MINEWSEMI

GNSS Module
ME3GGR31

Datasheet

V 1.0.0

Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Owen	2024.12.11	

Part Number

Model	Hardware Code
ME3GGR31	4NN

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https://en.minewsemi.com/file/ME3GGR31_Datasheet_EN.pdf

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1 PRODUCT INTRODUCTION

1.1 General Description

The ME3GGR31 is a single-frequency, full-constellation satellite positioning GNSS module. Featuring a multi-constellation RF front-end architecture, it supports all four major GNSS constellations (GPS, Beidou, Glonass, and Galileo) simultaneously, as well as QZSS and SBAS satellites. This combination results in a receiver with excellent sensitivity, acquisition capabilities, and interference suppression, ensuring reliable positioning even under challenging signal conditions. The multi-system support increases the number of visible satellites in dense urban environments, reducing the time to first fix and improving positioning accuracy, even in harsh conditions.

The ME3GGR31 is packaged in SMD standardized patch. its compact size and excellent positioning performance make it ideal for industrial and consumer applications such as Internet of Things devices, vehicle positioners, two-wheelers, and inspection jobs.

1.2 Key Parameters

ME3GGR31 Parameter	
Operating Frequency	GPS/QZSS L1 C/A：1575.42±1.023 MHz BDS B1I：1561.098±2.046 MHz B1c：1575.42±16.368 MHz GLONASS G1：1598.063 -1605.375 MHz GALILEO E1：1575.42±2.046 MHz QZSS L1 C/A：1575.42±1.023 MHz SBAS L1 C/A：1575.42±1.023 MHz
Sensitivity1	Cold start：-148dBm; Recapture：-159dBm; Track：-165dBm;
First Positioning Time1	Cold start：≤28s;　Hot start：1s;
Long-term ephemeris saved	Support 7-day ephemeris data preservation and prediction
Positional accuracy2	open sky：<1.5 m (CEP)
Velocity Accuracy2	<0.05 m/s
Time accuracy2	20ns
operating temperature	-40°C to +85°C
Refresh rate	Default GNSS: 1Hz, maximum 10Hz supported
Baud	Main Serial Port 115200bps (factory default)
Supported Protocols	NMEA 0183 protocols Ver. 4.10，RTCM 3.x

2 TECHNICAL INFORMATION

2.1 Supporting Constellations

The ME3GGR31 can simultaneously receive L1-band satellite signals supporting GPS, BDS, GLONASS, GALILEO, QZSS, and Satellite Based Augmentation System SBAS (WAAS, EGNOS, GAGAN, MSAS) due to its multi-constellation RF front-end architecture.

2.2 Satellite-based Augmentation System (SBAS)

The ME3GGR31 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)	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.

2.4 Satellite Enhancement Code Differential DGNSS

The ME3GGR31 supports the use of the code difference function, D-GNSS, with access to pseudo-range correction information in RTCM 2.3 or user-defined formats. The ME3GGR31, used as a mobile station, will attempt to provide the best possible positioning accuracy depending on the correction data received. Upon receipt of the RTCM message input stream, it will immediately enter differential mode. Upon entering D-GNSS mode, an improvement in positioning accuracy can be expected.

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 star-based or single-point positioning.

2.5 AGNSS

The ME3GGR31 supports for the AGNSS Accelerated Positioning Scheme. Please refer to "AGNSS Integration Guide.pdf" for specific usage methods.

2.6 Crystal Oscillators

The ME3GGR31 uses TCXO to allow weak signal acquisition, resulting in faster start-up and re-acquisition times.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 a positioning module with reliable positioning.

2.7 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 timing reference for the receiver. This mode of operation is called "hardware backup mode" and allows all relevant data to be saved in backup RAM for later hot-start.

2.8 Power System

The ME3GGR31 module is available in full operating mode and battery backup mode.
Full operation mode: All power supplies are normally supplied and the module is in full operation mode for normal signal reception and interpretation.
Battery Backup Mode: The module requires very little current (about 40uA) to maintain the RTC clock and backup RAM.Due to the built-in storage unit of the ME3GGR31, real-time ephemeris can be saved, even if there is no battery backup power supply, the ME3GGR31 can be quickly located within 2 hours after positioning.

2.9 Working Mode

The ME3GGR31 supports two power consumption modes, Sleep mode and Active mode. It is possible to switch from Active mode to Sleep mode through software and hardware.
Active mode: Normal operation mode where the DSP core is active and all peripherals are available.
Sleep mode: In this mode, the Soc DSP core, all digital logic (except the RTC Always-On logic), and major portions of the analog/RF circuits are stopped and powered down so that total current can be minimized. In this mode, only GPIOs (serial ports) or RTC timers can wake up the system to Active mode.
In Sleep mode, the BeiDou reference time will run in the RTC timer. The ephemeris and other BeiDou data will be saved to flash periodically for fast startup. If AGNSS/AGPS is available, the time and ephemeris will be downloaded to the Soc chip, so there is no need to switch to Sleep mode if AGNSS/AGPS is available or if you don't care about the hot start TTFF, just don't provide the backup power supply and turn off the VCC main power supply when you don't need to use the positioning function.
ME3GGR31 in software mode, when the module receives the host hibernation command and switches from Active mode to Sleep mode, the system shall keep power supply state. After entering Sleep mode, the VCC main power can be further turned off to save power, but at this time, it is necessary to ensure that V_BCKP is in the power supply state.
In hardware mode, if the module is in Active mode, VCC is powered off and V_BCKP remains active high, ME3GGR31 will automatically switch to Sleep mode. When the module is in sleep mode, all IOs connected to the module should remain in a low or high impedance state. If any of the connected IO pins present are in a high state, the leakage of the ME3GGR31 sleep circuitry will increase. When the ME3GGR31 wakes up from sleep mode (triggered by an RTC timer or GPIO), the VCC main power supply must remain active.
In addition, ME3GGR31 also has the function of automatic wake up from sleep mode, which can automatically wake up every two hours or between specified times, and cyclic sleep after receiving ephemeris to achieve real-time update of ephemeris data under ultra-low power consumption.

3 ELECTRICAL SPECIFICATION

3.1 Absolute Maximum Rating

Notation	Parameters	Minimum Value	Maximum Value	Unit
VCC	Mains voltage	-0.5	6.0	V
VBAT	Backup power supply voltage	-0.5	3.63	V
VI-max	I/O Pin Input Voltage	-0.5	3.63	V
Vhbm	ESD Contact	-	2000	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 protection. 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

Notation	Parameters	Minimum Value	Typical Value	Maximum Value	Unit
VCC	Mains voltage	2.0	3.3	5.5	V
VBAT	Backup power supply voltage	2.5	3.3	3.6	V
IABCmax	ANT_BIAS Maximum operating current	--	3.3	45	mA
Tenv	Operating temperature	-40	25	85	°C

3.3 Power Wastage

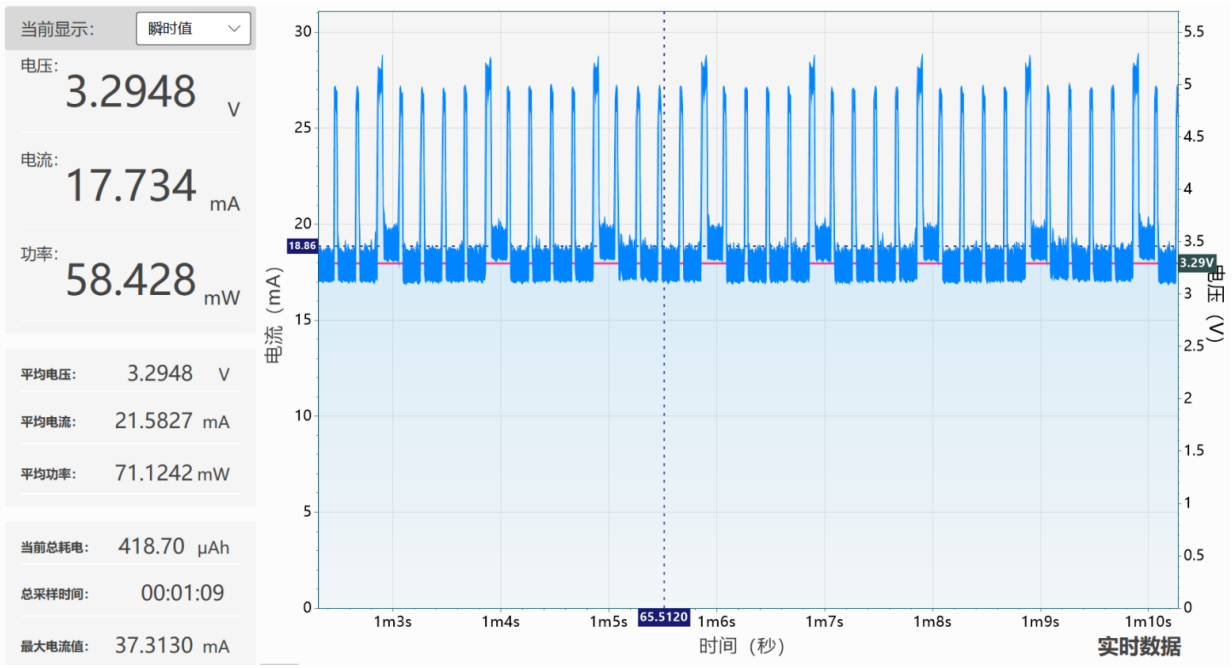
Notation	Parameters	Measurement Pins	Typical Value	Unit
ICCRX1 [1]	capture phase	VCC [2]	18	mA
ICCRX2 [1]	tracking stage	VCC [2]	16	mA
ICCDBM	hibernation	VBAT[3]	22	uA

Remarks:
* [1] Under open sky, GNSS, L1 band, tracking 32 satellites, successful positioning
* [2] Condition: VCC=3.3V, room temperature, all pins dangling
* [3] Condition: VBAT=3.3V, room temperature, all pins dangling

All specifications above are at an ambient temperature of 25°C. Extreme operating temperatures will significantly affect the specification values.

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.

The measured values of the capture phase current are as follows:



3.4 Antenna Gain Requirements

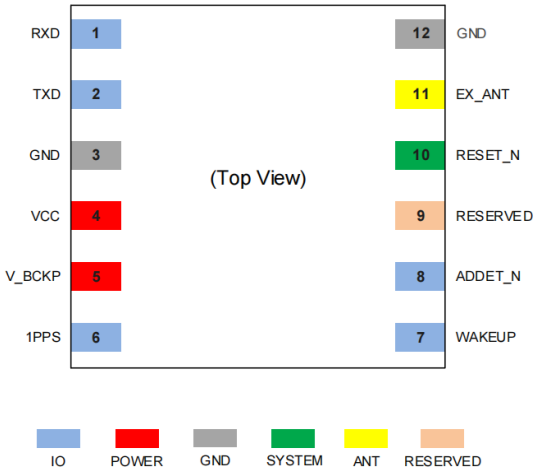
Since the ME3GGR31 has built-in LNA to support passive GNSS antennas, external active antenna gain is noted to be controlled.

Notation	Parameters	Min	Max	Unit
RFgain	Input Gain	0	30	dB

4 PACKAGE DEFINITION

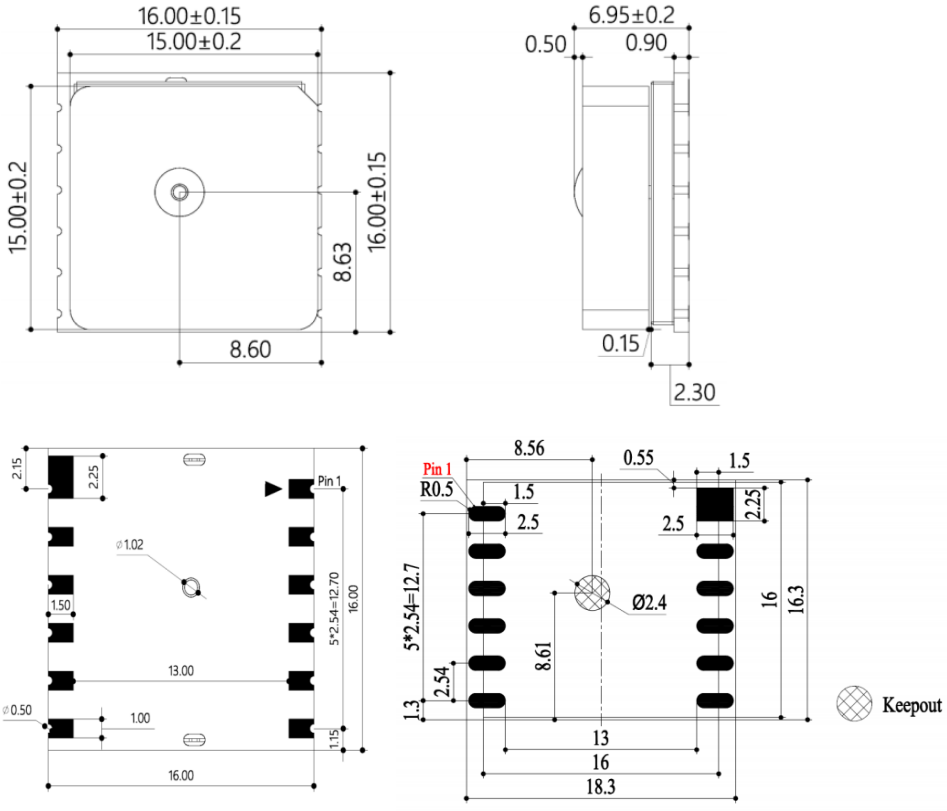
4.1 Module Pin Definitions

The ME3GGR31 is available in the industry's most common 16*16mm, LCC-12pin package, defined as follows:



Functionality	Name	Number	Signal Type	Description
power supply	VCC	4	Power	Mains Power-Input. Ensure that the power input is clean and stable.
	V_BCKP	5	Power	Backup Power Input. It is recommended to connect the backup power supply voltage to this pin in order to position the module for hot and warm start functions. If no backup power is available, V_BCKP can be connected to the main power supply or left dangling.
	GND	3,12	GND	Ensure that all GND pins on the module are well grounded.
Antennae	EX_ANT	11	I	Antenna input, impedance 50Ω, If not used, please hover
serial port /IO	TXD	2	O	GNSS_TX, NMEA0183 Output
	RXD	1	I	GNSS_RX, RTCM/ control instruction input
	PPS	6	O	Seconds pulse signal. 3.3V level. Suspend if not used.
	ADDET_N	8	O	External active antenna operating status indication
	WAKEUP	7	I	In the sleep state, pull high to wake up the module
	RESET_N	10	I	Reset signal, reset low. Suspension is recommended.
Else	NC	Others	-	NC, no definition, please hover

4.2 Mechanical Dimensions

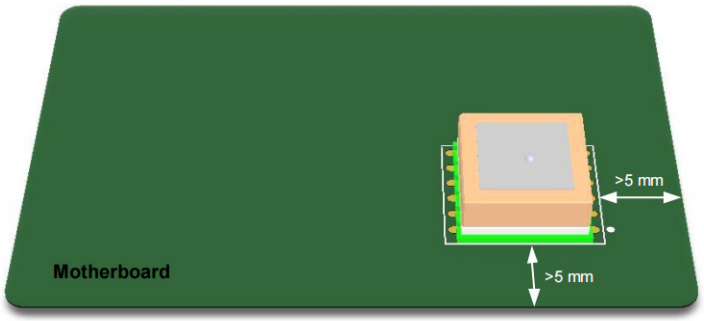


5 REFERENCE DESIGN

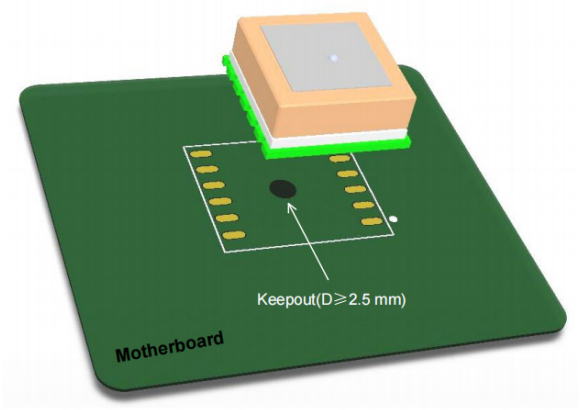
5.1 PCB Design

The ME3GGR31 is an ultra-compact module with a 15.0×15.0×4.0mm ceramic dielectric antenna. The module supports an external active antenna and the RF signal is obtained via the EX_ANT pin. The integrated patch signal and the external active antenna signal are intelligently switched via SPDT. The radiation characteristics of the antenna depend on various factors such as the size, shape, and dielectric constant of nearby components of the PCB. The following rules are recommended:

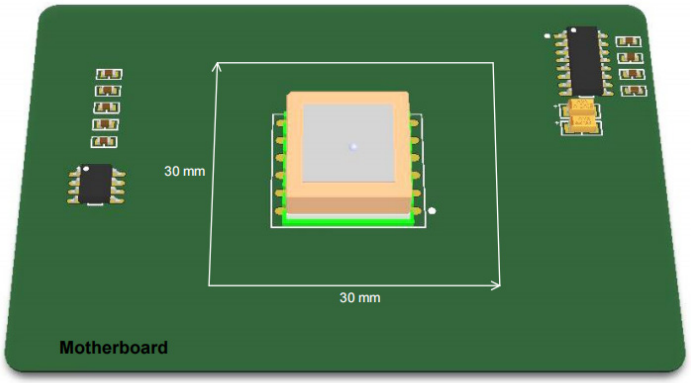
(1)Keep the module at least 5 mm away from the nearest edge of the motherboard, that is, it is best to place it in the center of the motherboard, and the antenna points to the sky;



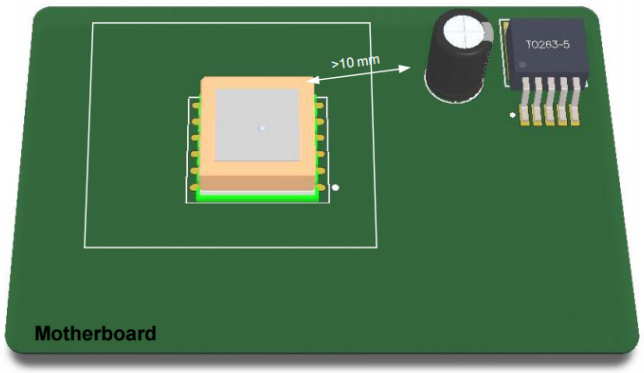
(2)Maintain the position corresponding to the feeding point of each layer of patch antenna on the motherboard, and ensure that the diameter of the occlusion area is not less than 2.5mm;



(3)If possible, reserve a 30 mm x 30 mm area for the ground plane. The performance of the integrated patch antenna depends on the actual size of the ground plane around the module. In addition, do not place any components, especially thick components, in this area (and do not allow interference with the signal path);

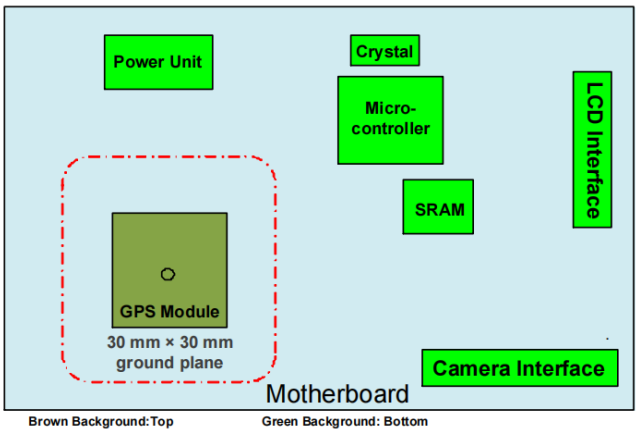


(4)Keep the patch antenna at least 10 mm away from other high metal components. Otherwise, the antenna performance will be affected.



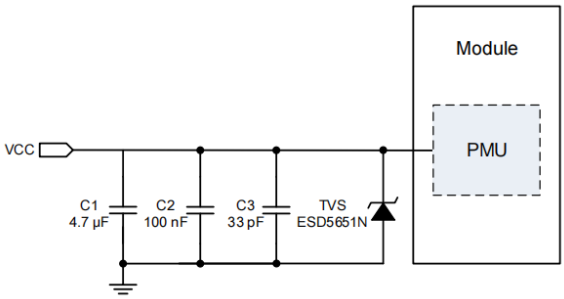
5.2 LAYOUT Notes

(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) Do not place modules near interference sources, such as communication module antennas, RF wiring, crystal oscillators, large inductors, and high frequency digital signal lines. Make sure that high-speed components and interfaces such as microcontrollers, crystals, LCDS, cameras are placed on the other side of the module and as far away from the module as possible, for example, at a diagonal position from the module.

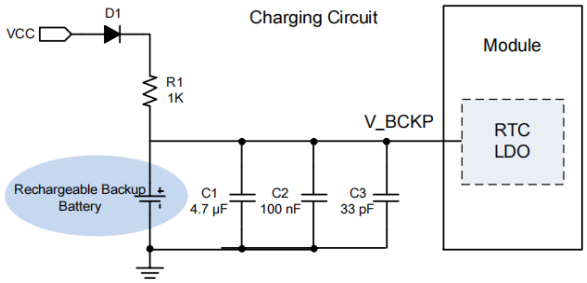


5.3 Power Supply

The ME3GGR31 Positioning Module is equipped with two power supply pins: VCC and V_BCKP. the main power supply is fed to the module via the VCC pin, and the V_BCKP power supply is fed to the module via the V_BCKP pin. To ensure the positioning performance of the module, the ripple of the module power supply should be controlled as much as possible. It is recommended to use an LDO supply with a maximum output current greater than 100mA. If the module's main power supply is disconnected, the system will provide power to the RTC and the Battery Backup RAM (BBR) through V_BCKP.



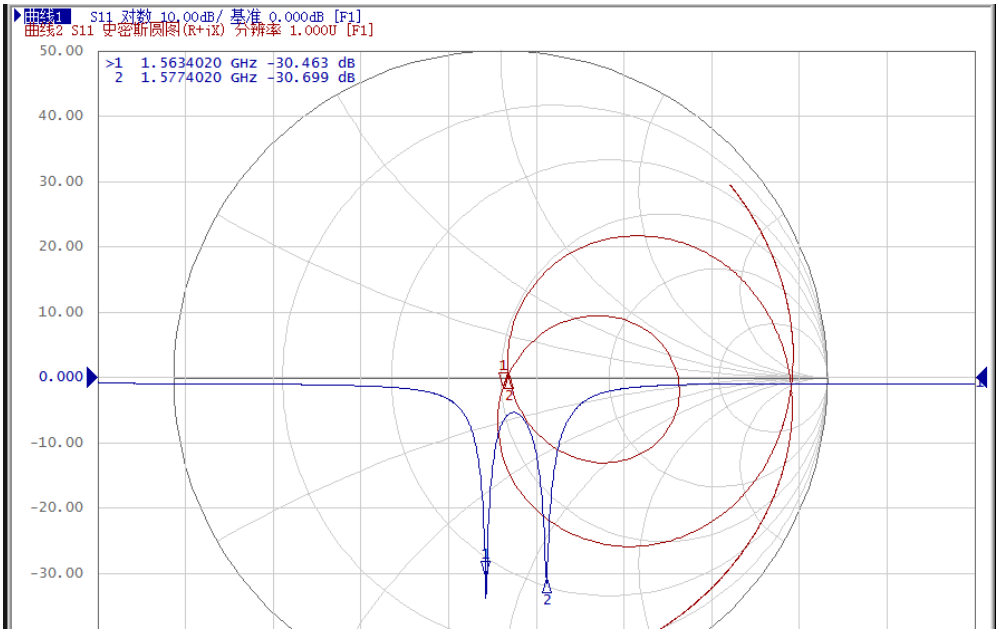
Therefore, even if the main power supply is disconnected, the ephemeris data can still be retained with the backup power supply and can be used for a hot or warm start when the system is powered up again. If the V_BCKP power is not connected, the ephemeris can still be started quickly in less than 2 hours. If ephemeris expires, the system will perform a cold start when powered on again.Note: If there is no backup power available, connect the V_BCKP pin to the VCC mains or leave it hover.



5.4 Antenna

The ME3GGR31 has a built-in low noise figure LNA and SAW, as well as a 15*15*4mm ceramic antenna. The specifications are as follows:

Parameter	Specification	Comment
Size	15.0 mm × 15.0 mm × 4.0 mm	
Range of Receiving Frequency	GPS L1 C/A (1574.397–1576.443 MHz) BeiDou B1I (1559.052–1563.144 MHz)	
Polarization	RHCP	Right Hand Circular Polarization
Gain at Zenith	GPS: 3.40 dBi BeiDou: 2.65 dBi	Peak Gain



If the built-in antenna cannot meet the signal requirements, an external active antenna can be used to supplement the signal.it is recommended to use an active antenna with a gain of less than 25dB and a noise figure of less than 1.5dB. The module supplies power to the external active antenna via RF_IN. If the active antenna cable is long, an active antenna with at least 15dB of gain is required to compensate for line losses. To maintain ground integrity, it is recommended that no or as few wires as possible be routed under the module.

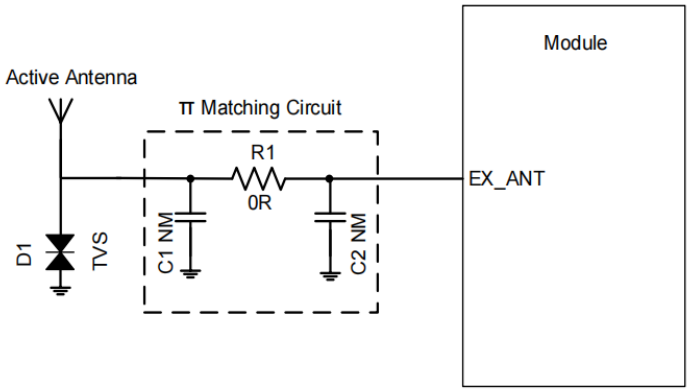
The AADET_N pin can be used to indicate the status of an external active antenna.

· When the external active antenna is not connected to the EX_ANT pin or has poor contact with the antenna's feed point, the AADET_N pin will remain high to indicate that there is no active antenna.

· When the active antenna is well connected, the AADET_N pin will be low.

AADET_N Level	Ext. Active Antenna Status	Inner Patch Antenna Status	Comment
Low	Working	Unused	
High	Short	Working	AADET_N checks the status of the external active antenna if it is used.
	Unused	Working	

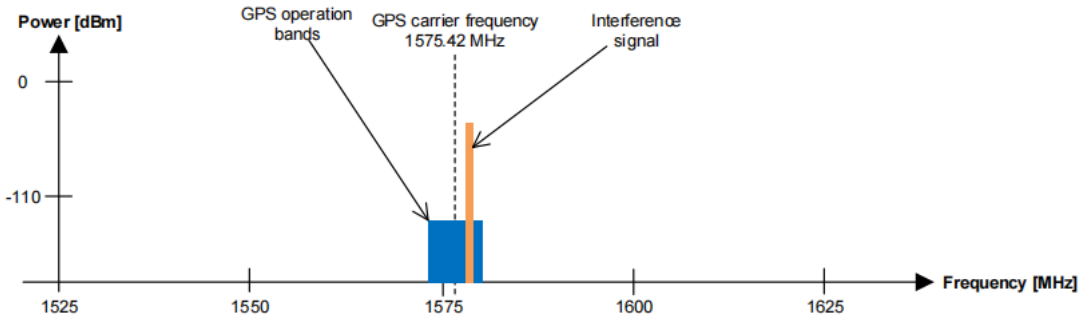
The recommended circuit for an external active antenna is as follows:



C1, C2, and R1 are reserved for matching antenna impedance. By default, R1 is 0Ω, while C1 and C2 are not installed. The D1 is an electrostatic discharge (ESD) protection device to protect input RF signals from potential damage caused by ESD. The RF tracking line impedance in the main PCB should be controlled at 50 Ω, and the tracking length should be as short as possible.

5.5 In-Band Interference

With in-band interference, 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.



Common frequency combinations are shown in the table below. The table lists some possible in-band interference caused by the intermodulation of two out-of-band signals or the second harmonics of LTE B13.

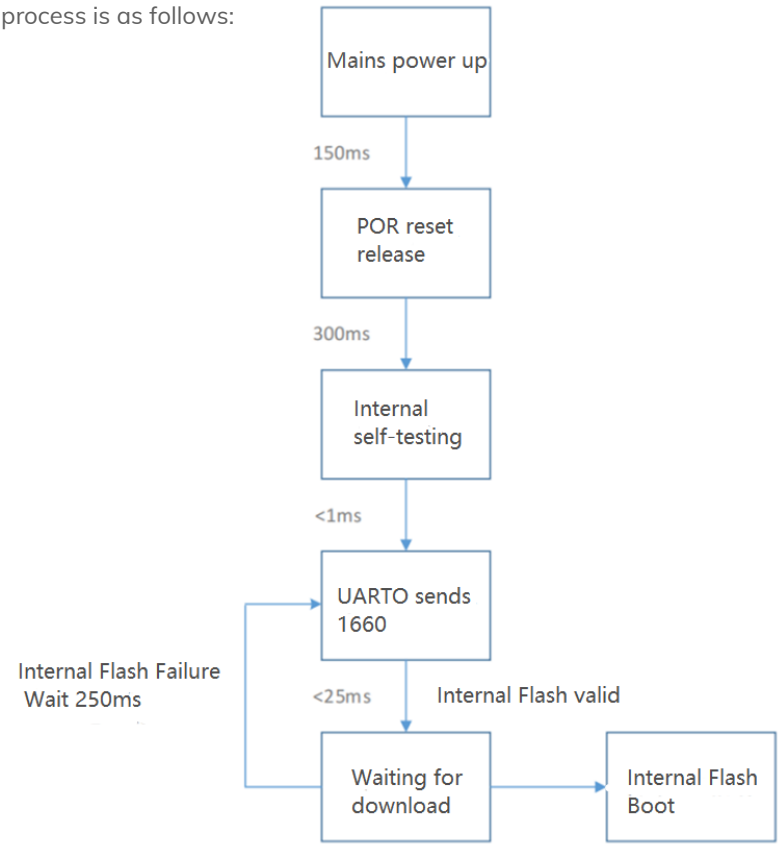
Source F1	Source F2	IM Calculation	IMD Products
GSM850/B5	Wi-Fi 2.4 GHz	F2 (2412 MHz) - F1 (837 MHz)	IMD2 = 1575 MHz
DCS1800/B3	PCS1900/B2	2 × F1 (1712.6 MHz) - F2 (1850.2 MHz)	IMD3 = 1575 MHz
PCS1900/B2	Wi-Fi 5 GHz	F2 (5280 MHz) - 2 × F1 (1852 MHz)	IMD3 = 1576 MHz
LTE B13	N/A	2 × F1 (786.9 MHz)	IMD2 = 1573.8 MHz

5.6 Serial Port Communication

Provide one way TTL level universal asynchronous transceiver (UART), the data format is: 1 bit start bit, 8 bit data bit, 1 bit stop bit, no parity bit, the default baud rate is 115200bps. after the module is normally powered on, the serial port will automatically send NMEA data. The host computer can set the module working mode and baud rate through the serial port. When this module is used in some specific application scenarios, the main power of the module may be turned off due to the power saving strategy, so as to further reduce the power consumption.
In this case, in order to avoid the high level of the serial port affecting the normal operation of the module, it is strongly recommended to disconnect the serial port connection at the same time when disconnecting the main power supply, or set the serial port to the state of input state + pull-down resistor or high resistance state + pull-down resistor.

5.7 Startup process

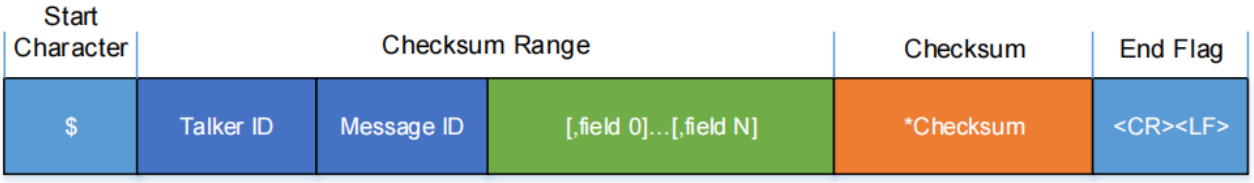
The module startup process is as follows:



6 SOFTWARE PROTOCOL

6.1 NEMA0183 Pact

The NMEA protocol is an ASCII based protocol where the record starts with a $ and ends with a carriage return/line feed character, and the checksum of the NMEA message, which can be used to detect corrupted data transmission. The frame structure is as follows:



The NEMA message output for the ME3GGR31 is shown in the following table:

NMEA Record	Description	Default
GNGGA	Global positioning system fixed data	Y
GNGLL	Geographic position—latitude/longitude	Y
GNGSA	GNSS DOP and active satellites	Y
GPGSV	GNSS satellites in view for GPS	Y
GLGSV	GNSS satellites in view for GLONASS	Y
BDGSV	GNSS satellites in view for BD	Y
GAGSV	GNSS satellites in view for Galileo	Y
GNRMC	Recommended minimum specific GNSS data	Y
GNVTG	Course over ground and ground speed	Y
GNZDA	Date and Time	N
GNGST	Position error statistics	Y

6.2 Example data

Serial port data within 1 second of the example after positioning:

$GNGGA,065826.00,2242.2940466,N,11401.6896089,E,1,31,0.5,133.811,M,0.000,M,,*4B
$GNGSA,A,3,02,04,07,08,09,16,21,30,194,195,196,199,1.0,0.5,0.8,1*34
$GNGSA,A,3,,,,,,,,,,,,,1.0,0.5,0.8,1*3D
$GNGSA,A,3,01,02,03,04,06,07,09,10,12,16,24,26,1.0,0.5,0.8,4*33
$GNGSA,A,3,29,35,59,60,,,,,,,,,1.0,0.5,0.8,4*3F
$GNGSA,A,3,,,,,,,,,,,,,1.0,0.5,0.8,2*3E
$GNGSA,A,3,02,08,15,,,,,,,,,,1.0,0.5,0.8,3*31
$GPGSV,5,1,17,01,00,000,40,02,55,156,45,04,20,195,37,07,49,321,42,1*61
$GPGSV,5,2,17,08,56,010,43,09,29,237,40,16,17,077,37,21,61,126,45,1*6D
$GPGSV,5,3,17,27,00,000,38,30,18,320,34,194,56,056,42,195,60,101,43,1*60
$GPGSV,5,4,17,196,21,165,39,199,60,149,37,43,00,000,43,56,00,000,45,1*6B

$GPGSV,5,5,17,57,00,000,41,,,,,,,,,,,,1*55
$BDGSV,6,1,21,01,46,125,43,02,46,234,39,03,61,189,43,04,32,111,39,1*71
$BDGSV,6,2,21,06,72,187,43,07,62,319,41,09,79,264,42,10,56,298,40,1*71
$BDGSV,6,3,21,12,26,215,39,16,70,184,45,24,17,318,37,26,61,353,45,1*7D
$BDGSV,6,4,21,29,19,038,40,35,80,037,47,38,00,000,37,39,00,000,45,1*75
$BDGSV,6,5,21,40,00,000,43,44,00,000,46,45,00,000,46,59,49,131,45,1*74
$BDGSV,6,6,21,60,42,238,43,,,,,,,,,,,,1*48
$BDGSV,3,1,09,24,17,318,34,26,61,353,41,29,19,038,34,35,80,037,43,2*71
$BDGSV,3,2,09,38,00,000,35,39,00,000,42,40,00,000,40,44,00,000,42,2*79
$BDGSV,3,3,09,45,00,000,42,,,,,,,,,,,,2*48
$GAGSV,1,1,03,02,33,066,39,08,24,204,37,15,36,176,39,,,,,7*4F
$GNVTG,0.00,T,,M,0.00,N,0.00,K,A*23
$GNRMC,065826.00,A,2242.2940466,N,11401.6896089,E,0.00,0.00,300124,,,A,V*39
$GNGST,065826.00,,,,,0.93,0.74,1.65*7D
$GNGLL,2242.2940466,N,11401.6896089,E,065826.00,A,A*70

6.3 Example of an actual star search

6.4 Common Commands

CMD TYPE	CMD Example:
hot start	$POLCFGRESET,0
cold start	$POLCFGRESET,1
Baud rate 115200	$POLCFGPRT,115200,0
Baud rate 9600 (too many satellites may congest the serial port)	$POLCFGPRT,9600,0
Turn off GSV output	$POLCFGMSG,0,2,0
Turn off GSA output	$POLCFGMSG,0,1,0

CMD TYPE	CMD Example:
Turn off GLL output	$POLCFGMSG,0,13,0
Turn off GST output	$POLCFGMSG,0,12,0
Turn off VTG output	$POLCFGMSG,0,3,0
Save configuration	$POLCFGSAVE
Sleep mode (can be woken up after receiving any data on the serial port)	Hex directives: 42 4b 51 05 00 03 00 08 00 00 00 00 00 00 00 00

Remarks:

1. All text format control commands should add Carriage Return (CR) and Line Feed (CF);
2. All configurations must be ended with a save command. Unsaved software configurations will become invalid after the module's main power supply VCC is powered on again;
3. Since ME31GR01 has a built-in Flash storage unit, the saved data configuration can remain effective after power failure;
4. A high refresh rate may require a larger baud rate, such as 115200 or higher to avoid serial port data congestion.

7 PACKAGING AND PROTECTION

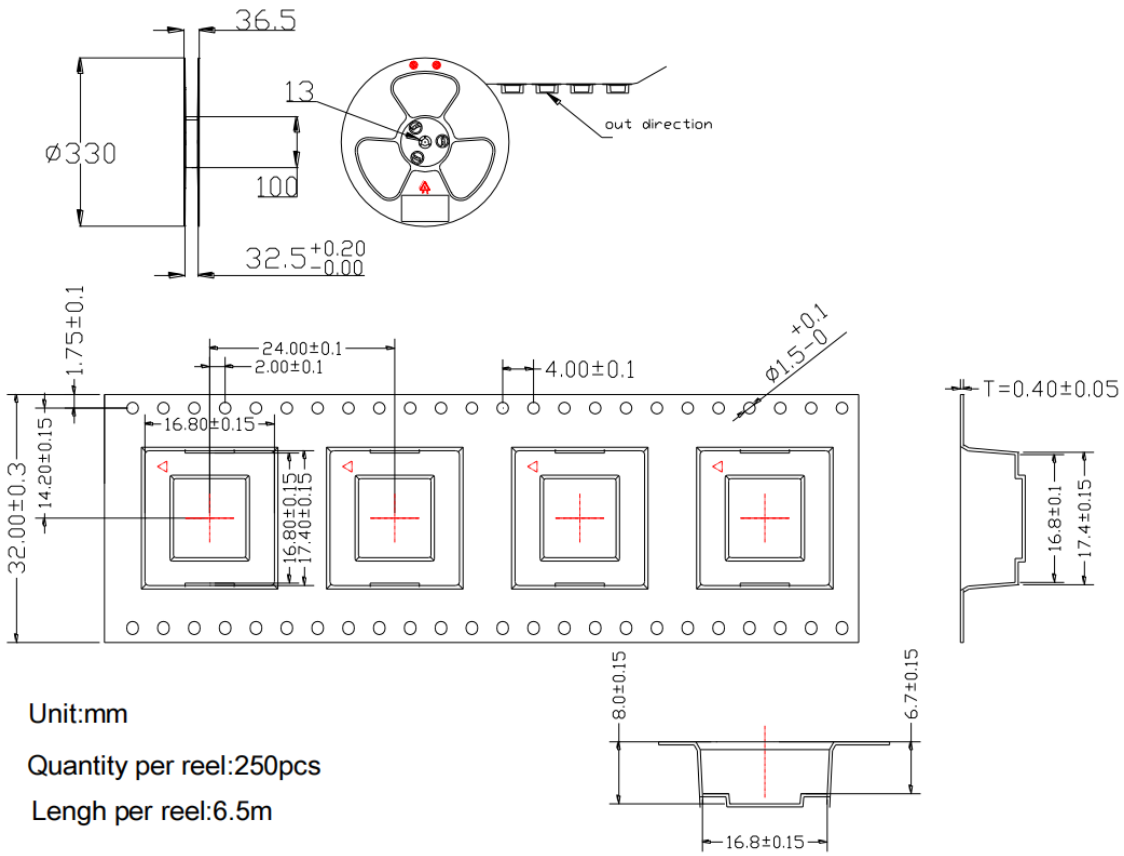
7.1 Wrap

The ME3GGR31 is humidity and static sensitive module. During packaging and transportation of the product, be sure to follow the handling requirements and take appropriate precautions to minimize product damage. The following table shows the standard packaging structure for transportation of the product.

Offerings	Reels	Sealed Bags	Shipping Cartons
			
ME3GGR31	200pcs/roll	1 roll/bag	1 bag/box, 3 boxes/ctn

7.2 Carrier Belts and Trays

The ME3GGR31 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.

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;

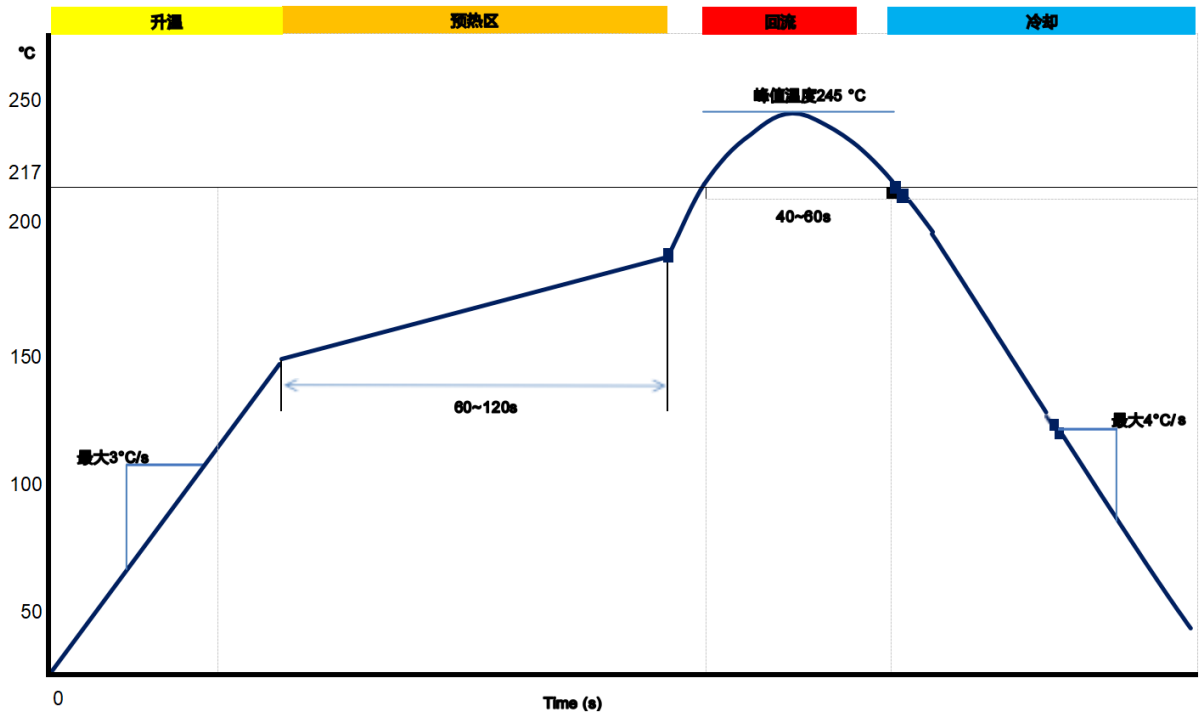
To prevent electrostatic discharge, do not expose the antenna area; if exposed by design, take appropriate ESD precautions and do not touch any exposed antenna area;

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.

7.5 Production Requirements

The recommended welding temperature profile is shown below:



In order to prevent the module from falling off during soldering, please do not design the module to be soldered on the back of the board, and it is better not to go through two soldering cycles.

The setting of soldering temperature depends on many factors in the product factory, such as the nature of the motherboard, paste type, paste thickness, etc. Please also refer to the relevant IPC standards and paste specifications.

Due to the relatively low temperature of leaded soldering, please prioritize other components on the board if using this soldering method. The openings of the stencil should meet the customer's own product design requirements and inspection specifications, and the thickness of the stencil is recommended to be 0.15mm.

8 ORDERING INFORMATION

8.1 Ordering Model

Ordering Model	Product Name	Default Baud Rate	Feature	Default Satellite Reception Frequency	
ME3GGR01	Single-frequency full-system satellite positioning module	115200	single-frequency full constellation	GPS/BDS/GLO/GAL/ QZSS，Support B1C	16*16，LCC12

9 STORAGE CONDITIONS

- **Please use this product within 6 months after signing up for it.**
  - This product should be stored without opening the package at an ambient temperature of 5~35°C and a humidity of 20~70%RH.
  - This product will be stored for more than 6 months after receipt. They must be confirmed before use.
  - Products must be stored in non-corrosive gases (CI2, NH3, SO2, NOx, etc.).
  - To avoid damage to the packaging materials, no excessive mechanical impact shall be applied, including but not limited to sharp objects adhering to the packaging materials and products falling.

- **This product is suitable for MSL3 (based on JEDEC standard J-STD-020).**
  - After opening the package, the product must be stored under conditions of ≤30°C/<60%RH. It is recommended to use it within 168 hours after opening the package.
  - When the color of the indicator in the package changes, the product should be baked before welding.

- **When exposed to (≥168h@30℃/60%RH) conditions, the recommended baking conditions:**
  1. 120 +5/-5℃, 8 hours, 1 time
  Products must be baked individually on heat-resistant trays because the materials (base tape, roll tape and cover tape) are not heat-resistant and the packaging materials may deform when the temperature is 120°C;
  2. 90℃ +8/-0℃, 24 hours, once
  The base tape can be baked together with the product at this temperature, Please pay attention to even heating.

10 HANDLING CONDITIONS

- Be careful in handling or transporting products because excessive stress or mechanical shock may break products.
- Handle with care if products may have cracks or damages on their terminals. If there is any such damage, the characteristics of products may change. Do not touch products with bare hands that may result in poor solder ability and destroy by static electrical charge.

11 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.

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13 RELATED DOCUMENTS

- MinewSemi_Product_Naming_Reference_Manual_V1.0
  https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf
- MinewSemi_Connectivity_Module_Catalogue_V2.0
  https://en.minewsemi.com/file/MinewSemi_Connectivity_Module_Catalogue_EN.pdf

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