# Revision History

<table>
<thead>
<tr>
<th>Rev.</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>05-19-08</td>
<td>Initial Draft – preliminary information</td>
</tr>
<tr>
<td>1.1</td>
<td>06-30-08</td>
<td>Information added</td>
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<tr>
<td>1.2</td>
<td>11-03-08</td>
<td>New layout; moved to Vincotech</td>
</tr>
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<td>1.3</td>
<td>02-18-09</td>
<td></td>
</tr>
<tr>
<td></td>
<td>mm-dd-yy</td>
<td></td>
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</table>
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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:

![A1035-E200-01-1 YK 47/08 Vincotech](image)

- Product code (A1035-E) with software version (200) and software revision (01) and hardware revision (1)
- Factory (YK: Bicske) and date code (week/year: 47/08)

Figure 1: A1035-E labels
1.2 Characteristics
The antenna modules are characterized by the following parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Channels</td>
<td>12, parallel tracking</td>
</tr>
<tr>
<td>Correlators</td>
<td>&gt; 32,000</td>
</tr>
<tr>
<td>Frequency</td>
<td>L1 (= 1,575 MHz)</td>
</tr>
<tr>
<td>Tracking Sensitivity</td>
<td>-157 dBm</td>
</tr>
<tr>
<td>Position Accuracy</td>
<td>Stand alone</td>
</tr>
<tr>
<td>Time To First Fix – TTFF (theoretical minimum values; values in real world may differ)</td>
<td>Obscuration recovery ((^{(1)}) 0.1 s</td>
</tr>
<tr>
<td></td>
<td>Hot start ((^{(2)})  &lt; 1 s</td>
</tr>
<tr>
<td></td>
<td>Warm ((^{(3)})  &lt; 35 s</td>
</tr>
<tr>
<td></td>
<td>Cold ((^{(4)})  &lt; 37 s</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Mechanical dimensions</th>
<th>Length</th>
<th>Width</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>21.2 mm</td>
<td>21.2 mm</td>
<td>7.8 mm</td>
</tr>
<tr>
<td>Width</td>
<td>0.835”</td>
<td>0.835”</td>
<td>0.307”</td>
</tr>
<tr>
<td>Height</td>
<td>0.307”</td>
<td>0.307”</td>
<td>0.307”</td>
</tr>
</tbody>
</table>

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.

![A1035-E tray specification](image)

**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](image)

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

2.4 Additional Equipment

<table>
<thead>
<tr>
<th>V23993EVA1035E</th>
<th>Demonstration Kit (including one module V23993A1035E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>V23993A1035ECLIP</td>
<td>Mounting clip for A1035-E module</td>
</tr>
</tbody>
</table>

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.

![Recommended minimum configuration A1035-E](image)

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

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

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

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vcc</td>
<td>Input</td>
<td>1.8V VDC (power supply)</td>
</tr>
<tr>
<td>3</td>
<td>Vcc</td>
<td>Input</td>
<td>1.8V VDC (power supply)</td>
</tr>
<tr>
<td>5</td>
<td>Vcc</td>
<td>Input</td>
<td>1.8V VDC (power supply)</td>
</tr>
<tr>
<td>7</td>
<td>Vcc</td>
<td>Input</td>
<td>1.8V VDC (power supply)</td>
</tr>
<tr>
<td>9</td>
<td>Vcc</td>
<td>Input</td>
<td>1.8V VDC (power supply)</td>
</tr>
<tr>
<td>11</td>
<td>Vcc</td>
<td>Input</td>
<td>1.8V VDC (power supply)</td>
</tr>
<tr>
<td>13</td>
<td>GND</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>15</td>
<td>GND</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>17</td>
<td>GND</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>19</td>
<td>GND</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>21</td>
<td>GND</td>
<td>GND</td>
<td>Ground</td>
</tr>
</tbody>
</table>

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

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

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

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Min</th>
<th>Typical</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3</td>
<td>V_{cc}</td>
<td>1.8V</td>
<td>1.85V</td>
<td>1.9V</td>
</tr>
<tr>
<td></td>
<td>Peak Acquisition Current (^{(1)})</td>
<td></td>
<td>120mA</td>
<td>130mA</td>
</tr>
<tr>
<td></td>
<td>Average Acquisition Current (^{(2)})</td>
<td></td>
<td>60mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tracking Current (^{(3)})</td>
<td></td>
<td>40mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Standby Current (^{(4)})</td>
<td></td>
<td>20 µA</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{cc}</td>
<td>Power Supply GSci500x</td>
<td>-0.3</td>
<td>1.95</td>
<td>V</td>
</tr>
<tr>
<td>V_{in}</td>
<td>Voltage to any input pin</td>
<td>-0.3</td>
<td>+2.0</td>
<td>V</td>
</tr>
<tr>
<td>I_{out}</td>
<td>Input current on any pin</td>
<td>-10</td>
<td>+10</td>
<td>mA</td>
</tr>
<tr>
<td>I_{tdv}</td>
<td>Absolute sum of all input currents during overload condition</td>
<td>200</td>
<td>mA</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Operating temperature</th>
<th>-30 … +85°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating humidity</td>
<td>Max. 85% r. H., non-condensing, at 85°C</td>
</tr>
</tbody>
</table>

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.

\[
\begin{align*}
10 \text{ m position deviation} &\approx 33 \text{ ns} \ 1\text{PPS deviation (typically)} \\
100 \text{ m position deviation} &\approx 333 \text{ ns} \ 1\text{PPS deviation (typically)}
\end{align*}
\]

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)
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