Low Profile SMD Ceramic Chip Loop Antenna for WLAN/Bluetooth/ISM applications

Product Datasheet

AC10248-01

July, 2023

Rev. 1.0

Revision History

Date	Rev.	Summary of Changes
26 July 2023	1.0	First version of Preliminary Product Datasheet

Table of Contents

1 Description and Specifications

1.1 Scope and purpose

The AC10248-01 is a high efficiency 2400-2500 MHz SMD Ceramic antenna optimized for embedded designs.

The antenna has been designed to support a wide variety of WLAN/Bluetooth and ISM applications:

- Access Point
- Smart Meters
- Connected Health (patient monitoring)
- Sensors and wearables
- OBDII
- M2M Industrial
- Tablets and handheld devices

1.2 Features

- High Efficiency (>75%) Antenna in ultra-small form factor
- Quasi-omnidirectional radiation pattern offering uniform coverage
- Low profile (< 0.8mm) SMD component for ease of integration
- Surface mount device suitable for automated assembly (SMT process).
- Supplied on Tape & Reel
- Highly Resistant to detuning
- Clean resonance with no unwanted out of band response.
- Ideal for smaller wearable designs.
- Suitable for sealing with resin / potting compounds
- RoHS and REACH Compliant
- For WLAN/Bluetooth/ISM Applications 2400 - 2500MHz

1.3 Antenna specifications

Table 1: AC10248-01 RF specifications

Parameters	AC10248-01
Frequency (MHz)	2400 - 2500
Typical efficiency	>75%
VSWR (return loss)	< 1.75:1
GND plane size	20 x 60mm
Input impedance	50Ω
Radiation pattern	Quasi- omnidirectional
Peak realized gain	< 3.0dBi

Notes:

- The characterization is performed with the antennas mounted on the evaluation board AC91248-060 with size W x L = 20 x 60mm.
- The evaluation board is tested in free space.

Table 2: Physical specifications

Parameter	AC10248-01
Size (L x W x H)	1.6 x 0.8 x 0.8 mm
Required clearance area	6.0 x 5.0 mm
Weight	<0.1g
Soldering Type	SMT through reflow

Notes:

- For all dimensions, the ISO 2768-mK standard is followed. For the outer dimensions this means a tolerance of ±0.1 mm is applicable

Table 3: AC10248-01 and AC31700-01B, environmental specifications

Parameter	AC10248-01
Operational temperature	-40˚C to +85˚C
Storage temperature	-10˚C to +40˚C
Relative humidity	≤75%
RoHS and REACH	Yes

The dimensions of the AC10248-01 antenna and required clearance area are shown in below figure.

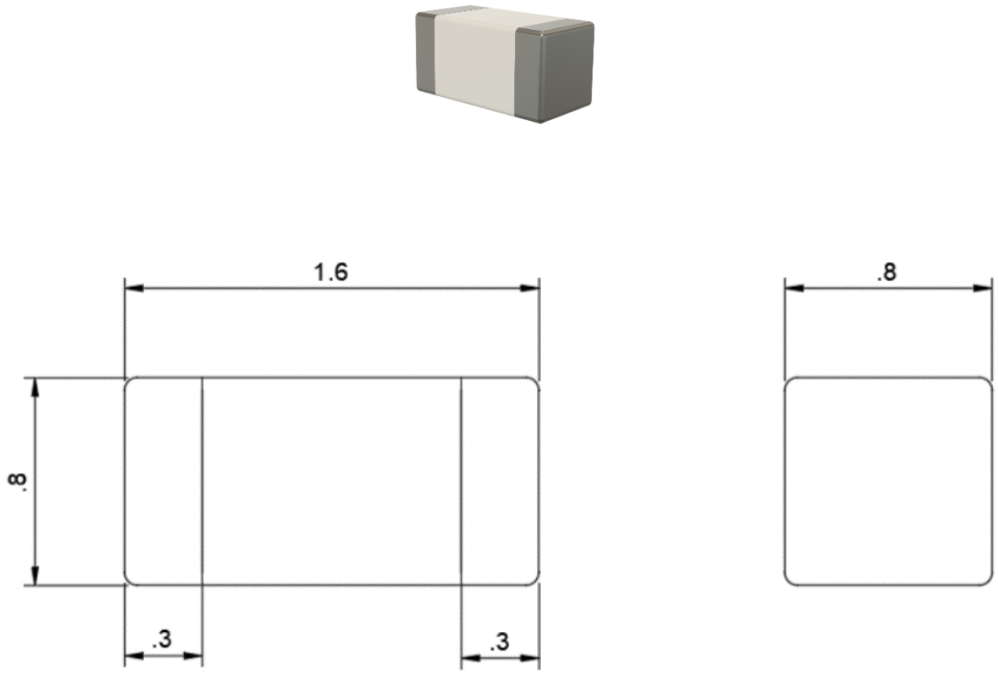


Figure 1: AC10248-01 top view and dimensions (mm)

1.4 Radiation pattern

The typical measured radiation patterns of the AC10248-01 antenna, when operating on a 20mm x 60mm host PCB, are depicted in below table and has been measured along the XZ, YZ and XY planes as shown in the figure below.

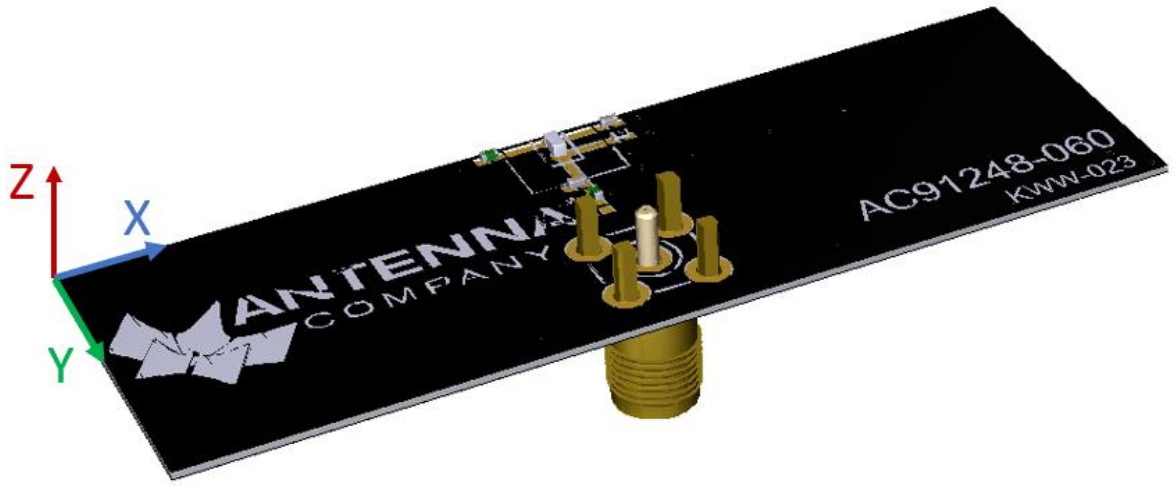
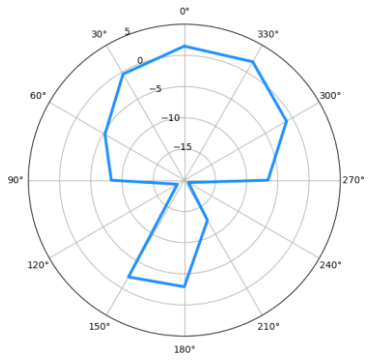


Figure 2: Illustration of radiation pattern evaluation planes

Table 4: Radiation patterns of AC10248-01 in standalone configuration

XY Plane	XZ Plane	YZ Plane
2440 MHz		
		

1.5 VSWR and Antenna Efficiency

The AC10248-01 has been characterized on the AC91248-060 evaluation board.

The measured VSWR and efficiency results as function of frequency are depicted in the figures below.

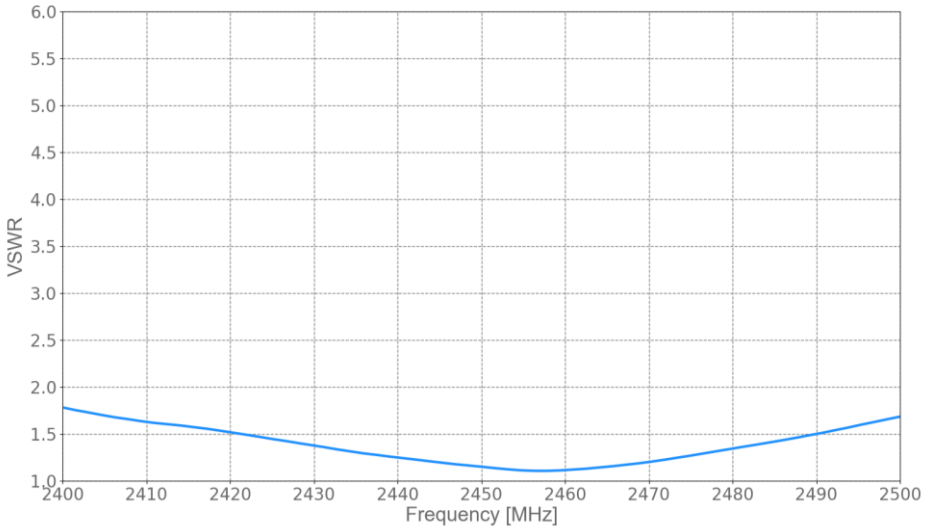


Figure 3: VSWR of the AC10248-01

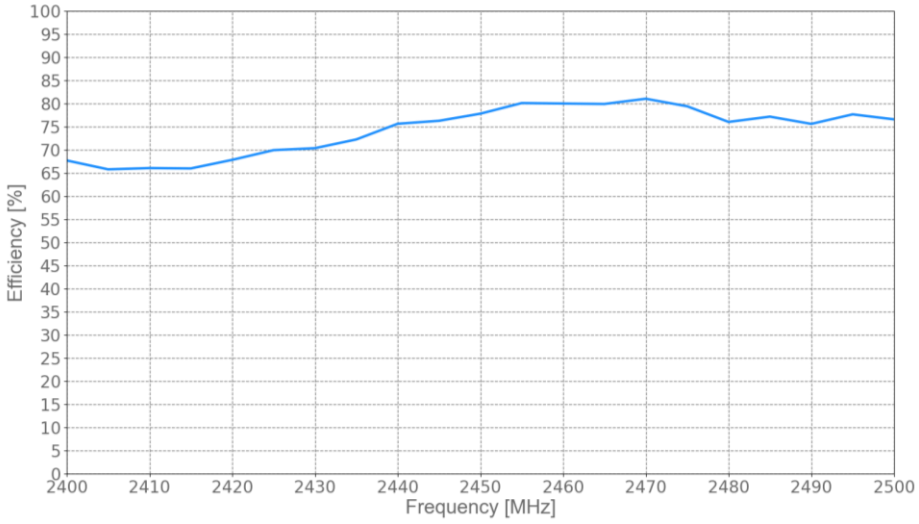


Figure 4: Efficiency of the AC10248-01

2 Product Handling & Integration

2.1 Assembly Recommendation

The figures below show the recommended location of the AC10248-01 antenna on the host PCB. The optimum location is the center of the longest PCB edge, with a minimum length of 20mm. A ground-free clearance area of 5 x 6 mm, highlighted by the green dashed rectangle is required through all the PCB layers.

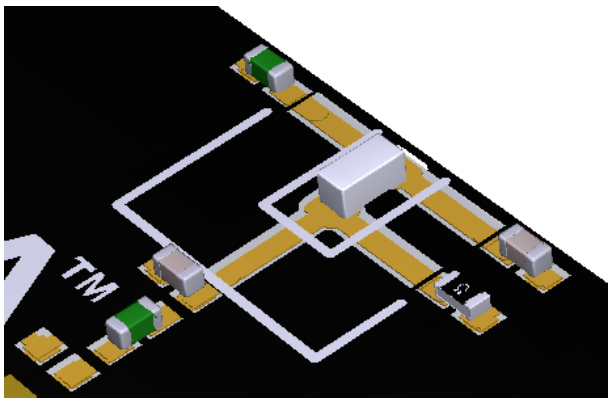


Figure 5: Isometric view of the AC10248-01 placement on the host PCB

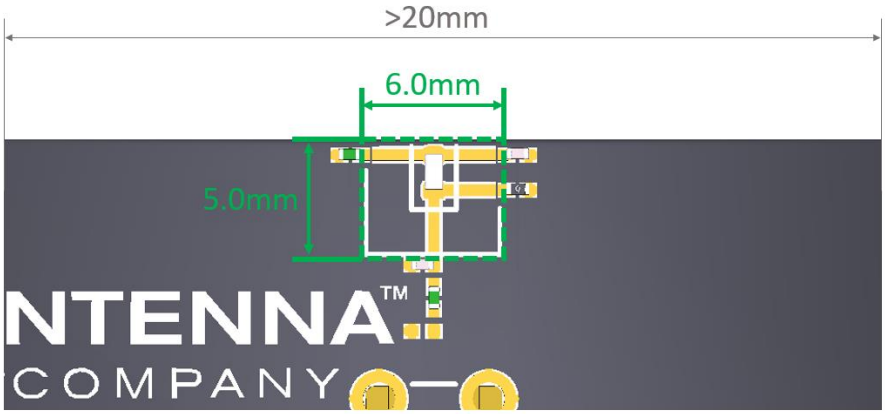


Figure 6: Illustration of the AC10248-01 integration on the top surface of the host PCB

2.2 Antenna Footprint

The recommended PCB layout presented in this section is valid for the standalone configuration (AC10248-01 only).

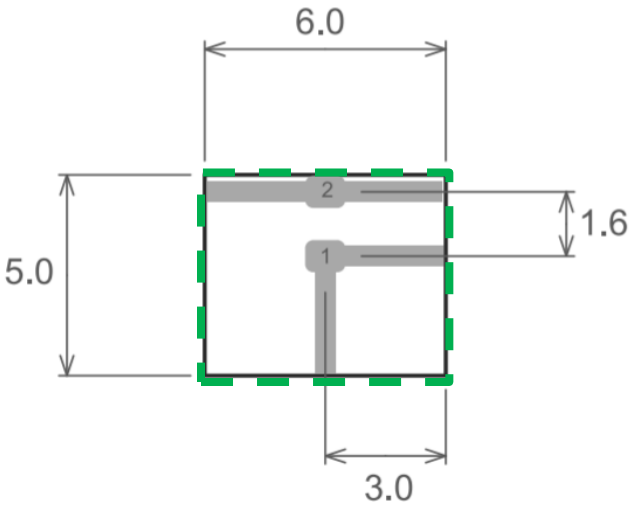


Figure 7: Footprint of the AC10248-01 on the top PCB layer. The two soldering pads are marked by the digits "1" and "2".

Additional notes

- Any inner PCB layer should be free from ground in the antenna section, delimited by the 5.0 x 6.0 mm clearance area.
- The top and bottom layers of the PCB should be flooded with GND to optimizes the antenna performance.
- For all dimension tolerances, standard PCB manufacturing guidelines should be followed.

2.3 Evaluation Kit

The evaluation kit depicted in below figure includes a SMA female connector and can be ordered for evaluation purposes. As shown on the evaluation board, it is recommended to mount the ceramic chip antenna on the shorter side of the PCBA to use the longer GND plane as antenna counterpoise and maximize performance.

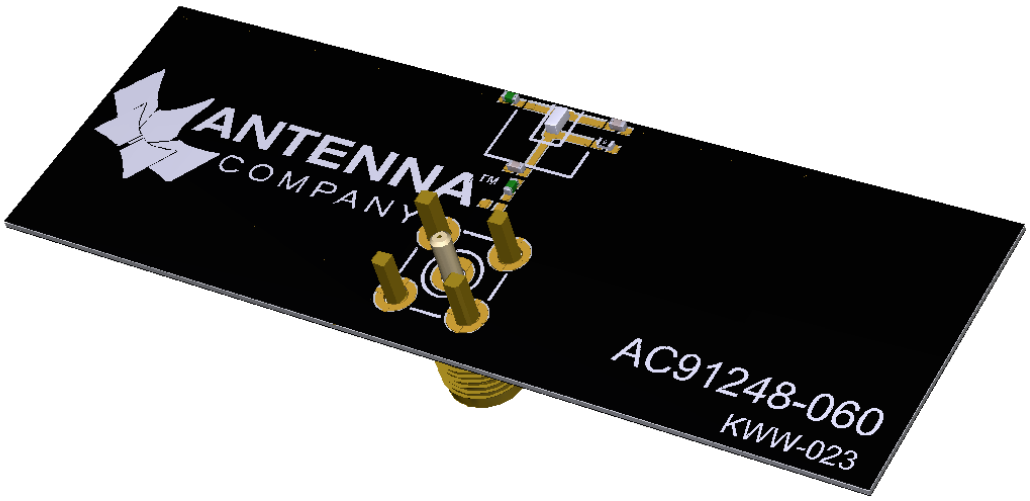


Figure 8: Isometric view of the evaluation kit

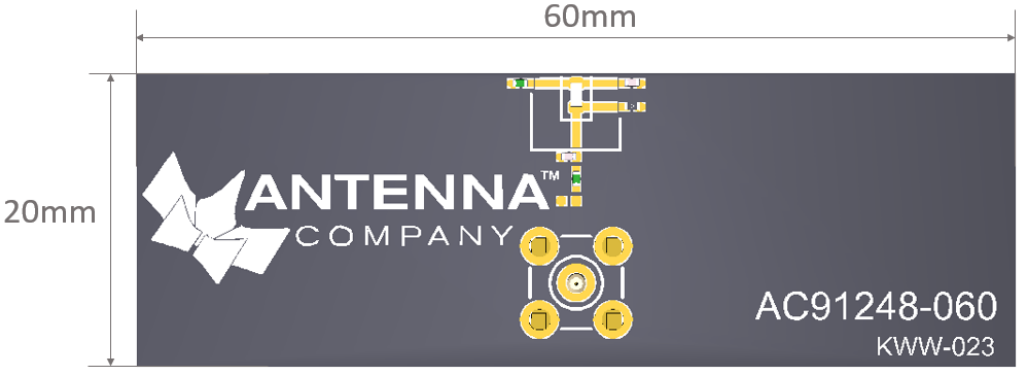


Figure 9: Visuals of the GND plane size of the evaluation board

2.4 Matching Network Topology

The matching network topology depicted in below figure is required on the main PCB, as close as possible to the AC10248-01 main antenna. The characteristic impedance of all transmission lines should be designed as 50 Ω. The length of the transmission lines connecting the antenna to the matching circuit and the radio should be kept as short as possible. Any other part of the RF circuit connected to the antenna, such as power amplifiers, should also be designed with a 50 Ω impedance.

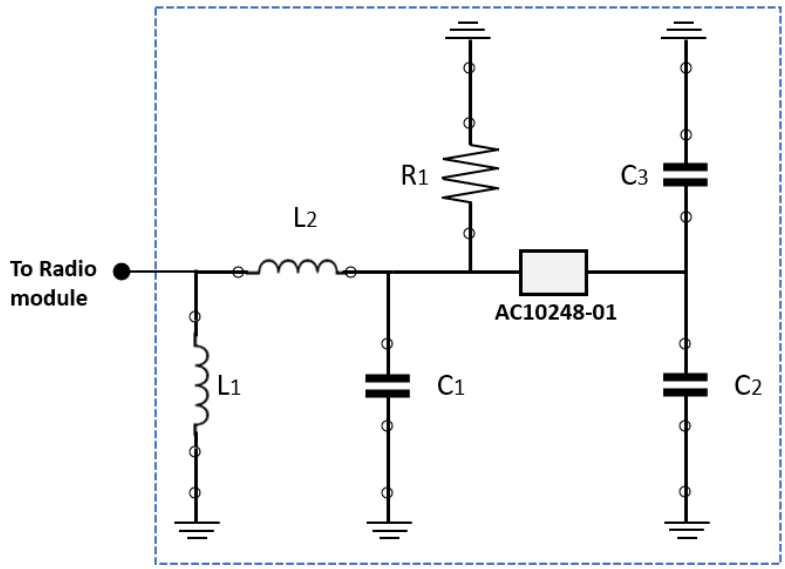


Figure 10: Required Matching Network Topology for AC10248-01

The component values and recommended types are listed in below table. Different values might be required depending on the host PCBA and the end-device environment. If you need assistance, please contact sales@antennacompany.com for antenna matching network support.

Table 5: Matching network component values

AC10248-01		
Component	**Value**	**Type**
Capacitor (C1)	0.3pF ±0.1pF	GJM1555C1HR30BB01D
Capacitor (C2)	1.0pF ±0.1pF	GCM1555C1H1R0CA16J
Capacitor (C3)	0.5pF ±0.1pF	GJM1555C1HR50BB01D
Inductor (L1)	Not fitted	NA
Inductor (L2)	1.2nH ±2%	LQG15HS1N2B02D
Resistor (R1)	0Ω	Nonspecific part

2.5 Assembly Recommendation: Reflow Profile

The recommended reflow profile is presented according to information on below figure and table.

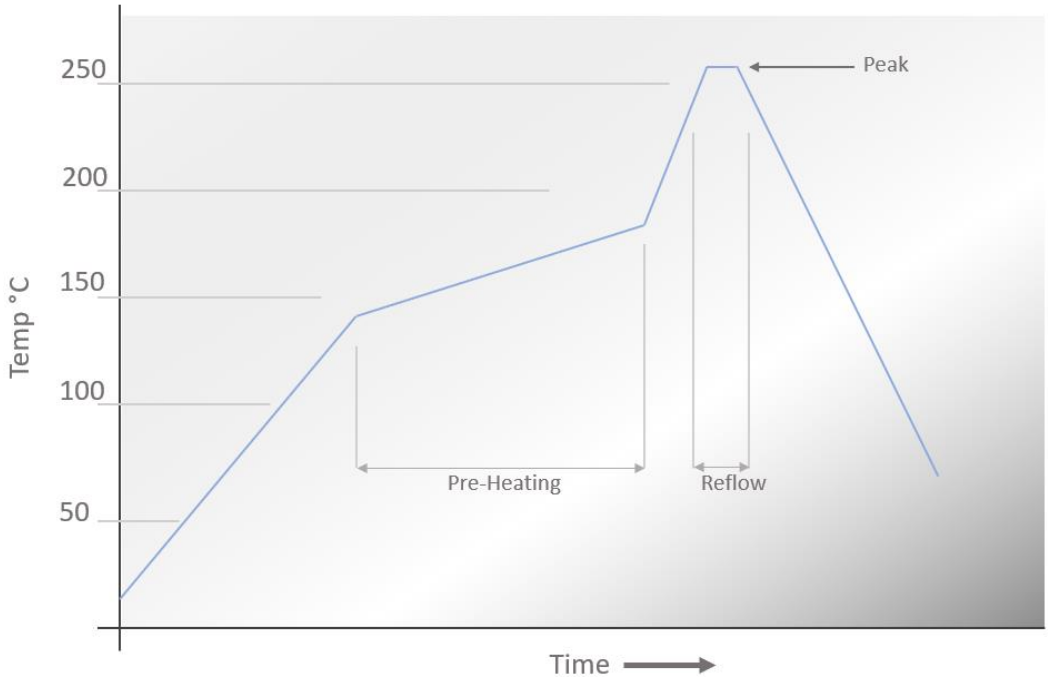


Figure 11: Suggested Reflow profile

Table 6 - Reflow Temperature Table

		Temp Range	Time
T0 - T1	Heating Zone	0 to 130°C	Controlled 1°C～3°C/sec
T1 - T2	Pre-Heating	130°C to 180°C	50s to 190s
T3 - T4	Reflow	220°C to 260°C (peak)	50s to 160s
T4 - End	Cooling Zone	Cool down	Controlled～4°C/sec

3 Product Marking & Ordering Information

3.1 Packaging

The AC10248-01 main antenna will be delivered in tape and reel. The packaging details are depicted in the figures below. The number of units per reel is 4000pcs.

	A0	B0	W	T	T1	P0	P1	P2	D0	E1	E2	F
TOLERANCES	typ.	typ.	+0.3/-0.1	typ.	max	±0.1		+0.05	+0.1/-0.0	±0.1	min.	±0.05
Size (mm)	1.05	1.85	8.00	0.95	0.10	4.00	4.00	2.00	1.50	1.75	6.25	3.50

	A	B	C	D	N	W1	W2	W3	W3	Type	material	VPE
TOLERANCES	±2.0	min.	min.	min.	min.	+1.5	max.	min.	max.			pcs
Size (mm)	178	1.5	12.8	20.2	50	8.4	14.4	7.9	10.9	Paper	polystyrene	4000

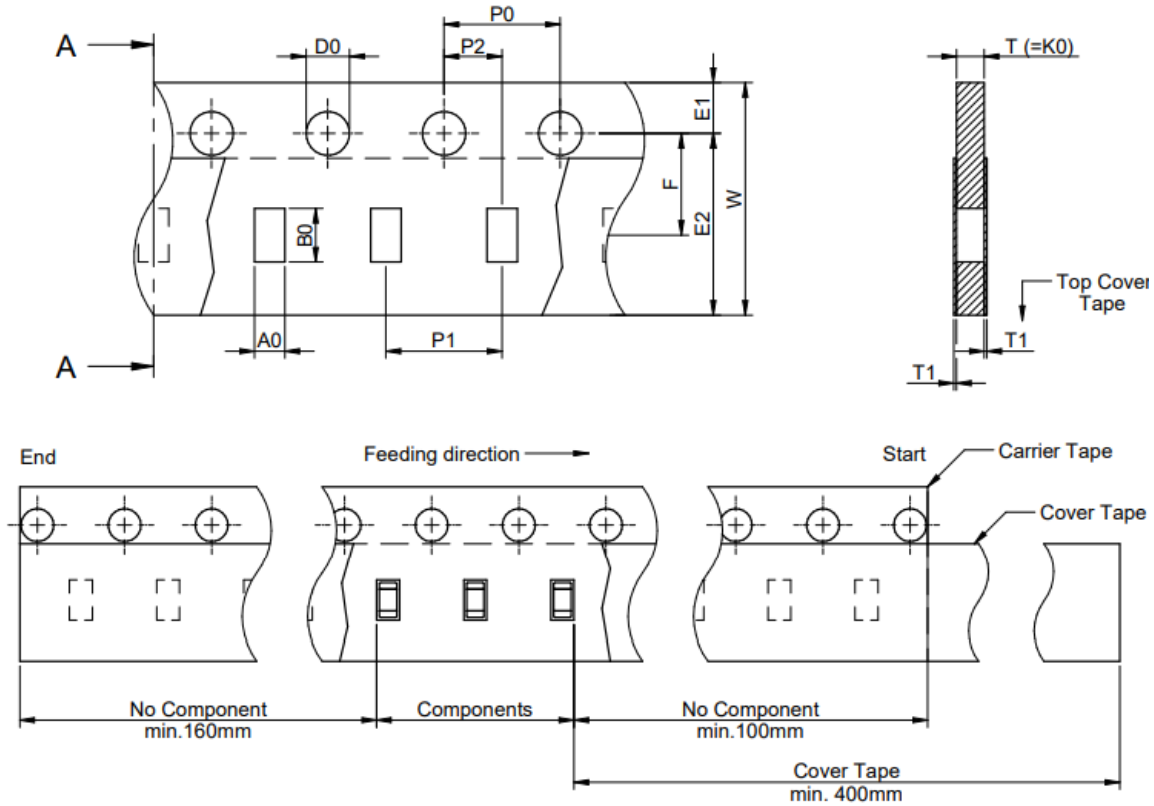


Figure 12: Tape packaging details of AC10248-01

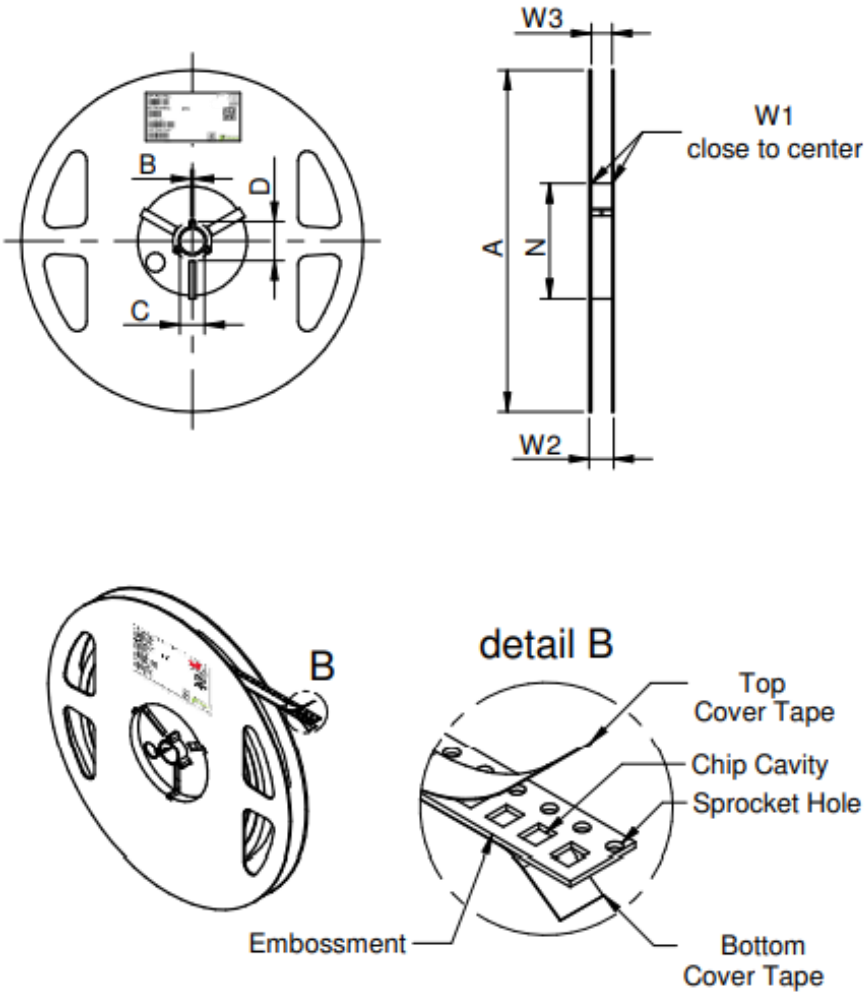


Figure 13: Reel packaging details of AC10248-01

3.2 Product Marking

There will be no markings on the ceramic chip antenna.

3.3 Ordering Information

Orders should be placed at orders@antennacompany.com.

For purchase orders please state: part number, description, quantity, and price

Table 7: AC10248-01, ordering information

Part number	Description	Minimum Order Quantity [pcs]	Order multiple [pcs]
AC10248-01	Low profile SMD ceramic chip loop antenna	4000	4000

For sample quantities, please contact sales@antennacompany.com.