OTI-226

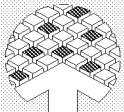## MPEG-2/Dolby Digital Audio/Video Decoder

product features

- Supports CSS authentication and decryption for DVD players or DVD-PC systems

- Supports system-level navigation processing

- Supports DVD 1.0 Video Object (VOB) bit streams

- Decodes MPEG-2 and MPEG-1 video in real time

- Display: NTSC (720x480 @ 60 fps) and PAL (720x576 @ 50 fps)

- Decodes Dolby AC-3, LPCM, or MPEG-1 (Layer 1 & Layer 2) audio samples and outputs in 2 channels

- Supports sub-picture decoding, DCC, Closed Caption, DSI, PCI and HLI parsing

- Programmable OSD

- Video Digest functions (MPEG-2, MPEG-1)

- Provides letterbox, pan & scan, and unaided 3:2 pull-down

- Zoom function

- Requires only 2MB SDRAM (1Mx16)

- Host interface supports 8-/16-bit microcontroller or ISA mode

- Supports VideoCD, CD-I and CD-DA

- Direct interface to industry-standard NTSC/PAL encoders, audio DACs, DVD/CD-DSP and SDRAM

- 160-pin QFP, TQFP

- Supports S/P DIF digital audio output

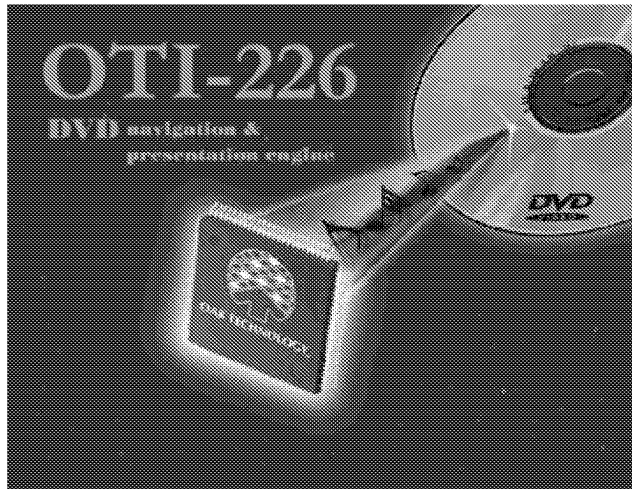- Development supported by DVD and DVD-PC system templates

OAK TECHNOLOGY.

The OTI-226 is a cost-effective, single-chip solution for DVD and DVD-PC systems that require MPEG decompression. The OTI-226 provides real-time MPEG-2 and MPEG-1 video decompression, incorporated with Dolby AC-3, MPEG-1, and Linear PCM (LPCM) audio decompression.

Sub-picture decoding, DCC, Closed Caption, DSI, PCI, and HLI parsing are provided for graphical interface to full-motion video, and OSD and Video Digest functions (MPEG-2 and MPEG-1) are provided for user-interface graphics. Full-motion video editing formats such as letterbox, pan & scan, and unaided 3:2 pull-down are supported by the OTI-226. CD-DA and VideoCD are also supported.

To provide sufficient security for movie studios and other content providers, the OTI-226 provides copy protection for audio/video content through the Content Scramble System (CSS) Authentication and Decryption module, as defined by the DVD 1.0 Specification. In a DVD player system, the scrambled data is passed through the system bus to the OTI-226, properly decrypted, and then processed. In a DVD-PC environment, the OTI-226 supports authentication and decryption for the hardware presentation side.

A glueless interface to various DVD/CD-DSPs, audio DACs, and industry-standard NTSC/PAL video encoders reduces overall system cost. Support for many bus interfaces provides system flexibility, including several host bus protocols such as Intel/Motorola microcontrollers and the ISA bus. An integrated 32-bit RISC engine with internal RAM and ROM controls the decoding, audio/video synchronization, and error concealment.

Architectural Overview

The OTI-226 can be programmed to receive the following data streams: DVD VOB, VideoCD, CD-I, MPEG-2 program, MPEG-1 system, MPEG-1 audio, MPEG-1 video, CD-ROM, or CD-DA. Program and system data streams are parsed using the internal 32-bit RISC engine. Once the data streams are parsed, the RISC CPU distributes the system, video, audio, and sub-picture data streams to the appropriate FIFOs for further decoding. The RISC core redirects the video streams to the video co-processor and the audio streams to the audio co-processor for direct decoding. For CD-DA operation, the OTI-226 operates in pass-through mode, directly transferring data to the buffer of the audio unit. The OTI-226 can also decode an MPEG-2 program stream and pass-through compressed audio data (AC-3, MPEG-2, etc.) via the IEC-958 (S/P DIF) port to allow an external sound processor to perform the audio processing.

OTI-226 Product Brief

Authentication and Decryption

CSS Authentication and Decryption

The OTI-226 includes support for CSS authentication and decryption. Decryption is required for DVD player environments. Authentication and decryption is required for DVD-PC solutions.

In a DVD player system, the scrambled data is sent to the OTI-226, and the CSS module descrambles and decompresses the data to recreate the original DVD bit stream, which is then processed by the OTI-226.

In a PC environment, the DVD-ROM drive and DVD decoder card must first verify their validity to each other prior to the DVD-ROM sending data to the decoder card. To verify validity, authentication is performed between the DVD-ROM and the decoder card. Once authentication succeeds, the scrambled data is transferred through the PC bus to the OTI-226 chip. The CSS module descrambles the encrypted data and reproduces the original DVD bit stream, which is then ready for processing by the OTI-226.
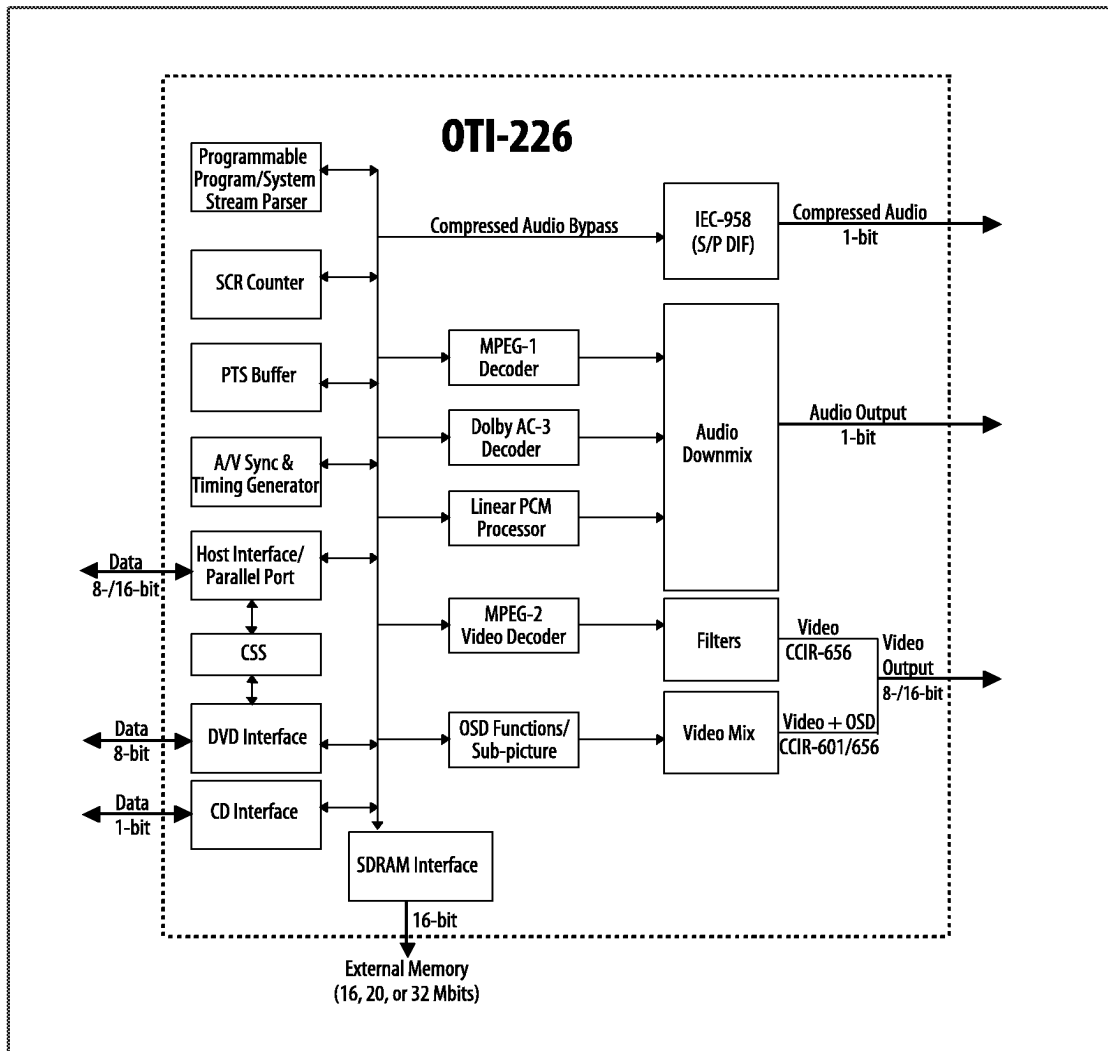
OTI-226 Architecture

OTI-226 Product Brief
Interfaces
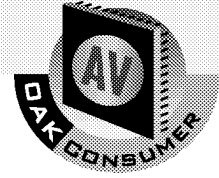
Host Interface

The host bus interface unit (HBIU) communicates with the 8-/16-bit microcontroller or 8-/16-bit ISA bus for system control and data flow operations. The HBIU performs chip initialization, delivers compressed video, audio, and sub-picture data, reports internal operational status, and generates a system interrupt. The OTI-226's internal registers, counters, memory, and SDRAM are accessible through the HBIU.

PLL and Clock Interface

The OTI-226 is a highly integrated DVD video/audio decoder with a direct interface to a DVD-DSP as well as a CD-DSP chip. It accommodates several clock sources, including an external system clock, video pixel clock, audio clock, DVD-DSP clock, and CD-DSP clock. To simplify the clocking scheme, the OTI-226 provides an internal high-precision PLL circuit which inputs sources from the DVD-DSP, video pixel clock, or the external system clock.

SDRAM Interface

The SDRAM controller has two primary functions. First, the controller provides address generation and control for up to 32 Mbits of external SDRAM. Second, the controller monitors the hardware blocks, provides the interrupt scheme, and schedules the movement of data in and out of the OTI-226. The minimum SDRAM memory size requirement for both PAL and NTSC decoding is only 16 Mbits, but an additional 4 Mbits or 16 Mbits extends OSD graphics and color capabilities, and allows an oversized video buffer verifier (VBV).

Audio Interface

The audio module interfaces to the RISC CPU and SDRAM controller modules. The audio interface's main function is to reconstruct Dolby AC-3, LPCM, or MPEG-1 (Layer 1 & 2) audio samples, but can also provide an audio co-processor bypass if an external sound processor is desired. The audio DAC interface is designed so that any of the popular audio DACs can be used.
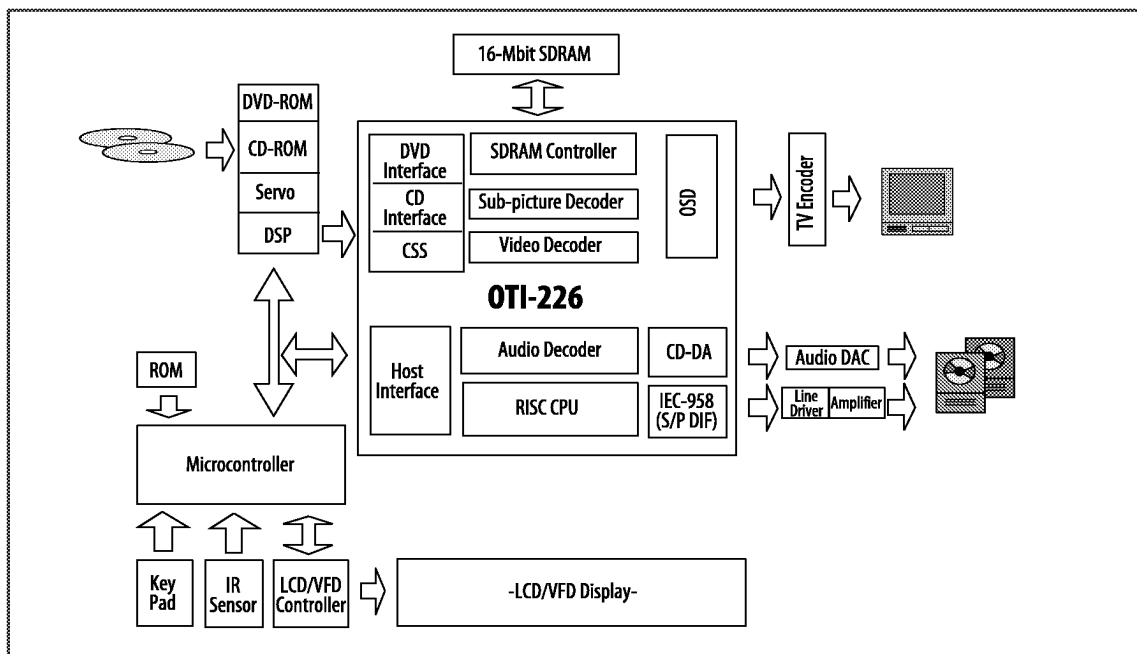
OTI-226 Block Diagram

OTI-226 Product Brief
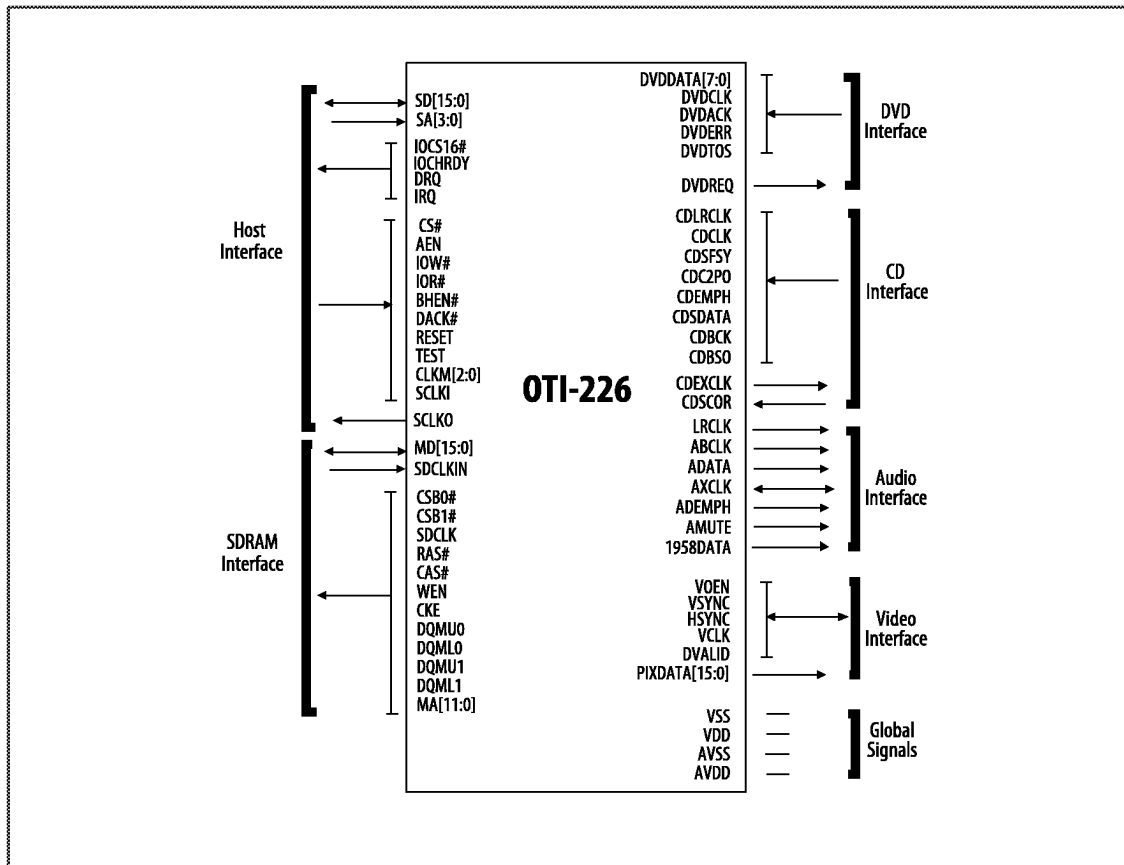## Interfaces

Video Interface

The OTI-226 offers video output flexibility, outputting the uncompressed video pixel data directly to a standard NTSC/PAL video encoder for standard television viewing. It can also display on a standard RGB computer monitor by simply adding a video overlay chip or a YUV/RGB DAC. Image quality is flicker-free and sharp because both horizontal and vertical lines are interpolated with the OTI-226 7-tap horizontal and 2-tap vertical filters. Letterbox, pan & scan, unaided 3:2 pull-down, upscaling of MPEG-1 images, 6:5 PAL-to-NTSC conversion, and 5:6 NTSC-to-PAL conversion are also supported.

DVD-DSP Interface

The OTI-226 provides a direct connection to an 8-bit parallel DVD-DSP, and can receive the following input formats: DVD VOB, MPEG-2 program data, MPEG-1 system data, MPEG-1 video, and MPEG-1 audio.

CD-DSP Interface

The OTI-226 provides a direct interface to receive 1-bit serial data output from the CD-DSP chip. The data stream may be CD-DA (Digital Audio), CD-ROM (ISO 9001 file format), or MPEG-1 (VideoCD, CD-I, or Karaoke CD titles).

External Interface Signals