Article

Point-of-Load power modules offer a beneficial and cost-effective alternative to discrete solutions

Author: Henry Lee, Product Marketing Manager, Murata Power Solutions

Introduction

As the semiconductor industry continues to move to smaller geometries, there is a corresponding growth in the demand for lower voltage power converters. Linked to this, there is a growing trend in both the data communications and industrial markets toward the use of a distributed power architecture that utilizes either an AC to 12VDC power supply or one or more single output, isolated brick-type converters to distribute a 5V or 12V bus voltage. From this bus voltage, individual non-isolated Point-of-Load (PoL) converters take their feed.

Equipment designers now have more products and suppliers to choose from as they decide whether a discrete or modular solution is best for their power requirements.

The Shift in Power

The use of PoL modules has grown steadily over the past several years as there are now more suppliers who can offer industry-standard products that meet customers' power requirements at competitive prices.

There is more behind the transition in preferred approach from discrete to modular PoL power than just the increase in choice and availability. Today the ratio of analog to digital engineering know-how within most companies designing and manufacturing electronic equipment is heavily weighted toward digital, even to the point where smaller businesses have no in-house power engineering "specialists." This situation has been reached due to the fact that digital has become the driving force behind the delivery of functionality in end products and power generally plays the supporting role – providing the power to

allow digital components to perform their increasingly comprehensive set of tasks. The growing availability of modular power has helped make the outsourcing of power design possible, and has seen a shift in power knowledge and capability from OEM customers to power specialist suppliers such as Murata Power Solutions. Here, experienced power experts are designing products with higher power conversion efficiencies in smaller form factors.

Benefits of Discrete PoL Power

In order to maximize ease of implementation and offset sometimes limited power engineering knowledge within the customer's business, suppliers of the primary components within a discrete PoL power solution typically offer a schematic of the complete PoL circuit and a Bill of Materials (BOM). This is of course a great help to the customer when acquiring the various parts and implementing the design on a PCB. Until recently the total cost of the individual components needed to achieve a discrete PoL solution was often less than that of a finished module. However, PoL module prices have become very competitive over the past few years. In addition to the board space savings they

can bring, PoL modules can now be on a par – or even lower cost – when looking at a straight BOM cost comparison to discrete solutions.

Flexibility and Ease of Use

Designing in a PoL power module is now as simple as the placement of an industry-standard modular pad layout; customers need only provide the appropriate physical space and interconnects on their PCB. For a discrete approach the scenario is far more complex, as the placement of the multiple components required can be challenging depending on the size and shape of the space available on the board. In many cases a discrete approach requires the provision of more board area than a PoL module. This presents obvious issues for designers who are tasked with producing smaller equipment designs leaving less room for the implementation of a power solution.

Power requirements can often change late in the system design. With a discrete design, the system board may need to be redesigned to accommodate an increase (or decrease) in system power requirements. With a PoL module

solution, multiple power levels are often available within the same package outline and pinout, giving system designers the flexibility to easily accommodate such changes with a simple change of the supplier part number on the BOM as opposed to having to re-spin their PCB.

In high density circuits, where digital and analog devices are often in close proximity, the issues of EMI/RFI and thermal management must also be carefully addressed. When implementing a discrete solution, these can be time consuming and problematic to overcome with the problem and the risk falling upon the equipment designer. With a PoL module, great consideration has been paid to the design, layout, and construction of the module in order to minimize the effects of EMI / RFI on nearby components

Industry Standard PoL Solutions

In the isolated and non-isolated PoL power sector, the prevailing standard is the Distributed-power Open Standards Alliance (DOSA). DOSA was established by leading DC/DC converter manufacturers to ensure future product compatibility

and standardization within what was becoming an increasingly fragmented power converter market. The goal of the alliance is to establish standards over a broad range of power converter form factors, footprints, feature sets, and functionality to help drive product development and facilitate alternate product sources.

DOSA has been very effective in that it defines certain criteria that make second sourcing easily achievable while still giving a fast-moving sector of the electronics market the freedom to evolve and meet the changing needs of the end applications. Testament to this is the new Okami range of DOSA compliant, non-isolated PoL converters.

New Generation PoL Modules

Some examples of useful features seen on latest generation modules include wide range input voltages and programmable single output voltages that make selection and implementation into a customer application more straightforward. Efficiency levels, often in the region of 93%, plus high power densities that

allow designers to implement a PoL solution in a remarkably small area with excellent thermal derating performance, add to the appeal of a PoL module.

A further consideration is that as the majority of components become available in surface mount (SMT) formats, it is advantageous for equipment designers to either eliminate through-hole components from their PCB designs or keep their use to a minimum. This enables the number of secondary PCB assembly processes to be kept to a minimum. In line with this, the latest PoL power modules are very often available in SMT as well as more traditional formats such as single-inline packages (SIP). In a further evolution of the SMT format, several of Murata Power Solutions' new Okami PoL DC/DCs utilize an innovative inspectable land grid array package (known as iLGA). The conventional LGA interconnect package provides space savings and an excellent conduction path from the PoL module to the larger heat dissipating copper areas of the host PCB. However, they prevent easy visual inspection of the solder connection between module and PCB. To date, the only real way to overcome this was by expensive X-ray inspection methods or by destructive cross-sectioning to allow inspection of the solder joint. To overcome this

problem, Murata Power Solutions developed the innovative inspectable LGA (iLGA) package, which features small plated cutouts (castellations) that allow easy access for visual inspection as well as test probe access to all pads.

Summary

Modular PoL power is becoming more accepted as a way to supply the power needs of devices such as ASICs, FPGAs, DSPs, microprocessors, and communications ICs in a wide range of applications. With the emergence of standards such as DOSA, designers and buyers have the option to choose industry standard modular PoL solutions from multiple suppliers.

The PoL modules described herein offer system designers the potential to spend their time on higher value-add activities such increasing system functionality and performance.

Ends

Fig 1: The Murata Power Solutions Okami OKL PoL DC/DC power converter.

Fig 2: Underside view of the Okami OKL PoL DC/DC converter showing iLGA cutouts that allow easy access for visual inspection as well as test probe access to all pads.

Fig 3: Block diagram of a typical distributed power architecture.

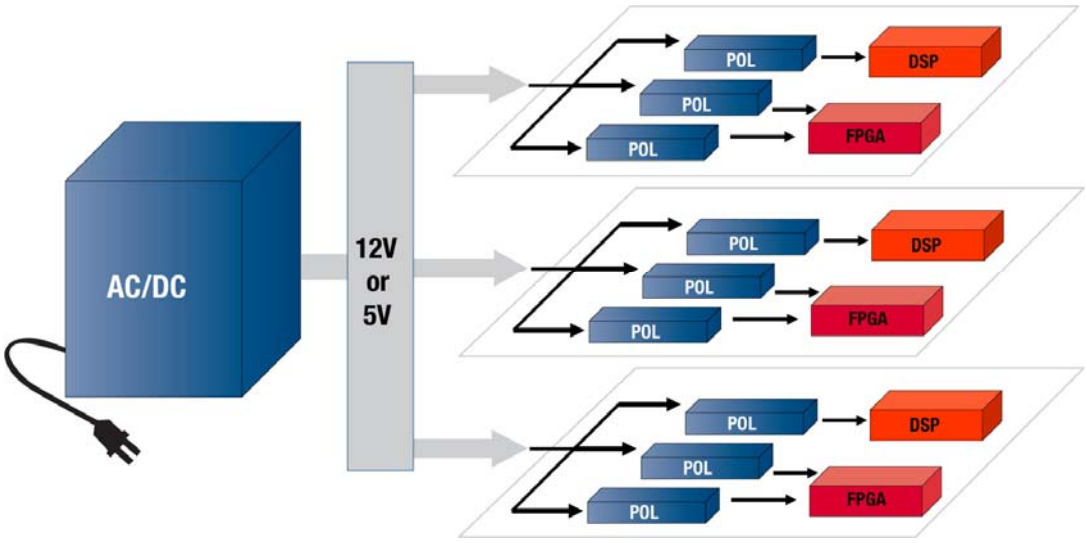

Fig 4: Author: Henry Lee, Product Marketing Manager, Murata Power Solutions.

Contact:
John Sutherby, Marketing Communications Department
Telephone: +1-508-339-3000 x 117