ANALOGIX
SEMICONDUCTOR

HDMI Transmitter

FEATURES

- **HDMI 1.2 compliant transmitter with HDCP**

  - Supports pixel rates beyond 165 Mpix/second
  - Low power consumption of 300 mW typical for 720P or 1080I
  - Supports One Bit Audio (DSD, SACD)
  - Pin compatible with SiI9030
  - Built-in video pattern generator and audio tone generator for system self-test
  - Firmware programmable output swing and pre-emphasis

- HDCP 1.2 compliant with internal keys
  - Backward compatible with DVI 1.0 standard

- Flexible 24-bit video pixel input interface
  - Supports 12/24-bit modes, 4:2:2, DDR, etc.

- Flexible digital audio interface
  - Supports S/PDIF, 8-ch I^2S, 6-ch 1-bit audio

- Fully integrated HDCP authentication hardware

- Automatic arbitration between host and DDC access through I^2C port

- Software-controlled power management

- 80-lead TQFP lead-free package

The ANX9030 is a high-performance, High Definition Media Interface (HDMI) transmitter chip with an advanced feature set offered only by Analogix Semiconductor.

The ANX9030 is pin-compatible with the SiI9030 yet offers additional features and functionality and lower power operation. It includes HDCP 1.2 (High-Bandwidth Digital Content Protection) circuitry with internal memory to store a unique HDCP device key.

The device directly interfaces to the HDMI output connector of an HDMI-enabled digital video source, such as a digital set-top box, DVD player, or integrated Audio/Video receiver. It also includes other HDMI connector functions such as the I^2C interface for the DDC (Display Data Channel) and the Hot Plug Detection input.

The ANX9030 accepts digital video and audio in many commonly used data formats, sample rates, and bit resolutions. Video, audio, auxiliary, and control data is packetized according to HDMI standards, making the ANX9030 fully compatible with HDMI receivers such as the ANX9011 and ANX9021.

The ANX9030 is offered in an 80-lead TQFP package.
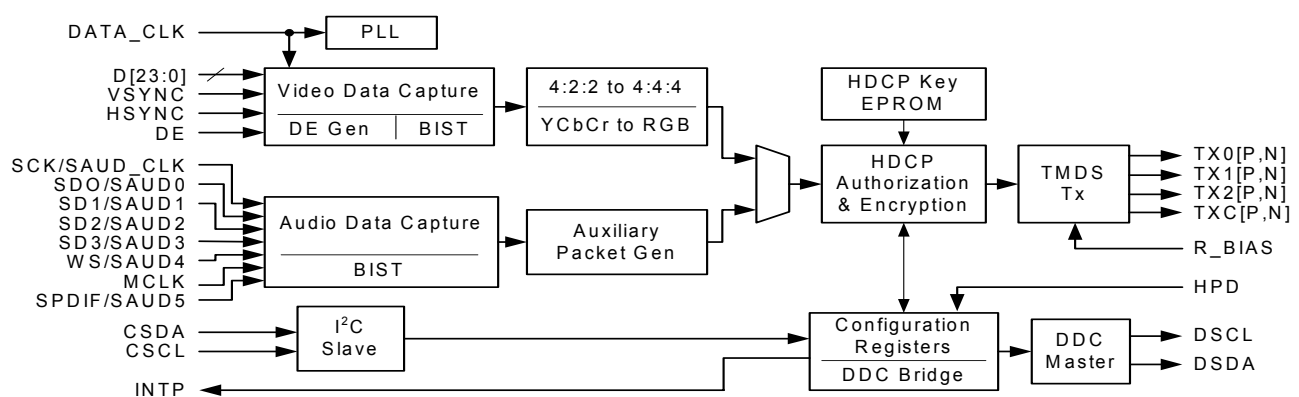
Block Diagram

Overview

HDMI has become the industry-standard interface for transporting digital video and audio between consumer electronic equipment such as DVD players, A/V receivers and digital televisions. HDMI includes the HDCP protocol to ensure protection from unauthorized duplication of copyrighted media content. The ANX9030 is compliant with the latest HDMI 1.2 standard and it also supports the optional 1-bit audio format for Super CD applications. Unique ANX9030 features include Built-in Self Test (BIST) for the video and audio streams and programmable pre-emphasis for each TMDS differential output.

Video data can be input to the ANX9030 in various 12-bit or 24-bit interface formats. Single or dual-edge clock latching is supported. Pixel rates up to 165 MHz enable video formats such as 1080p and WUXGA (1200 x 1920 at 60 Hz) with reduced blanking. HSYNC and VSYNC inputs are provided, or embedded sync can be detected when using ITU.656 format. A DE input is also provided, or a DE blanking period can be generated internally based on HSYNC timing and register settings. To comply with the 4:4:4 RGB output base level requirement of HDMI, a 4:2:2 to 4:4:4 sample rate interpolation filter is included, as well as a YCbCr to RGB color-space converter; either ITU.601 or ITU.709 color-matrix coefficients can be selected.

Audio data can be input through the serial S/PDIF interface in the format of IEC60958 (uncompressed LPCM) or IEC61937 (Dolby, DTS, etc.). Optionally, eight audio channels can be input through the four I^{2}S interfaces, or six channels of One Bit Audio through six 1-bit audio interfaces. One Bit Audio supports DSD (Direct Stream Digital) as used by Super Audio CD. Audio sample rates from 32 to 196 kHz are supported. In conformance with the HDMI standard, the audio clock rate can be asynchronous with the video pixel clock. Timing information (N and CTS values) are sent in HDMI auxiliary packets, along with audio format information, to allow the HDMI receiver to reconstruct the audio sample timing, data format and channelization.

The ANX9030 includes one HDMI transmitter (source) interface which is comprised of three TMDS data channels and one TMDS clock channel. The ANX9030 features Analogix' advanced low-jitter clock synthesis PLL architecture with firmware-configurable output swing and pre-emphasis for each TMDS channel, allowing signal optimization for long (or lower quality) cables.

The HDMI interface also includes the DDC (Display Data Channel) interface, as required for the HDMI connector, as well as the Hot Plug Detect (HPD) input.

The ANX9030 communicates with the system host micro controller through the dedicated host I^{2}C control interface. This enables the device to report media and link status, and allows device configuration and power management. The I^{2}C control interface is also used to read HDMI sink E-DID data received through the DDC link.

The HDCP encryption engine contains the encryption logic for all HDMI data (audio, video, and control). HDCP encryption and authentication is performed automatically following device initialization. Pre-programmed HDCP keys and Key Selector Vectors (KSV) are stored in embedded ROM for the encryption process. When using the ANX9030, system manufacturers do not need to purchase key sets from the Digital-Content LLC; the distribution and security of the HDCP keys are handled by Analogix.

Related Analogix Products

Product Part Number	Description
ANX9030 EV	ANX9030 Evaluation Kit
ANX9011	Single-channel HDMI receiver
ANX9021	Dual-channel HDMI receiver
ANX9801	DisplayPort transmitter
ANX9811	DisplayPort receiver