

Make Your SOC Design a Winner: Select the Right Memory IP

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How to choose embedded memory IP

Abstract: *The 2000 SIA roadmap shows over 50 % of the area in an SOC being occupied by embedded memory. The selection of the memory IP and supplier is critical to the success of the design and the ramp to volume. The Memory IP can determine yield, reliability, cost, speed and/or power. Mr. Ratford will help you navigate through the evaluation process by discussing key requirements and possible solutions when evaluating memory for your next SOC design.*

Introduction

Designers are facing increased market pressure to rapidly introduce new products, which shortens the time available for design and the ramp to production. Many semiconductor companies – both fab and fabless – are increasingly relying on external sources for various components of the system-on-chip (SoC) design. The use of silicon proven third-party semiconductor intellectual property (SIP) components allows semiconductor companies to meet market pressures while continuing to focus on the portions of the SoC that constitute their core competencies.

One area in which designers can really take advantage of third party IP is embedded memory, which is picking up momentum due to the rise of the Internet and the communications and consumer products that result from it's use. In fact according to the SIA, and as soon as next year, over half of the chip's surface will be memory.

The 4 S's

Since embedded memory plays such an important role in the success of the product careful consideration should be made when evaluating the type of memory IP. In general while there are many criteria to be considered they fall broadly into what we'll call the 4 S's: Selection, Specifications, Silicon and Supplier.

Selection refers to the types of memory IP needed on the current and future designs. A single design can require SRAM, Non-Volatile, DRAM, specialty memories (CAM's, Multiports, etc.) alone or in combination. They must be available on the latest standard logic processes from multiple foundries. Having this available from a single vendor has significant advantages.

Specifications refers to the data sheet numbers and their correlation to actual silicon. To achieve Speed, Area and Power targets requires separate products for High Speed, High Density or Ultra Low Power. SRAM requirements include single and dual port (2RW) SRAM's and register files, Rom's with multiple programming options (contact/via, metal, mask). Compilers that allow customization or modification of power busing, signal naming and control, multiple aspect ratios together with a complete set of verified EDA models and views are needed. To achieve this requires optimized architectures and a design style that achieve close to custom design results with the flexibility of a memory compiler.

Silicon refers to the actual silicon results and how closely this correlates to the specifications. This requires a robust design approach together with a comprehensive silicon validation program to ensure that memories will meet specifications and achieve high yield. Embedded memory must be manufactured, tested and characterized like standard products before being integrated into products. By purchasing memory IP that has already been rigorously tested and characterized, companies can shave months off their product cycle times with the assurance that these memories will work as designed. Since memory is a magnet for defects during IC manufacturing and typically has twice the wafer defect density of logic, the memory IP must come with an integrated embedded test and repair solution to achieve memory yields above 95 %. This should not require expensive external test equipment to achieve this.

Supplier refers to the IP Company itself. Here factors such as memory design expertise, company size and financial strength, support from design to production and product roadmap are factors to consider. A key litmus test is how many customers does the company have and are they repeat buyers?

Summary

Of course price is a consideration as well but if the 4 S's aren't first met it's irrelevant. Furthermore price really means Total Cost of Ownership not just initial cost so ask your vendor for a life cycle cost model if you don't already have one. The emergence of several successful memory IP companies (Virage Logic, Mosys. ATMOS, Rambus) suggests that designers can focus on their value add and sleep at night knowing the memory IP they need will be available.