

A telecommunication smart card supporting near field communication

Technical field

This invention is involved in mobile communication equipment, and more especially a telecommunication smart card with near field communication chip.

Background

Mobile payment is a payment mode by which user can use his/her mobile terminal (usually mobile phones) to pay for goods or service. The overall mobile payment value chain includes mobile operators, payment service providers, application providers, equipment manufacturers, system integrators, merchants and users. At present mobile payment service mainly adopts 13.56MHz and 2.4GHz standards. Implementation methods include DIC (Dual Interface Card) and NFC (Near Field Communication).

DIC solution is to implement mobile payment function by upgrading SIM card to implement the

independence of NFC based mobile payment services on mobile equipment so that mobile operator can actively take part in the promotion and application of mobile payment. The disadvantages of DIC solution are that the reserved contacts C4 and C8 for large-capacity and high-speed service are used. Because its storage and operation capacity relies on the SIM chip and it has no active power, it only can work at inactive communication mode, can't be used as reader and for point-to-point communication, and is difficult to call for hardware resources of mobile equipment which makes its application scope limited.

Main difference between NFC and DIC is that NFC integrates NFC chip and antenna, which makes the mobile equipments with NFC function not only can call for hardware resources of mobile phone, but also has near field communication function. Such mobile phones can be used as reader and tag, meanwhile, used for point-to-point communication. It can be applied extensively. But such solution bypasses the mobile operator who is in the key position of mobile payment value chain, and makes users change mobile phones to make them compatible with NFC standard. Those two

disadvantages will definitely influence the promotion and popularization of mobile payment service based on NFC solution. New-generation NFC solution in compliance with SWP (Single Wire Protocol) standard implements full duplex communication between NFC chip and SIM card through separate C6 without occupying two reserved contacts in the SIM card but implementing security function in the SIM card.

In order to avoid the dependence of mobile payment on the type of mobile phone terminals and implement complete mobile payment solution in the SIM card, presently mainstream DIC and single card solution both occupy the two reserved contacts C4 and C8 in the SIM card unavoidably. But the physical location of C4 and C8 on the SIM module determines the poor contact between antenna contacts and above two contacts.

At present, there is no telecommunication smart card with NFC chip inside and supporting near field communication in the market.

Invention contents

Purpose of this invention is to provide a telecommunication smart card with NFC function. The smart card has NFC function, solves the problem that mobile phones must be changed if NFC function is used, and solves the problems of poor contact of antenna contacts and reserved contacts being occupied.

The telecommunication smart card with NFC function provided by this invention contains card base, SIM module and antenna layer. SIM module on the card base contains a SIM chip. There are two reserved contacts and six functional contacts on the SIM module. Antenna layer includes the coil part, connection part and card contact part which is pasted on the card base.

Wherein, coil part, connection part and card contact part compose the antenna layer. NFC chip is on the SIM module. Full duplex communication is implemented between SIM chip and NFC chip through SWP protocol. The area surrounded by the six functional contacts is stress area, in which at least a new contact must be set.

The location of the mentioned SIM chip and NFC chip on the card base can be set freely according to different requirements and situation. Full-duplex communication is implemented on a signal line between SIM chip and NFC chip through SWP protocol. The mentioned stress area is surrounded by the 6 contacts so that the stress is well-distributed. On condition that normal use of SIM won't be affected, new contacts used for signal transmission can expand the function and application range of SIM card. On condition of stable stress and firm contact, the new contacts can be used for receiving and processing analog signals and digital signal to implement extended functions such as contactless communication, high-speed loading and so on, and solve the problem of the poor contact of antenna contacts and reserved contacts being occupied.

The invention provides the telecommunication smart card with the NFC function when there are 2 or more added contacts. When there are two or more new contacts, the telecommunication smart card supporting NFC function is implemented. The smart card is able to communicate in near field, can be used as reader in active mode and as tag in passive mode. It also can be used for

point-to-point communication between equipments. The connection between antenna contacts on the card contact part and two new contacts in the stress area makes the problem of two reserved contacts being occupied solved and implements firm and stable connection between antenna contacts and SIM card.

Brief description of drawings

FIG.1 is a top view of antenna layer of telecommunication smart card with NFC function.

FIG.2 is an illustration of connection between NFC chip, SIM chip and contacts in the SIM module.

FIG.3 is a top view of SIM card base and SIM module.

Detailed description of the embodiments

In the following part the invention will be detailed by means of embodiments and drawings. But the

embodiments are just illustrative and won't limit the protection scope of the invention.

As shown in Fig.1, 2 and 3, the telecommunication smart card supporting NFC in the embodiment includes:

Card base D, SIM module 400 on the card base D and antenna layer. The card base is the base material carrying chip of smart card or electronic component encapsulated with System in a Package (SiP).

Generally, the definition of SIM contacts complies with ISO 7816 Integrated Circuit (IC) card specification. There are two reserved contacts (namely C4 and C8) and six functional contacts (namely C1~C3, C5~C7). The five contacts C1, C2, C3, C5 and C7 are regular contacts of SIM card. C6 has been out of action as VPP. C4 and C8 have been extended as high-speed interface of new-generation SIM card by ISO. On the present SIM module, area among contacts consists of idle area and ground area. The ground area is used to connect with ground contact C5. The invention condenses the ground area into a ground contact and enlarges the idle area. On condition that normal use of SIM card won't be affected, a

large idle area can be saved to extend functions of SIM card. In the invention, the enlarged idle area (namely area surrounded by six functional contacts) is named stress area S used to place new contacts. As shown in Fig.3, two new contacts 410 are set in the stress area S on the SIM module 400.

As shown in Fig.2, the invention integrates NFC chip 500 into SIM module 400 which contains NFC chip 500 and SIM chip 600. RF antenna pins 510 of NFC chip connect with new contacts 410 on the SIM module respectively to receive and send RF signal. SWP pin 520 of NFC chip connects with SWP pin 610 of SIM chip on the SIM module to implement full-duplex communication through SWP protocol. All other regular pins of NFC chip connect with corresponding contacts. NFC chip 500 is embedded on the blank place of card base D.

New contacts 410 connecting with RF antenna pins 510 also can connect with antenna contact 310.

Antenna layer includes the coil part 100, connection part 200 and card contact part 300, which is pasted on the card base D.

Antenna contact 310 on the card contact part and two new contacts 410 on the SIM module 400 are connected through conductive coating layer. The antenna contact can be fixed by welding or plating conductive materials.

In order to make coil part 100, connection part 200 and card contact part 300 supported by carrier, those three parts are put on base B. The antenna spreading from coil part comes to the other side of base B through the hole 110. Fig.1 only shows the detailed embodiment of antenna coming to the other side of base B through the hole 110. Why to thread the antenna through the hole is to avoid cross contact on the same side of base B between antenna connecting with connection part and antenna on the coil part so as to make antenna invalidate.

In the preferred embodiment of the invention, card contact part 300 has the same shape with card base D and they are connected with adhesive sticker. Both sides of antenna contacts 310 on the card contact part 300 are covered with copper. Antenna contacts 310 connect with two new contacts 410 on the SIM module. RF antenna pins 510 on NFC chip connects with the two new contacts

410 to receive, send and process contactless RF signal. SWP pin 520 on NFC chip connects with SWP pin 610 on the SIM chip. Other regular pins of NFC chip and SIM chip directly connect with corresponding contacts. In addition, antenna contacts can be fixed by welding or plating conductive materials.

Other contacts on the card contact part 300 connect with corresponding contacts on the SIM module 400 so as to connect with circuit of mobile equipment.

The coil 100 can be round coil as shown in Fig.1, but also can be square or other coil.

The number of new contacts 410 in the stress area S on the SIM module can be one or more than two. The purpose of new contact 410 is not limited to connect with antenna or NFC chip. Its purpose will be illustrated with examples in the following part:

1. One new contact. Two RF antenna pins 510 on NFC chip 600 connect with two reserved contacts on the SIM module respectively. The two reserved contacts also connect with two antenna

contacts 310 on the card contact part 300 respectively via conductive coating layer.

2. One new contact. The new contact 410 is used to connect with one RF antenna pin 510 on NFC chip 600. The other RF antenna pin 510 on NFC chip 600 connects with one reserved contact on the SIM module. One antenna contact 310 connects with the new contact 410 and the other antenna contact 310 connects with the reserved contact via conductive coating layer.
3. Two or more new contacts. One RF antenna pin 510 on NFC chip 600 connects with one new contact 410 which connects with one antenna contact 310 on the card contact part 300 via conductive coating layer. Both other antenna contact 310 and other RF antenna pin 510 connect with one reserved contacts.
4. Two or more new contacts. Two RF antenna pins 510 on NFC chip 600 connect with two new contacts 410 respectively which connect with two

antenna contacts 310 on the card contact part 300 respectively via conductive coating layer.

5. Two or more new contacts. Two RF antenna pins 510 on NFC chip 600 connect with two reserved contacts on the SIM module respectively which connect with two antenna contacts 310 on the card contact part 300 respectively via conductive coating layer.

In the above five cases, new contacts which don't connect with antenna contacts are used for other purpose, e.g, transferring analog or digital signal and implementing high-speed loading, or connecting with functional contacts (e.g. VCC (C1)) for other purpose.

Explicitly, embodiments mentioned herein are just part of embodiments of the invention and but not all embodiments. All other embodiments based on the invention obtained by technicians in this field who haven't made innovation are also protected by the invention.

Claims

1. A telecommunication smart card supporting near field communication, consisting of card base, SIM module and antenna layer. SIM module on the card base contains a SIM chip 500. There are two reserved contacts and six functional contacts on the SIM module. Antenna layer includes the coil part 100, connection part 200 and card contact part 300 which is pasted on the card base D.

Wherein coil part 100, connection part 200 and card contact part 300 compose of an integer. There is a NFC chip 600 on the SIM module. Full duplex communication is implemented between SIM chip 500 and NFC chip 600 through SWP protocol. The area surrounded by six functional contacts is stress area S.

At least a new contact must be set in stress area S.

2. Implement telecommunication smart card with contactless communication according to claim 1. It has the following features: There are two new contacts 410 in the stress area S. The two new contacts 410 connect with two RF antenna pins 510 of NFC chip 600 respectively. They also connect with two antenna contacts 310 on the card contact part 300 via conductive coating layer.