



PA-23 Design Application Note



Underside SMT Contact Pads View



Top Side

CONTENTS

1. **BASICS**
2. **GROUND PLANE SIZE**
3. **GAIN**
4. **TECHNOLOGY ADVANTAGES**
5. **MOUNTING**
6. **ENVIRONMENTAL CONSIDERATIONS**
7. **TUNING**



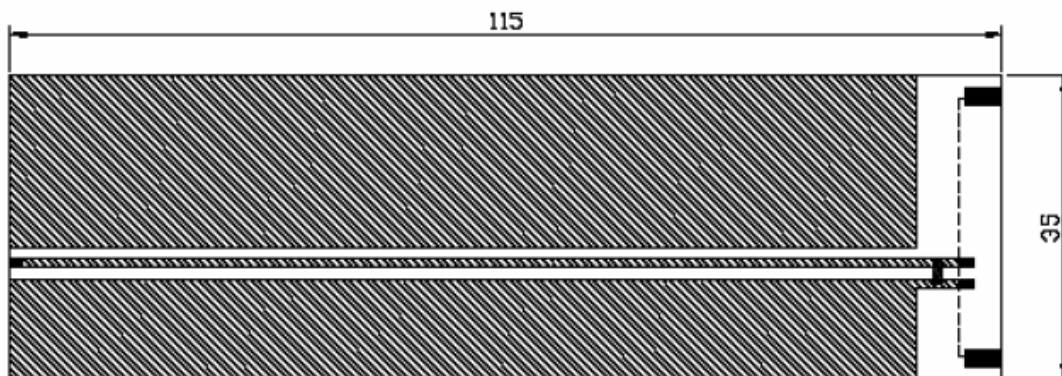
1. BASICS

A monopole antenna is a type of antenna formed by replacing one half of a dipole antenna with a ground plane perpendicular to the remaining half. By careful choice and formulation of dielectric material and care in manufacturing, a SMT monopole antenna can be constructed.

This design application note is intended to help the antenna integrator understand the relevant parameters affecting the antenna performance. Taoglas recommends that the integrator strictly follow the guidelines in this application note. Upon your device prototype completion Taoglas offers further optimization by custom tuning and testing service of the antenna in your device.

2. GROUND PLANE SIZE

A ground plane size of 115mm * 35mm was used for the evaluation board. Different ground plane sizes will change the S11 response. In general the larger ground plane size the higher the gain.



3. GAIN

The gain of the PA-23 will be affected by the area of the groundplane. In general the larger the ground-plane the higher the gain.



4. ADVANTAGES of the PA-23 SMT Monopole are as follows;

- Compact volume, minimum footprint - It can be placed into the housing of the mobile/handheld device, unlike most whip/rod/helix antennas.
- Labor saving SMT – also ensures higher quality yield rate
- No antenna tooling cost for customer. Tuning is done via printing change to the outer meander line.
- Robust single block structure
- Wider bandwidth at higher frequencies (1710MHz~2100MHz) compared to similar size antennas

5. MOUNTING

Follow drawing on specification.

Mount on non-conductive area close to groundplane ensuring minimum separation distances (4mm all around) are obeyed.

Best results are achievable when placed close to the edge of the board to allow the antenna to radiate outwards, see the outline drawing in the specification.

6. ENVIRONMENTAL CONSIDERATIONS

Close proximity to components or housing affects the electrical performance of all antennas. When placed on a non-conductive area of the board, there should be clearance of 4mm in all directions from the board/housing for maximum efficiency. A reduction in antenna efficiency or a slight shift in tuned frequency will be observed if these clearances are not adhered to. Proximity effects will also have an adverse effect on the radiation pattern of the antenna.

7. TUNING

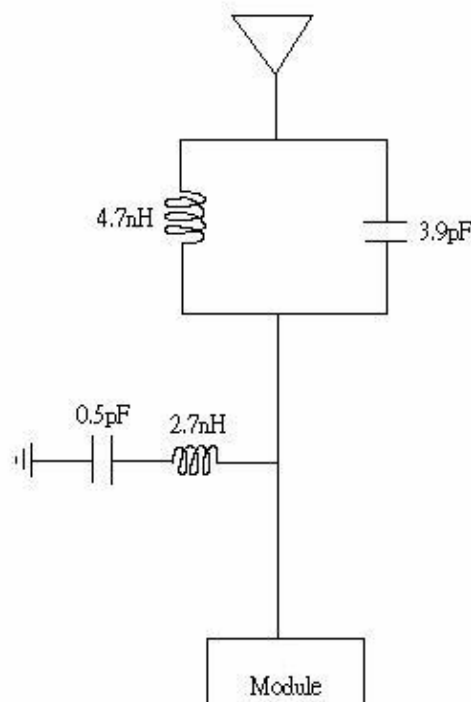
However tuning optimization can be carried out by an appropriate choice of matching circuit.

If the customer can give the housing and reference PCB to Taoglas then Taoglas can carry out the necessary S11 response measurements in both magnitude and Smith Chart format of the complete system. The necessary impedance matching circuit should be designed on the customer side if he/she has access to a software modelling tool which simulates the system. The matching circuit values obtained from this exercise can then be employed and adjusted via trial and error



to obtain the optimal 50 Ohm match at the frequencies of interest. It should be noted that the impedance matching can improve the response of the antenna at certain frequencies (or bands of frequencies in the case of wideband matching circuits) but a reduction in the response at other frequencies may be observed.

The following matching circuit was used on the Taoglas PA-23 Evaluation Board for this antenna.



Other Techniques for tuning

Lower Frequency

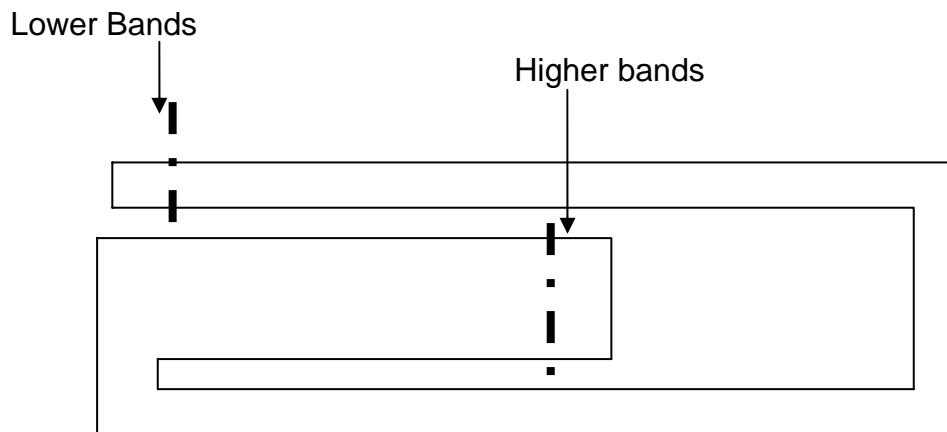
- A. Larger surface area on contact pad or on meander line can lengthen effective wavelength and reduce frequency. In practice this will only have minimal effect and it is difficult to implement at manufacturing. The best option is to keep clearance levels to maximum so that the antenna is performing efficiently as per specification, with maximum sensitivity.



Higher Frequency

A. Cutting areas on the top-side meander line can higher the frequency slightly

Cutting these areas can higher the frequency



Actual Positions

