
# Antenna Datasheet

**Product OC** (Antenna Only)**:** YCIS002AA
**Product OC** (Antenna + Rectangular EVB)**:** YCIS002AAEVB
**Version:** 2.0
**Date:** 2023-11-10
**Status:** Released

**Product Name:** ISM Ceramic SMD Antenna
**Key Features:**
Frequency band: 863-870 MHz
Efficiency: Up to 60.4 %
Dimensions: 10 mm × 3.2 mm × 0.5 mm
RoHS Compliant

# Overview

Quectel provides a range of antenna products that support the ISM radio band. These antennas are mounted inside the device to minimizes the interference of the devices' internal environment. With the antenna performance and this ensures a better efficiency, gain and omni-directional radiation, offering a superior user experience. Quectel also offers flexible installation with custom cable length and connector options.

# Contents

# 1 Specification

**Test Condition: Assembled On 80 mm × 40 mm EVB**

## 1.1. Electrical

| Electrical | |
|---|---|
| **Frequency Range** | 863–870 MHz |
| **Impedance** | 50 Ω |
| **Polarization** | Linear |
| **Radiation Pattern** | Omni-directional |

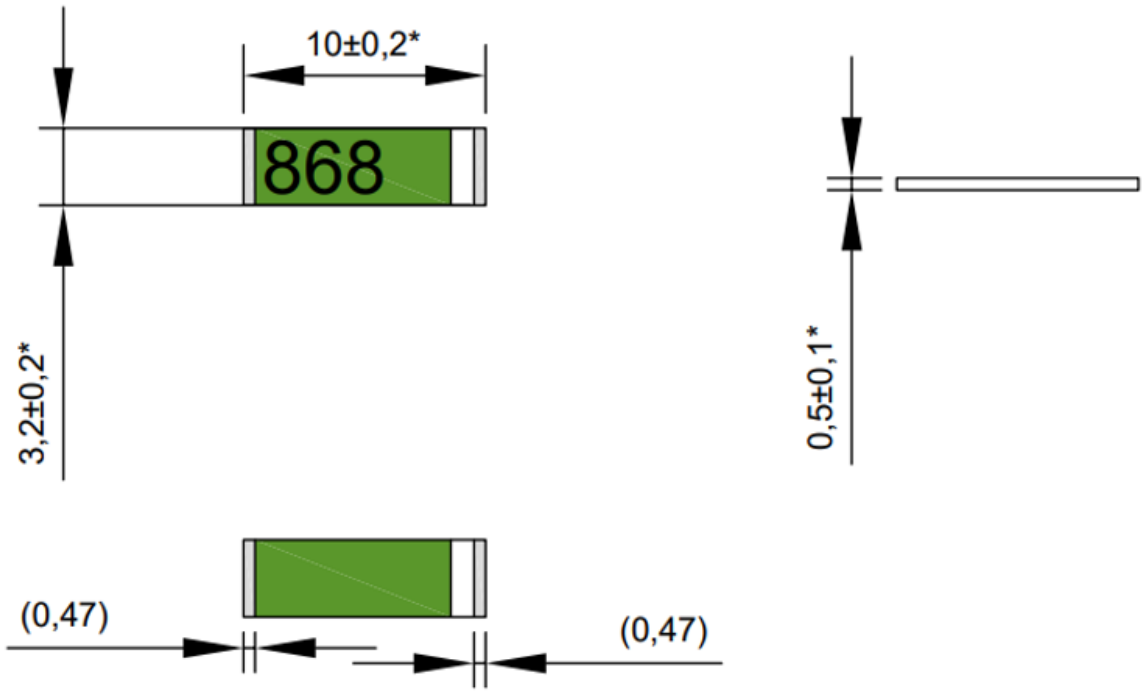
| Electrical - Detail | | |
|---|---|---|
| **Band** / **SPEC** | **Band** | **ISM 868 MHz** |
| | **Freq. (MHz)** | **863-870 MHz** |
| **Max VSWR** | | 2.9 |
| **Max Return Loss (dB)** | | -6.3 |
| **AVG Eff. (%)** | | 53.9 |
| **AVG AVG Gain (dB)** | | -2.7 |
| **Max Peak Gain (dBi)** | | 0.7 |
| **VSWR** | | ≤ 2.9 |
| **Return Loss** | | ≤ -6.3 dB |
| **Peak Gain** | | ≤ 0.7 dBi |

## 1.2. Mechanical & Environmental

| | |
|---|---|
| **Mechanical** | |
| **Antenna Size** | 10 mm × 3.2 mm × 0.5 mm |
| **Material & Color** | Ceramic & Natural |
| **Antenna Weight** | Typ. 0.052 g |
| **Mounting Type** | SMD |
| **Recommended EVB Size** | Rectangular EVB: 80 × 40 mm |
| **Environmental** | |
| **Operation Temperature** | -40 °C to +85 °C |
| **Storage Temperature** | -40 °C to +85 °C |
| **RoHS Compliant** | Yes |

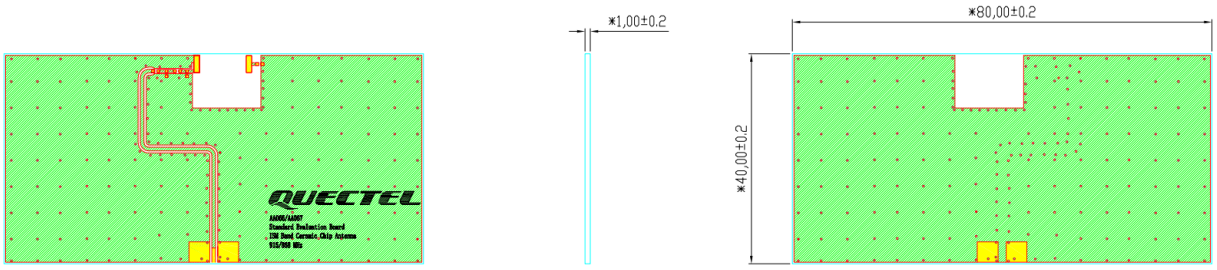
# 2 Drawing

## 2.1. Antenna




All dimensions are in mm

## 2.2. Rectangular EVB

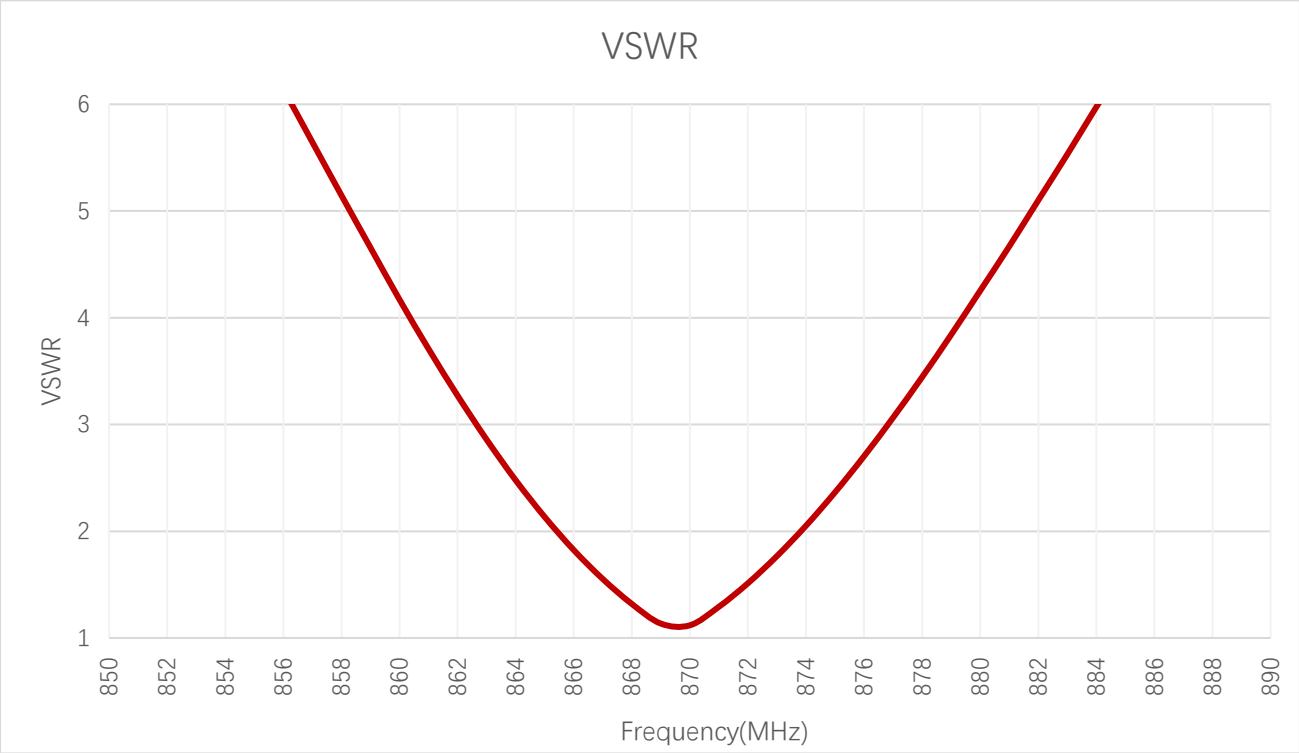



All dimensions are in mm.

# 3 Detailed Performance

## 3.1. S-Parameter Test

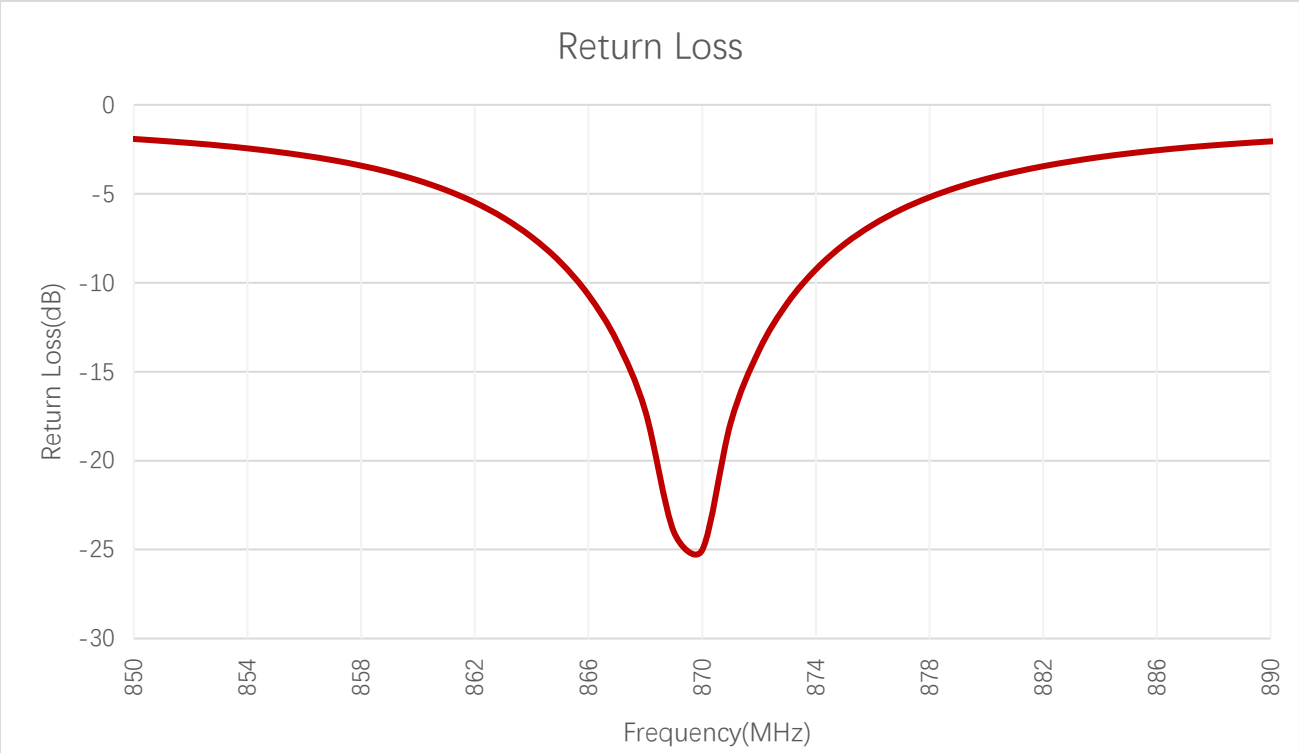
### 3.2.1. VSWR




**VSWR**

| Frequency (MHz) | 863 | 868 | 870 |
|---|---|---|---|
| VSWR | 2.9 | 1.3 | 1.1 |

### 3.2.2. Return Loss

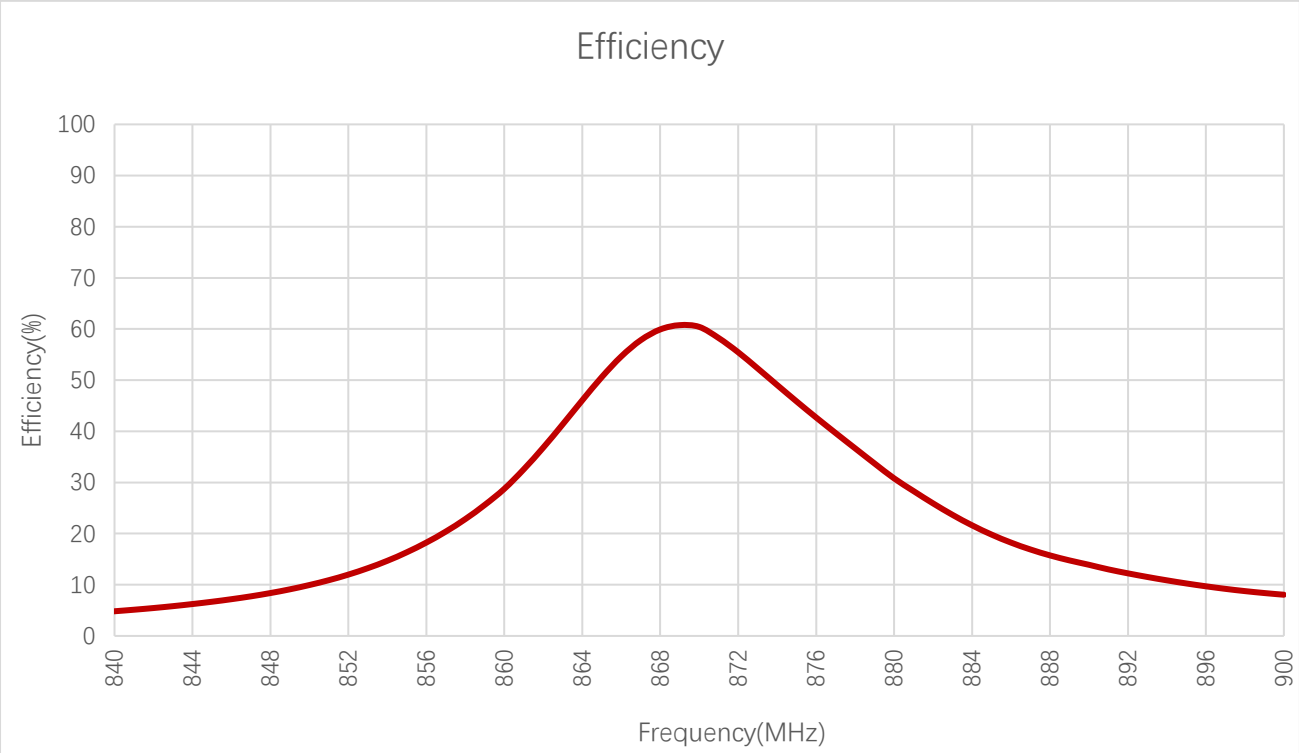



**Return Loss (dB)**

| Frequency (MHz) | 863 | 868 | 870 |
|---|---|---|---|
| Return Loss (dB) | -6.3 | -17.2 | -25.0 |

## 3.2. Radiation Performance Test

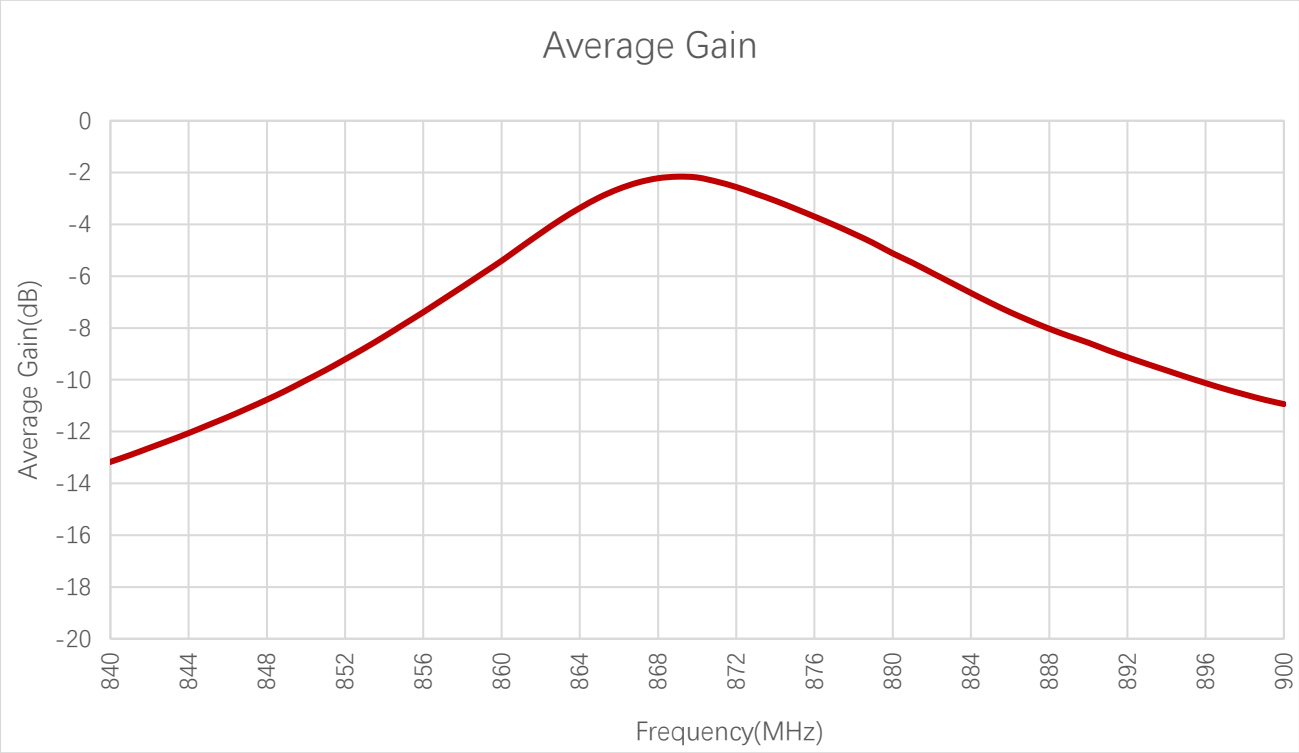
### 3.3.1. Efficiency




**Efficiency (%)**

| Frequency (MHz) | 863 | 868 | 870 |
|---|---|---|---|
| Efficiency (%) | 41.4 | 59.9 | 60.4 |

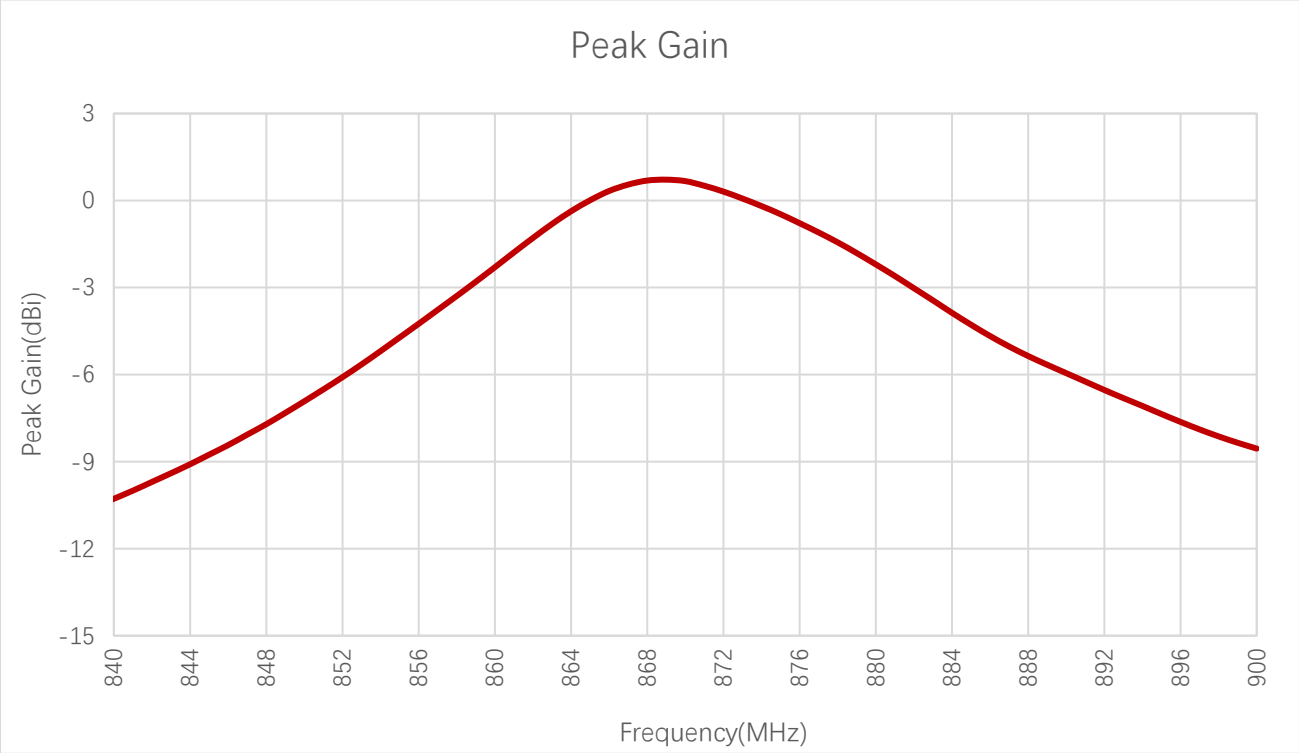
### 3.3.2. Average Gain




**Average Gain (dB)**

| Frequency (MHz) | 863 | 868 | 870 |
|---|---|---|---|
| Average Gain (dB) | -3.8 | -2.2 | -2.2 |

### 3.3.3. Peak Gain

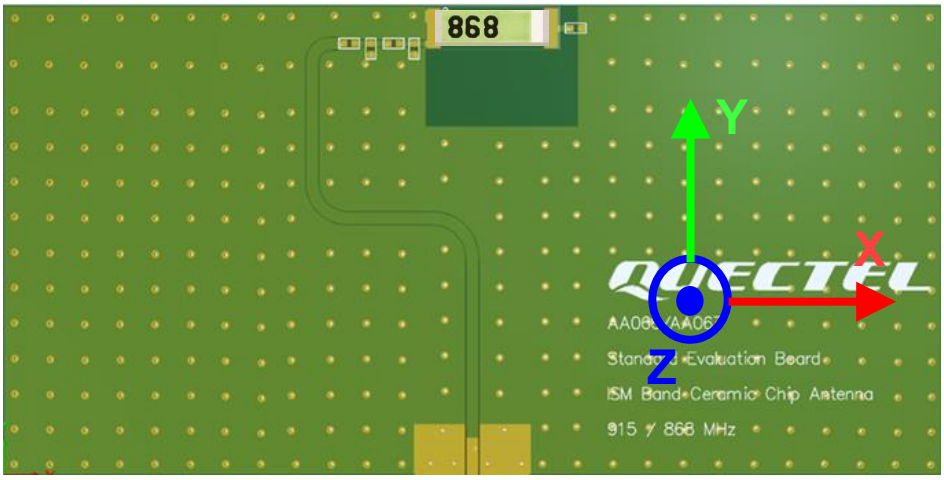



**Peak Gain (dBi)**

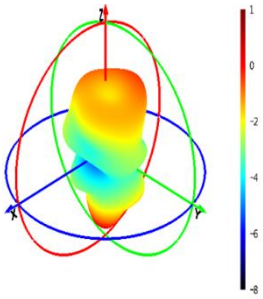
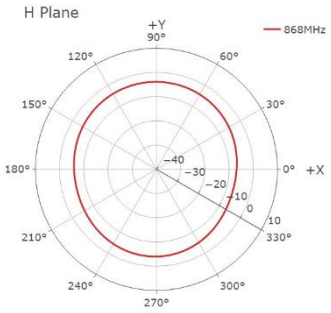
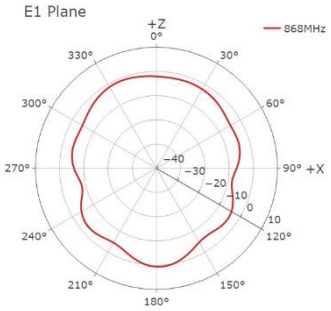
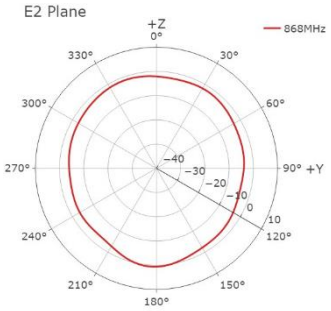
| Frequency (MHz) | 863 | 868 | 870 |
|---|---|---|---|
| Peak Gain (dBi) | -0.8 | 0.7 | 0.7 |

### 3.3.4. 3D & 2D Radiation Pattern

- Test Status: Assembled on 80 × 40 mm EVB
- Test Chamber: GL-S-1



- ISM

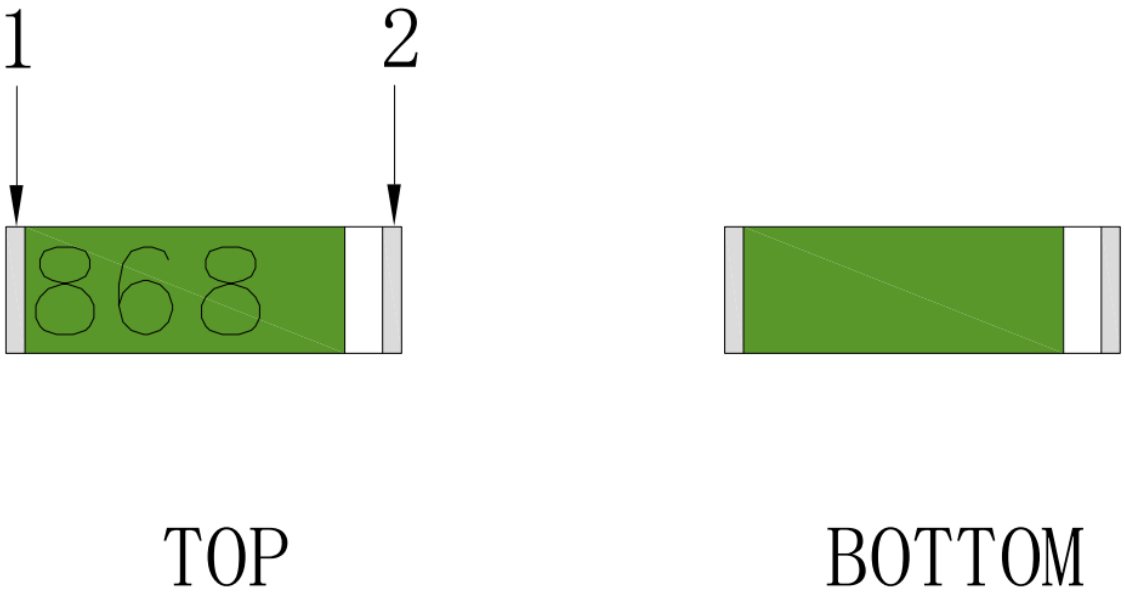
| 868 MHz | |
|---|---|
|  |  |
|  |  |

H Plane
868MHz
+Y
90°
120°
60°
150°
30°
180°
0°
+X
210°
330°
240°
300°
270°
−40
−30
−20
−10
0
10
E1 Plane
+Z
0°
330°
30°
300°
60°
270°
90°
+X
240°
120°
210°
150°
180°
E2 Plane
+Z
0°
330°
30°
300°
60°
270°
90°
+Y
240°
120°
210°
150°
180°

# 4 Schematic Symbol and Pin Definition

- The pin assignment for the antenna is as follows.
- The circuit symbol for the antenna is shown below. The antenna has 2 pins, only one of which works. All other pins are for mechanical strength.

| Pin | Description |
|---|---|
| 1 | Feed |
| 2 | Return / GND |



# 5 Transmission Line

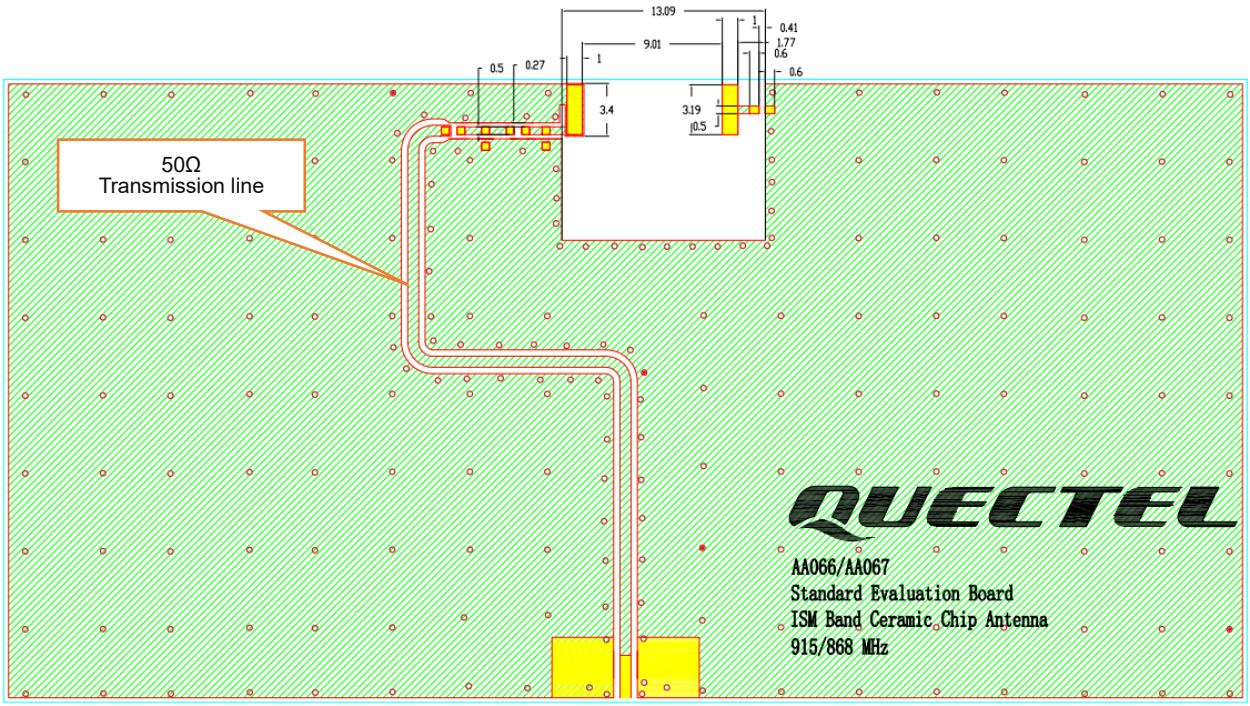
The characteristic impedance of all transmission lines shall be designed as 50 Ω.

- The length of the transmission lines should be kept as short as possible.
- Any other part of the RF system, such as transceiver, power amplifiers, etc., shall also be designed with an impedance of 50 Ω.

Once the material for the PCB has been chosen (PCB thickness and dielectric constant), a coplanar transmission line can easily be designed using any of the commercial software packages for transmission line design. For the chosen PCB thickness, copper thickness and substrate dielectric constant, the program will calculate the appropriate transmission line width and gaps on either side of the track so the characteristic impedance of the coplanar transmission is 50 Ω.

# 6 Recommended PCB Layout

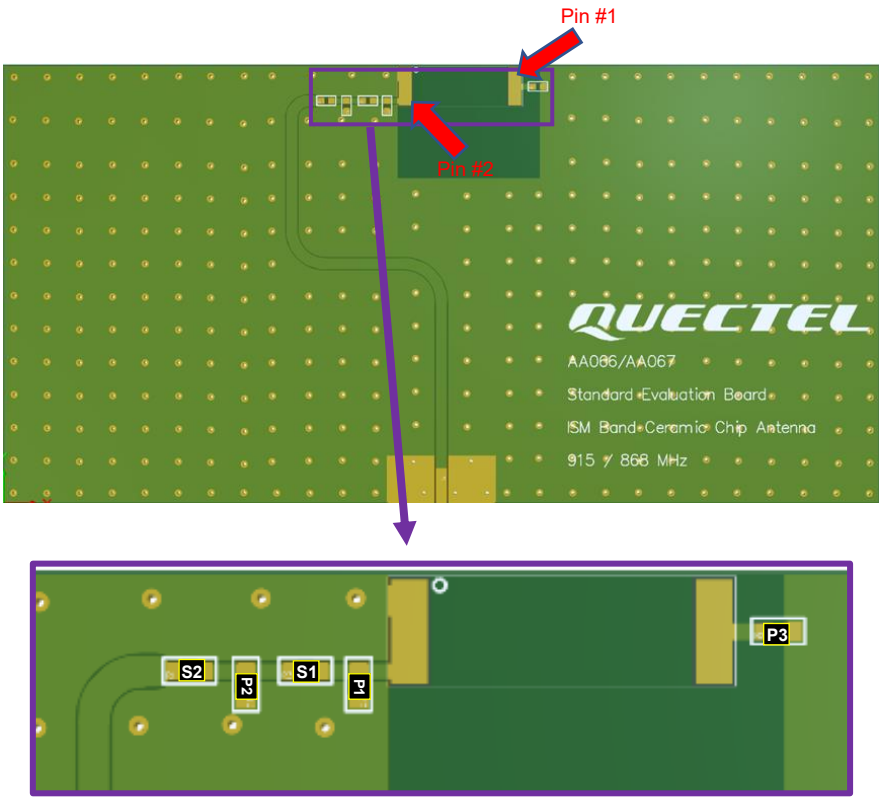
The host PCB must be designed using the PCB footprint shown with the correct clearances. An example of the PCB layout shows the antenna footprint. Please note this clearance area is critical to the performance of the antenna and must be applied through all layers of the PCB.




All dimensions are in mm.

# 7 Matching Circuit

Demo Board Top View




| | P1 | S1 | P2 | S2 | P3 |
|---|---|---|---|---|---|
| **Default Matching** | N/A | 0Ω | 5pF | 22pF | 12pF |
| **Tolerance** | N/A | / | ±0.05pF | ±5% | ±5% |

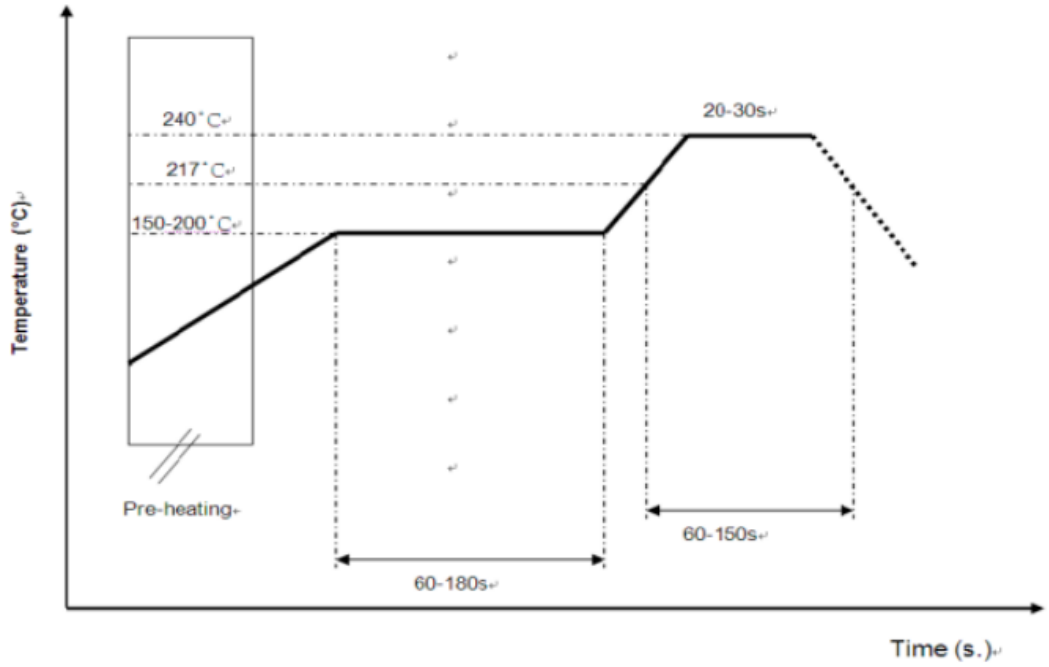
| Pin # | Description |
|---|---|
| **1** | Return / GND |
| **2** | Feed |

# 8 Soldering Temperature

| Phase | Profile Features | PB-Free Assembly |
|---|---|---|
| RAMP-UP | Avg. Ramp-up Rate (Tsmax to Tp) | 3 °C/second (Max.) |
| PREHEAT | Temperature Min (Tsmin)<br>Temperature Max (Tsmax) Time (tsmin to tsmax) | 150 °C<br>190 °C<br>110 seconds (Max.) |
| REFLOW | Temperature (TL) Total Time above TL (tl) | 220 °C<br>90 seconds (Max.) |
| PEAK | Temperature (Tp) | 230–250 °C |
| RAMP-DOWN | Rate | -1 °C/second (Max.) |

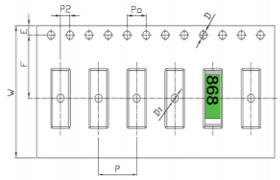
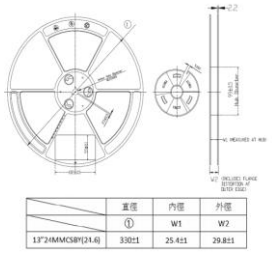
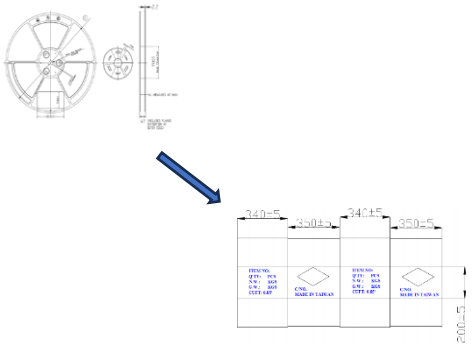
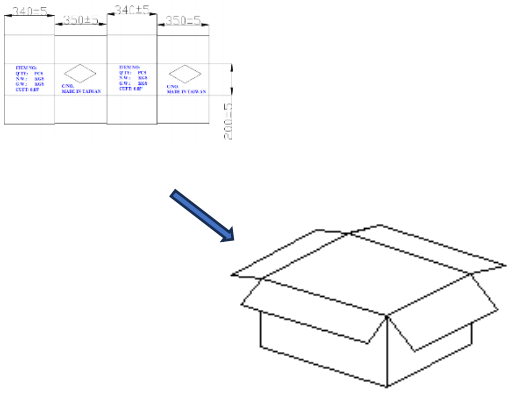
# 9 Reflow Profile

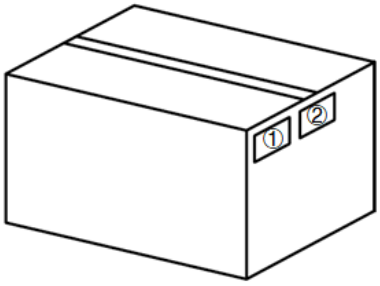
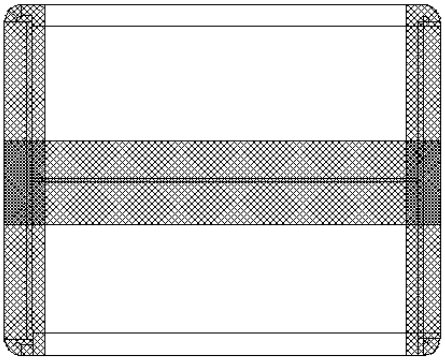
Typical Soldering Profile for Lead-free Process




*Recommended solder paste alloy: SAC305 (Sn96.5 /Ag3 /Cu0.5) Lead Free solder paste

# 10 Packaging

| Step | Packaging Picture / 2D Picture | Description |
|---|---|---|
| 1 |  <br>  | Reel |
| 2 |  | (6000 PCS Antennas / Reel)<br>2 reels are in the inner box. |
| 3 |  | (3 Inner Boxes / Carton Box)<br>(36000 PCS Antennas / Carton Box)<br>Estimated quantity<br>Products that cannot fill the entire carton box are packed in a suitable size carton box.<br>Carton Size:<br>L × W × H = 400 × 400 × 200 mm |

| | | |
|---|---|---|
| 4 |  | **Position for Attaching Labels**<br>① Carton Label<br>② Quality Label |
| 5 |  | **Sealing Cartons**<br>"工" type sealing cartons |
| 6 | The initial packaging method described above is for reference only, and the final actual packaging method shall be subject to the actual shipping packaging. | |

# Contact Us

**At Quectel, our aim is to provide timely and comprehensive services to our customers. If you require any assistance, please contact our headquarters:**

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Email: info@quectel.com

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# Revision History

| Version | Date | Author | Note |
|---|---|---|---|
| - | 2022-05-27 | Junsen LI/ Joye WANG | Creation of the document |
| 1.0 | 2022-05-27 | Junsen LI/ Joye WANG | First official release |
| 1.1 | 2022-09-20 | Junsen LI | Added Chapter 6. |
| 2.0 | 2023-11-10 | Tina GAN/ Lucky FENG/ David LIU/ Vinnie LIU | Numerous changes were made to this document. It should be read in its entirety. |

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