EMV® Chip At-a-Glance

Enabling Seamless and Secure Contact and Contactless Payments Around the World

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

IPR2025-01148
Apple EX1030 Page 1

Introduction

EMV® Chip technology makes seamless and secure contact and contactless payments with cards and mobile devices possible anywhere in the world. Based on the globally adopted EMV Chip Specifications, secure chips are used in billions of payment cards to validate their authenticity and safeguard against card fraud.

Whether you are a user of EMV Chip technology, or providing payments products and services, this eBook will broaden your understanding of EMV Chip, its history and evolution, and its foundational role in the next generation of secure and reliable digital payments.

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

Contents

01 What is EMV® Chip?
- 01 Overview of EMV® Chip
- 02 Benefits of EMV Chip: Secure, Seamless, Reliable
- 03 History and Evolution of EMV Chip

04 EMV Chip Specifications
- 04 What they Cover
- 04 Contact and Contactless
- 05 What about Mobile Payments?
- 06 EMV Product Evaluation and Approval

07 Future of EMV Chip

08 About EMVCo



© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

What is EMV® Chip?

Overview of EMV Chip

EMV® Chip[1] is a set of open, global technology specifications that makes seamless and secure contact and contactless payments with cards and mobile devices possible anywhere in the world.

Chip technology validates the authenticity of a card and generates a one-time use security code for every transaction, which helps prevent counterfeit, lost and stolen fraud.

EMV Chip Specifications provide a blueprint for chip technology to work consistently anywhere in the world to deliver the same result – secure, seamless and reliable in-store payments[2].

Based on the globally adopted EMV Chip Specifications, secure chips are used in nearly 12 billion credit and debit cards today as part of a layered security approach to combat fraud. Over 90% of all card-present transactions are EMV Chip-based[3].

[1]Although "EMV", "EMV Chip", "Chip and PIN", are all terms used to describe this type of technology, EMV® is a trademark term dating back to the 1990s, and it refers to the specifications administered by EMVCo.

[2]Card-based payments made in-person at a retail outlet, transit gate or other physical environment.

[3]Worldwide EMV® Deployment Statistics

[4]Worldwide EMV® Deployment Statistics

[5]Mastercard

[6]Nilson Report, 'Issue 1068'

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

EMV Chip Snapshot

More than **80** countries have adopted EMV Chip[4]



Nearly **12 billion** EMV Chip payment cards are in use today powering **90%** of in-store transactions globally[5]

Recognised as providing the best protection against losses from counterfeit cards[6]

IPR2025-01148
Apple EX1030 Page 4

Benefits of EMV® Chip: Secure, Seamless, Reliable

Technology Providers

Global compatibility

Specifications provide blueprint for developing products that will work seamlessly and securely anywhere they are used.

Flexible requirements

Specifications are flexible to support loyalty programmes, transit ticketing and other offerings not dedicated to payments.

Card Issuers and Merchants

Fraud prevention

Using EMV® Chip technology as part of a layered approach, payment card issuers and merchants around the world prevent fraud resulting from counterfeit, lost and stolen cards and increase the security of in-store payments.

Seamless acceptance

Global EMV Chip infrastructure makes it possible for merchants anywhere in the world to accept domestic and international chip-based payments seamlessly and securely.

Consumers

Secure and reliable payment

Consumers benefit from EMV Chip every day by being able to follow a familiar payment process to make secure, reliable card-based payments wherever they are in the world – whether inserting or tapping a card at a terminal or using a smartphone to make a contactless purchase.

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

World Pre-EMV Chip



- Rampant counterfeit fraud
- Chip card payments only possible domestically
- Magstripe technology only option for international card payments
- Greater reliance on other payment types, e.g., cheques, travellers' cheques, cash, etc.

World With EMV Chip



- Significantly reduced counterfeit fraud
- Close to 90% of card transactions globally are chip
- More than 80 countries have adopted EMV chip
- Reduction in use of less convenient payment types, e.g., cheques, travellers' cheques, cash, etc.



IPR2025-01148
Apple EX1030 Page 5

History and Evolution of EMV® Chip

EMV Chip Specifications were first created to address the need for chip cards and terminals to work effectively everywhere.

Early 1990s

Magnetic stripe primarily used for card payments

France pioneered the first mass deployment of chip cards for payment by the banking industry. By 1994, all French bank cards carried a chip using a French developed specification for chip card credit and debit payment, which dramatically reduced fraud due to counterfeit and lost and stolen cards.

Following the French success, several European markets issued chip-based bank cards through the 1990s.

These cards worked domestically but could not be used outside the country where they were issued.

Magnetic stripe technology, which offered limited fraud prevention benefits but worked globally, remained the de facto option for card cross-border payments.

A global standard was needed to advance secure chip card payments.

1994 – 2006

Global EMV Chip Specifications and infrastructure established

In the 1990s international payment systems jointly began the development of global chip specifications, with initial versions released in the mid-1990s. The EMV® Chip Specifications were then published in 1996.

In 1999, EMVCo was formed to manage, maintain and enhance the EMV® Chip Specifications.

The introduction of a global set of EMV Chip Specifications made it possible for everyone to use the same specifications for chip cards and terminals to deliver reliable, secure, and convenient in-person payments for businesses and consumers worldwide.

This meant any business in any country could use them and expect their products to work everywhere.

As a result, businesses around the world began adopting chip technology in place of magnetic stripe cards, drastically reducing card-present fraud and making in-store payments more efficient and secure.

2007 – TODAY

EMV Chip enables reliable and trusted transactions across contactless and mobile channels for in-store payments

As technology advanced to create new ways to make card payments at the point of sale, EMVCo adapted the EMV Chip Specifications to support contactless and mobile payments.

Today, EMV Chip is the bedrock technology for a portfolio of EMV Specifications enabling seamless and secure transactions across contact, contactless and mobile channels.

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

IPR2025-01148
Apple EX1030 Page 6

EMV® Chip Specifications

What they Cover

An EMV® Chip transaction requires communication between the chip in the card, smartphone, or other device making the payment and the acceptance terminal.

EMV Chip Specifications define the requirements for the chip to communicate with the acceptance terminal and exchange information to execute a transaction.

The transaction involves a dialogue between the card and the terminal, both of which perform steps that will constitute the full transaction, usually involving an authorisation system.

During an EMV transaction, the chip processes information and performs complex cryptography calculations for security and verification perspectives.



EMV Contactless Indicator

Contactless Symbol

Contact and Contactless

To execute a payment, the chip must exchange data with a chip reader in an acceptance terminal. There are two possible means by which this exchange may be made - contact or contactless. For both contact and contactless payments, the acceptance terminal provides power to the chip to enable the chip to function.

Chip cards that offer both contact and contactless capabilities are known as dual interface cards. When the chip is installed inside a non-card device, such as a wristband, contactless is typically the only option for communication to the acceptance terminal.

Did you Know?

EMVCo manages and licenses the EMV Contactless Indicator, a globally recognised consumer facing mark that demonstrates an EMV Contactless payment can be made. This is supported by the EMV Contactless Symbol, signifying that a payment terminal can accept EMV Contactless payments.

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

EMV Contact Chip

With contact, the card must be inserted into the terminal and the chip must have physical contact with the chip reader for the payment transaction to occur.



EMV Contactless Chip

With contactless, the card (or non-card device) must come within sufficient proximity of the reader, (a maximum distance of a few centimetres), for information to flow between the chip and the acceptance terminal.





IPR2025-01148
Apple EX1030 Page 7

EMV® Chip Specifications

What about Mobile Payments?

Though first developed for payment cards, EMV® Chip is not limited to this use.

It also supports payments made with mobile devices (such as smartphones, watches, wristbands, etc.) that use Near Field Communications (NFC) technology to act as contactless chip cards.

EMV Payment Tokenisation offers enhanced security for chip payments made with mobile devices, such as mobile wallets, by replacing valuable card data in a transaction with a payment token, which is worthless if stolen.



© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

How EMV Chip Specifications Align with Industry Standards

EMV Specifications complement industry standards that provide high level rules for compatibility by defining specifically what is needed for a seamless and secure technical interaction between the point-of-sale and payment products used by the consumer.

The EMV Chip Specifications cannot be considered in isolation, and to this end, EMVCo collaborates with multiple industry associations, standards organisations and technical bodies around the world to align related technical requirements.

ISO Standards

The EMV Chip Specifications are based on these underlying International Organisation for Standardisation standards:

- **ISO/IEC 7816: Identification Cards – Integrated Circuit(s) Cards**
- **ISO/IEC 14443: Identification Cards – Contactless Integrated Circuit(s) Cards – Proximity Cards**
- **ISO 8583: Financial transaction card originated messages**

PCI Security Standards

The EMV Chip Specifications and PCI Security Standards are complementary in enhancing payment security and reducing fraud due to counterfeit and lost and stolen cards.



PCI Security Standards Council™

IPR2025-01148
Apple EX1030 Page 8

EMV® Chip Specifications

EMV Product Evaluation and Approval

EMVCo accredits independent laboratories to test and evaluate EMV® products for conformance to the EMV Chip Specifications and EMV security requirements and guidelines, and qualifies test tools.

This includes the functional testing and approval of EMV Chip acceptance and payment devices and the security evaluation of EMV products:

- **EMV payment devices** – cards, NFC-enabled smartphones, wearables or other devices with a secure 'EMV payment application' or programme that allows them to make chip card-based payments seamlessly and securely.
- **EMV acceptance terminals** – terminals with a secure 'EMV kernel', which is the software component inside the terminal that performs EMV processing.

EMVCo issues type approvals and security evaluation certificates for products that demonstrate sufficient conformance.

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

Types of Testing and Evaluations

EMV Functional Approval

EMV Functional Approval processes assess whether a payment product or solution will perform in accordance with the EMV Specifications once deployed in the field.

Level 1

- Assesses the terminal chip reader for compliance with the mechanical and electrical protocols in the EMV Chip Specifications, which covers the transfer of data between the terminal and the chip card or device (smartphone, watch, etc.). This includes tests to confirm how close the card/device and the reader need to be for information to flow when a contactless payment is made.

Level 2

- Assesses the 'EMV kernel', which is the software component inside the terminal that implements EMV requirements. This consists of tests to confirm that the kernel supports the EMV payment application functions.

EMV Security Evaluation

EMV Security Evaluation processes are based on a set of EMV security requirements and guidelines made available to product providers and security evaluation laboratories.

Chip, Platform & Card

- Assesses the security of Integrated Circuit (IC), Platform (IC + Operating System), and IC Card (IC + OS + Application) products intended for use in EMV Chip payment.

Software-Based Mobile Payment (SBMP)

- Assesses the security of SBMP products comprising software (such as SDKs, protection tools, Trusted Execution Environments (TEE), etc.) and intended for use in payment solutions.

IPR2025-01148
Apple EX1030 Page 9

Future of EMV® Chip

→

The globally established EMV® Chip infrastructure provides a foundation for reliable and trusted transactions across contactless and mobile channels for in-store payments.

EMV Chip continues to advance to support digital payments, employing state of the art security such as Elliptic Curve Cryptography (ECC).

The flexibility of the specifications is extending the benefits of EMV Chip beyond retail in-store payments to transit, IoT and in-car payments.

EMVCo continues to evolve the EMV Chip Specifications in collaboration with merchants, issuers, acquirers, payment networks, financial institutions, manufacturers, technology providers and testing laboratories across the globe.

As consumers move away from cash and increasingly towards digital payments, we can expect EMV Chip technology to continue to be a critical enabler for secure, reliable card-based payments around the world.

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.

What are the different ways to pay that are supported by EMV Chip?

	01 Contact Chip	02 Contactless Chip	03 Mobile	04 QR Code
WHAT:	Payment cards with chips	Contactless payment cards with chip	Smartphone, watch or another mobile NFC device that acts as a contactless chip card	Static or dynamic QR codes
HOW:	Inserting or dipping chip card into a reader	Tapping chip card against a terminal	Tapping device against a terminal	Scanning or presenting QR code with a device



If you have additional questions or would like more information about working with EMVCo or adopting EMV Specifications, please visit **EMVCo.com.**

IPR2025-01148
Apple EX1030 Page 10

About EMVCo

EMVCo creates and manages EMV® Specifications and programmes that enable seamless and secure card-based payments for businesses and consumers worldwide.

EMV Specifications support technologies including EMV Chip, EMV Contactless, Mobile, QR Code, Secure Remote Commerce (SRC), 3-D Secure (3DS) and Payment Tokenisation and are widely used by the payments industry to develop products and services that deliver trusted and convenient in-store, online and remote card-based payments.

As a global technical body, EMVCo is collectively owned by American Express, Discover, JCB, Mastercard, UnionPay and Visa. Hundreds of payments stakeholders, including merchants, banks and technology providers, participate as EMVCo Associates and Subscribers to develop, evolve and enhance flexible EMV Specifications that support innovation and address marketplace needs. All EMV Specifications are available royalty free on the EMVCo website.

Stay up to date with EMVCo:

© 2022 EMVCo, LLC. All rights reserved. EMV® is a registered trademark in the U.S. and other countries and an unregistered trademark elsewhere. The EMV trademark is owned by EMVCo, LLC.