

MG-S01SP

SiRF Star III LowPower GPS Module



User's Manual Ver 1.02

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1. Introduction

1.1. Overview

Modulestek GPS module **MG-S01SP** is a high sensitivity, compact size, plug & play also the Low Power consumption GPS module board designed for a broad spectrum of OEM system applications. This product is based on the SiRF Star III technology and it will track up to 20 satellites at a time while providing fast time-to-first-fix. Its far reaching capability meets the sensitivity & accuracy requirements of car navigation as well as other location-based applications, such as AVL system. Handheld navigator, PDAs, Wrist Watches, Personal Locators, Toll collection, Fleet Management, pocket PC, or any battery operated navigation system.

The **MG-S01SP** design utilizes the latest surface mount technology and high level circuit integration to achieve superior performance while minimizing dimension and power consumption. This hardware capability combined with software intelligence makes the board easy to be integrated and used in all kinds of navigation applications or products.

1.2. Main Feature

- Built-in high performance SiRF Star III Low power chipset.
 - Built-in Ceramics Antenna; Low integration effort with Plug & Play GPS module.
 - Current consumption 40mA
 - 20 channels parallel.
 - Average Cold Start in 42 seconds.
 - -159 dBm sensitivity in tracking mode
 - NMEA0183 compliant protocol
 - Extreme fast TTFF at low signal level
 - Compact Size, Easy integration into hand-held device.
- MG-S01SP 19.0 x 19.0 x 6.5mm(18x18x2mm patch antenna)

2. Technical Specifications

2.1. Electrical Characteristics

General		Accuracy	
GPS Chip	SiRF Star III	Position	
Frequency	L1, 1575.42MHz	10 meters, 2D RMS 7 meters 2D RMS, WAAS corrected 1-5 meters, DGPS corrected	
C/A Code	1.023MHz chip rate	Velocity	0.1 m/sec
Channels	20 CH	Time	1ms synchronized to GPS time
Built-in 18 x 18 x 2 (mm) ceramics antenna		Datum	
		WGS-84	
Sensitivity		Dynamic Conditions	
To – 159Bm Tracking, Superior Urban Canyon Performance		Altitude	<18,000 m (60,000 feet)
Acquisition Rate		Velocity	<515 m/sec (1,000 knots)
Cold Start	42 sec, average	Acceleration	<4g
Warm Start	38 sec, average	Motional Jerk	<20 m/sec
Hot Start	6 sec, average	GPS Protocol	
Reacquisition	0.1sec, average	Default: NMEA-0183, GGA(1), GSA(1), GSV(5), RMC(1), Band rate 9600 bps, Data bit : 8, stop bit : 1	
Accuracy	Snap start 2 sec, average	Device Size	
Power		19.0 (L) x 19.0 (W) x 6.5 (H) mm	
Operation Power	3.3VDC+10%		
Current Consumption	40mA		
Backup Power	3.3V		
Environmental			
Operating Temperature	- 10 °C to + 60 °C	Accessories	
Relative Humidity	5% to 95% non-condensing		



3. Applications

MG-S01SP module board receiver is a high performance, ultra low power consumption, plug & play product. These applications are as follow.

- Car Navigation
- Wrist Watch
- Solar Operated Device
- Marine Navigation
- Fleet Management
- AVL and Location-Based Services
- Radar detector with GPS function
- Hand-Held Device for Personal Positioning and Navigation
- Ideal for PAD, Pocket PC and Other Computing Devices at GPS Application

4. Mechanical Dimensions

4.1. MG-S01SP

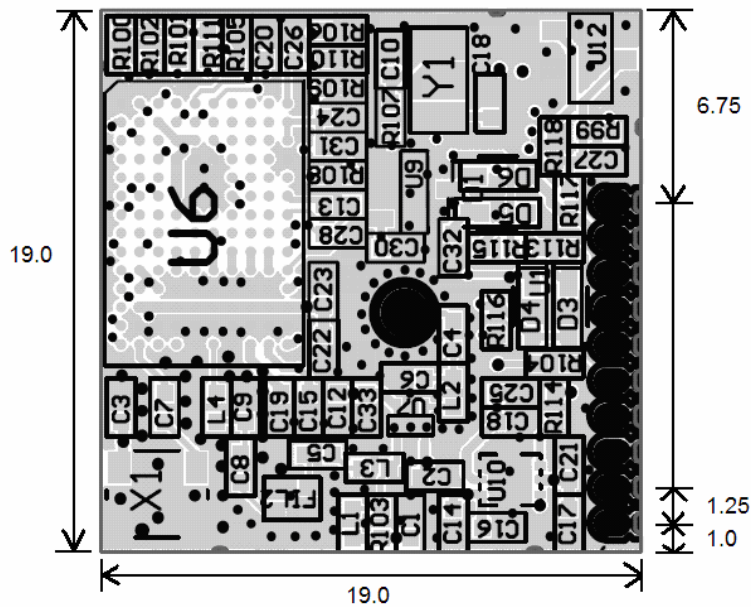
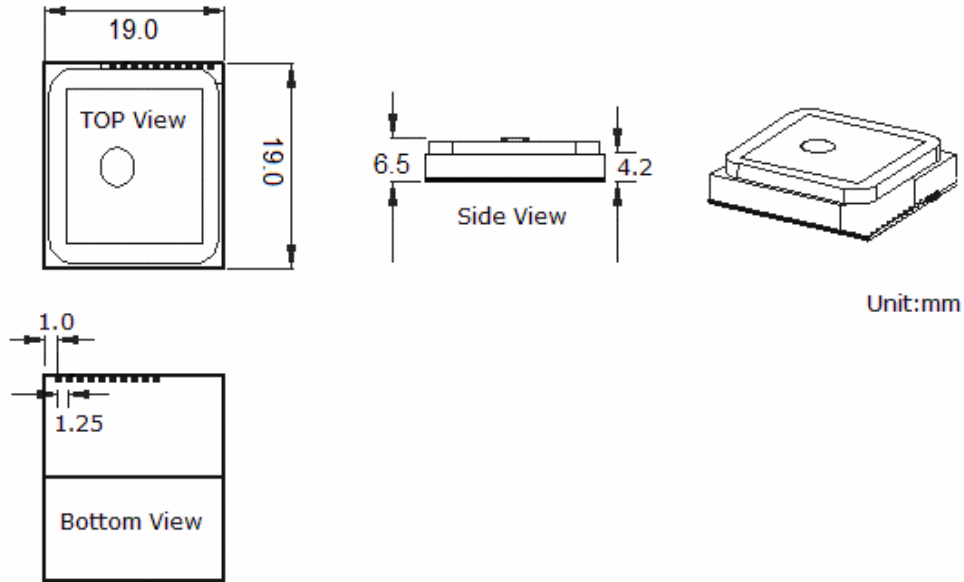
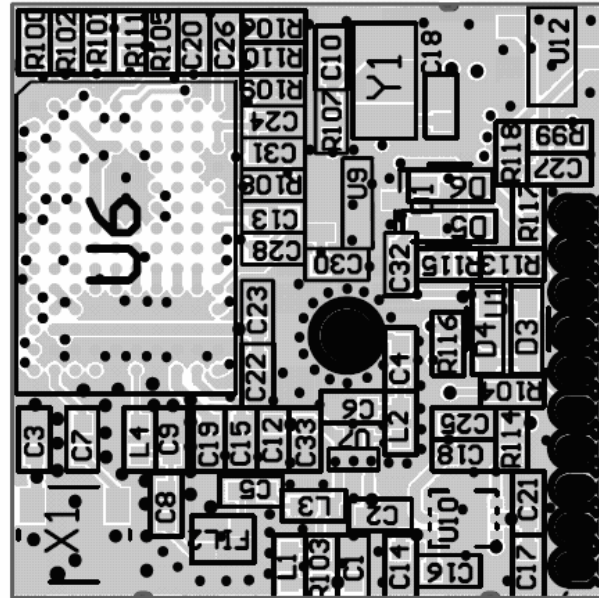


Figure 1: PCB Board dimensions (mm)

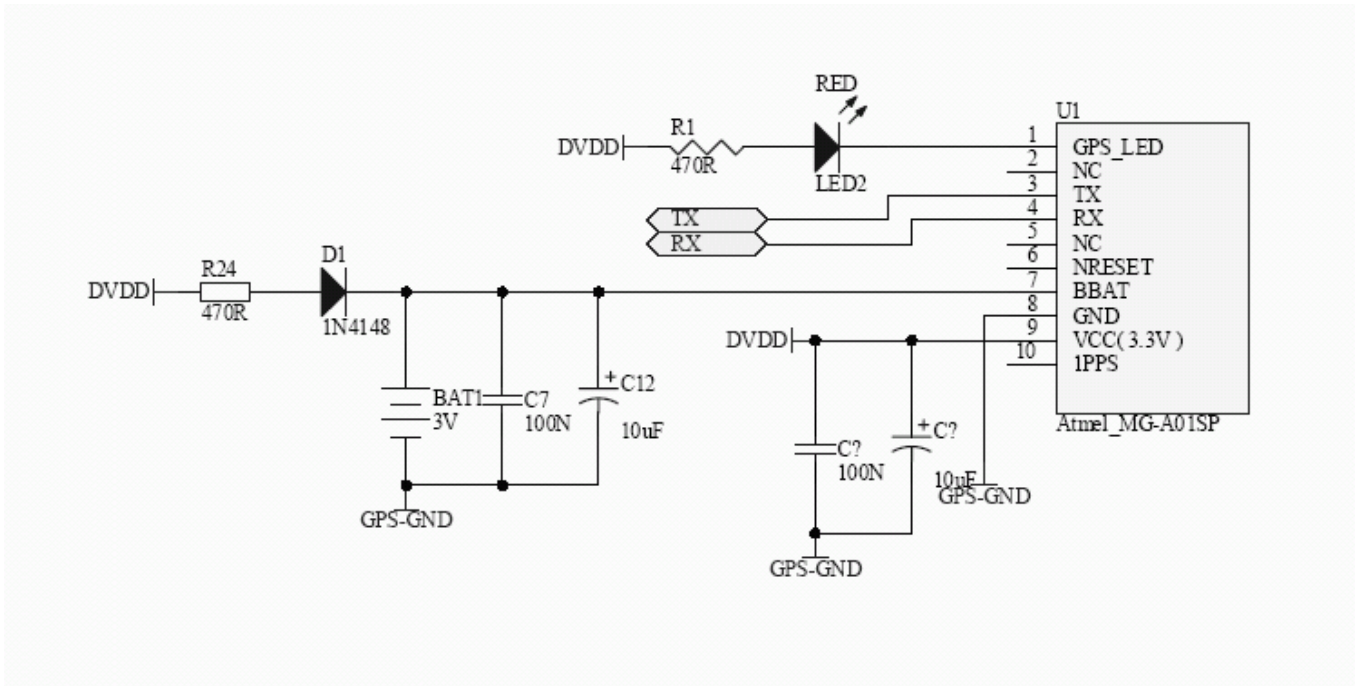
5. Board connections



- P10->1PPS
- P9->3.3V
- P8->DGND
- P7->BBAT
- P6->NRESET
- P5->Boot
- P4->RXD
- P3->TXD
- P2->NC
- P1->LED

PIN	Voltage level/ active level	Description
P1	LED	LED status
P2	TBD	Not to connect
P3	TxD2	USART2 Transmit
P4	RxD2	USART2 Receive.
P5	Boot	Not to connect (Reserved for firmware loading)
P6	NReset	Low level force reset
P7	BBat	Backup battery supply(1.95V~3.6V)
P8	DGND	Digital Ground
P9	3.3V	3.3V power supply
P10	1PPS	Time pulse signal

6. Application Schematic



Appendix A: Data Set

1. GGA data set

GGA--- Global Positioning System Fixed Data

Table 2 contains the values for the following example:

\$GPGGA,161229.487,3723.2475,N,12158.3416,W,1,07,1.0,9.0,M, , , 0000*18<CR> <LF>

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Position	161229.487		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		0 = invalid 1 = GPS fix (SPS) 2 = DGPS fix 3 = PPS fix 4 = Real Time Kinematic 5 = Float RTK 6 = estimated (dead reckoning) 7 = Manual input mode 8 = Simulation mode
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	meters	
Units	M	meters	
Geoid Separation		meters	
Units	M	meters	
Age of Diff. Corr.		second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message termination

2. GSA data set

GSA---GNSS DOP and Active Satellites

Table 5 contains the values for the following example:

\$GPGSA,A,3,07,02,26,27,09,04,15, , , , , 1.8,1.0,1.5*33<CR> <LF>

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1	A		M Manual- forced to operate in 2D or 3D mode A Automatic-allowed to automatically switch 2D/3D
Mode 2	3		1 Fix not available 2 2D 3 3D
Satellite Used in solution	07		Sv on Channel 1
Satellite Used in solution	02		Sv on Channel 2
Satellite Used			Sv on Channel 12
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR> <LF>			End of message termination

3. GSV data set

GSV---GNSS Satellites in View

Table 8 contains the values for the following example:

```
$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71
```

```
$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41<CR> <LF>
```

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Number of Messages1	2		Range 1 to 3
Message Number1	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1 (Range 1 to 32)
Elevation	79	Degrees	
Azimuth	048	Degrees	Channel 1 (Maximum 90)
SNR (C/No)	42	DBHz	Channel 1 (True, Range 0 to 359)
Satellite ID	27		Range 0 to 99, null when not tracking
Elevation	27	Degrees	Channel 4 (Range 1 to 32)
Azimuth	138	Degrees	Channel 4 (Maximum 90)
SNR (C/No)	42	DBHz	Channel 4 (True, Range 0 to 359)
Checksum	*71		Range 0 to 99, null when not tracking
<CR> <LF>			End of message termination

Depending on the number of satellites tracked multiple messages of GSV data may be required.

4. RMC data set

RMC---Recommended Minimum Specific GNSS Data

Table 9 contains the values for the following example:

\$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, ,*10<CR> <LF>

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E=east or W=west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation		degrees	E=east or W=west (Not shown)
Checksum	*10		
<CR> <LF>			End of message termination

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