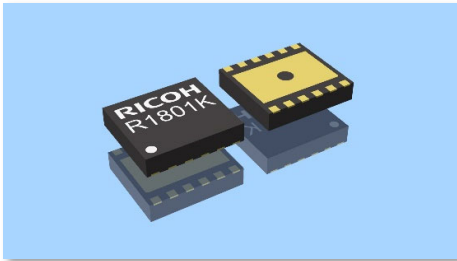


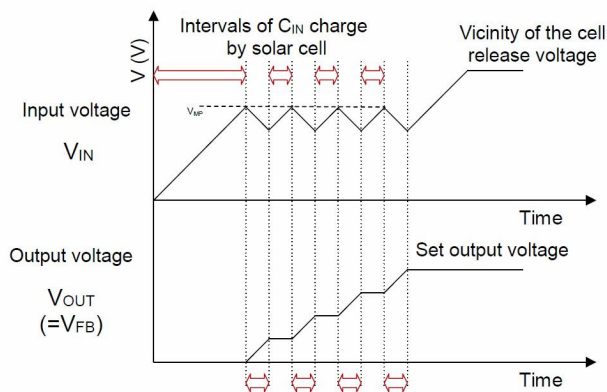
Ricoh launches Buck DC/DC Converter with 200nA quiescent current for Energy Harvesting applications



The R1801 is a Buck DC/DC Converter, designed for use in the Internet of Things ecosystem by extracting energy from PhotoVoltaic or PiezoElectric cells. It makes small devices energy autonomous protecting the environment by reducing the use and waste of primary batteries, while eliminating the impact of cabling cost and maintenance to replace

batteries regularly. A vast amount of these devices are to be deployed in environments such as offices, industrial sites, remote monitoring infrastructures and wearable fitness / healthcare devices.

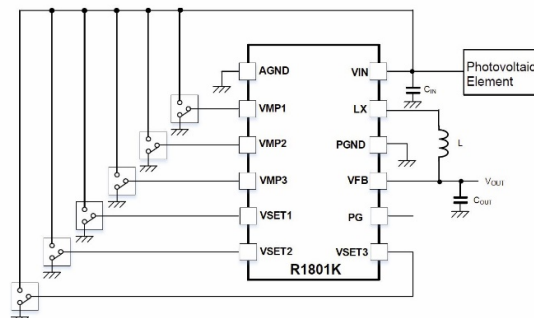
The DC/DC converter converts energy from a solar cell and stores it in battery or super capacitor storage elements. An ultra-low quiescent current of 200nA allows to use the harvester circuit even in a low-illuminated environment when the generated level of energy is moderate.



As soon as there is sufficient energy available on the input side, the buck DC/DC Converter will be enabled to transfer energy from input to output until the energy drops below a threshold. This process repeats and increases the voltage in the energy storage device until the required level is reached.

As soon the output voltage reaches 90% of its setting, the Power Good output becomes active and enables additional circuits. The Power Good output remains active until the output voltage drops below typically 2.13V, regardless whether an input voltage is present or not. In this way, it keeps circuits on the output active even during night time when the solar cell does not generates power.

One significant advantage of the R1801 is that the output and maximum power voltages are adjustable. It is possible to tailor the settings according to the solar cell performance. First of all, one has to select which product version to use for a project. The product version already has a preset Vset and Vmp voltage level. Secondly, it is possible to adjust these preset voltages a bit by controlling the three pins Vset1-3 and Vmp1-3. By configuring the three pins one selects how much the



initial voltage setting increases or decreases in a 100mV step, the total adjustable range is $\pm 300\text{mV}$.

The R1801 has a built-in reverse current protection to keep the energy in the energy storage device and prevents a current flow from output to input. When the input voltage drops below the output voltage, this protection circuit becomes active under the condition that the input voltage is equal to or greater than 2V. If the input voltage becomes less than 2V, the reverse current will charge the input for a short moment until the protection becomes active again. As a result, the average reverse current will be very small. In this way the R1801 remains providing power to connected circuits even without power from the solar cell.

The minimum required power to start-up the IC is 1 μW and its peak efficiency is around 80% at 10 μA output current (ex. $V_{\text{in}} = 4\text{V}$, $V_{\text{out}} = 3\text{V}$). The R1801 is available in a DFN(PLP)2730-12 package, samples and fully assembled + tested evaluation boards can be purchased from our authorized local distributors and online partners.

Features R1801:

Input Voltage Range: 2.3V to 5.5V

Output Voltage Range: 2.3V to 4.5V

Output Voltage Accuracy: $\pm 3.0\%$

Maximum Power Point Control Voltage Range: 2.7V to 5.3V

Operating Quiescent Current: Typ. 200nA ($T_a = 25^\circ\text{C}$, at no load) ($V_{\text{in}} = 4\text{V}$, $V_{\text{out}} = 3.0\text{V}$)

Starting Power: 1 μW ($V_{\text{in}} = 4\text{V}$, $V_{\text{out}} = 3.0\text{V}$)

Protection Circuits: Reverse Current Protection ($V_{\text{in}} \geq 2.0\text{V}$)

Other Features: Adjustable Maximum Power Point Control

Adjustable Output Voltage

Power Good Function

Output Current: 1mA

Peak Efficiency: 80% at 10 μA

Package R1801K: DFN(PLP)2730-12