

### Version History

Rev.	Date	Description
1.0	16-08-11	Initial Draft – preliminary information
2.0	22-08-11	Pin assignments complementation

### Order information for RB-2525GNS-[X1-X2](#)

**X1** : Connector type (**W** : 6 pins 1. mm wafer connector, **H** : 6 pins 1.27 mm male header)

**X2** : Battery (**B** : built-in battery, **N** : without built-in battery)

**Order Information for built-in GLONASS/GPS antenna modules,**

Part Number	Dimension (mm)	Serial Interface	Voltage Range (+/- 10%)	Output Connector type	1 PPS	Architecture
RB-2525GNS	25x25	UART/RS232	3.3-5V	<ul style="list-style-type: none"><li>➤ 6 pins wafer connector</li><li>➤ 6 pins male header</li></ul>	-	Flash

## 1 Functional Description

### 1.1 Introduction

**RB-2525GNS** is a highly integrated smart GLONASS/GPS module with a ceramic GLONASS/GPS patch antenna, it also can either connect to the external active antenna. The module is with 80 channel acquisition engine and 20 channel track engine, which be capable of receiving signals from up to 100 GLONASS/GPS satellites and transferring them into the precise position and timing information that can be read over UART/RS232 interface. Small size and high-end GLONASS/GPS functionality are at low power consumption, supply voltage of 3.3v-5v is supported.

**RB-2525GNS** is optimized for applications requiring good performance, low cost, and maximum flexibility; suitable for a wide range of OEM configurations including handhelds, MID, Mobile, PDA-centric personal navigation system.

The smart GLONASS/GPS antenna module is available as an off-the-shelf component, 100% tested. The smart GLONASS/GPS antenna module can be offered for OEM applications with the versatile adaptation in form and connection. Additionally, the antenna can be tuned to the final systems' circumstances.

### 1.2 Features

- **100 channels** to acquire and track satellites simultaneously
- Industry-leading TTFF speed
- Tracking sensitivity reaches **-161 dBm**
- 0.5 PPM TCXO for quick cold start
- Integral LNA with low power control
- Cold start <35 **sec** under clear Sky
- Hot start ≈ **1 sec** under clear Sky
- Accuracy 5m CEP
- DGPS and WAAS Capable
- Operable at 3.3v-5v LVTTTL/RS232
- UART interface at CMOS level
- Small form factor of 25 mm W x 25 mm Lx 8 mm H
- Mountable without solder process
- Support the built-in antenna or the external active antenna
- **1.00 m/m WTB Wafer SMT S/R R/A 6Pins OR 1.27 m/m male header 6 Pins**

### **1.3 Applications**

- Mobile phones
- MID
- Automotive and Marine Navigation
- Automotive Navigator Tracking
- Emergency Locator
- Geographic Surveying
- Personal Positioning
- Sporting and Recreation

- 2 Characteristics

- 2.1 General Specification

Parameter	Specification
Receiver Type	100 Channels GLONASS/GPS L1 frequency, C/A Code
Time-To-First-Fix	Cold Start (Autonomous) <34s (Average, under open sky) Warm Start (Autonomous) <32s (Average, under open sky) Hot Start (Autonomous) 1s (Average, under open sky)
Sensitivity	Tracking & Navigation -161 dBm Reacquisition -161 dBm Cold Start (Autonomous) -146 dBm
Accuracy	Autonomous 2.5 m CEP Velocity 0.1 m/sec (without aid) Time 300 ns
Update Rate	Supports 1 / 2 / 4 / 5 / 8 / 10/20 Hz update
Velocity Accuracy	0.1m/s
Heading Accuracy	0.5 degrees
Dynamics	4 G (39.2 m/sec)
Operational Limits	Velocity 515 m/s (1000 knots) Altitude <18000 meters (COCOM limit, either may be exceeded but not both)
Serial Interface	LVTTTL level with either <b><u>1.00 m/m WTB Wafer SMT S/R R/A 6Pins</u></b> , or <b><u>1.27 m/m male header 6 Pins</u></b>
Support antenna types	<b>Built-in patch antenna</b>
Protocol	NMEA-0183 V3.01 GPGGA, GNLL, GNGNS, GPGSA, GLGSA, GNGSA, GPGSV, GLGSV, GNVTG, GNRMC
Datum User definable	Default WGS-84 User definable
Input Voltage	3.3v-5v
Input Current	~65mA tracking
Dimension	25 mm L x 25 mm W x 8 mm H
Weight	18g

Table 1: RB-2525GNS General Specification

## 2.2 Serial Port Settings

The default configuration within the standard GLONASS/GPS firmware is:

- Standard configuration of serial port:
- Supporting 4800/9600/38400/115200 baud rate (**Default Value : 9600**), 8 data bits, no parity, 1 stop bit, no flow control

## 2.3 Improved TTF

In order to improve the TTF (Time To First Fix), **RB-2525GNS** has been built with the back-up battery (SEIKO) to support the RTC with a back-up power when no system power is available.

## 2.4 Operating Conditions

Parameter	Symbol	conditions	Min	Typ	Max	Units
Power supply voltage	VCC		3.3		5.0	V
VCC Supply current	Icc Acquisition	VCC = 3.3V		75		mA
		VCC = 5.0V		67		
	Icc Tracking	VCC = 3.3V		65		mA
		VCC = 5.0V		61		

Table 2: Operating Conditions

## 2.5 DC Electrical Characteristics

Voltage	+3.3V ~ +5.0V DC
Supply current	TBD @ 5.0V DC Typical
Backup Battery Power	+3.3V DC

Table 3: DC Electrical characteristics

## 2.6 GLONASS/GPS Status Indicator

- Non-Fixed mode : LED is always on
- Fixed mode : LED toggle every second

### 2.7 Mechanical Characteristics

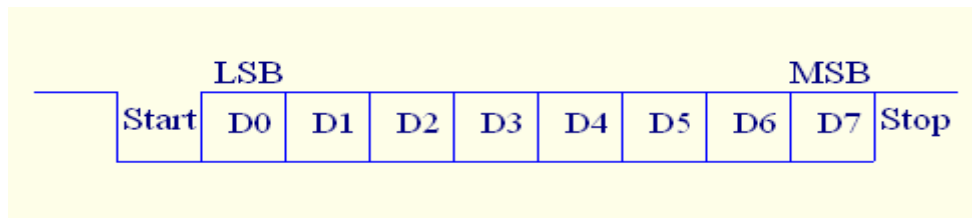
Mechanical dimensions	Length	25 mm
	Width	25 mm
	Height	8 mm
Weight		18g (may vary)

**Table 4: RB-2525GNS mechanical characteristics**

### 3. Communication Specifications

Item	Description
Interface	Full duplex serial interface
Bit rate	4800/9600/38400/115200bps
Start bit	1bit
Stop bit	1bit
Data bit	8bit
Parity	None
Transmission data	SACII NMEA0183 Ver:3.01
Update rate	1Hz
Output sentence	GPGGA, GPGSA, GPGSV, GPRMC, GPVTG (typ)

**Table 5: Communication Specifications**



**Fig. 1. Transmitting data stream**

### 4. Connector

The connector mounted on the RB-2525GNS is “1.00 m/m WTB Wafer SMT S/R R/A 6P”, the part number is 87213-0600G.

### 5. Block Diagram

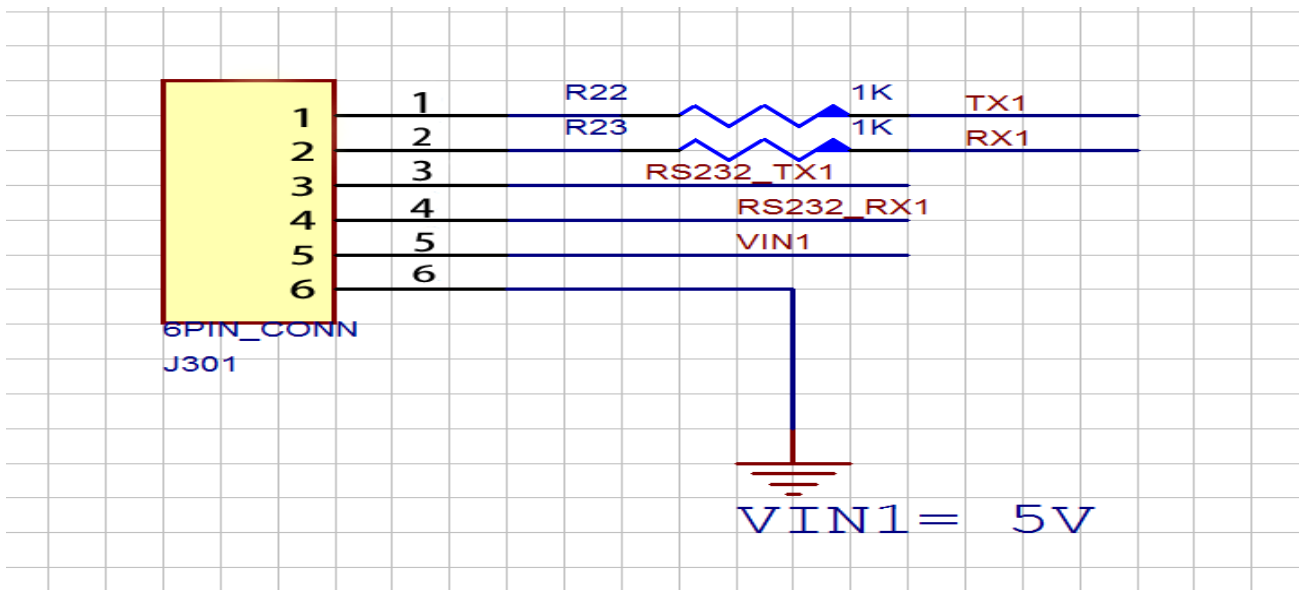
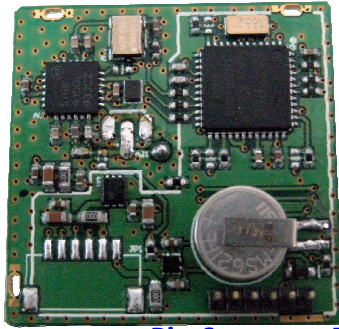


Figure 2 Block Diagram

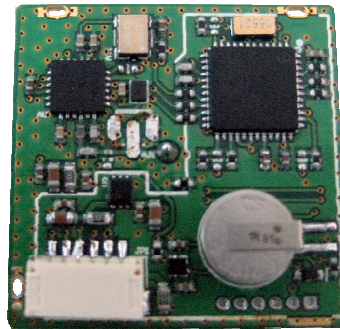


## 6. Pin Assignments Information



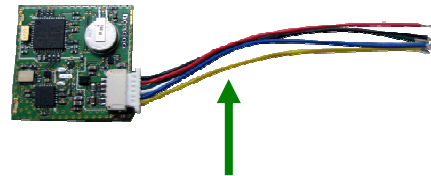
Pin 6 Pin 1

6 pins male header connector



Pin 6 Pin 1

6 pins wafer connector



6 wires with 6 pins wafer connector cable

Pin	Pin Name	Function description
1	TX_UART	UART level Data output
2	RX_UART	UART level Data input
3	TX_RS232	RS232 level Data Output
4	RX_RS232	RS232 level Data Output
5	VIN	3.3v-5v supply input
6	GND	GND

Table 6: Pin Assignments

### 7. Mechanical Drawing Outline

Unit: mm

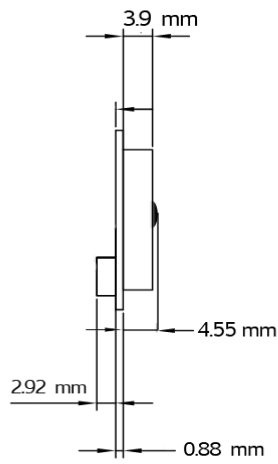


Figure 3.1 Side View ±10%

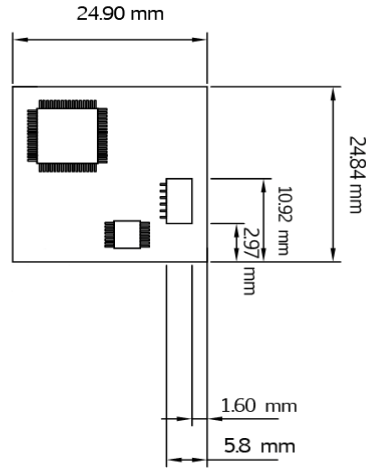


Figure 3.2 Top View ±10%

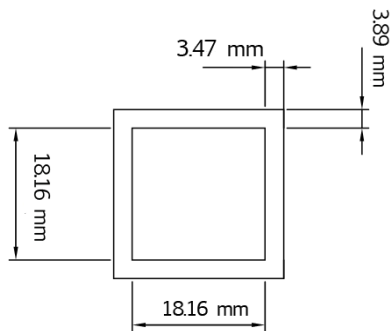


Figure 3.3 Patch Antenna ±10%

## 8 Quality and Reliability

### 8.1 Environmental Conditions

Parameter		Specification
Temperature	Operating	-20°C ~+65°C
	Storage	-40°C ~+80°C
Humidity		5%~95%
Storage		6 months in original vacuum package.

**Table 7: Environmental conditions**

### 8.2 Production Test

Each module is electrically tested prior to packing and shipping to ensure the GLONASS/GPS receiver performance and accuracy.

## 9. Software Interface

### 9.1 NMEA V4.00 Protocol

Its output signal level is TTL: 9600bps (default), 8 bit data, 1 stop bit and no parity. It supports the following NMEA-0183

Messages: GGA, GLL, GSA, GSV, RMC and VTG.

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

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

*Table 1 NMEA-0183 Output Messages*

#### 9.1.1 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	161229.487		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		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

Value	Description
0	Fix not available or invalid
1	GPS SPS Mode, fix valid
2	Differential GPS, SPS Mode, fix valid
3	GPS PPS Mode, fix valid

**Table 2-1** Position Fix Indicator

### 9.1.2 GLL-Geographic Position –Latitude/Longitude

Table 3 contains the values of the following Example:

\$GPGLL, 3723.2475, N, 12158.3416, W, 161229.487, A\*2C

**Table 3** GLL Data Format

Name	Example	Units	Description
Message ID	\$GPGLL		GLL protocol header
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
UTC Position	161229.487		hhmmss.ss
Status	A		A=data valid or V=data not valid
Checksum	*2C		
<CR> <LF>			End of message termination

9.1.3 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 4-2
Mode 2	3		See Table 4-1
Satellite Used	07		Sv on Channel 1
Satellite Used	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

Table 4-1 Mode 1

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

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

Table 4-2 Mode 2

9.1.4 **GSV**-GNSS Satellites in View

Table 5 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

Name	Example	Units	Description
Message ID	\$GPGSV		GSV protocol header
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(Maximum 90)
Azimuth	048	degrees	Channel 1(True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
....			....
Satellite ID	27		Channel 4(Range 1 to 32)
Elevation	27	degrees	Channel 4(Maximum 90)
Azimuth	138	degrees	Channel 4(True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR> <LF>			End of message termination

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

9.1.5 **RMC**-Recommended Minimum Specific GNSS Data

Table 6 contains the values of the following example:

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

Table 6 GGA Data Format

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
Checksum	*10		
<CR> <LF>			End of message termination

## 9.1.6 VTG-Course Over Ground and Ground Speed

Table 7 contains the values of the following example:

\$GPVTG, 309.62, T, , M, 0.13, N, 0.2, K\*6E

Table 7 VTG Data Format

Name	Example	Units	Description
Message ID	\$GPVTG		VTG protocol header
Course	309.62	degrees	Measured heading
Reference	T		True
Course		degrees	Measured heading
Reference	M		Magnetic
Speed	0.13	knots	Measured horizontal speed
Units	N		Knots
Speed	0.2	km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	*6E		
<CR> <LF>			End of message termination



## 9.2 MStar NMEA Command

<1>Cold Start Command

\$PMST02,58\*39

<2>Warm Start Command

\$PMST02,48\*38

<3>Hot Start Command

\$PMST02,0\*04

## 9.3 NMEA 2.0 & NMEA 4.0 format compare

NMEA 4.0 format

NMEA message	Talker identifiers	example
GGA	GP	\$GPGGA
GSA	GP, <b>GL, GN</b>	\$GPGSA, <b>\$GLGSA, \$GNGSA</b>
GSV	GP, <b>GL</b>	\$GPGSV, <b>\$GLGSV</b>
VTG	GN	<b>\$GNVTG</b>
RMC	GN	<b>\$GNRMC</b>

**GPXXX:** GPS mode

**GLXXX:** GLONASS mode

**GNXXX:** GPS/GLONASS mode