

IP-Windowing

IP Core for Hann, Blackman, and Boxcar Data Windowing Functions

FEATURES

- Boxcar, Hann and Blackman Data Window Functions
- Frame processing or continuous processing
- Complex 16-bit inputs, 24-bit outputs
- Point size: $N=2^M$, $M=5$ to 20.
- Clock rates to 300 MHz (Virtex5, -1 speed)
- 1% of Xilinx Virtex5 SX95T
- 16-bit complex inputs, 24-bit complex outputs
- Bit-true, cycle-true MATLAB model

APPLICATIONS

- FFT Analysis for Spectrum Analyzers
- Beamforming
- Image processing

IMPLEMENTATION SUPPORT

- MATLAB/Simulink model
- Testbench with test vectors
- Implementation control files
- User manual and implementation guide
- Application engineering support hotline/email

DESCRIPTION

The IP-Windowing core provides three data window functions that are runtime configurable between Boxcar, Hann and Blackman. The core is very compact and consumes <1% of a Virtex5 SX95 FPGA, while operating at speeds up to 300 MHz (-1 speed grade).

The three data windowing functions provide characteristics that suit different application purposes such as spectral analysis, beamforming and filtering. Boxcar provides the highest frequency resolution, Blackman has the least spectral leakage, while Hann window provides good performance on both frequency resolution and spectral leakage.

The IP-Windowing core can be configured as frame data processing or continuous data processing mode. The total latency for this core is 34 clock cycles.

The core is targeted at the Xilinx Virtex5 SX95T FPGA. The IP core is provided as a netlist and may be rapidly integrated into Virtex5 designs with the constraints and implementation control files provided. Support is available for targeting other FPGA devices or ASIC. Simulation models for system design are provided as fixed point MATLAB/Simulink files. The testbench is bit-true, cycle-true for device simulation. Source is available for purchase.



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IP-Windowing

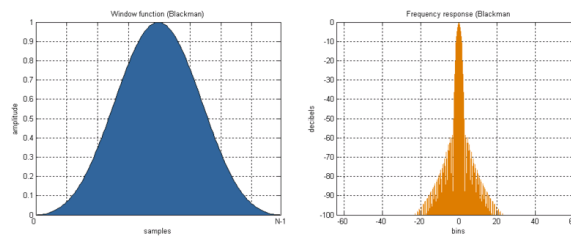
ORDERING INFORMATION

Product	Part Number	Description
IP-Windowing	58012	IP-Windowing, IP core for Hann, Blackman and Boxcar data windows. Netlist version.

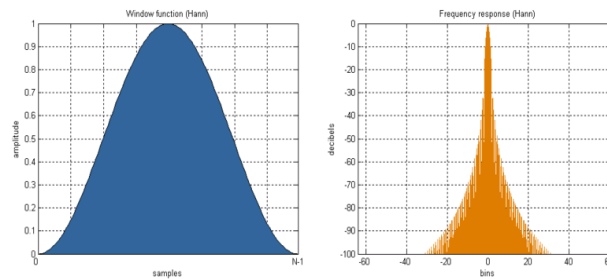
Windowing Functions

The IP-Windowing core provides these data windowing functions.

Window	Best for signal types	Frequency Resolution	Spectral Leakage	Amplitude Accuracy
Blackman	Random or mixed	Poor	Best	Good
Boxcar (uniform)	Random	Best	Poor	Poor
Hann	Random	Good	Good	Fair

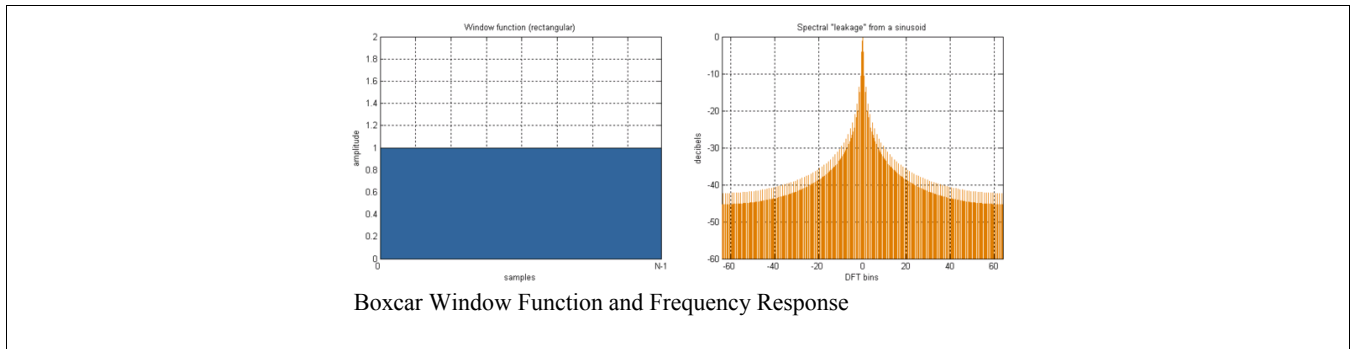


Blackman Window Function and Frequency Response

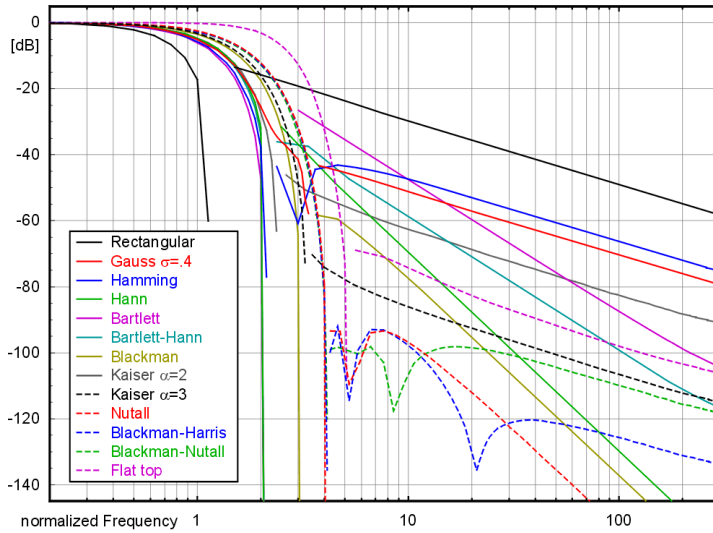


Hann Window Function and Frequency Response

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Window	Coherent Gain (CG)	Equivalent noise bandwidth(ENBW) (bins)
Blackman	0.42	1.726757
Boxcar (uniform)	1.0	1.0
Hann	0.5	1.5



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Standard Features

Inputs	
Inputs	Complex (I/Q)
Input Format	16-bit, 2's complement
Outputs	
Outputs	Complex (I/Q)
Output Format	24-bit, 2's complement
Window Functions	
Types	Hann, Blackman, Boxcar
Processing	Continuous or framed

Device Utilization		
Element	FPGA Resource	Virtex5 SX95T
LUT	670	1%
FF	825	1%
DSP48E	8	1%
BlockRAM	2	0.30%

Port Description

Signal	Size	IO	Description
reset	1	I	Asynchronous reset, active high.
clk	1	I	clock
ce	1	I	Clock enable, active high
din_i	16	I	Data in
din_q	16	I	Data in
wr	1	I	Data in write strobe, active high.
M	5	I	log2 (point size)
start	1	I	Window function start, active high. Asserting START starts applying the window function to the input data. Holding START high allows continuous data processing. Pulsed START allows the window function being applied for a single frame of data.
win_sel	2	I	Window selection Rectangular window (win_sel=0) Hann window (win_sel=1) Blackman window (win_sel=2)
win	24	O	Window function
dout_i	24	O	Data out
dout_q	24	O	Data out
valid	1	O	Data valid

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