MINEWSEMI

Single-Frequency Multi-Constellation GNSS Module

ME3AGR01

Datasheet

V 1.0.0

Version Note

Version	Details	Contributor(s)	Date	Notes
1.0.0	First edit	Michelle	2025.09.09	

Part Number

Model	Hardware Code
ME3AGR01	4NN

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https://en.minewsemi.com/file/ME3AGR01_Datasheet_EN.pdf

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1 PRODUCT INTRODUCTION

1.1 General Description

ME3AGR01 is a GNSS navigation and positioning module that supports all constellations of GNSS. ME3AGR01 has a built-in high-sensitivity, low-power GNSS chip and RF devices, enabling simultaneous multi-constellation positioning with signals from China's BeiDou (BDS), the US's GPS, Russia's GLONASS, the EU's Galileo, and Japan's QZSS. This achieves robust and accurate multi-system joint positioning.ME3AGR01 is a standard SMD industrial-grade component, compliant with ROHS standards, It measures only: 6x8x2.0mm, high sensitivity, anti-interference, high performance, low power consumption and other characteristics. The product is suitable for wearable devices, vehicle navigation and positioning, locator, car recorder, OBD and other scenes.

1.2 Key Parameters

Parameter	
Update Frequency	1Hz~10Hz
Pact	NMEA-0183
Satellite systems	BDS: B1I , B1C GPS: L1C/A, L1C GLONASS: G1 Galileo: E1B/C QZSS: L1C/A
Precision indicators	
Position Accuracy	≤1.5m CEP50
1PPS	20ns (24h RMS)
Rate Accuracy	0.1m/s
Cold Start	
TTFF (s)	26 (@-130dBm)
Hot Start	
TTFF (s)	1 (@-130dBm)
Recapture	
TTFF (s)	2 (@-130dBm)
CNR	
Signal Strength (dBm)	-130
CNR (dBc/Hz)	40

Sensitivity (typical)	
Cold Start(dBm)	-149dBm@GNSS
Trace(dBm)	-165dBm@GNSS
Recapture	-159dBm@GNSS
Application Limitations	
Acceleration	≤4 g
High degree	18,000 m
velocity	500 m/s
Power Supply	
Input Voltage	1.8-3.6 V (Recommended minimum voltage 1.9V, no less than 1.80V)
Input voltage @ external DCDC	0.9-3.6V (External DCDC voltage is higher than 0.9V, must not be lower than 0.90V)
Capture phase power consumption	144mW@3.3V 53mW@external DCDC 80mW@1.9V
Tracking Phase Power Consumption	130mW@3.3V 29mW@external DCDC 44mW@1.9V
Input Gain	15dB~35dB
Input Impedance	50Ω
Input power (max.)	10 dBm
Communication Interface	
	UART x 1
Environmental indicators	
Operating temperature	-40°C ~+85°C
Storage temperature	-40°C ~+85°C
Humidity level	5%~95% non-glutinous exposure
Vibratory	GB2423.10
Impact	GB2423.5
Accreditation	RoHS and REACH compliant

2 TECHNICAL INFORMATION

2.1 Supported Constellations

The ME3AGR01 supports concurrent GNSS satellite constellations, including GPS (SBAS and QZSS) signals, BDS signals, GLONASS signals, and GALILEO.

2.2 Satellite-Based Augmentation System (SBAS)

The ME3AGR01 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.

2.3 Quasi-Zenith Satellite (QZSS)

The Quasi-Zenith Satellite System (QZSS) is a navigation satellite coverage 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 AGNSS

The ME3AGR01 supports the AGNSS Accelerated Positioning Scheme. Please refer to 《GNSS_Protocol _and_AGPS _Applicable_Product_Reference_List_CN.pdf》 for details on how to use it.

2.5 Crystal Oscillator

The ME3AGR01 uses TCXO to allow weak signal acquisition, resulting in faster start-up and re-acquisition times. The 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 reliable positioning module for positioning.

2.6 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.

2.7 Working Modes

ME3AGR01 module has the following modes:

Running mode: the module's power supplies are normal, the CPU runs normally, the power supply of each power domain is configured by the firmware; all events, including external interrupt, communication request, timing and other events can be processed normally.

Idle mode: Soc is downclocked to 26 MHz TCXO clock frequency, and the CPU enters standby mode; The GNSS clock is turned off, some peripherals are retained; internal RTC timing or peripheral interrupt inputs can be exited.

V_BCKP mode: In this mode, the external I/O and main power supplies to the module are cut off, and only the V_BCKP power supply is retained; the power consumption of the chip can be reduced to a very low level, and the specific functions and power consumption depend on the software settings configured for this mode; When the IO power supply and the main power supply, the chip will return to its working mode.

Power Off mode: The chip is fully powered down when the external power supply is cut off.

3 ELECTRICAL SPECIFICATION

3.1 Absolute Maximum Rating

Notation	Parameters	Minimum Value	Maximum Value	Unit
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
Vhbm	ESD Contact	-	2000	V
T-storage	Storage temperature	-40	+85	℃
T-solder	Reflow temperature	--	250	℃

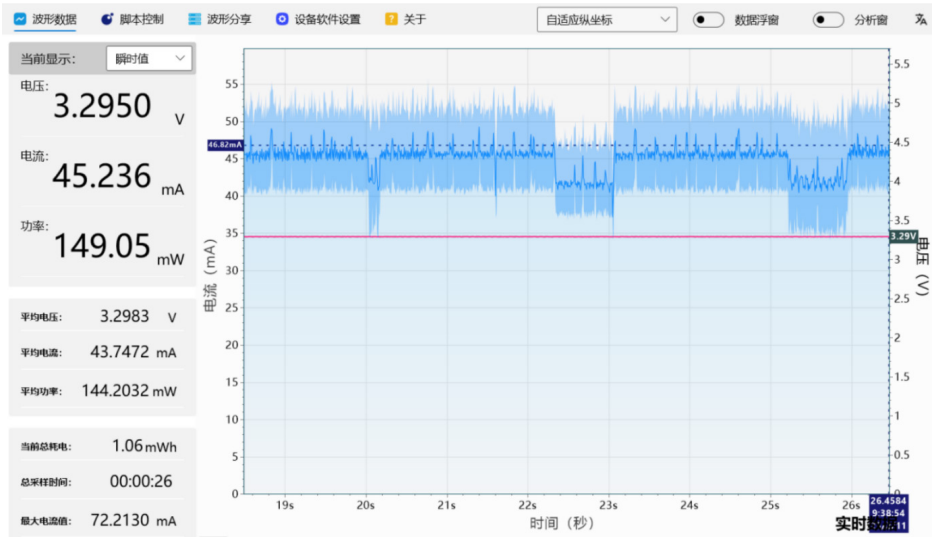
Pressurizing the equipment beyond the "Absolute Maximum Rating" may cause permanent damage.
The above figures are pressure ratings only. Products are not overvoltage or reverse voltage protected. If necessary, voltage spikes exceeding the supply voltage specifications listed in the table above must be limited to the specified range using an appropriate protection diode.

3.2 Electrical Parameters

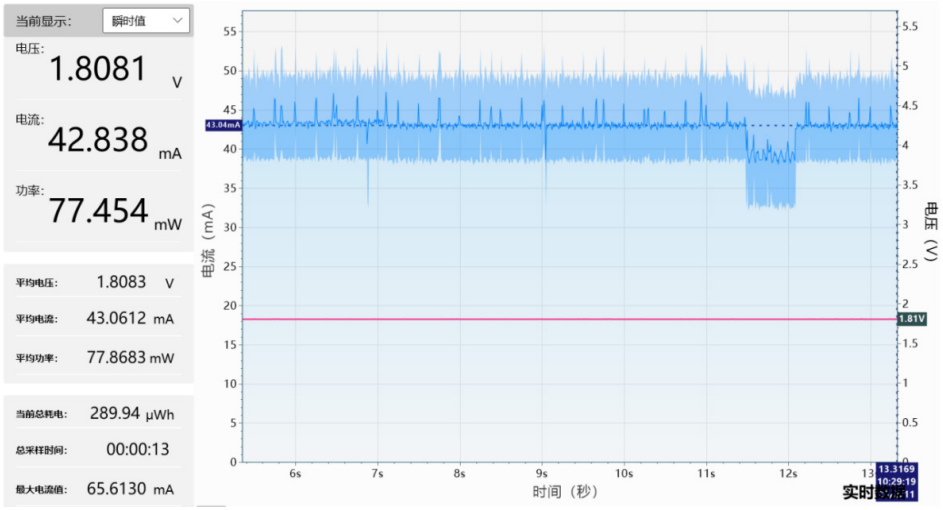
Parameters	Minimum Value	Average Value	Maximum Value	Unit
Power Supply Voltage	1.8V	3.3	3.6	V
Supply Current (Acquisition)	43	45	-	mA
Supply Current (Tracking)	40	39	-	mA
Operation Temperature	-40	+25	+85	°C

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 only as examples of typical power requirements. These Values are characterized based on samples measurements 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.

（1） Using 3.3V power supply without external DCDC, the capture phase, the measured values of current are as follows:

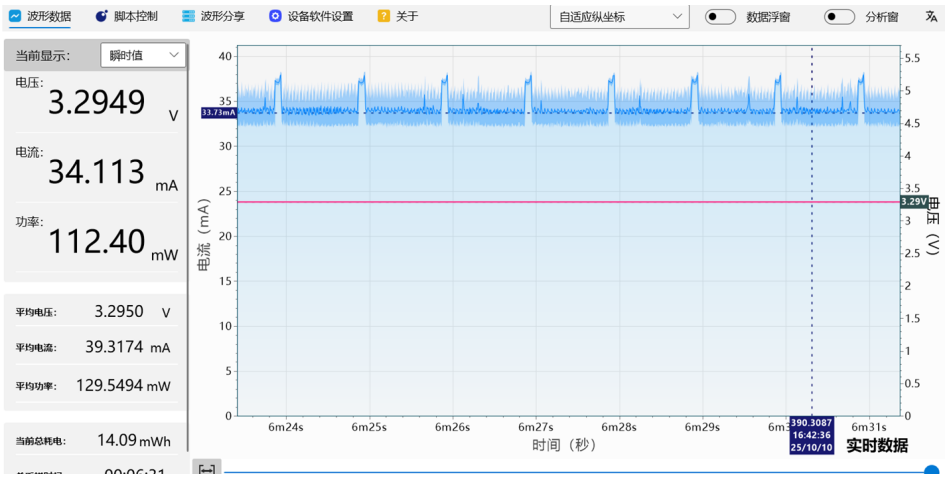


(2) Using 1.8V power supply without external DCDC, the capture phase, the measured values of current are as follows:

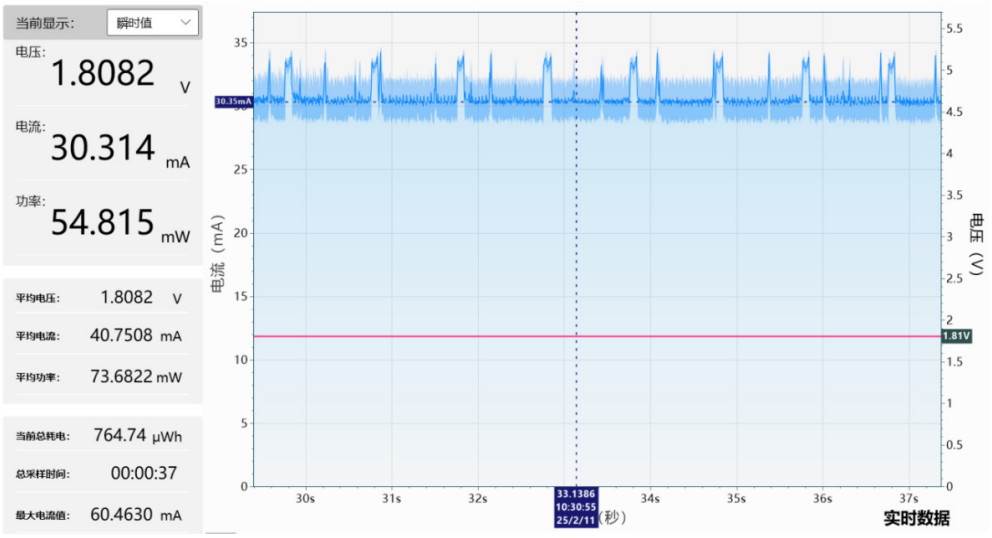


Note: 1.8V supply is the minimum limit, minimum 1.9V supply is recommended. Lower than 1.80V may cause the module to fail to start.

(3) Using 3.3V power supply without external DCDC, during the tracking phase, the measured values of current are as follows:

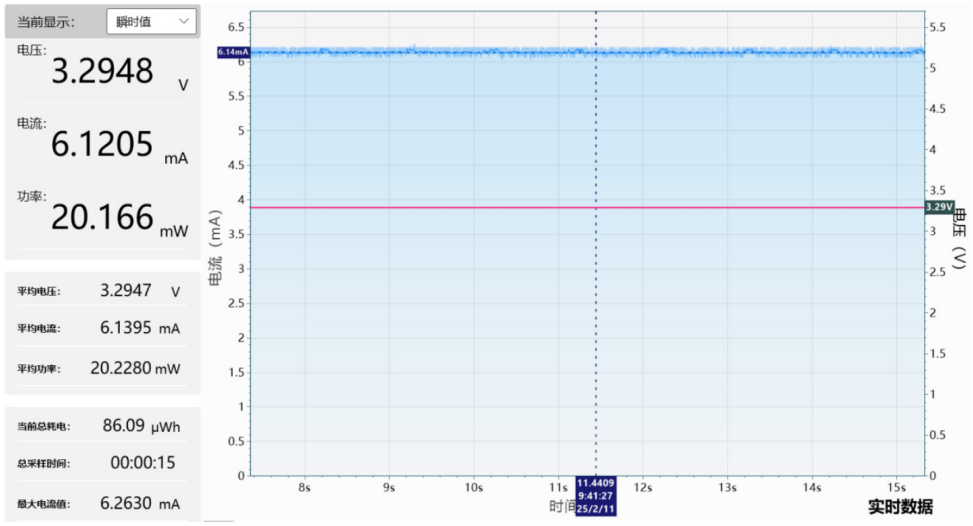


(4) Using 1.8V power supply without external DCDC, during the tracking phase, the measured values of current are as follows:

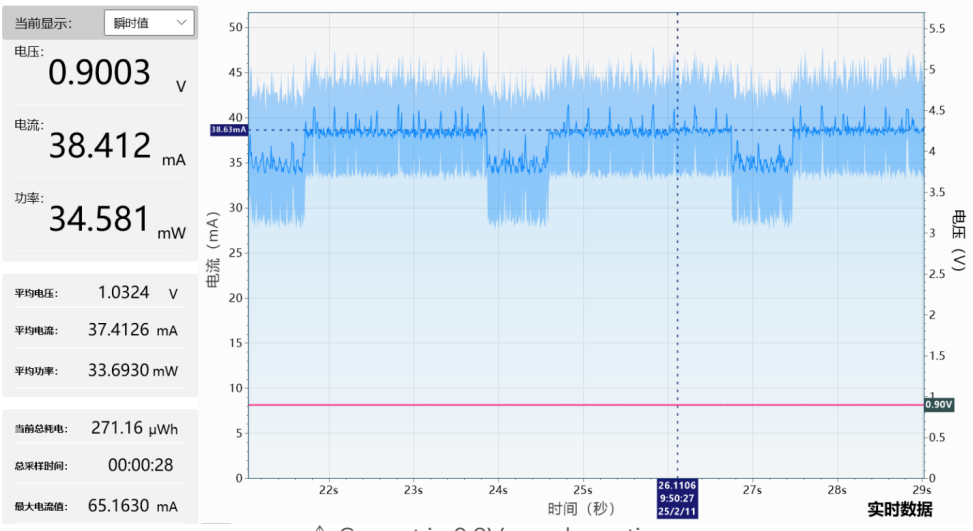


Note: 1.8V supply is the minimum limit, minimum 1.9V supply is recommended. Lower than 1.80V may cause the module to fail to start.

(5) Using a 3.3V power supply and an external DCDC, the capture phase, the measured values of current are as follows:

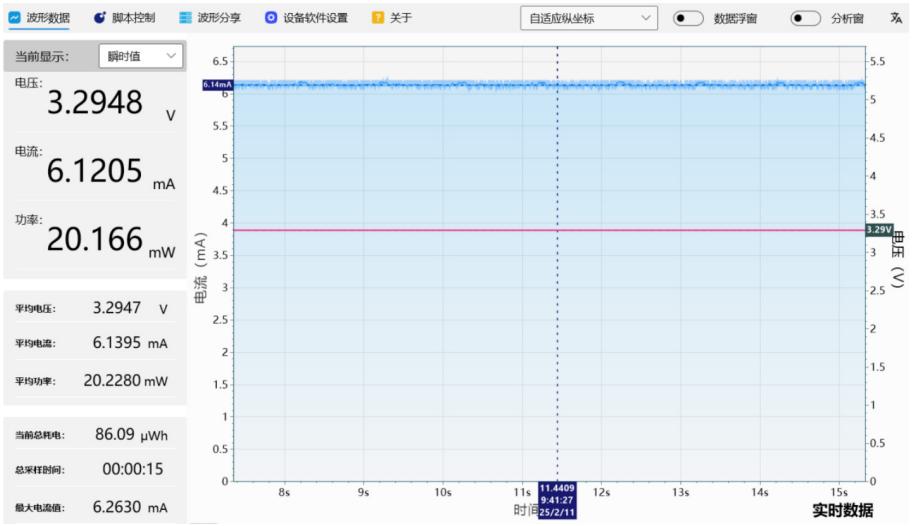


↑ Current in 3.3V supply section

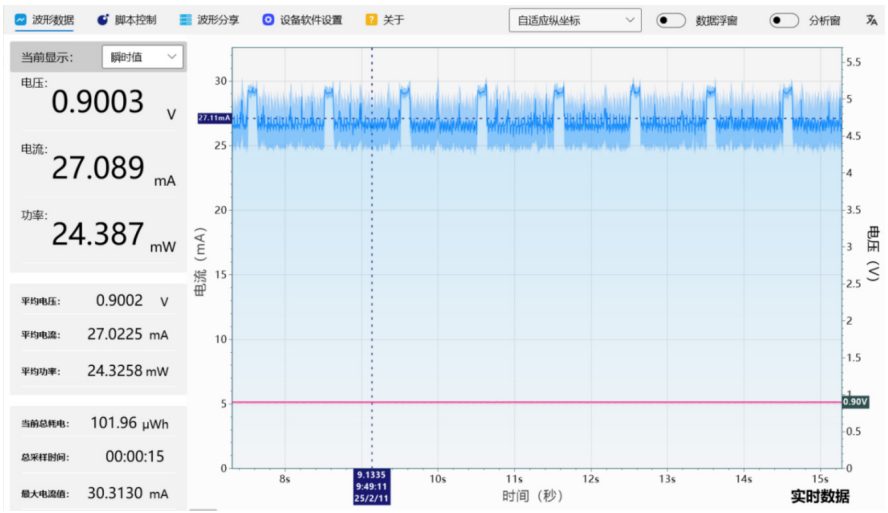


↑ Current in 0.9V supply section

(6) Using a 3.3V power supply and an external DCDC, the measured values of current during the tracking phase are as follows:



↑ Current in 3.3V supply section



↑ Current in 0.9V supply section

3.3 Power Consumption Test Summary

(1) The following lists a summary of power consumption tests corresponding to a typical single VCC supply voltage:

VCC Input Voltage	Capture phase power consumption (before localization)	Tracking phase power consumption (after localization)	External DCDC Voltage
VCC=1.9V	47mA，89mW	34mA，63mW	External DCDC=0V
VCC=2.5V	47mA，119mW	36mA，87mW	External DCDC=0V
VCC=3.0V	49mA，148mW	36mA，109mW	External DCDC=0V
VCC=3.3V	45mA，150mW	39mA，130mW	External DCDC=0V

(2) The following lists a summary of power consumption tests corresponding to typical VCC voltages with external DCDC inputs:

VCC Input Voltage	Capture phase power consumption (before localization)	Tracking phase power consumption (after localization)	External DCDC Voltage
VCC=1.9V	Ivcc=8.1mA; Idcdc=45mA;	Ivcc=8.1mA; Idcdc=27mA;	DCDC=0.9V
VCC=2.5V	Ivcc=9.1mA; Idcdc=45mA;	Ivcc=9.1mA; Idcdc=28mA;	DCDC=0.9V
VCC=3.0V	Ivcc=9.5mA; Idcdc=44mA;	Ivcc=9.5mA; Idcdc=28mA;	DCDC=0.9V
VCC=3.3V	Ivcc=9.8mA; Idcdc=44mA;	Ivcc=9.8mA; Idcdc=28mA;	DCDC=0.9V

3.4 Antenna Gain Requirements

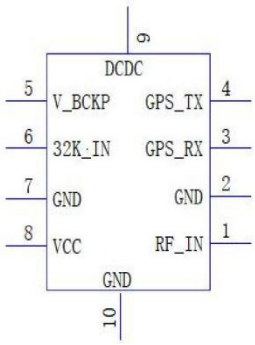
Since the ME3AGR01 has built-in LNA to support passive GNSS antennas, external active antenna gain is noted to be controlled.

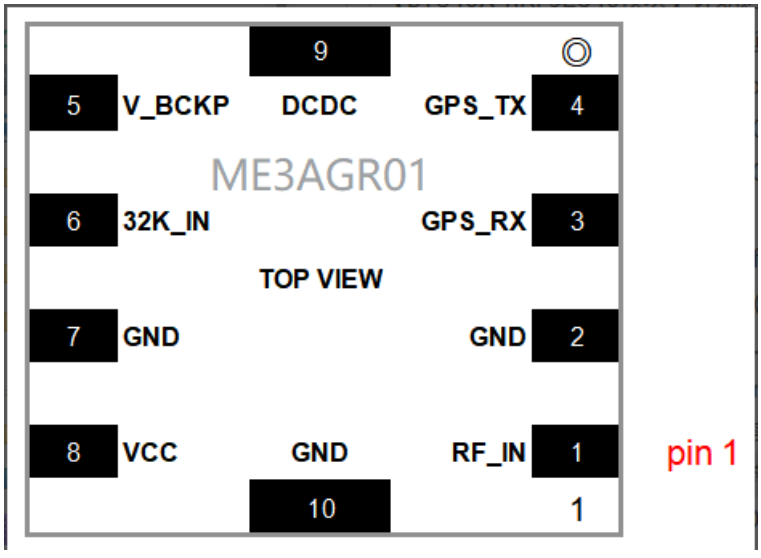
Notation	Parameters	Min	Max	Unit
RFgain	Input Gain	0	30	dB

4 PACKAGE DEFINITION

4.1 Module Pin Definitions

The ME3AGR01 is available in 6.0*8.0mm, LGA10pin package and defined as follows:

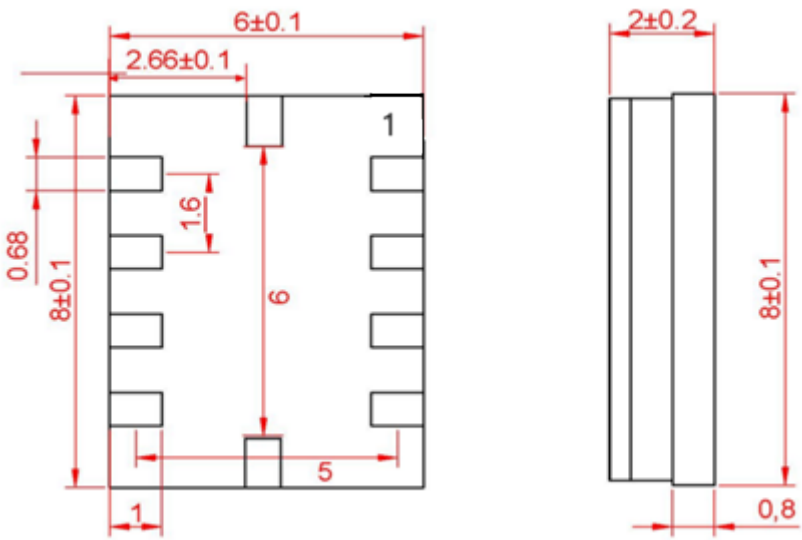




Number	Name	I/O	Description
1	RF_IN	I	RF Input. 50 ohm impedance match required on peripheral, no feed voltage to RF port
2	GND	I/O	GND
3	GPS_RX	I	Serial input (serial level determined by supply voltage)
4	GPS_TX	O	Serial output (serial level determined by supply voltage)
5	V_BCKP	I	RTC, SRAM Backup Power Supply. For hot start positioning
6	32K_IN	I	External clock signal. If you need to use the hot start function, you need to access the clock signal (the most convenient way is to access the clock signal of the 4G module), If you don't use it, you can leave it floating.
7	GND	I/O	GND
8	VCC	I	Power Input. Typical: 1.8 V Supply range: 1.8~3.3 V
9	DCDC	I	For low power consumption, connect an external 0.9V DCDC.
10	GND	I/O	GND

Note: The through-hole on the shield is not pin1. Pin1, as shown in the figure above, There is marked "1" on the shielding cover, representing pin 1 of the module.

4.2 Sizes

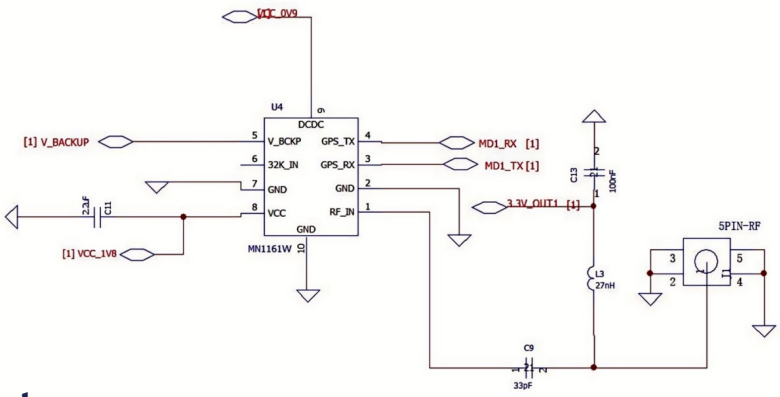


Bottom view

5 REFERENCE DESIGN

5.1 Schematic Design

The ME3AGR01 powers up and resets itself, the reference design is shown below. When connecting an active antenna, make sure the L3 inductor is in the SMD state for powering the active antenna; when connecting a passive antenna, L3 is not needed to feed the antenna. The characteristic impedance from the RF_IN pin to the antenna interface is 50Ω..



5.2 LAYOUT Notes

(1) The decoupling capacitor should be placed near the power supply pin of the module and the width of the power supply line should be more than 0.5mm.
(2) Do not run wires on the bottom of the module patch.
(3) The RF alignment from RF port of the module to the antenna interface should be at least 0.2mm~0.3mm, and adopt coplanar waveguide impedance model, and the spacing between the alignment and the ground copper skin should be controlled at about trace-to-ground spacing, and the guaranteed impedance should be 50Ω;
(4) The alignment from RF port to antenna interface of the module should reference the ground plane on the second layer of ground and ensure that the second layer of ground plane is complete;
(5) The module should not be placed near the interference sources, such as communication module antenna, RF alignment, crystal oscillator, large inductance and high-frequency digital signal traces.

5.3 Power Supply

The ME3AGR01 module is equipped with three power supply pins: VCC, V_BCKP and an external DCDC pin. The main power supply is fed to the module through the VCC pin, and the backup power supply is fed to the module through 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. An external DCDC pin can effectively reduce the system power consumption.
Therefore, even if the main power supply is disconnected, the ephemeris data can still be retained and warm or hot start can be achieved when the system is powered up again with the support of the backup power supply. If no backup power is connected and no data is received by the module, then the system will perform a cold start when the system is powered up again. NOTE: If there is no available backup power supply, connect the V_BCKP pin to VCC mains or leave it disconnected.
Precautions about power supply are as follows, Failure to meet the requirements may cause the module to malfunction, or CN0 value may be low, the number of satellites may be small, or the positioning may be slow or even non-working:
(1) If only VCC is supplied, the minimum supply voltage is recommended to be designed as 1.9V;
(2) If VCC and external DCDC, are powered simultaneously in low power mode, the external DCDC supply voltage must be greater than 0.90V;

5.4 Antenna

The ME3AGR01 incorporates a low noise figure LNA and SAW, and adopts a SAW preamplifier to ensure RF stability. It is recommended to use an active antenna with a gain of less than 30dB and a noise figure of less than 1.5dB. The module supplies power to the external active antenna through RF_IN. If a long active antenna cable is used, an active antenna with at least 15dB 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 underneath the module.

5.5 Serial Communication

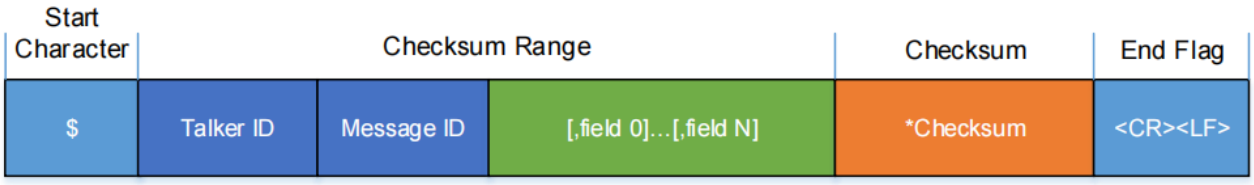
Provide one way TTL level universal asynchronous transceiver (UART), the data format is: 1 bit start bit, 8 bit data bit, 1 bit stop bit, no parity bit, the default baud rate is 115200bps. after the module is normally powered on, the serial port will automatically send NMEA data. The host computer can set the module working mode and baud rate through the serial port. When using this module in certain applications, the main power of the module may be turned off for power saving strategy, thus further reducing the power consumption.

At this time, 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 at the same time when disconnecting the main power supply, or to set the serial port to input mode + pull-down resistor or the state of high impedance state + pull-down resistor.

6 SOFTWARE PROTOCOL

6.1 NEMA0183 Protocol

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



The NEMA message output for the ME3AGR01 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
GBGSV	GNSS satellites in view for BD	Y
GAGSV	GNSS satellites in view for GALILEO	Y

NMEA Record	Description	Default
GNRMC	Recommended minimum specific GNSS data	Y
GNVTG	Course over ground and ground speed	N
GNZDA	Date and Time	N

6.2 Example data

Serial port data within 1 second after positioning example:

$GNRMC,035300.000,A,2242.29604,N,11401.68874,E,0.033,257.577,230224,,,A,S*05
$GNGGA,035300.000,2242.29604,N,11401.68874,E,1,33,0.527,134.5,M,-2.3,M,,*57
$GNGLL,2242.29604,N,11401.68874,E,035300.000,A,A*4D
$GNGSA,A,3,16,4,27,194,195,2,26,21,31,9,199,7,1.071,0.527,0.932,1*01
$GNGSA,A,3,28,37,39,10,9,40,16,23,7,6,27,59,1.071,0.527,0.932,4*0D
$GNGSA,A,3,68,81,78,82,69,88,,,,,,,1.071,0.527,0.932,2*30
$GNGSA,A,3,5,3,9,,,,,,,,,,1.071,0.527,0.932,3*03
$GPGSV,4,1,13,2,15,178,38,4,52,226,44,9,38,287,43,7,15,318,38,1*6F
$GPGSV,4,2,13,8,,,47,16,34,38,43,21,24,167,41,27,60,32,47,1*66
$GPGSV,4,3,13,26,16,65,37,31,22,119,42,194,55,46,44,199,59,149,39,1*6D
$GPGSV,4,4,13,195,46,117,44,1*6E
$GBGSV,6,1,22,6,83,56,45,7,71,286,45,10,60,264,43,9,72,346,44,1*7F
$GBGSV,6,2,22,16,80,86,46,19,,,37,23,36,78,45,28,65,104,48,1*47
$GBGSV,6,3,22,27,40,187,46,37,52,359,47,39,72,127,47,4,,,40,1*79
$GBGSV,6,4,22,40,74,318,46,43,,,42,46,,,39,56,,,45,1*40
$GBGSV,6,5,22,58,,,48,59,49,130,46,60,,,45,1,,,44,1*73
$GBGSV,6,6,22,2,,,40,3,,,45,1*72
$GLGSV,2,1,8,78,31,54,45,82,26,175,44,,,,47,69,30,267,45,1*4E
$GLGSV,2,2,8,81,58,116,49,,,,41,68,20,213,44,88,29,42,44,1*4B
$GAGSV,2,1,5,3,44,282,44,5,45,202,44,9,6,162,35,10,,,43,7*70
$GAGSV,2,2,5,11,,,41,7*43

6.3 Actual Star Search Example

6.4 Common Commands

CMD TYPE	CMD Example:
hot start	$RESET,0,h00
warm start	$RESET,0,h01
cold start	$RESET,0,hFF
Baud rate 115200	$CFGPRT,,h0,115200,129,35
Baud rate 9600 (too many satellites may congest the serial port)	$CFGPRT,,h0,9600,129,35
Turn off GSV output	$CFGMSG,0,3,0
Turn off GSA output	$CFGMSG,0,2,0
Turn off GLL output	$CFGMSG,0,1,0
Disable VTG output (disabled by default)	$CFGMSG,0,5,0
Disable ZDA output (disabled by default)	$CFGMSG,0,6,0
Disable GST output (disabled by default)	$CFGMSG,0,7,0
GPS satellite reception only	$CFGSYS,h00030009
Reception of GPS, BDS satellites	$CFGSYS,h00030099
Receive GPS, GLO, GAL satellites	$CFGSYS,h00031109
Reception of GPS, BDS, GLO, GAL satellites	$CFGSYS,h00031199
Standby mode (RF, crystal, memory subsystem operation)	$CFGPOWER,2
sleep mode	$CFGPOWER,3

Remarks:
1. All text format control commands should add Carriage Return (CR) and Line Feed (CF);
2. All software configurations expire after charging and powering up the module's main power supply VCC, if required, they need to be initialized again after powering up;
3. High refresh rates may require larger baud rates, such as 115200 or higher, to avoid serial port data congestion..

7 PACKAGING AND PROTECTION

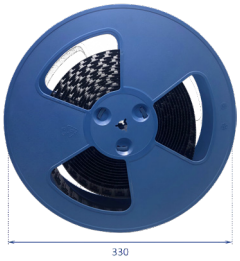
7.1 Package

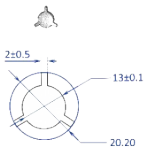
The ME3AGR01 is humidity and static sensitive. During packaging and transportation of the product, be sure to follow handling requirements and take appropriate precautions to minimize product damage. The following table shows the standard packaging structure for product transportation..

Offerings	Reels	Sealed Bags	Shipping Cartons
			
ME3AGR01	2000pcs/roll	1 roll/bag	1 bag/box, 3 boxes/ctn

7.2 Carrier Belts and Trays

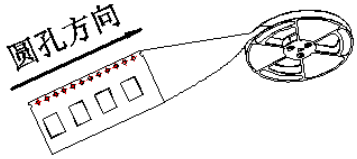
The ME3AGR01 is supplied on a reel (consisting of a tape and reel) and packaged in a ziplock bag with an anti-static effect to meet the customer's needs for efficient production, batch mounting and dismounting..

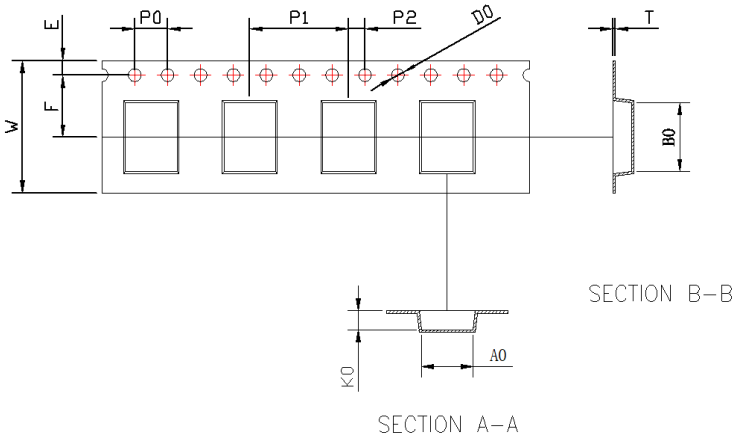




(Unit: mm)

载带上盘方向示意图





SECTION B–B

SECTION A–A

包装零件前的方向

D_0	$1.50^{+0.10}_{-0.00}$	W	16.00±0.30
A_0	6.30±0.10	E	1.75±0.10
B_0	8.40±0.10	F	7.50±0.10
K_0	2.30±0.10	P_0	4.00±0.10
T	0.30±0.05	P_1	12.0±0.10
		P_2	2.00±0.10

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;

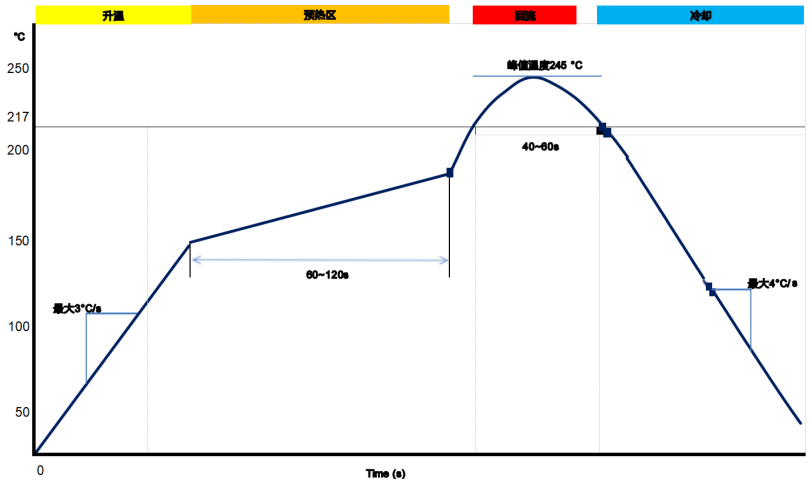
To prevent electrostatic discharge, do not expose the antenna area; if exposed by design, take appropriate ESD precautions and do not touch any exposed antenna area;

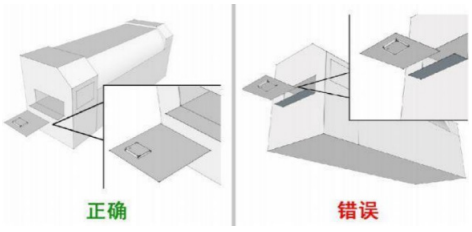
Be sure to use an ESD safe soldering iron when soldering RF connectors and antenna patches.

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.

If it is unavoidable to "solder on the back side and pass the module through the oven face down" due to process requirements, we recommend making a jig.

The setting of the soldering temperature depends on many factors in the product factory, such as the nature of the motherboard, the type of solder paste, the thickness of the solder paste, etc. Please also refer to the IPC/JEDC J-STD-020 standard and the specifications of the solder paste. When performing solder paste printing, please be careful if the amount of solder paste is excessive or insufficient, as these two conditions can lead to defects such as undercharging, voiding, and so on..

8 ORDERING INFORMATION

8.1 Ordering Model

Ordering Model	Product Name	Default Baud Rate	Default refresh rate	Default Satellite Reception Frequency	Physical Interface
ME3AGR01	Single-frequency full-system satellite positioning module	115200	1Hz	GPS/BDS/GLO/GAL/QZSS/SBAS	6*8mm, LGA10

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.

12 COPYRIGHT STATEMENT

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

For product change notifications and regular updates of Minewsemi documentation, please register on our website: **www.minewsemi.com**

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