

GNSS Module

MS34SN3

Datasheet

V 1.1.0

Applicable Product Model
MS34SN3

Version Note

Version	Details	Contributor(s)	Date	Notes
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1 Product Introduction

1.1 General description

The MS34SN3 is a five-star, ten-frequency, L1+L5 GNSS module with integrated RTK positioning engine. Built-in 12nm advanced process GNSS Soc chip, integrated with up to 530MHz ARM Cortex-M4 FPU and MPU, the module supports GPS, BeiDou, GLONASS, Galileo and QZSS multi-satellite systems, combined with RTK (carrier phase difference) technology, MS34SN3 can achieve centimeter level positioning accuracy, which greatly improves the device positioning accuracy while maintaining ultra-low power consumption. The MS34SN3 can achieve centimeter-level positioning accuracy, greatly improving the device's positioning accuracy while maintaining ultra-low power consumption.

The multi-satellite combination greatly increases the number of satellites visible when traveling in dense urban canyon environments, reducing the time to first fix and improving positioning accuracy, even up to 65 satellites in open environments! The RTK algorithm engine enables centimeter-level positioning accuracy on open roadways.

The superior positioning performance of the MS34SN3 makes it ideal for industrial and consumer applications in the automotive sector (e.g. T-Box, in-vehicle navigation, V2X), transportation sector (e.g. industrial vehicles, operational vehicle monitoring), trackers, shared motorcycles, smart agriculture, inspections, and more.

1.2 Key Parameter

MS34SN3 Parameter	
engine (loanword)	MTK 530MHz ARM Cortex-M4 FPU and MPU, 12nm advanced process
horoscope	GPS: L1 C/A, L5 BDS: B1I, B2a, GLONASS: L1 GALILEO: E1, E5a QZSS: L1 C/A, L5 SBAS: WAAS,EGNOS,MSAS,GAGAN,SDCM NAVIC*: L5 (optional)
operating frequency	GPS/QZSS L1: 1575.42±1.023MHz L5: 1176.45MHz±10.23MHz BDS B1I: 1561.098MHz±2.046MHz B2a: 1176.45MHz±20.46MHz GLONASS G1: 1601.71875MHz±3.91175MHz GALILEO E1: 1575.42±2.046MHz E5a: 1176.45MHz±10.23MHz NAVIC*: L5 (optional) L5: 1176.45MHz±10.23MHz
(level of) sensitivity¹	Cold Start: -148dBm; Recapture: -160dBm; Tracking: -165dBm;
First positioning time¹	Cold start: ≤24 seconds; Hot start: 1 second; AGPS Assist: <6 seconds;
Fixed solution convergence time	≤10 seconds
Positional accuracy²	Single-point localization: Open sky: <1.5 meters CEP Complex urban environments: <2.5 m CEP RTK: Horizontal positioning accuracy: 1cm+1PPM CEP Elevation accuracy: 2cm+1PPM CEP
Speed Accuracy²	<0.05 m/s
time accuracy²	20 nanoseconds
operating temperature	Operating temperature: -40°C to +85°C

refresh rate	GNSS RTK: 1-5Hz;
baud	Main Serial Port 115200bps (factory default)
RTCM differential output	Supports RTCM2.x, RTCM3.x outputs, MSM4/MSM7 support
Supported Protocols	NMEA 0183 Protocol Ver. 4.0/4.1 RTCM 2.3/2.4/3.0/3.2

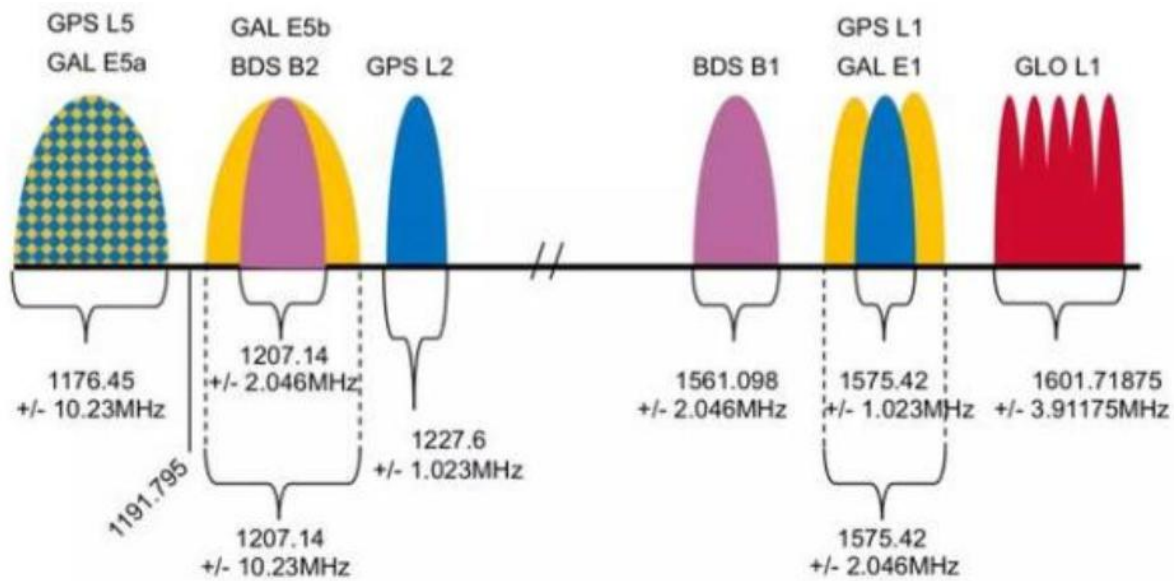
Remarks:

1. All satellites signal at -130 dBm
- 2 CEP, 50%, 24 hours static, -130 dBm, > 20 SVs

2 Technical Information

2.1 Supporting Constellations

Due to the multi-constellation RF front-end architecture, the MS34SN3 can simultaneously receive dual-band (L1+L5) satellite signals supporting GPS, BDS, GLONASS, GALILEO, IRNSS, QZSS, and the satellite-based augmentation systems SBAS (WAAS, EGNOS, GAGAN, and MSAS). The main frequencies of the GNSS are schematically shown in the figure below.



2.2 Satellite-based Augmentation System (SBAS)

The MS34SN3 supports the 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.

typology	satellite navigation system	Operation and maintenance country/region
Master Navigation System (GNSS)	GPS	United States of America
	Beidou (BDS)	sino
	GLONASS	Georgia
	GALILEO	EU
local navigation system	QZSS	Japanese
	NAVIC/IRNSS	India
Star-based Wide Area Strengthening (SBAS)	WASS	United States of America
	EGNOS	EU
	MSAS	Japanese
	GAGAN	India

2.3 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.

2.4 satellite enhancement

With multi-mode dual-frequency L1+L5 carrier phase difference function, the received input base station information should follow RTCM3.2 protocol. The base station can be a directly connected station or a virtual CORS station. The supported differential message types are listed in the table below.

message type	typology
1005 / 1006	Base Station Antenna Location Information
1074	Base station GPS observation message group
1084	Base station GLONASS observation volume message sets
1124	Base station BDS observation volume message set
1094	Base station GALILEO observation volume message sets

2.5 Carrier phase technology - RTK

The module supports GPS, BeiDou, GLONASS, Galileo and QZSS multi-satellite systems, as well as L1+L5 frequency points. Combined with RTK (carrier phase differential) technology, the MS34SN3 can achieve centimeter-level positioning accuracy, which greatly improves the device's positioning accuracy while maintaining ultra-low power consumption. Differential positioning is a necessary condition for centimeter-level accuracy, and the application needs to ensure that the receiver receives stars well.

2.6 Satellite augmentation - Differential DGNSS)

The MS34SN3 can also be downgraded to use the Code Differential function, D-GNSS, to access pseudo-range correction information in RTCM 2.3 or user-defined formats when RTK use is limited. The MS34SN3 used as a mobile station will attempt to provide the best possible positional accuracy depending on the correction data received. Upon receipt of the RTCM message input stream, it will immediately enter differential mode. Improvements in positioning accuracy can be expected after entering D-GNSS mode. D-GNSS is a differential system in which mobile stations use reference data from a reference station. If the RTCM correction function is not available, it will operate as a stand-alone precision receiver for GNSS satellite-based or single-point positioning.

3 Electrical Specification

3.1 Absolute maximum rating

notation	parameters	minimum value	maximum values	unit (of measure)
VCC	Mains voltage	-0.5	3.63	V
VBAT	Backup power supply voltage	-0.5	3.63	V
VI-max	I/O Pin Input Voltage	-0.5	3.63	V
T-storage	Storage temperature	-40	+85	°C
T-solder	Reflow temperature	--	250	°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 DC Characteristics

parameters	prerequisite	minimum value	typical value	maximum values	unit (of measure)
VCC	Mains voltage	1.8	3.3	3.6	V
VBAT	Backup power supply voltage	1.8	3.3	3.6	V
ICC _{max}	Maximum operating current on VCC	--	3.3	200	mA
T _{env}	Operating Temperature	-40	--	85	°C

3.3 power wastage

notation	parameters	Measurement Pins	typical value	unit (of measure)
ICCRX1 ^[1]	capture phase	VCC ^[2]	20	mA
ICCRX2 ^[1]	tracking stage	VCC ^[2]	14	mA

Remarks:

- Under open sky, GNSS, L1 + L5 bands, tracking 32 satellites, successful positioning.
- Conditions: VCC=3.3V, room temperature, all pins suspended

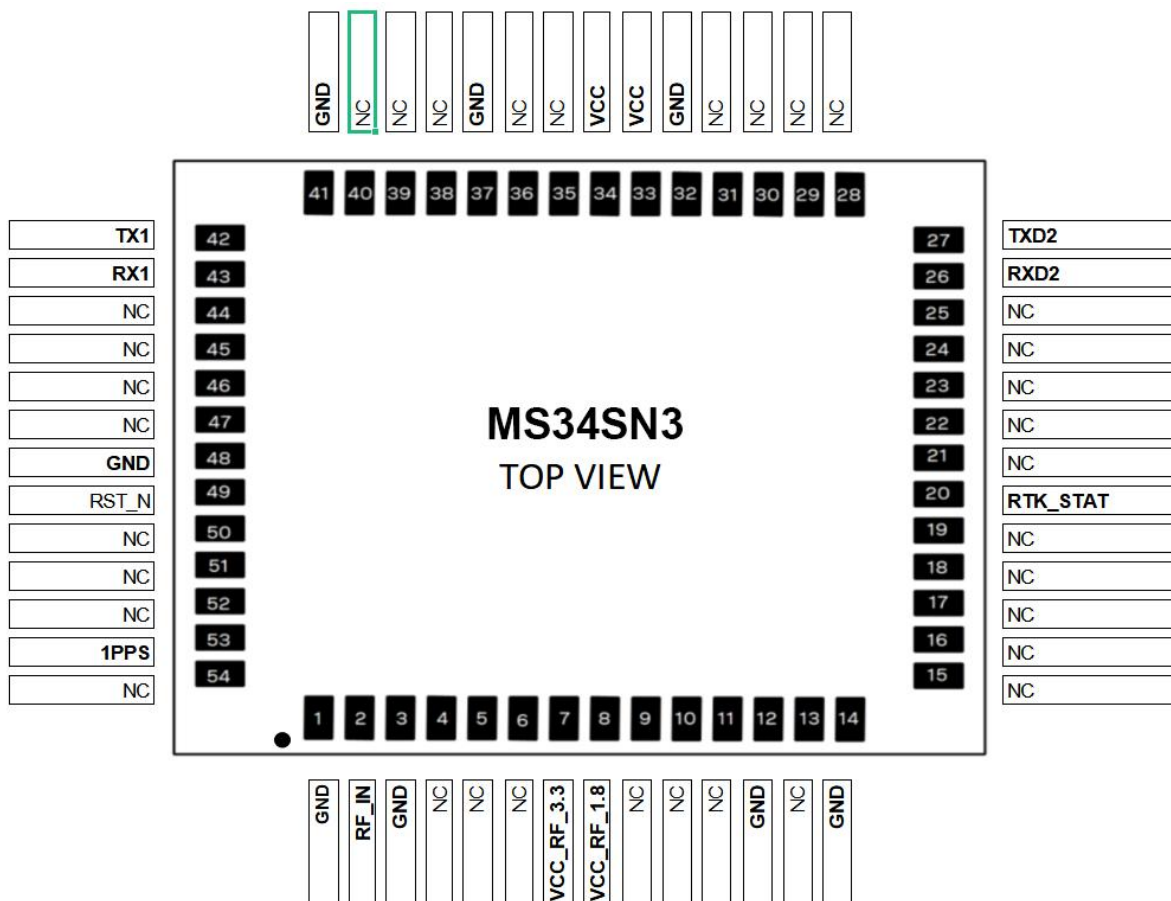
All of the above specifications are at 25°C ambient temperature. Extreme operating temperatures can seriously affect specification values. Applications operating near temperature limits.

The values in the table are for customer reference only and are intended as examples of typical power requirements. Values are characterized as 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.

4 Package Definition

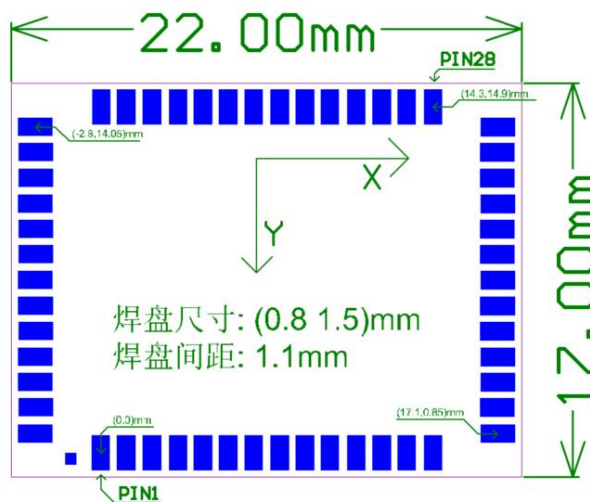
4.1 Module Pin Definitions

The MS34SN3 is available in a 22*17mm , LGA-54pin package and is defined as follows:



serial number	name (of a thing)	I/O	descriptive
2	RF_IN	I	Antenna Signal Input
7	VCC_RF_3.3	I	RF antenna power supply 3.3V
8	VCC_RF_1.8	I	RF antenna power supply 1.8V, low-power antenna used when 1.8V is used
20	RTK_STAT	O	Current positioning status of the module
26	RXD2	I	Differential Data, AT Commands, FOTA Upgrade
27	TXD2	O	NMEA-0183 , Base Station Mode RTCM3 Differential Outputs
33	VCC	I	main power
34	VCC	I	Main power supply, recommended two-way power supply, system stability
42	TXD1	O	Main serial port (same function as UART1_TXD)
43	RXD1	I	Differential Data, AT Command, FOTA Upgrade
49	RST_N	I	reset
53	1PPS	O	time pulse
	GND		Grounding, PIN 1/3/12/32/37/41/48

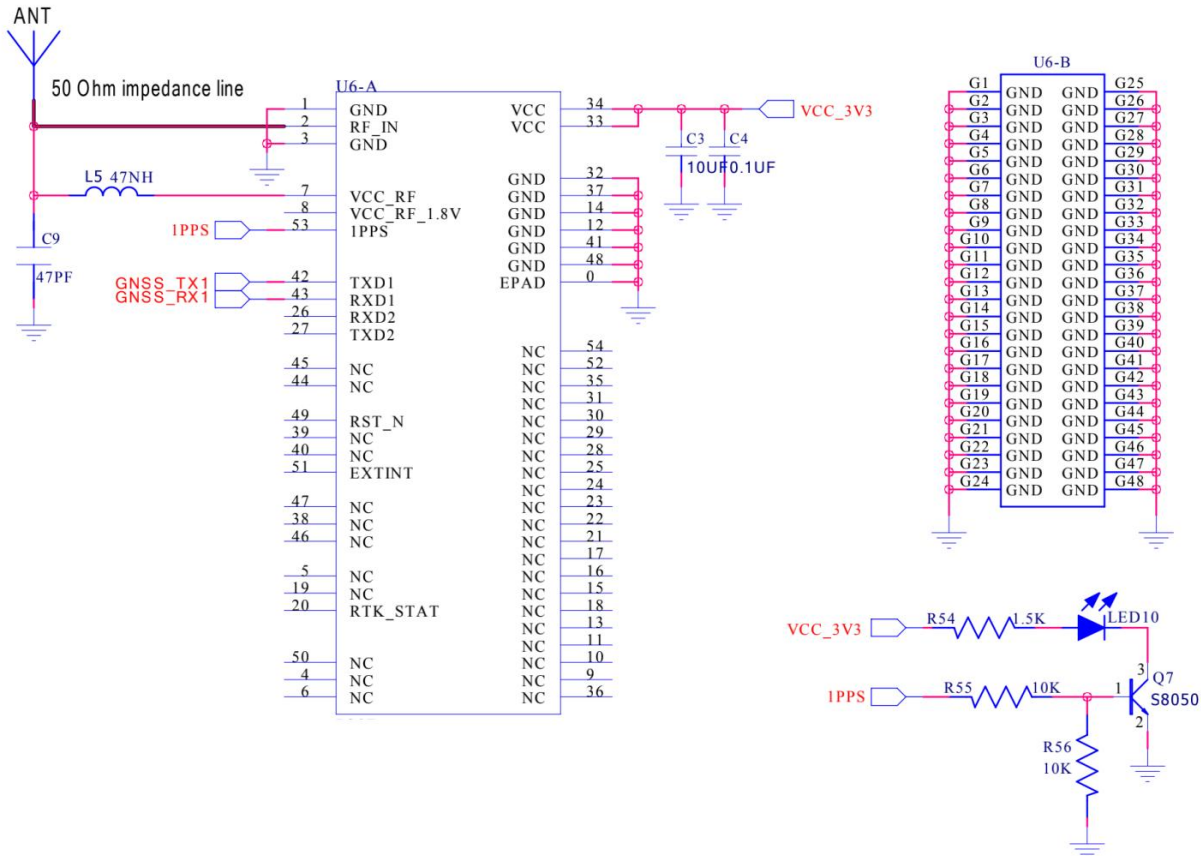
4.2 Mechanical dimensions



5 reference design

5.1 schematic design

The application schematic of the MS34SN3 using the module to power the antenna (internal power supply) is shown below:



If the high-precision active antenna is a low-power design with 1.8V power supply, pin 8 can be used to supply 1.8V. Of course, the high-precision antenna can be externally powered, and when the antenna is externally powered, L5 47nH NC, change to an external power supply of 3.3V or other antenna-adapted voltage.

5.2 LAYOUT Notes

- (1) Decoupling capacitors are placed close to the module power supply pins, and ensure that the power supply alignment width is more than 0.5mm;
- (2) No wires are allowed to be routed at the bottom of the module patch;
- (3) The RF alignment between the RF port of the module and the antenna interface should be at least 0.2mm~0.3mm, and the coplanar waveguide impedance model should be adopted, and the spacing between the alignment and the ground copper skin should be controlled to be about 1 times of the spacing, and the impedance should be guaranteed to be 50Ω;
- (4) The alignment from the module RF port to the antenna connector references Layer 2 ground and ensures that the Layer 2 ground plane is relatively complete;
- (5) Modules should not be placed near sources of interference, such as communication module antennas, RF alignments, crystal oscillators, large inductors, and high-frequency digital signal lines.

6 Packaging and Protection

6.1 wrap

The MS34SN3 is humidity and static sensitive. It is important that you follow the handling requirements and take appropriate precautions to minimize product damage during packaging and shipping of the product. The following table shows the standard packaging structure for product transportation.

offerings	reels	Sealed Bags	Shipping cartons
module (in software)	500pcs/roll	1 roll/bag	1 bag/box, 3 boxes/ctn

6.2 Carrier belts and trays

The MS34SN3 is supplied on a reel (consisting of a tape and reel) and packaged in a ziplock bag with an anti-static effect to meet the customer's needs for efficient production, batch installation and disassembly.

6.3 stockpile

In order to prevent the product from moisture and electrostatic discharge, the sealed bag of the product is equipped with desiccant and humidity indicator card, which allows the user to know the humidity condition of the environment in which the product is located. The product has a moisture sensitivity rating of MSL3.

6.4 ESD protection

The GNSS positioning module contains highly sensitive electronics and is an electrostatic sensitive device (ESD). Please note the following precautions, as failure to follow these precautions may result in serious damage to the module!

- Ground yourself before patching the antenna. Do not touch any charged capacitors and other devices (e.g., antenna patch ~10 pF; coaxial cable ~50 -80 pF/m; soldering iron) when bringing out the RF pin;
- To prevent electrostatic discharge, do not expose the antenna area; if exposed by design, take appropriate ESD precautions and do not touch any exposed antenna area;
- Be sure to use an ESD safe soldering iron when soldering RF connectors and antenna patches.
- Add ESD diode to RF input to prevent ESD; add ESD diode to UART interface



7 Ordering Information

7.1 Ordering Model

Ordering Model	Pseudolaric acid	Default Baud Rate	characterization	Default satellite reception frequency	physical interface
MS34SN3	GNSS Module	115200	Dual-frequency RTK	GPS/BDS/GLO/GAL/QZSS L1+L5 Simultaneous multi-constellation positioning	22*17, LGA54

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