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Solar Powered Mobile Charger Using Buck Converter

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Abstract-The proposed system, solar powered charger (SPC) plays an important role in mobile charging during travelling. The sun is the ultimate power source and solar energy is renewable energy source. The SPC system is ecofriendly and user friendly. The solar panel used is of 12v rating. The voltage must be suitably step down. The simplest way to reduce the voltage of a DC supply is to use a linear regulator (such as a 7805), but linear regulators waste energy as they operate by dissipating excess power as heat. Buck converters, on the other hand, can be remarkably efficient (95% or higher for integrated circuits), making them useful for tasks such as converting the main voltage in a computer (4-5V in mobile phones, 12 V in a desktop, 12-24 V in a laptop) down to the 0.8-1.8 volts
needed by the processor.

Keywords: Buck Converter,Photovoltaic Cell

INTRODUCTION:

It employs Maximum Power Point Tracking (MPPT) technology to confirm maximum utilization of trapped solar energy in the solar panel.MPPT mechanism makes use of an algorithm and an electronic circuitry, so that maximum amount of generated power is transferred to the load.This is based on the principle of impedance matching between load and PV array. As a 12 V solar panel is used SPC consists of a buck converter for stepping down the voltage level which is suitable for charging mobile phones

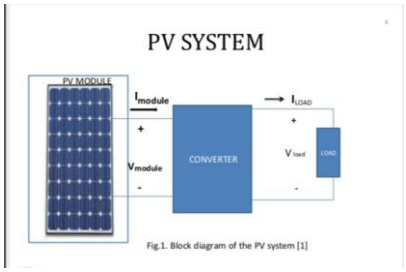
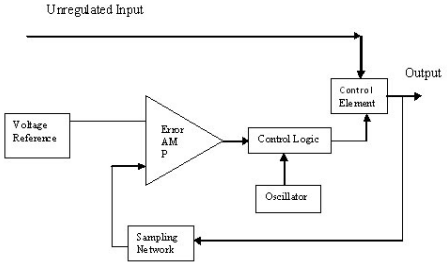


Fig.1. Block diagram of the PV system [1]

II.CIRCUIT DIAGRAM AND EXPLANATION:

SMPS:SMPS is the Switched Mode Power Supply circuit which is designed for obtaining the regulated DC output voltage from an unregulated DC or AC voltage.



Block Diagram of Switched Mode Power Supply

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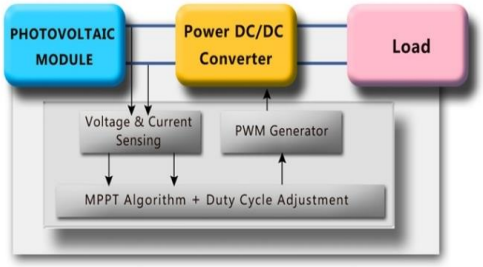
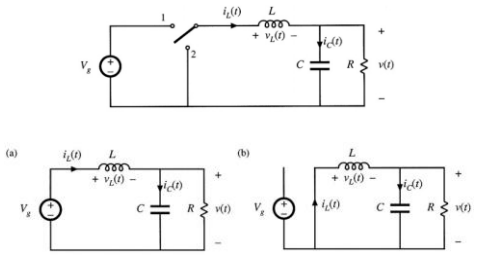


Fig. 2. PV panel with DC–DC converter and MPPT.

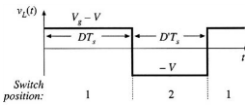
BUCK CONVERTER:

The buck is a non-isolated power stage topology, sometimes called a step down power stage.These converters produce a lower average output voltage than the DC input voltage.It consists of a DC input voltage source , inductor L, controlled switch (MOSFET), diode D, filter capacitor C, and load resistance R.

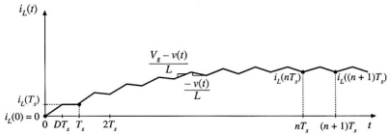
BUCK CONVERTER(CIRCUIT DIAGRAM):



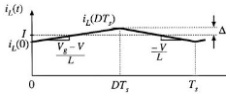
Mode 1:switch is connected to supply. Mode 2:switch is disconnected from supply



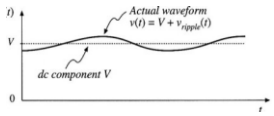
Voltage across inductor



transient current through inductor



Steady state current through inductor



Actual voltage across capacitor

MPPT CHARGE CONTROLLER:

MPPT stands for maximum power point tracking.To charge battery in more efficient manner, the pv array is operated at a point where the pv output power is maximum.To extract maximum power from pv array, a dc to dc converter is used between the pv array and the battery.

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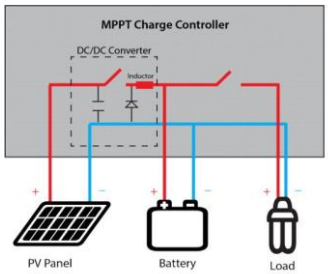

CONCLUSION AND FUTURE SCOPE:

A dc-dc buck converter is introduced between PV system and load to meet the dynamic energy requirement of the load in an efficient way. It is observed that, the buck converter largely increases the system efficiency by using MPPT technique.

1.If designed accurately ,it can be a market product.
2.By making some modifications we can use this charger to charge batteries used in different portable devices like laptop, walky-talky, i-POD, digital camera etc.

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