MINEWSEMI

GNSS Module

ME32GR01

Datasheet

V 1.0.0

Applicable Product Model
ME32GR01

Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Michelle	2023.12.05	

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1 Product Introduction

1.1 General Description

The ME32GR01 is a multi-constellation, concurrent, simultaneous multi-constellation L1+L5 positioning GNSS module. All four major GNSS constellations (GPS, Beidou, Glonass and Galileo) can be received simultaneously thanks to the multi-constellation RF front-end architecture, giving the receiver excellent sensitivity and acquisition capabilities, and excellent interference suppression characteristics allow the receiver to achieve reliable positioning even under difficult signal conditions. The multi-system 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 in harsh environments.

The excellent positioning performance of ME32GR01 makes it ideal for industrial and consumer applications such as vehicle locators, two-wheeler positioning, shared motorcycle, T-Box, in-car navigation, transportation sector (e.g., industrial vehicles, operational vehicle supervision), and inspection operations, etc.

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1.2 Key Parameter

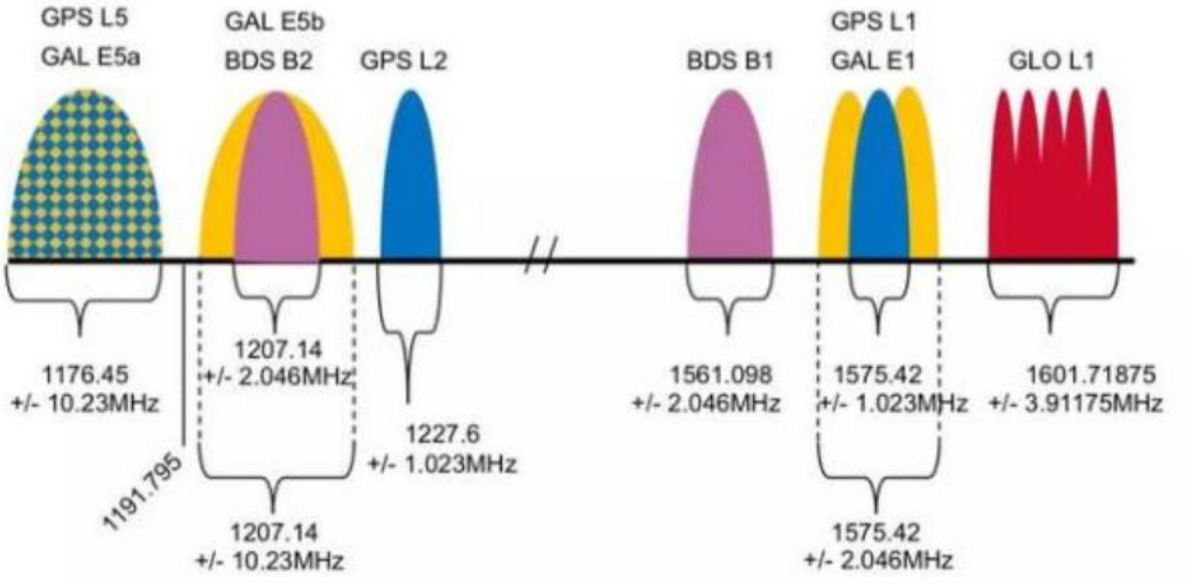
ME32GR01 Parameter	
Constellation	GPS: L1 C/A, L5 BDS: B1I, B2a, GLONASS: L1 GALILEO: E1, E5a QZSS: L1 C/A, L5 SBAS: WAAS,EGNOS,MSAS,GAGAN,SDCM IRNSS/NAVIC: L5
Operating Frequency	GPS/QZSS L1: 1575.42±1.023MHz L5: 1176.45MHz±10.23MHz BDS B1I: 1561.098MHz±2.046MHz B2a: 1176.45MHz±20.46MHz GLONASS G1: 1601.71875MHz±3.91175MHz GALILEO E1: 1575.42±2.046MHz E5a: 1176.45MHz±10.23MHz IRNSS/NAVIC: L5 L5: 1176.45MHz±10.23MHz
(Level of) Sensitivity[1]	Cold Start: -148dBm; Recapture: -159dBm; Tracking: -163dBm;
First Positioning Time[1]	Cold start: ≤28 seconds; Hot start: 1 second;
Positional Accuracy[2]	Single-point localization: Open sky: <1.5 meters CEP Complex urban environments: <2.5 m CEP
Speed Accuracy[2]	<0.05 m/s
Time Accuracy[2]	20 nanoseconds
Operating Temperature	Operating temperature: -40°C to +85°C
Refresh Rate	Default GNSS: 1Hz ,Supports up to 20Hz
Baud	Main Serial Port 115200bps (factory default)
RTCM Differential Output	Supports RTCM3.x output
Supported Protocols	NMEA 0183 Protocol Ver. 4.0/4.1 RTCM 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

ME32GR01 can simultaneously receive dual-band (L1+L5) satellite signals supporting GPS, BDS, GLONASS, GALILEO, IRNSS*, QZSS, and Satellite Based Augmentation System SBAS (WAAS, EGNOS, GAGAN, and MSAS) due to the adoption of multi-constellation RF front-end architecture. The main GNSS frequencies are illustrated in the figure below



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2.2 Satellite-based Augmentation System (SBAS)

The ME32GR01 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 add-on 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)	China
	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.

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2.4 Raw Satellite Observations (RAW)

GNSS raw survey data may contain all or some of the following data:

Element
Pseudorange and pseudorange rate
Navigation messages
Cumulative change or carrier
Hardware clocks

2.5 Satellite Augmentation - Code Differential DGNSS

The ME32GR01 can also be downgraded to use the code difference function, D-GNSS, to access pseudo-range correction information in RTCM 2.3 or user-defined formats when RTK use is limited. The ME32GR01 used as a mobile station will attempt to provide the best possible positioning accuracy depending on the correction data received. Upon receiving the RTCM message input stream, it will immediately enter differential mode. Improvements in positioning accuracy can be expected upon entering D-GNSS mode.

D-GNSS is a differential system where the mobile station uses 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.

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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	℃
T-solder	Reflow temperature	--	250	℃

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.

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3.2 DC Characteristics

Parameters	Prerequisite	Minimum Value	Typical Value	Maximum Values	Unit (of measure)
VCC	Mains voltage	2.0	3.3	3.6	V
VBAT	Backup power supply voltage	2.5	3.3	3.6	V
$IABC_{max}$	ANT_BIAS Maximum operating current	--	3.3	45	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]	25	mA
ICCRX2 [1]	tracking stage	VCC [2]	23	mA
ICCDBM	hibernation	VBAT [3]	22	uA

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

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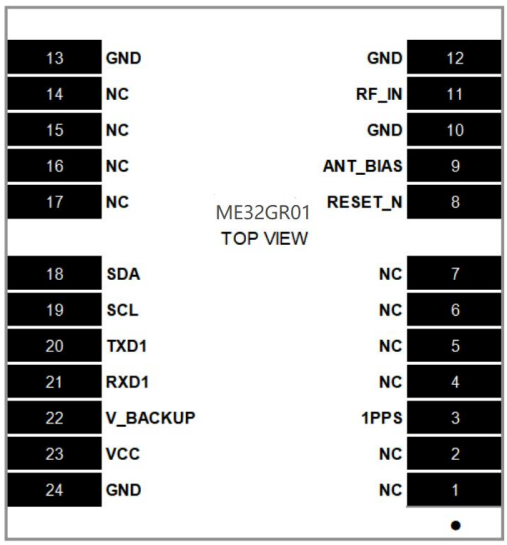
4 Package Definition

4.1 Module Pin Definitions

The ME32GR01 is available in a 16*12mm， LCC-24pin package and is defined as follows:



Serial number	Name (of a thing)	I/O	Descriptive
3	1PPS	O	Time pulse/second pulse
8	RESET_N	I	Reset, Reset Low, Recommended Suspend
9	ANT_BIAS	O	RF antenna power supply 3.3V, max. operating current 45mA, overload trigger protection
11	RF_IN	I	Antenna Signal Input, No Feeder
18	SDA	I/O	I2C SDA
19	SCL	I	I2C SCL
20	TXD	O	Primary USB port， GPS-> Host
21	RXD	I	Primary USB port， Host -> GPS。 Differential Data, AT Commands, FOTA Upgrade
22	V_BACKUP	I	Backup power supply, support hardware hot start. Operating voltage 1.5-3.6V
23	VCC	I	Mains power supply, operating voltage 2.0-3.6V
	GND	I	GND， PIN 10， 12， 13， 24

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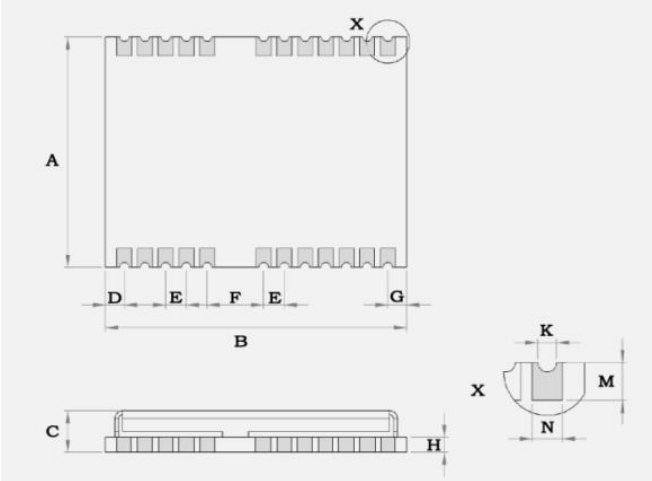
5 Package Specifications

5.1 Dimensions



5.2 Mechanical Dimensions

Serial Number	Minimum (mm)	Typical Values (mm)	Maximum Value (mm)
A	12.0	12.2	12.4
B	15.8	16.0	16.2
C	2.2	2.4	2.5
D	0.9	1.0	1.3
E	1.0	1.1	1.2
F	2.9	3.0	3.1
G	0.9	1.0	1.3
H	0.7	0.8	0.9
K	0.4	0.5	0.6
M	0.8	0.9	1.0
N	0.7	0.8	0.9

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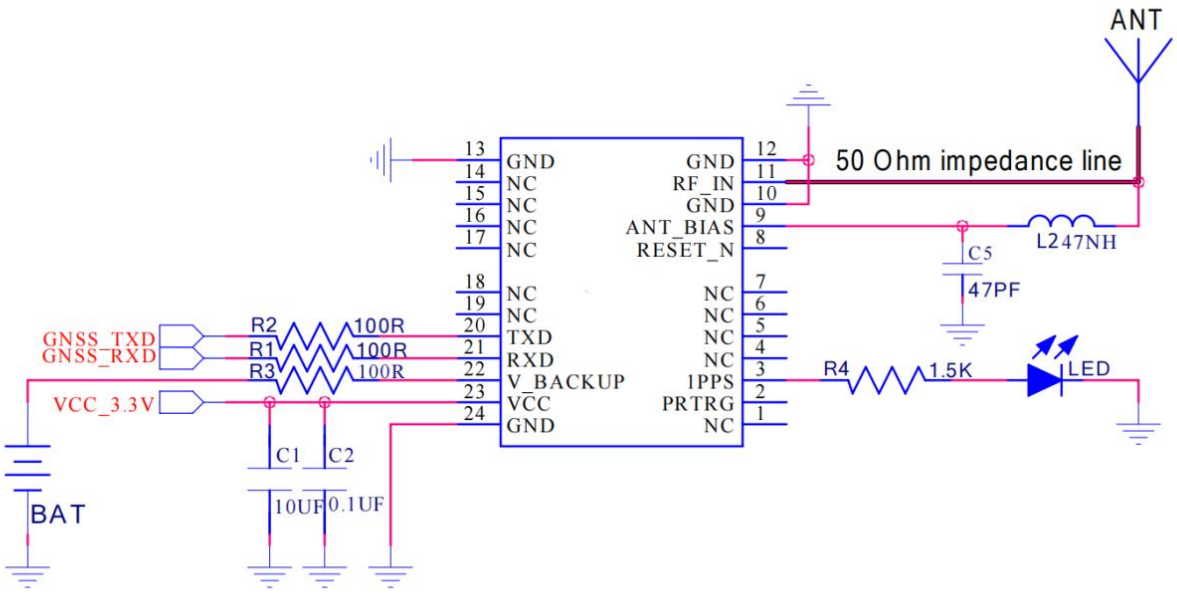
6 Reference Design

6.1 Schematic Design

The reference design of ME32GR01 is shown below. When connecting the active antenna, please make sure that the 47nH inductor at L2 is in the SMD state, which is used to power the active antenna; the characteristic impedance from the RF_IN pin to the antenna connector is 50Ω. The antenna's performance is critical to the system when applying the antenna, and it is important to ensure the technical parameters of the dual-band high-precision antenna. pin22 can be connected to the V_BACKUP backup power supply, which supports the hardware hot-start.



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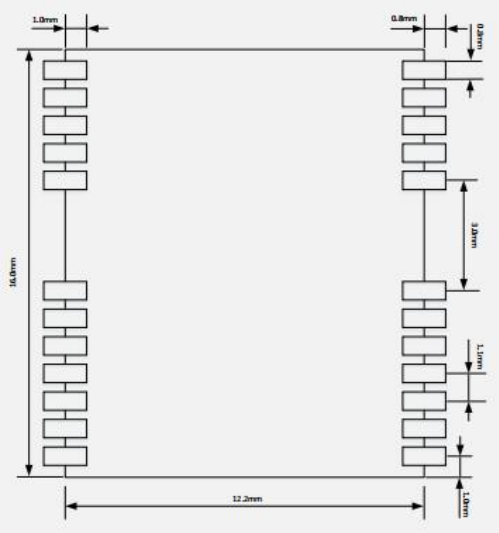
6.2 PCB Package Reference

The package reference recommendations for the ME32GR01 are as follows:



6.3 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.

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7 Packaging and Protection

7.1 Wrap

The ME32GR01 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	1000pcs/roll	1 roll/bag	1 bag/box, 3 boxes/ctn

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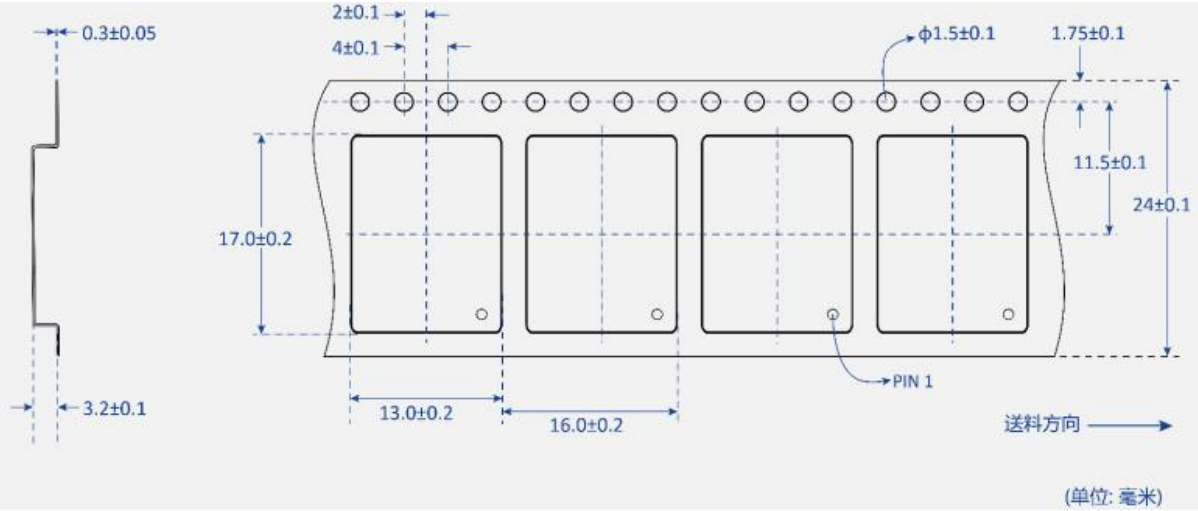
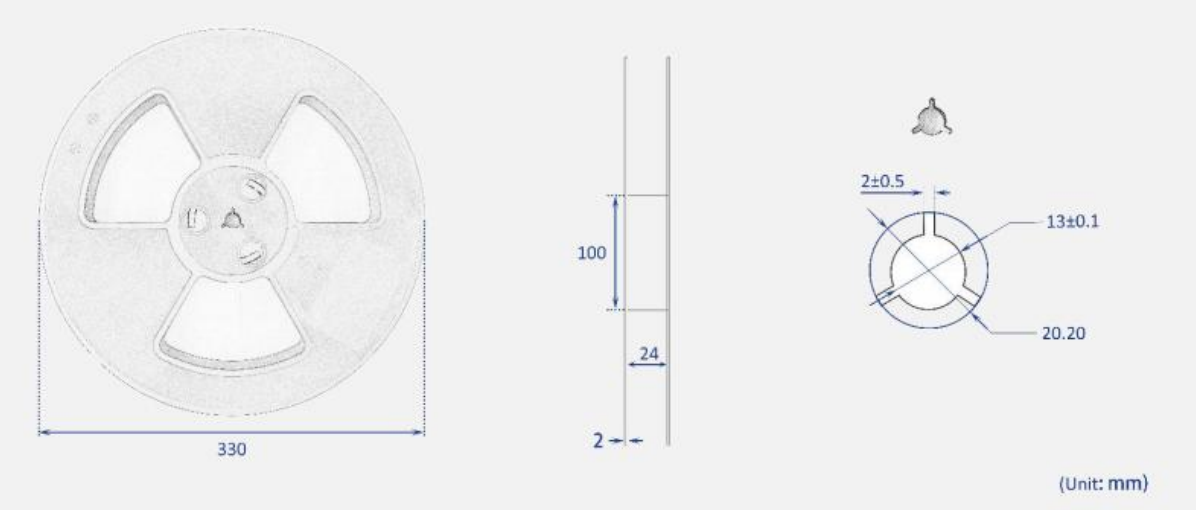
7.2 Carrier Belts and Trays

The ME32GR01 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 removal. The following picture shows the dimensional details of the tape reel.





7.3 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.

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7.4 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.

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8 Ordering Information

8.1 Ordering Model

Ordering Model	Product Name	Default Baud Rate	Characterization	Default Satellite Reception Frequency	Physical Interface
ME32GR01	GNSS Module	115200	dual frequency L1+L5	GPS/BDS/GLO/GAL/ IRNSS/QZSS	16*12, LCC24

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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:

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