

## Key Design Features

- Synthesizable, technology independent VHDL IP Core
- Decoding of a bayer-mapped image from an image sensor or Colour Filter Array (CFA)
- Supports all image resolutions from 16 x 16 pixels up to  $2^{14}$  x  $2^{14}$
- Support for all sensor pixel widths from 2-bits and above
- Support for different CFA sensor alignments
- Fully pipelined architecture with simple flow control
- Input and output ports can interface directly to a FIFO if required
- Features a 5x5 polyphase interpolation filter
- Output 1 x 24-bit pixel per clock
- No frame buffer required
- Small implementation size
- Support for 300 MHz+ operation on basic FPGA devices<sup>1</sup>

## Block Diagram

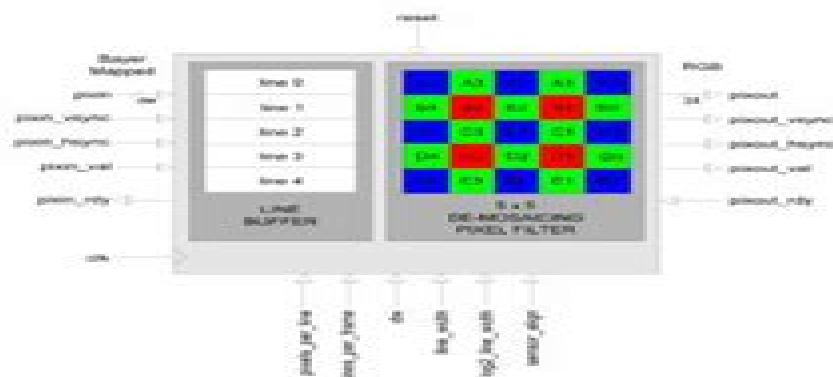


Figure 1: Bayer-to-RGB converter architecture

## Applications

- Bayer-mapped to 24-bit RGB decoding (de-mosaicing)
- Digital camera image processing
- Forms an essential first stage in most digital processing pipelines that contain an image sensor

## Generic Parameters

Generic name	Description	Type	Valid range
dw	Sensor width in bits	integer	$\geq 2$
line_width	Width of linescores in pixels	integer	$2^1 < \text{pixels} < 2^{14}$
log2_line_width	Log2 of linescore width	integer	$\log_2(\text{line\_width})$
sensor_align	Bayer pattern sensor alignment	integer	0 : BGBG ... GRGR ...  1 : GBGB ... RGRG ...  2 : GRGR ... BGBG ...  3 : RGRG ... GBGB ...

## Pin-out Description

Pin name	I/O	Description	Active state
clk	in	Synchronous clock	rising edge
reset	in	Asynchronous reset	low
pixels_per_line	in	Number of pixels per line Range: $2^1 < \text{lines} < 2^{14}$	data
lines_per_frame	in	Number of lines per frame Range: $2^1 < \text{lines} < 2^{14}$	data
pixel_in [dw-1:0]	in	n-bit bayer-mapped pixel in	data
pixel_vsync	in	Vertical sync in (Coincident with first pixel of input frame)	high
pixel_hsync	in	Horizontal sync in (Coincident with first pixel of input line)	high
pixel_val	in	Input pixel valid	high
pixel_rdy	out	Ready to accept input pixel (Handshake signal)	high
pixel_out [23:0]	out	24-bit RGB pixel out	data
pixel_vsync	out	Vertical sync out (Coincident with first pixel of output frame)	high
pixel_hsync	out	Horizontal sync out (Coincident with first pixel of output line)	high
pixel_val	out	Output pixel valid	high
pixel_rdy	in	Ready to accept output pixel (Handshake signal)	high

<sup>1</sup> Xilinx Virtex5 used as a benchmark.

# Key Design Features Block Diagram Zipcores

**JR Anderson**



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