ANN-MB1

L1/L5 multi-band high precision GNSS antenna
Data sheet

Abstract

This technical data sheet describes the ANN-MB1 multi-band L1/L5 active GNSS antenna that supports GPS, GLONASS, Galileo, and BeiDou. The antenna provides a fast and easy solution for high precision applications with an excellent price-to-performance ratio. The antenna also offers versatile mounting options.

Document information

Title	**ANN-MB1**
Subtitle	L1/L5 multi-band high precision GNSS antenna
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Product status	Corresponding content status	
In Development / Prototype	Objective Specification	Target values. Revised and supplementary data will be published later.
Engineering Sample	Advance Information	Data based on early testing. Revised and supplementary data will be published later.
Initial Production	Early Production Information	Data from product verification. Revised and supplementary data may be published later.
Mass Production / End of Life	Production Information	Document contains the final product specification.

This document applies to the following products:

Product name	Type number	Connector type	PCN reference	Product status
ANN-MB1	ANN-MB1-00-00	SMA	N/A	Engineering Sample

Contents

1   Overview

The u-blox ANN-MB1 multi-band (L1/L5/E5a/B2a/NavIC) active GNSS antenna is designed to reduce the time-to-market for the new generation of high precision GNSS applications, which require highly accurate location abilities. The compact design, excellent price-to-performance ratio, and versatile mounting choices provide customers with a fast, easy, and reliable multi-band antenna solution. The ANN-MB1 antenna is a perfect match to the u-blox F9 platform (for example, ZED-F9T-10B), supporting L1 and L5 bands, thus providing customers with the valuable antenna solution they need to minimize evaluation and design-in efforts.

The ANN-MB1 includes a high-performance multi-band RHCP dual-resonance, dual-feed patch antenna element, a built-in high-gain LNA with SAW pre-filtering, and a 5-meter antenna cable with an SMA connector.

2 Electrical specifications

Parameter	L1 band	L5/E5a/B2a/NavIC band
Frequency[1]	1559-1606 MHz	1164-1188 MHz
Impedance[1]	50 Ω	50 Ω
Gain[1]	Typ. 3.8 dBic (Zenith)	Typ. 1.3 dBic (Zenith)
Axial ratio[1]	Typ. 3.3 dB (Zenith)	Typ. 3.4 dB (Zenith)
Efficiency[1]	Typ. 55%	Typ. 40%
Polarization[1]	RHCP	RHCP

Table 1: Patch antenna element specifications

Parameter	L1 band	L5/E5a/B2a/NavIC band
Frequency	1559-1606 MHz	1164-1188 MHz
Impedance	50 Ω	50 Ω
LNA gain[2,3]	Typ. 29 ± 3.0 dB	Typ. 33 ± 3.0 dB
LNA noise figure[2,3]	Typ. 2.7 dB	Typ. 2.8 dB
Output VSWR	Typ. 2.0	Typ. 2.0
Cable insertion loss (RG-174, length 5 m)	Typ. 7.0 dB	Typ. 5.5 dB
Total gain[2,4]	Typ. 22 dB	Typ. 27.5 dB
Out-of-band rejection		
min 100 MHz from GNSS band edges	Typ. 55 dB (at <1459 MHz), 70 dB (>1706 MHz)	Typ. 85 dB (at <1064 MHz), 60 dB (>1288 MHz)
at selected cellular bands	Typ. 75 / 75 / 75 / 65 / 65 / 85 / 85 / 65 dB (at 699 / 785 / 915 / 1710 / 1880 / 1980 / 2300 / 2690 MHz)	Typ. 75 / 80 / 75 / 70 / 70 / 90 / 85 / 70 dB (at 699 / 785 / 915 / 1710 / 1880 / 1980 / 2300 / 2690 MHz)
Supply voltage[5]	3.0-5.0 V	
Supply current[2,5]	Typ. 15 mA	

Table 2: Amplifier specifications

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[1] Measured on a ø12 cm ground plane. Measured values include the antenna feed network (hybrid coupler).
[2] Measured using 5.0 V supply voltage
[3] Includes LNA and SAW pre-filter section
[4] Includes LNA gain and cable insertion loss
[5] Single supply for L1 and L5 bands

3 Mechanical specifications
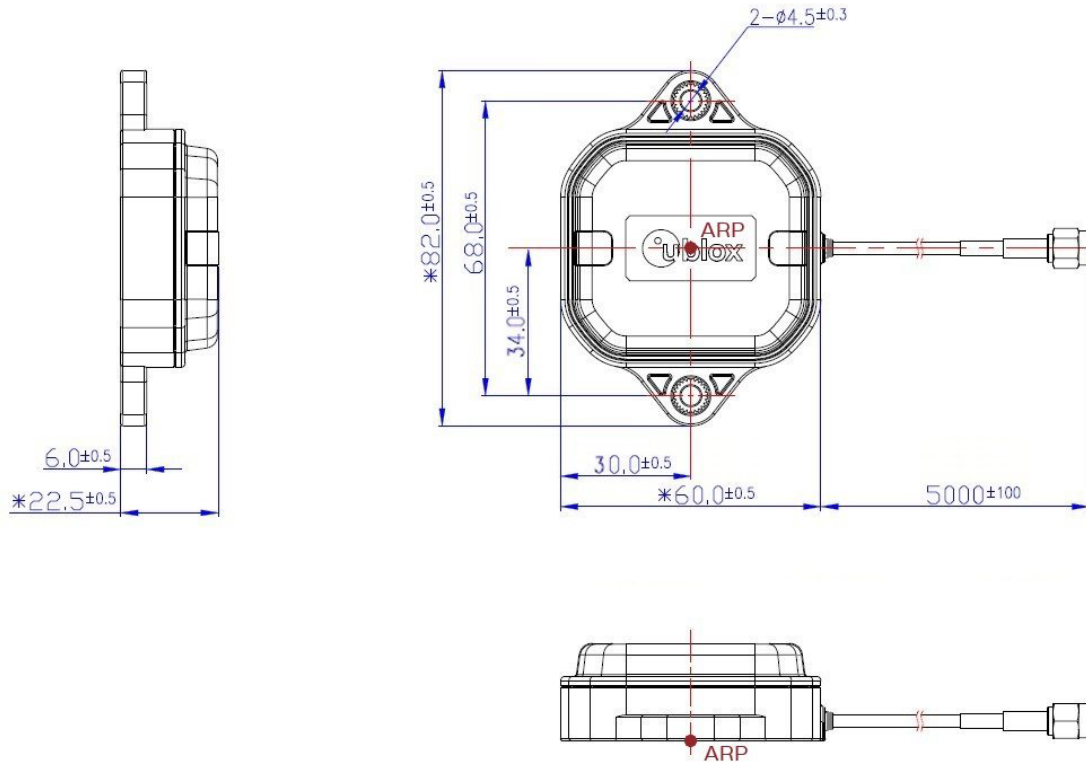
3.1 Mechanical drawing

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)	164 g
Size	82.0 x 60.0 x 22.5 mm
Connector options	SMA (plug)
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 specifications

3.3 Connector type

SMA (plug) ANN-MB1-00

Table 4: ANN-MB1 connector type

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 ºC, 96 hours
Vibration	MIL-STD-810G, Method 514.7 Vibration

5 Absolute maximum ratings

Parameter	Symbol	Condition	Min	Max	Units
Power supply voltage	VCC		0.0	10.0	V
Operating temperature	T_{GP}		–40	+85	°C
Storage temperature	T_{STG}		–40	+85	°C

Table 5: Absolute maximum ratings

⚠ Stressing the device beyond the "Absolute Maximum Ratings" may cause permanent damage. These are stress ratings only. The product is not protected against overvoltage or reversed voltages. If necessary, voltage spikes exceeding the power supply voltage specification, given in the table above, must be limited to values within the specified boundaries by using the appropriate protection diodes.

6 Antenna characteristics

6.1 Block diagram

A simplified block diagram for ANN-MB1 L1/L5 multi-band antenna 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-meter coaxial cable is connected to the amplifier section output.
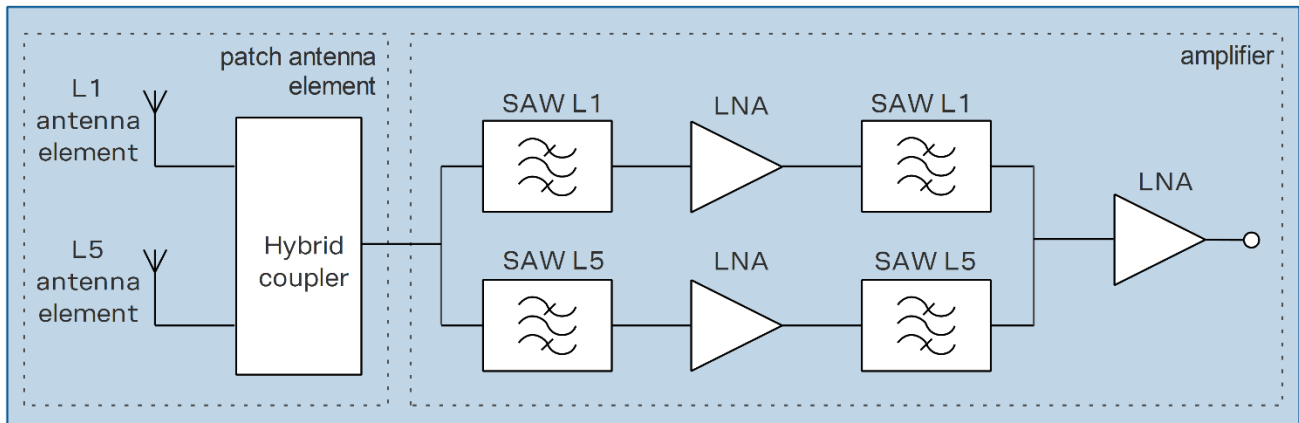

Figure 2: Simplified ANN-MB1 block diagram

6.2 Antenna phase center

Typical values for the absolute antenna phase center offset in L1 and L5 bands are given in Table 6. 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 a 120-millimeter 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	Overall azimuth/elevation
GPS L1 C/A	1575.42 MHz	< TBD mm in all directions	TBD mm	< TBD mm
GPS L5	1176.45 MHz	< TBD mm in all directions	TBD mm	< TBD mm

Table 6: Typical values for phase center offset and variation relative to antenna reference point (ARP) at L1 and L5 bands. Measured on a circular 120-millimeter ground plane.

6.3   Radiation pattern

The radiation patterns at the L1 and L5 bands are shown in Figure 4 and Figure 5, respectively. The RHCP gain value is the total gain including the passive antenna element, the amplifier section, and the RG174 cable. The planes for the 2-D cuts are H (xy plane), E1 (xz plane), and E2 (yz plane). The coordinate axes are defined in Figure 3.

☞   The spherical coordinate system used to represent the radiation pattern data is different from the "North", "East", "Up" coordinate system used for antenna phase center offset in section 6.2.
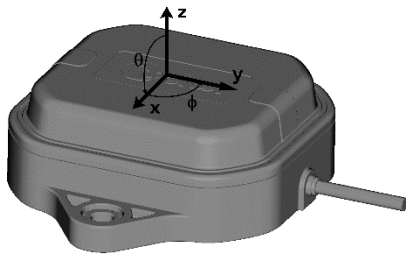

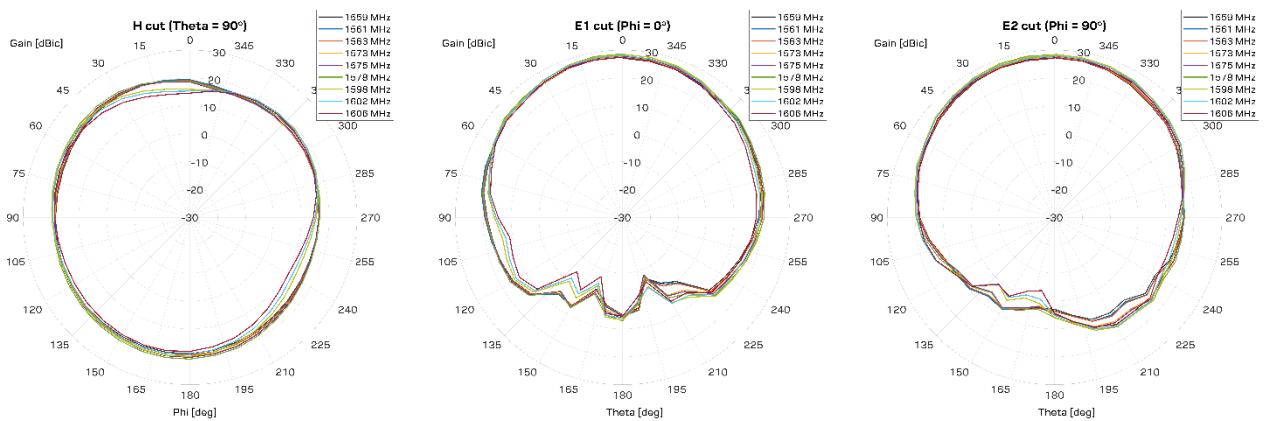**Figure 3: Definition of coordinate axes for radiation pattern plots**

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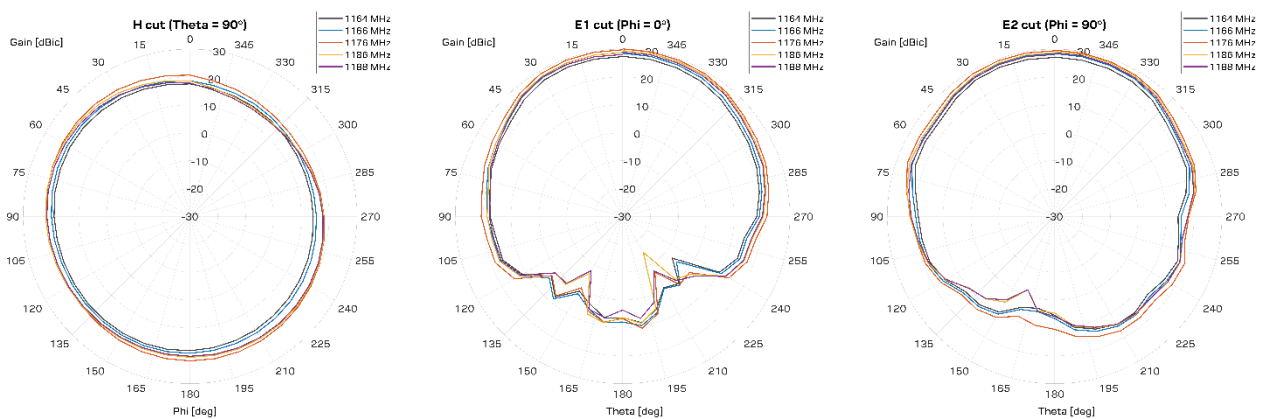

Figure 5: Radiation pattern at the L5 band. The 2-D cuts are measured at 1164 - 1188 MHz (five frequencies).

7 Product labeling

The product information label is found on the underside of the ANN-MB1 L1, L5 multi-band GNSS antenna. The label includes the product type number, which provides important information on the product.
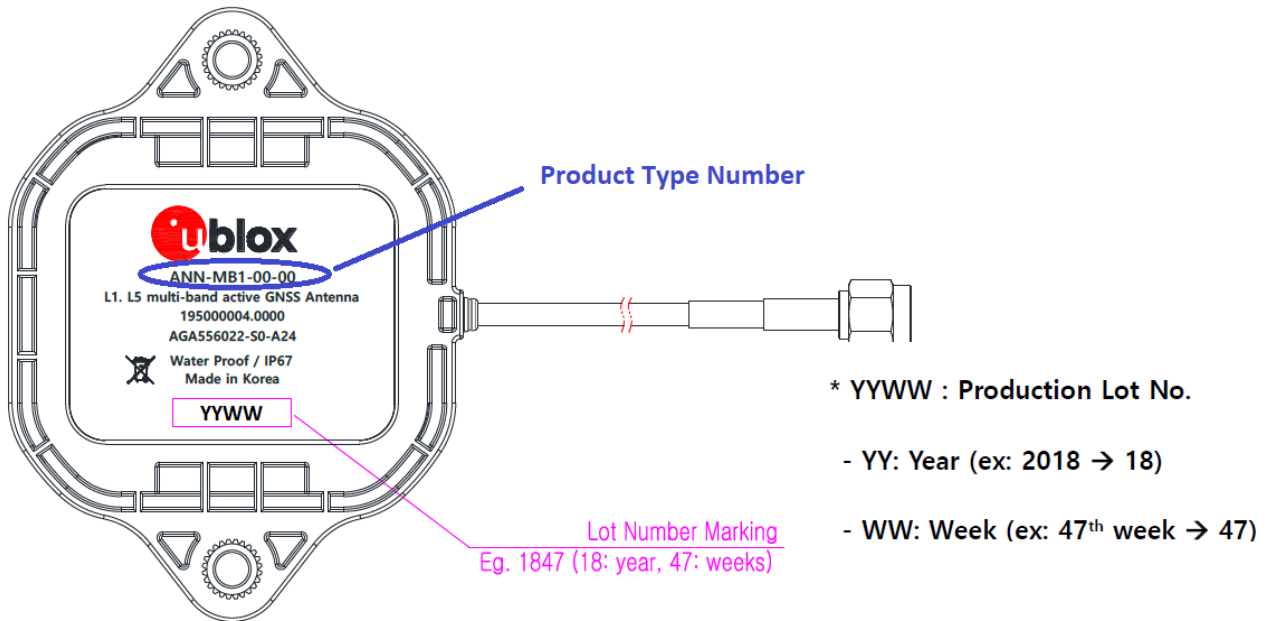

Figure 6: ANN-MB1 multi-band GNSS antenna product label

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 7 and Table 8.

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

Table 7: Product code formats

Code	Meaning	Example
PPP	Product family	ANN
GV	Product generation	MB: Multi-band
Y	Product variant	1: L1, L5 high precision
NN	Option	Connector type: 00 = SMA connector
XX	Product revision	

Table 8: Explanation of product codes

8   Ordering information

Ordering no.	Product
ANN-MB1-00	L1/L5 multi-band active GNSS antenna, 5 m cable, SMA (plug) connector Single units

Table 9: Ordering information

Revision history

Revision	Date	Name	Comments
R01	15-Mar-2021	rmak	Advance Information.

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