

# SE867-AGPS Product Description

80311ST10073a Rev. 1 – 2010-05-19



This document is relating to the following products:

PRODUCT
SE867-AGPS



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## 1. Introduction

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### 1.1. Audience

This document is intended for customers who are evaluating one or more products in the applicability table.

### 1.2. Contact Information, Support

For general contact, technical support, to report documentation errors and to order manuals, contact Telit's Technical Support Center (TTSC) at:

[TS-EMEA@telit.com](mailto:TS-EMEA@telit.com)  
[TS-NORTHAMERICA@telit.com](mailto:TS-NORTHAMERICA@telit.com)  
[TS-LATINAMERICA@telit.com](mailto:TS-LATINAMERICA@telit.com)  
[TS-APAC@telit.com](mailto:TS-APAC@telit.com)

Alternatively, use:

<http://www.telit.com/en/products/technical-support-center/contact.php>

For detailed information about where you can buy the Telit modules or for recommendations on accessories and components visit:

<http://www.telit.com>

To register for product news and announcements or for product questions contact Telit's Technical Support Center (TTSC).

Our aim is to make this guide as helpful as possible. Keep us informed of your comments and suggestions for improvements.

Telit appreciates feedback from the users of our information.



### 1.3. Text Conventions



***Danger – This information MUST be followed or catastrophic equipment failure or bodily injury may occur.***



***Caution or Warning – Alerts the user to important points about integrating the module, if these points are not followed, the module and end user equipment may fail or malfunction.***



**Tip or Information – Provides advice and suggestions that may be useful when integrating the module.**

All dates are in ISO 8601 format, i.e. YYYY-MM-DD.

### 1.4. Related Documents

The following is a list of applicable documents downloadable from the Download Zone section of Telit’s website <http://www.telit.com>

[1] “SE867-AGPS User Guide”

[2] “SE867-AGPS Evaluation Board User Guide”

### 1.5. Document change log

Revision	Date	Changes
ISSUE#0	2009-10-23	First Release
ISSUE#1	2010-05-19	Updated §4.1 “SE-867 Evaluation Kit” Updated §5.1 “GPS NMEA” Updated §5.2 “Assisted GPS” Updated §5.3 “Analysis Tool” Updated operating temperature range Updated §7



## 2. Overview

The Telit SE867-AGPS is a small form factor GPS stand alone module based on an advanced 44-channels GPS chipset with additional AGPS feature.

The SE867-AGPS is capable of position fixing and tracking without the need of anything else than a low current power source and a standard UART connection. The protocol used for the serial communication is the standard NMEA.

An integrated power supply circuit allows a wide range of input voltages making the SE867-AGPS integration in customer application circuits easier.





### 3. General product description

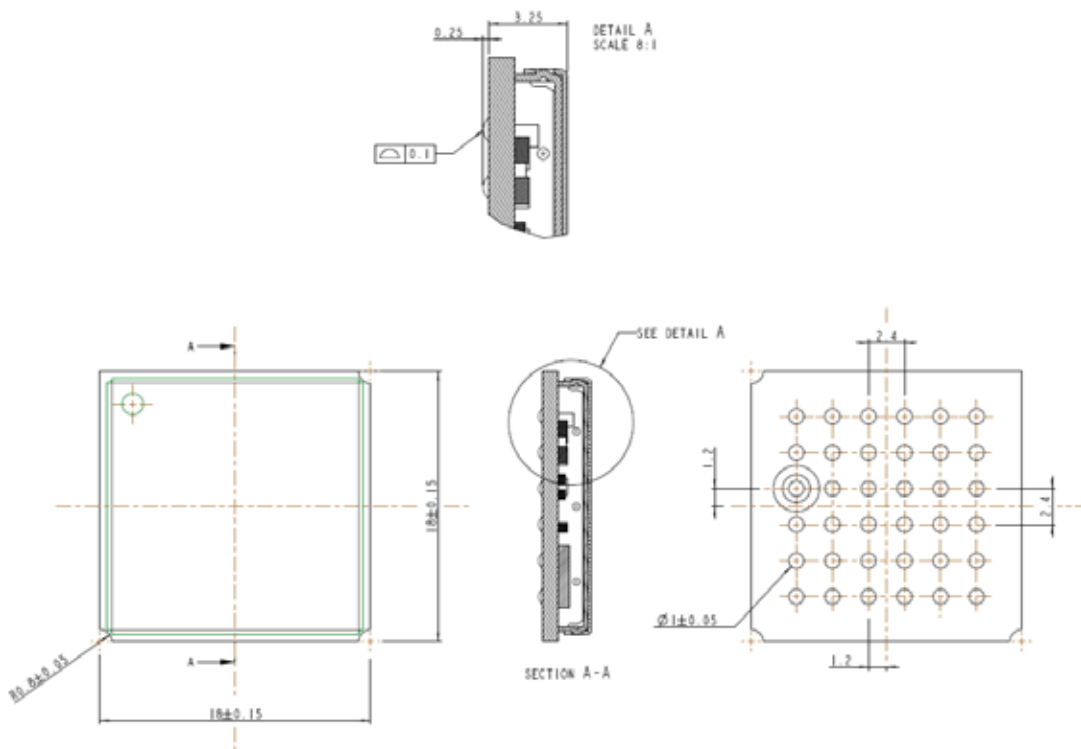


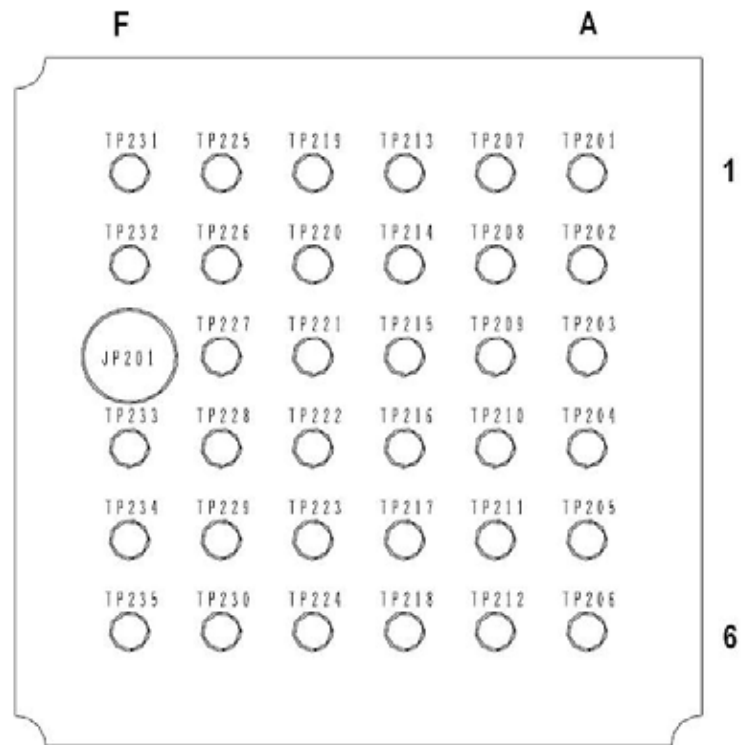
NOTE: The illustrations in this Product Description are only schematic and do not assure fidelity to construction or layout details, finishes, writings or colors.

#### 3.1. Dimensions

The **Telit SE867-AGPS module** overall dimensions are:

- Length: 18 mm
- Width: 18 mm
- Thickness: 3.5 mm
- Weight 1.8 g





Bottom side



### 3.2. Environmental requirements

#### 3.2.1. Temperature range

	SE867-AGPS	Notes
Operating Temperature Range	-30°C ÷ +85°C	
Storage and Non Operating Temperature Range	-30°C ÷ +85°C	

Table 1

#### 3.2.2. RoHS compliance

Telit SE867-AGPS module is fully compliant to EU RoHS Directives.



### 3.3. Main features

SE867-AGPS includes a High performance single chip GPS receiver. The main features of the system are:

- High sensitivity for indoor reception, up to -160dBm (with a good active antenna)
- 44-channel GPS architecture, featuring multiple independent search engines tracking channels with power-down capability
- Extremely fast TTFF at low signal levels
- Hot start: 1.3s
- Accuracy: < 1m (CEP50, autonomous acquisition)
- GPS NMEA 0183 output format
- Datum WGS84
- SBAS functionality
- AGPS functionality
- Low power consumption

#### 3.3.1. Specifications

##### 3.3.1.1. Sensitivity

Time To First Fix-	
Hot Start	1.3 s
Cold Start	< 35 s
Sensitivity	
Tracking	-160dBm

Table 2



**NOTE:** TTFF tests have been performed with all SV @-130dBm. To achieve the reported sensitivity performances a good active antenna is required.



### 3.3.1.2. Power consumption and input voltage configurations

Mode	Description	Current	Unit
Full GPS	100% duty cycle for search engine and correlators. Tracking 8 SVs, one fix/sec	65.5	mA
Tracking	10% search engine activity, tracking 8 SV	61	mA
Full Acquisition	8 search engine active, software depending on acquisition algorithm	57.5	mA
Sleep mode	Main clock off, memories on	61	µA

Table 3



**NOTE:** The values in Table 3 are referred to the module alone, external active antenna supply current is not included. Please note that power consumption depends also on firmware configurations.

The input voltage depends on the chosen power configuration (please refer to “SE867-AGPS User guide” for a more detailed description of the available power configurations); the on board LDOs allow the module to be alternatively supplied within the following ranges:

- Range 1: 1.71V ÷ 1.89V (nominal 1.8V)
- Range 2: 2.7V ÷ 3.3V (nominal 3V)

The voltage range can be extended to 2.5V ÷ 4.2V following the power supply configuration guidelines reported in “SE867-AGPS User Guide” (document reference 1V0300860).

Please note that interface logic levels depend on the chosen power supply configuration and range. Furthermore, specific configuration for lithium battery supplied design is available. More details are available in the user guide.



### 3.4. Antenna

The required GPS antenna can be either active or passive. A good active antenna choice is suggested in order to increase sensitivity; if a passive antenna is chosen an external LNA is required to be inserted. Table 4 reports the specifications for the required antenna. Please refer to the “SE867-AGPS User guide” for a more detailed description of the antenna choice and connection.

ANTENNA REQUIREMENTS	
Central frequency	1575.42 MHz (GPS L1)
Bandwidth	±1.023MHz
Amplification (active antenna only)	25dB typ. (30dB max)
Noise figure (active antenna only)	< 1.5dB
Impedance [Ohm]	50
Supply voltage (active antenna only)	Depends on customer design
Coupling with other signals is not allowed	

Table 4



**NOTE:** active antenna feeding must be externally supplied.



### **3.5. Logic level specifications**

SE867-AGPS logic levels depend on the chosen I/O supply voltage. Standard 1.8V and 3.3V logic levels are included among the available choices. Please refer to “SE867-AGPS User guide” for a more detailed description.

### **3.6. RTC crystal**

In order to fully exploit all the SE867-AGPS capabilities an external RTC crystal is required. In this way, the module will be able to maintain an internal clock during power save mode and perform hot and warm start. Alternatively, an external clock signal at 32.768 kHz can be supplied to the module via the RTC\_IN pin.



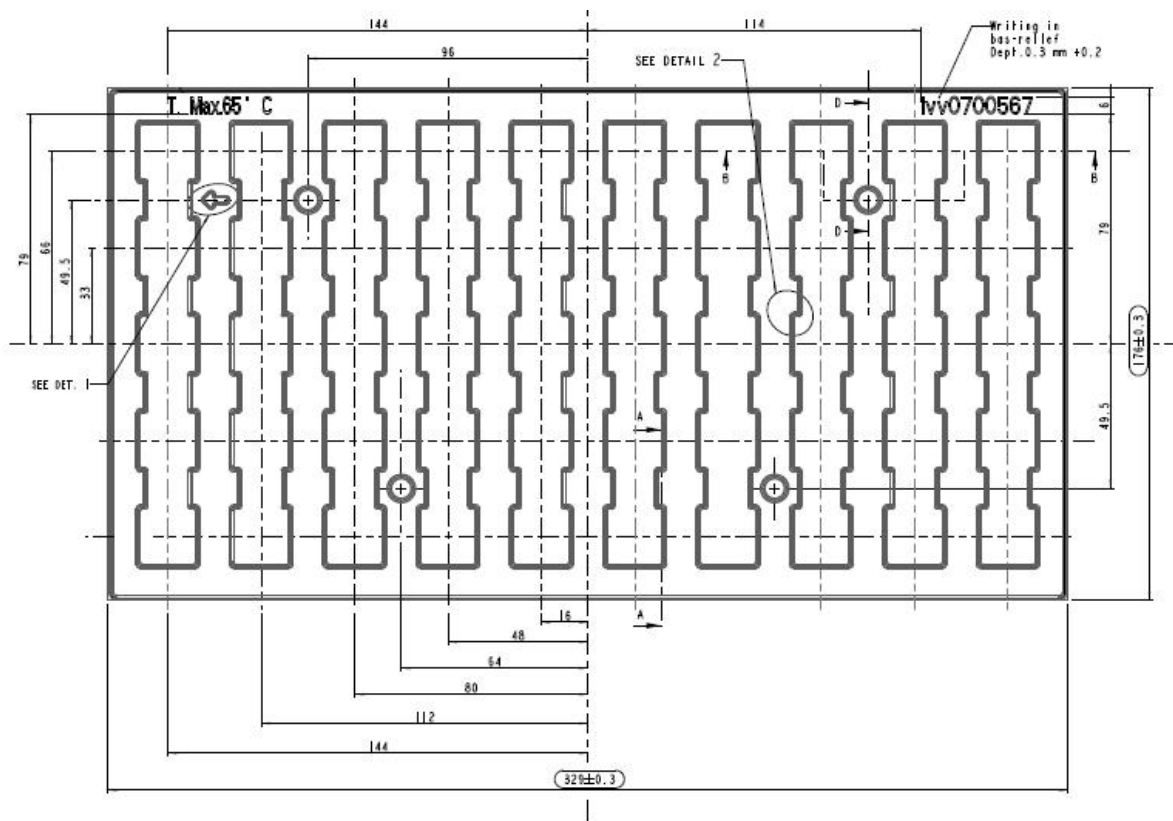
### 3.7. Mounting SE867-AGPS on the application board

#### 3.7.1. General

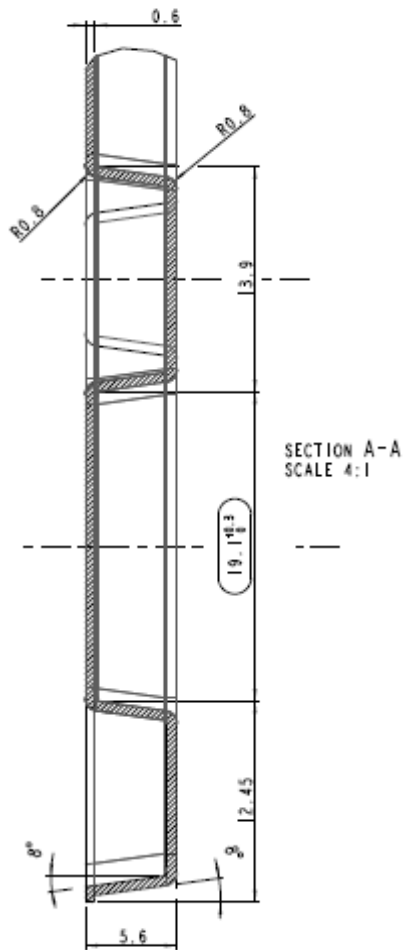
Telit SE867-AGPS module has been designed in order to be compliant with a standard lead-free SMT process. For detailed information about PCB pad design and conditions in SMT process please refer to “SE867-AGPS User guide”.

#### 3.7.2. Packing System

According to SMT process for pick & place movement requirements, Telit SE867-AGPS modules are packaged in trays containing 50 pieces each. Tray dimensions are (dimensions in mm, general tolerance  $\pm 0.1$ , please note that trays can withstand a maximum temperature of 65°C):







## 4. SE867-AGPS evaluation kit

### 4.1. Short description

The EVB-867 is the evaluation kit of SE867-AGPS. It is provided to the customer to evaluate the performances of Telit SE867-AGPS module in all the available configurations.

The evaluation kit consists in a single board with:

- SE867-AGPS module
  - Mini-USB connector for power supply and data communication with a PC
  - FTDI chip for USB to UART conversion
  - SMA RF connector for external active antenna or instrument connection
  - DIP switches for configuration options selection

The FTDI chip allows using a common mini USB cable to transfer data avoiding the need for a RS232 connection and reducing the data transmission and the power supply to a single cable connection.

The setup to run the EVB is a PC to connect with the evaluation kit equipped with a software application to perform NMEA data flow reading and position fixing (e.g. Visual GPS, available for free in Internet).

For more detailed information, please refer to “SE867-AGPS Evaluation Board User Guide”.



## 5. Software Features

### 5.1. GPS NMEA

SE867-AGPS relays GPS data stream conform to NMEA 0183 format.

Default output format configuration is 9600bps, 8N1.

Other available output configuration speeds are: 9600, 19200, 38400, 57600 and 115200 bps.

#### 5.1.1. Standard NMEA Sentences

SE867-AGPS supports the following standard NMEA messages:

- **DTM** – Datum Being Used
- **GGA** – GPS Fix Data
- **GLL** – GPS Geographic Position
- **GSA** – GPS DOP and Active Satellites
- **GSV** – Satellites in View
- **RMC** – Recommended Minimum Specific GPS Data
- **VTG** – Course over Ground and Ground Speed
- **ZDA** – GPS Time and Date

#### 5.1.2. Custom NMEA Sentences

SE867-AGPS custom NMEA messages are structured according to the standard template of NMEA format:

**"\$PUNV,<command/response>\*cc<carriage return><new line>"**

'PUNV' is the SE867-AGPS custom command prefix coming first a <command/response> field as below:

Command/Response	In/Out	Description
ASSIST	In	UTC time assistance input message
STORELGF	In	Force immediate LGF store operation
START	In	Request for immediate restart
SLEEP	In	Request to stop the navigation and enter to sleep mode
WAKEUP	In	Wake up from sleep
STOP	In	Request to stop the navigation
CONFIG	In	Request to configure configuration section
SET	In	Change configuration in RAM only



GETCONFIG	In	Request to read configure information of configuration section
VERSION	In	Request Version, alias to <i>PUNV,GETCONFIG,09</i>
FOM	Out	Navigation quality indicator (figure-of-merit)
SDB	Out	Satellites' data Information
AGC	Out	Automatic gain control debug data
CLKOFFSET	Out	Master clock offset data
CFG_R	Out	Reply message for read configure information
CFG_S	Out	Reply message for write configure information
ERR	Out	Error message
OK	Out	Success message

Table 5

## 5.2. Assisted GPS – AGPS

SE867-AGPS supports Assisted GPS (AGPS) technology to speed up navigation in challenging environments: indoors, in urban canyons and in other locations where broadcast satellite signals are obscured. AGPS can also accelerate the navigation process in conditions where broadcast ephemeris is available, by quickly securing location information from non-broadcast sources, thus reducing power consumed in satellite search mode.

See 80000nt10036a\_SE867-AGPS\_Assisted\_GPS\_Application\_Note for more details.

## 5.3. Analysis Tool

SE867-AGPS module can be evaluated through GPS environment analysis tools (e.g., such as, Orion Analyzer, VisualGPS, VisualGPSXP and similar tools) that allow the user to view:

- Navigation Data (2D/3D Fix, Latitude, Longitude, Altitude, Speed, Heading, TTFF, Date, Time, HDOP, VDOP, PDOP)
- Position Plot
- Sky Plot
- History
- Signal Strength
- NMEA Output Stream

Orion Analyzer Tool is available for development, ask to TTSC for details.



## 6. Conformity assessment issues

Assessment of the final product must be made against the essential requirements of the EMC and the LVD Directives.

The SE867-AGPS module is conform to the following European Union Directives:

- Low Voltage Directive 2006/95/EEC and product safety
- Directive EMC 2004/108/EC for conformity for EMC

In order to satisfy the essential requirements SE867-AGPS module is compliant with the following standards:

- Electromagnetic compatibility and Radio spectrum Matters (EMC and ERM) EN 300 440-1 (v1.4.1)and Standard: EN 300 440-2 (v1.2.1) (2002-5)
- EMC (Electromagnetic Compatibility). Standards: EN 301 489-1 (v1.8.1) and EN 301 489-3 (1.4.1) (2002-8)
- Safety Standards: EN 60 950-1:2006



## 6.1. Declaration of Conformity



### DECLARATION OF CONFORMITY

We, **Telit Communications S.p.A**

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

declare under our sole responsibility that the product:

**PE17-A**

introduced in the market with the commercial name:

**SE867-AGPS**

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:

EMC (R&TTE art. 3.1b)	EN 301 489-1 v1.8.1 (2008-04); EN 301 489-3 v1.4.1 (2002-8)
EMC and ERM (RTTE art.3.2)	EN 300 440-1 v1.4.1 (2008-5); EN 300 440-2 v1.2.1 (2008-05)
Safety (R&TTE art. 3.1a)	EN 60950-1:2006

The conformity assessment procedure is referred to the Article10 and detailed in Annex III of Directive 1999/5/EC.

The technical documentation relevant to the above product including the applied radio test suites and reports are held at:

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

Trieste, **28th October 2009**



\_\_\_\_\_  
EMEA Quality Director  
Guido Walcher



## 7. Safety recommendations

### READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc
- Where there is risk of explosion such as gasoline stations, oil refineries, etc

It is responsibility of the user to enforce the country regulation and the specific environment regulation

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming to the security and fire prevention regulations.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself.

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 external networks or 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.

The European Community provides some Directives for the electronic equipments introduced on the market. All the relevant information's are available on the European Community website:



<http://ec.europa.eu/enterprise/sectors/rtte/documents/>

The text of the Directive 99/05 regarding telecommunication equipments is available, while the applicable Directives (Low Voltage and EMC) are available at:

[http://ec.europa.eu/enterprise/sectors/electrical/lvd/index\\_en.htm](http://ec.europa.eu/enterprise/sectors/electrical/lvd/index_en.htm)

