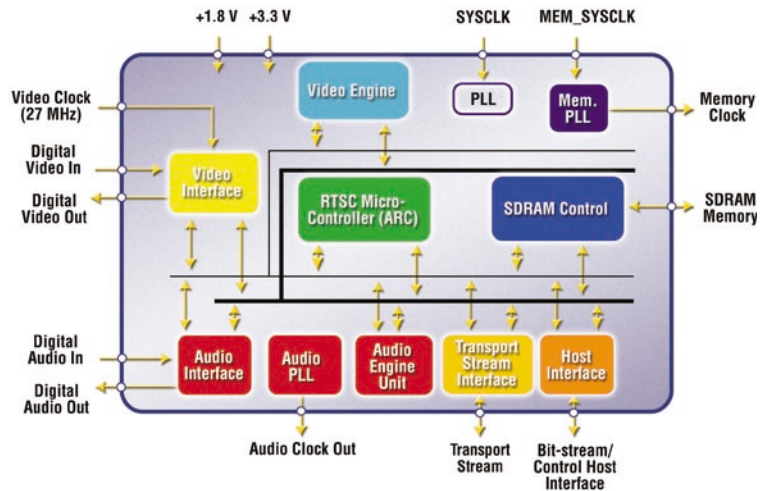


MPEG-2 Audio/Video Encoder

Low-Cost, Feature-Rich MPEG-2 Encoder for Mass-Market Applications

CS92199 Features

- Single-chip, real-time, MPEG-2 audio/video encoder with system multiplexor and programmable VBI insertion
- ITU-R BT.601 or ITU-R BT.656 Video I/O
- I²S audio input and output
- Digital loopback (audio and video output of frame buffer contents) enables preview capability
- 32-bit SDRAM interface requiring a single 2 M x 32 MB SDRAM running at 166 MHz
- Intel®/Motorola® 16-bit host interface or 8-bit interface
- Transport stream interface; 8-bit parallel or serial
- Supports real-time MPEG-1 or MPEG-2 audio/video bitstream encoding
- Encodes Transport, Program, and Elementary bitstreams
- Supports real-time encoding of two-channel audio using Dolby® Digital Consumer Encoding (DDCE) or MPEG audio (including MP3)
- Programmable system mux with VCD and SVCD format support
- Supports both PAL and NTSC
- Supports one-pass encoding using either constant bit rate or variable bit rate control
- Field, 16x8 (pixel), and frame-mode motion prediction for superior video quality especially at lower rates (2-4 Mbs)
- Integrated programmable video preprocessor including spatial (intraframe) and temporal (interframe) noise-reduction filters
- 1.8 V and 3.3 V power supplies, 5 V I/O tolerant
- 272 BGA package



The CS92199 is a single-chip, real-time MPEG-2 audio and video encoder with an integrated system multiplexor and programmable Vertical Blanking Integral (VBI) insertion. The CS92199 is targeted for cost-constrained, mass-market, video-recording systems including PC peripherals, VCD/SVCD Video Recorders, Personal Video Recorders (PVR), and DVD Recorders.

The CS92199 encoder integrates all the encoding features of the CS92288 MPEG-2 audio/video CODEC plus:

- A 32-bit SDRAM interface
- Programmable VBI insertion
- Transport stream interface; 8-bit parallel or serial

By integrating advanced MPEG-2 encoding features, such as support for both frame and field-motion prediction, and proprietary rate control algorithms, the CS92199 yields bitstreams with exceptional video quality especially at lower bit rates (2-4 Mbps).

The CS92199 encoder enables the introduction of affordable video products featuring high-quality digital recording in PC and consumer electronic applications.

Technical Overview

The CS92199 combines a programmable ARC core, a programmable DSP core, and dedicated processing units organized as a process pipeline. The ARC core supports programmable VBI data insertion and system mux requirements.

For video coding, the CS92199 fully complies with the ISO/IEC 13818 Main Profile at Main level (MPEG-2 MP@ML) or with the ISO/IEC 11172 (MPEG-1) formats.

For audio coding, the audio DSP supports dual-channel Dolby Digital Consumer Encoding (DDCE) and MPEG audio encoding (including MP3). An integrated audio PLL can provide audio master clock signals to external audio A/D converters.

The CS92199 supports a 32-bit SDRAM interface and integrates a separate memory PLL. Flash or EEPROM memories are supported as well.

The CS92199 provides support for multiple types of host interfaces, including 8-bit and 16-bit (Intel/Motorola). A dedicated transport stream interface can be configured to operate in either 8-bit parallel or serial mode.

Audio A/D and D/As (digital loopback) can be connected using dedicated I²S buses. NTSC/PAL video decoders and encoders (digital loopback) can be connected using either ITU-R BT.601 or ITU-R BT.656 interfaces.

To support board-testing facilities, the CS92199 includes a JTAG interface.

Applications

The CS92199 is targeted for digital video recording applications such as:

- PC Peripherals such as USB-based video recorders and PCI encoding cards
- VCD and SVCD Recorders
- Digital Video Recorders (DVR/PVR)
- DVD Recorders

MPEG Video

The CS92199 provides application program control over a large number of encoding parameters such as I, P, B-picture cadence, GOP structure, and rate control. Internal rate control provides a high degree of flexibility in relation to the output bit rate, including the ability to generate variable bit rate compressed video streams in one pass. This makes it suitable for storage-sensitive applications such as DVD Recorders and PVRs. Preprocessing support includes spatial noise prefiltering, temporal noise prefiltering, chroma down conversion, and scene-change detection.

Audio

The CS92199 supports two-channel MPEG-1 and MPEG-2 audio (all Layers, including MP3) and Dolby Digital.

Systems

The CS92199 is a single stream MPEG-compliant encoder that outputs transport streams, program streams, elementary video streams, or elementary audio streams.

Interfaces

The CS92199 includes a 32-bit SDRAM memory interface, video interfaces (ITU-R 601 or ITU-R 656), audio interfaces (I²S), a 16-bit Intel/Motorola host interface, a generic 8-bit host interface, a dedicated transport stream interface, and serial EPROM/Flash memory interface.

The CS92199 is an ideal MPEG solution because it delivers...

Superior Video Quality

The CS92199 is one of few consumer-grade MPEG CODECs that support motion estimation using frame, 16x8, and field prediction. Most commercially available MPEG-2 encoders support only frame prediction. Cirrus Logic's support of advanced motion estimation modes, such as field and 16x8 pixel, combined with proprietary rate-control algorithms, yields bitstreams with exceptional video quality especially at lower bit rates (2-4 Mbps).

Superior Audio Features

Cirrus Logic is a leader in digital audio and the CS92199 is no exception. A programmable DSP supports Dolby Digital consumer encoding and all MPEG audio formats, including MP3.

Video Preprocessor

- Accepts ITU-R BT.601 or ITU-R BT.656
- 4:2:2 to 4:2:0 conversion
- Spatial noise pre-filters
- Temporal noise filtering
- Scene-change detection
- Digital loop back enables preview capability

Video Encoder

- Real-time encoding in MPEG-1 or MPEG-2 MP@ML
- NTSC: (720-D1, 704-D1, 640-VGA, 544, 480-2/3D1, 352-1/2D1) x 480, or 352 x 240 (CIF), or 176 x 112 (QCIF) at 30 or 29.97 Hz
- PAL: (720-D1, 704-D1, 640-VGA, 544, 480-2/3D1, 352-1/2D1) x 576, or 352 x 288 (CIS/SIF), or 176 x 144 (QCIF) at 25 Hz
- ITU-R 656 or ITU-R 601
- Proprietary high-performance motion estimation
- Field, 16x8, and frame-mode prediction
- Field- or Frame-based DCT
- Programmable encoding parameters
 - IBBBP, IBBP, IBP, IP, I GOP structures
 - User-defined quantization matrices
 - Average bit rate
 - Active picture area selection
 - VBR or CBR

Audio Processor

- Programmable, 24-bit, digital signal processor
- Input sampling rates: 32, 44.1, 48 kHz
- Two-channel audio encoding in either LPCM, MPEG or Dolby Digital

System Processor

- Based on powerful ARC core
- Hardware System multiplexor with VCD, SVCD, or DVD application format support
- Transport, program, and elementary stream support
- Programmable VBI data insertion

System Interfaces

- 16-bit Intel or Motorola interface
- 8-bit microcontroller interface
- 32-bit SDRAM interface requires a single 2 M x 32 memory running at 166 MHz
- Programmable SDRAM PLL
- Programmable audio PLL clock for A/D and D/As
- Flash and EPROM serial interface
- 8051 protocol interface
- I²S Audio
- General Purpose I/O
- Transport stream interface; serial or 8-bit parallel
- ITU-R BT.601 and BT.656 interfaces
- JTAG Interface

Technology

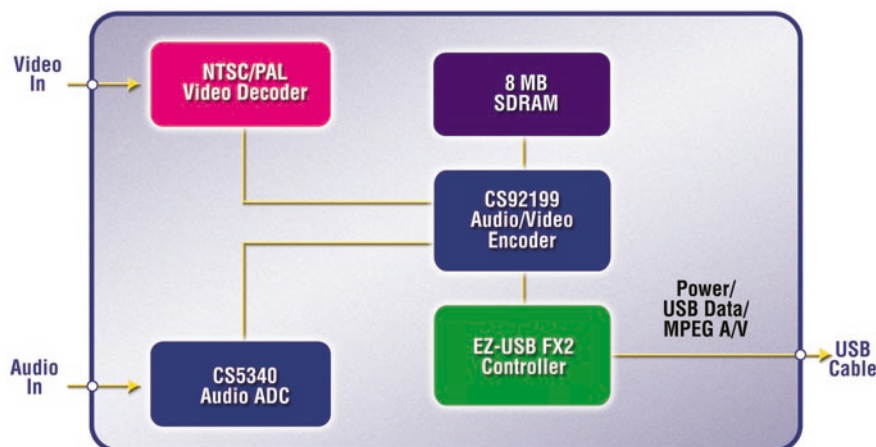
- 0.18 micron CMOS technology
- 272-pin BGA package
- 3.3 and 1.8 Volts power supplies
- 5 V I/O tolerance
- Internal pull-ups for SDRAM data buses
- 0.8 W typical average power consumption at 108 MHz with memory running at 166 MHz

System Design Examples

USB-DVR 8.0

The CS92199 is an ideal solution for a variety of MPEG-2 applications such as USB-based PC peripherals and PCI Encoding Cards. As an example, the Cirrus USB-DVR 8.0 PC reference design (shown below) combines the CS92199 with a software DVD decoder running on a Windows®-based PC. The final product is an ultra cost-effective DVD creation system for Windows-based PCs that delivers full resolution, full frame rate, MPEG-2 audio and video encoding in real-time with frame accurate lip sync.

To reduce system costs, the CS92199 implements a 32-bit memory bus architecture, which requires only a single 2 M x 32 SDR memory for full resolution NTSC and PAL operation. The CS92199 is also compatible with popular video digitizers, such as the Philips® SAA-7114/7115 and Texas Instruments® TVP-5150, ensuring maximum design and pricing flexibility.



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