

MPPTair – Solar Power Optimizer for Aircrafts

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In any solar powered system, a DC/DC-Converter plays a major role for the tracking of the solar panels Maximum Power Point (MPP). The Bern University of Applied Sciences in Biel/Bienne already has a proven track record in the design of such high efficiency converters for solar race cars. For the use in a solar powered aircraft the power to weight ratio is as important as efficiency. To reduce weight, a new converter topology has been chosen. Due to this design change and the increased switching frequency the weight of the MPPT will decrease significantly.

In the near future, renewable energy sources such as solar energy will become essential, as already today we are facing a shortage of fossil energy. Apart from efforts aimed at raising the efficiency of photovoltaic cells and arrays, there is also the need to improve the other components of a photovoltaic system. For these reasons, the Bern University of Applied Sciences in Biel-Bienne, has developed a high-efficiency Maximum Power Point Tracker. The MPPT new Generation, which is now supported by drivetek ag, is a high performance switching DC/DC-converter with an efficiency of up to 99 %.

The MPPT nG was originally developed for the use in the World Solar Challenge's race cars, where it already supported two winning

teams. For a new application in a solar powered aircraft, the tracker has to be reduced in size and weight. This is the main goal of our diploma thesis which includes the development of a new hardware and software design.

The used Digital Signal Processor (DSP) from Texas Instruments is capable to control the MPPT with a sophisticated new control approach which minimizes the switching losses. Owing to this approach and the increased switching frequency which goes up to 400 kHz smaller and lighter capacitors and most notably lighter inductor coils could be chosen. This also makes it possible to design the converter in a very flat, compact style.

The newly chosen topology of four interleaved boost converters minimizes the current ripple and im-

proves the electromagnetic compatibility of the converter.

To cover a broad spectrum of communication needs, the new converter comes with a fully implemented CAN Interface. As a superior protocol, CANopen provides a very flexible and open standard which also leaves space for manufacturer specific ideas. This permits controlling, setting up and supervising the MPPT with a CANopen LabView interface which can be adapted to the needs of the MPPT with almost no effort.

These design parameters make the new developed MPPTair a lightweight DC/DC Boost Converter which is optimized for the use in the air.



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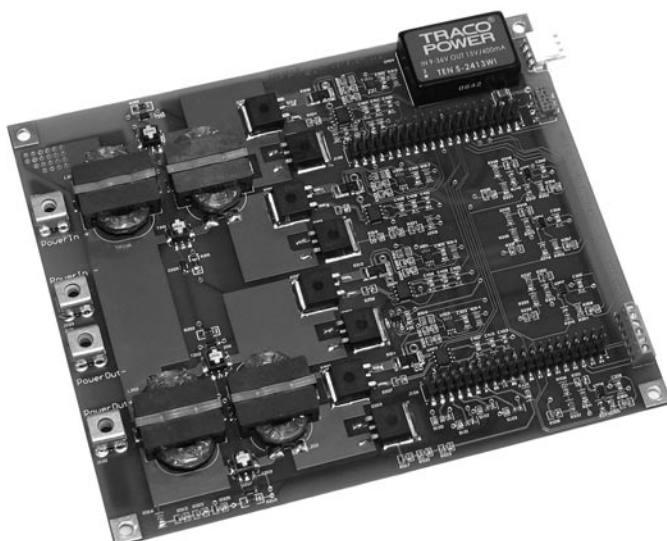


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The MPPTair DC/DC-Converter with its DSP Controller Board

