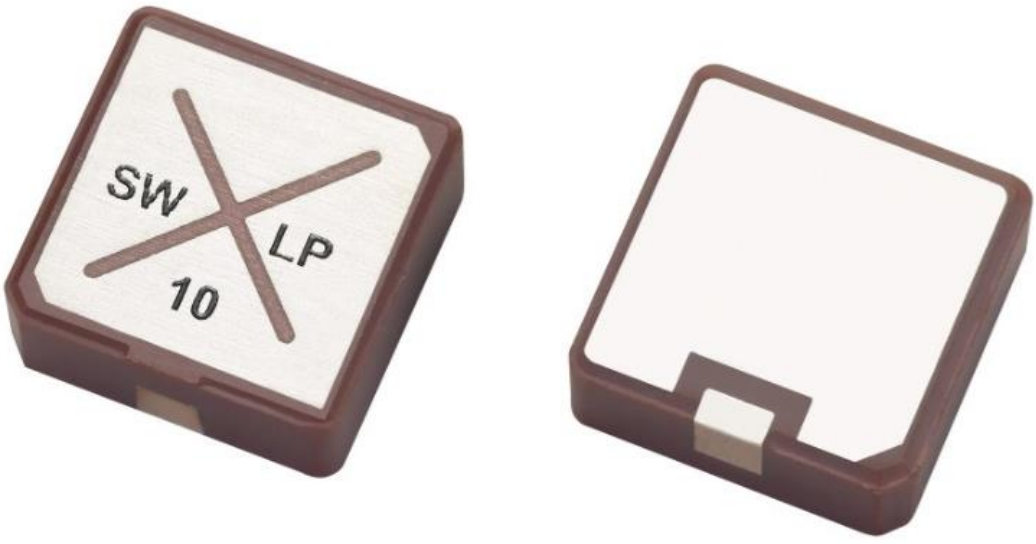
SPECIFICATION
PATENT PENDING

Part No. : **SWLP.2450.10.4.A.02**

Product Name : 10mm Surface Mount 2.4 GHz Patch Antenna

Feature : 2400 MHz to 2500 MHz SMT Ceramic Patch Antenna
Best solution for Bluetooth LE Wearable Applications
Works equally well on WIFI/WLAN/ISM/ZigBee
10*10*4mm
Tuned on a 12*16mm ground plane
Linearly Polarized
Patent Pending
RoHS Compliant



1. Introduction

The SWLP.2450.10.4.A.02 patent pending 10mm SMT ceramic patch antenna is a breakthrough antenna in terms of size and performance. The smallest 2.4GHz patch available worldwide, it is ideally suited for 2.4 GHz applications such as Bluetooth LE, Wi-Fi, ISM, and ZigBee. It was developed specifically for Bluetooth LE wearable applications to work directly on ground (except for feed area) and over metal, device environments which traditional chip antennas cannot operate in. The antenna also does not need ground plane clearance around it (except for feed area). It provides omni-directional coverage similar to chip antennas on small boards.

The antenna exhibits 24.8% efficiency on a 12*16mm ground plane at 2455 MHz. If utilized on a 50*50 ground plane, efficiency will improve to 40% at 2455MHz.

Typical applications are:

* Wearables
* Tablets
* Hand-held devices
* USB dongles
* Smart home applications

The SWLP.2450.10.4.A.02 can be placed in any position on the device ground plane. Like all small antennas, frequency detuning or efficiency change can occur due to surrounding components and enclosure housing. Larger ground-planes increase peak gain and efficiency. Taoglas helps customers fine tune the antenna for optimal performance through matching, correct board layout, transmission line design, and if necessary, custom antenna tuning for a MOQ.

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.

Contact your regional Taoglas sales office for support.

2. Specification Table

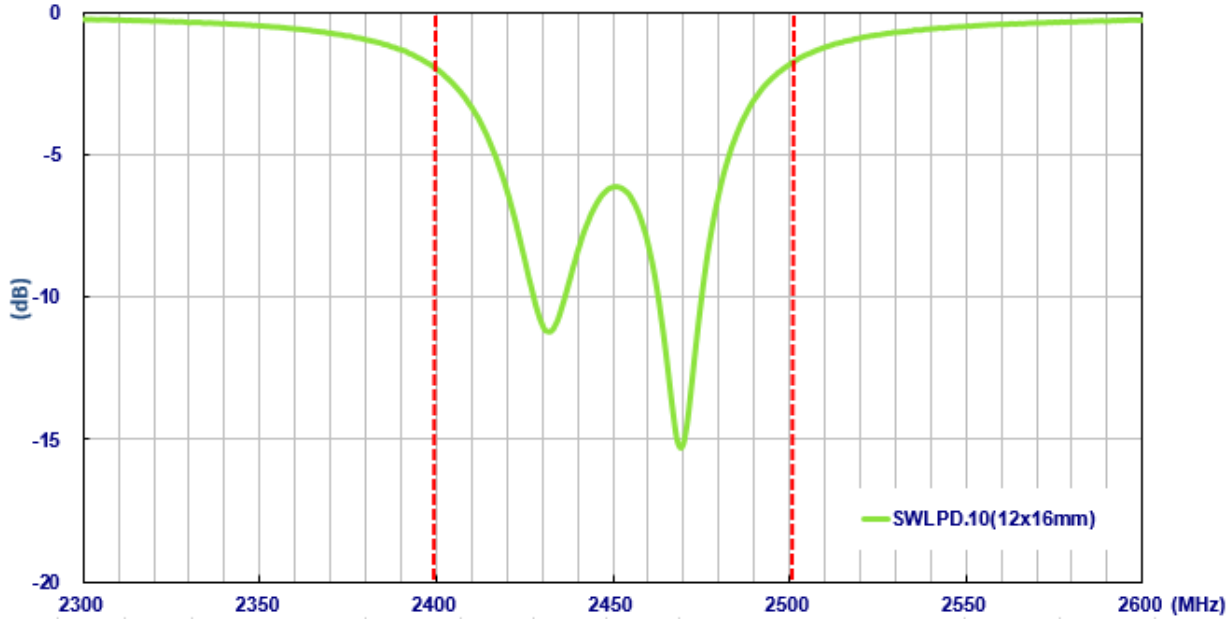
ELECTRICAL	
Frequency Range	2400 MHz to 2500 MHz
Efficiency	24.80% @2455 MHz, Edge 10.42% @2400 MHz, 11.40% @2500 MHz
Average Gain	-6 dBi @2450 MHz
VSWR	3 max @ Center Frequency
Peak Gain	-1.0 dBi typ.
Polarization	Linear
Impedance	50 Ohm
MECHANICAL	
Dimensions	10mm X 10mm X 4mm
Weight	3.1 g
ENVIRONMENTAL RATINGS	
Operating Temperature	-40◦C to + 105◦C
Storage Temperature	-40◦C to + 105◦C

*All tests done on a 12*16 mm ground plane. Antenna performance will vary depending on ground-plane dimensions and housing.

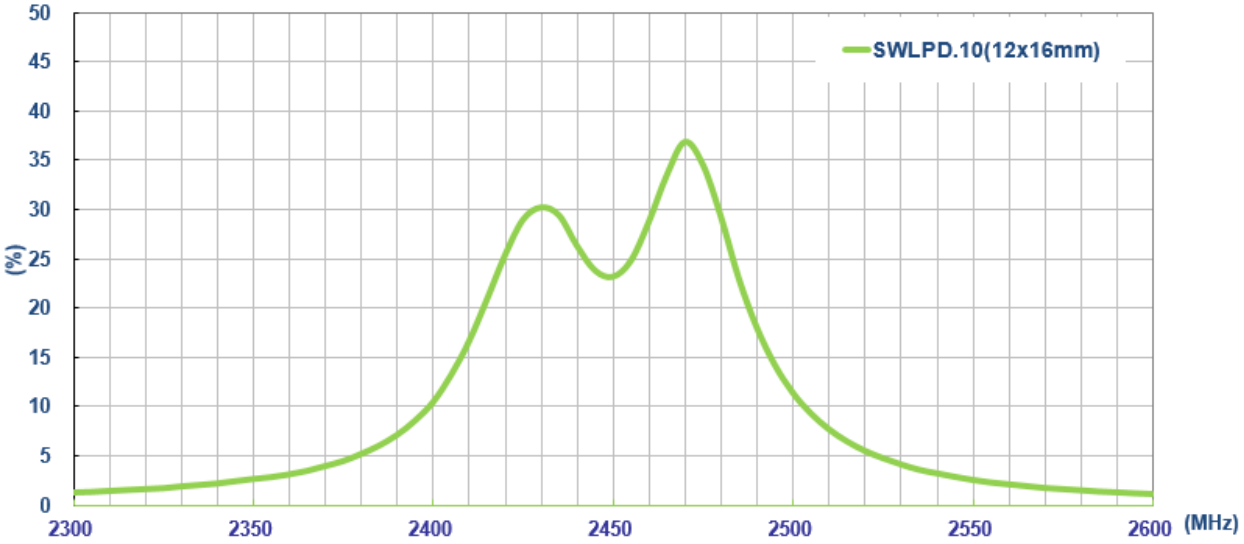
Figure 1 – Antenna on Evaluation Board, Top View (left) and Bottom View (right)

3. Antenna Characteristics

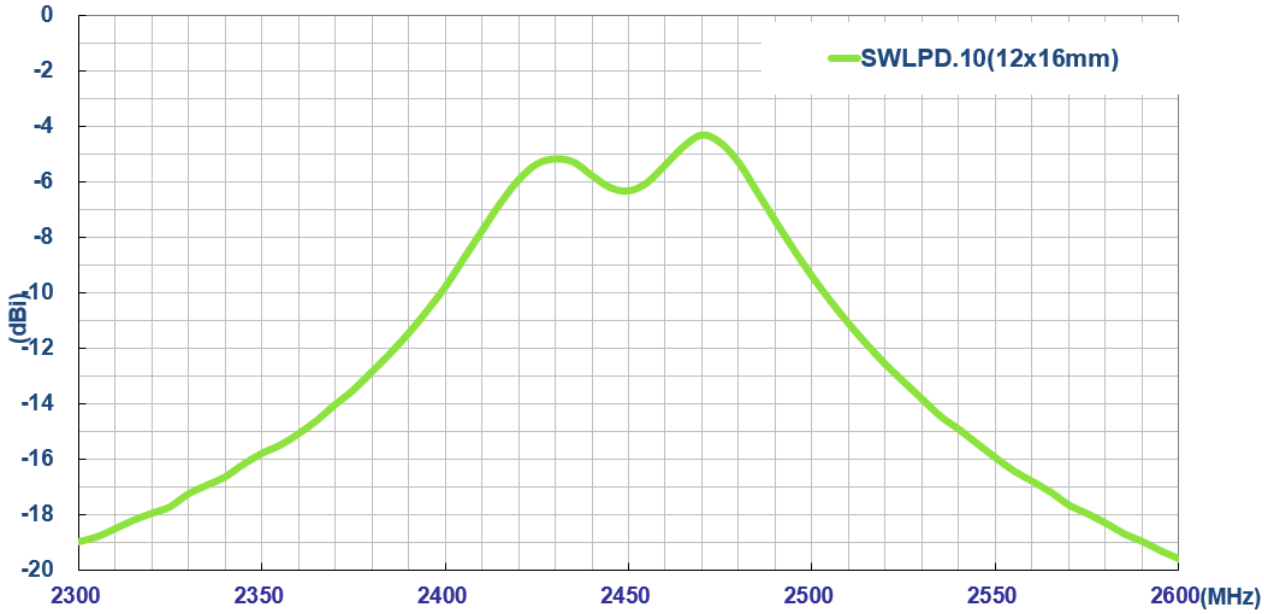
3.1 Return Loss



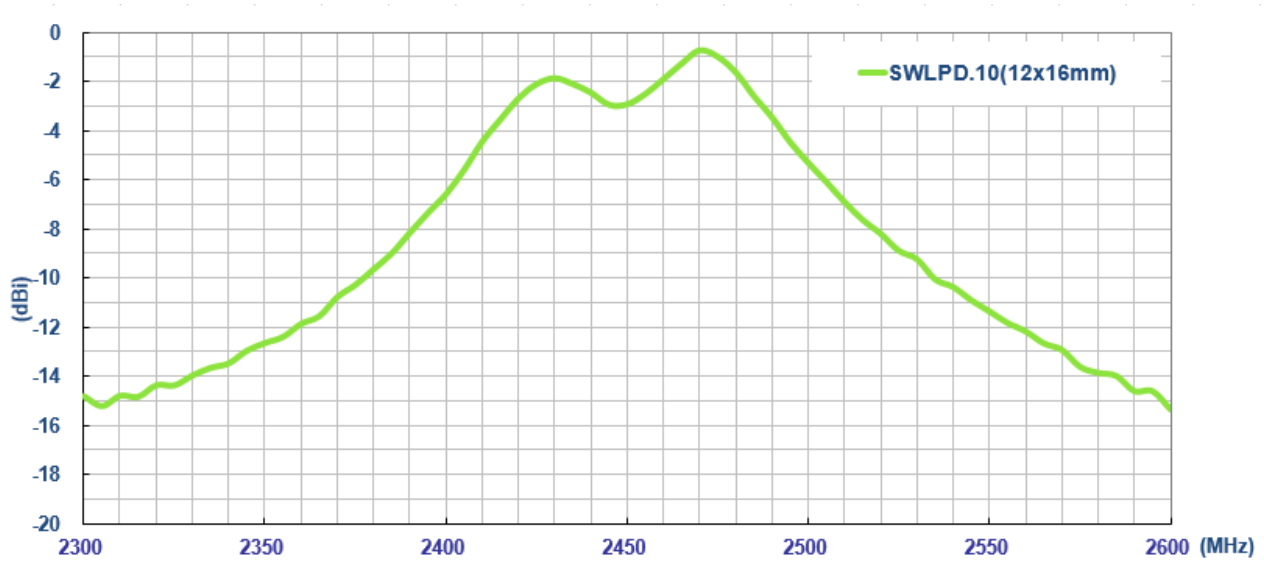
3.2 Efficiency



3.3 Average Gain



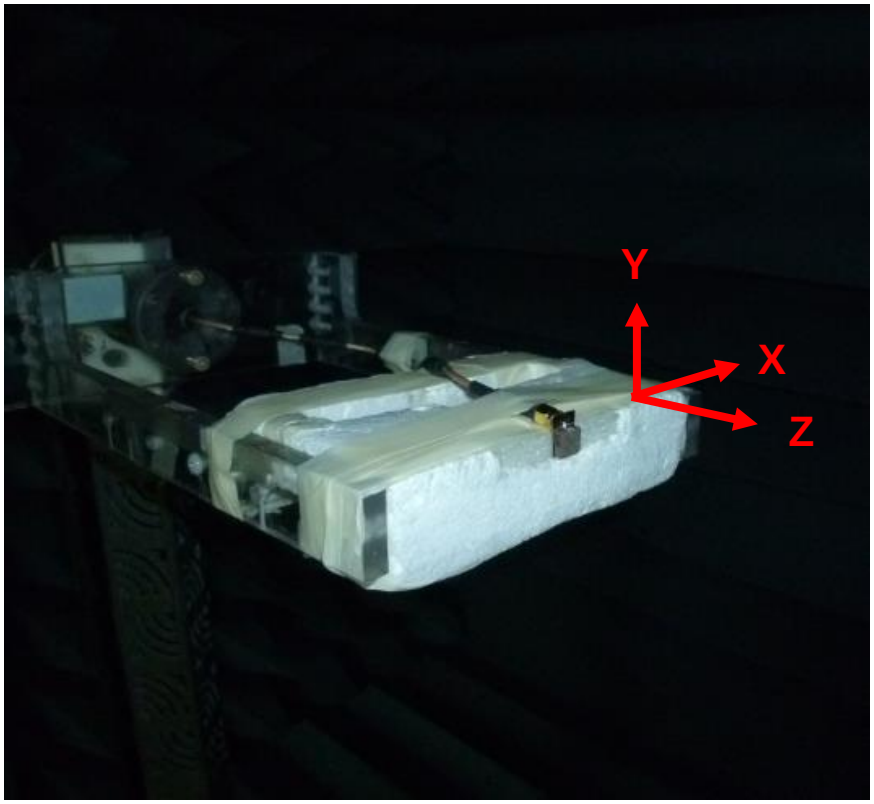
3.4 Peak Gain



4. Antenna Radiation Patterns

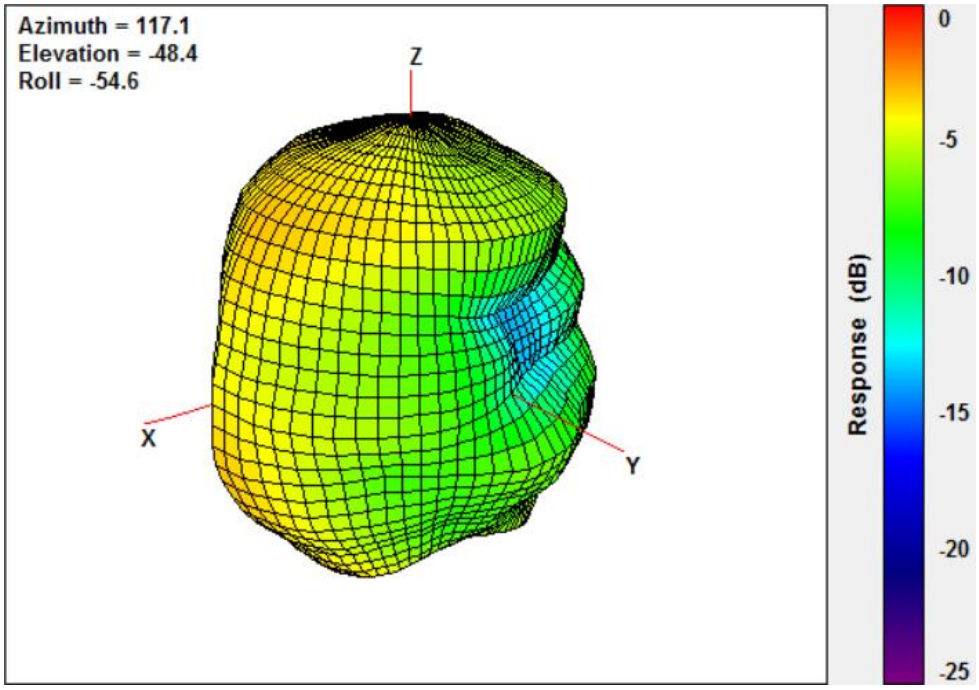
4.1 Test Setup

The antenna radiation pattern measurement setup is shown below

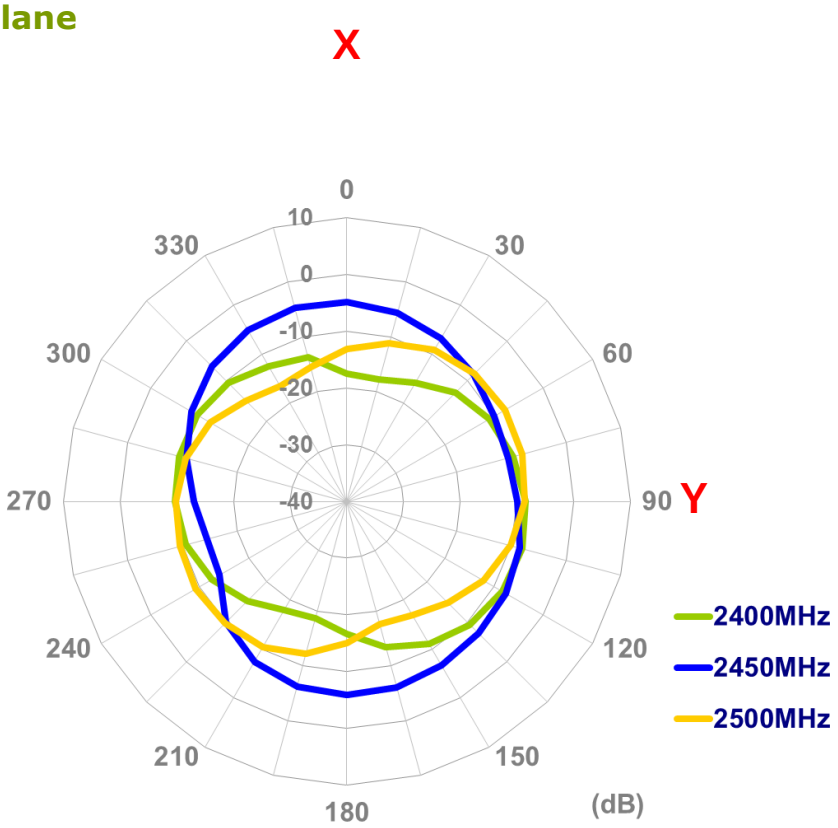


4.2 Antenna Radiation Patterns

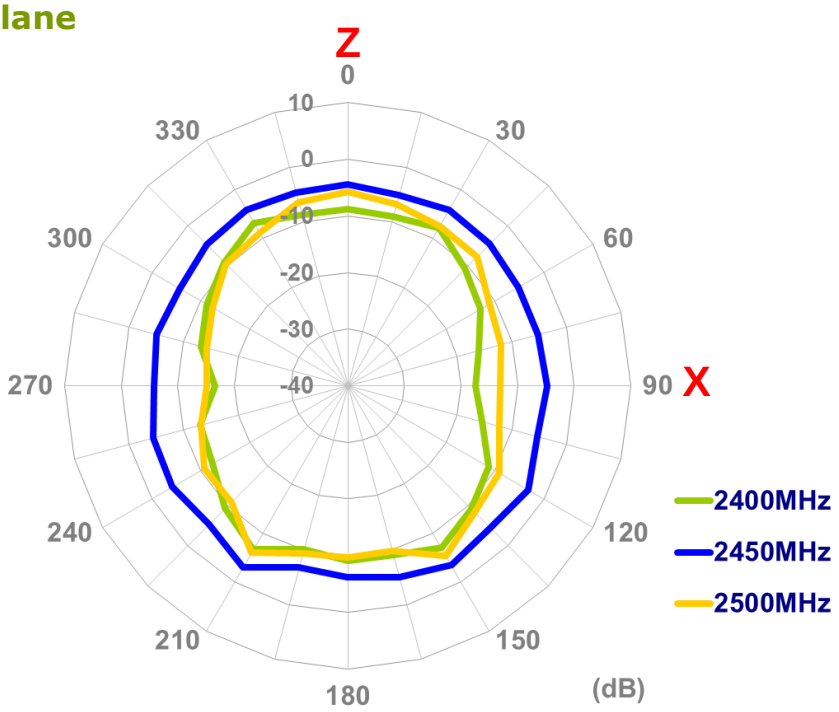
4.2.1 3D Radiation Pattern at 2450MHz



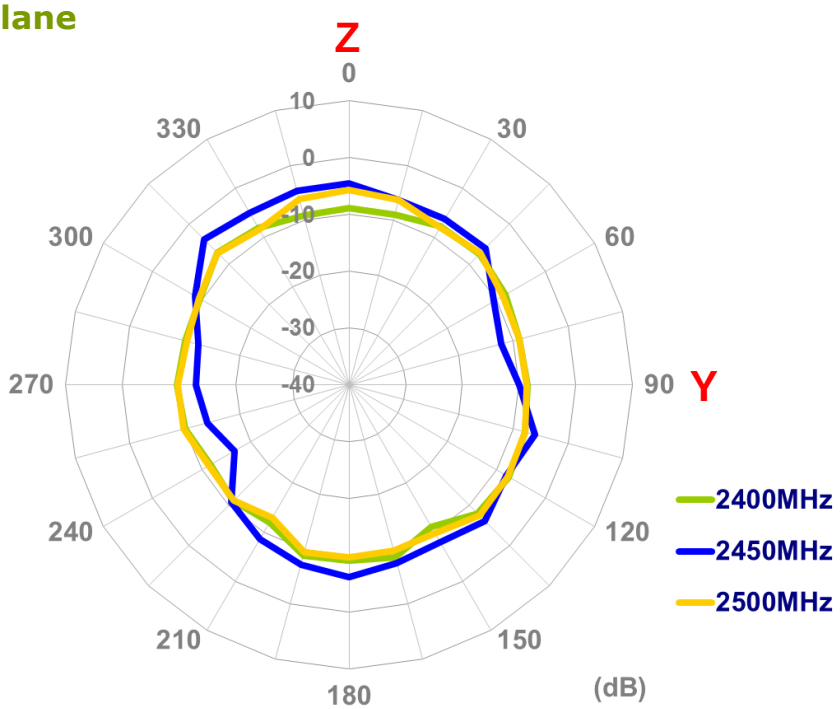
4.2.2 XY-Plane



4.2.3 XZ-Plane

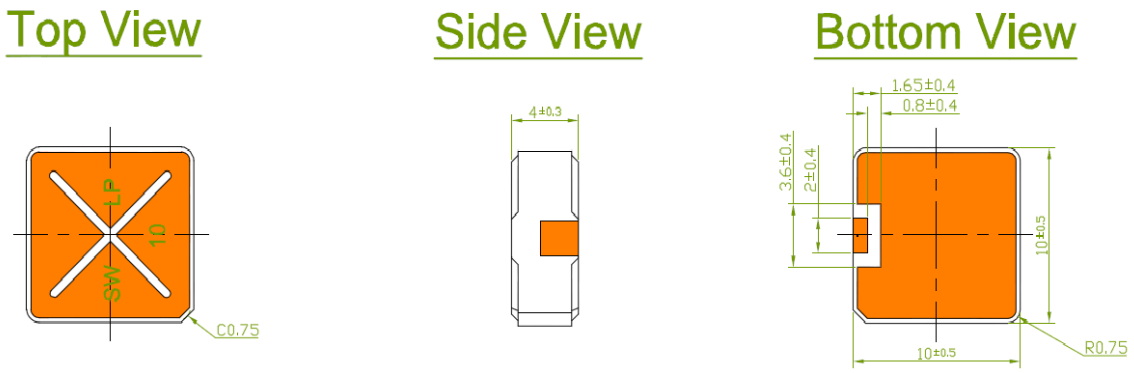


4.2.4 YZ-Plane



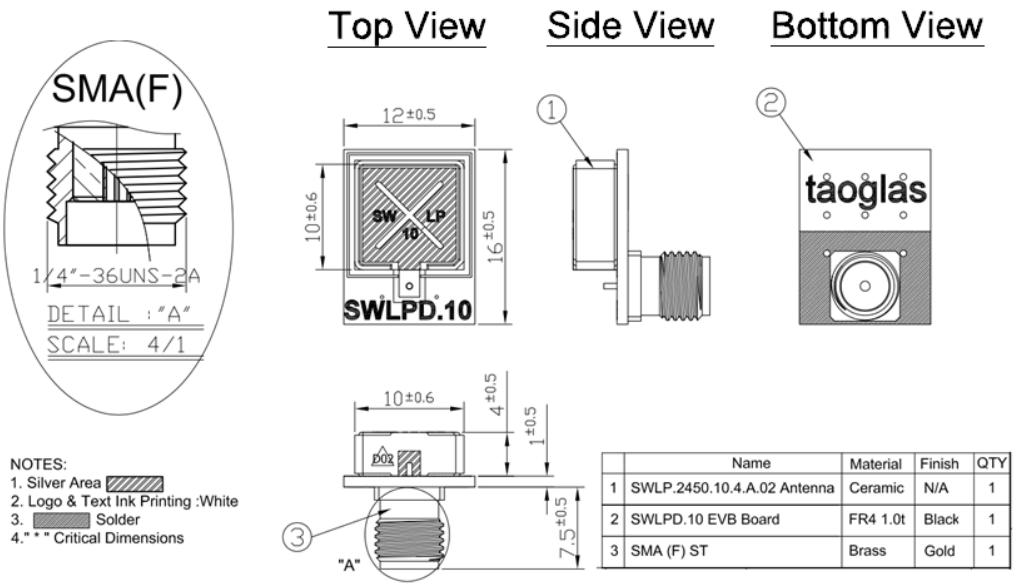
5. Mechanical Drawing

5.1 Patch



Unit:mm

5.2 Evaluation Board Dimensions



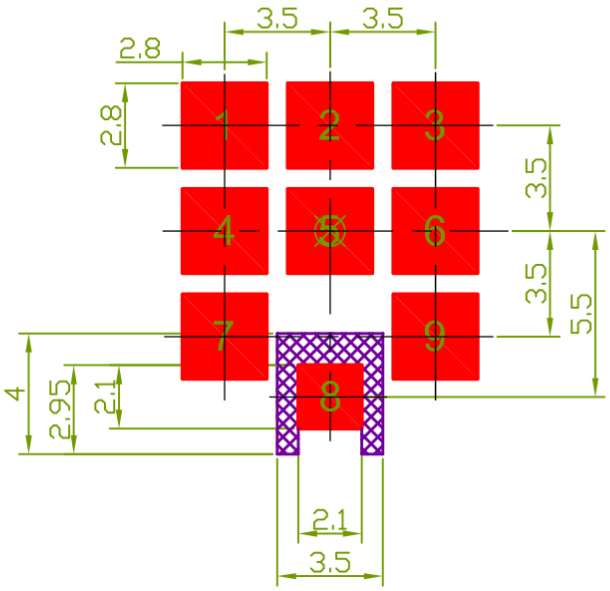
	Name	Material	Finish	QTY
1	SWLP.2450.10.4.A.02 Antenna	Ceramic	N/A	1
2	SWLPD.10 EVB Board	FR4 1.0t	Black	1
3	SMA (F) ST	Brass	Gold	1

Unit:mm

6. Footprint

6.1 Top Copper

Pads 1, 2, 3, 4, 5, 6, 7 and 9 are the same size. They should be connected to GND.

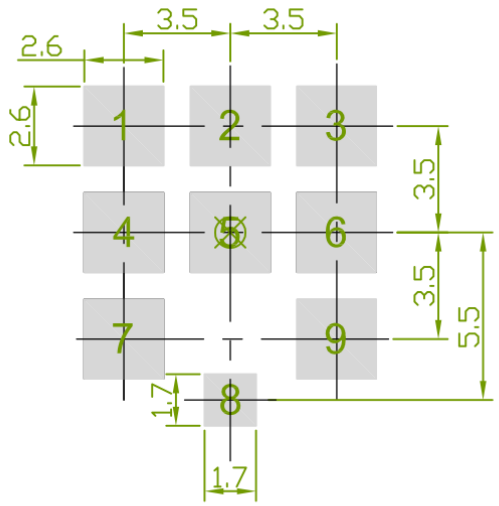


NOTE:

1. Ag Plated area
2. Solder Mask area
3. Copper area
4. Paste area
5. Copper Keepout Area
6. Copper keepout should extend through all PCB layers.
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

6.2 Top Solder Paste

Pads 1, 2, 3, 4, 5, 6, 7 and 9 are the same size.



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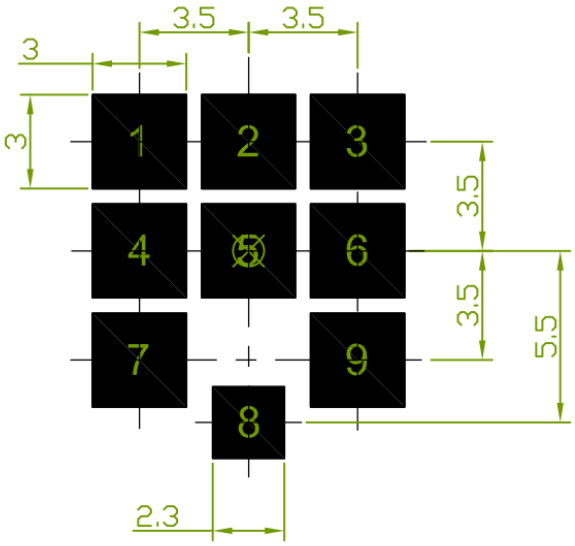
6.3 Top Solder Mask

Pads 1, 2, 3, 4, 5, 6, 7 and 9 are the same size,
This drawing is a negative of solder mask. Black regions are anti-mask.



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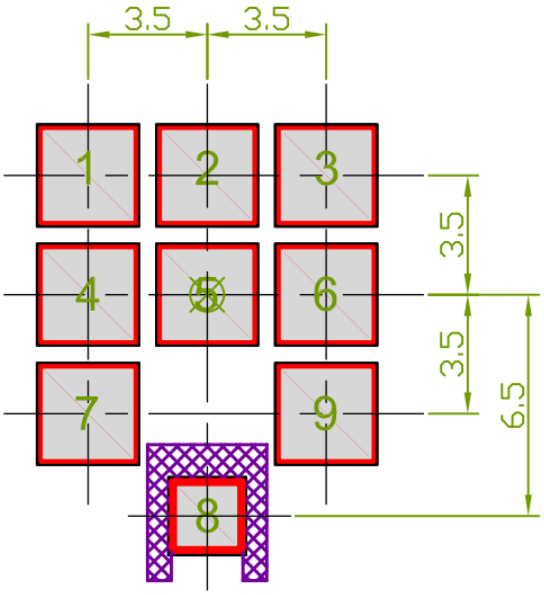
6.4 Composite Diagram



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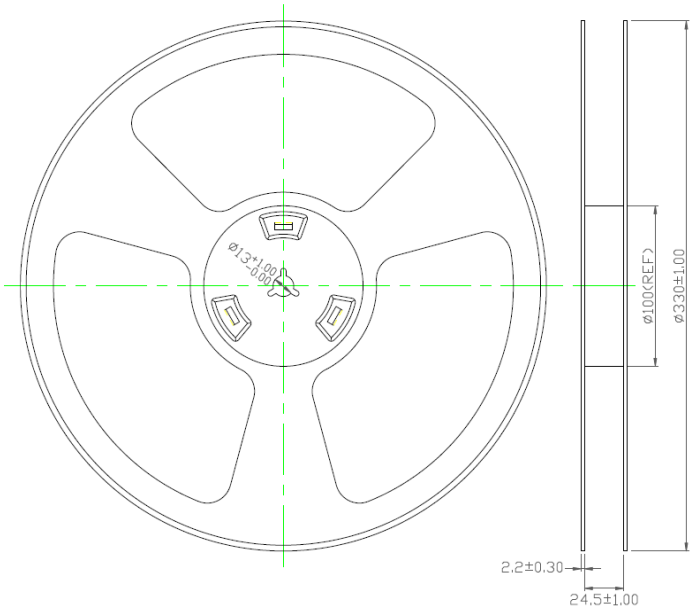
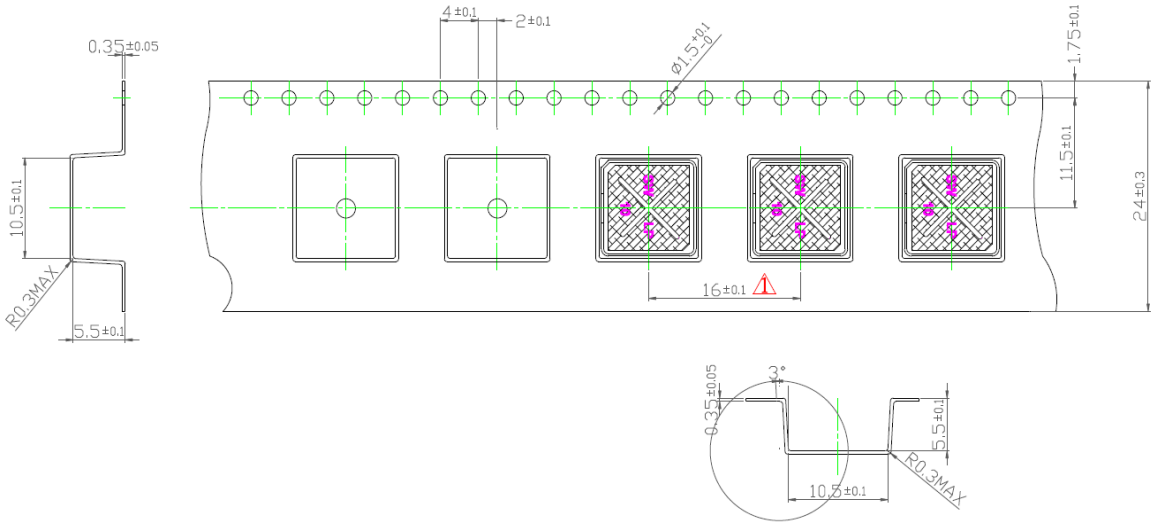
8. The dimension tolerances should follow standard PCB manufacturing guidelines

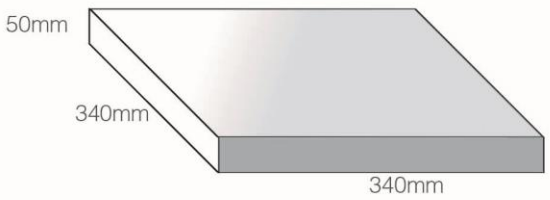
7. Packaging

IEC 286-3 : Polyester Blister Tape Reel
500 Pieces SWLP.2450.10.4.A.02
Dimensions - Diameter 335*30mm
Weight - 1.24Kg

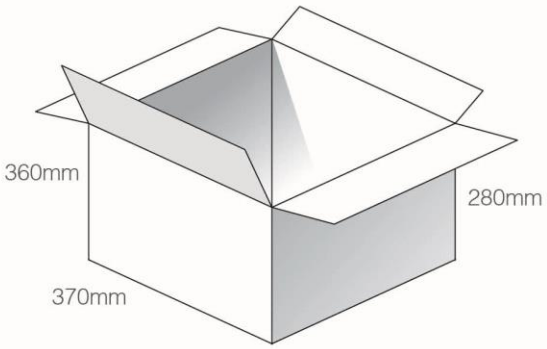




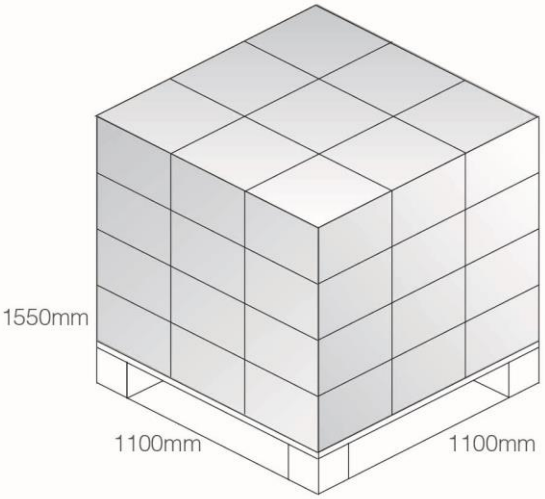
1 pc reel in small inner box
Dimensions - 340*340*50mm
Weight - 1.6Kg



5 Reels / 2,500 pcs in one carton
Carton Dimensions - 360*370*280mm
Weight - 10.6Kg



Pallet Dimensions 1100*1100*1270mm
36 Cartons per Pallet
9 Cartons per layer
4 Layers

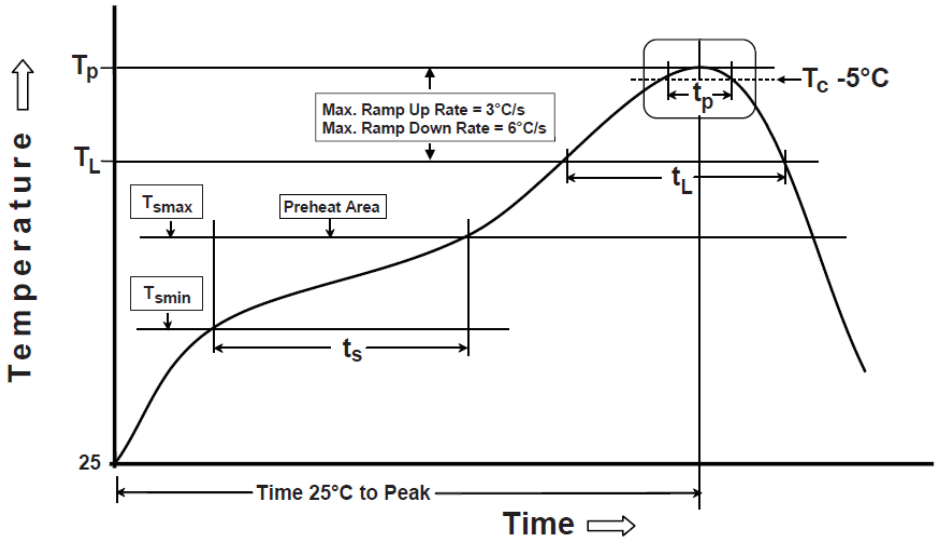


8. Recommended Reflow Temperature Profile

The SWLP.10 can be assembled following Pb-free assembly. According to the Standard IPC/JEDEC J-STD-020C, the temperature profile suggested is as follows:

Phase	Profile Features	Pb-Free Assembly (SnAgCu)
PREHEAT	Temperature Min(Tsmin) Temperature Max(Tsmax) Time(ts) from (Tsmin to Tsmax)	150°C 200°C 60-120 seconds
RAMP-UP	Avg. Ramp-up Rate (Tsmax to TP)	3°C/second(max)
REFLOW	Temperature(TL) Total Time above TL (tL)	217°C 30-100 seconds
PEAK	Temperature(TP) Time(tp)	260°C 15-25 seconds
RAMP-DOWN	Rate	6°C/second(max)
Time from 25°C 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



Soldering condition: Apply preheating at 120°C for 2-3 minutes. Finish soldering for each terminal within 3 seconds. If soldering iron temperature over270°C±10°C for 3 seconds, it may cause component surface peeling or damage.