The 5th Gen. Full HD In/Out Video Display Processor with Embedded Memory and HDMI Output

MDIN-340

◆ **MDIN-340** is a highly integrated single chip implementation of deinterlacing, format conversion, video enhancement and graphic OSD.

◆ **MDIN-340** receives any format of interlaced scan video up to 1080i and progressive scan video up to full-HD, and performs deinterlacing and format conversion to produce any desired format of interlaced or progessive scan video up to full-HD with excellent signal quality preservation.

◆ **MDIN-340** provides high quality edge preserving deinterlacing with the 5th generation motion adaptive 3-D deinterlacing algorithm and performs proper processing for various speed motion and film video sources.

◆ **MDIN-340** provides a versatile 2-D graphics engine with bitmap and character mode.

◆ **MDIN-340'**s high quality deinterlacing, format converting, video enhancement and OSD capability are suitable for digital display applications such as digital video recorder(DVR), IP camera, set-top-box, DVD player, Blu-ray player, TV box, AV receiver and scan converter system.

Macro Image Technology

Main Features

- Two digital video input ports for up to 10-bit precision interlaced or progressive scan video up to Full HD
- 4 I^{2}S and one S/PDIF audio input ports
- Analog RGB/component and HDMI output(ver. 1.3)
- Pixel-by pixel level motion adaptive 3-D deinterlacing
- Advanced multi-directional edge preserving deinterlacing
- Deinterlacing with various speed motion and still image detection and processing
- Robust film sequence, bad-edit and subtitle detection and processing
- MPEG noise(block noise and mosquito noise) reduction
- Cross-color suppression(CCS) for 2-D comb-filter video decoder
- Automatic chroma upsampling error(CUE) detection and correction
- Independent horizontal and vertical scaling with anti-aliasing interpolation filter
- Horizontal peaking filter and color enhancement processing for crisper picture quality
- Programmable brightness, contrast, hue, saturation control with adaptive contrast enhancement
- 2 layer OSD with 4 sprites per layer(bitmap and character mode)
- Cost and size effective embedded frame memory
- Serial(I^{2}C) host bus interface
- 144-pin FBGA package(12mm x 12mm) and Pin-compatible with MDIN-240/241H

Specifications

Video Input
Digital format with up to 10-bit precision
Input resolution : Full HD support
    Interlaced video up to 1920x1080i(1920x1152i)
    Progressive video up to 1920x1080p(1920x1152p)
Video format : Sub-sampling type : RGB/YCbCr 4:4:4 or YCbCr 4:2:2
              Y/C type : Multiplexed(BT.656) or separated(BT.601)
              Sync type : Separated or embedded(BT.1120 or BT.656)
              Digital input : 24-bit(4:4:4) or 8/10/16/20/24-bit(4:2:2)

Video Output
Analog format with triple 10-bit DACs HDMI(ver. 1.3)/DVI
Output resolution : Full HD support
    Interlaced video up to 1920x1080i(1920x1152i)
    Progressive video up to 1920x1080p(1920x1152p)
Video format : Sub-sampling type : RGB/YCbCr 4:4:4 or YCbCr 4:2:2
              Y/C type : Multiplexed(BT.656) or separated(BT.601)
              Sync type : Separated or embedded(BT.1120 or BT.656)
Analog video output with triple 10-bit DACs(separate sync or sync on G/Y)

Deinterlacing
Motion adaptive 3-D deinterlacing on a per-pixel basis
Advanced multi-directional edge preserving
Various speed motion and still image detection
Motion boundary preserving
Film mode support for 3:2 and 2:2 pull-down
Bad-edit/subtitle detection and adaptation

Noise Reduction and Cross Color Suppression
MPEG noise(block noise and mosquito noise) reduction
Cross-color suppression for 2-D comb-filtered input(CCS)
Automatic chroma upsampling error(CUE) detection and correction

Format Conversion
Independent horizontal and vertical scaling with anti-aliasing interpolation filter
8(H) x 4(V) taps for luma, 4(H) x 4(V) taps for chroma
Format conversion from one format to another format with an arbitrary scaling ratio
Scaling ratio : x1/15 ~ unlimited
Non-uniform scaling for panorama mode
Programmable size & position zoom in/out

Display Functions
CSC for brightness, contrast, hue, saturation
Programmable output sync generation
Lock-to-input sync mode or free-run mode
Video overlay on background video

Frame Rate Conversion
Frame rate conversion from 3-250Hz to 3-250Hz
Conversion ratio : x1/31 ~ x31
Uses double frame buffer

Video Enhancement
High order programmable horizontal peaking filter
Filter for color component enhancement
LTI and CTI for edge enhancement
Independent color control(ICC)
Dynamic contrast enhancement(DCE)

OSD
Four layers : Two layers with 4 sprites per layer
             One cursor and one background layer
Up to 256-color palette mode bitmap
16, 24 or 32-bit full color mode bitmap
Sprite, palette or pixel based alpha blending
Up to 32 x 63 font size, and 1-bpp or 4-bpp font color
32-row x 16-col or 16-row x 32-col character map
Bitmap fill, copy and run-length decoding

HDMI/DVI Transmitter
Industrial standard compliant HDMI 1.3, DVI 1.0, EIA/CEA-861D and HDCP 1.2
Deep color(36-bit) and xvYCC support
I^{2}C master interface for DDC connection
Integrated HDCP cipher engine and pre-programmed HDCP keys
Hot plug detection for monitor/TV interface
Four I^{2}S audio inputs : 2Ch. 192kHz or 8Ch. 96kHz
Audio up-sampling for HDMI standard
Industrial audio standard support :
        IEC60958 for PCM
        IEC61937 compressed audio(Dolby Digital, DTS and etc.)
Adjustable audio delay for A/V synchronization(up to 680ms at 48kHz)
Built in consumer electronics control(CEC) support

Frame Buffer Memory
Embedded frame buffer memory

Communication Interface
2-wire serial interface-I^{2}C

Miscellaneous
Auto detection of input video/sync
Internal programmable PLLs
Genlock to background video sync
Built-in test pattern generation logic
PWM control for flat panel display

Electrical and Mechanical Characteristics
1.2, 1.8V & 3.3V supply voltage
Low power consumption
144-pin FBGA package(12mm x 12mm/0.8mm pitch)
Pin-compatible with MDIN-240/241H