

Product name	Description	Version
LS2003J-2RE	Standalone GPS smart antenna module	1.2



## 1 Introduction

LS2003J-2RE is a complete standalone GPS smart antenna module, the module is powered by MediaTek GPS chip and it can provide user with superior sensitivity and performance even in urban canyon and dense foliage environment.

The module includes embedded chip antenna and GPS receiver circuits, dedicated designed for tablet PC, MID, PND and smart phone that are going to integrate GPS function.

## 2 Features

- Tiny size: 16.0x12.2x2.8 mm
- MediaTek high sensitivity solution
- Support 66-channel GPS
- Fast TTFF at low signal level
- Built-in 12 multi-tone active interference canceller
- Support Japan QZSS
- Ultra low power consumption
- Fast TTFF at low signal level
- $\pm 11$ ns high accuracy time pulse (PPS)
- Indoor and outdoor multi-path detection and compensation
- SMD type with stamp holes; RoHS compliant
- IATF 16949 quality control
- Support RTCM SC-104 Version-2.x

## 3 Application

- Personal positioning and navigation
- Automotive navigation, model aircraft navigation
- Marine navigation

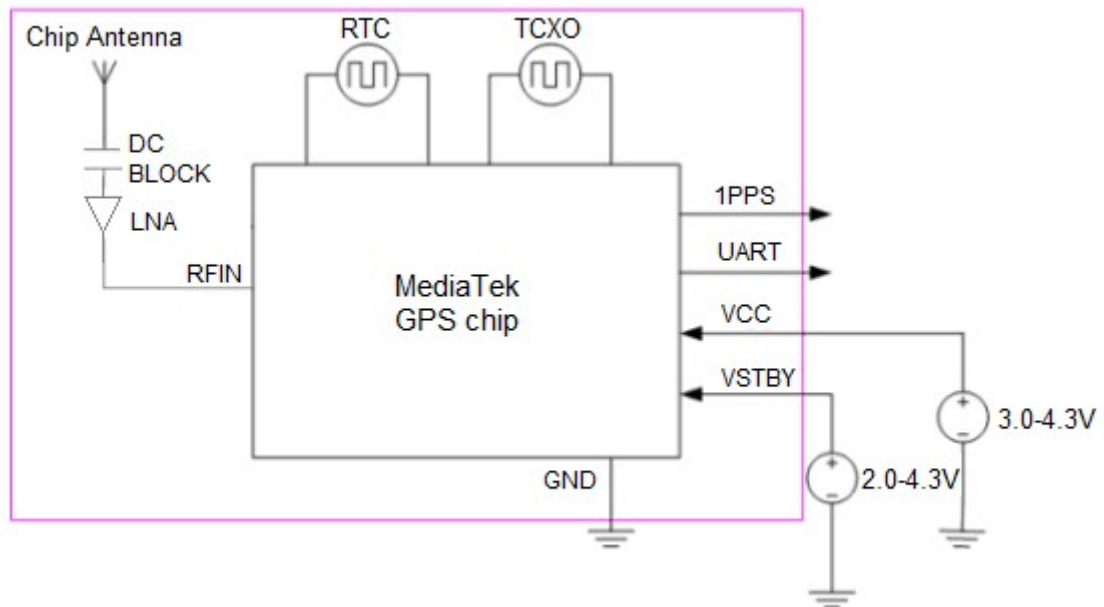


Fig 3-1 System block diagram.

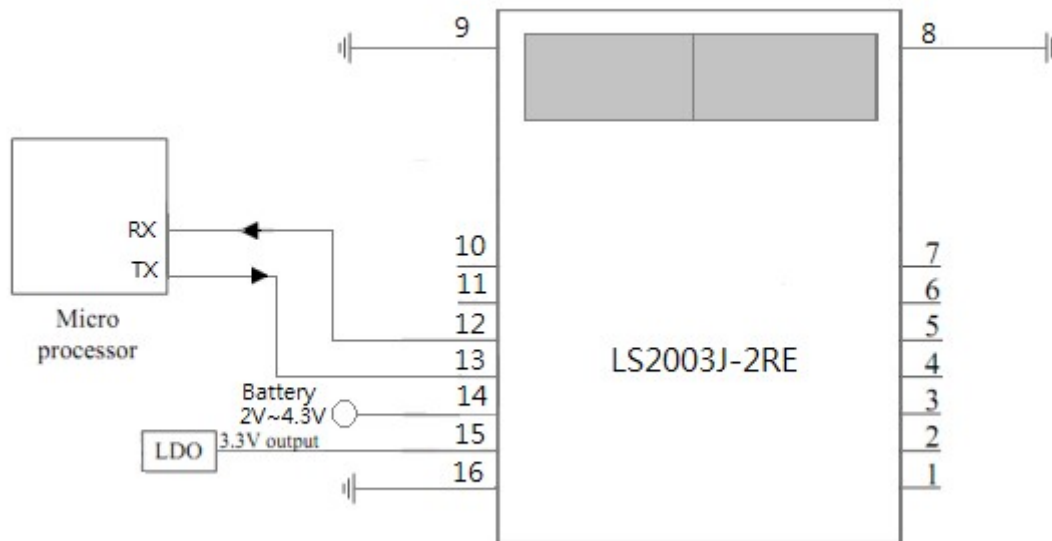


Fig 3-2 Typical application circuit that uses embedded antenna.

## 4 GNSS receiver

### 4.1 GPS receiver

Chip	MediaTek MT3337E	
Frequency	L1 1575.42MHz, C/A code	
Channels	Support 66 channels (22 Tracking, 66 Acquisition)	
Update rate	1Hz default	
Acquisition Time	Hot start (Open Sky)	1 s (typical)
	Cold Start (Open Sky)	34s (typical)
Position Accuracy	Autonomous	2.5m CEP
	SBAS	2.5m (depends on accuracy of correction data).
Max. Altitude	50,000m	
Max. Velocity	< 515 m/s	
Protocol Support	NMEA 0183 ver 3.10	9600 bps, 8 data bits, no parity, 1 stop bits (default) 1Hz: GGA , GLL , GSA , GSV , RMC , VTG
	RTCM SC-104 v2.x	message types 1,2,3, and 9

### 4.2 GPS antenna

The antenna type of LS2003J-2RE is chip antenna. Its performance is greatly affected by many factors, such as the size of PCB ground plane, installation position and its surrounding materials. In order to make it perform well and save user from reinventing the wheel, please consult our FAE before get started to design.

Antenna type	Chip antenna
Polarization	RHCP
Frequency	1575.42MHz

## 5 Pin assignment and descriptions

Top View

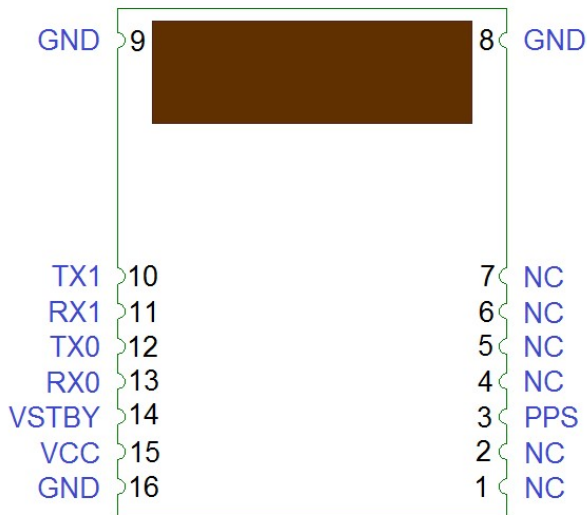


Table 5-1 Pin descriptions

Pin #	Name	Type	Description	Note
1	NC		No connect	
2	NC		No connect	
3	PPS	O	Time pulse (PPS, default 100 ms pulse/sec when 3D fix is available)	
4	NC		No connect	
5	NC		No connect	
6	NC		No connect	
7	NC		No connect	
8	GND	P	Ground	
9	GND	P	Ground	
10	TX1	O	Serial output for channel 1	
11	RX1	I	Serial input for channel 1	
12	TX0	O	Serial output for channel 0 (Default NMEA)	
13	RX0	I	Serial input for channel 0 (Default NMEA)	
14	VSTBY	P	Backup battery supply voltage This pin is optional.	1
15	VCC	P	DC supply voltage	
16	GND	P	Ground	

<Note>

1. The module doesn't has hot start when this pin and VCC pin are not applied.

## 6 DC & Temperature characteristics

### 6.1 Absolute maximum ratings

Parameter	Symbol	Ratings	Units
Input Voltage	VCC	4.3	V
Input Backup Battery Voltage	VSTBY	4.3	V
Operating Temperature Range	Topr	-40 ~ 85	°C
Storage Temperature Range	Tstg	-40 ~ 85	°C

### 6.2 DC Electrical characteristics

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Input Voltage	VCC		3.0	3.3	4.3	V
Input Backup Battery Voltage	VSTBY		2.0		4.3	V
Supply Current	Icc	VCC = 3.3V, w/o active antenna, Peak Tracking Acquisition Standby		23 <sup>(1)</sup> 26 441	90	mA mA mA uA
Backup Battery Current	IVSTBY	VCC = 0V		9		uA
High Level Input Voltage	V <sub>IH</sub>		2.0		3.6	V
Low Level Input Voltage	V <sub>IL</sub>		-0.3		0.8	V
High Level Input Current	I <sub>IH</sub>	no pull-up or down	-1		1	uA
Low Level Input Current	I <sub>IL</sub>	no pull-up or down	-1		1	uA
High Level Output Voltage	V <sub>OH</sub>		2.4		3.3	V
Low Level Output Voltage	V <sub>OL</sub>				0.4	V
High Level Output Current	I <sub>OH</sub>			2		mA
Low Level Output Current	I <sub>OL</sub>			2		mA

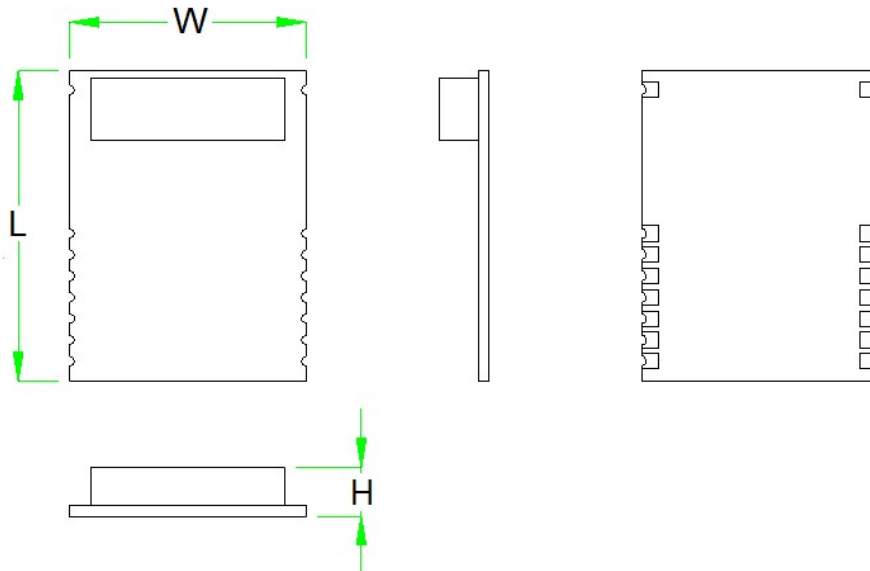
Note 1: Measured when position fix (1Hz) is available, input voltage is 3.3V.

### 6.3 Temperature characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Temperature	Topr	-40	-	85	°C
Storage Temperature	Tstg	-40	25	85	°C

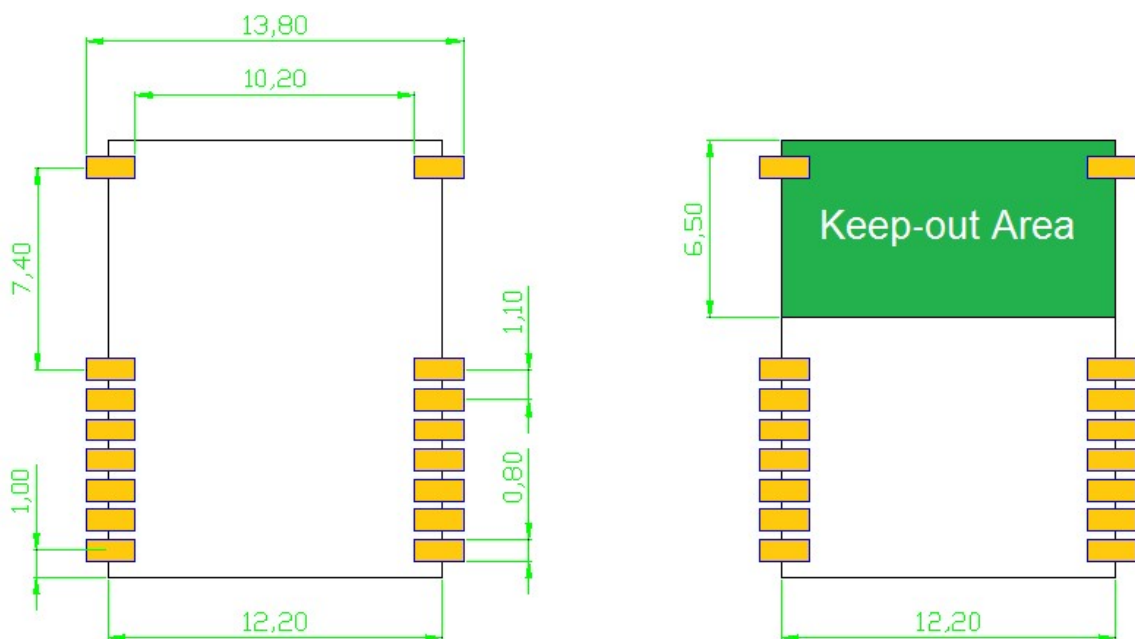
## 7 Mechanical specification

### 7.1 Outline dimensions



Symbol	Min. (mm)	Typ. (mm)	Max. (mm)
W	12.1	12.2	12.3
L	15.9	16.0	16.6
H	2.7	2.8	2.9

### 7.2 Recommended land pattern dimensions



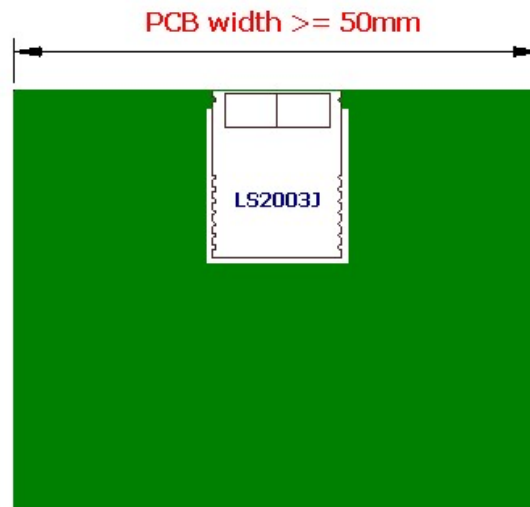
Unit: mm

## 7.3 PCB layout suggestion

The LS2003J-2RE module antenna's radiation pattern and tuning are directly related to the size and shape of the ground plane. When user integrates this module into product, more than likely it will be on a different size PCB. Which means the GPS performance will differ from the datasheet.

### 7.3.1 Limitation of PCB width

Suggest the PCB width should be equal to or greater than 50mm, if the PCB width is smaller than 50mm that will cause poor GPS performance. For the optimum GPS performance, the PCB width larger than or equal to 80mm is suggested.

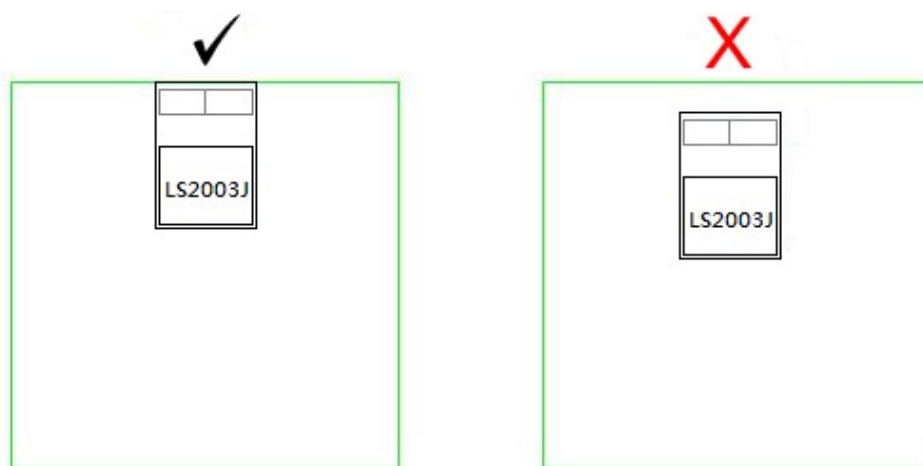


Note: All copper under the module keep-out area (6.5x12.2mm) should be removed. Placement of other components is not allowed under the keep-out area on opposite side.

### 7.3.2 Installation position on the PCB

The optimum PCB placement of LS2003J-2RE module is at the center of the top edge.

But LS2003J-2RE can receive GPS signals from many directions so that it can be placed on the bottom side or top side.



Note: Any metal materials surround the LS2003J-2RE module will degrade GPS performance.

LS2003J can be placed on the bottom side or top side.

