antenova

DATASHEET

M20057-1

M20057-1 • RADIONOVA®



Features

- SMD Active GNSS active antenna (GPS/GLONASS/GALILEO/BEIDOU)
- SAW filter on board
- Ultra-small SMD package; 7.0 x 7.0 x 0.9mm
- 1.5 to 3.3V supply
- Low power consumption

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1. Description

A compact Active GNSS antenna using a high performance LNA with SAW for optimum performance. The M20057-1 operates from a 1.5 – 3.3V supply with low power consumption. The active antenna has the SAW filter before the LNA to maximize the filtering, so that the module can be operated close to interference sources.

2. Applications

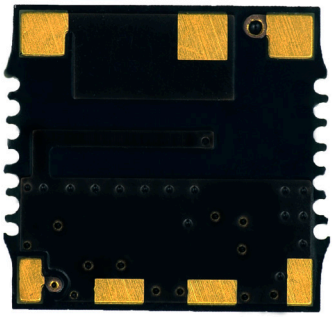
- Wearable devices
- Portable devices
- Asset tracking / Personal safety
- Sport cameras / Equipment
- Smart watches
- Navigation devices

3. Part number

M20057-1



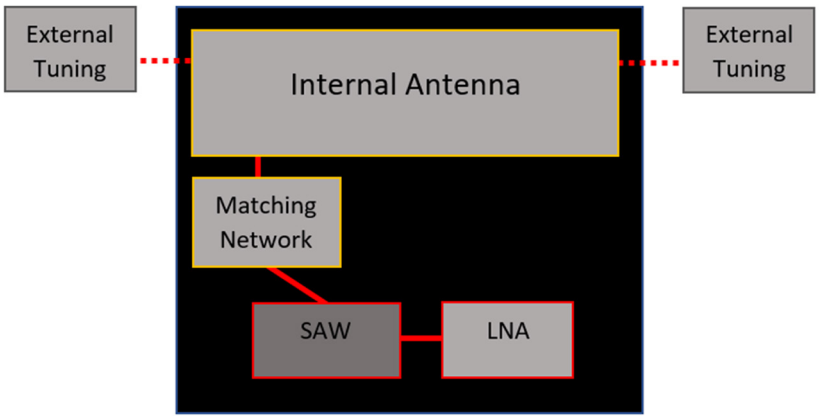
Top view



Bottom view

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4. Functional block diagram



5. Module specifications

5.1. Absolute maximum ratings

SYMBOL	PARAMETER	MIN	MAX	UNIT
V_{CC}	Main supply voltage	-0.3	3.6	V
RF_{IN}	Maximum RF input power	N/A	0.0	dBm
T_{STG}	Storage temperature	-40	+85	°C
T_{OP}	Operating temperature	-40	+85	°C

Exposure to absolute ratings may adversely affect reliability and may cause permanent damage.

5.2. Recommended operating conditions

SYMBOL	PARAMETER	MIN	TYP	MAX	UNIT
V_{CC}	Main supply voltage	1.5	-	3.3	V
T_{OP}	Operating temperature	-40	-	+85	°C

5.3. DC electrical characteristics

Conditions: V_{CC} = 3.3V, T_{OP} = 25 °C

SYMBOL	PARAMETER	TYP	UNIT
$I_{CC(AVG)}$	Supply current (on mode)	2.6	mA

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5.4. RF specifications

Conditions: V_{CC} = 3.3V, T_{OP} = 25 °C, Freq = 1575.420MHz

SYMBOL	PARAMETER	TYP	UNIT
$Gain_{LNA}$	LNA Insertion power gain	18.5	dB
NF	Noise Figure	0.9	dB
ANT_{RL}	Antenna return loss	< -10	dB
ANT_{EFF}	Antenna total efficiency	65	%

Note: All data based on Antenova EVB-1

5.5. Band rejection

FREQUENCY	STANDARD	TYP*	UNIT
698-798	LTE700	53	dB
824-849	Cellular CDMA	54	dB
869-894	GSM850	55	dB
880-915	GSM900	55	dB
1710-1785	GSM1800/DCS	40	dB
1850-1910	GSM1900/PCS	43	dB
1920-1980	WCDMA	38	dB
2400-2492	WLAN, BT and WiMAX	33	dB
2500-2690	LTE2600	33	dB

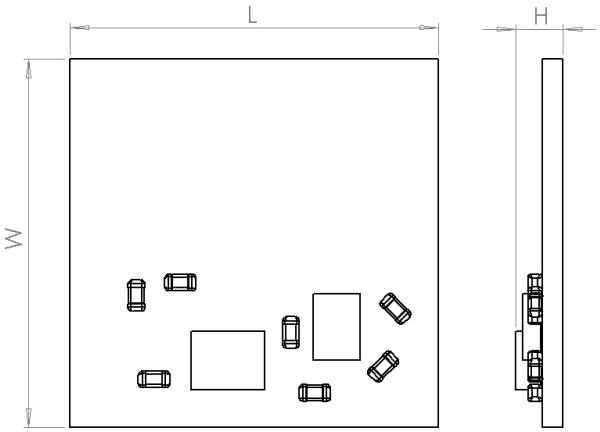
Note: Does not include antenna rejection.

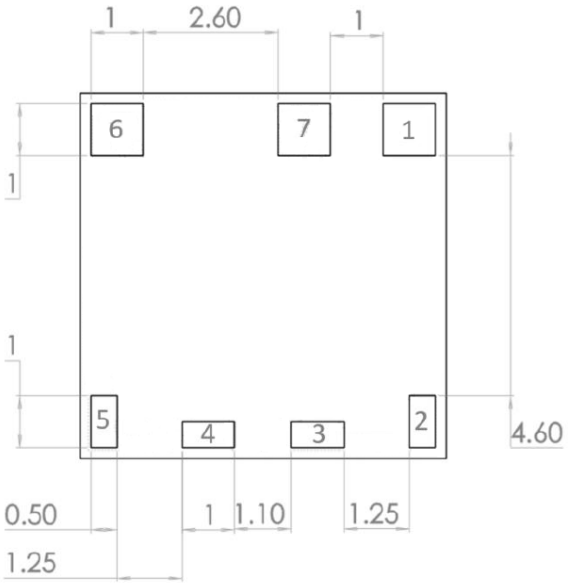
5.6. Mechanical specifications

PARAMETER	TYP	UNIT
Active antenna exterior dimensions (L x W x H)	7.0 (±0.1) x 7.0 (±0.1) x 0.9 (±0.2)	mm
Active antenna support and connection	Surface mounted (SMD)	-
Active antenna mass	≤0.2	g

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6. Module dimension





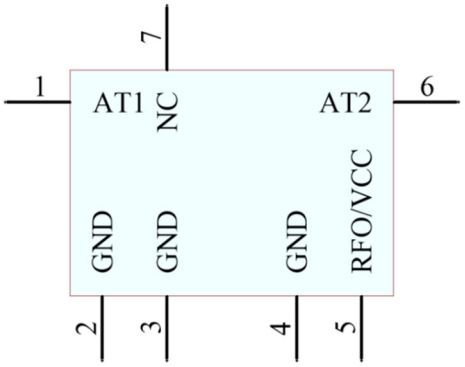
L	W	H
Length	Width	Height
7.0 ±0.1	7.0 ±0.1	0.9 ±0.2

All dimensions in (mm)

Pads 1, 6, 7 =1.0 x 1.0 (mm)
Pads 2, 3, 4, 5 =1.0 x 0.5 (mm)

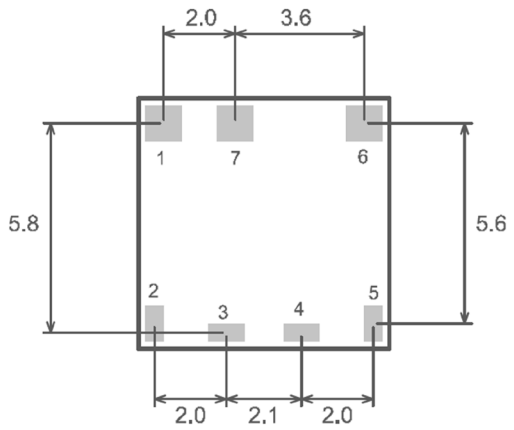
7. Schematic symbol and pin definition

PIN	DESIGNATOR	DESCRIPTION
1	AT1	Antenna tuning left side
2	GND	Ground connection
3	GND	Ground connection
4	GND	Ground connection
5	RFO/VCC	RF signal output / DC voltage input
6	AT2	Antenna tuning right side
7	NC	Not connected



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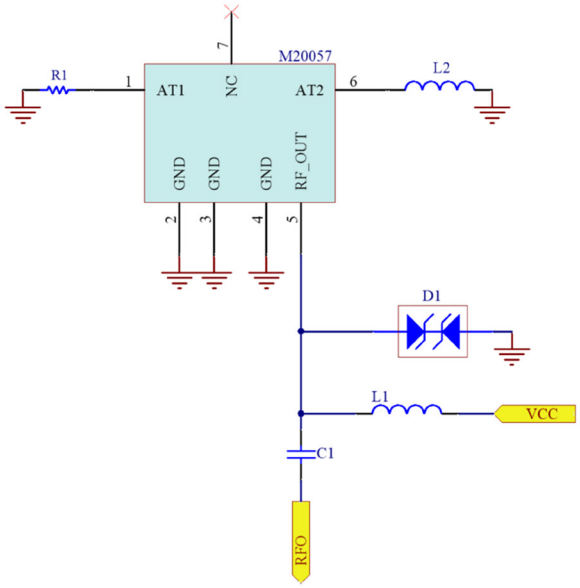
8. Host PCB footprint



All dimensions in (mm)

9. Active antenna application

9.1. Reference schematic

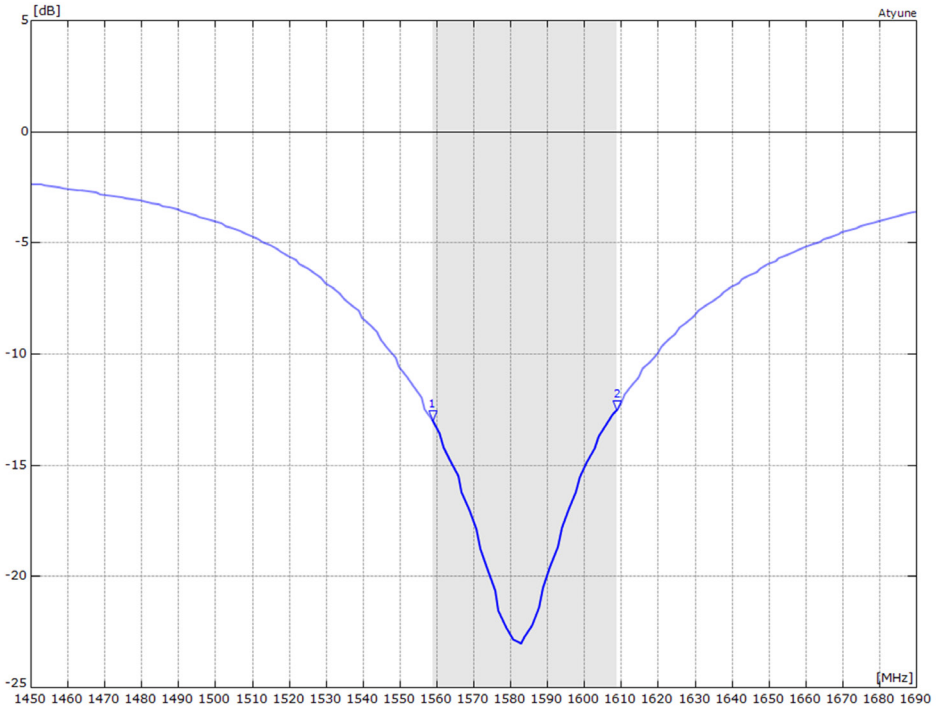


DESIGNATOR	VALUE	DESCRIPTION/COMMENTS	QUANTITY
D1	ESD diode	TVS 20kV ESD protection (Non-specific)	1
L1	47nH inductor	RF choke	1
C1	22pF capacitor	DC blocking capacitor	1
L2	1.8nH inductor	Antenna tuning (value dependent on host PCB)	1
R1	0 ohm	For additional antenna tuning	1

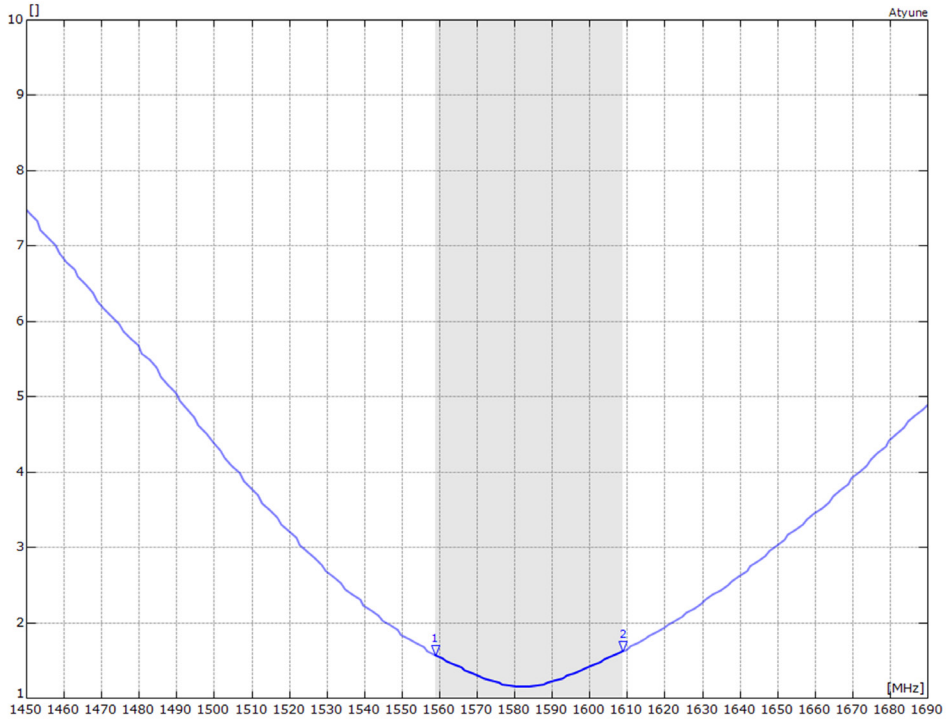
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9.2 Active antenna performance

9.2.1. Antenna return loss



9.2.2. Antenna VSWR



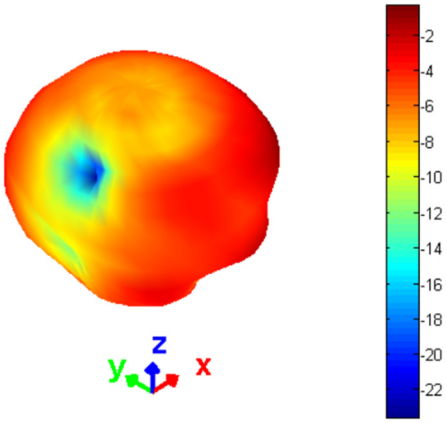
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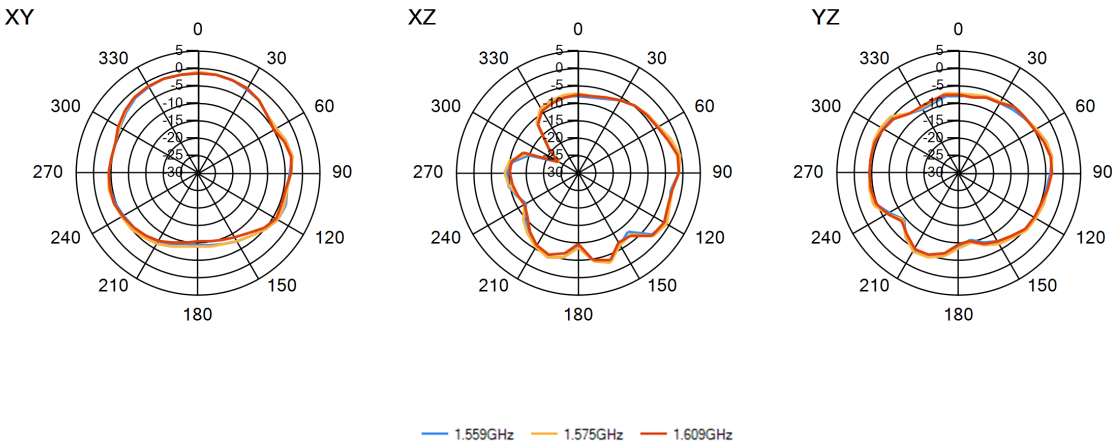
9.2.3. Antenna pattern

Antenna pattern 1559 MHz - 1609 MHz

3D pattern at 1575MHz





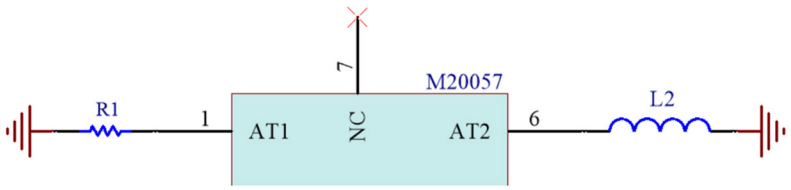


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9.3. External matching

The M20057-1 active antenna uses external matching circuit components on the host PCB to fine-tune the onboard antenna to each specific application. This “external matching” allows compensating for the detuning of the antenna caused by various components that can be close to the M20057-1 active antenna in the actual application (plastic case, battery, speakers, etc).
The external matching must be placed on the host PCB as close as possible to the active antenna pads AT1(Pad1) and AT2 (Pad6), respectively. A single matching component for each pin is required. A perfect GND plane connecting for each matching component is needed. For multi-layer PCB, an individual GND via should be placed close to the matching component as possible.

Schematic: See below based on Antenova EVB-1: AT1 uses a 0ohm resistor and AT2 uses a 1.8nH inductor to tune the antenna. Provision must be made for these components in as they will be required to optimise the antenna performance for your PCB – please see the Antenova website Support (Services) section for details on how we can support you to select these components.



Type of Matching Components:

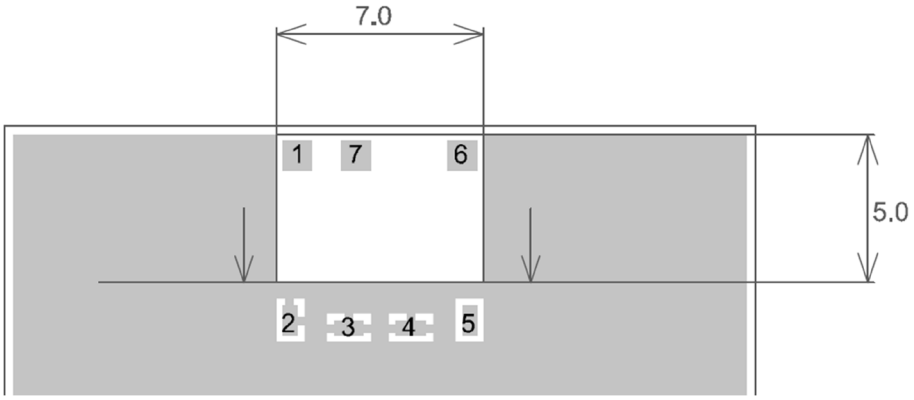
- Capacitors: Use 0402, COG components
- Inductors:
  - High-Q, wire wound inductors in 0402 sizes are recommended for maximum performance, e.g. Murata LQW15 series.
  - Good quality multi-layer type inductors (e.g. Murata LQG15 series) can also be used as a lower cost alternative.

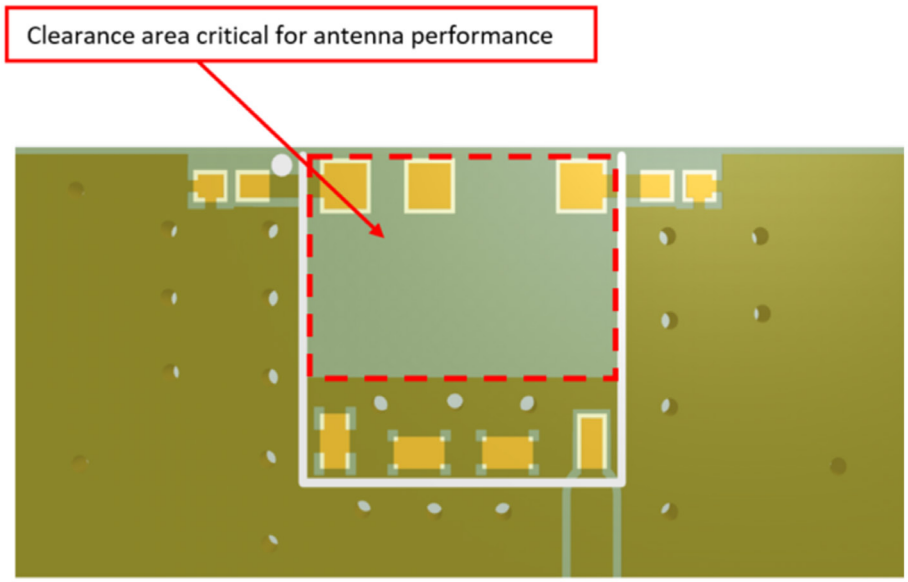
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9.4. Antenna clearance matching

The M20057-1 active antenna requires a clearance on the host PCB to operate. The clearance means that no ground or tracks of any kind can be placed within this area. This clearance area also needs to be applied through the entire PCB stack up. The minimum area needed for clearance is 7.0mm x 5.0mm.

Top view of M20045-1 host PCB footprint



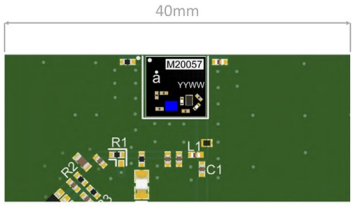


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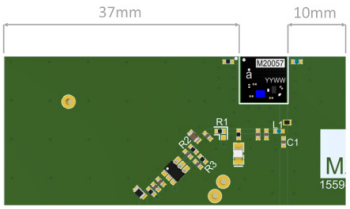
9.5. Active antenna placement guidelines

For the M20057-1 active antenna, care must be taken when defining the placement of the module on the host PCB. Here are some guidelines that should be used when deciding the position of the module.

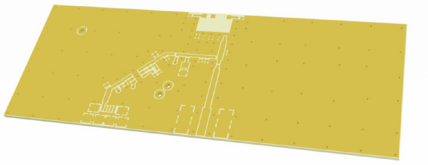
- The active antenna top edge should be placed almost level with the centre of the LONG edge of the host PCB.
- The edge of the host PCB that the active antenna is to be placed should be a minimum of 40mm in length. Shorter PCB lengths maybe possible, depending on your device and performance requirements, please visit ask.antenova.com for more detailed guidance.



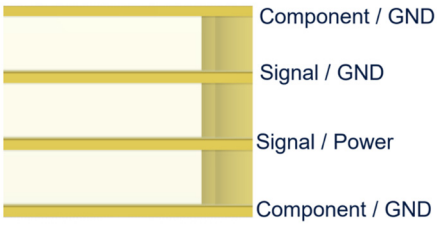
- Central placement of the active antenna is advised. However, an offset placement is also possible.
- For an offset closer to the PCB edge to the right side of the active antenna, a minimum of 10mm distance is required to the edge of the host PCB (see example, right, based on the EVK).



- The active antenna uses the host PCB ground to effectively radiate. As such, a GND plane must be placed on the host PCB on at least one layer.
- In this example, the only area void of GND is the antenna keep-out area. The solder mask is removed to make the copper visible.



- An ideal stack-up for a host PCB would be to use the top and bottom layers as GND planes, while using the internal layers for any signal and power planes. This not only helps the GPS antenna to perform effectively, but also helps to reduce any potential noise issues that can be associated with mixed signal PCB's.
- The example on the right shows a 4-layer host PCB. For GND layer, all available space should not be used for signal trace routing or component placement.



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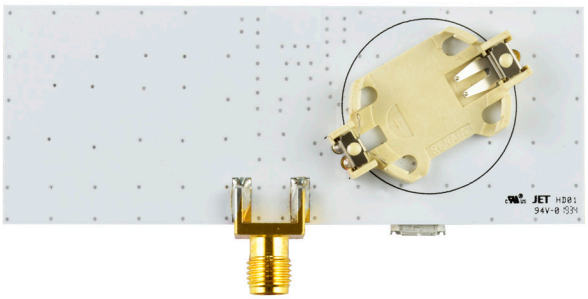
10. Evaluation kit

The EVK is a single PCB that contains the M20057-1 active antenna and required components to run on a PC via a USB cable and Antenova software. Evaluation kits are available on request. Please contact Antenova for more information. (Part number: M20057-EVB-1).

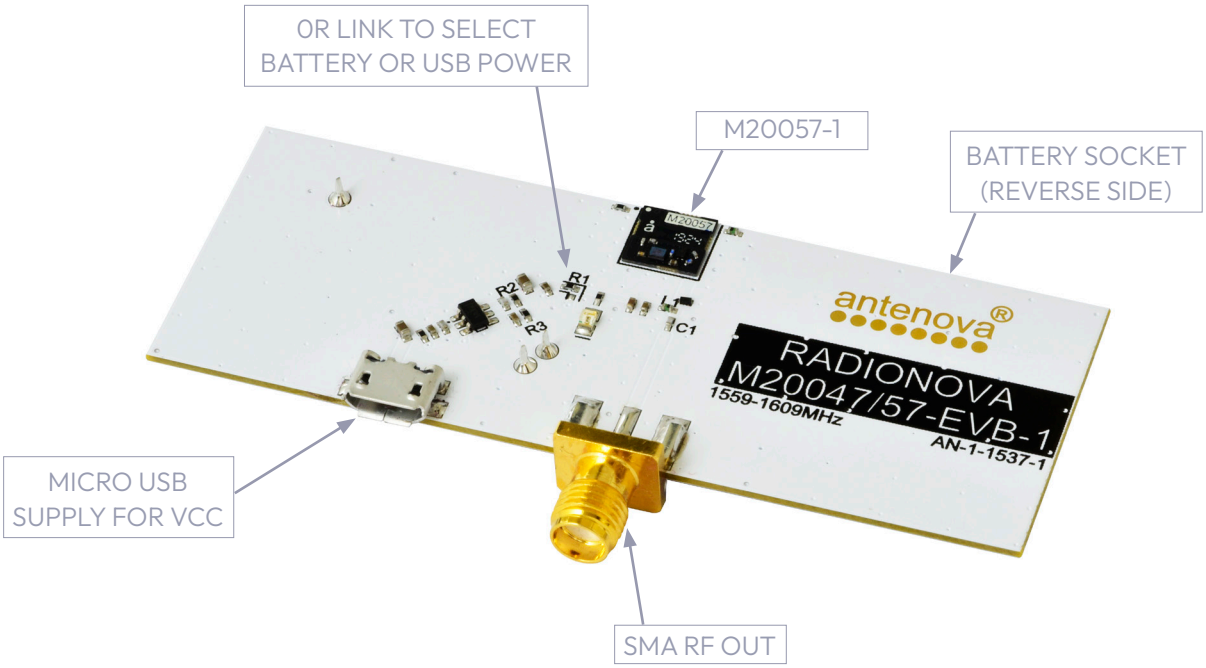
To order a reference board please see antenova.com



Top view



Bottom view



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11. Reflow soldering

11.1. Placement

Typical placement systems used for any BGA/LGA package are acceptable.
Recommended nozzle diameter for placement: 5mm

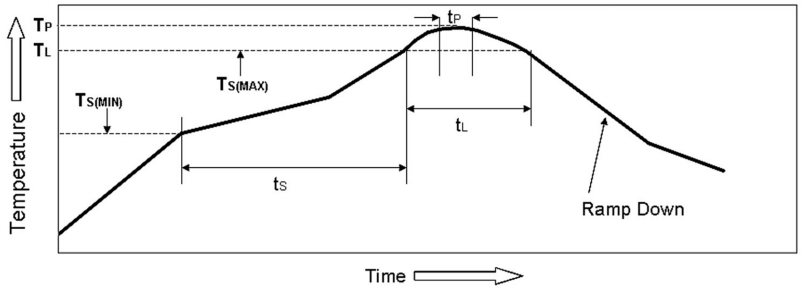
11.2. Soldering paste

Use of “No Clean” soldering paste is strongly recommended, as it does not require cleaning after the soldering process has taken place. An example of suitable soldering paste is Alpha OM350.

11.3. Soldering

The recommended soldering profile for M20057-1 active antenna is shown below. However, it is the responsibility of the Contract Manufacturer to determine the exact reflow profile used, taking into consideration the parameters of the host PCB, solder paste used, etc.

PROFILE FEATURE		PB-FREE SOLDER
Pre-Heat	Temperature (T_s) Min	130°C
	Temperature (T_s) Max	220°C
	Time (t_s)	<150s
Reflow	Liquidus Temperature - (T_l)	220°C
	Time (t_l)	45-90s
Peak Package Body Temperature (T_p)		245°C
Time within 5°C of peak temp (t_p)		30s
Average Ramp up rate - T_s(max) to (T_p)		3°C/s
Ramp Down Rate		6°C/s max



The Pb Free Process-Package Peak Reflow Temperature is 260°C.
Exceeding the maximum soldering temperature could permanently damage the module.

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11.4. Multiple soldering

The M20057-1 active antenna can be submitted up to 2 reflow soldering processes.

Upside-down soldering is acceptable but it is recommended that the Contract Manufacturer qualify the process before mass production. The second reflow must take place within the recommended floor life limit (MSL3). Please contact Antenova for further information.

11.5. Hand soldering

Hand-soldering and rework of the M20057-1 active antenna is acceptable, however care must be taken to avoid short circuits due to the small size of the module pads.

12. Quality and environmental specifications

TEST	STANDARD	PARAMETERS
PCB inspection	IPC-6012B, Class 2. Qualification and Performance Specification for Rigid Printed Boards - Jan 2007	
Assembly inspection	IPC-A-610-D, Class 2 “Acceptability of electronic assemblies”	
Temperature range	ISO16750-3	-30 °C, +25 °C, +85 °C, operating
Moisture/Reflow sensitivity	IPC/JEDEC J-STD-020D.1	MSL3
Storage (Dry Pack)	IPC/JEDEC J-STD-033C	MSL3
Solderability	EN/IEC 60068-2-58 Test Td	More than 90% of the electrode should be covered by solder. Solder temperature 245 °C ± 5 °C

Moisture sensitivity:

Antenova ships all devices dry packed in tape on reel with desiccant and moisture level indicator sealed in an airtight package. If on receiving the goods the moisture indicator is pink in colour or a puncture of the airtight seal packaging is observed, then follow J-STD-033 “Handling and Use of Moisture/ Reflow Sensitive Surface Mount Devices”.

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13. Hazardous material regulation conformance

The RF antenna module has been tested to conform to RoHS and REACH requirements. A certificate of conformance is available from Antenova's website.

14. Packaging

14.1. Optimal storage conditions

Typical placement systems used for any BGA/LGA package are acceptable. Recommended nozzle diameter for placement: 5mm

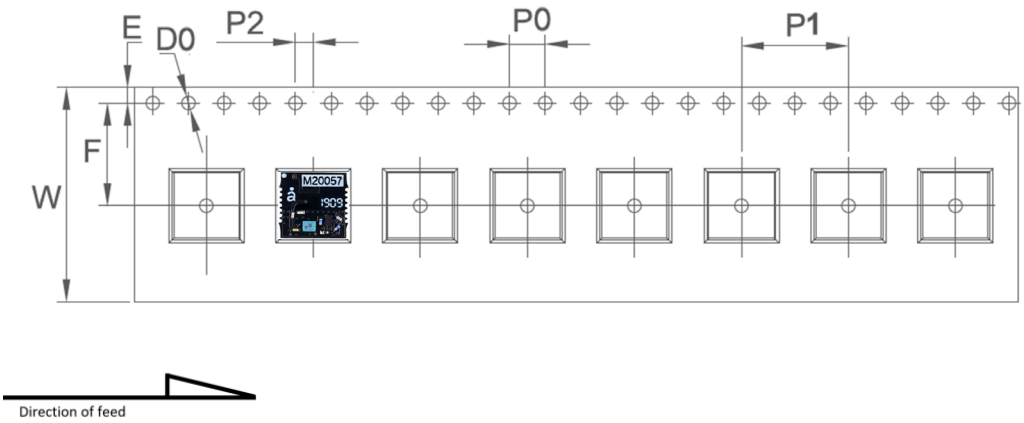
TEMPERATURE	-10°C to 40°C
HUMIDITY	Less than 75% RH
SHELF LIFE	24 Months
STORAGE PLACE	Away from corrosive gas and direct sunlight
PACKAGING	Reels should be stored in unopened sealed manufacturer's plastic packaging.
MSL LEVEL	3

Note:
The M20057-1 active antennas meet MSL Level 3 of the JEDEC specification J-STD-020D - 168 hours Floor Life (out of bag) ≤30 °C/60% RH. If the stated floor life expires prior to reflow process then follow J-STD-033 "Handling and Use of Moisture/Reflow Sensitive Surface Mount Devices".

The shelf life of the antenna is 2 years provided the factory seal on the package has not been broken.

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14.2. Tape characteristics



P0	P1	P2	D0
4.00 ± 0.1	12.00 ± 0.1	2.00 ± 0.1	1.55 ± 0.1

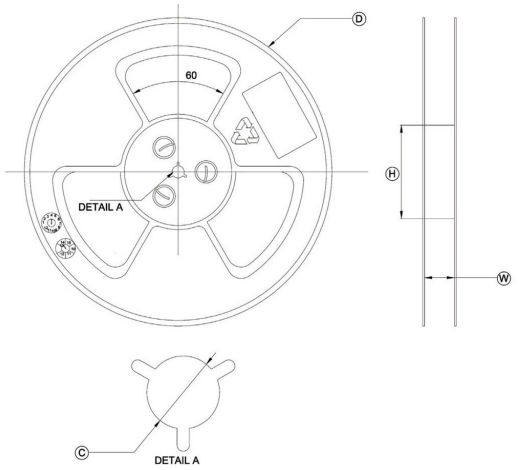
E	F	W
1.75 ± 0.1	11.50 ± 0.1	24.00 ± 0.3

All dimensions in (mm)

QUANTITY	LEADING SPACE	TRAILING SPACE
1000 pcs / reel	50 blank module holders	50 blank module holders

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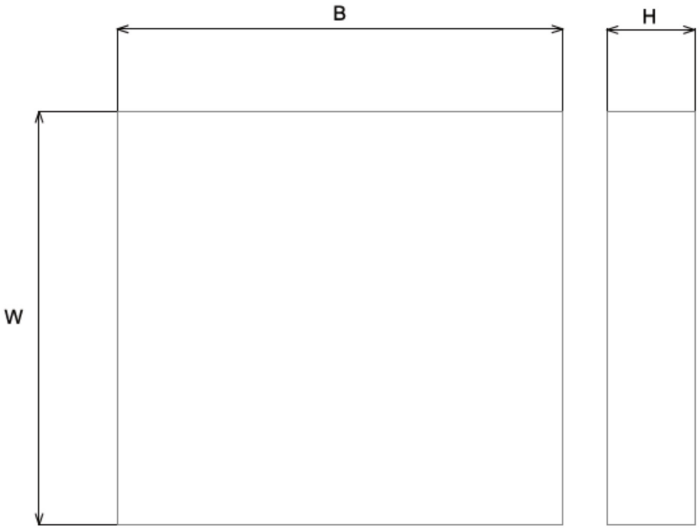
14.3. Reel dimensions



D	C	H	W
330.0 ± 2.0	13.3 ± 0.3	100.0 ± 3.0	24.5 ± 0.2

All dimensions in (mm)

14.4. Box dimensions



Width (W)	Breadth (B)	Height (H)
340mm	339mm	53mm

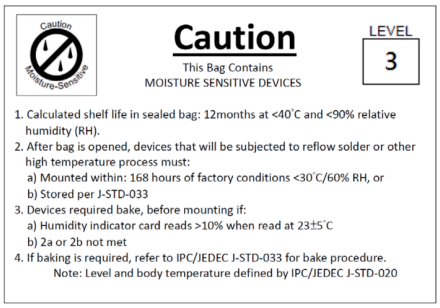
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14.5. Bag properties

Reels are supplied in protective plastic packaging.

14.6. Reel label information





Quality statements

Antenova's products conform to REACH and RoHS legislation. For our statements regarding these and other quality standards, please see antenova.com.

Certification No. 11070
ISO 9001

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Datasheet version

3.01 release 1st June 2026

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Antenna design, integration and test resources

Product designers – the details contained in this datasheet will help you to complete your embedded antenna design. Please follow our technical advice carefully to obtain optimum antenna performance.

We aim to support our customers to create high performance wireless products. You will find a wealth of design resources, calculators and case studies to aid your design on our website.

Antenova's design laboratories are equipped with the latest antenna design tools and test chambers. We provide antenna design, test and technical integration services to help you complete your design and obtain the required certifications.

If you cannot find the antenna you require in our product range, please contact us to discuss creating a custom antenna to meet your exact requirements.

Share knowledge with RF Experts around the world

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