PmodGPS™ Reference Manual

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Note: This document applies to REV A of the board.

DIGILENT®
www.digilentinc.com
1300 NE Henley Court, Suite 3
Pullman, WA 99163
(509) 334 6306 Voice | (509) 334 6300 Fax

Overview

The PmodGPS is an ideal solution for any embedded system in need of satellite positioning accuracy. It features the GlobalTop Gms-u1LP GPS antenna module which utilizes the MediaTek GPS MT3329.

Features include:

- standard UART interface
- input voltage: 3V – 3.6V
- 10Hz maximum update rate (1Hz Default rate)
- 3m 2D accuracy without aid
- super low power consumption (24mA tracking and 30mA during acquisition)
- ultra-high sensitivity: -165dBm
- 515m/s maximum velocity and 18,000m maximum altitude
- integrated ceramic GPS antenna
- auto switchover to external antenna
- 12.5mm coin cell retainer for battery backup of GPS RTCC and almanac

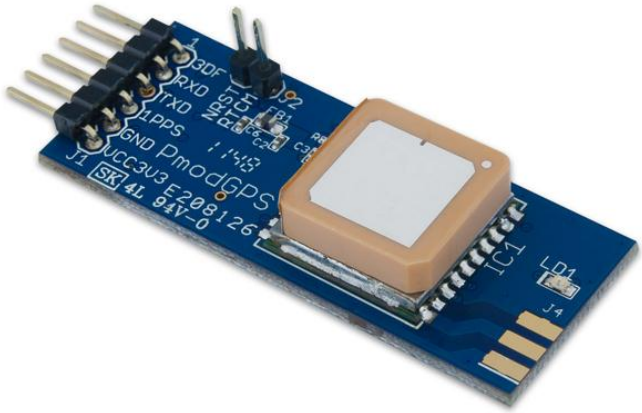
Functional Description

The Pmod GPS utilizes a standard 6-pin connector and communicates via 2-wire UART. Also available on the board is a 2-pin connector for control of the NRST pin to the module and also the RTCM pin for DGPS data of RTCM protocol (this feature is disabled by default, contact GlobalTop to enable).

Interface

The PmodGPS uses UART protocol for data transmission and reception. By default, the interface uses a baud rate of 9600, 8 data bits, no parity, and a single stop bit. The module provides the option for changing the baud rate to predefined values which range from 4800 to 115,200.

The reset pin (NRST) on J2 is active low. If the NRST pin is toggled, the device will undergo a full reset. This reset performs



similarly to a power cycling of the device. The 1PPS pin on J1 provides a one pulse-per-second output which is synchronized to GPS time. See the timing diagram in fig.1 for a visual representation.

1PPS Timing Diagram

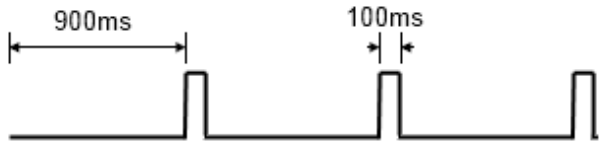


Figure 1 – 1PPS Pin

The 3DF pin on J1 indicates a positional fix. . When the module has a fix (2D or 3D) this pin is held low, if the module is unable to get a fix then the pin will toggle every second as seen below in the diagram. LD1 also follows this same behavior pattern in order to give the user a visual representation.

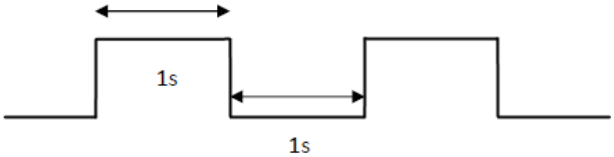


Figure 2 – 3DF Pin output without a fix

The PmodGPS also comes with a coin cell retainer designed for a 12.5 mm coin cell battery. By installing a 3V coin cell battery the user can significantly reduce the amount of time that it takes to acquire the first fix. When a battery is installed the module may be able to perform a hot start or a warm start instead of a cold start when power is first applied to VCC.

Note: The ground square solder pad of the coin cell retainer may have an oxide build up that will keep the battery from making a good connection. The user should simply scuff up the square solder pad inside J3 to remove any buildup. This can also occur if there has not been a battery in the retainer for a while.

A cold start takes 1-2 minutes while outside in good conditions, and can take several minutes more if conditions are worse or the module is indoors. A hot start takes 3-5 seconds, and a warm start varies depending on how long the module has sat unpowered. To cause a hot start, the module must have acquired a fix within approximately the last two hours and the backup power (coin cell battery) must be supplied. A warm start occurs when the battery is still supplied but it has been more than two hours since last power on.

If the user desires, an external antenna can be used by installing a Linx Technologies Inc. CONSMA 003.062 module on header J4. In some conditions, the antenna can speed up acquisition, especially if the antenna is outdoors while the module is indoors.

For data output from the module, the PmodGPS uses sentences based on the NMEA protocol. Each NMEA message starts with a ($) dollar sign. The next five characters will be the talker ID and the arrival alarm. In the case of this module, the talker ID will be “GP” and the arrival alarm will be the specific sentence output descriptor. Following this are the individual data fields each separated by a comma. After the data fields there is an asterisk followed by the checksum. A sentence is ended with <CR><LF>. For example output sentences, see the end of this manual.

It is possible to configure some of the characteristics of the device by writing command packets to the module. However, this functionality is more advanced and not all of the command packets are openly distributed. In order to change the baud rate to 38,400 (minimum baud for 10Hz data acquisition) the user must send the module “$PMTK251,38400*27<CR><LF>” over the UART. The “*27” corresponds to a checksum, if a different baud is desired to be substituted, a new checksum must be calculated using GlobalTop’s Checksum Tool. The command for changing the data acquisition to 10Hz from 1Hz is “$PMTK226,3,30*4<CR><LF>” (the same checksum process applies here). For more information on the individual command packets contact GlobalTop for their complete command list or see the FAQ for how to change the baud rate.

Interface Connector Signal Description

Connector J1		
Pin	**Signal**	**Description**
1	3DF	3D-Fix Indicator
2	RX	Receive
3	TX	Transmit
4	1PPS	1 Pulse Per Second
5	GND	Power Supply Ground
6	VCC	Power Supply (3.3v)

Connector J2		
Pin	**Signal**	**Description**
1	~RST	Reset (active low)
2	RTCM	DGPS data pin (contact GlobalTop for use)

For more information on the GPS module interface, see the Gms-U1LP datasheet available online or from GlobalTop at www.gtop-tech.com.

Output Sentences

GGA

```
$GPGGA,064951.000,2307.1256,N,12016.4438,
E,1,8,0.95,39.9,M,17.8,M,,*65<CR><LF>
```

Example	Description
$GPGGA	Message ID
064951.000	UTC Time (hhmmss.sss)
2307.1256	Latitude (ddmm.mmmm)
N	N/S indicator
12016.4438	Longitude (dddmm.mmmm)
E	E/W indicator
1	Position Fix Indicator
8	Satellites used
0.95	HDOP
39.9	MSL Altitude
M	Units
17.8	Geoidal Separation
M	Units
	Age of Diff. Corr.
*65	Checksum
<CR><LF>	End of message indicator

GSA

```
$GPGSA,A,3,29,21,26,15,18,09,06,10,,,,,
2.32,0.95,2.11*00<CR><LF>
```

Example	Description
$GPGSA	Message ID
A	Mode1 (see GlobalTop manual)
3	Mode2 (see GlobalTop manual)
29	Satellite used (CH1)
21	Satellite used (CH2)
….	
	Satellite Used (Ch12)
2.32	PDOP
0.95	HDOP
2.11	VDOP
*00	Checksum
<CR><LF>	End of message indicator

GSV

```
$GPGSV,3,1,09,29,36,029,42,21,46,314,43,
26,44,020,43,15,21,321,39*7D<CR><LF>
```

Example	Description
$GPGSV	Message ID
3	Number of Messages
1	Message Number
09	Satellites in View
29	Satellite ID (CH1)
36	Elevation (CH1)
029	Azimuth (CH1)
42	SNR (C/No)
….	
15	Satellite ID CH(4)
21	Elevation (CH4)
321	Azimuth (CH4)
39	SNR (C/No)
*7D	Checksum
<CR><LF>	End of message indicator

RMC

```
$GPRMC,064951.000,A,2307.1256,N,12016.443
8,E,0.03,165.48,260406,3.05,W,A*55<CR><LF>
```

Example	Description
$GPRMC	Message ID
064951.000	UTC Time (hhmmss.sss)
A	Status (A = data valid)
2307.1256	Latitude (ddmm.mmmm)
N	N/S indicator
12016.4438	Longitude (dddmm.mmmm)
E	E/W indicator
0.03	Speed over ground (knots)
165.48	Course over ground (degrees)
260406	Date (ddmmyy)
3.05	Magnetic Variation (degrees)
W	E/W indicator
A	Mode (see GlobalTop manual)
*55	Checksum
<CR><LF>	End of message indicator

VTG

```
$GPVTG,165.48,T,,M,0.03,N,0.06,K,A*37<CR>
<LF>
```

Example	Description
$GPVTG	Message ID
165.48	Course (degrees)
T	Reference (true or false)
	Course (degrees)
M	Reference (Magnetic)
0.03	Speed
N	Units (N = knots)
0.06	Speed
K	Units (K = km/hr)
A	Mode (see GlobalTop manual)
*37	Checksum
<CR><LF>	End of message indicator