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## HDMI Transmitter

**IDTV936**

### FEATURES

#### HIGHLIGHTS

- ◆ Compatible with HDMI 1.3 specification
- ◆ Deep Color support - up to 36-bit color depth
- ◆ Support of xvYCC color space (IEC 61966-2-4)
- ◆ Supports resolutions up to 1080p@60Hz or 720p/1080i@120Hz
- ◆ Support of Dolby® TrueHD, DTS-HD and DVD Audio (2-channel audio up to 192 kHz and 8-channel audio up to 192 kHz)
- ◆ Support of HBR (High Bit Rate) audio
- ◆ Integrated HDCP encryption engine

#### KEY FEATURES

- ◆ **Digital Video Output**
  - Integrated HDMI 1.3 TMDS core running at 250 MHz
  - Flexible video interface supports various input formats:
    - 12/24/30/36-bit RGB/YCbCr 4:2:4
    - 16/20/24-bit YCbCr 4:2:2
    - 8/10/12-bit YCbCr 4:2:2 (ITU-R BT.601 and BT.656 compliant)
  - High precision internal video processing
    - Full precision internal video processing (color space conversion and chroma sample rate conversion)
    - Fully-programmable color space conversion
    - Supports xvYCC video color space (IEC 61966-2-4)
    - Supports data clipping, data linear compression and expansion for gamut mapping between different color spaces
  - ITU-R BT.601 and BT.709 compliant, high quality FIR low-pass filter supports both chroma downsampling and upsampling (4:2:2<->4:4:4)
  - Supports resolutions up to UXGA for PC applications and 1080p@60Hz or 720p/1080i@120Hz for HDTV applications
  - Provides 12-bit to 8/10-bit dithering for 8/10-bit output to reduce the effects of requantization error
  - Input video clock can be optionally multiplied by 0.5, 1 or 2
- ◆ **Digital Audio Output**
  - Supports inputs from audio interface SPDIF or 4 x I<sup>2</sup>S or 8 x DSD
    - 4 x I<sup>2</sup>S interface accepts Dolby® TrueHD, DTS-HD and DVD-Audio (2-channel audio up to 192 kHz and 8-channel audio up to 192 kHz)
    - SPDIF input supports PCM, Dolby Digital, DTS digital transmission (32 -192 kHz)
    - SPDIF input is compatible with IEC 60958 or IEC 61937

- Supports audio downsampling at 1/2, 1/3 or 1/4 sampling rate for both SPDIF and I<sup>2</sup>S
- 8 x DSD interface supports both 2-channel and up to 8-channel one bit audio streams
- No audio master clock is required for either SPDIF or I<sup>2</sup>S support
- ◆ **Content Protection**
  - Built-in HDCP encryption engine for media content protection
  - Pre-programmed HDCP keys
  - On-chip MPU for HDCP operations
- ◆ **Other Features**
  - Compatible with DVI 1.0, and HDCP 1.2 specifications; Fully backward compatible with HDMI 1.1 and 1.2 generations of transmitters
  - Pin mapping is compatible with Silicon Image SiI9134
  - Master I<sup>2</sup>C with integrated DDC (Display Data Channel) simplifies system design and saves customer cost
  - Register-programmable through slave I<sup>2</sup>C interface
  - Flexible interrupt registers with interrupt pin
  - Supports Receiver Hot Plug Detection and Receiver Connection Detection
  - Selectable double termination (near end) improves impedance matching and signal integrity
  - Flexible power management and 1.8V core for low power operation
  - 5V tolerance for digital inputs eliminates the need for extra devices
  - Package:100-Pin TQFP

### APPLICATIONS

- ◆ DVD players and recorders
- ◆ Digital set-top boxes
- ◆ PVRs (Personal Video Recorders)
- ◆ AV receivers

### COMPLIANT STANDARDS

- ◆ HDMI 1.3
- ◆ DVI 1.0
- ◆ EIA/CEA-861D
- ◆ HDCP 1.2

## DESCRIPTION

The IDTV936 is a high-definition multimedia transmitter compliant with the DVI (Digital Video Interface) 1.0, HDMI (High-Definition Multimedia Interface) 1.3 and HDCP (High-bandwidth Digital Content Protection) 1.2 protocols. This device is designed for next generation HD-DVD and Blu-Ray players and DVD recorders that require High Definition Audio and Deep Color features. It is also fully backward compatible with HDMI 1.1 and 1.2 generations of transmitters. It supports up to 1080p resolution at 60Hz and up to 36-bit color depth, high fidelity audio with latest Dolby TrueHD and DTS-HD high bit-rate audio formats. It supports DVD Audio with 7.1-surround at 192 kHz, and stereo audio at 192 kHz.

A flexible video interface is provided, which supports a variety of input formats including 12/24/30/36-bit RGB or YCbCr 4:4:4, 16/20/24-bit YCbCr 4:2:2, 8/10/12-bit YCbCr 4:2:2 (ITU-R BT.601 and BT.656 compliant).

The IDTV936 supports high precision internal video processing by chroma resampling (4:2:2->4:4:4) and color space conversion (CSC). Each component of video data (RGB or YCbCr) is expanded to 12 bits in width and then undergo full precision pixel processing; When the output is non-12 bits, 12-to-10 or 12-to-8 bit dithering can be conducted. The device has a high quality, full precision FIR low-pass filter (ITU-R BT.601 and BT.709 compliant) to support both chroma sample interpolation and decimation. It also supports color space conversion with fully programmable conversion coefficients (14 bits, including a sign bit). Furthermore, this device supports data clipping, data linear compression and expansion for gamut-mapping between color spaces; xvYCC color space is also supported.

The IDTV936 provides a high-end digital audio interface supporting SPDIF or I<sup>2</sup>S (4 - channel) or DSD (8 - channel) input. The 4 x I<sup>2</sup>S interface accepts Dolby<sup>®</sup> TrueHD, DTS-HD and DVD-Audio (up to 192 kHz for both 2-channel and 8-channel audios). The SPDIF input supports PCM, Dolby Digital and DTS digital transmission (32 kHz to 192 kHz). In addition, the audio master clock is not absolutely required for either SPDIF or I<sup>2</sup>S support. Audio down sampling at 1/2, 1/3 or 1/4 sampling rate for both SPDIF and I<sup>2</sup>S is also available. The 8 x DSD interface, with an audio sample frequency range of 32 - 192 kHz, supports both 2 - channel and up to 8 - channel one bit audio stream.

For secure transmission of high-definition video and audio, IDTV936 integrates an HDCP encryption engine. It has an on-chip MPU to perform HDCP operations. Each device is pre-programmed with unique HDCP keys, simplifying manufacturing process and reducing cost.

A 1.8V core enables low power operation, and flexible power management will minimize power consumption. All digital inputs are 5V tolerant, without any extra device being needed.

Further information on IDTV936's color space conversion (CSC), HDCP controller, whole-chip programming, and video input sync timing requirements can be found in the following documents.

- AN-606: CSC User's Guide for IDTV936.
- AN-607: HDCP Controller User's Guide for IDTV936.
- AN-608: Programmer's Guide for IDTV936.
- AN-609: Input Sync Timing Requirements for IDTV936.