

# **REB-0808 Operation Manual**

Version 0.4  
2010/12/08

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## **1 Introduction**

RoyalTek announce REB-0808 module with the SiRFstar IV GPS chipset. This module embedded active Jammer remover to ensure fast and accurate navigation in hostile signal/high noise environment. Power by the new SiRFStar IV architecture, the module can acquire satellites as low as -163dBm better than SiRF Star III. The high sensitivity, low power, 48-channel GPS module is the best choice to be embedded in a device such as Car tracking device, Locator application, and safety alarm device.

### **Product Features**

- ✧ Extremely smallest form factor (8.4 x 8.5 x 1.95) that it can be fast time to market to integrate into the smallest portable devices.
- ✧ Additional 3 dB in track sensitivity is better than the SiRF Star III.
- ✧ Support MEMS Sensor to detection and wake up the device for power saving and longer battery life.
- ✧ Adaptive Micro-power controller- only 50 to 500uA to maintain hot start capability.
- ✧ Embedded InstantFix CGEE and Reverse CGEE (3 days) for faster warm start.
- ✧ Embedded active Jammer remover to ensure fast and accurate navigation in hostile signal environments – GSM, NB environments

### **1.1 Product Applications**

- ✧ Pet/personal Tracker, AVL / Location-Based Services Tracker
- ✧ Fitness
- ✧ Industrial Handsets and personal position and navigation device
- ✧ Gaming console
- ✧ Cameras / Digital camcorder

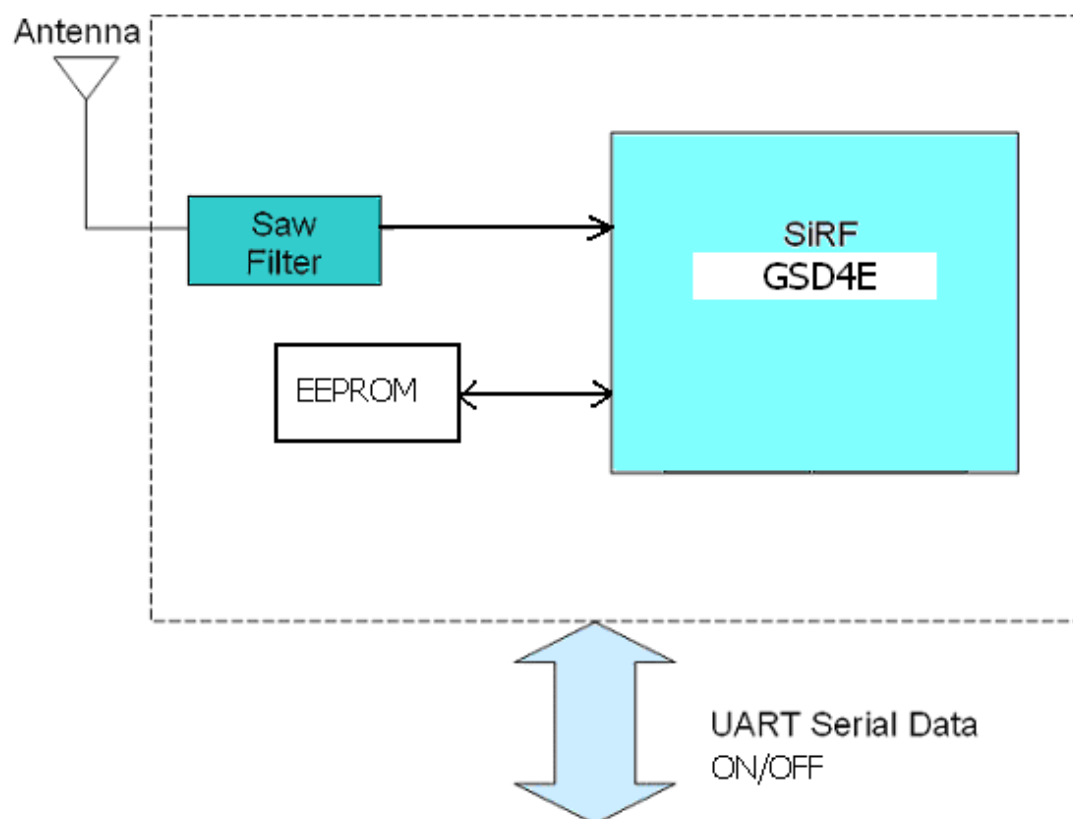
## 1.2 Product Pictures

### (1) REB-0808



## 1.3 REB-0808 Block Diagram

- a. External antenna.
- b. 12-pin I/O pin



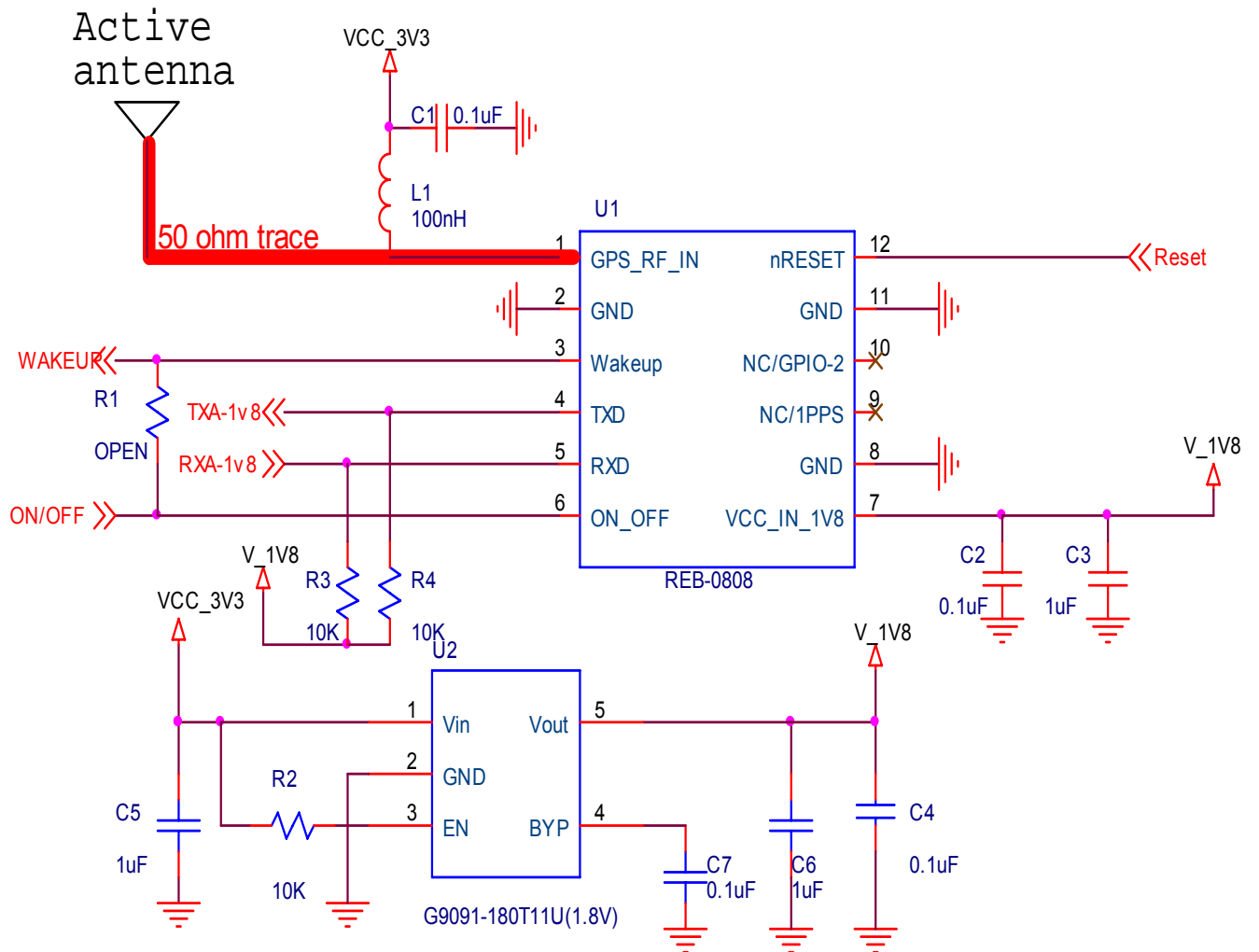
## 1.4 REB-0808 Technical Specification

Impedance : 50Ω

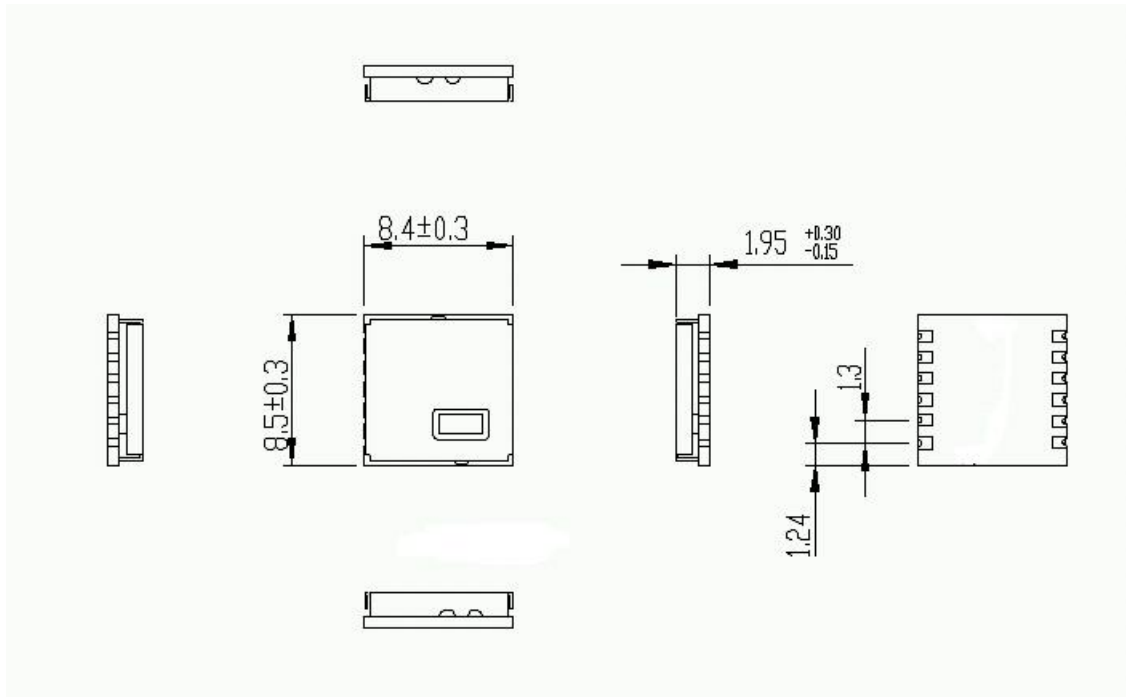
No	Function	Specification
GPS receiver		
1	Chipset	SiRFstarIV GSD4e-9311-TR Signature ROM
2	Frequency	L1 1575.42MHz
3	Code	C.A. Code.
4	Channels	48 track verification channels
5	Chip Sensitivity	High sensitivity navigation engine (PVT) tracks as low as -163dBm
6	Chip Cold start	35 sec @ open sky (Typical)
7	Chip Warm start	35 sec @ open sky (Typical)
8	Chip Hot start	1 sec @ open sky (Typical)
9	Reacquisition	0.1sec typical
10	Position accuracy	2.5meters(50% 24hr static, -130dBm)
11	Maximum altitude	18288 m
12	Maximum velocity	514 m/s
13	Update rate	1Hz
14	SBAS(optional)	WAAS, EGNOS
15	Active Jammer Remover:	<ul style="list-style-type: none"> <li>■ Removes in-band jammers up to 80 dB-Hz</li> <li>■ Tracks up to 8 CW jammers</li> </ul>
Interface		
16	LNA	Embedded 1 stage LNA
17	I/O Pin	12pins
Mechanical requirements		
18	Weight	≤ 5g
19	Dimension(mm)	8.4 x 8.5 x 1.95(+/-0.3mm)
Power consumption		
20	VCC	DC +1.8V@ ±5%
21	Current	Normal mode : Avg. ≤ 60mA@1.8V(without ext. antenna) Hibernate mode : Avg. ≤ 30uA@1.8V(without ext. antenna)
Environment		
22	Temperature	- Operating : -30 ~ 85°C - Storage : -40 ~ 85°C
23	Humidity	≤ 95%

## 1.5 Application Circuit

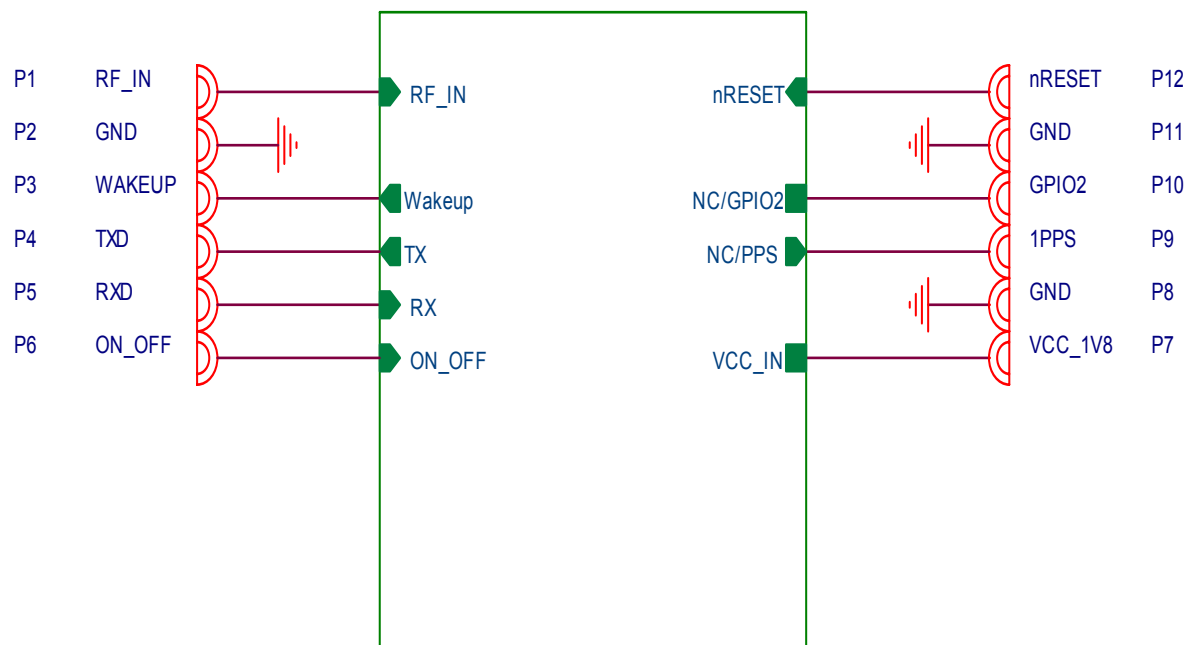
Reference schematic:



## 1.6 Mechanical Layout



## 1.7 Hardware interface





## Pin definition:

Pin	Signal Name	I/O	Description	Characteristics
1	RF_IN	I	GPS Signal input	50 $\Omega$ @1.57542GHz
2	GND	G	Ground	Reference Ground
3	WAKEUP	O	Wake up	System on wakeup: High System off wakeup: Low
4	TXD	O	Serial port A	$V_{OH} \geq 1.35V$ $V_{OL} \leq 0.4V$
5	RXD	I	Serial port A	$3.6V \geq V_{IH} \geq 1.26V$ $-0.4V \leq V_{IL} \leq 0.45V$
6	ON_OFF	I	Edge triggered soft on/off request	Power control pin ,need a pulse to ON or OFF the Chip set. (CMOS I/O run from 1.8v)
7	VCC_1V8	I	DC Supply Voltage input	DC +1.8V, RANGE : 1.71~1.89V
8	GND	G	Ground	Reference Ground
9	NC/PPS	O	One pulse per second	$V_{OH} \geq 1.35V$ $V_{OL} \leq 0.4V$
10	NC/GPIO[2]	I/O	General purpose I/O	$V_{OH} \geq 1.35V$ $V_{OL} \leq 0.4V$ $3.6V \geq V_{IH} \geq 1.26V$ $-0.4V \leq V_{IL} \leq 0.45V$
11	GND	G	Ground	Reference Ground
12	nRESET	I	Reset (Active low)	$3.6V \geq V_{IH} \geq 1.26V$ $-0.4V \leq V_{IL} \leq 0.45V$

- **V\_1V8 (DC 1.8V@ 5% power Input)**

This is the DC power supply input pin for GPS system. It provides voltage to module.

- **GND**

GND provides the ground.

- **RXD**

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

- **TXD**

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

- **GPS\_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  $50\Omega$ )

Recommend to use Active antenna (Gain 27).

- **Reset**

This pin provides an active-low reset input to the board. It causes the board to reset and start searching for satellites. If not utilized, may be left it open.

- **PPS (TIMEMARK)**

This pin provides one pulse-per-second output from the board, which is synchronized to GPS time. Need firmware supporting. If this pin is not used, it can open.

**Note: At present PPS function are not available.**

- **GPIO Functions**

Several I/Os are connected to the digital interface connector for custom applications.

If don't used, can open.

**Note: At present GPIO function are not available.**

- **Power**

Connect VCC\_IN\_1V8 pin to DC 1.8V. The power supply must add bypass capacitor (10uF and 1uF).It can reduce the Noise from power supply and increase power stability.

- **Shutdown**

Shutdown the REB-0808 module, don't remove the Vcc\_IN\_1V8 Pin, must to use on/off pulse to make it into Hibernate mode. (It's will keep the Warm start and Hot start function work well)

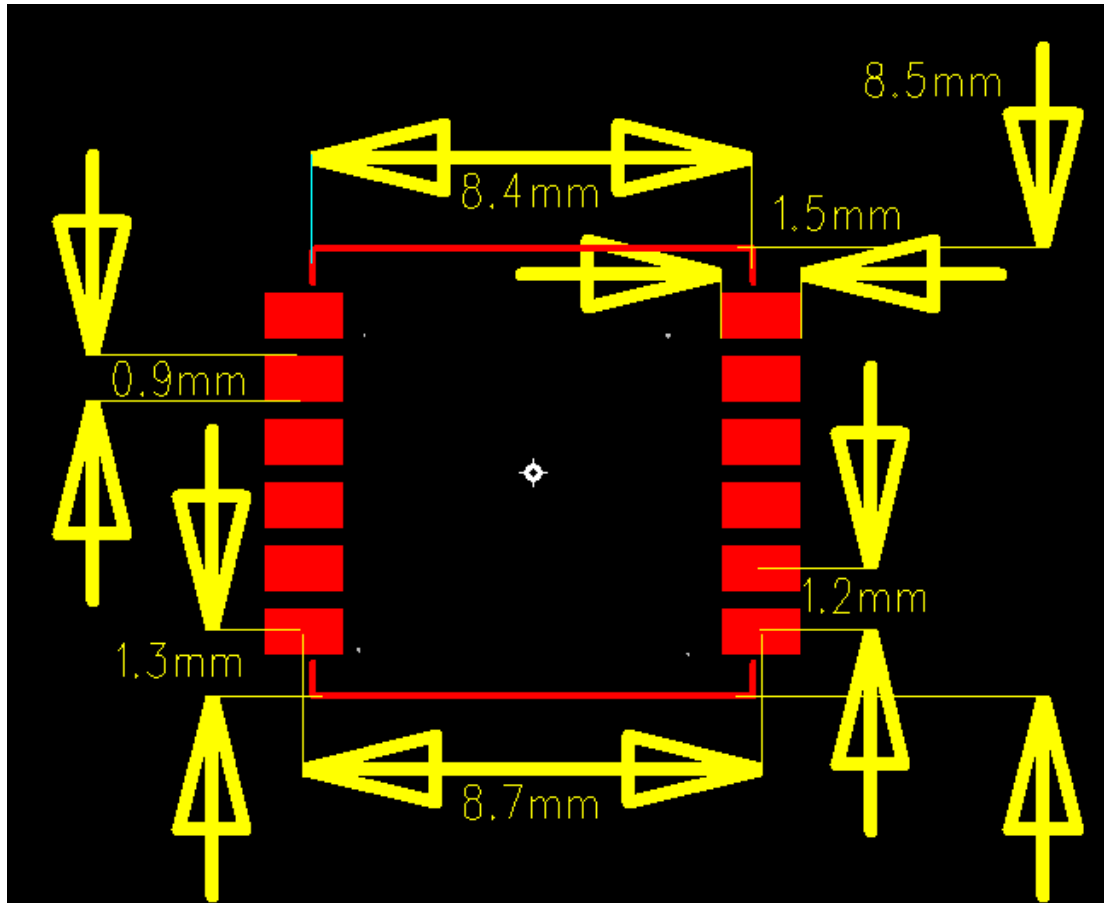
- **ON/OFF**

Input pulse is required to start the system, and switch the operation mode to Full -power mode or Hibernate mode.

- **Wakeup**

Wakeup output indicate the chip states, when chip is working the output is high level. Wakeup output can control or enable the external regulator. (ex. To control external antenna power)

## 1.8 Footprint and paste mask



## 2 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	161229.4 87		hhmmss.sss
Latitude	3723.247 5		ddmm.mmmm
N/S Indicator	N		N=north or S=south
Longitude	12158.34 16		Dddmm.mmmm
E/W Indicator	W		E=east or W=west
Position Fix Indicator	1		See Table 2-1
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

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 <sup>1</sup>	2		Range 1 to 3
Messages Number <sup>1</sup>	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

<sup>1</sup>Depending 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

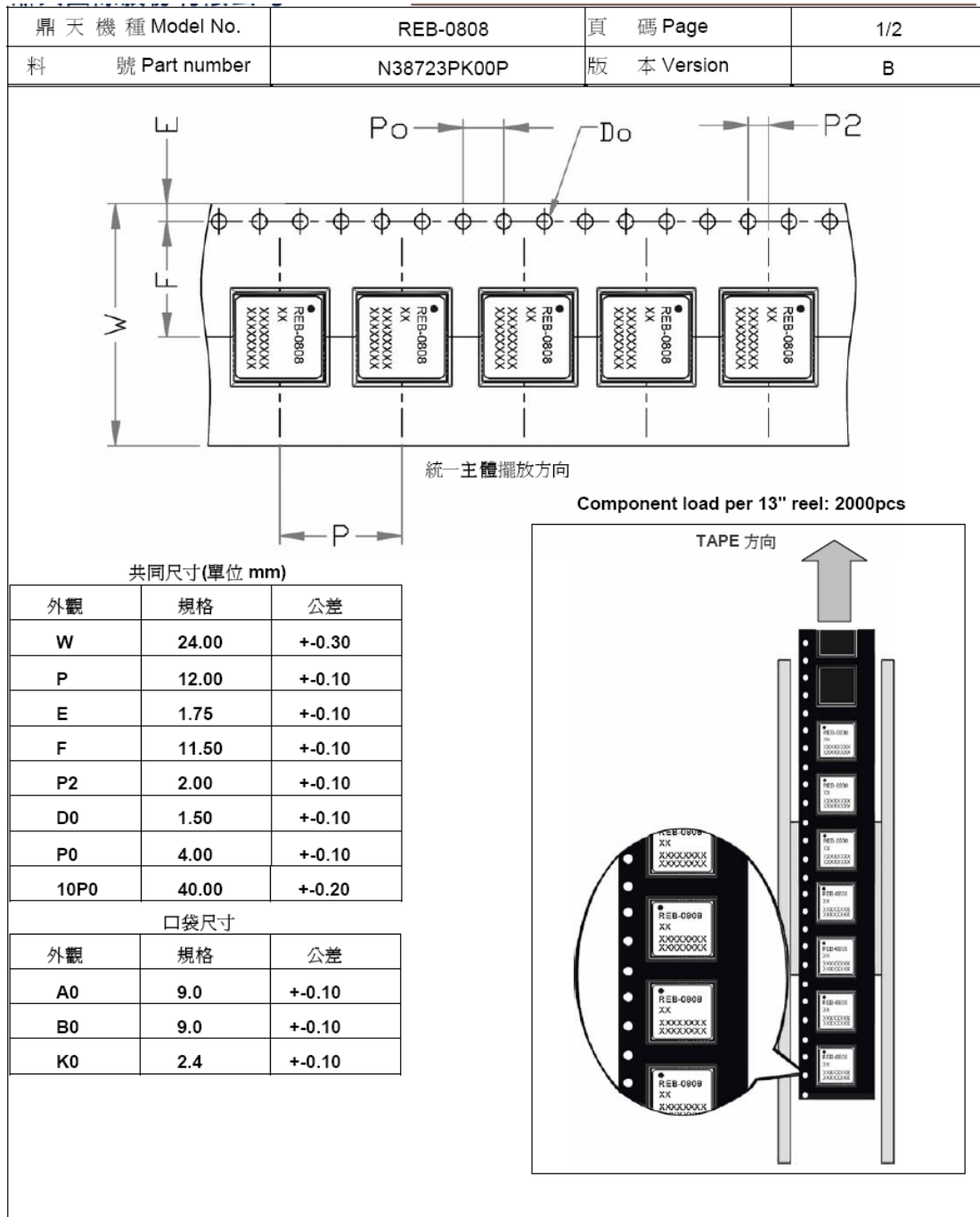


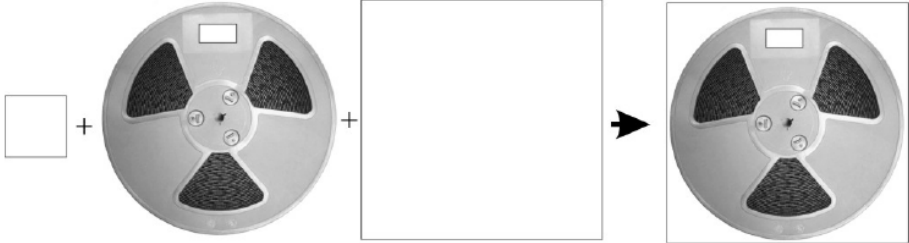
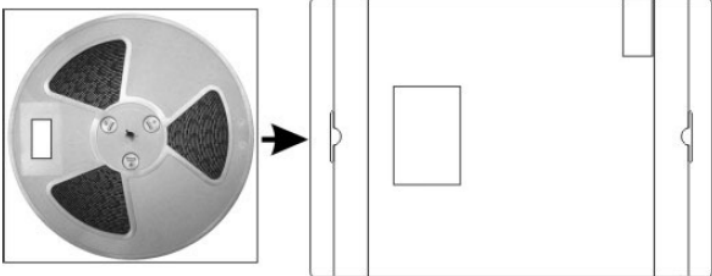
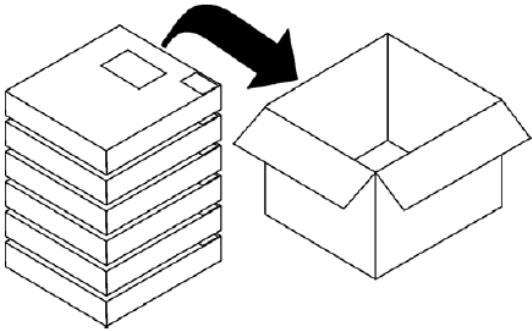
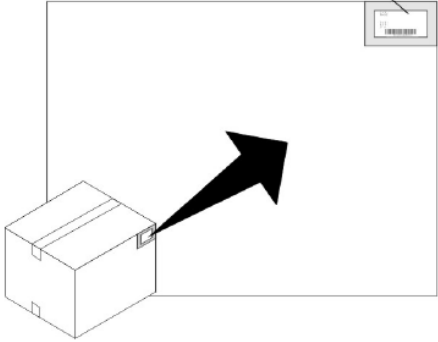
Table 10 GLL Data Format

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

### 3 Package Specification and Order Information

#### Taping Reel



鼎天機種 Model No.	REB-0808	頁碼 Page	2/2
料號 Part number	N38723PK00P	版本 Version	B
 <p>Set1 : REEL 貼附序號貼紙(3L060N08N7)後與乾燥劑置入袋中. 標籤型式及貼附位置, 請參照標籤規格書 REEL pastes attaches the serial number label, REEL and the SILICA GEL sets at into in the bag.</p>			
 <p>Set2 : 包裝好的料帶,放入內盒包裝,內盒需要貼附序號貼紙, 標籤型式及貼附位置, 請參照標籤規格書 In Tape puts in the box packing, The box pastes attaches the serial number label</p>			
 <p>Set2 標籤規格書貼附序號標籤, 一箱放置 6 盒 please refer to the label specification for all labels and its placement ,total of 6pcs/box</p>		<p>外箱序號標籤置於外箱右上角, 但避開封箱膠帶貼附</p>  <p>Final: 再將 Container 蓋上並打包即完成包裝; 如圖 標籤型式及貼附位置, 請參照標籤規格書 Close the carton, then pack the box; as shown on the diagram please refer to the label specification for all labels and its placement</p>	

## 4 Contact Royaltek

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## 5 Revision History

Title	REB-0808 GPS Module		
Doc Type	Operational Manual		
Revision Number	Date	Author	Change notice
0.1	2010/11/04	May Chen	Initial Release
0.2	2010/11/18	May Chen	Modification: 1) General spec update. 2) the current add Hibernate mode : Avg. $\leq 30\mu A@1.8V$ (without ext. antenna) 3) Footprint and paste mask detail dimension
0.3	2010/11/24	May Chen	Update REB-0808 Mechanical Drawing
0.4	2010/12/08	May Chen	Update the Photo

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