

Load Dump Analysis in a 42/14V DC-DC Converter for Automotive Applications

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Abstract

The paper presents a model for a dc-dc centralised based architecture using Matlab/Simulink for load dump analysis. As the electrical load varies for various driving conditions such as day or night, summer or winter; and city or country side, the analysis of load change is a very important parameter for system behaviour. In order to study the 42V power generation dynamic performance under load variations, step change in loads have been investigated. A detailed mathematical model for a 3-phase, 4 kW and 42V Lundell alternator average electrical equivalent circuit along with the DC/DC converter based architectures for dual-voltage systems has been covered in previous publications. Aspects of the steady-state output current capabilities, transient behaviour due to load dump on the 14/42V buses and the behaviour of the system model under different loads are assessed and results discussed. The performance of the 42V Lundell alternator with the interleaved six-phase buck dc-to-dc converter system is modelled using Simulink software to assess the effectiveness of the model and its transient behaviour. The simulated results are presented for the transient characteristics of the system for load dumps.

Keywords: 42V PowerNet, automotive, DC-DC converters, dual system, load dump, transient.

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