TAOGLAS



Datasheet

**Part No:**
**WLA.10**

**Description:**

Dual-Band 2.4GHz/5.8GHz Wi-Fi® Ceramic Substrate Loop Antenna

**Features:**

- Dimensions: 3.2mm *1.6mm * 0.5mm
- High Efficiency
- Dual-band Wi-Fi® 2.4/5.8GHz
- Low profile
- Compact Size
- Surface-Mount
- RoHS and REACH compliant

| | | |
|---|---|---|
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# 1. Introduction



The WLA.10 2.4 / 5.8 GHz Loop antenna is a high efficiency, miniature SMD, edge mounted ceramic antenna for Dual-band 2.4 / 5.8 GHz Wi-Fi® and 802.11 applications where PCB space is limited, such as hand-held devices. The WLA.10 uses the main PCB as its ground plane, thereby maintaining good efficiency despite its small size. The efficiency is very stable on the complete bandwidth of both lower and upper bands allowing for maximum data throughput rates on all channels available.

The WLA.10 can be tuned for different PCB sizes/environments by simply changing the values of the matching circuit. Multiple WLA.10 antennas can be integrated easily on a board to achieve excellent MIMO throughput. At 3.2mm*1.6mm*0.5mm, the WLA.10 is one of the smallest antennas available worldwide. This antenna is delivered on tape and reel.

Typical application
- Dual-band Wi-Fi® Communications
- Handheld Devices
- IEEE 802.11 b/g/n/ac
- Tablet PCs
- Specialized Control Systems
- Wireless Remote Controls

The results below are based on a 80mm x 40mm ground-plane. If your ground-plane is smaller the efficiency will decrease.

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 2 dBi 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 2 dBi peak gain, but
you don't need to select an embedded antenna that has a peak gain of less than 2 dBi 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 3 dBi or more if available. Once that antenna gets integrated into your device, performance will degrade below this 2 dBi 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.

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 information please contact your regional Taoglas customer support team.

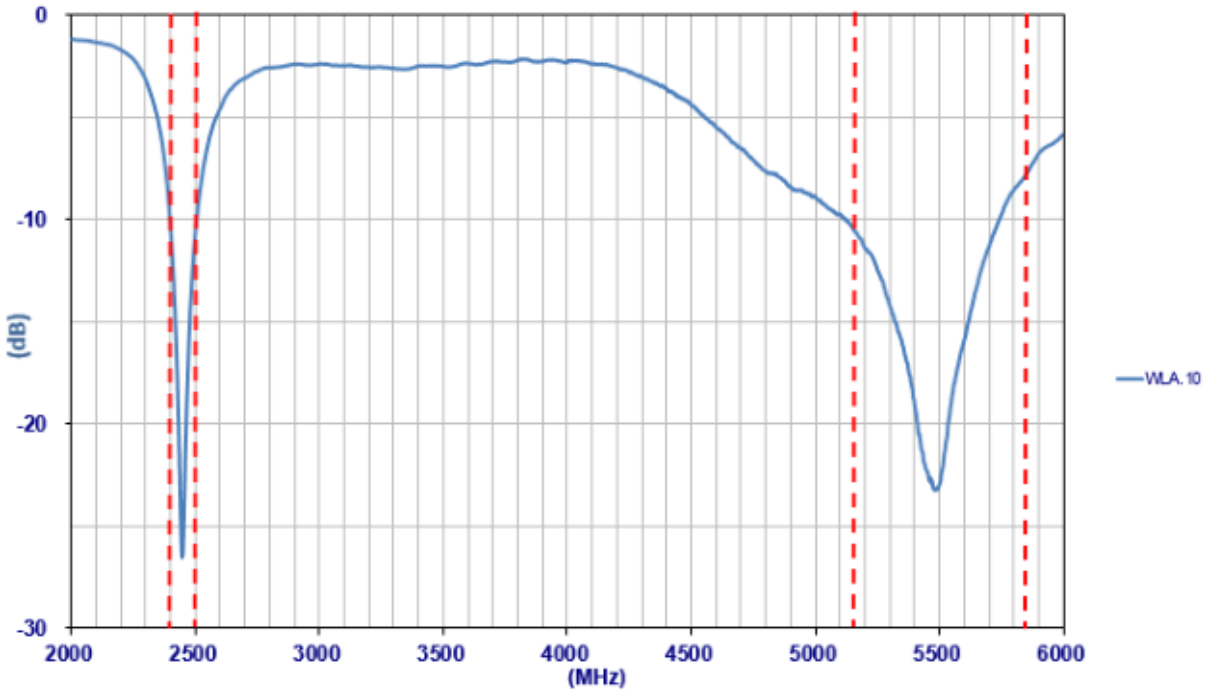
# 2. Specifications

| Electrical | | |
|---|---|---|
| Frequency (MHz) | 2400-2500 | 5150-5850 |
| Bandwidth (MHz) | 100 (RL<-10) | 1332 (RL<-6) |
| Peak Gain (dBi) | 1.25 | 2.17 |
| Efficiency (%) | 66.40 | 59.68 |
| Impedance (Ω) | 50 | 50 |
| Polarization | Linear | Linear |
| Maximum Input Power | 2W | |
| **Mechanical** | | |
| Dimensions (mm) | 3.2 x 1.6 x 0.5 | |
| Ground plane (mm) | 80 x 40 (Standard Evaluation Board) | |
| Weight (g) | 0.02 | |
| **Environmental** | | |
| Temperature Range | -40°C to 105°C | |
| Humidity | Non-condensing 65°C 95% RH | |
| Moisture Sensitivity Level (MSL) | 3 (168 Hours) | |

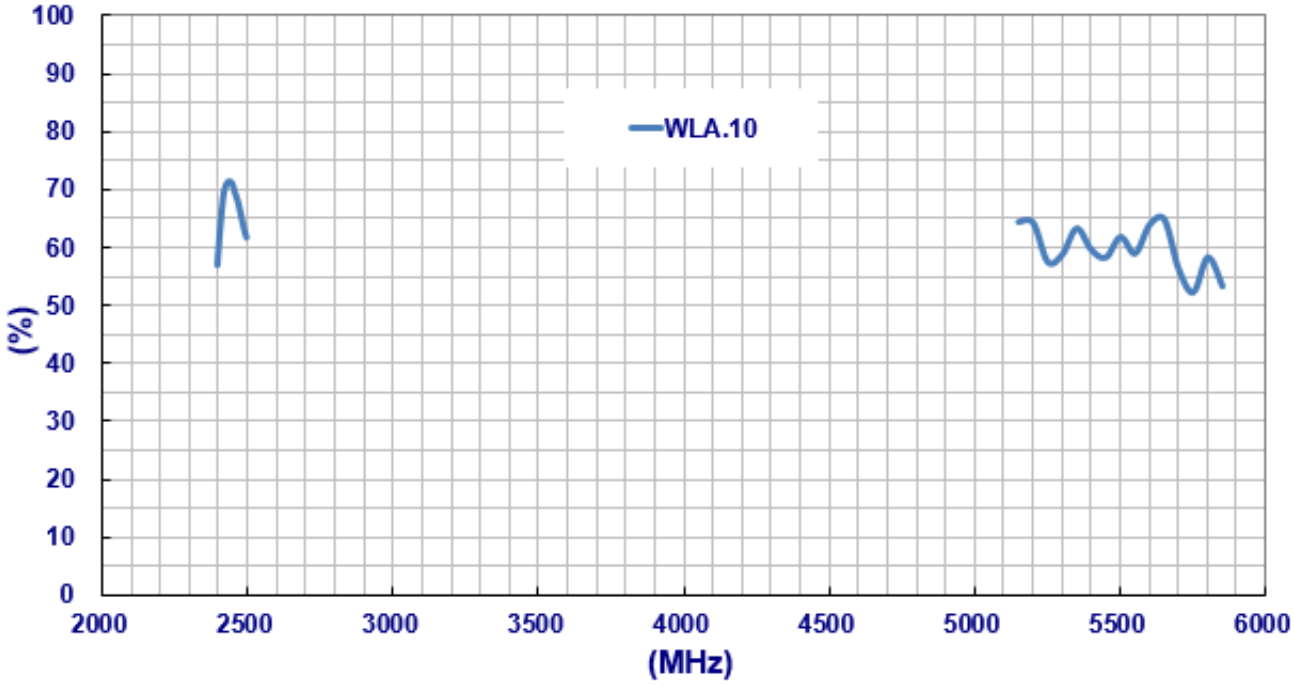
*Tested on 80mm*40mm evaluation board.

# 3. Antenna Characteristics

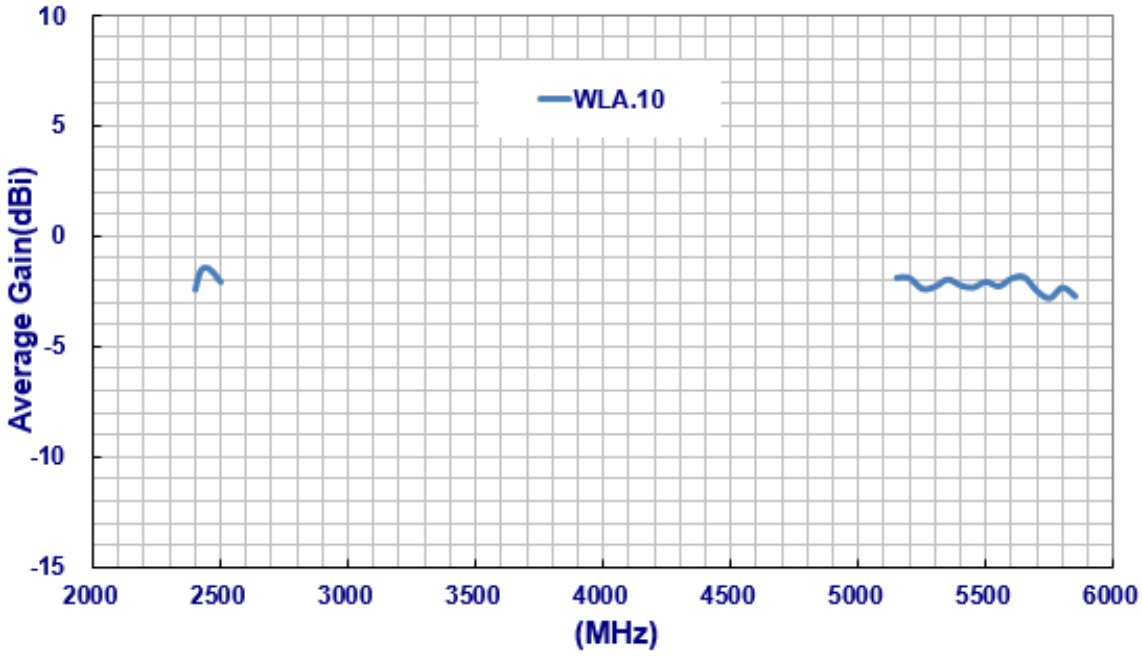
## 3.1 Return Loss



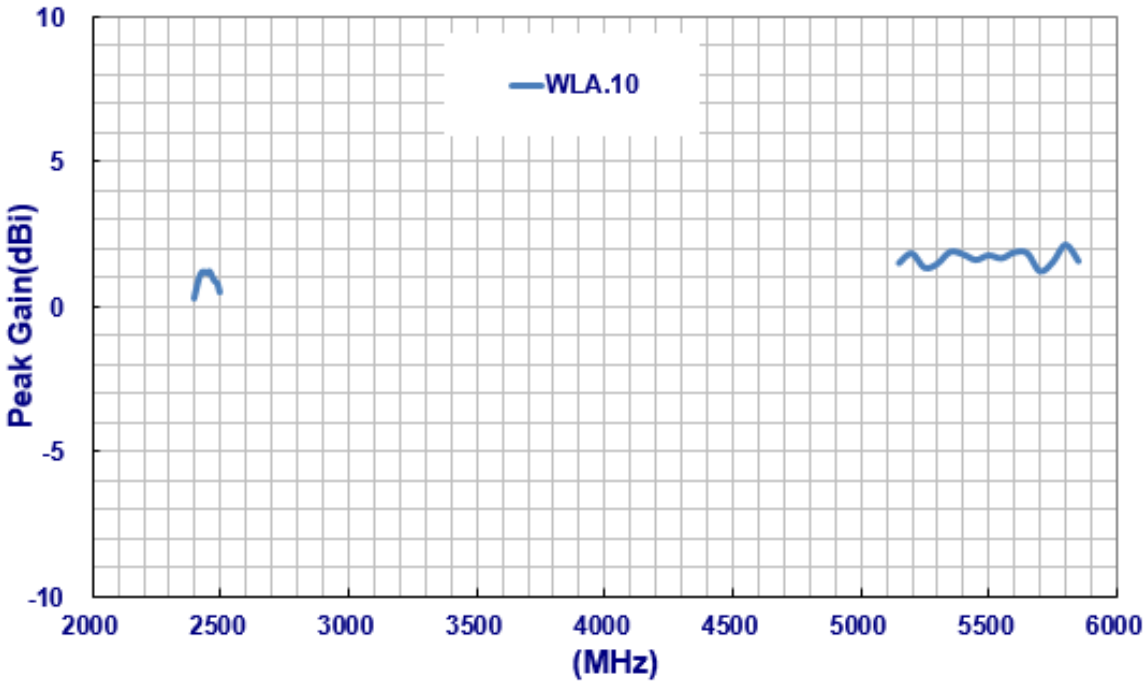

## 3.2 Efficiency



## 3.3 Average Gain

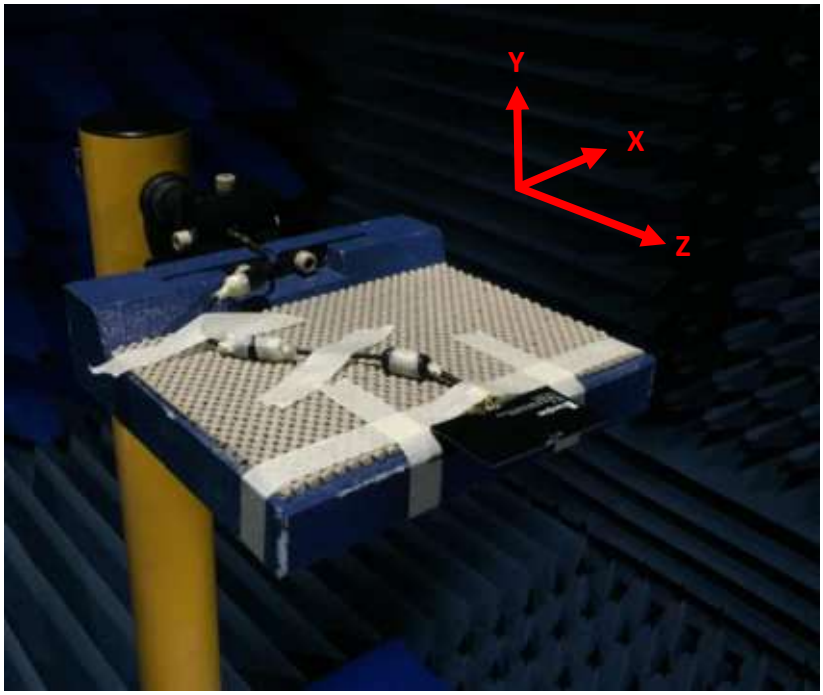



## 3.4 Peak Gain

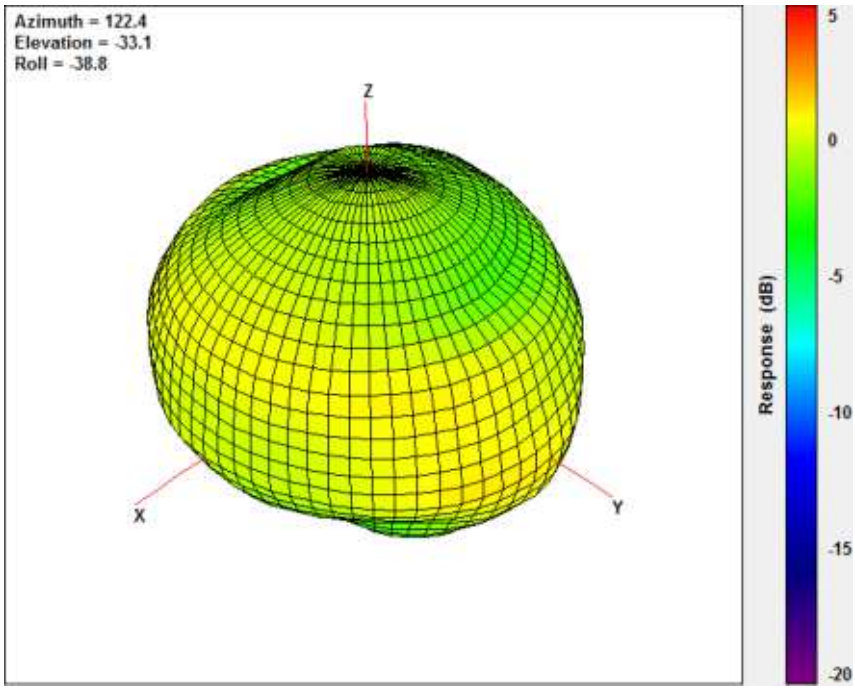


# 4. Radiation Patterns

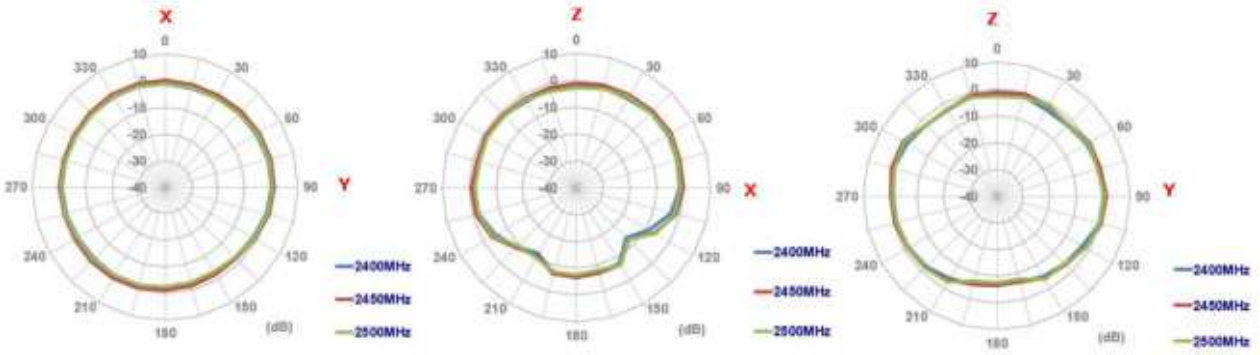
## 4.1 Test Setup



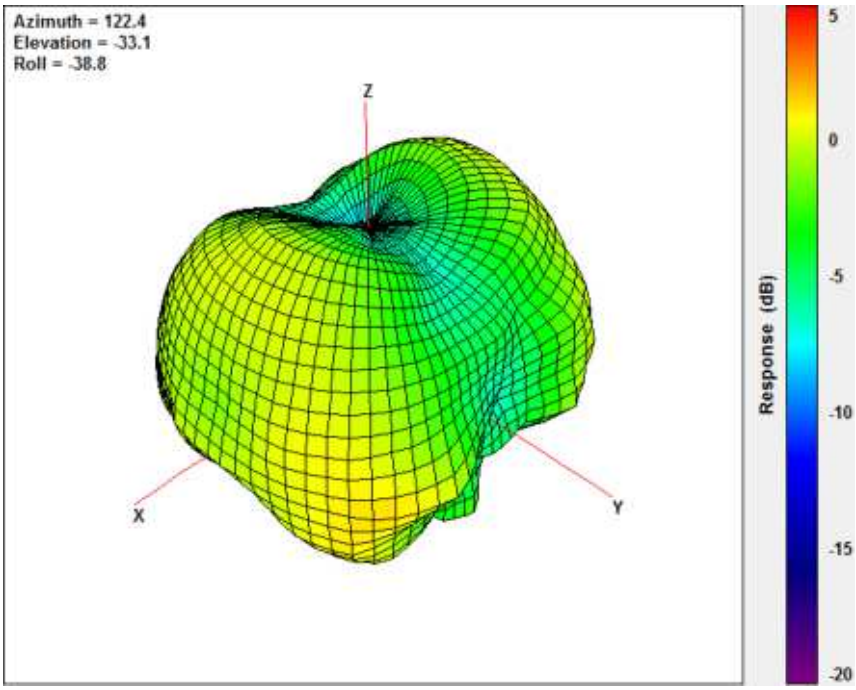
## 4.2 3D and 2D Radiation Patterns



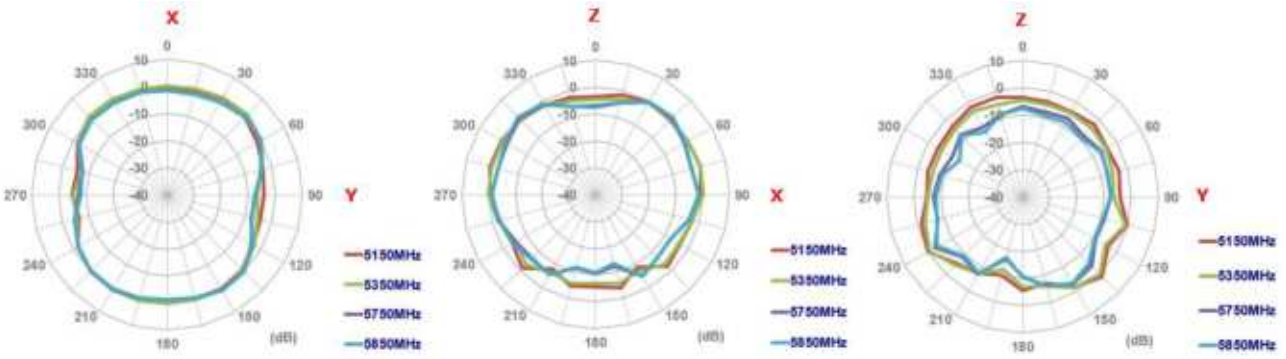

| XY Plane | XZ Plane | YZ Plane |
|---|---|---|



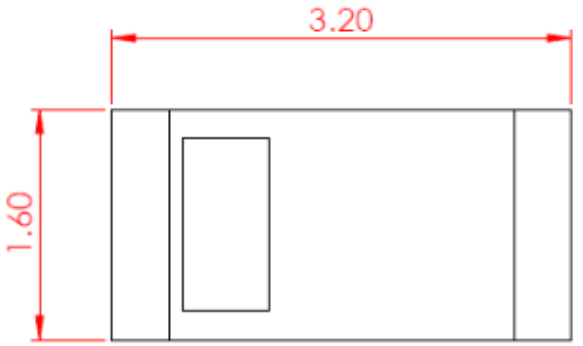
## 5550MHz




| XY Plane | XZ Plane | YZ Plane |
|---|---|---|



# 5. Mechanical Drawing (Units: mm)




TOP VIEW



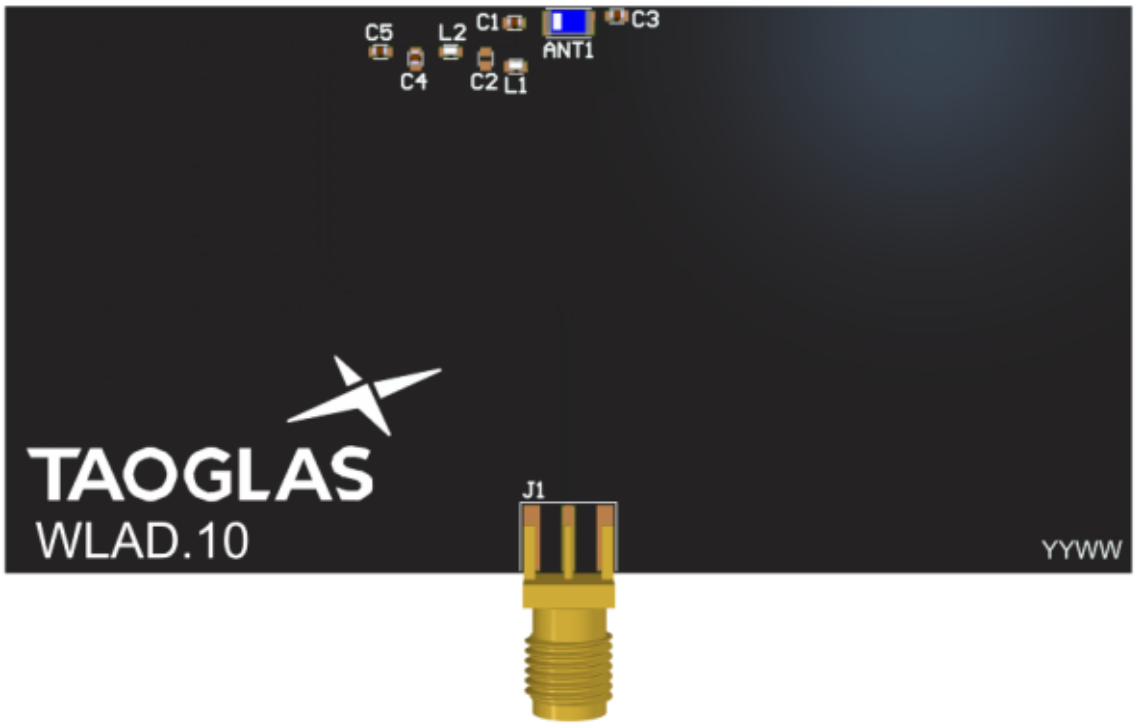

FRONT VIEW



BOTTOM VIEW

# 6. Antenna Intergration Guide

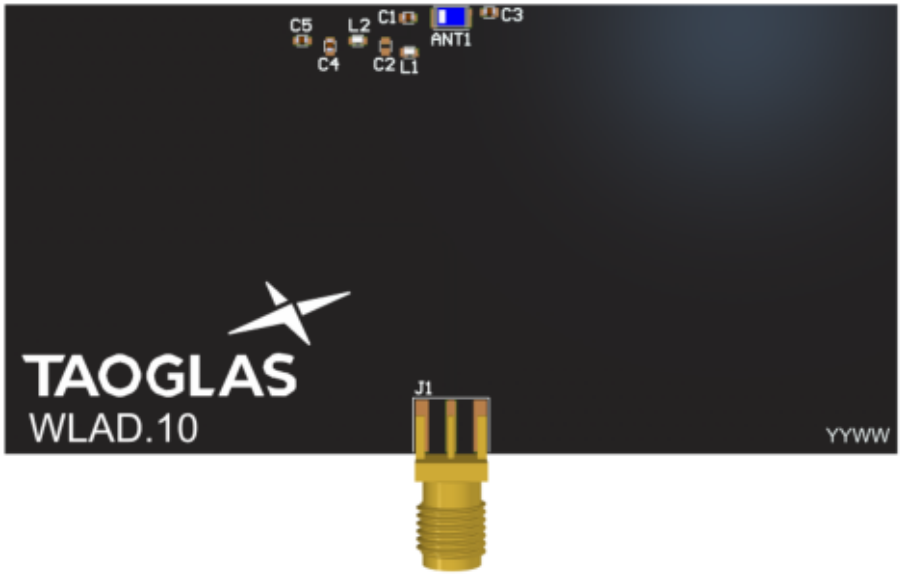
The following is an example on how to integrate the WLA.10 into a design. This antenna has 3 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.
The antenna should be placed mid-point on the long side of the PCB to take advantage of the ground plane on each side of the antenna.




Top view of PCB.

Please find the Integration files in Altium, 2D formats and the 3D model for the WLA.10 here:
https://www.taoglas.com/product/3-21-6-0-5mm-wla-10-wi-fi-dual-band-2-4ghz5-8ghz-chip-antenna/

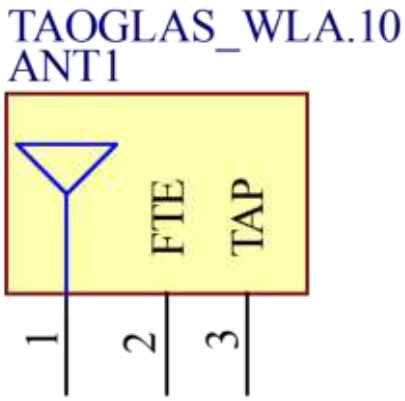
## 6.1 Schematic Symbol and Pin Definition



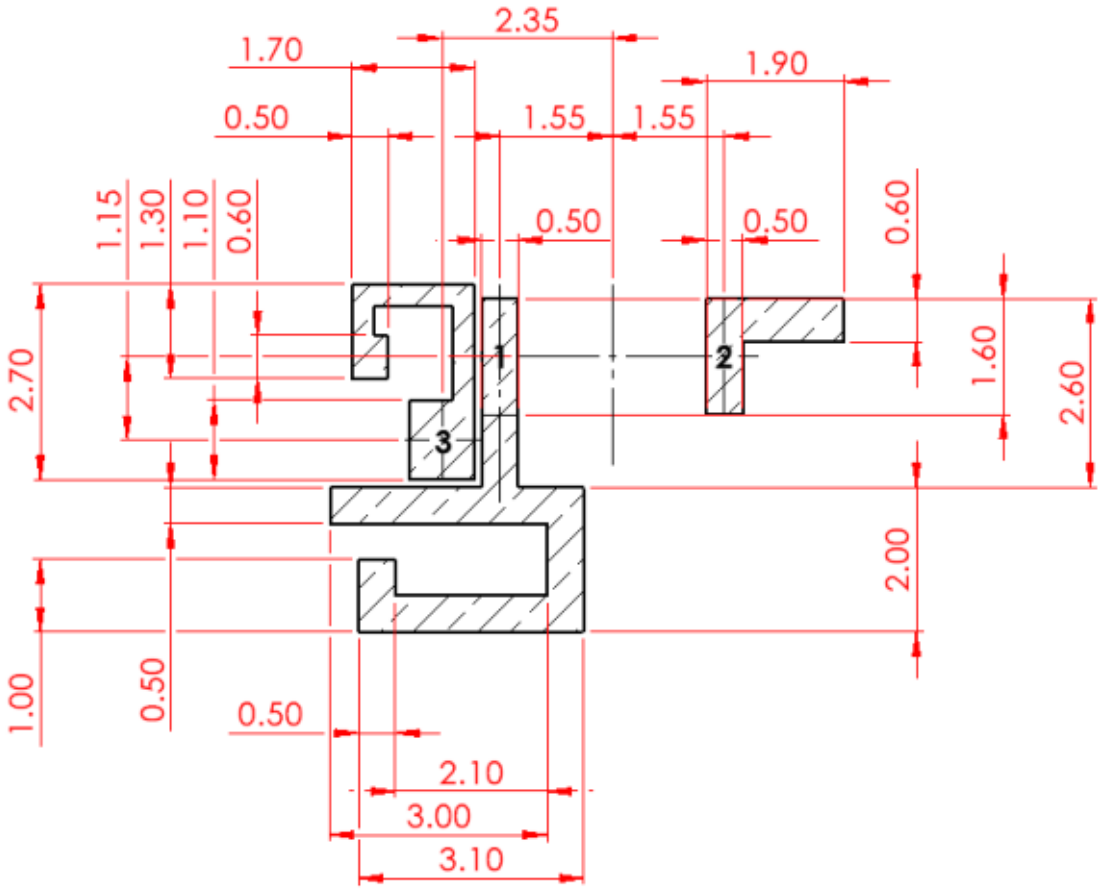

Above is a 3D model of the WLA.10 on a PCB.

The circuit symbol for the WLA.10 is shown below. The antenna has 3 pins as indicated below.

| Pin | Description |
|---|---|
| 1 | RF Feed |
| 2 | Fine Tuning Element |
| 3 | Tap |

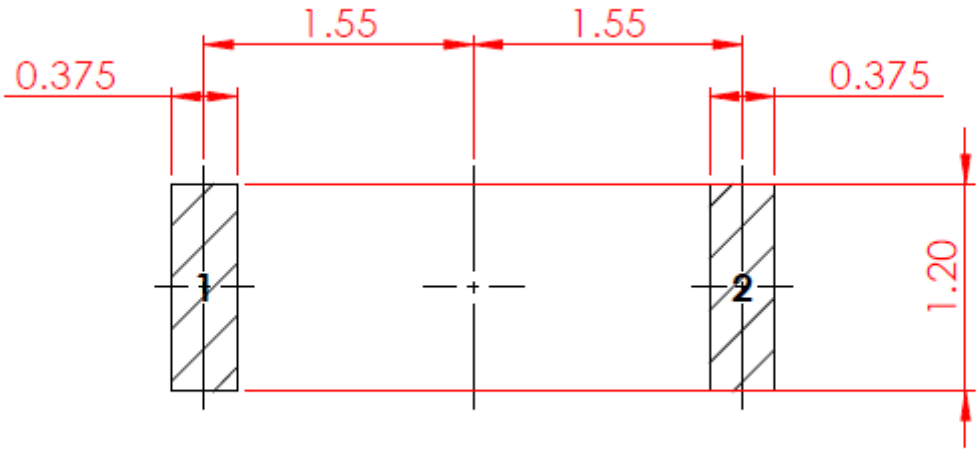


## 6.2 Antenna Footprint



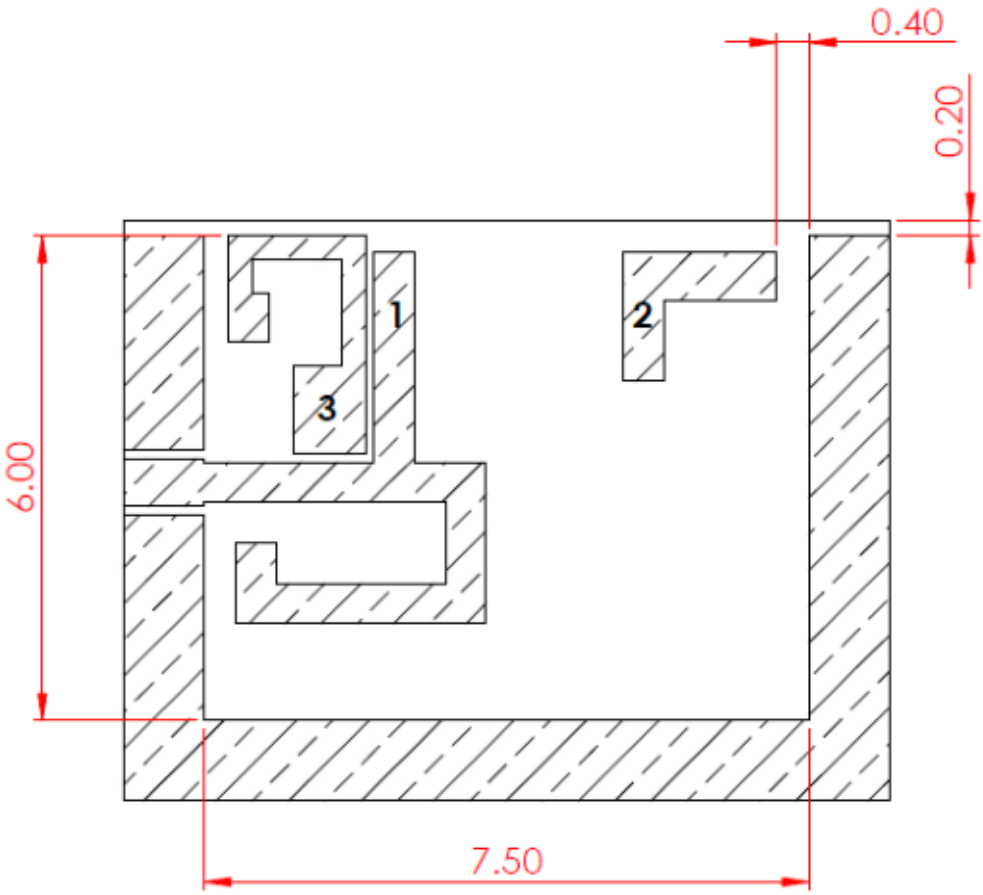

| Pin | Description |
|---|---|
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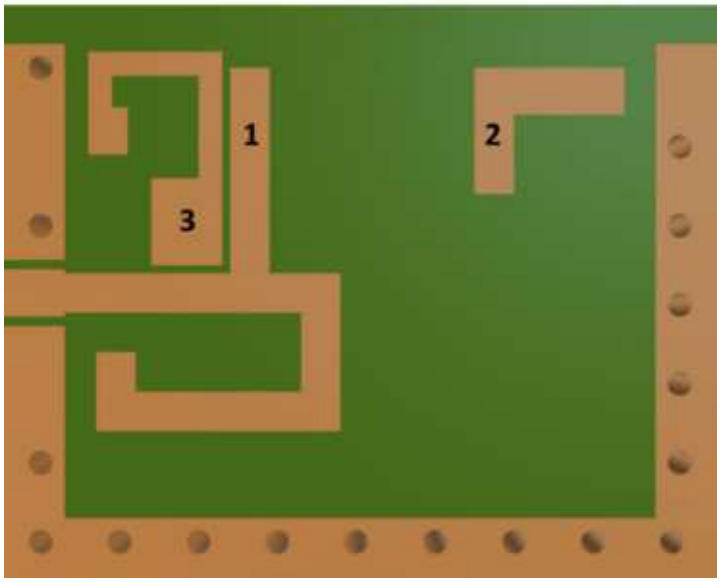
## 6.3 Top Solder Paste



## 6.4 Copper Clearance

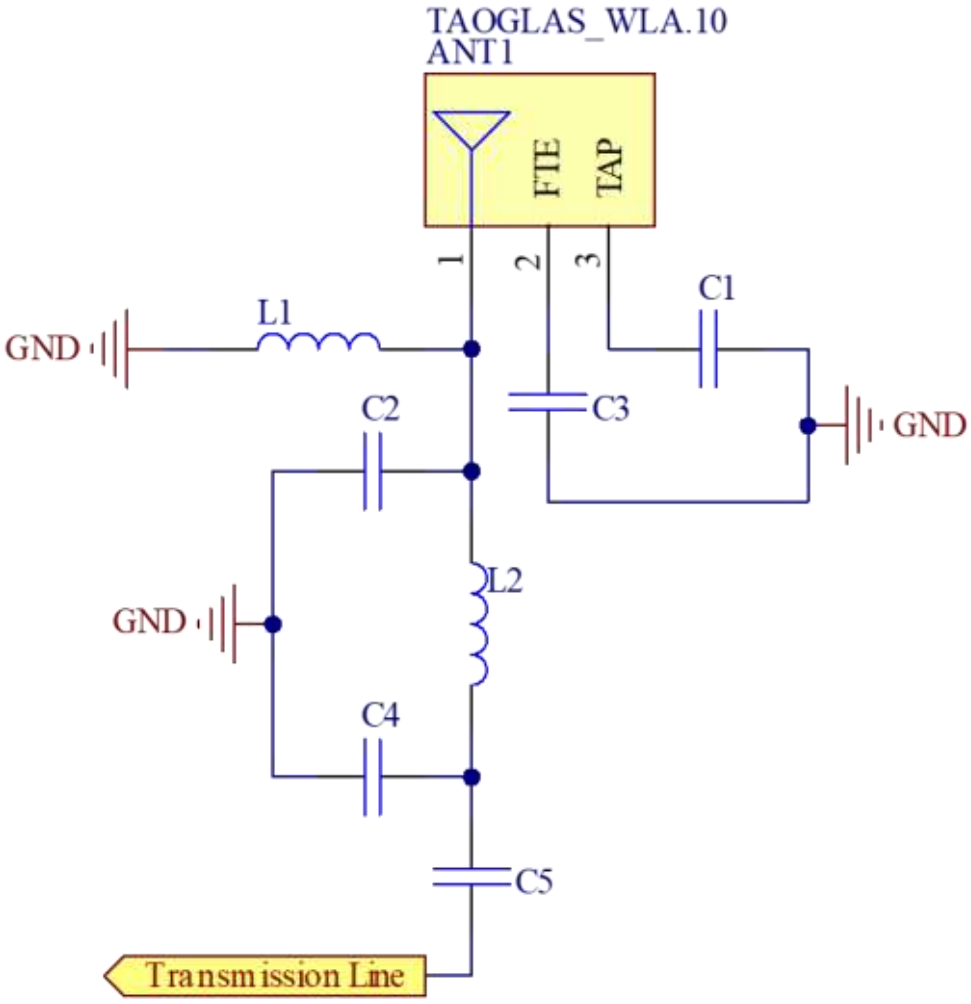
The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the WLA.10 clearance area. The copper keep out area applies to all layers on the PCB.
The copper clearance area extends to 7.5mm in length and 6mm in width around the antenna. The PCB edge clearance should be a minimum of 0.1mm, example below is 0.5mm.



## 6.5 Schematic Layout

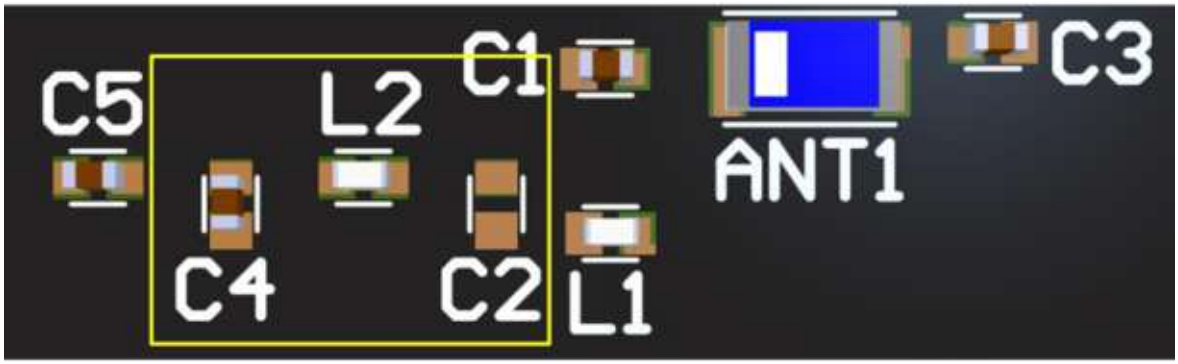
Matching components with the WLA.10 are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a “pi” network, for the WLA.10.



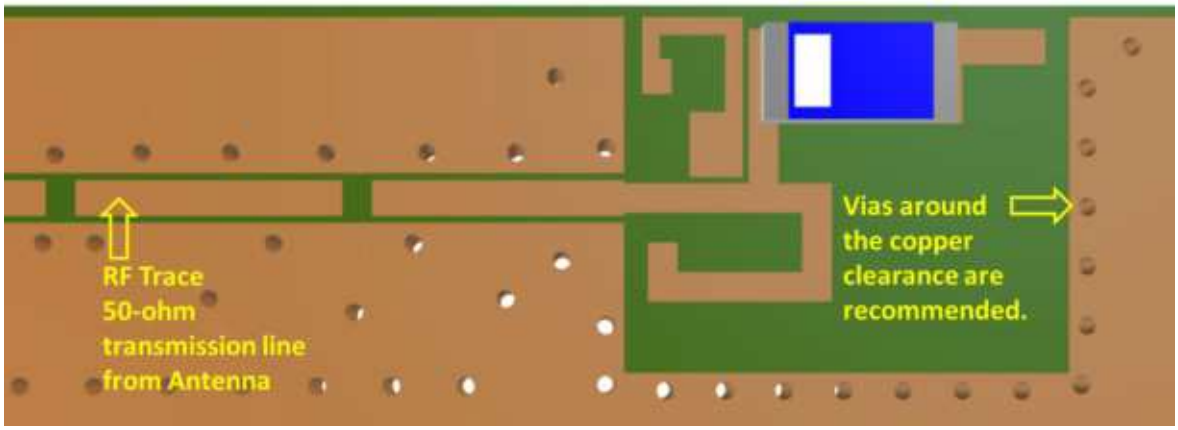

| Designator | Type | Value | Manufacturer | Manufacturer Part Number |
|---|---|---|---|---|
| C1 | Capacitor | 0.3pF | Murata | GRM1555C1HR30CA01D |
| C2 | Capacitor | Not Fitted | - | - |
| C3 | Capacitor | 0.9pF | Murata | GRM1555C1HR90CA01D |
| C4 | Capacitor | 0.2pF | Murata | GRM1555C1HR20WA01D |
| C5 | Capacitor | 22pF | Murata | GRM1555C1H220JA01D |
| L1 | Inductor | 1nH | TDK | MLK1005S1N0ST000 |
| L2 | Inductor | 1.2nH | TDK | MLK1005S1N2ST000 |

## 6.6 Antenna Integration

The WLA.10 should be placed mid-point on the long side of the PCB to take advantage of the ground plane extending from each side of the antenna.
The RF trace must maintain a 50Ω transmission line. A “Pi” Matching Network is recommended for the RF transmission line, the values and components for the matching circuit will depend on the tuning needed. Ground vias should be placed around the transmission line and the copper clearance area.




WLA.10 antenna mounted on a PCB, showing “Pi” matching network.




WLA.10 antenna mounted on a PCB, showing transmission line and integration notes.

## 6.7 Final Integration

The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.



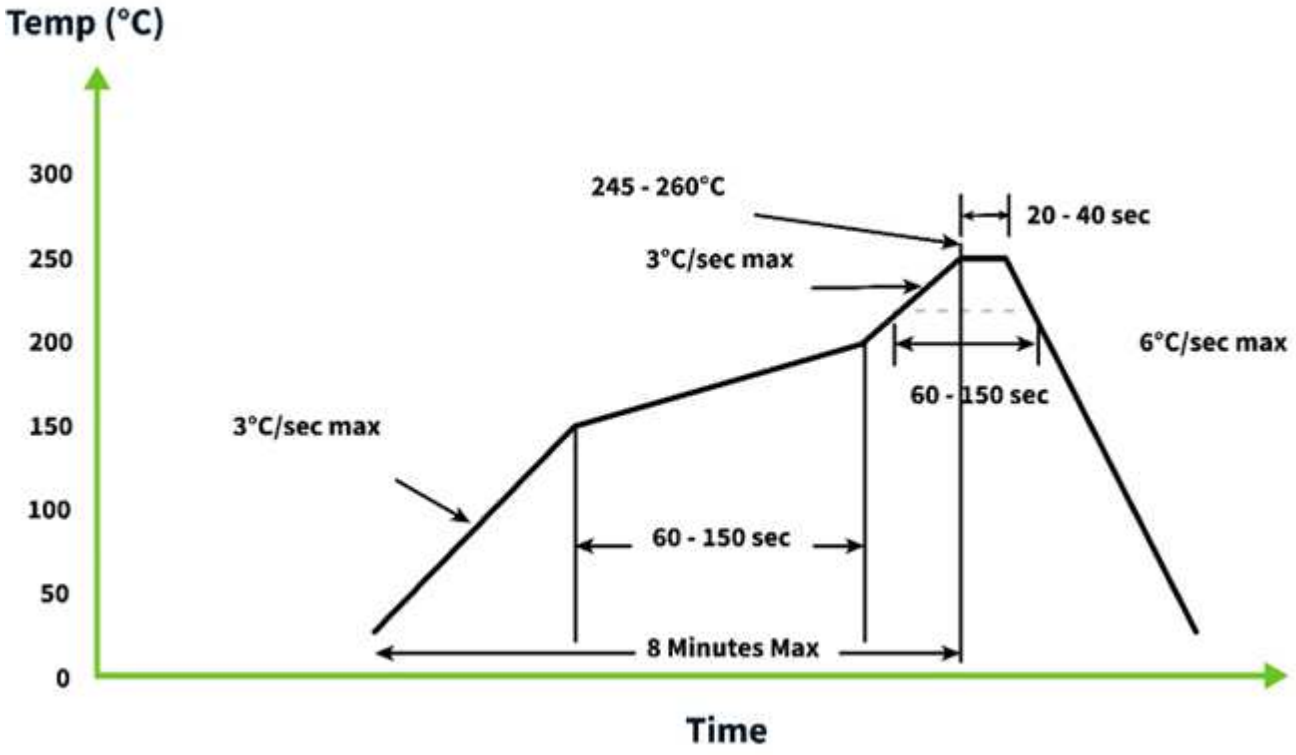

Top Side (WLA.10 placement on 80x40mm PCB)



Bottom Side (80x40mm PCB)

# 7. Solder Reflow Profile

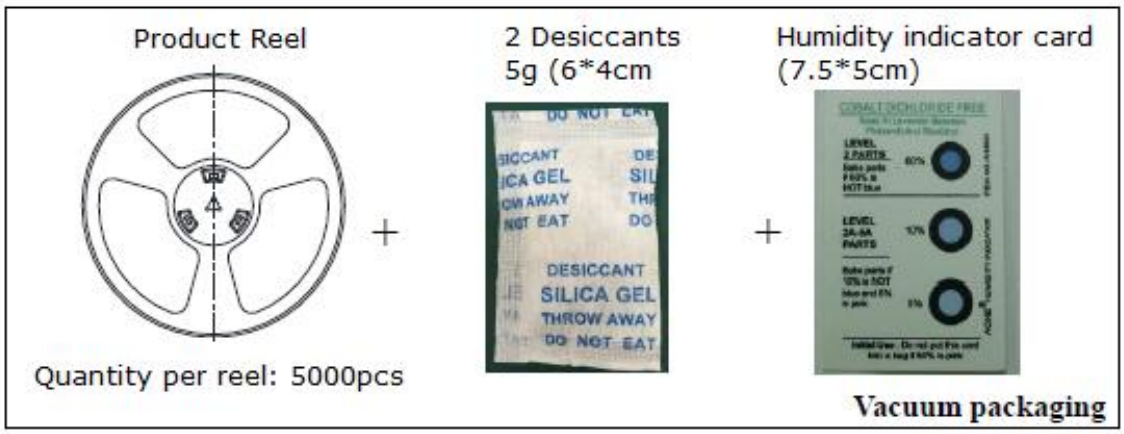
The WLA.10 can be assembled by following the recommended soldering temperatures are as follows:



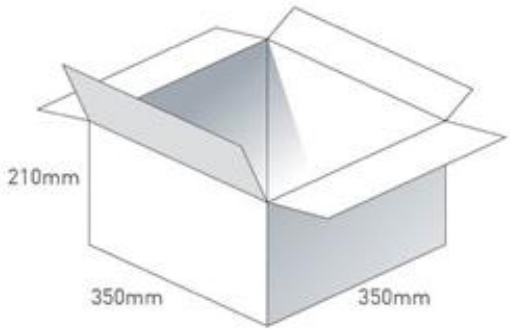

*Temperatures listed within a tolerance of +/- 10º C

Smaller components are typically mounted on the first pass, however, we do advise mounting the WLA.10 when placing larger components on the board during subsequent reflows.

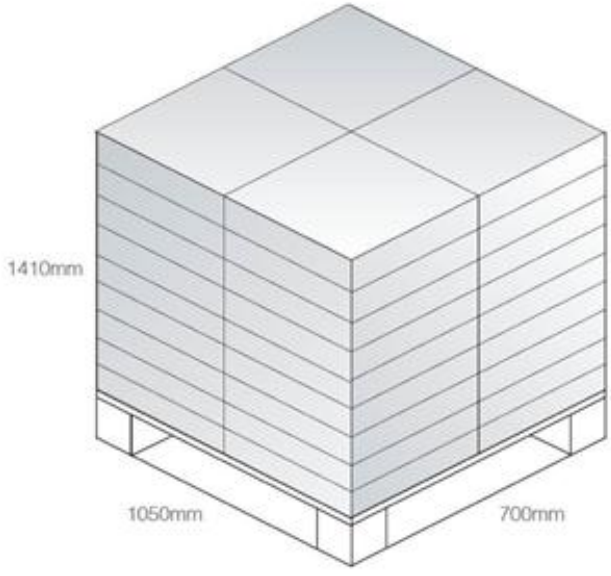
# 8. Packaging




9 reels / 45000 pcs in one carton
Carton Dimensions - 350*350*210mm
Weight - 9Kg




Pallet Dimensions 1050*700*1410mm
36 Cartons per Pallet
4 Cartons per layer
9 Layers



## Changelog for the datasheet

**SPE-16-8-052 - WLA.10**

| **Revision: H (Current Version)** | |
|---|---|
| Date: | 2025-07-02 |
| Changes: | Added L2 description to component table in integration guide. |
| Changes Made by: | Gary West |

**Previous Revisions**

| **Revision: G** | |
|---|---|
| Date: | 2023-09-05 |
| Changes: | Updated Antenna Integration Guide |
| Changes Made by: | Gary West |

| **Revision: B** | |
|---|---|
| Date: | 2021-10-04 |
| Changes: | Full datasheet template update, Addition of MSL & Integration Guide. |
| Changes Made by: | Gary West |

| **Revision: F** | |
|---|---|
| Date: | 2023-09-05 |
| Changes: | Updated Solder Reflow Information |
| Changes Made by: | Cesar Sousa |

| **Revision: A (Original First Release)** | |
|---|---|
| Date: | 2016-05-17 |
| Notes: | |
| Author: | Technical Writer |

| **Revision: E** | |
|---|---|
| Date: | 2022-12-09 |
| Changes: | Updated antenna integration guide. |
| Changes Made by: | Gary West |

| **Revision: D** | |
|---|---|
| Date: | 2022-05-24 |
| Changes: | Antenna temperature range updated. (ISO16750-4 - 5.1.2.2) |
| Changes Made by: | Gary West |

| **Revision: C** | |
|---|---|
| Date: | 2022-01-14 |
| Changes: | Updated Antenna Integration Guide |
| Changes Made by: | Gary West |

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