

**PROCESS FOR PRODUCING A CARD HAVING A CONTACTLESS FUNCTION AND/OR A
CONTACT FUNCTION**

5 The invention relates to a process for producing a portable object with a contactless function and/or a contact function.

 The invention is for example used to produce contact and/or contactless payment cards, dual-interface cards, or hybrid cards used in the banking sector. The invention may also be used in the areas of identification, transport, health, passports, etc.

10 There are a number of techniques for producing cards having a contactless function and a contact function. In general, chip cards or cards with integrated circuits consist of a micromodule comprising a chip and a flexible printed circuit with one or two layers made of metallized etched copper.

15 These production techniques often prove to be expensive.

 One of the objects of the present invention is to provide a production process that is less expensive than that typically used in the prior art by moving the electronic circuit to the substrate of the card.

20 The subject of the invention relates to a process for producing a portable object, such as an integrated-circuit card, and to the card thus obtained, in which the chip is integrated in a low-cost substrate provided with at least those elements providing the contact function. The substrate may also comprise an antenna allowing the contactless exchange function.

25 The invention relates to a process for producing a portable object, characterized in that it comprises at least the following steps:

- a) providing a substrate located in the portable object provided with one or more cavities, said substrate comprising one or more connection pads that are connected to one or more electrically conductive tracks, at the ends of which one or more integrated circuits are connected;
- 30 b) providing one or more electrically conductive elements;

- c) substantially matching the size and the geometry of a cavity to the dimensions of one of said electrically conductive elements, at least a portion of the cavity being arranged directly above one or more connection pads;
- d) using an electrically conductive means to connect the one or more electrically conductive elements via a first face at least to the connection pads of the substrate.

According to one variant embodiment, the electrically conductive element is arranged in said cavity such that the outside surface of said electrically conductive element lies substantially in the same plane as the outside surface of the portable object.

An anisotropic adhesive material may be used to connect the electrically conductive element to the connection pads of the substrate.

According to one variant embodiment, an isotropic adhesive is used to connect the electrically conductive element to the connection pads of the substrate.

The substrate may comprise an antenna formed of one or more turns, the turns of the antenna being connected to the integrated circuit via conductive lands.

The electrically conductive tracks are connected to the integrated circuit by means of, for example, wire bonding.

The metal tracks may be connected to the integrated circuit by means of a flip-chip technique.

The substrate may comprise one or more electrically conductive tracks on at least one face.

According to another embodiment, the substrate may comprise one or more electrically conductive tracks made of aluminium or of copper.

The invention also relates to a portable object obtained by implementing the process according to the invention. The object comprises at least the following elements:

- a substrate comprising at least one or more connection pads that are connected to one or more electrically conductive tracks,
- an integrated circuit connected to one end of at least one or more electrically conductive tracks,
- 5 • one or more conductive elements suitable for connecting to the portable object,
- a cavity located entirely or partly directly above at least one of the connection pads, the geometry and dimensions of the cavity being suitable for accommodating one of said conductive elements,
- 10 • an electrically conductive means suitable for electrically connecting the conductive element via a first face (inside face) at least to the connection pads of the substrate.

The portable object may be a contact card or a contact and/or contactless card.

15 Other features and advantages of the present invention will become more clearly apparent upon reading the description of exemplary embodiments provided by way of completely non-limiting illustration alongside the appended figures, in which:

- Figure 1 is a plan view of a substrate comprising the antenna, the integrated circuit and the routing to the pads according to the invention;
- 20 • Figure 2 is a sectional view of a card comprising the substrate of Figure 1; and
- Figure 3 shows one variant embodiment.

25 For the purpose of making the features of the invention readily understandable, the following description is provided by way of completely non-limiting illustration for a dual-interface card having a contact payment function and a contactless payment function.

Figure 1 schematically shows one face 1a of a low-cost substrate 1 comprising an antenna 2, mechanical connection pads 3 for the contact function and two connection lands 4₁, 4₂ for the contactless function.

The substrate 1 is made for example of polyvinyl chloride (PVC),
 5 of polyethylene terephthalate glycol (PETG), of polycarbonate (PC) or of any other polymer used and known by those skilled in the art for producing a card.

The antenna 2 may be printed, deposited or inlaid using technologies that are known in the field.

10 Each of the connection pads 3 and of the connection lands (conductive lands) 4₁, 4₂ is connected to a chip 5 via suitable electrically conductive tracks (conduction lines) 6.

A connection land 4₁ providing the contactless function is connected to a first end 2a of the antenna 2 and to a first pad 7₁ of the chip 5.
 15 The second connection land 4₂ is connected to a second end 2b of the antenna and to a second pad 7₂ of the chip 5.

The other connection pads 8 of the chip 5 connecting the contact pads 3 to the chip 5 are connected to this chip via the metal tracks 6, for example. This connection connects the chip to a contact area that allows
 20 contact with an external reader (not shown for the sake of simplifying the figure).

Figure 2 is a sectional view of a card (portable object) according to the invention. The substrate 1 thus equipped is positioned between two layers of plastic 10, 11 before being laminated, thus forming a card 12. The
 25 technology for the laminating operation is known to those skilled in the art and will not be described in detail.

The card comprises at least one cavity 13, for example a machined cavity, the dimensions and geometry of which are matched to the geometric characteristics of an electrically conductive element such as a
 30 contact area 14 (electrically conductive element not having a chip for example). The location of the cavity 13 on the card is determined in particular

according to the position of the contact pads 3 providing the contact function. The contact area 14 is positioned directly above the connection pads of the electrically conductive tracks so as to allow the contact function to be performed. The contact area 14 is held in place on the substrate 1 by means
5 of an electrically conductive means such as an electrically conductive material 15, for example an adhesive such as an anisotropic adhesive glue, arranged on a first face (inside face) 14i of the contact area. Apertures 16, five apertures in the example given, allow the five connection pads 3 to be exposed for the contact function, thus providing the connection between an
10 external reader and the chip.

When the chip comprises a plurality of cavities, the geometry and the dimensions of a cavity will be defined according to one of said electrically conductive elements.

The dimensions of a cavity 13 are such that the outside face 14e
15 of the contact area, of around 50 to 300 mm² (the surface that is intended to make contact with a card reader and that is opposite the face of the contact area on which the adhesive is placed), is located substantially in the same plane as the upper surface 12s of the card 12 (surface of the card closest to the card-reader connector).

20 The adhesive material 15 used to hold the contact area in place while providing electrical contact is for example chosen from the following list of materials: an anisotropic conductive adhesive favouring conduction in the z-direction for example, an isotropic conductive adhesive or any other adhesive material that is known in the field.

25 The electrically conductive tracks 6 (connection lines) of the substrate are made, for example, of aluminium or of copper. They may be printed on the substrate, inlaid or deposited using any technology that is compatible with the nature of the substrate being used. The electrically conductive tracks may be made using any suitable material exhibiting
30 technical characteristics that are similar to those of aluminium or of copper (conductive inks for example).

Various technologies known to those skilled in the art may be used to connect the electrically conductive tracks to the chip. It is possible to form the connections by means of conductive wires, which technique is known as wire bonding, or by means of the flip-chip technique.

5 According to one embodiment, the substrate 1 may comprise, on each of its faces 1a, 1b, one or more electrically conductive tracks. The tracks are then electrically connected to one another by means of an electrical connection formed mechanically or by ultrasound between two or more layers of conductors, which connection is more commonly known as a
10 crimp, or by means of electrically conductive elements passing through the substrate, for example metallized vias or apertures.

The contact area or conductive element, which typically does not comprise the chip, is for example provided with ISO connection pads or any other connection means compatible with a card reader.

15 The invention is also applicable to the case in which the substrate does not comprise an antenna. The application is then a card having only a contact function, a display, etc.

In the embodiment illustrated in Figure 3, the substrate comprises two metal surfaces 30, 31 surrounding the chip instead of the antenna
20 formed of turns. The dimensions and the geometry of the conductive metal surfaces 30, 31 depend in particular on the use for the card. The dimensions of the conductive surfaces or areas are chosen to absorb potential XY mismatches of the antenna of the card body in relation to the module.

The process for producing a chip card provided with a cavity
25 according to the invention comprises the following steps:

- a) providing a substrate 1 such as described above composed for example of sheets of PVC or polymers, said low-cost substrate comprising one or more connection pads that are connected to electrically conductive tracks, at the ends of which one or more integrated circuits or chips are connected;
- 30 b) providing an electrically conductive element 14 (contact area that contains connection pads and does not contain a chip);

- c) substantially matching the size and the geometry of a cavity 13 in a card body comprising the substrate 1 to the dimensions of the electrically conductive element, the cavity being arranged such that at least a portion of the cavity is located directly above the connection pads of the electrically
- 5 conductive tracks of the substrate, thereby allowing the conductive element to be positioned facing the connection pads of the carrier and the contact function via the apertures 16;
- d) using an electrically conductive means 15 to secure the electrically conductive element to the connection pads of the substrate.

10 In the case that the card comprises a plurality of cavities, the size and the geometry of the cavities will be matched to the cavity that is intended to accommodate the electrically conductive element.

It is possible to use an anisotropic or isotropic conductive adhesive depending on whether or not it is desired to promote exchanges between the

15 chip and the contacts of the contact area.

According to one embodiment, a substrate on which the metal tracks are printed, by means of a printing technique, is used.

The cost for producing a card according to the invention is considerably decreased by using this technology employing a plastic sheet

20 instead of a multilayer and by depositing the chip and the connection pads and/or the antenna used for a contactless function of the card on one and the same substrate.

CLAIMS

1 – Process for producing a portable object, characterized in that it comprises at least the following steps:

- 5 a) providing a substrate (1) in a body (10, 11) of the portable object, said portable body being provided with one or more cavities (13), said substrate (1) comprising one or more connection pads (3) that are connected to one or more electrically conductive tracks (6), at the ends of which one or more integrated circuits (5) are connected;
- 10 b) providing one or more electrically conductive elements (14);
c) substantially matching the size and the geometry of a cavity (13) to the dimensions of one of said electrically conductive elements (14), at least a portion of the cavity being arranged directly above one or more connection pads (3);
- 15 d) using an isotropic adhesive material (15) to connect the one or more electrically conductive elements (14) via a first face (14i) at least to the connection pads (3) of the substrate (1).

- 2 – Production process according to Claim 1, characterized in that the one or
- 20 more electrically conductive elements (14) are arranged in said cavity (13) such that the outside surface (14e) of said electrically conductive elements lies substantially in the same plane as the outside surface (12s) of the portable object (12).

- 25 3 – Production process according to Claim 1 or 2, characterized in that a substrate (1) comprising an antenna formed of one or more turns is used and in that the one or more turns of the antenna are connected to the integrated circuit (5).

4 – Production process according to one of Claims 1 to 3, characterized in that the electrically conductive tracks (6) are connected to the integrated circuit (5) by means of wire bonding.

5 5 – Production process according to one of Claims 1 to 4, characterized in that the electrically conductive tracks (6) are connected to the integrated circuit (5) by means of a flip-chip technique.

6 – Production process according to one of the preceding claims,
10 characterized in that a substrate (1) comprising one or more electrically conductive tracks (6) printed on at least one face is used.

7 – Production process according to one of the preceding claims,
characterized in that a substrate (1) comprising one or more electrically
15 conductive tracks (6) made of aluminium is used.

8 – Production process according to one of the preceding claims,
characterized in that a substrate (1) comprising one or more electrically
conductive tracks (6) made of copper is used.

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9 – Portable object (12) obtained by implementing the process, characterized in that it comprises at least the following elements:

- a substrate (1) arranged in the body of the portable object, said substrate comprising at least one or more connection pads (3) that are
25 connected to one or more electrically conductive tracks (6),
- said body comprising one or more cavities (13) that are located entirely or partly directly above at least one of the connection pads (3), the geometry and dimensions of a cavity (13) being suitable for accommodating one of said conductive elements (14),
- 30 • an integrated circuit (5) connected to one end of at least one or more electrically conductive tracks (6),

- one or more conductive elements (14) suitable for connecting to the portable object,
- an electrically conductive isotropic adhesive material (15) suitable for electrically connecting the conductive element (14) via a first face (14i) at least to the connection pads of the substrate.

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10 – Portable object according to Claim 9, characterized in that the object is a contact card.

10 11 – Portable object according to Claim 9, characterized in that the object is a contactless card.

12 – Portable object according to Claim 9, characterized in that the object is a card comprising the contact and contactless functionalities.

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