BMPS Application Guideline

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Endorsement

The BMPS Application Guideline is endorsed by the following system integrators and end-users

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1 Introduction

Time to market is shorter, with ever increasing pressure on the power system designer to deliver cost effective power systems that are reliable, easy to manufacture, and pass regulatory qualification on the first attempt. It's rarely acceptable to wait several months or even years for the development of customized power system solutions. System integrators and equipment manufacturers demand denser, more reliable power systems that are truly designed for manufacturing, but with a reduced development schedule and budget. The above can be a difficult challenge. This overview of modern power system design and the technologies and components available to support it, is an endeavor to assist the designer with the above challenge.

Since mid 1980's the development of miniaturized switching power supplies has brought on the practical implementation of decentralized or distributed power systems utilizing standardized Board Mounted Power Supplies (BMPS) i.e. Distributed Power Architectures (DPA). BMPS in this context means on-board DC/DC converters and DC/DC regulators, sometimes referred to as DC/DC power modules or simply power modules or converters. DC/DC regulators are commonly known as point-of-load (POL) regulators.

However, the selection of such standardized BMPS is not always easy due to the wide range of products now available and the sometime confusing performance claims made. Some suppliers emphasize power density, others switching frequency or converter topology, still others efficiency.

Which is most important? How does the reliability of decentralized or distributed power architectures compare with centralized systems? What factors determine reliability? How are small BMPS packaged within a system? What provisions are required for cooling? Why can't the maximum rated power of some converters be realized in practical systems? What are the real costs associated with power converter failures? Even though the newly available technologies and products offer exciting benefits, the list of questions such as those above seems to keep growing. The purpose here is to answer these questions and others, and provide a practical source of information for the power system designer - information that is based upon experience with actual systems and applications rather than just textbook formulas. It is our hope that the information contained here will be helpful in selecting a power system architecture that meets the needs of the product, selecting the appropriate BMPS or components with which to implement the system, and in applying the selected BMPS and components correctly. The result should be a design that meets the product needs, requires minimal design and qualification time, and has an acceptable manufacturing cost.

This Guideline is aimed at facilitating the communication between suppliers of BMPS and their customers, which are system integrators and EMS providers. The guideline provides easy access to the key items of information for:

- System integrators when they are designing printed wiring board assemblies with BMPS
- EMS providers when they are assembling printed wiring boards with BMPS
- Power supply manufacturers when they are designing and manufacturing BMPS

The guideline will first give an overview of power system requirements, starting at the circuit level and extending into system controls and packaging and regulatory requirements. Next, power system architectures in a generalized way are addressed before focusing in on decentralized or distributed power architectures. Tradeoffs between custom and standard power converters from a design and system management point of view will be discussed followed by an overview of commonly used converter topologies and their characteristics. It then looks in more detail at the design and implementation of decentralized power systems including electrical design, thermal design, and other product considerations. Reliability is ever more important in today's power systems, and a section is devoted to several aspects of power system reliability, including prediction, design practices, and how reliability is affected by power architecture and hardware choices. The 'bottom line' for most system manufacturers is cost. A separate chapter is devoted to cost analysis techniques useful for decentralized power system design, considering a product's 'life cycle cost', which consists not only of price, manufacturing and

installment costs, but also very important indirect costs such as time-to-market, spare parts, service action and operational expenditures. Furthermore, it's shown how reliability information can be accounted for when doing cost analysis. There is also a section that attempts to clear the clouds and uncertainties regarding the design for conducted emissions compatibility, which is one of the more important design challenges. A section describing selection criteria for BMPS follows this which includes general considerations, a summary review of converter topologies and a comparison between standard and custom designed BMPS as well as discrete solutions.

Ending the guideline are two sections covering the new digital power technology and the important issue about energy and environmental performance.

Finally a list of recent practical references is included for those readers wishing to expand upon the content supplied in this guideline.

The HDP User Group's BMPS Application Guidelines are primarily based upon Ericsson Power Modules POWERBOOK, 4th revised edition with its first edition issued 1993, complemented with new valuable additions from both system integrators and EMS providers as well as other power supply manufacturers.

The final content has been gathered and reviewed by the BMPS Reference Group formed out of members from EPSMA, PSMA and HDP User Group.