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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 | 6000                                                                                                                                                              |
| Total RAM Bits                 | 73728                                                                                                                                                             |
| Number of I/O                  | 188                                                                                                                                                               |
| Number of Gates                | -                                                                                                                                                                 |
| Voltage - Supply               | 1.14V ~ 1.26V                                                                                                                                                     |
| Mounting Type                  | Surface Mount                                                                                                                                                     |
| Operating Temperature          | -40°C ~ 100°C (TJ)                                                                                                                                                |
| Package / Case                 | 256-BGA                                                                                                                                                           |
| Supplier Device Package        | 256-FPBGA (17x17)                                                                                                                                                 |
| Purchase URL                   | <a href="https://www.e-xfl.com/product-detail/lattice-semiconductor/lfxp6e-4fn256i">https://www.e-xfl.com/product-detail/lattice-semiconductor/lfxp6e-4fn256i</a> |

## 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 2-3 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.

**Figure 2-3. Slice Diagram**

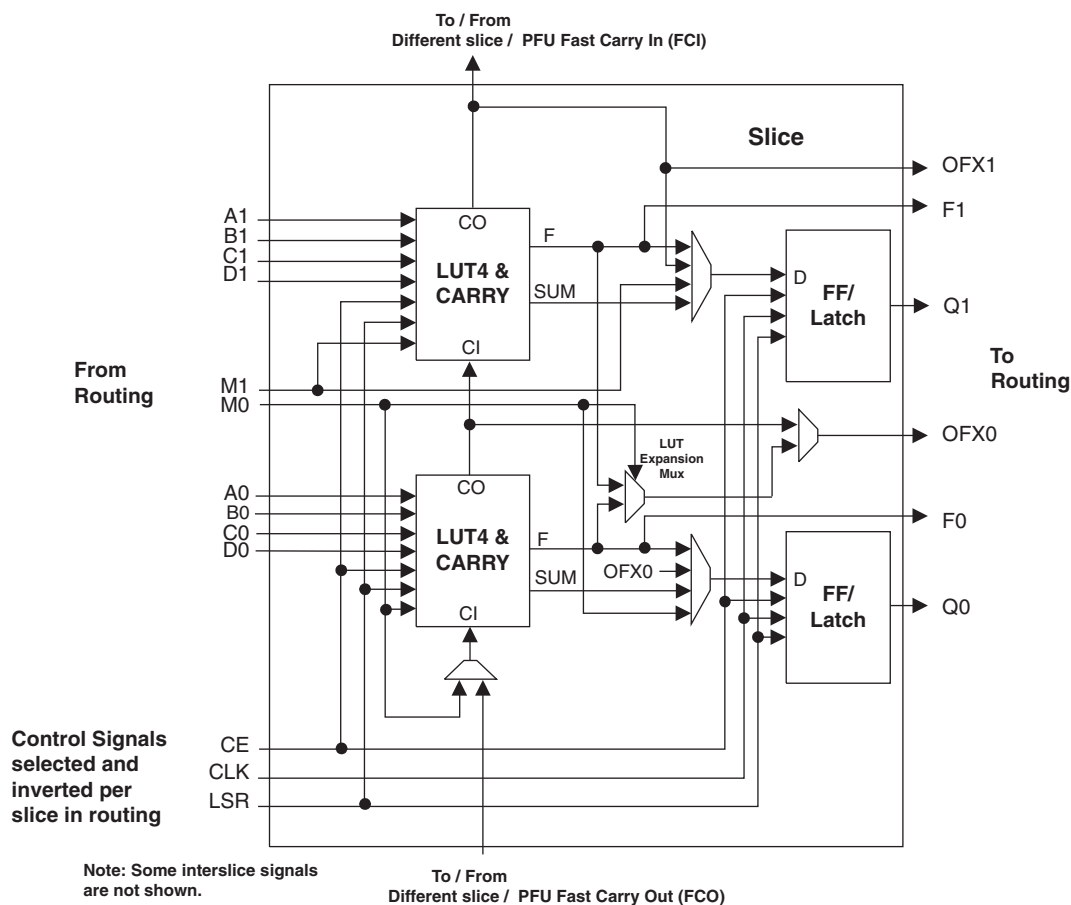
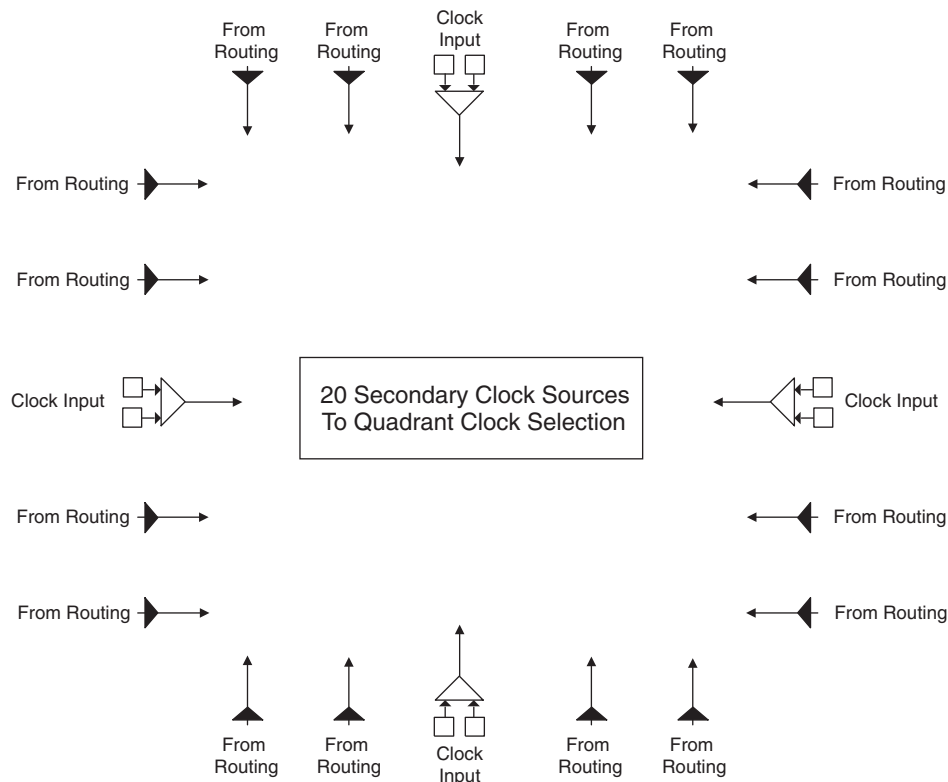


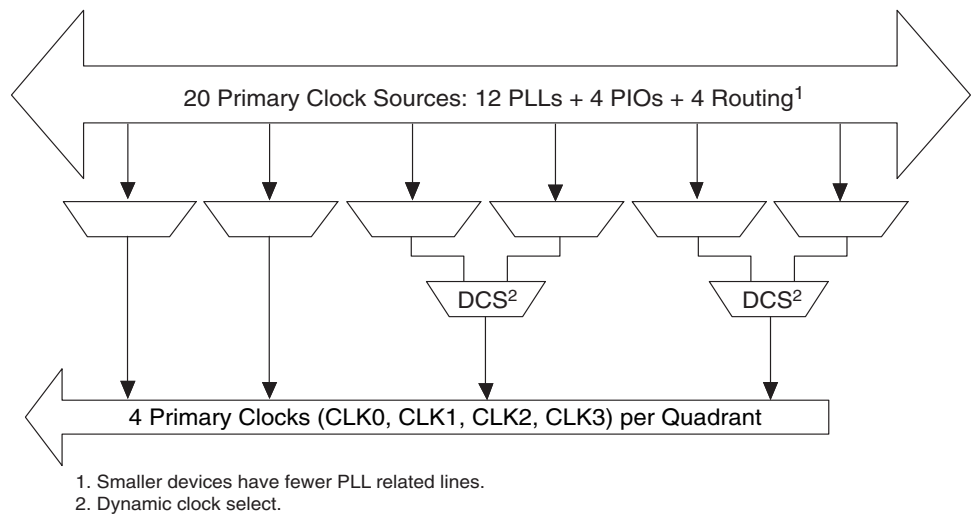
Figure 2-6. Secondary Clock Sources



**Clock Routing**

The clock routing structure in LatticeXP devices consists of four Primary Clock lines and a Secondary Clock network per quadrant. The primary clocks are generated from MUXs located in each quadrant. Figure 2-7 shows this clock routing. The four secondary clocks are generated from MUXs located in each quadrant as shown in Figure 2-8. Each slice derives its clock from the primary clock lines, secondary clock lines and routing as shown in Figure 2-9.

Figure 2-7. Per Quadrant Primary Clock Selection



**Hot Socketing Specifications**<sup>1, 2, 3, 4, 5, 6</sup>

| Symbol   | Parameter                    | Condition                                  | Min. | Typ. | Max.    | Units         |
|----------|------------------------------|--------------------------------------------|------|------|---------|---------------|
| $I_{DK}$ | Input or I/O Leakage Current | $0 \leq V_{IN} \leq V_{IH} \text{ (MAX.)}$ | —    | —    | +/-1000 | $\mu\text{A}$ |

1. Insensitive to sequence of  $V_{CC}$ ,  $V_{CCAUX}$  and  $V_{CCIO}$ . However, assumes monotonic rise/fall rates for  $V_{CC}$ ,  $V_{CCAUX}$  and  $V_{CCIO}$ .
2.  $0 \leq V_{CC} \leq V_{CC} \text{ (MAX)}$  or  $0 \leq V_{CCAUX} \leq V_{CCAUX} \text{ (MAX)}$ .
3.  $0 \leq V_{CCIO} \leq V_{CCIO} \text{ (MAX)}$  for top and bottom I/O banks.
4.  $0.2 \leq V_{CCIO} \leq V_{CCIO} \text{ (MAX)}$  for left and right I/O banks.
5.  $I_{DK}$  is additive to  $I_{PU}$ ,  $I_{PW}$  or  $I_{BH}$ .
6. LVCMOS and LVTTL only.

**Programming and Erase Flash Supply Current<sup>1, 2, 3, 4, 5</sup>**

| Symbol      | Parameter                                    | Device    | Typ <sup>6</sup> | Units |
|-------------|----------------------------------------------|-----------|------------------|-------|
| $I_{CC}$    | Core Power Supply                            | LFXP3E    | 30               | mA    |
|             |                                              | LFXP6E    | 40               | mA    |
|             |                                              | LFXP10E   | 50               | mA    |
|             |                                              | LFXP15E   | 60               | mA    |
|             |                                              | LFXP20E   | 70               | mA    |
|             |                                              | LFXP3C    | 50               | mA    |
|             |                                              | LFXP6C    | 60               | mA    |
|             |                                              | LFXP10C   | 90               | mA    |
|             |                                              | LFXP15C   | 100              | mA    |
|             |                                              | LFXP20C   | 110              | mA    |
| $I_{CCAUX}$ | Auxiliary Power Supply<br>$V_{CCAUX} = 3.3V$ | LFXP3E/C  | 50               | mA    |
|             |                                              | LFXP6E/C  | 60               | mA    |
|             |                                              | LFXP10E/C | 90               | mA    |
|             |                                              | LFXP15E/C | 110              | mA    |
|             |                                              | LFXP20E/C | 130              | mA    |
| $I_{CCJ}$   | $V_{CCJ}$ Power Supply <sup>7</sup>          | All       | 2                | mA    |

1. For further information on supply current, please see details of additional technical documentation at the end of this data sheet.

2. Assumes all outputs are tristated, all inputs are configured as LVCMOS and held at the  $V_{CCIO}$  or GND.

3. Blank user pattern; typical Flash pattern.

4. Bypass or decoupling capacitor across the supply.

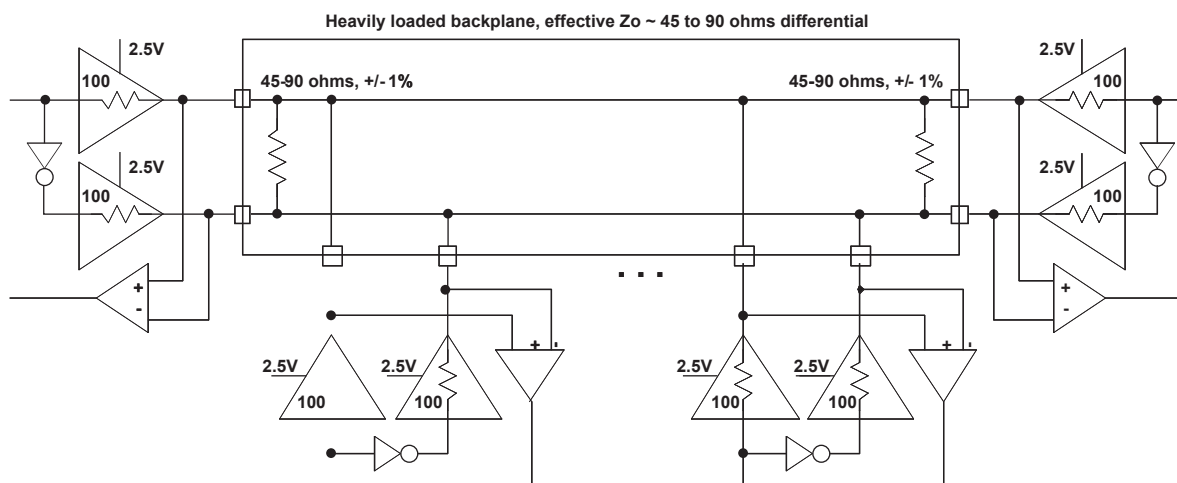
5. JTAG programming is at 1MHz.

6.  $T_A=25^{\circ}C$ , power supplies at nominal voltage.

7. When programming via JTAG.

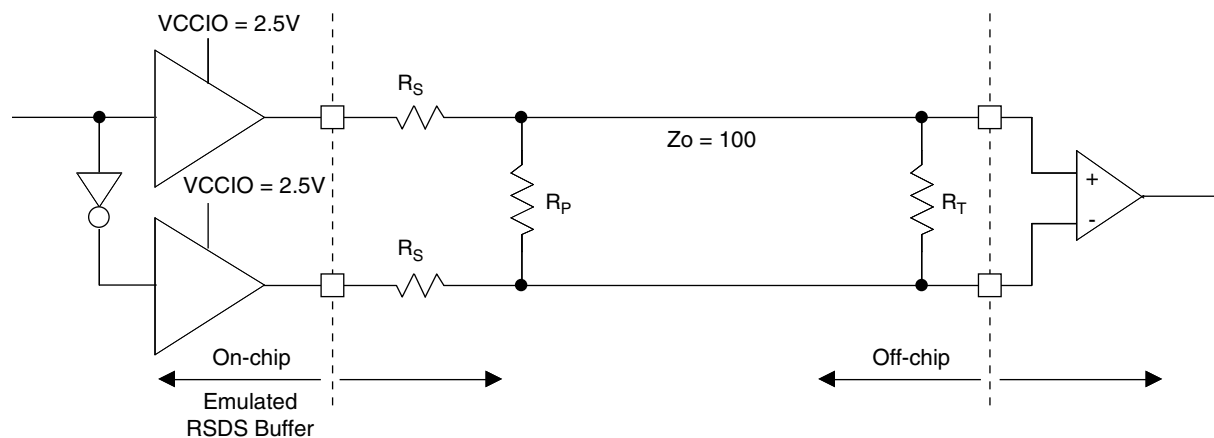
**sysIO Differential Electrical Characteristics****LVDS****Over Recommended Operating Conditions**

| Parameter Symbol   | Parameter Description                        | Test Conditions                              | Min.        | Typ. | Max.  | Units         |
|--------------------|----------------------------------------------|----------------------------------------------|-------------|------|-------|---------------|
| $V_{INP}, V_{INM}$ | Input Voltage                                |                                              | 0           | —    | 2.4   | V             |
| $V_{THD}$          | Differential Input Threshold                 |                                              | +/-100      | —    | —     | mV            |
| $V_{CM}$           | Input Common Mode Voltage                    | $100\text{mV} \leq V_{THD}$                  | $V_{THD}/2$ | 1.2  | 1.8   | V             |
|                    |                                              | $200\text{mV} \leq V_{THD}$                  | $V_{THD}/2$ | 1.2  | 1.9   | V             |
|                    |                                              | $350\text{mV} \leq V_{THD}$                  | $V_{THD}/2$ | 1.2  | 2.0   | V             |
| $I_{IN}$           | Input current                                | Power on or power off                        | —           | —    | +/-10 | $\mu\text{A}$ |
| $V_{OH}$           | Output high voltage for $V_{OP}$ or $V_{OM}$ | $R_T = 100\text{ ohms}$                      | —           | 1.38 | 1.60  | V             |
| $V_{OL}$           | Output low voltage for $V_{OP}$ or $V_{OM}$  | $R_T = 100\text{ ohms}$                      | 0.9V        | 1.03 | —     | V             |
| $V_{OD}$           | Output voltage differential                  | $(V_{OP} - V_{OM}), R_T = 100\text{ ohms}$   | 250         | 350  | 450   | mV            |
| $\Delta V_{OD}$    | Change in $V_{OD}$ between high and low      |                                              | —           | —    | 50    | mV            |
| $V_{OS}$           | Output voltage offset                        | $(V_{OP} - V_{OM})/2, R_T = 100\text{ ohms}$ | 1.125       | 1.25 | 1.375 | V             |
| $\Delta V_{OS}$    | Change in $V_{OS}$ between H and L           |                                              | —           | —    | 50    | mV            |
| $I_{OSD}$          | Output short circuit current                 | $V_{OD} = 0\text{V}$ Driver outputs shorted  | —           | —    | 6     | mA            |

**Figure 3-2. BLVDS Multi-point Output Example****Table 3-2. BLVDS DC Conditions<sup>1</sup>****Over Recommended Operating Conditions**

| Symbol              | Description                 | Typical |         | Units |
|---------------------|-----------------------------|---------|---------|-------|
|                     |                             | Zo = 45 | Zo = 90 |       |
| Z <sub>OUT</sub>    | Output impedance            | 100     | 100     | ohms  |
| R <sub>TLEFT</sub>  | Left end termination        | 45      | 90      | ohms  |
| R <sub>TRIGHT</sub> | Right end termination       | 45      | 90      | ohms  |
| V <sub>OH</sub>     | Output high voltage         | 1.375   | 1.48    | V     |
| V <sub>OL</sub>     | Output low voltage          | 1.125   | 1.02    | V     |
| V <sub>OD</sub>     | Output differential voltage | 0.25    | 0.46    | V     |
| V <sub>CM</sub>     | Output common mode voltage  | 1.25    | 1.25    | V     |
| I <sub>DC</sub>     | DC output current           | 11.2    | 10.2    | mA    |

1. For input buffer, see LVDS table.

**Figure 3-4. RSDS (Reduced Swing Differential Standard)****Table 3-4. RSDS DC Conditions**

| Parameter  | Description                 | Typical | Units |
|------------|-----------------------------|---------|-------|
| $Z_{OUT}$  | Output impedance            | 20      | ohms  |
| $R_S$      | Driver series resistor      | 300     | ohms  |
| $R_P$      | Driver parallel resistor    | 121     | ohms  |
| $R_T$      | Receiver termination        | 100     | ohms  |
| $V_{OH}$   | Output high voltage         | 1.35    | V     |
| $V_{OL}$   | Output low voltage          | 1.15    | V     |
| $V_{OD}$   | Output differential voltage | 0.20    | V     |
| $V_{CM}$   | Output common mode voltage  | 1.25    | V     |
| $Z_{BACK}$ | Back impedance              | 101.5   | ohms  |
| $I_{DC}$   | DC output current           | 3.66    | mA    |



**LatticeXP Internal Timing Parameters<sup>1</sup> (Continued)**

Over Recommended Operating Conditions

| Parameter             | Description                                         | -5   |      | -4   |      | -3   |      | Units |
|-----------------------|-----------------------------------------------------|------|------|------|------|------|------|-------|
|                       |                                                     | Min. | Max. | Min. | Max. | Min. | Max. |       |
| $t_{RSTO\_EBR}$       | Reset To Output Delay Time from EBR Output Register | —    | 1.61 | —    | 1.94 | —    | 2.32 | ns    |
| <b>PLL Parameters</b> |                                                     |      |      |      |      |      |      |       |
| $t_{RSTREC}$          | Reset Recovery to Rising Clock                      | 1.00 | —    | 1.00 | —    | 1.00 | —    | ns    |
| $t_{RSTSU}$           | Reset Signal Setup Time                             | 1.00 | —    | 1.00 | —    | 1.00 | —    | ns    |

1. Internal parameters are characterized but not tested on every device.  
Timing v.F0.11

**sysCLOCK PLL Timing****Over Recommended Operating Conditions**

| Parameter                 | Descriptions                          | Conditions                              | Min.  | Typ. | Max.    | Units |
|---------------------------|---------------------------------------|-----------------------------------------|-------|------|---------|-------|
| $f_{IN}$                  | Input Clock Frequency (CLKI, CLKFB)   |                                         | 25    | —    | 375     | MHz   |
| $f_{OUT}$                 | Output Clock Frequency (CLKOP, CLKOS) |                                         | 25    | —    | 375     | MHz   |
| $f_{OUT2}$                | K-Divider Output Frequency (CLKOK)    |                                         | 0.195 | —    | 187.5   | MHz   |
| $f_{VCO}$                 | PLL VCO Frequency                     |                                         | 375   | —    | 750     | MHz   |
| $f_{PFD}$                 | Phase Detector Input Frequency        |                                         | 25    | —    | —       | MHz   |
| <b>AC Characteristics</b> |                                       |                                         |       |      |         |       |
| $t_{DT}$                  | Output Clock Duty Cycle               | Default duty cycle elected <sup>3</sup> | 45    | 50   | 55      | %     |
| $t_{PH}^4$                | Output Phase Accuracy                 |                                         | —     | —    | 0.05    | UI    |
| $t_{OPJIT}^1$             | Output Clock Period Jitter            | $f_{OUT} \geq 100\text{MHz}$            | —     | —    | +/- 125 | ps    |
|                           |                                       | $f_{OUT} < 100\text{MHz}$               | —     | —    | 0.02    | UIPP  |
| $t_{SK}$                  | Input Clock to Output Clock Skew      | Divider ratio = integer                 | —     | —    | +/- 200 | ps    |
| $t_W$                     | Output Clock Pulse Width              | At 90% or 10% <sup>3</sup>              | 1     | —    | —       | ns    |
| $t_{LOCK}^2$              | PLL Lock-in Time                      |                                         | —     | —    | 150     | us    |
| $t_{PA}$                  | Programmable Delay Unit               |                                         | 100   | 250  | 400     | ps    |
| $t_{IPJIT}$               | Input Clock Period Jitter             |                                         | —     | —    | +/- 200 | ps    |
| $t_{FBKDLy}$              | External Feedback Delay               |                                         | —     | —    | 10      | ns    |
| $t_{HI}$                  | Input Clock High Time                 | 90% to 90%                              | 0.5   | —    | —       | ns    |
| $t_{LO}$                  | Input Clock Low Time                  | 10% to 10%                              | 0.5   | —    | —       | ns    |
| $t_{RST}$                 | RST Pulse Width                       |                                         | 10    | —    | —       | ns    |

1. Jitter sample is taken over 10,000 samples of the primary PLL output with clean reference clock.

2. Output clock is valid after  $t_{LOCK}$  for PLL reset and dynamic delay adjustment.

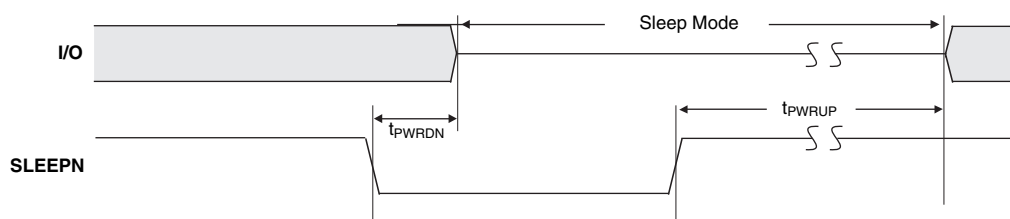
3. Using LVDS output buffers.

4. As compared to CLKOP output.

Timing v.F0.11

**LatticeXP “C” Sleep Mode Timing**

| Parameter     | Descriptions                              | Min.   | Typ. | Max. | Units |
|---------------|-------------------------------------------|--------|------|------|-------|
| $t_{PWRDN}$   | SLEEPN Low to I/O Tristate                | —      | 20   | 32   | ns    |
| $t_{PWRUP}$   | SLEEPN High to Power Up                   | LFXP3  | —    | 1.4  | ms    |
|               |                                           | LFXP6  | —    | 1.7  | ms    |
|               |                                           | LFXP10 | —    | 1.1  | ms    |
|               |                                           | LFXP15 | —    | 1.4  | ms    |
|               |                                           | LFXP20 | —    | 1.7  | ms    |
| $t_{WSLEEPN}$ | SLEEPN Pulse Width to Initiate Sleep Mode | 400    | —    | —    | ns    |
| $t_{WAWAKE}$  | SLEEPN Pulse Rejection                    | —      | —    | 120  | ns    |



**LFXP3 & LFXP6 Logic Signal Connections: 144 TQFP (Cont.)**

| Pin Number | LFXP3        |      |                |                | LFXP6        |      |                |                |
|------------|--------------|------|----------------|----------------|--------------|------|----------------|----------------|
|            | Pin Function | Bank | Differential   | Dual Function  | Pin Function | Bank | Differential   | Dual Function  |
| 93         | PR9A         | 2    | T              | PCLKT2_0       | PR12A        | 2    | T              | PCLKT2_0       |
| 94         | PR8B         | 2    | C              | RUM0_PLLC_IN_A | PR8B         | 2    | C              | RUM0_PLLC_IN_A |
| 95         | PR8A         | 2    | T              | RUM0_PLLT_IN_A | PR8A         | 2    | T              | RUM0_PLLT_IN_A |
| 96         | PR7B         | 2    | C <sup>3</sup> | -              | PR7B         | 2    | C <sup>3</sup> | -              |
| 97         | PR7A         | 2    | T <sup>3</sup> | DQS            | PR7A         | 2    | T <sup>3</sup> | DQS            |
| 98         | VCCIO2       | 2    | -              | -              | VCCIO2       | 2    | -              | -              |
| 99         | PR6B         | 2    | -              | VREF1_2        | PR6B         | 2    | -              | VREF1_2        |
| 100        | PR5A         | 2    | -              | VREF2_2        | PR5A         | 2    | -              | VREF2_2        |
| 101        | GNDIO2       | 2    | -              | -              | GNDIO2       | 2    | -              | -              |
| 102        | PR3B         | 2    | C              | RUM0_PLLC_FB_A | PR3B         | 2    | C              | RUM0_PLLC_FB_A |
| 103        | PR3A         | 2    | T              | RUM0_PLLT_FB_A | PR3A         | 2    | T              | RUM0_PLLT_FB_A |
| 104        | PR2B         | 2    | C <sup>3</sup> | -              | PR2B         | 2    | C <sup>3</sup> | -              |
| 105        | PR2A         | 2    | T <sup>3</sup> | -              | PR2A         | 2    | T <sup>3</sup> | -              |
| 106        | VCCAUX       | -    | -              | -              | VCCAUX       | -    | -              | -              |
| 107        | TDO          | -    | -              | -              | TDO          | -    | -              | -              |
| 108        | VCCJ         | -    | -              | -              | VCCJ         | -    | -              | -              |
| 109        | TDI          | -    | -              | -              | TDI          | -    | -              | -              |
| 110        | TMS          | -    | -              | -              | TMS          | -    | -              | -              |
| 111        | TCK          | -    | -              | -              | TCK          | -    | -              | -              |
| 112        | VCC          | -    | -              | -              | VCC          | -    | -              | -              |
| 113        | PT25A        | 1    | -              | VREF1_1        | PT28A        | 1    | -              | VREF1_1        |
| 114        | PT24A        | 1    | -              | -              | PT27A        | 1    | -              | -              |
| 115        | PT23A        | 1    | -              | D0             | PT26A        | 1    | -              | D0             |
| 116        | PT22B        | 1    | C              | D1             | PT25B        | 1    | C              | D1             |
| 117        | PT22A        | 1    | T              | VREF2_1        | PT25A        | 1    | T              | VREF2_1        |
| 118        | PT21A        | 1    | -              | D2             | PT24A        | 1    | -              | D2             |
| 119        | VCCIO1       | 1    | -              | -              | VCCIO1       | 1    | -              | -              |
| 120        | PT20B        | 1    | -              | D3             | PT23B        | 1    | -              | D3             |
| 121        | GNDIO1       | 1    | -              | -              | GNDIO1       | 1    | -              | -              |
| 122        | PT17A        | 1    | -              | D4             | PT20A        | 1    | -              | D4             |
| 123        | PT16A        | 1    | -              | D5             | PT19A        | 1    | -              | D5             |
| 124        | PT15B        | 1    | C              | D6             | PT18B        | 1    | C              | D6             |
| 125        | PT15A        | 1    | T              | -              | PT18A        | 1    | T              | -              |
| 126        | PT14B        | 1    | -              | D7             | PT17B        | 1    | -              | D7             |
| 127        | GND          | -    | -              | -              | GND          | -    | -              | -              |
| 128        | PT13B        | 0    | C              | BUSY           | PT16B        | 0    | C              | BUSY           |
| 129        | PT13A        | 0    | T              | CS1N           | PT16A        | 0    | T              | CS1N           |
| 130        | PT12B        | 0    | C              | PCLKC0_0       | PT15B        | 0    | C              | PCLKC0_0       |
| 131        | PT12A        | 0    | T              | PCLKT0_0       | PT15A        | 0    | T              | PCLKT0_0       |
| 132        | PT11B        | 0    | C              | -              | PT14B        | 0    | C              | -              |
| 133        | VCCIO0       | 0    | -              | -              | VCCIO0       | 0    | -              | -              |
| 134        | PT11A        | 0    | T              | DQS            | PT14A        | 0    | T              | DQS            |
| 135        | PT9A         | 0    | -              | DOUT           | PT12A        | 0    | -              | DOUT           |
| 136        | GNDIO0       | 0    | -              | -              | GNDIO0       | 0    | -              | -              |
| 137        | PT8A         | 0    | -              | WRITEN         | PT11A        | 0    | -              | WRITEN         |
| 138        | PT7A         | 0    | -              | VREF1_0        | PT10A        | 0    | -              | VREF1_0        |

**LFXP3 & LFXP6 Logic Signal Connections: 144 TQFP (Cont.)**

| Pin Number | LFXP3        |      |              |               | LFXP6        |      |              |               |
|------------|--------------|------|--------------|---------------|--------------|------|--------------|---------------|
|            | Pin Function | Bank | Differential | Dual Function | Pin Function | Bank | Differential | Dual Function |
| 139        | PT6A         | 0    | -            | DI            | PT9A         | 0    | -            | DI            |
| 140        | PT5A         | 0    | -            | CSN           | PT8A         | 0    | -            | CSN           |
| 141        | PT3B         | 0    | -            | VREF2_0       | PT6B         | 0    | -            | VREF2_0       |
| 142        | CFG0         | 0    | -            | -             | CFG0         | 0    | -            | -             |
| 143        | CFG1         | 0    | -            | -             | CFG1         | 0    | -            | -             |
| 144        | DONE         | 0    | -            | -             | DONE         | 0    | -            | -             |

1. Applies to LFXP "C" only.
2. Applies to LFXP "E" only.
3. Supports dedicated LVDS outputs.

**LFXP3 & LFXP6 Logic Signal Connections: 208 PQFP (Cont.)**

| Pin Number | LFXP3                                 |      |                |               | LFXP6                                 |      |                |               |
|------------|---------------------------------------|------|----------------|---------------|---------------------------------------|------|----------------|---------------|
|            | Pin Function                          | Bank | Differential   | Dual Function | Pin Function                          | Bank | Differential   | Dual Function |
| 47         | GNDIO6                                | 6    | -              | -             | GNDIO6                                | 6    | -              | -             |
| 48         | PL18B                                 | 6    | C <sup>3</sup> | -             | PL26B                                 | 6    | C <sup>3</sup> | -             |
| 49         | GND                                   | -    | -              | -             | GND                                   | -    | -              | -             |
| 50         | VCCAUX                                | -    | -              | -             | VCCAUX                                | -    | -              | -             |
| 51         | SLEEPN <sup>1</sup> /TOE <sup>2</sup> | -    | -              | -             | SLEEPN <sup>1</sup> /TOE <sup>2</sup> | -    | -              | -             |
| 52         | INITN                                 | 5    | -              | -             | INITN                                 | 5    | -              | -             |
| 53         | VCC                                   | -    | -              | -             | VCC                                   | -    | -              | -             |
| 54         | PB2B                                  | 5    | -              | VREF1_5       | PB5B                                  | 5    | -              | VREF1_5       |
| 55         | PB3A                                  | 5    | T              | -             | PB6A                                  | 5    | T              | DQS           |
| 56         | PB3B                                  | 5    | C              | -             | PB6B                                  | 5    | C              | -             |
| 57         | PB4A                                  | 5    | T              | -             | PB7A                                  | 5    | T              | -             |
| 58         | PB4B                                  | 5    | C              | -             | PB7B                                  | 5    | C              | -             |
| 59         | GNDIO5                                | 5    | -              | -             | GNDIO5                                | 5    | -              | -             |
| 60         | PB5A                                  | 5    | T              | -             | PB8A                                  | 5    | T              | -             |
| 61         | PB5B                                  | 5    | C              | VREF2_5       | PB8B                                  | 5    | C              | VREF2_5       |
| 62         | PB6A                                  | 5    | T              | -             | PB9A                                  | 5    | T              | -             |
| 63         | PB6B                                  | 5    | C              | -             | PB9B                                  | 5    | C              | -             |
| 64         | VCCIO5                                | 5    | -              | -             | VCCIO5                                | 5    | -              | -             |
| 65         | PB7A                                  | 5    | T              | -             | PB10A                                 | 5    | T              | -             |
| 66         | PB7B                                  | 5    | C              | -             | PB10B                                 | 5    | C              | -             |
| 67         | PB8A                                  | 5    | T              | -             | PB11A                                 | 5    | T              | -             |
| 68         | PB8B                                  | 5    | C              | -             | PB11B                                 | 5    | C              | -             |
| 69         | GNDIO5                                | 5    | -              | -             | GNDIO5                                | 5    | -              | -             |
| 70         | PB9A                                  | 5    | -              | -             | PB12A                                 | 5    | -              | -             |
| 71         | PB10B                                 | 5    | -              | -             | PB13B                                 | 5    | -              | -             |
| 72         | PB11A                                 | 5    | T              | DQS           | PB14A                                 | 5    | T              | DQS           |
| 73         | PB11B                                 | 5    | C              | -             | PB14B                                 | 5    | C              | -             |
| 74         | VCCIO5                                | 5    | -              | -             | VCCIO5                                | 5    | -              | -             |
| 75         | PB12A                                 | 5    | T              | -             | PB15A                                 | 5    | T              | -             |
| 76         | PB12B                                 | 5    | C              | -             | PB15B                                 | 5    | C              | -             |
| 77         | PB13A                                 | 5    | T              | -             | PB16A                                 | 5    | T              | -             |
| 78         | PB13B                                 | 5    | C              | -             | PB16B                                 | 5    | C              | -             |
| 79         | GND                                   | -    | -              | -             | GND                                   | -    | -              | -             |
| 80         | VCC                                   | -    | -              | -             | VCC                                   | -    | -              | -             |
| 81         | PB14A                                 | 4    | T              | -             | PB17A                                 | 4    | T              | -             |
| 82         | GNDIO4                                | 4    | -              | -             | GNDIO4                                | 4    | -              | -             |
| 83         | PB14B                                 | 4    | C              | -             | PB17B                                 | 4    | C              | -             |
| 84         | PB15A                                 | 4    | T              | PCLKT4_0      | PB18A                                 | 4    | T              | PCLKT4_0      |
| 85         | PB15B                                 | 4    | C              | PCLKC4_0      | PB18B                                 | 4    | C              | PCLKC4_0      |
| 86         | PB16A                                 | 4    | T              | -             | PB19A                                 | 4    | T              | -             |
| 87         | VCCIO4                                | 4    | -              | -             | VCCIO4                                | 4    | -              | -             |
| 88         | PB16B                                 | 4    | C              | -             | PB19B                                 | 4    | C              | -             |
| 89         | PB17A                                 | 4    | -              | -             | PB20A                                 | 4    | -              | -             |
| 90         | PB18B                                 | 4    | -              | -             | PB21B                                 | 4    | -              | -             |
| 91         | PB19A                                 | 4    | T              | DQS           | PB22A                                 | 4    | T              | DQS           |
| 92         | GNDIO4                                | 4    | -              | -             | GNDIO4                                | 4    | -              | -             |

**LFXP6 & LFXP10 Logic Signal Connections: 256 fpBGA (Cont.)**

| Ball Number | LFXP6         |      |                |                | LFXP10        |      |                |                |
|-------------|---------------|------|----------------|----------------|---------------|------|----------------|----------------|
|             | Ball Function | Bank | Differential   | Dual Function  | Ball Function | Bank | Differential   | Dual Function  |
| L15         | PR21B         | 3    | C <sup>3</sup> | -              | PR28B         | 3    | C <sup>3</sup> | -              |
| L14         | PR21A         | 3    | T <sup>3</sup> | -              | PR28A         | 3    | T <sup>3</sup> | -              |
| -           | GNDIO3        | 3    | -              | -              | GNDIO3        | 3    | -              | -              |
| L12         | PR17B         | 3    | C              | -              | PR26A         | 3    | -              | -              |
| M16         | PR20B         | 3    | C              | -              | PR25B         | 3    | C              | RLM0_PLLC_IN_A |
| N16         | PR20A         | 3    | T              | -              | PR25A         | 3    | T              | RLM0_PLLT_IN_A |
| K14         | PR19B         | 3    | C <sup>3</sup> | -              | PR24B         | 3    | C <sup>3</sup> | -              |
| K15         | PR19A         | 3    | T <sup>3</sup> | -              | PR24A         | 3    | T <sup>3</sup> | DQS            |
| K12         | PR17A         | 3    | T              | -              | PR23B         | 3    | -              | -              |
| K13         | PR22A         | 3    | -              | VREF2_3        | PR22A         | 3    | -              | VREF2_3        |
| -           | GNDIO3        | 3    | -              | -              | GNDIO3        | 3    | -              | -              |
| L16         | PR18B         | 3    | C <sup>3</sup> | -              | PR21B         | 3    | C <sup>3</sup> | -              |
| K16         | PR18A         | 3    | T <sup>3</sup> | -              | PR21A         | 3    | T <sup>3</sup> | -              |
| J15         | PR16B         | 3    | C <sup>3</sup> | -              | PR19B         | 3    | C <sup>3</sup> | -              |
| J14         | PR16A         | 3    | T <sup>3</sup> | -              | PR19A         | 3    | T <sup>3</sup> | -              |
| J13         | GNDP1         | -    | -              | -              | GNDP1         | -    | -              | -              |
| J12         | VCCP1         | -    | -              | -              | VCCP1         | -    | -              | -              |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| J16         | PR12B         | 2    | C              | PCLKC2_0       | PR17B         | 2    | C              | PCLKC2_0       |
| H16         | PR12A         | 2    | T              | PCLKT2_0       | PR17A         | 2    | T              | PCLKT2_0       |
| H13         | PR13B         | 2    | C <sup>3</sup> | -              | PR16B         | 2    | C <sup>3</sup> | -              |
| H12         | PR13A         | 2    | T <sup>3</sup> | -              | PR16A         | 2    | T <sup>3</sup> | DQS            |
| H15         | PR2B          | 2    | C <sup>3</sup> | -              | PR15B         | 2    | -              | -              |
| H14         | PR6B          | 2    | -              | VREF1_2        | PR14A         | 2    | -              | VREF1_2        |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| G15         | PR11B         | 2    | C <sup>3</sup> | -              | PR13B         | 2    | C <sup>3</sup> | -              |
| G14         | PR11A         | 2    | T <sup>3</sup> | -              | PR13A         | 2    | T <sup>3</sup> | -              |
| G16         | PR8B          | 2    | C              | RUM0_PLLC_IN_A | PR12B         | 2    | C              | RUM0_PLLC_IN_A |
| F16         | PR8A          | 2    | T              | RUM0_PLLT_IN_A | PR12A         | 2    | T              | RUM0_PLLT_IN_A |
| G13         | PR2A          | 2    | T <sup>3</sup> | -              | PR11B         | 2    | -              | -              |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| G12         | PR9B          | 2    | C <sup>3</sup> | -              | PR8B          | 2    | C              | -              |
| F13         | PR9A          | 2    | T <sup>3</sup> | -              | PR8A          | 2    | T              | -              |
| B16         | PR7B          | 2    | C <sup>3</sup> | -              | PR7B          | 2    | C <sup>3</sup> | -              |
| C16         | PR7A          | 2    | T <sup>3</sup> | DQS            | PR7A          | 2    | T <sup>3</sup> | DQS            |
| F15         | PR14A         | 2    | -              | -              | PR6B          | 2    | -              | -              |
| E15         | PR5A          | 2    | -              | VREF2_2        | PR5A          | 2    | -              | VREF2_2        |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| F14         | PR4B          | 2    | C <sup>3</sup> | -              | PR4B          | 2    | C <sup>3</sup> | -              |
| E14         | PR4A          | 2    | T <sup>3</sup> | -              | PR4A          | 2    | T <sup>3</sup> | -              |
| D15         | PR3B          | 2    | C              | RUM0_PLLC_FB_A | PR3B          | 2    | C              | RUM0_PLLC_FB_A |
| C15         | PR3A          | 2    | T              | RUM0_PLLT_FB_A | PR3A          | 2    | T              | RUM0_PLLT_FB_A |

**LFXP15 & LFXP20 Logic Signal Connections: 256 fpBGA (Cont.)**

| Ball Number | LFXP15                                |      |                |                | LFXP20                                |      |                |                |
|-------------|---------------------------------------|------|----------------|----------------|---------------------------------------|------|----------------|----------------|
|             | Ball Function                         | Bank | Differential   | Dual Function  | Ball Function                         | Bank | Differential   | Dual Function  |
| L4          | PL32A                                 | 6    | -              | -              | PL36A                                 | 6    | -              | -              |
| -           | GNDIO6                                | 6    | -              | -              | GNDIO6                                | 6    | -              | -              |
| K4          | PL33A                                 | 6    | T              | -              | PL37A                                 | 6    | T              | -              |
| K5          | PL33B                                 | 6    | C              | -              | PL37B                                 | 6    | C              | -              |
| N1          | PL35A                                 | 6    | -              | VREF2_6        | PL39A                                 | 6    | -              | VREF2_6        |
| N2          | PL36B                                 | 6    | -              | -              | PL40B                                 | 6    | -              | -              |
| P1          | PL37A                                 | 6    | T <sup>3</sup> | DQS            | PL41A                                 | 6    | T <sup>3</sup> | DQS            |
| P2          | PL37B                                 | 6    | C <sup>3</sup> | -              | PL41B                                 | 6    | C <sup>3</sup> | -              |
| -           | GNDIO6                                | 6    | -              | -              | GNDIO6                                | 6    | -              | -              |
| L5          | PL38A                                 | 6    | T              | LLM0_PLLT_FB_A | PL42A                                 | 6    | T              | LLM0_PLLT_FB_A |
| M6          | PL38B                                 | 6    | C              | LLM0_PLLC_FB_A | PL42B                                 | 6    | C              | LLM0_PLLC_FB_A |
| M3          | PL39A                                 | 6    | T <sup>3</sup> | -              | PL43A                                 | 6    | T <sup>3</sup> | -              |
| N3          | PL39B                                 | 6    | C <sup>3</sup> | -              | PL43B                                 | 6    | C <sup>3</sup> | -              |
| -           | GNDIO6                                | 6    | -              | -              | GNDIO6                                | 6    | -              | -              |
| P4          | SLEEPN <sup>1</sup> /TOE <sup>2</sup> | -    | -              | -              | SLEEPN <sup>1</sup> /TOE <sup>2</sup> | -    | -              | -              |
| P3          | INITN                                 | 5    | -              | -              | INITN                                 | 5    | -              | -              |
| -           | GNDIO5                                | 5    | -              | -              | GNDIO5                                | 5    | -              | -              |
| -           | GNDIO5                                | 5    | -              | -              | GNDIO5                                | 5    | -              | -              |
| -           | GNDIO5                                | 5    | -              | -              | GNDIO5                                | 5    | -              | -              |
| R4          | PB11A                                 | 5    | T              | -              | PB15A                                 | 5    | T              | -              |
| N5          | PB11B                                 | 5    | C              | -              | PB15B                                 | 5    | C              | -              |
| P5          | PB12A                                 | 5    | T              | VREF1_5        | PB16A                                 | 5    | T              | VREF1_5        |
| -           | GNDIO5                                | 5    | -              | -              | GNDIO5                                | 5    | -              | -              |
| R1          | PB12B                                 | 5    | C              | -              | PB16B                                 | 5    | C              | -              |
| N6          | PB13A                                 | 5    | -              | -              | PB17A                                 | 5    | -              | -              |
| M7          | PB14B                                 | 5    | -              | -              | PB18B                                 | 5    | -              | -              |
| R2          | PB15A                                 | 5    | T              | DQS            | PB19A                                 | 5    | T              | DQS            |
| T2          | PB15B                                 | 5    | C              | -              | PB19B                                 | 5    | C              | -              |
| R3          | PB16A                                 | 5    | T              | -              | PB20A                                 | 5    | T              | -              |
| T3          | PB16B                                 | 5    | C              | -              | PB20B                                 | 5    | C              | -              |
| T4          | PB17A                                 | 5    | T              | -              | PB21A                                 | 5    | T              | -              |
| R5          | PB17B                                 | 5    | C              | VREF2_5        | PB21B                                 | 5    | C              | VREF2_5        |
| N7          | PB18A                                 | 5    | T              | -              | PB22A                                 | 5    | T              | -              |
| -           | GNDIO5                                | 5    | -              | -              | GNDIO5                                | 5    | -              | -              |
| M8          | PB18B                                 | 5    | C              | -              | PB22B                                 | 5    | C              | -              |
| T5          | PB19A                                 | 5    | T              | -              | PB23A                                 | 5    | T              | -              |
| P6          | PB19B                                 | 5    | C              | -              | PB23B                                 | 5    | C              | -              |
| T6          | PB20A                                 | 5    | T              | -              | PB24A                                 | 5    | T              | -              |
| R6          | PB20B                                 | 5    | C              | -              | PB24B                                 | 5    | C              | -              |
| P7          | PB21A                                 | 5    | -              | -              | PB25A                                 | 5    | -              | -              |
| N8          | PB22B                                 | 5    | -              | -              | PB26B                                 | 5    | -              | -              |
| R7          | PB23A                                 | 5    | T              | DQS            | PB27A                                 | 5    | T              | DQS            |

**LFXP10, LFXP15 & LFXP20 Logic Signal Connections: 388 fpBGA (Cont.)**

| Ball Number | LFXP10                                    |      |                |                | LFXP15                                    |      |                |                | LFXP20                                    |      |                |                |
|-------------|-------------------------------------------|------|----------------|----------------|-------------------------------------------|------|----------------|----------------|-------------------------------------------|------|----------------|----------------|
|             | Ball Function                             | Bank | Diff.          | Dual Function  | Ball Function                             | Bank | Diff.          | Dual Function  | Ball Function                             | Bank | Diff.          | Dual Function  |
| U1          | PL25A                                     | 6    | T              | LLM0_PLLT_IN_A | PL29A                                     | 6    | T              | LLM0_PLLT_IN_A | PL33A                                     | 6    | T              | LLM0_PLLT_IN_A |
| T2          | PL25B                                     | 6    | C              | LLM0_PLLC_IN_A | PL29B                                     | 6    | C              | LLM0_PLLC_IN_A | PL33B                                     | 6    | C              | LLM0_PLLC_IN_A |
| V1          | PL26A                                     | 6    | T <sup>3</sup> | -              | PL30A                                     | 6    | T <sup>3</sup> | -              | PL34A                                     | 6    | T <sup>3</sup> | -              |
| U2          | PL26B                                     | 6    | C <sup>3</sup> | -              | PL30B                                     | 6    | C <sup>3</sup> | -              | PL34B                                     | 6    | C <sup>3</sup> | -              |
| W1          | PL28A                                     | 6    | T <sup>3</sup> | -              | PL32A                                     | 6    | T <sup>3</sup> | -              | PL36A                                     | 6    | T <sup>3</sup> | -              |
| V2          | PL28B                                     | 6    | C <sup>3</sup> | -              | PL32B                                     | 6    | C <sup>3</sup> | -              | PL36B                                     | 6    | C <sup>3</sup> | -              |
| -           | GNDIO6                                    | 6    | -              | -              | GNDIO6                                    | -    | -              | -              | GNDIO6                                    | 6    | -              | -              |
| P3          | PL29A                                     | 6    | T              | -              | PL33A                                     | 6    | T              | -              | PL37A                                     | 6    | T              | -              |
| P4          | PL29B                                     | 6    | C              | -              | PL33B                                     | 6    | C              | -              | PL37B                                     | 6    | C              | -              |
| Y1          | PL30A                                     | 6    | T <sup>3</sup> | -              | PL34A                                     | 6    | T <sup>3</sup> | -              | PL38A                                     | 6    | T <sup>3</sup> | -              |
| W2          | PL30B                                     | 6    | C <sup>3</sup> | -              | PL34B                                     | 6    | C <sup>3</sup> | -              | PL38B                                     | 6    | C <sup>3</sup> | -              |
| R3          | PL31A                                     | 6    | -              | VREF2_6        | PL35A                                     | 6    | -              | VREF2_6        | PL39A                                     | 6    | -              | VREF2_6        |
| R4          | PL32B                                     | 6    | -              | -              | PL36B                                     | 6    | -              | -              | PL40B                                     | 6    | -              | -              |
| T3          | PL33A                                     | 6    | T <sup>3</sup> | DQS            | PL37A                                     | 6    | T <sup>3</sup> | DQS            | PL41A                                     | 6    | T <sup>3</sup> | DQS            |
| T4          | PL33B                                     | 6    | C <sup>3</sup> | -              | PL37B                                     | 6    | C <sup>3</sup> | -              | PL41B                                     | 6    | C <sup>3</sup> | -              |
| -           | GNDIO6                                    | 6    | -              | -              | GNDIO6                                    | 6    | -              | -              | GNDIO6                                    | 6    | -              | -              |
| V4          | PL34A                                     | 6    | T              | LLM0_PLLT_FB_A | PL38A                                     | 6    | T              | LLM0_PLLT_FB_A | PL42A                                     | 6    | T              | LLM0_PLLT_FB_A |
| V3          | PL34B                                     | 6    | C              | LLM0_PLLC_FB_A | PL38B                                     | 6    | C              | LLM0_PLLC_FB_A | PL42B                                     | 6    | C              | LLM0_PLLC_FB_A |
| U4          | PL35A                                     | 6    | T <sup>3</sup> | -              | PL39A                                     | 6    | T <sup>3</sup> | -              | PL43A                                     | 6    | T <sup>3</sup> | -              |
| U3          | PL35B                                     | 6    | C <sup>3</sup> | -              | PL39B                                     | 6    | C <sup>3</sup> | -              | PL43B                                     | 6    | C <sup>3</sup> | -              |
| -           | GNDIO6                                    | 6    | -              | -              | GNDIO6                                    | 6    | -              | -              | GNDIO6                                    | 6    | -              | -              |
| W5          | SLEEPN <sup>1</sup> /<br>TOE <sup>2</sup> | -    | -              | -              | SLEEPN <sup>1</sup> /<br>TOE <sup>2</sup> | -    | -              | -              | SLEEPN <sup>1</sup> /<br>TOE <sup>2</sup> | -    | -              | -              |
| Y2          | INITN                                     | 5    | -              | -              | INITN                                     | 5    | -              | -              | INITN                                     | 5    | -              | -              |
| -           | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              |
| -           | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              |
| Y3          | -                                         | -    | -              | -              | PB3B                                      | 5    | -              | -              | PB7B                                      | 5    | -              | -              |
| W3          | -                                         | -    | -              | -              | PB4A                                      | 5    | T              | -              | PB8A                                      | 5    | T              | -              |
| W4          | -                                         | -    | -              | -              | PB4B                                      | 5    | C              | -              | PB8B                                      | 5    | C              | -              |
| AA2         | -                                         | -    | -              | -              | PB5A                                      | 5    | -              | -              | PB9A                                      | 5    | -              | -              |
| AA1         | -                                         | -    | -              | -              | PB6B                                      | 5    | -              | -              | PB10B                                     | 5    | -              | -              |
| W6          | PB2A                                      | 5    | -              | -              | PB7A                                      | 5    | T              | DQS            | PB11A                                     | 5    | T              | DQS            |
| W7          | -                                         | -    | -              | -              | PB7B                                      | 5    | C              | -              | PB11B                                     | 5    | C              | -              |
| Y4          | PB3A                                      | 5    | T              | -              | PB8A                                      | 5    | T              | -              | PB12A                                     | 5    | T              | -              |
| -           | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              |
| Y5          | PB3B                                      | 5    | C              | -              | PB8B                                      | 5    | C              | -              | PB12B                                     | 5    | C              | -              |
| AB2         | PB4A                                      | 5    | T              | -              | PB9A                                      | 5    | T              | -              | PB13A                                     | 5    | T              | -              |
| AA3         | PB4B                                      | 5    | C              | -              | PB9B                                      | 5    | C              | -              | PB13B                                     | 5    | C              | -              |
| AB3         | PB5A                                      | 5    | T              | -              | PB10A                                     | 5    | T              | -              | PB14A                                     | 5    | T              | -              |
| AA4         | PB5B                                      | 5    | C              | -              | PB10B                                     | 5    | C              | -              | PB14B                                     | 5    | C              | -              |
| W8          | PB6A                                      | 5    | T              | -              | PB11A                                     | 5    | T              | -              | PB15A                                     | 5    | T              | -              |
| W9          | PB6B                                      | 5    | C              | -              | PB11B                                     | 5    | C              | -              | PB15B                                     | 5    | C              | -              |
| AB4         | PB7A                                      | 5    | T              | VREF1_5        | PB12A                                     | 5    | T              | VREF1_5        | PB16A                                     | 5    | T              | VREF1_5        |
| -           | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              | GNDIO5                                    | 5    | -              | -              |
| AA5         | PB7B                                      | 5    | C              | -              | PB12B                                     | 5    | C              | -              | PB16B                                     | 5    | C              | -              |
| AB5         | PB8A                                      | 5    | -              | -              | PB13A                                     | 5    | -              | -              | PB17A                                     | 5    | -              | -              |
| Y6          | PB9B                                      | 5    | -              | -              | PB14B                                     | 5    | -              | -              | PB18B                                     | 5    | -              | -              |
| AA6         | PB10A                                     | 5    | T              | DQS            | PB15A                                     | 5    | T              | DQS            | PB19A                                     | 5    | T              | DQS            |
| AB6         | PB10B                                     | 5    | C              | -              | PB15B                                     | 5    | C              | -              | PB19B                                     | 5    | C              | -              |
| Y9          | PB11A                                     | 5    | T              | -              | PB16A                                     | 5    | T              | -              | PB20A                                     | 5    | T              | -              |



**LFXP10, LFXP15 & LFXP20 Logic Signal Connections: 388 fpBGA (Cont.)**

| Ball Number | LFXP10        |      |       |               | LFXP15        |      |       |               | LFXP20        |      |       |               |
|-------------|---------------|------|-------|---------------|---------------|------|-------|---------------|---------------|------|-------|---------------|
|             | Ball Function | Bank | Diff. | Dual Function | Ball Function | Bank | Diff. | Dual Function | Ball Function | Bank | Diff. | Dual Function |
| G7          | VCCAUX        | -    | -     | -             | VCCAUX        | -    | -     | -             | VCCAUX        | -    | -     | -             |
| T16         | VCCAUX        | -    | -     | -             | VCCAUX        | -    | -     | -             | VCCAUX        | -    | -     | -             |
| T7          | VCCAUX        | -    | -     | -             | VCCAUX        | -    | -     | -             | VCCAUX        | -    | -     | -             |
| G10         | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             |
| G11         | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             |
| G8          | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             |
| G9          | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             |
| H8          | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             | VCCIO0        | 0    | -     | -             |
| G12         | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             |
| G13         | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             |
| G14         | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             |
| G15         | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             |
| H15         | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             | VCCIO1        | 1    | -     | -             |
| H16         | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             |
| J16         | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             |
| K16         | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             |
| L16         | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             | VCCIO2        | 2    | -     | -             |
| M16         | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             |
| N16         | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             |
| P16         | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             |
| R16         | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             | VCCIO3        | 3    | -     | -             |
| R15         | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             |
| T12         | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             |
| T13         | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             |
| T14         | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             |
| T15         | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             | VCCIO4        | 4    | -     | -             |
| R8          | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             |
| T10         | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             |
| T11         | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             |
| T8          | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             |
| T9          | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             | VCCIO5        | 5    | -     | -             |
| M7          | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             |
| N7          | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             |
| P7          | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             |
| R7          | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             | VCCIO6        | 6    | -     | -             |
| H7          | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             |
| J7          | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             |
| K7          | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             |
| L7          | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             | VCCIO7        | 7    | -     | -             |

1. Applies to LFXP "C" only.
2. Applies to LFXP "E" only.
3. Supports dedicated LVDS outputs.

**LFXP15 & LFXP20 Logic Signal Connections: 484 fpBGA (Cont.)**

| Ball Number | LFXP15        |      |                |                | LFXP20        |      |                |                |
|-------------|---------------|------|----------------|----------------|---------------|------|----------------|----------------|
|             | Ball Function | Bank | Differential   | Dual Function  | Ball Function | Bank | Differential   | Dual Function  |
| R18         | PR38B         | 3    | C              | RLM0_PLLC_FB_A | PR42B         | 3    | C              | RLM0_PLLC_FB_A |
| R17         | PR38A         | 3    | T              | RLM0_PLLT_FB_A | PR42A         | 3    | T              | RLM0_PLLT_FB_A |
| Y22         | PR37B         | 3    | C <sup>3</sup> | -              | PR41B         | 3    | C <sup>3</sup> | -              |
| Y21         | PR37A         | 3    | T <sup>3</sup> | DQS            | PR41A         | 3    | T <sup>3</sup> | DQS            |
| W22         | PR36B         | 3    | -              | -              | PR40B         | 3    | -              | -              |
| W21         | PR35A         | 3    | -              | VREF1_3        | PR39A         | 3    | -              | VREF1_3        |
| P17         | PR34B         | 3    | C <sup>3</sup> | -              | PR38B         | 3    | C <sup>3</sup> | -              |
| P18         | PR34A         | 3    | T <sup>3</sup> | -              | PR38A         | 3    | T <sup>3</sup> | -              |
| -           | GNDIO3        | 3    | -              | -              | GNDIO3        | 3    | -              | -              |
| R19         | PR33B         | 3    | C              | -              | PR37B         | 3    | C              | -              |
| R20         | PR33A         | 3    | T              | -              | PR37A         | 3    | T              | -              |
| V22         | PR32B         | 3    | C <sup>3</sup> | -              | PR36B         | 3    | C <sup>3</sup> | -              |
| V21         | PR32A         | 3    | T <sup>3</sup> | -              | PR36A         | 3    | T <sup>3</sup> | -              |
| U22         | PR30B         | 3    | C <sup>3</sup> | -              | PR34B         | 3    | C <sup>3</sup> | -              |
| U21         | PR30A         | 3    | T <sup>3</sup> | -              | PR34A         | 3    | T <sup>3</sup> | -              |
| P19         | PR29B         | 3    | C              | RLM0_PLLC_IN_A | PR33B         | 3    | C              | RLM0_PLLC_IN_A |
| P20         | PR29A         | 3    | T              | RLM0_PLLT_IN_A | PR33A         | 3    | T              | RLM0_PLLT_IN_A |
| -           | GNDIO3        | 3    | -              | -              | GNDIO3        | 3    | -              | -              |
| T22         | PR28B         | 3    | C <sup>3</sup> | -              | PR32B         | 3    | C <sup>3</sup> | -              |
| T21         | PR28A         | 3    | T <sup>3</sup> | DQS            | PR32A         | 3    | T <sup>3</sup> | DQS            |
| R22         | PR27B         | 3    | -              | -              | PR31B         | 3    | -              | -              |
| R21         | PR26A         | 3    | -              | VREF2_3        | PR30A         | 3    | -              | VREF2_3        |
| N19         | PR25B         | 3    | C <sup>3</sup> | -              | PR29B         | 3    | C <sup>3</sup> | -              |
| N20         | PR25A         | 3    | T <sup>3</sup> | -              | PR29A         | 3    | T <sup>3</sup> | -              |
| N18         | PR24B         | 3    | C              | -              | PR28B         | 3    | C              | -              |
| M18         | PR24A         | 3    | T              | -              | PR28A         | 3    | T              | -              |
| -           | GNDIO3        | 3    | -              | -              | GNDIO3        | 3    | -              | -              |
| P22         | PR23B         | 3    | C <sup>3</sup> | -              | PR27B         | 3    | C <sup>3</sup> | -              |
| P21         | PR23A         | 3    | T <sup>3</sup> | -              | PR27A         | 3    | T <sup>3</sup> | -              |
| N22         | -             | -    | -              | -              | PR26B         | 3    | C <sup>3</sup> | -              |
| N21         | -             | -    | -              | -              | PR26A         | 3    | T <sup>3</sup> | -              |
| M19         | -             | -    | -              | -              | PR25B         | 3    | -              | -              |
| M20         | GNDP1         | -    | -              | -              | GNDP1         | -    | -              | -              |
| L18         | VCCP1         | -    | -              | -              | VCCP1         | -    | -              | -              |
| M21         | -             | -    | -              | -              | PR24A         | 2    | -              | -              |
| M22         | PR22B         | 2    | C <sup>3</sup> | -              | PR23B         | 2    | C <sup>3</sup> | -              |
| L22         | PR22A         | 2    | T <sup>3</sup> | -              | PR23A         | 2    | T <sup>3</sup> | -              |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| L19         | -             | -    | -              | -              | PR22B         | 2    | C <sup>3</sup> | -              |
| L20         | -             | -    | -              | -              | PR22A         | 2    | T <sup>3</sup> | -              |
| L21         | PR21B         | 2    | C              | PCLKC2_0       | PR21B         | 2    | C              | PCLKC2_0       |
| K22         | PR21A         | 2    | T              | PCLKT2_0       | PR21A         | 2    | T              | PCLKT2_0       |

**LFXP15 & LFXP20 Logic Signal Connections: 484 fpBGA (Cont.)**

| Ball Number | LFXP15        |      |                |                | LFXP20        |      |                |                |
|-------------|---------------|------|----------------|----------------|---------------|------|----------------|----------------|
|             | Ball Function | Bank | Differential   | Dual Function  | Ball Function | Bank | Differential   | Dual Function  |
| J21         | PR20B         | 2    | C <sup>3</sup> | -              | PR20B         | 2    | C <sup>3</sup> | -              |
| J22         | PR20A         | 2    | T <sup>3</sup> | DQS            | PR20A         | 2    | T <sup>3</sup> | DQS            |
| K18         | PR19B         | 2    | -              | -              | PR19B         | 2    | -              | -              |
| K19         | PR18A         | 2    | -              | VREF1_2        | PR18A         | 2    | -              | VREF1_2        |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| K21         | PR17B         | 2    | C <sup>3</sup> | -              | PR17B         | 2    | C <sup>3</sup> | -              |
| K20         | PR17A         | 2    | T <sup>3</sup> | -              | PR17A         | 2    | T <sup>3</sup> | -              |
| H21         | PR16B         | 2    | C              | RUM0_PLLC_IN_A | PR16B         | 2    | C              | RUM0_PLLC_IN_A |
| H22         | PR16A         | 2    | T              | RUM0_PLLT_IN_A | PR16A         | 2    | T              | RUM0_PLLT_IN_A |
| J20         | PR15B         | 2    | C <sup>3</sup> | -              | PR15B         | 2    | C <sup>3</sup> | -              |
| J19         | PR15A         | 2    | T <sup>3</sup> | -              | PR15A         | 2    | T <sup>3</sup> | -              |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| J17         | PR13B         | 2    | C <sup>3</sup> | -              | PR13B         | 2    | C <sup>3</sup> | -              |
| J18         | PR13A         | 2    | T <sup>3</sup> | -              | PR13A         | 2    | T <sup>3</sup> | -              |
| G21         | PR12B         | 2    | C              | -              | PR12B         | 2    | C              | -              |
| G22         | PR12A         | 2    | T              | -              | PR12A         | 2    | T              | -              |
| F21         | PR11B         | 2    | C <sup>3</sup> | -              | PR11B         | 2    | C <sup>3</sup> | -              |
| F22         | PR11A         | 2    | T <sup>3</sup> | DQS            | PR11A         | 2    | T <sup>3</sup> | DQS            |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| H20         | PR10B         | 2    | -              | -              | PR10B         | 2    | -              | -              |
| H19         | PR9A          | 2    | -              | VREF2_2        | PR9A          | 2    | -              | VREF2_2        |
| H17         | PR8B          | 2    | C <sup>3</sup> | -              | PR8B          | 2    | C <sup>3</sup> | -              |
| H18         | PR8A          | 2    | T <sup>3</sup> | -              | PR8A          | 2    | T <sup>3</sup> | -              |
| E21         | PR7B          | 2    | C              | RUM0_PLLC_FB_A | PR7B          | 2    | C              | RUM0_PLLC_FB_A |
| E22         | PR7A          | 2    | T              | RUM0_PLLT_FB_A | PR7A          | 2    | T              | RUM0_PLLT_FB_A |
| D21         | PR6B          | 2    | C <sup>3</sup> | -              | PR6B          | 2    | C <sup>3</sup> | -              |
| D22         | PR6A          | 2    | T <sup>3</sup> | -              | PR6A          | 2    | T <sup>3</sup> | -              |
| G20         | PR5B          | 2    | C <sup>3</sup> | -              | PR5B          | 2    | C <sup>3</sup> | -              |
| G19         | PR5A          | 2    | T <sup>3</sup> | -              | PR5A          | 2    | T <sup>3</sup> | -              |
| G17         | PR4B          | 2    | C              | -              | PR4B          | 2    | C              | -              |
| G18         | PR4A          | 2    | T              | -              | PR4A          | 2    | T              | -              |
| -           | GNDIO2        | 2    | -              | -              | GNDIO2        | 2    | -              | -              |
| F18         | PR3B          | 2    | C <sup>3</sup> | -              | PR3B          | 2    | C <sup>3</sup> | -              |
| F19         | PR3A          | 2    | T <sup>3</sup> | -              | PR3A          | 2    | T <sup>3</sup> | -              |
| C22         | PR2B          | 2    | -              | -              | PR2B          | 2    | -              | -              |
| F20         | TDO           | -    | -              | -              | TDO           | -    | -              | -              |
| E20         | VCCJ          | -    | -              | -              | VCCJ          | -    | -              | -              |
| D19         | TDI           | -    | -              | -              | TDI           | -    | -              | -              |
| E19         | TMS           | -    | -              | -              | TMS           | -    | -              | -              |
| D20         | TCK           | -    | -              | -              | TCK           | -    | -              | -              |
| C20         | -             | -    | -              | -              | PT56A         | 1    | -              | -              |
| -           | GNDIO1        | 1    | -              | -              | GNDIO1        | 1    | -              | -              |

**LFXP15 & LFXP20 Logic Signal Connections: 484 fpBGA (Cont.)**

| Ball Number | LFXP15        |      |              |               | LFXP20        |      |              |               |
|-------------|---------------|------|--------------|---------------|---------------|------|--------------|---------------|
|             | Ball Function | Bank | Differential | Dual Function | Ball Function | Bank | Differential | Dual Function |
| D18         | -             | -    | -            | -             | PT55B         | 1    | C            | -             |
| E18         | -             | -    | -            | -             | PT55A         | 1    | T            | -             |
| C19         | -             | -    | -            | -             | PT54B         | 1    | C            | -             |
| C18         | -             | -    | -            | -             | PT54A         | 1    | T            | -             |
| C21         | -             | -    | -            | -             | PT53B         | 1    | C            | -             |
| -           | GNDIO1        | 1    | -            | -             | GNDIO1        | 1    | -            | -             |
| B21         | -             | -    | -            | -             | PT53A         | 1    | T            | -             |
| E17         | PT48B         | 1    | C            | -             | PT52B         | 1    | C            | -             |
| E16         | PT48A         | 1    | T            | -             | PT52A         | 1    | T            | -             |
| C17         | PT47B         | 1    | C            | -             | PT51B         | 1    | C            | -             |
| D17         | PT47A         | 1    | T            | DQS           | PT51A         | 1    | T            | DQS           |
| F17         | PT46B         | 1    | -            | -             | PT50B         | 1    | -            | -             |
| F16         | PT45A         | 1    | -            | -             | PT49A         | 1    | -            | -             |
| C16         | PT44B         | 1    | C            | -             | PT48B         | 1    | C            | -             |
| D16         | PT44A         | 1    | T            | -             | PT48A         | 1    | T            | -             |
| A20         | PT43B         | 1    | C            | -             | PT47B         | 1    | C            | -             |
| -           | GNDIO1        | 1    | -            | -             | GNDIO1        | 1    | -            | -             |
| B20         | PT43A         | 1    | T            | -             | PT47A         | 1    | T            | -             |
| A19         | PT42B         | 1    | C            | -             | PT46B         | 1    | C            | -             |
| B19         | PT42A         | 1    | T            | -             | PT46A         | 1    | T            | -             |
| C15         | PT41B         | 1    | C            | -             | PT45B         | 1    | C            | -             |
| D15         | PT41A         | 1    | T            | -             | PT45A         | 1    | T            | -             |
| A18         | PT40B         | 1    | C            | -             | PT44B         | 1    | C            | -             |
| B18         | PT40A         | 1    | T            | -             | PT44A         | 1    | T            | -             |
| F15         | PT39B         | 1    | C            | VREF1_1       | PT43B         | 1    | C            | VREF1_1       |
| -           | GNDIO1        | 1    | -            | -             | GNDIO1        | 1    | -            | -             |
| E15         | PT39A         | 1    | T            | DQS           | PT43A         | 1    | T            | DQS           |
| A17         | PT38B         | 1    | -            | -             | PT42B         | 1    | -            | -             |
| B17         | PT37A         | 1    | -            | -             | PT41A         | 1    | -            | -             |
| E14         | PT36B         | 1    | C            | -             | PT40B         | 1    | C            | -             |
| F14         | PT36A         | 1    | T            | -             | PT40A         | 1    | T            | -             |
| D14         | PT35B         | 1    | C            | -             | PT39B         | 1    | C            | -             |
| C14         | PT35A         | 1    | T            | D0            | PT39A         | 1    | T            | D0            |
| A16         | PT34B         | 1    | C            | D1            | PT38B         | 1    | C            | D1            |
| B16         | PT34A         | 1    | T            | VREF2_1       | PT38A         | 1    | T            | VREF2_1       |
| A15         | PT33B         | 1    | C            | -             | PT37B         | 1    | C            | -             |
| B15         | PT33A         | 1    | T            | D2            | PT37A         | 1    | T            | D2            |
| -           | GNDIO1        | 1    | -            | -             | GNDIO1        | 1    | -            | -             |
| E13         | PT32B         | 1    | C            | D3            | PT36B         | 1    | C            | D3            |
| D13         | PT32A         | 1    | T            | -             | PT36A         | 1    | T            | -             |
| C13         | PT31B         | 1    | C            | -             | PT35B         | 1    | C            | -             |
| B13         | PT31A         | 1    | T            | DQS           | PT35A         | 1    | T            | DQS           |

**Commercial (Cont.)**

| Part Number     | I/Os | Voltage | Grade | Package | Pins | Temp. | LUTs  |
|-----------------|------|---------|-------|---------|------|-------|-------|
| LFXP15E-3FN484C | 300  | 1.2V    | -3    | fpBGA   | 484  | COM   | 15.5K |
| LFXP15E-4FN484C | 300  | 1.2V    | -4    | fpBGA   | 484  | COM   | 15.5K |
| LFXP15E-5FN484C | 300  | 1.2V    | -5    | fpBGA   | 484  | COM   | 15.5K |
| LFXP15E-3FN388C | 268  | 1.2V    | -3    | fpBGA   | 388  | COM   | 15.5K |
| LFXP15E-4FN388C | 268  | 1.2V    | -4    | fpBGA   | 388  | COM   | 15.5K |
| LFXP15E-5FN388C | 268  | 1.2V    | -5    | fpBGA   | 388  | COM   | 15.5K |
| LFXP15E-3FN256C | 188  | 1.2V    | -3    | fpBGA   | 256  | COM   | 15.5K |
| LFXP15E-4FN256C | 188  | 1.2V    | -4    | fpBGA   | 256  | COM   | 15.5K |
| LFXP15E-5FN256C | 188  | 1.2V    | -5    | fpBGA   | 256  | COM   | 15.5K |

| Part Number     | I/Os | Voltage | Grade | Package | Pins | Temp. | LUTs  |
|-----------------|------|---------|-------|---------|------|-------|-------|
| LFXP20E-3FN484C | 340  | 1.2V    | -3    | fpBGA   | 484  | COM   | 19.7K |
| LFXP20E-4FN484C | 340  | 1.2V    | -4    | fpBGA   | 484  | COM   | 19.7K |
| LFXP20E-5FN484C | 340  | 1.2V    | -5    | fpBGA   | 484  | COM   | 19.7K |
| LFXP20E-3FN388C | 268  | 1.2V    | -3    | fpBGA   | 388  | COM   | 19.7K |
| LFXP20E-4FN388C | 268  | 1.2V    | -4    | fpBGA   | 388  | COM   | 19.7K |
| LFXP20E-5FN388C | 268  | 1.2V    | -5    | fpBGA   | 388  | COM   | 19.7K |
| LFXP20E-3FN256C | 188  | 1.2V    | -3    | fpBGA   | 256  | COM   | 19.7K |
| LFXP20E-4FN256C | 188  | 1.2V    | -4    | fpBGA   | 256  | COM   | 19.7K |
| LFXP20E-5FN256C | 188  | 1.2V    | -5    | fpBGA   | 256  | COM   | 19.7K |

**Industrial**

| Part Number    | I/Os | Voltage      | Grade | Package | Pins | Temp. | LUTs |
|----------------|------|--------------|-------|---------|------|-------|------|
| LFXP3C-3QN208I | 136  | 1.8/2.5/3.3V | -3    | PQFP    | 208  | IND   | 3.1K |
| LFXP3C-4QN208I | 136  | 1.8/2.5/3.3V | -4    | PQFP    | 208  | IND   | 3.1K |
| LFXP3C-3TN144I | 100  | 1.8/2.5/3.3V | -3    | TQFP    | 144  | IND   | 3.1K |
| LFXP3C-4TN144I | 100  | 1.8/2.5/3.3V | -4    | TQFP    | 144  | IND   | 3.1K |
| LFXP3C-3TN100I | 62   | 1.8/2.5/3.3V | -3    | TQFP    | 100  | IND   | 3.1K |
| LFXP3C-4TN100I | 62   | 1.8/2.5/3.3V | -4    | TQFP    | 100  | IND   | 3.1K |

| Part Number    | I/Os | Voltage      | Grade | Package | Pins | Temp. | LUTs |
|----------------|------|--------------|-------|---------|------|-------|------|
| LFXP6C-3FN256I | 188  | 1.8/2.5/3.3V | -3    | fpBGA   | 256  | IND   | 5.8K |
| LFXP6C-4FN256I | 188  | 1.8/2.5/3.3V | -4    | fpBGA   | 256  | IND   | 5.8K |
| LFXP6C-3QN208I | 142  | 1.8/2.5/3.3V | -3    | PQFP    | 208  | IND   | 5.8K |
| LFXP6C-4QN208I | 142  | 1.8/2.5/3.3V | -4    | PQFP    | 208  | IND   | 5.8K |
| LFXP6C-3TN144I | 100  | 1.8/2.5/3.3V | -3    | TQFP    | 144  | IND   | 5.8K |
| LFXP6C-4TN144I | 100  | 1.8/2.5/3.3V | -4    | TQFP    | 144  | IND   | 5.8K |