IMARV™

The 5th Generation Video Display Processor with Embedded Memory and HDMI/CVBS Output

MDIN-325/340

Brief sheet

Version 0.3

Preliminary

2010-Feb-25

Macro Image Technology
Overview

MDIN-325/340 is a highly integrated single chip implementation of deinterlacing, format conversion, video enhancement and graphic OSD. It receives any format of interlaced scan video up to 1080i and progressive scan video up to full-HD, and performs deinterlacing and/or format conversion to produce any desired format of interlaced or progressive scan video up to full-HD with excellent signal quality preservation. Macro Image Technology’s proprietary iMARVTM technology 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-325/340 also provides a versatile 2-D graphics engine with bitmap and character mode. MDIN-325/340’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.

Main Features

- Two digital video input ports for up to 12-bit precision interlaced or progressive scan video
- 4 I2S and one S/PDIF audio input ports (MDIN-340 Only)
- Digital video output, analog VGA/Component output, HDMI ver. 1.3 output (MDIN-340 Only) and CVBS video output (MDIN-325 Only),
- 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
- 3-D and MPEG noise reduction filter with cross-color suppression
- 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
- 4-layer OSD with indexed mode and 2- or 16-color character mode
- Cost and size effective embedded frame memory
- Serial (I-C) host bus interface
- 144-pin FBGA packages (12mm x 12mm)

MDIN325 : Footprint compatible with MDIN-220) and MDIN340 : Footprint compatible with MDIN-240

Block Diagram
Specifications

Video Input
- Digital format with up to 12-bit precision
- Input Resolution
  - Interlaced video : up to 1920x1080i
  - Progressive video : up to 1920x1080p
- 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 : Separate or embedded (BT.1120)
  - Digital input: 36/30/24-bit(4:4:4) or 8/10/16/20/24-bit(4:2:2)
    (Compatible with 4 channel video decoder output)

Video Output
- Digital and analog format with triple 10-bit DACs
- Output Resolution
  - Interlaced video : up to 1920x1080i
  - Progressive video : up to 1920x1080p
- 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 : Separate or embedded (BT.1120)
  - Digital output (MDIN325 Only):
    36/30/24-bit(4:4:4) or 8/10/16/20/24-bit(4:2:2)
    Single/Dual mode output
- Analog video output with triple 10-bit DACs
  (Separate sync or Sync on G/Y)
- CVBS(NTSC/PAL) video (MDIN325Only)
- HDMI(ver. 1.3) output (MDIN340 Only)

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
- High quality 3-D noise reduction with motion detection
- MPEG 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)x4(V) taps for luma, 4(H)x4(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
- PIP and POP display
- 3x3 or 4x4 multi-window with one active video

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

Signal 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 32x63 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(MDIN340 Only)
- Industrial Standard Compliant
  HDMI 1.3, DVI 1.0, EIA/CEA-861D and HDCP 1.1
- Deep color 36-bit color depth(xvYCC) support
- I2C Master interface for DDC connection
- Integrated HDCP cipher engine and Pre-programmed HDCP keys
- Hot plug detection for monitor/TV interface
- Four I2S audio inputs : 2-ch 192kHz or 8-ch 96kHz
- Audio Up-Sampling for HDMI standard
- Industrial audio standard support
  IEC60958 for PCM and 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-I2C

Miscellaneous
- Auto detection of input video/sync
- Internal programmable PLLs
- Genlock. to background video sync
- Built-in test pattern generation logic
- Auxiliary Scaler with OSD for CVBS output(MDIN325 Only)
- 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)
MDIN325 : Footprint compatible with MDIN-220.
MDIN340 : Footprint compatible with MDIN-240.