

Considerations for PCB-based Antenna

WM72016-6 RFID



DESCRIPTION

The MaxArias Wireless Memories from Ramtron can successfully operate with antenna designs from standard PCB traces on standard PCB materials as well as flexible substrates constructed from Mylar. This application note discusses some of the factors engineers should take into account when considering their own antenna designs.

Antenna designs are critical to the performance of a wireless memory whether they are constructed from standard FR4 on a PCB or from more flexible substrates. The antenna is typically designed to optimize RF backscattering efficiency at the center of the desired frequency band. This band is dependent on the region where the transponder is going to be operated in (i.e. North America, Japan, China, etc.) and needs to be tuned accordingly. Several factors go into designing an antenna and are discussed herein.

EXAMPLE ANTENNA

Ramtron has utilized the antenna in Figure 1 on its WM72016-6-EVAL-915-ANT evaluation board. This is a standard $\frac{1}{4}$ wave dipole antenna design that is common in UHF applications. It is not optimized in terms of trace width, antenna material, matching Wireless Memory impedance and/or overall antenna structural area where the radiation is backscattered to an interrogating reader. This design does work efficiently enough, however, for evaluation purposes and to illustrate Ramtron's unique, Wireless Memory features associated with its F-RAM technology. These unique features include symmetrical read and write distances, large block write capability, extremely short read/write times, and a unique address pointer essentially eliminating the need for an interrogator to spend time locating the next available user memory location.

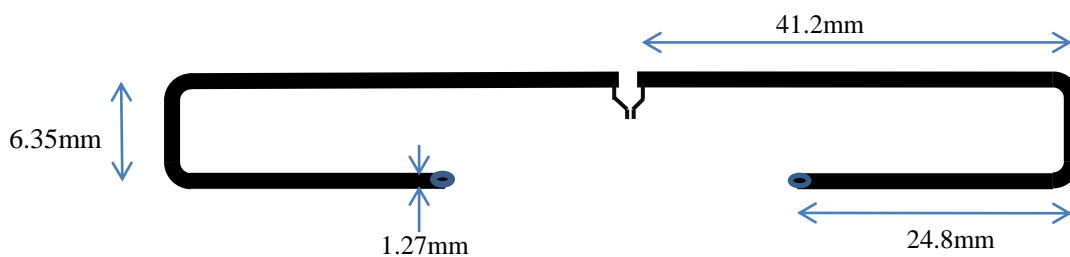


Figure 1. Antenna Trace Lengths and Widths

ANTENNA DESIGN CONSIDERATIONS

The following antenna design factors affect the efficiency and overall performance of a wireless memory:

- The material used for the PCB where the antenna is going to reside or the substrate material used for a flexible inlay
- The material used for the antenna itself (i.e. copper, silver ink, aluminium, etc.). Material properties such as trace conductivity and insulator dielectric constant play a major role in the performance of antenna design.

- The thickness of the material used for the PCB substrate
- The shape and thickness of the antenna traces. This includes corner radiuses, trace length, distance between traces and overall antenna pattern.

Engineers can quickly see that the design of transponder antennas is a specialized activity using CAD tools that are specifically targeted for antenna design. There are a number of specialized companies that are able to design antennas for customers to optimize performance. Unless an engineer has antenna design experience, Ramtron recommends that the services of an external company are sought.