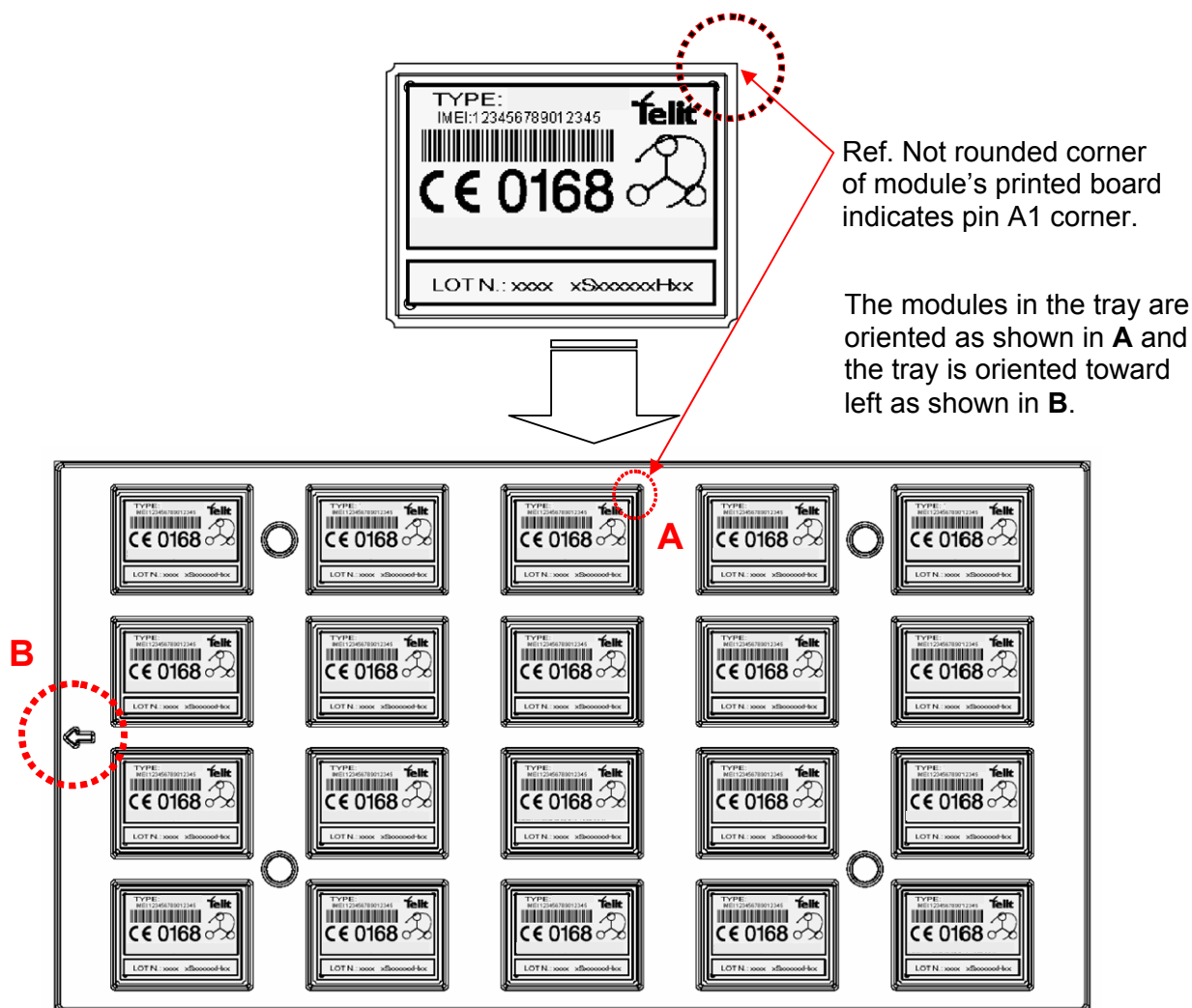
6   Evaluation Kit EVK-PRO^3

In order to assist you in the development of your **Telit GE863-PRO^3 module** based application, Telit can supply an **Evaluation Kit EVK-PRO^3** with appropriate power supply, SIM card holder, RS232 serial port level translator and USB host & device, SD Card holder, SAM Card holder, Ethernet and antenna connection.

The development of the applications utilizing the **Telit GE863-PRO^3 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 design phase, the EVK 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 GE863-PRO^3 Evaluation Kit** refer to the documentation provided with the Telit GE863-PRO^3 Hardware User Guide and EVK-PRO3 User Guide.

7   Conformity Assessment Issues

The **Telit GE863-PRO³ modules** are assessed to be conform to the R&TTE Directive.
If the module is installed in conformance with Telit installation instructions it will require no further evaluation under **Article 3.2** of the R&TTE Directive and do not require further involvement of an 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 the 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.

The **Telit GE863-PRO³ modules** are 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 GE863-PRO³ 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 GE863-PRO³ modules** are FCC Approved as module to be installed in other devices. These devices have 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 ID is required.

The **Telit GE863-PRO³ modules** are conforming to the following US Directives:

- Use of RF Spectrum. Standards: FCC 47 Part 24 (GSM850 - GSM 1900)
- EMC (Electromagnetic Compatibility). Standards: FCC47 Part 15

The GE863-PRO3 module 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.

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Telit Communications S.p.A. may void the user's authority to operate the equipment.

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

- The 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 antenna(s) used for this module must not exceed 3 dBi for mobile and fixed or mobile operating configurations.

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. Interference statement:

The **Telit GE863-PRO³ module** complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

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

For questions regarding your product or this FCC declaration, contact:

Telit wireless solutions Inc.
Americas

3131 RDU Center Drive,
USA – 27560 Morrisville, NC 27560, USA
Phone: +1 888 846 9773
Fax: + 1 888 846 9774
e-mail: americas.info@telit.com

To identify this product, refer to the Part, Series, or Model number found on the product.

7.1   GE863-PRO³: Conformity Assessment

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

GE863-PRO3

Quad-Band GSM850/EGSM900/DCS1800/PCS1900 GPRS CMR 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 verified against the following harmonized standards:

RF spectrum efficiency (R&TTE art. 3.2)	EN 301 511: v9.0.02 (2003-03)
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 60950-1:2001 + A11:2004

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:

BABT, Balfour House, Churchfield Road, Walton-on-Thames, Surrey, KT12 2TD, United Kingdom

BABT File number: NC13523 i01

Identification mark: **0168**

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,   **06 March 2008**

Quality Director
Ing. Guido Walcher

08DOC01 MOD.003 03/08 REV.11

Notified Body Statement of Opinion

No.   THER1 08 05 66194 002

Certificate Holder:	**TELIT Communications S.p.A.** Via Stazione di Prosecco 5/B 34010 Sgonico TS ITALY
Product:	**GSM Technology Quad-Band GSM/GPRS module**
Model(s):	**GE863-PRO3**
Technical data:	TCF No.26826B_GE863-PRO3_rev2

In accordance with Annex IV of European Union Council Directive 1999/5/EC on radio equipment and telecommunications terminal equipment, our opinion is that the equipment identified above and described in the Annex to this statement of opinion complies with the requirements of the above Directive as stated in article 3.1 (a) in respect of Health & Safety, article 3.1 (b) in respect of EMC and article 3.2 in respect of Radio Spectrum Use.

BABT File number: NC13523 i02 (mod)

Date,   2008-05-23   (Alan Binks
                             Certification Manager, BABT)

British Approvals Board for Telecommunications (BABT) is appointed as a Notified Body, with the identification number 0168, in accordance with the Council Directive 1999/5/EC for radio equipment and telecommunications terminal equipment. The CE marking and the BABT 0168 identification number may be used on the equipment described above, subject to the equipment meeting the compliance requirements of all applicable EU directives. This statement of opinion remains the property of BABT and is not transferable.

Page 1 of 3

British Approvals Board for Telecommunications • TÜV SÜD Group •
Balfour House • Churchfield Road • Walton-on-Thames • Surrey • KT12 2TD • United Kingdom

7.2   GE863-PRO³: RoHS certificate

DECLARATION OF EU RoHS Compliance

We,

Telit Communications S.p.A

Of:

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

declare under our sole responsibility that the products:

GE863-PRO3
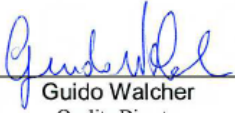
to which this declaration relates, is in full compliance with EU Directive 2002/95/EC on restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS), subsequent amendments and the European Court of Justice decision on Deca-BDE substances from July 1, 2008.

The technical documentation or other information showing that electrical and electronic equipment which has put on the market, complies the requirements of regulation, will be held at:

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

Trieste, **July 30, 2008**

_____   _____
Antonino Sgroi   Guido Walcher
R&D Head   Quality Director

Rev.2

7.3 GE863-PRO³ : FCC Equipment Authorization

TCB

GRANT OF EQUIPMENT AUTHORIZATION

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

MET Laboratories, Inc.
914 W. Patapsco Avenue
Baltimore, MD 21230-3432

TCB

Date of Grant: 05/14/2008

Application Dated: 05/14/2008

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: RI7863P3
Name of Grantee: Telit Communications S.p.A.
Equipment Class: PCS Licensed Transmitter
Notes: Quad-Band GSM/GPRS module -Model: GE863-PRO3
Modular Type: Single Modular

Grant Notes	FCC Rule Parts	Frequency Range (MHZ)	Output Watts	Frequency Tolerance	Emission Designator
	22H	824.2 - 848.8	1.85	1.0 PM	290KGXW
	24E	1850.2 - 1909.8	0.95	1.0 PM	290KGXW

Licensed Modular Transmitter. Power Output listed is conducted. The maximum antenna gain approved for use with this device is 3dBi. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from a persons and must not be co-located or operating in conjunction with any other antenna or transmitter. A separate approval is required for portable operating configurations, as defined in 2.1093 of the rules. The final product operating with this transmitter must include operating instructions and applicable warnings for end users and installers to satisfy RF exposure compliance requirements. OEM integrators must be informed of these specific requirements. This Grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. This device contains functions that are not operational in U.S. territories.
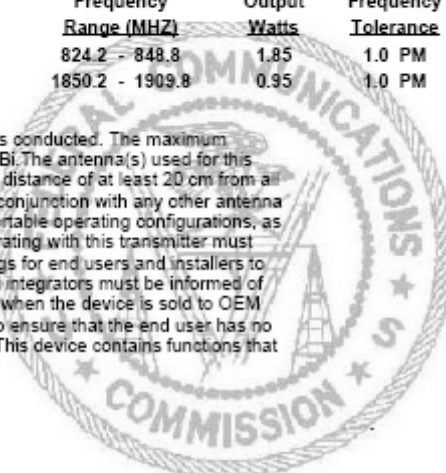
7.4   GE863- PRO³ : IC Equipment Authorization

GRANT OF EQUIPMENT CERTIFICATION

THE FOLLOWING EQUIPMENT HAS BEEN TESTED
AND CERTIFIED UNDER
INDUSTRY CANADA
RSS-132 ISSUE 2, RSS-133 ISSUE 4
RSS-GEN, ISSUE 2, JUNE 2007

CB   Issued By: CB

MET Laboratories, Inc.
914 W. Patapsco Avenue
Baltimore, Maryland 21230
Laboratory Number: 2043A

Equipment Certification is hereby issued to the Identified Certificate Holder and is VALID ONLY for the equipment identified herein.
La certification du matériel est distribuée à la Société identifiée et est VALIDE SEULEMENT pour l'équipement identifié ci-dessous.
NOT TRANSFERABLE / PAS TRANSMISSIBLE

FILE/CERTIFICATE NUMBER: 205-5-2008-80777

CERTIFICATION NUMBER: IC: 5131A-863P3

Issued to/Délivré a: Telit Communications S.p.A	Date of Grant: May 12, 2008
Address: VIA STAZIONE DI PROSECCO 5/B, I-34010 TRIESTE, ITALY	

Nature of Application/Nature d'Application: Original
Equipment Description/Genre de Matériel: Quad-Band GSM/GPRS module -Model: GE863-PRO3
Equipment Category/Catégorie de Matériel: Category I

Model Number(s)/Modele   GE863-PRO3

Conducted RF Power or Field Strength/Puissance H.F.:   1.83 W , 0.95 W
Frequency Range/Bande de Fréquences: 824.2 - 848.8 , 1850.2 - 1909.8
Bandwidth(s)/ largeurs de bande: 290 kHz
Emission Designations/Genre D'Émission: 290KGXW
Antenna Information/ l'information d'antenne: connector

Test Lab: AT4 Wireless, Centro de Tecnología de las Comunicaciones, S.A., Parque Tecnologico de Andalucia, C/Severo Ochoa 2, 29590 Campanillas - Malaga Spain
          rorejas@cetecom.es Tel: 34-952-61-93-57
Test Lab IC Site Number: IC: 4621A-1

Notes: Licensed Modular Transmitter. Power Output listed is conducted. The maximum antenna gain approved for use with this device is 3dBi. 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. A separate approval is required for portable operating configurations. The final product operating with this transmitter must include operating instructions and applicable warnings for end users and installers to satisfy RF exposure compliance requirements. OEM integrators must be informed of these specific requirements. This Grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. This device contains functions that are not operational in North America.

Certification of equipment means only that the equipment met the requirements of the above noted specification(s). License applications, where applicable to use certified equipment, are acted on accordingly by the issuing office and will depend on the existing radio environment, service and location of operation. This certificate is issued on condition that the holder complies and will continue to comply with requirements and procedures issued by Industry Canada.

La certification du matériel signifie seulement que le matériel a satisfait aux exigences de la norme indiquée ci-dessus. Les demandes de licence nécessaires pour l'utilisation du matériel certifié sont traitées en conséquence par le bureau de délivrance et dépendent des conditions radio ambiantes, du service et de l'emplacement d'exploration. Le présent certificat est délivré à la condition que le titulaire satisfasse et continue de satisfaire aux exigences et aux procédures d'Industrie Canada.

ISSUED UNDER THE AUTHORITY OF THE MINISTER OF INDUSTRY
PUBLIÉ AVEC L'AUTORISATION DU MINISTRE DES INDUSTRIES

Authorized MET Representative Signature: _____
Printed: May 12, 2008   Shawn McMillen

8   Safety Recommandations

<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://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

9 GE863-PRO[3] Technical Support

Telit's technical support to **GE863-PRO[3]** wireless modem customers consists in:

• Technical documentation: available for download into the Website www.telit.com >Products >Modules > selected model.
• Engineering support: accessible via E-Mail service with 48 hr replies assured under normal conditions.

10 List of acronyms

ACM	Accumulated Call Meter
ADC	Analog Digital Converter
ASCII	American Standard Code for Information Interchange
AT	Attention commands
BGA	Ball Grid Array (of solder balls on surface mount devices)
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)
FTP	File Transfer Protocol
GGA	Global Positioning System Fix Data
GLL	Geographic Posotion – Latitude/Longitude
GPS	Global Positioning System, based on reception of signals from orbiting satellites
GPIO	General Purpose Input/Output
GPRS	General Radio Packet Service
GSA	GPS receiver operating mode, SVs used for navigation, and DOP values.
GSM	Global System for Mobile communication
GSV	Number of SVs in view, PRN numbers, elevation, azimuth & SNR values.
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
JTAG	Joint Test Action Group
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LF	Linefeed
ME	Mobile Equipment
MMC	Multi Media Card
MMI	Man Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
NMEA	National Marine Electronics Association
OEM	Other Equipment Manufacturer
PB	Phone Book
PDU	Protocol Data Unit
PH	Packet Handler
PIN	Personal Identity Number
PLMN	Public Land Mobile Network
PPS	Precision Positioning Service
PUCT	Price per Unit Currency Table
PUK	PIN Unblocking Code
PWM	Pulse Width Modulation
RACH	Random Access Channel
RLP	Radio Link Protocol
RMC	Recommended Minimum Specific GPS/TRANSIT Data
RMS	Root Mean Square
RoHS	Reduction of Hazardous Substances
RTS	Ready To Send
RI	Ring Indicator
SAM	Security Authentication Module
SCA	Service Center Address
SD	Secure Digital
SIM	Subscriber Identity Module
SMD	Surface Mounted Device
SMS	Short Message Service
SMSC	Short Message Service Center
SPS	Standard Positioning Service
SS	Supplementary Service
SPI	Serial Peripheral Interface
TIA	Telecommunications Industry Association
TTFF	Time To First Fix
UART	Universal Asynchronous Receiver/Transmitter
UDUB	User Determined User Busy
USB	Universal Serial Bus

USSD	Unstructured Supplementary Service Data
USART	Universal Sinchronous Asynchronous Receiver/Transmitter
VTG	Actual track made good and speed over ground

11 Document Change Log

Revision	Date	Changes
ISSUE#0	24/08/07	Initial Release
ISSUE#1	08/08/08	Updated Introduction paragraph Added certifications in 7 Conformity Assessment Issues paragraph
ISSUE#2	04/11/08	Updated conformity assessment paragraph: Declaration of Conformity and RoHS declaration Updated ARM power consumption Changed number of available GPIO from 90 to 88