



When Execution Matters

Preparing for the Upturn in Semiconductor Industry through System-in-Package (SiP) Modules February 11, 2009 – 3:26 pm by Uday Chaka

In a challenging economic climate like the one we are in, many semiconductor companies facing demand declines and rising capital costs are increasingly resorting to across-the-board cuts to survive the downturn. Leading semiconductor companies, on the other hand, are preparing for the upturn by making strategic investments to move up the value chain.

Consumers have always demanded high tech products that are smaller, lighter and cheaper. Consumer electronics giants and their component suppliers have been catering to this demand by developing new technologies and subsystems that are smaller and more compact. System in a Package (SiP) or Multi-Chip Module (MCM) is an innovation in the semiconductor industry to create portable 'plug-and-play' systems that combine multiple functions or expand the functionality of a single chip to form a smaller and cheaper subsystem in a consumer electronics product.

Semiconductor companies have typically focused on designing the best chips and designed their operations to make single chips for their customers – consumer electronic giants. As they start building SiPs or MCMs (henceforth, referred to as modules), companies realize the advantages of incorporating multiple chips in a product. Being closer to the customer (and the money), the module maker has enormous leverage in deciding which chips go into the module, and this advantage can redefine the competitive landscape. While the company can generate demand for the chips it already makes, it also has an opportunity to change industry dynamics by building partnerships with other semiconductor companies, including current competitors, to fill any functional or performance gaps.

The macroeconomic conditions, consumer demand for smaller and cheaper products, and a better understanding of the benefits will nudge forward-thinking semiconductor companies to make modules. The winning strategy for any such semiconductor company over the next few years is to perform a rigorous analysis of its core strengths and identify the suite of operations that need to be executed in-house to make modules profitably, and outsource rest of the operations. The key operational areas to effect change are product development, manufacturing, system infrastructure, and finance.

Product Development

Module makers have to keep the module design in-house, as it is a core function, but the engineering organization may need to redesign the product development process to include aspects of working with multiple teams within and outside the company, integrating them into the product definition and change management processes. Information should therefore be accessible across firewalls, while ensuring adequate controls to protect internal and vendor intellectual property.

Manufacturing/ Supply Chain

Module manufacturing involves various steps, including demand planning / forecasting, supply planning, procurement of chips and non-criticals (boards and passive components), assembling and testing the modules, shipping the finished modules to the customer or electronic manufacturing service providers (EMS) locations, and managing returns. In addition, support operations, such as order processing, inventory management, and financial transactions are executed simultaneously, where applicable.

While outsourcing manufacturing to contract manufacturers (CMs) and logistics to third-party logistics (3PL) is a prevalent trend among semiconductor companies, complexity introduced by module manufacturing presents more options.

Activities and Possible Roles for Players in the Supply Chain

| | Customer | EMS | Module maker | CM | Supplier | 3PL | Distributor |
|-------------------------------|----------|-----|--------------|----|----------|-----|-------------|
| Demand Planning / Forecasting | ⓪ | ✓ | ✓ | | | | |
| Supply Planning | ✓ | ✓ | ⓪ | | | | |
| Procurement of chips | | | ⓪ | | | | |
| Procurement of non-criticals | | | | ⓪ | | | |
| Assembling and testing | | | | ⓪ | | | |
| Inbound logistics | | | ✓ | ✓ | ✓ | ⓪ | |
| Outbound logistics | ✓ | ✓ | ✓ | ✓ | | ⓪ | |
| Inventory Management | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

⓪ = Preferred Option

✓ = Possible Option

The preferred options minimize the total cost of the supply chain by getting the activity at each step executed by the organization that has the best information, expertise and cost advantage. In reality, the costs of managing any demand shocks are often underestimated and are usually shared by customers (lost sales) or manufacturers (excess inventory) with acrimony.

This opens up a potential opportunity for a module maker to manage the supply chain operations for the end-to-end module manufacturing and offer it as a service to the customer, thereby opening up another revenue stream and differentiating themselves from the competition.

System Infrastructure

IT organizations may need to upgrade or configure existing system infrastructure to support new business processes and to share information with new partners. Product lifecycle management (PLM), forecasting, planning, ERP, middleware and EDI systems are likely candidates for such transformation in order to manage complex BOMs, multiple inventory locations, VMI and consignment options.

As many of these are one time installations or configurations, contractors with the requisite skill sets may be engaged. Investments in system infrastructure are crucial to avoid communication and quality issues.

Finance

While the individual financial transactions do not seem to differ much from chip manufacturing, module manufacturing presents interesting challenges due to the number of players involved, inventory location of materials and partial ownership issues:

- How do you establish cost of inventory that is only partially owned by the module maker?
- When does the ownership of inventory pass to the customer?
- Who is responsible for returns and to what extent?
- Who owns the work-in-process inventory?
- Who owns the inventory while it is in transit?

Most of these questions are resolved through contractual agreements between the module maker and other partners, such as customers, contract manufacturers, 3PL, and suppliers. The terms of the contractual agreement are incorporated into pricing and typically reflect the negotiating power of the players involved. Module manufacturers should use their leverage to get the best pricing terms while minimizing risk.

In summary, making modules will enable a semiconductor company emerge strong from the recession and gain market share. However, as some companies that have successfully transitioned to module manufacturing learned, engaging multiple partners in new areas requires due diligence and building additional capabilities in internal operations, such as product development, manufacturing / supply chain, system infrastructure and finance. In the current economic climate, which is characterized by pricing pressures, efficiencies realized in a leaner supply chain will benefit all players, particularly the module maker who assumes a leadership role in this transformation.