ZEVIO™

Application Processor Architecture

OVERVIEW

The ZEVIO™ application processor architecture enables fast time-to-market for a wide variety of lower-cost, low-power consumer electronics products. The architecture enables system designers to cost-effectively design System-on-Chips (SoC) and provides an alternative to standard products that are available on the market. The ZEVIO architecture simplifies custom design and allows system designers to move from specification to prototypes in as little as six months. When combined with the LSI Logic 3D graphics and sound processors, the ZEVIO architecture can bring new dimensions to products such as GPS navigation systems, electronic toys and edutainment applications, personal media players, and handheld products.

FLEXIBLE ARCHITECTURE

ZEVIO is a multi-core architecture that allows seamless connection of IP cores, using the LSI CoreWare library or customer IP, to develop a complex SoC. It breaks away from the traditional CPU-centric architecture and enables other cores, such as media processors, to be the primary processing units. With a menu of pre-verified IP cores–from ARM and ZSP® DSP to video codecs and 3D graphics and 2D/3D sound processors–the ZEVIO architecture enables fast and reliable customization of products. Because the ZEVIO architecture alleviates steps in a complex system design, customers can concentrate on the design and implementation of their differentiating product features.

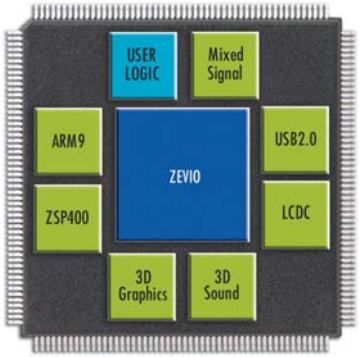

Figure 1. Example of an electronic toy SoC based on the ZEVIO architecture

Inside the ZEVIO architecture are peripherals, including four 16-bit timers, a 32-channel interrupt controller, an 8-channel DMA controller, a watch dog timer and a real-time clock which runs off a separate power supply. The memory controller supports a cost-effective 16bit-wide SDRAM interface by running at twice the frequency of the system bus. The advanced power management unit (PMU) precisely controls the clock and minimizes logic toggling to reduce average power consumption

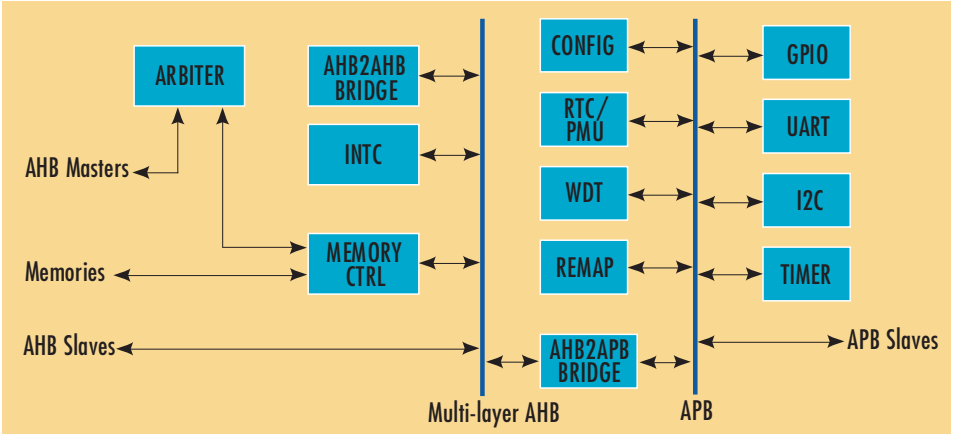

Figure 2. ZEVIO Application Processor Architecture Block Diagram

ZEVIO BENEFITS

- Specification to prototype in as little as six months
- Low-power design ideal for portable applications
- Cost effectively design SoC products
- Lowers the barrier-to-entry of 3D technology in consumer electronics

FEATURES

- Multi-core architecture
- Integrates essential IPs for consumer SoCs
- Seamless connection of the LSI Logic CoreWare library and user logic
- Advanced power management and precise clock control for each individual module
- Programmable reference board enables pre-silicon validation and software development

3D GRAPHICS PROCESSOR

- Highly autonomous 3D graphics processor integrating geometry and rendering engines
- 3D graphics performance of 1.5M polygons/sec at 75MHz
- Cost-effective implementation in 200k gates
- Low power consumption of 0.25mW/MHz in 0.13µm technology

3D SOUND PROCESSOR

- 3D sound processor with 64 configurable voices
- Advanced 3D voices utilizing cross-talk cancellation, low-pass filter and 3D positioning using HRTF coefficients
- Drivers and converters for standard MIDI format playback
- Cost-effective implementation in 80k gates
- Low power consumption of 0.05mW/MHz in 0.13µm technology

of the entire system. The PMU can control on chip power islands to reduce leakage for power-sensitive applications.

PROGRAMMABLE REFERENCE BOARD

The ZEVIO programmable reference board enables system designers to evaluate the SoC in a cycle-accurate environment as the chip is being developed, allowing enhanced validation and early software development. The software can then be ready for immediate bring up on the SoC, significantly reducing product time-to-market.

3D GRAPHICS PROCESSOR

The 3D graphics processor is designed to achieve optimal cost performance and reduce overall software development time by including the features most requested by software developers. Careful trade-offs have been made to achieve the best, cost performance and lowest power that can be accepted by both developers and the cost-sensitive consumer market.

The graphics processor only requires 200k gates including both the geometry and rendering engines and boasts a peak performance of 1.5M polygons per second when running at 75MHz. The power consumption in 0.13µm process technology is only 0.25mW/MHz.

Some of the key features supported by the geometry engine include near clipping, back-face culling and specular lighting. The rendering engine features include depth buffering, fog generation, bilinear interpolation and perspective correct textures.

3D SOUND PROCESSOR

The 2D/3D sound processor also aims to efficiently meet the sound synthesizing requirements for consumer products. It supports up to 48 2D voices and 16 3D voices for a total of 64 voices. The sound processor is designed to operate at 24 MHz, and its output is 44.1 KHz 16-bit PCM samples. Drivers and converters for standard MIDI format playback are provided with sound font optimization capabilities.

Despite its rich feature set, the sound processor is implemented in only 80k gates reducing power consumption in 0.13µm process technology to 0.05mW/MHz.

SYSTEM AND SOFTWARE PARTNERS

Industry leaders in consumer 3D graphics, embedded systems and software technologies have chosen to work with LSI to support the ZEVIO architecture. Mobile entertainment hardware and software design experts from KOTO Co., Ltd. collaborated on the creation of the 3D graphics and sound processors with a focus on low cost, low power, and ease of programmability.

To streamline product and application software development, LSI has engaged with strategic partners ACCESS CO., Ltd., and HI CORPORATION to contribute 3D graphics and embedded system expertise. ACCESS' flagship NetFront™ web browser for portable devices and its µMore™ real-time operating system and HI's MascotCapsule 3D graphics API ensure fast time-to-market for products built on the ZEVIO architecture.

For more information about LSI ZEVIO application processor architecture partners please visit their respective websites:

KOTO Co., LTD.	http://www.koto.co.jp
ACCESS CO., LTD.	http://www.access.co.jp/english/
HI CORPORATION	http://www.hicorp.co.jp

For more information and sales office locations, please visit the LSI Logic web sites at:

www.lsilogic.com **http://lsilogic.com/contacts**

Technical Support
Tel: 800 633 4545
LSI Logic Corporation

North American Headquarters
Milpitas, CA
Tel: 866 574 5741 (within U.S)
408 954 3108 (outside U.S.)

LSI Logic Europe Ltd.
European Headquarters
United Kingdom
Tel: 44 1344 413200

LSI Logic KK Headquarters
Tokyo, Japan
Tel: 81 3 5463 7165

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