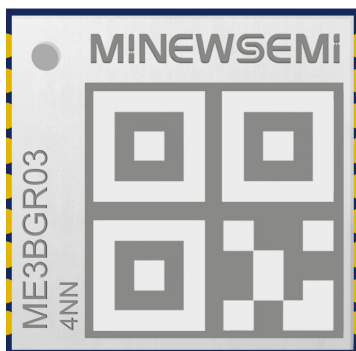


GNSS Module

ME3BGR03



Datasheet
V 1.0.0



Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Michelle	2025.11.03	

Part Number

Model	Hardware Code
ME3BGR03	4NN

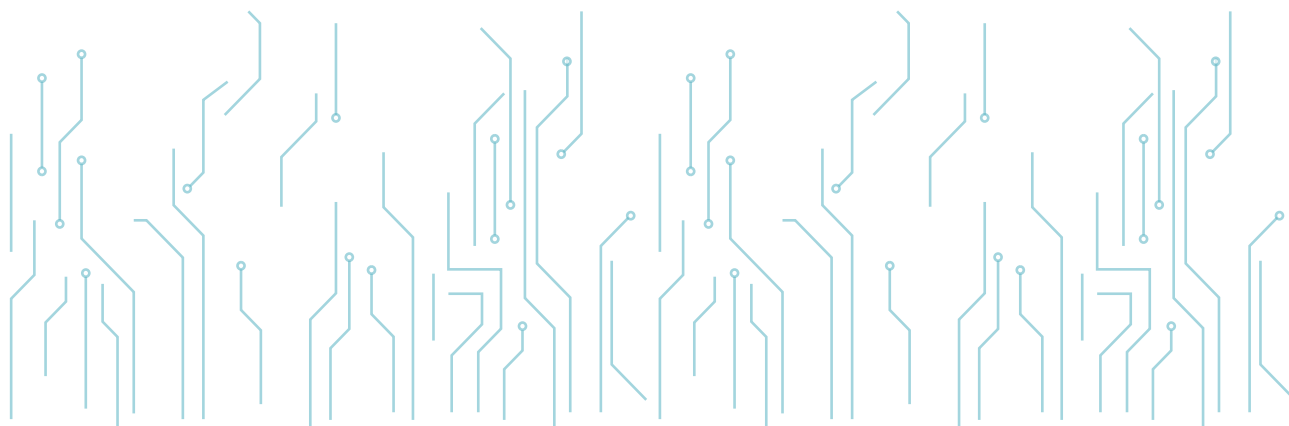
Click the icon to view and download the latest product documents electronically.
https://en.minewsemi.com/file/ME3BGR03_Datasheet_EN.pdf





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1 PRODUCT INTRODUCTION

1.1Introduction

The ME3BGR03 is a high-performance and highly integrated single BeiDou high-precision positioning module that supports signal reception and positioning for BeiDou satellite navigation system.

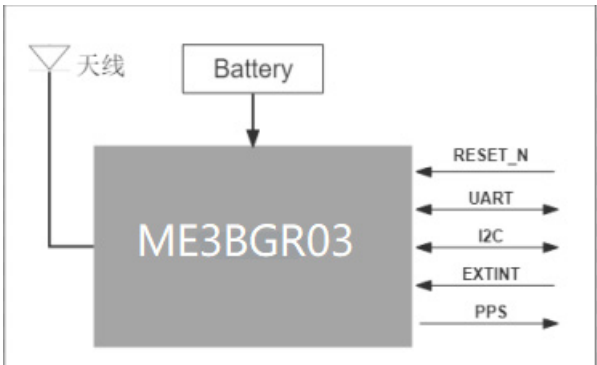
The ME3BGR03 single BeiDou module integrates a high-performance positioning chip and built-in high-precision RTK positioning algorithm. It is designed to be compatible with the mainstream positioning module in the market and features low power consumption and a miniaturized to enhance device endurance.

The application areas cover bike-sharing, drones, car navigation and vehicle management, etc. Jointly with the BeiDou ground-based augmentation system, it provides strong support for high-precision navigation and positioning.

1.2 Characterisation

- Supports BeiDou 3 satellite system
- Supports BDS B1I,B2a signals, independent single BeiDou positioning
- Built-in domestic high-precision positioning chip, supports on-chip dual-frequency high-precision positioning engine.
- Dual-core ultra-floating-point computing power.
- Small size, high integration, using surface mount package mode, for ease of to production
- Compatible with mainstream positioning modules, facilitating easy upgrade and maintenance

1.3 System block diagram



1.4 Key Parameters

ME3BGR03 Parameter	
Satellite tracking channel	128
Satellite systems	BDS: B1I, B1C, B2a Beidou B1C[Customised firmware support]
Frequency of data updates	1Hz
Position accuracy[1]	single point level <2m CEP50 RTK level 1cm+1ppm CEP50; altitude 2cm+1ppm CEP50
Speed and time accuracy	velocity <0.05m/s CEP50 PPS ≤20ns 1 σ

First positioning time	Hot start: <1s Cold start: 32s A-BDS[2] : 3-6s
Sensitivity[3]	Cold start: -144dBm Recapture: -158dBm Tracking: -166dBm
Application limit	Speed Limit:515m/s Height Limits:18,000m
Security check	Built-in antenna short circuit and open circuit detection
Connector	UART 2; I2C 1
Data format	NMEA 0183 Agreement Ver. 4.1 RTCM 3.2 Qianxun Ownership Agreement
Working conditions	Mains voltage:1.8~3.6V Standby voltage:1.8-3.6V RTK positioning mode:≤103mW @1.8V Standby mode:<22μW @1.8V
Storage temperature	40℃ ~ +85℃
operating temperature	-40℃ ~ +85℃
Package Size	10.1*9.7*2.5mm LCC Stamp hole packaging

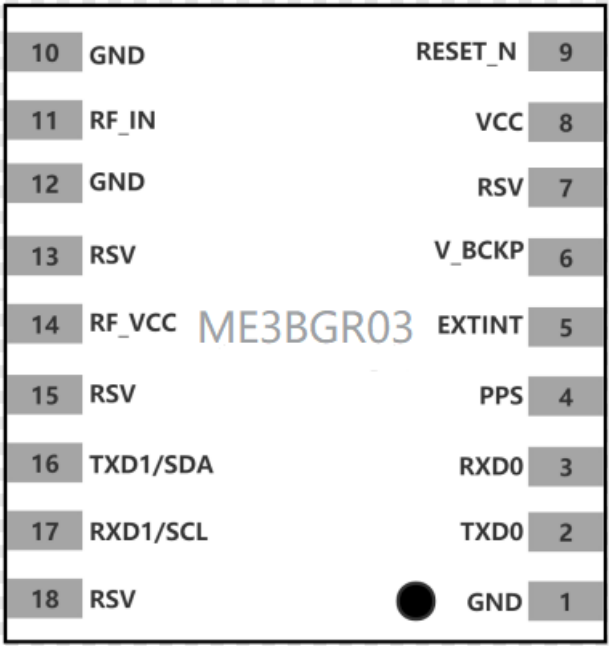
Notes:

[1] Positioning of dual-frequency satellite signals under open sky during non-ionospheric active periods

[2] Dual-frequency satellite signal positioning under open skies

[3] External High Performance LNA

2 MODULE PIN DEFINITIONS



Number	Name	I/O	Description
1	GND	-	GND
2	TXD0[1]	O	Serial 0 Output
3	RXD0	I	Serial 0 Output
4	PPS	O	second pulse signal
5	EXTINT	I	External interrupt pin; module can be exited from standby mode by applying a high-level signal greater than 10ms. The module can be woken from standby mode by applying a high-level signal (>10ms) to the external interrupt pin. It remains in standby when no signal is applied.
6	V_BCKP	-	Backup power input
7	RSV	-	Reserved (kept suspended when not in use)
8	VCC[2]	-	Power Input
9	RESET_N	I	Active-low module reset input
10	GND	-	GND
11	RF_IN	I	Antenna Signal Input
12	GND	-	GND
13	RSV	-	Reserved (kept suspended when not in use)
14	RF_VCC	O	RF power output, suitable for use as an external active antenna power supply
15	RSV	-	Reserved (kept suspended when not in use)
16	TXD1/SDA	O	Serial 1 Output/I2C Data
17	RXD1/SCL	I	Serial 1 Input/I2C Clock
18	RSV	-	Reserved (kept suspended when not in use)

Notes:

[1] TXD0 is an output pin which should be held low for 100ms after the module powers on ; otherwise the module will enter engineering mode and will not work properly. Recommendation: The pin connected to TXD0 should be held low for 100ms after the module powers on, or always configured as a (pull-down) input.

[2] The module power-on slope shall be greater than 0.5mV/ μ s (500V/s) and ensure that the power-up starts from 0V.



3 ELECTRICAL SPECIFICATION

3.1 Absolute Maximum Rating

Notation	Parameters	Minimum Value	Maximum Value	Unit
VCC	Mains voltage	-0.2	3.6	V
VBAT	Backup power supply voltage	-0.2	3.6	V
VI-max	I/O Pin Input Voltage	-0.2	3.6	V
T-storage	Storage temperature	-40	+85	°C
T-solder	Reflow temperature	--	260	°C

3.2 IO Port Characteristics

3.2.1 RESET_N

Notation	Parameters	Conditions	Minimum Value	Typical value	Maximum Value	Unit
I _{IZ}	Input Leakage Current	--	--	--	±1	μA
V _{IH}	Input High Level	--	VCC*0.7	--	VCC	V
V _{IL}	Input Low Level	--	0	--	VCC*0.3	V

3.2.2 RF_VCC Port Characteristics

Parameters	Conditions	Minimum Value	Typical value	Maximum Value	Unit
RF_VCC Supply Current	--	11	--	57	mA
RF_VCC Supply Voltage	--	1.8	--	3.3	V

3.2.3 Other IO port characteristics

Notation	Parameters	Conditions	Minimum Value	Typical value	Maximum Value	Unit
I _{IZ}	Leakage Current Input	--	--	--	±1	μA
V _{IH}	High Level Input Voltage	--	VCC*0.7	--	VCC	V



Notation	Parameters	Conditions	Minimum Value	Typical value	Maximum Value	Unit
V_{IL}	Low Level Input Voltage	--	0	--	$VCC \times 0.3$	V
V_{OH}	High Level Output Voltage	$I_{OH} = 22.4 \text{ mA}$, $VCC = 3.3V$	--	$VCC \times 0.8$	--	V
R_{pu}	pull-up resistor	$VDD_{IO} = 3.3V$ normal temperature	--	70	--	K Ω
		$VDD_{IO} = 1.8V$ normal temperature	--	160	--	K Ω
R_{pd}	pull-down resistor	$VDD_{IO} = 3.3V$ normal temperature	--	88	--	K Ω
		$VDD_{IO} = 1.8V$ normal temperature	--	220	--	K Ω

3.3 DC Characteristics

3.3.1 Working conditions

Notation	Parameters	Minimum Value	Typical value	Maximum Value	Unit
VCC	Mains voltage	1.62	3.3	3.63	V
V_BCKP	Backup supply voltage	1.62	3.3	3.63	V
T_{env}	Working environment temperature	40	--	85	$^{\circ}C$

3.3.2 Power wastage

Notation	Parameters	Minimum Value	Unit
VCC	operating mode (GNSS, L1+L5) [1]	102	mW
	operating mode (GNSS, L1+L5) [2]	126	mW
	operating mode (GNSS, L1+L5 RTK) [3]	102	mW
	operating mode (GNSS, L1+L5 RTK) [4]	126	mW
V_BCKP	standby mode[5]	22	μW
	standby mode[6]	31	μW

Notes:

[7] Under open skies, BDS, positioning successful $VCC = 1.8V$

[8] Under Open Skies, BDS, Positioning Successful $VCC = 3.3V$

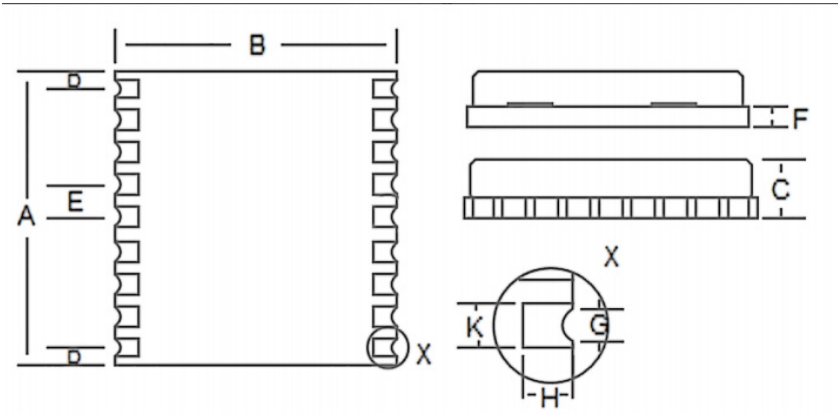
[9] Under open skies, BDS, RTK positioning successful $VCC = 1.8V$

[10] Under open sky, BDS, RTK positioning successful $VCC = 3.3V$

[11] Conditions: $V_{BCKP} = 1.8V$, Room Temperature, All Pins Unconnected

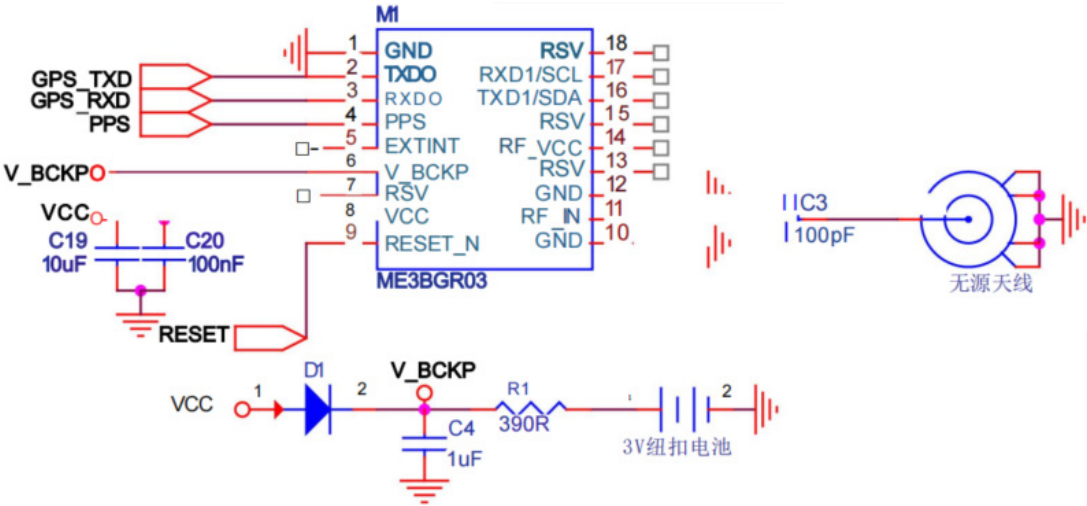
[12] Conditions: $V_{BCKP} = 3.3V$, Room Temperature, All Pins Unconnected

4MECHANICAL SPECIFICATIONS

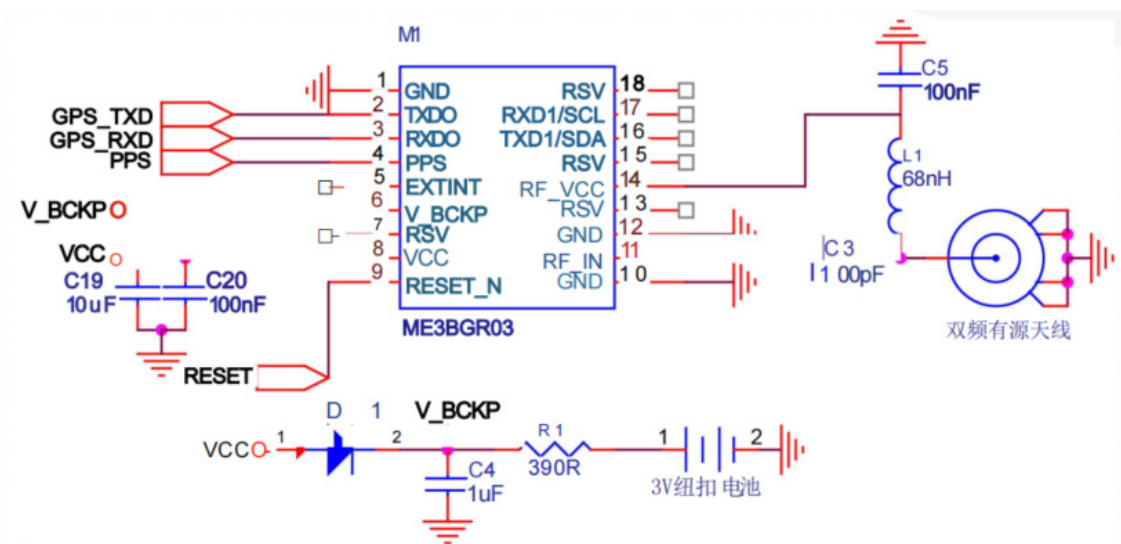


Serial Number	Minimum (mm)	Typical Values (mm)	Maximum Value (mm)
A	9.6	10.1	10.7
B	9.5	9.7	9.9
C	2.3	2.5	2.7
D	0.55	0.65	0.95
E	1.0	1.1	1.2
F	-	0.8	-
G	0.4	0.5	0.6
H	0.9	1.0	1.1
K	0.7	0.8	0.9

5REFERENCE DESIGN



Reference Design Schematic (passive antenna)



Reference Design Schematic (Dual-frequency active antenna)

6 CAVEAT

6.1 Hardware Design

To ensure that the ME3BGR03 functions properly and fully utilizes its performance, the design also needs to pay attention to the following matters:

1. Power supply: use low ripple, high stability power supply, voltage ripple peak value should not exceed 50mV.

Place decoupling capacitors near the module power supply pins, and the power trace width should be more than 0.5mm.

LDOs are used to ensure clean power supply, and the output current of at least 400mA, and the LDOs should be placed as close as possible to the module in the layout.

Widen the power supply trace or use split-lay copper surfaces to carry current.

Avoid routing power supplies close to high power and high inductance devices such as inductors.

All GND pins must be connected to the ground plane.

2. UART interface: Make sure that the signals and baud rates of the pins of the master device and ME3BGR03 module are the same. TXD0 is an output pin, which should be kept low within 100ms of power-on; otherwise, the module will enter engineering mode and cannot work normally. Suggestion: The pin connected to TXD0 should be held low within 100ms of power-on, or always configured as (pull-down) input.

3. Antennas:

Antenna interface: Pay attention to the impedance matching of the antenna line, keep the trace short and avoid sharp bends. It is recommended that the RF trace from the RF port of the module to the antenna interface should be wider greater than 0.2mm and placed as close as possible. The RF part of the trace adopts coplanar waveguide impedance model, and the spacing between the trace and the ground copper skin is controlled to be approximately 1 times the trace width to ensure the RF impedance matching is 50Ω; it is recommended to use Layer 2 as the reference ground plane for the trace from the RF port of the module to the antenna interface and ensure the integrity.

Antenna Position: To ensure a good signal-to-noise ratio, ensure that the antenna is well isolated from sources of electromagnetic radiation, especially those in the 1559-1577MHz band, and avoid routing the antenna directly underneath the ME3BGR03.

Antenna Gain: When using an external active antenna, it is recommended that the antenna gain be less than 30dB.

If the antenna short circuit occurs, power off the module as soon as possible and remove the antenna short circuit fault. After the short circuit is removed, then power up the module to work.

The antenna short circuit detection threshold currents are as follows:



The antenna short circuit determination threshold currents are as follows:

VCC / antenna state	3.3V	1.8V
Open Circuit->Normal	about 8mA	About 4mA
Normal->Short Circuit	About 60mA	About 35mA

The maximum operating current of the active antenna for the ME3BGR03 should be less than 60 mA. If the antenna is short-circuited, the module outputs an alarm (QXANTSTAT statement, as shown below):

Executable statement	STAT	Antenna state
\$QXANTSTAT,STAT	0	normalcy
	1	Short Circuit
	2	Open Circuit

Note: The output is valid only when the external antenna is active and the detection circuit is working properly.

4. Anti-interference

This module is a temperature-sensitive device. Drastic temperature changes will degrade its performance. keep it away from high-temperature airflow and high-power heating devices.

Do not place the module near sources of interference, such as communication antennas, crystals, large inductors, or high-frequency digital signal lines, and it is recommended to have a solid ground plane beneath the module.

6.2 Module Reset Signal Description

Pulling the RESET_N pin low for more than 100μs during normal module operation will reset the ME3BGR03.

7 PACKAGING AND PROTECTION

7.1 Package

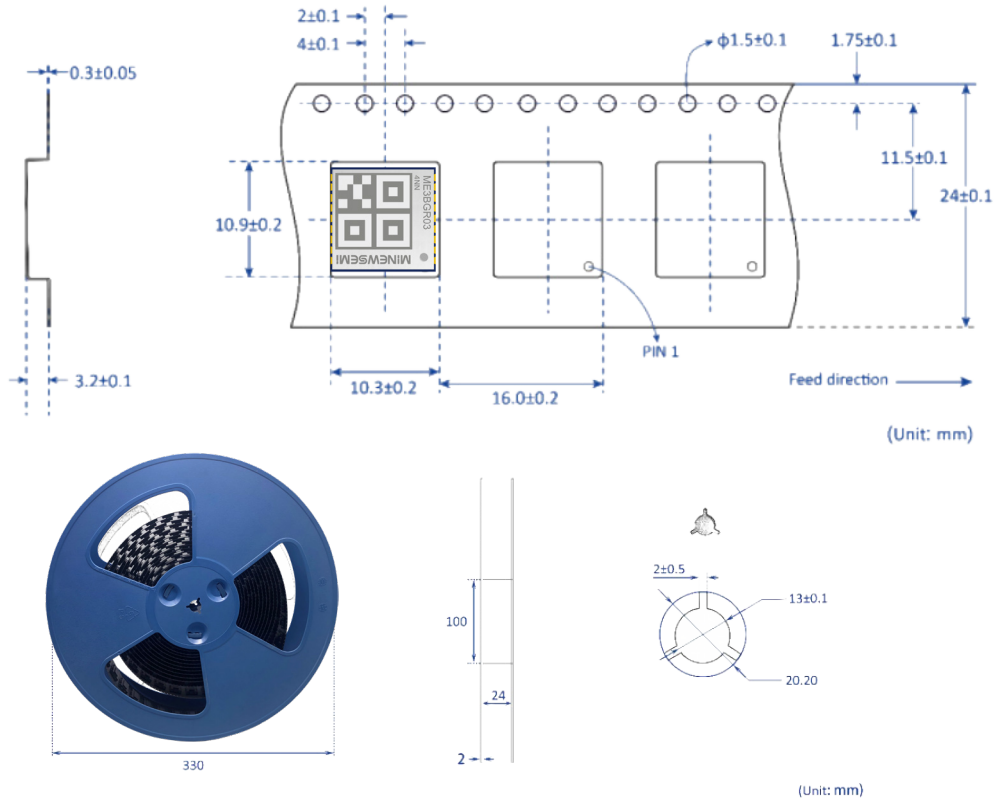
The ME3BGR03 Positioning Module is humidity and static sensitive. During the packaging and transportation of the product, please be sure to follow the relevant handling requirements and take appropriate precautions to minimize product damage. The following table shows the standard packaging structure for product transportation.

Offerings	Reels	Sealed Bags	Shipping Cartons
			
ME3BGR03	1500pcs/roll	1 roll/bag	1 bag/box, 3 boxes/ctn



7.2 Carrier Tapes and Trays

The ME3BGR03 is supplied on a reel (consisting of a tape and reel) and packaged in a sealed bag with an anti-static effect to meet the customer's needs for efficient production, batch installation and removal. The picture below shows the dimensional details of the tape reel.



7.3 Storage

To protect the product from moisture and electrostatic discharge, a desiccant and a humidity indicator card are included in the sealed bag, which allows the user to know the humidity condition of the environment in which the product is located. The moisture sensitivity level of the ME3BGR03 is MSL3.

7.4 ESD Protection

The Positioning Module contains highly sensitive electronic circuits and is an Electrostatic Sensitive Device (ESD). Please note the following precautions. Failure to follow these precautions may result in serious damage to the module!

Ground yourself before antenna patching. 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. Special care must be taken to minimize the risk of electrostatic discharge during operational use. In addition to standard ESD safety measures, the following measures should be considered:

- ESD diode on RF input to prevent electrostatic discharges

- Do not touch any exposed antenna area

- Adding an ESD Diode to the UART Interface



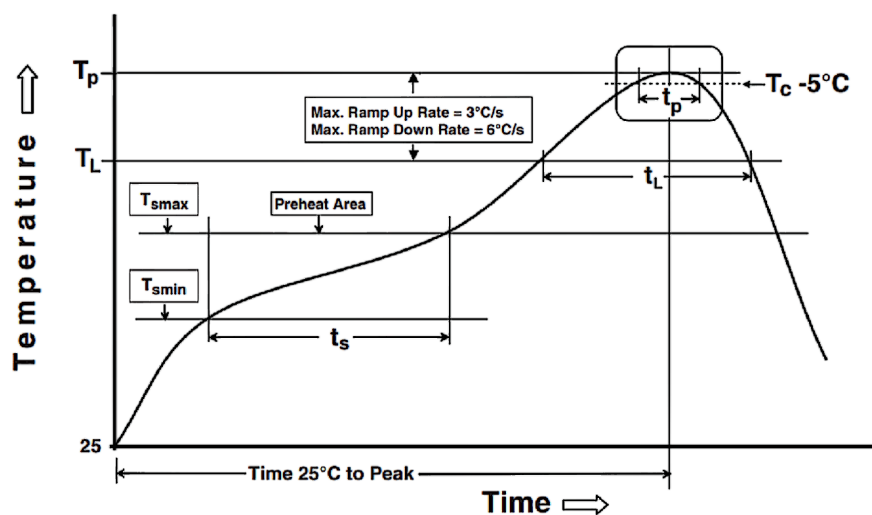
7.5 Reflow Profile

Curve characteristic	Pb-free process
Preheating/impregnation	150 °C
Minimum temperature (T _{smin})	200 °C
Max. temperature (T _{smax})	60 ~ 120s
Timing t _s (T _{smin} to T _{smax})	
Rate of increase(TL to T _p)	3 °C/s (maximum values)
liquid phase temperature(TL)	217°C
Timing t _L (Time to maintain temperature above TL)	60 ~ 150s
peak encapsulated body temperature(T _p)	Cannot exceed T _c [1]
Duration within 5°C of specified t _c temperature (t _p)	30*s[2]
Rate of descent (T _p to T _L)	6°C/s (maximum values)
25°C Time to peak temperature	8minutes (maximum values)

Notes:

[1] T_c=260°C

[2] No more than 30 seconds above 25°C.



Reflow Profile (Reference IPC/JEDEC J-STD-020E Specification)

8 ORDERING INFORMATION

8.1 Ordering Model

Ordering Model	Product Name	Default Baud Rate	Default refresh rate	Default Satellite Reception Frequency	Physical Interface
ME3BGR03	Single Beidou RTK positioning module	115200	1Hz	BDS B1I,B2a	10*10, LCC18

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 (Cl₂, NH₃, SO₂, NO_x, 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°C/60%RH) conditions, the recommended baking conditions:
 1. 120 +5/-5°C, 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°C +8/-0°C, 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](https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf)
https://en.minewsemi.com/file/MinewSemi_Product_Naming_Reference_Manual_EN.pdf
- [MinewSemi_Connectivity_Module_Catalogue](https://en.minewsemi.com/file/MinewSemi_Connectivity_Module_Catalogue_EN.pdf)
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