LSI Logic DiMeNsion™ 8652
HDD/DVD Recorder Processor

DiMeNsion™-2

OVERVIEW

The DiMeNsion-2 is the second generation family of DVD recorder processor products based on the DoMiNo™ architecture. The DiMeNsion-2 is intended for demanding, yet cost-sensitive, A/V codec applications in consumer electronics products. A true system-on-a-chip solution, the DiMeNsion-8652 (DMN-8652) empowers dual-drive products while reducing cost, design complexity, power consumption and time-to-market.

The DMN-8652 enables consumer electronics manufacturers to offer a category of products that leverages the flexibility provided by the combination of hard disk and optical disk drives. The DMN-8652 accepts video from broadcast TV and other analog video sources and compresses and formats the video for storage on hard disk, or on DVD discs in industry-standard recordable formats (DVD-RAM, DVD-RW/R, DVD+RW/R). It permits control of DV camcorders connected via FireWire® using the AV/C protocol, and transcodes DV-25 video for storage on hard disk or DVD. The DMN-8652 supports simultaneous play back of video from hard disk or DVD, and a range of background copying operations (including dubbing and transrating) between the hard disk and optical drives.

The DMN-8652 offers DoMiNoFX™ technologies – industry-leading pre- and post-processing of video to create a visibly superior viewing experience. LSI Logic's proprietary TrueView™ Pro motion-compensated temporal filtering (MCTF) algorithm provides a cleaner picture through substantial noise reduction. This technique is coupled with the LSI Logic fifth-generation PerfectView® Pro compression technology for excellent video quality, even at very low bit rates. The LSI Logic TrueScan™ Pro motion-compensated de-interlacing (MCDI) then recreates clear images on progressive scan displays through the elimination of video blurring in moving scenes.

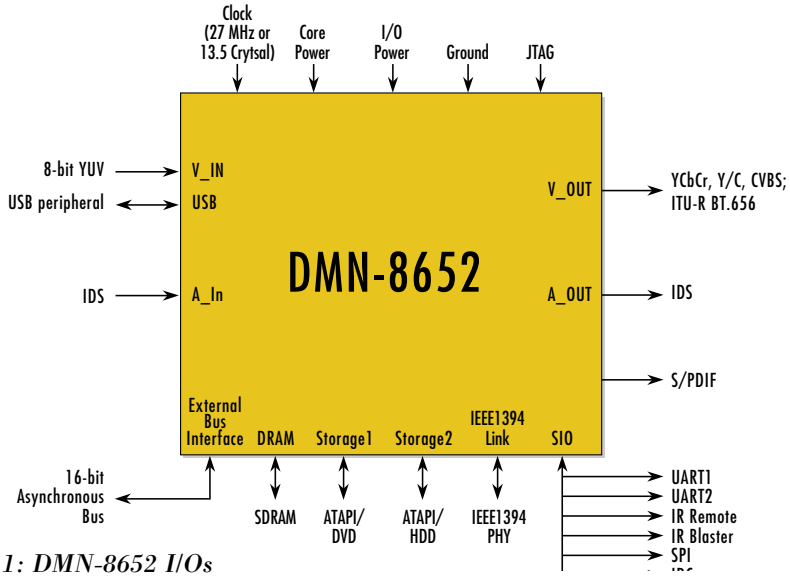


Figure 1: DMN-8652 I/Os



SYSTEM FEATURES

- Concurrent timeshifting and video archiving onto DVD
- High-speed video archiving onto DVD with bit-rate adjustment
- USB connectivity
- Record broadcast TV to DVD with timeshift capability
- Store analog video on DVD
- Playback MPEG-4 video
- Archive DV camcorder content on DVD with single remote control operation (Direct Digital Dub™)
- DVD playback
- Output video in progressive mode
- DoMiNoFX™ technologies for the highest-quality video

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DEVICE FEATURES

- Dual 150 MIPS RISC architecture with integrated audio DSP
- Flexible video DSP and motion estimation processors
- Integrated TV encoder and video DACs
- 2 storage device interface controllers for IDE/ATAPI devices
- High-performance memory controller for support of up to 256 MB of external SDR/DDR SDRAM
- Integrated USB controller
- Second generation DV codec
- IEEE1394 link layer with 5C content protection and AV/C protocol support
- 2D graphics engine (native 24-bit RGB with 8-bit alpha) with DVD sub-picture decode
- Serial I/O interface controller for infrared port, general-purpose serial I/O, etc.

CAPABILITIES

For HDD and DVD video recording applications, the DMN-8602 supports video compression in compliance with the MPEG-1, MPEG-2, and DV-25 specifications, and video decompression in compliance with the MPEG-1, MPEG-2, DV-25, and MPEG-4 specifications. It also transcodes between DV-25 and MPEG-2. The product supports corresponding audio compression and decompression in compliance with the Dolby Digital CE and MPEG-1 layer 2 specifications. For audio recording applications, the DMN-8652 supports transcoding between CD-DA or WMA audio formats.

For playback applications, the product supports the playback of DVD-Video disks with Dolby Digital 5.1, MPEG-1 layer 2 and DTS audio encoding, and VCD and SVCD disks. For audio playback applications, the product supports the decoding of DVD-Audio disks (MLP), Windows Media Audio (WMA) and CD-DA formats. The DMN-8602 also performs all audio post-processing tasks such as 3D audio effects (Phantom™ Surround) and bass management functions.

The DMN-8652 is capable of a high degree of concurrency. Examples of this are DVD playback with background record to hard disk; time-shift (simultaneous record and delayed play back of the same program) on hard disk; DV camcorder to DVD archive with simultaneous display; copy a program from hard disk to DVD with background record of another program to hard disk; and archive from hard disk to DVD at high compression.

SYSTEM DESIGN

The high level of integration of the DMN-8652 drastically reduces system component count, and consequently system cost. Figure 2 shows a block diagram of an advanced HDD/DVD recorder based on DMN-8652.

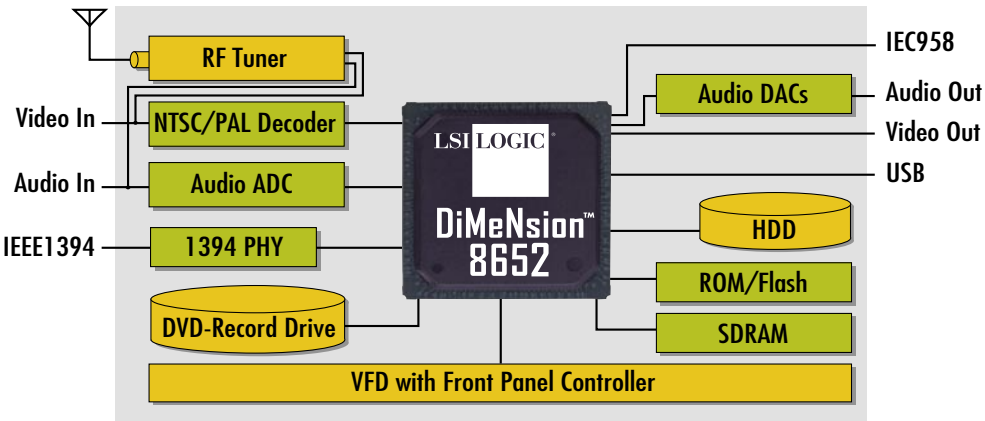


Figure 2: DMN-8652 DVD/HDD Recorder System

In addition to including a CPU, graphics engine, and complete audio and video systems, the DMN-8652 integrates an NTSC/PAL TV encoder, a second-generation DV codec, a Unified Memory Architecture and a USB controller. The USB controller allows for connectivity with flash memory cards and digital still cameras. In addition, the DMN-8652 has two dedicated ATAPI controllers that support the DVD recorder and hard disk drives. There is built-in support for progressive video output. This high level of integration makes DMN-8652 one of the most comprehensive and cost-competitive HDD/DVD recordable solutions in the market today.

ARCHITECTURE

The DoMiNo architecture – the foundation of the DMN-8652 product features – represents the optimal balance between hardware and software. Repetitively executed, computationally complex pixel processing tasks are accelerated in hardware execution units. Higher-level data processing is performed on standard RISC processors, per-mitting substantial product flexibility and use of industry-standard development tools.

The DMN-8652 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 inte-grated with the Wind River Systems® VxWorks RTOS and is supported by an industry-leading software development tool-chain.

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Summary of Specifications	
Video Interface	
Input	One 8-bit YUV 4:2:0 video stream
Output	Digital: One 16-bit ITU-R BT.656 interlaced video output Analog: Support for (M) NTSC, (B,D,G,H,I) PAL, CVBS, Y/C, analog component video RGB or SMPTE YCbCr outputs
Audio Interface	
Inputs	2 channels, IDS compatible, 16-24 bits/sample
Outputs	10 channels, IDS compatible, 16-24 bits/sample, S/PDIF
I/O	
Low Speed Serial	2x UARTS, SPI, IR, IR Blaster, IDC
Storage	2 IDE interfaces for ATAPI devices
High Speed Serial	IEEE 1394 Compliant, USB
Processing	
A/V Codec	Single-stream, full-duplex, audio and video codec
Encode Formats	MPEG-2 MP@ML, MPEG-1, DV-25, DDCE
Decode Formats	MPEG-2 MP@ML, MPEG-1, MPEG-4,DV-25, AC-3, DDCE, MLP, AAC, DTS, WMA
Logical Disk Formats	DVD-VR (DVD-RAM, DVD-RW), DVD-V (DVD-R, DVD-RW), DVD+VR (DVD+RW, DVD+R)
Encryption/Decryption	CPPM, CPRM, CSS, 5C
System	
Internal CPU Host	Internal host with 16-bit generic external bus interface
Graphics	2D OSD - up to 24 bit/pixel RGB with 8-bit alpha channel - with flicker filter, video scaler
Memory	
Memory	up to 256 MB of SDRAM
Physical	
System Clock	13.5 or 27 MHz
Operating	Power <2.7 W
Package	388 BGA
JTAG	
Compliance	IEEE 1149.1 compliant boundary scan and PCB assembly testing

For more information please call:

LSI Logic Corporation
North American Headquarters
Milpitas, CA
Tel: 866-574-5741

North America
Milpitas, CA
Tel: 1-408-490-8000
Fax: 1-408-490-8590

Europe
European Headquarters
United Kingdom
Tel: 44-1344-413200
Fax: 44-1293-651119

Hong Kong
Kowloon Tong, Hong Kong
Tel: 852-2192-1789
Fax: 852-2511-6939

China
Beijing, China
Tele: 86-10-626-38296
Fax: 86-10-626-38322
Chengdu, China
Tel: 86-28-667-8831
Fax: 86-28-667-8054

Japan
Tokyo, Japan
Tel: 81-3-5463-7821
Fax: 81-3-5463-7820

Korea
Seoul, Korea
Tele: 82-2-528-3400
Fax: 82-2-528-2250

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