



Development of Power Electronics' Systems

– From Blank Sheet to Mass Production and Beyond –

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. It starts from the initial idea then goes through first prototypes till approvals phase and release for mass production. In addition, some aspects of customer support and miscellaneous topics will be covered as well.

The intended audience is students of all levels as well practicing engineers that are not familiar will R&D process and related challenges. Objective is to get a feeling about each phase in the development process, its challenges and terminology. Tutorial is planned as half a day tutorial or to last somewhere between 2 to 3 hours.

Content

Part 1 (1-1.5 hours)

1. Introduction

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

1.1.1 What is pre-development?

1.2 Typical structure(s) of a R&D department

1.2.1 Stakeholders and their roles

1.3 Learning of power electronics

2. Development phase

2.1 Requirements and specification

2.2 Initial concept, calculations and simulations



2.2.1 Modeling vs. simulation

2.2.2 CAD Software

2.3 Bread-boards and first tests

2.3.1 Proto-boards vs. Adaptacks

2.3.2 Personal safety

2.3.3 Measurement equipment

2.4 Schematics and layout

2.5 Magnetics and mechanical parts

2.6 Prototypes and their verification

2.6.1 First, second and pilot-run prototypes

2.6.2 Control, thermal and EMC challenges

3. Qualification and Approvals

3.1 Test plan

3.2 Approval agencies

Coffee Break (0.5 hour)

Part 2 (1-1.5 hours)

4. Mass production and after sales support

4.1 DFM report and tools verification

4.2 Production tests and “green light”

4.3 After sales support

4.4.1 Example 1: Field problem

4.4.2 Example 2: Production problem

4.4.3 Example 3: End-of-Life (EOL) part (supply chain problem)

5. Miscellaneous topics

5.1 Project and product management

5.1.1 Datasheet and user manual

5.1.2 Schedule-chicken game



5.2 Working with external partners and China

5.3 Performance indicators, patents and papers' publishing

6. Q&A session

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Biography:

D. Vračar graduated from School of Electrical Engineering, University of Belgrade, Serbia with department for "Power Converters and Drives" as Dipl.-Ing. (2000) and Magister (2007).

His industrial experience amounts to 8 years in the implementation and maintenance of telecom and datacenter power supplies plus 10 years in R&D of power electronics' systems (e.g. solar inverters, industrial SMPS and telecom power supply systems).

He has published several conference papers, holds one patent in power conversion systems and was delivering internal training sessions. His interests include modeling, simulation, control and design of power converters, trainings delivery and project management.