

# ANN-MB series

Multi-band, high precision GNSS antennas

Data Sheet



## Abstract

This technical data sheet describes the ANN-MB Multi-band (L1, L2/E5b/B2I) active GNSS antennas that support GPS, GLONASS, Galileo, and BeiDou. The antennas provide a fast and easy solution for high precision applications with an excellent price to performance ratio. The antenna variants offer versatile mounting and connector options.

# Document Information

|                               |  |             |
|-------------------------------|--|-------------|
| <b>Title</b>                  | <b>ANN-MB series</b>                     |             |
| <b>Subtitle</b>               | Multi-band, high precision GNSS antennas |             |
| <b>Document type</b>          | Data Sheet                               |             |
| <b>Document number</b>        | UBX-18049862                             |             |
| <b>Revision and date</b>      | R05                                      | 28-Nov-2022 |
| <b>Disclosure Restriction</b> | Production Information                   |             |

| <b>Product status</b>                | <b>Corresponding content status</b> |  |
|--------------------------------------|-------------------------------------|--|
| <b>In Development / Prototype</b>    | Objective Specification             | Target values. Revised and supplementary data will be published later.                 |
| <b>Engineering Sample</b>            | Advance Information                 | Data based on early testing. Revised and supplementary data will be published later.   |
| <b>Initial Production</b>            | Early Production Information        | Data from product verification. Revised and supplementary data may be published later. |
| <b>Mass Production / End of Life</b> | Production Information              | Document contains the final product specification.                                     |

This document applies to the following products:

| <b>Product name</b> | <b>Type number</b> | <b>Connector type</b> | <b>PCN reference</b> | <b>Product status</b> |
|---------------------|--------------------|-----------------------|----------------------|-----------------------|
| ANN-MB (SMA)        | ANN-MB-00-00       | SMA                   | N/A                  | Mass Production       |
| ANN-MB (SMB)        | ANN-MB-01-00       | SMB                   | N/A                  | Mass Production       |
| ANN-MB (MCX)        | ANN-MB-02-00       | MCX                   | N/A                  | Mass Production       |

u-blox or third parties may hold intellectual property rights in the products, names, logos and designs included in this document. Copying, reproduction, modification or disclosure to third parties of this document or any part thereof is only permitted with the express written permission of u-blox.

The information contained herein is provided "as is" and u-blox assumes no liability for its use. No warranty, either express or implied, is given, including but not limited to, with respect to the accuracy, correctness, reliability and fitness for a particular purpose of the information. This document may be revised by u-blox at any time without notice. For the most recent documents, visit [www.u-blox.com](http://www.u-blox.com).

Copyright © u-blox AG.

# Contents

|  |           |
|--|-----------|
| <b>Document Information</b> .....              | <b>2</b>  |
| <b>Contents</b> .....                          | <b>3</b>  |
| <b>1 Overview</b> .....                        | <b>4</b>  |
| <b>2 Electrical specification</b> .....        | <b>4</b>  |
| <b>3 Mechanical specification</b> .....        | <b>5</b>  |
| 3.1 Mechanical drawing .....                   | 5         |
| 3.2 Mechanical data .....                      | 5         |
| 3.3 Connector types .....                      | 5         |
| <b>4 Environmental information</b> .....       | <b>6</b>  |
| <b>5 Absolute maximum ratings</b> .....        | <b>6</b>  |
| <b>6 Antenna characteristics</b> .....         | <b>7</b>  |
| 6.1 Block diagram .....                        | 7         |
| 6.2 Antenna phase center .....                 | 7         |
| 6.3 Radiation pattern .....                    | 8         |
| <b>7 Product labeling</b> .....                | <b>9</b>  |
| 7.1 Explanation of product codes .....         | 9         |
| <b>8 Ordering information</b> .....            | <b>10</b> |
| <b>9 Approvals and safety precaution</b> ..... | <b>10</b> |
| 9.1 Approvals .....                            | 10        |
| 9.2 Safety precaution .....                    | 10        |
| <b>Revision history</b> .....                  | <b>11</b> |
| <b>Contact</b> .....                           | <b>12</b> |

# 1 Overview

The u-blox ANN-MB multi-band (L1, L2/E5b/B2I) active GNSS antennas are designed to reduce time to market for the next generation of high precision GNSS applications, which require highly accurate location information. The compact design, excellent price to performance ratio, and versatile mounting and connector choices provide customers with fast, easy, and reliable multi-band antenna solutions. The ANN-MB antenna is a perfect match to the u-blox F9 platform, including the ZED-F9P module, thus providing customers with a valuable antenna solution to minimize design-in efforts.

The ANN-MB series includes a high-performance multi-band RHCP dual-feed patch antenna element, a built-in high-gain LNA with SAW pre-filtering, and a 5 m antenna cable with three connector options (SMA, SMB, MCX).

## 2 Electrical specification

### Patch antenna specification

| Parameter                 | L1 Band                | L2/E5b/B2I Band            |
|---------------------------|------------------------|----------------------------|
| Frequency <sup>1</sup>    | 1559-1606 MHz          | 1197-1249 MHz              |
| Impedance <sup>1</sup>    | 50 Ω                   | 50 Ω                       |
| Gain <sup>1</sup>         | Typ. 3.5 dBic (Zenith) | Typ. 0.0-2.0 dBic (Zenith) |
| Axial ratio <sup>1</sup>  | Max. 2.0 dB (Zenith)   | Max. 2.0 dB (Zenith)       |
| Polarization <sup>1</sup> | RHCP                   | RHCP                       |

Table 1: Patch antenna element specification

### Amplifier specification

| Parameter  | L1 Band  | L2/E5b/B2I Band  |
|--|--|--|
| Frequency  | 1559-1606 MHz  | 1197-1249 MHz  |
| Impedance  | 50 Ω   | 50 Ω   |
| LNA Gain <sup>2,3</sup>                                      | Typ. 28 ± 3.0 dB   | Typ. 28 ± 3.0 dB   |
| LNA Noise Figure <sup>2,3</sup>                              | Max. 2.8 dB  | Max. 3.2 dB  |
| Output VSWR  | Max. 2.0   | Max. 2.0   |
| Cable Insertion Loss (RG-174, length 5 m)                    | Typ. 6.6 dB  | Typ. 5.6 - 6.6 dB  |
| Total Gain <sup>2,4</sup>                                    | Typ. 21.4 dB   | Typ. 21.4 - 22.4 dB  |
| Out-of-band rejection  |  |  |
| min. 100 MHz from GNSS band edges at selected cellular bands | Typ. 65 dB (at <1459 MHz), 70 dB (>1706 MHz)<br>Typ. 85 / 80 / 70 / 75 / 80 dB (at 698 / 960 / 1710 / 2170 / 2690 MHz) | Typ. 50 dB (at <1097 MHz), 75 dB (>1349 MHz)<br>Typ. 65 / 45 / 45 / 75 / 80 dB (at 698 / 960 / 1710 / 2170 / 2690 MHz) |
| Supply voltage <sup>5</sup>                                  | 3.0 - 5.0 V  |  |
| Supply current <sup>2,5</sup>                                | Typ. 15 mA   |  |

Table 2: Amplifier specification

<sup>1</sup> Measured on a ø15 cm ground plane. Measured values include the antenna feed network (hybrid coupler).

<sup>2</sup> Measured using 5.0 V supply voltage

<sup>3</sup> Includes LNA and SAW pre-filter section

<sup>4</sup> Includes LNA Gain and Cable Insertion Loss

<sup>5</sup> Single supply for L1 and L2/E5b/B2I bands

### 3 Mechanical specification

#### 3.1 Mechanical drawing

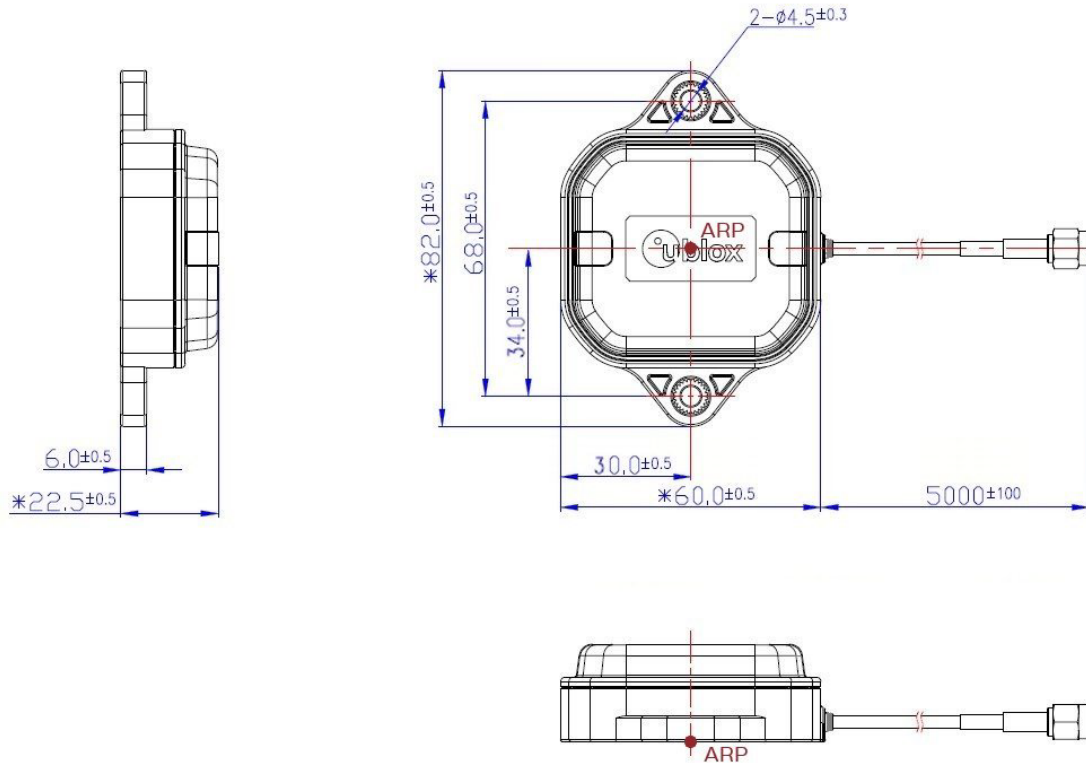


Figure 1: ANN-MB series mechanical drawing. Dimensions are given in mm. The antenna reference point (ARP) is marked with a red dot.

#### 3.2 Mechanical data

| Parameter                    | Specification   |
|------------------------------|---|
| Weight (Typical incl. cable) | 173 g   |
| Size                         | 82.0 x 60.0 x 22.5 mm <sup>3</sup>                                    |
| Connector options            | SMA, SMB, MCX   |
| Cable type, length           | RG174, 5.0 m  |
| Mounting                     | Magnetic base, fixed installation option (screw mount, 2 x M4 screws) |
| Housing Color                | Black   |

Table 3: Mechanical specification

#### 3.3 Connector types



Table 4: ANN-MB connector types

## 4 Environmental information



| Parameter                      | Specification   |
|--------------------------------|---|
| Operating temperature          | -40 to +85 °C   |
| Storage temperature            | -40 to +85 °C   |
| ESD circuit protection         | ±15 kV (IEC61000-4-2)   |
| Ingress protection (IP) rating | IP67 (Protected from dust and temporary immersion in water up to 1 m depth) |
| Humidity                       | 95%RH, 60 °C, 96 hours  |
| Vibration                      | MIL-STD-810G, Method 514.7 Vibration  |

**Table 5: Environmental information**

## 5 Absolute maximum ratings

| Parameter             | Symbol           | Condition | Min | Max  | Units |
|-----------------------|------------------|-----------|-----|------|-------|
| Power supply voltage  | VCC              |           | 0.0 | 10.0 | V     |
| Operating temperature | T <sub>OP</sub>  |           | -40 | +85  | °C    |
| Storage temperature   | T <sub>STG</sub> |           | -40 | +85  | °C    |

**Table 6: Absolute maximum ratings**

- 
 Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only. Operation of the device at these or at any other conditions above those given below is not implied. Exposure to limiting values for extended periods may affect device reliability.
- 
 The product is not protected against overvoltage or reversed voltages. Voltage spikes exceeding the power supply voltage specification, given in the table above, must be limited to values within the specified boundaries by using appropriate protection diodes.

## 6 Antenna characteristics

### 6.1 Block diagram

A simplified block diagram for ANN-MB multi-band antenna series is shown in [Figure 2](#). The block diagram is divided into patch antenna element and amplifier sections. The patch antenna element section is specified in [Table 1](#) and the amplifier section in [Table 2](#). The 5 m coaxial cable is connected to the amplifier section output.

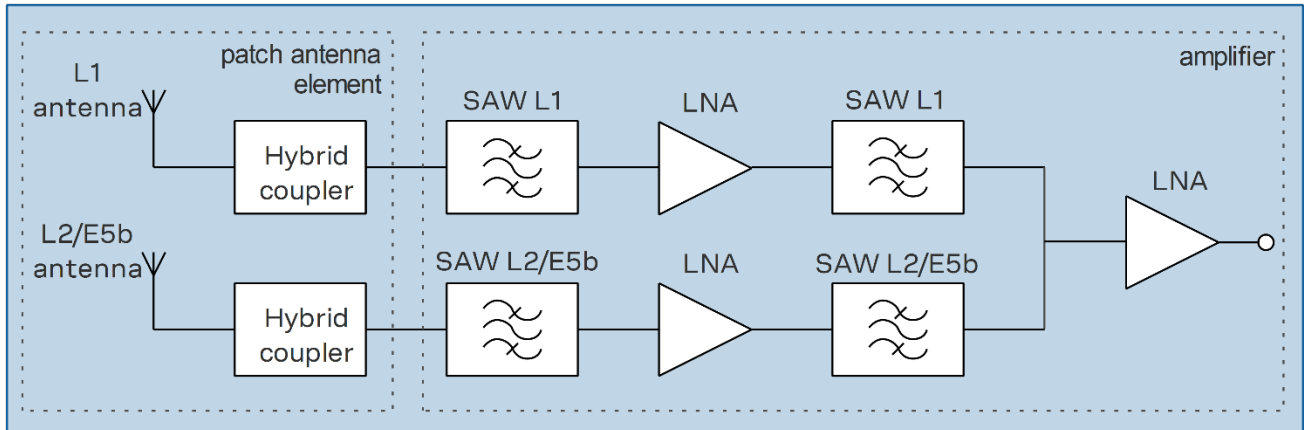


Figure 2: Simplified ANN-MB series block diagram

### 6.2 Antenna phase center

Typical values for the absolute antenna phase center offset in L1 and L2 bands are given in [Table 7](#). The phase center offset is given in millimeters with respect to the antenna reference point defined in [Figure 1](#). The “North” direction is toward the cable connector. The “Up” direction is normal to the antenna ground plane, toward the patch element.

The phase center offset is measured on a circular ground plane with 120 mm diameter. Any change in ground plane size or shape may affect the phase center offset.

| GNSS       | Frequency   | Phase center offset      |        | Phase center variation     |
|------------|-------------|--------------------------|--------|----------------------------|
|            |             | Horizontal plane         | Up     | Over all azimuth/elevation |
| GPS L1 C/A | 1575.42 MHz | < 5 mm in all directions | 8.9 mm | < 5 mm                     |
| GPS L2C    | 1227.60 MHz | < 5 mm in all directions | 7.6 mm | <10 mm                     |

Table 7: Typical values for phase center offset and variation relative to antenna reference point (ARP) in L1 and L2 bands. Measured on a circular 120 mm ground plane.

### 6.3 Radiation pattern

The radiation pattern in the L1 and L2 bands are shown in Figure 4 and Figure 5, respectively. The 2-D cuts for  $H(xy)$ ,  $E1(xz)$ , and  $E2(yz)$  planes are shown at BeiDou, GPS, and Glonass frequencies. The coordinate axes are defined in Figure 3.

Note: The spherical coordinate system used represent radiation pattern data is different from the “North”, “East”, “Up” coordinate system used for antenna phase center offset in section 6.2.

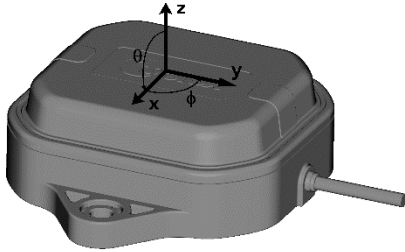


Figure 3: Definition of coordinate axes for radiation pattern plots.

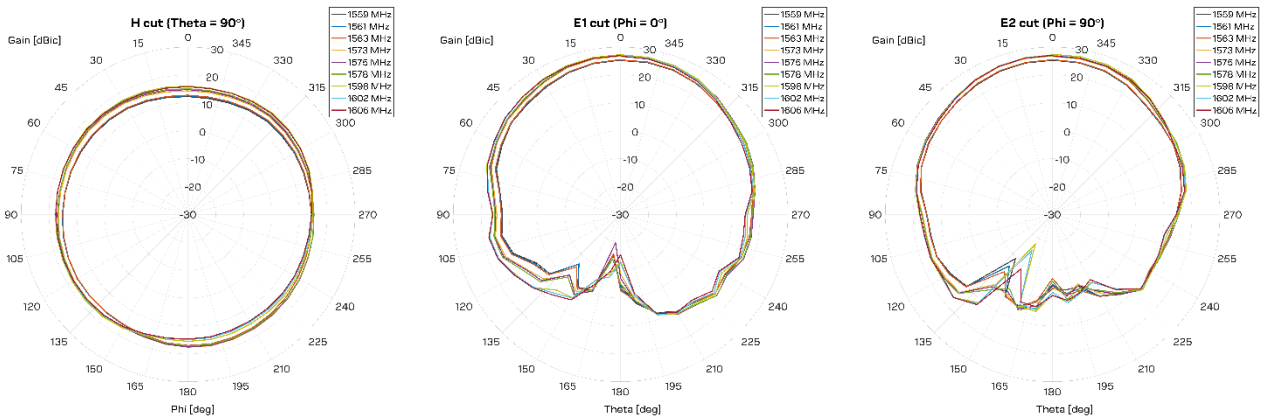


Figure 4: Radiation pattern in L1 band. The 2-D cuts are measured at 1559 - 1606 MHz (nine frequencies).

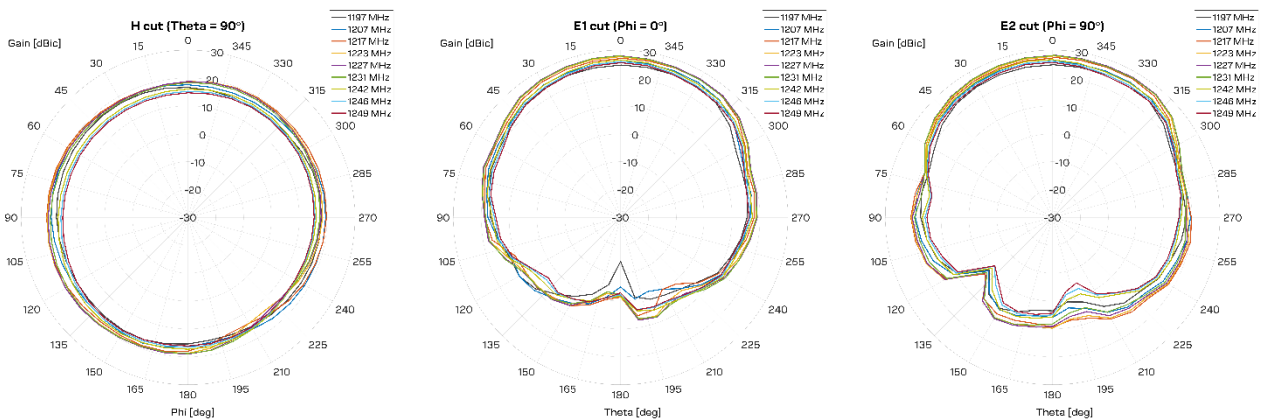


Figure 5: Radiation pattern in L2 band. The 2-D cuts are measured at 1197 - 1249 MHz (nine frequencies).



## 7 Product labeling

The product information label is found on the underside of the ANN-MB multi-band GNSS antenna. The label includes the product type number, which provides important information on the product.

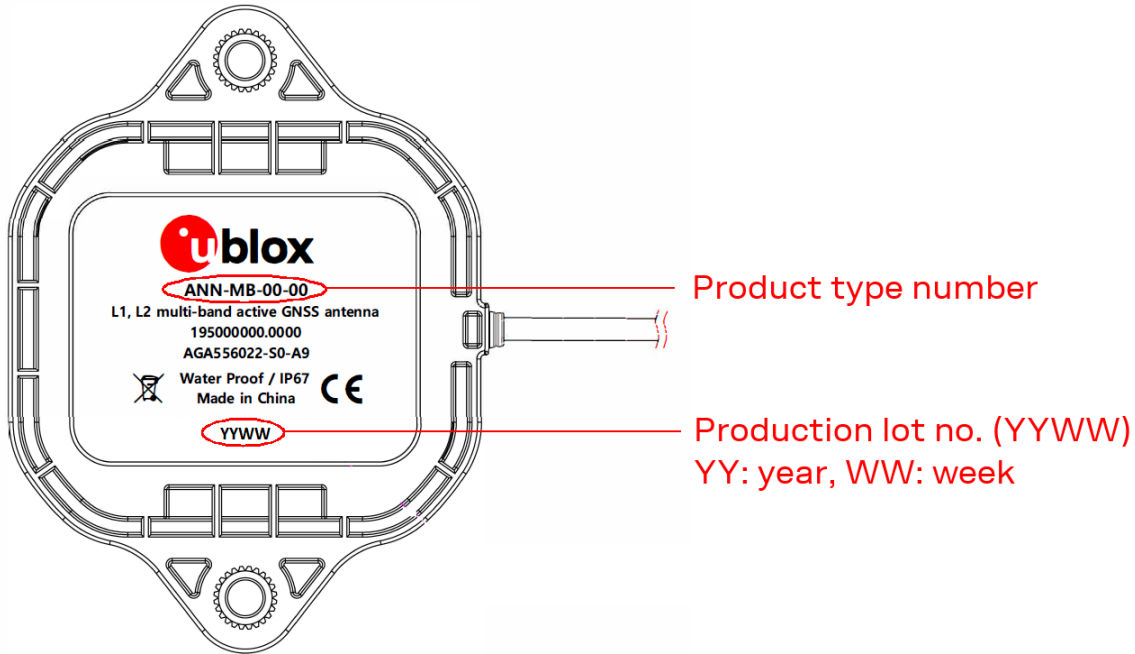


Figure 6: ANN-MB multi-band GNSS antenna product label. ANN-MB is produced in China or in Korea.

### 7.1 Explanation of product codes

Three different product code formats are used. The **Product name** is used in general communications about product families and variants. The **Ordering code** includes options, whereas the **Type number** includes information on the hardware version. The product code formats are described in [Table 8](#) and [Table 9](#).

| Format        | Structure    |
|---------------|--------------|
| Product name  | PPP-GV       |
| Ordering code | PPP-GV-NN    |
| Type number   | PPP-GV-NN-XX |

Table 8: Product code formats

| Code | Meaning            | Example   |
|------|--------------------|---|
| PPP  | Product family     | ANN   |
| GV   | Product generation | MB: Multi-band  |
| NN   | Option             | Connector type:<br>00 = SMA connector<br>01 = SMB connector<br>02 = MCX connector |
| XX   | Product revision   |   |

Table 9: Explanation of product codes

## 8 Ordering information

| Ordering No. | Product   |
|--------------|---|
| ANN-MB-00    | Multi-band active GNSS antenna, 5 m cable, SMA (plug) connector<br>Single units |
| ANN-MB-01    | Multi-band active GNSS antenna, 5 m cable, SMB (plug) connector<br>Single units |
| ANN-MB-02    | Multi-band active GNSS antenna, 5 m cable, MCX (plug) connector<br>Single units |

**Table 10: Ordering information**

## 9 Approvals and safety precaution

### 9.1 Approvals

ANN-MB complies with all the essential requirements for RED 2014/53/EU. The ANN-MB Declaration of Conformity (DoC) is available at [www.u-blox.com](http://www.u-blox.com) within Support > Product resources > Conformity Declaration.

ANN-MB complies with the Directive 2011/65/EU (EU RoHS 2) and its amendment Directive (EU) 2015/863 (EU RoHS 3).

### 9.2 Safety precaution

ANN-MB shall be supplied by a power supply complying with the requirements of PS1 according to safety standard EN 62368-1 (<https://webstore.iec.ch/publication/27412>).

## Revision history

| Revision | Date        | Name | Status / Comments   |
|----------|-------------|------|---|
| R01      | 10-Sep-2018 | rmak | Objective Specification.  |
| R02      | 10-Dec-2018 | rmak | Advance Information. Updated Figure 1 and Table 5 for added fix installation option. Updated Table 2 (outband rejection), Table 3 (antenna weight) and section 6.3 (Radiation Pattern). Adjusted temperature specification (Table 5). Added section 5 (absolute maximum ratings) and Figure 6 (product label information).  |
| R03      | 18-Feb-2019 | rmak | Early Production Information. Updated Table 2 (out-of-band rejection values), Figure 1 (mechanical drawing), Table 3 (mechanical data), Table 4 (ANN-MB connector types), Table 5 (environmental information), Figure 6 (product label), section 6.3 (radiation pattern). Added section 9 Approvals and safety information. |
| R04      | 09-Jul-2019 | rmak | Production Information. Added B2I in supported bands in section 1 and section 2. Included antenna reference point (ARP) in Figure 1. Added section 6.2 (Antenna phase center). Revised connector description to "plug" in Table 4 and Table 10. Modified wording of the RoHS statement in section 9.1.                      |
| R05      | 28-Nov-2022 | rmak | Updated section 5 Absolute maximum ratings. Editorial change. Updated section 7 Product labeling. Added China as a country of origin (China and Korea). Updated section Contact.  |

## Contact

Address: u-blox AG  
Zürcherstrasse 68  
8800 Thalwil  
Switzerland

For further support and contact information, visit us at [www.u-blox.com/support](http://www.u-blox.com/support).

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[u-blox:](#)

[ANN-MB-00](#) [ANN-MB-01](#) [ANN-MB-02](#)