



FGPSMOSL1 / FS01 Datasheet

Rev.A02

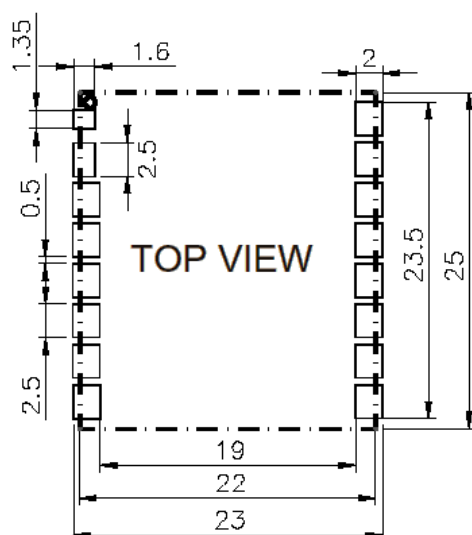
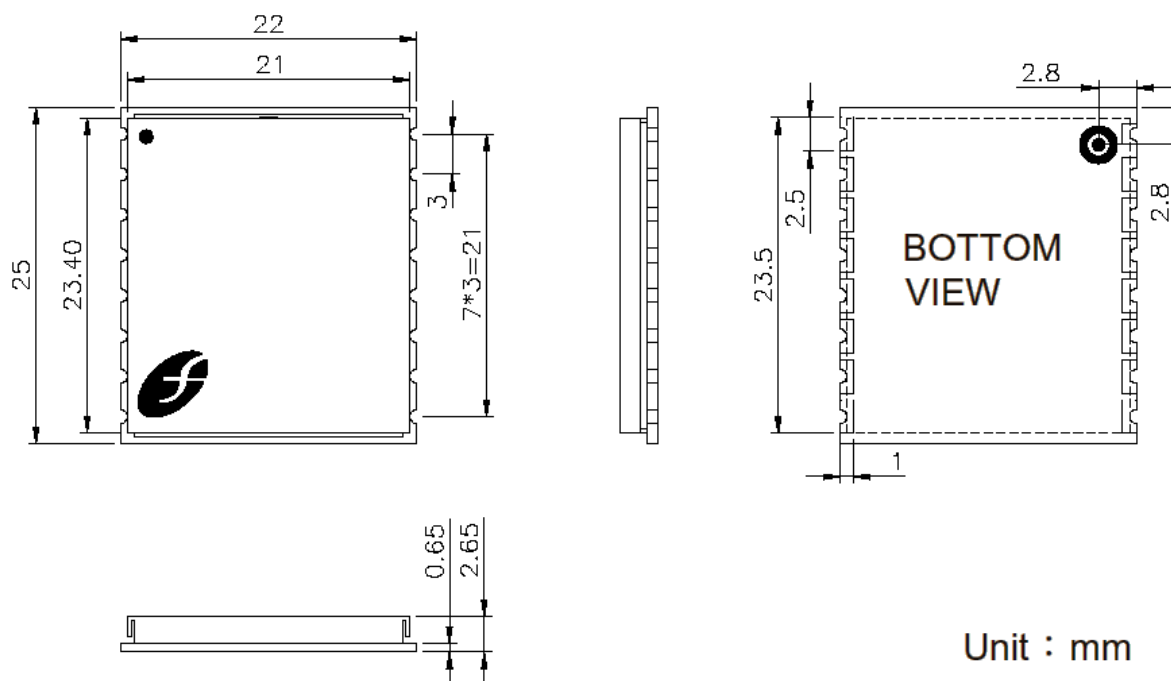
Description

The FS01GPS Receiver Module is a GPS receiver providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions. The GPS chipsets inside FS01 are designed by **SiRF Technology, Inc.**, which is the world's leading GPS solution provider. The chipset is **SiRF StarIII chipset**. The GPS solution enables small form factor devices. They deliver major advancements in GPS performances, accuracy, integration, computing power and flexibility. They are designed to simplify the embedded system integration process. The FS01 module is the best choice for you to design the GPS related products.

FS01 Features

- ✿ Based on **SiRF StarIII** Architecture.
- ✿ GPS chipset : GSC3F-7879
- ✿ High sensitivity : Up to -159 dBm tracking, superior urban performances
- ✿ Cold Start is under 41 seconds (Typical)
- ✿ Warm Start is under 37 seconds (Typical)
- ✿ Hot Start is under 1 seconds (Typical)
- ✿ Embedded ARM7TDMI
- ✿ Small form factor and low cost solution
- ✿ 4Mb internally packaged Flash memory for GPS navigation data
- ✿ GPS Data interface : TTL level serial port
- ✿ GPS Data Protocol : NMEA-0183
- ✿ RoHS compliant

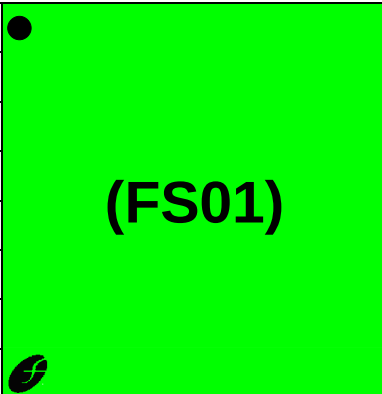
Dimensions



Recommended Solder Pad Layout

I/O Pin Definition

Pin	Name	Description	Note
1	Antenna_In	Antenna Input	DC output for active antenna
2	GND	Ground	GND for RF
3	GPIO_A	General Purpose I/O A	3D-fix indicator
4	GPIO_B	Not used	
5	GPIO_C	Not used	
6	GPIO_D	Not used	
7	1PPS	1PPS Time Mark Output	1 pulse per second
8	BOOTSET	Not used	
9	TXDA	Serial Data Output A	NMEA output
10	RXDA	Serial Data Input A	Firmware update
11	TXDB	Serial Data Output B	Not used
12	RXDB	Serial Data Input B	Not used
13	NRESET	Reset Input, Active Low	
14	BACKUP_PWR	Backup Power DC 3.3 V	Regulated DC supply from mother board
15	GND	Ground	GND for digital
16	VCC	+3.0 ~ 3.3V DC Power Input	Regulated DC supply from mother board

1	Antenna_In		16	VCC
2	GND		15	GND
3	GPIO_A		14	BACKUP_PWR
4	GPIO_B		13	NRESET
5	GPIO_C		12	RXDB
6	GPIO_D		11	TXDB
7	1PPS		10	RXDA
8	BOOTSET		9	TXDA



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Description of I/O Pin

Antenna_In (Pin1)

GPS analog signal input to the module. It also output DC 3.3V for active antenna.

GND (Pin2, Pin15)

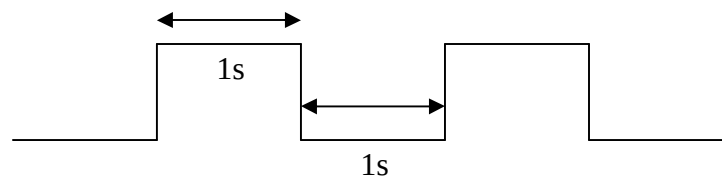
The analog ground and digital ground for the module. Connect all grounds.

GPIO_A (Pin3)

The GPIO_A was assigned as fix flag output.

n Before 2D Fix

The GPIO_A should continuously output one-second high-level with one-second low-level signal.



n After 2D or 3D Fix

The GPIO_A should continuously output low-level signal.

Low _____

GPIO_B (Pin4)

Not used.

GPIO_C (Pin5)

Not used.

GPIO_D (Pin6)

Not used.



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1PPS (Pin7)

This pin provides one pulse-per-second output from the module, which is synchronized to GPS time.

BOOTSET (Pin8)

No utilized, keep float.

TXDA (Pin9)

This is the UART transmitter of the module. It outputs the GPS information for application.

RXDA (Pin10)

This is the UART receiver of the module. It is used to receive software commands and firmware update.

TXDB (Pin11)

Not used.

RXDB (Pin12)

Not used.

NRESET (Pin13)

With a low level, it causes the module to reset. If not utilized, keep float.

BACKUP_PWR (Pin14)

This is the battery backup input that powers the GPS chipset and the RTC to keep the GPS data information when main power is removed.

It should be between DC 3.0V~3.3V.

VCC (Pin16)

The main DC power supply is DC 3.0V ~3.3V for the module.



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Specification

General	
Chipset	SiRF StarIII GSC3F-7879
Frequency	L1, 1575.42 MHz
C/A Code	1.023 MHz
Channels	20 channels
Dimensions	
Length/Width/Height	25/22/2.6 mm
Weight	4 g
Performance Characteristics	
Position Accuracy	10 meters, 2D RMS
	7 meters 2D RMS, WAAS corrected
	1-5 meters, DGPS corrected
Velocity Accuracy	0.1 meters/second
Timing Accuracy	1 microsecond synchronized to GPS time
Sensitivity	Tracking : -159dBm
Acquisition (Open sky, stationary)	
Reacquisition Time	0.1 sec (Typical)
Hot start	1 sec (Typical)
Warm start	37 sec (Typical)
Cold start	41 sec (Typical)
Dynamic	
Altitude	Maximum 18,000 m
Velocity	Maximum 515 m/s



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Acceleration	Maximum 4 g
Jerk	20 meters/second ³ ,max
Power	
Input Voltage	DC 3.0V~3.3V
Backup Voltage	DC 3.0V~3.3V
Power Consumption @ 3.3V	Acquisition : 63 mA Typical
I/O	
Map Datum	WGS-84
Signal Output	8 data bits, no parity, 1 stop bit
Available Baud Rates	4800/9600/38400/57600/115200 bps (Default : 9600)
Protocols	NMEA 0183 (Default : GGA,GSA,GSV,RMC,VTG)
Data output Interface	
Protocol messages	9600 bps/8/N/1 (Default)
Output format	GGA(1sec),GSA(1sec),RMC(1sec),VTG(1sec),GSV(5sec) (Default)
Environment	
Operating Temperature	-30 °C ~ 85 °C
Storage Temperature	-40 °C ~ 125 °C
Operating Humidity	5% ~ 95% (no condensing)



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NMEA Output Sentence

Table-1 lists each of the NMEA output sentences specifically developed and defined by SiRF Technology Inc. for use within SiRF products

NMEA Output Sentence		Table-1
Option	Description	
GGA	Time, position and fix type data.	
GSA	GPS receiver operating mode, active satellites used in the position solution, and DOP values.	
GSV	The number of GPS satellites in view satellite ID numbers, elevation, azimuth, and SNR values.	
RMC	Time, date, position, course and speed data. Recommended Minimum Navigation Information.	
VTG	Course and speed information relative to the ground.	

GGA—Global Positioning System Fixed Data. Time, Position and fix related data for a GPS receiver

Table-2 contains the values for the following example :

\$GPGGA,020111.000,2307.1207,N,12016.4421,E,1,05,1.6,34.2,M,17.8,M,,0000*63

GGA Data Format				Table-2
Name	Example	Units	Description	
Message ID	\$GPGGA		GGA protocol header	
UTC Time	020111.000		hhmmss.sss	
Latitude	2307.1207		ddmm.mmmm	
N/S Indicator	N		N=north or S=south	
Longitude	12016.4421		dddmm.mmmm	
E/W Indicator	E		E=east or W=west	
Position Fix Indicator	1		See Table-3	
Satellites Used	05		Range 0 to 12	



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HDOP	1.6		Horizontal Dilution of Precision
MSL Altitude	34.2	meters	Antenna Altitude above/below mean-sae-level
Units	M	meters	Units of antenna altitude
Geoidal Separation	17.8	meters	
Units	M	meters	Units of geoidal separation
Age of Diff. Corr.		second	Null fields when DGPS is not used
Differential reference station ID	0000		
Checksum	*63		
<CR> <LF>			End of message termination

Position Fix Indicator Table-3	
Value	Description
0	Fix not available
1	GPS fix
2	Differential GPS fix

GSA—GNSS DOP and Active Satellites

Table-4 contains the values for the following example :

\$GPGSA,A,3,10,02,04,17,13,,,,,,,,,5.9,1.6,5.7*38

GSA Data Format				Table-4
Name	Example	Units	Description	
Message ID	\$GPGSA		GSA protocol header	
Mode 1	A		See Table-5	
Mode 2	3		See Table-6	



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Satellite Used	10		SV on Channel 1
Satellite Used	02		SV on Channel 2
....			
Satellite Used			SV on Channel 12
PDOP	5.9		Position Dilution of Precision
HDOP	1.6		Horizontal Dilution of Precision
VDOP	5.7		Vertical Dilution of Precision
Checksum	*38		
<CR> <LF>			End of message termination

Mode 1		Table-5
Value	Description	
M	Manual—forced to operate in 2D or 3D mode	
A	2D Automatic—allowed to automatically switch 2D/3D	

Mode 2		Table-6
Value	Description	
1	Fix not available	
2	2D (< 4 SVs used)	
3	3D ($\geq$ 4 SVs used)	

GSV—GNSS Satellites in View

Table-7 contains the values for the following example :

\$GPGSV,3,1,11,10,48,255,37,04,47,036,37,02,46,342,38,17,37,140,37*7B

\$GPGSV,3,2,11,13,26,052,35,24,23,071,16,05,18,282,,28,38,178,10*73

\$GPGSV,3,3,11,23,18,077,,31,18,142,,20,13,038,*46

GSV Data Format				Table-7
Name	Example	Units	Description	
Message ID	\$GPGSV		GSV protocol header	
Number of	3		Range 1 to 3	



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Messages			<i>(Depending on the number of satellites tracked, multiple messages of GSV data may be required.)</i>
Message Number1	1		Range 1 to 3
Satellites in View	11		
Satellite ID	10		Channel 1 (Range 1 to 32)
Elevation	48	degrees	Channel 1 (Maximum 90)
Azimuth	255	degrees	Channel 1 (True, Range 0 to 359)
SNR (C/No)	37	dBHz	Range 0 to 99, (null when not tracking)
....			
Satellite ID	17		Channel 4 (Range 1 to 32)
Elevation	37	degrees	Channel 4 (Maximum 90)
Azimuth	140	degrees	Channel 4 (True, Range 0 to 359)
SNR (C/No)	37	dBHz	Range 0 to 99, (null when not tracking)
Checksum	*7B		
<CR> <LF>			End of message termination

RMC—Recommended Minimum Navigation Information

Table-8 contains the values for the following example :

\$GPRMC,020111.000,A,2307.1207,N,12016.4421,E,0.08,159.87,270406,,,A*65

RMC Data Format			Table-8
Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	020111.000		hhmmss.sss
Status	A		A=data valid or V=data not valid



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Latitude	2307.1207		ddmm.mmmmm
N/S Indicator	N		N=north or S=south
Longitude	12016.4421		dddmm.mmmmm
E/W Indicator	E		E=east or W=west
Speed Over Ground	0.08	knots	
Course Over Ground	159.87	degrees	True
Date	270406		ddmmyy
Magnetic Variation		degrees	E=east or W=west (SiRF Technology Inc. does support magnetic declination)
Mode	A		A=Autonomous, D=DGPS, E=DR
Checksum	*65		
<CR> <LF>			End of message termination

VTG—Course and speed information relative to the ground.

Table-9 contains the values for the following example :

\$GPVTG,159.87,T,,M,0.08,N,0.1,K,A*06

VTG Data Format			Table-9
Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course	159.87	degrees	Measured heading
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic (SiRF Technology Inc. does not support magnetic declination.)
Speed	0.08	knots	Measured horizontal speed
Units	N		Knots



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Speed	0.1	km/hr	Measured horizontal speed
Units	K		Kilometers per hour
Mode	A		A=Autonomous, D=DGPS, E=DR
Checksum	*06		
<CR> <LF>			End of message termination