ON-OFF APPARATUS AND ELECTRONIC DEVICE

CROSS-REFERENCE TO RELATED APPLICATION

This application is a Singapore national phase application of International Application Serial No. PCT/CN2016/106795, filed on November 22, 2016, which claims priority to Chinese Patent Application Serial No. 201510849252.6, filed with the State Intellectual Property Office of P. R. China on November 27, 2015 by TENDYRON CORPORATION, and titled with "ON-OFF APPARATUS AND ELECTRONIC DEVICE".

TECHNICAL FIELD

The present disclosure relates to the field of electronic technologies, and particular to, an on-off apparatus and an electronic device.

BACKGROUND

In related arts, a coil is directly connected to a chip in an electronic device such as a smart card. When the smart card is placed in a radio frequency field, a chip circuit of the smart card consumes field energy to communicate with a card reader (such as Point of Sale (POS) terminal, Near Field Communication (NFC) mobile phone or the like). In practice, in order to save a size of the smart card, a battery is not generally set in the smart card. Therefore, an existing smart card generally does not have other power consumption components except the chip circuit.

With the development of the smart cards, there is a need to include other power consumption components in addition to the chip circuit in the smart card in related arts. For example, a display screen is set on the smart card for displaying information during a transaction process. In this condition, it is required to power the smart card. Therefore, it may be desirable to provide a power acquirement circuit in the smart card. The power acquirement circuit acquires electric energy from the coil. In this case, it may be unable to obtain optimal power-acquirement efficiency when the chip circuit and the power acquirement circuit share a common coil. However, adding a power acquirement coil may increase difficulty and cost of circuit designs, and also affects communication between the smart card and other devices. Therefore, a radio frequency carrier between the coil and the chip must be turned off when a common coil is used as the communication coil and the power acquirement coil. How to disconnect the radio frequency carrier between the coil and the chip is a technical problem to be solved in related arts.

connection or disconnection between the first connection pin and the second connection pin under the control of the control signal. This alternative implementation solution makes the control module 128 to be implemented via an existing component or via an integrated chip, which extends implementation ways of the control module 128.

In an alternative implementation solution of embodiments of the present disclosure, the control module 128 may be a NMOS (N-channel metal oxide semiconductor) transistor, of which a drain electrode (D) functions as the first connection pin of the control module 128, a source electrode (S) functions as the second connection pin of the control module 128, and a gate electrode (G) functions as the control pin of the control module 128. The electrical path between the source electrode (S) and the drain electrode (D) is turned on or turned off according to the control signal input at the gate electrode (G). Certainly, the control module 128 may also be a PMOS (P-channel metal oxide semiconductor) transistor. Connections of the electrodes may be set with reference to conduction conditions of the PMOS transistor, which is not limited herein. The MOS (metal oxide semiconductor) is configured as the control module 128, which may simply the implementation of the circuit and save the cost.

The first unidirectional conduction module 129 is connected between the first load 126 and the second load 127 and between the first pin 121 and the second pin 122, and is configured to turn on the path between the first pin 121 and the second pin 122 in a case that the path between the third pin 123 and the fourth pin 124 is turned on, and to turn off the path between the first pin 121 and the second pin 122 in a case that the path between the third pin 123 and the fourth pin 124 is turned off. That is, in this embodiment, the first unidirectional conduction module 129 has such functions. In the case that the path between the third pin 123 and the fourth pin 124 is turned on, the first unidirectional conduction module 129 is equivalent to a resistor with a very small resistance value. The AC signal inputted at the AC input end 100 may be transmitted to the AC output end 110 through the first DC isolating component 130, the first unidirectional conduction module 129 and the second DC isolating component 140. In the case that the path between the third pin 123 and the fourth pin 124 is turned off, the first unidirectional conduction module 129 is equivalent to a resistor with a very large resistance value, and is equivalent to a disconnection point. The AC signal inputted at the AC input end 100 cannot be transmitted through the first unidirectional conduction module 129 to the AC output end 110. That is, the path from the AC input end 100 to the AC output end 110 is turned off.

signal, so as to turn on or off the path form the DC power supply to the ground. In a cast that the path from the DC power supply to the ground is turned on, due to the characteristic of the PIN diode that the PIN diode is equivalent to a resistor when switched on, the AC signal input at the first end TA of the AC input port may be transmitted to the first end LA of the AC output port through D29 while the AC signal flowed back from the second end LB of the AC output port may be transmitted to the second end TB of the AC input port through D30 if the AC signal at the first end TA of the AC input port is positive half-cycle. Therefore, a transmission of the AC signal is realized in an entire loop from the AC input port to the AC output port. In addition, since the capacitor has a DC isolating and AC passing function, the DC signal from the DC power supply cannot flow through the capacitors C39 and C40 to the first end TA of the AC input port and the first end LA of the AC output port, and cannot flow through the capacitors C41 and C43 to the second end TB of the AC input port and the second end LB of the AC output port. Therefore, the transmission of the AC signal may be not effected. In a cast that the path from the DC power supply to the ground is turned off, due to the characteristic of the PIN diode, both of D29 and D30 are equivalent to a capacitor of 0.2pF when switched off, and the AC signal between the AC input end TA and the AC output end LA may be isolated. That is, the carrier signal between the AC input end TA and the AC output end LA is isolated.

Embodiment 3

This embodiment provides an electronic device.

The electronic device provided in this embodiment may include the on-off apparatus described in any implementation solution of Embodiment 1.

Fig. 7 is a schematic diagram of an electronic device provided in this embodiment. As illustrated in Fig. 7, the electronic device provided in this embodiment includes a coil 70, a chip 72 having a contactless function and an on-off apparatus 74 connected between the coil 70 and the chip 72. The coil 70 is connected to an AC input end of the on-off apparatus 74, and the chip 72 having the contactless function is connected to an AC output end of the on-off apparatus 74.

With the electronic device provided in this embodiment, switch-on or switch-off of an on-off module in the on-off apparatus 74 may be controlled by inputting a control signal, thereby connecting the chip 72 having the contactless function to or disconnecting the chip 72 having the contactless function from the coil 70.

The electronic device provided in this embodiment may include, but be not limited to, a smart

thereby saving a size and manufacturing cost of the electronic device.

The on-off apparatus 84 in this embodiment may adopt any alternative implementation solution described in Embodiment 2. For details, the descriptions made to Embodiment 2 may be referred to, which is not described in detail in this embodiment.

Fig. 9 is a schematic diagram of a circuit principle of an alternative electronic device provided in this embodiment. As illustrated in Fig. 9, in this embodiment, the rectifying apparatus 86 may use four diodes to form a "bridge" typed structure, i.e., a full-wave rectifying circuit. An end IB of the diode rectifying bridge is connected to the first input end B of the coil, and another end IA of the diode rectifying bridge is connected to the second input end A of the coil. A rectifying circuit may also be adopted in the chip 82 having the contactless function. The rectifying circuit adopts a similar diode rectifying bridge to the rectifying apparatus 86. The IA end of the diode rectifying bridge in the chip 82 is connected to the first end LA of the AC output end of the on-off apparatus 84, and the IB terminal of the diode rectifying bridge in the chip 82 is connected to the second end LB of the AC output end of the on-off apparatus 84.

As illustrated in Fig. 9, the first output end B of the coil L8 (i.e. an antenna of the electronic device) is connected to the second end TB of the AC input end of the on-off apparatus 84. The second output end A of the coil L8 is connected to the first end TA of the AC input end of the on-off apparatus 84. The second end LB of the AC output end of the on-off apparatus 84 is connected to the input end LB1 of the chip 82 having the contactless function. The first end LA of the AC output end of the on-off apparatus 84 is connected to the input end LA1 of the chip 82 having the contactless function. The control pin of the on-off apparatus 84 is configured to receive the control signal ANNT_CTRL. As illustrated in Fig. 9, the on-off apparatus 84 adopts a circuit structure as illustrated in Embodiment 2, Specific connections of components of the on-off apparatus and the principle of the on-off apparatus may be referred to the descriptions made to Fig. 6 in Embodiment 2.

Now, the working principle of the electronic device provided in embodiments of the present disclosure will be described taking that the second output end B of the coil is high level and the first output end A of the coil is low level as an example. When the control signal ANNT_CTRL outputted at an external control pin is high level, the NMOS transistor Q8 is turned on, a DC path, i.e. a path V_PWR……>R12……>D29……>R13……>D30……>R16……>Q8……>GND is turned on. Each of D29 and D30 is equivalent to a resistor having a small resistance value. Due to