Development of Power Electronics Hardware in Industrial and Automotive Environments

Abstract

Power electronics plays significant role in many modern applications like: home appliances, consumer electronics, industry, transportation and automotive, power generation, transmission and distribution. Independent of converter size, complexity and power level, the development process is more or less similar.

This tutorial will provide an overview and address challenges in development process of low-voltage power converters, i.e. input/output voltages are less than 1 kV ac and 1.5 kV dc. The process starts with the concept phase then goes through first prototypes till approvals phase and release for the mass production. In addition, some aspects of customer support will be covered as well.

The intended audience is students, academic staff, and practicing engineers that are not familiar will development process of power electronics hardware for the mass production. Typically academic staff and researchers are focused on the first 20% of the total work needed to bring a product to the market. Hence, objective here is to get a basic understanding about each phase in the development process. Tutorial is planned as half a day tutorial or to last around 3 hours plus Q&A session.

Content

Part 1 (1.5 hours)

1. Introduction

    1.1 Difference between R (research) and D (development)

    1.2 Typical structure of an engineering department

    1.3 Learning of power electronics

2. Development phase

    2.1 Concept phase: requirements, specification, calculations, and simulations

    2.2 Prototyping and lab safety

    2.3 Schematics and layout

    2.4 Magnetic and mechanical design

    2.6 Thermal simulation

    2.7 Control, thermal, and EMC challenges

2.8 Verification, validation, and approvals

2.9 Industrial vs. automotive projects

Coffee break (0.5 hour)

Part 2 (1.5 hours)

3. Mass production and customer support

3.1 General info

3.2 Practical examples of field, production, and supply chain problems

4. Misc. topics: project and product management, systems engineering, etc.

5. Case-study: development of an active-clamped flyback dc-dc converter 57 W with 800 V input and five outputs

6. Q&A session

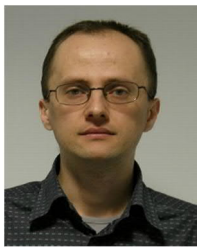
Instructor:

Name: Darko Vračar

Affiliation: BRUSA Elektronik (München) GmbH, Munich, Germany

E-mail: darko.vracar@brusa.biz

Biography:



Darko Vračar received the Dipl.-Ing. and Magister degrees in electrical engineering from the School of Electrical Engineering, University of Belgrade, Belgrade, Serbia, in 2000 and 2007, respectively, where he is currently pursuing the Ph.D. degree. His major field of study was power converters and drives.

He is also with BRUSA Elektronik (München) GmbH, Munich, Germany. He has 22 years of industrial experience. Areas of expertise are implementation of telecom and datacenter power supplies, and R&D of power electronics' systems, such as solar inverters, SMPS for industrial, automotive, and telecom applications. He has published several papers related to power converters and drives and holds one patent in power conversion systems. His research interests include simulation, control, and design of power converters. In addition, he was delivering training sessions related to power electronics' topics or industrial standards.

Mr. Vračar is a member of the following IEEE Societies: Industry Applications, Industrial Electronics, and Power Electronics. He is a Reviewer of journal Electronics.