FOR IMMEDIATE RELEASE

Development of 13.56MHz rectifier circuit technology for using oxide semiconductor TFT

-- Paving the way towards a thin, light and flexible wireless devices --

Tokyo, December 7, 2010 --- Hitachi, Ltd. (NYSE: HIT/TSE: 6501, hereafter Hitachi) today announced the development of rectifier circuit technology using oxide semiconductor[*1] thin-film transistor (TFT)[*2] for the 13.56 megahertz (MHz)[*3] frequency used in RFID and IC card systems, as part of its efforts to achieve thin, light and flexible film-like wireless devices. The technology developed enables radio waves received by an antenna to be converted into direct-current (DC) voltage. This technology is based on the fully depleted oxide semiconductor TFT technology[*4] developed by Hitachi in 2008. By optimizing the structure of the oxide semiconductor TFT and minimizing the power loss at the junction between the oxide semiconductor material and metal wiring material, a rectifier circuit with a practical output voltage was achieved.

Flexible devices, in which electronic circuits such as those in RFID tags, sensors, and displays are fabricated on a plastic film, are attracting attention as next-generation devices which are thin, light, flexible and can be attached to surfaces which are curved or may change shape. Thus, research and development on related technologies are being conducted worldwide. In particular, as wireless devices such as RFID tags have a wide range of applications, they are expected to be put into practical use.

Therefore, Hitachi focused on oxide semiconductor TFT which can be fabricated at a suitably low temperature for plastic films and have good switching performance. In 2008, a fully depleted oxide semiconductor TFT technology was developed, and low voltage operation was confirmed. Since then, to facilitate the realization of practical film-like wireless devices, Hitachi has been working on the development of a high utility rectifier circuit which can convert the 13.56MHz radio wave used by RFID and in IC card systems into direct-current power after being received by the antenna. This has resulted in the rectifier circuit technology developed which achieves both a long communication distance and a high direct-current voltage at the same frequency. Features of the rectifier circuit technology developed are as described below.

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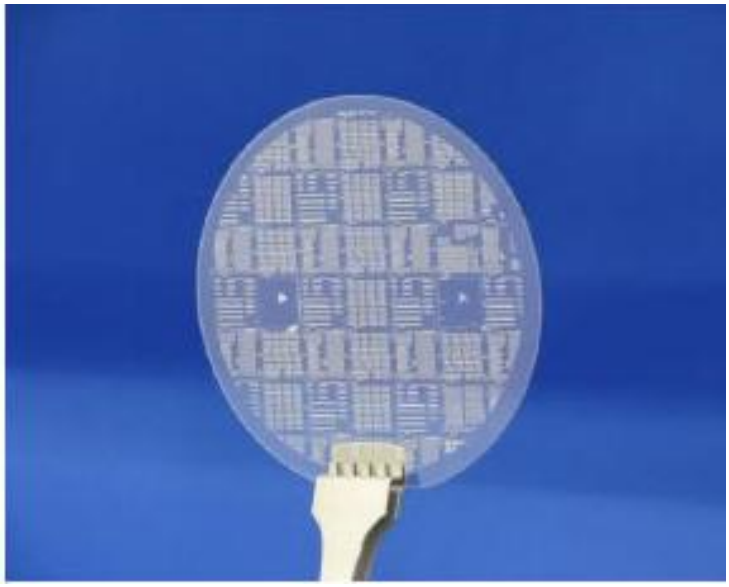
1. Electron mobility[*5] was increased by improving the metal composition of the oxide semiconductor material, resulting in higher TFT operation speed.

2. By redesigning the thickness of the oxide semiconductor material, the power loss at the junction between the oxide semiconductor and metal wiring was controlled to a minimum, thus raising the output voltage of the rectifier circuit.

3. The metal wiring material and its processing method were improved to enable the circuits to be fabricated without degrading TFT properties in the production process.

Using the technology developed, a prototype oxide semiconductor TFT wireless rectifier circuit was fabricated on a glass substrate at a low temperature also suitable to plastic films. In experiments converting 13.56MHz radio waves emitted from a commercial 200mW reader into direct current via an antenna, it was confirmed that at least 12V DC voltage could be obtained from the circuit under optimal conditions, and that DC voltage could be obtained even when the distance between the reader and the antenna coil was greater than 10cm.

These results will be presented on December 7, 2010, at the IEEE International Electron Devices Meeting, which will be held from December 6 to 8, 2010 in San Francisco, U.S.



Rectifier circuit developed with oxide semiconductor TFT

■Notes

*1 Oxide semiconductor: Metal oxides which show a semiconductor property. Zinc-oxide (ZnO) and indium-gallium-zinc-oxide (InGaZnO) are two well-known oxides which have been applied to transistors. As metal-oxide films can be formed close to room temperature using sputtering, its use in new areas such as flexible devices is expected.

*2 Thin-film transistor (TFT): A transistor fabricated on insulator substrates such as glass or plastic films. Currently, they are mainly used as pixel driving elements in active-matrix liquid crystal displays.

*3 13.56MHz: One of wireless radio frequency used in RFID tags and contactless IC cards, etc., with a maximum communication distance of about 1m.

*4 Fully depleted oxide semiconductor TFT technology: Technology which enhances the switching performance of oxide semiconductor TFT by controlling the thickness of an oxide semiconductor and designing the number of free electrons within it to lower than a given value. This technology was developed in 2008, when Hitachi participated in the Solution-Oriented Research for Science and Technology (SORST) program, which was supported by the Japan Science and Technology Agency. In the oxide semiconductor TFT used in this development, indium-gallium-zinc-oxide (InGaZnO) was employed in the channel layer.

*5 Mobility: A physical value that characterizes the velocity of carriers (electrons and holes) in a solid-state material when they are driven by an electric field. The larger the mobility, the higher the switching performance of a transistor and the better the power consumption and performance of a circuit are.

■About Hitachi, Ltd.

Hitachi, Ltd., (NYSE:HIT / TSE:6501), headquartered in Tokyo, Japan, is a leading global electronics company with approximately 360,000 employees worldwide. Fiscal 2009 (ended March 31, 2010) consolidated revenues totaled 8,968 billion yen ($96.4 billion). Hitachi will focus more than ever on the Social Innovation Business, which includes information and telecommunication systems, power systems, environmental, industrial and transportation systems, and social and urban systems, as well as the sophisticated materials and key devices that support them. For more information on Hitachi, please visit the company's website at http://www.hitachi.com.

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