

Bluetooth™ Inverted-F Antenna Application Note

Design of an Inverted-F Antenna

Background

When choosing a Bluetooth-antenna there are a number of variants to choose from. Different antennas have different properties such as bandwidth, gain, polarization, impedance, ground, the influence of the environment, radiation pattern etc, etc. Further more the engineer must consider properties such as facilitate mounting, size and cost. This document will focus on the Inverted-F antenna (IFA).

Design

In applications where cost is critical and range is not, an IFA might be considered. The antenna is etched on the PCB where the extra size of the PCB is the only cost.

The IFA is a variant of a monopole antenna where a part of the top section is parallel with the ground plane. A grounded stub is implemented in order to minimize the capacitance introduced as a result of this topology.

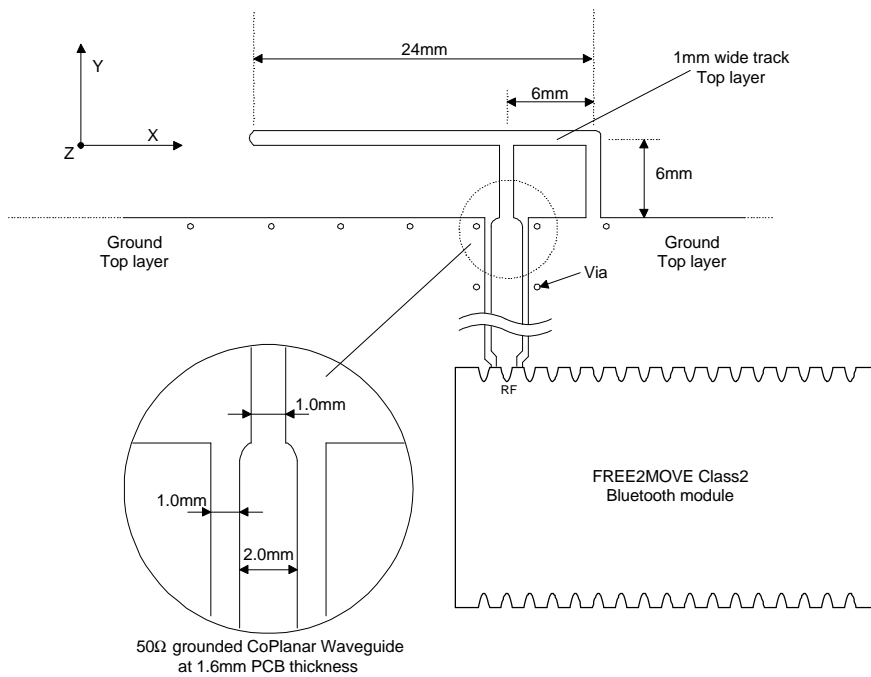


Figure1: Drawing of a inverted-F antenna on a two-layer PCB, top-view

The PCB is a standard 1.6mm FR4 material. The ground plane should be as big as possible and placed both on the top and bottom side as depicted in figure 1 and 2. In figure 2 it is seen that there should not be ground underneath the antenna.

A number of vias should be used to make a good HF-connection between the two sides of the PCB.

The IFA have an impedance of 50Ω which must be maintained on the copper line to the Bluetooth module. The dimensions of this Co-Planar Wave guide is shown in the circle in figure 1. The Bluetooth module should be placed as close to the antenna as possible and optimally with a straight wave guide. If the wave guide must be bent then it is recommended to use only 45degrees angles.

The radiation of the antenna is low in the X-direction and high in Y and Z-direction.

This design is believed to work. However, the design have not yet been verified.

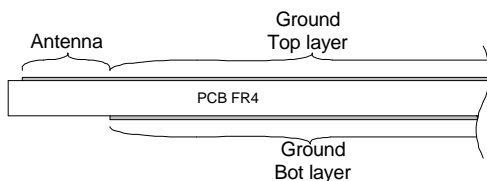


Figure2: Antenna side-view