Solar charge management chip selection CN3063/CN3065/CN3722

Key words: Solar cells Photovoltaic cells Maximum Power Point Tracking (MPPT) Battery Charge Management

I-V characteristics of photovoltaic cells

Photovoltaic cells (solar cells) are generally composed by the p-n junction, the p-n junction in the light (photons) lead to the re-combination of electrons and holes to generate electricity. A simplified model of the p-n junction is the characteristics of diode, we generally to the circuit shown in Figure 1 as a photovoltaic cell characteristics.

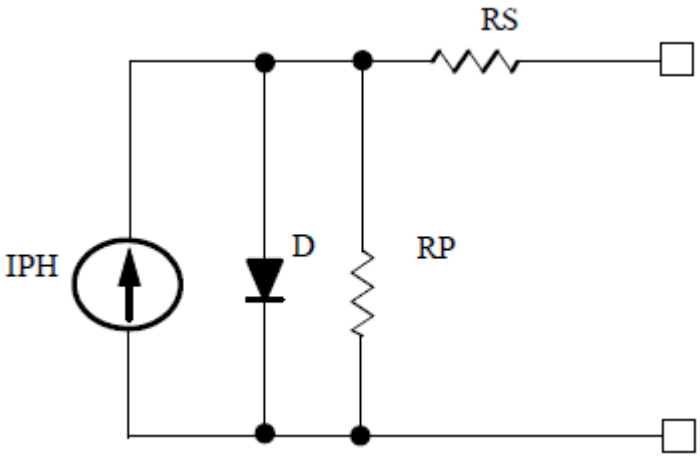

Figure1 The simplify circuit model of photovoltaic cells

Current source IPH produce the current and photovoltaic cells is directly proportional to the brightness. When no load is connected photovoltaic cells, almost all the current flows through the diode D, whose forward voltage determines the photovoltaic cells of the **open circuit voltage (V_{OC})**. The voltage will vary due to the different characteristics of various types of photovoltaic cells. However, for most silicon photovoltaic cells, the voltage is between 0.5V to 0.6V, which is also a pn junction diode forward voltage.

Actual PV cell parallel resistance (RP), leakage current is very small, and the RS will produce a connection loss. Because of the series resistor (RS), the voltage will be slightly decreased. Sometimes, however, through the internal diode current is too small to cause enough bias voltage across the diode will be a sharp decline with increasing load current. Finally, if all the current only flows through the load without flow through the diode, the output voltage will be zero. This current is called the photovoltaic cell short circuit current (I_{SC}). I_{SC} and V_{OC} are the main parameters of the photovoltaic cells. Therefore, the photovoltaic cells is that the current limit “type power supply”, its output voltage will decrease with the increase of the output current and load current reaches the short circuit current is reduced to zero.

Photovoltaic Maximum Power Point Tracking (MPPT)

Photovoltaic Maximum Power Point Tracking (MPPT) in order to ensure the change of light intensity, the photovoltaic cells has been the maximum power output, to take advantage of solar energy. Generally, switch mode DC-DC converter to achieve the MPPT function, to maintain the output voltage and charging current multiplied by (output power) to maximize. Because the constant mode, high voltage will be converted into useful work released in the form of heat, so the constant mode to achieve maximum power point tracking does not necessarily guarantee a relatively high utilization of solar energy efficiency.

CN3722 switch buck-mode DC-DC converter is to achieve maximum power point tracking for photovoltaic cells, the input voltage maximum up to 28V is suitable for the application of input voltage and the battery voltage is relatively large difference. Figure 2 shows the CN3722 maximum power point tracking.

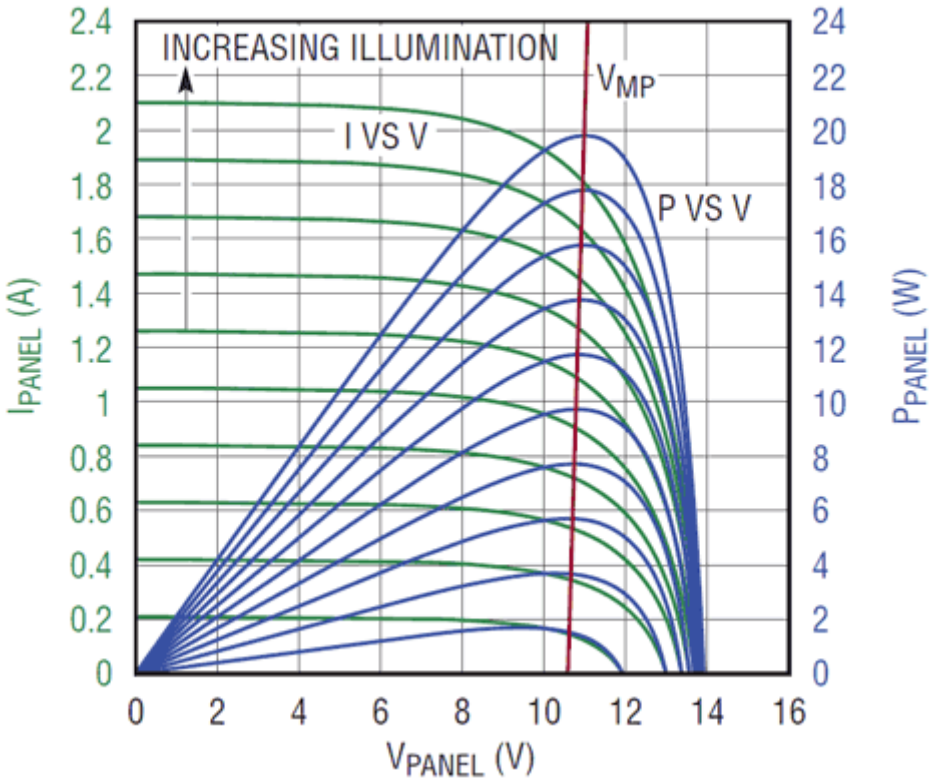

Figure 2 CN3722 maximum power point tracking.

In Figure 2, green line is the curve of the I-V characteristics of photovoltaic cells under different light conditions, the blue line shows the output power curve, the red line indicates the CN3722 track the maximum power point.

Switch buck mode Photovoltaic Maximum Power Point Tracking is for relatively large difference in input voltage and the battery voltage or large charging current application.

Switch buck mode Photovoltaic Maximum Power Point Tracking also has the following two drawbacks, first the high cost of switching DC-DC converter. Second, the voltage output of the photovoltaic cells is relatively low, or the charging current is relatively small and may not be able to truly improve the charging efficiency. In this case, we can consider the charge current automatically adjusts chip.

Automatically adjusts the charge current

Low output voltage of photovoltaic cells, or the charging current is relatively small, if it is for a single lithium battery charging, you can consider using the CN3063 or CN3065.CN3063 和 CN3065. Using constantly charge mode, simple, low cost, but also automatically adjusts the charge current according to the current output capacity of photovoltaic cells. Automatic charging current adjustment mode, the output voltage of the photovoltaic cells is modulated at a level slightly higher than the voltage of the battery is full, which can charge the battery full, but also ensures maximum use of solar energy.