

Platform-based SoC design comes of age

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The continuous scaling of silicon process geometries has afforded the modern chip designer to integrate virtually all system functions in a single chip. Highly-integrated chips such as SoCs are being perceived as the panacea to the dilemma, so many chip manufacturers and designers are facing the need for more functionality at lower power, lower cost and smaller

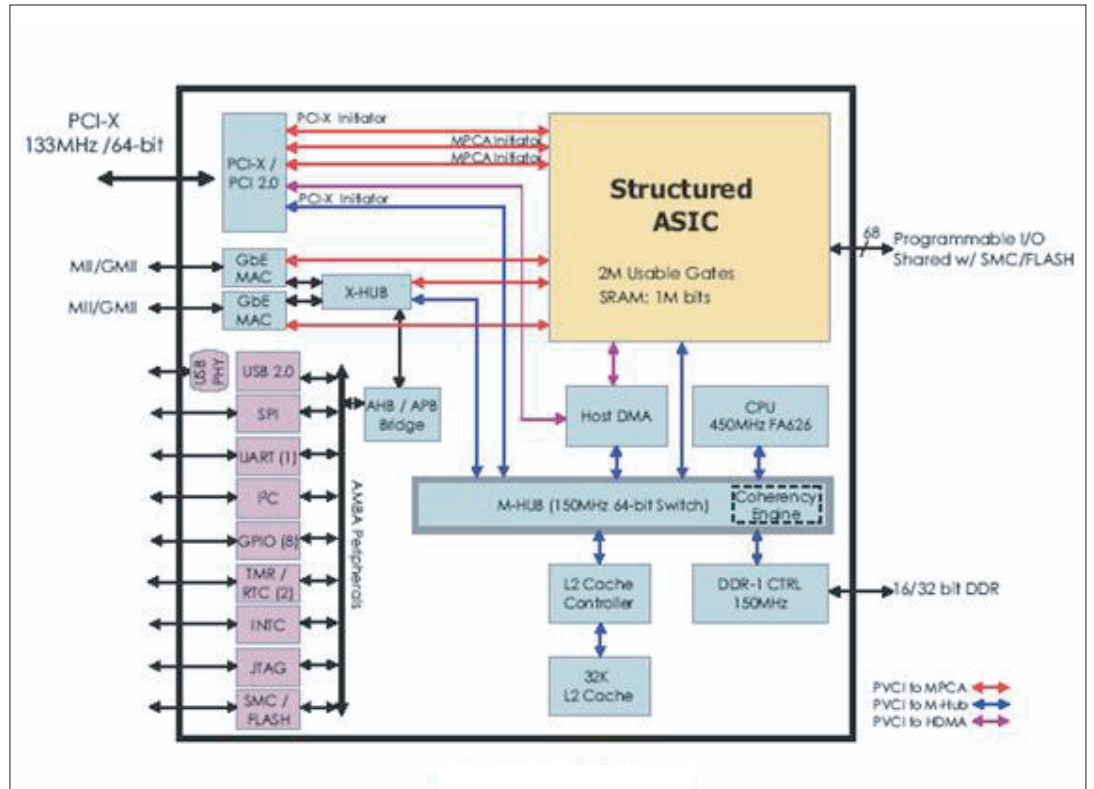


Figure 2: All major blocks are connected together via a cross-bar switching fabric, M-Hub.

form factors. Unfortunately, design productivity can't keep up with the pace of Moore's Law. Because of this, design reuse emerged as a possible approach to boost design productivity.

Despite the push for reus-

able IP-based design throughout the 1990s and early 2000s, most design approaches are still largely ad hoc block-based and require customized integration. To use a pre-designed block, an engineer must un-

derstand how it works and how it integrates with other components within the design. To add to the difficulty, third-party IP blocks—even those available commercially and pre-verified through silicon—are plagued with inadequate documentation and deliverable standards.

Using a pre-designed IP block cannot guarantee first cut success without extra effort spent on verification and debugging.

Over the past few years, several companies have shifted their design approach by standardizing their own sets of IP or virtual components and software in a fully integrated common architecture from which products with common features can be built, resulting to a platform-based design. Several companies are using the platform-based design approach as an effective strategy to address product complexity and time-to-market at all levels. Derivative designs can be accomplished quickly by adding just a few IP components.

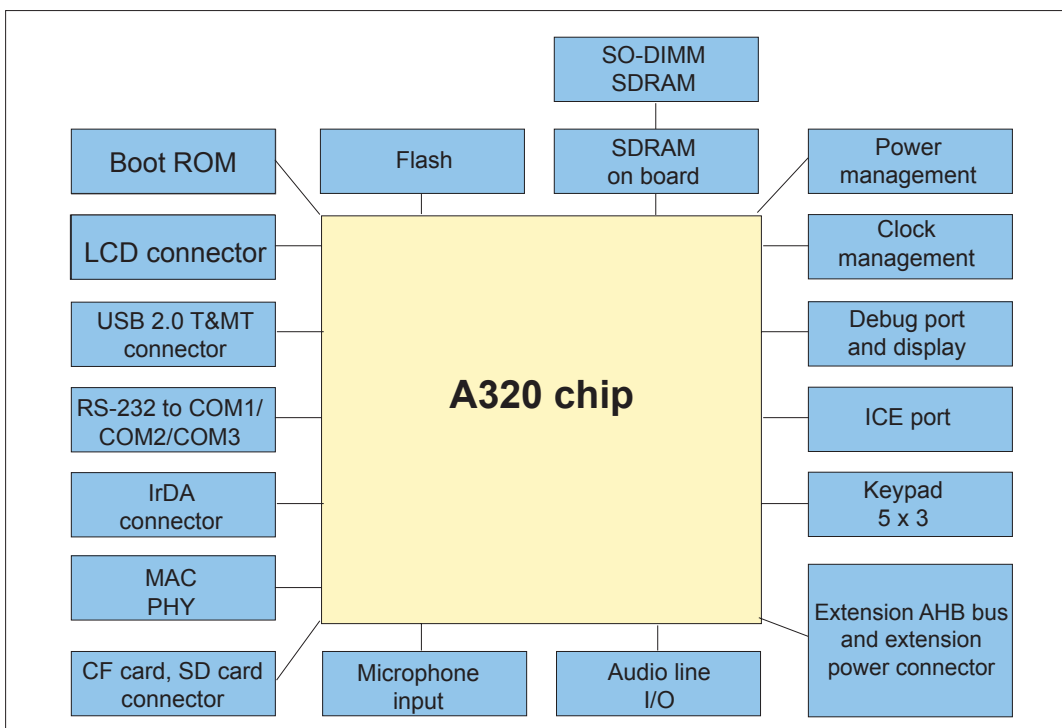


Figure 1: Platform improves design time by offering pre-integrated architectures that permit a high degree of versatility.

Moreover, integrated architecture minimizes verification uncertainties that greatly reduce design effort and risk.

Beyond the technical challenges of SoCs, there are certain issues that are less discussed, but crucial to the success of platform-based SoCs. One such challenge is the interaction between SoC design team with external subgroups such as the IP provider, software developer, system designer, verification team, EDA tool provider and foundry. Unfortunately, most modern platform-SoC providers typically stem up from only one or two disciplines mentioned, possibly creating weak links that seriously inhibit proper execution of the SoC design process. Ideally, the SoC design team and the subgroups should be in close proximity with each other so that design issues can be quickly resolved in a meeting.

Few companies other than large semiconductor conglomerates may possess the luxury of having many of the subgroups in-house. Taiwan presents itself as a suitable platform SoC incubator. It has a complete IC supply chain found within a few square miles of the Hsinchu Science Park. Taiwan has mature design service companies with complete portfolio of virtual components, including ARM-compatible 32bit embedded processor and high-speed I/Os. Platform-SoC solution providers in Taiwan have worked with

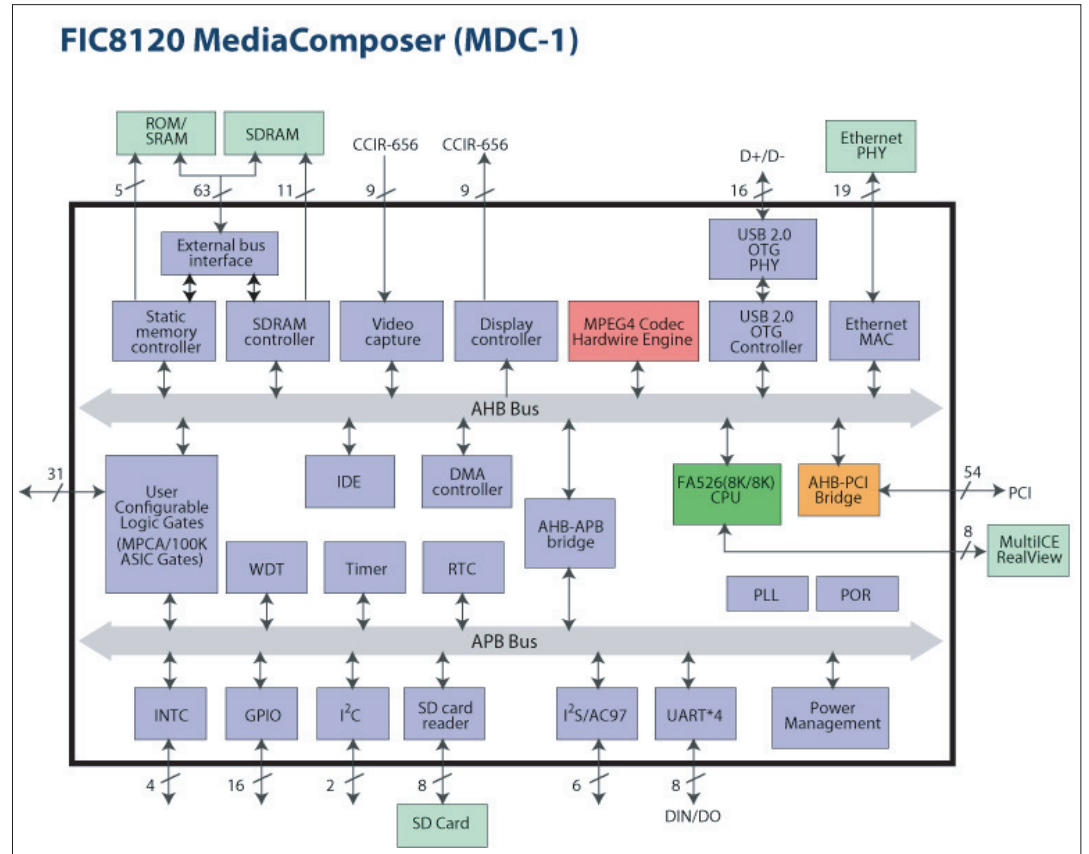


Figure 3: The MPEG-4 platform consists of an MPEG-4/JPEG codec core, combined with a high-speed CPU and several embedded hardware blocks such as discrete cosine transform, quantization and motion estimation.

the networking and MPEG-4 platforms.

Networking, MPEG4

The networking platform adopts UMC's 0.13µm process technology with a 450MHz 32bit ARMv4 embedded processor core, 1Mb on-chip SRAM, PCI-X, GbE MAC and various network-essential I/Os. All major blocks are connected together via a cross-bar switching fabric, M-Hub, which ensures high bandwidth and data coherence.

Product differentiation can be achieved with metal programmable cell array, making it a perfect solution for the establishment of TCP/IP offload, 802.11i or IP security engines.

The MPEG-4 platform consists of an MPEG-4/JPEG codec core combined with a high-speed CPU and several embedded hardware blocks such as discrete cosine transform, quantization, motion estimation and variable length coding. When used with a DSP, it can

perform coding/decoding of different music formats, making it ideal for A/V products such as DVD players, home media centers and portable multimedia players.

Platform improves design time by offering pre-integrated architecture that permits a high degree of versatility to interconnect reusable functional blocks into the SoC design. Platform-based design is clearly a powerful IP-reuse approach to SoC.