



How to Improve the Profitability of Fabless Semiconductor Companies

There are several effective strategies available to meet the challenges of managing the complexity of the semiconductor manufacturing supply chain while increasing gross margin and enterprise value.

Executive summary

Semiconductor industry gross margins are under pressure. The average gross margin of the industry in Q4 2013 was 53 percent, which was a quarter-over-quarter decline of over 100 basis points (bps), and a continued decline of over 300 bps from the high water mark in Q3 2010 of 56 percent.¹

Outsourcing the capital-intensive tasks of semiconductor manufacturing to the external supply chain reduces working capital requirements. However, the fixed costs and associated overhead of the operations team, who perform product engineering and supply chain management, can account for six to 18 percent of the cost of goods sold⁷ (COGS), which weighs on margins. For example, companies that produce three to five 65nm chips per year may efficiently utilize their operations teams. However,

the move to 40nm and below has significantly changed these economics. One 28nm tapeout requires 78 percent more design time² and 40 percent more non-recurring investment³ than a 40nm tapeout. These increased costs limit fabless semiconductor companies (FSCs) to fewer tapeouts,⁴ which means there are fewer part numbers for the operations team to manage. Before 28nm the operations team was a perennial need, but it became seasonal at the new lower node. Fewer parts in the supply chain means reduced utilization of the operations team, which puts more pressure on gross margins. As legacy products mature, gross margins are squeezed even more.

This white paper explores strategies to mitigate these cost and complexity challenges. We will also explore how FSCs can leverage their supply chain for greater profits.

**Figure 1:
Escalating Design Costs for Advanced Nodes**

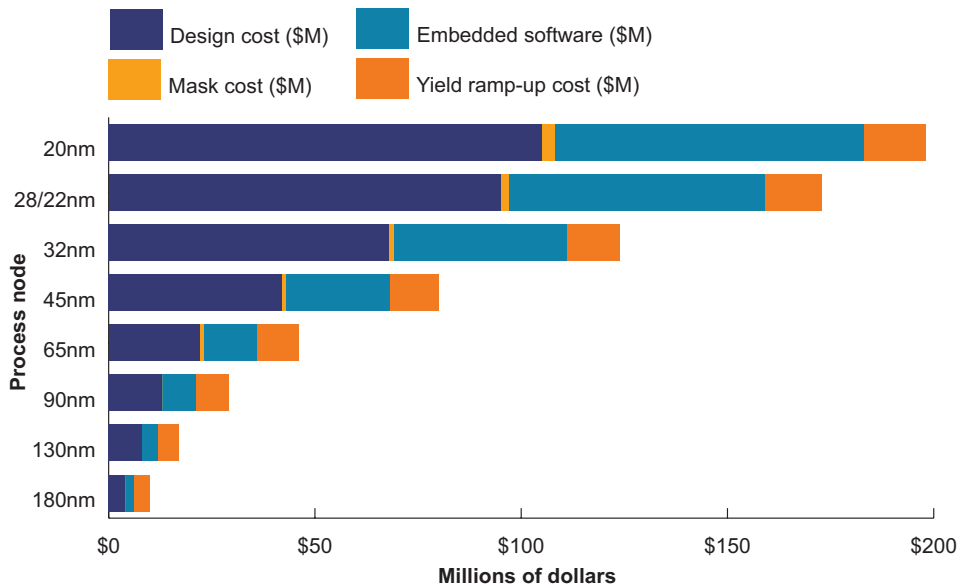


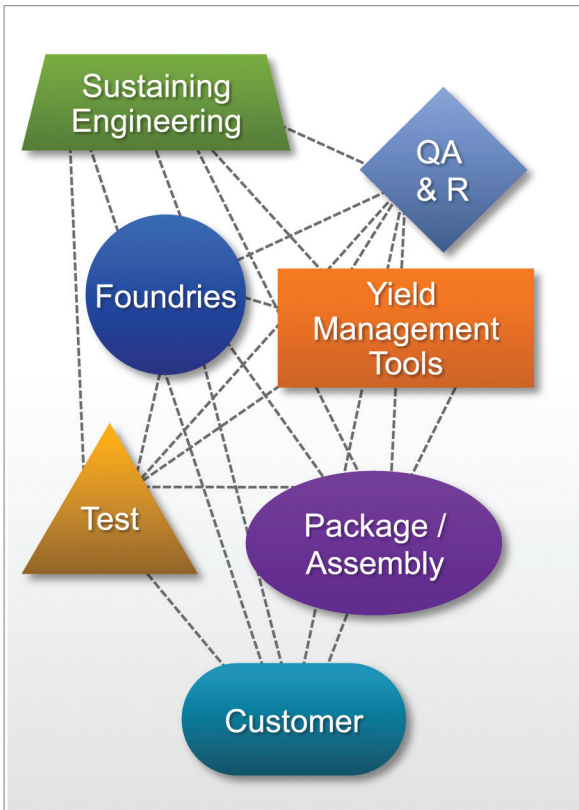
Chart created by eSilicon based on Gartner data³

Introduction

Running an FSC is tough. Making a profit doing it is even tougher. All this while innovating to delight customers and tackling arguably the most difficult technical challenge of our time, i.e., designing and delivering a system-on-chip (SoC) device. Meeting seemingly impossible performance, power and area targets while differentiating to create unique value all require focus. But designing chips is only half of the investment necessary to bring the device to market. In order to deliver devices to customers on time, on budget, and with high quality and reliability, FSCs must also manage the supply chain from wafer fabrication to test, assembly and delivery. This takes both time and money but rarely adds differentiating value to the chips.

The semiconductor industry is in a disaggregated state where many FSCs exist in the ecosystem. Each one manages its supply chain to ensure delivery of finished parts to its customers, who then manage their own supply chains to produce finished boards and systems containing multiple semiconductor devices, typically from multiple providers. The ecosystem is complex, forcing FSCs to build operations teams to manage the various aspects of device manufacture, including test, assembly and shipment of chips.

Figure 2:
Disaggregated Supply Chain



In the Q4 2013 financial reporting cycle, 31 mid-size FSCs showed average gross margins of 51 percent in their SEC filings, more than two percent below the industry average,¹ with a high of 71 percent and a low of 25 percent. A typical FSC gives up about half of its gross revenues to supply chain costs and fixed costs,¹ where the fixed costs usually amount to six to 18 percent of gross revenues.⁷ How an operations team is structured impacts not only the complexity of managing an FSC and its supply chain, but its financial performance as well. These companies need to reduce supply chain costs and reduce the fixed costs of their operations teams, all while finding more efficient ways to manage the supply chain.

Last-time buys

The operations model makes managing cash another challenge. From the time an order is placed for wafer lots to the time finished goods are delivered to the end customer and paid for, three to five months will have elapsed,⁷ tying up precious cash. As product lines mature, challenges arise in managing the supply chain to keep the product in production to satisfy the demand from customers without having to do last-time buys. This issue can manifest in a number of ways. For example, if a fabrication process is being discontinued, but the systems that consume the chips requiring that process have two or three years left in their life cycle, an expensive last-time buy is required.

ERP upgrades

When the complexity of managing the supply chain increases as the FSC tries to scale, its enterprise resource planning (ERP) system may not be up to the task. Adding a supply chain management module typically costs \$1 million just for the software.⁸ Then there is the expense of integration, which is another \$500,000 for a company with \$400 million in COGS.⁸

Strategies to address these challenges

Strategy #1: Organizational management

FSCs outsource manufacturing tasks to reduce capital expenditures. What if there was an option to outsource operations responsibility to both reduce fixed costs and improve cash flow? A new type of semiconductor manufacturing services (SMS) model is emerging to provide FSCs a fulfillment arm for products through a single point of contact. This comprises yield management, quality and reliability, sustaining engineering, packaging, assembly and test, and foundry services. SMS services simplify the complexity of producing parts in the supply chain. The task becomes as simple as placing a purchase order with the SMS provider, who in turn manages all aspects of manufacturing to deliver finished parts. Cash flow improves because the outsource business model requires no work in process (WIP) financing. Parts are paid for as they are delivered. Now the FSC can use its cash to invest in innovation and differentiation. The SMS provider also provides the ERP

infrastructure, information and business-to-business (B2B) feeds necessary for part availability tracking and financial reporting.

Figure 3:
A New Approach to Outsourcing Semiconductor Manufacturing



This model works for acquired products as well. Over the past five years, semiconductor companies have been acquiring product lines from other companies to increase market share.⁵ A big challenge faced when acquiring a product line is to integrate the new products without missing a beat in delivery to new or existing customers. Engaging an SMS provider to become the virtual operations team for the acquired products accelerates the operational management of the portfolio without stressing the existing organizations that continue supporting other parts of a product portfolio. The step-function increase in revenue becomes achievable with the right SMS provider who has the experience, expertise and scale necessary to respond quickly, efficiently and effectively.

Strategy #2: Supply management

Managing end of life

The product life cycle of a system may be several years longer than the life cycle for the SoC devices on its bill of materials (BOM), which puts stress on supplier relationships. When a custom SoC supplier pushes to end-of-life a chip in a system that their customer wants to keep selling, the customer is forced to invest in a last-time buy, which can be fraught with problems. It is difficult to forecast the volume of parts required to service future

demand in order to make an intelligent last-time buy of a custom SoC, which makes the inventory investment risky. Order too much and a company carries unwanted inventory. Order too little and customers go unserved. Engaging a partner that provides SMS services avoids placing devices into end of life prematurely. If the SMS provider has enough scale across the supply chain it can easily absorb responsibility for manufacture.

Managing supplier changes

In addition, when a component on the BOM requires a supplier change, it triggers either investment in another expensive qualification cycle to keep the system active, or discontinuing the system, either of which is painful. Engaging a partner that provides SMS coupled with ASIC services creates a useful tool for an FSC purchasing department to reduce the risk of a single-source custom SoC in a system. By granting manufacturing rights to the SMS provider and allocating a portion of the production volume, the SMS provider becomes an alternate source for the selected SoCs. This helps ensure continued delivery of the parts over the life cycle of the system.

Managing design changes

The services that supply chain companies offer also follow product life cycles, which inevitably lead to supply discontinuity challenges. It may be that a semiconductor fab is shutting down a line, or migrating away from a process version, or a package or test platform is being discontinued. Again, an SMS provider that also provides ASIC services is able to retarget the design to a new process node, package or test program to provide continuing supply of a part that would otherwise enter end of life.

Strategy #3: Portfolio management

Over the life cycle of an SoC, the gross margin performance of the product changes. FSCs balance the overall portfolio to achieve an average gross margin. It gets tough when the portfolio becomes heavily weighted with products that still have strong demand, but have lower gross margin performance than is acceptable for the company overall. For example, products with margins in the 35 to 40 percent range are typically 10 to 15 bps below average gross margin targets. They may be products in the mature phase of their life cycle, or part of an M&A transaction that included low-margin portfolio products. FSCs are faced with the hard choice between end of life—despite their customers' needs—or suffering margin deficiency.

Managing margins

It is possible to partner with an SMS provider to apply a model that converts a portion of the margin into royalty. In this case the FSC may retain ownership of the parts, their brand is maintained with the parts, and they manage the marketing and support. The key difference is that the end customer places purchase orders for the parts directly with the SMS provider. The SMS provider handles the manufacture, delivery and billing, and pays a percentage of gross revenues back to the fabless semiconductor

company. This allows the FSC to recognize the revenue without COGS burden, thereby increasing their overall gross margin percentage. In some cases, the SMS provider may acquire some products outright and continue to offer them to existing customers. Both models provide options to leverage parts of the product portfolio to increase gross margin which has a direct, positive impact on enterprise value.⁶

eSilicon's SMS solution

When an FSC engages with eSilicon, they gain a business partner equipped to manage the supply chain to ensure success. eSilicon acts as a single point of contact to the supply chain while providing online visibility into the manufacturing process. eSilicon has built strong relationships across the global semiconductor supply chain, focusing on efficiency and customer satisfaction. The company has built a world-class operations team that leverages the experience and success of eSilicon into solid business processes. These processes are based on automation that provide 24/7 visibility of WIP to their customers, either through the innovative eSilicon® Access® production management system, or through a direct link to their customer's ERP systems for seamless integration. In 2013 eSilicon delivered over 47 million complex SOC units from over 150 unique designs to customers around the world.

Conclusion

There are effective strategies to meet the challenges of managing the manufacturing supply chain while increasing gross margin, reducing management complexity, and increasing enterprise value. Three strategies addressing the organization of operations teams, mitigation of supply risks and management of the product portfolio have been presented.

eSilicon Products and Services

In the 14 years since its founding, eSilicon has grown to become a leading independent semiconductor design and manufacturing services provider, delivering complex custom SoCs, and standard and custom semiconductor IP to OEMs, independent device manufacturers, FSCs and wafer foundries. eSilicon has kept its skills at the cutting edge by producing an average of 26 new designs annually over the last five years, including three 28nm SoCs in 2013. eSilicon also provides custom memory IP and high-speed SerDes while meeting exacting power, performance and area constraints.

For information on our SMS offerings and how SMS can help you leverage your supply chain for greater profits, please contact sales@esilicon.com.

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