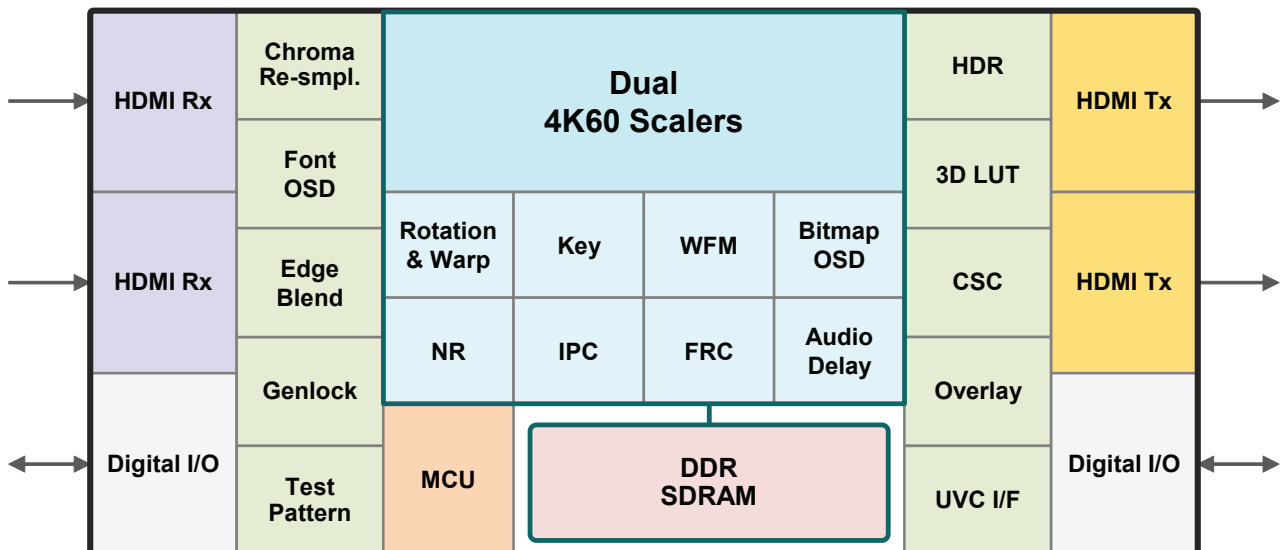
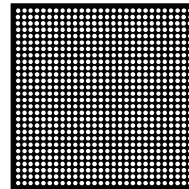


# 4K60 Video Display Processor of Dual Scalers

with Embedded SDRAM

## MDIN-620



- ◆ **MDIN-620** is a highly integrated SoC that can do UHD(4K60) video processing for dual scalers with embedded SDRAMs. It includes many I/O interfaces, such as dual HDMI receivers, dual HDMI transmitters, dual digital video I/O ports, digital audio ports, and a USB/UVC controller interface. The video resolution of the I/O interface is up to 4096x2160@60Hz for progressive video and up to 1080i for interlaced video.
- ◆ **MDIN-620** provides a lot of functions including, up/down scaling, seamless switching, frame rate conversion, deinterlacing, HDR/SDR conversion, any degree rotation, warping, edge blending, genlock, up/downstream color keying, waveform display, vectorscope, histogram display, keystone correction, bitmap OSD & font OSD, and noise reduction. MDIN-620 supports YCbCr(4:4:4 or 4:2:2) and RGB 4:4:4 color processing with 8/10/12-bit precision per color component.
- ◆ **MDIN-620** is suitable for many industry 4K60 video products, such as digital signage, converter box, broadcast monitor, video projector, and video presentation systems.

# Main Features

- ◆ Dual HDMI Receivers & Dual HDMI Transmitters
- ◆ Two Digital Video Input/Output Ports
- ◆ I<sup>2</sup>S and SPDIF Digital Audio Input & Output
- ◆ Dual Scalers
- ◆ Warping & Rotation
- ◆ Keystone Correction with Edge Blending

- ◆ Frame Rate Conversion
- ◆ HDR Conversion
- ◆ Bitmap OSD & Font OSD
- ◆ Luma & Chroma Keying
- ◆ Waveform Monitor, Vectorscope & Histogram display
- ◆ Embedded 32-bit MCU and SDRAM

# Specifications

## HDMI Receiver & Transmitter

Dual HDMI Receiver ports & Dual HDMI Transmitter ports  
Support up to 4096x2160@60Hz Video  
Max. 18Gbps per HDMI port  
HDMI 1.4/2.0 compliant  
250Mbps ~ 6.0Gbps per channel  
Fully compliant with HDMI Repeater  
DVI 1.0 backward compatible  
HDCP 1.4/2.x compliant  
HDCP Repeater capability  
Pre-programmed HDCP 1.4 & 2.x device key  
HDCP 1.4 to/from HDCP 2.x conversion  
On-chip EDID RAM  
RGB 4:4:4, YCbCr 4:4:4/2:2/4:2:0  
8/10/12-bit per color component (Deep color)

## Digital Video Input & Output

In : Up to 4096x2160@60Hz, Max. 600MHz pixel rate  
Out : Up to 4096x2160@30Hz, Max. 300MHz pixel rate  
Up to 4096x2160@60Hz, Max. 600MHz pixel rate (MDIN-620R1)  
RGB/YCbCr 4:4:4 24/30/36-bit  
YCbCr 4:2:2 8/10/12/16/24-bit(Y/C Multiplexed or Separated)  
Single/Dual-edge & Single/Dual-pixel clock mode

## USB/UVC Controller Interface

MJPEG compressed video output up to 4K@60Hz for YC 4:2:2  
Uncompressed video output up to 4K@20/30Hz for YC 4:2:2/4:2:0  
2-channel 48KHz PCM audio output

## Audio Input & Output

Four sets of digital audio input and output port  
8-channel I<sup>2</sup>S and 1-channel SPDIF per digital audio port  
I<sup>2</sup>S & SPDIF : Up to 192kHz  
Flexible switching among digital audio in/out and HDMI Rx/Tx audio  
Adjustable audio delay for A/V synchronization

## Format Conversion

Independent H&V scaling with arbitrary scaling ratio  
Down-scaling ratio : Up to x1/127  
Up-scaling ratio : Unlimited(no rotation) or Up to x8(45° rotation)

## Warping

Video warping with image size up to 4096x2160  
Any angle rotation with minimum 0.01° step  
Keystone correction  
Edge blending with horizontal and vertical overlap at a time

## Display Functions

Zoom, PIP, POP  
Seamless video scaling & switching  
Video-to-video blending with 64 level blending ratio  
Lock-to-input sync mode or free-run mode  
Programmable output sync generation

## Frame Rate Conversion

Frame rate conversion from 3-250Hz to 3-250Hz  
Conversion ratio : x1/31 ~ x31

## Image Processing

HDR conversion for HDR10 & HLG  
3D LUT for accurate color management  
Gamma, brightness, contrast, hue, and saturation control  
Motion adaptive 3D Deinterlace  
2D/3D noise reduction  
Overlap area edge blending  
High order programmable horizontal and vertical peaking filter  
Dithering for 12/10-bit to 10/8-bit output

## Bitmap OSD & Font OSD

Bitmap OSD & Graphic Accelerator  
Max. 6 layers with 1 cursor and 1 background layers  
1/2/4/8-bit indexed color mode & 16/24/32-bit full color mode  
32-level pixel based alpha blending  
Graphic acceleration for rectangle fill/copy & character drawing  
Font OSD  
SRAM based Font OSD with Max. 128 horizontal and 64 vertical fonts  
Fixed Font Size of 24x32, 32x32, 48x64 or 64x64  
Variable horizontal font size  
Rotation of 90°/180°/270°

## Keying

Upstream Key 1 layer, Downstream Key 1 layer  
Key tolerance control  
Despill & Key filter  
Internal key generation  
Transition with various patterns

## Signal Monitor Functions

Waveform, Vectorscope, and Histogram display  
Up to 4 display windows & R/G/B or Y/Cb/Cr display for each window  
Zebra and color pattern display  
Focus Assist  
Blue-only & Mono-only display

## MCU and Communication Interface

Embedded 32-bit MCU  
External serial flash memory interface with Quad-bit SPI master  
External host interface with 4-wire SPI and 2-wire I<sup>2</sup>C

## Miscellaneous

Auto detection of input video/sync  
Internal programmable PLLs  
Genlock to external video sync

## Electrical and Mechanical Characteristics

1.0V/1.2V/1.8V/3.3V supply voltage  
784-ball BGA package (29mm x 29mm, 1.0mm ball pitch)