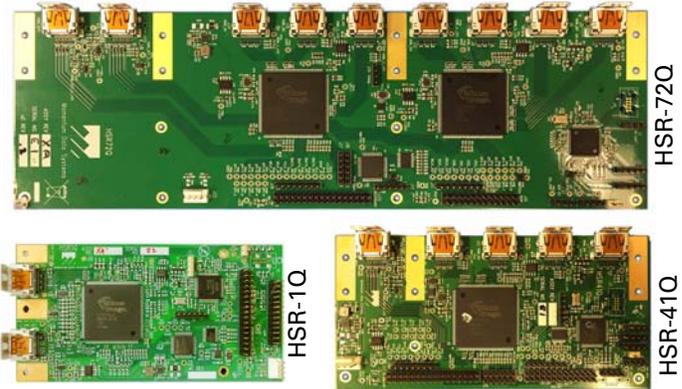


5th generation HDMI repeaters with audio extract/insert - Product Summary -



First generation HDMI products supported 165 MHz pixel rates; which allowed 1080p 60 Hz video with 8 or 12 bit/component color depth (RGB 4:4:4 and YUV 4:2:2 formats). Second generation HDMI products supported 225 MHz equivalent pixel rates, allowing for 1080p 60 Hz video with more than 8 bits/pixel for RGB. Third generation HDMI products support 300 MHz (equivalent), allowing for 4K 24/30 Hz video. The 4th generation product defined new HDCP 2.2 encryption, which the film studio industry requires to view 4K content. 5th generation products support HDMI 2.0b which include full 600 MHz 4K video and HDCP 2.2 on all inputs.

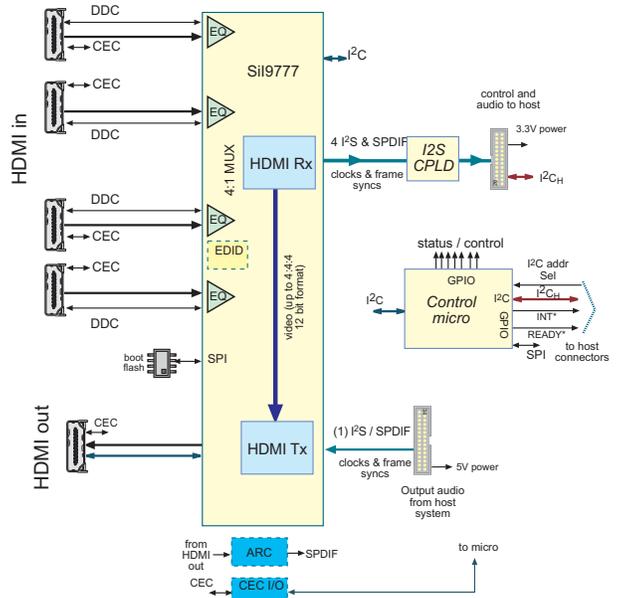
Built with the latest HDMI technology from Analog Devices or Silicon Image (now part of Lattice), MDS OEM HDMI repeater modules for AV applications offer a unique set of features for audio use.

With MDS modules manufacturers can have solutions ready for market with minimal development risk. Manufacturers can focus on the user experience and “front panel” and “rear panel” design and avoid the headaches of the high speed design and the complex software for HDMI processing.

Product Details

The feature comparison following table summarizes the 4th and 5th generation HDMI repeater products available from MDS. A separate datasheet describes MDS’ 4th gen products. All inputs feature adaptive cable EQ that supports (typical, for good quality source and cable) 10m at the highest supported data rate.

Model	Inputs	Outputs	3D	HDR	OSD	Audio Loop	DSD	ARC	CEC
HSR-82.2	8, one with HDCP 2.2 300 MHz	two 300 MHz, one with HDCP 2.2	Yes	No	Yes	Yes	Yes	Yes	Yes
HSR-41.2	4, one with HDCP 2.2 300 MHz	one 300 MHz HDCP 2.2	Yes	No	Yes	Yes	Yes	Yes	Yes
HSR-72Q	7, all with HDCP 2.2 600 MHz	one 600 MHz HDCP 2.2, one 300 MHz HDCP 1.4	Yes	Yes	No	Yes	No	Yes	Yes
HSR-41Q	4, all with HDCP 2.2 600 MHz	one 600 MHz HDCP 2.2	Yes	Yes	No	Yes	No	Yes	Yes
HSR-1Q	one 600 MHz HDCP 2.2	one 600 MHz HDCP 2.2	Yes	Yes	No	Yes	No	Yes	Yes



HSR-41Q Block Diagram

The HDMI inputs and outputs support the mandatory video features found in the HDMI 2.0 specification at equivalent frequencies up to 600 MHz, which include 4K 60 Hz as well as HDR (10 bit). High quality Tyco HDMI connectors are used to ensure reliable connector operation over the life of the product.

Audio extract/insert

All MDS HDMI repeater products extract the audio (as four I²S lines along with a SPDIF line) for local processing. The audio decoder can then provide a downmixed stereo PCM signal for the HDMI transmitter.

Common design

The HSR-1Q, HSR-41Q and HSR-72Q are mechanically compatible with the 2nd and later generation MDS HDMI products. The same connector signals are used, though there are slightly different operational characteristics due to the HDMI parts used.

The software API for the three models are likewise a superset of the earlier generation products. This commonality in hardware and software allows system designs to easily incorporate any MDS HDMI repeater product.

HDMI switcher/repeater modules

Flexible EDID control

An HDMI repeater device would not function well in the real world if it simply assumed the two connected HDMI sink devices support the same capability. For example, an HDMI source might need to route to an audio system and a projector. The projector might only support stereo PCM audio.

If the repeater blindly took the lowest common format among the connected sink devices, the audio system would always be fed 2 channel PCM data by the source instead of surround sound (compressed) data.

The cards can be set to assign input audio formats different from the sink device(s) supported formats.

As with the HSR-82.2, the 2nd output on the HSR-72Q can not pass 4K video. It is suggested that this port be used for audio only to avoid customer confusion in a 4K product.

HDCP 2.2

All three models support HDCP 2.2 on all inputs to support the latest 4K media devices.

HDCP 2.2 introduces a large number of new restrictions on viewing content and can lead to unexpected problems in whole home or commercial installations with a mix of device capabilities. MDS products automatically attempt to avoid as many issues as possible, but can not correct for faulty source devices.

Four input switcher single output repeater

MDS offers a four input, one output switcher/repeater modules, the HSR-41Q.

The HSR-41Q can loop audio from input to output; for AV Receiver applications the general mode of operation is that the decoder would be fed the (Dolby/DTS) encoded input and supply a stereo (PCM) downmix for the sink device.

Mechanically the HSR-41Q can mount into the same set of holes as the HSR-72Q, simplifying chassis designs when two different configurations may be desired.

The HSR-41Q supports pass through of the mandatory 3D formats defined in the HDMI 1.4 specification. The ARC feature is supported but requires a full CEC implementation of the Audio System logical device as defined in the HDMI specification.

The HSR-1Q is a narrower board than the HSR-41Q with just one input connector, but otherwise is identical.

Seven input switcher repeater

Many AV applications require sending video to one location and audio to another. The 72Q's output can be used for this purpose, or to create a second copy of video for non-4K applications. CEC and ARC are only supported on the pri-



HSR-41Q HDMI switcher/repeater

mary output, the CEC specification does not support multi-output repeaters. The other specifications on the HSR-72Q are the same as the HSR-41Q.

Developing with MDS HDMI modules

MDS offers an evaluation kit that provide everything needed to evaluate the modules and start code development on your host processor.

The kit include the module (mounted to a base), interconnect cables, power supply, a (generic) host side API library, and a microprocessor based demonstration program to simplify experimentation.

Host connectors

A 26 pin IDC (.1") connector carries primary 3.3V power, the I²C control signals, and the audio signals received by the card.

Note that the audio data may be invalid due to the source creating bad data or things like cable disconnects. Users of the audio data should check status to mute during recognized invalid data periods and be prepared to handle audio clock discontinuities.

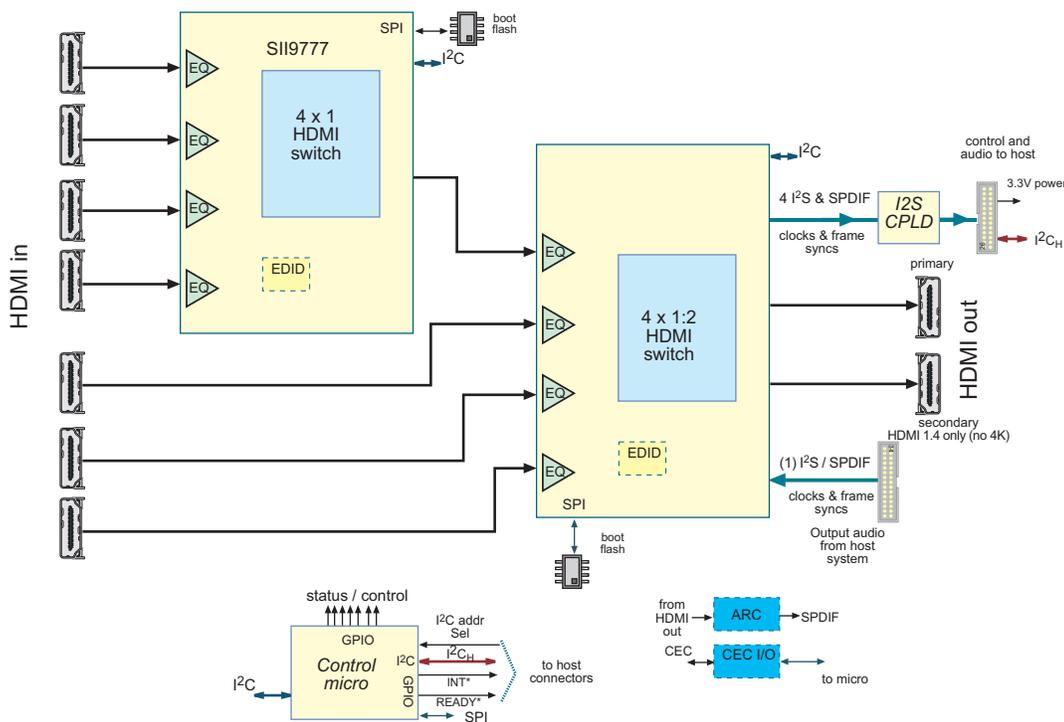
MDS Alpha messaging control protocol

All products uses the same I²C based messaging protocol used on other MDS OEM products. Users of those products will find the HDMI modules easy to control; users new to the MDS alpha messaging protocol can start with supplied C++ based examples that can be recompiled to run on typical embedded 32 bit microcontrollers.

Board integration

The boards require 3.3 and 5V power. In addition to the I²S related signals, connection to I²C clock/data, and a (board to host) interrupt line are needed. The board's reset input should only be released once the supplies are stable and the host is ready to start interacting with the board. For full details the relevant hardware manual should be consulted.

HDMI switcher/repeater modules



HSR-72Q Block Diagram

Audio subsystem differences from 4th generation boards

The Silicon Image (now Lattice) devices used in these boards only offer a subset of the audio capabilities of the ADI devices previously used. Key differences to note for customers using this as an upgrade are as follows.

The audio clock interruptions are different, the Lattice part does not maintain valid clock. MDS has added a CPLD to make the board act more like existing MDS HDMI products, but existing systems should be thoroughly reevaluated with the new boards.

As noted in the summary table the Lattice HDMI parts do not support DSD.

Only one I2S line (i.e. stereo) is available for audio output with the Lattice part, versus 4 I2S in the prior generation boards. As the output normally only carries a stereo mix-down this should not affect operation. Internally to the HDMI chip all audio can be passed through for a bypass mode.

Evaluation kit

To gain experience with integrating MDS HDMI products into your system design, MDS offers an evaluation kit that includes the selected HDMI repeater board and the adapter board shown on the last page.

Using this board and the provided software the HSR can be controlled and configured without the need to have your own host application code running yet.

Pass through connectors allow connecting to your audio subsystem but still use the MDS provided software for control and status monitoring. Alternately the EVM board can be setup for loopback of received HDMI audio to the output.

An audio DAC is connected to the primary I2S input line to allow playback of 2 channel stereo PCM without need to connect external devices. Likewise a SPDIF in and out allows for easy experimentation before connecting into a more complex system.

MDS HDMI testing of a final customer unit

MDS must be supplied with a final unit to run a range of mandatory HDMI tests to ensure conformance with the HDMI licensing rules. Customers with their own HDMI license can do their own family product self certifications.

Two levels of testing are possible, a basic test for cases where CEC is not being used, and a combined basic plus CEC test for units that will use CEC (use of ARC requires CEC). Typical test periods run from 1 to 3 days, unless problems are found, which is unlikely in the basic tests but possible in the CEC test as the host software must process and respond to a range of possible CEC messages.

HDMI switcher/repeater modules

Ordering information

Minimum order quantity of standard OEM boards is 50 pieces. Please contact MDS' OEM sales manager for details.

HSR-72Q 7 input, HDMI switcher/repeater. One 600 MHz full featured output.

- HDMI 1.4 & 2.0b mandatory formats
- Up to "4K" pixel rates at 24-60 Hz (4:4:4)
- 4K 4:2:0 format video at 60 Hz
- Up to 12 bit Deep Color and HDR
- All typical colorspace supported
- Audio extraction/injection (I2S standard) and loop through
- CEC switch and Audio System device support
- ARC (primary output)

HSR-41Q: 4 input HDMI switcher/repeater.

- HDMI 1.4 & 2.0b mandatory formats
- Up to "4K" pixel rates at 24-60 Hz (4:4:4)
- 4K 4:2:0 format video at 60 Hz
- Up to 12 bit Deep Color and HDR
- All typical colorspace supported
- Audio extraction/injection (I2S standard) and loop through
- CEC switch and Audio System device support
- ARC (primary output)

HSR-1Q: single input HDMI switcher/repeater.

- Same as 41Q except single input

The actual allowed input format is determined by the sink device(s) connected to the unit, the above descriptions define the maximum available capability.

Video using Dolby's proprietary HDR video format is passed by the board as that format is designed to be backwards compatible. To license Dolby's video products please contact Dolby for more information.

Related products

#-EVM-KIT: Add this suffix to the above for the developer/eval kit

- Selected board
- IDC cables
- Eval adapter board with USB port to I²C feature to allow control from a PC 'terminal'
- Control API documentation
- Example code
- Connector, power, and mechanical information
- Power supply (110/220 universal input brick)

HTEST-BASIC: HDMI product family self certification test

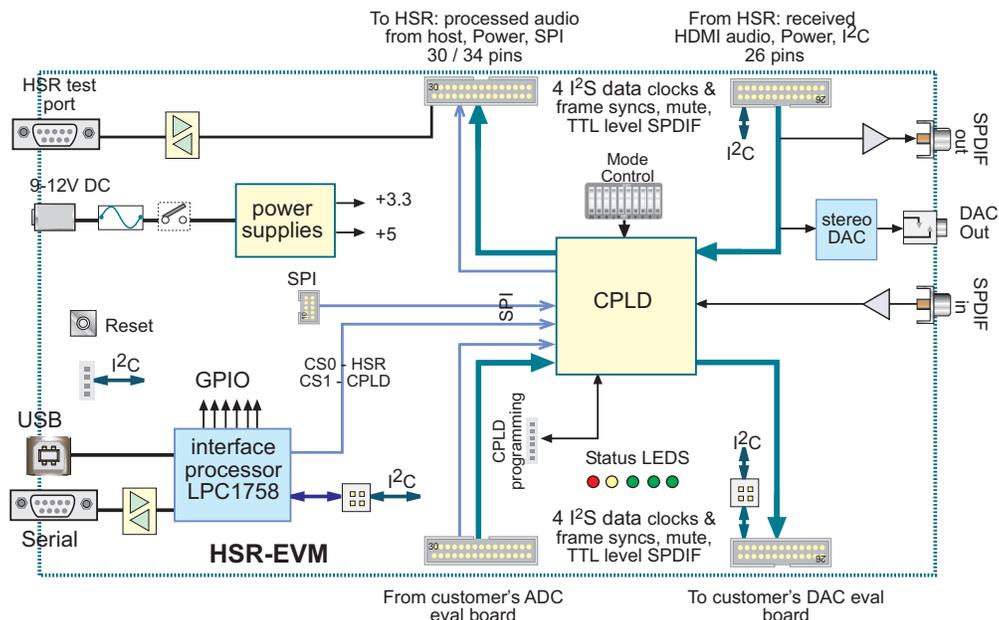
HTEST-CEC: For HDMI product using CEC (or ARC), verification of proper CEC handling

Licensing

These products use licensed technologies and are only available for sale to authorized audio / video companies. Please contact MDS for more information.

Trademarks:

Dolby is trademark of Dolby Laboratories, Inc., DTS is a trademark of Digital Theater Systems, Inc. HDMI, the HDMI logo and High-Definition Multimedia Interface are trademarks or registered trademarks of HDMI Licensing LLC. HDCP is a trademark of Digital Content Protection, LLC. x.v.Color is a trademark of Sony. DAE and DAE-8 are trademarks of MDS.



Eval kit adapter board