

**Telit**

**TRIZIUM<sup>®</sup> - GPS**

**Product Description**

**Rev. 1**

**DAI Telecom S.p.a.**

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## 1.1 Overview

Aim of this document is the description of features, functions and interfaces of the [Telit TRIZIUM®-GPS modules](#).

The [Telit TRIZIUM®-GPS modules](#) are small, lightweight and low power consumption devices that allow digital communication services wherever a GSM 900, DCS 1800, PCS1900 network is present, as well as position location by mean the GPS receiver. The GSM/DCS/PCS part of the product is based on the [Telit TRIZIUM® module](#).

The TRIZIUM-GPS is an application based on main PCB where is assembled a TRIZIUM Module, a GPS module, a SIM card holder, a GSM antenna connector, a GPS antenna connector and an interface connector to interface the TRIZIUM - GPS circuit with the Customer applications.

For the GSM part, the [Telit TRIZIUM®-GPS module](#) includes features like GPRS, Voice, Circuit Switch Data transfer, Fax, Phonebook and SMS support, 'Easy GPRS' embedded TCP/IP stack and 'EASY CAMERA', battery charging capabilities.

The GPS part of the module is based on ST Microelectronics Vespucci BB Chipset.

The product is intended for OEM usage and dedicated to portable data, voice and position location applications such as:

- ❑ **Fleet Management**
- ❑ **Asset Tracking**
- ❑ **Car and Truck Security**
- ❑ **In-vehicle applications**

In order to meet the competitive OEM and vertical market stringent requirements, Telit supports its customers with a dedicated [TRIZIUM® Module Support Policy](#) with:

- ❑ an [Evaluation Kit](#) to help you develop you application;
- ❑ a dedicated Website ([www.TRIZIUM.com](http://www.TRIZIUM.com)) with all updated information available;
- ❑ a high level specialist technical support to assist you in your development;
- ❑ free SW releases upgrade download (via the Website) every time a new functionality will be added to the [Telit modules](#) SW.

For more updated information concerning product Roadmap and availability, technical characteristics, commercial and other issues please check the [Telit TRIZIUM® modules](#) dedicated Website [www.TRIZIUM.com](http://www.TRIZIUM.com) or mail to:

[ts-trizium@telit.net](mailto:ts-trizium@telit.net), for any **Technical** information or support you may need

[ci-trizium@telit.net](mailto:ci-trizium@telit.net), for any **Commercial**, sales or marketing related info

[af-trizium@telit.net](mailto:af-trizium@telit.net) , for **After Sales** issues

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*NOTE: Some of the performances of the [Telit TRIZIUM modules](#) depend on SW version installed on the module itself. In particular on Chapter 5, dedicated to the supported AT commands, the minimum SW version required to support each specific AT command is reported.*

*The **Telit TRIZIUM** SW group is continuously working in order to add new features and improve the overall performances. From time to time that a new SW version is released, it will be freely distributed by the **Telit TRIZIUM module** dedicated Website*

*The **Telit TRIZIUM modules** are easily upgradeable by the developer using the suitable tools provided by the Technical support.*

*For more info about this topics, please check **Telit TRIZIUM modules** dedicated Website [www.trizium.com](http://www.trizium.com) and [www.telit.com](http://www.telit.com).*

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## 2 General Product Description

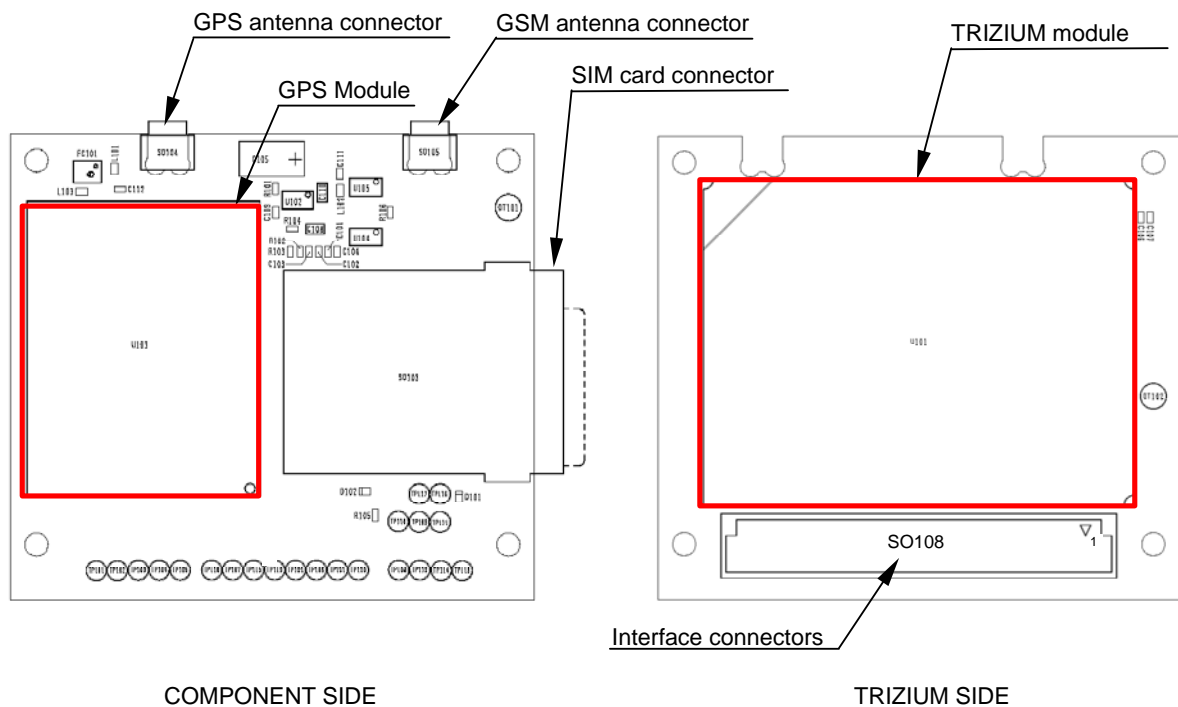
The TRIZIUM-GPS is an application based on main PCB where is assembled a Telit TRIZIUM Module, a GPS receiver, a SIM card holder, a GSM antenna connector, a GPS antenna connector and an interface connector to interface the TRIZIUM-GPS with the Customer applications.

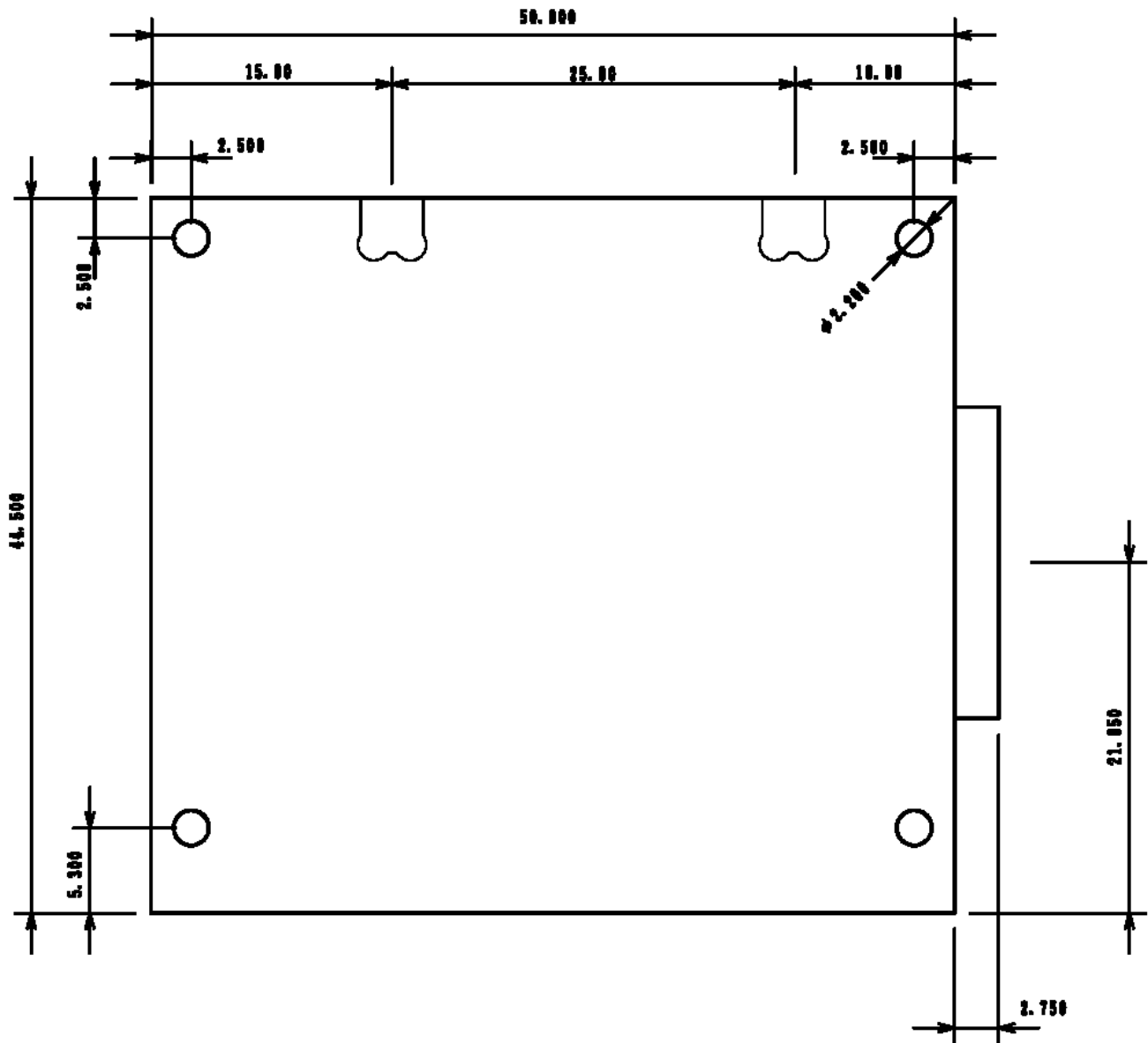
The two parts of the TRIZIUM-GPS product can be accessed and therefore used separately by mean the SO108 interface connector or, can be used in a Master-Slave configuration. In a Master-Slave configuration, the GSM part acts as Master, while the GPS acts as Slave.

Both the GSM and GPS parts talk to the external world through the 4 serial ports available on the SO108 connector. In the Master-Slave configuration, the GSM Trace port, pin 30 and 31, has to be connected to pin 57, 58 (GPS commands).

### 2.1 Size

- **Length:** 52,5 mm
- **Width:** 46 mm
- **Thickness:** 11 mm





Bottom View

## 2.2 Weight

The weight is 21 gr.

## 2.3 Environmental requirements

The **Telit TRIZIUM-GPS** is compliant to the applicable ETSI reference documentation GSM 05.05 Release1999 ETSI EN300910 V8.4.1

### 2.3.1 Temperature range

- Temperature in normal functional conditions  $-10^{\circ}\text{C} \div +55^{\circ}\text{C}$
- Temperature in extreme functional conditions\*  $-25^{\circ}\text{C} \div +75^{\circ}\text{C}$
- Temperature in storage conditions  $-30^{\circ}\text{C} \div +85^{\circ}\text{C}$

\*these temperatures can affect the sensitivity and performance of the module

### 2.3.2 Vibration Test (non functional)

TBD

## 2.4 GPS features

### 2.4.1 Front-End

Receiver Band L1 @ 1575.42MHz; low noise LNA with the following features:

- two step gain adjustment;
- external antenna activation monitor;
- image rejection mixer (integrated VCO);
- single conversion @ IF=4.092 MHz;
- data and clk in output @Fclk (integrated filter and limiter);
- consumption typical 150 mW.

### 2.4.2 GPS Base-Band Processor

- Single-chip ARM7 TDMI RISC CPU 32-bit;
- Embedded SW: GPS receiver with tracking capability up to 12 satellites;
- 256KB Flash memory on-board (100K erasing/programming cycles);
- 64 KB RAM memory;

### 2.4.3 GPS performance

- Accuracy (DOP 95%): 3m in horizontal, 5m in vertical;
- Hot start < 3s, warm start < 32s, cold start <60s;
- Obscuration recovery < 1s.

## 2.5 GSM 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	
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

## 2.6 GSM Transmitter output power

BAND	Class	RF output peak Power (on 50 Ohm)
GSM-900	4	2W / +33dBm
DCS-1800	1	1W / +30dBm
PCS-1900	1	1W / +30dBm

## 2.7 GSM Reference sensitivity

According to the GSM specifications:

BAND	Class of reference	Sensitivity
GSM-900	4	-102 dBm
DCS-1800	1	-102 dBm
PCS-1900	1	-102 dBm

## 2.8 Antennas

### 2.8.1 GSM Antenna

The antenna that the customer chooses to use, depending on his application, should fulfill the following requirements:

<b>Frequency range</b>	Standard Dual Band frequency range, Standard Tri Band frequency range
<b>Bandwidth</b>	80 MHz in GSM & 170 MHz in DCS & 140 MHz PCS band
<b>Gain</b>	> 0 dB (referenced to 1/2 dipole)
<b>Impedance</b>	50 ohm
<b>Input power</b>	> 2 W peak power
<b>VSWR absolute max</b>	<= 10:1
<b>VSWR recommended</b>	<= 2:1

### 2.8.2 Antenna connectors

2 x MMCX RF Connectors for:

- GSM antenna
- active GPS antenna (status monitored).

### 2.8.3 GPS Antenna

Antenna Type:	Active Patch Antenna
Centre frequency:	1575.42 MHz
Bandwidth:	± 1.023 MHz
S.W.R. Antenna:	2.0 Max
Gain Pacht Antenna:	+ 1.5 dBi Min
Impedance:	50 Ohm
Polarization:	RHCP
Current consumption:	3 V = 13 ± 0.6 mA. 5 V = 26.3 ± 1.3 mA.
Power gain:	3 V = 22 ± 5 dB 5 V = 25 ± 5 dB.
Gain of complete active antenna (LNA+ANTENNA):	26.5 dBi ± 5 dBi
Noise figure:	1.8 ÷ 2.2 dB
Supply voltage:	3÷5 V
Temperature:	-30°C, +85°C

## 2.9 Supply voltage

The external power supply must be connected to VBATT signal (pin 1-3 of the S0108 connector) and must fulfill the following requirements:

- Nominal operating voltage 3.8 V
- Operating voltage range 3.4 V - 4.2 V

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

The GPS part of the module instead, is powered by an on-board voltage regulator. The GPS's voltage regulator is controlled externally by mean VCC\_EN\_GPS available on pin 61.

## 2.10 Power consumption

### 2.10.1 GSM Power consumption

The typical current consumption of the GSM part of the [Telit TRIZIUM-GPS module](#) is:

- Power off current (typical) < 30  $\mu$ A;
- Stand-by current < 19 mA<sub>rms</sub> (< 4 mA<sub>rms</sub> using command **ATError! Reference source not found.**)
- Operating current in voice ch. 170 mA<sub>rms</sub> @ typical network conditions
- Operating current in voice ch. < 270 mA<sub>rms</sub> 1.9 A<sub>peak</sub> @ worst network conditions
- Operating current in GPRS class 10 < 500 mA<sub>rms</sub> @ worst network conditions

### 2.10.2 GPS Power consumption

The typical current consumption of the GPS part of the [Telit TRIZIUM-GPS module](#) is:

- Stand-by current 30  $\mu$ A
- Operating current 50 mA

## 2.11 GPS Serial ports

The UART 0 of the GPS is configured at 9600 bps with the following GPS sentences:

- GGA
- VTG
- GSA
- GSV
- RMC
- GLL (future feature)

The UART 2 of the GPS is configured as in/out port at 4800 bps with the same above sentences.

## 2.11.1 GPS Sentences

The following GPS sentences are available:

**GGA** - essential fix data which provide 3D location and accuracy data.

```
$GPGGA,123519,4807.038,N,01131.000,E,1,08,0.9,545.4,M,46.9,M,,*47
```

Where:

GGA	Global Positioning System Fix Data
123519	Fix taken at 12:35:19 UTC
4807.038,N	Latitude 48 deg 07.038' N
01131.000,E	Longitude 11 deg 31.000' E
1	Fix quality: 0 = invalid
	1 = GPS fix (SPS)
	2 = DGPS fix
	3 = PPS fix
	4 = Real Time Kinematic
	5 = Float RTK
	6 = estimated (dead reckoning) (2.3 feature)
	7 = Manual input mode
	8 = Simulation mode
08	Number of satellites being tracked
0.9	Horizontal dilution of position
545.4,M	Altitude, Meters, above mean sea level
46.9,M	Height of geoid (mean sea level) above WGS84 ellipsoid
(empty field)	time in seconds since last DGPS update
(empty field)	DGPS station ID number
*47	the checksum data, always begins with *

If the height of geoid is missing then the altitude should be suspect. Some non-standard implementations report altitude with respect to the ellipsoid rather than geoid altitude. Some units do not report negative altitudes at all. This is the only sentence that reports altitude.

**VTG** - Velocity made good. The gps receiver may use the LC prefix instead of GP if it is emulating Loran output.

```
$GPVTG,054.7,T,034.4,M,005.5,N,010.2,K
```

where:

VTG	Track made good and ground speed
054.7,T	True track made good
034.4,M	Magnetic track made good
005.5,N	Ground speed, knots
010.2,K	Ground speed, Kilometers per hour

Note that, as of the 2.3 release of NMEA, there is a new field in the VTG sentence at the end just prior to the checksum.

**GSA** - GPS DOP and active satellites. This sentence provides details on the nature of the fix. It includes the numbers of the satellites being used in the current solution and the DOP. DOP (dilution of precision) is an indication of the effect of satellite geometry on the accuracy of the fix. It is a unitless number where smaller is better. For 3D fixes using 4 satellites a 1.0 would be considered to be a perfect number, however for overdetermined solutions it is possible to see numbers below 1.0.

There are differences in the way the PRN's are presented which can effect the ability of some programs to display this data. For example, in the example shown below there are 5 satellites in the solution and the null fields are scattered indicating that the almanac would show satellites in the null positions that are not being used as part of this solution. Other receivers might output all of the satellites used at the beginning of the sentence with the null field all stacked up at the end. This difference accounts for some satellite display programs not always being able to display the satellites being tracked. Some units may show all satellites that have ephemeris data without regard to their use as part of the solution but this is non-standard.

```
$GPGSA,A,3,04,05,,09,12,,,24,,,,,2.5,1.3,2.1*39
```

Where:

GSA	Satellite status
A	Auto selection of 2D or 3D fix (M = manual)
3	3D fix - values include: 1 = no fix 2 = 2D fix 3 = 3D fix
04,05...	PRNs of satellites used for fix (space for 12)
2.5	PDOP (dilution of precision)
1.3	Horizontal dilution of precision (HDOP)
2.1	Vertical dilution of precision (VDOP)
*39	the checksum data, always begins with *

**GSV** - Satellites in View shows data about the satellites that the unit might be able to find based on its viewing mask and almanac data. It also shows current ability to track this data. Note that one GSV sentence only can provide data for up to 4 satellites and thus there may need to be 3 sentences for the full information. It is reasonable for the GSV sentence to contain more satellites than GGA might indicate since GSV may include satellites that are not used as part of the solution. It is not a requirement that the GSV sentences all appear in sequence. To avoid overloading the data bandwidth some receivers may place the various sentences in totally different samples since each sentence identifies which one it is.

The field called SNR (Signal to Noise Ratio) in the NMEA standard is often referred to as signal strength. SNR is an indirect but more useful value than raw signal strength. It can range from 0 to 99 and has units of dB according to the NMEA standard, but the various manufacturers send different ranges of numbers with different starting numbers so the values themselves cannot necessarily be used to evaluate different units. The range of working values in a given gps will usually show a difference of about 25 to 35 between the lowest and highest values, however 0 is a special case and may be shown on satellites that are in view but not being tracked.

```
$GPGSV,2,1,08,01,40,083,46,02,17,308,41,12,07,344,39,14,22,228,45*75
```

Where:

GSV	Satellites in view
2	Number of sentences for full data
1	sentence 1 of 2
08	Number of satellites in view
01	Satellite PRN number
40	Elevation, degrees
083	Azimuth, degrees
46	SNR - higher is better for up to 4 satellites per sentence
*75	the checksum data, always begins with *

**RMC** - NMEA has its own version of essential gps pvt (position, velocity, time) data. It is called RMC, The Recommended Minimum, which will look similar to:

```
$GPRMC,123519,A,4807.038,N,01131.000,E,022.4,084.4,230394,003.1,W*6A
```

Where:

RMC	Recommended Minimum sentence C
123519	Fix taken at 12:35:19 UTC
A	Status A=active or V=Void.
4807.038,N	Latitude 48 deg 07.038' N
01131.000,E	Longitude 11 deg 31.000' E
022.4	Speed over the ground in knots
084.4	Track angle in degrees True
230394	Date - 23rd of March 1994
003.1,W	Magnetic Variation
*6A	The checksum data, always begins with *

Note that, as of the 2.3 release of NMEA, there is a new field in the RMC sentence at the end just prior to the checksum.

## 2.12 SIM

The internal SIM holder can be used as well as an external one, by mean the pin 25, 26, 27, 28, 29.

## 2.13 Embodied Battery charger

The battery charger is suited for 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 typ | 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 TRIZIUM pins.

**NOTE:** when power is supplied to the CHARGE pin, a battery must always be connected to the VBATT pins of the TRIZIUM.

## 2.14 User Interface

# 3 The user interface is managed by AT commands specified on the GSM 07.07 and 07.05 specifications and

# listed in the chapter 5, Software Features

## 3.1 Enhanced Easy GPRS Extension

### 3.1.1 Overview

The Easy GPRS feature allows a **Telit TRIZIUM** 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 TRIZIUM** module, regardless of all the software stacks underlying.

An example of the protocol stack involved in the devices is reported:

This particular implementation allows to the devices interfacing to the **Telit TRIZIUM** 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.

The new **Enhanced version** of the 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.

### 3.1.2 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:

- a) configuring the GPRS Access
- b) configuring the embedded TCP/IP stack behaviour
- c) defining the Internet Peer to be contacted
- d) request the GPRS and socket connections to be opened (host is connected)
- e) exchange raw data
- f) 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 viceversa. Control plane of ongoing socket connection is deployed internally to the module.

### **3.1.2.1 Configuring the GPRS access**

The GPRS access configuration is done by setting:

- the GPRS context number 1 parameters (see +CGDCONT command)
- the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

### **3.1.2.2 Configuring the embedded TCP/IP stack**

The TCP/IP stack behaviour must be configured by setting:

- the packetizer default packet size (see command #PKTSZ)
- the data sending timeout (see command #DSTO)
- the socket inactivity timeout (see command #SKTTO)

### **3.1.2.3 Defining the Internet peer to be contacted**

As last setting definition, the host to be contacted and on which port/protocol must be set :

- the socket definition (see command #SKTSET)

This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.

If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.

### **3.1.2.4 Open the connection with the internet host**

With the AT#SKTOP all the process required to connect with the internet host starts:

- TRIZIUM activates the first context
- TRIZIUM proceeds to the authentication with the parameters specified on par.5.1.2.1 and par. 5.1.2.2
- Eventually does the DNS query to resolve the IP address of the host name internet peer
- TRIZIUM establishes a TCP/UDP (depending on the parameter request) connection with the given internet host
- Once the connection is up the module reports the code: CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

### **3.1.2.5 Close the Socket and deactivate the context**

The connection can be closed because of:

- remote host TCP connection close
- socket inactivity timeout
- Terminal Equipment by issuing the escape sequence "+++"
- Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.

The pause time is defined in the parameter S12.

On the reception of an escape sequence the TRIZIUM closes the connection, deactivates the GPRS context returning to command mode and issuing the NO CARRIER code.

### 3.1.3 Enhanced Easy GPRS Outgoing connection

The New Enhanced Easy GPRS feature provides a way to place outgoing TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.

The steps that will be required open a socket and close it without closing the GRPS context are:

- g) configuring the GPRS Access
- h) configuring the embedded TCP/IP stack behaviour
- i) defining the Internet Peer to be contacted
- j) request the GPRS context to be activated
- k) request the socket connection to be opened
- l) exchange data
- m) close the TCP connection while keeping the GPRS active

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 viceversa. Control plane of ongoing socket connection is deployed internally to the module.

#### 3.1.3.1 Configuring the GPRS access

The GPRS access configuration is done by setting:

- the GPRS context number 1 parameters (see +CGDCONT command)
- the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

#### 3.1.3.2 Configuring the embedded TCP/IP stack

The TCP/IP stack behaviour must be configured by setting:

- the packetizer default packet size (see command #PKTSZ)
- the data sending timeout (see command #DSTO)
- the socket inactivity timeout (see command #SKTTO)

#### 3.1.3.3 Defining the Internet peer to be contacted

As last setting definition, the host to be contacted and on which port/protocol must be set :

- the socket definition (see command #SKTSET)

This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.

If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.

Note that this setting command is not needed if the new #SKTD command is used.

#### 3.1.3.4 Request the GPRS context to be activated

With the new command #GPRS you can activate or deactivate a GPRS context INDEPENDENTLY from the TCP socket opening,

AT#GPRS=1 activates the context,

AT#GPRS=0 deactivates the context

Therefore with the AT#GPRS=1 command the module

- TRIZIUM activates the context previously defined with AT+CGDCONT
- TRIZIUM proceeds to the authentication with the parameters specified par. 5.1.2.1 and par. 5.1.2.2.

Note that activating a context implies getting an IP address from the network and this will be maintained throughout the session.

The response code to the AT#GPRS=1 command reports the IP address obtained from the network, allowing the user to report it to his server or application.

Deactivating the context implies freeing the network resources previously allocated to the device.

### **3.1.3.5 Open the connection with the internet host**

With the new command #SKTD (socket Dial) the TCP/UDP request to connect with the internet host starts:

- Eventually does the DNS query to resolve the IP address of the host name internet peer
- TRIZIUM establishes a TCP/UDP (depending on the parameter request) connection with the given internet host
- Once the connection is up the module reports the code: CONNECT

Note that the peer specifications of this socket Dial are within the command and not the one stored with #SKTSET command.

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.

In the same manner, when disconnecting the #SKTD command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

### **3.1.3.6 Close the Socket without deactivating the context**

The connection can be closed because of:

- remote host TCP connection close
- socket inactivity timeout
- Terminal Equipment by issuing the escape sequence "+++"
- Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.

The pause time is defined in the parameter S12.

On the reception of an escape sequence if the socket was opened with the AT#SKTD command, the TRIZIUM closes the connection, does not deactivate the GPRS context and returns to command mode issuing the NO CARRIER code.

## **3.1.4 Enhanced Easy GPRS Incoming Connection**

The New Enhanced Easy GPRS feature provides a way to accept incoming TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.

The steps that will be required to open a socket in listen, waiting for connection requests from remote hosts and accept these request connections only from a selected set of hosts, then close it without closing the GRPS context are:

- a) configuring the GPRS Access
- b) configuring the embedded TCP/IP stack behaviour (see par. 5.1.3.2)
- c) defining the Internet Peer that can contact this device (firewall settings) (see par. 5.1.4.1)
- d) request the GPRS context to be activated (see par. 5.1.3.4)
- e) request the socket connection to be opened in listen (see par. 5.1.4.2)
- f) receive connection requests (see par. 5.1.4.3)
- g) exchange data
- h) close the TCP connection while keeping the GPRS active (see par. 5.1.3.6)

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 viceversa. Control plane of ongoing socket connection is deployed internally to the module.

### 3.1.4.1 Defining the Internet Peer that can contact this device (firewall settings)

The TRIZIUM has an internal Firewall that controls the behaviour of the incoming connections to the module.

The firewall applies for INCOMING (listening) connections, OUTGOING connections will be always done regardless of the firewall settings.

Firewall General policy is DROP, therefore all packets that are not included into an ACCEPT chain rule will be silently discarded.

When a packet incomes from the IP address <incoming IP>, the firewall chain rules will be scanned for matching with the following criteria:

<incoming IP> & <net mask> = <ip\_address> ?

if the result is yes, then the packet is accepted and the rule scan is finished, otherwise the next chain is taken into account until the end of the rules when the packet is silently dropped if no matching was found.

For example, let assume we want to accept connections only from our devices which are on the IP addresses ranging from :

197.158.1.1 to 197.158.255.255

We need to add the following chain to the firewall:

```
AT#FRWL=1,"197.158.1.1","255.255.0.0"
```

### 3.1.4.2 Request the socket connection to be opened in listen

With the new command #SKTL (socket Listen) the TCP request to start listening for connection requests is executed:

- TRIZIUM opens a listening socket on the port specified, waiting for incoming TCP connections (depending on the parameter request) with the internet hosts

The parameters that shall be specified are the local port where packets shall be received, the type of socket and the closing behaviour.

### 3.1.4.3 Receiving connection requests

Once the connection request is received, the module reports an indication of connection with an unsolicited code

```
+CONN FROM: <remote address>
```

- then connection is accepted and once it is up the module reports the code:  
CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

Note that the connections request are FIRST screened in the firewall, then if they are accepted they pass to the listening socket; therefore only hosts that are in the ACCEPT chain rules of the firewall can induce a connection request, the other host requests will be silently discarded without any indication to the remote host (for security reasons).

Once the connection is received and closed, the socket is not anymore in listen. If the application needs again to be in listen, then it shall send again the socket listen #SKTL command.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.

In the same manner, when disconnecting the #SKTL command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

### **3.1.5 Known limitations**

The implementation of the EASY GPRS feature has the following known limitations:

- Only one socket can be opened at a time, no multiple socket connections can be made;
- Only one connection request can be accepted at a time, subsequent requests will be silently discarded.
- Only the first GPRS context is associated with this feature;
- It is taken for granted that external processor will be able to handle at least a limited v.24 implementation: RTS, CTS and, highly recommended, DCD lines; this because software flow control is not applicable to the feature;
- Due to the particularity of this feature, the flow control of both the directions uplink and downlink is interlocked

## 3.2 Jammed Detect & Report Extension

### 3.2.1 Overview

The Jammed Detect & Report feature allows a **Telit TRIZIUM-GPS** 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.

## 3.3 GPS

Refer to AT GPS specification for the commands syntax.

AT Command.

### 3.3.1 GSM Speech Coding

The GSM part of the [Telit TRIZIUM-GPS modules](#) vocoder supports the following rates:

- Half Rate.
- Full rate,
- Enhanced Full Rate

### 3.3.2 SIM Reader

The [Telit TRIZIUM-GPS modules](#) supports phase 2 GSM11.14 - SIM 3V volts ONLY.

### 3.3.3 SMS

The [Telit TRIZIUM-GPS module](#) supports the following SMS types:

Mobile Terminated (MT) class 0 – 2 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.

### 3.3.4 Real Time Clock and Alarm

The [Telit TRIZIUM-GPS module](#) supports the Real Time Clock and Alarm functions through AT commands, furthermore an alarm output pin (GPIO6) can be configured to indicate the alarm with a hardware line output.

Furthermore the Voltage Output of the RTC power supply is provided so that a backup capacitor can be added to increase the RTC autonomy.

### 3.3.5 Data/fax transmission

The [Telit TRIZIUM-GPS module](#) supports:

- Packed Data transfer GPRS Class B, Multislot Class 10
- Data transmission according to the GSM 07.07, 07.05
- CSD up to 14.4 Kbps
- Fax service, Class 1 Group 3
- Fax service, Class 2 Group 3 (future SW release)

### 3.3.6 Local security management

With lock of Subscriber Identity module (SIM), and security code request at power-up.

### 3.3.7 Call control

Call cost control function.

### 3.3.8 Phonebook

Function available to store the telephone numbers in SIM memory.

Capability depends on SIM version/memory

### 3.3.9 Characters management

Availability of lowercase, uppercase and IRA characters. (international reference alphabet)

In SMS PDU mode all character set are supported.

### 3.3.10 SIM related functions

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

### 3.3.11 Call status indication

By AT commands.

### 3.3.12 Indication of network service availability

By AT commands and LED indication on dedicated output.

The STAT\_LED is an Open Collector output where it is possible to directly connect a LED to show information on the network service availability and Call status.

**STAT\_LED indications**

LED status	Device Status
permanently off	device off
fast blinking (period 1s, Ton 0,5s)	Net search / Not registered / turning off
slow blinking (period 3s, Ton 0,3s)	Registered full service
Permanently on	a call is active

### 3.3.13 Automatic answer (Voice, Data or FAX)

After n (depends of settings) rings automatically answers with beep (see S0 param).

### 3.3.14 Supplementary services (SS)

- 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)

### 3.3.15 Acoustic signaling

The acoustic signalling of [Telit TRIZIUM-GPS module](#) 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.

### 3.3.16 DTMF tones

DTMF tones managed by specific AT commands.

These tones are generated with AT commands only during voice calls.

The minimum duration of a DTMF tone is 100 ms.

Group low	Group high		
	1209 Hz	1336 Hz	1477 Hz
697 Hz	1	2	3
770 Hz	4	5	6
852 Hz	7	8	9
941 Hz	*	0	#

### 3.3.17 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 (see Alternate function of the GPIO7).

The ringing tone and the other signaling tones can be redirected to this Buzzer output with a specific AT command (see AT#SRP and AT#GPIO).

## 3.4 Logic level specifications

Where not specifically stated, all the interface circuits work at 2.8V CMOS logic levels.

The following table shows the logic level specifications used in the [Telit TRIZIUM-GPS module](#) interface circuits:

#### Absolute Maximum Ratings -Not Functional

Parameter	Min	Max
Input level on any digital pin when on	-0.3V	+3.75V
Input voltage on analog pins when on	-0.3V	+3.0 V

#### Operating Range - Interface levels (2.8V CMOS)

Level	Min	Max
Input high level	2.1V	3.3V
Input low level	0V	0.5V
Output high level	2.2V	3.0V
Output low level	0V	0.35V

For 2,0V signals:

**Operating Range - Interface levels (2.0V CMOS)**

Level	Min	Max
Input high level	1.6V	3.3V
Input low level	0V	0.4V
Output high level	1,65V	2.2V
Output low level	0V	0.35V

### 3.4.1 GSM Reset signal

Signal	Function	I/O	Pin
RESET	Phone reset	I/O	13 (connector SO108)

RESET is used to reset the GSM part of the [Telit TRIZIUM-GPS module](#). Whenever this signal is pulled low, the GSM part (TRIZIUM) is reset. When the device is reset it stops any operation and after the release of the reset it shuts down, without doing any detach operation from the network where it is registered to. This behavior is not 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 stucked waiting for some network response.

The RESET is internally controlled on start-up to achieve always a proper power-on reset sequence, so there's no need to control this pin on start-up. It may only be used to reset a device already on that is not responding to any command.

---

*NOTE: do not use this signal to power off the [Telit TRIZIUM-GPS module](#). Use the ON/OFF signal (Pin 12 of SO108) to perform this function or the AT#SHDN command.*

---

**Reset Signal Operating levels:**

Signal	Min	Max
RESET Input high	2.2V*	3.3V
RESET Input low	0V	0.2V

\* this signal is internally pulled up so the pin can be left floating if not used.

If unused, this signal may be left unconnected. If used, then it **must always be connected with an open collector transistor**, to permit to the internal circuitry the power on reset and under voltage lockout functions.

## 3.5 RTC Bypass out

The PIN VRTC brings out the Real Time Clock supply which is separate from the rest of the digital part, allowing to have 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.

## 3.6 VOUT power output

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

**Operating Range - VOUT power supply**

	<b>Min</b>	<b>Typ</b>	<b>Max</b>
Output voltage	2.75V	2.85V	2.95V
Output current			100mA
Output bypass capacitor			2.2 $\mu$ F

## 3.7 GPS Electrical characteristics

### 3.7.1 Front End Electrical characteristics

Function	Note	Min	Typ	Max	Unit
NF (overall)	GS = Low		2.5	3.0	dB
Forward Gain	GS = Low			14	dB
Forward Gain	GS = High	4			dB
Max Input power	GS = High			-95	dBm
IF			4.092		MHz
IF Bw	(± 3 dB)	-2		2	MHz
Recovery time from overload -30 dBm			4	10	µS
Group delay Variation	(in Bw)		0.1		µS
Oscillator Frequency	F <sub>clk</sub> =16.368 MHz	-10		10	ppm

### 3.7.2 Electrical characteristics nominal (GPS signaling)

Signal / Function	Note	Min	Typ	Max	Unit
Rx frequency: L1			1575.42 ± 1.023		MHz
C/A code	Chip rate		1.023		MHz
Protocol: NMEA 0183 ver. 3.0 Data rate out:	UART 0 @ 9600 bps 8N1 No flow control		1		Hz
Protocol: TSIP out Data rate:	UART 0 @ 4800 b/s 8N1 No flow control		1		Hz
Protocol: TAIP out Data rate:	UART 0 @ 4800 b/s 8N1 No flow control		1		Hz
Debug GPS data-out	UART 2 @ 38400 b/s 8N1 No flow control		1		Hz
Sensibilità (tracking)		-150			dBm
Tracking channels				12	
NF			6.5	7	dB
Linearity: -130 dBm			-36.5		dBHz
Linearity: -150 dBm			-16.5		dBHz
Doppler shift			TBD		
Cold start : Time to first fix . All signals up TBD dBHz	No initialization; No recent almanac	TBD		60	Sec
Warm start (All signals up TBD dBHz)	Initialization (last position); No recent almanac	TBD		32	Sec
Hot start (All signals up TBD dBHz)	Initialization; valid almanac	TBD		3	Sec
Obscuration recovery	The clock always valid		1	TBD	Sec
PPS	Pulse per second	-50		50	nSec
Position accuracy Horizontal (Fix)	SA off			3	m (CEP)

Signal / Function	Note	Min	Typ	Max	Unit
Position accuracy Horizontal (Fix)	DGPS SA off		1		m (CEP)
Position accuracy vertical (Fix)	SA off			5	m (CEP)
Position accuracy Horizontal (Fix)	Differential SA off			2	m (CEP)

### 3.7.3 Power supply signal levels

Signal	Pin n°	Min	Typ	Max	Unit
Vcc	8	3.0	3.3	3.6	V
Ic (standby)				30	μA
Ic (normal)			48	50	mA
VAnt	19	Vcc-0.5		5.2	V
GS	24	Vcc -0.6		Vcc+0.6	V
AntStat	25	Vcc-0.5		Vcc+0.5	V
GPIO [I]	27..30	VIH = 0.7Vcc		VIL = 0.3Vcc	V
GPIO [O]	27..30	VOH = Vcc-0.8		VOL = 0.4	V
All other pins		-0.3		3.6	V

### 3.7.4 GPS Signaling

Signal/ Function	Note	Min	Typ	Max	Unit
PPS	Pulse duration		0.5		Sec
AntStat (sensor output) 1 mA current source	Antenna current < 15mA or > 30 mA	0		0.5	V
AntStat (sensor output) 1 mA current source	Antenna current [ 15÷ 30] mA	Vcc-0.5		Vcc	V
Gain Select	14 dB	0		0.6	V
Gain Select	4 dB	Vcc-0.6		Vcc	V

## 3.8 Audio levels specifications

The audio of the [Telit TRIZIUM-GPS module](#) 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 TRIZIUM-GPS module](#) has a built in echo canceller and a noise suppressor, tuned separately for the two audio paths; for the internal path the echo canceller parameters are suited to cancel the echo generated by a handset, while for the external audio path they are suited for a hands-free use.

For more information on the audio refer to the Hardware User Guide.

The following table reports all the audio level specifications.

### Microphone characteristics

	Internal audio mic. input	External audio mic. input
Line coupling	AC (100nF cond.)	AC ( 100nF cond.)
Line type	Balanced	Balanced
Differential input resistance	25k $\Omega$	25k $\Omega$
Line nominal sensitivity	50mV <sub>rms</sub>	3mV <sub>rms</sub>
Max input voltage	360mV <sub>rms</sub>	22mV <sub>rms</sub>
Microphone nominal sensitivity - Analog Gain suggested	-45dB <sub>V<sub>rms</sub>/Pa</sub> / +24dB	-45dB <sub>V<sub>rms</sub>/Pa</sub> / +10dB
Echo canceller type	handset	Car kit hands free

### Speaker characteristics

	Internal audio ear. output	External audio ear. output
Line coupling	DC	DC
Line type	Bridged	Bridged
Speaker impedance	$\geq 16\Omega \pm 5\%$ @ 1kHz	$\geq 16\Omega \pm 5\%$ @ 1kHz
Minimum load impedance	15 $\Omega$	15 $\Omega$
Signal bandwidth	150-8000 Hz @ -3dB	150-8000 Hz @ -3dB
Maximum output	1700mV <sub>rms</sub>	850mV <sub>rms</sub>
Maximum power output	30mW	7.5mW
Volume level steps (SW)	-2dB	-2dB
Number of volume steps (SW)	10	10

### 3.9 Interface connector on TRIZIUM-GPS

SO108 connector pinout

Pin n°	Signal	I/O	Function	Type
1-3	VBATT	-	Main power supply	Power
4-6	GND	-	Ground	Power
7	GPSA_OUT_GPS	O	Reserved	-
8	GPIO_CE1_GPS		GPS GPIO	CMOS 2.8V
9	GPIO_CE2_GPS		GPS GPIO	CMOS 2.8V
10	GPIO_GC_GPS		GPS GPIO	CMOS 2.8V
11	CHARGE	AI	Charger input	Power
12	ON/OFF	I	Input command for switching power ON or OFF (toggle command). The pulse to be sent to the TRIZIUM must be equal or greater than 1 second.	Pull up to VBATT
13	*RESET	I	Reset input	-
14	VOUT	O	Power output for external accessories (camera)	-
15	VRTC	AO	VRTC Backup capacitor	Power
16	AXE	I	Hands-free switching	CMOS 2.8V
17	MIC_HF-	AI	Hands-free microphone input; phase -, nominal level 3mVrms	Audio
18	MIC_HF+	AI	Hands-free microphone input; phase +, nominal level 3mVrms	Audio
19	MIC_MT-	AI	Handset microphone signal input; phase-, nominal level 50mVrms	Audio
20	MIC_MT+	AI	Handset microphone signal input; phase+, nominal level 50mVrms	Audio
21	EAR_HF-	AO	Hands-free ear output, phase -	Audio
22	EAR_HF+	AO	Hands-free ear output, phase +	Audio
23	EAR_MT+	AO	Handset earphone signal output, phase +	Audio
24	EAR_MT-	AO	Handset earphone signal output, phase -	Audio
25	VSIM	AO	External SIM signal – Power (3)	3V ONLY
26	CCIO	I/O	External SIM signal - Data I/O	3V ONLY
27	CCRST	O	External SIM signal – Reset	3V ONLY
28	CCLK	O	External SIM signal – Clock	3V ONLY
29	CCIN	I	External SIM signal - Presence (active low)	CMOS 2.8V
30	TX_TRACE	O	TX Data for debug monitor (1)	CMOS 2.8V
31	RX_TRACE	I	RX Data for debug monitor (1)	CMOS 2.8V
32	IICSDA	I/O	Camera IIC interface / GPIO4 Configurable general purpose I/O pin	CMOS 2.8V
33	IIC_SCL	I/O	Camera IIC interface / GPIO2 Configurable general purpose I/O pin	CMOS 2.8V
34	TX_PROG	O	Serial data output to DTE	CMOS 2.8V
35	RX_PROG	I	Serial data input from DTE	CMOS 2.8V
36	C106 / CTS	O	Output for Clear to send signal (CTS) to DTE	CMOS 2.8V

Pin n°	Signal	I/O	Function	Type
37	C125 / RING	O	Output for Ring indicator signal (RI) to DTE	CMOS 2.8V
38	C107 / DSR	O	Output for Data set ready signal (DSR) to DTE	CMOS 2.8V
39	C109 / DCD	O	Output for Data carrier detect signal (DCD) to DTE	CMOS 2.8V
40	C108 / DTR	I	Input for Data terminal ready signal (DTR) from DTE (4)	CMOS 2.8V
41	C105 / RTS	I	Input for Request to send signal (RTS) from DTE	CMOS 2.8V
42	ADC IN	AI	Analog/Digital converter input	A/D
43	GPIO1	I/O	Switch between GPS command and NMEA	CMOS 2.8V
44	STAT_LED	O	TRIZIUM Status indicator led	CMOS 2.8V
45	CAM_DRDY	I/O	Camera DRDY / GPIO5 (4)	CMOS 2.8V
46	OE_CAM	I/O	Output Enable Camera / GPIO7 (4)	CMOS 2.8V
47	CAM_SYNC/ TEST_MODE	I/O	Camera Sync (4)	CMOS 2.8V
48	MON1/CAM_CLK	I/O	Camera clock (4)	CMOS 2.8V
49	PD0	I/O	Port D0 / GPIO8 (4)	CMOS 2.8V
50	PD1	I/O	Port D1 / GPIO9 (4)	CMOS 2.8V
51	PD2	I/O	Port D2 / GPIO10 (4)	CMOS 2.8V
52	PD3	I/O	Port D3 / GPIO11 (4)	CMOS 2.8V
53	PD4	I/O	Port D4 / GPIO12 (4)	CMOS 2.8V
54	PD5	I/O	Port D5 / GPIO13 (4)	CMOS 2.8V
55	PD6	I/O	Port D6 / GPIO3 (4)	CMOS 2.8V
56	PD7	I/O	Port D7 / GPIO6 (4)	CMOS 2.8V
57	TX2_GPS	O	GPS UART 2 GPS commands	CMOS 2.8V
58	RX2_GPS	I	GPS UART 2 GPS commands	CMOS 2.8V
59	TX0_GPS	O	GPS UART 0 NMEA output	CMOS 2.8V
60	RX0_GPS	I	GPS UART 0 , high	CMOS 2.8V
61	VCC_EN_GPS	I	Enable GPS supply (Enable High)	-
62	ANTSTAT_GPS	O	Antenna Ext Status	-
63	PPS	-	Reserved	-
64	TEST0	-	Reserved	-
65	ENABLE	-	Reserved	-
66	GS	-	Reserved	-
67	TEST1	-	Reserved	-
68	LOCK	-	Reserved	-
69	*RST	I	GPS Reset input	-
70	VGPS	AO	GPS Power supply	Power
71	SSC1_CLK	O	Synchronous serial interface	CMOS 2.8V
72	SSC1_MRST	I	Synchronous serial interface	CMOS 2.8V
73	SSC1_MTSR	O	Synchronous serial interface	CMOS 2.8V
74	TP108	-	Reserved	-
75	TP109	-	Reserved	-
76	TP110	-	Reserved	-
77	TP111	-	Reserved	-
78	TP112	-	Reserved	-
79	TP113	-	Reserved	-
80	TP114	-	Reserved	-

- (1) For the exclusive use of the Technical Support Service
- (2) An earphone with a 150 ohm impedance can be directly connected to EAR+ and EAR–
- (3) On this pin a maximum of 47nF bypass capacitor is allowed.
- (4) When activating the Easy camera these pins will not be available for other use

## 4 Evaluation Kit

In order to assist you in the development of your [Telit TRIZIUM-GPS module](#) based application, DAI Telecom can supply an [Evaluation Kit](#) with appropriate power supply and the following key features:

- RS232 interface for
  - NMEA sentences @ 9.600 bps
  - NMEA sentences @ 4.800 bps
  - Debug UART GSM/GPS (or optional USB)
  - AT Command / Full V.24 GSM (data)
- GSM / GPS firmware upgrade
- GSM Audio interface with Hands-Free functionality

The EVK 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 EVK system with a PC or other DTE.

The development of the applications utilizing the [Telit TRIZIUM-GPS 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.

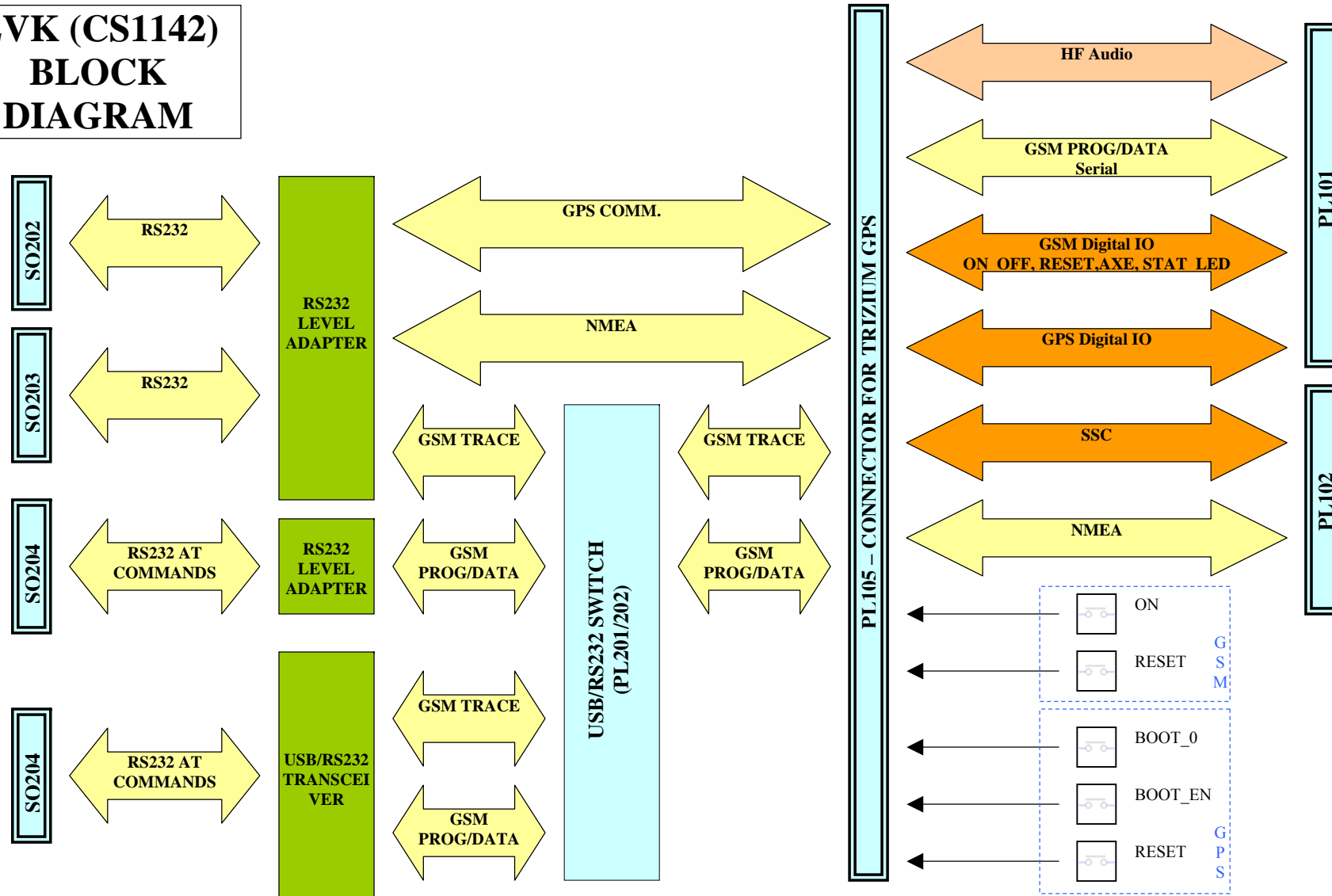
### 4.1 Evaluation Kit description

For a detailed description of the [Telit Evaluation Kit](#) refer to the documentation provided with the Telit TRIZIUM-GPS Hardware User Guide.

The [Telit Evaluation Kit](#) can be divided into different blocks depending on the function they implement.

A schematic showing the EVK board and its blocks is shown on the next page:

### EVK (CS1142) BLOCK DIAGRAM





### 4.1.1 Power Supply

It must fulfill the following requirements:

- Nominal operating voltage 3.8 V
- Operating voltage range 3.4 V - 4.2 V

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

### 4.1.2 Serial interface

The communications between your application and the [Telit TRIZIUM-GPS module](#) must be done through a serial RS232 port.

All levels of the RS232 port are conforming to RS232 and V.24 standard and a PC serial port can be directly connected to this connector.

### 4.1.3 USB interface and Driver

The EVK provides an on-board USB converter. Therefore, each serial port can be switched to the USB converter. The USB driver is provided by the Telit web site.

### 4.1.4 Audio

The [Evaluation Kit board](#) provides two software/hardware selectable audio paths, the handset/headset and the hands-free one.

Furthermore, for each audio path, two solutions are presented: single-ended and balanced.

### 4.1.5 GPIO

All the available General Purpose Input Output ports of the [Telit TRIZIUM-GPS module](#) are supported in the SO108 connector.

## 5 Service and firmware update

### 5.1 GSM part

The serial cable used for the communication with a PC can be also used to update the GSM part of [Telit TRIZIUM-GPS module](#) firmware. The RS232 connector DB type 9 pin is used to connect the [Telit Evaluation Kit](#). to any DTE . All levels are conformed to RS232 and V.24 standard and a PC serial port can be directly connected to this connector. The firmware update can be done with a specific software tool provided by Telit that runs on windows based PCs.

#### 5.1.1 Step-by-Step upgrade procedure

- I. Download the specific software for upgrading (Flash programmer TFI\_TRIZIUM.zip).from the site [www.TRIZIUM.com](http://www.TRIZIUM.com), or request it at this e-mail address [ts-trizium@telit.net](mailto:ts-trizium@telit.net)
- II. Unzip the file TFI\_TRIZIUM.zip. A new folder **TRIZIUM/** will be created
- III. Mount the [Telit TRIZIUM-GPS module](#) in the [Evaluation Kit](#) (using the dedicated adaptor)and supply power
- IV. Run the file *TFI\_TRIZIUM.exe*.
- V. Press the Start Procedure button and within 5 seconds press the ON/OFF button on the board. Keep pressed the ON/OFF button for 5 seconds and then leave it.

First the program will erasure the content of flash memory

Then the program will write on the flash memory

Wait for the end of programming green message COK

Your [Telit TRIZIUM-GPS module](#) is now programmed with the new GSM firmware.

## 6 Software Features

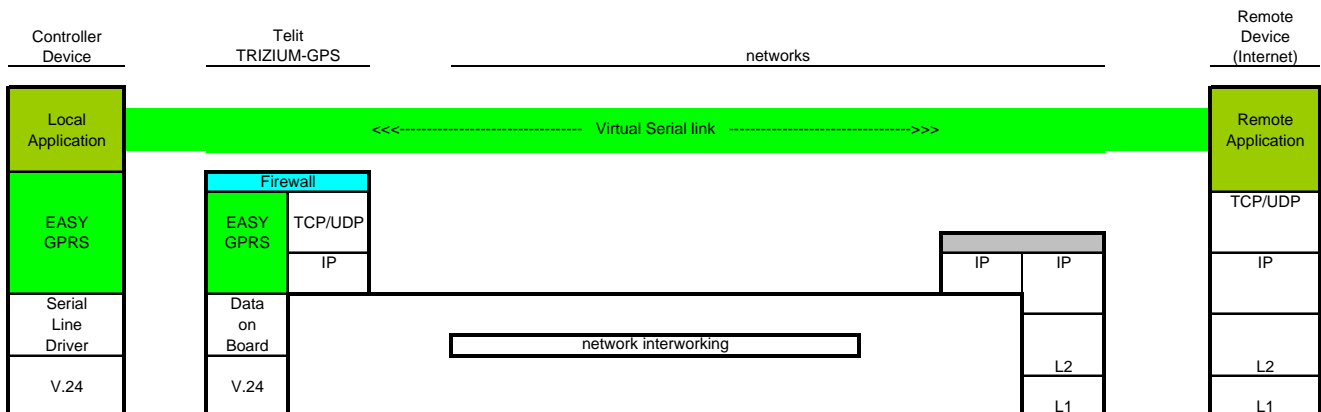
### 6.1 Enhanced Easy GPRS Extension

#### 6.1.1 Overview

The Easy GPRS feature allows a **Telit TRIZIUM** 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 TRIZIUM** module, regardless of all the software stacks underlying.

An example of the protocol stack involved in the devices is reported:



This particular implementation allows to the devices interfacing to the **Telit TRIZIUM** 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.

The new **Enhanced version** of the 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.

## 6.1.2 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:

- n) configuring the GPRS Access
- o) configuring the embedded TCP/IP stack behaviour
- p) defining the Internet Peer to be contacted
- q) request the GPRS and socket connections to be opened (host is connected)
- r) exchange raw data
- s) 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 viceversa. Control plane of ongoing socket connection is deployed internally to the module.

### 6.1.2.1 Configuring the GPRS access

The GPRS access configuration is done by setting:

- the GPRS context number 1 parameters (see +CGDCONT command)
- the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

### 6.1.2.2 Configuring the embedded TCP/IP stack

The TCP/IP stack behaviour must be configured by setting:

- the packetizer default packet size (see command #PKTSZ)
- the data sending timeout (see command #DSTO)
- the socket inactivity timeout (see command #SKTTO)

### 6.1.2.3 Defining the Internet peer to be contacted

As last setting definition, the host to be contacted and on which port/protocol must be set :

- the socket definition (see command #SKTSET)

This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.

If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.

### 6.1.2.4 Open the connection with the internet host

With the AT#SKTOP all the process required to connect with the internet host starts:

- TRIZIUM activates the first context
- TRIZIUM proceeds to the authentication with the parameters specified on par.5.1.2.1 and par. 5.1.2.2
- Eventually does the DNS query to resolve the IP address of the host name internet peer
- TRIZIUM establishes a TCP/UDP (depending on the parameter request) connection with the given internet host
- Once the connection is up the module reports the code: CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

### **6.1.2.5 Close the Socket and deactivate the context**

The connection can be closed because of:

- remote host TCP connection close
- socket inactivity timeout
- Terminal Equipment by issuing the escape sequence "+++"
- Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.

The pause time is defined in the parameter S12.

On the reception of an escape sequence the TRIZIUM closes the connection, deactivates the GPRS context returning to command mode and issuing the NO CARRIER code.

## **6.1.3 Enhanced Easy GPRS Outgoing connection**

The New Enhanced Easy GPRS feature provides a way to place outgoing TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.

The steps that will be required open a socket and close it without closing the GRPS context are:

- t) configuring the GPRS Access
- u) configuring the embedded TCP/IP stack behaviour
- v) defining the Internet Peer to be contacted
- w) request the GPRS context to be activated
- x) request the socket connection to be opened
- y) exchange data
- z) close the TCP connection while keeping the GPRS active

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 viceversa. Control plane of ongoing socket connection is deployed internally to the module.

### **6.1.3.1 Configuring the GPRS access**

The GPRS access configuration is done by setting:

- the GPRS context number 1 parameters (see +CGDCONT command)
- the Authentication parameters: User Name and Password (see commands #USERID, #PASSW)

### **6.1.3.2 Configuring the embedded TCP/IP stack**

The TCP/IP stack behaviour must be configured by setting:

- the packetizer default packet size (see command #PKTSZ)
- the data sending timeout (see command #DSTO)
- the socket inactivity timeout (see command #SKTTO)

### **6.1.3.3 Defining the Internet peer to be contacted**

As last setting definition, the host to be contacted and on which port/protocol must be set :

- the socket definition (see command #SKTSET)

This command permits also to specify the host name instead of its IP address, if a host name is given to the set command, then the module stores it as a host nick name. It is care of the module user to guarantee that the host nick name provided corresponds to an existing internet peer.

If an host nick name has been given then, while opening the connection in response to the AT#SKTOP command, the module will autonomously activate a GPRS connection and query its DNS to obtain the IP address relative to the host nick name provided. This process of context activation and DNS query may require a bit more time and requires that the GPRS network coverage is good enough to permit data transfers.

Note that this setting command is not needed if the new #SKTD command is used.

#### **6.1.3.4 Request the GPRS context to be activated**

With the new command #GPRS you can activate or deactivate a GPRS context INDEPENDENTLY from the TCP socket opening,

AT#GPRS=1 activates the context,

AT#GPRS=0 deactivates the context

Therefore with the AT#GPRS=1 command the module

- TRIZIUM activates the context previously defined with AT+CGDCONT
- TRIZIUM proceeds to the authentication with the parameters specified par. 5.1.2.1 and par. 5.1.2.2.

Note that activating a context implies getting an IP address from the network and this will be maintained throughout the session.

The response code to the AT#GPRS=1 command reports the IP address obtained from the network, allowing the user to report it to his server or application.

Deactivating the context implies freeing the network resources previously allocated to the device.

#### **6.1.3.5 Open the connection with the internet host**

With the new command #SKTD (socket Dial) the TCP/UDP request to connect with the internet host starts:

- Eventually does the DNS query to resolve the IP address of the host name internet peer
- TRIZIUM establishes a TCP/UDP (depending on the parameter REQUEST) connection with the given internet host
- Once the connection is up the module reports the code: CONNECT

Note that the peer specifications of this socket Dial are within the command and not the one stored with #SKTSET command.

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.

In the same manner, when disconnecting the #SKTD command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

#### **6.1.3.6 Close the Socket without deactivating the context**

The connection can be closed because of:

- remote host TCP connection close
- socket inactivity timeout
- Terminal Equipment by issuing the escape sequence "+++"
- Network deactivation

Note: if in the raw data to be sent there's an escape sequence, then the TE must work it out and sent it in a different fashion to guarantee that the connection is not closed.

The pause time is defined in the parameter S12.

On the reception of an escape sequence if the socket was opened with the AT#SKTD command, the TRIZIUM closes the connection, does not deactivate the GPRS context and returns to command mode issuing the NO CARRIER code.

## 6.1.4 Enhanced Easy GPRS Incoming Connection

The New Enhanced Easy GPRS feature provides a way to accept incoming TCP/UDP connections and keep the same IP address after a connection, leaving the GPRS context active.

The steps that will be required to open a socket in listen, waiting for connection requests from remote hosts and accept these request connections only from a selected set of hosts, then close it without closing the GRPS context are:

- i) configuring the GPRS Access
- j) configuring the embedded TCP/IP stack behaviour (see par. 5.1.3.2)
- k) defining the Internet Peer that can contact this device (firewall settings) (see par. 5.1.4.1)
- l) request the GPRS context to be activated (see par. 5.1.3.4)
- m) request the socket connection to be opened in listen (see par. 5.1.4.2)
- n) receive connection requests (see par. 5.1.4.3)
- o) exchange data
- p) close the TCP connection while keeping the GPRS active (see par. 5.1.3.6)

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 viceversa. Control plane of ongoing socket connection is deployed internally to the module.

### 6.1.4.1 Defining the Internet Peer that can contact this device (firewall settings)

The TRIZIUM has an internal Firewall that controls the behaviour of the incoming connections to the module.

The firewall applies for INCOMING (listening) connections, OUTGOING connections will be always done regardless of the firewall settings.

Firewall General policy is DROP, therefore all packets that are not included into an ACCEPT chain rule will be silently discarded.

When a packet incomes from the IP address <incoming IP>, the firewall chain rules will be scanned for matching with the following criteria:

$$\text{<incoming IP> \& \text{<net mask> = \text{<ip\_address> ?}}$$

if the result is yes, then the packet is accepted and the rule scan is finished, otherwise the next chain is taken into account until the end of the rules when the packet is silently dropped if no matching was found.

For example, let assume we want to accept connections only from our devices which are on the IP addresses ranging from :

197.158.1.1 to 197.158.255.255

We need to add the following chain to the firewall:

```
AT#FRWL=1,"197.158.1.1","255.255.0.0"
```

### 6.1.4.2 Request the socket connection to be opened in listen

With the new command #SKTL (socket Listen) the TCP request to start listening for connection requests is executed:

- TRIZIUM opens a listening socket on the port specified, waiting for incoming TCP connections (depending on the parameter request) with the internet hosts

The parameters that shall be specified are the local port where packets shall be received, the type of socket and the closing behaviour.

### 6.1.4.3 Receiving connection requests

Once the connection request is received, the module reports an indication of connection with an unsolicited code  
+CONN FROM: <remote address>

- then connection is accepted and once it is up the module reports the code:  
CONNECT

From this moment the data incoming in the serial port is packet and sent to the Internet host, while the data received from the host is serialised and flushed to the Terminal Equipment.

Note that the connections request are FIRST screened in the firewall, then if they are accepted they pass to the listening socket; therefore only hosts that are in the ACCEPT chain rules of the firewall can induce a connection request, the other host requests will be silently discarded without any indication to the remote host (for security reasons).

Once the connection is received and closed, the socket is not anymore in listen. If the application needs again to be in listen, then it shall send again the socket listen #SKTL command.

NOTE: this command differently from the AT#SKTOP DOES NOT automate all the process of activating the GPRS, if no GPRS is active the command reports ERROR; therefore before issuing this command the GPRS shall be activated with AT#GPRS=1 command.

In the same manner, when disconnecting the #SKTL command does not close the GPRS context, leaving it active for next connections until an AT#GPRS=0 command is issued or the network requests a context closing.

### 6.1.5 Known limitations

The implementation of the EASY GPRS feature has the following known limitations:

- Only one socket can be opened at a time, no multiple socket connections can be made;
- Only one connection request can be accepted at a time, subsequent requests will be silently discarded.
- Only the first GPRS context is associated with this feature;
- It is taken for granted that external processor will be able to handle at least a limited v.24 implementation: RTS, CTS and, highly recommended, DCD lines; this because software flow control is not applicable to the feature;
- Due to the particularity of this feature, the flow control of both the directions uplink and downlink is interlocked

## 6.2 Jammed Detect & Report Extension

### 6.2.1 Overview

The Jammed Detect & Report feature allows a **Telit TRIZIUM-GPS** 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.

## 6.3 GPS

Refer to AT GPS specification for the commands syntax.

## 7 AT Command

The GSM part of the [Telit TRIZIUM-GPS module](#) can be driven via the serial interface using the standard AT commands<sup>1</sup>. The [Telit TRIZIUM-GPS 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 TRIZIUM-GPS module](#) supports also Telit proprietary AT commands for special purposes.

The Trizium Family AT Command Description document, code 80264ST10013a, shows a dedicated detailed description of all supported AT commands and how to use the AT commands with the [Telit TRIZIUM Family modules](#) through some example scripts.

The following table lists all supported AT commands and related brief description.

---

<sup>1</sup> 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.

## 7.1 AT Commands availability

Generic Modem Control		TRIZIUM-GPS
&F	Reset base section factory profile configuration	•
&F1	Reset full factory profile configuration	•
Z	Soft reset	•
+FCLASS	Select active service class	•
&Y	Designate a default reset basic profile	•
&P	Designate a default reset full profile	•
&W	Store current configuration	•
&Z	Store telephone number in the internal phonebook	•
&N	Display internal phonebook stored numbers	•
+GMI	Request manufacturer identification	•
+GMM	Request model identification	•
+GMR	Request revision identification	•
+GCAP	Request capabilities list	•
+GSN	Request serial number	•
&V	Display current configuration & profile	•
&V0	Display current configuration & profile	•
&V1	Display S registers values	•
&V2	Display last connection statistics	•
&V3	Display S registers values	•
\V	Single line connect message	•
%L	Report line signal level	•
%Q	Report line quality	•
+GCI	Select the country of installation	•
L	Monitor speaker loudness	•
M	Monitor speaker mode	•
DTE - modem interface control		TRIZIUM-GPS
E	Command echo	•
Q	Quiet result codes	•
V	Result code form	•
X	Extended result codes	•
I	Request identifier and software checksum	•
&C	Data carrier detect (DCD) control	•
&D	Data terminal ready (DTR) control	•
&K	Flow control	•
&Q	Sync/async mode	•
&S	Data set ready (DSR) control	•
\R	Ring (RI) control	•
+IPR	Fixed DTE interface rate	•
+IFC	DTE - DTA flow control	•
+ILRR	DTE - modem rate reporting	•
+ICF	DTE - modem character format	•
Call Control		TRIZIUM-GPS
D	Dial	•
T	Set tone dial	•
P	Set pulse dial	•
A	Answer	•
A/	Last command automatic repetition	•
H	Disconnect	•
O	Return to On Line Mode	•
&G	Guard tone	•

Modulation control		TRIZIUM-GPS
+MS	Modulation control	•
%E	Enable/disable line quality monitor and auto retrain or fallback / fall forward	•
\N	Operating mode	•
Compression control		TRIZIUM-GPS
+DS	Set data compression	•
+DR	Data compression reporting	•
Break control		TRIZIUM-GPS
\B	Transmit break to remote	•
\K	Break handling	•
S parameters		TRIZIUM-GPS
S0	Number of rings to auto answer	•
S1	Ring counter	•
S2	Escape character	•
S3	Carriage return character	•
S4	Line feed character	•
S5	Backspace character	•
S7	Wait time for carrier, silence or dial tone	•
S12	Escape prompt delay	•
S25	Delay to DTR off	•
S30	Disconnect inactivity timer	•
S38	Delay before forced hang up	•
ETSI GSM 07.07 AT Commands		TRIZIUM-GPS
+CGMI	Request manufacturer identification	•
+CGMM	Request model identification	•
+CGMR	Request revision identification	•
+CGSN	Request product serial number identification	•
+CSCS	Select TE character set	•
+CIMI	Request international mobile subscriber identity (IMSI)	•
Call control		TRIZIUM-GPS
+CBST	Select bearer service type	•
+CRLP	Radio link protocol	•
+CR	Service reporting control	•
+CEER	Extended error report	•
+CRC	Cellular result codes	•
+CSNS	Single numbering scheme	•
Network service handling		TRIZIUM-GPS
+CNUM	Subscriber number	•
+COPN	Read operator names	•
+CREG	Network registration report	•
+COPS	Operator selection	•
+CLCK	Facility lock/ unlock	•
+CPWD	Change facility password	•
+CLIP	Calling line identification presentation	•
+CLIR	Calling line identification restriction	•
+CCFC	Call forwarding number and conditions	•
+CCWA	Call waiting	•
+CHLD	Call holding services	•
+CUSD	Unstructured supplementary service data	•
+CAOC	Advice of charge	•
+CLCC	List current calls	•
+CSSN	SS Notification	•
+CCUG	Closed User Group supplementary service control	•
Mobile Equipment control		TRIZIUM-GPS

+CPAS	Phone activity status	•
+CFUN	Set phone functionality (Power Saving Management)	•
+CPIN	Enter PIN	•
+CSQ	Signal quality	•
+CPBS	Select phonebook memory storage	•
+CPBR	Read phonebook entries	•
+CPBF	Find phonebook entries	•
+CPBW	Write phonebook entry	•
+CCLK	Clock Management	•
+CALA	Alarm Management	•
+CALM	Alert sound mode	•
+CRSL	Ringer sound level	•
+CLVL	Loudspeaker volume level	•
+CMUT	Microphone mute control	•
+CACM	Accumulated call meter	•
+CAMM	Accumulated call meter maximum	•
+CPUC	Price per unit and currency table	•
Mobile equipment errors		TRIZIUM-GPS
+CMEE	Report mobile equipment error	•
Voice Control (TIA IS-101)		TRIZIUM-GPS
+VTS:	DTMF tones transmission	•
Commands For GPRS		TRIZIUM-GPS
+CGACT	PDP context activate or deactivate	•
+CGATT	GPRS attach or detach	•
+CGDATA	Enter data state	•
+CGDCONT	Define PDP context	•
+CGPADDR	Show PDP address	•
+CGREG	GPRS network registration status	•
+CGQMIN	Quality of service profile (minimum acceptable)	•
+CGQREQ	Quality of service profile (requested)	•
Commands For Battery Charger		TRIZIUM-GPS
+CBC	Battery Charge	•
ETSI GSM 07.05 AT Commands for SMS and CB services		TRIZIUM-GPS
+CSMS	Select message service	•
+CPMS	Preferred message storage	•
+CMGF	Message format	•
+CSMP	Set parameters in text mode	•
+CSDH	Show parameters in text mode	•
+CSAS	Save setting text mode	•
+CRES	Restore text mode settings	•
+CSCB	Select Cell Broadcast Message types	•
Message configuration		TRIZIUM-GPS
+CSCA	Service center address	•
Message receiving and reading		TRIZIUM-GPS
+CNMI	New message indications to Terminal Equipment	•
+CMGL	List messages	•
+CMGR	Read message	•
Message sending and writing		TRIZIUM-GPS
+CMGS	Send message	•
+CMSS	Send message from storage	•
+CMGW	Write message to memory	•
+CMGD	Delete message	•
Custom AT Commands		TRIZIUM-GPS
#CGMI	Request manufacturer identification	•
#CGMM	Request model identification	•

#CGMR	Request revision identification	•
#CGSN	Request product serial number identification	•
#CIMI	Request international mobile subscriber identity (IMSI)	•
#CAP	Change Audio Path (a)	•
#SRS	Select ringer sound (a)	•
#SRP	Select Ringer Path (a)	•
#STM	Signaling Tones Mode (a)	•
#PCT	Display PIN Counter	•
#SHDN	Software Shut Down	•
#WAKE	Wake from Alarm mode	•
#QTEMP	Query Temperature overflow	•
#SGPO	Set General Purpose Output (g)	•
#GGPI	Read General Purpose Input (g)	•
#GPIO	General Purpose Input/Output pin control (g)	•
#MONI	Monitor Cells	•
#QSS	Query SIM Status	•
#ACAL	Set Automatic Call	•
#SMOV	SMS Overflow	•
#SHFEC	Set Hands free echo canceller (a)	•
#HFMICG	Hands free Microphone Gain (a)	•
#HSMICG	Handset Microphone Gain	•
#SHFSD	Set Hands free side tone (a)	•
#/	Repeat last command	•
#BND	Select Band	•
FAX Class 1 Commands		TRIZIUM-GPS
+FCLASS	Select active service class	•
+FMI	Report manufacturer ID	•
+FMM?	Report model ID	•
+FMR	Report revision ID	•
Transmission/Reception control		TRIZIUM-GPS
+FTS	Stop Transmission and pause	•
+FRS	Wait for receive silence	•
+FTM	Transmit data modulation	•
+FRM	Receive data modulation	•
+FTH	Transmit data with HDLC framing	•
+FRH	Receive data with HDLC framing	•
Serial port control		TRIZIUM-GPS
+FLO	Select flow control specified by type	•
+FPR	Select serial port rate	•
+FDD	Double escape character replacement control	•
<b>Enhanced Easy GPRS custom AT command Definition</b>		TRIZIUM-GPS
#USERID	Authentication User ID control	•
#PASSW	Authentication Password control	•
#PKTSZ	Packet Size control	•
#DSTO	Data Sending TimeOut control	•
#SKTTO	Socket inactivity timeout control	•
#SKTSET	Socket definition control	•
#SKTOP	Socket Open command	•
#QDNS	Query DNS	•
#SKTCT	Socket TCP Connection Timeout	•
#SKTSAV	Socket Parameters Save Command	•
#SKTRST	Socket Parameters Reset Command	•
#GPRS	GPRS context activation control	•
#SKTD	Socket Dial	•
#SKTL	Socket Listen	•

#FRWL	Firewall setup	•
Easy Camera Extension - Camera Management		TRIZIUM-GPS
#CAMON	Camera ON	
#CAMOFF	Camera OFF	
#TPHOTO	Camera Take Photo	
#RPHOTO	Camera Read Photo	
#OBJL	Object List	
#OBJR	Object Read	
#CAMQUA	Camera Select Quality of Photo	
#CMODE	Camera Select Operating MODE	
Email management		TRIZIUM-GPS
#ESMTP	Email SMTP server	•
#EADDR	Email sender address	•
#EUSER	Email authentication USER NAME	•
#EPASSW	Email authentication PASSWORD	•
#SEMAIL	Send Email	•
#ESAV	Email Parameters Save Command	•
#ERST	Email Parameters Reset Command	•
Easy Scan Extension		TRIZIUM-GPS
#CSURV	Network Survey of the complete 900/1800/1900 Network	•
#CSURVC	Network Survey in computer friendly format	•
#CSURVU	Network Survey of user defined 900/1800/1900 channels	•
#CSURVUC	Network Survey in computer friendly format	•
#CSURVF	Network Survey Format	•
Jammed Detect & Report custom AT command		TRIZIUM-GPS
#JDR	Jammed Detect & Report	•
PYTHON Script Management commands		TRIZIUM-GPS
#WSCRIPT	Write script command	
#ESCRIPT	Select Active script command	
#RSCRIPT	Read script command	
#LSCRIPT	List script names command	
#DSCRIPT	Delete script command	
#REBOOT	Reboot command	
GPS AT Commands		TRIZIUM-GPS
AT\$GPSP	GPS controller power management ON, OFF	•
AT\$GPSP?	Reports the status of the GPS power management	•
AT\$GPSR	GPS reset	
AT\$GPSB	GPS reset with boot mode (production test mode)	
AT\$GPSD	GPS device type set	•
AT\$GPSSW	get GPS software and hardware version	•
AT\$GPSRTC	set the GSM RTC reference info	
AT\$GPSANTC	antenna configuration	
AT\$GPSANTMV	antenna monitoring voltage	
AT\$GPSANTMI	antenna monitoring current	
AT\$GPSANTMU	antenna unsolicited monitoring	
AT\$GPSCOM	GPS command driven mode configuration	•
AT\$GPSDATA	GPS data read mode configuration	•
AT\$GPSCOMS	GPS command serial link speed configuration	•
AT\$GPSDATAS	GPS data read serial link speed configuration	•
AT\$GPSFAST	GPS fast acquisition enable	•
AT\$GPSNMEA	SET NMEA format and activate/deactivate unsolicited	•
AT\$GPSPOS	Get position information	•
AT\$GPSRAW	Send raw data to GPS	•

## 8 Conformity Assessment Issues

The **Telit TRIZIUM-GPS** module is assessed to be conforming to the R&TTE Directive as stand-alone product, so if the module is installed in conformance with Dai Telecom installation instructions require 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 TRIZIUM-GPS module** 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 TRIZIUM 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 TRIZIUM-GPS module** is FCC Approved as module to be installed in other devices. This device is to be used only for fixed and mobile applications. If the final product after integration is intended for portable use, a new application and FCC ID is required.

The **Telit TRIZIUM-GPS module** is conforming to the following US Directives:

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

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 7 dBi for mobile and fixed or mobile operating configurations.
- Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and to have their complete product tested and approved for FCC compliance.

Interference statement:

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

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

## **8.1 Declaration of conformity**

Under approval

## **8.2 TRIZIUM: Conformity Assessment**

Under approval

## **8.3 TRIZIUM: FCC Equipment Authorization**

Under approval

## 9 TRIZIUM Technical Support

Telit technical support to [Telit TRIZIUM-GPS modules](#) customer is included into the dedicated Website ([www.TRIZIUM.com](http://www.TRIZIUM.com)) and official Website ([www.telit.net](http://www.telit.net)) which contains also all available technical documentation download, application examples, Telit engineering support accessible via selective E-Mail ([ts-trizium@telital.com](mailto:ts-trizium@telital.com)) service with 24 hr replies assured.

# 10 Acronyms

<b>ACM</b>	Accumulated Call Meter
<b>ASCII</b>	American Standard Code for Information Interchange
<b>AT</b>	Attention commands
<b>CB</b>	Cell Broadcast
<b>CBS</b>	Cell Broadcasting Service
<b>CCM</b>	Call Control Meter
<b>CLIP</b>	Calling Line Identification Presentation
<b>CLIR</b>	Calling Line Identification Restriction
<b>CMOS</b>	Complementary Metal-Oxide Semiconductor
<b>CR</b>	Carriage Return
<b>CSD</b>	Circuit Switched Data
<b>CTS</b>	Clear To Send
<b>DAI</b>	Digital Audio Interface
<b>DCD</b>	Data Carrier Detected
<b>DCE</b>	Data Communications Equipment
<b>DRX</b>	Data Receive
<b>DSR</b>	Data Set Ready
<b>DTA</b>	Data Terminal Adaptor
<b>DTE</b>	Data Terminal Equipment
<b>DTMF</b>	Dual Tone Multi Frequency
<b>DTR</b>	Data Terminal Ready
<b>EMC</b>	Electromagnetic Compatibility
<b>ETSI</b>	European Telecommunications Equipment Institute
<b>FTA</b>	Full Type Approval (ETSI)
<b>GPRS</b>	General Radio Packet Service
<b>GSM</b>	Global System for Mobile communication
<b>HF</b>	Hands Free
<b>IMEI</b>	International Mobile Equipment Identity
<b>IMSI</b>	International Mobile Subscriber Identity
<b>IRA</b>	Internationale Reference Alphabet
<b>ITU</b>	International Telecommunications Union
<b>IWF</b>	Inter-Working Function
<b>LCD</b>	Liquid Crystal Display
<b>LED</b>	Light Emitting Diode
<b>LF</b>	Linefeed
<b>ME</b>	Mobile Equipment
<b>MMI</b>	Man Machine Interface
<b>MO</b>	Mobile Originated
<b>MS</b>	Mobile Station
<b>MT</b>	Mobile Terminated
<b>OEM</b>	Other Equipment Manufacturer
<b>PB</b>	Phone Book
<b>PDU</b>	Protocol Data Unit
<b>PH</b>	Packet Handler
<b>PIN</b>	Personal Identity Number
<b>PLMN</b>	Public Land Mobile Network
<b>PUCT</b>	Price per Unit Currency Table
<b>PUK</b>	PIN Unblocking Code
<b>RACH</b>	Random Access Channel

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<b>RLP</b>	Radio Link Protocol
<b>RMS</b>	Root Mean Square
<b>RTS</b>	Ready To Send
<b>RI</b>	Ring Indicator
<b>SCA</b>	Service Center Address
<b>SIM</b>	Subscriber Identity Module
<b>SMD</b>	Surface Mounted Device
<b>SMS</b>	Short Message Service
<b>SMSC</b>	Short Message Service Center
<b>SS</b>	Supplementary Service
<b>TIA</b>	Telecommunications Industry Association
<b>UDUB</b>	User Determined User Busy
<b>USSD</b>	Unstructured Supplementary Service Data

# 11 Revision history

Revision	Date	Changes
1	17/05/05	Removed: <ul style="list-style-type: none"> <li>- Easy Script functionality</li> <li>- Easy Camera functionality</li> </ul> Moreover: <ul style="list-style-type: none"> <li>- all 4 serial port (GSM and GPS) have been ported on the SO108 connector, no internal connections available anymore</li> <li>- GPS antenna specification added</li> <li>- NMEA sentences, added</li> <li>- GPS UART 0 speed 9600 bps instead of 19200 bps</li> </ul>