

The Growing Importance of Supplier Design Assistance

From November 2010 *High Frequency Electronics*
Copyright © 2010 Summit Technical Media, LLC

This report discusses a topic that represents a major shift in the way design engineers perform their job assignments, which now may involve a greatly increased role for vendors in the earliest stages of product design.

Although supplier involvement has always been important, the depth of that involvement has steadily grown in recent years. *High Frequency Electronics* has been monitoring this trend, and in 2011, we will be providing articles with specific examples of close supplier-designer collaboration.

Factors Behind this Trend

There are several key factors that have resulted in a greater need for supplier involvement in the high frequency design process:

Complexity—Modern commercial, industrial and military electronic systems are much more complex than they were just ten years ago. Among the most visible contributors to this complexity are modulation and coding schemes, interfaces with large external networks, compliance with detailed standards and protocols, as well as much higher levels of hardware integration, using many different fabrication and packaging technologies.

The design process has become similarly complex. Computer simulation has reached the point where many of the building blocks are designed entirely in a virtual laboratory, with “first pass success” being the objective. Prototyping, measurement and revision is reserved only for those portions of the system where EDA tools are not yet perfect, where new design principles are being implemented, or where the performance of available components is variable.

Specialization—The complexity of modern systems includes the need for collaboration among different engineering disciplines and sub-disciplines. RF/microwave engineers design only a portion of systems that also involve extensive digital control and signal processing functions, mechanical and ergonomic design, thermal management, DC power consumption management, and efficient manufacturing techniques.

Within the various disciplines are areas of further specialization, from overall system architecture design

down to individual circuit element designs—RFIC/MMIC design and fabrication, DSP algorithm development and implementation, packaging expertise, analog/digital/power/RF signal distribution and interfacing, and many other specific design functions.

Time-to-market—Whether it is the short timetable of commercial wireless development, or the longer time between milestones of a military program, every electronic system design has deadlines to meet. With the higher performance and greater complexity of today’s systems, an OEM is not likely to have all the necessary expertise in-house. Component vendors, subcontractors, contract design firms and assembly service providers may all have a role in completing the new design within the required timetable.

Finding the Right Design Resources

In many cases, the specialized knowledge for a particular component or subsystem (e.g. chipset) resides with the experts at companies which supply those types of devices.

For example, a well-established silicon or GaAs IC company understands the capabilities of their fabrication process better than anyone else. In the past, a system was often designed using a collection of standard components, assembled as needed to obtain the desired functionality. All the IC vendor needed to do was provide high quality, reliable and consistent products, at an acceptable price.

Today, however, a designer has the task of integrating many of those “standard functions” into a single integrated circuit. Because the arrangement of functions is unique, each IC becomes a custom component. Achieving the desired performance of this circuit—now on a semiconductor substrate instead of a printed circuit board—requires knowledge that is not available to the OEM employee. Proprietary knowledge of a semiconductor process is the sole domain of the IC manufacturer, so their designers *must* be involved in a collaborative effort with their customers.

Standard ICs are still an important part of the design process, since they have no NRE cost and usually are the highest performance option. But even standard ICs require more interaction between suppli-

er and customer than in the past. The specific types of functionality, signal and control interfaces, power requirements, etc., will vary from one IC manufacturer to another, and from one IC process to another. To get the performance advantage of standard ICs, the designer must apply them properly. Assistance in achieving a good design is an essential role of the IC company's application engineering staff.

Another example is the well-known area of *microwave components*—modules or subsystems that provide a specific function and meet specific performance objectives. (In a sense, these are really the first “integrated circuits” although the term is usually applied to monolithic ICs.) Since supplier-OEM relationships have been close for a long time, the changes in this area are not so dramatic, but there is certainly an increased reliance on the specialized knowledge of the component companies. Unlike the past, today's OEM customer may not have a microwave design engineer on staff with enough experience to completely specify a component and follow up on its development, manufacture and test. Now, the OEM design team must reach out to the component vendor to provide the initial design expertise, as part of the design team. For the supplier, this is different role than simply supplying a stand-alone piece to customer specifications.

Project Management Challenges

As noted above under “Specialization,” a product development design team already includes members from all the engineering specialties required to complete the design. The participation of applications staff at supplier companies adds to the challenges of managing this group. Not only are vendor participants not employees, they are remotely located. With easy teleconferencing and e-mail, location may not be a big problem—although face-to-face interaction is often the best way to solve a design problem or simplify some staff coordination issue.

As an outside participant, there will be issues of confidentiality and rights to intellectual property of both customer and vendor. These issues need to be covered in the purchase and services agreement. A standard nondisclosure agreement (NDA) may not be sufficient to address the depth of collaboration in this situation. And any legal document must also ensure that the technical objectives are met, so engineering managers must work with the legal staff, adding another task to project management.

Another issue with project management is the engineering knowledge itself. The ideal situation for project management is for the customer to have an understanding of all phases of the work, providing direction to both staff and vendors. Today's complex technology, combined with the desire to develop prod-

ucts quickly, means that an OEM often will not have sufficient in-house technical ability. In this case, expertise from outside the company is required, whether from the vendor, a hired consultant, or an outside design firm.

With these thing in mind, many product development projects will begin with an assessment of technical goals. A decision must be made whether to simply create a product and sell it, or to add a particular technology to the company's core capabilities. In other words, do you simply get some help to deliver the product, or do you want to develop and understanding of how to make more (and better) of these types of products in the future?

Consultants and Design House Services

Although reliance on the expertise of component vendors is the main topic of this report, traditional avenues for obtaining new technology warrant attention as well. Bringing in a consultant to help develop products, and in the process, train company staff, is a time-honored tradition in the high frequency electronics industry. The ability to “rent” high-level expertise is a cost-effective business practice.

Recently, design firms that specialize in key areas of new technology have seen an increased role in recent years, especially in the area of adding wireless capability to an existing non-RF product line. Working with these firms is a process that lies somewhere between working with a consultant, or with the applications staff of a hardware supplier. While they act in a consulting role, these firms often have special relationships with component vendors, perhaps even being certified by the vendor as qualified designers of products using their components.

Summary

We are watching the growing trend of greater reliance on outside expertise to develop new high frequency products, especially the role of the applications support staff at component supplier companies. This trend is a response to the increased complexity of all modern electronics, the wide range of implementation options for a new design, as well as the marketplace pressure of fast product development timetables.

For the OEM customer, working with your component vendors is more important than at any time in the past. Specialized knowledge of fabrication technologies, device performance capabilities, and the fastest, most economical options for product design may not be available to the OEM. However, each vendor can contribute a piece of that essential understanding. We will continue to watch and report on the management challenges of incorporating vendors' assistance into the design and development process.