DiMeNsion™-3 DVD Recorder Solution
Servo, Video Decoder and System Processor

DiMeNsion™

OVERVIEW

The LSI Logic DiMeNsion™-3 comprehensive DVD recorder solution includes a single-chip DVD recorder DSP servo + analog front end (AFE); a family of analog video decoders; and a third-generation DoMiNo™-based DVD recorder processor. The DiMeNsion-3 solution is intended for higher performance, yet cost-sensitive, worldwide DVD recorder and combination products.

The high level of integration of the DiMeNsion-3 solution drastically reduces system component count, and consequently system cost. Figure 1 shows a block diagram of an advanced DVD recorder based on the DiMeNsion-3 solution. With its unique Unified Memory Architecture (UMA), the entire system requires only a single DRAM and Flash device. Integrated Real Time Clock and low power standby mode eliminate the need for a front panel microcontroller.

In addition to enabling cost-effective designs, the DiMeNsion-3 solution enables higher-end features, including SACD and DVD Audio for universal audio players; MPEG-4 and DivX® encoding and playback, enabling up to 12 hours of recording on a single DVD disc; SD to HD up-conversion and HD JPEG; LSI Logic's Direct Digital Dub™ technology to simplify the transfer of personal digital content from a camcorder to DVD over FireWire; and new, more advanced edge filtering and deinterlacing capabilities to provide impressive noise reduction on analog inputs and eliminate video blurring in moving scenes via DoMiNoFX™ technologies. The DoMiNoFX industry-leading pre- and post-processing video technologies create a visibly superior viewing experience. This coupled with LSI Logic's fifth-generation compression technology, offers excellent video quality, even at very low bit rates.

DiMeNsion-3 SYSTEM FEATURES

- All major silicon components of a DVD+R/+RW, DVD-R/-RW DVD recorder

- Unified memory architecture requiring single DRAM and Flash devices for complete system

- Store up to 12 hours of analog video on DVD in MPEG-4 format

- MPEG-4 and DivX® encode and playback

- DVD Audio and SACD playback

- CD/VCD/DVD playback

- Simultaneous interlaced and progressive video outputs

- Connect to digital still cameras and memory cards via the USB port

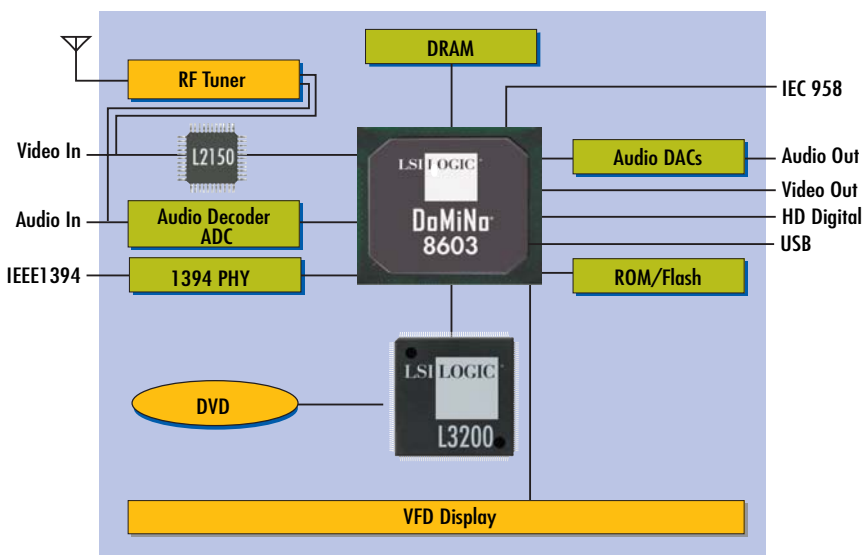- View brilliant JPEG pictures in high definition

Figure 1: DVD Recorder System Based on the DiMeNsion-3 Solution

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DiMeNsion™-3 DVD Recorder Solution
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- Convert standard definition video to digital high definition

- DoMiNoFX™ technologies for the highest video quality

- Archive DV camcorder content on DVD with single remote control operation (Direct Digital Dub™)

DMN-8603 DEVICE FEATURES

- Single x16 DDR SDRAM operation

- Dedicated device interface for L3200 servo controller with integrated AFE

- Integrated MPEG4 Codec for up to 12 hours of video recording on optical disc

- Integrated RTC and low power standby mode eliminates front panel microcontroller

- SACD playback with L3200

DSP SERVO + AFE

The L3200 optical read/write DSP servo with integrated AFE is optimized for consumer recorder applications to reduce overall system costs. With industry-leading integration for DVD recorder drives, the L3200 provides a glueless interface and does not require additional DRAM or Flash. The L3200 supports both record and playback from DVD+R/+RW and DVD-R/-RW media and playback from DVD, CD, CD-R/-RW and SACD.

ANALOG VIDEO DECODER

The DiMeNsion-3 solution offers a family of analog video decoders to cost-effectively address a variety of DVD recorder models with different requirements in different regions. The L2150 video decoder is designed to address worldwide, entry-level models. It includes 9-bit video ADCs and supports both NTSC and PAL.

The L2146 is optimized to address higher-quality video recorder models in North America and Europe by supporting RGB and Component analog inputs. It includes 10-bit video ADCs and supports both NTSC and PAL.

DVD RECORDER SYSTEM PROCESSOR

A true system-on-a-chip solution, the DoMiNo 8603 (DMN-8603) reduces cost, design complexity, power consumption and time-to-market, and offers broadest feature set with the best image quality. In addition to including a CPU and graphics engine, the DMN-8603 integrates an NTSC/PAL TV encoder, a third-generation DV codec, an MPEG-4 codec, SACD decoder, and a USB controller.
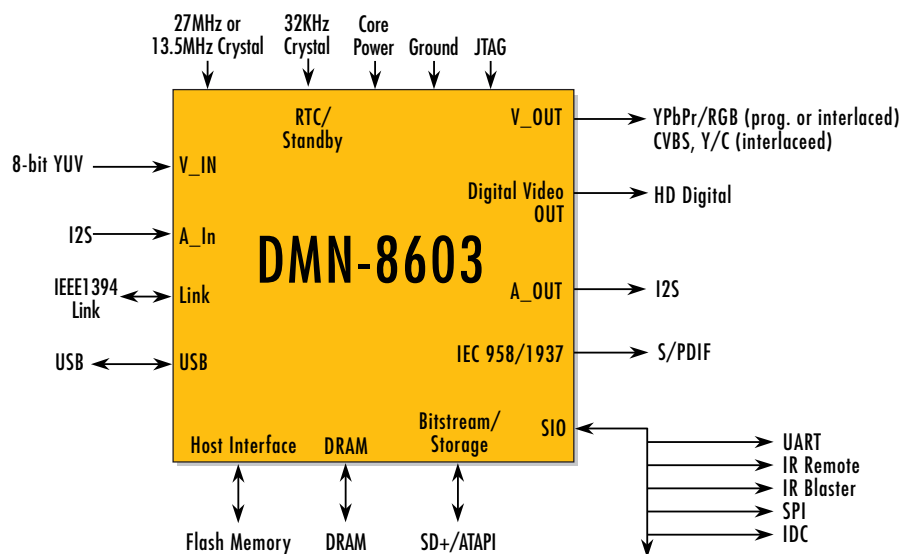

Figure 2: DMN-8603 DVD Recorder Processor

The DMN-8603 accepts video from broadcast TV and other analog video sources and compresses and formats the video for storage on DVD in industry-standard recordable formats. The DMN-8603 supports simultaneous record and playback operations. With its third-generation DV codec, the DMN-8603 supports archiving digital camcorder content to a DVD.

The DMN-8603 offers the longest record time in the industry while continuing to offer the industry's best video quality. The DMN-8603 enables brilliant display of JPEG pictures through High Definition JPEG available only with the DoMiNo architecture. The USB controller allows for connectivity with flash memory cards and digital still cameras.

CAPABILITIES

For DVD video recording applications, the DMN-8603 supports video compression in compliance with the MPEG-1, MPEG-2, MPEG-4 and DV-25 specifications, and video decompression in compliance with the MPEG-1, MPEG-2, DV-25, and MPEG-4 ASP* specifications. The DMN-8603 also enables transcoding between DV-25 and MPEG-2 and MPEG-2 to MPEG-4. The product supports corresponding audio compression and decompression in compliance with the Dolby Digital CE, MPEG-1 Layer 3 and MPEG-1 layer 2 specifications.

The DMN-8603 supports recording on DVD-RW/-R, and DVD+RW/+R media using +VR, -VR, DVD-V or DivX® formats and provides complete DVD recordable drive buffer management. The DMN-8603 can support either half-duplex (separate recording or playback) or full-duplex (simultaneous recording and play back) operations on the DVD recordable drive.

For DVD playback applications, the product supports the playback of DVD-Video disks with Dolby Digital 5.1, MPEG-1 layer 2 and DTS audio encoding, disks encoded with DivX® technology, MPEG-1 VCD and SVCD disks. For audio playback applications, the product supports the decoding of DVD-Audio disks (MLP), SACD, MPEG-1 layer 3 (MP3), Windows Media Audio (WMA) and CD-DA formats. The DMN-8603 also performs all audio post-processing tasks such as 3D audio effects and bass management functions

ARCHITECTURE

The DoMiNo architecture - the foundation of the DMN-8603 product - represents the optimal balance between hardware and software.

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Repetitively executed, computationally complex pixel processing tasks are accelerated in hardware execution units. Higher-level data processing is performed on standard RISC processors, permitting substantial product flexibility and use of industry-standard development tools.

The DMN-8603 is compatible with the LSI Logic C-Ware™ architecture, which provides a standardized API that is reusable across LSI Logic DoMiNo-based consumer digital video products, fully preserving software investment. C-Ware is integrated with the Wind River Systems® VxWorks RTOS and is supported by an industry-leading software development tool-chain.

Summary of Specifications for DiMeNsion-3 Solution

Video Interface

Input	One 8-bit YUV 4:2:2 video stream
Output	Digital: ITU-R BT.656 interlaced (SD)/SMPTE 274M (1080i)/SMPTE 296M (720P)
	Analog: Support for NTSC/PAL (B,D,G,H,I), CVBS, Y/C,
	Analog component video RGB or SMPTE YcbCr outputs. Simultaneous Interlaced and progressive video outputs

Audio Interface

Inputs	2 Channels, I2S compatible, 16-24 bits/sample
Outputs	8 channels, I2S compatible, 16-24 bits/sample, S/PDIF

I/O

Low speed serial	UART, SPI, IR, IR Blaster, I²C
Storage	Dedicated interface for L3200 Optical Servo with AFE Record & Playback: DVD+R/+RW, DVD-R/-RW Playback: DVD, CD, CD-R/-RW, SACD
High speed serial	USB: Two full speed USB ports IEEE1394: With AV/C

Processing

A/V Codec	Single Stream, full-duplex, audio and video codec with SD-HD up-conversion
Encode formats	MPEG2 MP@ML, MPEG4 ASP*, DivX®, MPEG1, DV-25, DDCE, MP3
Decode formats	MPEG2MP@ML, DivX®, MPEG1, MPEG4, DV-25, AC-3, DDCE, MLP, SACD, AAC, DTS, MP3, WMA
Logical disk formats	DVD-V, DVD-VR (DVD-R, DVD-RW), DVD+VR (DVD+R, DVD+RW)
Encryption/Decryption	CPPM, CPRM, CSS, 5C

System

Standby mode	Low power standby mode
Real Time Clock	Internal RTC operating with a 32KHz Crystal and battery backup
Graphics	2D OSD - up to 24 bit/pixel RGB with 8-bit alpha blending with flicker free filter and video scaler

Memory

Memory	Single x16 DDR or x32 (DDR or SDR). Up to 128MB Unified memory architecture supporting single DRAM and Flash in a complete DVD Recorder (when used with L3200)

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