

REB-1315S5 Operational Manual

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1. Introduction

RoyalTek REB-1315S5 is the GPS module of CSR SiRFstarV™. The module is powered by latest CSR SiRFstarV™ 5e-based chip, multi-GNSS platform and able to track GPS and Glonass constellation at the same time. With RoyalTek proprietary navigation technology that provides you stable and accurate navigation data. The suitable form factor and miniature design is the best choice to be embedded in a device such as portable navigation device, personal locator, speed camera detector and vehicle locator.

Product Features

- 2 52 track verification channels.
- 2 Support GPS, GLONASS, QZSS and being deployed for Compass and Galileo.
- 2 Support client-based and server-based SiRF InstantFix™ Extended Ephemeris (EE),
- 2 Embedded CGEE / SGEE (With back-end server support) to speed up TTFF performance.
- 2 Power supply 3.3V voltage.
- 2 SMT type with stamp holes
- 2 Small form factor with embedded SiRF Star V technology.
- 2 Removes in-band jammers up to 80 dB-Hz, tracks up to 8 CW jammers
- 2 Excellent sensitivity for urban canyon and foliage environments.

1.1 Product Applications

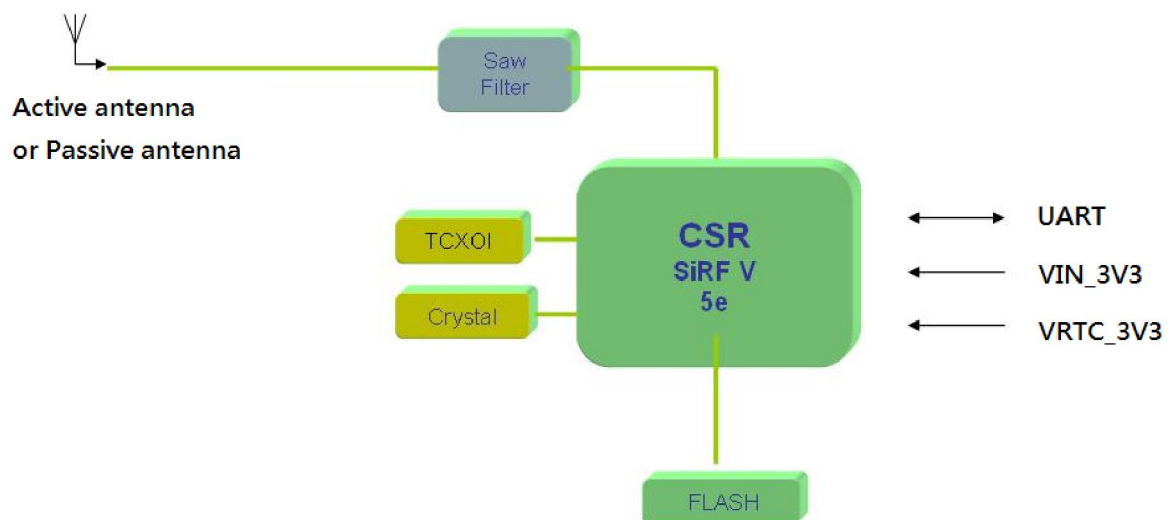
- 2 Automotive navigation
- 2 Personal positioning and navigation
- 2 Mobile gaming
- 2 Cameras
- 2 Asset Tracking
- 2 Others location-aware consumer devices

2. Product Pictures



3. REB-1315S5 Block Diagram

System block diagram description:



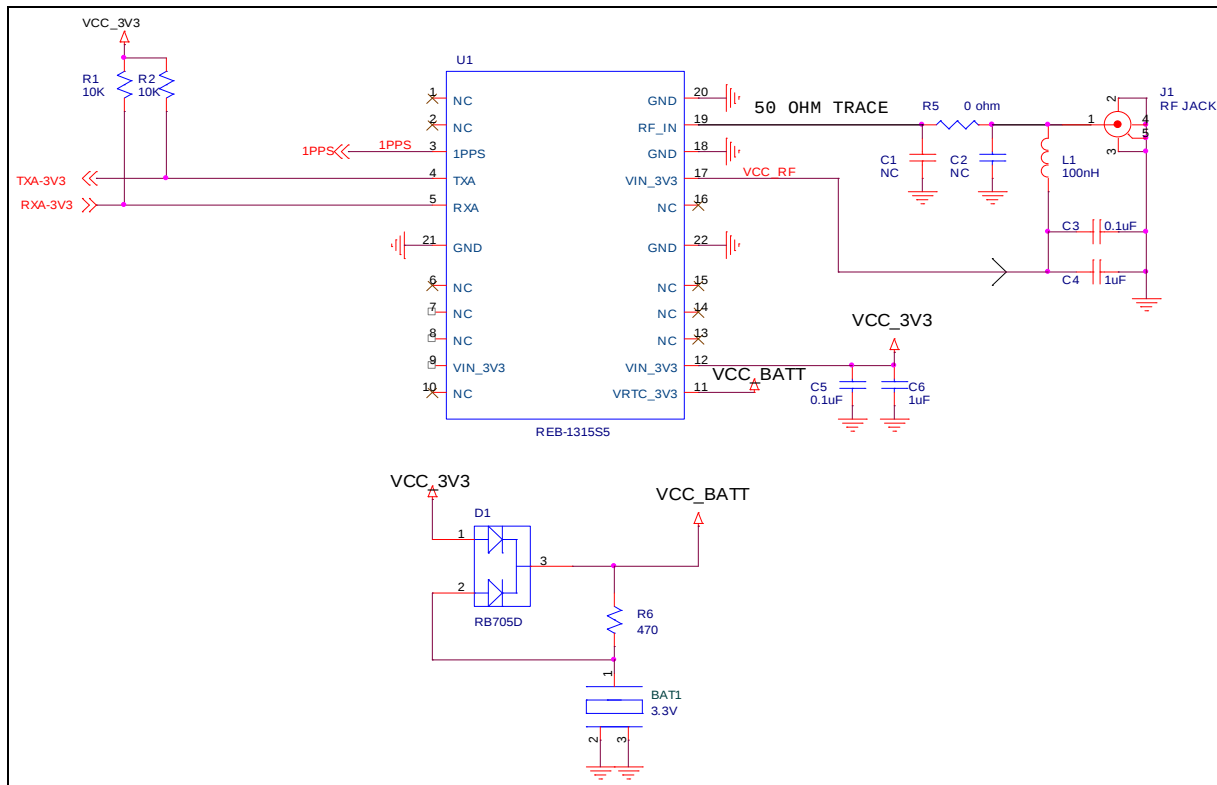
4. REB-1315S5 Technical Specification

Impedance : 50Ω

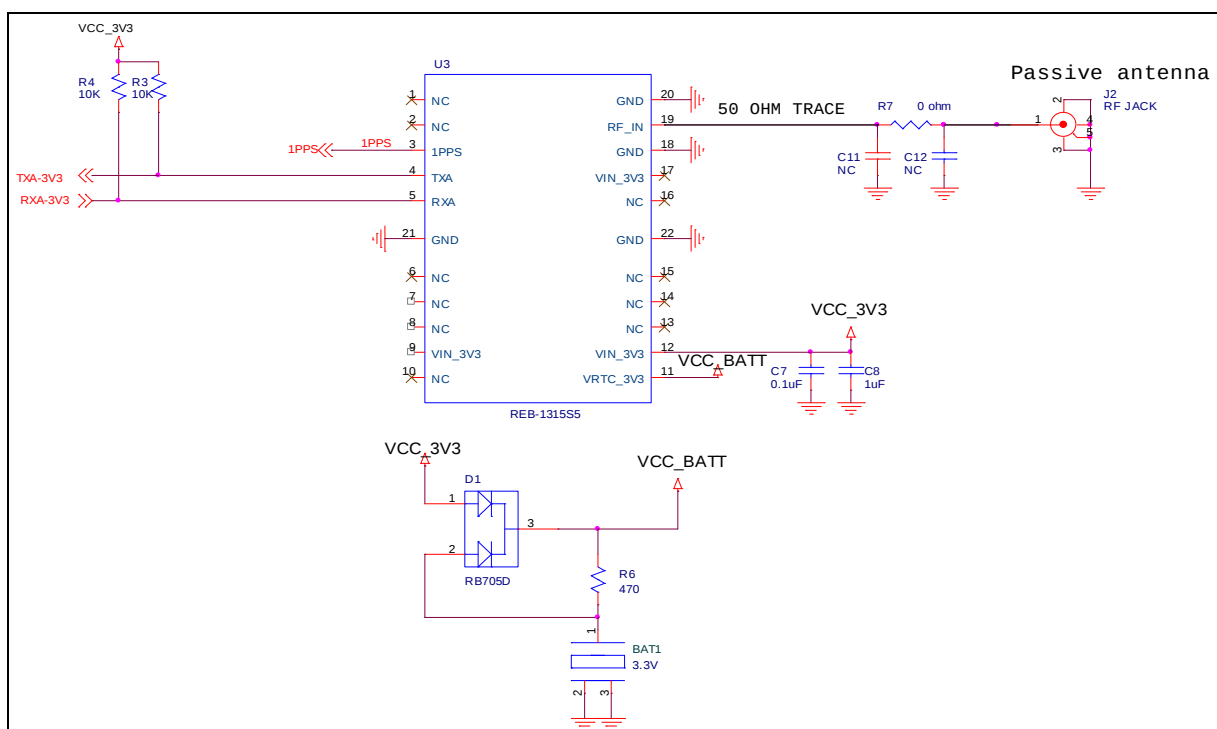
No	Function	Specification
GPS receiver		
1	Chipset	CSR SiRFstarV™ 5e CSRG0530 version
2	Frequency	Tracking L1,GPS CA code and GLONASS FDM Channels
3	Code	C.A. Code.
4	Channels	52 channels
5	Sensitivity	Autonomous Acquisition -146dBm Tracking Sensitivity -165dBm
6	Chipset Cold start(open sky)	35 sec
7	Chipset Warm start(open sky)	35 sec
8	Chipset Hot start(open sky)	1 sec
9	Reacquisition	0.1sec typical
10	Position accuracy	Position: within 10m for 90%
11	Maximum altitude	18000 m
12	Maximum velocity	515 m/s
13	Update rate	1Hz
14	Protocol	Default GGA(1),GSA(1),GSV(5),RMC(1)
Interface		
15	I/O Pin	22pins
Power consumption		
16	Vcc	DC +3.3V@ ±5%
17	Current (TBD)	Normal Current 35mAh (Typ.) Hibernate Current 50uA (Typ.)
Mechanical requirements		
18	Dimension(mm)	13 ±0.2 x 15.2 ±0.2 x 2.2 ±0.25mm
19	Weight	3g
Environment		
20	Operating/Storage temperature	Operating : -40 ~ 85 Storage: -40 ~ 85
21	Humidity	95% non-condensing

5. Reference schematic:

Active antenna

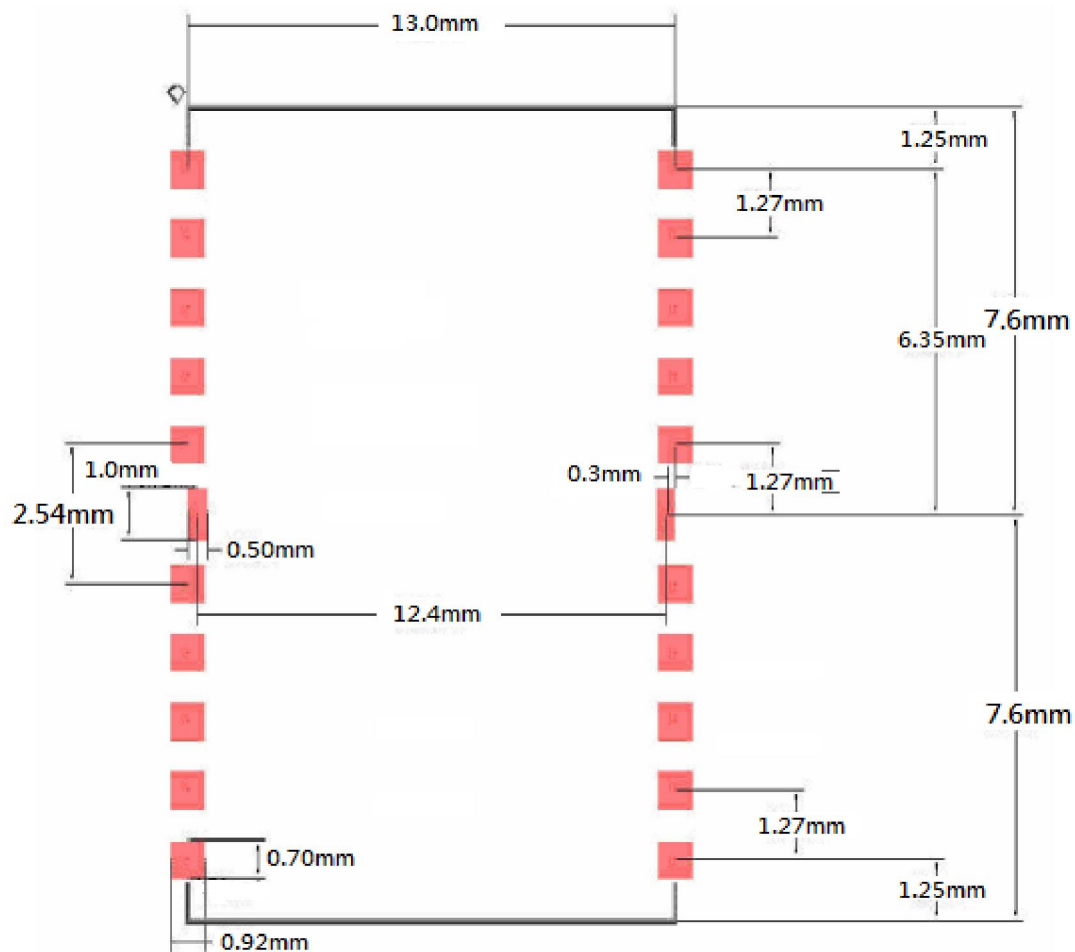


Passive antenna



6. Recommend layout PAD & Moisture Sensitivity:

6.1 Recommend layout PAD

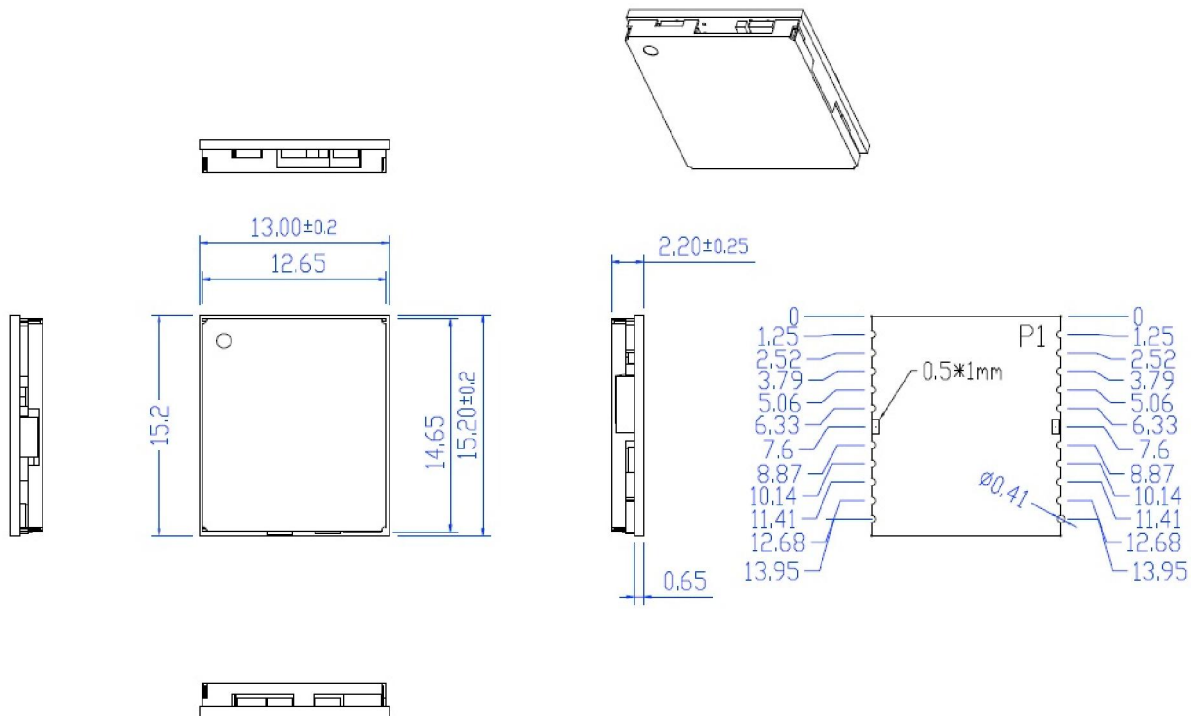


6.2 Moisture Sensitivity

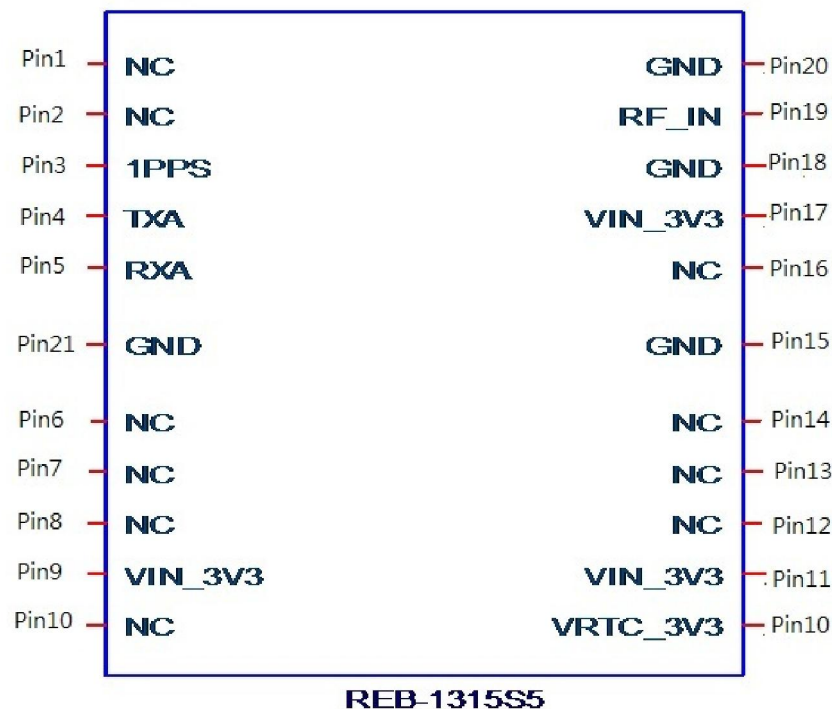
The GPS module must be placed and reflowed within 48 hours of first opening the hermetic bag, at factory conditions are less than 30 °C and less than 60% RH.

Level 5 (48 hours at $\leq 30^\circ\text{C}$ /60% RH by floor life)

7. Mechanical diagram



8. Interface pin definition



Pin definition:

Pin number	Pin function	Type	Description	ELECTRICAL CHARACTERISTICS
1	NC	~	NO CONNECTION	
2	NC	~	NO CONNECTION	
3	1PPS	O	1PPS TIMEMARK PULSE	200mS ACTIVE HIGH VOL <0.4V, VOH >2.2V
4	TXA	O	UART SERIAL DATA OUTPUT	VOL <0.4V, VOH >2.2V
5	RXA	I	UART SERIAL DATA INPUT	VIL <0.45V, 1.26V<VIH <3.6V
6	NC	~	NO CONNECTION	
7	NC	~	NO CONNECTION	
8	NC	~	NO CONNECTION	
9	VIN_3V3	P	NO CONNECTION	
10	NC	~	NO CONNECTION	
11	VRTC_3V3	P	BACK UP BATTERY	2.2V MIN. 3V TYP. 3.3V MAX.

			VOLTAGE INPUT	
12	VIN_3V3	P	SUPPLY MAIN VOLTAGE INPUT	3.3V±5%
13	NC	~	NO CONNECTION	
14	NC	~	NO CONNECTION	
15	NC	~	NO CONNECTION	
16	NC	~	NO CONNECTION	
17	VIN_3V3	P	PROVIDE VOLTAGE FOR ACTIVE ANTTENA	3.3V±5% , Base Pin11 .
18	GND	P	GROUND	
19	RF_IN	RF	GPS RF SIGNAL INPUT	Impedance 50Ω
20	GND	P	GROUND	
21	GND	P	GROUND	
22	GND	P	GROUND	

n **VCC_IN (DC 3.3V@ 5% power Input)**

This is the DC power supply input pin for GPS system. It provides voltage to module. The power supply must add bypass capacitor (10uF and 1uF). It can reduce the Noise from power supply and increase power stability.

If shutdown the REB-1315S5 module, please remove the VCC_IN Pin voltage into Hibernate mode.(It's will keep the Warm start and Hot start function work well)

n **GND**

GND provides the reference ground.

n **RXA**

This is the main receiver channel and is used to receive software commands to the board from SIRFdemo software or from user written software.

n **TXA**

This is the main transmitting channel and is used to output navigation and measurement data to SiRFdemo or user written software.

n **RF_IN**

Connecting to the antenna has to be routed on the PCB. The transmission line must to be control impedance from RF_IN pin to the antenna or antenna connector of your choice. (Impedance 50Ω)

Can be used for active antennas or passive antenna.

Active Antenna Gain Selection: 15 ~ 20dB

We recommend using active antennas, because the active antenna actual test better than the passive antenna..

n **VCC_RF_OUT**

This pin can provide maximum power 30mA@3.3V for active antenna.

n **1PPS (TIMEMARK)**

This pin provides one pulse-per-second output from the board, which is synchronized to GPS time. Need firmware supported. If don't used, can open.

n **VRTC_3V3 (Backup battery)**

This is the battery backup input that powers supply the Hibernate mode when main power is removed. It's will keep the Warm start and Hot start function work well.

Typical current draw is 50uA.

The supply voltage should be between 2.2V and 3.3V.

9. Software Interface

NMEA Protocol

NMEA Output Messages: the Engine board outputs the following messages as shown in Table 1:

Table 1 NMEA-0183 Output Messages

NMEA Record	Description
GGA	Global positioning system fixed data
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data
GLL	Geographic position – latitude/longitude
VTG	Course over ground and ground speed

GGA-Global Positioning System Fixed Data

Table 2 contains the values of the following example:

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

Table 2 GGA Data Format

Name	Example	Units	Description
Message ID	\$GPGGA		GGA protocol header
UTC Position	161229.48 7		hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.341 6		Dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 3
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

Table 3 Position Fix Indicators

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3-5	Not Supported
6	Dead Reckoning Mode, fix valid

GSA-GNSS DOP and Active Satellites

Table 4 contains the values of the following example:

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

Table 4 GSA Data Format

Name	Example	Units	Description
Message ID	\$GPGSA		GSA protocol header
Mode 1	A		See Table 5
Mode 2	3		See Table 6
ID of Satellite Used	07		Sv on Channel 1
ID of Satellite Used	02		Sv on Channel 2
....			
ID of 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

Table 5 Mode 1

Value	Description
M	Manual-forced to operate in 2D or 3D mode

A	Automatic-allowed to automatically switch 2D/3D
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Table 6 Mode 2

Value	Description
1	Fix not available
2	2D
3	3D

GSV-GNSS Satellites in View

Table 7 contains the values of 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

Table 7 GSV Data Format

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
Total Number of Messages ¹	2		Range 1 to 3
Messages Number ¹	1		Range 1 to 3
Satellites in View	07		
Satellite ID	07		Channel 1(Range 1 to 32)
Elevation	79	degrees	Channel 1(Range 00 to 90)
Azimuth	048	degrees	Channel 1(True, Range 000 to 359)
SNR (C/No)	42	dBHz	Channel 1(Range 0 to 99, null when not tracking)
Satellite ID	27		Channel 4(Range 01 to 32)
Elevation	27	degrees	Channel 4(Range 00 to 90)
Azimuth	138	degrees	Channel 4(True, Range 000 to 359)
SNR (C/No)	42	dB-Hz	Channel 4(Range 00 to 99, null when not tracking)
Checksum	*71		
< CR > < LF >			End of message termination

¹Depending on the number of satellites tracked multiple messages of GSV data may be required.

RMC-Recommended Minimum Specific GNSS Data

Table 8 contains the values of the following example:

\$GPRMC, 161229.487, A, 3723.2475, N, 12158.3416, W, 0.13, 309.62, 120598, , *10

Table 8 RMC Data Format

Name	Example	Units	Description
Message ID	\$GPRMC		RMC protocol header
UTC Time	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	True
Course Over Ground	309.62	degrees	
Date	120598		ddmmyy
Magnetic Variation		degrees	
Variation sense			E=east or W=west (Not shown)
Mode	A		A=Autonomous, D=DGPS, E=DR
Checksum	*10		
<CR><LF>			End of message termination

VTG-Course Over Ground and Ground Speed

Table 9 contains the values of the following example:

\$GPVTG,79.65,T,M,2.69,N,5.0,K,A*38

Table 9 VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course over rground	79.65	degrees	Measured heading
Reference	T		True
Course over ground		degrees	Measured heading
Reference	M		Magnetic
Speed over ground	2.69	Knots	Measured speed
Units	N		Knots
Speed over ground	5.0	Km/hr	Measured speed
Units	K		Kilometer per hour
Mode	A		A-autonomous, D=DGPS, E=DR
Checksum	*38		
<CR><LF>			End of message termination

GLL-Geographic Position – Latitude/Longitude

Table 10 contains the values of the following example:

\$GPGLL,2503.6319,N,12136.0099,E,053740.000,A,A*52

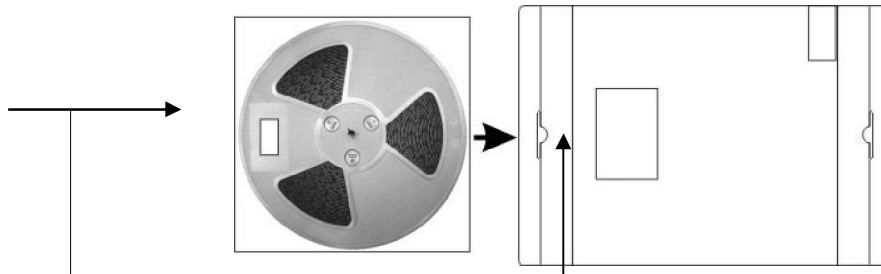
Table 10 GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
Latitude	2503.6319		ddmm.mmmm
N/S indicator	N		N=north or S=south
Longitude	12136.0099		Dddmm.mmmm
E/W indicator	E		E=east or W=west
UTC Time	053740.000		hhmmss.sss
Status	A		A=data valid or V=data not valid
Mode	A		A=autonomous, D=DGPS, E=DR
Checksum	*52		
<CR><LF>			End of message termination

10. Package Specification and Order Information

Shipment Method: Tape and reel

SMT type with stamp holes (22 holes)



11. Contact Royaltek

Contact: sales@royaltek.com

Headquarter:

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Web Site Customer Service: <http://www.royaltek.com/contact>

Revision History

Title	REB-1315S5 GPS Module	
Doc Type	Operational Manual	
Revision Number	Date	Change notice
0.2	20130830	Draft spec
0.25	20130904	Updated the ME drawing
0.3	20130916	Updated "recommend layout pad"

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