

## Datasheet for Image Up-Scaler IP

### Functional Descriptions:

One of the important operations required in video/image processing is image up-scaling. Scaling is done to increase the size of the image. The Image Scaler IP allows linear scaling of image in both horizontal and vertical direction. Linear scaling is achieved through replication of the pixels, as per scaling factor.

Block diagram of the Image Scaler IP is as shown in Fig 1. Image scaler takes the original un-scaled image and scaling factors as inputs and gives out

scaled image. The original un-scaled image pixel data is read from input video memory. The output of Image Scaler IP is stored in output video memory.

### Features:

- Image Scaler IP scales the image of any width and height
- w\_factor and h\_factor is an integer value greater than zero.

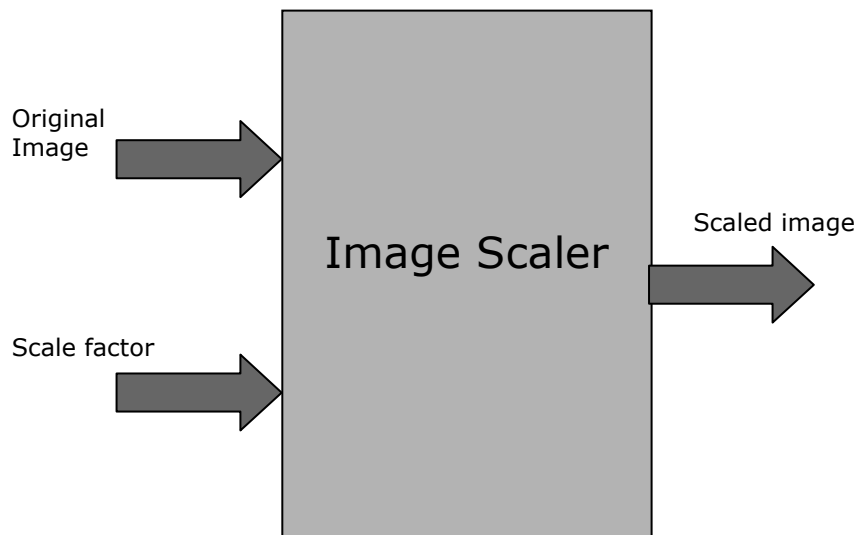


Fig 1: Block diagram of Image Scaler IP

### Description:

The inputs 'w\_factor' and 'h\_factor' are the factors by which the width and height of the original image should be scaled. Each pixel of the original image is repeated 'w\_factor' times horizontally and 'h\_factor' times vertically. The inputs 'image\_width' and 'image\_height' are the width and height of the original unscaled image.

The width and height of the output scaled image will be 'w\_factor\*image\_width' and 'h\_factor\*image\_height' respectively.

Schematic symbol of the Image Scaler IP is given in Fig 2. Description of the ports of the Image Scaler IP can be referred from Table 1.

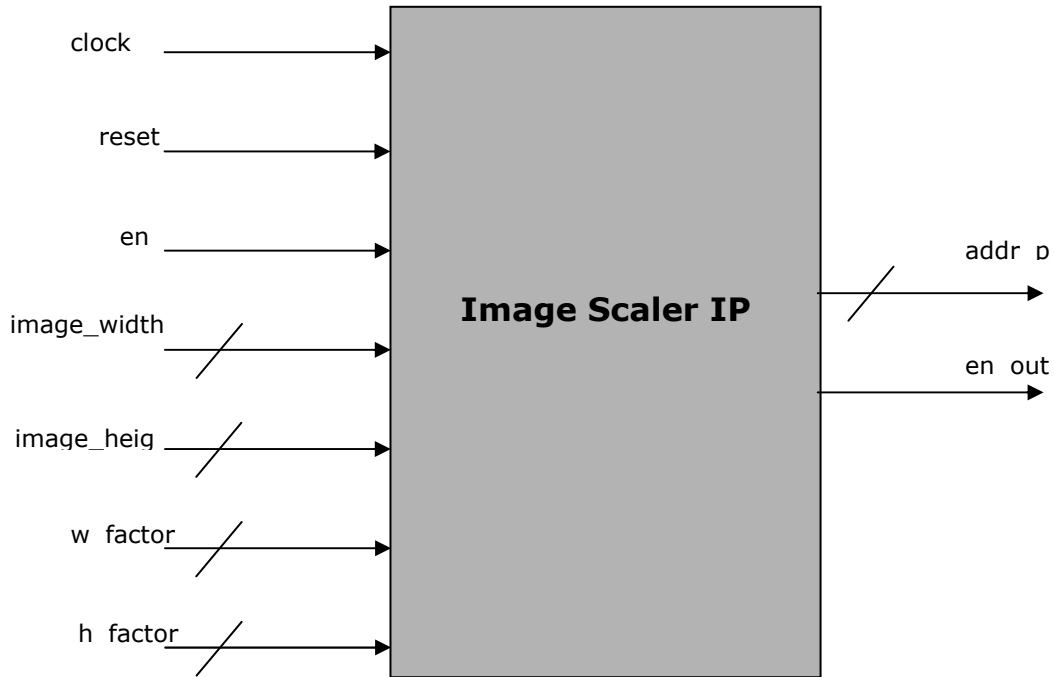


Fig 2: Schematic symbol

Table 1: Signal descriptions of Image scaler IP.

Signal(Port)	Width	Input/Output	Description
clock	1	input	This is clock input pin.
reset	1	input	This is a reset input pin.
en	1	input	en is Enable signal. The address of the output image pixels are issued only when this signal in 1.
image_width	Configurable Parameter	input	This is the width of the original image.
image_height	Configurable Parameter	input	This is the height of the original image.
w_factor	Configurable Parameter	input	w_factor is a scale factor in horizontal-direction.
h_factor	Configurable Parameter	input	h_factor is a scale factor in vertical direction.
addr_p	Configurable Parameter	output	addr_p is the address of the output image memory
en_out	1	output	Enable for output pixel.

**Example:**

Image scaler IP is used to scale the image QVGA to VGA image (320x240 → 640x480).

**Performance:**

For image 160 X 90 scaled to get image of 1280 X 720

Device	Slice Count	Lut4 count	Frequency(Post PNR)
Spartan-3A (xc3s700a)	68	128	272 MHz

**Verification:**

Image scaler is tested and verified on spartan 3A board.

**Deliverables:**

- Verilog RTL source code
- Test benches
- Synthesis and Simulation scripts
- Detailed user documentation, including RTL source code documentation