
**Identification cards — Contactless
integrated circuit cards — Vicinity
cards —**

**Part 2:
Air interface and initialization**

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*Cartes d'identification — Cartes à circuit(s) intégré(s) sans contact —
Cartes de voisinage —*

Partie 2: Interface et initialisation dans l'air

ISO/IEC 15693-2:2006

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

ISO/IEC 15693-2 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology, Subcommittee SC 17, Cards and personal identification*.

This second edition cancels and replaces the first edition (ISO/IEC 15693-2:2000), of which it constitutes a minor revision. It also incorporates Technical Corrigendum ISO/IEC 15693-2:2000/Cor.1:2001.

ISO/IEC 15693 consists of the following parts, under the general title *Identification cards — Contactless integrated circuit cards — Vicinity cards*:

- *Part 1: Physical characteristics* [ISO/IEC 15693-2:2006](https://standards.iteh.ai/catalog/standards/sist/a6b52279-3182-435e-9ccc-735229e58e2b/iso-iec-15693-2-2006)
- *Part 2: Air interface and initialization* <https://standards.iteh.ai/catalog/standards/sist/a6b52279-3182-435e-9ccc-735229e58e2b/iso-iec-15693-2-2006>
- *Part 3: Anticollision and transmission protocol*

Introduction

ISO/IEC 15693 is one of a series of International Standards defining the parameters for identification cards as defined in ISO/IEC 7810 and the use of such cards for international interchange.

This part of ISO/IEC 15693 defines the electrical characteristics of the contactless interface between a vicinity card and a vicinity coupling device. The interface includes power and bi-directional communications.

This part of ISO/IEC 15693 does not preclude the incorporation of other standard technologies on the card.

Contactless card standards cover a variety of types as embodied in ISO/IEC 10536 (close-coupled cards), ISO/IEC 14443 (proximity cards) and ISO/IEC 15693 (vicinity cards). These are intended for operation when very near, nearby and at a longer distance from associated coupling devices, respectively.

The International Organization for Standardization (ISO) and International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of patents.

ISO and IEC take no position concerning the evidence, validity and scope of these patent rights.

The holders of these patent rights have assured ISO and IEC that they are willing to negotiate licences under reasonable and nondiscriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with the ISO and IEC. Information may be obtained from the following companies.

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Koninklijke Philips Electronics N.V. Prof. Holstlaan 6 6566 AA Eindhoven The Netherlands	7.2, Data rate and data coding
Omron Corporation Intellectual Property Group 20 Igadera, Shimokaiinji, Nagaokakyo-City Kyoto, 617-8510 Japan	
EM Microelectronic-Marin SA IP Management Rue des Sors 3 CH-2074 Marin	7.2, Data rate and data coding 7.3, VCD to VICC frames
Texas Instruments Deutschland GmbH D-85350 Freising Germany	8.2, Subcarrier 8.3, Data rates

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Identification cards — Contactless integrated circuit cards — Vicinity cards —

Part 2: Air interface and initialization

1 Scope

This part of ISO/IEC 15693 specifies the nature and characteristics of the fields to be provided for power and bi-directional communications between vicinity coupling devices (VCDs) and vicinity cards (VICCs).

This part of ISO/IEC 15693 is to be used in conjunction with other parts of ISO/IEC 15693.

This part of ISO/IEC 15693 does not specify the means of generating coupling fields, nor the means of compliance with electromagnetic radiation and human exposure regulations which can vary according to country regulations and/or standards.

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2 Normative references

[ISO/IEC 15693-2:2006](https://standards.iteh.ai/catalog/standards/sis/a6152279-3182-435f-9ccc-735231e58e8e/iso-iec-15693-2-2006)

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 10373-7, *Identification cards — Test methods — Part 7: Vicinity cards*

ISO/IEC 15693-1, *Identification cards — Contactless integrated circuit(s) cards — Vicinity cards — Part 1: Physical characteristics*

ISO/IEC 15693-3, *Identification cards — Contactless integrated circuit(s) cards — Vicinity cards — Part 3: Anticollision and transmission protocol*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 15693-1 and the following apply.

3.1

modulation index

index equal to $[a-b]/[a+b]$ where a and b are the peak and minimum signal amplitude, respectively

NOTE The value of the index may be expressed as a percentage.

3.2

subcarrier

signal of frequency f_s used to modulate the carrier of frequency f_c

3.3

byte

string that consists of 8 bits of data designated b1 to b8, from the most significant bit (MSB,b8) to the least significant bit (LSB,b1)

4 Symbols and abbreviated terms

For the purposes of this document, the following abbreviated terms and symbols apply.

4.1 Abbreviated terms

- ASK amplitude shift keying
- EOF end of frame
- LSB least significant bit
- MSB most significant bit
- PPM pulse position modulation
- RF radio frequency
- SOF start of frame
- VCD vicinity coupling device
- VICC vicinity integrated circuit card

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4.2 Symbols

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- a carrier amplitude without modulation
- b carrier amplitude when modulated
- f_c frequency of operating field (carrier frequency)
- f_s frequency of subcarrier
- H_{max} maximum operating field
- H_{min} minimum operating field

5 Initial dialogue for vicinity cards

The dialogue between the VCD and the VICC (one or more VICCs may be present at the same time) is conducted through the following consecutive operations:

- activation of the VICC by the RF operating field of the VCD,
- VICC waits silently for a command from the VCD,
- transmission of a command by the VCD,
- transmission of a response by the VICC.

These operations use the RF power transfer and communication signal interface specified in the following paragraphs and shall be performed according to the protocol defined in ISO/IEC 15693-3.

6 Power transfer

Power transfer to the VICC is accomplished by radio frequency via coupling antennas in the VCD and in the VICC. The RF operating field that supplies power to the VICC from the VCD is modulated for communication from the VCD to the VICC, as described in Clause 7.

6.1 Frequency

The frequency f_c of the RF operating field is $13,56 \text{ MHz} \pm 7 \text{ kHz}$.

6.2 Operating field

A VICC shall operate as intended continuously between H_{\min} and H_{\max} .

The minimum operating field is H_{\min} and has a value of 150 mA/m rms .

The maximum operating field is H_{\max} and has a value of 5 A/m rms .

A VCD shall generate a field of at least H_{\min} and not exceeding H_{\max} at manufacturer's specified positions (operating volume).

In addition, the VCD shall be capable of powering any single reference VICC (defined in the test methods) at manufacturer's specified positions (within the operating volume).

The VCD shall not generate a field higher than the value specified in ISO/IEC 15693-1 (alternating magnetic field) in any possible VICC position.

Test methods for determining the VCD operating field are defined in ISO/IEC 10373-7.

7 Communications signal interface VCD to VICC

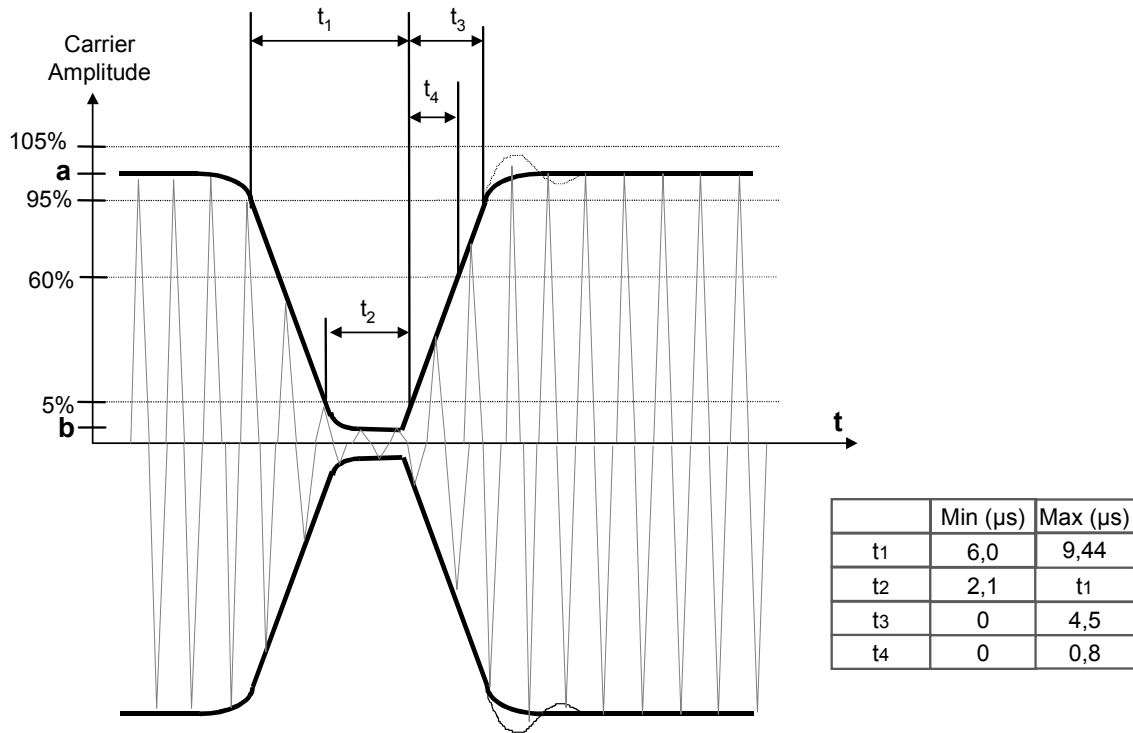
For some parameters several modes have been defined in order to meet different international radio regulations and different application requirements.

From the modes specified any data coding can be combined with any modulation.

7.1 Modulation

Communications between the VCD and the VICC takes place using the modulation principle of ASK. Two modulation indexes are used, 10 % and 100 %. The VICC shall decode both. The VCD determines which index is used.

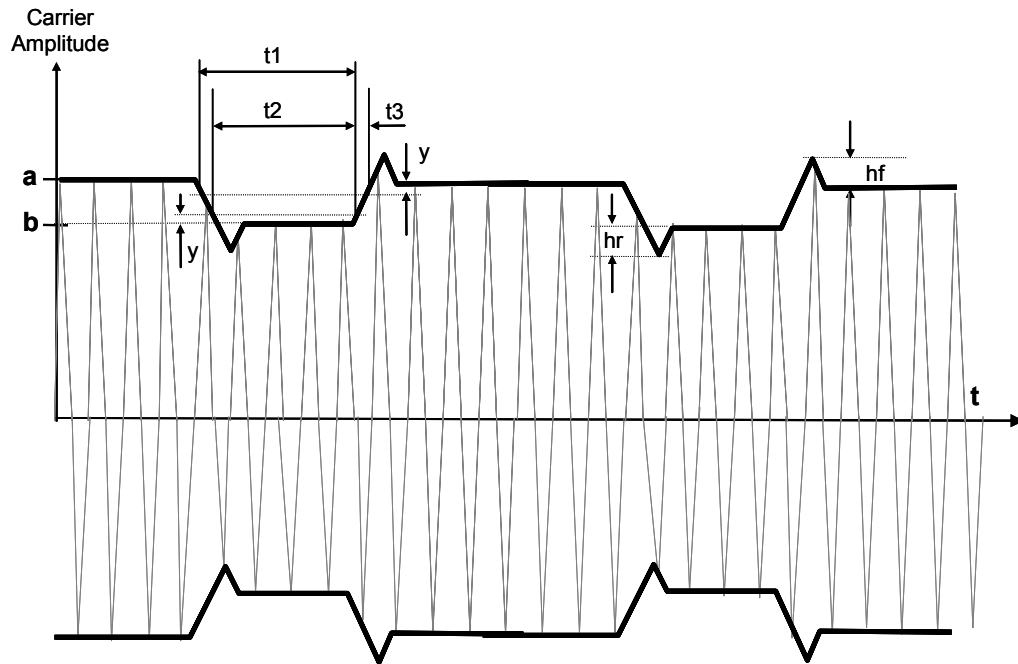
Depending on the choice made by the VCD, a "pause" will be created as described in Figure 1 and Figure 2.



The clock recovery shall be operational after t_4 max.

Figure 1 — Modulation of the carrier for 100 % ASK

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	Min	Max
t1	6,0 μ s	9,44 μ s
t2	3,0 μ s	t1
t3	0	4,5 μ s
Modulation Index	10%	30%

y	0,05 (a-b)
hf, hr	0,1 (a-b) max

The VICC shall be operational for any value of modulation index between 10 % and 30 %.

Figure 2 — Modulation of the carrier for 10 %

7.2 Data rate and data coding

Data coding shall be implemented using pulse position modulation.

Two data coding modes shall be supported by the VICC. The selection shall be made by the VCD and indicated to the VICC within the start of frame (SOF), as defined in 7.3.

7.2.1 Data coding mode: 1 out of 256

The value of one single byte shall be represented by the position of one pause. The position of the pause on 1 of 256 successive time periods of $256/f_c$ ($\sim 18,88 \mu$ s), determines the value of the byte. In this case the transmission of one byte takes $\sim 4,833$ ms and the resulting data rate is 1,66 kbits/s ($f_c/8192$). The last byte of the frame shall be completely transmitted before the EOF is sent by the VCD.

Figure 3 illustrates this pulse position modulation technique.