The 15 most Frequently Asked Questions about RFID

1. What is meant by RFID ?

RFID is the abbreviation for Radio Frequency Identification and means identifying objects by radio without touching them. It involves the non-contact reading, writing or deletion of data in a memory. This data can uniquely identify an object or can describe its characteristics, such as type, manufacturing date or price. The advantage of RFID is that it functions via radio waves even without direct line-of-sight. There are two basic types of RFID systems, active und passive. The difference between the two is primarily whether they possess their own power supply (active), as in an automatic toll station or a car key with radio remote control, or do not (passive), as in electronic tags for example.

2. What are smart labels or “smart tags“?

Any label that can be read by computers is referred to as a smart tag. Even the barcodes introduced 20 years ago on all goods in retail outlets are actually smart tags. The standard EAN (Electronic Arcticle Number) barcode can store a maximum of 13 characters. This is just sufficient for storing the name of the manufacturer and type of goods; but not enough, for example, to accept all the operational data for all the books in a lending library, including items such as inventory number, date of purchase, number of times lent out or location on shelves, in addition to the title and author. Libraries in Vienna, Austria, and Stuttgart, Germany, are therefore using RFID chips, which store up to 10,000 bits. This is equivalent to around one typewritten page of text.

Technically the smart tags consist of the RFID electronics with the RFID chip and the transmit circuit, an aluminum antenna loop roughly the size of a credit card, which are embedded together in a plastic foil, as well as an adhesive paper label that normally shows the most important information stored on the chip in a form that people can read.

3. How do smart tags work?

The RFID chips are an important component of electronically-readable labels. The chips are EEPROMs (Electronically Erasable Programmable Read Only Memory), which can store their information without power over many years.

This is how they work: The reader/scanner continuously transmits a radio signal that requests the RFID chip to register. If the signal encounters the antenna of a smart tag, the chip is given a wake up call, so to speak. The radio waves supply it with energy. The chip checks the signal to ensure that it is the correct addressee and, with encrypted information, also checks whether the reader/scanner is authorized to access the stored information, retrieves the desired information from its memory, and returns it encrypted to the reader for forwarding to a computer. The RFID chip uses the residual energy of the reader's radio waves for transmission. Since the smart tag does not have a battery of its own, this response signal is very weak. The maximum range is thus around one meter. Exactly how far depends on the size of the antenna, since the greater its surface area the more energy the RFID chip receives and the more is left for transmission.

Current smart tags usually measure 7.5 cm x 4.5 cm and are thus around the size of a credit card. For smaller goods there are also variants measuring 4.5 cm x 4.5 cm and labels for CDs and DVDs, with round paper labels to prevent imbalance with a diameter or of around 4.7 cm.

4. What are the benefits of smart tags?

Generally, the advantage is that they allow things to be uniquely identified and found again. Or more specifically: Anyone traveling by air does not just want a case back at the end of their journey, they want their own case. Luggage Tags for luggage handling systems at airports are thus one possible early application of RFID technology, providing fast and reliable identification.

Fast, secure and reliable identification is also what is required in corporate logistics processes, in large warehouses, in hospitals or for the transportation of goods and in the retail sector: Auto seats should arrive correctly, in the color ordered and just-in-time on the assembly line; the smart tags check up automatically that the right container with the right pharmacological substance reaches the production line; blood tests are uniquely assigned to the patient from whom they came; the supply of supermarkets with fresh and reordered goods calls for a complex and error-free delivery network; the entry tickets for the 2006 Soccer World Cup will be forgery-proof –

all thanks to RFID chips. There are any number of other potential RFID applications. It could be the goods' individual quality program during production, the supervision of delivery trucks in logistics, the administration of empty containers for billing the cost of waste disposal to the originator, or anti-theft devices on trucks and individual goods during transports. Original spare parts can be identified with RFID labels, access control to sports and music events will be able to rely on them. And many other beneficial applications will use RFID technologies in the future.

5. Which applications and industries will use RFID technologies in the near future?

In every application in which it is necessary to identify and manage thousands or even millions of objects and goods quickly and reliably, or to track their positions during production and logistics processes, RFID technologies can be used. The RFID method can considerably reduce logistics expenditures, particularly for industries, such as textiles or automobiles, which manufacture goods in numerous production stages at various locations around the world.

6. Will RFID chips make goods more expensive in the future?

Basically what RFID chips can-do was already possible by other means. Their decisive advantage is that they can do it more quickly, electronically and at unbeatable lower cost. Today, in quantity of one million pieces, the electronics (chips, antenna, connecting circuit between chip antenna) for a smart tag still costs around 50 eurocents. This is too expensive for most retail goods. In two to three years' time, however, the experts see these costs already falling to around 20 cents – although massive increases in volume and new manufacturing technologies are required to bring down costs below this level. Infineon is conducting research into such options. Commercially, however, it will take five to ten years for this to become a reality.

7. Do RFID chips bring even more radiation into the environment?

First of all: Readers/scanners for RFID chips transmit normal radio waves, like radio or television, just at shorter wavelengths. The chips respond to the magnetic field of the readers with such weak signals that even the readers have difficulties in perceiving them. Thus even at a distance of just a few meters the radio emissions are no longer measurable – much to the annoyance of market researchers in pursuit of customer habits or industrial spies or those in power wishing to investigate their citizens: To eavesdrop they would have to be very close. And that arouses attention.

8. Will RFID chips allow big brother to watch me as a consumer?

Any purchase made on a credit, discount or customer card is already recorded and evaluated in computers. Particular inclinations can be taken from these card bookings. You don't need smart tags for this. RFID chips just store product data; only when purchased with a card are products linked to people – regardless of whether a card operates with RFID technology or not.

It is not RFID chips that are the risk, it is what is done with the data. Discussions are currently underway to press for better protection for personal customer data. The technical options for this already exist.

9. Can RFID labels be integrated into goods but invisible to the customer?

Anyone who really wants to do this will do it. But it won't be that easy. The RFID chips themselves, with a surface area of around 1 square millimeter, are as small as grains of sand but their antennas must be large otherwise the chips cannot be perceived by their reader units. This is a law of physics. A scary example, which is often quoted, is that RFID chips could be hidden in the soles of shoes and read out by a scanner in the carpet. But how would the soles of the shoes know who is in the shoes?

Infineon believes the marking of RFID in consumer goods, as demanded by consumer protection groups, is a sensible requirement. The consumer should have the option of removing the tag or having it destroyed at the time of purchase.

10. Can I as a consumer switch off the RFID chips after my purchase?

Even today, there are various options to remove a smart tag after purchase: I can have smart tags, like all labels, removed in the shop after my purchase or I can take them off myself at home. A few retailers who have tested RFID price tags have installed deletion stations for their customers where all data can be deleted after purchase. An American security company is now also offering an RFID blocker which overlays the radio signals of the chips and thereby makes it impossible to read out the data without authorization. Anyone can prevent themselves being spied on.Even so, covert observers are still dealt a bad hand since they have to get very close to their target in order to receive the weak signals of the electronic tags – not more than 70 centimeters away.

11. Can anybody covertly read out the information stored on electronic tags?
First of all, the short range of radio signals of RFID chips at around 70 centimeters at 13.56 MHz is a first level of protection against covert reading out of data. It means that someone would have to be very close to access information. In addition, to do so would require an expensive reader/scanner. And furthermore, the data on electronic tags is mostly very well encrypted by the manufacturer. Even if the information were successfully read out, the combinations of apparently meaningless sequences of letters, numbers and special characters would first have to be decrypted.

12. Can the state or my employer use RFID chips to monitor my private life?
No more than before. It has been suggested that money bills and passports should be equipped with RFID chips to protect against forgery. The advantages: the RFID technology improves fraud protection and verification is simple and reliable. Passports are already machine-readable, but without data protection through encryption. It is not technically possible to read money bills through the pocket since the antennas of the RFID chips are too close to one another and thus cancel out each other's effect.
A company already possesses a great deal of electronic information from which the performance and behavior of its employees can be determined. However, legal regulations successfully prevent misuse. RFID chips could create new opportunities for electronic monitoring of employees. It will be the task of legislators, collective bargaining bodies and works councils to find practicable regulations for this, which protect the interests of the employee.

13. Can RFID labels interfere with other technical devices?
No, at least not electronic tags that are passive RFID systems without their own power supply. Their radio signals are too weak. Active RFID systems with power supply transmit on separately assigned frequencies, so they do not cause interference. However, the RFID chips themselves can be disturbed by high-frequency radiation or magnetic fields. Studies at the University of Karlsruhe, Germany, show that a computer monitor close to the RFID reader/scanner significantly reduces the reliability of identification. Adverse effects can also occur in production workshops in factories with strong electrical currents and magnetic fields.

14. Will smart tags produce even more electronic waste?

RFID labels can be reused by deleting the stored data and replacing it with new data (read/write cycles: 500,000) . Which is also true for closed transport systems, such as transport containers. This produces major savings compared to paper barcode labels, although these are much cheaper to make.

However, there is one factor that counts against reuse in the mass market. RFID labels are too valuable and durable to be used just once, e. g. to record yoghurt pots is an example often quoted.

The volume of electronic waste from RFID chips is manageable: Silicon chips are becoming ever smaller, the antenna loop consists of a wafer-thin copper or aluminum layer – all this makes up just a millionth of a gram (microgram). Most material is encased within a plastic body that can be recycled in the same way as plastic.

15. Will RFID labels replace the barcode on goods?

Although within the next three to five years, smart labels are expected to substitute barcodes in many logistics applications, they will certainly not totally replace them in the foreseeable future. There are various reasons for this: Today barcodes can still be made at far lower cost than intelligent tags. Simply because of their price, RFID labels are also only really suitable for high-priced goods. This means that the benefit is less in recording the price than in providing a certificate of authenticity. It is not worth sticking a label on every milk carton costing 50 cents. Thus smart tags are currently mainly used in logistics where palettes or transport cases must be identified in order to reliably track and trace their route.

With foodstuffs, in particular, RFID labels are still wishful thinking since the chips have technical difficulties in functioning reliably close to metal or water. Solutions are being worked on but will take some time.

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