Power Modules – From Up and Down to Up and Coming

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Power modules are key components in customers' applications. Rarely are they interchangeable as each application has its unique set of specifications, so customers depend on power module manufacturers far more than on other suppliers. This invests the latter with great responsibility to the former, and this duty-bound relationship makes the industry so exciting and challenging. If a company fails to earn the customer's confidence and build bonds of trust, it will be unlikely to thrive, much less survive, in this line of business.

Although the market for power modules has seen its share of ups and downs, it harbors great potential for long-term growth, on the order of around 10.7%*, or more than threefold discrete power semiconductors' 3.3%* market growth. Much of this is attributable to megatrends such as renewable energy, automation, e-mobility and industries' efforts to boost efficiency in face of climbing energy costs. None of these trends shows any signs of slowing, so this growth is sure to continue.

So why are modules outpacing discrete solutions when at cursory glance the latter would seem to be so much cheaper? A closer look reveals some clear advantages: Modules' many integration options give them a technical and economic edge over discrete solutions, especially at the point where electrical performance and heat dissipation converge. Whereas a discrete solution consists of up to 20 components - semiconductors, insulators, thermal grease and lots of screws - a power module provides the complete circuit, highly integrated in an electrically insulated housing. Some may even be fixed in place with just a single screw. All of this contributes greatly to the overall application's build quality and durability. On top of that, the module's compact design reduces stray inductances so that the individual chips can be switched faster at higher voltages to make the most of the latest generations of chips' performance. Looking at the big picture to consider the total cost of ownership, modules beat discrete solutions hands down.

1 A balancing act between cost and performance

Motion control applications are prevalent, so the drives market has proven stable with a potential growth rate of 14.3%*. The renewable energy segment is more volatile, and power module manufacturers have to be very agile here. Other interesting applications beyond these mainstream uses include (uninterruptible) power supplies, welding machines and energy storage systems.

Power modules can do wonderful things for a remarkably wide range of specifications. However, standard products do not always allow for the best solution. Striking the

perfect balance between cost and performance often means adapting a standard product. This is why the best solution can only be found if the supplier understands the intricacies of the application and is willing to work closely with the customer until that solution stands.

2 The importance of being a reliable partner

No matter how we cut the pie, product cycles are long, and sales cycles extremely so, in every slice. This is why the relationship between the manufacturer and customer has to be close, trusting and open.

A power module manufacturer has to invest as much as two years up front before the deal may even be clinched, and then maintain very high support levels. This is why this fast-paced and ever-changing business requires a long-term view, an anticipatory mindset and in-depth understanding of customers' diverse markets.

Time is a problem on both ends: Suppliers make wafers and dice to order only. A ten-week wait is the norm even for samples. Customers expect manufacturers to be more agile than that, and deliver within four to six weeks. This gap has to be closed, and the only way to do it is with smart supply systems and close coordination that also requires trust and collaboration throughout the supply chain.

Customers calculate system costs over years because product lifecycles are so long. However, they still have to bend to price pressure, which is where power modules come into play. The key to containing costs is to take advantage of the next cost-optimized generations of semiconductor components. This requires rapid qualification and implementation in product designs.

However, any design change for custom applications involves tremendous effort. Reliability tests and qualification assessments have to be created anew. Vincotech has found a way to reduce this effort and costs – with a modular system comprised of pre-qualified components and processes. It affords each customer utmost freedom to pick the solution that best fits the given application. What's more, this system ensures qualified samples are available at the earliest turn.

At Vincotech, experience taught us that the best solutions come by collaborating with the customer, so we listen, think ahead, and strive to ask the right questions. Putting the customer and the application's specifications first and providing superior technical support throughout the product's lifecycle – this is what a responsible power module manufacturer does.

* Source: IHS Research, Power Semiconductors Discretes and Modules Report – 2013