

GNSS Module

MS37SN2

Datasheet

V 1.0.0

Applicable Product Model
MS37SN2

Version Note

Version	Details	Contributor(s)	Date	Notes
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1 Product Introduction

1.1 General description

MS37SN2 is a multi-system, concurrent positioning GNSS module. It features an advanced MTK GNSS SoC chip built on advanced technology, integrating a main frequency of up to 530MHz ARM Cortex-M4 with FPU and MPU. The module supports multiple satellite systems, including GPS, BDS, GLONASS, GALILEO, and QZSS, providing excellent positioning performance while maintaining low power consumption. By leveraging multiple satellite systems, MS37SN2 significantly increases the number of visible satellites in dense urban and canyon environments, reducing initial positioning time and enhancing accuracy. It achieves precise positioning even in challenging conditions.

With its outstanding performance, MS37SN2 is an ideal choice for applications in the automotive industry (such as T-Box and in-car navigation), transportation sector (including industrial and operational vehicles), trackers, shared electric bicycles, smart agriculture, and inspections.

1.2 Features

- Supports full constellation solutions for BDS, GPS, GALILEO, GLONASS, and QZSS.
- Enables multi-system positioning solution outputs.
- Standard SMD package size with excellent I/O compatibility.
- Supports SBAS differential correction.
- Low power consumption support.

1.3 Key Parameter

MS37SN2 Parameter	
Engine	MTK 530MHz ARM Cortex-M4 FPU and MPU
Constellations	GPS: L1 C/A BDS: B1I GLONASS: L1 GALILEO: E1 QZSS: L1 C/A SBAS: WAAS,EGNOS,MSAS,GAGAN,SDCM
Operating Frequencies	GPS/QZSS : 1575.42±1.023MHz BDS : 1561.098MHz±2.046MHz GLONASS : 1601.71875MHz±3.91175MHz GALILEO 1575.42±2.046MHz
Sensitivity1	Cold Start: -148dBm Reacquisition: -160dBm Tracking: -165dBm
First LoCation Time1	Cold Start: ≤24 seconds Hot Start: 1 second AGPS Assist: <6 seconds
Position Accuracy2	Single Point Positioning: Open Sky: <2.0 meters CEP Complex Urban Environments: <3.0 meters CEP
Velocity Accuracy2	<0.05 m/s
Time Accuracy2	20ns
Operating Temperature	Operating Temperature: -40°C to +85°C

Refresh Rate	GNSS: 1Hz;
Baud Rate	Main Serial Port 115200 (factory default, configurable)
Supported Protocols	NMEA 0183 Protocol Ver 4.1

Notice: ¹ CN0 \geq 40dB, SV \geq 6 satellites ²24 hours, OPEN SKY environment,

2 Technical Information

2.1 Supported Constellations

MS37SN2 supports multiple satellite constellations due to its multi-constellation RF front-end architecture. It can simultaneously receive signals from GPS, BDS, GLONASS, GALILEO, QZSS, and Satellite-Based Augmentation Systems (SBAS) such as WAAS, EGNOS, GAGAN, and MSAS. The receiving frequencies are: 1575.42 MHz (GPS, GALILEO, QZSS), 1561.098 ± 2.046 MHz (BDS), and $1602.5625 \text{ MHz} \pm 4 \text{ MHz}$ (GLONASS).

2.2 SBAS

MS37SN2 supports the reception of SBAS broadcast signals. These systems supplement GNSS data with augmentation data in other regions or wide-area GPS enhancement. By providing satellite broadcast ranging corrections and integrity information, the GNSS receiver can utilize this data to enhance result accuracy. SBAS satellites can serve as additional satellites for ranging (navigation), further improving availability. Supported SBAS types include: GAGAN, WAAS, EGNOS, and MSAS.

Type	Satellite Navigation System	O&M Country/Region
Main navigation system (GNSS)	GPS	America
	BDS	China
	GLONASS	Russia
	GALILEO	European Union
Area navigation system	QZSS	Japan
	NAVIC/IRNSS	Indian
SBAS	WASS	America
	EGNOS	European Union
	MSAS	Japan
	GAGAN	Indian

2.3 QZSS

The Quasi-Zenith Satellite System (QZSS) is a navigation satellite coverage system for the Pacific region of Japan and Australia that transmits other GPS L1C/A and L5 signals. The module is able to receive and track these signals simultaneously with GPS, improving usability, especially in maintaining positioning in harsh signal conditions such as urban canyons.

2.4 DGNSS

MS37SN2 can receive pseudorange correction information in RTCM format. When used as a rover station, MS37SN2 will attempt to provide the best possible positioning accuracy based on the received correction data. Upon receiving RTCM message input, it will immediately enter differential mode. Improved positioning accuracy can be expected in D-GNSS mode. D-GNSS is a differential system where the rover station uses reference data from a reference station. If RTCM correction functionality cannot be utilized, it will operate as an independent precision receiver, performing GNSS standalone positioning.

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3 Electrical Specification

3.1 Absolute maximum rating

Symbol	Parameter	Min	Max	Units
VCC	Main Power Supply Volt.	-0.5	4.3	V
VBAT	Backup Power Supply Volt.	-0.5	4.6	V
VI-max	I/O Pin input Volt.	-0.5	3.63	V
T-storage	Storage temperature	-40	+85	°C
T-solder	Reflow Soldering Temperature	--	250	°C

Applying pressure beyond the "absolute maximum ratings" to the device may cause permanent damage.

The provided data represents pressure levels only. The product does not have overvoltage or reverse voltage protection. If necessary, appropriate protection diodes must be used to limit voltage spikes above the specified range of power supply voltage specifications mentioned in the table.

3.2 DC characteristics

Symbol	Parameter	Min	Typ	Max	Units
VCC	Main Power supply voltage	2.8	3.3	4.3	V
VBAT	Backup Power supply voltage	2.3	3.3	4.6	V
ICCmax	Max operating current on VCC	--	3.3	200	mA
Tenv	Operating temperature	-40	--	85	°C

3.3 Power consumption

Symbol	Parameter	Measurement Pin	Typical Value	Unit
ICCRX1 [1]	capture phase	VCC [2]	14	mA
ICCRX2 [1]	tracking phase	VCC [2]	12	mA
ICCDBM	sleep	VBAT[3]	5	μA

Notice:

1. Under open sky, in the GNSS L1 frequency band, tracking 16 satellites, successful positioning.
2. Conditions: VCC=3.3V, indoor temperature, all pins floating.
3. Conditions: VBAT=3.3V, indoor temperature, all pins floating.

All specifications are performed at an ambient temperature of 25°C. Extreme operating temperatures can severely affect specification values. Applications operating near temperature extremes.

The values in the table are for customer reference only and are only examples of typical power requirements. Values are sampled, actual power requirements will vary depending on firmware version used. external circuitry, number of satellites tracked, signal strength, type of start-up as well as time, duration and test conditions.

3.4 Antenna Gain Requirements

Due to the built-in LNA in MS37SN2 and support for passive GNSS antennas, external antenna gain should be carefully controlled.

Symbol	Parameter	Max	Min	Units
RFgain	Input gains	0	23	dB

4 Pin Information

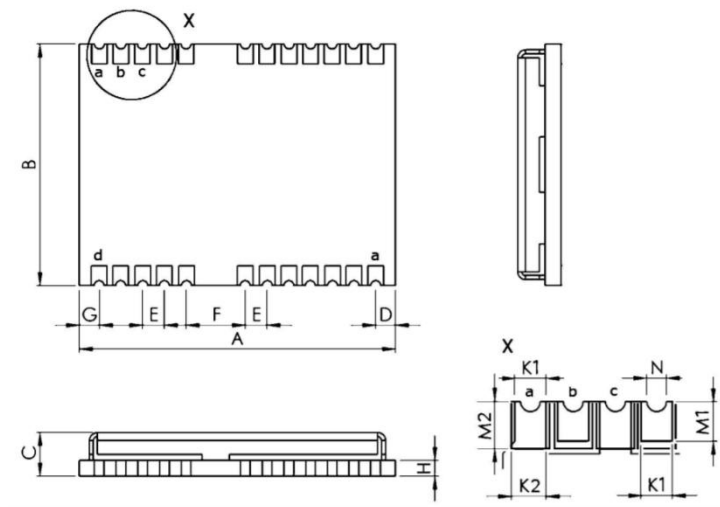
4.1 Pin assignment

MS37SN2 adopts the widely-used 16*12mm, LCC-24pin package, defined as follows:



Number	Name	I/O	Description
1	WAKE_UP	I	Wake-up from standby mode
3	1PPS	O	Time pulse
8	RESET	I	Reset, low-level reset, recommended to float
9	VCC_RF 3.3V	O	RF antenna power supply: 3.3V
11	RF_IN	I	Antenna signal input
16	TXD1	O	NMEA-0183
17	RXD1	I	Differential data, AT commands, FOTA upgrades
20	TXD0	O	Main serial port (functions same as UART1_TXD)
21	RXD0	I	Differential data, AT commands, FOTA upgrades
22	V_BACKUP	I	Backup power supply, supports hardware hot start
23	VCC	I	Main power supply
	GND	I	Ground, PIN 10, 12, 13, 24

4.2 Dimensions

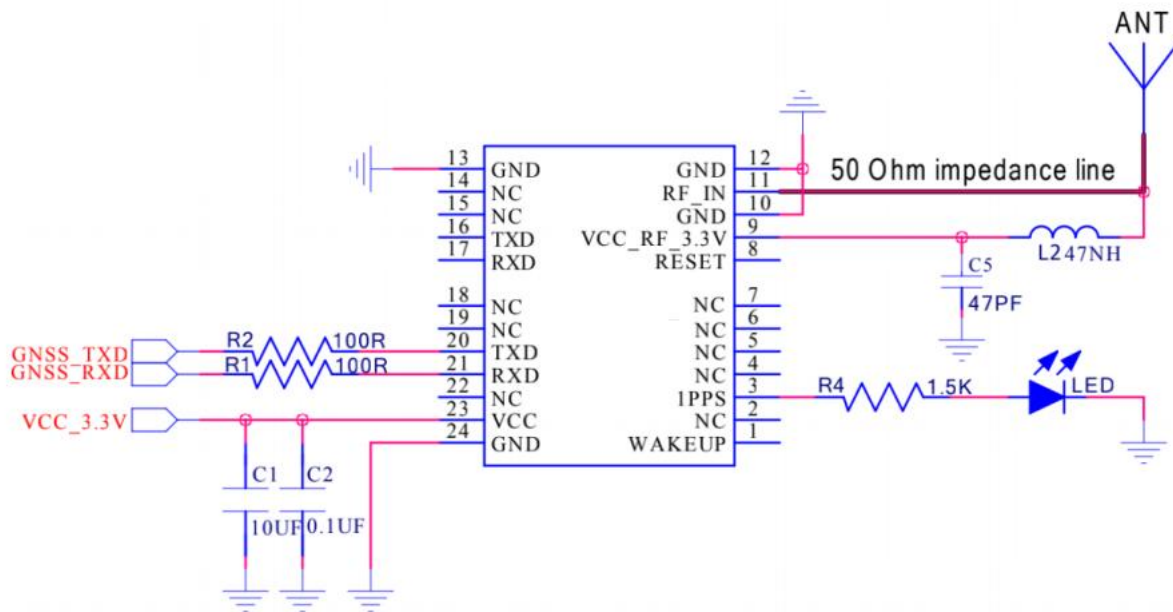


Number	Description	Min (mm)	Typ (mm)	Max (mm)
A	Length	15.9	16.0	16.6
B	Width	12.1	12.2	12.3
C	Module Total Thickness	2.2	2.4	2.6
D,G	Horizontal Edge to Pin Spacing	0.9	1.0	1.3
E	Pin Spacing	1.0	1.1	1.2
F	Gap Width	2.9	3.0	3.1
H	PCB Thickness		0.82	
K1	Pad Width (Metal)	0.7	0.8	0.9
K2	Pad Width (Metal/Solder)	0.7	0.8/0.9	0.9/1.2
M1	Pad Height (Metal)	0.7	0.8	0.9
M2	Pad Height (Metal/Solder)	0.7	0.9	1.1
N	Pad Semi-Diameter	0.4	0.5	0.6

5 Electrical Schematic

5.1 Schematic design

The MS37SN2 reference design is shown below. When connecting an active antenna, make sure the 47nH inductor in the L1 and L2 position is patched. This is used to power the active antenna. The characteristic impedance from the RF_IN pin to the antenna interface is 50Ω. In applications, the performance of the antenna is very important for the system, and the technical parameters of the dual-frequency precision antenna must be guaranteed. Pin22 can be connected to V_BACKUP backup power supply, supports hardware hot start, also supports Pin1 software wake up, high level is enabled.



5.2 Layout notice

- (1) Place the decoupling capacitors close to the power pins of the module, and ensure that the width of the power traces is more than 0.5mm;
- (2) No wiring is allowed at the bottom of the module patch;
- (3) The RF trace from the module RF port to the antenna interface must be at least 0.2mm~0.3mm, and the co-planar wave guide impedance model is used, and the spacing between the trace and the ground copper is controlled at about 1 times the spacing , and the guaranteed impedance is 50Ω;
- (4) The wiring from the module RF port to the antenna interface refers to the second layer ground, and ensure that the second layer ground plane is relatively complete;
- (5) Do not place the module near interference sources, such as communication module antennas, RF traces, crystal oscillators, large inductor, and high-frequency digital signal lines.

6 Packaging Information

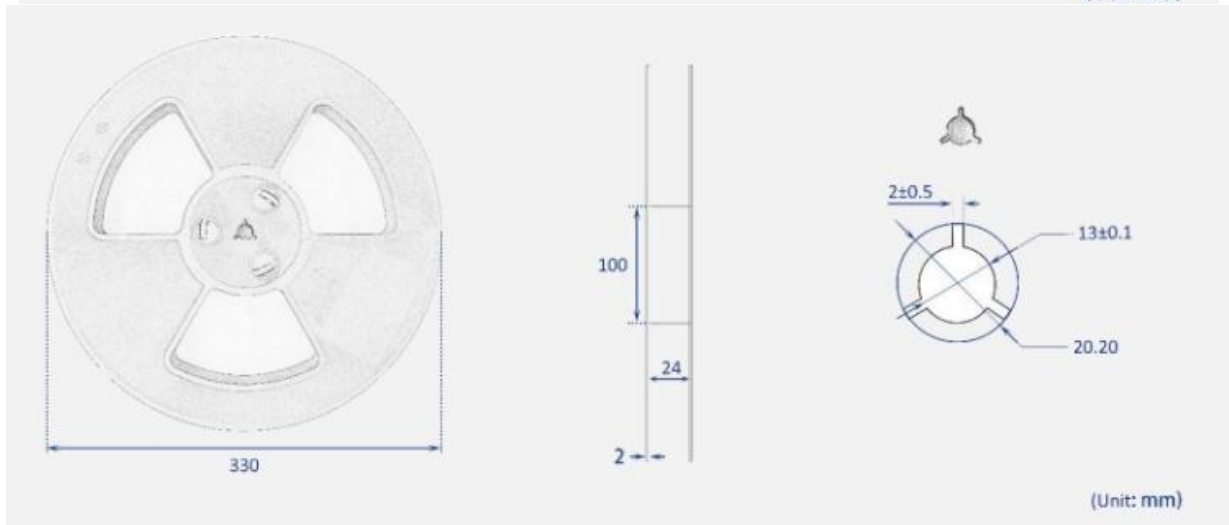
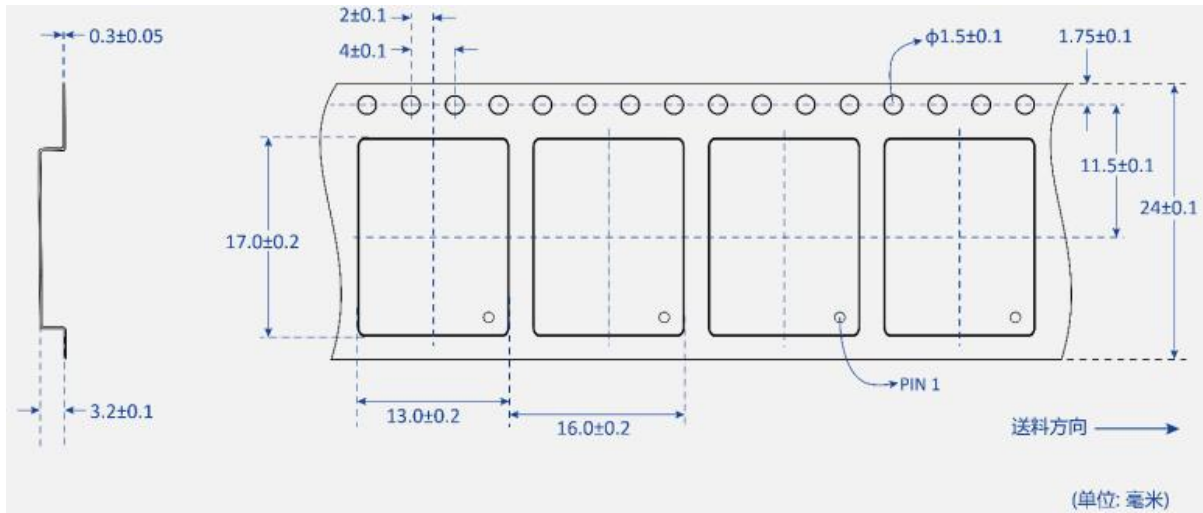
6.1 Package

MS37SN2 is a device sensitive to humidity and static electricity. During product packaging and shipping, be sure to follow the relevant handling requirements and take appropriate precautions to reduce product damage. The table below shows the standard packaging structure for product shipping.

Product	Reels	Sealed Bags	Shipping Cartons
			
Module	1000 pcs/roll	1 roll/bag	1 bag/box,3 boxes/carton

6.2 Tape and Reel

MS37SN2 adopts the method of reel (consisting of tape and reel), and is packed in sealed bag with anti-static effect to meet the needs of customers for efficient production, batch installation and disassembly. The picture below shows the size details of the tape.



6.3 Storage

In order to prevent the product from being damp and electrostatic discharge, a desiccant and a humidity indicator card are attached in the sealed packaging bag of the product. The user can know the humidity condition of the environment where the product is located through the humidity indicator card. The moisture sensitivity level of the product is MSL3.

6.4 ESD protection

GNSS positioning modules contain highly sensitive electronics and are classified as electrostatic sensitive devices (ESD). Please pay attention to the following operation matters.

- If the following precautions are not followed, it may cause serious damage to the module!
- Do not touch any live capacitors and other devices when pulling out the RF pins (e.g. antenna patch ~10 pF; coaxial cable ~50 –80 pF/m; soldering iron);
- To prevent electrostatic discharge, do not expose the antenna area; if it is exposed due to design reasons, please take appropriate ESD protection measures and do not touch any exposed antenna area;
- When soldering RF connectors and antenna patches, please make sure to use an ESD safe soldering iron.
- Add an ESD diode to the RF input section and UART interface to prevent electrostatic discharge;



7 Ordering Information

7.1 Order Part Number

Packing Detail	Name	Default Baud Rate	Default Satellite Reception Frequency	Physical Interface
MS37SN2	GNSS Module	115200	GPS/BDS/GLO/GAL/ QZSS	16*12, LCC24

● Quality

Cognizant of our commitment to quality, we operate our own factory equipped with state-of-the-art production facilities and a meticulous quality management system. We hold certifications for ISO9001, ISO14001, ISO27001, OHSAS18001, BSCI.

Every product undergoes stringent testing, including transmit power, sensitivity, power consumption, stability, and aging tests. Our fully automated module production line is now in full operation, boasting a production capacity in the millions, capable of meeting high-volume production demands.

● Contact Us

Shenzhen Minewsemi Co., Ltd. is committed to swiftly delivering top-quality connectivity modules to our customers. For assistance and support, please feel free to contact our relevant personnel, or contact us as follows:

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