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Fabless yet Fabulous

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EDN

Over the past couple of decades, India has established itself as a leading destination of application software development and outsourcing. ASIC or silicon chips are also designed with the help of EDA tools using software languages known as HDL (hardware descriptive language). Since the last 5 years, a number of Indian companies have emerged as favored destinations for ASIC services too. Though the design part of an ASIC is still held proprietary by the parent company, Indian companies contribute with verification and prototyping services, which comprise over 70% of the entire silicon design. Of late, however, a number of companies are also partnering as ODC (offshore development centers) and contribute to the design and physical design (die realization) of the chip.

Once a chip is designed and verified on software it has to be taped-out (developed) on silicon in foundries. So far, India has not established itself as a force to reckon with in the manufacturing domain, irrespective of the technology or industry, as opposed to its Asian counterparts like China and Taiwan. Foundries or fabs, as it commonly referred to, are well established in the Asian countries. As new semiconductor fabs are built in China and various other geographic locations, the government recently announced a semiconductor policy along with incentives to encourage companies to build a semiconductor fabrication (fab) facility.

India seems to be late in the fab game, as governments of current fab heavyweights like Japan, Taiwan, Korea and China offered attractive incentives and heavy subsidies decades ago to promote the development of fabs in their respective countries. Can India can compete with its Asian neighbors in pricing and technology and develop as a tape-out hub? Will developing fabs help generate more employment and revenue and pour in foreign investments despite the tall order of odds stacked against us? These pertinent questions need to be answered.

Chip design industry

According to ISA, the Indian semiconductor market is expected to more than double its revenue - from \$2.70 billion in 2006 to \$5.49 billion by 2009 with a CAGR of 26.7%. The report predicts that by 2009, India's share in the global market will touch 1.6%. The potential growth opportunity is immense, considering the fact that the global market will reach \$338 billion. The country's electronic design services industry has come a long way since 1985 when TI became the first multinational to open a design center in India. Today, there are a number of established multinational companies and Silicon Valley startups with R&D centers in India.

eInfochips, incepted in 1994, is an independent fabless electronic design services company offering silicon design, verification, physical design, FPGA prototyping and IP development services. With over 715 engineers and 7 design centers in India, the company has contributed to over 150 chip designs in automotive, consumer, semiconductor, avionics, networking and communication segments through its wide array of RTL to GDS II services and solutions.

eInfochips has forged partnerships with leading silicon companies and EDA tool companies such as Cadence, Mentor Graphics and Synopsys, and is currently offering OVM (Open Verification Methodology) IP development services, DO-254 compliant (avionics application) ASIC/FPGA/SoC design and verification services, and 45nm chip Physical design services.

As for captive design centers, Intel, Texas Instruments, STMicroelectronics, and Freescale, to name a few, have set up shop on Indian shores.

Fab business model

Previously, semiconductor companies owned fabs and taped out their own chips, making them self-reliant. However, owing to mass risks associated with fabs, this model has slowly changed to a fabless model. Companies now enter into a joint venture with fabs along with other industry leaders. This strategy helps companies share the costs of research and development (R&D). Example of successful joint ventures with fabs include Crolles-2 Alliance between NXP Semiconductors, STMicroelectronics and Freescale Semiconductors, and the IBM alliance for DRAM with Sony, Toshiba and Infineon as partners. With increasing cost of R&D while exploring smaller dimension chips like 45nm in the manufacturing sector, the fabless model has made steady progress and gained increasing popularity over the years.

The Indian advantage:

The perceived advantages in setting up fabs in India are:

- a) A mature and credible software industry reputation,
- b) A legal system with good track record for IP protection and enforcement of business contracts,
- c) A large pool of young, skilled and talented engineers, and
- d) A large number of established fabless companies.

Hurdles

Technology: In order to attract business from silicon giants, Indian fabs must offer the state-of-the-art 65 or 45nm technology for die fabrication. This will put us in direct competition with the Asian manufacturing giants. Over and above this, Indian fabs must offer some value additions by way of turnaround time or manufacturing quality to reap market share and profitability. Chip tape out is a very expensive process. Millions of dollars are put on the line for successful tape out. This process has to be handled with dexterity and accuracy.

Location and strategy: Steady supply water, power and raw material such as silicon substrates and other metals that are used to enhance conductivity and interconnectivity in silicon wafers has to be established with foundries. Also, an ecosystem of manufacturing, packaging, testing and shipment needs to be developed. Partnering with existing power houses and taking up production of memory chips and display drivers contracts for starters could be a viable option to make headway in this industry. The dominant players in fab industry have gained a blinding lead in terms of technology and advanced packaging techniques. Direct competition would be counterproductive as far as survival and sustenance is concerned.

Education: Countries such as Israel, Japan and Taiwan have invested heavily in innovative and quality education, enabling them to churn out competitive engineering work force. India does have legacy institutes, but it still a long way from incorporating the latest technologies and tools in students' curriculum. Also, corporate academia programs must be encouraged by government. eInfochips has regularly partnered and trained students from leading engineering colleges in Ahmedabad to make our workforce competitive and employable in today's day and age.

The road ahead:

It must be noted that the industry has survived for over a decade with foundry partnerships. Offering a value proposition with fully integrated services may not be a worthy argument, unless benchmarks and examples are set by way of deliverables. Embarking on uncharted territories must be exercised with caution as huge investments are at stake. Partnering with established foundries like TSMC, UMC, Silterra, Chartered etc. may be a safe way of initiating the services. Apart from incentives, government must make

efforts in branding India as a semiconductor-manufacturing hub, and try to rope in expatriates serving in leading companies across the globe to train engineers and manage these foundries. Education in silicon fabrication must be revved up to nurture skilled manpower and this is not an easy endeavor. The road to success may be strewn with thorns, but with smart decisions, consistent results, disciplined and quality effort, and a well trained work force, the country may well be on the way to being a semiconductor house over the next decade.

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