

Smartkeys to the future

Vehicle security, connectivity and personalization in the smart key era

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Mobile phones have become smartphones, wristwatches have become smartwatches and now, electronic car keys have become smartkeys. Portable, wireless and remarkably interactive, smartkeys are, in many ways, like other recently introduced smart devices. What sets them apart is security. Smartkeys are purpose-built for secure transactions, so they can be trusted to safely and securely deliver advanced functionality. This paper looks at how smartkeys enhance vehicle security, connectivity and personalization—without adding risk.

Introduction

We live in an era of smart devices. Yesterday's familiar electronic items are now equipped with a remarkable level of intelligence and are able to do a whole new set of tasks: mobile phones are now smartphones, capable of more than just making calls; wristwatches are now smartwatches, capable of more than just telling time; and most recently, electronic car keys are now smartkeys, capable of more than just opening and starting a car.

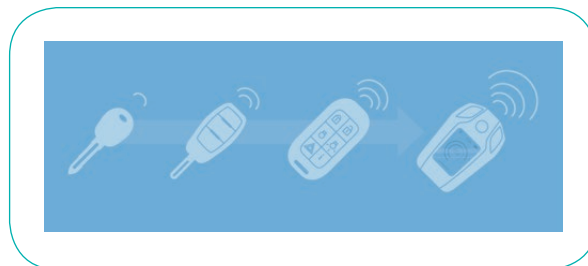


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Small enough to fit in a pocket, yet equipped with a touchscreen and secure wireless connectivity, smartkeys have much in common with other smart devices. They can:

- ▶ Interact with other electronic systems
- ▶ Run apps and exchange digital content
- ▶ Perform the functions of a smartcard for tasks like mobile payments, ticketing and physical access

This flexibility opens up a number of possibilities for advanced functionality. Consider the following examples:

- ▶ When you leave for work in the morning, a smartkey can lock the front door, open the garage door and automatically adjust the car's seats and mirrors to your preferred settings.
- ▶ It can pay tolls for turnpikes and bridges, pay for the tickets needed to ride public transport and pay for lunch.
- ▶ A smart key can open the gate at a parking garage, open the doors at work, or open the lock on a bike rental or hotel room.
- ▶ It can even be used to grant temporary access to your car, so a delivery service can leave a package in your car's trunk while you're somewhere else.

Reading through the list of examples, it's easy to mistake a smartkey for a smartphone or some other smart device, but a smartkey is different. From start to finish, smartkeys are designed and manufactured for safety and security. They're tailor-made for use cases that require trust and security. As a result, you can rely on smartkeys to safely perform sensitive functions, like payment, access, remote control and more.

In this paper, we look at why smartkeys deliver such a high level of security, explain why smartkeys are a smart investment, highlight one of the enabling technologies for smartkeys (Near-field communication, or NFC) and list the reasons why NXP is the ideal partner for designing and delivering best-in-class smartkeys.

Smartkeys are all about security and convenience

Smartkeys are, first and foremost, made to be trusted. As they continue to evolve, safety and security will remain the basis for their development.

Keys are, by definition, security mechanisms. The first keys to be used with cars were introduced in the 1920s and secured the glove box and trunk, so personal items could be safely stowed in the car. The first ignition keys, which replaced starter buttons in the 1940s, served to deter thieves, too, but also increased safety by making it harder for a child to move a car that had been left in gear.

As time went on and electronic features such as remote lock and unlock, alarm, and immobilizer were added in, car keys took security further, preventing the car from being stolen or operated once in the wrong hands. Even the convenience features of present-day electronic car keys, including RF for remote control, are an outgrowth of security since they make it easier to lock the car or push a panic button. Smart motion detection will further increase energy efficiency. Innovative UWB technology will enable ranging & localization for new convenience use cases such as advanced welcome light, asset tracking or autonomous parking.

Smartkeys extend functionality while continuing the tradition of trust. They're manufactured in a secure environment that connects each key to a single vehicle and include new, sophisticated functions that make the device more resilient, so as to protect against current and emerging attack and fraud scenarios.

Smartkeys will coexist with smartphones and wearables

Smartkeys serve a very particular niche in the automotive market will coexist with other smart devices. As a portable component of the car, the smartkey is just one of the smart devices that make up a personal network, along with smartphones, tablets, smartwatches, fitness bracelets and other wearables.

Smartkeys are tightly linked with vehicle ownership. They're issued with the car and bundled with the vehicle at the time of purchase. When the car is sold or disposed, the smartkey is sold or disposed of along with it. A person might get a new smartphone or tablet every couple of years, but will keep their smartkey for as long as they own their car – and that could be many years, even a decade.

Also, unlike a smartphone, a smartkey doesn't need cellular service or Wi-Fi® to operate, and can still open and start a car even if the battery is dead. Whatever the situation—an underground parking garage, a remote rural area, or some kind of emergency—the smartkey remains an essential device, providing manual backup for opening and starting the car.

Smartkeys are a smart investment

There are several reasons why leading automotive manufacturers are investing in smartkey development. Smartkeys are desirable objects that help reinforce brands, enhance service offerings, differentiate products, and strengthen partnerships.

Brand recognition

Having a sophisticated, highly interactive device like a smartkey can be seen as a status symbol, providing an emotional attachment to the car and the brand itself. Advanced personalization, secure connectivity, interaction with other mobile devices, payment, access, fleet management and all other extra smartkey features make the smartkey and its car more desirable.

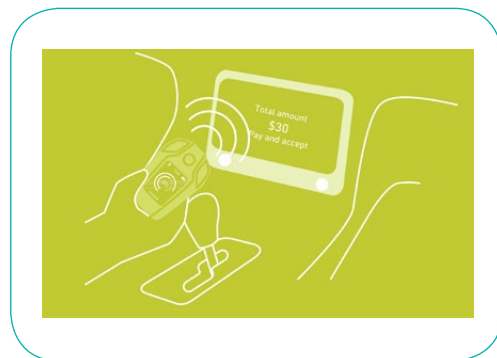
Cobranding and corporate partnerships

Using the smartkey as a payment, access, or loyalty card creates opportunities for cobranding and corporate partnerships. Consumers can be encouraged to buy specific after-market products or accessories, or specific consumables, such as fuel, oil, or tires, from partner companies. Payment functions can also be used to “unlock” new features in the car, at any point in the vehicle's lifecycle.

Personalization

Today's consumers are increasingly comfortable with the idea of customizing and personalizing their digital devices, and smartkeys are an extension of this concept. Like other devices that can log personal preferences and automatically update settings to reflect personal habits, the smartkey can make automatic adjustments such as:

- ▶ Seat and mirror position to match driver preference
- ▶ Preprogrammed navigation for the fastest, least congested way to work
- ▶ Tuning the radio to a favorite station



Following the trend in smartwatches, smartkeys can be issued in various form factors, with stylish details, to suit individual tastes.

New car and driver interactions

Smartkeys enable new interactions with the car itself. The car can send messages to the smartkey, including but not limited to a scheduled maintenance status, fuel and battery level notifications, tire pressure warnings, or “door open” alerts. These messages help the driver improve operation and stay ahead of upkeep. Wireless interfaces such as NFC and Bluetooth® make it easy to connect the smartkey to the car’s network or the driver’s smartphone or tablet for a bigger display and even more details.

IoT connectivity

NFC and Bluetooth can connect the smartkey to the Internet of Things, for cloud-based control and management. Car manufacturers can use over-the-air (OTA) updates to securely upgrade firmware without costly factory recalls. OTA updates can also be used to enhance applications for car sharing, fleet management and delivery services. Access to the vehicle can be granted and revoked on a secure, restricted basis so that, for example, car-sharing and rental services can give customers temporary access to a vehicle and fleet operators can manage driver access remotely.

A key ingredient for smartkeys: NFC

Several of the new capabilities associated with smartkeys—payments, access, higher security and more sophisticated connectivity—are made possible by near-field communication (NFC), a tap-and-go technology that shares information and initiates tasks when two devices are brought close together. NFC is a proximity RFID technology, co-invented by NXP, and an outgrowth of contactless smartcard technology. As such, it’s fully compatible with the in-place infrastructure for payments, ticketing, access, and more.

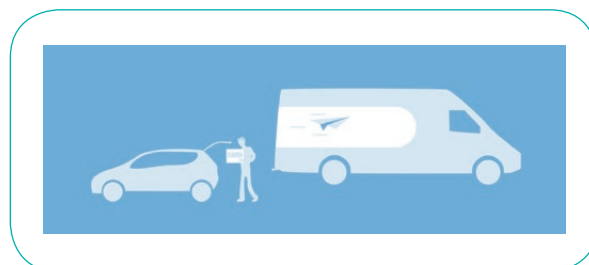
NFC is now available in nearly every major smartphone and is the enabling technology for a growing number of mobile-payment applications. NFC is also gaining ground in wearables, because initiating a secure transaction is both intuitive and deliberate – the user has to physically tap one device to another to establish a secure connection.

Combining NFC with a secure element (an IC that safeguards data) creates a safe way to manage and control personal information, with easy-to-configure limits on how much data is okay to share with a service.

Tap-and-go technology

With NFC, a tap is all it takes to ...

- ▶ Make a payment (using smartcard emulation)
- ▶ Exchange digital content (by interacting with a reader)
- ▶ Connect electronic devices (using peer-to-peer communication)



NXP is the right smartkey partner

NXP is uniquely positioned in the smartkey market. We've been developing best-in-class car-access systems for more than two decades and currently work with 19 of the top 20 car manufacturers. We offer industry-leading competence in all relevant technologies and we know what it takes to create secure, easy-to-use and life-enhancing devices.

Innovation

We're known for the groundbreaking automotive ideas we've introduced for car access, security systems, in-vehicle networking, vehicle connectivity, onboard entertainment and more. For car keys specifically, we've been either first or an early entrant with a number of important technologies, including immobilizers and advanced solutions for passive keyless entry.

Expertise

Our design teams have the broad-based experience that can come only from long-standing partnerships with customers in a range of industries. Our ongoing collaboration with leading smartphone, wearable, and automotive suppliers gives us deep insight into every use case for car access and we have leading LF and RF expertise in every operating environment. We work on an evolutionary basis, moving methodically from one generation to the next, to increase performance while maintaining backward compatibility.

Security

Using technologies already trusted in some of the world's most sensitive security applications, we provide security solutions that are both elegant and easy to use. We protect high-value assets and prevent their misuse without compromising the user experience. The result is a vanguard of new features that add value in a secure way.

Performance

Throughout the design spectrum, from low end to high, we deliver the robust performance required to create smartkeys that are reliable and intuitive. NXP covers more frequencies and ensures interoperability so new features don't interfere with existing ones or make previous versions obsolete. As the same time, we deliver the system-level power management that ensures extended LF and RF range with minimum power consumption, so smartkey users don't have to worry about battery life.

Conclusions

Smart keys leverage several major trends, including secure access, integrated mobility and personalized electronics. These compact, interactive, wireless devices make driving better by enabling new levels of security, connectivity and personalization. They give automotive manufacturers new ways to reinforce brands and build deeper relationships with partners and customers and they promise to transform the interactions between cars and their drivers. NXP Semiconductors is a leading player in all the technologies related to smartkeys and is an ideal partner for creating highly functional and desirable smartkeys that deliver the right combination of security, simplicity and efficiency.

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