# Lattice Semiconductor Corporation - LFECP10E-3FN484C Datasheet


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## Understanding Embedded - FPGAs (Field Programmable Gate Array)

Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

## Applications of Embedded - FPGAs

The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

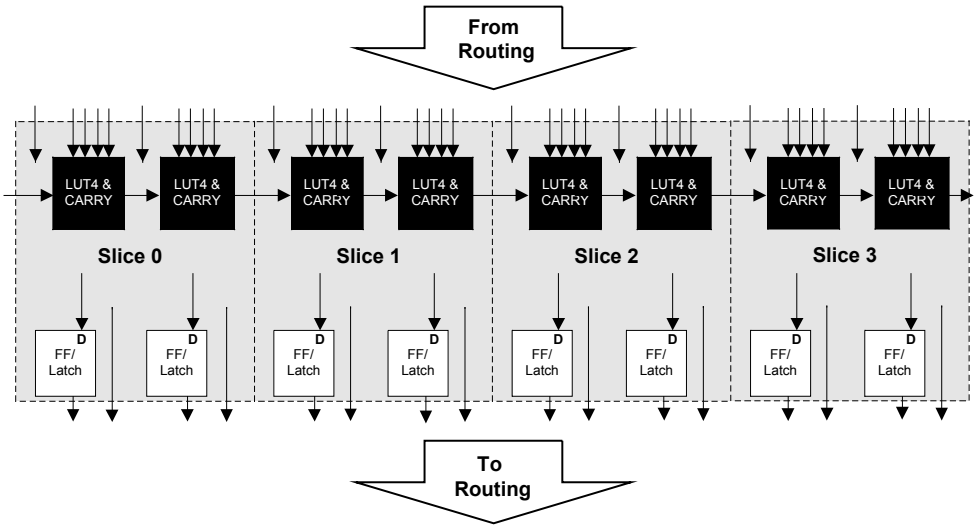
| Details | |
|---|---|
| Product Status | Obsolete |
| Number of LABs/CLBs | - |
| Number of Logic Elements/Cells | 10200 |
| Total RAM Bits | 282624 |
| Number of I/O | 288 |
| Number of Gates | - |
| Voltage - Supply | 1.14V ~ 1.26V |
| Mounting Type | Surface Mount |
| Operating Temperature | 0°C ~ 85°C (TJ) |
| Package / Case | 484-BBGA |
| Supplier Device Package | 484-FPBGA (23x23) |
| Purchase URL | https://www.e-xfl.com/product-detail/lattice-semiconductor/lfecp10e-3fn484c |

## PFU and PFF Blocks

The core of the LatticeECP/EC devices consists of PFU and PFF blocks. The PFUs can be programmed to perform Logic, Arithmetic, Distributed RAM and Distributed ROM functions. PFF blocks can be programmed to perform Logic, Arithmetic and ROM functions. Except where necessary, the remainder of the data sheet will use the term PFU to refer to both PFU and PFF blocks.

Each PFU block consists of four interconnected slices, numbered 0-3 as shown in Figure 2-3. All the interconnections to and from PFU blocks are from routing. There are 53 inputs and 25 outputs associated with each PFU block.

***Figure 2-3. PFU Diagram***




### Slice

Each slice contains two LUT4 lookup tables feeding two registers (programmed to be in FF or Latch mode), and some associated logic that allows the LUTs to be combined to perform functions such as LUT5, LUT6, LUT7 and LUT8. There is control logic to perform set/reset functions (programmable as synchronous/asynchronous), clock select, chip-select and wider RAM/ROM functions. Figure 2-4 shows an overview of the internal logic of the slice. The registers in the slice can be configured for positive/negative and edge/level clocks.

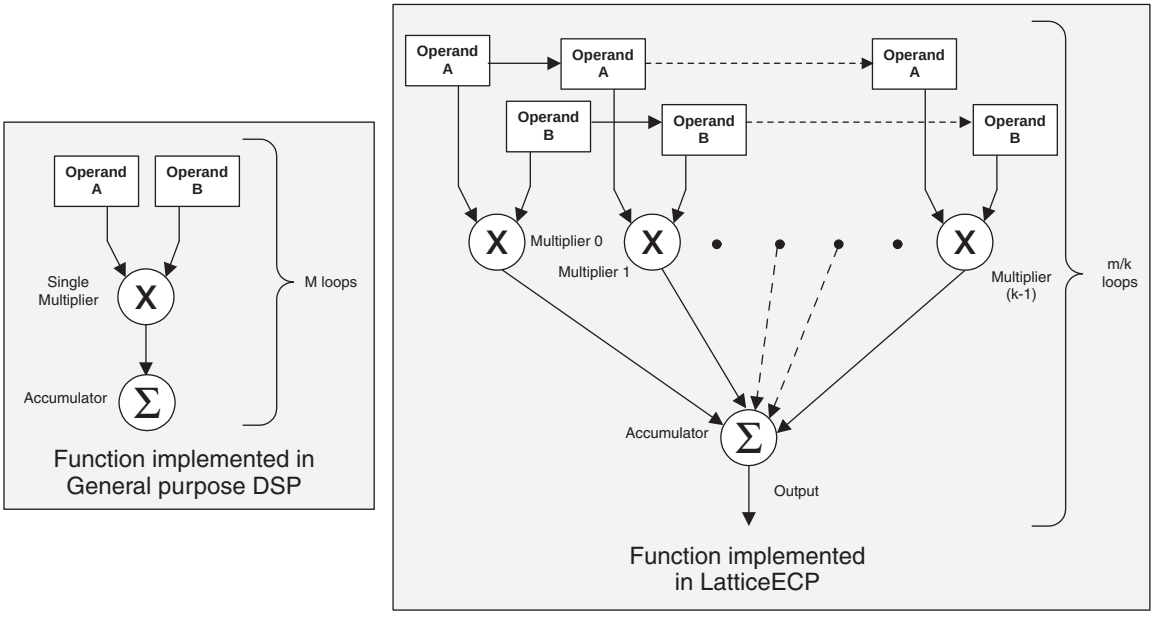
There are 14 input signals: 13 signals from routing and one from the carry-chain (from adjacent slice or PFU). There are 7 outputs: 6 to routing and one to carry-chain (to adjacent PFU). Table 2-1 lists the signals associated with each slice.

decoders. These complex signal processing functions use similar building blocks such as multiply-adders and multiply-accumulators.

## sysDSP Block Approach Compared to General DSP

Conventional general-purpose DSP chips typically contain one to four (Multiply and Accumulate) MAC units with fixed data-width multipliers; this leads to limited parallelism and limited throughput. Their throughput is increased by higher clock speeds. The LatticeECP, on the other hand, has many DSP blocks that support different data-widths. This allows the designer to use highly parallel implementations of DSP functions. The designer can optimize the DSP performance vs. area by choosing an appropriate level of parallelism. Figure 2-18 compares the serial and the parallel implementations.

***Figure 2-18. Comparison of General DSP and LatticeECP-DSP Approaches***




## sysDSP Block Capabilities

The sysDSP block in the LatticeECP-DSP family supports four functional elements in three 9, 18 and 36 data path widths. The user selects a function element for a DSP block and then selects the width and type (signed/unsigned) of its operands. The operands in the LatticeECP-DSP family sysDSP Blocks can be either signed or unsigned but not mixed within a function element. Similarly, the operand widths cannot be mixed within a block.

The resources in each sysDSP block can be configured to support the following four elements:

- MULT (Multiply)
- MAC (Multiply, Accumulate)
- MULTADD (Multiply, Addition/Subtraction)
- MULTADDSUM (Multiply, Addition/Subtraction, Accumulate)

The number of elements available in each block depends on the width selected from the three available options x9, x18, and x36. A number of these elements are concatenated for highly parallel implementations of DSP functions. Table 2-1 shows the capabilities of the block.

*Figure 2-27. Input Register DDR Waveforms*

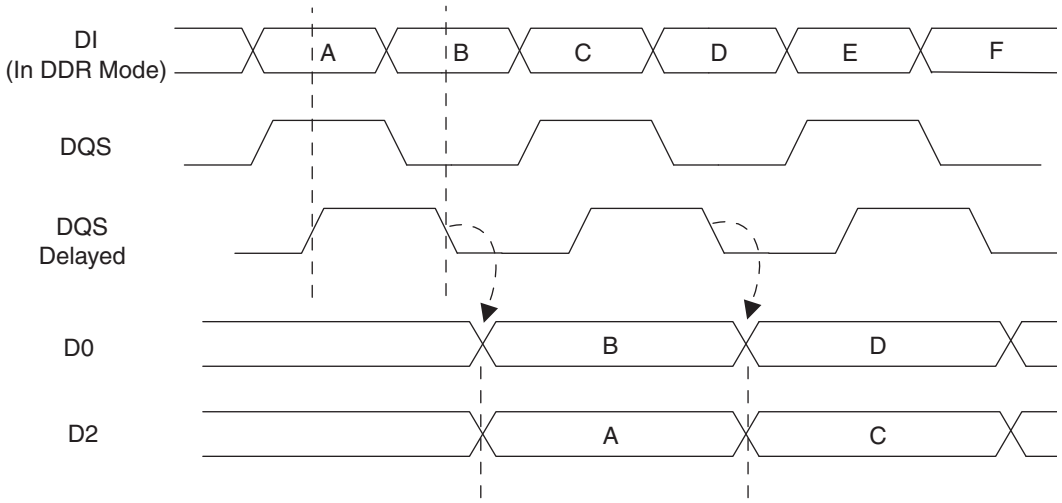
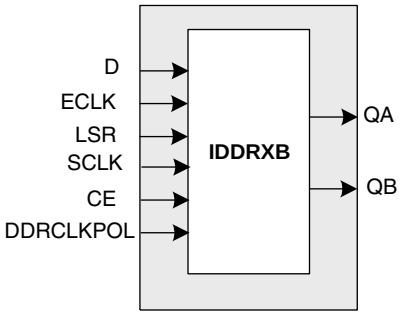



*Figure 2-28. INDDRXB Primitive*




**Output Register Block**

The output register block provides the ability to register signals from the core of the device before they are passed to the sysI/O buffers. The block contains a register for SDR operation that is combined with an additional latch for DDR operation. Figure 2-29 shows the diagram of the Output Register Block.

In SDR mode, ONEG0 feeds one of the flip-flops that then feeds the output. The flip-flop can be configured a D-type or latch. In DDR mode, ONEG0 is fed into one register on the positive edge of the clock and OPOS0 is latched. A multiplexer running off the same clock selects the correct register for feeding to the output (D0).

Figure 2-30 shows the design tool DDR primitives. The SDR output register has reset and clock enable available. The additional register for DDR operation does not have reset or clock enable available.

*Table 2-14. Supported Output Standards*

| Output Standard | Drive | $V_{CCIO}$ (Nom.) |
|---|---|---|
| **Single-ended Interfaces** | | |
| LVTTL | 4mA, 8mA, 12mA, 16mA, 20mA | 3.3 |
| LVCMOS33 | 4mA, 8mA, 12mA 16mA, 20mA | 3.3 |
| LVCMOS25 | 4mA, 8mA, 12mA, 16mA, 20mA | 2.5 |
| LVCMOS18 | 4mA, 8mA, 12mA, 16mA | 1.8 |
| LVCMOS15 | 4mA, 8mA | 1.5 |
| LVCMOS12 | 2mA, 6mA | 1.2 |
| LVCMOS33, Open Drain | 4mA, 8mA, 12mA 16mA, 20mA | — |
| LVCMOS25, Open Drain | 4mA, 8mA, 12mA 16mA, 20mA | — |
| LVCMOS18, Open Drain | 4mA, 8mA, 12mA 16mA | — |
| LVCMOS15, Open Drain | 4mA, 8mA | — |
| LVCMOS12, Open Drain | 2mA, 6mA | — |
| PCI33 | N/A | 3.3 |
| HSTL18 Class I, II, III | N/A | 1.8 |
| HSTL15 Class I, III | N/A | 1.5 |
| SSTL3 Class I, II | N/A | 3.3 |
| SSTL2 Class I, II | N/A | 2.5 |
| SSTL18 Class I | N/A | 1.8 |
| **Differential Interfaces** | | |
| Differential SSTL3, Class I, II | N/A | 3.3 |
| Differential SSTL2, Class I, II | N/A | 2.5 |
| Differential SSTL18, Class I | N/A | 1.8 |
| Differential HSTL18, Class I, II, III | N/A | 1.8 |
| Differential HSTL15, Class I, III | N/A | 1.5 |
| LVDS | N/A | 2.5 |
| BLVDS[1] | N/A | 2.5 |
| LVPECL[1] | N/A | 3.3 |
| RSDS[1] | N/A | 2.5 |

1. Emulated with external resistors.

## Hot Socketing

The LatticeECP/EC devices have been carefully designed to ensure predictable behavior during power-up and power-down. Power supplies can be sequenced in any order. During power up and power-down sequences, the I/Os remain in tristate until the power supply voltage is high enough to ensure reliable operation. In addition, leakage into I/O pins is controlled within specified limits, this allows for easy integration with the rest of the system. These capabilities make the LatticeECP/EC ideal for many multiple power supply and hot-swap applications.

# Configuration and Testing

The following section describes the configuration and testing features of the LatticeECP/EC devices.

## IEEE 1149.1-Compliant Boundary Scan Testability

All LatticeECP/EC devices have boundary scan cells that are accessed through an IEEE 1149.1 compliant test access port (TAP). This allows functional testing of the circuit board, on which the device is mounted, through a serial scan path that can access all critical logic nodes. Internal registers are linked internally, allowing test data to

## Initialization Supply Current[1, 2, 3, 4, 5, 6]

**Over Recommended Operating Conditions**

| Symbol | Parameter | Devices | Typ.[6] | Units |
|---|---|---|---|---|
| $I_{CC}$ | Core Power Supply Current | LFEC1 | 25 | mA |
| | | LFEC3 | 40 | mA |
| | | LFECP6/LFEC6 | 50 | mA |
| | | LFECP10/LFEC10 | 60 | mA |
| | | LFECP15/LFEC15 | 70 | mA |
| | | LFECP20/LFEC20 | 150 | mA |
| | | LFECP33/LFEC33 | 220 | mA |
| $I_{CCAUX}$ | Auxiliary Power Supply Current | LFEC1 | 30 | mA |
| | | LFEC3 | 30 | mA |
| | | LFECP6/LFEC6 | 30 | mA |
| | | LFECP10/LFEC10 | 35 | mA |
| | | LFECP15/LFEC15 | 35 | mA |
| | | LFECP20/LFEC20 | 40 | mA |
| | | LFECP33/LFEC33 | 40 | mA |
| $I_{CCPLL}$ | PLL Power Supply Current | | 12 | mA |
| $I_{CCIO}$ | Bank Power Supply Current[7] | LFEC1 | 4 | mA |
| | | LFEC3 | 5 | mA |
| | | LFECP6/LFEC6 | 6 | mA |
| | | LFECP10/LFEC10 | 6 | mA |
| | | LFECP15/LFEC15 | 7 | mA |
| | | LFECP20/LFEC20 | 8 | mA |
| | | LFECP33/LFEC33 | 8 | mA |
| $I_{CCJ}$ | $V_{CCJ}$ Power Supply Current | | 20 | mA |

1. Until DONE signal is active.
2. For further information about supply current, please see the list of technical documentation at the end of this data sheet.
3. Assumes all outputs are tristated, all inputs are configured as LVCMOS and held at the $V_{CCIO}$ or GND.
4. Frequency 0MHz.
5. Pattern represents typical design with 65% logic, 55% EBR, 10% routing utilization.
6. $T_J$=25ºC, power supplies at nominal voltage.
7. Per bank.

*Figure 3-14. sysCONFIG Master Serial Port Timing*

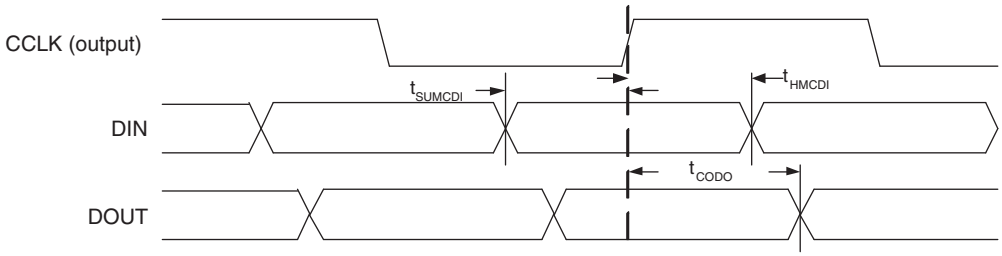



*Figure 3-15. sysCONFIG Slave Serial Port Timing*

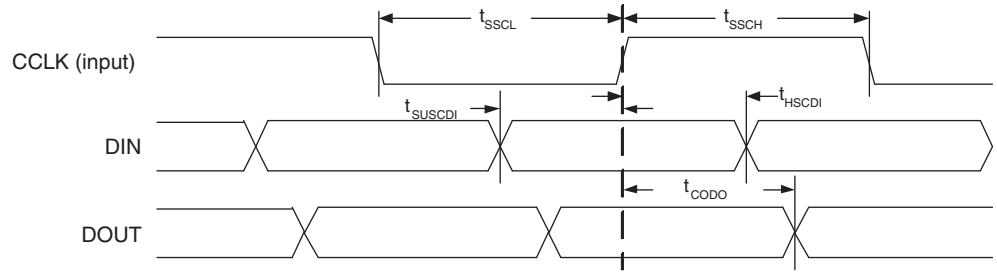
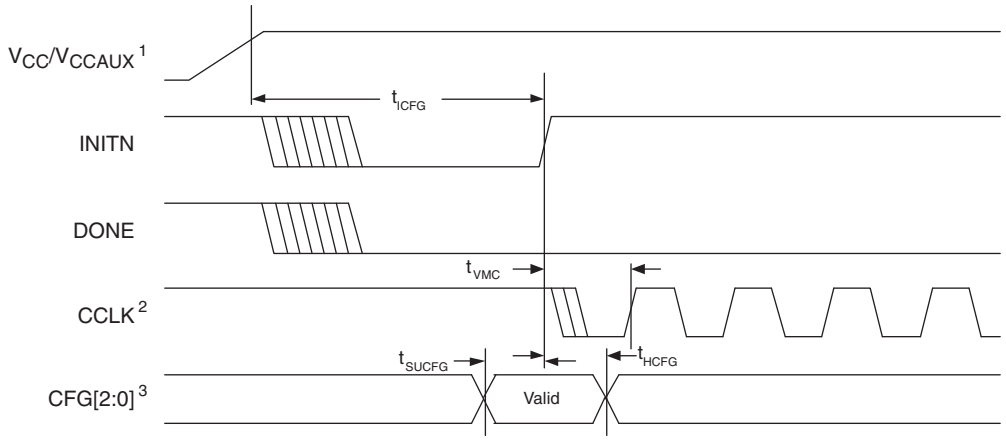



*Figure 3-16. Power-On-Reset (POR) Timing*




1. Time taken from $V_{CC}$ or $V_{CCAUX}$, whichever is the last to reach its $V_{MIN}$.
2. Device is in a Master Mode.
3. The CFG pins are normally static (hard wired).

## PICs and DDR Data (DQ) Pins Associated with the DDR Strobe (DQS) Pin

| PICs Associated with DQS Strobe | PIO Within PIC | DDR Strobe (DQS) and Data (DQ) Pins |
|---|---|---|
| P[Edge] [n-4] | A | DQ |
| | B | DQ |
| P[Edge] [n-3] | A | DQ |
| | B | DQ |
| P[Edge] [n-2] | A | DQ |
| | B | DQ |
| P[Edge] [n-1] | A | DQ |
| | B | DQ |
| P[Edge] [n] | A | [Edge]DQSn |
| | B | DQ |
| P[Edge] [n+1] | A | DQ |
| | B | DQ |
| P[Edge] [n+2] | A | DQ |
| | B | DQ |
| P[Edge] [n+3] | A | DQ |
| | B | DQ |

Notes:
1. “n” is a Row/Column PIC number
2. The DDR interface is designed for memories that support one DQS strobe per eight bits of data. In some packages, all the potential DDR data (DQ) pins may not be available.
3. PIC numbering definitions are provided in the “Signal Names” column of the Signal Descriptions table.

## LFEC1, LFEC3 Logic Signal Connections: 100 TQFP (Cont.)

| Pin Number | LFEC1 | | | | LFEC3 | | | |
|---|---|---|---|---|---|---|---|---|
| | Pin Function | Bank | LVDS | Dual Function | Pin Function | Bank | LVDS | Dual Function |
| 82 | PT11B | 1 | C | VREF2_1 | PT19B | 1 | C | VREF2_1 |
| 83 | PT11A | 1 | T | VREF1_1 | PT19A | 1 | T | VREF1_1 |
| 84 | PT10B | 1 | C | | PT18B | 1 | C | |
| 85 | PT10A | 1 | T | | PT18A | 1 | T | |
| 86 | VCCIO1 | 1 | | | VCCIO1 | 1 | | |
| 87 | VCCAUX | - | | | VCCAUX | - | | |
| 88 | PT9B | 0 | C | PCLKC0_0 | PT17B | 0 | C | PCLKC0_0 |
| 89 | GND0 | 0 | | | GND0 | 0 | | |
| 90 | PT9A | 0 | T | PCLKT0_0 | PT17A | 0 | T | PCLKT0_0 |
| 91 | PT8B | 0 | C | VREF1_0 | PT16B | 0 | C | VREF1_0 |
| 92 | PT8A | 0 | T | VREF2_0 | PT16A | 0 | T | VREF2_0 |
| 93 | PT7B | 0 | | | PT15B | 0 | | |
| 94 | PT6B | 0 | C | | PT14B | 0 | C | |
| 95 | PT6A | 0 | T | TDQS6 | PT14A | 0 | T | TDQS14 |
| 96 | PT4B | 0 | C | | PT12B | 0 | C | |
| 97 | PT4A | 0 | T | | PT12A | 0 | T | |
| 98 | PT2B | 0 | C | | PT10B | 0 | C | |
| 99 | PT2A | 0 | T | | PT10A | 0 | T | |
| 100 | VCCIO0 | 0 | | | VCCIO0 | 0 | | |

*Double bonded to the pin.

# LFEC1, LFEC3, LFECP/EC6 Logic Signal Connections: 144 TQFP (Cont.)

| Pin Number | LFEC1 | | | | LFEC3 | | | | LFECP6/EC6 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Pin Function | Bank | LVDS | Dual Function | Pin Function | Bank | LVDS | Dual Function | Pin Function | Bank | LVDS | Dual Function |
| 50 | PB8B | 5 | C | VREF1_5 | PB16B | 5 | C | VREF1_5 | PB16B | 5 | C | VREF1_5 |
| 51 | PB9A | 5 | T | PCLKT5_0 | PB17A | 5 | T | PCLKT5_0 | PB17A | 5 | T | PCLKT5_0 |
| 52 | GND5 | 5 | | | GND5 | 5 | | | GND5 | 5 | | |
| 53 | PB9B | 5 | C | PCLKC5_0 | PB17B | 5 | C | PCLKC5_0 | PB17B | 5 | C | PCLKC5_0 |
| 54 | VCCAUX | - | | | VCCAUX | - | | | VCCAUX | - | | |
| 55 | VCCIO4 | 4 | | | VCCIO4 | 4 | | | VCCIO4 | 4 | | |
| 56 | PB10A | 4 | T | WRITEN | PB18A | 4 | T | WRITEN | PB18A | 4 | T | WRITEN |
| 57 | PB10B | 4 | C | CS1N | PB18B | 4 | C | CS1N | PB18B | 4 | C | CS1N |
| 58 | PB11A | 4 | T | VREF1_4 | PB19A | 4 | T | VREF1_4 | PB19A | 4 | T | VREF1_4 |
| 59 | PB11B | 4 | C | CSN | PB19B | 4 | C | CSN | PB19B | 4 | C | CSN |
| 60 | PB12A | 4 | T | VREF2_4 | PB20A | 4 | T | VREF2_4 | PB20A | 4 | T | VREF2_4 |
| 61 | PB12B | 4 | C | D0/SPID7 | PB20B | 4 | C | D0/SPID7 | PB20B | 4 | C | D0/SPID7 |
| 62 | PB13A | 4 | T | D2/SPID5 | PB21A | 4 | T | D2/SPID5 | PB21A | 4 | T | D2/SPID5 |
| 63 | GND4 | 4 | | | GND4 | 4 | | | GND4 | 4 | | |
| 64 | PB13B | 4 | C | D1/SPID6 | PB21B | 4 | C | D1/SPID6 | PB21B | 4 | C | D1/SPID6 |
| 65 | PB14A | 4 | T | BDQS14 | PB22A | 4 | T | BDQS22 | PB22A | 4 | T | BDQS22 |
| 66 | PB14B | 4 | C | D3/SPID4 | PB22B | 4 | C | D3/SPID4 | PB22B | 4 | C | D3/SPID4 |
| 67 | PB15A | 4 | T | | PB23A | 4 | T | | PB23A | 4 | T | |
| 68 | PB15B | 4 | C | D4/SPID3 | PB23B | 4 | C | D4/SPID3 | PB23B | 4 | C | D4/SPID3 |
| 69 | PB16B | 4 | | D5/SPID2 | PB24B | 4 | | D5/SPID2 | PB24B | 4 | | D5/SPID2 |
| 70 | PB17B | 4 | | D6/SPID1 | PB25B | 4 | | D6/SPID1 | PB25B | 4 | | D6/SPID1 |
| 71 | VCCIO4 | 4 | | | VCCIO4 | 4 | | | VCCIO4 | 4 | | |
| 72* | GND3<br>GND4 | - | | | GND3<br>GND4 | - | | | GND3<br>GND4 | - | | |
| 73 | VCCIO3 | 3 | | | VCCIO3 | 3 | | | VCCIO3 | 3 | | |
| 74 | PR14A | 3 | | VREF1_3 | PR18A | 3 | | VREF1_3 | PR27A | 3 | | VREF1_3 |
| 75 | PR12B | 3 | C | | PR16B | 3 | C | | PR25B | 3 | C | |
| 76 | PR12A | 3 | T | | PR16A | 3 | T | | PR25A | 3 | T | |
| 77 | PR11B | 3 | C | | PR15B | 3 | C | | PR24B | 3 | C | |
| 78 | PR11A | 3 | T | RDQS11 | PR15A | 3 | T | RDQS15 | PR24A | 3 | T | RDQS24 |
| 79 | PR10B | 3 | C | RLM0_PLLC_FB_A | PR14B | 3 | C | RLM0_PLLC_FB_A | PR23B | 3 | C | RLM0_PLLC_FB_A |
| 80 | GND3 | 3 | | | GND3 | 3 | | | GND3 | 3 | | |
| 81 | PR10A | 3 | T | RLM0_PLLT_FB_A | PR14A | 3 | T | RLM0_PLLT_FB_A | PR23A | 3 | T | RLM0_PLLT_FB_A |
| 82 | PR9B | 3 | C | RLM0_PLLC_IN_A | PR13B | 3 | C | RLM0_PLLC_IN_A | PR22B | 3 | C | RLM0_PLLC_IN_A |
| 83 | PR9A | 3 | T | RLM0_PLLT_IN_A | PR13A | 3 | T | RLM0_PLLT_IN_A | PR22A | 3 | T | RLM0_PLLT_IN_A |
| 84 | VCCIO3 | 3 | | | VCCIO3 | 3 | | | VCCIO3 | 3 | | |
| 85 | PR8B | 3 | C | DI/CSSPIN | PR12B | 3 | C | DI/CSSPIN | PR21B | 3 | C | DI/CSSPIN |
| 86 | PR8A | 3 | T | DOUT/CSON | PR12A | 3 | T | DOUT/CSON | PR21A | 3 | T | DOUT/CSON |
| 87 | PR7B | 3 | C | BUSY/SISPI | PR11B | 3 | C | BUSY/SISPI | PR20B | 3 | C | BUSY/SISPI |
| 88 | PR7A | 3 | T | D7/SPID0 | PR11A | 3 | T | D7/SPID0 | PR20A | 3 | T | D7/SPID0 |
| 89 | CFG2 | 3 | | | CFG2 | 3 | | | CFG2 | 3 | | |
| 90 | CFG1 | 3 | | | CFG1 | 3 | | | CFG1 | 3 | | |
| 91 | CFG0 | 3 | | | CFG0 | 3 | | | CFG0 | 3 | | |
| 92 | VCC | - | | | VCC | - | | | VCC | - | | |
| 93 | PROGRAMN | 3 | | | PROGRAMN | 3 | | | PROGRAMN | 3 | | |
| 94 | CCLK | 3 | | | CCLK | 3 | | | CCLK | 3 | | |
| 95 | INITN | 3 | | | INITN | 3 | | | INITN | 3 | | |
| 96 | GND | - | | | GND | - | | | GND | - | | |
| 97 | DONE | 3 | | | DONE | 3 | | | DONE | 3 | | |
| 98 | GND | - | | | GND | - | | | GND | - | | |

## LFECP/EC6, LFECP/EC10 Logic Signal Connections: 208 PQFP (Cont.)

| Pin Number | LFECP6/LFEC6 | | | | LFECP10/LFEC10 | | | |
|---|---|---|---|---|---|---|---|---|
| | Pin Function | Bank | LVDS | Dual Function | Pin Function | Bank | LVDS | Dual Function |
| 85 | VCCIO4 | 4 | | | VCCIO4 | 4 | | |
| 86 | PB18A | 4 | T | WRITEN | PB26A | 4 | T | WRITEN |
| 87 | PB18B | 4 | C | CS1N | PB26B | 4 | C | CS1N |
| 88 | PB19A | 4 | T | VREF1_4 | PB27A | 4 | T | VREF1_4 |
| 89 | PB19B | 4 | C | CSN | PB27B | 4 | C | CSN |
| 90 | PB20A | 4 | T | VREF2_4 | PB28A | 4 | T | VREF2_4 |
| 91 | PB20B | 4 | C | D0/SPID7 | PB28B | 4 | C | D0/SPID7 |
| 92 | PB21A | 4 | T | D2/SPID5 | PB29A | 4 | T | D2/SPID5 |
| 93 | GND4 | 4 | | | GND4 | 4 | | |
| 94 | PB21B | 4 | C | D1/SPID6 | PB29B | 4 | C | D1/SPID6 |
| 95 | PB22A | 4 | T | BDQS22 | PB30A | 4 | T | BDQS30 |
| 96 | PB22B | 4 | C | D3/SPID4 | PB30B | 4 | C | D3/SPID4 |
| 97 | PB23A | 4 | T | | PB31A | 4 | T | |
| 98 | PB23B | 4 | C | D4/SPID3 | PB31B | 4 | C | D4/SPID3 |
| 99 | PB24A | 4 | T | | PB32A | 4 | T | |
| 100 | PB24B | 4 | C | D5/SPID2 | PB32B | 4 | C | D5/SPID2 |
| 101 | PB25A | 4 | T | | PB33A | 4 | T | |
| 102 | PB25B | 4 | C | D6/SPID1 | PB33B | 4 | C | D6/SPID1 |
| 103 | PB33A | 4 | | | PB41A | 4 | | |
| 104 | VCCIO4 | 4 | | | VCCIO4 | 4 | | |
| 105* | GND3<br>GND4 | - | | | GND3<br>GND4 | - | | |
| 106 | VCCIO3 | 3 | | | VCCIO3 | 3 | | |
| 107 | PR27B | 3 | C | VREF2_3 | PR36B | 3 | C | VREF2_3 |
| 108 | PR27A | 3 | T | VREF1_3 | PR36A | 3 | T | VREF1_3 |
| 109 | PR26B | 3 | C | | PR35B | 3 | C | |
| 110 | PR26A | 3 | T | | PR35A | 3 | T | |
| 111 | PR25B | 3 | C | | PR34B | 3 | C | |
| 112 | PR25A | 3 | T | | PR34A | 3 | T | |
| 113 | PR24B | 3 | C | | PR33B | 3 | C | |
| 114 | PR24A | 3 | T | RDQS24 | PR33A | 3 | T | RDQS33 |
| 115 | PR23B | 3 | C | RLM0_PLLC_FB_A | PR32B | 3 | C | RLM0_PLLC_FB_A |
| 116 | GND3 | 3 | | | GND3 | 3 | | |
| 117 | PR23A | 3 | T | RLM0_PLLT_FB_A | PR32A | 3 | T | RLM0_PLLT_FB_A |
| 118 | PR22B | 3 | C | RLM0_PLLC_IN_A | PR31B | 3 | C | RLM0_PLLC_IN_A |
| 119 | PR22A | 3 | T | RLM0_PLLT_IN_A | PR31A | 3 | T | RLM0_PLLT_IN_A |
| 120 | VCCIO3 | 3 | | | VCCIO3 | 3 | | |
| 121 | PR21B | 3 | C | DI/CSSPIN | PR30B | 3 | C | DI/CSSPIN |
| 122 | PR21A | 3 | T | DOUT/CSON | PR30A | 3 | T | DOUT/CSON |
| 123 | PR20B | 3 | C | BUSY/SISPI | PR29B | 3 | C | BUSY/SISPI |
| 124 | PR20A | 3 | T | D7/SPID0 | PR29A | 3 | T | D7/SPID0 |
| 125 | CFG2 | 3 | | | CFG2 | 3 | | |
| 126 | CFG1 | 3 | | | CFG1 | 3 | | |

# LFECP/EC6, LFECP/EC10, LFECP/EC15 Logic Signal Connections: 484 fpBGA (Cont.)

| LFECP6/LFEC6 | | | | | LFECP10/LFEC10 | | | | | LFECP/LFEC15 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function |
| V12 | PB16B | 5 | C | VREF1_5 | V12 | PB24B | 5 | C | VREF1_5 | V12 | PB24B | 5 | C | VREF1_5 |
| AB10 | PB17A | 5 | T | PCLKT5_0 | AB10 | PB25A | 5 | T | PCLKT5_0 | AB10 | PB25A | 5 | T | PCLKT5_0 |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| AB11 | PB17B | 5 | C | PCLKC5_0 | AB11 | PB25B | 5 | C | PCLKC5_0 | AB11 | PB25B | 5 | C | PCLKC5_0 |
| Y12 | PB18A | 4 | T | WRITEN | Y12 | PB26A | 4 | T | WRITEN | Y12 | PB26A | 4 | T | WRITEN |
| U11 | PB18B | 4 | C | CS1N | U11 | PB26B | 4 | C | CS1N | U11 | PB26B | 4 | C | CS1N |
| W12 | PB19A | 4 | T | VREF1_4 | W12 | PB27A | 4 | T | VREF1_4 | W12 | PB27A | 4 | T | VREF1_4 |
| U12 | PB19B | 4 | C | CSN | U12 | PB27B | 4 | C | CSN | U12 | PB27B | 4 | C | CSN |
| W13 | PB20A | 4 | T | VREF2_4 | W13 | PB28A | 4 | T | VREF2_4 | W13 | PB28A | 4 | T | VREF2_4 |
| U13 | PB20B | 4 | C | D0/SPID7 | U13 | PB28B | 4 | C | D0/SPID7 | U13 | PB28B | 4 | C | D0/SPID7 |
| AA12 | PB21A | 4 | T | D2/SPID5 | AA12 | PB29A | 4 | T | D2/SPID5 | AA12 | PB29A | 4 | T | D2/SPID5 |
| GND | GND4 | 4 | | | GND | GND4 | 4 | | | GND | GND4 | 4 | | |
| AB12 | PB21B | 4 | C | D1/SPID6 | AB12 | PB29B | 4 | C | D1/SPID6 | AB12 | PB29B | 4 | C | D1/SPID6 |
| T13 | PB22A | 4 | T | BDQS22 | T13 | PB30A | 4 | T | BDQS30 | T13 | PB30A | 4 | T | BDQS30 |
| V13 | PB22B | 4 | C | D3/SPID4 | V13 | PB30B | 4 | C | D3/SPID4 | V13 | PB30B | 4 | C | D3/SPID4 |
| W14 | PB23A | 4 | T | | W14 | PB31A | 4 | T | | W14 | PB31A | 4 | T | |
| U14 | PB23B | 4 | C | D4/SPID3 | U14 | PB31B | 4 | C | D4/SPID3 | U14 | PB31B | 4 | C | D4/SPID3 |
| Y13 | PB24A | 4 | T | | Y13 | PB32A | 4 | T | | Y13 | PB32A | 4 | T | |
| V14 | PB24B | 4 | C | D5/SPID2 | V14 | PB32B | 4 | C | D5/SPID2 | V14 | PB32B | 4 | C | D5/SPID2 |
| AA13 | PB25A | 4 | T | | AA13 | PB33A | 4 | T | | AA13 | PB33A | 4 | T | |
| GND | GND4 | 4 | | | GND | GND4 | 4 | | | GND | GND4 | 4 | | |
| AB13 | PB25B | 4 | C | D6/SPID1 | AB13 | PB33B | 4 | C | D6/SPID1 | AB13 | PB33B | 4 | C | D6/SPID1 |
| AA14 | PB26A | 4 | T | | AA14 | PB34A | 4 | T | | AA14 | PB34A | 4 | T | |
| Y14 | PB26B | 4 | C | | Y14 | PB34B | 4 | C | | Y14 | PB34B | 4 | C | |
| Y15 | PB27A | 4 | T | | Y15 | PB35A | 4 | T | | Y15 | PB35A | 4 | T | |
| W15 | PB27B | 4 | C | | W15 | PB35B | 4 | C | | W15 | PB35B | 4 | C | |
| V15 | PB28A | 4 | T | | V15 | PB36A | 4 | T | | V15 | PB36A | 4 | T | |
| T14 | PB28B | 4 | C | | T14 | PB36B | 4 | C | | T14 | PB36B | 4 | C | |
| AB14 | PB29A | 4 | T | | AB14 | PB37A | 4 | T | | AB14 | PB37A | 4 | T | |
| GND | GND4 | 4 | | | GND | GND4 | 4 | | | GND | GND4 | 4 | | |
| AB15 | PB29B | 4 | C | | AB15 | PB37B | 4 | C | | AB15 | PB37B | 4 | C | |
| AB16 | PB30A | 4 | T | BDQS30 | AB16 | PB38A | 4 | T | BDQS38 | AB16 | PB38A | 4 | T | BDQS38 |
| AA15 | PB30B | 4 | C | | AA15 | PB38B | 4 | C | | AA15 | PB38B | 4 | C | |
| AB17 | PB31A | 4 | T | | AB17 | PB39A | 4 | T | | AB17 | PB39A | 4 | T | |
| AA16 | PB31B | 4 | C | | AA16 | PB39B | 4 | C | | AA16 | PB39B | 4 | C | |
| AB18 | PB32A | 4 | T | | AB18 | PB40A | 4 | T | | AB18 | PB40A | 4 | T | |
| AA17 | PB32B | 4 | C | | AA17 | PB40B | 4 | C | | AA17 | PB40B | 4 | C | |
| AB19 | PB33A | 4 | T | | AB19 | PB41A | 4 | T | | AB19 | PB41A | 4 | T | |
| GND | - | - | | | GND | - | - | | | GND | GND4 | 4 | | |
| AA18 | PB33B | 4 | C | | AA18 | PB41B | 4 | C | | AA18 | PB41B | 4 | C | |
| W16 | NC | - | | | W16 | NC | - | | | W16 | PB42A | 4 | T | |
| U15 | NC | - | | | U15 | NC | - | | | U15 | PB42B | 4 | C | |
| V16 | NC | - | | | V16 | NC | - | | | V16 | PB43A | 4 | T | |
| U16 | NC | - | | | U16 | NC | - | | | U16 | PB43B | 4 | C | |
| Y17 | NC | - | | | Y17 | NC | - | | | Y17 | PB44A | 4 | T | |
| V17 | NC | - | | | V17 | NC | - | | | V17 | PB44B | 4 | C | |
| AB20 | NC | - | | | AB20 | NC | - | | | AB20 | PB45A | 4 | T | |
| GND | - | - | | | GND | - | - | | | GND | GND4 | 4 | | |
| AA19 | NC | - | | | AA19 | NC | - | | | AA19 | PB45B | 4 | C | |
| Y16 | NC | - | | | Y16 | NC | - | | | Y16 | PB46A | 4 | T | BDQS46 |

# LFECP/EC6, LFECP/EC10, LFECP/EC15 Logic Signal Connections: 484 fpBGA (Cont.)

| LFECP6/LFEC6 | | | | | LFECP10/LFEC10 | | | | | LFECP/LFEC15 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function |
| A4 | NC | - | | | A4 | PT9B | 0 | C | | A4 | PT9B | 0 | C | |
| B4 | NC | - | | | B4 | PT9A | 0 | T | | B4 | PT9A | 0 | T | |
| C4 | NC | - | | | C4 | PT8B | 0 | C | | C4 | PT8B | 0 | C | |
| C5 | NC | - | | | C5 | PT8A | 0 | T | | C5 | PT8A | 0 | T | |
| D6 | NC | - | | | D6 | PT7B | 0 | C | | D6 | PT7B | 0 | C | |
| B5 | NC | - | | | B5 | PT7A | 0 | T | | B5 | PT7A | 0 | T | |
| E6 | NC | - | | | E6 | PT6B | 0 | C | | E6 | PT6B | 0 | C | |
| C6 | NC | - | | | C6 | PT6A | 0 | T | TDQS6 | C6 | PT6A | 0 | T | TDQS6 |
| A3 | NC | - | | | A3 | PT5B | 0 | C | | A3 | PT5B | 0 | C | |
| B3 | NC | - | | | B3 | PT5A | 0 | T | | B3 | PT5A | 0 | T | |
| F6 | NC | - | | | F6 | PT4B | 0 | C | | F6 | PT4B | 0 | C | |
| D5 | NC | - | | | D5 | PT4A | 0 | T | | D5 | PT4A | 0 | T | |
| F7 | NC | - | | | F7 | PT3B | 0 | C | | F7 | PT3B | 0 | C | |
| E8 | NC | - | | | E8 | PT3A | 0 | T | | E8 | PT3A | 0 | T | |
| G6 | NC | - | | | G6 | PT2B | 0 | C | | G6 | PT2B | 0 | C | |
| E7 | NC | - | | | E7 | PT2A | 0 | T | | E7 | PT2A | 0 | T | |
| GND | - | - | | | GND | GND0 | 0 | | | GND | GND0 | 0 | | |
| A1 | GND | - | | | A1 | GND | - | | | A1 | GND | - | | |
| A22 | GND | - | | | A22 | GND | - | | | A22 | GND | - | | |
| AB1 | GND | - | | | AB1 | GND | - | | | AB1 | GND | - | | |
| AB22 | GND | - | | | AB22 | GND | - | | | AB22 | GND | - | | |
| H15 | GND | - | | | H15 | GND | - | | | H15 | GND | - | | |
| H8 | GND | - | | | H8 | GND | - | | | H8 | GND | - | | |
| J10 | GND | - | | | J10 | GND | - | | | J10 | GND | - | | |
| J11 | GND | - | | | J11 | GND | - | | | J11 | GND | - | | |
| J12 | GND | - | | | J12 | GND | - | | | J12 | GND | - | | |
| J13 | GND | - | | | J13 | GND | - | | | J13 | GND | - | | |
| J14 | GND | - | | | J14 | GND | - | | | J14 | GND | - | | |
| J9 | GND | - | | | J9 | GND | - | | | J9 | GND | - | | |
| K10 | GND | - | | | K10 | GND | - | | | K10 | GND | - | | |
| K11 | GND | - | | | K11 | GND | - | | | K11 | GND | - | | |
| K12 | GND | - | | | K12 | GND | - | | | K12 | GND | - | | |
| K13 | GND | - | | | K13 | GND | - | | | K13 | GND | - | | |
| K14 | GND | - | | | K14 | GND | - | | | K14 | GND | - | | |
| K9 | GND | - | | | K9 | GND | - | | | K9 | GND | - | | |
| L10 | GND | - | | | L10 | GND | - | | | L10 | GND | - | | |
| L11 | GND | - | | | L11 | GND | - | | | L11 | GND | - | | |
| L12 | GND | - | | | L12 | GND | - | | | L12 | GND | - | | |
| L13 | GND | - | | | L13 | GND | - | | | L13 | GND | - | | |
| L14 | GND | - | | | L14 | GND | - | | | L14 | GND | - | | |
| L9 | GND | - | | | L9 | GND | - | | | L9 | GND | - | | |
| M10 | GND | - | | | M10 | GND | - | | | M10 | GND | - | | |
| M11 | GND | - | | | M11 | GND | - | | | M11 | GND | - | | |
| M12 | GND | - | | | M12 | GND | - | | | M12 | GND | - | | |
| M13 | GND | - | | | M13 | GND | - | | | M13 | GND | - | | |
| M14 | GND | - | | | M14 | GND | - | | | M14 | GND | - | | |
| M9 | GND | - | | | M9 | GND | - | | | M9 | GND | - | | |
| N10 | GND | - | | | N10 | GND | - | | | N10 | GND | - | | |
| N11 | GND | - | | | N11 | GND | - | | | N11 | GND | - | | |
| N12 | GND | - | | | N12 | GND | - | | | N12 | GND | - | | |

# LFECP/EC20 and LFECP/EC33 Logic Signal Connections: 484 fpBGA (Cont.)

| LFECP20/LFEC20 | | | | | LFECP/LFEC33 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function |
| V2 | PL41B | 6 | C | LLM0_PLLC_IN_A | V2 | PL53B | 6 | C | LLM0_PLLC_IN_A |
| U3 | PL42A | 6 | T | LLM0_PLLT_FB_A | U3 | PL54A | 6 | T | LLM0_PLLT_FB_A |
| V3 | PL42B | 6 | C | LLM0_PLLC_FB_A | V3 | PL54B | 6 | C | LLM0_PLLC_FB_A |
| U4 | PL43A | 6 | T | | U4 | PL55A | 6 | T | |
| V5 | PL43B | 6 | C | | V5 | PL55B | 6 | C | |
| W1 | PL44A | 6 | T | | W1 | PL56A | 6 | T | |
| GND | GND6 | 6 | | | GND | GND6 | 6 | | |
| W2 | PL44B | 6 | C | | W2 | PL56B | 6 | C | |
| Y1 | PL45A | 6 | T | LDQS45 | Y1 | PL57A | 6 | T | LDQS57 |
| Y2 | PL45B | 6 | C | | Y2 | PL57B | 6 | C | |
| AA1 | PL46A | 6 | T | | AA1 | PL58A | 6 | T | |
| AA2 | PL46B | 6 | C | | AA2 | PL58B | 6 | C | |
| W4 | PL47A | 6 | T | | W4 | PL59A | 6 | T | |
| V4 | PL47B | 6 | C | | V4 | PL59B | 6 | C | |
| W3 | PL48A | 6 | T | VREF1_6 | W3 | PL68A | 6 | T | VREF1_6 |
| Y3 | PL48B | 6 | C | VREF2_6 | Y3 | PL68B | 6 | C | VREF2_6 |
| GND | GND6 | 6 | | | GND | GND6 | 6 | | |
| GND | GND5 | 5 | | | GND | GND6 | 6 | | |
| GND | - | | | | GND | GND6 | 6 | | |
| GND | - | | | | GND | GND5 | 5 | | |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| V7 | PB10A | 5 | T | | V7 | PB10A | 5 | T | |
| T6 | PB10B | 5 | C | | T6 | PB10B | 5 | C | |
| V8 | PB11A | 5 | T | | V8 | PB11A | 5 | T | |
| U7 | PB11B | 5 | C | | U7 | PB11B | 5 | C | |
| W5 | PB12A | 5 | T | | W5 | PB12A | 5 | T | |
| U6 | PB12B | 5 | C | | U6 | PB12B | 5 | C | |
| AA3 | PB13A | 5 | T | | AA3 | PB13A | 5 | T | |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| AB3 | PB13B | 5 | C | | AB3 | PB13B | 5 | C | |
| Y6 | PB14A | 5 | T | BDQS14 | Y6 | PB14A | 5 | T | BDQS14 |
| V6 | PB14B | 5 | C | | V6 | PB14B | 5 | C | |
| AA5 | PB15A | 5 | T | | AA5 | PB15A | 5 | T | |
| W6 | PB15B | 5 | C | | W6 | PB15B | 5 | C | |
| Y5 | PB16A | 5 | T | | Y5 | PB16A | 5 | T | |
| Y4 | PB16B | 5 | C | | Y4 | PB16B | 5 | C | |
| AA4 | PB17A | 5 | T | | AA4 | PB17A | 5 | T | |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| AB4 | PB17B | 5 | C | | AB4 | PB17B | 5 | C | |
| Y7 | PB18A | 5 | T | | Y7 | PB18A | 5 | T | |
| W8 | PB18B | 5 | C | | W8 | PB18B | 5 | C | |
| W7 | PB19A | 5 | T | | W7 | PB19A | 5 | T | |
| U8 | PB19B | 5 | C | | U8 | PB19B | 5 | C | |
| W9 | PB20A | 5 | T | | W9 | PB20A | 5 | T | |

# LFECP/EC20 and LFECP/EC33 Logic Signal Connections: 484 fpBGA (Cont.)

| LFECP20/LFEC20 | | | | | LFECP/LFEC33 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function |
| U9 | PB20B | 5 | C | | U9 | PB20B | 5 | C | |
| Y8 | PB21A | 5 | T | | Y8 | PB21A | 5 | T | |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| Y9 | PB21B | 5 | C | | Y9 | PB21B | 5 | C | |
| V9 | PB22A | 5 | T | BDQS22 | V9 | PB22A | 5 | T | BDQS22 |
| T9 | PB22B | 5 | C | | T9 | PB22B | 5 | C | |
| W10 | PB23A | 5 | T | | W10 | PB23A | 5 | T | |
| U10 | PB23B | 5 | C | | U10 | PB23B | 5 | C | |
| V10 | PB24A | 5 | T | | V10 | PB24A | 5 | T | |
| T10 | PB24B | 5 | C | | T10 | PB24B | 5 | C | |
| AA6 | PB25A | 5 | T | | AA6 | PB25A | 5 | T | |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| AB5 | PB25B | 5 | C | | AB5 | PB25B | 5 | C | |
| AA8 | PB26A | 5 | T | | AA8 | PB26A | 5 | T | |
| AA7 | PB26B | 5 | C | | AA7 | PB26B | 5 | C | |
| AB6 | PB27A | 5 | T | | AB6 | PB27A | 5 | T | |
| AB7 | PB27B | 5 | C | | AB7 | PB27B | 5 | C | |
| Y10 | PB28A | 5 | T | | Y10 | PB28A | 5 | T | |
| W11 | PB28B | 5 | C | | W11 | PB28B | 5 | C | |
| AB8 | PB29A | 5 | T | | AB8 | PB29A | 5 | T | |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| AB9 | PB29B | 5 | C | | AB9 | PB29B | 5 | C | |
| AA10 | PB30A | 5 | T | BDQS30 | AA10 | PB30A | 5 | T | BDQS30 |
| AA9 | PB30B | 5 | C | | AA9 | PB30B | 5 | C | |
| Y11 | PB31A | 5 | T | | Y11 | PB31A | 5 | T | |
| AA11 | PB31B | 5 | C | | AA11 | PB31B | 5 | C | |
| V11 | PB32A | 5 | T | VREF2_5 | V11 | PB32A | 5 | T | VREF2_5 |
| V12 | PB32B | 5 | C | VREF1_5 | V12 | PB32B | 5 | C | VREF1_5 |
| AB10 | PB33A | 5 | T | PCLKT5_0 | AB10 | PB33A | 5 | T | PCLKT5_0 |
| GND | GND5 | 5 | | | GND | GND5 | 5 | | |
| AB11 | PB33B | 5 | C | PCLKC5_0 | AB11 | PB33B | 5 | C | PCLKC5_0 |
| Y12 | PB34A | 4 | T | WRITEN | Y12 | PB34A | 4 | T | WRITEN |
| U11 | PB34B | 4 | C | CS1N | U11 | PB34B | 4 | C | CS1N |
| W12 | PB35A | 4 | T | VREF1_4 | W12 | PB35A | 4 | T | VREF1_4 |
| U12 | PB35B | 4 | C | CSN | U12 | PB35B | 4 | C | CSN |
| W13 | PB36A | 4 | T | VREF2_4 | W13 | PB36A | 4 | T | VREF2_4 |
| U13 | PB36B | 4 | C | D0/SPID7 | U13 | PB36B | 4 | C | D0/SPID7 |
| AA12 | PB37A | 4 | T | D2/SPID5 | AA12 | PB37A | 4 | T | D2/SPID5 |
| GND | GND4 | 4 | | | GND | GND4 | 4 | | |
| AB12 | PB37B | 4 | C | D1/SPID6 | AB12 | PB37B | 4 | C | D1/SPID6 |
| T13 | PB38A | 4 | T | BDQS38 | T13 | PB38A | 4 | T | BDQS38 |
| V13 | PB38B | 4 | C | D3/SPID4 | V13 | PB38B | 4 | C | D3/SPID4 |
| W14 | PB39A | 4 | T | | W14 | PB39A | 4 | T | |
| U14 | PB39B | 4 | C | D4/SPID3 | U14 | PB39B | 4 | C | D4/SPID3 |

# LFECP/EC20 and LFECP/EC33 Logic Signal Connections: 484 fpBGA (Cont.)

| LFECP20/LFEC20 | | | | | LFECP/LFEC33 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function |
| AB1 | GND | - | | | AB1 | GND | - | | |
| AB22 | GND | - | | | AB22 | GND | - | | |
| H15 | GND | - | | | H15 | GND | - | | |
| H8 | GND | - | | | H8 | GND | - | | |
| J10 | GND | - | | | J10 | GND | - | | |
| J11 | GND | - | | | J11 | GND | - | | |
| J12 | GND | - | | | J12 | GND | - | | |
| J13 | GND | - | | | J13 | GND | - | | |
| J14 | GND | - | | | J14 | GND | - | | |
| J9 | GND | - | | | J9 | GND | - | | |
| K10 | GND | - | | | K10 | GND | - | | |
| K11 | GND | - | | | K11 | GND | - | | |
| K12 | GND | - | | | K12 | GND | - | | |
| K13 | GND | - | | | K13 | GND | - | | |
| K14 | GND | - | | | K14 | GND | - | | |
| K9 | GND | - | | | K9 | GND | - | | |
| L10 | GND | - | | | L10 | GND | - | | |
| L11 | GND | - | | | L11 | GND | - | | |
| L12 | GND | - | | | L12 | GND | - | | |
| L13 | GND | - | | | L13 | GND | - | | |
| L14 | GND | - | | | L14 | GND | - | | |
| L9 | GND | - | | | L9 | GND | - | | |
| M10 | GND | - | | | M10 | GND | - | | |
| M11 | GND | - | | | M11 | GND | - | | |
| M12 | GND | - | | | M12 | GND | - | | |
| M13 | GND | - | | | M13 | GND | - | | |
| M14 | GND | - | | | M14 | GND | - | | |
| M9 | GND | - | | | M9 | GND | - | | |
| N10 | GND | - | | | N10 | GND | - | | |
| N11 | GND | - | | | N11 | GND | - | | |
| N12 | GND | - | | | N12 | GND | - | | |
| N13 | GND | - | | | N13 | GND | - | | |
| N14 | GND | - | | | N14 | GND | - | | |
| N9 | GND | - | | | N9 | GND | - | | |
| P10 | GND | - | | | P10 | GND | - | | |
| P11 | GND | - | | | P11 | GND | - | | |
| P12 | GND | - | | | P12 | GND | - | | |
| P13 | GND | - | | | P13 | GND | - | | |
| P14 | GND | - | | | P14 | GND | - | | |
| P9 | GND | - | | | P9 | GND | - | | |
| R15 | GND | - | | | R15 | GND | - | | |
| R8 | GND | - | | | R8 | GND | - | | |
| J16 | VCC | - | | | J16 | VCC | - | | |
| J7 | VCC | - | | | J7 | VCC | - | | |

## LFECP/EC20, LFECP/EC33 Logic Signal Connections: 672 fpBGA (Cont.)

| LFEC20/LFECP20 | | | | | LFECP/EC33 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ball Number | Ball Function | Bank | LVDS | Dual Function | Ball Number | Ball Function | Bank | LVDS | Dual Function |
| M10 | GND | - | | | M10 | GND | - | | |
| M11 | GND | - | | | M11 | GND | - | | |
| M12 | GND | - | | | M12 | GND | - | | |
| M13 | GND | - | | | M13 | GND | - | | |
| M14 | GND | - | | | M14 | GND | - | | |
| M15 | GND | - | | | M15 | GND | - | | |
| M16 | GND | - | | | M16 | GND | - | | |
| M17 | GND | - | | | M17 | GND | - | | |
| N10 | GND | - | | | N10 | GND | - | | |
| N11 | GND | - | | | N11 | GND | - | | |
| N12 | GND | - | | | N12 | GND | - | | |
| N13 | GND | - | | | N13 | GND | - | | |
| N14 | GND | - | | | N14 | GND | - | | |
| N15 | GND | - | | | N15 | GND | - | | |
| N16 | GND | - | | | N16 | GND | - | | |
| N17 | GND | - | | | N17 | GND | - | | |
| P10 | GND | - | | | P10 | GND | - | | |
| P11 | GND | - | | | P11 | GND | - | | |
| P12 | GND | - | | | P12 | GND | - | | |
| P13 | GND | - | | | P13 | GND | - | | |
| P14 | GND | - | | | P14 | GND | - | | |
| P15 | GND | - | | | P15 | GND | - | | |
| P16 | GND | - | | | P16 | GND | - | | |
| P17 | GND | - | | | P17 | GND | - | | |
| R10 | GND | - | | | R10 | GND | - | | |
| R11 | GND | - | | | R11 | GND | - | | |
| R12 | GND | - | | | R12 | GND | - | | |
| R13 | GND | - | | | R13 | GND | - | | |
| R14 | GND | - | | | R14 | GND | - | | |
| R15 | GND | - | | | R15 | GND | - | | |
| R16 | GND | - | | | R16 | GND | - | | |
| R17 | GND | - | | | R17 | GND | - | | |
| T10 | GND | - | | | T10 | GND | - | | |
| T11 | GND | - | | | T11 | GND | - | | |
| T12 | GND | - | | | T12 | GND | - | | |
| T13 | GND | - | | | T13 | GND | - | | |
| T14 | GND | - | | | T14 | GND | - | | |
| T15 | GND | - | | | T15 | GND | - | | |
| T16 | GND | - | | | T16 | GND | - | | |
| T17 | GND | - | | | T17 | GND | - | | |
| U10 | GND | - | | | U10 | GND | - | | |
| U11 | GND | - | | | U11 | GND | - | | |

## Thermal Management

Thermal management is recommended as part of any sound FPGA design methodology. To assess the thermal characteristics of a system, Lattice specifies a maximum allowable junction temperature in all device data sheets. Designers must complete a thermal analysis of their specific design to ensure that the device and package do not exceed the junction temperature limits. Refer to the Thermal Management document to find the device/package specific thermal values.

### For Further Information

For further information regarding Thermal Management, refer to the following located on the Lattice website at www.latticesemi.com.

- Thermal Management document
- Technical Note TN1052 - Power Estimation and Management for LatticeECP/EC and LatticeXP Devices
- Power Calculator tool included with Lattice's ispLEVER design tool, or as a standalone download from www.latticesemi.com/software

# LatticeECP/EC Family Data Sheet Ordering Information



## Part Number Description

LFXXX XX X – X XXXX X

**Device Family**
- Lattice EC (FPGA)
- Lattice ECP (EC FPGA + DSP Blocks)

**Logic Capacity**
- 1* = 1.5K LUTs
- 3* = 3K LUTs
- 6 = 6K LUTs
- 10 = 10K LUTs
- 15 = 15K LUTs
- 20 = 20K LUTs
- 33 = 33K LUTs

**Supply Voltage**
- E = 1.2V

**Grade**
- C = Commercial
- I = Industrial

**Package**
- T100 = 100-pin TQFP*
- T144 = 144-pin TQFP
- Q208 = 208-pin PQFP
- F256 = 256-ball fpBGA
- F484 = 484-ball fpBGA
- F672 = 672-ball fpBGA
- TN100 = 100-pin Lead-free TQFP*
- TN144 = 144-pin Lead-free TQFP
- QN208 = 208-pin Lead-free PQFP
- FN256 = 256-ball Lead-free fpBGA
- FN484 = 484-ball Lead-free fpBGA
- FN672 = 672-ball Lead-free fpBGA

**Speed**
- 3 = Slowest
- 4
- 5 = Fastest

*Not available in the LatticeECP Family.

## Ordering Information

Note:þLatticeECP/EC devices are dual marked. For example, the commercial speed grade LFEC20E-4F484C is also marked with industrial grade -3I (LFEC20E-3F484I). The commercial grade is one speed grade faster than the associated dual mark industrial grade. The slowest commercial speed grade does not have industrial markings. The markings appear as follows: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## Conventional Packaging

**LatticeEC Commercial**

| Part Number | I/Os | Grade | Package | Pins | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC1E-3Q208C | 112 | -3 | PQFP | 208 | COM | 1.5K |
| LFEC1E-4Q208C | 112 | -4 | PQFP | 208 | COM | 1.5K |
| LFEC1E-5Q208C | 112 | -5 | PQFP | 208 | COM | 1.5K |
| LFEC1E-3T144C | 97 | -3 | TQFP | 144 | COM | 1.5K |
| LFEC1E-4T144C | 97 | -4 | TQFP | 144 | COM | 1.5K |
| LFEC1E-5T144C | 97 | -5 | TQFP | 144 | COM | 1.5K |
| LFEC1E-3T100C | 67 | -3 | TQFP | 100 | COM | 1.5K |
| LFEC1E-4T100C | 67 | -4 | TQFP | 100 | COM | 1.5K |
| LFEC1E-5T100C | 67 | -5 | TQFP | 100 | COM | 1.5K |

| Part Number | I/Os | Grade | Package | Pins | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC3E-3F256C | 160 | -3 | fpBGA | 256 | COM | 3.1K |
| LFEC3E-4F256C | 160 | -4 | fpBGA | 256 | COM | 3.1K |
| LFEC3E-5F256C | 160 | -5 | fpBGA | 256 | COM | 3.1K |
| LFEC3E-3Q208C | 145 | -3 | PQFP | 208 | COM | 3.1K |
| LFEC3E-4Q208C | 145 | -4 | PQFP | 208 | COM | 3.1K |
| LFEC3E-5Q208C | 145 | -5 | PQFP | 208 | COM | 3.1K |
| LFEC3E-3T144C | 97 | -3 | TQFP | 144 | COM | 3.1K |
| LFEC3E-4T144C | 97 | -4 | TQFP | 144 | COM | 3.1K |
| LFEC3E-5T144C | 97 | -5 | TQFP | 144 | COM | 3.1K |
| LFEC3E-3T100C | 67 | -3 | TQFP | 100 | COM | 3.1K |
| LFEC3E-4T100C | 67 | -4 | TQFP | 100 | COM | 3.1K |
| LFEC3E-5T100C | 67 | -5 | TQFP | 100 | COM | 3.1K |

| Part Number | I/Os | Grade | Package | Pins | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC6E-3F484C | 224 | -3 | fpBGA | 484 | COM | 6.1K |
| LFEC6E-4F484C | 224 | -4 | fpBGA | 484 | COM | 6.1K |
| LFEC6E-5F484C | 224 | -5 | fpBGA | 484 | COM | 6.1K |
| LFEC6E-3F256C | 195 | -3 | fpBGA | 256 | COM | 6.1K |
| LFEC6E-4F256C | 195 | -4 | fpBGA | 256 | COM | 6.1K |
| LFEC6E-5F256C | 195 | -5 | fpBGA | 256 | COM | 6.1K |
| LFEC6E-3Q208C | 147 | -3 | PQFP | 208 | COM | 6.1K |
| LFEC6E-4Q208C | 147 | -4 | PQFP | 208 | COM | 6.1K |
| LFEC6E-5Q208C | 147 | -5 | PQFP | 208 | COM | 6.1K |
| LFEC6E-3T144C | 97 | -3 | TQFP | 144 | COM | 6.1K |
| LFEC6E-4T144C | 97 | -4 | TQFP | 144 | COM | 6.1K |
| LFEC6E-5T144C | 97 | -5 | TQFP | 144 | COM | 6.1K |

| Part Number | I/Os | Grade | Package | Pins | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC10E-3F484C | 288 | -3 | fpBGA | 484 | COM | 10.2K |
| LFEC10E-4F484C | 288 | -4 | fpBGA | 484 | COM | 10.2K |
| LFEC10E-5F484C | 288 | -5 | fpBGA | 484 | COM | 10.2K |
| LFEC10E-3F256C | 195 | -3 | fpBGA | 256 | COM | 10.2K |

## Lead-Free Packaging

**LatticeEC Commercial**

| Part Number | I/Os | Grade | Package | Pins/Balls | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC1E-3QN208C | 112 | -3 | Lead-Free PQFP | 208 | COM | 1.5K |
| LFEC1E-4QN208C | 112 | -4 | Lead-Free PQFP | 208 | COM | 1.5K |
| LFEC1E-5QN208C | 112 | -5 | Lead-Free PQFP | 208 | COM | 1.5K |
| LFEC1E-3TN144C | 97 | -3 | Lead-Free TQFP | 144 | COM | 1.5K |
| LFEC1E-4TN144C | 97 | -4 | Lead-Free TQFP | 144 | COM | 1.5K |
| LFEC1E-5TN144C | 97 | -5 | Lead-Free TQFP | 144 | COM | 1.5K |
| LFEC1E-3TN100C | 67 | -3 | Lead-Free TQFP | 100 | COM | 1.5K |
| LFEC1E-4TN100C | 67 | -4 | Lead-Free TQFP | 100 | COM | 1.5K |
| LFEC1E-5TN100C | 67 | -5 | Lead-Free TQFP | 100 | COM | 1.5K |

| Part Number | I/Os | Grade | Package | Pins/Balls | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC3E-3FN256C | 160 | -3 | Lead-Free fpBGA | 256 | COM | 3.1K |
| LFEC3E-4FN256C | 160 | -4 | Lead-Free fpBGA | 256 | COM | 3.1K |
| LFEC3E-5FN256C | 160 | -5 | Lead-Free fpBGA | 256 | COM | 3.1K |
| LFEC3E-3QN208C | 145 | -3 | Lead-Free PQFP | 208 | COM | 3.1K |
| LFEC3E-4QN208C | 145 | -4 | Lead-Free PQFP | 208 | COM | 3.1K |
| LFEC3E-5QN208C | 145 | -5 | Lead-Free PQFP | 208 | COM | 3.1K |
| LFEC3E-3TN144C | 97 | -3 | Lead-Free TQFP | 144 | COM | 3.1K |
| LFEC3E-4TN144C | 97 | -4 | Lead-Free TQFP | 144 | COM | 3.1K |
| LFEC3E-5TN144C | 97 | -5 | Lead-Free TQFP | 144 | COM | 3.1K |
| LFEC3E-3TN100C | 67 | -3 | Lead-Free TQFP | 100 | COM | 3.1K |
| LFEC3E-4TN100C | 67 | -4 | Lead-Free TQFP | 100 | COM | 3.1K |
| LFEC3E-5TN100C | 67 | -5 | Lead-Free TQFP | 100 | COM | 3.1K |

| Part Number | I/Os | Grade | Package | Pins/Balls | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC6E-3FN484C | 224 | -3 | Lead-Free fpBGA | 484 | COM | 6.1K |
| LFEC6E-4FN484C | 224 | -4 | Lead-Free fpBGA | 484 | COM | 6.1K |
| LFEC6E-5FN484C | 224 | -5 | Lead-Free fpBGA | 484 | COM | 6.1K |
| LFEC6E-3FN256C | 195 | -3 | Lead-Free fpBGA | 256 | COM | 6.1K |
| LFEC6E-4FN256C | 195 | -4 | Lead-Free fpBGA | 256 | COM | 6.1K |
| LFEC6E-5FN256C | 195 | -5 | Lead-Free fpBGA | 256 | COM | 6.1K |
| LFEC6E-3QN208C | 147 | -3 | Lead-Free PQFP | 208 | COM | 6.1K |
| LFEC6E-4QN208C | 147 | -4 | Lead-Free PQFP | 208 | COM | 6.1K |
| LFEC6E-5QN208C | 147 | -5 | Lead-Free PQFP | 208 | COM | 6.1K |
| LFEC6E-3TN144C | 97 | -3 | Lead-Free TQFP | 144 | COM | 6.1K |
| LFEC6E-4TN144C | 97 | -4 | Lead-Free TQFP | 144 | COM | 6.1K |
| LFEC6E-5TN144C | 97 | -5 | Lead-Free TQFP | 144 | COM | 6.1K |

| Part Number | I/Os | Grade | Package | Pins/Balls | Temp. | LUTs |
|---|---|---|---|---|---|---|
| LFEC10E-3FN484C | 288 | -3 | Lead-Free fpBGA | 484 | COM | 10.2K |
| LFEC10E-4FN484C | 288 | -4 | Lead-Free fpBGA | 484 | COM | 10.2K |
| LFEC10E-5FN484C | 288 | -5 | Lead-Free fpBGA | 484 | COM | 10.2K |
| LFEC10E-3FN256C | 195 | -3 | Lead-Free fpBGA | 256 | COM | 10.2K |