MINEWSEMI

GNSS Module

MS32SN4

DateSheet

V 1.1.0

Applicable Product Model
MS32SN4

Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Coral	2022.12.22	
1.1.0	Layout Changes	Michelle	2023.08.30	

Web: www.minewsemi.com Tel: 0755-2801 0353 E-mail: minewsemi@minew.com

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1 Product Introduction

1.1 General description

MS32SN4 series products are high performance, low power consumption, GPS navigation and positioning modules.MS32SN4 has a built-in high sensitivity GNSS chip and ceramic antenna, and adopts MediaTek's high performance and low power consumption positioning engine, which provides excellent sensitivity and superior TTFF without host interaction. The product is suitable for vehicles or positioning devices that require high sensitivity and fast TTFF in weak signal environments while maintaining low system power consumption.

1.2 Key Parameter

MS32SN4 Parameter	
engine (loanword)	MediaTek MTK3337, 158MHz, ARM7EJ-S
frequency	GPS, SBAS, QZSS
(level of) sensitivity	Tracking:-165dBm; Recapture:-163dBm; Cold Start -148dBm
cold start	Average 29 seconds. Open sky.
hot start	Average 1 second
AGPS Assist	EASY™ Average 10 seconds
accurate	Autonomous level: 2.5 meters SBAS: 2.0 meters
maximum height	50,000 meters
Maximum speed	500 m/s
maximum acceleration	≦ 4G
baud	9600bps (factory default)
Update Frequency	1-10 Hz
characterization	DGPS (RTCM), A-GPS (EPO, EASY, LOCUS) FCC E911, Multipath Detection and Suppression

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2 Technical Information

2.1 Supported Constellations

The MS32SN4 receives and tracks GPS (including SBAS and QZSS) signals at 1575.42 MHz.

2.2 AGPS

The MS32SN4 supports three AGPS accelerated positioning schemes including EPO™, AlwaysLocateTM, and EASY™.

2.3 EPOTM

EPO™ provides predicted Extended Predictive Orbit (EPO) data to speed up TTFF. Users can download EPO data from an FTP server via the Internet or wireless network to the GPS engine, which will use the EPO data to assist with position calculations. Insufficient satellite navigation information or weak signal area.

2.4 AlwaysLocate™

AlwaysLocateTM is the intelligent controller for cycle mode. Depending on the environment and motion conditions, the GNSS module can adaptively adjust the working/standby time to achieve a balance between positioning accuracy and power consumption. In this mode, the host CPU does not need to control the GNSS module until the host CPU needs GPS position data.

2.5 EASY™

EASY ™ is an embedded aid for fast positioning, at power up the GPS engine automatically calculates and predicts ephemeris data (up to 3 days) and saves the predicted information in memory, the GPS engine uses this information for If there is not enough satellite positioning information available this feature will

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help to improve positioning and TTFF in indoor or urban conditions, therefore a backup power supply is required (VBACKUP).

2.6 Satellite-based Augmentation System (SBAS)

The MS32SN4 supports reception of SBAS broadcast signals. These systems supplement GNSS data with other regional or wide area GPS augmentation data. The system broadcasts distance correction and integrity information via satellite, which can be used by GNSS receivers to improve the accuracy of results. SBAS satellites can be used as additional satellites for ranging (navigation) to further improve availability. The following SBAS types are supported: GAGAN, WAAS, EGNOS and MSAS.

2.7 Quasi-Zenith Satellite (QZSS)

The Quasi-Zenith Satellite System (QZSS) is a navigation satellite overlay system for the Pacific Ocean covering Japan and Australia that transmits other GPS L1C/A signals. The module is capable of receiving and tracking these signals simultaneously with GPS, which improves availability and maintains positioning especially in poor signal conditions such as urban canyons.

2.8 crystal oscillator

The MS32SN4 uses the TCXO version, which allows for accelerated weak signal acquisition, resulting in faster startup and re-acquisition times than the crystal version.TCXO allows the product to ensure that it is stable and immune to frequency interference over its entire operating range (-40° to + 85° C), making it the most reliable positioning module in the industry.

2.9 Real Time Clock (RTC)

The RTC is driven by a 32 kHz oscillator using an RTC crystal. If the mains voltage fails, some parts of the receiver will shut down, but the RTC will still operate to provide a

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timing reference for the receiver. This mode of operation is referred to as "hardware backup mode", which allows all relevant data to be saved in backup RAM for later hot-booting.The MS32SN4 incorporates a "battery" to support the function of being used as a backup power supply.

2.10 power system

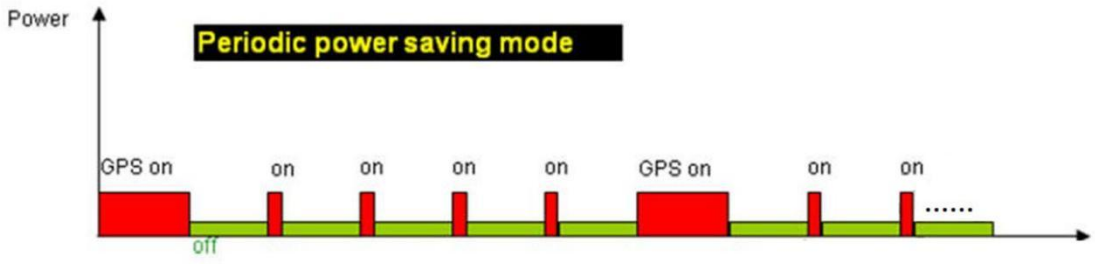
The MS32SN4 provides a power-optimized architecture with a built-in automatic power-saving feature that minimizes power consumption for a given time. In addition, the receiver can be used in two modes of operation: continuous mode for optimal performance and power-saving mode to optimize power consumption, respectively.

2.11 standby mode

The user can issue a software command to put the GNSS module into standby mode, which consumes less than 200uA of current. The GNSS module will wake up when any byte is received.

2.12 periodicity model

When the GNSS module is commanded to be in cyclic mode, it will be in operation and standby periodically. Its power consumption is shown below.



2.13 Continuous mode

Continuous mode uses the acquisition engine at full performance, resulting in the shortest possible TTFF and highest sensitivity. It searches all possible satellites until the annual calendar is fully downloaded. The receiver then switches to the

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tracking engine to reduce power consumption.

As a result, a lower level of tracking current consumption will be realized in the following cases:

- Obtaining a valid GNSS position
- The entire yearbook has been downloaded

Ephemeris valid for each satellite in the field of view

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3 Electrical Specification

3.1 Absolute maximum rating

parameters	minimum value	maximum values	unit (of measure)
Power Supply Voltage	0	6.0	V
Serial Port Input Voltage	-0.5	3.6	V
ESD Contact	-	3000	V
Storage Temperature	-40°C	+85°C	℃

Pressurizing the equipment beyond the "Absolute Maximum Rating" may cause permanent damage.

The above figures are pressure ratings only. Products are not overvoltage or reverse voltage protected. If necessary, voltage spikes exceeding the supply voltage specifications listed in the table above must be limited to the specified range using an appropriate protection diode.

3.2 Electrical parameters

parameters	minimum value	average value	maximum values	unit (of measure)
Power Supply Voltage	3.0	5.0	5.5	V
Supply Current (Acquisition)	35	40	45	mA
Supply Current (Tracking)	30	35	40	mA
Operation Temperature	-40	+25	+85	℃

All specifications are made at an ambient temperature of 25°C. Extreme operating temperatures can seriously affect specification values. Applications operating near temperature limits. The values in the table are for customer reference only and are intended as examples of typical power requirements only. Values are characterized as

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samples and actual power requirements will vary depending on the firmware version used, external circuitry, number of satellites tracked, signal strength, type of activation as well as time, duration, and test conditions.

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4 Antenna Performance

4.1 Location of the antenna

The antenna is a key part of any GNSS receiver design, and the location of the antenna is critical to the optimal performance of the GNSS receiver.The GNSS signal is right-hand circularly polarized (RHCP), so the antenna plane should be as parallel to the horizon as possible when in use. For good search performance, the antenna must have a complete view of the sky to ensure that as many visible satellites as possible can be captured, and, most critically, the antenna should be located as far away from radiated or interfering signals as possible.

4.2 Antenna parameters

Characteristics	Min	Typ	Max.	Units
Range of Receiving Frequency	-	1575.42	-	MHz
Band With(Return loss ≤-10dB)	5	-	-	MHz
V.S.W.R (in Center Frequency)	-	-	1.5	-
Gain(Zenith)	-	2	-	dBi
Axial Ratio	-	-	5	dB
Frequency Temperature Coefficient	-10	0	10	ppm/°C

NOTE: Interfering signals from in-band and out-of-band frequency sources may degrade performance.

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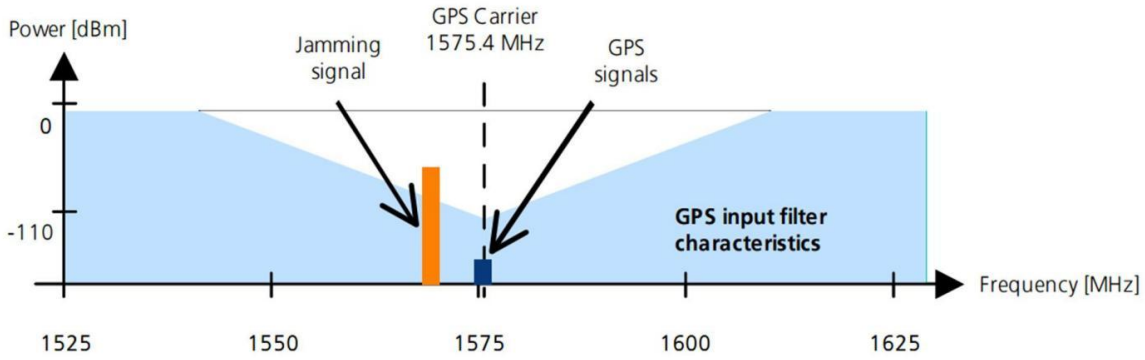
4.3 in-band interference

In-band interference occurs when the signal frequency is very close to the GPS frequency of 1575 MHz. Such interference signals are usually caused by harmonics generated by displays, microcontrollers, bus systems, etc.

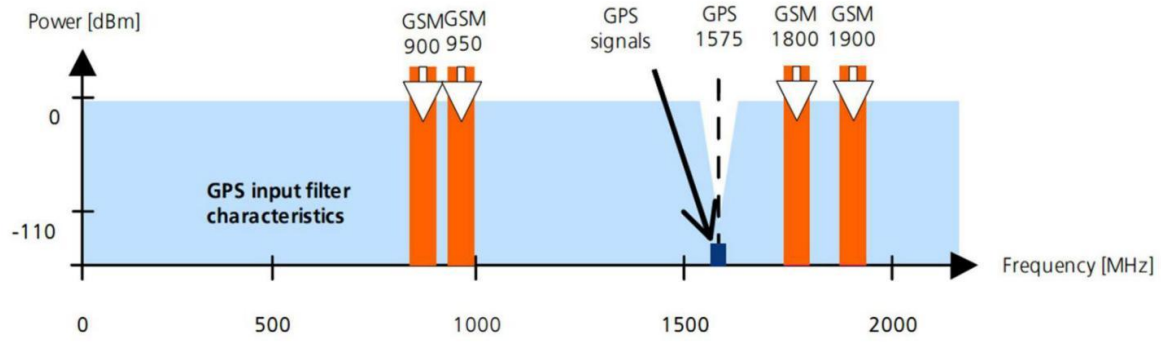


Measures to prevent in-band interference include:

- shielding layer
- Layout Optimization
- filtering radio waves (i.e. pick out one frequency)
- Location of GPS antenna

4.4 out-of-band interference

Out-of-band interference is usually caused by signal frequencies different from the GPS carrier. The source is usually a wireless communication system such as GSM, CDMA, WCDMA, WiFi, BT etc.



The MS32SN4 is configured with SAW to reduce out-of-band interference by adding a SAW filter.

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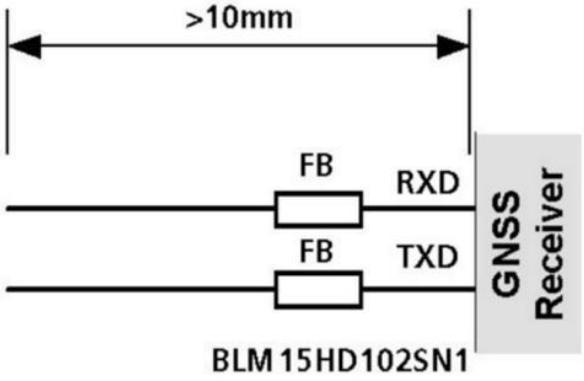
4.5 Serial EMI

Any I/O signal line longer than about 3 mm can act as an antenna and can pick up any RF signal and transmit it as noise to a GNSS receiver. This applies in particular to unshielded lines where the corresponding GND layer is far away or completely missing and the line is close to the edge of the printed circuit board.

For example, if a cellular signal is radiated into an unshielded high impedance line, it may generate noise on the order of volts, which will not only distort the receiver operation, but also cause permanent damage. On the other hand, noise generated at the I/O pins will emanate from the unshielded I/O lines. When this noise is coupled to the GNSS antenna, receiver performance may degrade.

To avoid interference due to improper shielding, it is recommended to use resistors (e.g. R> 20 W), ferrite beads (e.g. BLM15HD102SN1) or inductors (e.g. LQG15HS47NJ02) in series on the I / O lines. These components should be chosen carefully as they can also affect the signal rise time. The following shows an example of EMI protection measures on the RXD / TXD lines using ferrite beads.



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5 software protocol

5.1 5.1 NME A0183 Agreement

The NMEA protocol is an ASCII-based protocol where records begin with a $ and start with a carriage return/line feed character. GPS-specific messages all begin with $GPxxx, where xxx is the three-letter identifier of the message data that follows. NMEA messages have checksums that can be used to detect corrupted data transmissions.

NMEA records	descriptive	default (setting)
GPGGA	Global positioning system fixed data	Y
GPGLL	Geographic position-latitude/longitude	Y
GPGSA	GNSS DOP and active satellites for GPS	Y
GPGSV	GNSS satellites in view for GPS	Y
GPRMC	Recommended minimum specific GNSS data	Y
GPVTG	Course over ground and ground speed	Y
GPZDA	Date and Time	N

5.2 Common Commands

CMD TYPE	CMD Example
Hot Restart	$PMTK101*32<CR><LF>
Warm Restart	$PMTK102*31<CR><LF>
Cold Restart	$PMTK103*30<CR><LF>
Full Cold Restart	$PMTK104*37<CR><LF>
System Sleep Mode	$PMTK161,1*29<CR><LF>
System Wake up	$PMTK161,0*28<CR><LF>.

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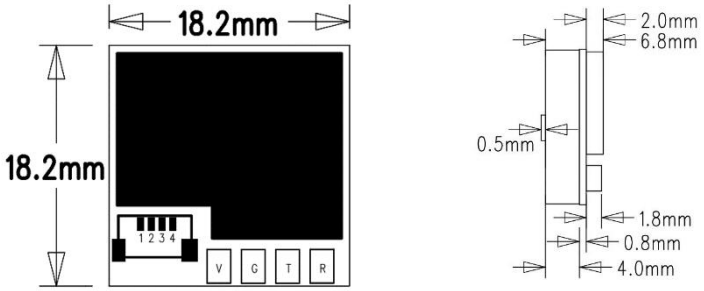
6 hardware interface

6.1 dimension drawing



Characteristics	Min	Typ	Max.	Units
Length	-	18.2	-	mm
Width	-	18.2	-	mm
MAX High	-	6.8	-	mm
Cable Length	-	30	-	mm

Tolerance: ±0.25mm

6.2 interface definition

※ Type : I (input), O (output), I/O (bidirectional), P (Power), G (Ground)

Definition of Sleeper Connector

Pin	Name	Type	Pin Description
1	GPS_RXD	I	Serial RX Port (Host to GPS)
2	VCC	P	Power supply
3	GPS_TXD	O	Serial TX Port (GPS to Host)
4	GND	G	Ground

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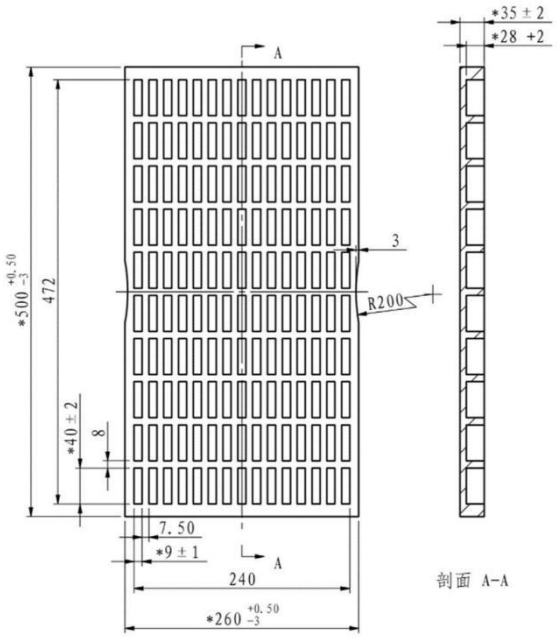
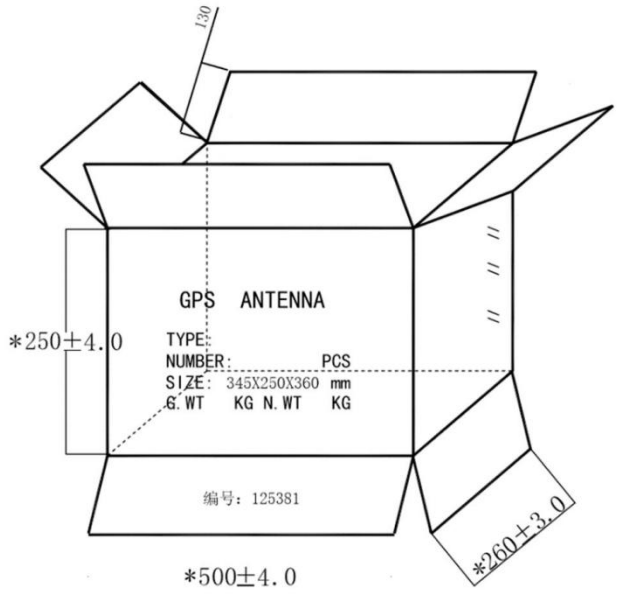
7 Packaging and Protection

7.1 wrap

The MS32SN4 is delivered in a boxed package for efficient production, production lot setup and tear down. Minimum order quantity package number: 150 * 6 = 900 PCS.

NO	Part Name	Q,ty / Ctn	Out Size (mm)
1	Box Carton	1/1	500(W)mm×260(D)×250(H)mm
2	Pad Carton	6/1	-
3	Tray	150/1	-





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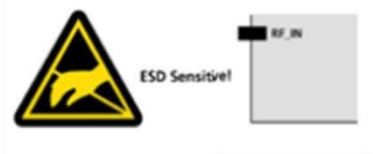
7.2 electrostatic protection

The MS32SN4 module is an electrostatic sensitive device (ESD). Observe the following precautions for handling! Failure to observe these precautions may seriously damage the GNSS receiver!

GNSS receivers are electrostatic sensitive devices (ESD) and require special precautions when handling. Because of the risk of electrostatic charges, extra care must be taken when handling patch antennas. In addition to standard ESD safety practices, the following measures should be considered when handling receivers:

- Unless there is current coupling between the local GND (i.e., the bench) and the PCB GND, the first point of contact when handling the PCB must always be between the local GND and the PCB GND.
- Before installing the antenna patch, connect the ground of the device.
- When handling RF pins, do not contact any charged capacitors and be careful when touching materials that generate a charge (e.g., patch antenna ~10 pF, coaxial cable ~50-80 pF/m, soldering iron).
- To prevent static electricity from being generated through the RF input, do not touch any exposed antenna areas. If there is a risk of touching exposed antenna areas in non-ESD-protected work areas, take appropriate ESD protection measures in the design.
- Be sure to use an ESD-safe soldering iron when soldering RF connectors and patch antennas to the R F pins of the receiver.



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8 Ordering Information

8.1 Ordering Model

Welcome to order, we promise to give you the best quality products and services.

Ordering Model	Diethylammonium chloride	Default frequency	Antenna Size	physical interface
MS32SN4	GNSS Module	GPS/QZSS	18*18*4 mm	0.8mm 4pin horizontal paste

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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, OHSA18001, 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:

Web： www.minewsemi.com

Email： minewsemi@minew.com

Linkedin： www.linkedin.com/company/minewsemi

Shop： https://minewsemi.en.alibaba.com/

Tel： +86 0755-28010353

Address： 3rd Floor,I Building, Gangzhilong Science Park, NO.6, Qinglong Road,Longhua District, Shenzhen, China

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MINEWSEMI

Tel: 0086-755-2801 0353
Email: minewsemi@minew.com
Web: www.minewsemi.com
Address: 3rd Floor, Building I, Gangzhilong Science Park, Qinglong RoadLonghua District, Shenzhen 518109, China