SPECIFICATION

Part No. : **LA.02**

Model : 2.4GHz
Embedded Loop Chip Antenna

Description : 1dBi 2400MHz to 2500MHz
Wi-Fi/Bluetooth/Bluetooth LE/ ZigBee

Features : 8*2*2mm Ceramic Antenna
Surface Mount
Low Profile
Peak gain 1dBi
50 Ohm Impedance
Components can be mounted on opposite side of board to the antenna

RoHS

1. Introduction

The LA.02 is a 2.4GHz embedded loop chip antenna that has best in class efficiency, 66% on center frequency. It's a miniature SMD ceramic component, designed to be mounted directly on the edge of the main device PCB and is suitable especially for very small space requirements for Bluetooth LE, Wi-Fi, 802.11 applications. The LA.02 uses this main PCB ground plane to increase antenna efficiency, requiring minimum ground-clearance around the antenna. The opposite side of the board on which the antenna is mounted does not need ground-clearance, allowing more space for components or signal routing. This antenna is delivered on tape and reel.

Typical applications
- Telematics devices
- Bluetooth LE Wearables
- Bluetooth Headsets
- Hand-held devices when Bluetooth/Wi-Fi functions are needed, e.g., smart phone.
- IEEE802.11 b/g
- ZigBee
- Wireless PCMCIA cards or USB dongle

Some frequency offset may happen as is normal with antennas embedded devices, so the antenna can be tuned for different PCB sizes and enclosures by simply changing the value of the matching circuit. Please contact your regional Taoglas sales office for support.

Many module manufacturers specify peak gain limits for any antennas that are to be connected to that module. Those peak gain limits are based on free-space conditions. In practice, the peak gain of an antenna tested in free-space can degrade by at least 1 or 2dBi when put inside a device. So ideally you should go for a slightly higher peak gain antenna than mentioned on the module specification to compensate for this effect, giving you better performance.

Upon testing of any of our antennas with your device and a selection of appropriate layout, integration technique, or cable, Taoglas can make sure any of our antennas' peak gain will be below the peak gain limits. Taoglas can then issue a specification and/or report for the selected antenna in your device that will clearly show it complying with the peak gain limits, so you can be assured you are meeting regulatory requirements for that module.

For example, a module manufacturer may state that the antenna must have less than 2dBi peak gain, but you don't need to select an embedded antenna that has a peak gain of less than 2dBi in free-space. This will give you a less optimized solution. It is better to go for a slightly higher free-space peak gain of 3dBi or more if available. Once that antenna gets integrated into your device, performance will degrade below this 2dBi peak gain due to the effects of GND plane, surrounding components, and device housing. If you want to be absolutely sure, contact Taoglas and we will test. Choosing a Taoglas antenna with a higher peak gain than what is specified by the module manufacturer and enlisting our help will ensure you are getting the best performance possible without exceeding the peak gain limits.

2. Specifications

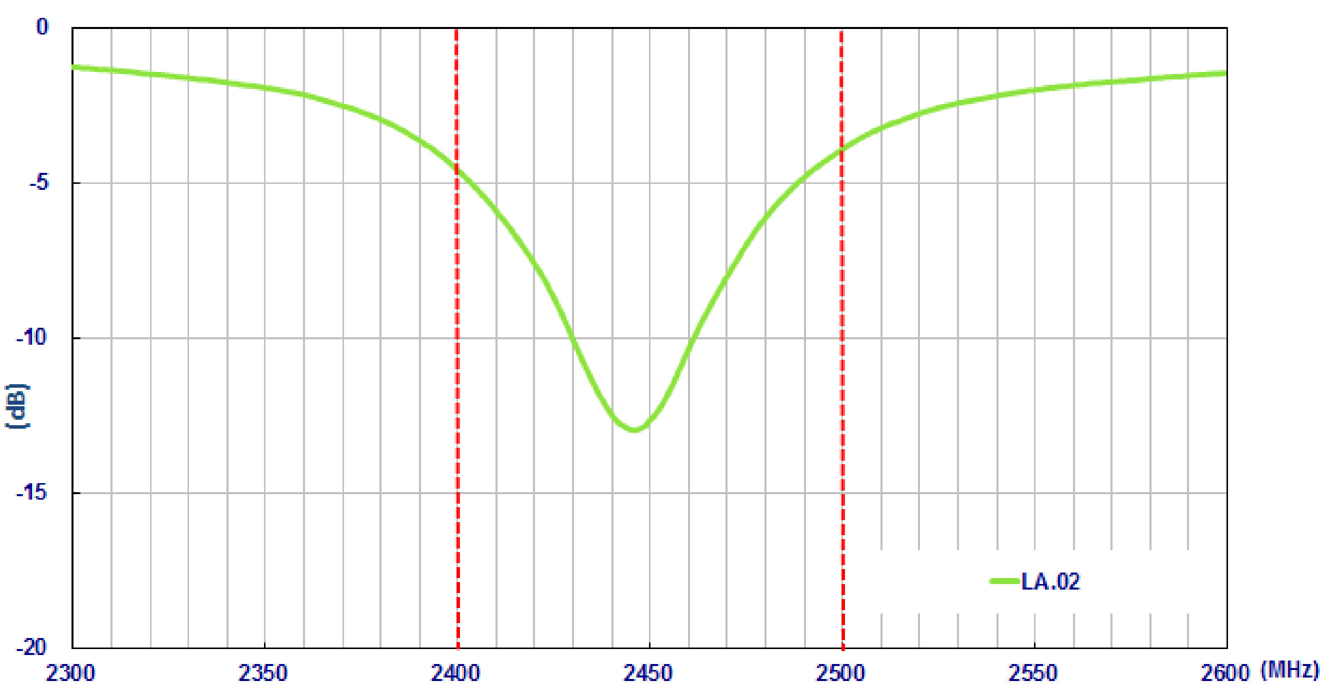
The LA.02 is designed to mount at the center of the edge of an evaluation board that is 80 x 40mm.The antenna performance was measured with the LA.02 mounted on the evaluation board with SMA(F) connector.

No	Parameter	Specification*
1	Center Frequency	2400-2500MHz
2	Dimensions	8*2*2mm
3	VSWR	2 max (Center Frequency)
4	Polarization	Linear
5	Bandwidth	100MHz min.
6	Gain	Peak 1dBi typ.
7	Efficiency	66% (Center Frequency)
8	Impedance	50 Ω
Mechanical		
9	Dimensions	8*2*2mm
10	Material	Ceramic
11	Weight	0.11 g
Environmental		
12	Operating Temperature	-40°C~+85°C
13	Storage Temperature	-40°C~+105°C
14	Temperature Coefficient (τf)	0 ± 20 ppm @-20ºC to +80ºC
15	Recommended Reel Storage Condition	5°C to 40°C Relative Humidity 20% to 70%

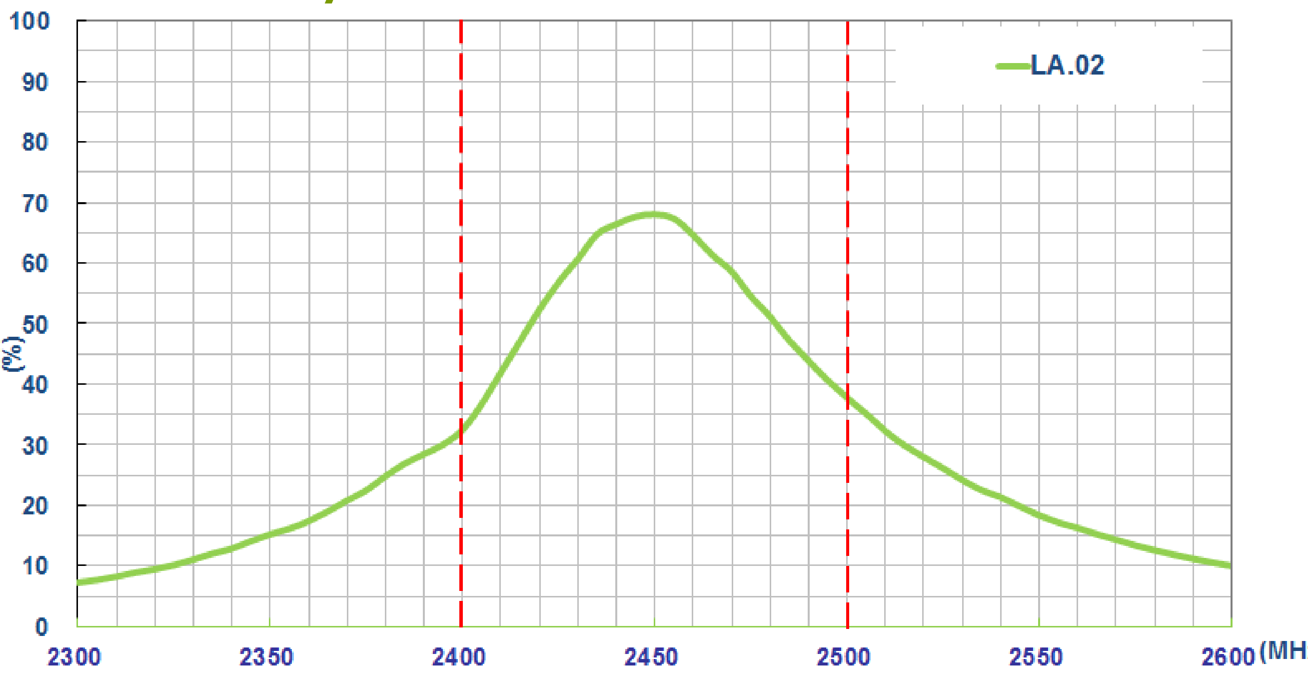
* The data was measured in a CTIA Authorized Test Lab.

3. Electrical Specification (80*40mm ground plane)

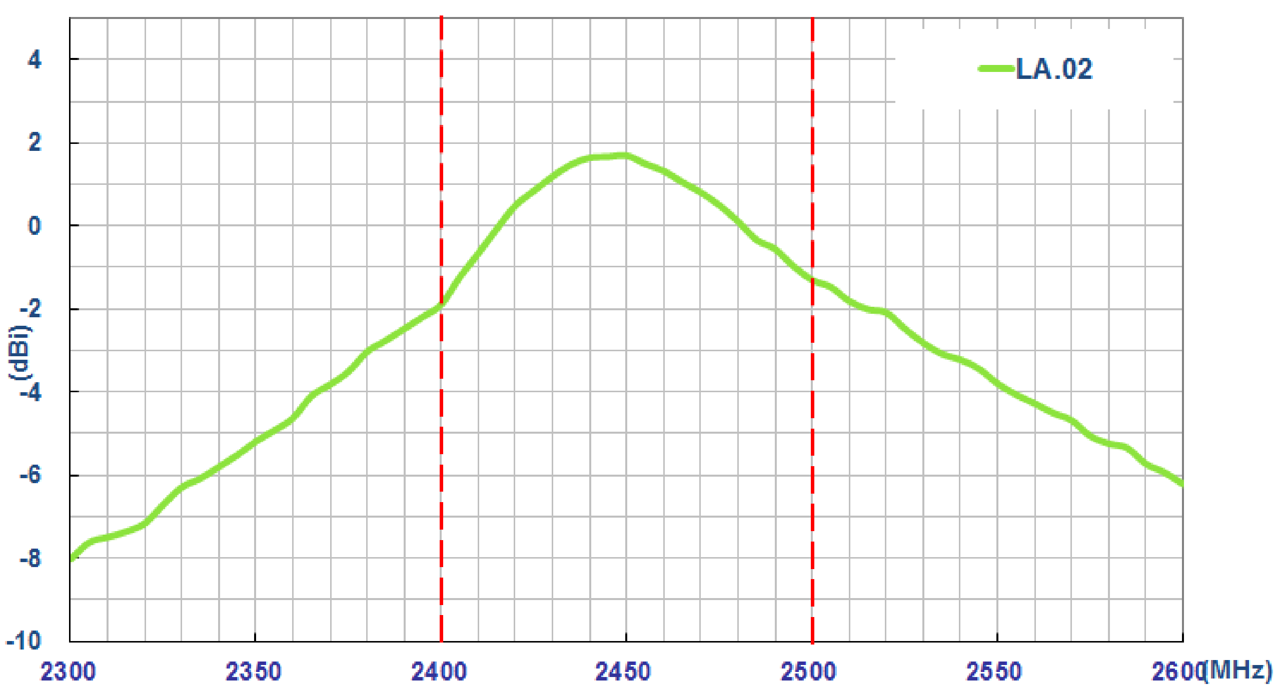
3.1 Return Loss (S11)



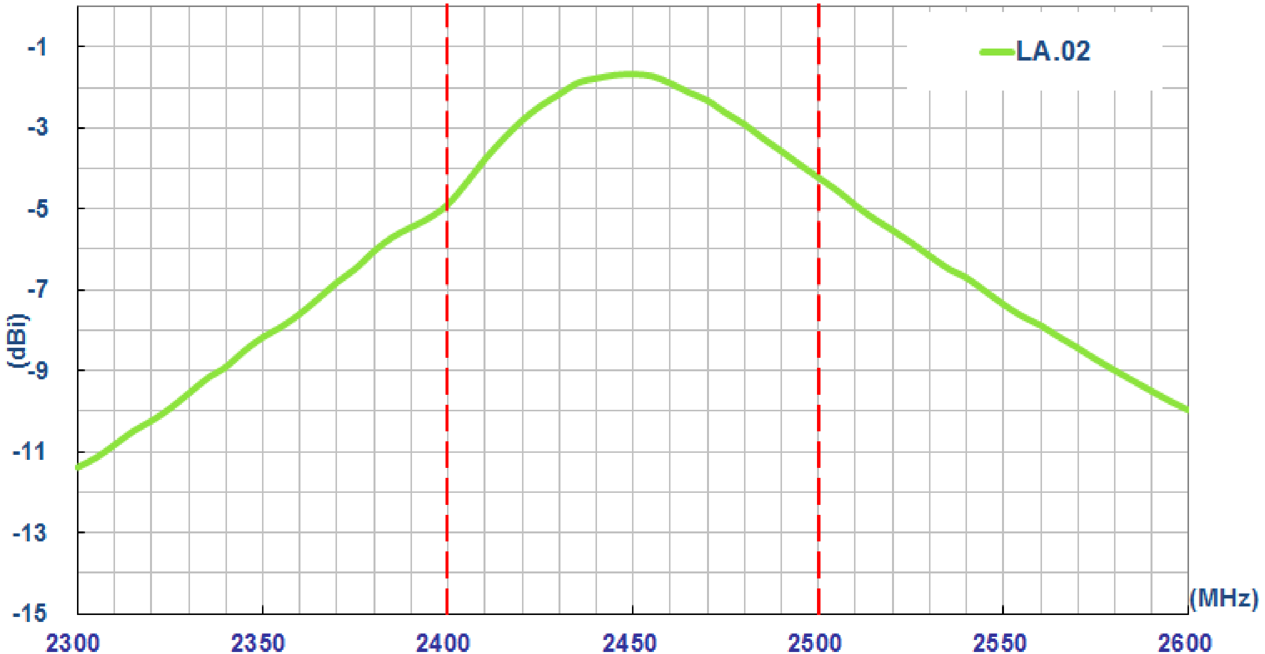
3.2 Efficiency



3.3 Peak Gain

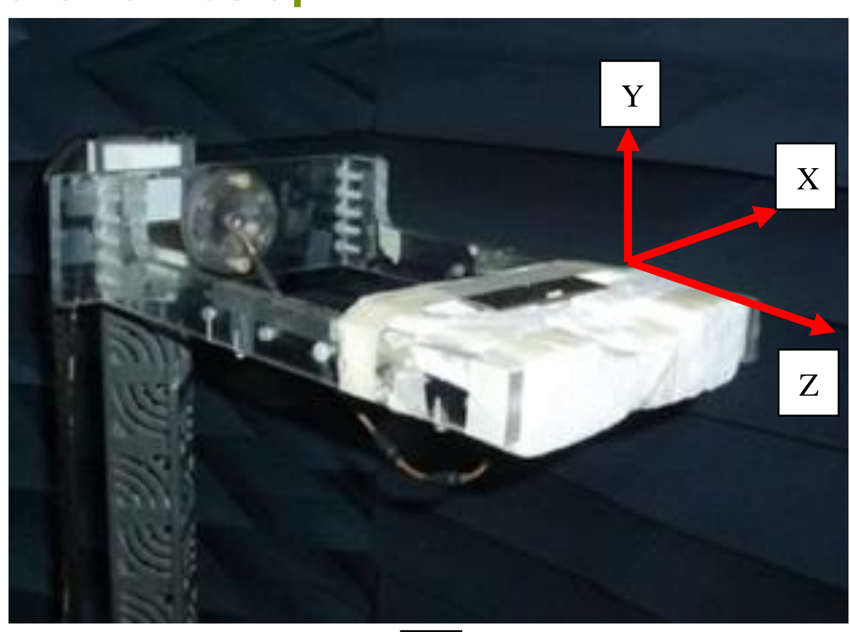


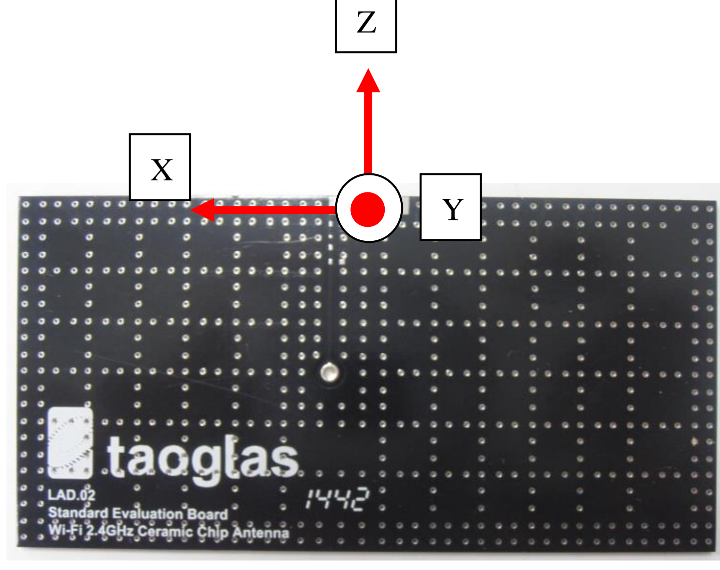
3.3 Average Gain



4. Radiation Pattern

4.1 Measurement Setup





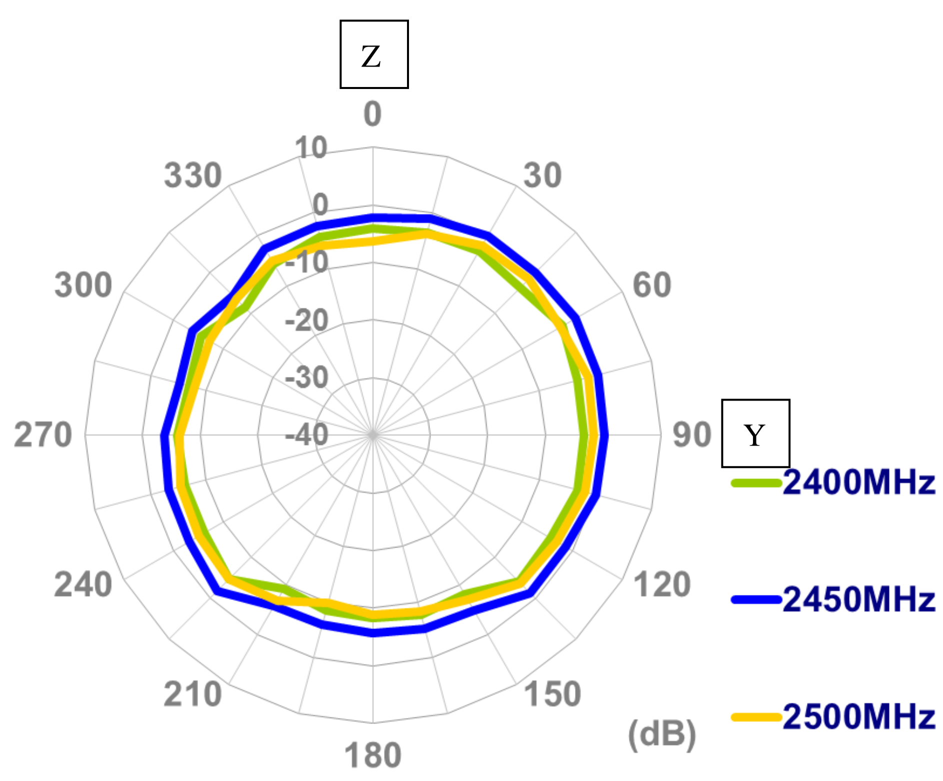
4.2 2D Radiation Pattern

X

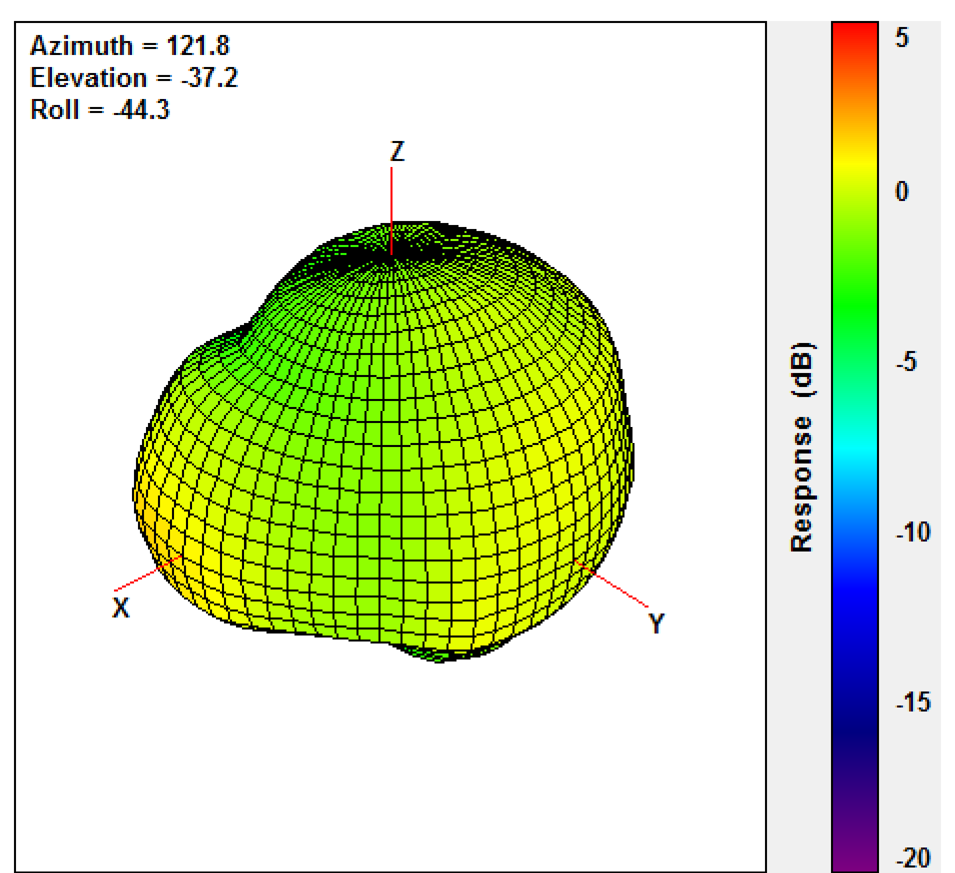
0
10
330
30
0
-10
300
60
-20
-30
270
-40
90
Y
2400MHz
240
120
2450MHz
210
150
2500MHz
(dB)
180

Z

0
10
330
30
0
-10
300
60
-20
-30
270
-40
90
X
2400MHz
240
120
2450MHz
210
150
2500MHz
(dB)
180



4.3 3D Gain pattern @2450MHz

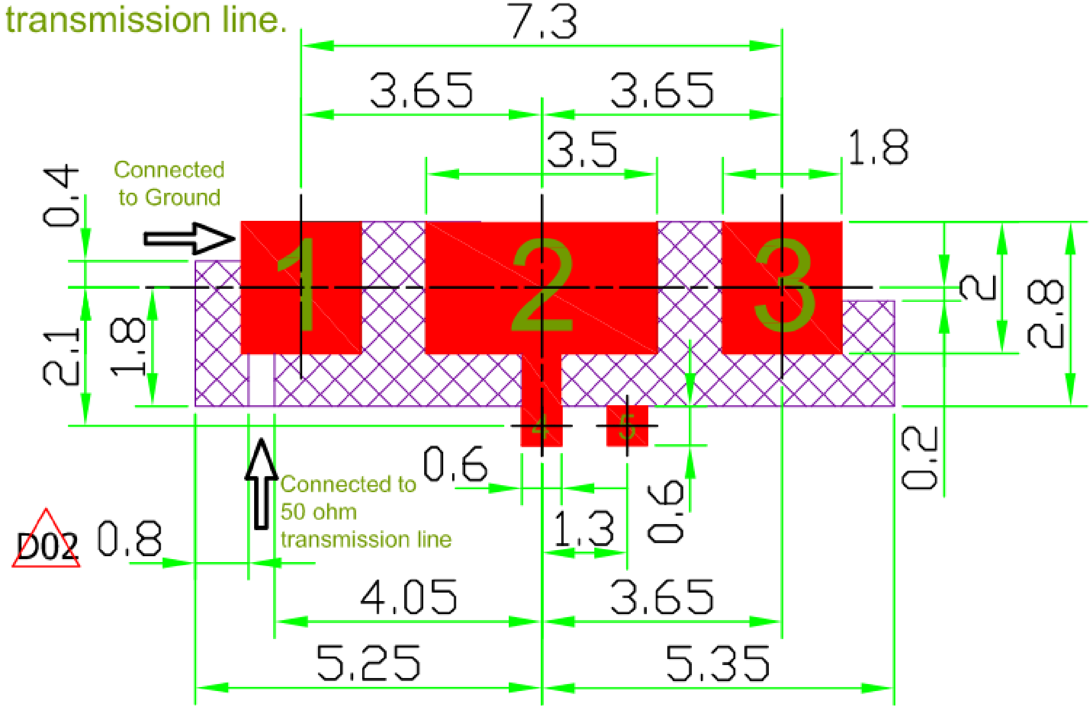


5. Layout Guide (Unit: mm)

Land pattern for soldering (grey marking areas) is as shown below. A matching circuit similar to the one shown in section 5.5 is also required.

5.1 Top Copper

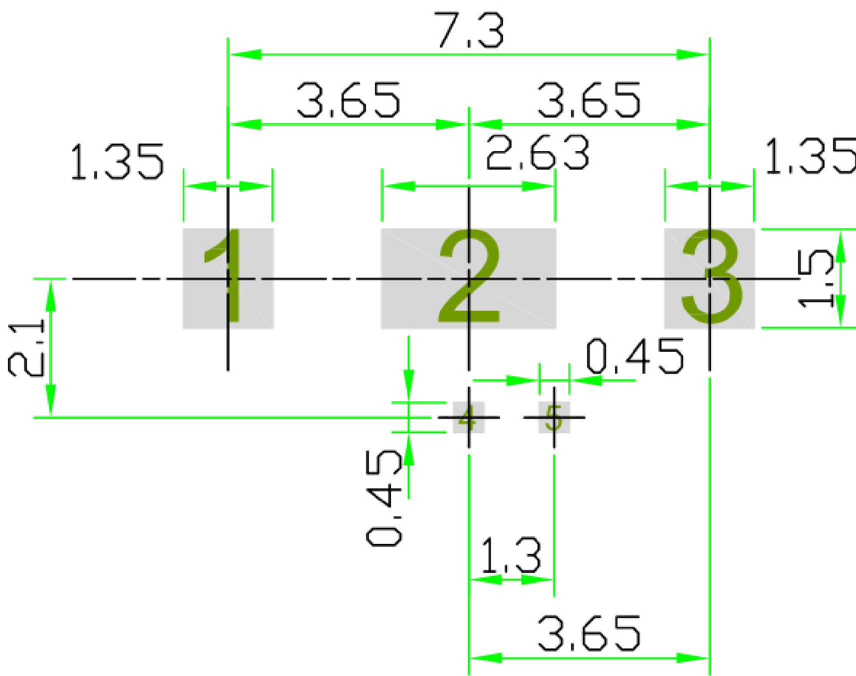
Pads 1 and 3 are the same size, Pads 4 , 5 are the same size.
Pad 1 , 3 , 5 should be connected to Ground. Pad 1 should be connected to a 50 ohm transmission line.



NOTE:
1. Tin Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Copper Keepout area
6. Ground keepout should extend from top layer through all inner PCB layers to minimize coupling from RF feed to ground. The bottom PCB layer can be solid ground plane.
7. Any vias in pads should be either filled or tented to prevent solder from wicking away from the pad during reflow.
8. The dimension tolerances should follow standard PCB manufacturing guidelines
9.Pads 4 and 5 are reserved and typically not populated.

5.2 Top Solder Paste

Pads 1 and 3 are the same size, Pads 4, 5 are the same size.

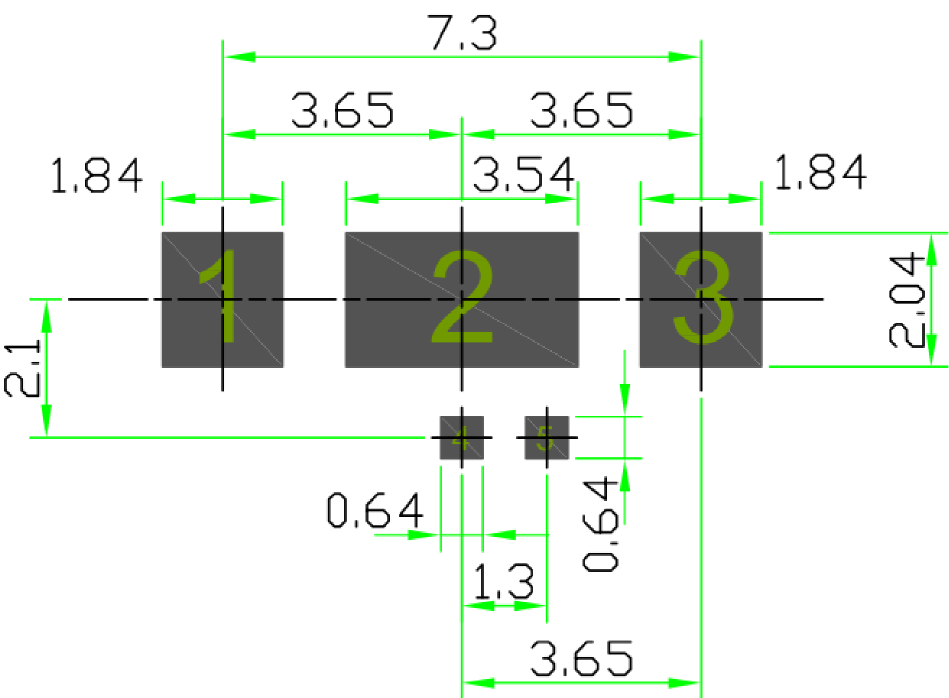


NOTE:

1. Tin Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Copper Keepout area
6. Ground keepout should extend from top layer through all inner PCB layers to minimize coupling from RF feed to ground. The bottom PCB layer can be solid ground plane.
7. Any vias in pads should be either filled or tented to prevent solder from wicking away from the pad during reflow.
8. The dimension tolerances should follow standard PCB manufacturing guidelines
9. Pads 4 and 5 are reserved and typically not populated.

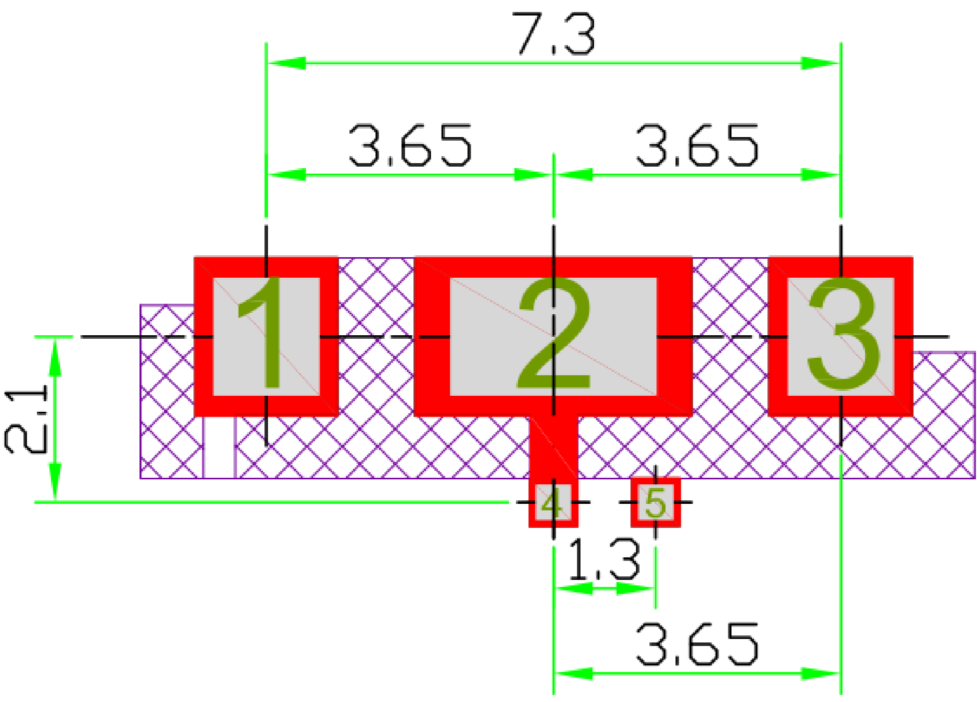
5.3 Top Solder Mask

Pads 1 and 3 are the same size, Pads 4 , 5 are the same size.
This drawing is a negative of solder mask. Black regions are anti-mask.



NOTE:
1. Tin Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Copper Keepout area
6. Ground keepout should extend from top layer through all inner PCB layers to minimize coupling from RF feed to ground. The bottom PCB layer can be solid ground plane.
7. Any vias in pads should be either filled or tented to prevent solder from wicking away from the pad during reflow.
8. The dimension tolerances should follow standard PCB manufacturing guidelines
9.Pads 4 and 5 are reserved and typically not populated.

5.4 Composite Diagram

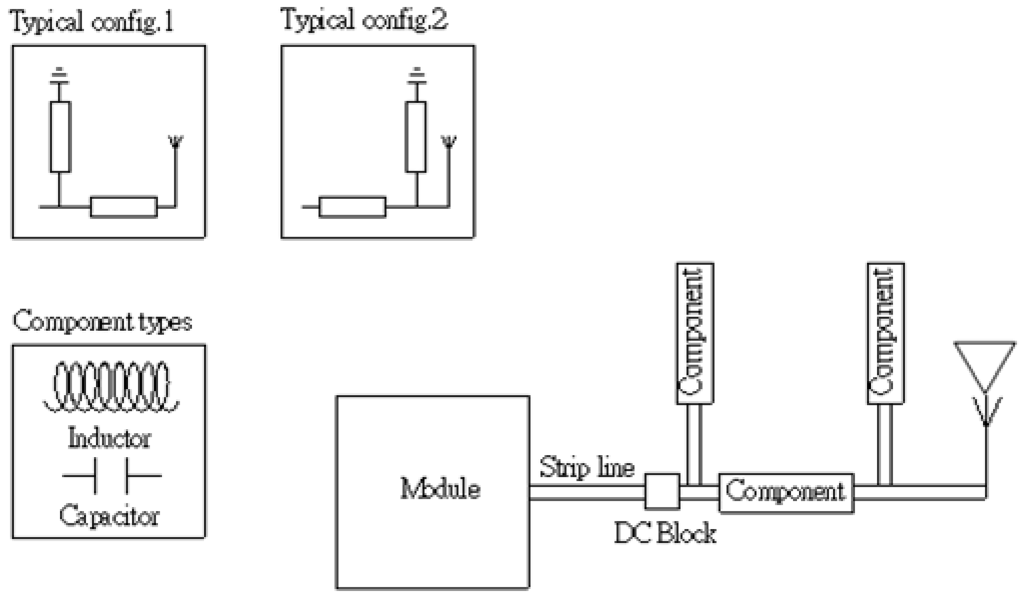


NOTE:

1. Tin Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Copper Keepout area
6. Ground keepout should extend from top layer through all inner PCB layers to minimize coupling from RF feed to ground. The bottom PCB layer can be solid ground plane.
7. Any vias in pads should be either filled or tented to prevent solder from wicking away from the pad during reflow.
8. The dimension tolerances should follow standard PCB manufacturing guidelines
9. Pads 4 and 5 are reserved and typically not populated.

5.5 Matching Circuit

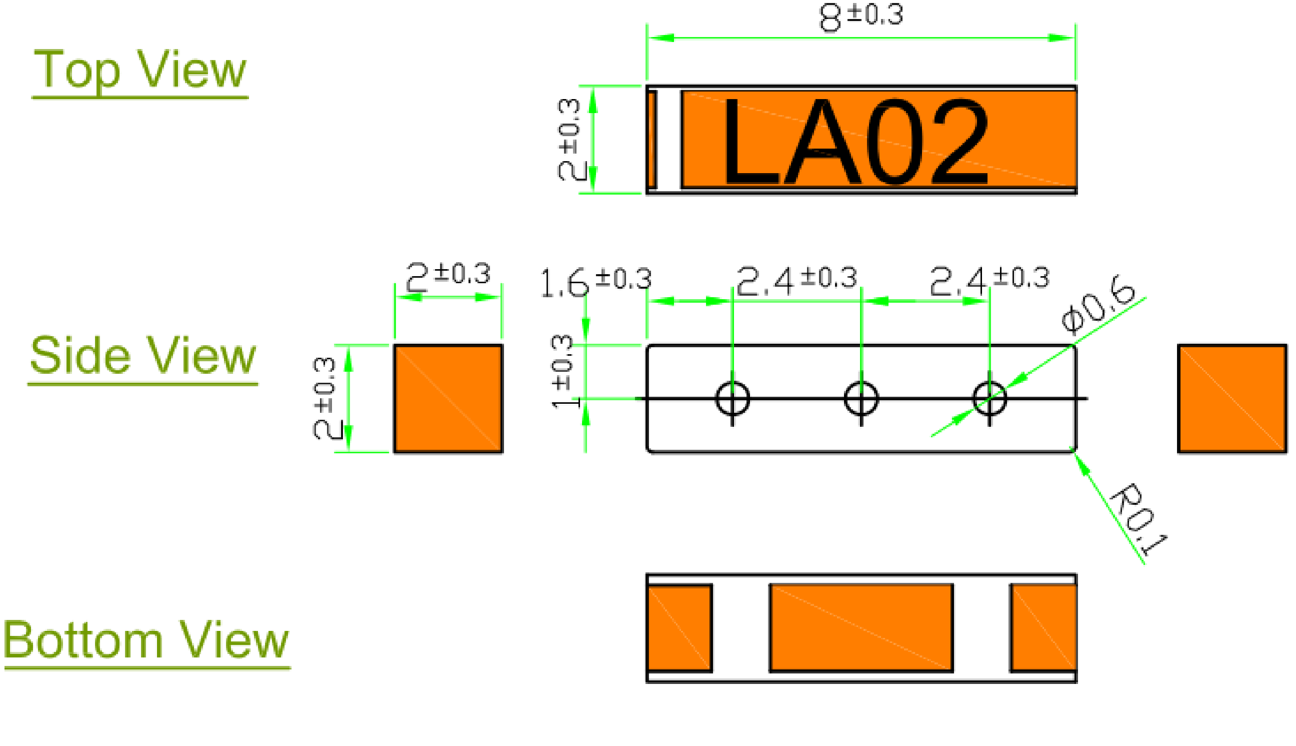
Like all antennas, surrounding components, enclosures, and changes to the GND plane dimensions can alter performance. A pi-matching network like the one shown below is required in case adjustments need to be made. The antenna evaluation board (EVB) has a similar matching network. The components on the EVB are a good starting point for a new design, but will need to be adjusted upon integration to as close as possible to 50 Ohm impedance for best performance. The zero ohm resistor is needed for the ability to solder down a coax pigtail to make measurements with a vector network analyzer. Contact your regional Taoglas sales office for support.



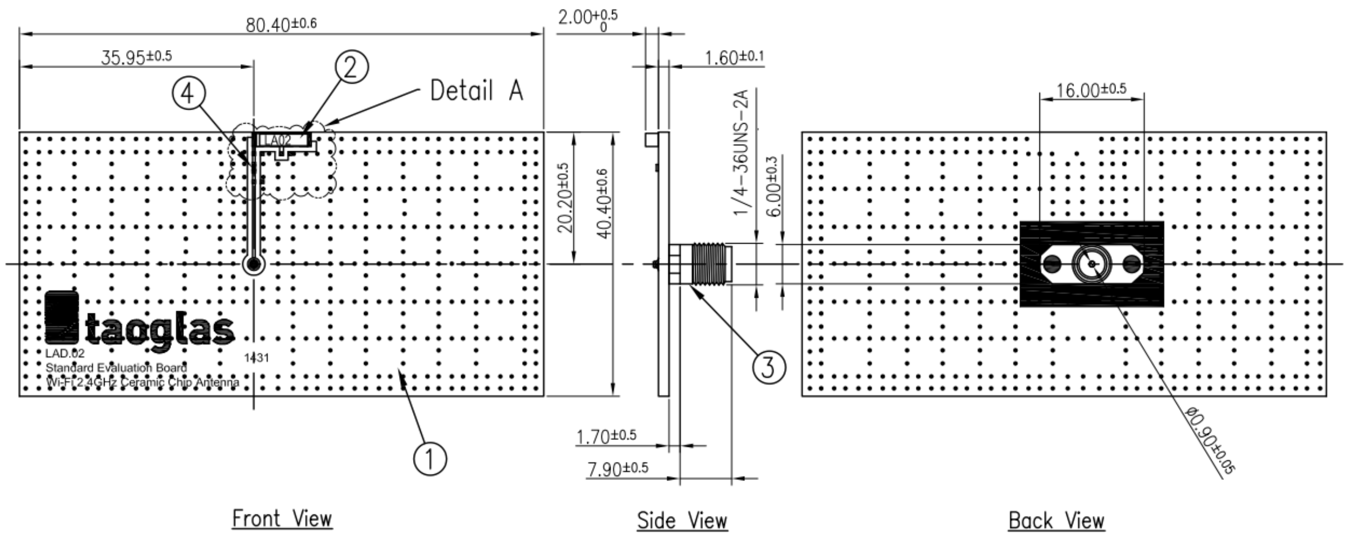
The matching network has to be individually designed using one,two or three components.

6. Antenna Drawings

6.1 Antenna Main Body (Unit: mm)



6.2 Antenna with Evaluation board LAD.02 (Unit: mm)

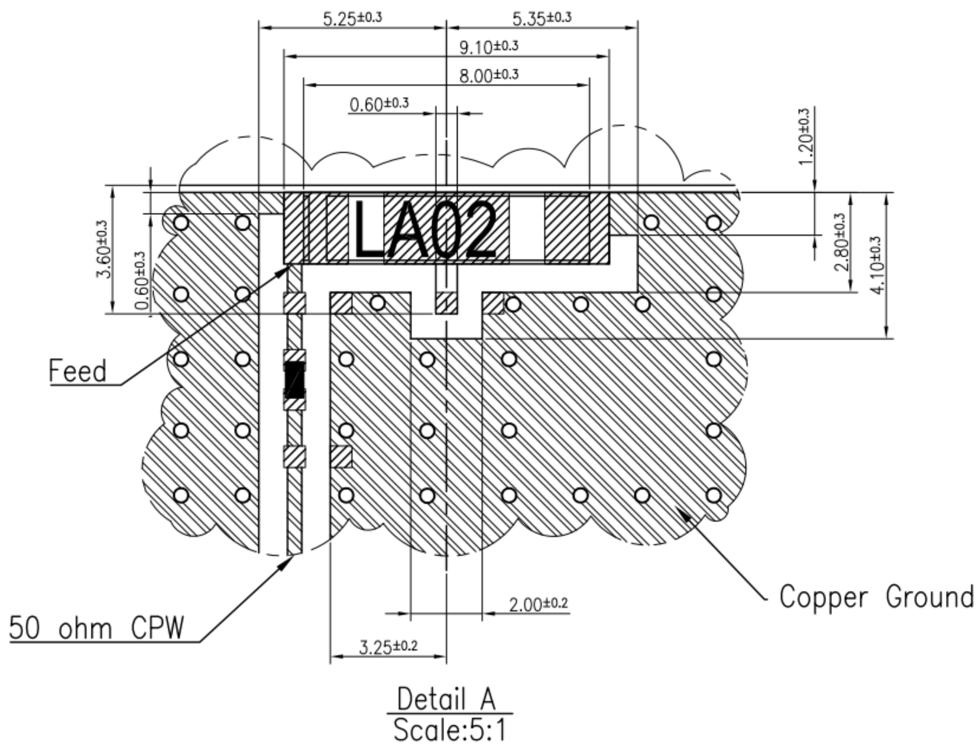


NOTES:

1. Solder Area
2. Logo & Text Ink Printing : White
3. Copper
4. Matching Component

	Name	P/N	Material	Finish	QTY
1	LAD.02_EVB Board	100214H000007A	FR4 1.6t	Black	1
2	LA.02 Chip Antenna	001514L000007A	Ceramic	N/A	1
3	SMA(F) ST	200411I000007A	Brass	Gold Plated	1
4	Resistor 0Ω (0402)	001514L010007A	Ceramic	N/A	1

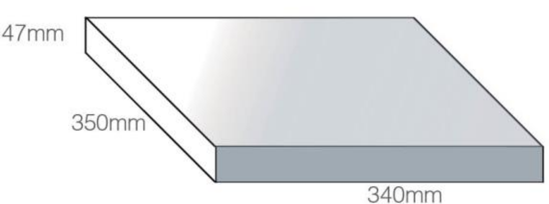
6.3 Footprint on Taoglas Evaluation board (Unit: mm)



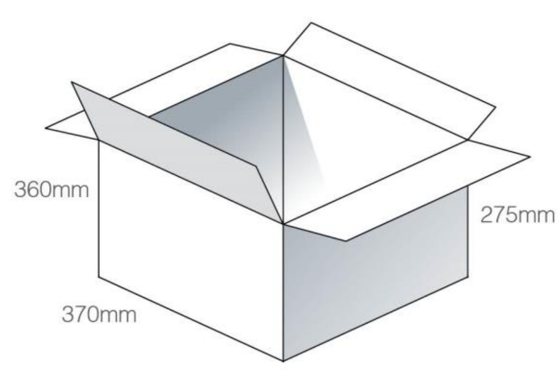
7. Packaging

IEC 286-3 : Polyester Blister Tape Reel
2,000 Pieces LA.02
Dimensions - Diameter 330*18mm
Weight - 650g

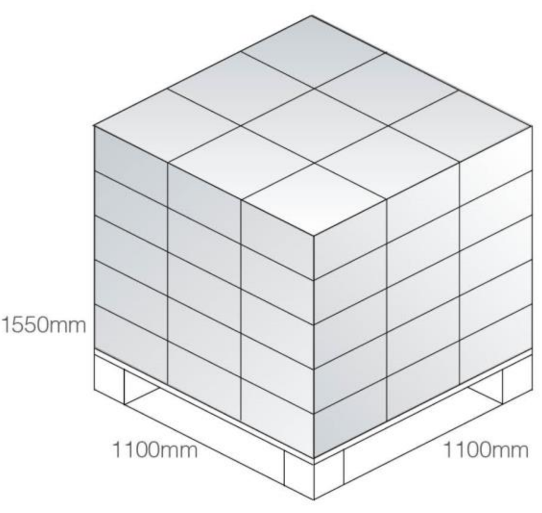
Unit: mm



1 pc reel in small inner box
Dimensions - 350*340*47mm
Weight - 1Kg



5 Reels / 10,000 pcs in one carton
Carton Dimensions - 360*370*275mm
Weight - 6Kg



Pallet Dimensions 1100*1100*1550mm
45 Cartons per Pallet
9 Cartons per layer
5 Layers

Unit: mm

8. Recommended Reflow Temp Profile

Phase	Profile features	Pb-Free Assembly (SnAgCu)
PREHEAT	-Temperature Min(Tsmin) -Temperature Max(Tsmax) -Time(ts) form (Tsmin to Tsmax)	150℃ 200℃ 60-120 seconds
RAMP-UP	Avg. Ramp-up Rate (Tsmax to TP)	3℃/second(max)
REFLOW	-Temperature(TL) -Total Time above TL (t L)	217℃ 30-100 seconds
PEAK	-Temperature(TP) -Time(tp)	260℃ 5-10 second
RAMP-DOWN	Rate	6℃ / second max.
Time from 25℃ to Peak Temperature		8 minutes max.
Composition of solder paste		96.5Sn/3Ag/0.5Cu
Solder Paste Model		SHENMAO PF606-P26

The graphic shows temperature profile for component assembly process in reflow ovens