



## > CEVA-AUDIO

The market for digital audio solutions including audio players, digital audio for cellular handsets or home entertainment systems is very dynamic and highly competitive. Digital audio devices are decreasing dramatically in size and there is a strong

### Target Markets

- > Audio players - flash or HDD based players, CD players
- > Cellular handsets, incorporating digital audio
- > Voice-over-IP (VoIP)
- > Home entertainment - including DTV, Personal Video Recorders (PVR), set-top boxes

demand for longer playback time while using smaller batteries. These market requirements translate into demand for platforms operating at consistently lower power.

Existing audio codecs are evolving relentlessly and new standards are constantly emerging. Consumers still expect high quality sound reproduction, which necessitates even higher complexity audio standards. On the commercial side, varying royalty plans and payment schemes also influence the usage and acceptance of the numerous standards. With such a changeable environment, a fully programmable platform emerges as the best solution for the market.

To meet these challenges, CEVA has developed CEVA-Audio™ - a DSP-based audio platform targeting high-volume markets such as portable audio players, cellular handsets and home entertainment systems.

CEVA-Audio is a low-power, low-cost platform that combines several CEVA-developed technologies including CEVA-TeakLite-II™, an enhanced version of the widely-adopted CEVA-TeakLite™ DSP core, a cache memory subsystem, audio peripherals, a comprehensive set of audio codecs and complete tool chain support.

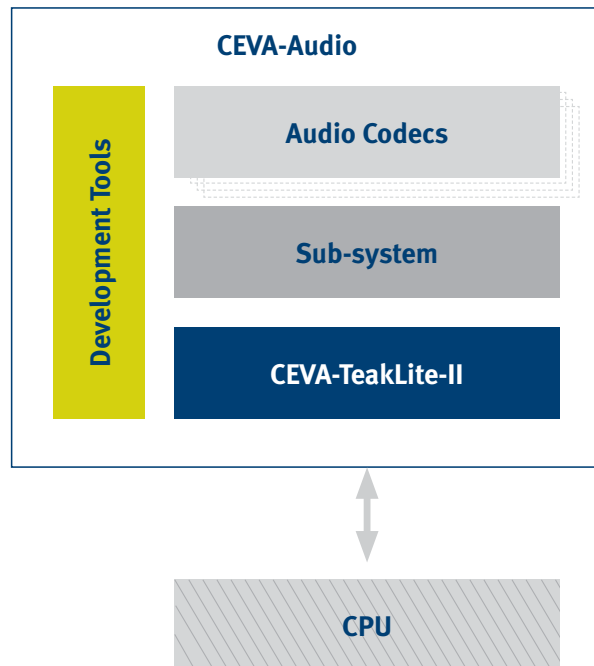
CEVA-Audio is essentially a fully synthesizable soft IP. It operates at up to 245MHz in 90nm process, is based on a small DSP core and incorporates a cache memory subsystem, providing the best price/performance ratio in the market. Power consumption is 0.3mW/Mhz for stereo MP3 decoding and the smallest die size configuration starts at one square millimeters at TSMC 90nm G process. To extend battery life the solution offers three levels of power consumption: active mode, slow mode – to reduce clock speed, and stop/idle mode.

CEVA-Audio is further enhanced by the vast CEVAnet™ partner program, whereby partners provide additional audio software and tools to extend the CEVA-Audio-based products.

## Platform Benefits

- › Integrated, programmable audio platform
  - DSP core and subsystem
  - Broad range of audio codecs
  - Shorter time to market
  - Lower risks
- › Robust performance
  - Low cost: 1mm<sup>2</sup> for combined DSP, subsystem and on-chip memories, at 90nm process
  - Low power: 0.3 mW/MHz for stereo MP3 decoder
- › Strong technology heritage
  - Leverages on widely-deployed CEVA-TeakLite technology
  - Audio codecs deployed in key cellular and consumer device markets
- › Single source solution
  - Reduces risks and solution complexity
- › Qualified IP
  - Stringent functional verification procedure
  - Simulation environment allows verification of customer SoC integration
  - Fully synthesizable RTL code
  - Robust RTL to GDSII design flow using mainstream, industry-standard EDA tools

## CEVA-Audio Platform



CEVA-Audio Platform - Building Blocks

The CEVA-Audio solution is comprised of four key elements:

- › Programmable DSP Engine– the 245MHz CEVA-TeakLite-II is a small die, low power DSP core
- › Audio Subsystem – the Xpert-TeakLite-II, a highly integrated, compact audio sub-system, incorporating a cache memory architecture with a small memory footprint and an AMBA standard bridge for easy system integration
- › Audio Software – CEVA’s open, programmable platform contains a comprehensive set of industry standard audio, speech and voice codecs
- › Complete development tool chain – a complete software development suite and system boards for easy customer integration from initial design through final tapeout

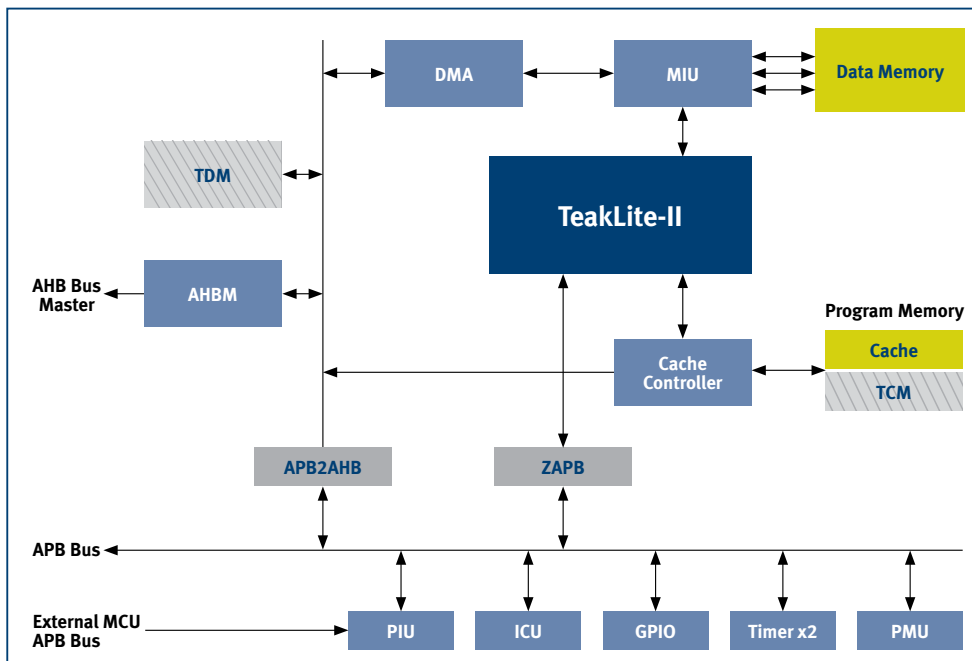
## CEVA-Audio DSP Engine

The DSP engine incorporates a very low-power, low-cost, fully synthesizable CEVA-TeakLite-II DSP core. Thanks to a small die size of 0.24mm<sup>2</sup> (at 90nm TSMC G process) and a 16-bit instruction width, the DSP engine enables the production of low cost silicon and a small memory footprint. The DSP includes a blend of DSP and CPU instructions and can run at up to 245MHz implementing 90nm TSMC G process. The core is binary-compatible to the CEVA-TeakLite DSP core.

## CEVA-Audio – Memory and Audio Subsystem

CEVA-Audio includes audio peripherals and a memory subsystem that are optimized for audio applications.

- › Processor Interface Unit (PIU)
  - Command/Reply protocol registers for host communication
  - Semaphore mechanism
  - Interrupt generation for host and DSP
  - Asynchronous APB interface (clock decoupling)
- › External interfaces
  - AHB Master port for easy integration to external memory resources
  - APB bus enables off the shelf APB peripherals
  - APB slave port for inter processor communications
  - APB internal bus and peripherals
- › 16 general purpose I/Os (GPIO)
- › 2 timers
- › Interrupt Control Unit (ICU)
  - 16 interrupts - 12 internal and 4 external sources
  - Configurable level/edge behavior for all interrupt sources
- › Optional TDM - Buffered Time Domain Multiplexing Ports (BTDM)
  - Single Rx channel, single Tx channel
  - Provides full-duplex, bi-directional communication with external serial devices, such as codecs, analog interface chips and A/D and D/A converters
  - Compatible with a wide variety of standards:
    - › PRI, E1, T1, IOM-2, I2S, AC97
- › Program Memory
  - Configurable – cache of 2K / 8K word
  - Optional Tightly Coupled Memory (TCM) up to 2K word
- › Data Memory
  - Configurable – 8K / 12K / 16K / 32K word
- › Three fully software programmable DMA channels
  - Simultaneous DSP and DMA memory access
  - Emulation support
- › Power Management Unit (PMU)
  - Controls the hardware module clocks
  - Supports clock division



Optional

CEVA-Audio - Hardware Platform

## CEVA-Audio Software

The CEVA-Audio software incorporates speech/voice and audio codecs that are widely adopted industry standards. This improves time to market and eases the integration into customers' SoCs.

- › Broad range of codecs:
  - Audio: MP3, WMA, LC-AAC, HE-AAC, Ogg Vorbis, BSAC, SBC, both decoders and encoders.
  - High End Audio: Dolby Digital: 5.1, 7.1, Dolby Digital+, TrueHD, MLP, DTS, DTS-HD.
  - Post Processing: Dolby Pro Logic, SRS, PCM Mixing, EQ, Pitch Correction, Rate Conversion.
  - Speech/Voice: G.731.1, G.729, G.726, G.711, G.168, AMR, WB-AMR, echo cancellation, noise suppression.
- › Application framework
  - Inter Processor Communication (IPC) protocol library
  - Scheduler

- Advanced GUI debugger
  - › Scripting support (CLI/TCL)
  - › Multi core Support
  - › Interface to Verilog simulators (DBGVerifier)
  - › Built in extendible simulator
  - › Emulator I/F (PP/USB/JTAG)
  - › MATLAB connection
- Application Profiler
  - › Performance measurement
- › System Boards
  - Support for audio-in, audio-out, SD/MMC card
  - Easy integration with ARM development board

## CEVA-Audio Development Tools

CEVA has developed a suite of advanced software and hardware development environments, releasing several versions over the course of more than fourteen years. The GUI-based development environment allows the programmer to comfortably follow the various processes, allowing greater efficiency within programming, compiling and debugging processes. The mature and completely field proven tools are available for PC/Windows, UNIX/Solaris and Linux operating systems.

- › Complete and Integrated Software Development Tools
  - Advanced user friendly IDE
  - Optimizing C/C++ Compiler
  - Assembler, linker & utilities

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