

# Murata Electronics

## RFID - Frequently Asked Questions

### **Q: What is the frequency of operation of RFID?**

**A:** there are several frequencies used for passive (i.e. battery-less tags) RFID, the most common ones being LF (“low frequency”, around 125 kHz), HF (“high frequency”, at 13.56 MHz) and UHF (“ultra high frequency” in the unlicensed 902 – 928 MHz frequency band in North America and similar bands worldwide)

For PCB tracking, we recommend to use the UHF band with industry standard EPCglobal Gen2 / ISO 18000-6C due to the long range and high speed it enables, it’s universal acceptance for supply chain management and many other applications and the fact that small UHF tag antennas can easily be integrated into the PCB.

### **Q: Why are there 4 different versions of MAGICSTRAP® (Types 1 to 4)?**

**A:** the 4 types correspond to 4 different matching networks inside MAGICSTRAP®, which in turn allow 4 different antenna reference designs with various performance / board space trade-offs.

### **Q: How to choose the right MAGICSTRAP® Type?**

**A:** the MAGICSTRAP® Type can be selected as a function of the range required and the space available on the PCB for the antenna reference design. Refer to the range chart found in the Application Guide that shows the trade-offs involved.

### **Q: What is the RFID integrated circuit in MAGICSTRAP®?**

**A:** MAGICSTRAP® offers two IC options for the LXMS31 series - NXP G2XM chip or Impinj Monza4QT.

### **Q: What is the schedule for RFID chips that have an I<sup>2</sup>C interface to other electronics on the PCB?**

**A:** we expect these chips to become available on the market mid-2013.

Murata is currently in the final stages of development and can support small qty engineering samples.

### **Q: Does Murata provide support for antenna design?**

**A:** yes! Murata provides antenna reference designs and can assist to integrate these designs into the customer’s PCB. These reference designs can be downloaded directly from Murata’s website for quick and seamless integration (<http://www.murataamericas.com/rfidsoftware>). Murata can also support a custom antenna design for the customer. There is currently no fee for these services.

**Q: Does Murata provide a complete solution for PCB tracking?**

**A:** Murata provides MAGICSTRAP® and antenna reference designs to integrate an RFID tag in the customer's PCB. Murata does not provide a complete system solution including readers, software, etc. Murata is working with partners and can recommend companies that can complement its product offering:

- System integrators
- RFID equipment suppliers
- Software providers
- Etc.

**Q: Can Murata introduce an interested customer to a system integrator partner?**

**A:** yes

We can recommend a system integrator based on the objectives, use cases / scenarios (traceability in production, inventory, supply chain, anti-counterfeiting, etc) and the customer location.

**Q: What type of readers do we recommend for PCB tracking applications?**

**A:** it depends on the use cases. There are several types of readers more or less appropriate for a specific use case, for example:

- Handheld reader for anti-counterfeiting in the field or for taking inventory
- Fixed reader with one or multiple external antennas for PCB traceability in the production line
- USB dongle reader for check in/check out process

**Q: What are the types of RFID readers available?**

**A:** RFID readers come in different types, form factors, etc.. depending on the intended use.

Here are the main selection parameters:

- Fixed or hand-held
- Maximum transmit power: up to max legal 1W power or less
- Number of antennas
- External or integrated antenna(s)
- Powering method: AC adapter, Power-over-Ethernet (POE), Power over USB
- Degree of ruggedness (humidity ratings for indoors / outdoors; drop tests for handheld readers)
- Connectivity options: ethernet, USB, wi-fi, bluetooth
- Specialty readers, e.g. forklift readers, portal readers, readers able to tell direction of passage, readers embedded in other equipment (POS reader, etc),...

**Q: Why does MAGICSTRAP® ease the antenna design process?**

**A:** thanks to the impedance matching network inside MAGICSTRAP®, which provides a stable matching to the IC, MAGICSTRAP® can use the PCB ground plane as its antenna; Murata also provides reference designs that take very little board space to connect MAGICSTRAP® to the ground plane. All this makes the antenna design process easier than competing solutions.

**Q: When we say that MAGICSTRAP® has higher “performance” than other solutions, what does “performance” mean?**

**A:** the term “performance” for a tag usually means “long range”, since range is often a limiting factor, especially if the tag antenna needs to be kept small.

But other factors are also included under the “performance” label, including consistency of the range in various environments (immunity to detuning) and good range over a broad frequency bandwidth.

**Q: What is the range that can be achieved with an RFID tag on a PCB, and what does it depend on?**

**A:** the range may vary greatly depending on many factors:

- The size of the tag on the PCB: using the PCB GND plane as the antenna, we like to have a length of 10 to 15 cm with MAGICSTRAP® in the middle to achieve up to 5 m of range, sometimes more, in ideal situations
- The size of PCB area dedicated to RFID (MAGICSTRAP® and traces connecting it to the antenna GND plane)
- The environment, including enclosure, location and make-up of nearby objects, orientation of PCB compared to reader
- The reader: type, transmit power, antenna gain and circularity
- Other secondary parameters

**Q: Is the range the same for reading and writing the tag?**

**A:** no; with most current tags, the write range is shorter than the read range.

- Write range is typically +/-50% of read range
- Often ok to have shorter write range
- Writing to tags is often done one by one ( i.e. only one tag must be in the reader’s field of view, which requires shorter range)
- Reading tags is often done in bulk ( i.e. many units in reader’s field of view for quick inventory, which benefits from a longer range)

**Q: Are there cases where the range is too long?**

**A:** yes, for example when one wants to isolate a single tag for reading or writing, or only access a limited physical zone.

Reducing the reader transmit power or selecting specific reader antennas can help constrain the reader's read or write zone.

**Q: Since MAGICSTRAP® can be used without any tag antenna at very short range, is this useful for PCB tracking?**

**A:** yes, it may be useful in some applications where authentication is needed and the PCB is easily or directly accessible at short range (a few mms). For example, Beta Layout, a producer of PCB prototype boards (small production runs) uses MAGICSTRAP® without antennas so customers can identify each prototype uniquely.

However, in most applications, the range requirement is longer than what can be achieved without an antenna.

**Q: Can MAGICSTRAP® withstand standard production processes?**

**A:** yes, MAGICSTRAP® can withstand both wave and reflow soldering processes.