



# TAOGLAS®



# Datasheet

## 915MHz Ceramic Loop Antenna

**Part No:**  
ILA.09

### Description

915MHz Embedded Ceramic Loop Antenna for ISM/Lora/LPWAN/Sigfox

### Features:

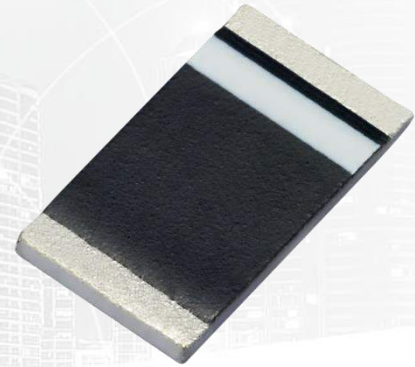
- High Efficiency
- Omnidirectional
- Low profile
- Tiny Size
- Dims: 5.0\*3.0\*0.5mm
- Surface-Mount
- RoHS & REACH Compliant

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# 1. Introduction



The ILA.09 is a new 915MHz ISM band embedded ceramic loop antenna from Taoglas featuring good efficiency of 55% at the center of the band. It is the perfect solution for the growing number of devices using the 915MHz band such as Sigfox and LoRa applications in the US, or in metering application.

This antenna works best when placed at the center of the board edge. The ILA.09 antenna, at 5\*3\*0.5mm, is low profile and would be suitable for devices with space constraints. The ILA.09 is delivered on tape and reel and now allows M2M customers to use an omnidirectional SMT antenna. The omnidirectional radiation characteristics allow for excellent performance regardless of device orientation. This is especially useful for devices that are not fixed in one particular spot during use. When there is little PCB space available for antenna placement, but high performance is required, the ILA.09 is the ideal choice.

The antenna is manufactured in a TS16949 first tier automotive approved facility and has passed the most stringent reliability testing. Since it is SMD, it is much easier to integrate and more reliable in high volume production compared to helical antennas which are cumbersome to install and subject to variability due to the need for manual assembly.

This antenna can be mounted with no performance degradation in either orientation as long as the antenna is soldered correctly via Surface mounting. Please see the integration instructions section for further detail regarding the optimum way to integrate this antenna into your device.

For further optimization to customer-specific device environments and for support to integrate and test this antennas performance in your device, contact your regional Taoglas Customer Services Team.

#### Applications:

Sigfox, Lora, LPWAN, Automated Meter Reading (AMR), Radio Frequency Identification (RFID), Remote, Monitoring, Healthcare, Sensing, Alarm Systems, Handheld Devices

## 2. Specification

LTE Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
915MHz	902-928	49.1	-3.09	1.57	50 $\Omega$	Linear	Omni	2W

Mechanical	
Dimensions (mm)	5.0 x 3.0 x 0.5
Ground plane (mm)	80 x 40
Weight (g)	0.02

Environmental	
Temperature Range	-40°C to 85°C
Storage Temperature	-40°C to 85°C
Humidity	20% to 70%
Moisture Sensitivity Level	3 (168 Hours)

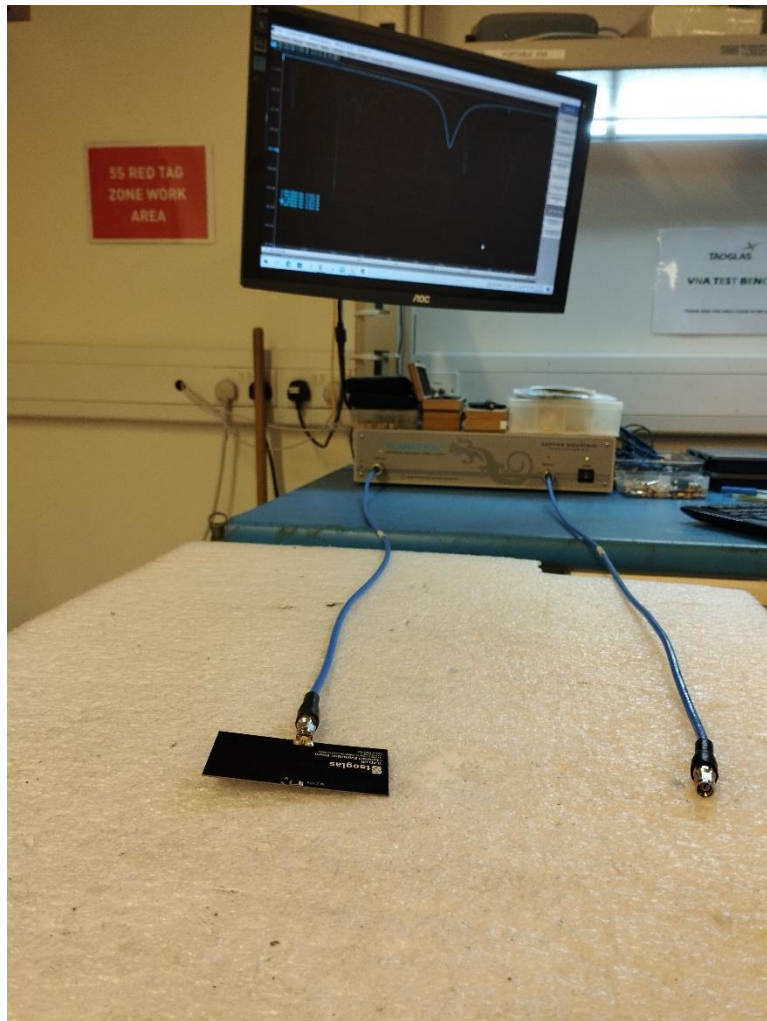
### 3. Antenna Characteristics

#### 3.1 Test Setup

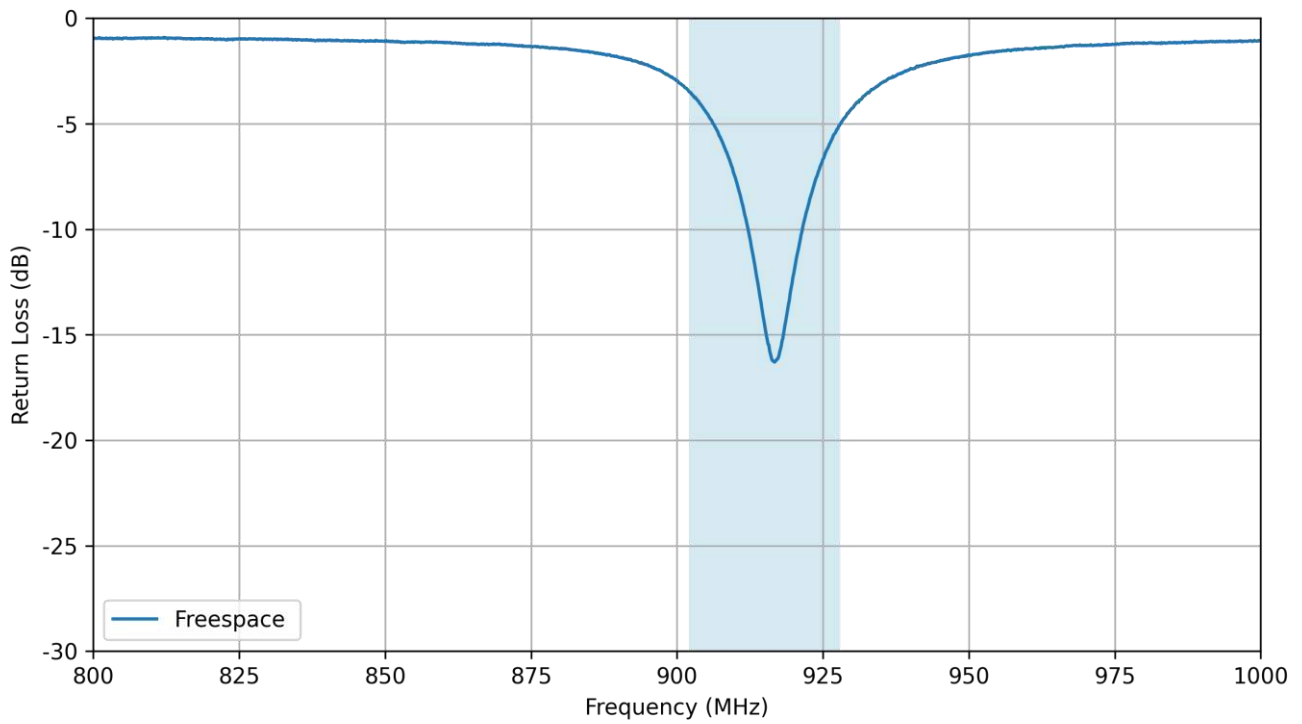
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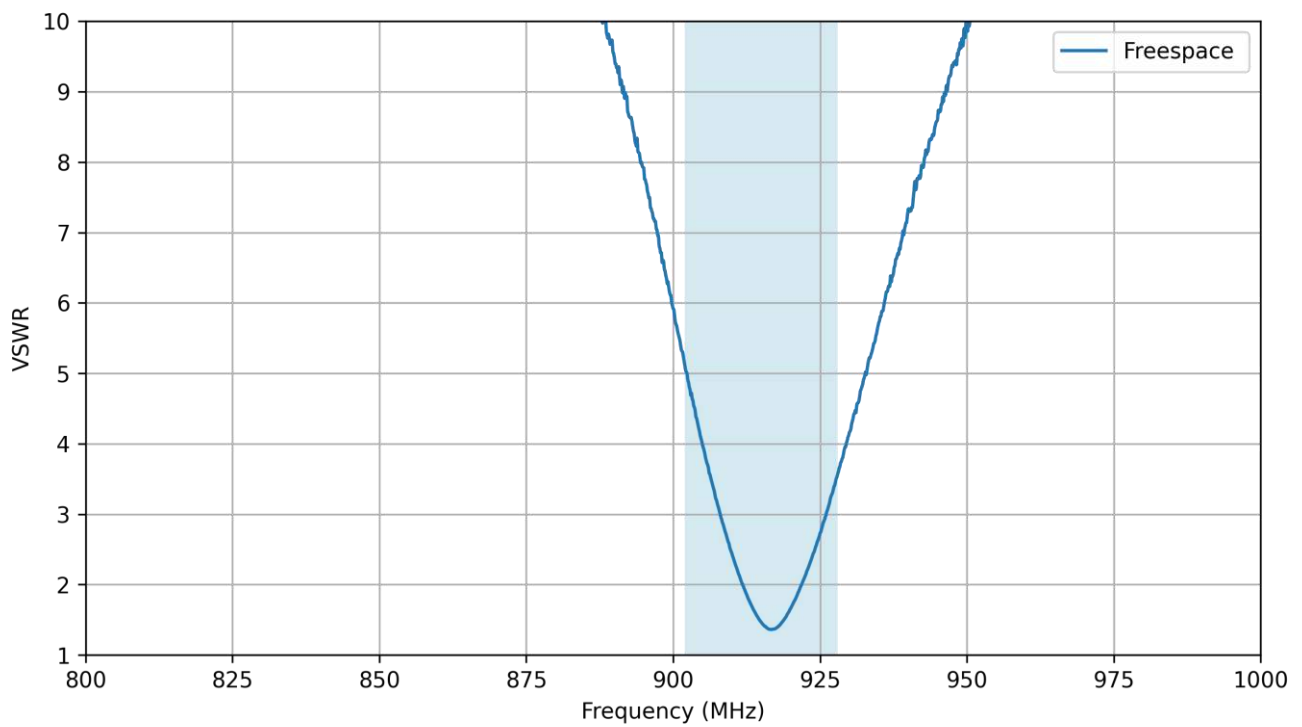
Vector Network Analyzer



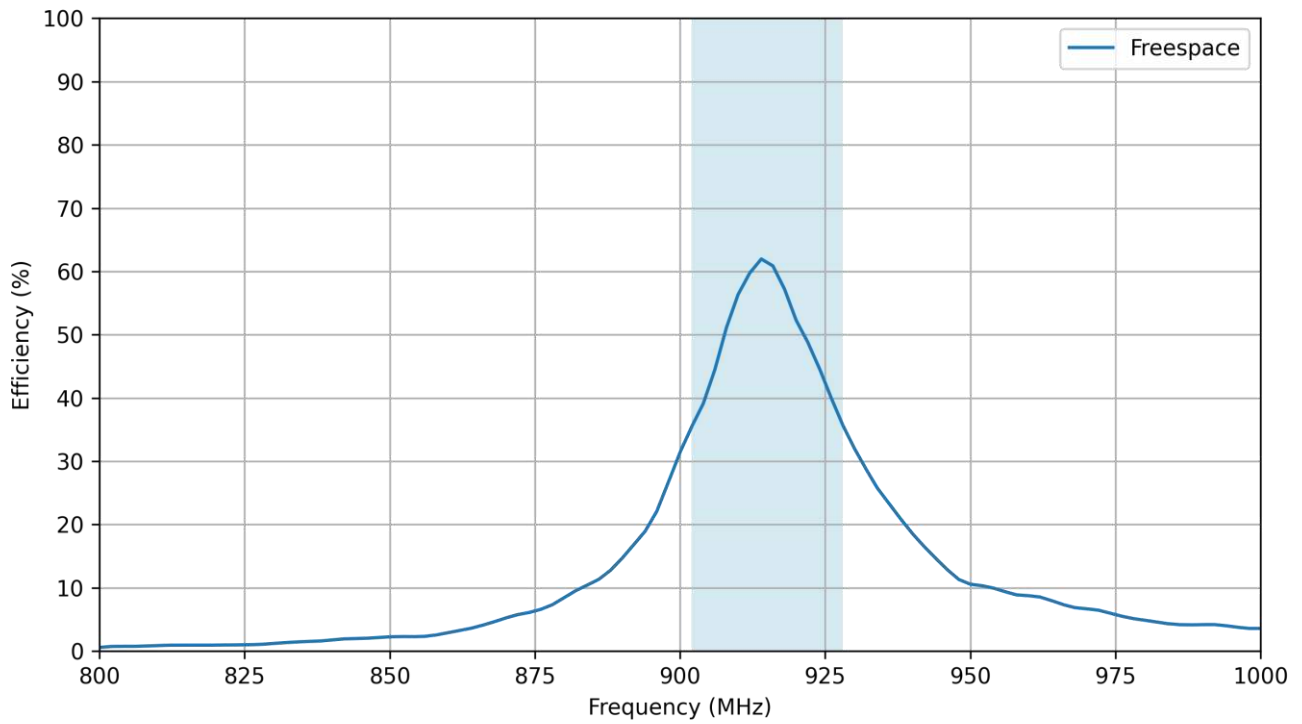
### 3.2 Return Loss



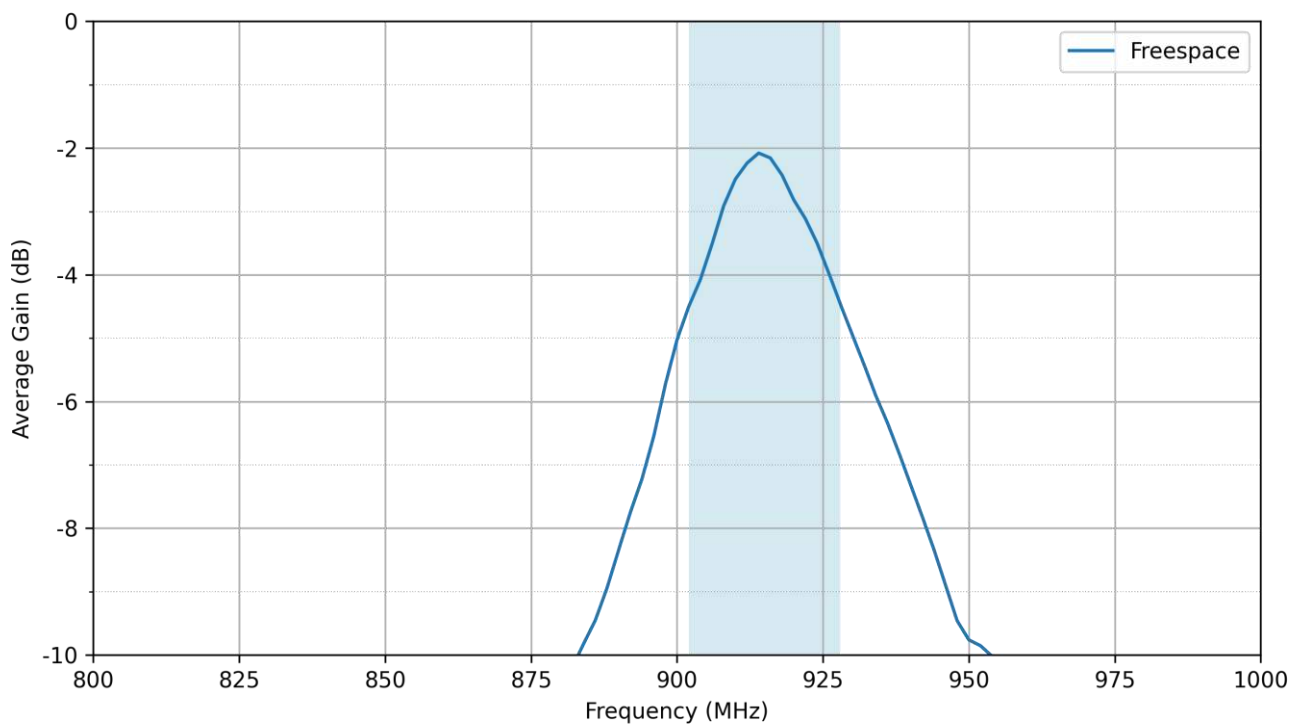
### 3.3 VSWR



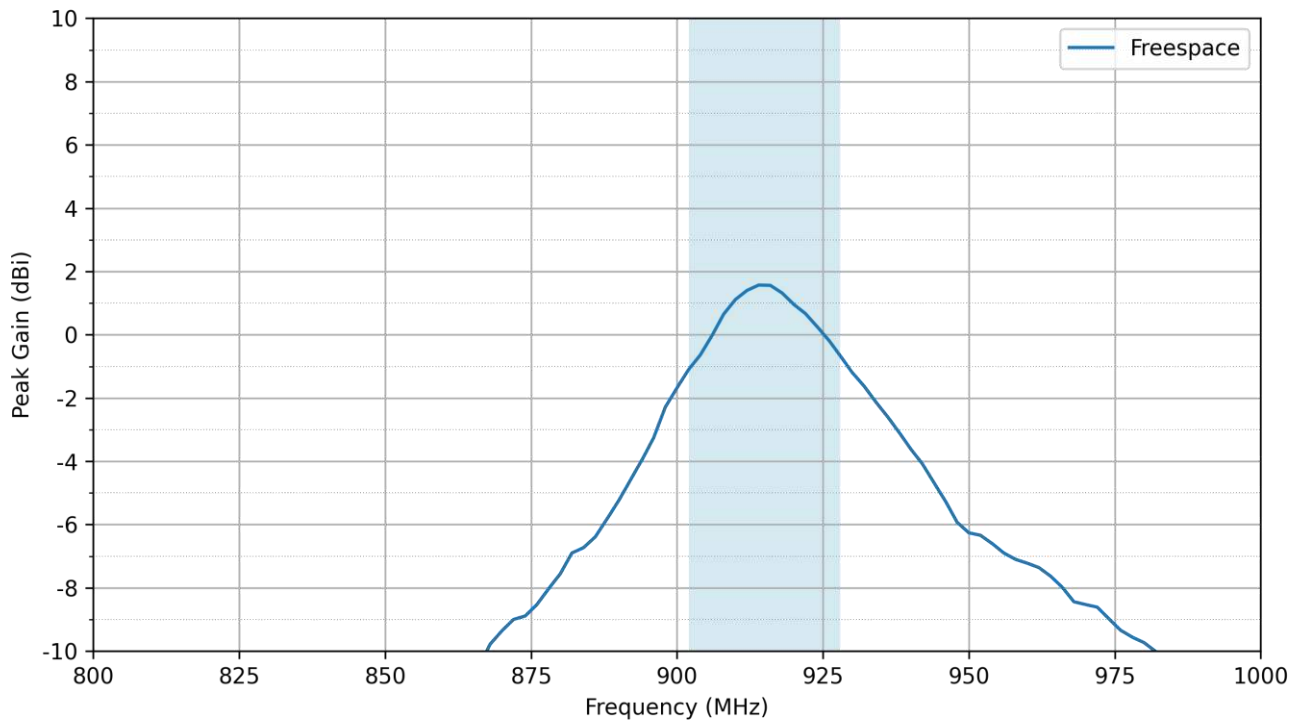
### 3.4 Efficiency



### 3.5 Average Gain



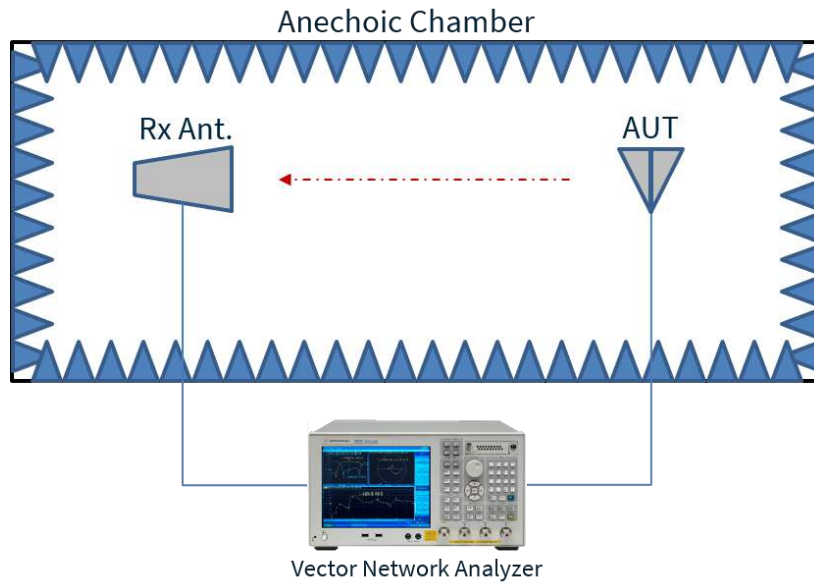
### 3.6 Peak Gain



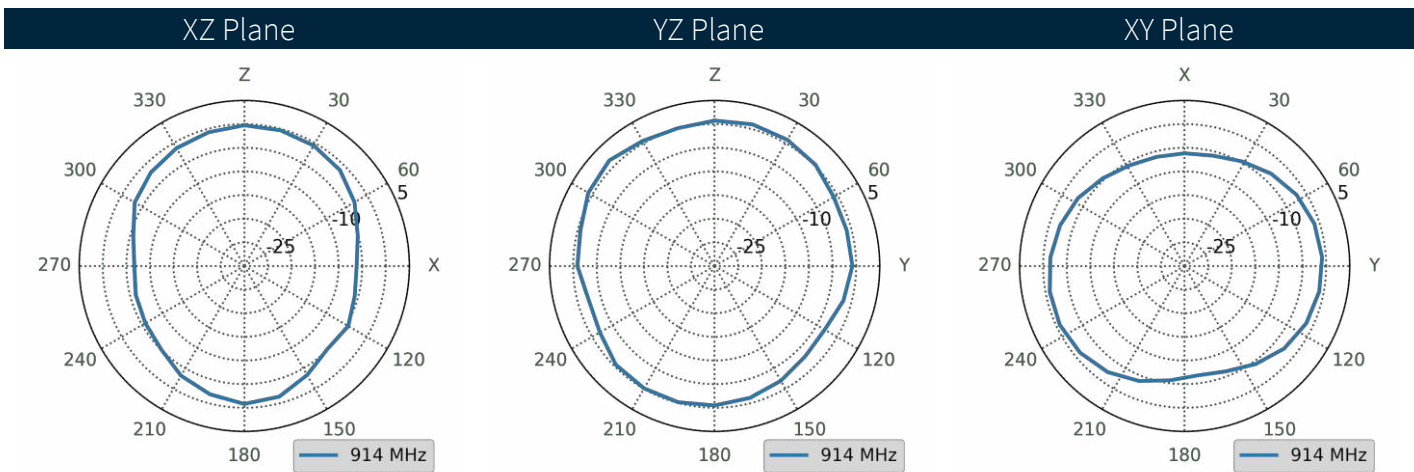
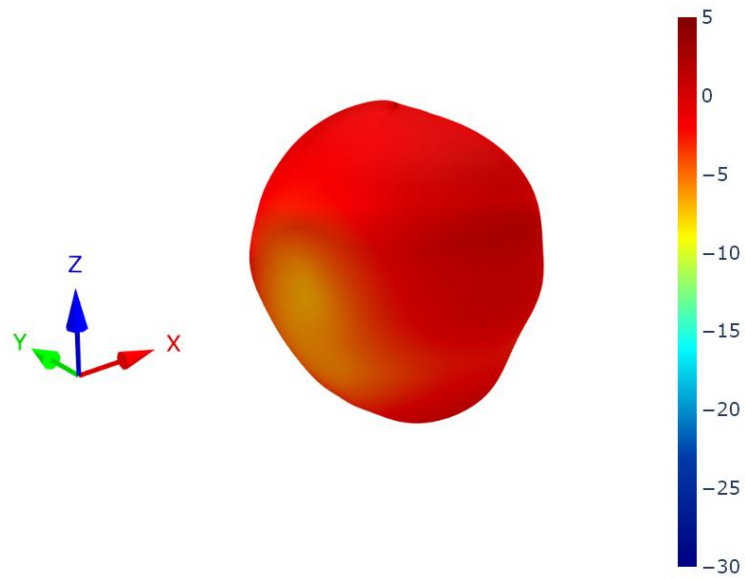


## 4. Radiation Patterns

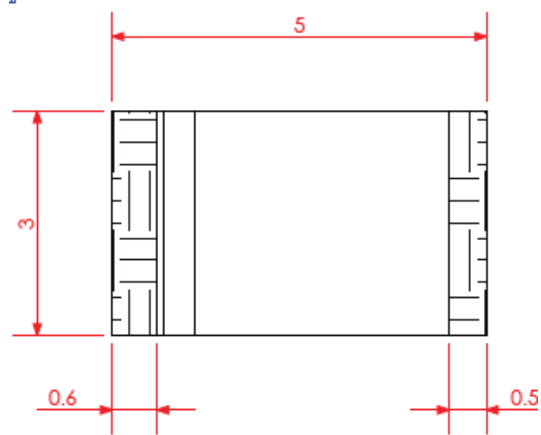
### 4.1 Test Setup



4.2 Freespace Patterns at 915 MHz



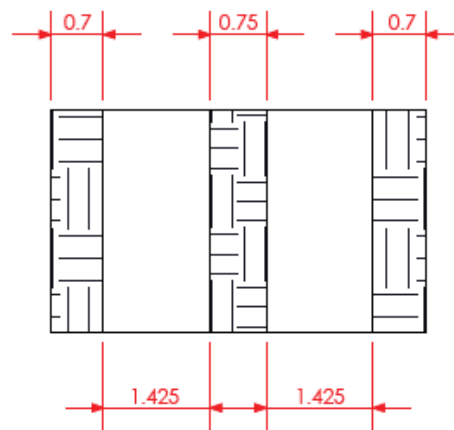
# 5. Mechanical Drawing



TOP VIEW



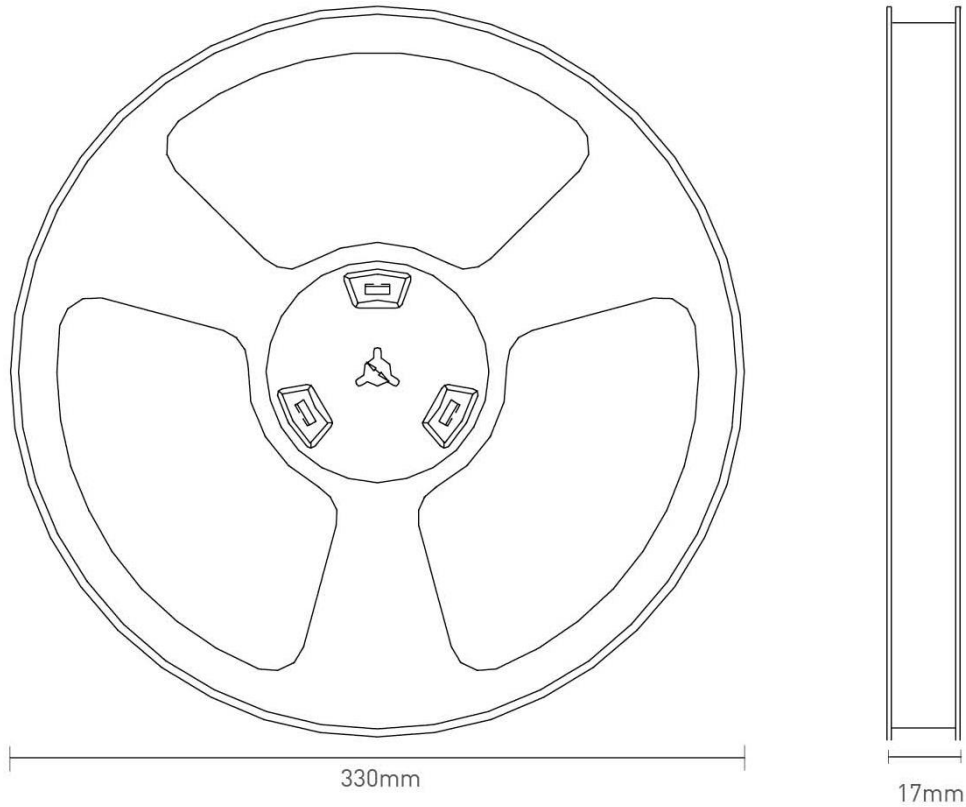
SIDE VIEW



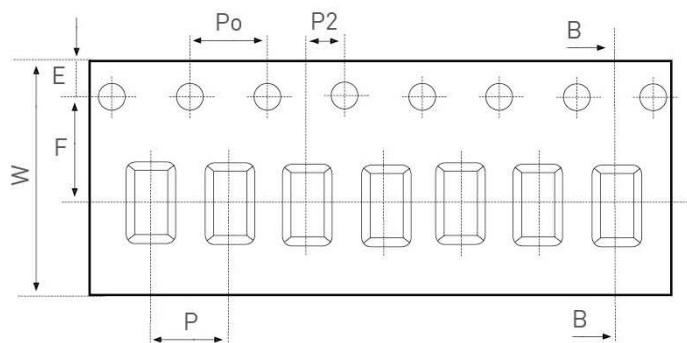
BOTTOM VIEW

## 6. Packaging

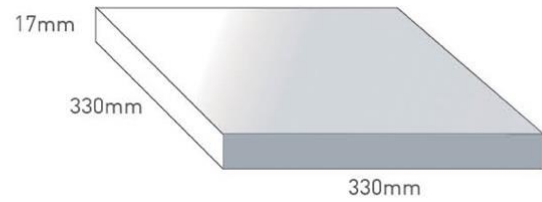
6000 pcs ILA.09 per tape & reel  
 Dimensions - 330\*330\*17mm  
 Weight - 680g



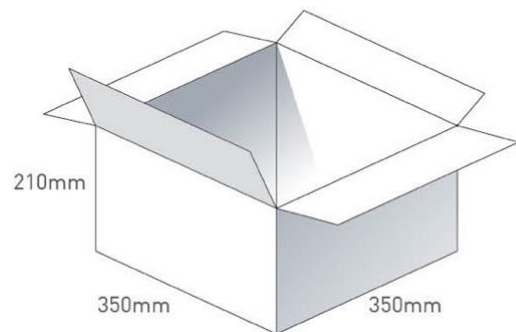
Tape Dimensions (unit: mm)		
Feature	Spec	Tolerances
W	12.00	±0.30
P	4.00	±0.10
E	1.75	±0.10
F	5.50	±0.10
P2	2.00	±0.10
D	1.50	+0.10 -0.00
Po	4.00	±0.10
10Po	40.00	±0.10



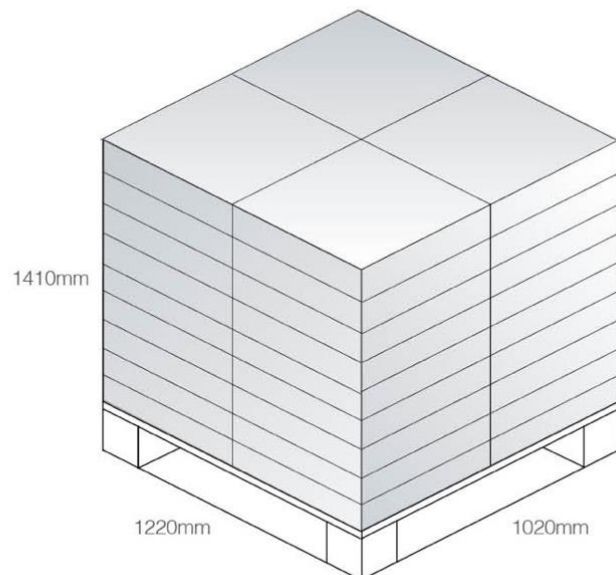
6000 pcs ILA.09  
 1 reel in small inner box  
 Dimensions - 330\*330\*17  
 Weight - 680g



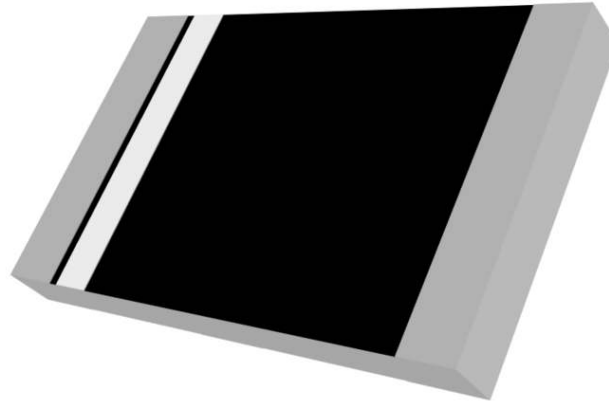
9 boxes / 54000 pcs in one carton  
 Carton Dimensions - 350\*350\*210mm  
 Weight - 6.69Kg



Pallet Dimensions 1220\*1020\*1410mm  
 36 Cartons per Pallet  
 4 Cartons per layer  
 9 Layers



## 7. Antenna Integration Guide

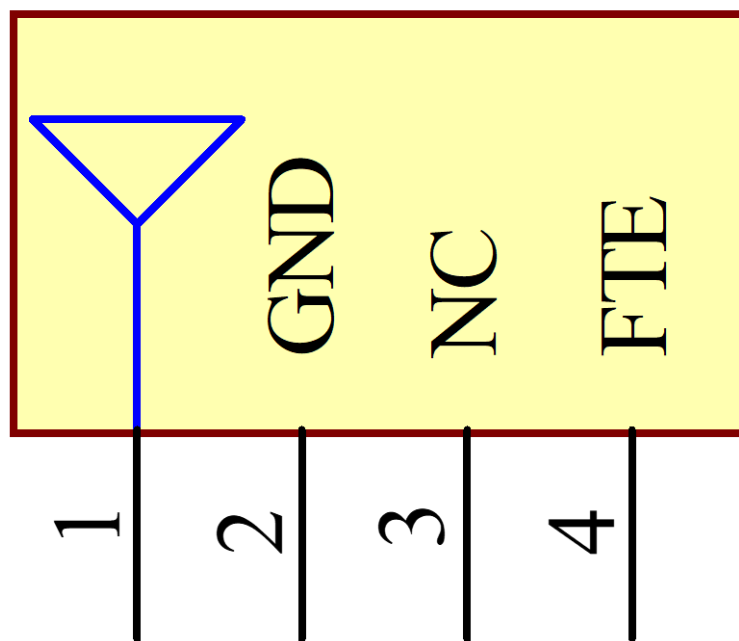


## 7.1 Schematic and Symbol Definition

The circuit symbol for the antenna is shown below. The antenna has 4 pins with only three pins (Pin 1, 2 & 4) as functional. Pin 3 is for mechanical strength.

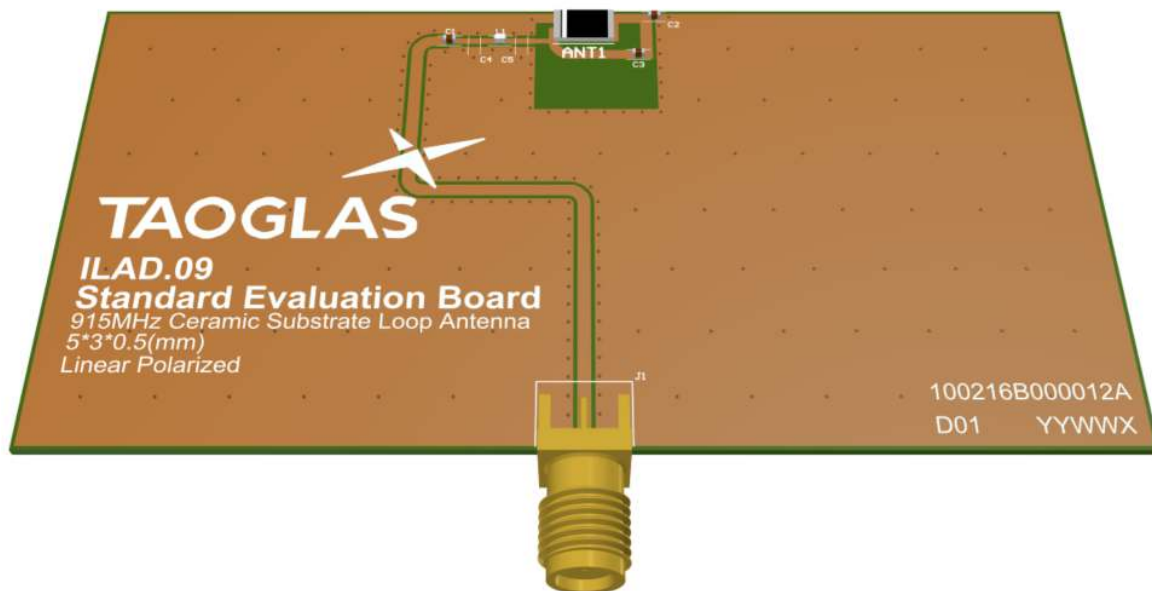
Pin	Description
1	RF Feed
2	Ground
3	Mechanical, Not Connected
4	Fine Tuning Element

TAOGLAS\_ILA.09  
ANT1



## 7.2 Antenna Integration

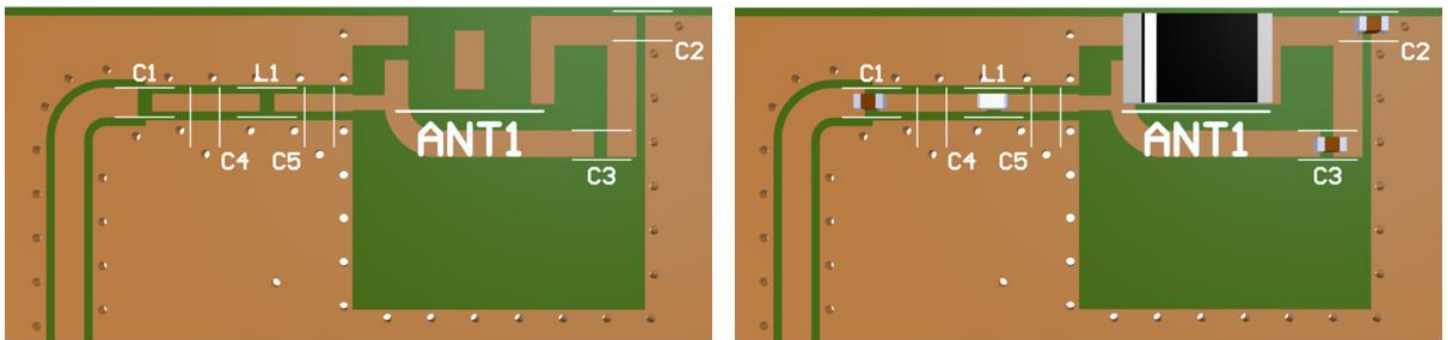
For any given PCB size, the antenna should ideally be placed on the PCB's longest side, to take advantage of the ground plane. Optimized matching components can be placed as shown.





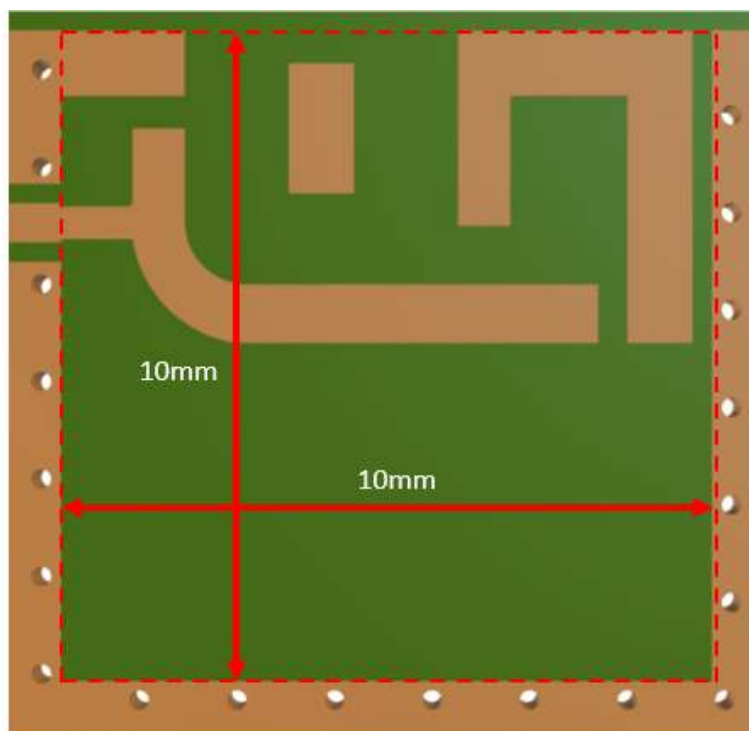
### 7.3 PCB Layout

The footprint and clearance on the PCB must meet the layout drawing in section (Footprint Drawing). Note the placement of the optimized components. L1 is placed as close as possible to the RF feed (pad 1) within the RF Trace. C1 is then placed tightly in series after that. C4 & C5 are optional components but the footprints are recommended in case they are needed. C3 is placed within the copper keep out connecting the RF feed (pad 1) to the fine-tuning element (pad 3), with C2 placed across the fine-tuning element and ground.



### 7.4 PCB Keepout

Below shows the antenna footprint and clearance through ALL layers on the PCB. Only the antenna pads and connections to feed and GND are present within this clearance area (marked RED). The clearance area extends to 5mm from the antenna mechanical pads to the ground area. This clearance area includes the bottom side and ALL internal layers on the PCB.



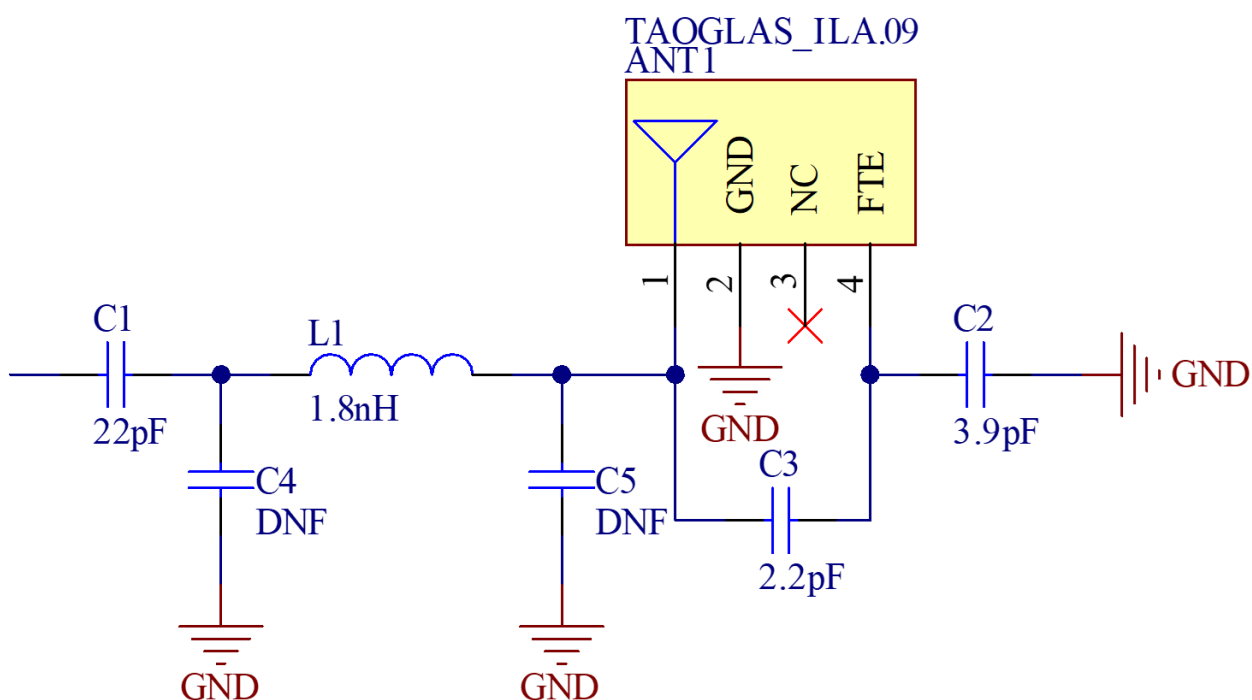
**7.5** Evaluation Board



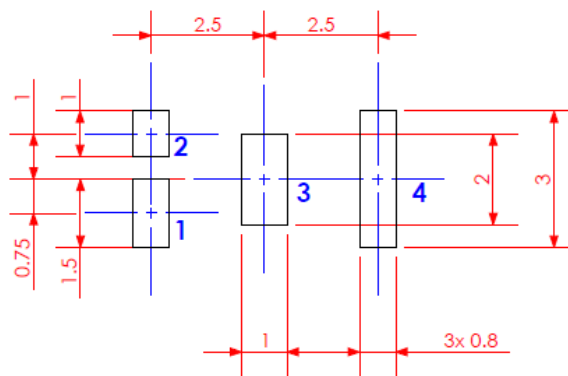
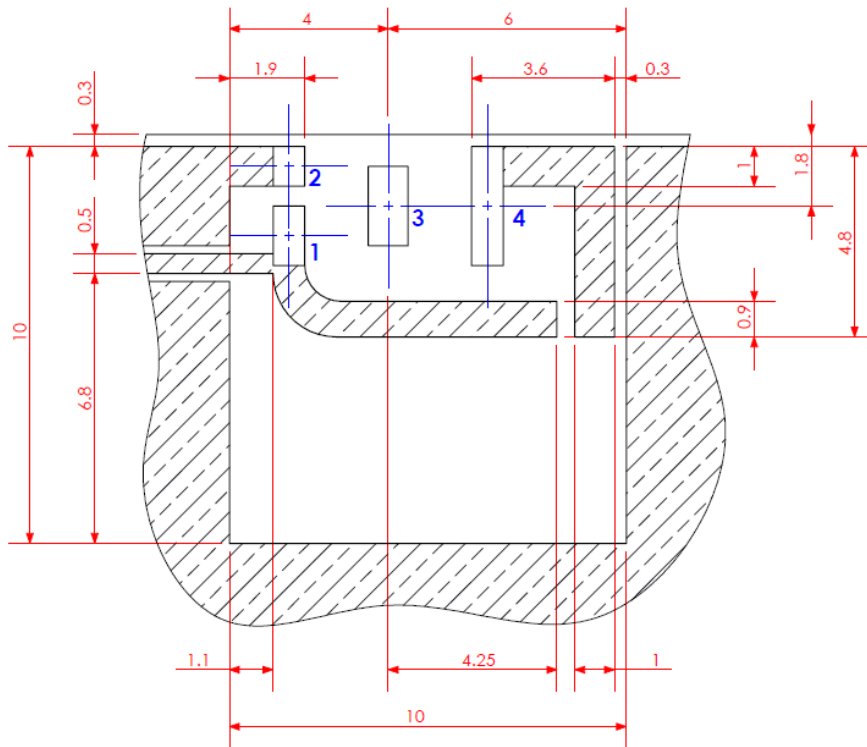
## 7.6 Evaluation Board Matching Circuit

Matching components with the ILA.09 are recommended for the antenna to have optimal performance on the evaluation board, located in the spaces specified in the above images. Additional matching components may be necessary for your device, so we recommend incorporating extra component footprints, forming a “pi” network, between the cellular module and the edge of the ground plane.

Designator	Type	Value	Manufacturer	Manufacturer Part Number
L1	Inductor	1.8nH	TDK Corporation	MLK1005S1N8ST000
C1	Capacitor	22pF	Murata Electronics	GCM1555C1H220JA16D
C2	Capacitor	3.9pF	Murata Electronics	GRM1555C1H3R9CA01D
C3	Capacitor	2.2pF	Murata Electronics	GRM1555C1H2R2CA01D
C4, C5	Capacitor	Not Fitted	-	-



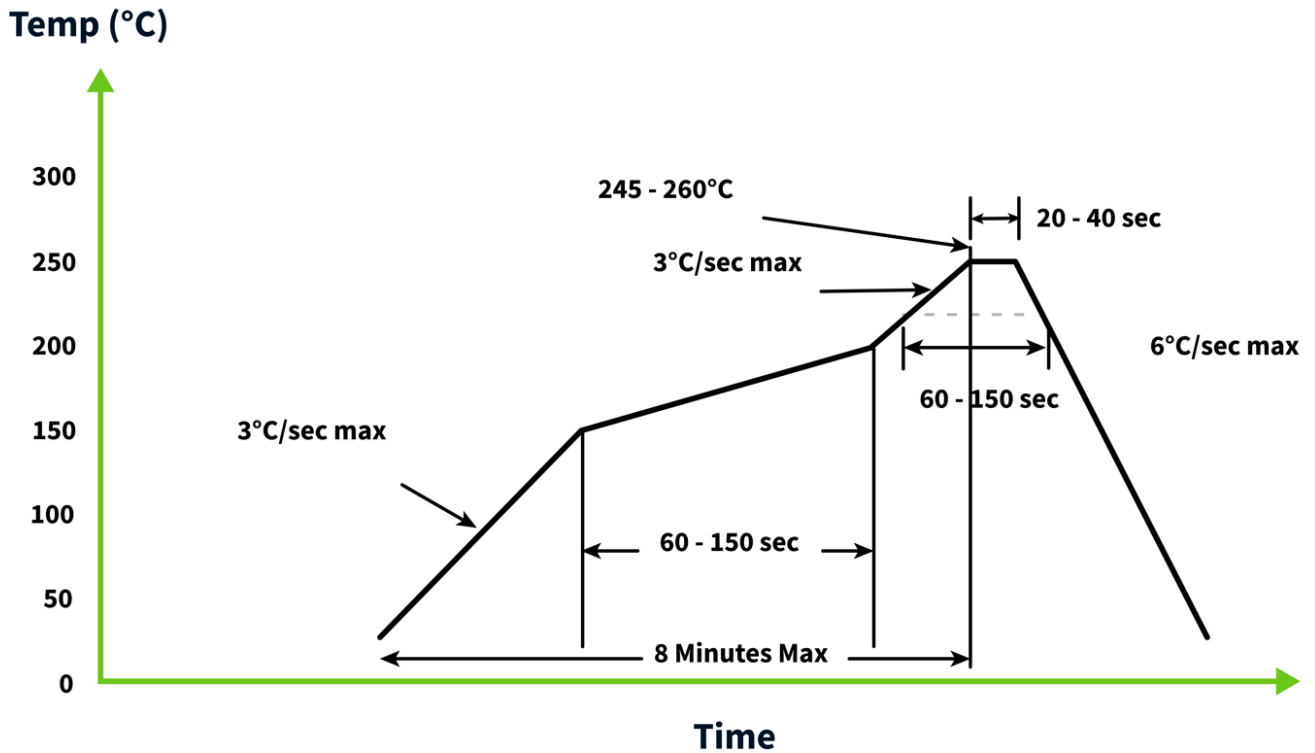
7.7 Footprint



FOOTPRINT SOLDER PADS

## 8. Solder Reflow Profile

The ILA.09 can be assembled by following the recommended soldering temperatures are as follows:



The ILA.09 is not limited to the number of passes through the reflow process. Smaller components are typically mounted on the first pass, however, we do advise mounting the ILA.09 when placing larger components on the board during subsequent reflows.

Changelog for the datasheet

**SPE-16-8-051 – ILA.09**

**Revision: D (Current Version)**

Date:	2023-06-30
Changes:	Retest and full datasheet update
Changes Made by:	Gary West

**Previous Revisions**

**Revision: C (Current Version)**

Date:	2023-03-13
Changes:	Antenna Integration Guide
Changes Made by:	Cesar Sousa

**Revision: B (Current Version)**

Date:	2021-10-31
Changes:	Format Change, MSL
Changes Made by:	Erik Landi

**Revision: A (Original First Release)**

Date:	2016-05-17
Notes:	Initial Release
Author:	STAFF



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