News Release

OKI SEMICONDUCTOR

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September 27, 2011

OKI Semiconductor, the first in the industry, starts sample shipment of power supply control LSI, which automatically controls dual power supplies by solar panel and coin cell

- Lowest power consumption in the industry, simple design, reduced development time, and improved battery life -

OKI Semiconductor, a subsidiary of ROHM Group, has developed power controlling "ML9077/ML9078 series" LSI for small sized electronics using small capacity battery such as coin battery and others, which, controlling dual power supplies consists of solar panel and batteries, get microcomputer and peripheral equipments drive.

These LSIs drive microcomputer and peripheral equipments, while charging a secondary battery from a solar panel, protecting the overcharge, or switching electric supply sources between a solar panel and a primary battery, all automatically.

ML9077, depending upon the residuary quantity (voltage) of a secondary battery, automatically controls charging of the secondary battery by the solar panel and supplying of power to a microcomputer and peripheral equipments by the secondary battery.

ML9078, comparing continuously the power supply voltage of the solar panel and the residuary quantity (voltage) of the primary battery, makes automatic selection of higher power between them for power supply to the microcomputer and peripheral equipments.

Because in these ML9077/ML9078 functions including high-precision voltage comparison at ultra-low electricity consumption and power supply switching while keeping low impedance characteristics of power lines are all self-controlled requiring no external control, it is easily possible to build a power supply system using a solar panel.

ML9077 has been already put to commercial production and ML9078 starts sample shipment in September and will start production launch at 500 thousand units per month in January 2012. It is planned to use OKI Semiconductor Miyagi (in Miyagi Prefecture) for the preceding process of production and OKI Semiconductor Miyazaki (in Miyazaki Prefecture) for the later process.

At present, interest in solar energy and other clean energy is significantly increasing and it is expected that the size of clean energy will be securely upgraded. In the area of small sized electronics, using small cell such as button battery, interest in the use of solar energy is high, energy generation by solar panel has been already adopted as power source in some wristwatches and pocket calculators for postponement of battery life or elimination of battery.

However, there are cases where adoption of products are difficult due to increase of development

cost and system components, because for utilization of solar energy it is required to configure new electronic system that combines solar panel and battery, to retain the safety functions for voltage control of power supplied to the microcomputer and for protection of abnormal current to the battery, as well as installation of control circuit. The methods for easy implementation of such safety functions and control circuit are earnestly desired so that solar energy use can be widely expanded in the market.

OKI Semiconductor, having fields of expertise in designing of LSI at ultra-low electricity consumption and designing of LSI for power source system using solar panel and battery, focused the above-mentioned situation and has now developed the ML9077/ML9078 mounting safety functions and control circuits, both inevitable for utilization of solar energy. With these, the first in the industry, LSIs have been realized with which dual power supplies of solar panel and battery are automatically controlled at ultra-low electricity consumption aiming for the market of application mounting low-power microcomputer using small battery such as coin battery, by taking advantage of expertise in LSI designing technology at ultra-low electricity consumption and technology in power supply system using solar panel.

These LSIs have safety functions and features for the customers to use solar energy safely and easily on their own applications.
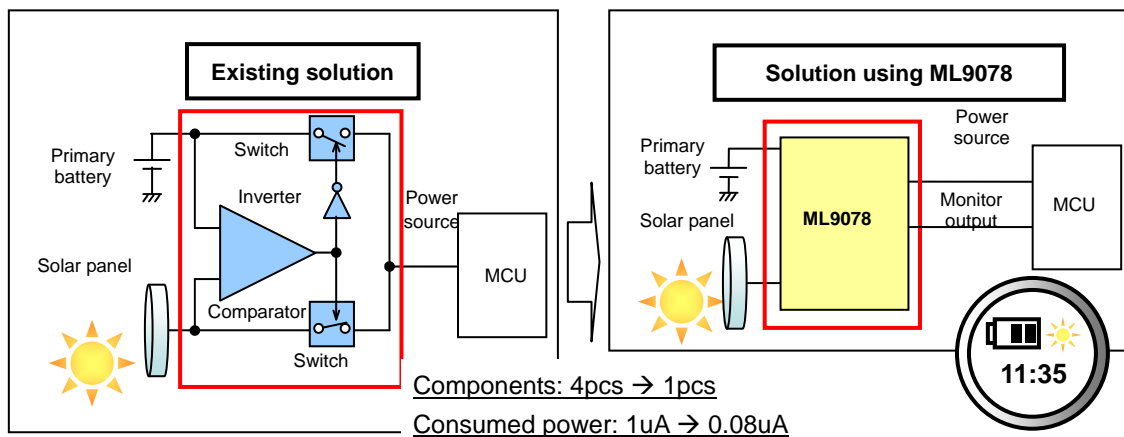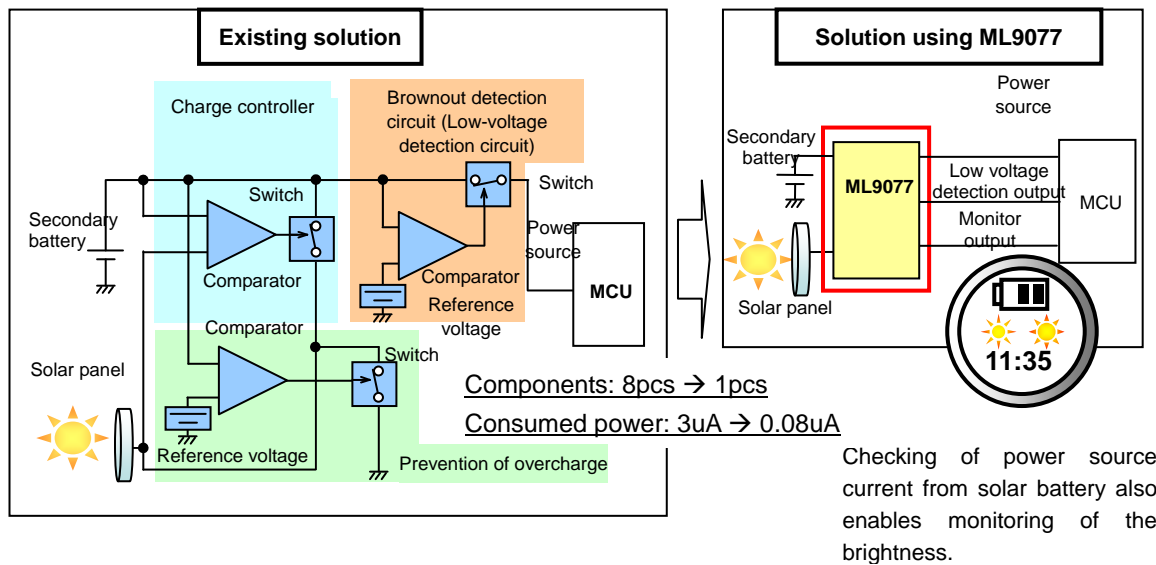
<ML9077: Secondary battery and solar panel control>
・Continuously monitor the secondary battery situation and stop charging of the secondary battery when an overcharge voltage is detected
・Continuously monitor the secondary battery situation and stop power supply when a low voltage is detected in order to prevent reckless driving of a microcomputer
・Enable to monitor output the solar panel generation current to be used for the brightness determination
・Quiescent consumption current on the secondary battery = 80nA or less (at 25 degree centigrade)

<ML9078: Primary battery and solar panel control>
・Protection of primary battery by prevention function of generation current entry to the primary battery from solar panel
・Prevention of high power supply to microcomputer by constant-voltage conversion of generation current from solar panel
・Enable to monitor output the situation of power supply selection in order to easily verify the driving situation of solar energy
・Quiescent consumption current of the primary battery = 80nA or less (at 25 degree centigrade)
(ML9078-01/02)
= 150nA or less (at 25 degree centigrade)
(ML9078-03)

Also, as the common characteristics of these LSIs, they control dual power sources of solar panel and battery on an entirely-independent basis; there is no need to control by any application soft or loading of another component, which enables system-costs reduction. Additionally, these LSIs will contribute to miniaturization of customers' products; the vent size of a chip product is 1.5mm□ or less and the size of a package is of 3mm x 3mm in case of WQFN type.

OKI Semiconductor is committed continuously to develop and provide high-quality and confidently usable products by increasing lineup of LSIs meeting customers' needs in the market of application mounting low-power microcomputer.

Components: 8pcs → 1pcs
Consumed power: 3uA → 0.08uA

Checking of power source current from solar battery also enables monitoring of the brightness.

Components: 4pcs → 1pcs
Consumed power: 1uA → 0.08uA

Monitoring of signals "primary battery is being used" or "solar battery is being used" enables to display an "ECO" icon on customer's product.

[**Features**]

ML9077

・Ultra-low electricity consumption

Secondary battery can charge the solar panel generation power high in efficiency, as the quiescent consumption current of the secondary battery operating at 25 degree centigrade is 80nA or less and the quiescent consumption current of the solar panel is also 80nA or less.

・Protection function of overcharge

Battery charge will be stopped when the charging voltage exceeds the overcharge level set-up for the secondary battery, so that overcharge of secondary battery can be prevented. The overcharge voltage level can be chosen from either of 3.1V or 2.6V allowing use of two Battery types: 3V series batteries and 2.5V series batteries.

・Low voltage detect function

Power supply from the secondary battery will be blocked when detection signal is output if the

secondary battery voltage lowers the low voltage detect threshold. With this, reckless driving of the microcomputer at low voltage can be prevented.

Setting of low voltage detect threshold can be chosen from a microcomputer for 1.1V operation or the one for 1.8V operation.

・Power supply at low impedance

Because such low impedance power is provided at the VDO output terminal that 50mV or less drop of output voltage at 20mA output load current, it is available to various products. (When remaining power of a secondary battery is 1.8V or more)

・Monitoring function of solar power supply

As there is a terminal available for monitoring the solar panel power generation current, it is possible to determine the brightness using the said current.

ML9078

・Ultra-low electricity consumption

The quiescent consumption current of the primary battery operating at 25 degree centigrade is 80nA or less in case of ML9078-001/ML9078-002 and 160nA or less in case of ML9078-003, and also the quiescent consumption current of the solar panel power generation current during non-operation of regulator is 160nA or less. As driving of a microcomputer and peripheral equipments by solar panel generation current can be realized in high efficiency as current consumption of the primary battery can be restrained, it is possible to extend the life of the primary battery.

・Backflow prevention function of solar panel generation current to the primary battery

As solar panel voltage and primary battery voltage are continuously monitored, connection from the primary battery can be automatically blocked when the solar panel voltage becomes higher than the primary battery voltage, therefore, backflow of solar panel generation current to the primary battery can be prevented. With this, destruction of the primary battery caused by the voltage applied by the solar panel can be prevented.

・Solar panel voltage limiting function

Solar panel voltage can be automatically limited if it exceeds a limiting voltage. As voltage exceeding the limit will not be provided to the microcontroller, damage of microcontroller caused by high voltage applied by the solar panel can be prevented.

The limiting voltages are 1.65V and 3.3V in case of ML9078-001, 1.5V and 3.0V in case of ML9078-002, and at the same voltage with the residual voltage of the primary battery in case of ML9078-00. Three versions are assembled so that various types of solar panel and microcontrollers can be suited.

・Low output power impedance

Because such low impedance power supply will be provided at the VDO output terminal that 150mV or less drop of output voltage at 2mA output load current various products can be available. (When remaining power of a primary battery is 2V or more)

・Power source comparison function between solar panel/primary battery

Solar panel voltage and primary battery voltage are always comparatively monitored and a chosen power supply source can be displayed at any moment.

[Field of application]

Wristwatches, Standing clocks, Pocket calculators, Bicycle meters, Remote controllers, Lights, Handy radios, Portable toys, and Battery charger, etc.

[Sales plan]

ML9077

- ・Sample shipment   : Currently being supplied
- ・Sample price   : Yen 100 (tax not included)
- ・Evaluation board   : Scheduled in October 2011
- ・Mass production plan   : Currently being supplied

ML9078
- ・Sample shipment schedule : Scheduled in September 2011
- ・Sample price   : Yen 100 (tax not included)
- ・Evaluation board   : Scheduled in October 2011
- ・Mass production plan   : Planned to be in January 2012

[Overview/features]

ML9077
- ・Operating voltage   : 0.0V to 3.6V (Solar cell voltage)
            : 0.0V to 3.2V (Secondary battery voltage)
- ・Operating temperature : -20 °C to +70°C
- ・Maximum quiescent current on the secondary battery side
            : 80nA (Ta = 25°C)
- ・Overcharge prevention voltage : 3.1V ± 0.1V (When a Lithium Manganese Dioxide [ML]
            Secondary battery is used)
            / 2.6V ± 0.1V (When a Cobalt Titanium Lithium [CTL]
            Secondary battery is used)
            (Solar cell current = 0.15uA to 6mA Ta = 25°C)
- ・Secondary battery charging electric potential difference (Secondary battery voltage - Solar cell voltage)
            : 0V to 0.1V
            (Solar cell voltage > 2.0V, Solar cell electric current =< 1mA)
- ・Low voltage detecting voltage/ Reckless drive prevention voltage
            : 1.15V ± 0.1V / 1.8V ± 0.1V
- ・Secondary battery electric supply potential difference (Secondary battery voltage - VDO output voltage)
            : 0V to 50mV
            (Secondary battery voltage=>1.8V, Secondary battery current
            =< 20mA)
- ・Package   : Chip, 12 pins WQFN (3.0mm x 3.0mm)

ML9078
- ・Operating voltage   : 0.0V to 4.0V (Solar cell voltage)
            : 1.1V to 3.6V (Primary battery voltage)
- ・Operating temperature : -20°C to +70°C
- ・Maximum quiescent current on the primary battery side
            : 80nA (Ta = 25°C) ML9078-01/ML9078-02
            150nA (Ta = 25°C) ML9078-03
- ・Regulator voltage   : 1.65V ± 0.1V / 3.3V ± 0.1V (ML9078-01)
            1.5V ± 0.1V / 3.0V ± 0.1V (ML9078-02)
            VBAT ± 0.1V (ML9078-03)

・Primary battery electric supply potential difference (Primary battery voltage - VDO voltage)

                : 0V to 0.15V

                (Primary battery voltage=>2.0V, Primary battery current

                =< 2mA)

・Solar cell electric supply potential difference (Solar cell voltage - VDO output voltage)

                : 0V to 0.13V

                (Solar cell voltage=>2.0V, Solar cell current =< 2mA)

・Package   : Chip, 12 pins WQFN (3.0mm x 3.0mm)

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