

The 4th Generation SD to Full-HD Up-converter with Embedded Memory and HDMI Output

MDIN-221/241H



- ◆ **MDIN-221/241H** 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-221/241H** 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-221/241H** 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-221/241H**'s high quality deinterlacing, format converting and video enhancement capability are suitable for digital display applications such as set-top-box, digital video recorder(DVR), DVD player, TV Box and portable converter system.

Main Features

MDIN-221/241H

- ◆ Two digital video input ports for 10-bit precision interlaced or progressive scan video
- ◆ Four I²S and one S/PDIF audio input ports(MDIN-241H Only)
- ◆ MDIN-221 : Analog RGB/Component and Digital video output
MDIN-241H : Analog RGB/Component and HDMI output(ver. 1.2)
- ◆ 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)
- ◆ Cost and size effective embedded frame memory
- ◆ Serial I²C bus interface
- ◆ 144-pin FBGA packages(12mm x 12mm)

Specifications

Video Input

Digital video input with 10-bit precision
Input resolution : Interlaced 720x480i or 720x576i
Progressive up to 1280x1024p
Video format : 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.656/BT.1120)
Digital input : 12/24-bit(4:4:4) or 8/10/16/20-bit(4:2:2)

Video Output

Digital(MDIN-221 Only) and analog video output
HDMI(ver. 1.2) output(MDIN-241H Only)
Output resolution : Interlaced up to 1920x1080i
Progressive up to 1920x1080p
Digital output video format(MDIN-221 Only) :
12/24-bit(4:4:4) or 8/10/16/20-bit(4:2:2)
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.656/BT.1120)
Analog video output with triple 10-bit DACs(Separated sync or Sync on G/Y)

Deinterlacing

Motion adaptive 3-D deinterlacing on a per-pixel basis
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/subtitle detection and adaptation

Noise Reduction and Cross Color Suppression

High quality 3-D noise reduction with motion detection
Cross-color suppression for 2-D comb-filtered input

Format Conversion

Independent horizontal and vertical scaling with anti-aliasing 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

Display Functions

Brightness, contrast, hue, saturation control
Programmable display size and position

Frame Rate Conversion

Frame rate conversion from 3-250Hz to 3-250Hz
Conversion ratio : x1/31 ~ x31
Utilizes embedded memory as frame buffer

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

Bitmap and character mode OSD
One layer with 4 sprites
16-color with 32-level 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 copy and run-length decoding

HDMI/DVI Transmitter(MDIN-241H Only)

Industrial standard compliant HDMI 1.2, DVI 1.0, EIA/CEA-861D and HDCP 1.1
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
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-I²C

Miscellaneous

Auto detection of input video/sync
Support composite sync and non-standard sync signal
Lock-to-input sync mode or free-run mode
Programmable output sync signal generation
Built-in test pattern generation logic

Electrical and Mechanical Characteristics

1.2, 1.8V & 3.3V supply voltage
3.3V I/O signal interface
Low power consumption : Max 0.5W(for HDMI output)
Max 0.7W(for analog output)
144-pin FBGA package(12mm x 12mm/0.8mm pitch)