National Semiconductor

Mediamatics™ NDV8501
DVD on a Chip Processor

General Description

Platform

The Mediamatics™ NDV8501 DVD on a Chip Processor provides next generation features and cost effective system integration for Universal DVD Players and Internet connected Players/Recorders. Integration of an industry standard RISC processor architecture operating at high performance levels allows system developers to combine the ease of C based application coding with flexible system extensions unavailable in other platforms. This processor can be equally applied to DVD-Video & DVD-Audio playback, DVD recordable solutions, Hard Disk Drive based recordable solutions and Internet Appliance products.

Audio

The NDV8501 provides unsurpassed audio processing quality and flexibility with wide ranging support for all common disc-based audio formats and many Internet based formats. A custom 24-bit DSP has been developed to provide a powerful solution for the latest compute intensive audio algorithms. Support for common DVD-Video, VideoCD and CD formats has been carried forward from previous generation devices and in addition, support for DVD-Audio formats, DTS, MPEG-2 multi-channel, Dolby Prologic, HDCD and MP3 have been added. Karaoke processing and a royalty-free 3D Stereo Surround implementation are also provided. The flexible audio structure allows audio data to originate from disc-based media, external digital audio streams or via the Internet. Full 5.1 channel output with simultaneous 2-channel down-mix and IEC958/1937 output is standard for the NDV8501.

Features

The NDV8501 is a 2nd generation "system on silicon" solution for consumer DVD Players. Significant feature enhancements are being provided on the NDV8501 device to address both full-featured DVD-Players and DVD-R/W Recorder/Player products.

System Solution

- Designed for DVD Players with the capability to play DVD-Video, DVD-Audio, VideoCD 2.0, CD-DA, CD-DA in DTS format, and CD-DA with CD-TEXT content
- Unified Memory Architecture (UMA) allows sharing of single memory pool for instruction fetch, execution space, system stream demux, video decode, audio decode, video display and audio presentation
- Primary clock operating frequency range between 80 – 100MHz based on feature/power requirements
- Three on-chip PLLs/Frequency Synthesizers which can generate all required system clocks
- Design optimized for 16Mbit & 64Mbit SDRAM operation
- Flexible host bus, communication ports & DVD Front-End control to support all DVD system elements

Integrated RISC Processor

- Industry standard 32-bit RISC processor
- 4KB direct mapped instruction cache
- 1KB data cache
- Processor is available for graphics generation, front-end control and external peripheral control

DVD Front End Interface

- Supports DVD (Video & Audio), Video CD 2.0 (White Book) & derivatives and CD-DA (Red Book)
- 8-bit parallel & serial transfer protocols supported
- Integrated CSS decryption/descrambling for DVD-Video content

DVD Demux Engine

- Accepts input from front end at up to 40Mbps+
- Program Stream demultiplexing
- Sub-stream header parsing for DVD
- Works with DVD-R/W formats
- Enhancements from previous generation Mediamatics designs to support DVD-Audio formats

MPEG Video Decode

- Decodes MPEG1 video & MPEG2 main level, main profile video (720x576)
- Maximum input bit-rate of 15 Mbits/sec

MPEG & Dolby Audio

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- Custom 24-bit DSP design optimized for processing of DVD audio formats
- Provides 6 channel PCM outputs + simultaneous 2 channel stereo downmixed PCM outputs
- Decodes MPEG1 & 2 stereo formats and MPEG-2 multi-channel extensions
- Decodes Dolby Digital Surround (Dolby AC-3) up to 5.1 channels with Class A certification
- Decodes DTS audio up to 5.1 channels
- Decodes DVD-Audio formats including Meridian Lossless Packing
- Decodes High Definition Compact Digital (HDCD) data formats
- Provides 3D Stereo Surround Audio with Mediamatics royalty free algorithm
- Audio down mixing options for Dolby Digital/MPEG/DTS/DVD-Audio
- Audio up-sampling/down-sampling options for high bandwidth streams such as 96kHz & 192kHz
- Bass redirection for all audio formats supported
- Flexible interface for multiple audio DACs for 16/18/20/24 bit formats, 256x & 384x oversampling clocks
- Integrated IEC958 & IEC1937 encoder (SPDIF output)
- IEC1937 support for MPEG, Dolby & DTS encoded material
- Simultaneous SPDIF output with analog DAC output including selectable disc-original/PCM out
- Integrated Karaoke audio capture port
- DSP integration of Karaoke processing & effects: pitch shift, echo, chorus, harmony & flanging
- Audio Frequency Synthesizer to support multiple audio sampling rates

Video/Graphics Processor
- 4-tap 8-phase vertical filter/scaler, 8-tap 8-phase horizontal filter/scaler for ZOOM & MPEG-1 scaling
- Arbitrary scaling from 0.25X to 8X
- YUV 4:2:0 input format with vertical filter for chroma conversion to 4:4:4
- Pan & Scan support for 4:3 output conversion
- 4:3 down-sampling for letterbox output
- Sub-Picture decoder with Alpha Blending for DVD SPUs
- 2/4/8 bit full screen OSD functions with alpha blending for flexible graphics display
- OSD support for Digesting & Strobing functions
- OSD support for scrolling MPEG backgrounds
- OSD support for animation of " icons"
- Closed caption support
- CCIR656 " style" digital video output port with progressive output to enable external video processors/encoders
- CCIR656 digital video input port that can provide a system solution for DVD-R/W products

NTSC/PAL Encoder
- Progressive Video support for ANSI/SMPTE Standard 293M-1996 (720 x 483 @ 59.94Hz)
- Interlaced Video support for NTSC-M, PAL-B/D/G/H/I, PAL-M & PAL-Combination N
- Composite, S-Video, SCART & YCrCb component video outputs
- Wide Screen Signaling in encoder for PAL formats
- Copy Generation Management System in NTSC/PAL encoder for both NTSC & PAL formats
- 4 field NTSC or 8 field PAL generation
- Luminance/Chrominance Filtering with 2x oversampling
- 4 10-bit Video DACs
- Macrovision Copy Protection Version 7.1

Communication Ports
- Flexible serial port communication combinations
- 2 integrated UART modules
- 2 integrated 3-wire Synchronous Serial Ports
- Sharing of pins via 3 different modes that allow designer to choose the configuration of serial ports
- Integrated Consumer Infrared demodulator in one UART

Pulse Width Modulator
- On-chip PWM provided to integrate " front end" microcontroller functions into on-chip RISC processor

Standby Power Down
- Activity on UART, SSP or IR ports prompts system bring-up from power-saving modes

Design for Test
- Full scan methodology

Low cost manufacturing
- 2.5V, 0.25µ, 5-layer metal, single poly, standard cell National Semiconductor technology
- 240 pin PQFP package

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