# GM-M02, L1/L5 Dual-band GNSS, Concurrent 4-Satellite Navigation Systems, Supporting NavIC

RoHS Compliant




## Overview

Based on the AG3335 chip by 12nm technology, GR-M02 is able to track signals from all civil navigation systems, i.e. GPS, GLONASS, GALIELO, BEIDOU, QZSS, and NavIC. With plenty of visible satellites, better fixing geometry and by using good signals both help to achieve better accuracy. In addition, it also tracks L1 and L5 bands simultaneously which allows canceling out errors introduced when signals pass through the ionosphere and troposphere. This results in higher accuracy compared to single-band GNSS. Thanks to these characteristics, positioning becomes easy and more accurate even in the typical GPS difficult environments.

The exceptional performance is carried out by the well-designed antenna, LED, connector, and all circuits necessary for dual-band positioning.

This compact GR-M02 is a plug-and-play GNSS smart antenna allowing you to enjoy high performance GNSS function with minimum adoption efforts.

## Applications

- Navigation (autos, trains, boats, pedestrians etc.)
- ELD (Electronic Logging Device)
- Timing (precise clock, FEMTO cell, traffic lights etc.)

## Features

- Based on the 12nm technology AG3335 chip
- 135 channels, tracks all civil navigation systems
- Concurrent tracking of positioning satellites
  - L1/L5 dual-band
  - Multi-constellation: GPS, GLONASS, GALILEO, BEIDOU, QZSS, NavIC
  - SBAS ranging (WAAS, EGNOS, MSAS, GAGAN)
- SLAS (Sub-meter Level Augmentation) support in Japan
- High performance: -165dBm tracking sensitivity
- Support of smart jammer detection on GPS, GLONASS, Galileo, BEIDOU bands.
- 12 multi-tone AIC (active interference canceller) in both L1/L5 bands for removing unwanted signals.
- Indoor and outdoor multi-path detection and compensation
- PPS of ±10ns accuracy with adjustable duty cycle
- Up to 10Hz update rate
- RTCM ready (v2.3 and v3.3)
- AGPS/AGNSS
  - EPO™ (Extended Prediction Orbit) orbit prediction
  - EASY™ (Embedded Assist System) self-generated orbit prediction
- LOCUS™ logger function
- All-in-one, plug-n-play smart antenna module
  - Built-in L1/L5 dual-band G3B= GNSS antenna
  - Built-in wire-to-board digital connector
  - Built-in backup battery for faster position fix

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- Built-in LED for position fix indication
- Built-in UART/RS232 option

- External backup power option via I/O pin is available for special application of high working temperature.
- Fully EMI shielded
- Industrial operating temperature range: -40 ~ 85℃

Note: ™ Airoha trade mark

⁼G3B: GPS/GLONASS/GALILEO/BEIDOU

## Technical Specifications

### Receiver Performance Data+

| | |
|---|---|
| Receiver Type | 135 channels,<br>L1:<br>1602 MHz:<br>GLONASS:L1OF<br>1575.42 MHz<br>GPS & QZSS: L1 C/A<br>SBAS: L1<br>QZSS L1 SAIF<br>Galileo: E1 (E1B+E1C)<br>1561.098 MHz<br>BEIDOU B1I<br>L5: 1176.45 MHz<br>GPS & QZSS: L5<br>Galileo: E5a<br>BEIDOU: B2a<br>NAVIC SPS |
| Horizontal Position Accuracy | 1.5m (L1+L5 dual-band)<br>(50% 24hr static, -130dBm) |
| Vertical Position Accuracy | 2.25m (L1+L5 dual-band)<br>(50% 24hr static, -130dBm) |
| Velocity Accuracy | <0. 05 m/s (speed, autonomous)<br>(50%@30m/s) |
| Time Pulse Signal Accuracy | ± 10 ns clear sky, 1-sigma |
| Time To First Fix<br>Hot start<br>Warm start<br>Cold start | Autonomous (50% -130dBm)<br>1sec<br>24sec<br>24sec |
| Sensitivity (Autonomous) | Acquisition: -148dBm<br>Tracking: -165dBm |
| Max. Update Rate | 10Hz (default 1Hz) |
| Max. Altitude | <18,000 m |
| Max. Velocity | <1,852 km/hr |
| Protocol Support | NMEA V3.01 & V4.10<br>GGA, GSA, GSV, RMC, VTG<br>UART: N-8-1<br>38400/115200(default)/921600bps<br>Proprietary PAIR command<br>Proprietary Binary sentence |
| SBAS Support | WAAS, EGNOS, MSAS,GAGAN |
| AGPS/AGNSS | ● EPO data: GPS, GLONASS<br>● QEPO data: GPS, GLONASS, GALILEO, BEIDOU<br>● EASY: GPS |
| Dynamics | <4g |

**+ Note. According to IC Spec**

### Electrical Data

| | |
|---|---|
| Power Supply (VCC) | 3.3 ~ 5 V (TTL, RS232)<br>4.5 ~ 5.5 V (USB) |
| Power Consumption (average tracking, 77-SV in fix) | 56mA (TTL)<br>59mA (RS232)<br>94mA (USB) |
| Backup Power (V_BAT) | 2~5 V |
| TTL I/O | $V_{IH}$: 2~3.15V, $V_{IL}$: 0~0.8V<br>$V_{OH}$: >2.1V, $V_{OL}$< 0.72V |

### Environmental Data

| | |
|---|---|
| Operating temperature | -40 ~ 85℃ except |

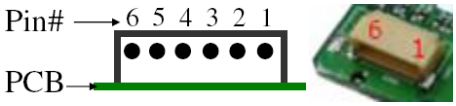
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| | |
|---|---|
| | battery: -20~60℃ |
| Storage temperature | -40 ~ 85℃ except battery: -40~60℃ |
| Vibration | 5Hz to 500Hz, 5g |
| Shock | Half sine 30g/11ms |

## Others

| | |
|---|---|
| Dimension | 30*30*11.8 $mm^3$ |
| Weight | 19.2 g: GM-M02T<br>19.3g: GM-M02R<br>19.4 g: GM-M02U |

## 6-pin Interface, pitch 1.0mm




## Ordering Information

### GM-M02R

| Pin | Name | Function | I/O |
|---|---|---|---|
| 1 | GND | Ground | Input |
| 2 | VCC | Power supply | Input |
| 3 | TXD-TTL | TTL level serial data output | Output |
| 4 | RX-RS232 | RS232 level serial data input | Input |
| 5 | TX-RS232 | RS232 level serial data output | Output |
| 6 | RXD-TTL | TTL level serial data input | Input |

### GM-M02T

| Pin | Name | Function | I/O |
|---|---|---|---|
| 1 | GND | Ground | Input |
| 2 | VCC | Power supply | Input |
| 3 | TXD-TTL | TTL level serial data output | Output |
| 4 | PWR_CTRL | Power control,<br>high/floating: ON, low: OFF | Input |
| 5 | 1PPS-TTL | Pulse Per Second signal | Output |
| 6 | RXD-TTL | TTL level serial data input | Input |

### GM-M02P

| Pin | Name | Function | I/O |
|---|---|---|---|
| 1 | GND | Ground | Input |
| 2 | VCC | Power supply | Input |
| 3 | TX-RS232 | Serial data output | Output |
| 4 | RX-RS232 | Serial data input | Input |
| 5 | 1PPS-TTL | Pulse Per Second signal | Output |
| 6 | NC | No connection | - |

### GM-M02Q

| Pin | Name | Function | I/O |
|---|---|---|---|
| 1 | GND | Ground | Input |
| 2 | VCC | Power supply | Input |
| 3 | TX-RS232 | Serial data output | Output |
| 4 | RX-RS232 | Serial data input | Input |
| 5 | 1PPS-RS232 & | Pulse Per Second signal | Output |
| 6 | NC | No connection | - |

### GM-M02U

| Pin | Name | Function | I/O |
|---|---|---|---|
| 1 | GND | Ground | Input |
| 2 | VCC | Power supply | Input |
| 3 | D+ | USB D+ | I/O |
| 4 | D- | USB D- | I/O |
| 5 | NC | No connection | - |
| 6 | NC | No connection | - |

Note. W connects DCD to 1PPS while U doesn't.

& Please be noted that the RS232 line transceiver would introduce 0.3 us pulse skew to the 1PPS signal of RS232 model.

* This document is subject to change without notice.

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