

transponder thus formed. These modules are complicated to produce and expensive.

Document 2012 0050130 describes a radiofrequency communication device comprising an insulating substrate carrying an antenna connected to a chip and a capacitor. The capacitor is obtained by two conductive plates arranged on either side of the substrate.

Patent application US 2003 184495 A1 describes a contactless communication device such as a token or tag. It discloses a substrate bearing circular antenna turns with: (i) a first end terminating inside the turns; and (ii) a second end terminating outside the turns. A radiofrequency chip is arranged inside the turns. The chip has a first connection to the first end of the antenna inside the turns. The second end of the antenna is connected to a second connection of the chip through a sheet capacitor. The sheet capacitor is larger than the radiofrequency chip and is positioned to span the turns to connect the second end of the antenna to the second connection of the chip. The sheet capacitor requires use of electrodes placed on either side of a dielectric layer.

Patent application FR 2 803439 A1 describes a radiofrequency communication device. It comprises an insulating substrate carrying screen-printed antenna coils and connections for a radio frequency chip and for a capacitor. The capacitor is made in several layers by screen printing. Only the chip is a surface mounted component.

Technical problem.

The above modules do not make it possible to optimise the radiofrequency performance at the best cost.

5 The aim of the invention is to solve the problems above and, in particular, to obtain a high-performance radiofrequency module that is more straightforward and less expensive to manufacture.

10 Summary of the invention.

The invention consists in, first adopting a single-face antenna-module substrate, second providing a capacitor in the form of a passive device or integrated circuit, and third configuring said single-face substrate so as to allow surface mounting (SMD) of a device (resistance capacitor, coil or other) in the form of a passive device or integrated-circuit chip and the connection thereof to the antenna. Finally, and fourth, the invention consists in using a smart-card type of production process to ensure mechanical reliability and amortise the manufacturing price.

15

20

The configuration of the module should allow easy production on industrial scale using conventional technologies in the smart-card industry.

5 Thanks to the design of the module, it is possible to do away with conductive vias through the insulating film, with redirection tracks on one face of the substrate opposite that supporting the antenna.

10 It is possible to protect the connections of the chip to the antenna in a central or median coating area while having the antenna on a single face.

Production is also simplified with single-face etching
15 while the chip is in a central or median position, allowing an optimal surface for gluing the module into the card, where applicable.

The invention thus relates to a smart card module with
20 a radiofrequency integrated-circuit chip, comprising
- an insulating substrate, metallisations comprising conductive tracks, made on the same side of the substrate and forming an antenna with two connection terminals,

25 - at least one area on the base film for coating or placing the radiofrequency integrated-circuit chip and a capacitance in the form of a surface-mounted device, the radiofrequency integrated-circuit chip and the device being arranged on the same single face of the
30 substrate and connected to the antenna,

CLAIMS

1. A smart card module (1B) with an integrated-circuit (IC) chip, comprising:
- 5 - an insulating substrate (3),
- metallisations comprising conductive tracks (25), made on the same single side of the substrate (12), forming an antenna (2) and comprising two connection ends (8, 9),
- 10 - an area (16) for coating or placing the radiofrequency integrated-circuit chip (4) and a device (14) in the form of a surface-mounted device (SMD),
- the radiofrequency integrated-circuit chip and the device being arranged on the same single face of the
- 15 substrate and connected to the antenna (2), by an electrical connection,
- characterised in that the metallisations (2) are on the same single side of the insulating substrate, said electrical connection (28, 26) being made via
- 20 perforations (17) through the insulating film (3) or directly on surface metallisations.
2. The smart card module (1B) according to the preceding claim, characterised in that it comprises a
- 25 spiral including antenna turns (25) at the periphery (33) of the substrate, the chip (4) and the device (14) being arranged inside the spiral.
3. The smart card module (1B) according to one of the preceding claims, characterised in that it comprises a
- 30 metallised redirection terminal (21) inside the spiral, said metallised redirection terminal being connected to the antenna (2) by an electrical connection (19) in the sectioned or un-short-circuited state.
- 35 4. The smart card module (1B) according to any preceding claim, characterised in that the chip (4) and the device (14) are connected to a single pair of interconnection terminals (8, 21) arranged inside the

spiral.

5 5. The smart card module (1B) according to any preceding claim, characterised in that the device (14) is a capacitance.

10 6. The smart card module (1B) according to any preceding claim, characterised in that the device (14) has a first volume less than a second volume of the chip (4).

15 7. The smart card module (1B) according to any preceding claim, characterised in that the device (14) and the chip (4) are coated with the same single coating material (6).

20 8. A smart card module (1B) with a radiofrequency integrated-circuit chip (4), a spiral antenna (2) including antenna turns (25), an interconnection terminal (21), and a device (14) with a first end and a second end mounted on a single side of insulating substrate (3), characterized in that:

25 - the spiral antenna (2) is formed at the periphery (33) of the substrate (3) and comprises an inner terminal (8) at an inner end of the spiral antenna (2) and an outer terminal (9) at an outer end of the spiral antenna (2);

30 - the chip (4) and the device (14) are mounted on the substrate (3) inside the spiral antenna (2);

 - the inner terminal (8) is connected electrically to a first lead of the chip (4) and the first end of the device (14) inside the spiral antenna (2);

35 - the interconnection terminal (21) is connected electrically to a second lead of the chip (4) and the outer terminal (9);

 - the outer terminal (9) is brought close to the interconnection terminal (21) via a deflection (D) of

the antenna turns (25), the deflection (D) extending from the periphery (33) of the substrate (3) toward the interconnection terminal (21); and

5 - the outer terminal (9) is electrically connected to the interconnection terminal (21) via a soldered wire (26a) or an electrical connection printed on an insulating bridge (27) of the antenna turns (25).

10 9. The smart card module (1B) according to claim 8, characterised in that the device (14) is a capacitance.

15 10. The smart card module (1B) according to any of claims 8-9, characterised in that the device (14) has a first volume less than a second volume of the chip (4).

11. The smart card module (1B) according to any of claims 8-10, characterised in that the device (14) and the chip (4) are coated with the same single coating material (6).