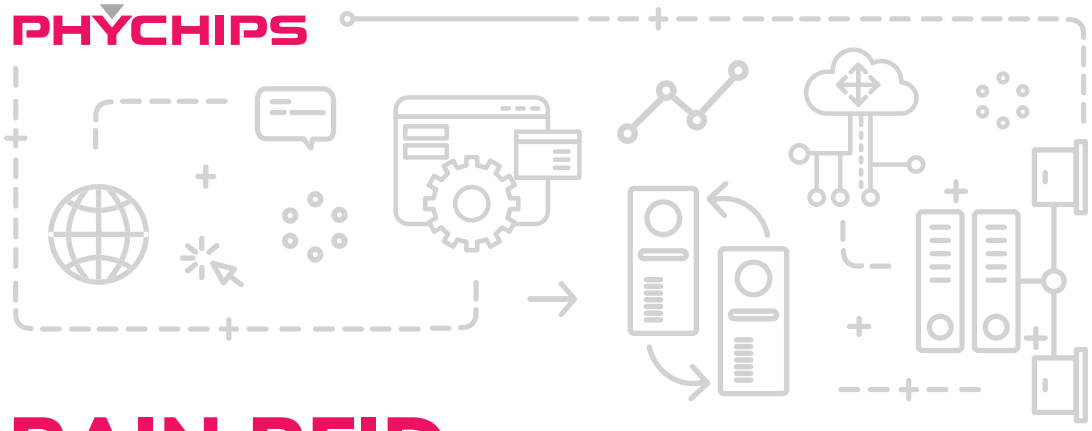
PHYCHIPS



RAIN RFID READER SOLUTIONS

RAIN RFID Reader **Chip** \ RAIN RFID Reader **Module** \ RAIN RFID Reader **Antenna**

PHYCHIPS

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PHYCHIPS

Introduction

PHYCHIPS is a company that specializes in manufacturing and supplying UHF RFID reader/writer SoC, reader modules, and antennas based on wireless communication core semiconductor technology. By providing essential components required for building RFID solutions as a turn-key solution, PHYCHIPS offers professional technical support from experienced hardware and software engineers, enabling customers to reduce development time and costs while achieving optimized performance.

VISION

The most trusted and customer-focused RFID company

MISSION

By providing the best RFID product, we create the RFID/IoT world

Products

RFID Reader Chip

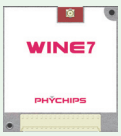
PR9200

PR7

RFID Reader Module

RED2

RED4S



WINE7

WINE5

WINE3

RFID Reader Antenna

QUBE4010 Plus

QUBE6010 Plus

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Ceramic Patch

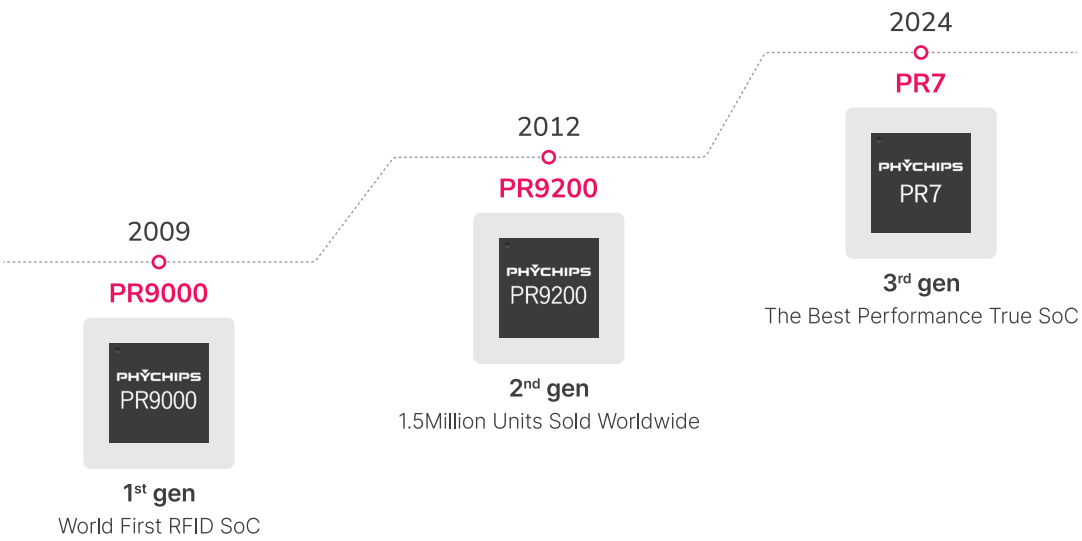
About PHYCHIPS

The most trusted and customer-focused RFID company

PHYCHIPS' history can be described as the history of UHF RFID technology. In 2009, we pioneered the release of PR9000, the world's first System-on-Chip(SoC) for RFID reader based on the 8051 MCU, enabling the groundbreaking implementation of compact, lightweight, and low-power consumption short-range mobile RFID readers. Our second-generation product, PR9200, launched in 2012, improved its read and write performance with the ARM Cortex-MO MCU, establishing itself as a bestseller in short-range applications within 3 meters. PHYCHIPS has supplied over 1.5 million SoCs to leading global reader manufacturers, significantly reducing the technological barrier and manufacturing costs for RFID reader development, contributing to the expansion of the RFID market.

True RAIN RFID SoC

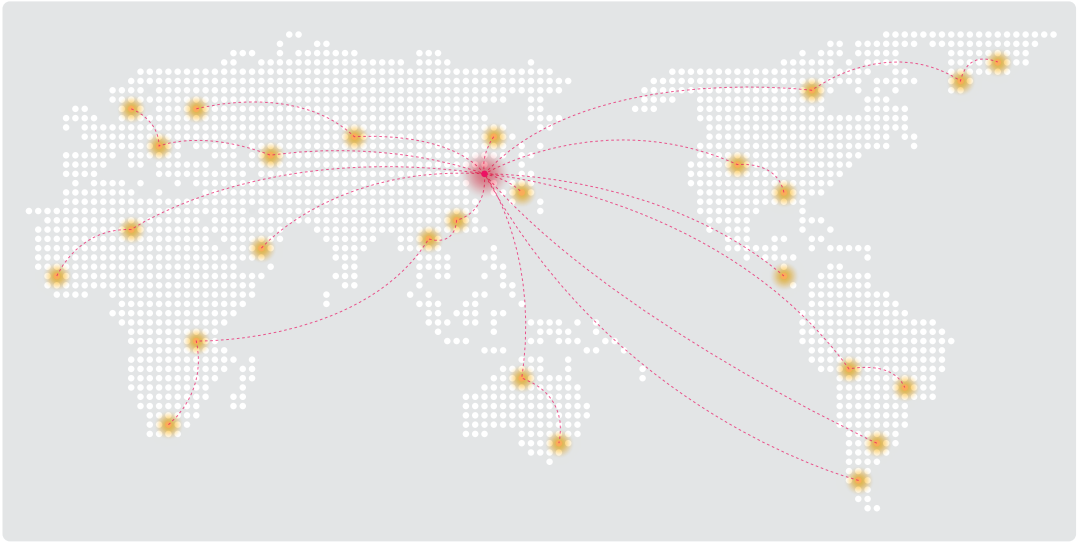
The third-generation product, PR7, developed for high-performance and long-range applications, achieves a 20dB sensitivity improvement compared to the second generation, making it suitable for handheld and fixed readers. It features an ARM Cortex-M3 processor operating at 128MHz and 256kB of flash memory built into the PR7 chip, enabling the implementation of a true Soc RAIN RFID reader/writer system without the need for an external MCU. Additionally, it incorporates various peripherals, including ADC, DAC, and USB, as well as high-speed digital interfaces, allowing developers to realize a wide range of IoT applications beyond our imagination.



Industry standard QUBE antenna

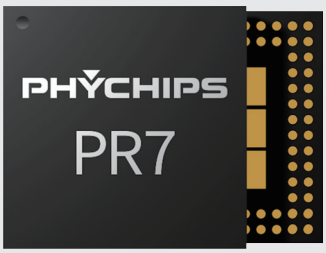
Unlike other wireless communications, RFID uses the same frequency band for transmission and reception simultaneously. This means that a strong transmitter signal reflected back from the antenna can interfere with the receiver, reducing the receiver sensitivity. Therefore, RFID reader antennas need to have very low reflection coefficient. Since 2015, PHYCHIPS, in collaboration with KAIST, developed a new concept of RFID antennas with low reflection coefficients across a wide frequency range. These antennas have been supplied to global RFID reader manufacturers under the brand name QUBE. Currently, QUBE antennas have become the standard antenna for designing handheld reader, with over 400,000 units supplied so far.

PHYCHIPS has been working with global companies as they develop products, to address their key particular needs. And we offer technical support to customers and can suggest various antennas, together with reader chips or modules, which includes designing and tuning the antennas for customers' unique environments. PHYCHIPS will continue to improve product performance and explore and support new applications to provide trust and convenience to more customers.



RAIN RFID Reader Chip

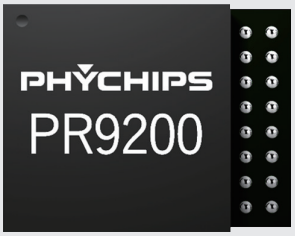
PR7



RAIN RFID | 3rd Gen SoC | Cortex-M3 | Flash 256KB | USB | WINE RCP

The PR7 is a true single SoC solution for RAIN RFID reader/writer which integrated high performance UHF RF/Analog, MODEM, ARM Cortex-M3 processor, Flash memory and many other features with fully compliant EPC Global Gen2v2/v3, ISO18000-63 protocol. With high integration and excellent performance, it will be a new product that leads the market by being used in various fields ranging from handheld to fixed readers.

PR9200



RAIN RFID | 2nd Gen SoC | Cortex-M0 | Flash 64KB | RED RCP

The PR9200 is a RAIN RFID reader SoC that supports the EPC UHF Gen2 air protocol and includes a built-in UHF RF, MODEM, ARM Cortex-MO processor, and memory. A complete reader can be configured without adding a separate external MCU or memory. This provides a cost-effective solution for low power, short range IoT applications.

RAIN Reader Chip Selection

Item		PR7	PR9200
PHYCHIPS' Generation		3rd	2nd
Air Protocol		EPC Gen2v2/v3 GBT AAR ISO 18000-62, 63, 64	EPC Gen2v2
ReceiverSensitivity[1] [dBm]	Max. Sensitivity Mode	-86(M8, 250KHz)	-
	M4, 250kHz	-84	-65
Max. Read Rate[2] [tags/sec]	M4, 250kHz	200	170
	FM0, 640kHz	1000	-
Package		8×8 96pin LGA	6×6 64pin BGA
MCU Integration	Core	ARM Cortex-M3	ARM Cortex-M0
	Clock Speed	128MHz	19.2MHz
Flash Memory		128MHz	64MHz
SRAM		256kB	16kB
Peripheral	UART	O	O
	I2T	O	O
	SPI	O	O
	QSPI	O	X
	USB	O	X
	GPIO	24	16
Rx Balun		Included	Required External Components
POR/BOD		Included	Required External Components
Tx Leakage Cancellation		Included	Required External Components
User Application Programming		O	O
Reader Modes		12+	1 + Customized
Worldwide Region Support		O	O
Reader Protocol		WINE	RED
Internal PA		20dBm	20dBm
Recommended Tx Power(External PA)		Max. 33dBm	Max. 27dBm

1. Measurement Env. : Antenna port, included 1 OdB directional coupler, 10% Error rate, CISC RFID Xplorer, 30dBm(for PR7)/27dBm(for PR9200)
2. Measurement Env. : 6dBi Antenna, 30dBm Tx output, 400 tags

RAIN RFID Reader Module

WINE Series

RAIN RFID

PR7 embedded

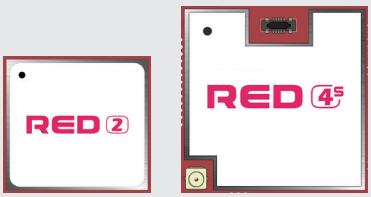
MULTI Protocol
ISO 18000-62, 63, 64

WINE RCP

Powered by PHYCHIPS' advanced PR7 chip, the WINE series offers a full spectrum of UHF RFID reader modules designed to meet the needs of diverse applications—from mobile to fixed readers. Each module is built for high performance, cost efficiency, and seamless global deployment with simple region configuration.

- **WINE7** is a high-performance module with 30dBm output power, supporting USB/UART/SPI/I2C interfaces, with built-in DRM filtering.
- **WINE5** provides moderate output power(27dBm) and a compact form factor. It offers low power consumption and supports UART/SPI interfaces,.
- **WINE3** is designed for low power consumption and cost efficiency with 20dBm output power and a small size.

RED Series



RAIN RFID

PR9200 embedded

SMD

RED RCP

RED series are designed based on PHYCHIPS' PR9200, which offers a small size and excellent performance, enabling customers to respond to the market quickly and easily. RED4S has Tx output of 27dBm and is inserted into mobile readers such as dongle-type and jacket-type readers, which is widely used in IoT applications. It obtained FCC, CE, TELEC, and KC certifications. RED2 has a size of 14mm x 13mm and is designed for small devices that require a short read range.

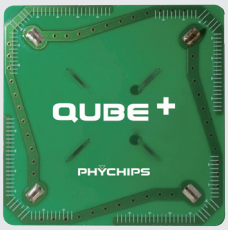
RAIN Reader Module Selection

Item	WINE7	WINE5	WINE3
Reader Chip	PR7	PR7	PR7
Air Protocol	EPC Gen2v2/v3 ISO 18000-62, 63, 64	EPC Gen2v2/v3 ISO 18000-62, 63, 64	EPC Gen2v2/v3 ISO 18000-62, 63, 64
Interface	UART, USB, SPI, I2C	UART, USB, SPI, I2C	UART, SPI
Antenna Port	1(U.FL)	N/A	N/A
Mount Type	Screw Assembly	SMD	SMD
Pin Count	15pin(1.25mm Pitch) 40pin(0.5mm Pitch)	24pin	24pin
Supply Voltage	5V	3.3V	3.3V
Output Power Range	0~30dBm	0~27dBm(Japan: 0~24dBm)	0~20dBm
Power Consumption	1A@5V, 5W	0.6A@3.3V, 2W	0.3A@3.3V, 1W
Size(W x L x H)	40.0 × 36.0 × 7.2 mm^3	18.0 × 18.0 × 3.0 mm^3	18.0 × 18.0 × 3.0 mm^3
Reader Protocol	WINE RCP RED RCP compatible	WINE RCP RED RCP compatible	WINE RCP RED RCP compatible

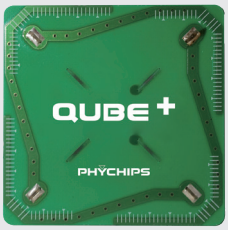
Item	RED2	RED4S
Reader Chip	PR9200	PR9200
Air Protocol	EPC Gen2v2	EPC Gen2v2
Interface	UART(Default), SPI	UART(Default)
Antenna Port	N/A	1(U.FL)
Mount Type	SMD	SMD
Pin Count	28pin	36pin
Supply Voltage	3.6V	3.6V
Output Power Range	9~16dBm	13~27dBm(Japan: 13~23dBm)
Power Consumption	0.21A@3.6V, 0.75W	0.55A@3.6V, 2W
Size(W x L x H)	14.0 × 13.0 × 2.5 mm^3	24.0 × 24.0 × 3.0 mm^3
Reader Protocol	RED RCP	RED RCP

RAIN RFID Reader Antenna

QUBE4010 Plus



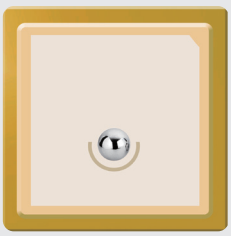
QUBE6010 Plus

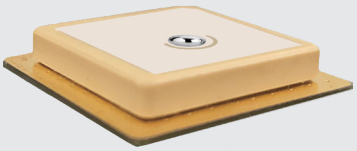


QUBE6015 Plus

QUBE series are high performance antennas using patented original technologies such as Quadrifilar helical antenna, Power dividing, etc.
It is smaller, lighter, and more robust than any other high gain antennas, and can maintain constant performance in any environment.
It provides optimized performance for medium and long-range UHF RFID applications.

Item	QUBE4010 Plus	QUBE6010 Plus	QUBE6015 Plus
Size(W x L x H)	40 × 40× 10mm^3	60 × 60 × 10mm^3	60 × 60 × 15mm^3
Gain	-0.8dBic(EU) 1.0dBic(US)	2.6dBic(EU) 3.3dBic(US)	3.0dBic(EU) 4.0dBic(US)
BW (-3dBic@Peak Gain)	16MHz	24MHz(EU) 30MHz(US)	30MHz(EU) 35MHz(US)
Axial Ratio	1.3	1.3	1.3
Polarization	RHCP	RHCP	RHCP
Weight	7g	11.5g	13g
Center Frequency	866MHz(EU) 921MHz(US)	866MHz(EU) 921MHz(US)	866MHz(EU) 921MHz(US)





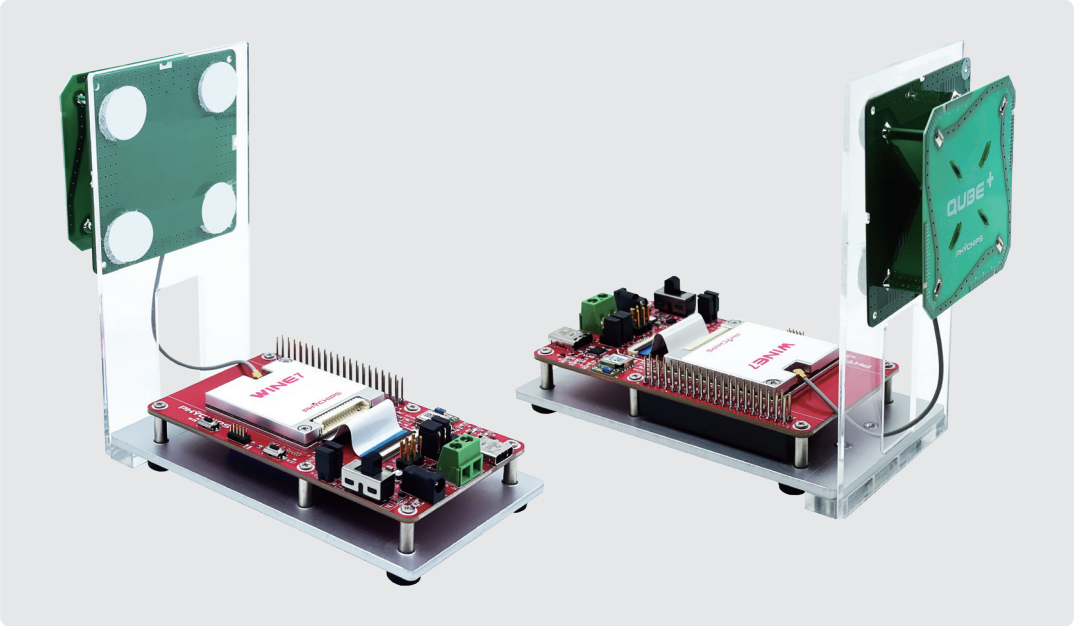
Ceramic Patch

The ceramic patch is a high-performance antenna using proprietary materials specially developed for high-performance antenna elements.
It has lower fabrication cost which easily mass manufactured.
Its small and light features are fit to compact devices to provide optimized performance for short-range UHF RFID applications.

Item	Ceramic Patch
Size(W x L x H)	25 × 25 × 4mm^3
Gain	0dBic
BW (-3dBic@Peak Gain)	3MHz
Axial Ratio	< 1.5
Polarization	RHCP
Weight	9.5g
Center Frequency	866MHz(EU) 921MHz(US)

RAIN RFID Developer Kit

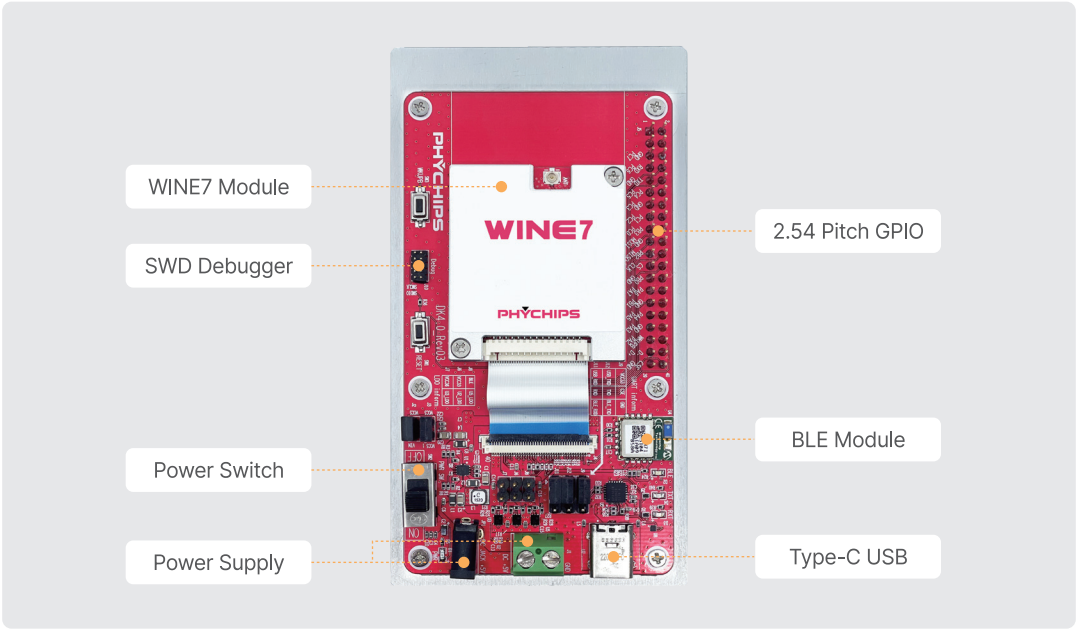
PR7 Developer Kit



This powerful developer kit helps you to understand and evaluate PR7 and WINE7 easily for your development. The DK is offered with PHYCHIPS' high-performance antenna, QUEB6015 Plus, along with the standard firmware. It is directly connected to a PC via C-type USB and comes with the WINE Utility, a GUI for Windows, allowing users to experience all the features of PR7.

- High performance 30dBm module
- Support all features of PR7 Soc
- USB interface: Type-C
- 2.54 pitch GPIO header for customer's application
- Connectable with Raspberry Pi 4
- WINE Utility for PC

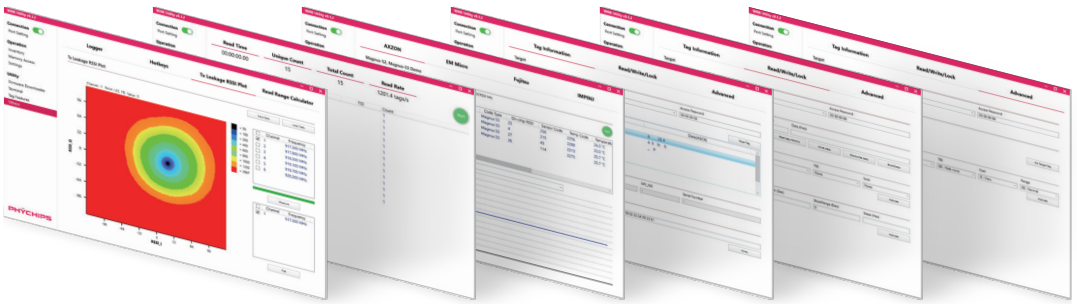
Board Description



WINE Utility

The WINE Utility is a GUI program for Windows for PR7 and WINE7 applications.

- EPC Gen2: Inventory, Memory access
- PR7 RF and Modem setting
- Firmware download
- Support various tag features of AXZON, EM Micro, Fujitsu, Impinj



Applications

RFID technology is widely used in several commercial and industrial applications to search, identify, track, and communicate with various objects, people, items, or things. It automates the collection of data and reduces human effort and error.
Here are some representative examples of RFID applications.
These applications are contributing to improved efficiency and safety by utilizing wireless communication and automatic identification technologies.

Retail & Supply Chain

RFID in retail involves placing an RFID tag on an item to communicate with an RFID reader, and processes it with software to generate real-time results for inventory, transaction, stock level, or individual customer purchase order history. Additionally, it simplifies the typical retail inventory process, which is highly manual, time consuming, and only performed at predetermined intervals.

Medical & Hospital

RFID technology provides reliable, automated data capture systems that support many medical applications, including:

· Management of surgical instruments
· Staff and patient workflow support
· Medical equipment location management, automation of supply chain management

Logistics

RFID is ideal for the processes of warehouses or distribution centres, as the functions performed in them are always related to products and goods that have tags with necessary information. With this technology it will be simpler to monitor goods and know their origin and destination.

Cash Management

RFID enables real-time tracking of cash bags throughout the movement process, human identification of bags, and robotic sorting. Also, there is a smart safe which secure cash management device designed to accept individual notes using RFID technology.

Automotive

RFID tags embedded in tires ensure reliable tire identification and enable to build data driven services & solutions. The RFID tire management solution can automatically visualize and keep track on the flow of tires, moving in/out of the retreading factory and making the tire inspection process easy, accurate, and fast.

Agriculture

RFID technology provides an array of benefits in agriculture that can streamline various agricultural operations increasing efficiency and production. It is mainly used for monitoring and collecting data in real-time to ensure a successful harvest, and animal tracking in livestock farming and processed food chains for traceability.

Parking Lot

RFID parking control systems provide a robust security layer by ensuring that only authorized vehicles gain access to the premises. With the unique identification capabilities of RFID tags, the system can accurately authenticate vehicles, minimizing the risk of unauthorized entry.

PHYCHIPS

RAIN RFID
READER SOLUTIONS

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