

Characteristics of EMV chip cards

Characteristics of EMV chip cards

These cards have a small microprocessor chip embedded in them that stores and processes data

EMV chip card also referred as Integrated circuit card (ICC) or smart cards

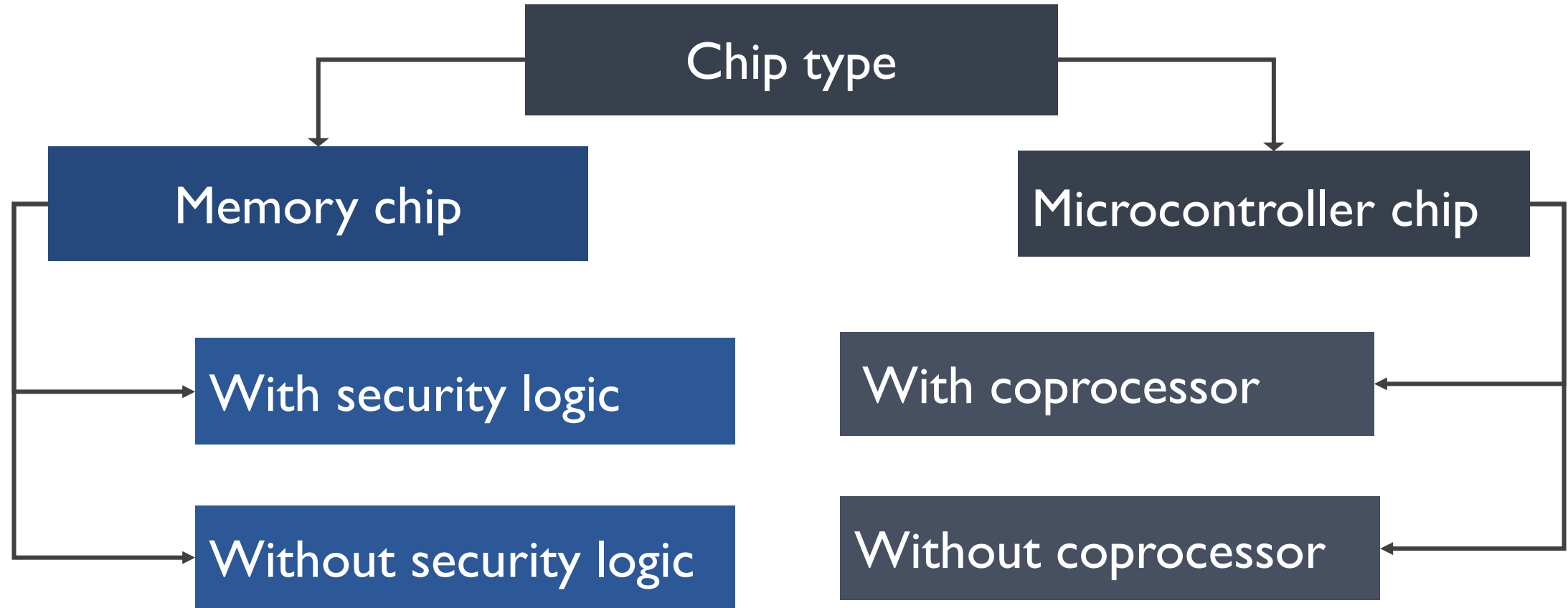


The ICC is required to have physical characteristics as defined in ISO 7816-1

- | | |
|--|---|
| <ul style="list-style-type: none">• Size• Shape | <ul style="list-style-type: none">• Location• Number of contacts |
|--|---|

Characteristics of EMV chip cards

The different types of chips that are available



Characteristics of EMV chip cards

Memory chip

Store data but does not have a processor to perform operations on the data

With security logic



Without security logic

Additional security features , encryption and digital signatures
Perform offline transactions

Characteristics of EMV chip cards

Microcontroller chip

This can store and process data

Without coprocessor

With coprocessor

Performs cryptographic operations, key management functions, improve performance and reduce power consumption

Used for applications that require high levels of security, such as banking and financial transactions

The coprocessor enables the card to perform **offline transactions**

Characteristics of EMV chip cards



Memory chip card without
security logic and
coprocessor

Low
Cost



Microcontroller chip card
with security logic and
coprocessor

High
Cost

The background is a collage of various currency notes and symbols, including the Euro (€), Dollar (\$), and Rupee (₹). Large, semi-transparent numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 0) are scattered across the image. Orange arrows point from these numbers towards the central text box. For example, arrow 1 points up, arrow 2 points left, arrow 3 points right, arrow 4 points down, arrow 5 points up, arrow 6 points down, arrow 7 points down, and arrow 8 points right.

Types of chip card: based on data transmission

Types of chip card: based on data transmission

Contact method

Traditional method of transmitting data between the card and the terminal via inserting the card into the terminal.

Card inserted
into a terminal



Characteristics of EMV chip cards

Contactless method

This method uses radio frequency communication to transmit data between card and terminal without physical contact



Characteristics of EMV chip cards

Dual interface method

This combines both the contact and contactless methods to provide greater flexibility and convenience to the cardholder



Characteristics of EMV chip cards

EMV chip card will depend on

- *Card's features*
- *The payment network*
- *The specific application being used*

Contactless cards
(convenience and speed)

Contact cards
(widely used)

Dual interface cards
(used in variety of situation)

The background is a collage of various currency notes and symbols, including the Euro (€), US Dollar (\$), and Indian Rupee (₹). Large, semi-transparent numbers (1, 2, 3, 4, 5, 6, 7) are scattered across the image. Orange arrows point from these numbers to specific elements: 1 points to a US dollar bill, 2 points to a Euro symbol, 3 points to a Euro bill, 4 points to a Euro bill, 5 points to a Euro bill, 6 points to a Euro bill, and 7 points to a Euro bill. A central dark blue rectangle contains the title text.

Types of chip card: Physical characteristics

Physical characteristics

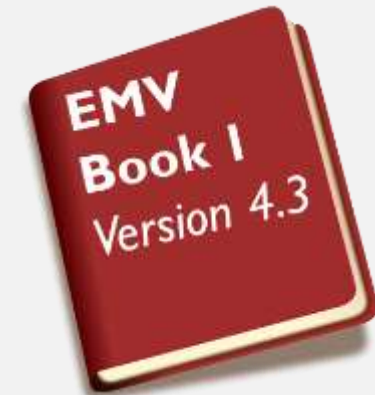
Physical characteristics of the chip

- *Module height*
- *Dimensions of contacts*
- *Locations of contacts*
- *Assignment of contacts*

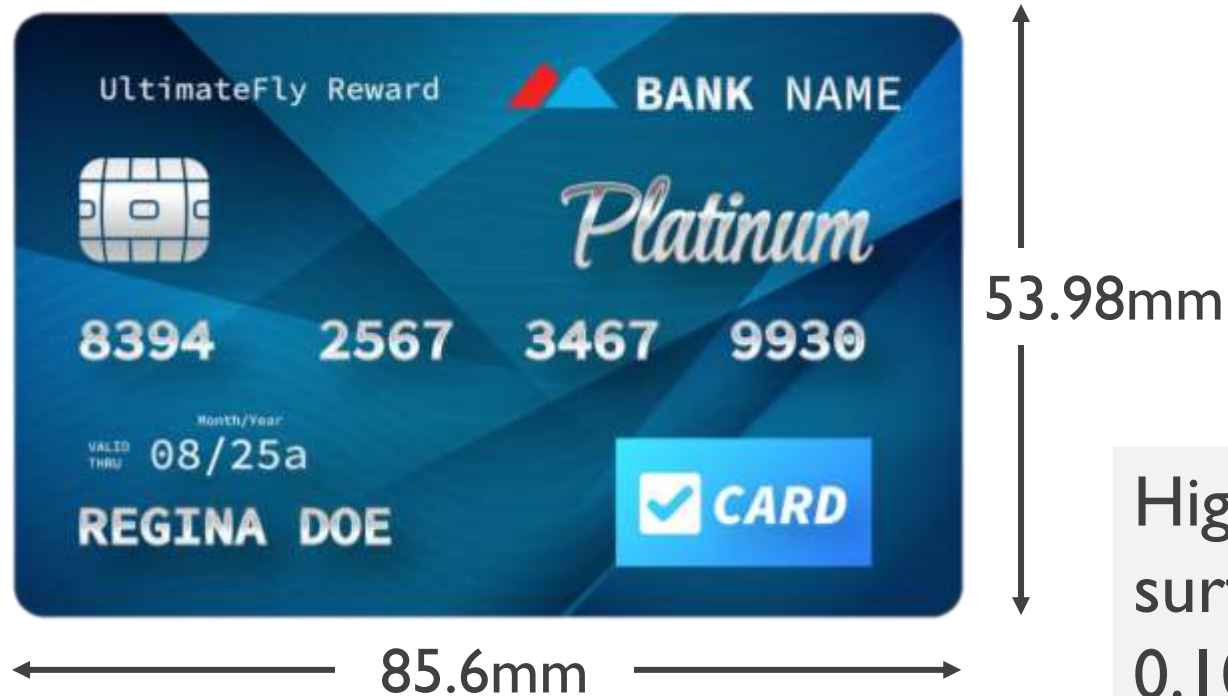


Physical characteristics are stated by **ISO 7816 -1**

Defined in EMV book 1, version 4.3



Physical characteristics



Thickness 0.8mm approximately

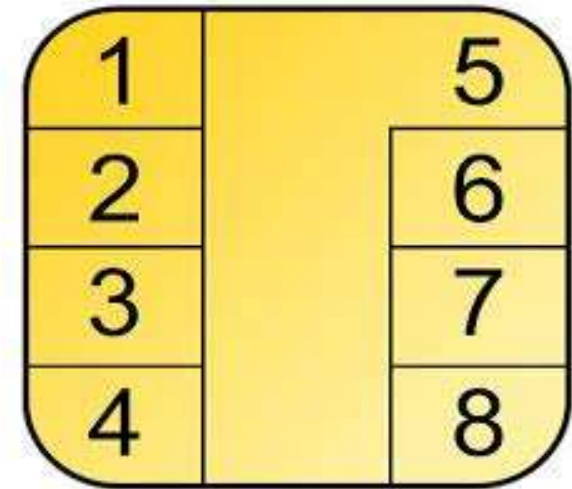
Highest point on the IC module surface should not be greater than 0.10 mm above the card

Lowest point on the IC module must not be greater than 0.10 mm

Physical characteristics

Contact plate on the front side of the card contains eight electrical contacts

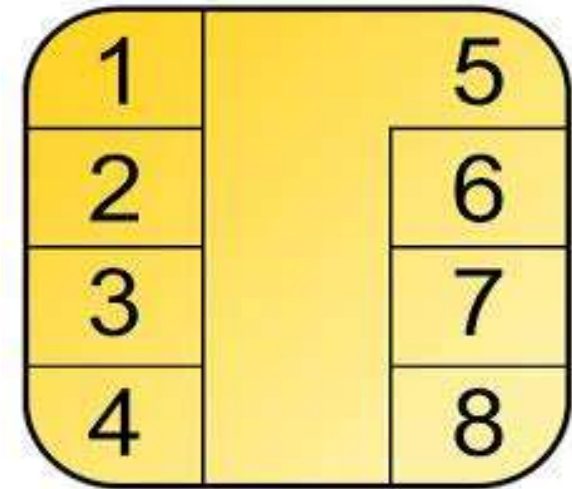
Dimension of 8.00 mm by 5.15 mm



ISO 7816-2 Defines the purpose of each contact point

Physical characteristics

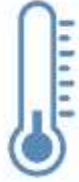
Contact 1 - VCC (*power supply voltage*)
Contact 2 – RST(*reset*)
Contact 3 – CLK (*clock*)
Contact 4 – RFU (*reserved for future use*)
Contact 5 – GND (*ground*)
Contact 6 – VPP (*programming voltage*)
Contact 7 – I/O (*input/output*)
Contact 8 - RFU (*reserved for future use*)



The background features a collage of various currency notes and symbols, including the Euro (€), US Dollar (\$), and Indian Rupee (₹). Large, semi-transparent numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 0) are scattered across the image. Orange arrows point from these numbers to the central text box: 1 points up, 2 points left, 3 points right, 4 points down, 5 points up, 6 points left, 7 points down, 8 points right, 9 points up, and 0 points right.

Types of chip card: Electrical characteristics

Electrical characteristics



Temperature



Voltage

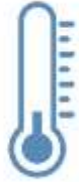


Current



The temperature requirement for the correct operation of the ICC is between 0°C and 50°C

Electrical characteristics



Temperature



Voltage



Current

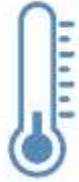


The voltage requirement for the three operating classes of ICC

Symbol	Condition	Minimum	Maximum
VCC	Class A	4.6 V	5.4 V
	Class B	2.76 V	3.24 V
	Class C	1.66 V	1.94 V

Electrical characteristics

Electrical characteristics



Temperature



Voltage



Current



The current requirement for the three classes, which is 55 milliamps

Symbol	Condition	Minimum	Maximum
ICC	Class A		55mA
	Class B		55mA
	Class C		55mA

Test Your Knowledge!

Which ISO standard defines the physical characteristics of integrated circuit cards?

1

ISO 7816

2

ISO 14443

**Time's
up!**



The background is a collage of various currency symbols and numbers. Large, semi-transparent numbers like '7', '8', '6', '1', '0', '3', '7', '1', '6' are scattered across the image. Currency symbols including the Euro (€), Dollar (\$), and Pound (£) are also visible. There are orange arrows pointing in different directions: one pointing up on the left, one pointing right at the top right, and one pointing down on the bottom right. A central dark blue rectangle with a white border contains the text 'Contactless communications' in white.

Contactless communications

Contactless communications

Radio Frequency is used to transmit data b/w card & terminal



Contactless communications

Radio Frequency is used to transmit data b/w card & terminal

Contactless communication using a smartphone

The methodology is referred to as near-field communication (NFC)

Range of NFC is typically 10 cm



Contactless communications



Install mobile
payment app

Enter payment card
information

Hold phone close
to the payment
terminal

Confirm the
payment with their
phone

Contactless communications

Parameter	NFC	RFID
Operating frequency	13.56 megahertz	13.56 megahertz
Communication	Two way	One way
ISO	ISO 14443	ISO 14443, ISO 15693, and ISO 18000
Scan distance	10 centimeters	1 meter

The background is a collage of various currency symbols and numbers. Large, semi-transparent numbers like '7', '8', '6', '1', '0', '3', '7', '1', '6', '4', '6' are scattered across the image. Currency symbols such as the Euro (€), Dollar (\$), and Pound (£) are also visible. Orange arrows point in various directions: one points up from the bottom left, another points right from the top right, and a third points down from the top right. A central dark blue rectangle with a white border contains the text 'Chip Software'.

Chip Software

Chip Software

The operating system used in EMV chip cards is typically a proprietary, real-time operating system optimized for low-power, low-cost devices

The software is embedded in the chip and can't be changed



Predominant choice for EMV chip cards due to the highly regulated nature

Chip Software



*Open source software
are also available*

*Software that is freely available and
can be modified, studied, and
distributed by anyone*



*It is designed to be platform-
independent and supports
multiple programming languages*

Chip Software

It is used to load various application load on operating system

Payment applications

The primary application used in EMV chip card, help to make payment at the point-of-sale(POS) terminal



ATM applications

Used to withdraw cash from ATMs and perform other banking transactions, require a PIN code

Chip Software

It is used to load various application load on operating system

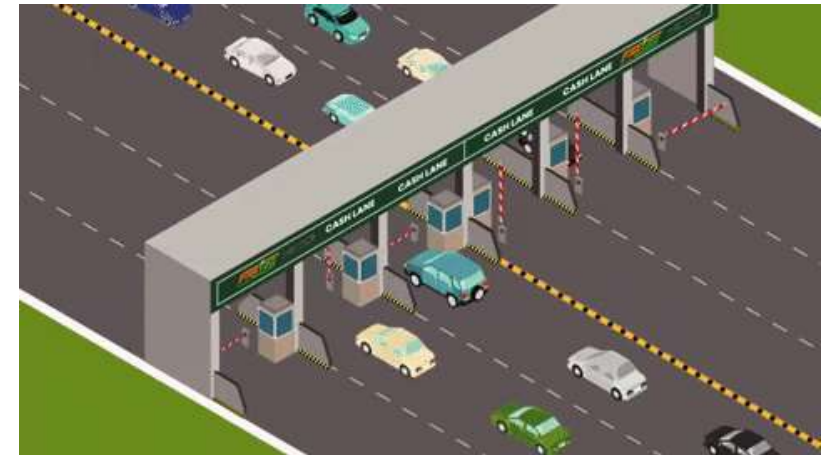


Loyalty applications

Manage loyalty or rewards programs example earning points or cashback

Transit applications

Store transit fare data, use in public transportation systems



The background is a collage of various currency symbols and banknotes. Large, semi-transparent numbers (1, 2, 3, 4, 5, 6, 7, 8, 9, 0) and symbols (€ and \$) are scattered across the image. Orange arrows point from some of these numbers towards the central title box. The title box is a dark blue rectangle with a white border, containing the text "Payment application structure" in white. The overall color scheme is dominated by orange, blue, and green tones.

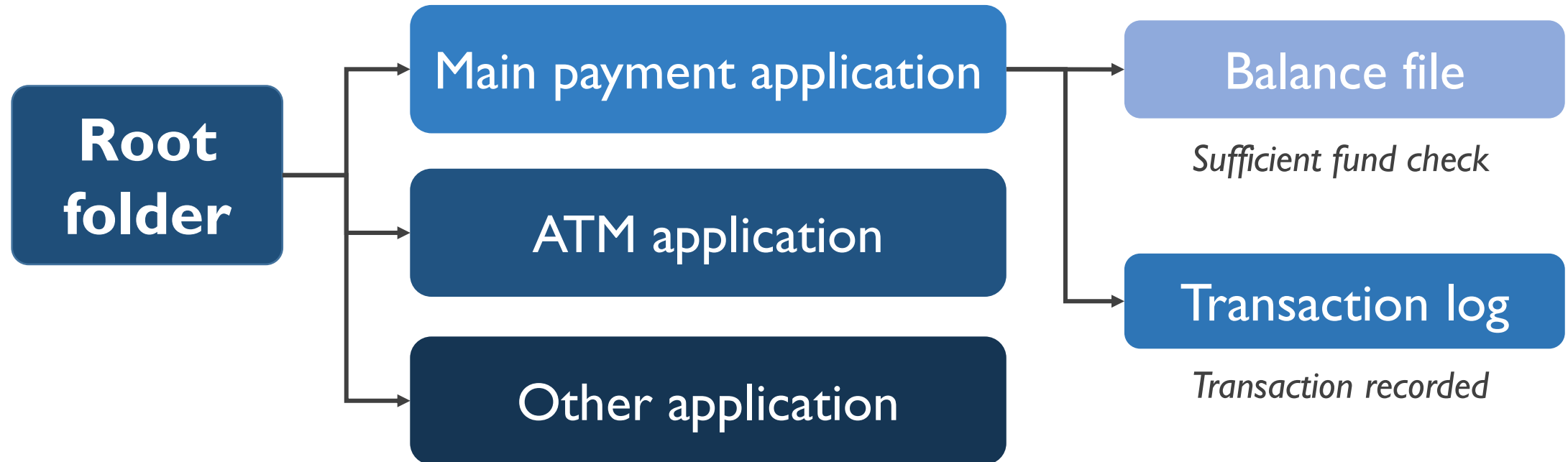
Payment application structure

Payment application structure

Payment application is stored on the integrated chip in a hierarchical file structure



Files are organized in a tree-like structure, each file within a folder



Payment application structure

There are hidden files within the file system

