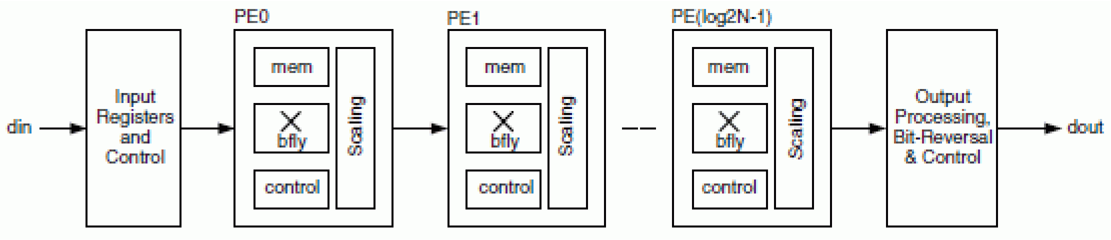
FFT Compiler

Overview

Lattice's FFT Compiler offers forward and inverse Fast Fourier Transforms for point sizes from 64 to 16384. This IP core can be configured to perform forward FFT, inverse FFT (IFFT) or port selectable forward/inverse FFT. The FFT compiler offers two choices of implementation: high performance (Streaming I/O) and low resource (Burst I/O). In the high performance implementation, the FFT IP core can perform real-time computations with continuous data streaming in and out at clock rate. There can also be arbitrary gaps between data blocks allowing discontinuous data blocks. The low resource implementatio can be used when it is required to use lesser slices (logic unit of Lattice FPGA devices) and EBR (Embedded Block RAM) resources or if the device is too small to accommodate the high performance version.

To account for the data growth in fine register length implementations, the FFT compiler allows one of three fixed scaling or dynamic scaling after each radix-2 stage of the FFT computation. The low resource version also supports block floating point arithmetic that provides increased dynamic range for intermediate computations. The FFT comp also allows the number of FFT points to be varied dynamically through a port.



Features

- Wide range of points sizes: 64, 128, 256, 512, 1024, 2048, 4096, 8192, and 16384
- Choice of high-performance (streaming I/O) and low resource (burst I/O) versions
- Run-time variable FFT point size
- Forward, inverse or port-configurable forward/inverse transform modes
- Choice of no scaling, fixed scaling (RS111/RS211) and dynamically variable stage-wise scaling
- Data precision of 8 to 24 bits
- Twiddle factor precision of 8 to 24 bits
- Natural order for input and choice of bit-reversed or natural order for output
- Support for arbitrary gaps between input data blocks in high-performance realization
- Block floating point scaling support in low resource configurations

Performance and Resource Utilization[1]

LatticeECP3[1]

# Points	Operating mode	SLICEs	LUTs	Registers	sysMEM EBRs	sysDSP Blocks	f_{MAX}(MHz)
64	Low Resource	493	668	727	3	2	285

# Points	Operating mode	SLICEs	LUTs	Registers	sysMEM EBRs	sysDSP Blocks	f_{MAX}(MHz)
64	High Performance	733	1433	1174	1	2	243
256	Low Resource	575	821	783	3	2	255
256	High Performance	1065	2074	1636	3	3	266
1024	Low Resource	653	964	820	3	2	254
1024	High Performance	1329	2602	2056	6	4	261
8192	Low Resource	722	1089	870	18	2	258
8192	High Performance	1957	3843	2762	21	6	229

1. Performance and utilization data are generated targeting a LFE3-95E-8FN672CES device using Lattice Diamond 1.0 and Synpl Pro D-2009.12L-1 software. Performance may vary when using a different software version or targeting a different device densit or speed grade within the LatticeECP3 family.

LatticeECP2M[1]

# Points	Operating mode	SLICEs	LUTs	Registers	sysMEM EBRs	sysDSP Blocks	f_{MAX}(MHz)
64	Low Resource	534	681	730	3	1	286
64	High Performance	989	1437	1174	1	2	243
256	Low Resource	616	830	789	3	1	292
256	High Performance	1419	2070	1636	3	3	266
1024	Low Resource	718	991	839	3	1	273
1024	High Performance	1782	2618	2056	6	4	261
8192	Low Resource	787	1123	897	18	1	234
8192	High Performance	2518	3867	2762	21	6	229

1. Performance and utilization data are generated targeting a LFE2M-35E-7F672C device using Lattice Diamond 1.0 and Synplify Pro D-2009.12L-1 software. Performance may vary when using a different software version or targeting a different device densit or speed grade within the LatticeECP2M family.

LatticeECP2[1]

# Points	Operating mode	SLICEs	LUTs	Registers	sysMEM EBRs	sysDSP Blocks	f_{MAX}(MHz)
64	Low Resource	499	608	695	3	1	283
64	High Performance	723	1435	1174	1	2	283
256	Low Resource	578	745	755	3	1	250
256	High Performance	1049	2078	1636	3	3	250
1024	Low Resource	666	894	804	3	1	258
1024	High Performance	1324	2626	2056	6	4	258
8192	Low Resource	787	1123	897	18	1	240
8192	High Performance	1952	3880	2762	21	6	240

-2009.12L-1 software. Performance may vary when using a different software version or targeting a different device density or speed grade within the LatticeECP2 family.

LatticeECP/EC[1]

# Points	Operating mode	SLICEs	LUTs	Registers	sysMEM EBRs	sysDSP Blocks	f_{MAX}(MHz)
64	Low Resource	488	588	705	3	1	213
64	High Performance	998	1444	1174	1	2	208
256	Low Resource	575	732	772	3	1	212
256	High Performance	1424	2060	1636	3	3	200
1024	Low Resource	702	957	861	5	1	192
1024	High Performance	1781	2589	2056	7	4	182
8192	Low Resource	769	1055	913	36	1	189
8192	High Performance	2579	3950	2762	38	6	179

1. Performance and utilization data are generated targeting a LFECP33E-5F672C device using Lattice Diamond 1.0 and Synplify I D-2009.12L-1 software. Performance may vary when using a different software version or targeting a different device density or speed grade within the LatticeECP family.

LatticeXP2[1]

# Points	Operating mode	SLICEs	LUTs	Registers	sysMEM EBRs	sysDSP Blocks	f_{MAX}(MHz)
64	Low Resource	534	681	730	3	1	261
64	High Performance	989	1437	1174	1	2	243
256	Low Resource	616	830	789	3	1	226
256	High Performance	1419	2070	1636	3	3	266
1024	Low Resource	718	991	839	3	1	237
1024	High Performance	1782	2618	2056	6	4	261

1. Performance and utilization data are generated targeting a LFXP2-17E-7F484C device using Lattice Diamond 1.0 and Synplify D-2009.12L-1 software. Performance may vary when using a different software version or targeting a different device density or speed grade within the LatticeXP2 family.

Ordering Information

Family	Part Numbers
LatticeECP3	FFT-COMP-E3-U2
LatticeECP2M	FFT-COMP-PM-U2
LatticeECP2	FFT-COMP-P2-U2
LatticeECP/EC	FFT-COMP-E2-U2
LatticeXP2	FFT-COMP-X2-U2

IP Version: 2.6

Evaluate: To download a full evaluation version of this IP, go to the IPexpress tool and click the IP Server button ir the toolbar. All LatticeCORE IP cores and modules available for download will be visible. For more information on viewing/downloading IP please read the **IP Express Quick Start Guide**.

Purchase: To find out how to purchase the IP Core, please contact your **local Lattice Sales Office**.