

# Video Smoothing IP Core

## Real-time High-quality Video Processing Technology

Lattice Semiconductor, a leading smart connectivity solutions provider powered by low power FPGA, video ASSP, 60 GHz millimeter wave, and IP products, offers a family of high-quality cineramIC™ video processing IP cores targeted for integration with appropriate digital image processing blocks, such as video encoders or decoders for digital video system-on-chip (SoC) designs, to deliver optimum image quality.

Chip designers will be able to embed Lattice's industry-leading video processing technologies into a wide range of consumer electronics devices including DTVs, Blu-ray players, digital media adapters, and set-top boxes, as well as mobile phones, tablets and laptops, where advanced image enhancement technologies may not have been implemented previously. The major processing blocks available for licensing currently include: Scaler IP cores (Adaptive Scaler), Video Enhancement IP cores (Mosquito Noise Reduction, Detail & Edge Enhancement, and Video Smoothing), and Deinterlacer IP cores (Progressive Re-Processing and Precision Deinterlacing).

### Applications



DTVs



Blu-ray Disc™  
Player



Set-top Boxes



Broadcast



Smart  
Cables



Docking Stations/  
Adapters



Mobile  
Devices

Lattice's video smoothing technology removes the jagged (rough or irregular) edges in an image. Typically, these "jaggies" are caused by upscaling or zooming by large scaling ratios. Other causes include compression artifacts, poor-quality deinterlacing, or resolution limitations in digital sampling of an image. Smoothing technology creates the effect of a high-resolution image, without softening the entire image. Video smoothing is particularly useful when scaling the video output from a mobile device or Internet-based video.

The video smoothing IP core can be used for many applications to improve the quality of video or still images. For example, as part of a video SoC for broadcast applications, Blu-ray or DVD players, the IP core's algorithms enhance the quality of video streams when they are shown on a DTV or HD display. In this case, the IP core will be placed in the digital video processing chain behind a video decoder (such as Lattice's cineramIC video decoder IP core), behind a scaler (such as Lattice's adaptive scaler IP core) or as part of a video output unit which sends the video content to the display.

In SoCs for DTVs or computer displays, the video smoothing IP core will improve any incoming video and still image content for display. The core can also be integrated into SoCs for smart cables to increase quality of the images sent from a source to a DTV where both devices do not offer this capability. Since the IP core is a hardwired solution requiring only low power, the core is very suitable for mobile devices too.

The video smoothing IP works with 8-, 10-, or 12-bit color depth and with all SD and HD resolutions. The video smoothing process can be easily controlled via software.

## Key Features

- Technology smoothes jaggies (rough and irregular edges in upscaled images)
- Supports SD and HD up to 4Kx2K to dramatically improve resolution quality
- Works with any video input resolution
- Eliminates artifacts caused by poor-quality deinterlacers
- Programmable software measures filtering needed
- 8-, 10-, or 12-bit processing
- Filtering done on both luma and chrome components
- Bypass mode

## Benefits Summary

- Achieve a more natural appearance and improve the quality of low-resolution video sources

## Adaptive Scaling Features

### Inputs

- Up to 12-bit 4:4:4 (other formats on request)

### Outputs

- Up to 12-bit 4:4:4 (other formats on request)

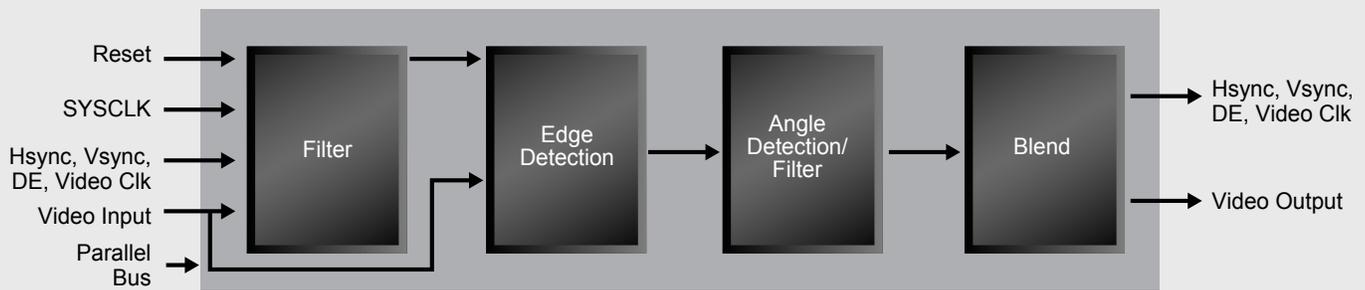
### Miscellaneous

- Easy to use parallel bus interface
- Silicon proven design with process and foundry independent design description
- No external memory chips required

### Deliverables

- RTL source code (System Verilog)
- C++ model
- Test environment
- IP core documentation

### Diagram



### Before



### After



## Applications Support

[www.latticesemi.com/support](http://www.latticesemi.com/support)



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