

# The 4th Generation SD to Full-HD Up-converter

## MDIN-200



iMARV™

- ❖ **MDIN-200** is a highly integrated single chip implementation of deinterlacing, format conversion and video enhancement. It converts SD video to higher resolution format, up to full-HD.
- ❖ **MDIN-200** provides two digital input ports for 10-bit precision interlaced or progressive scan video, and one analog and digital output port with 10-bit precision progressive or interlaced scan video.
- ❖ **MDIN-200** receives any format of input video and performs deinterlacing and format conversion to produce any desired format of progressive and interlaced scan video with excellent signal quality preservation.
- ❖ **MDIN-200** provides high quality edge preserving deinterlacing with the 4th generation motion adaptive 3-D deinterlacing algorithm and performs proper processing for fast motion and film video sources.
- ❖ **MDIN-200** provides high quality 3-D noise reduction with preserving details, and it also provides cross-color suppression.
- ❖ **MDIN-200's** high quality deinterlacing, format converting and video enhancement capability is suitable for digital display applications such as set-top-box, DVR(digital video recorder), DVD player, and scan converter system.

*The Macro Image Technology's proprietary iMARV technology makes **MDIN-200** the highest quality up-converter.*

# Main Features

- ◆ Two digital video input ports for 10-bit precision interlaced or progressive scan video
- ◆ Digital and analog component video output with 10-bit precision progressive or interlaced scan video
- ◆ Motion adaptive 3-D deinterlacing with pixel-by-pixel level motion adaptive interpolation
- ◆ Advanced multi-directional edge preserving deinterlacing
- ◆ Deinterlacing with fast motion, slow motion and still image detection and processing
- ◆ Deinterlacing with film mode, bad-edit and subtitle detection and processing
- ◆ 3-D noise reduction filter with cross-color suppression
- ◆ 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
- ◆ 1 layer OSD with 16 colors and 4 sprites(bitmap and character mode)
- ◆ Seamless interface to 64Mbit SDRAM(2M x 32bit or 4M x 16bit) widely available in the market
- ◆ Serial I<sup>2</sup>C bus interface
- ◆ 176-pin LQFP package(24mm x 24mm)

# Specifications

## Input Format

Digital format with 10-bit precision

Resolution : Interlaced scan 720x480i@60Hz or 720x576@50Hz  
Progressive scan up to 1280x1024p@60Hz

Video format : RGB/YCbCr 4:4:4 or YCbCr 4:2:2  
YC Type : Multiplexed(BT.656) or Separated(BT.601)  
Sync type : Separated or Embedded(BT.656/BT.1120)  
Digital input : 24-bit(4:4:4) or 8/10/16/20-bit(4:2:2)

## Output Format

Digital and analog format with triple 10-bit DACs

Resolution : Interlaced scan up to 1920x1080i  
Progressive scan up to 1920x1080p

Video format : RGB/YCbCr 4:4:4 or YCbCr 4:2:2  
YC Type : Multiplexed(BT.656) or Separated(BT.601)  
Sync type : Separated or Embedded(BT.656/BT.1120)  
Digital output : 24-bit(4:4:4) or 8/10/16/20-bit(4:2:2)

Analog video output with triple 10-bit DACs(Separated sync or Sync on G/Y)

## Deinterlacing

Deinterlacing for interlaced scan video

Motion adaptive 3-D deinterlacing on a per-pixel basis

Programmable motion detection and adaptation control

Adaptive motion-weighted interpolation for eliminating non-motion artifacts

Advanced multi-directional edge preserving

Fast motion, slow motion and still image detection

Motion boundary preserving

High frequency area detection and adaptation

Film mode support for 3:2 and 2:2 pull-down

Bad-edit detection and adaptation

Programmable setting of subtitle area and artifacts elimination

## Noise Reduction and Cross Color Suppression

High quality 3-D noise reduction with motion detection

Cross-color and cross-luminance suppression

## Format Conversion

Independent horizontal and vertical scaling with antialiasing interpolation filter

Format conversion from one format to another format with an arbitrary scaling ratio

Scaling ratio : x1/15 ~ unlimited

Programmable size & position zoom in/out

## Frame Rate Conversion

Frame rate conversion from 3-250Hz to 3-250Hz

Conversion ratio : x1/31 ~ x31

Uses external frame buffer

## Display Functions

Brightness, contrast, hue and saturation control

Programmable output sync generation

Lock-to-input sync mode or free-run mode

## Signal Enhancement

High order programmable horizontal peaking filter

Filter for color component enhancement

LTI and CTI for edge enhancement

Programmable gain control & coring

Adaptive contrast enhancement

## OSD

One layer with 4 sprites

16-color with 32-level 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 copy and run-length decoding

## Frame Buffer Memory

64Mbit external SDRAM

16-bit or 32-bit data width interface

## Communication Interface

I<sup>2</sup>C Slave, Max 400kHz

## Miscellaneous

Auto detection of input video/sync

Internal programmable PLLs

Built-in test pattern generation logic

## Electrical and Mechanical Characteristics

1.8V & 3.3V supply voltage

176-pin LQFP package(24mm x 24mm)