Appeal decision

Appeal No. 2016-8952

Kanagawa, Japan

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2014-187812, entitled "semiconductor chip" (the application published on March 5, 2015, Japanese Unexamined Patent Application Publication No. 2015-43434) has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

1 History of the procedures

The present application is a divisional application filed on September 16, 2016 from Patent Application No. 2010-266297 filed on November 30, 2010 (referred to as "original application" below). A request for examination was filed on September 16, 2014, the notice of reasons for refusal was issued on November 10, 2015, and the written opinion was submitted on January 18, 2016. The decision of refusal was issued

on March 8, 2016, and an appeal against the examiner's decision of refusal was requested on June 15, 2016 together with the submission of the written amendment.

2 The Invention

The invention according to Claim 1 of the present application (referred to as "The Invention" below) is acknowledged as follows, as specified by matters described in Claim 1 amended by the written amendment dated on June 15, 2016.

"A semiconductor chip formed in a rectangular shape surrounded by four sides, comprising:

a first terminal configured to be formed along one of the four sides and to be electrically connected to a solar cell;

a second terminal configured to be formed along the one side and electrically connected to a secondary cell; and

a wiring configured to electrically connect the first terminal and the second terminal".

3 Cited Document

(1) Cited Document

The following matters are described in a publication that had been distributed in Japan before the application of the original application of the present application cited in the reasons for refusal of the examiner's decision, Japanese Unexamined Patent Application Publication No. 2007-221872 (referred to as "Cited Document" below).

A "[0037]

Next, the present invention is described in detail based on the embodiments illustrated in the drawings.

First embodiment

FIG. 1 is a block diagram of an exemplary configuration of a power supply device including a charge circuit of a secondary cell according to a first embodiment of the present invention.

In FIG. 1, a power supply device 1 includes a first DC power supply 2 including a fuel cell or a solar cell which outputs a generated first voltage V1, a second DC power supply 3 for generating and outputting a predetermined second voltage V2 based on power supplied from outside such as an AC adapter, a secondary cell 4 formed of a lithium-ion battery, and a charge circuit 5 for charging the secondary cell 4 with a voltage obtained by boosting the first voltage V1 from the first DC power supply 2".

B "[0040]

Next, FIG. 2 is a diagram of an exemplary inner structure of a charge circuit unit 11 and a power switching circuit 12 in FIG. 1.

In FIG. 2, the charge circuit unit 11 includes an inductor L1, a capacitor C1, resistances R1 and R2, and a charge control circuit 13, and the charge control circuit 13 includes a switching element M1 formed of an NMOS transistor which performs a switching operation to control an output of the first voltage V1 from the fuel cell 2 and a switching element M2 for synchronous rectification formed of a PMOS transistor. In addition, the charge control circuit 13 includes a current detection circuit 21 which detects a charging current from a voltage between both ends of the resistance R1 to detect the charging current to the lithium-ion battery 4 and generates and outputs a signal Si indicating the detected current value and a control circuit 22 which performs switching control to the switching element M1 and the switching element M2 for synchronous rectification according to the signal Si from the current detection circuit 21 and a secondary cell voltage Vb.

[0041]

The power switching circuit 12 includes a first voltage detection circuit 31 which detects the first voltage V1 from the fuel cell 2 and generates and outputs a signal S1 indicating the detection result, a secondary cell voltage detection circuit 33 which detects the voltage of the lithium-ion battery 4 and generates and outputs a signal Sb indicating the detection result, a changeover switch 34 which exclusively outputs any one of the first voltage V1, the second voltage V2, or the secondary cell voltage Vb according to the input control signal, and a power supply switch control circuit 35 which makes the changeover switch 34 output the largest one of the first voltage V1, the second voltage V2, and the secondary cell voltage Vb from the signals input from the first voltage detection circuit 31, the second voltage detection circuit 32, and the secondary cell voltage detection circuit 33 to a part of or all the elements forming the charge circuit unit 11 including the control circuit 22. The power switching circuit 12 and the charge control circuit 13 are integrated on a single IC, and the IC includes terminals T1 to T6".

C "[0044]

In such a structure, the control circuit 22 performs constant current charging or constant voltage charging to the lithium-ion battery 4. In a case of the constant current charging, the control circuit 22 detects a charging current to the lithium-ion battery 4 from the signal Si input from the current detection circuit 21 and performs PWM control or PFM control to the switching element M1 to make the switching element M1 perform switching so that the detected charging current is maintained to be a predetermined value. Concurrently, the control circuit 22 makes the switching element M2 for synchronous rectification perform a switching operation contrary to the switching element M1. When the switching element M1 is turned on and is made into a conductive state and the switching element M2 for synchronous rectification is turned off and is made into a cut-off state, energy is stored in the inductor L1.

Subsequently, when the switching element M1 is turned off and is made into the cut-off state and the switching element M2 for synchronous rectification is turned on and is made into the conductive state, the energy stored in the inductor L1 is added to the first voltage V1 and output to the terminal T3. In addition, the energy is smoothed by the resistance R2 and the capacitor C1 and boosts the first voltage V1, and then, is supplied to the lithium-ion battery 4".

D In FIG. 2, a structure is illustrated in which the first DC power supply 2 is connected to the terminal T2 of the IC via the inductor L1, the secondary cell 4 is connected to the terminal T3 of the IC via the resistance R1, and the terminals T2 and T4 are connected to each other via the switching element M2 for synchronous rectification in the IC.

(2) Cited Invention

In (1) A, "the first DC power supply 2 including a solar cell" is described. In (1) B, it is described that "the power switching circuit 12 and the charge control circuit 13 are integrated on a single IC, and the IC includes terminals T1 to T6". Based on (1) D, in FIG. 2, "a structure in which the first DC power supply 2 is connected to the terminal T2 of the IC via the inductor L1, the secondary cell 4 is connected to the terminal T3 of the IC via the resistance R1, and the terminals T2 and T4 in the IC are connected to each other via the switching element M2 for synchronous rectification" is illustrated. Accordingly, it is acknowledged that the following invention (referred to as "Cited Invention" below) is described in Cited Document.

"An IC, comprising:

a terminal T2 configured to be connected to a solar cell via an inductor L1; and

a terminal T3 configured to be connected to a secondary cell via a resistance R2, wherein

the terminals T2 and T3 are connected to each other via a switching element M2 for synchronous rectification".

4 Comparison

(1) Corresponding relationship between The Invention and Cited Invention

A The IC is a chip on which a semiconductor integrated circuit is provided and has a rectangular shape. In consideration of that this is the technical common sense, both of The Invention and Cited Invention are "semiconductor chips formed in a rectangular shape surrounded by four sides" in common.

B Since the terminal T2 in Cited Invention is "connected to a solar cell via an inductor L1", it can be said that the terminal T2 is electrically connected to the solar cell.

Therefore, The Invention and Cited Invention include "the first terminal electrically connected to the solar cell" in common.

C Since the terminal T3 in Cited Invention is "connected to a secondary cell via a resistance R2", the terminal T3 is electrically connected to the secondary cell.

Therefore, The Invention and Cited Invention include "the second terminal electrically connected to the secondary cell" in common.

D The terminals T2 and T3 in Cited Invention are "connected to each other via a switching element M2 for synchronous rectification", and it is obvious that some wiring is used to connect the terminals. Therefore, it is acknowledged that the terminals T2 and T3 are electrically connected to each other with the wiring.

Accordingly, it is acknowledged that The Invention and Cited Invention include "wiring for electrically connecting the first terminal to the second terminal" in common.

(2) Corresponding features and different features between The Invention and Cited Invention

Based on the above corresponding relationship, The Invention and Cited Invention correspond to each other in the point A below, and are different from each other in the point B below.

A Corresponding features

"A semiconductor chip formed in a rectangular shape surrounded by four sides, comprising:

a first terminal configured to be electrically connected to a solar cell;

a second terminal configured to be electrically connected to a secondary cell; and

wiring configured to electrically connect the first terminal to the second terminal".

B The different features

In The invention, the "first terminal" is "formed along one of the four sides", and the "second terminal" is "formed along the one side". Whereas, it is not certain whether Cited Invention is configured in this way.

5 Judgment by the body

(1) Regarding the different feature

The terminals T2 and T3 in Cited Invention are connected to each other via the switching element M2 for synchronous rectification. However, in the paragraph [0044] in Cited Document, it is described that, by switching the switching element M2 for synchronous rectification, the energy stored in the inductor L1 is output to the terminal T3, is smoothed by the resistance R2 and the capacitor C1, and boosts the first voltage V1. Therefore, it can be found that the switching element M2 for synchronous rectification in Cited Invention is used as a switching element of a DC-DC converter.

It is acknowledged that a terminal of the semiconductor chip used for the DC-DC converter is appropriately arranged according to a product and the like in which the DC-DC converter is used. Between the terminals T2 and T3 in Cited Invention, a relatively large charging current is flowed from the solar cell to the single switching element M2 for synchronous rectification. Therefore, by arranging the terminals T2 and T3 along the same side of the semiconductor chip, a distance between the single switching element M2 for synchronous rectification and the terminals T2 and T3 is shortened, and the relatively large current is made to easily flow. This is acknowledged as a design matter which is appropriately set by a person skilled in the art.

(2) Regarding working-effect of the present application

In the paragraph [0007] of the present application, it is described that "According to the present invention, there is provided a semiconductor chip in which the length of wiring for electrically connecting a solar cell to a secondary cell receives less effect from other inner circuits and which can reduce an electrical loss in a case where the solar cell charges the secondary cell".

However, in The Invention, it is specified that the first terminal is formed along one of the four sides and the second terminal is formed along the one side. However, a layout of the "wiring" for electrically connecting the first terminal to the second terminal in the semiconductor chip is not specified. In addition, even when the first terminal and the second terminal are formed along the same side, there is a case where both terminals are formed apart from each other at both ends of the semiconductor chip. Therefore, it cannot be said that the structure of The Invention provides an effect such that "the length of the wiring receives less effect from the other inner circuits" and "the electrical loss is reduced".

Therefore, it cannot be said that the working-effect of The Invention is exceptionally advantageous compared to that of Cited Invention.

(3) Appellant's allegation

In the appeal against the examiner's decision of refusal requested on June 15, 2016, the Appellant alleged that

"(d) Comparison between The Invention and Cited Invention

The features of the semiconductor chip according to amended Claim 1 are to be formed in a rectangular shape surrounded by four sides and to include a first terminal which is formed along one of the four ends and is electrically connected to a solar cell, a second terminal which is formed along the one side and is electrically connected to a secondary cell, and wiring which electrically connects the first terminal to the second terminal.

Therefore, according to the semiconductor chip according to the amended Claim 1, a unique effect can be obtained such that, by connecting the first terminal and the second terminal formed respectively along the one side of the rectangular semiconductor chip with the wiring, since the path of the wiring receives less effect by an arrangement of inner circuits of the semiconductor chip, the wiring can be shortened as possible. In addition, the electrical loss in the wiring in accordance with the charge from the solar cell connected to the first terminal to the secondary cell connected to the second terminal can be reduced.

Here, in FIG. 1 in Cited Document 1, a block diagram of the exemplary structure of the charge circuit 5 is illustrated. The charge circuit 5 includes the charge circuit unit 11 for charging the secondary cell 4 and the power switching circuit 12 which is connected to the first DC power supply 2, the second DC power supply 3, and the secondary cell 4 and connects one of these three voltage supply sources having the highest voltage to the charge circuit unit 11 as a power source.

In FIG. 2 in Cited Document 1, as described in the paragraph [0040], the exemplary inner structure of the charge circuit unit 11 and the power switching circuit 12 in FIG. 1 is illustrated.

Here, the configuration diagram of the charge circuit 5 indicates a logical connection state between components included in the charge circuit 5. Different from a layout plan or a wiring diagram, the configuration diagram does not illustrate the arrangement of the components and connection paths between the components as a physical arrangement of an actual product. In addition, in Cited Document 1, there is no description and indication such that the configuration diagram of the charge circuit 5 illustrated in FIG. 2 indicates the physical arrangement of the components and the like included in the charge circuit 5.

Even when the point that the IC chip is surrounded by four side and formed in a rectangular shape is the technical common sense, based on the only indication such that the broken line portion formed in a rectangular shape in FIG. 2 is an IC, it is unreasonable to understand that the broken line indicates the shape of the IC chip.

As described in the paragraph [0041] in Cited Document 1, the broken line portion in FIG. 2 only indicates that the power switching circuit 12 and the charge control circuit 13 are integrated on the single IC.

That is, it should be said that Cited Document 1 does not disclose the positions of the components in the semiconductor chip. Therefore, it cannot be assumed that the position of the terminal illustrated in the broken line indicating the range of the IC in

FIG. 2 indicate the physical position of the terminal in the IC.

In this way, in Cited Document 1, the physical positions of the components included in the IC are not clearly indicated. Therefore, with reference to FIG. 2 in Cited Document 1, the terminal T3 connected to the secondary cell 4 is formed along the side of the semiconductor chip where the terminal T2 connected to the first DC power supply 2 is formed, and the terminals T2 and T3 are connected to each other via the switching element M2. Accordingly, the grounds for the decision for refusal which indicates that the invention according to the amended Claim 1 is not different from the invention described in Cited Document 1 and a person skilled in the art can easily arrive at the invention from the invention described in Cited Document 1, cannot be accepted.

Therefore, it is considered that the invention of the semiconductor chip according to the amended Claim 1 has novelty and inventive step".

However, as described in (2) above, in the invention according to the amended Claim 1 (The Invention), although it is specified that the first terminal is formed along one of the four sides and the second terminal is formed along the one side, it is not specified how the "wiring" for electrically connecting the first terminal to the second terminal is arranged in the semiconductor chip. A case where the first terminal and the second terminal are formed apart from each other along the same side is included. Therefore, in the invention according to the amended Claim 1 (The Invention), the path of the wiring does not receive less effect from the arrangement of the inner circuits of the semiconductor chip, and the wiring is not shortened as possible. Accordingly, "the unique effect such that the electrical loss in the wiring in accordance with the charge from the solar cell connected to the first terminal to the secondary cell connected to the second terminal can be reduced" cannot be acknowledged.

Furthermore, as described in (1) above, it is acknowledged that the IC in Cited Invention is used for the DC-DC converter and the terminals are appropriately arranged in the DC-DC converter according to the used product and the like, and the relatively large charging current is flowed from the solar cell to the single switching element M2 for synchronous rectification between the terminals T2 and T3 in Cited Invention. Therefore, by arranging the terminals T2 and T3 along the same side of the semiconductor chip, the distance between the single switching element M2 for synchronous rectification and the terminals T2 and T3 are shortened to make the relatively large current be easily flowed. It is acknowledged that this is only a design matter which is appropriately set by a person skilled in the art.

Accordingly, the Appellant's allegation cannot be accepted.

6 Closing

As described above, since The Invention could be easily achieved by a person skilled in the art according to Cited Invention, the described matters in Cited Document, and the technical common sense, the appellant should not be granted a patent for the invention in accordance with the provisions of Article 29(2) of the Patent Act.

Therefore, the present application should be refused without examining other Claims.

Therefore, the appeal decision shall be made as described in the conclusion.

March 31, 2017

Chief administrative judge: FUKAZAWA, Masashi

Administrative judge: IIDA, Seiji

Administrative judge: ODA, Hiroshi