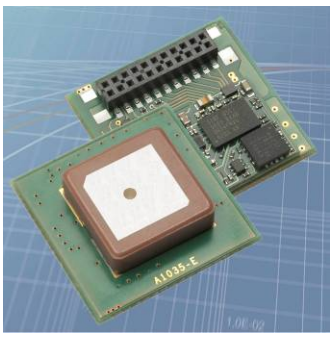
GPS Receiver A1035-E

A Description of Vincotech's
GPS Smart Antenna Module A1035-E

User's Manual

Version 1.3
Hardware Revision 01



Revision History

Rev.	Date	Description
1.0	05-19-08	Initial Draft – preliminary information
1.1	06-30-08	Information added
1.2	11-03-08	New layout; moved to Vincotech
1.3	02-18-09	
	mm-dd-yy	

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Table of Contents

1 Introduction

Vincotech's smart GPS antenna A1035-E is the combination of a highly integrated GPS receiver module and a ceramic GPS patch antenna. The antenna is connected to the module via an LNA. The module is capable of receiving signals from up to 12 GPS satellites and transferring them into position and timing information that can be read over a serial port. Small size and high-end GPS functionality are combined at low power consumption:

- Operable at 1.8V / 73mW (typ.) @ trickle power mode
- Small form factor of 21 x 21 mm (0.83" x 0.83")
- Standard power and I/O connector
- Mountable without solder process
- Field replaceable

The smart antenna module is available as an off-the-shelf component, 100% tested and shipped in trays.

Note: The module can be offered for OEM applications with adaptation in form and connection. Additionally, the antennas can be tuned to their final environment.

1.1 Label

The A1035-E's labels hold the following information:

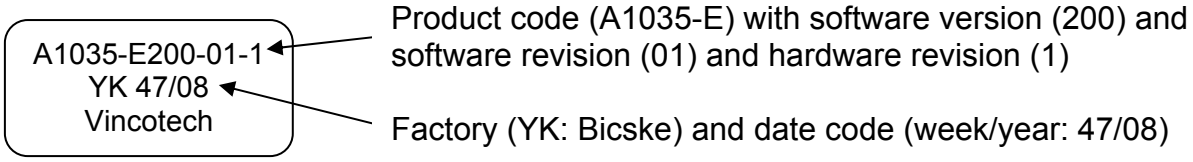


Figure 1: A1035-E labels

1.2 Characteristics

The antenna modules are characterized by the following parameters.

Channels		12, parallel tracking
Correlators		> 32,000
Frequency		L1 (= 1,575 MHz)
Tracking Sensitivity		-157 dBm
Position Accuracy	Stand alone	< 5 m CEP (SA off)
Time To First Fix – TTFF (theoretical minimum values; values in real world may differ)	Obscuration recovery (1)	0.1 s
	Hot start (2)	< 1 s
	Warm (3)	< 35 s
	Cold (4)	< 37 s

Table 1: A1035-E characteristics

(1) The calibrated clock of the receiver has not stopped, thus it knows precise time (to the µs level).
(2) The receiver has estimates of time/date/position and valid almanac and ephemeris data.
(3) The receiver has estimates of time/date/position and recent almanac.
(4) The receiver has no estimate of time/date/position, and no recent almanac.

1.3 Mechanical Characteristics

Mechanical dimensions	Length Width Height	21.2 mm, 0.835” 21.2 mm, 0.835” 7.8 mm, 0.307”
Weight		5.6 g, 0.2 oz

Table 2: A1035-E dimensions and weight

1.4 Handling Precautions

The smart GPS antenna A1035-E is a module that is sensitive to electrostatic discharge (ESD). Please handle with appropriate care.

2 Ordering Information

2.1 GPS Receiver A1035-E

The order numbers are built as follows:

- **V23993A1035Exxx**

"V23993" stands for Vincotech's wireless and communication products, the "A1035-E" for the A1035-E module. The "xxx" stands for the according firmware version. If no firmware version is noted in an order, the latest version will be provided.

2.2 Packing of the A1035-E

The A1035-E comes in trays.

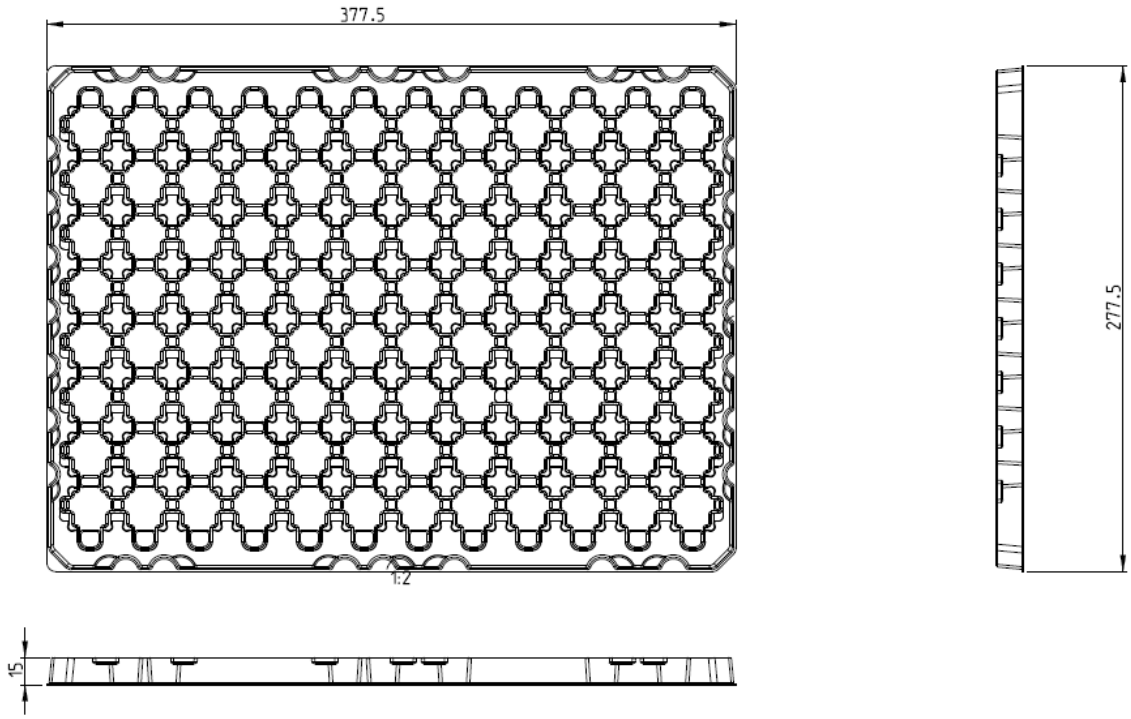


Figure 2: A1035-E tray specification (1)

One tray holds 96 A1035-E modules.
One box can hold 11 trays with a stacking height of about 12 mm. 11th tray is used as cover, therefore 10 filled trays with a total of 960 modules in one complete box.

2.3 A1035-E Clips

In order to support easy mounting and dismounting of the A1035-E antenna modules, special clips have been developed. These clips can be ordered separately (see “2.4 Additional Equipment”).

Figure 3: A1035-E clip

Details on the clip and a note how to use it can be found in the appropriate application notes / manuals.

2.4 Additional Equipment

V23993EVA1035E	Demonstration Kit (including one module V23993A1035E)
V23993A1035ECLIP	Mounting clip for A1035-E module

Table 3: Additional equipment

A detailed description of the EVA1035-E Evaluation Kit can be found in the appropriate manual.

3 Quick Start

In order to allow an easy and quick start with the modules A1035-E, this chapter provides a short overview on the most important steps to receive NMEA messages with position information on a serial port. For details please refer to the according chapters.

3.1 Minimum Configuration

The following picture shows a recommended minimum configuration for the connection of a micro-controller within a 3.3 V environment

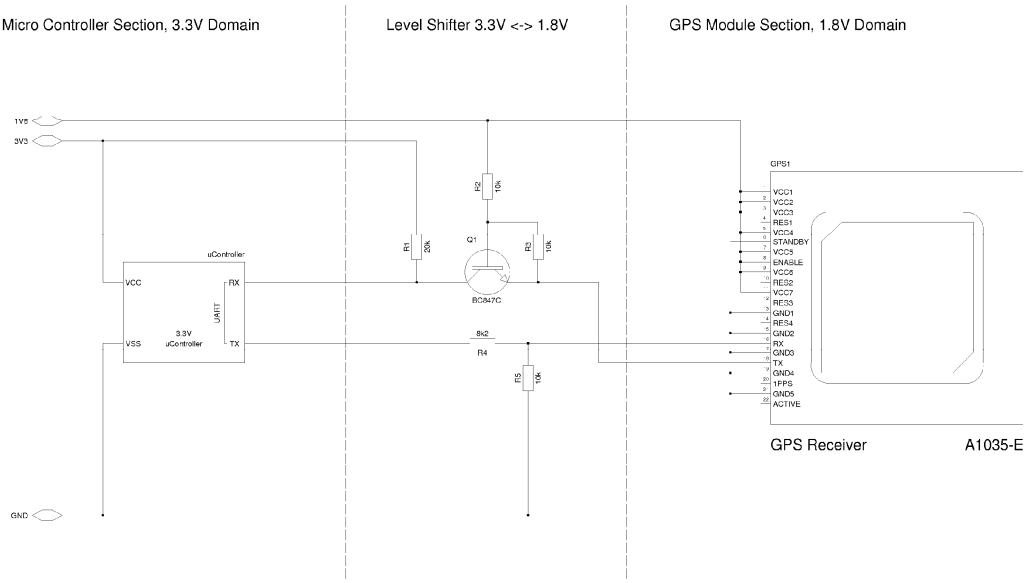


Figure 4: Recommended minimum configuration A1035-E

3.2 Serial Port Settings

The default configuration within the standard GPS firmware is:

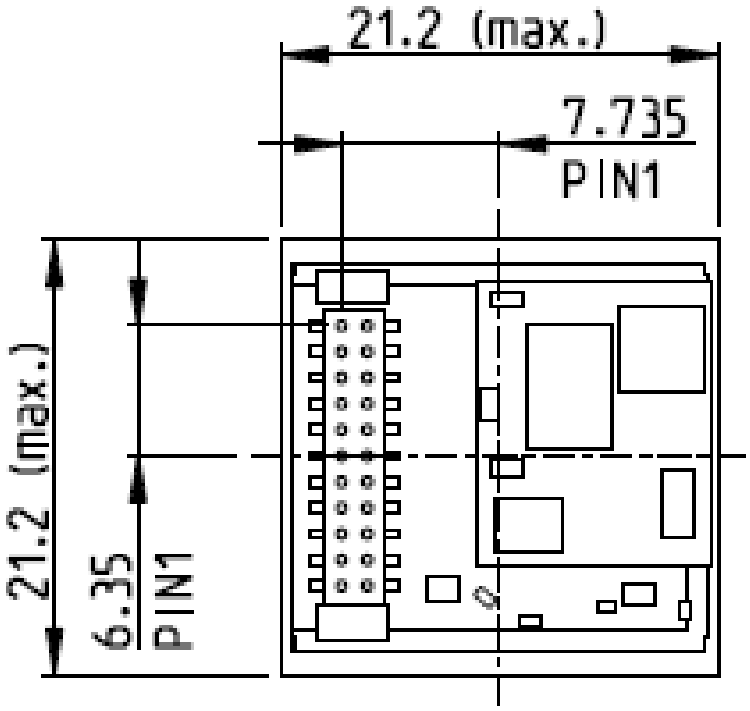
- Serial 0 (NMEA) 19,200 baud, 8 data bits, no parity, 1 stop bit, no flow control

3.3 Improved TTFF

In order to improve the TTFF (Time To First Fix), it is recommend to keep the Vcc all the time and use Enable PIN (see chapter “9.2 Enable Pin”) or software standby function.

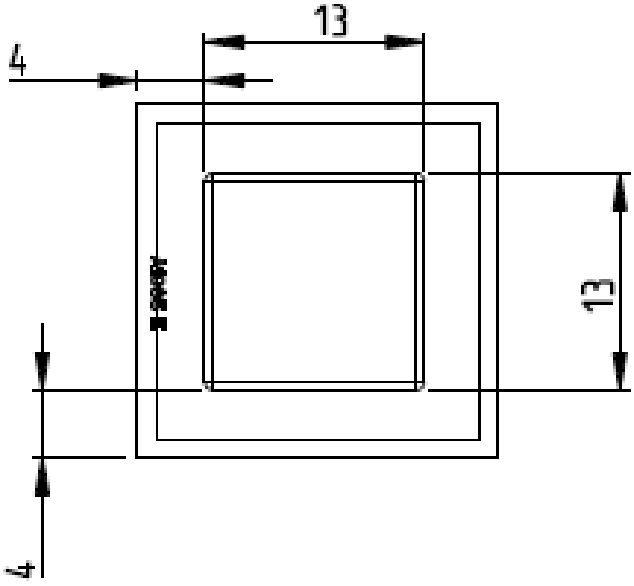
4 Mechanical Outline

4.1 Overview A1035-E



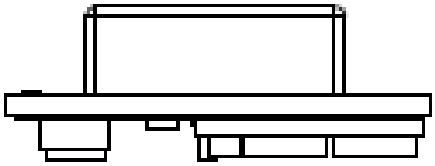
All dimensions in [mm]

Figure 5: Mechanical outline overview A1035-E (bottom)



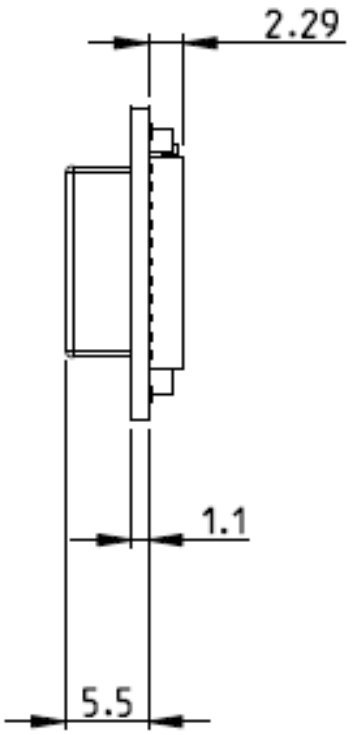
All dimensions in [mm]

Figure 6: Mechanical outline overview A1035-E (top)



All dimensions in [mm]

Figure 7: Mechanical outline overview A1035-E (side A)



All dimensions in [mm]

Figure 8: Mechanical outline overview A1035-E (side B)

4.2 Connector A1035-E

The power and I/O connector used on the A1035-E is a 1.27mm (0.05”) low profile, double row socket with a height of 2.21mm (.087”) and a total of 22 contacts. Potential counterparts on the motherboard are e.g. Samtec 1.27mm (0.05”) micro strips of the FTS series (e.g. FTS-111-02-L-DV-P-TR).

5 Pin-out Information

5.1 Layout A1035-E

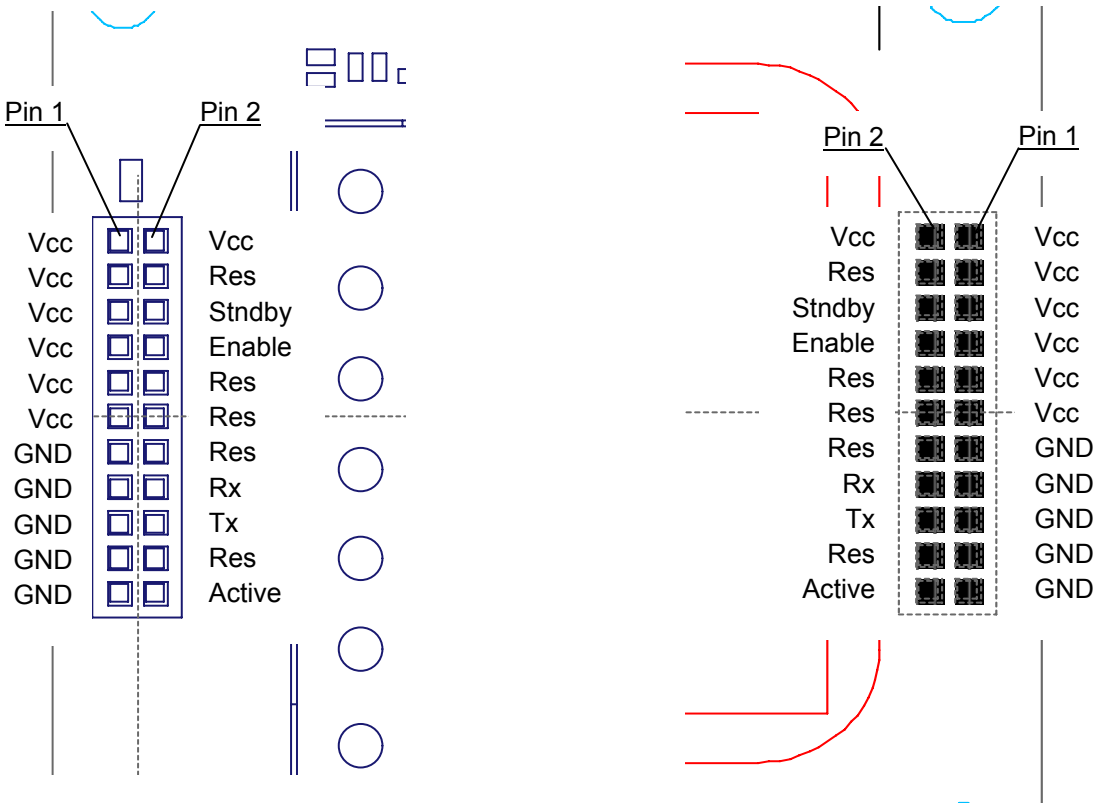


Figure 9: Pin out information A1035-E (bottom and top view)

Bottom view is showing the side of the module that will face the carrier board.

5.2 Description A1035-E Signals

This table describes the functionality of the pins and their associated symbols.

Please note: all Vcc Pin must be connected to power supply!

Pin	Symbol	Function	Description
1	Vcc	Input	1.8V VDC (power supply)
3	Vcc	Input	1.8V VDC (power supply)
5	Vcc	Input	1.8V VDC (power supply)
7	Vcc	Input	1.8V VDC (power supply)
9	Vcc	Input	1.8V VDC (power supply)
11	Vcc	Input	1.8V VDC (power supply)
13	GND	GND	Ground
15	GND	GND	Ground
17	GND	GND	Ground
19	GND	GND	Ground
21	GND	GND	Ground

Table 4: Pin description A1035-E (part 1)

Pin	Symbol	Function	Description
2	Vcc	Input	1.8V VDC (power supply)
4	Res.		Reserved – leave open
6	Stndby	Input	Standby
8	Enable	Input	Enable
10	Res.		Reserved – leave open
12	Res.		Reserved – leave open
14	Res.		Reserved – leave open
16	RX	Input	Serial 19,200 baud input
18	TX	Output	Serial 19,200 baud output
20	1PPS	Output	1PPS – (pulse per second) Signal
22	Active	Output	High when module is working

Table 5: Pin description A1035-E (part 2)

5.3 General Comments

The following comments should be considered for a design with and use of the module:

- Standard configuration of serial port:
  Serial 0 (NMEA) 19,200 baud, 8 data bits, no parity, 1 stop bit, no flow control

6 Electrical Characteristics

6.1 Operating Conditions

Pin	Description	Min	Typical	Max
1, 2, 3	V_{cc}	1.8V	1.85V	1.9V
	Peak Acquisition Current (1)		120mA	130mA
	Average Acquisition Current (2)		60mA	
	Tracking Current (3)		40mA	
	Standby Current (4)		20 µA	

Table 6: Operating Conditions

(1) Peak acquisition current is characterized by millisecond bursts above average acquisition current
(2) Average current is typically only the first two seconds of TTFF
(3) Tracking current typically includes tracking and the post acquisition portion of TTFF
(4) During standby state: RTC block and core powered on and clock off.

6.2 Absolute Maximum Ratings

Symbol	Parameter	Min	Max	Unit
V_{CC}	Power Supply GSCi500x	-0.3	1.95	V
V_{in}	Voltage to any input pin	-0.3	+2.0	V
I_{out}	Input current on any pin	-10	+10	mA
I_{tdv}	Absolute sum of all input currents during overload condition		200	mA

Table 7: Absolute maximum ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

7 Mounting

The A1035-E offers a power and I/O connector with a 1.27mm (0.05”) low profile, double row socket with a total of 22 contacts. Potential counterparts on the motherboard are Samtec 1.27mm (0.05”) micro strips of the FTS series. For fixing the A1035-E on a motherboard separately provided clips are recommended.

For details on the mounting clip and further mounting instructions please refer to the according documents.

8 Quality and Reliability

8.1 Environmental Conditions

Operating temperature	- 30 … + 85°C
Operating humidity	Max. 85% r. H., non-condensing, at 85°C

Table 8: Environmental conditions

8.2 Product Qualification

Basic qualification tests:

- Temperature Cycling –30°C … +85°C
- Temperature Humidity Bias 85°C / 85% RH
- High / Low Temperature Operating –30° / +85°C
- High Temperature Operating Life +85°C
- Vibration Variable Frequency
- Mechanical Shock

Please contact Vincotech for detailed information.

8.3 Production Test

Each module is electrically tested prior to packing and shipping to ensure state of the art GPS receiver performance and accuracy.

9 Applications and Hints

9.1 1PPS pin (1 pulse per second pin)

The 1PPS pin is an output pin.

In addition to precise positioning, GPS also allows for accurate timing due to the synchronized atomic clocks in the GPS satellites. While the current date and time is transmitted in NMEA sentences, an exact and accurate timing signal is provided via the 1PPS pin of the A1035-E modules.

Note: The 1PPS clock accuracy directly depends on the position accuracy! The GPS signals travel at the speed of light, therefore a position inaccuracy directly translates into 1PPS inaccuracies.

10 m position deviation ≈ 33 ns 1PPS deviation (typically)
100 m position deviation ≈ 333 ns 1PPS deviation (typically)

The 1PPS signal is provided on a “as is” basis with no accuracy specification.
The given values are based on a 10 satellite, static GPS simulator scenario.
The 1PPS pin is an output pin.

9.2 Enable Pin

The Enable pin is an input PIN and high active.

The module will immediately switch to standby mode by pulling the Enable pin to “low”. The RTC keeps running and the internal SRAM will be back upped. This keeps the Ephemeris and Almanac stored. Pulling the Enable pin back to “high” within 2 hours will end in hot start situation.

9.3 Standby Pin

The Standby pin is an input pin and high active.

Pulling Standby pin to high will activate “Keep Ephemeris Alive” mode with factory preset variables (reactivating the acquisition / tracking mode after 60 minutes power save mode). Please see Firmware manual A1082-A.

10 Demonstration Kit A1035-E

For demonstration and easy evaluation of GPS performance Vincotech offers an Evaluation Kit (including one GPS A1035-E module) It contains a USB interface with according drivers to connect easily to a PC. The USB interface is an extension of the serial port 0, therefore sending NMEA sentences and accepting commands. At the same time it provides power to the module.

For the development of new software and applications the Evaluation Kit also provides NMEA messages on C-MOS level via a terminal plug.

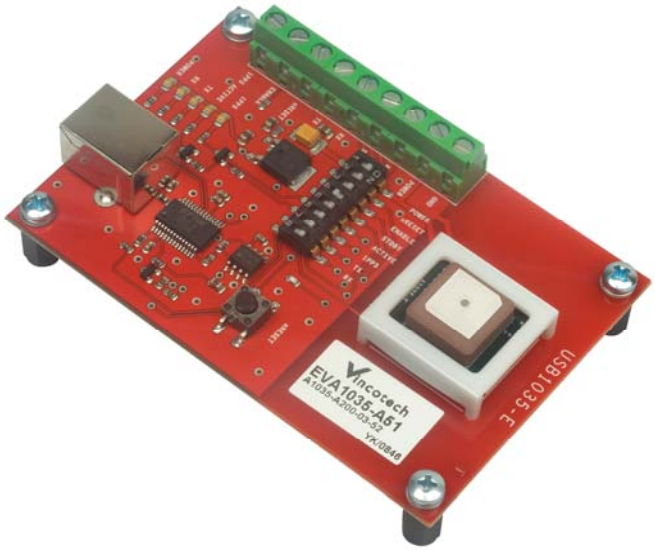


Figure 10: Evaluation kit EVA1035-E

For further information please contact Vincotech.

11 Related Information

11.1 Contact

This manual was created with due diligence. We hope that it will be helpful to the user to get the most out of the GPS module.

Any inputs regarding possible errors or mistakable verbalizations, and comments or proposals for further improvements to this document, made to Vincotech, Germany, are highly appreciated.

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11.2 Related Documents

- GPS Evaluation Kit EVA1035-H (Vincotech)
- GPS Firmware A1082-A (Vincotech)
- GPS AppNote A1082 & A1035-E Power Supply (Vincotech)
- GPS A1035-E Clip Specification (Vincotech)
- GPS A1035-E Mounting Instruction(Vincotech)
- Instant GPS IC Interface Control Drawing manual (SiRF)

11.3 Related Tools

- GPS Cockpit (Vincotech)

12 List of Tables

13 List of Figures