



RFID (Contactless IC Card/Tag & Reader/Writer)
Outline
Applications
Features



Contactless IC Card and Reader/Writer



UHF- band Reader/Writer

Outline

A Ubiquitous Society Forged by RFID

Is it coming up on 5 years since we first heard the word ubiquitous? Its original ideal of being only a dreamlike image both everywhere and nowhere is finally beginning to convey a specific position.

For example, “ RFID ”

RFID is now spreading rapidly as a core technology of a ubiquitous society. RFID is short for “ Radio Frequency ID ”, a technology for reading and writing IC chips using radio wave. Products combining a small IC chip and an antenna are processed to various tag types such as plastic cards, labels and stickers for portable use by people or use by affixing it to an object to be managed. Information on the tag is recorded, enabling various services simply by bringing it close to a reader/writer.

IC card tickets for public transportation are one familiar example

Devices using RFID have increased for making payments at convenience stores or for mileage cards at airline companies, and there are those already using these as ID authentication systems for employee or student IDs.

Cards have also been introduced that can make payments for game fees at recreation facilities and record game information played at game arcades to develop characters for continued enjoyment days after. It is also not that uncommon to have RFID tags embedded in tickets to prevent counterfeiting at large events like the World Cup or the Beijing Olympics. This technology is also starting to be used in public service cards such as IC driver ’ s licenses, IC passports and resident registration cards.

This technology is spreading across manufacturing, logistics and inventory management industries

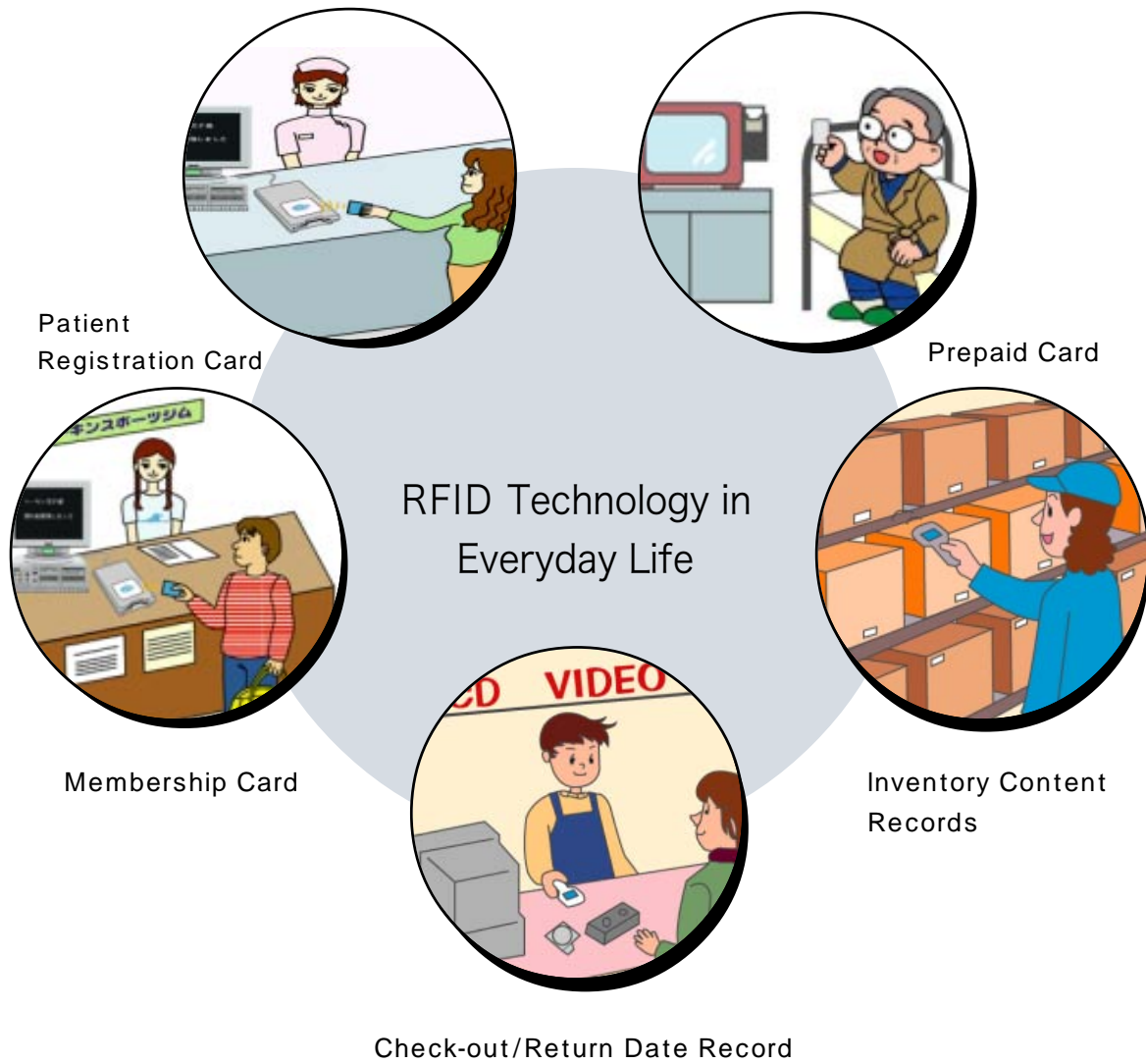
Affixing RFID tags to each component or module when assembling products in factories enables detailed recording of the process they are in or what inspections have been conducted, enabling efficient production management.

Finished products are shipped based on tag information, break-bulked at the logistics sites and shipped to each location to accurately check whether the products have arrived at retailers. The retailers also use it for inventory management by counting the number of products stored in carts without having to check each product one by one, and getting automatic notification if there are any stock-out items.

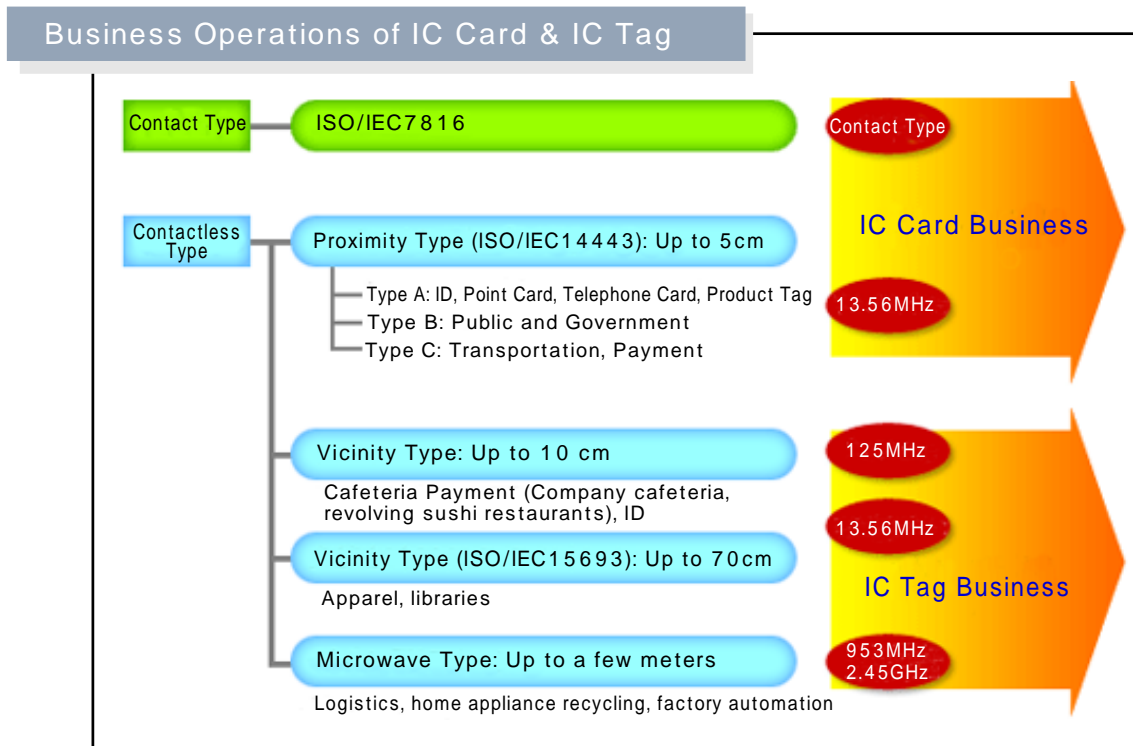
Especially in the food distribution field, it is starting to be used for tracking and traceability when there is a breakout of Mad Cow Disease or Avian Flu to see where these meats have been shipped to.

Ubiquitous means to be everywhere at the same time

RFID technology, according to the meaning of this word, is to be everywhere at the same time into society, making our lives more convenient and abundant.



RFID tags are classified into 4 types according to the radio wave type used, and used in combination with these characteristics.



(1)

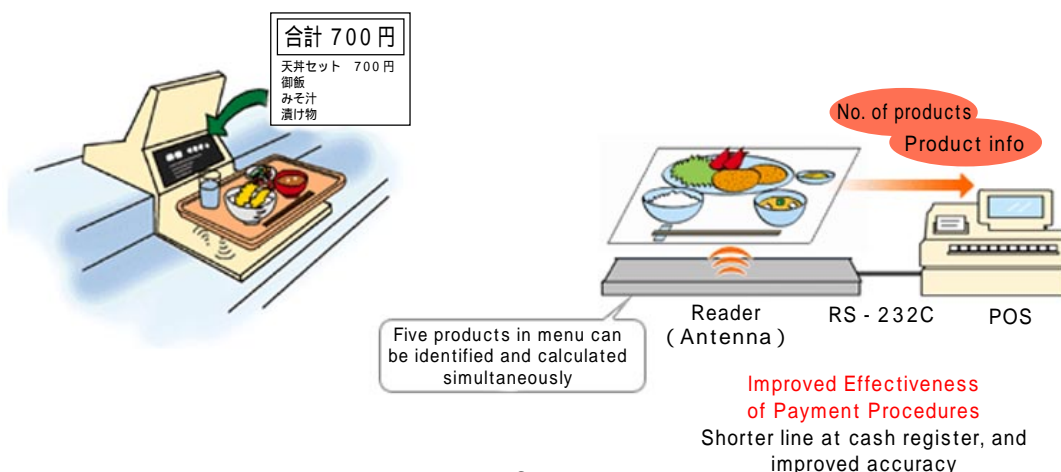
The RFID tag that first came into use uses a frequency at a long waveband of 125 to 135 kHz. This tag type has an effective distance of 30cm, and is resistant to rain, etc., but it has a slow information communications speed, thus it cannot communicate large amounts of information.

It has automobile anti-crime immobilizer and other security applications, and is also embedded to ski resort lift tickets, dishes at revolving sushi restaurants and in tableware at buffet dining halls and used for fee payment.

Case Study: Cafeteria Auto-payment System

Manage cafeteria/restaurant payment using contactless IC tag

- Store menu information such as product name, price, calorie on contactless IC tag
- Seamless bill calculation at cafeteria
- Enabling auto-payment at cash register using a combination of prepaid cards and pay-later method



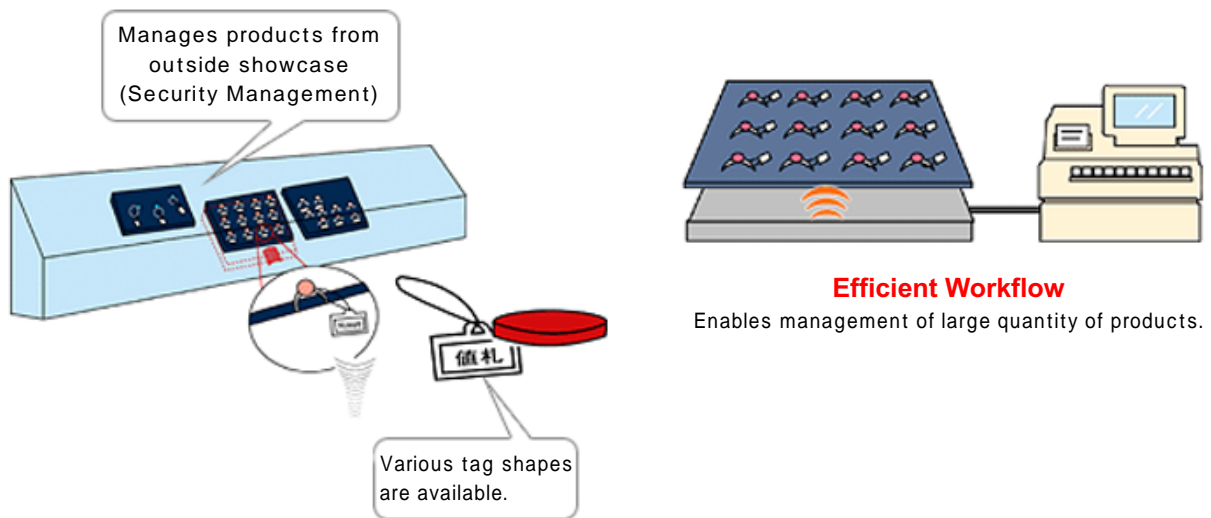
(2)

The short waveband 13.56 MHz is the most widely used today. This wavelength resists water, dust and other environments, there is no need to worry about orienting the antenna to receive radio waves and it has a fast communications speed. However, its effective distance is only 10 to 20cm, thus it is used by holding the card over the reader.

It is used for IC card tickets for public transportation, employee and student ID and other ID cards, for security cards, game arcade, recreation facility and other cards, and for goods management tags.

Case Study: Goods Management System (Jewelry Store)

Product management using contactless IC tag
Enabling real-time inventory & hot-selling information management



(3)

The micro 2.45 GHz waveband uses the same frequency band as microwave ovens and wireless LAN (802.11b/g). The effective range is around 1m, it can be aimed directly at locations and has a very fast communications speed. However, is it not suitable for cards people carry because it absorbs moisture. It is currently used for product logistics management, etc.

(4)

The ban on the use of UHF 953 MHz band was lifted according to amendments to the Radio Law 2005 autumn, bringing with it much future promise. It has an effective range of around 4m, and has directivity and a fast communications speed, thus making it a leading frequency band in the logistics field in the future. However, as it is easily affected by moisture, metal and other environments, systems must be configured according to the installation environment.

The RFID market scale is expected to reach 40% for short waveband (13.56 MHz), 40% for UHF (950 MHz), and 20% for the micro waveband (2.45 MHz) and long waveband (135 kHz) combined.

Features Wide-Ranging, Responds Flexibly to Customer Needs

NEC TOKIN is one of a handful of manufacturers in Japan providing wide-ranging technology and know-how through total solutions from media cards, tags, reader/writer terminals (reader/writer) and other hardware to IC card OS and access control systems software.

For example, most manufacturers for tags purchase finished modules called Clip On Board (COB) from semiconductor manufacturers and process these for card and other types to be sold.

However, NEC TOKIN does not manufacture IC circuits, but performs consistent production whereby it purchases wafer forms from semiconductor manufacturers, cuts them thinly and precisely, divides them into individual chips, designs and attaches antennas to a shape matched to the purpose and processes them to cards and tags. This keeps costs down yet provides high quality.

Another great advantage of NEC TOKIN is its analog design, antenna and simulation technologies cultivated over many long years.

Business Experience of NEC TOKIN in IC Cards and IC Tags



Some might wonder why handle analog in this digital age. Yet, analog technology is vital to an RFID world using radio waves.

Radio waves are extremely delicate where just the slightest environmental impact such as the shape of a room, the location of steel framing, or where people gather most often prevents its performance from being realized.

In this situation, site engineering, such as simulation technology to analyze environments, arrange devices, design antennas to be attached to tags and verify that they function correctly, is key to realizing high performance.

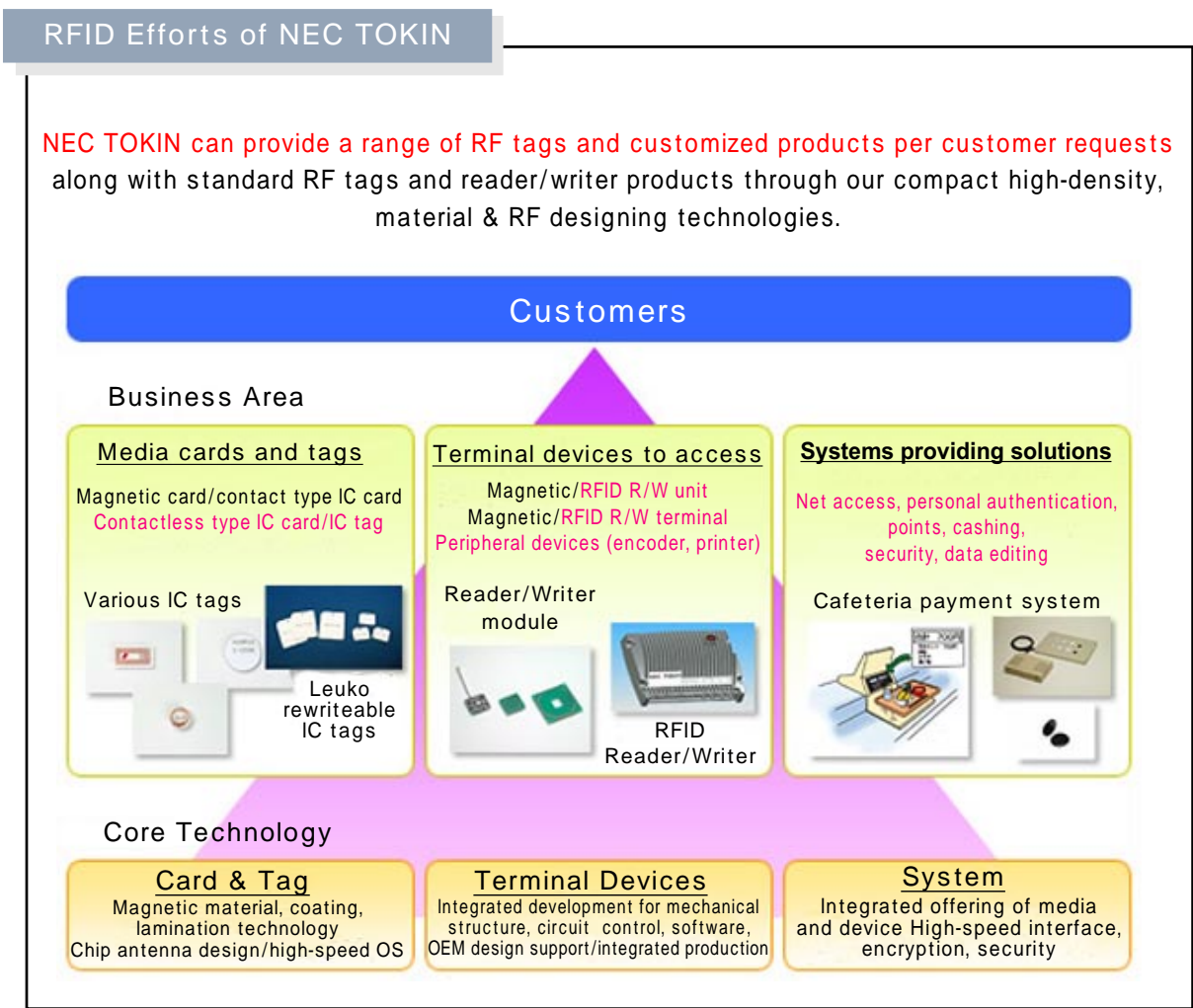
Tags and readers/writers also do not resonate radio waves if communications distance and power consumption, etc. do not match, making it difficult to receive radio waves up to the distance originally intended. In response, NEC TOKIN, with its two-way analog technology on the tag and reader/writer side, can provide the perfect system configuration. NEC TOKIN has materials technology for various tag types and the know-how to manufacture high quality cards with proven results in telephone cards, etc.

There are actually many types of tags.

For example, tableware such as dishes at revolving sushi restaurants is washed in very hot water to maintain hygiene. As a result, processing technology using heat-resistant resin conforming to the Food Hygiene Law is required for tableware tags.

For employee and student IDs, the smoothness of the card surface must also be maintained in order to apply a leuko layer for printing facial pictures and names on the card surface and for printing out the remaining balance. Or, for tag types affixed to metals, performance drops when radio waves are emitted to the metallic side, thus it is essential to have a method of creating a layer without radio waves being emitted to the metallic side.

Whenever customers request us to do something in a particular way, or have questions about how to realize their visions, NEC TOKIN is ready and fully equipped to provide the perfect system configuration to respond to any requests or questions from its customers.



The NEC TOKIN RFID is already being used in many locations, and the company provides a full lineup of products from 125 kHz to 2.45 GHz.

NEC TOKIN has also teamed up with its parent, NEC Corporation, and Impinj, Inc. in the United States to begin providing trial kits of readers/writers and tags conforming to “UHF EPC Global Class 1 Gen 2” which promises to become the global logistics standard specifications after the lifting of the ban on UHF last autumn.

NEC TOKIN would like to use its high technology and full capabilities to play a wider role in the forming of a fundamental ubiquitous society in the future.