With the introduction of the ThunderBird family of PCI audio accelerators, Philips Semiconductors now offers comprehensive, highly integrated solutions for both PCI and USB audio. Designed for PC soundcards or motherboards, video games and other multimedia computing applications, the latest SAA7785 features exceptional hardware acceleration performance, 3D virtualization and comprehensive multichannel capabilities.

SAA7785 ThunderBird Avenger™ PCI 3D audio accelerator

High performance PCI audio accelerator with multi-channel capability, 3D sound and music synthesis

Key advantages

- Brings the 'Home Theatre' experience to the PC
  - Quadraphonic and 5.1 playback of 3D audio games and movie DVDs
- Transforms stereo sources into quadraphonic or 5.1 channel output
  - Adds a new dimension to CD, MP3 and MIDI music recordings
  - Ordinary stereo games become immersive 3D audio games
- Movies, film clips and cut scenes envelope the viewer in a realistic soundscape
- Compelling interactive 3D sound
  - Effective two speaker, headphone, quadraphonic and 5.1 multichannel algorithms
  - DirectSound3D™, EAX™ 1.0, EAX™ 2.0 and A3D™ 1.0 compatibility
- AC3 5.1 or stereo playback through S/PDIF output
- Superior hardware acceleration with extremely low CPU load
- High concurrency

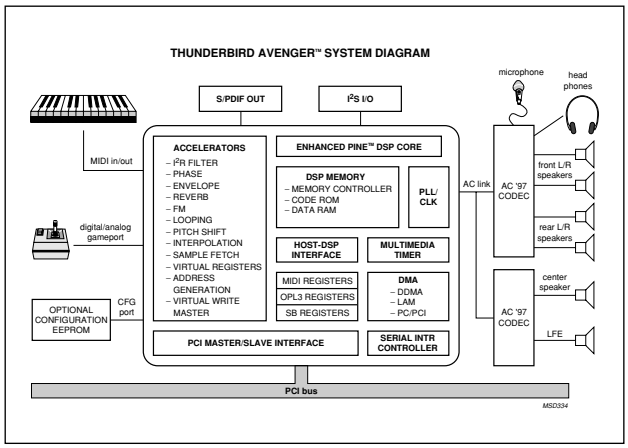
Applications

- Complete audio subsystem when combined with AC97 CODEC
- PC soundcards and motherboards
- Video games and other PCI bus-based multimedia applications

Philips Semiconductors has long been a leading innovator and supplier of a wide range of PC audio components. Now the new SAA7785, the latest in the ThunderBird family of dedicated PCI audio accelerators, represents the ultimate in home theatre, gaming and music audio reproduction. A cost-effective and feature-rich solution, it boasts the industry's highest concurrency, including up to 96 simultaneous 3D streams, and provides support for up to 5.1 speaker output for all PCI-based audio applications, including 3D games, music and DVD movies.

All Philips' ThunderBird PCI™ true hardware 3D audio accelerators create a 3-dimensional soundscape around the listener, resulting in a dramatically more realistic and entertaining audio experience. At their heart is a specialized second generation ActiMedia™ DSP core, which performs all positional 3D, music synthesis and SoundBlaster™ functions on-chip. This frees up the host CPU, significantly boosting graphics performance and raising system benchmarks.

The SAA7785 ThunderBird Avenger takes the family's comprehensive multichannel processing capabilities even further, delivering enhanced music playback by converting any stereo source to quadraphonic or 5.1 speaker output. Integrated S/PDIF output and support for optional S/PDIF input enable high quality digital connections to AC3 decoders, mini-disc or DAT recorders, CD players, digital speakers and other consumer entertainment equipment. It also includes I²S IN and I²S OUT digital connections, a MIDI port and a digital/analog dual game port. When combined with AC97-based audio CODECs, the SAA7785 creates a high quality, high performance and low cost audio processing subsystem.

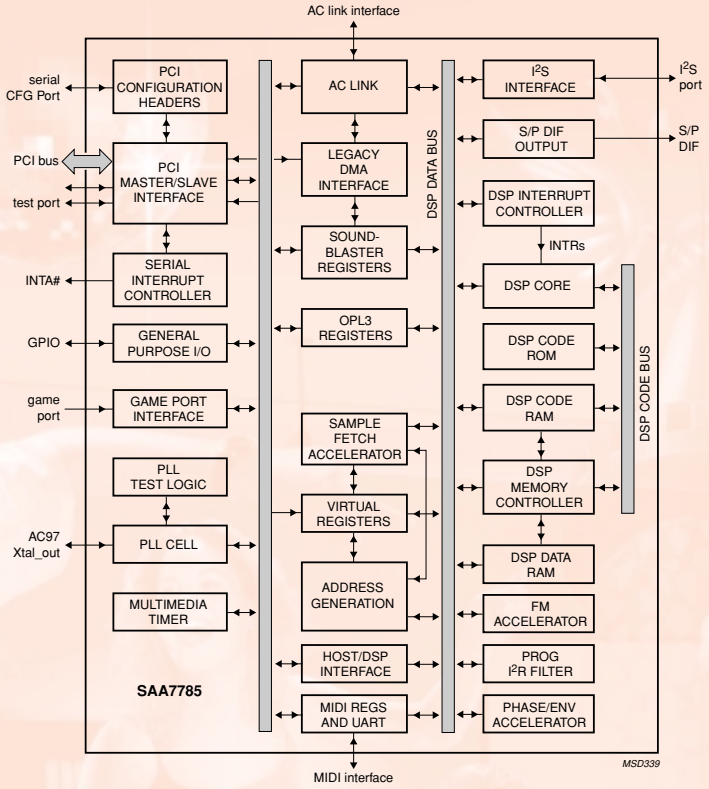


Let's make things better.

PHILIPS

SAA7785 ThunderBird Avenger

3D audio with attitude



The SAA7785 ThunderBird Avenger is one of the most powerful PCI audio accelerators available today, with an extraordinarily rich feature set and an extremely low implementation cost. The combination of its high performance ActiMedia DSP engine, innovative and entertaining QSound Labs algorithms and efficient architecture enables it to process an amazing 96 3D streams and up to 256 total DirectSound streams simultaneously.

Two wavetable synthesis engines can be used separately or in parallel for optimum performance in all applications. Up to 64 wavetable voices can be processed in hardware, without any significant loading on the CPU, while the accompanying professional quality, highly configurable, soft-synthesizer can produce up to an additional 256 voices using the host, including special effects and XG™ support. This brings the total wavetable polyphony of the SAA7785 to 320, an overall concurrency of an outstanding 512 simultaneous streams. The soft-synthesizer can be optimized for highest quality with pure music applications, or for minimum CPU overhead in gaming applications.
CPU load is further minimized by performing sample rate conversion, panning, mixing, 3D virtualization, filtering, music synthesis, multi-channel conversion and gameport functions on the hardware DSP. The result is higher quality audio output, and greater graphic frame rates and system benchmarks.

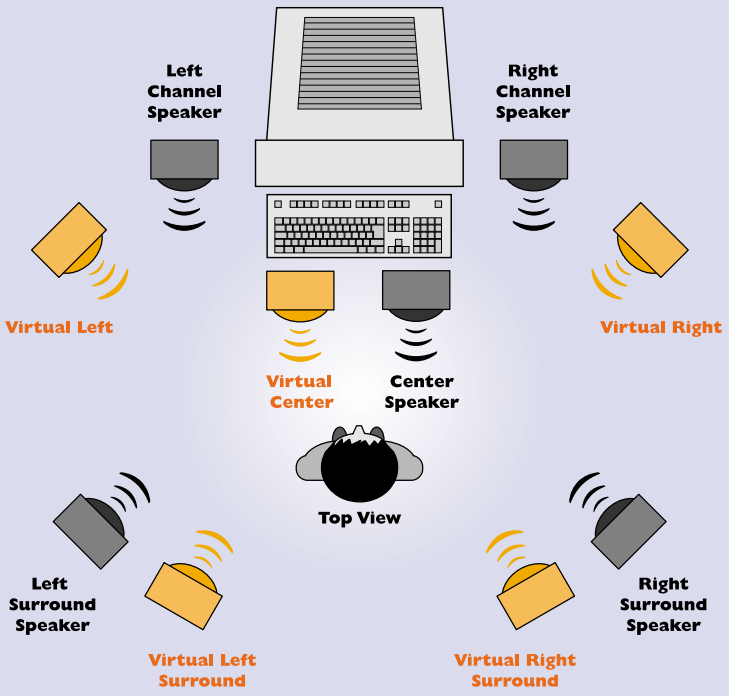
SoundBlaster Pro™ compatibility in both real mode DOS and DOS windows is achieved through hardware SoundBlaster and OPL 3 (FM) emulation registers. Legacy DMA over the PCI bus is supported on all major platforms utilizing PC/PCI, DDMA or our proprietary Legacy Accommodation Mode™ (LAM™). DOS music synthesis includes stereo MIDI playback and quadraphonic MIDI playback, as well as FM emulation.

ThunderBird PCI products use a digital operating mode to eliminate software polling, accelerating the game port function and significantly improving system performance. Joystick buttons can be polled or interrupt driven to enhance performance further, and a default analog mode assures compatibility with DOS and other non-DirectInput™ applications.

QSOUND 3D AUDIO ALGORITHMS

ThunderBird Avenger utilizes QSound Labs' most advanced algorithms for 3D virtualization, multichannel processing, audio mixing and wavetable synthesis. These algorithms are based on the patented, Emmy award winning QSound technology used by major recording and television studios. The only solution on the market developed specifically for loudspeakers rather than headphones, QSound's Q3D™ requires no crosstalk cancellation. The result is a wide 'sweet-spot', strong positional perception and insensitivity to head movement and position, allowing listeners to enjoy a true 3D experience.

Using the ActiMedia DSP, QSound3DInteractive™ interactively positions DirectSound streams in 3D space around the listener. Three different 3D engines, based on HRTF and patented QSound technology, render sound over 2 speakers, headphones, quadraphonic or 5.1 speakers. Q3DI™ utilizes the industry standard DirectSound3D™ API and is compatible with DirectSound3D, EAX™ 1.0, EAX 2.0 and A3D™ 1.0 applications. QSound Environmental Modeling™ 2.0 (QEM™ 2.0) adds further realism by using reverb, obstruction and occlusion for additional positional cues. With QEM enabled, each DirectSound3D sound source receives reverb, simulating acoustic reflections based on the regions reverb preset and the sources' current position relative to the listener.



QSound Multi-Speaker System (QMSS)

In addition, obstruction and occlusion filters are used to simulate the acoustic effects of barriers and openings such as walls, doorways and pillars in virtual 3D gaming environments.

QSound Multi-Speaker System™ (QMSS™) uses a proprietary stereo-to-quadraphonic or 5.1 speaker remapping algorithm to transform ordinary stereo into more immersive quadraphonic and 5.1 applications. Not simply mirroring the front speaker output to the rear speakers, QMSS creates 4 or 5.1 individual channels - so DirectSound games become more realistic with action all around the listener; music CD, MP3 and MIDI playback becomes more immersive; and stereo and Dolby ProLogic™ film clips become theatre-like in presentation without needing a specific decoder. QMSS can also enhance Dolby Digital™ DVD playback using only stereo or Dolby ProLogic™ audio tracks.

SAA7785 FEATURES

- QSound3DInteractive positional 3D
  - Hardware DSP processing for maximum performance
  - 2, 4 and 5.1 speaker and headphone algorithms
  - DirectSound3D, EAX 1.0, EAX 2.0 and A3D 1.0 compatible
- Enhanced QSound Multi-Speaker System
  - Stereo-to-quadraphonic and stereo-to-5.1 speaker conversion
  - Supports digital and analog (external input) sources
  - Non-3D games become immersive multichannel 3D games
  - Enhanced DVD movie playback
- QXpander and stereo-to-3D remapping
- QSound Environmental Modeling
  - Adds reverb, obstruction and occlusion as positional cues
  - Effective even over just 2 speakers
  - EAX 2.0 compatible/I3D Level 2.0 compliant
- S/PDIF support for interfacing to consumer entertainment equipment
  - S/PDIF OUT for AC3 5.1 or stereo playback
  - Support for optional S/PDIF IN
- 14 channel virtual write master for multichannel redirection
- Processing of 512 simultaneous inputs, including 256 DirectSound streams and up to 96 concurrent 3D streams
- 64 hardware wavetable polyphony
- 256 host wavetable polyphony with XG support
- Global reverb for digital and analog (external input) sources
- Enhanced MIDI reverb and chorus (per track and global)
- Dual gameport accelerator with legacy and digital joy-stick modes
- Supports quadraphonic and dual AC97 CODECs
- MPU-401 UART
- I^2S In and Out Ports
- 100 TQFP or 128 TQFP package
- 3.3 V operation with 5 V tolerant I/O

ACTIMEDIA DSP ARCHITECTURE

ActiMedia DSP architecture combines the strengths of programmable and fixed function DSP architectures. Programmability enables custom features, field upgrades and simple application development, while an array of gate-efficient fixed function DSP processors (accelerators) operate in parallel to provide an excellent price/performance ratio. Unlike fixed-point DSPs that must use a single resolution for all audio processing, each accelerator is designed with the optimum resolution for its function. This preserves audio integrity without the cost of a high-resolution or floating point programmable DSP implementation. The result is performance, quality and concurrency that requires many times the processing power available in more classical architectures.

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