

CFFT A new radix 4 complex fft processor

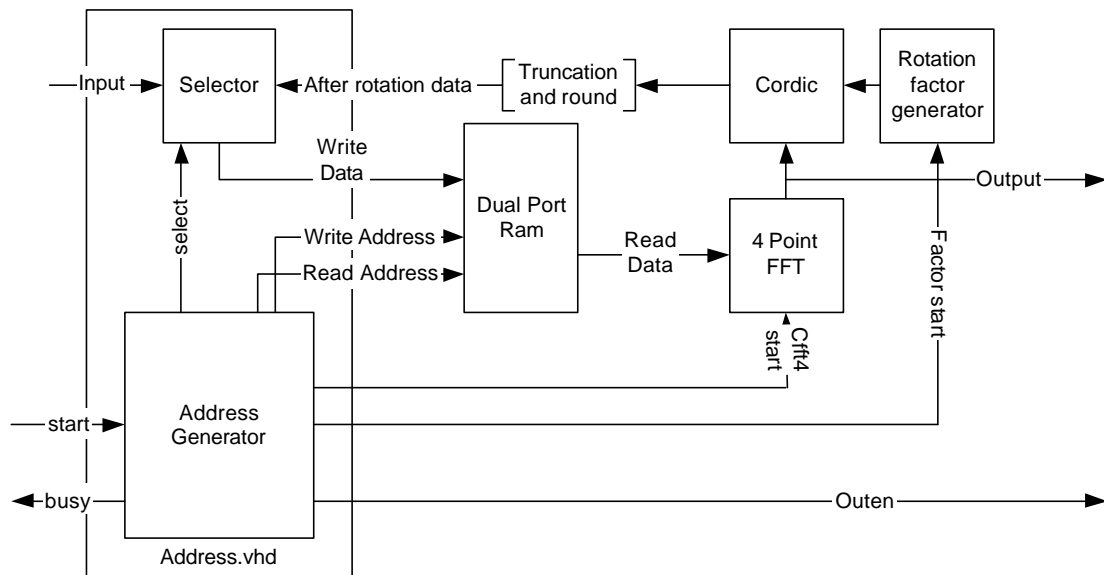
1. Description

CFFT is an data width and sample point configurable radix-4 FFT core. As the twiddle factor is implemented as CORDIC algorithm, the signal gain after CFFT is different from standard FFT algorithm. But for OFDM modulation and demodulation this is not important. The gain is fixed, so we can apply with constant coefficient to get equivalent conventional FFT. The input of FFT core is ordered by radix 4 and the output is reverse ordered.

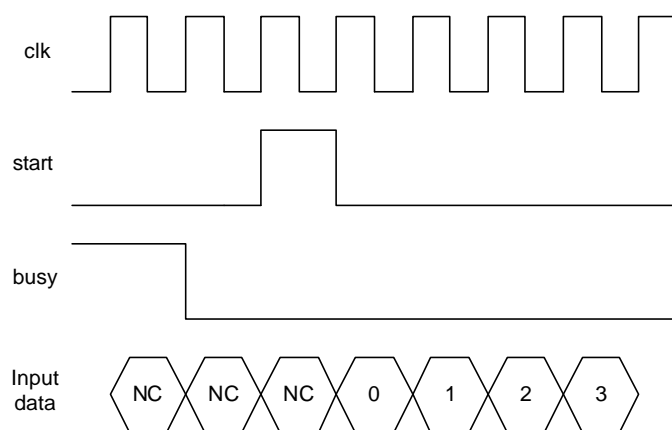
2. Theory of operation

FFT algorithm is described in detail in many text books. We'll just skip it here.

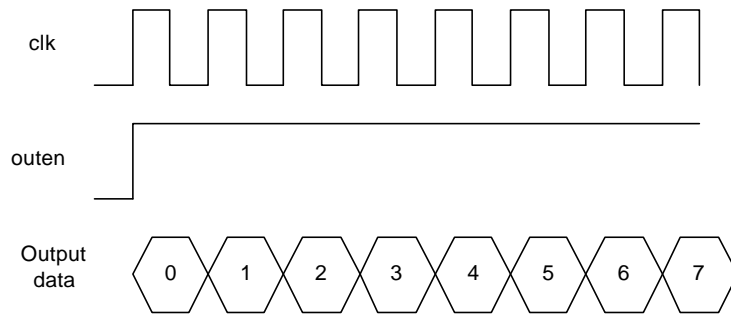
3. Block diagram



4. Timing



a. input timing



b. output timing

5. Misc

a. gain

Point	Standard FFT	This one	Standard IFFT	This one
256	1	0.0698	1/256	17.9
1024	1	0.0287	1/1024	29.4
4096	1	0.0118	1/4096	48.2742

The result is obtained by comparison between Matlab simulation and circuit simulation.

b. output order

The output sequence is 2bit reverse ordered. For example, the 789th (1100010101) output in an 1024-point FFT is actually at 339 (0101010011).

c. synthesis

this core can be synthesized by Synplify70 and place-and-routed by Xilinx ISE4.1. an 1024-point FFT with 12bit IQ input can be fitted in one XCV50E-6 and the speed can reach 90M.