



GPS Receivers A1082-A

A description of Tyco Electronics'
GPS module A1082-A

User's Manual

Version 1.0
Hardware Revision 01

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Revision History

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1.0	25-10-07	Initial Draft.
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1 Introduction

Tyco Electronics' GPS module A1082-A is a highly integrated GPS receiver module that can be used as an SMT component. It is capable to receive signals from up to 12 GPS satellites and transferring them into position and timing information that can be read over a serial port. This new generation of GPS module combines small size and high-end GPS functionality at lowest power consumption:

- Operable at 1.8V / 65mW (typ.) @ trickle power mode
- Small form factor of 13.97 x 11.43 mm (0.55" x 0.45")
- Cost-effective antenna input
- Single-sided SMD-**BGA** component, for reflow soldering
- Tape & reel packaging

The A1082-A GPS receivers are available as off-the-shelf component, 100% tested and shipped in standard tape-and-reel package.

1.1 Label

The A1082-A label holds the following information:



Hardware
rr: Hardware Ausgabe / Hardware Release

Software
tt: Software Release
sss: Software Version

Datecode and Location
BZ: Munich / YK: Bicske
ww: Woche / week
yy: Jahr / Year

Figure 1: A1082-A label

1.2 Characteristics

The modules are characterized by the following parameters.

1.2.1 GPS Characteristics

Channels		12, parallel tracking
Correlators		20.000
Frequency		L1 (= 1575 MHz)
Tracking Sensitivity		-157dBm
Horizontal Position Accuracy	Stand alone ⁽⁵⁾	< 2,5m CEP (SA off)
Time To First Fix – TTFF (theoretical minimum values; values in real world may differ)	Obscuration recovery ⁽¹⁾	0.1s
	Hot start ⁽²⁾	< 1s
	Warm ⁽³⁾	< 35s
	Cold ⁽⁴⁾	< 37s

Table 1: A1082 GPS characteristics

- (1) The calibrated clock of the receiver has not stopped, thus it knows precise time (to the μ s 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.
- (5) CEP 50% 24 hours static

1.2.2 Mechanical Characteristics

A1082-A Mechanical dimensions	Length	13.97mm, 0.55"
	Width	11.43mm, 0.45"
	Height	2.4mm, 0.095"
A1082-A Weight		1g, < 0.05oz

Table 2: A1082-A dimensions and weight

1.3 Handling Precautions

The GPS receiver module A1082-A is sensitive to electrostatic discharge (ESD). Please handle with appropriate care.

2 Ordering Information

2.1 GPS Receiver A1082-A

The order number is built as follows:

- **V23993A1082A**

V23993 stands for Tyco Electronics wireless and communication products, A1082A for the A1082-A module.

2.2 Packing

2.2.1 Packaging of the A1082-A

The A1080-A GPS module comes in a tape and reel package suitable for pick and place machines.

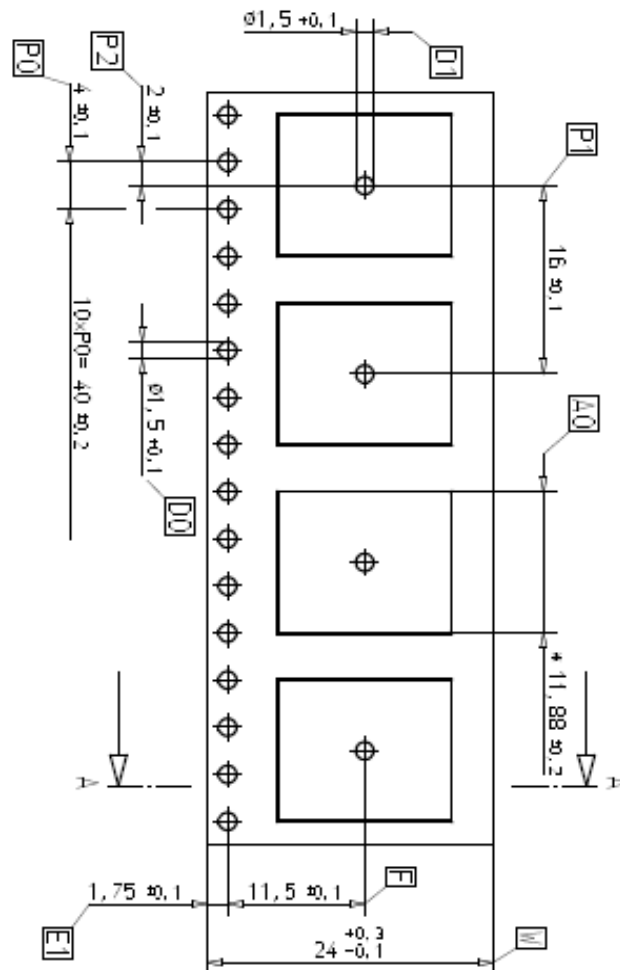


Figure 2: A1082-A tape specifications (1)

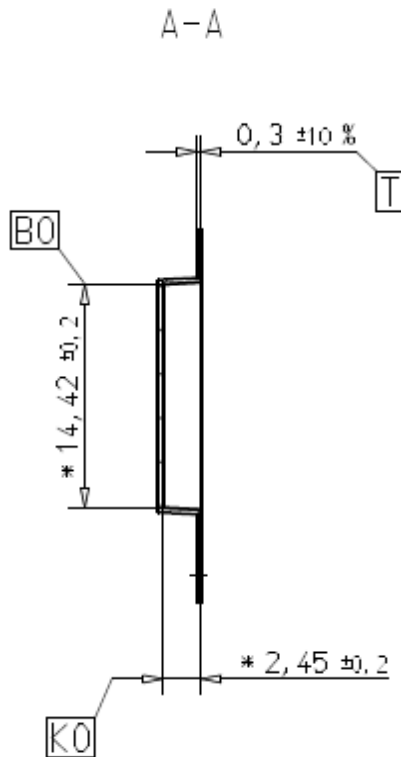


Figure 3: A1082-A tape specifications (2)

2.3 Additional Equipment

V23993EVA1082A	Evaluation Kit (including one module V23993A1082A)
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Table 3: Additional equipment

A detailed description of the additional kit can be found in the according manuals.

3 Quick Start

In order to allow an easy and quick start with the modules A1082-A, this chapter provides a short overview on the most important steps to receive NMEA messages with position information on a serial port.

3.1 Minimum Configuration

The following picture shows a recommended minimum configuration for NMEA output and commands sent and received via an RS232 interface based on the GPS module A1082-A.

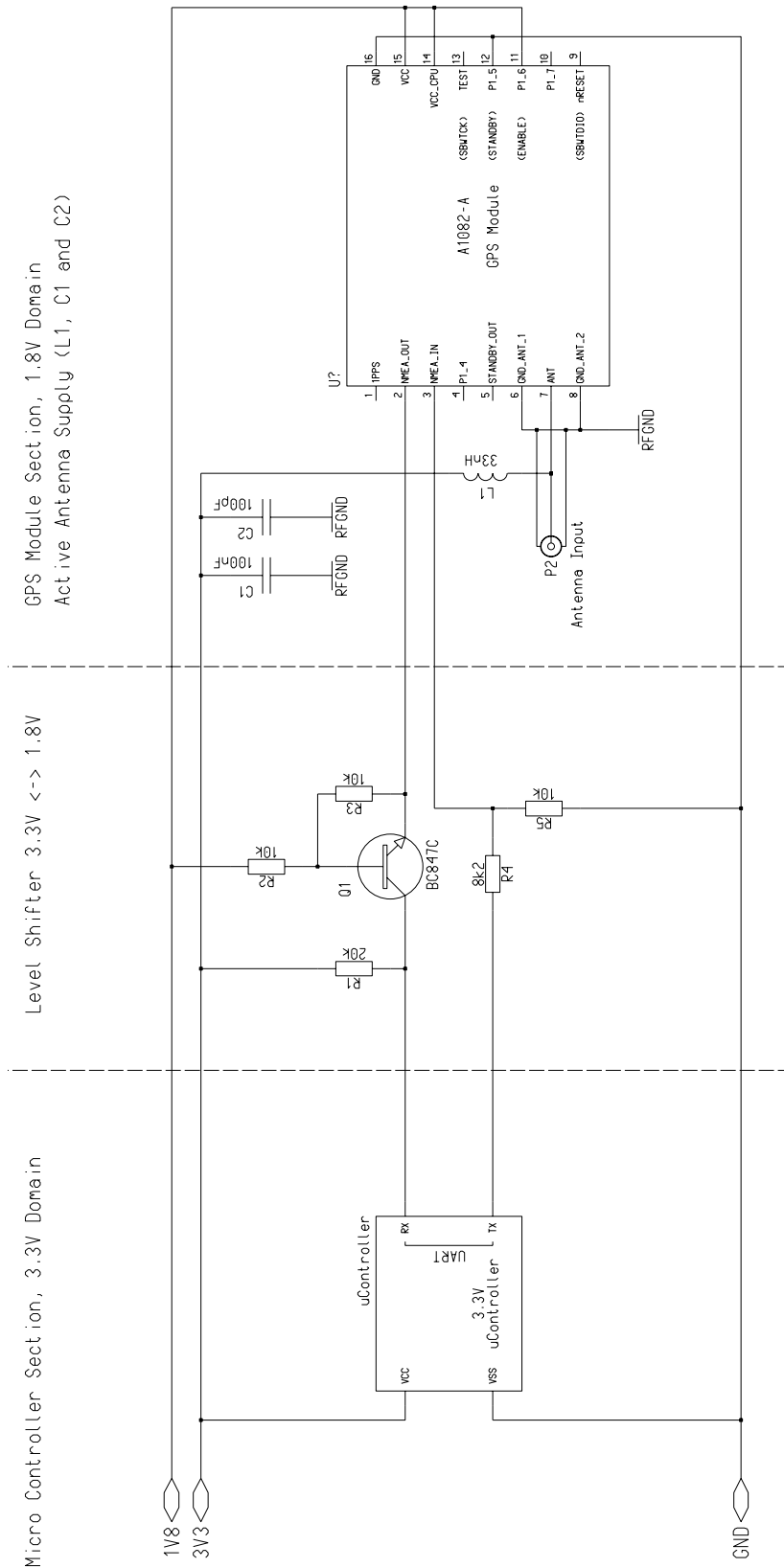


Figure 4: Recommended minimum configuration A1082-A

3.2 Antenna

The A1082-A GPS module is optimized for active antennas.

3.3 Serial Port Settings

The default configuration within the standard GPS firmware is:

- Serial 0 (NMEA) 4,800 baud, 8 data bits, no parity, 1 stop bit, no flow control

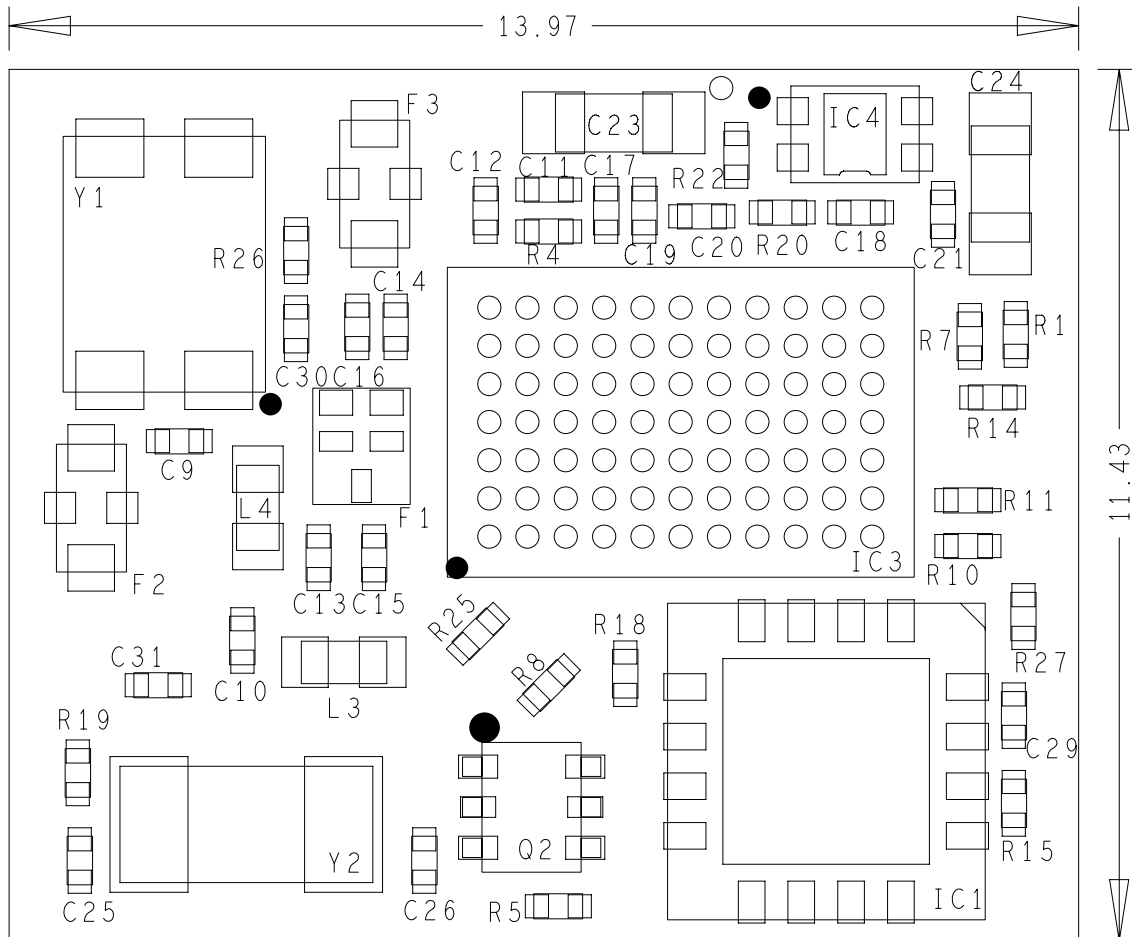
3.4 Improved TTFF

In order to improve the TTFF (Time To First Fix), it is recommend to keep the Vcc & VCC_CPU all the time and use Enable PIN (see chapter 10.1 Enable Pin) or software standby function.

Please see Firmware User manual for details.

4 Mechanical Outline

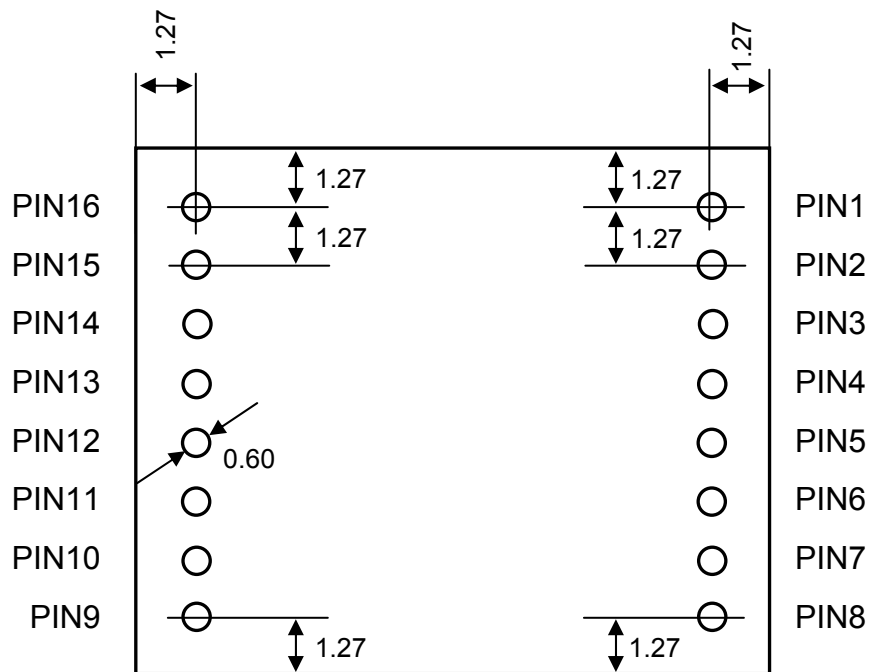
4.1 Details Component Side A1082-A



All dimensions in [mm, (inch)]

Figure 5: Mechanical outline component side A1082-A

4.2 Details Solder Side A1082-A



Solder pad size: \varnothing 0.6mm
All dimensions in [mm]

Figure 6: Mechanical outline solder side A1082-A

5 Pin-out Information

5.1 Layout A1082-A

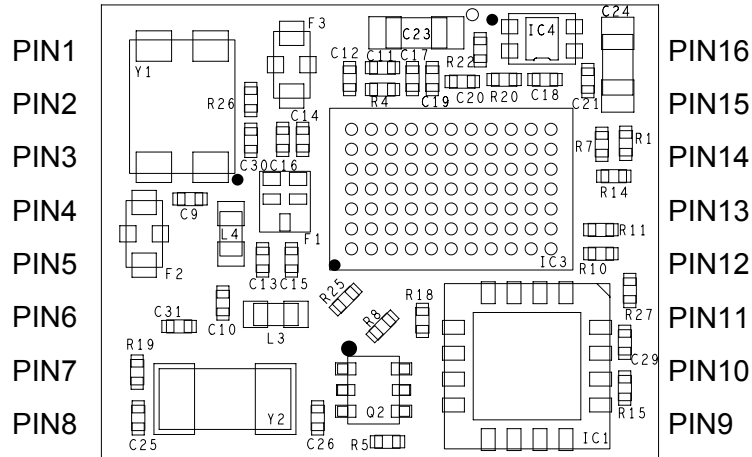


Figure 7: Pin-out information A1082-A

5.2 Description A1082-A Signals

PIN	Name	Function	Comment
1	1PPS	Output	1 Pulse Per Second
2	TX0	Output	NMEA 4800 baud output
3	RX0	Input	NMEA 4800 baud input
4	Reserved	Input	Reserved (leave open)
5	FDOUT	Output	Low power (trickle, standby) indicator
6	GND_ANT	RF GND	Antenna Ground, do not connect to GROUND, connect to antenna shield
7	RF_IN	Input	RF input (Antenna input , Z=50 Ohm)
8	GND_ANT	RF GND	Antenna Ground, do not connect to GROUND, connect to antenna shield
9	Reserved	Input/Output	Reset (leave open)
10	Reserved	Input	Reserved (leave open)
11	P1.6	Input	Enable (low active)
12	P1.5	Input	Standby (high active)
13	Reserved	Input	SBWTCK (do not connect)
14	VCC_CPU	Power	Vcc 1.8V (+/- 5%)
15	VCC	Power	Vcc 1.8V (+/- 5%)
16	GND	GND	Ground

Table 4: Pin description A1082-A

5.3 General Comments

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

- Standard configuration of serial port (standard GPS software):
Serial 0 (NMEA) 4,800 baud, 8 data bits, no parity, 1 stop bit, no flow control
- Antenna (Antenna connected to Antenna Pin)
Use ground pins (PIN6, PIN8) close to the antenna input for RF ground.

6 Electrical Characteristics

6.1 Operating Conditions

Pin	Description	Min	Typical	Max
7	V_{cc}	1.75V	1.8V	1.85V
	Peak Acquisition Current ⁽¹⁾		110mA	120mA
	Tracking Current ⁽²⁾		50mA	60mA
	Tracking Current, trickle mode ⁽³⁾		35mA	50mA
	Standby Current ⁽⁴⁾		30 μ A	

Table 5: A1082 electrical characteristics

- (1) Peak acquisition current is characterized by millisecond bursts above average acquisition current
- (2) Tracking current typically includes tracking and the post acquisition portion of TTFF
- (3) Tracking current with activated trickle power mode (standard configuration)
- (4) During standby state: RTC block and core powered on and clock off.

6.2 Typical Operating Conditions

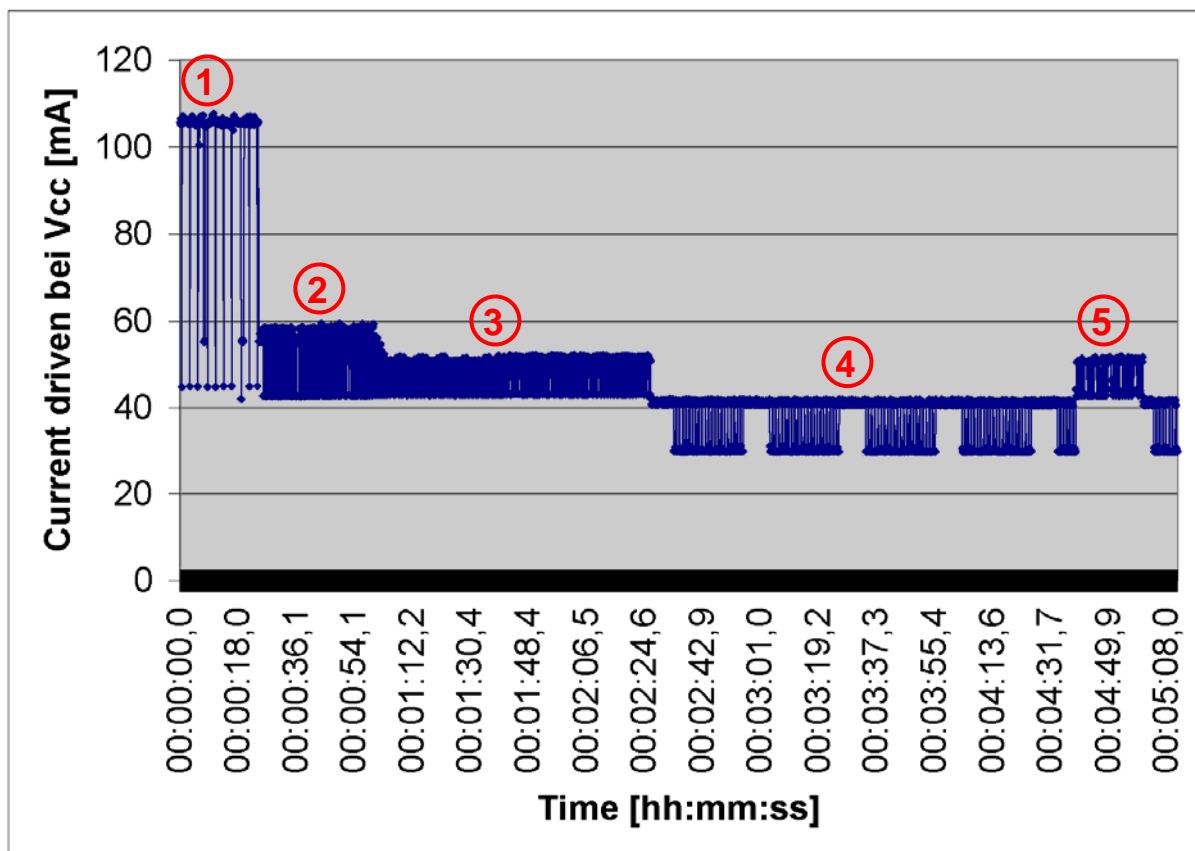


Figure 8: typical operating condition A1082-A

- ① Acquiring first satellite (cold start only)
- ② Acquiring all satellites which are necessary to calculate a fix (cold start only)
- ③ Ephemeris download from all visible satellites
- ④ Trickle power mode
- ⑤ Hot start after resetting the module

6.3 Absolute maximum ratings

Symbol	Parameter	Min	Max	Unit
V_{CC}	Power Supply GSCi500x	-0.3	+1.85	V
V_{CC_CPU}	Power Supply host processor	-0.3	+1.85	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 6: 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

This chapter covers the mounting of the A1082-A.

7.1 Proposed Footprint for Soldering

The following proposal of a footprint for soldering is assuming a stencil thickness of 150µm. ✕ marks the center of the through holes.

TBD

Figure 9: Soldering footprint proposal A1082-A

Please note that copper and solder paste footprint are identical. The final footprint has to be evaluated and qualified by the manufacturer according to the specific processes.

7.2 Recommended Profile for Reflow Soldering

Typical values for reflow soldering of the module in convection or IR/convection ovens are as follows:

Peak temperature (RoHS compliant process)	245°C
Average ramp up rate to Peak (183°C to Peak)	3°C / second max.
Preheat temperature 125 (±25°C)	120 seconds max.
Temperature maintained above 183°C	60 ... 150 seconds
Time within 5°C of actual peak temperature	10 ... 20 seconds
Ramp Down rate	6°C / second max.
Time 25°C to peak temperature	6 minutes max.

Table 7: Reflow soldering profile A1082-A

As results of soldering may vary among different soldering systems and types of solder and depend on additional factors like density and types of components on board, the values above should be considered as a starting point for further optimization.

8 Use of Antenna

8.1 Connection of RF Signal

The ANT pin is used to connect the receiver with the GPS antenna. The design of the antenna connection has to be done strictly according to RF design rules. A 50Ω PCB strip line is required. The following drawings shall explain the guidelines. A major rule is to keep the strip line as short as possible. Additionally, antenna ground (GNDANT) should be routed to the ground plane of the PCB (the ground plane is on a lower PCB layer) by via as demonstrated in the drawing.

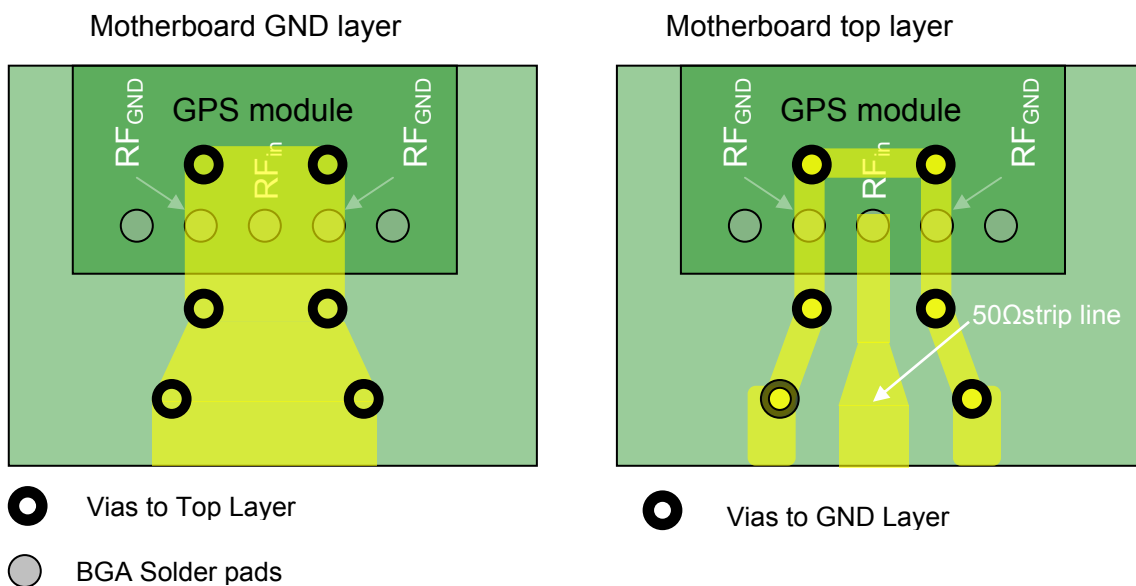


Figure 10: Antenna connector strip line A1082-A

In order to gain the impedance of 50Ω, the width of the strip line needs to be calculated. It depends on the thickness or height of the PCB layer (both parameters are shown in following drawing). For the calculation, it is assumed that the PCB material is FR4.

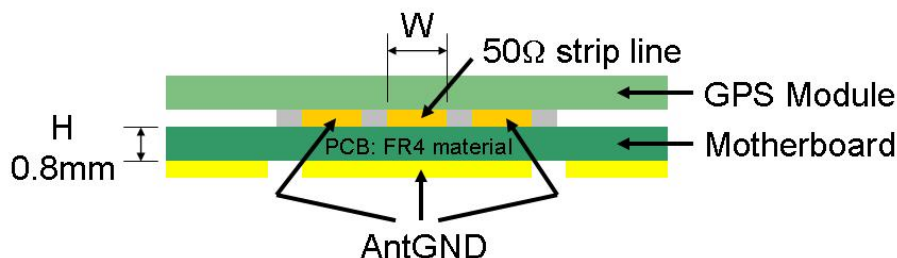


Figure 81: Strip line parameters A1082-A

In this case, the width should be about 1.8 times the height of the PCB:

$$W = 1.8 \times H$$

In the example, one would get a width of $W = 1.8 \times 0.8\text{mm} = 1.44\text{mm}$.

9 Quality and Reliability

9.1 Environmental Conditions

Operating temperature	-40 ... +85°C
Operating humidity	Max. 85% r. H., non-condensing, at 85°C
MSL JEDEC (Moisture Sensitivity Level)	3
Storage	6 months in original package.

Table 8: Environmental conditions

9.2 Product Qualification

Prior to product qualification the GPS receiver is preconditioned according to EIA/JEDEC standard JESD22-A113-B / Level 3.

Basic qualification tests:

- MSL Classification according to J-STD-020C (MSL3 @ 245°C)
- MSL Rework Compatibility according to J-STD-020C
- Temperature Cycling -40°C ... +85°C
- Temperature Humidity Bias 70°C / 85% RH
- High / Low Temperature Operating -40° / +85°C
- High Temperature Operating Life +85°C
- Vibration Variable Frequency
- Mechanical Shock

Please contact Tyco Electronics for detailed information.

9.3 Production Test

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

Demonstration Kits

9.4 Evaluation Kit A1082-A

For demonstration and easy evaluation of GPS performance Tyco Electronics offers a Demonstration Kit (including one GPS A1082-A 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. Accompanied by an antenna it offers a ready-to-go set.

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

For further information please contact Tyco Electronics.

10 Application and Hints

10.1 Enable PIN (P1.6)

The Enable PIN is an input PIN and low 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.

10.2 1PPS 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 A1082-A modules.

10.3 Standby PIN (P1.5)

The Standby pin is an input pin and high active.

Pulling Standby pin to high will activate trickle power mode with factory preset variables. Please see Firmware manual A1082-A.

10.4 FDOUT PIN

FDOUT Pin is an output pin.

FDOUT indicates active low power modes (trickle, standby). Typical application to use this pin is to deactivate external LNA or active antenna to reduce power consumption to minimum.

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.

Anyway, inputs about errors or mistakable verbalizations and comments or proposals to TYCO Electronics, Power Systems in Munich, Germany, for further improvements are highly appreciated.

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11.2 Related Documents

- Manual: Instant GPS IC Interface Control Drawing manual (SiRF)

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