

DVD Decoder with MP4, MP3 and WMA Playback

Description

The EM8500 is a single-chip progressive DVD decoder that supports the DVD-Video, Superbit™ DVD, SVCD, VCD, Kodak Picture CD and CD media formats. Playback of DivX™ Video, MP3, WMA and MPEG-4 AVI files on CD is also supported. An embedded RISC processor provides system control, navigation, and many other features.

Video decoding support includes MPEG-1, MPEG-2 MP@ML, MPEG-4 advanced simple profile Level 5¹. Audio decoding support includes Dolby® Digital 5.1, Windows® Media Audio (WMA) v8 and MPEG-1 Layers 1, 2 and 3 (MP3). DVD-Video support includes hardware CSS decryption, 16:9 and 4:3 aspect ratios, letterboxing, 3:2 pull-down, multiple angles and sub-picture.

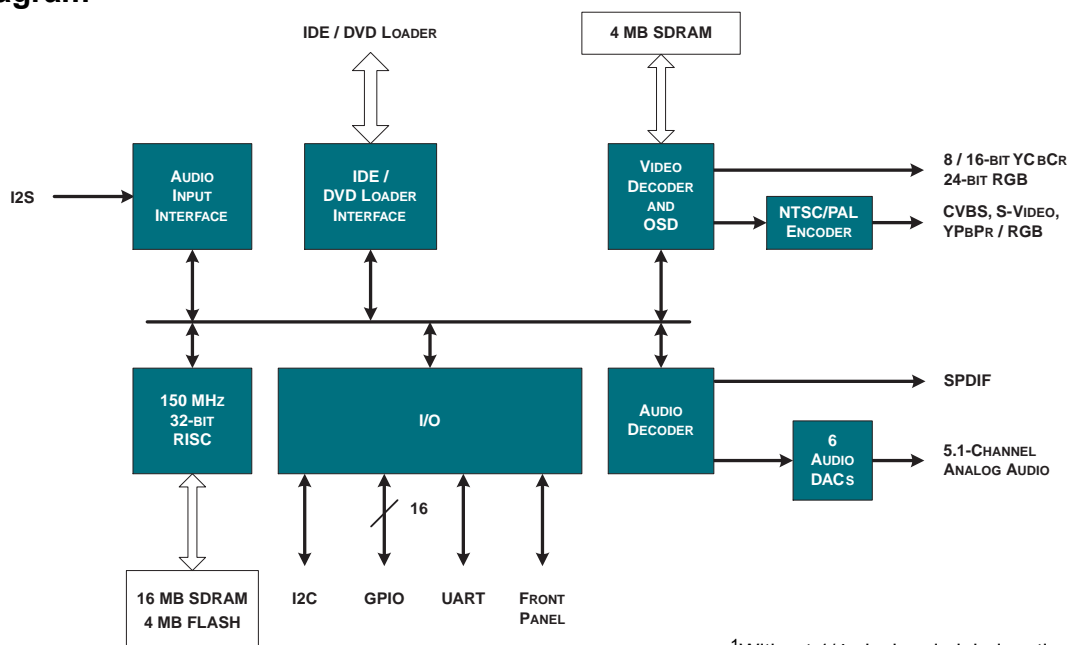
Based on the company's award-winning REALmagic® Video Streaming Technology, the EM8500 enables manufacturers to quickly develop next-generation progressive DVD players.

Design assistance and software customization is available through our Professional Services Group.

Features

- Progressive DVD playback, no chroma upsampling error
- Supports DVD-Video, Superbit DVD, DVD-R/DVD-RW (conditional), SVCD, VCD, Kodak Picture CD, CD/CD-R/CD-RW (audio, WMA, DivX™, MP3 and MPEG-4 AVI files) media formats.
- MPEG-1, MPEG-2 MP@ML, MPEG-4 Advanced Simple Profile Level 5¹ video decoding
- Dolby Digital 5.1, MPEG-1 Layers 1, 2 and 3 (MP3) and Windows Media Audio (WMA) v8 audio decoding
- Supports Sanyo and Sony DVD loaders
- Supports DVD loaders that use IDE (ATA/ATAPI-4) interface
- HTML-based user interface

Block Diagram



¹Without 1/4 pixel and global motion compensation

Audio Input and Output Interfaces

The audio decoder supports the following formats:

- Dolby Digital with conformance to Group A (20-bit)
- MPEG-1 Layers 1, 2, and 3 (MP3)
- Windows Media Audio (WMA) v8
- 16-bit linear PCM data

5.1-Channel Analog Audio Outputs

The six on-chip 20-bit 96 kHz audio DACs output either 2-channel down-mixed Dolby Digital audio, decoded Dolby Digital 5.1 audio, decoded MPEG audio, decoded WMA audio, or PCM audio data. When generating 2-channel audio, the other outputs are muted.

S/PDIF Digital Audio Output

The S/PDIF output block can receive 2-channel linear PCM, compressed DTS, and compressed Dolby Digital audio data. It then converts it into a serial bitstream compatible with the S/PDIF specification.

I2S Digital Audio Outputs

Three sets of I2S digital audio outputs are available for interfacing to three external stereo audio DACs for improved audio performance. In this configuration, the analog audio outputs are not available.

I2S Digital Audio Input

The EM8500 supports an I2S digital audio input, configurable as either a master or slave. This audio data may be output onto the S/PDIF or stereo analog audio outputs.

Features

- 8-bit full-screen OSD (720x480 or 720x576) with alpha blending and flicker filtering
- I2C master interface
- Front panel controller interface (supports NEC uPD16311 or PTC PT6312)
- 1.8V core with 3.3V I/O (5V tolerant) for low power operation
- Package: 328 BGA

Video Outputs

- NTSC/PAL composite and S-video outputs with Macrovision v7.1 protection (10-bit DACs)
- Analog YPbPr or RGB video outputs with Macrovision AGC v1.03 protection (10-bit DACs), scalable up to HDTV resolution
- 24-bit digital RGB output supports DVI with HDCP

Audio Inputs/Outputs

- Digital audio input interface: I2S
- Digital audio output interface: S/PDIF (IEC 60958) for linear PCM, compressed Dolby Digital, and compressed DTS
- Six sigma-delta audio DACs provide 5.1-channel analog audio outputs
- Three optional I2S serial digital audio outputs allow using external audio DACs for improved performance

Video Output Interfaces

Video output ports provide digital RGB or YCbCr outputs and include an integrated NTSC/PAL video encoder and video DACs for composite, s-video and YPbPr/RGB analog outputs.

VBI Support

NTSC closed captioning on lines 21 and 284 is supported. In addition, NTSC widescreen signaling (WSS) and copy generation management (CGMS-A) on lines 20 and 283, as defined by IEC 61880, is supported. This information specifies the aspect ratio of the current program and also provides copy protection capabilities.

PAL widescreen signaling (WSS) on line 23, as defined by ETSI EN300284 and ITU-R BT.1119, is supported. This information specifies the aspect ratio of the current program.

Digital Video Output

The digital video output supports 8- / 16-bit BT.601 / BT.656 4:2:2 YCbCr or 24-bit RGB data. It may be operated as a timing master or slave at rates up to 75 MHz and resolutions up to 720p or 1080i.

The 24-bit RGB output mode supports an external DVI / HDCP transmitter, such as those from Silicon Image.

TV Encoder - Composite and S-Video Output

The EM8500 has a high-quality NTSC/PAL encoder (with Macrovision v7.1 protection) that supports the NTSC-M, NTSC-J, PAL-B/D/G/H/I, PAL-60 and PAL-M baseband video standards. The analog video outputs are capable of driving a doubly-terminated 75-ohm load.

Component Analog Output

The EM8500 also includes component YPbPr or RGB analog outputs, with Macrovision AGC v1.03 protection in 480p YPbPr mode. The analog video outputs are capable of driving a doubly-terminated 75-ohm load.

When generating analog RGB or YPbPr video, the composite video output is always present; the s-video output is not available.

This component analog output can be either RGB or YPbPr video data, with the following resolutions and frame refresh rates:

- 720 x 480i @ 30 Hz
- 720 x 576i @ 25 Hz
- 720 x 480p @ 60Hz
- 720 x 576p @ 50 Hz
- 1280 x 720p @ 50 and 60 Hz
- 1920 x 1080i @ 25 and 30 Hz

If copy protection is used during DVD-Video playback, the resolution on the analog YPbPr / RGB outputs may not be higher than standard definition (720x480 or 720x576) unless driving a VGA monitor. If the output is configured to be progressive YPbPr, only 480p video may be generated.

IDE / DVD-Video Loader Interface

Either an IDE interface or DVD-Video loader interface may be used.

The IDE (ATA/ATAPI-4) interface enables the use of DVD loaders with a compatible interface. The 8-/16-bit parallel DVD-Video loader interface is compatible with Sanyo and Sony DVD loaders.

Front Panel Controller Interface

The front panel controller interface directly supports the NEC uPD16311 and PTC PT6312. Other front panel controllers may be used by interfacing to the UART or GPIO.

Memory Requirements

The EM8500 has two memory interfaces, one for MPEG decoding and one for the internal RISC.

MPEG Decoding

A minimum of 4 MB of 100 MHz SDRAM is required for the MPEG decoder memory interface.

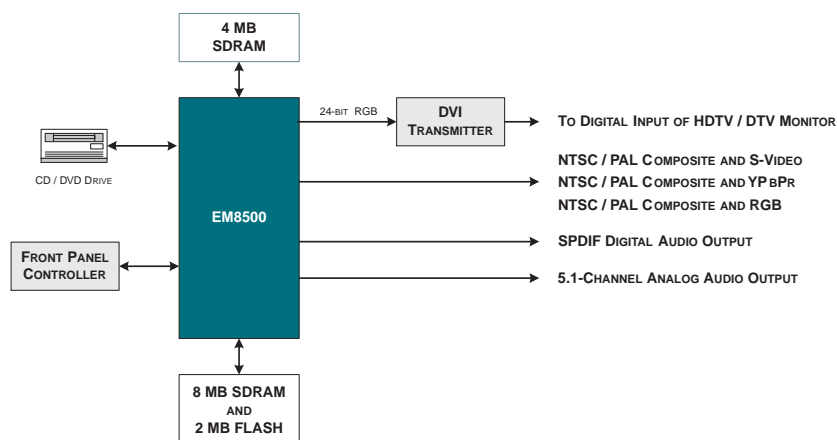
RISC CPU

The RISC CPU memory interface supports up to 16MB of 100 MHz SDRAM and up to 4MB of flash memory.

Application Example: Progressive DVD Player

The progressive DVD player example below requires very little external logic since the EM8500 provides most of the features including:

- Progressive DVD-Video playback
- DivX™ Video, SVCD, VCD, MPEG-4 playback
- Interlaced or progressive YPbPr or RGB video outputs
- NTSC / PAL composite and s-video outputs
- Analog and S/PDIF audio outputs



General Specifications

Media Formats

- DVD-Video, Superbit DVD, SVCD (IEC 62107-2000), VCD 1.x and 2.0
- DVD-R/DVD-RW (conditional)
- CD/CD-R/CD-RW
 - WMA, DivX™¹, MP3 and MPEG-4¹ AVI files using ISO 9660 format
- Audio CDs
- Kodak Picture CD (JPEG files using ISO 9660 format)
- 15 Mbps sustained input data rate

Video Decoding Standards

- MPEG-1, MPEG-2 MP@ML
- MPEG-4 Advanced Simple Profile Level 5¹. Rectangular shape video decoding for one object up to CCIR 601 resolution (720x480 or 720x576), support for B pictures, no data partitioning, no text/graphics compositing.
- DVD-Video and Superbit DVD
 - CSS decryption
 - 16:9 and 4:3 playback, letterbox, 3:2 pull-down
 - Multiple angles and sub-picture
 - DVD-Video navigation software
- DivX™ Video (4.02 or higher¹)
- Error concealment

Video Processing

- Brightness, color, contrast controls
- Advanced scaling up to 1920x1080 pixels
- Interlaced or progressive output up to 60 Hz
- 8-bit full-screen OSD (720x480 or 720x576) with alpha blending and flicker filtering

Video Interfaces

- NTSC/PAL composite and s-video analog outputs with Macrovision v7.1 protection (27 MHz 10-bit DACs)
- Analog RGB / YPbPr (SDTV or HDTV resolution, interlaced or progressive) with Macrovision AGC v1.03 protection in 480p output mode (10-bit DACs)
- 75 MHz 8- / 16-bit BT.656 / BT.601 YCbCr video output port or 24-bit RGB video output port for DVI with HDCP support

Audio Decoding Standards

- Dolby Digital 5.1
- MPEG-1 Layers 1, 2 and 3 (MP3)
- Windows Media Audio (WMA) v8
- 16-bit linear PCM

Audio Interfaces

- S/PDIF (IEC 60958) serial digital output for PCM, compressed Dolby Digital, and compressed DTS
- I2S serial digital audio input
- Six on-chip audio DACs (100 dB SNR) provide 5.1-channel analog audio outputs
- Three optional I2S serial digital audio outputs allow using external audio DACs for improved performance

IDE / DVD-Video Loader Interface

- Supports Sanyo and Sony DVD loaders
- Supports DVD loaders that use IDE (ATA/ATAPI-4) interface

Front Panel Controller Interface

- Supports NEC uPD16311 or PTC PT6312 Front Panel Controller

General Purpose Input / Output

- 16 pins of general purpose I/O
- I2C master interface
- UART

Power Management

- 1.8V core with 3.3V I/O (5V Tolerant)
- Typical power dissipation:
 - Analog video outputs off: 1W
 - Analog video outputs on: 1.5W

Package

- 328-pin BGA

¹Without 1/4 pixel and global motion compensation, 720x576 maximum source resolution

Product Selection Guide

Feature	EM8500 ¹
Media Formats DVD-Video, Superbit DVD, SVCD, VCD 1.x and 2.0, Kodak Picture CD CD/CD-R/CD-RW, DVD-R/DVD-RW (conditional)	yes yes
Video Decoding MPEG-1, MPEG-2 MP@ML MPEG-4 Advanced Simple Profile Level 5 ²	yes yes
Audio Decoding Dolby Digital 5.1 MPEG-1 Layers 1, 2, and 3 (MP3) Windows Media Audio (WMA) v8	yes yes yes
NTSC/PAL Composite and S-video Outputs Macrovision v7.1 protection	yes yes
YPbPr or RGB Analog Video Outputs Macrovision AGC v1.03 protection for 480p output mode	yes yes
Audio Inputs and Outputs S/PDIF digital audio output 5.1-channel analog audio outputs	yes yes
Package	328 BGA
Power Supply	1.8v / 3.3v

¹May be sampled or sold only to companies that are both Macrovision and Dolby licensed.

²Without 1/4 pixel and global motion compensation.

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