

Interleaved Boost Converter²

A 48Vdc to 350Vdc interleaved boost converter

Client:	<i>The Hague University of Applied Sciences in collaboration with ATAG Benelux , CASPOC Simulation Research</i>	
Mentors:	<i>D. C. Zuidervliet</i>	<i>(d.c.zuidervliet@hhs.nl)</i>
	<i>P. J. van Duijsen</i>	<i>(p.vanduijsen@caspoc.com)</i>
	<i>J. van Os</i>	<i>(jvanos@atagbenelux.com)</i>
Duration:	<i>Shift 2 (10 weeks)</i>	
Start date:	<i>16-11-2020 – 05-02-2020</i>	
Location:	<i>The Hague University of Applied Sciences – Delft</i>	
Theme:	<i>Direct Current Research</i>	

Introduction

In the future of energy distribution the worlds electricity will probably be produced by direct current sources. Because these sources can fluctuate a battery storage system needs to be connected. In this design for a boost converter is presented so it's possible to boost the voltage from a 48Vdc battery to a 350Vdc grid voltage level. Since this converter needs to be able to operate at lower as well as higher power levels the efficiency of a single boost converter would drop considerably. Therefore multiple parallel converters are essential. The chosen topology for this converter is a interleaved two stage boost converter. This topology was chosen so it could be converted into a bidirectional boost converter and to reduce EMI interleaving the converters. A prototype of this converter was tested and was capable of delivering more than 300W.

Topic

The Hague University of Applied Sciences has this first prototype of the Interleaved Boost Converter, see fig 1. The DC-Lab and ATAG needs this boost converter too boost the batty voltage 48Vdc of their Self-Sustaining Tuktuk to power a DC-Induction hob on 350Vdc. At this point there is one double stage circuit working. The next step is a interleaved version where we can place multiple converters to get a higher power output. To get in the kW range we need a "motherboard-PCB" so multiple stages can be connected and controlled. For this PCB we need a stackable design, that can handle the amount of current and with keeping heat transfer (air flow) in mind. Also a redesign of the first prototype is needed to get it more efficient and compatible with this motherboard-PCB.

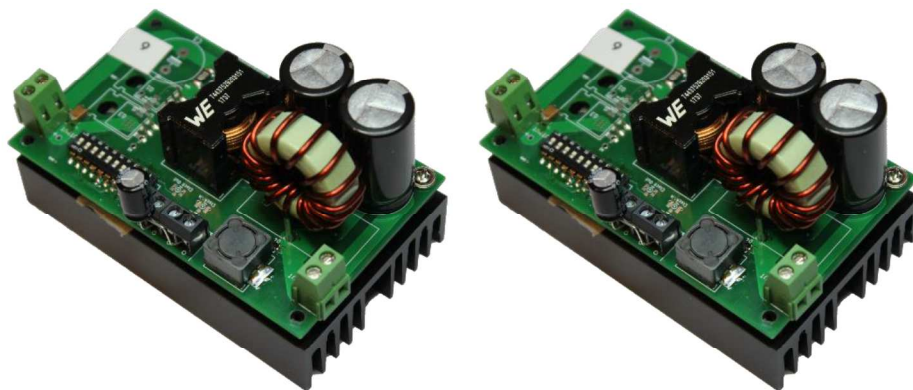


Figure 1 – Version 1.0 of the Interleaved Boost Converter, stage 1 (115Vdc) + stage 2 350Vdc .