MAXIMUM POWER POINT TRACKING IN PHOTOVOLTAIC MODULES USING COMMERCIALLY AVAILABLE INTEGRATED CIRCUITS (ICs)

IITM Technology Available for Licensing

Problem Statement & Unmet Need

- Photovoltaic (PV) modules help in the conversion of solar energy into the electrical form. **Power electronic interface can be adopted** to maximize the energy transfer to the loads. Use of **Maximum Power Point Tracking (MPPT)** algorithm enables this, under various environmental conditions.
- For extracting maximum power from the PV module, digital control platforms like microcontrollers/microprocessors/FPGAs are commonly used. Amongst various methods of implementing MPPT, few methods also exist that use analog electronic circuits. Above MPPT implementation methods **require extensive knowledge on control loop design** and its tuning to achieve stability and optimum performance. Such requirements make practical MPPT implementation a challenging task.
- Some Integrated Circuits (ICs) with built-in MPPT algorithm are also developed. But they are **not commercially available**. Moreover, all the above MPPT implementation methods are specific to a DC-DC converter topology.
- Some of the semiconductor companies have published application notes on how to use their devices for MPPT on application specific circuits. But they are found to be oriented towards battery charging circuits. Hence, there is a need for **simple yet effective method to implement MPPT in PV systems.**

Technology

- The present invention relates to implementation of MPPT in PV systems using commercially available Integrated Circuits (ICs) from semiconductor companies like Texas Instruments, Analog Devices, Microchip, Infineon, ROHM etc.
- The use of these commercially available ICs is **exploited to track the Maximum Power Point (MPP) of PV modules** just by adding basic electronic circuit blocks. The proposed idea is simple and can be implemented by referring to the **IC datasheet** and with the basic knowledge on electronic circuit design.
- The additional electronic circuits added are small, can be **integrated into the silicon of the commercially available ICs** and the new product/IC can be marketed as MPPT controller. The effort required to build on the existing ICs is very small.
- The proposed idea is broader than the products like - SM72442 and SM72445 from Texas Instrument, has an excellent potential to market and the new IC (MPPT controller) can be oriented towards the **power management product lineup** (like battery charger ICs, LED drivers, DC-DC converter controllers etc.)

Applications - All photovoltaic systems which use DC-DC converters and implement MPPT.

Intellectual Property

- IITM IDF Ref. **2342**
- Patent Status - **Granted**

Advantages / Value Proposition

- **Easy Implementation**, does not require expertise in control system design and tuning.
- Does not require MPPT algorithm implementation either by coding or by complex circuits or by using FPGA.
- It can be integrated into the **silicon of commercially available ICs** and the new product can be marketed as MPPT controller with minimum effort on IC development and validation.
- It can be implemented on **multiple DC-DC Converter topologies.**
- Excellent dynamic response to both change in **irradiance level** and **load condition**.

TRL (Technology Readiness Level)

TRL - 4, Technology is experimentally demonstrated in lab scale.

Research Lab

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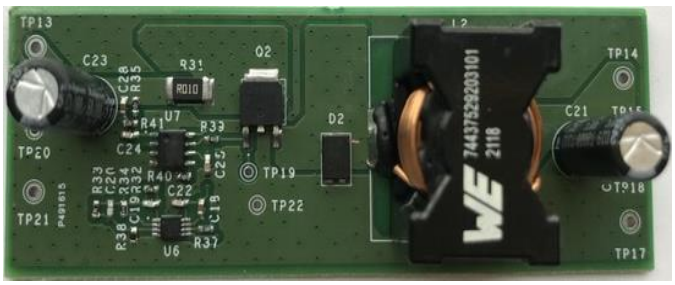
Images

A



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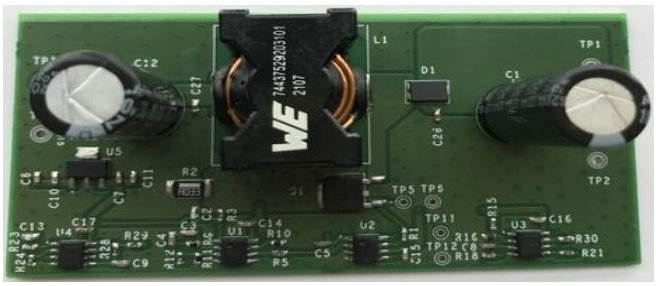
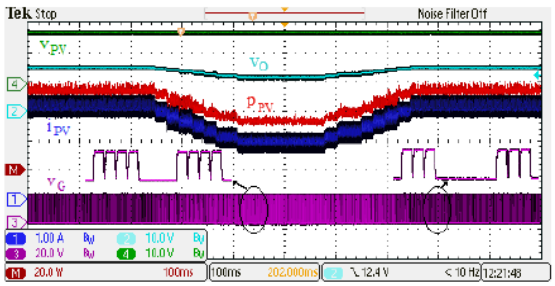
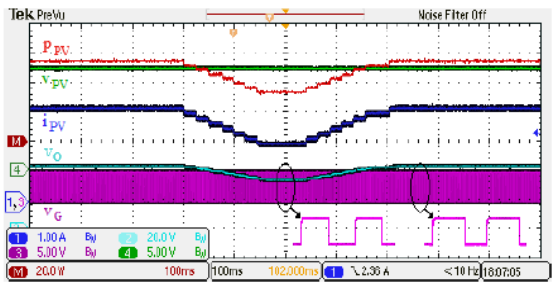


Fig.1 Implementation of MPPT system on a 100W (A) Buck (B) Boost converter.

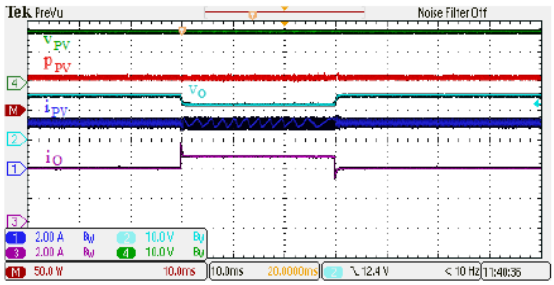


(a)

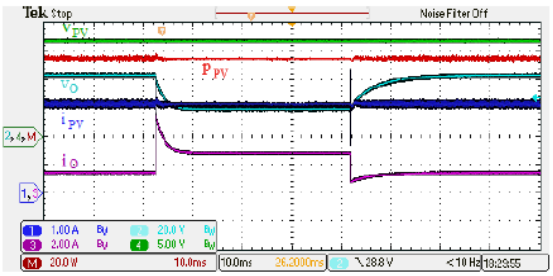


(b)

Experimental results for change in irradiance level with: (a) Buck converter (b) Boost converter



(a)



(b)

Experimental results for step change in load with: (a) Buck converter (b) Boost converter

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