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## 6<sup>TH</sup> GENERATION HDMI REPEATERS WITH AUDIO INSERTION/ EXTRACTION—PRODUCT SUMMARY

1<sup>st</sup>-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). Four subsequent generations of HDMI products added support for evolving specifications covering ever-higher video carrier frequencies, bit-depths and color spaces—including the seemingly now-forgotten 3D formats—along with updates to HDCP content copy-protect schemes.

Built with the latest HDMI technology from ITE Technology Corp., MDS' new 6<sup>th</sup> generation "T" Series of 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 data layout and complex software required for HDMI processing.

### HSR-41T



#### Four-Input Switcher, Single-Output Repeater

- Up to 12-bit Deep Color and HDR
- All typical color spaces supported

- Audio extraction/injection (I<sup>2</sup>S standard) and loop through
- HDMI 1.4 & 2.0b mandatory formats
- HDCP 2.3 for all ports
- Up to "4K" pixel rates at 24-60 Hz (4:4:4)
- 4K 4:2:0 format video at 60 Hz
- ARC/ CEC support
- Enhanced ARC (eARC) support
- DSD Audio extraction support
- Low-Power Standby Mode support

The HSR-41T 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.

### HSR-82T



#### Eight-Input Switcher, Dual-Output Repeater

- Two 600 MHz full-featured outputs
- Up to 12-bit Deep Color and HDR
- All typical color spaces supported
- Audio extraction/injection (I<sup>2</sup>S standard) and loop through
- HDMI 1.4 & 2.0b mandatory formats
- HDCP 2.3 for all ports
- Up to "4K" pixel rates at 24-60 Hz (4:4:4)
- 4K 4:2:0 format video at 60 Hz
- Audio extraction/injection (I<sup>2</sup>S standard) and loop through
- ARC/ CEC support
- Enhanced ARC (eARC) support
- DSD Audio extraction support
- Low-Power Standby Mode support



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Many AV applications require sending video to one location and audio to another. The HSR-82T's outputs can be used for this purpose, or to send a copy of video to a secondary display.

On the HSR-82T, both dual-outputs are capable of passing full video resolutions and up to HDCP 2.3-protected content.

ARC, eARC and CEC are supported on the primary output only.

The 8:2 configuration is standard; however, both 7:2 and 9:2 can be ordered as custom build options.

The 9<sup>th</sup> input then resides on the opposite (forward) edge of the pcb from the other 8 rear-panel inputs, to facilitate a front-panel HDMI input.

## COMMON DESIGN

The HSR-41T and HSR-82T 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 T series is 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.

## PRODUCT DETAILS

The HDMI inputs and outputs support the mandatory video features found in the HDMI 2.0b specification at equivalent frequencies up to 600 MHz, which include 4K-60 Hz as well as various HDR formats.

Both ARC (2-channel PCM/ S/PDIF audio return from the display) and Enhanced ARC (more commonly, eARC—multi-channel PCM and Bitstream audio return from the display) are supported.

The HSR implements support for necessary housekeeping CEC functions without Host intervention. Higher level CEC functionality for the Amplifier logical device will require interaction

between the HSR and the Host system.

Content bearing Dolby's proprietary Dolby Vision HDR format is supported by the HSR-T boards. To become licensed for featuring Dolby Video support in your product's marketing and labeling, please contact Dolby Licensing Sales for more information.

All inputs feature adaptive cable EQ for minimization of potential in-field inter-operability issues between different manufacturers' products.

High quality Tyco HDMI connectors are used to ensure reliable connector operation over the life of the product.

## AUDIO INSERT/ EXTRACT

All MDS HDMI repeater products can either pass through or extract the audio input (as four I<sup>2</sup>S lines along with a S/PDIF line) for local processing. The audio decoder can then provide a downmixed stereo PCM signal for the HDMI transmitter. Audio can be inserted into one output port.

## HDCP

HSR-T series models feature latest HDCP 2.3 copy-protection on all inputs and outputs so as to support the latest 4K media devices.

Previously, HDCP 2.2 introduced more complex methods for device "hand-shaking," which could lead to unexpected problems in whole home or commercial installations having a mix of device capabilities.

MDS' HSR products automatically attempt to avoid as many issues as possible, but cannot always correct for faulty source devices or HDMI cabling.

## HOST CONNECTORS

A 26 pin IDC (.1") connector carries primary 3.3V power, the I<sup>2</sup>C 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.

## ALPHA MESSAGING CONTROL

All products use the same I<sup>2</sup>C 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 I<sup>2</sup>S-related signals, connection to I<sup>2</sup>C 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.

## EVALUATION KIT

To gain experience with integrating MDS HDMI products into your system design, MDS offers an "EVM" evaluation kit that includes the selected HDMI repeater board and the adapter board shown below (see also block diagram pg. 4).

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 I<sup>2</sup>S input line to allow playback of 2 channel stereo PCM without need to connect external devices. Likewise, S/PDIF in and out allow for easy experimentation before connecting into a more complex system.

The kit includes the target HSR and EVM modules (mounted to a base), interconnect cables, power supply, a (generic) host side API library, and a microprocessor-based demonstration program to simplify experimentation. An allowance of up to 8 hours of online MDS senior video engineering support is included in the system price.



*HSR-EVM development board*

## ORDERING INFORMATION

Minimum production order quantity of standard OEM HSR modules is 25 units. Initial engineering and development quantities can also be arranged. Please contact MDS' sales team for further details.

## LICENSING

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

As a licensed HDMI and HDCP Adopter, MDS is authorized to sell its HSR solutions to non-Adopter "re-sellers," under the provision that said re-seller cannot use the official HDMI logo on its products or marketing materials.

## LICENSING (CONT.)

Re-seller must sign a legal agreement with MDS which testifies that the HSR will not be modified in any way nor copy-protection disabled.

Reseller must also supply MDS with a pre-production sample unit on which to run a range of mandatory HDMI tests, to ensure and document conformance with the HDMI licensing rules. 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).

Customers with their own HDMI license can do their own family product self-certifications.

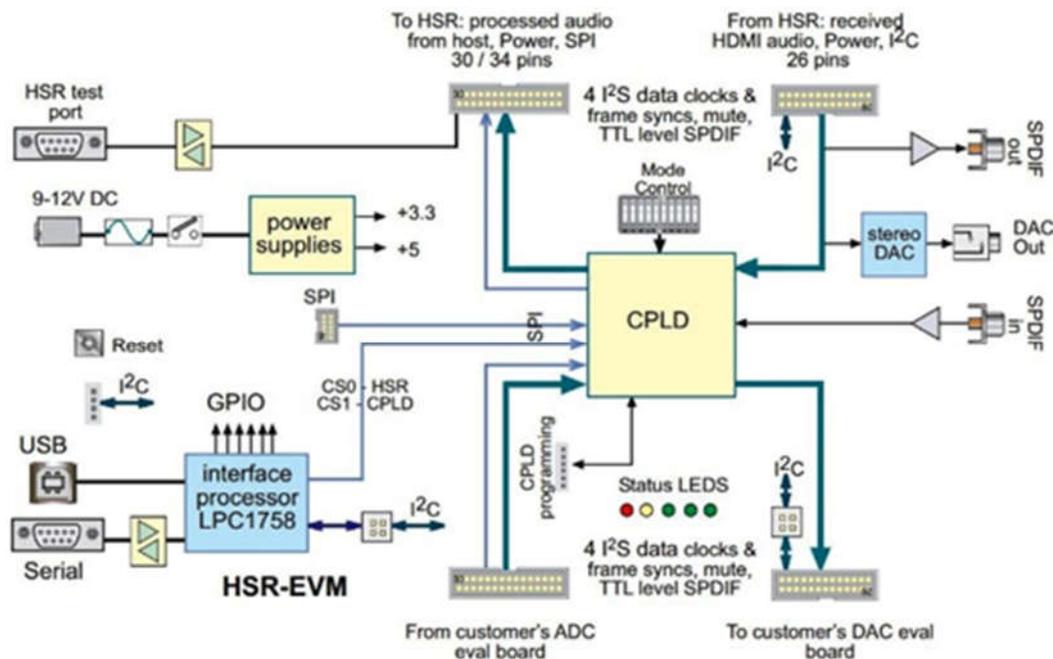
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HSR-EVM

HSR-T, Rev1c. 2019-Preliminary-Specifications subject to change.