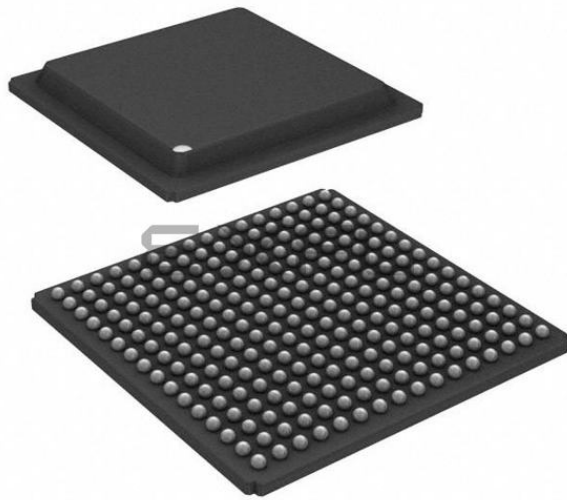




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## Understanding [Embedded - FPGAs \(Field Programmable Gate Array\)](#)

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.

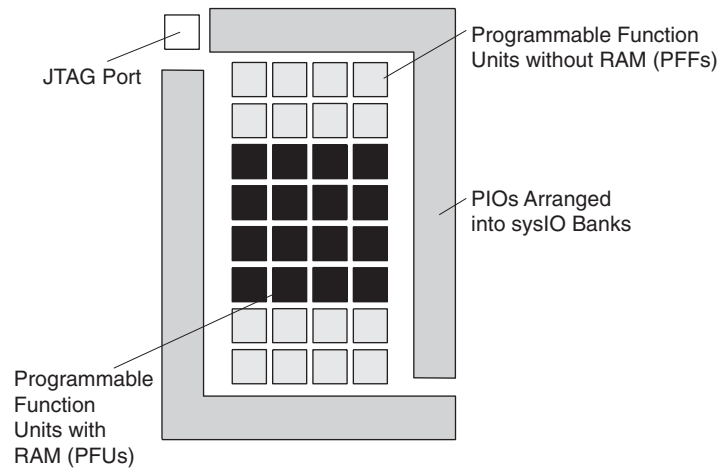
## Applications of Embedded - FPGAs

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

### Details

|                                |                                                                                                                                                                             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Status                 | Active                                                                                                                                                                      |
| Number of LABs/CLBs            | 150                                                                                                                                                                         |
| Number of Logic Elements/Cells | 1200                                                                                                                                                                        |
| Total RAM Bits                 | 9421                                                                                                                                                                        |
| Number of I/O                  | 211                                                                                                                                                                         |
| Number of Gates                | -                                                                                                                                                                           |
| Voltage - Supply               | 1.71V ~ 3.465V                                                                                                                                                              |
| Mounting Type                  | Surface Mount                                                                                                                                                               |
| Operating Temperature          | 0°C ~ 85°C (TJ)                                                                                                                                                             |
| Package / Case                 | 256-LBGA                                                                                                                                                                    |
| Supplier Device Package        | 256-FTBGA (17x17)                                                                                                                                                           |
| Purchase URL                   | <a href="https://www.e-xfl.com/product-detail/lattice-semiconductor/lcmxo1200c-4ftn256c">https://www.e-xfl.com/product-detail/lattice-semiconductor/lcmxo1200c-4ftn256c</a> |

**Figure 2-3. Top View of the MachXO256 Device**

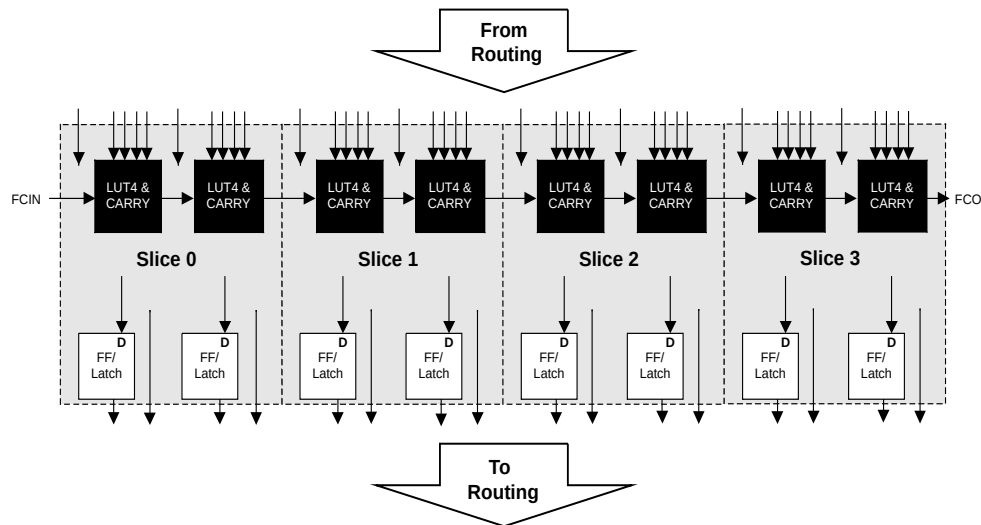


## PFU Blocks

The core of the MachXO 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 Distributed ROM functions. Except where necessary, the remainder of this 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 2-4. There are 53 inputs and 25 outputs associated with each PFU block.

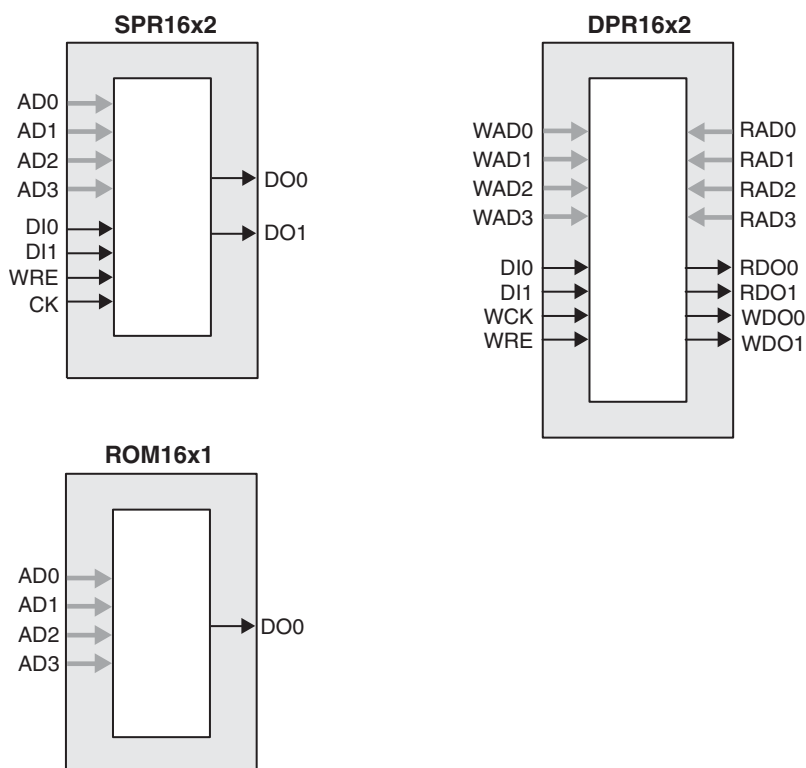
**Figure 2-4. PFU Diagram**



## 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 2-5 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.

**Figure 2-6. Distributed Memory Primitives**



**ROM Mode:** The ROM mode uses the same principal as the RAM modes, but without the Write port. Pre-loading is accomplished through the programming interface during configuration.

### PFU Modes of Operation

Slices can be combined within a PFU to form larger functions. Table 2-4 tabulates these modes and documents the functionality possible at the PFU level.

**Table 2-4. PFU Modes of Operation**

| Logic                      | Ripple            | RAM                        | ROM         |
|----------------------------|-------------------|----------------------------|-------------|
| LUT 4x8 or<br>MUX 2x1 x 8  | 2-bit Add x 4     | SPR16x2 x 4<br>DPR16x2 x 2 | ROM16x1 x 8 |
| LUT 5x4 or<br>MUX 4x1 x 4  | 2-bit Sub x 4     | SPR16x4 x 2<br>DPR16x4 x 1 | ROM16x2 x 4 |
| LUT 6x2 or<br>MUX 8x1 x 2  | 2-bit Counter x 4 | SPR16x8 x 1                | ROM16x4 x 2 |
| LUT 7x1 or<br>MUX 16x1 x 1 | 2-bit Comp x 4    |                            | ROM16x8 x 1 |

### Routing

There are many resources provided in the MachXO devices to route signals individually or as buses with related control signals. The routing resources consist of switching circuitry, buffers and metal interconnect (routing) segments.

The inter-PFU connections are made with three different types of routing resources: x1 (spans two PFUs), x2 (spans three PFUs) and x6 (spans seven PFUs). The x1, x2, and x6 connections provide fast and efficient connections in the horizontal and vertical directions.

## sysCLOCK Phase Locked Loops (PLLs)

The MachXO1200 and MachXO2280 provide PLL support. The source of the PLL input divider can come from an external pin or from internal routing. There are four sources of feedback signals to the feedback divider: from CLKINTFB (internal feedback port), from the global clock nets, from the output of the post scalar divider, and from the routing (or from an external pin). There is a PLL\_LOCK signal to indicate that the PLL has locked on to the input clock signal. Figure 2-10 shows the sysCLOCK PLL diagram.

The setup and hold times of the device can be improved by programming a delay in the feedback or input path of the PLL which will advance or delay the output clock with reference to the input clock. This delay can be either programmed during configuration or can be adjusted dynamically. In dynamic mode, the PLL may lose lock after adjustment and not relock until the  $t_{LOCK}$  parameter has been satisfied. Additionally, the phase and duty cycle block allows the user to adjust the phase and duty cycle of the CLKOS output.

The sysCLOCK PLLs provide the ability to synthesize clock frequencies. Each PLL has four dividers associated with it: input clock divider, feedback divider, post scalar divider, and secondary clock divider. The input clock divider is used to divide the input clock signal, while the feedback divider is used to multiply the input clock signal. The post scalar divider allows the VCO to operate at higher frequencies than the clock output, thereby increasing the frequency range. The secondary divider is used to derive lower frequency outputs.

**Figure 2-10. PLL Diagram**

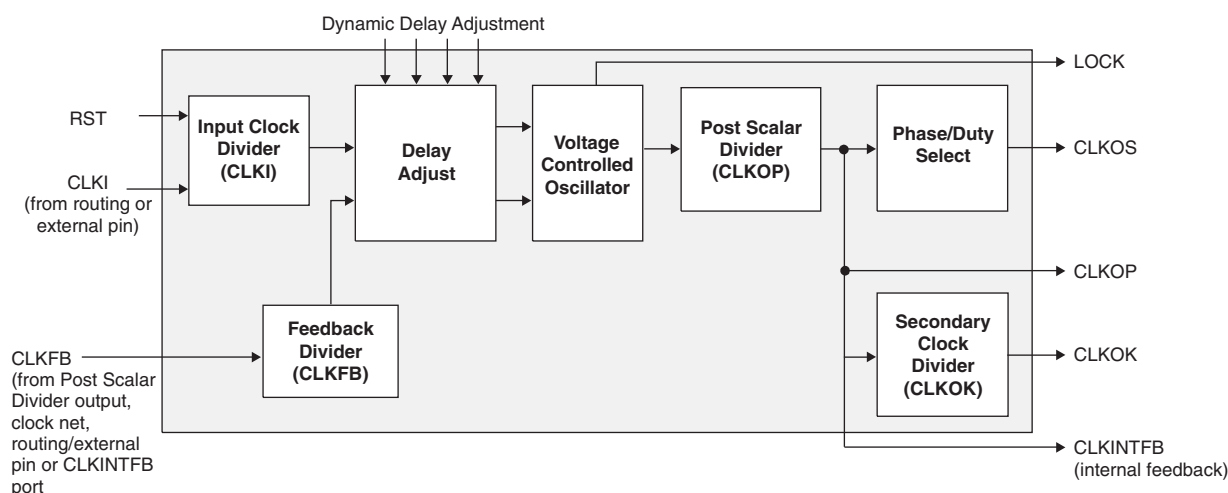
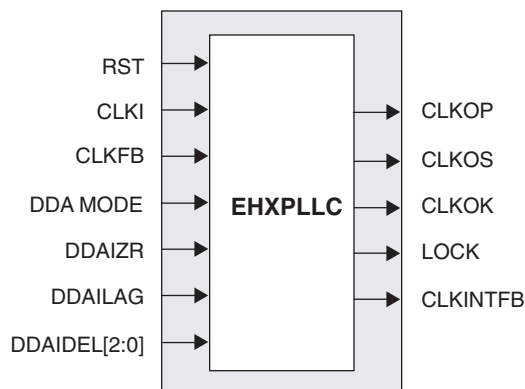


Figure 2-11 shows the available macros for the PLL. Table 2-5 provides signal description of the PLL Block.

**Figure 2-11. PLL Primitive**



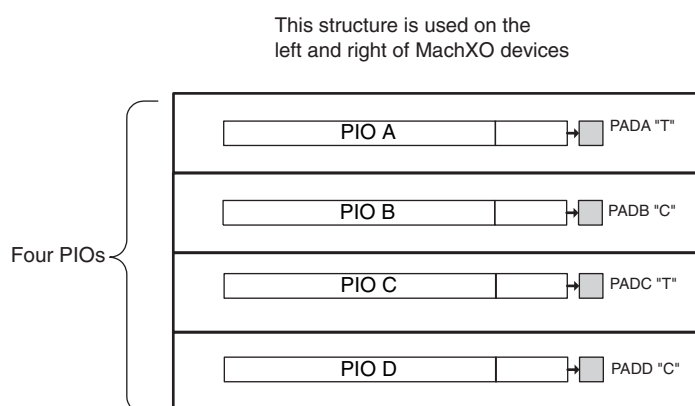
## PIO Groups

On the MachXO devices, PIO cells are assembled into two different types of PIO groups, those with four PIO cells and those with six PIO cells. PIO groups with four IOs are placed on the left and right sides of the device while PIO groups with six IOs are placed on the top and bottom. The individual PIO cells are connected to their respective sysIO buffers and PADs.

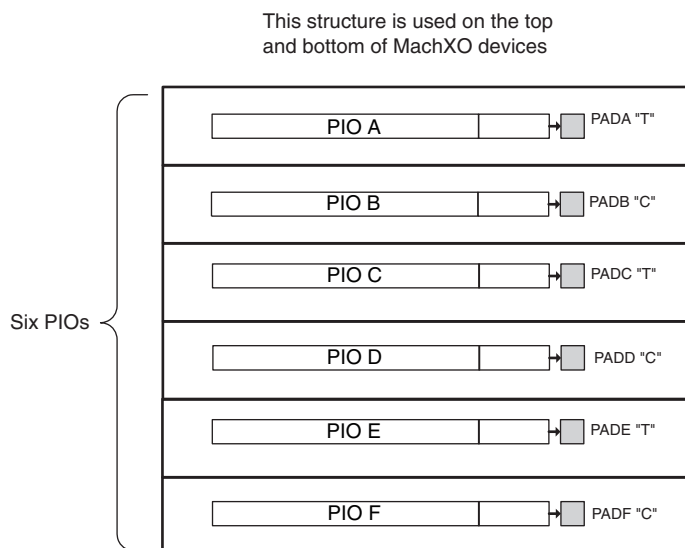
On all MachXO devices, two adjacent PIOs can be joined to provide a complementary Output driver pair. The I/O pin pairs are labeled as "T" and "C" to distinguish between the true and complement pins.

The MachXO1200 and MachXO2280 devices contain enhanced I/O capability. All PIO pairs on these larger devices can implement differential receivers. In addition, half of the PIO pairs on the left and right sides of these devices can be configured as LVDS transmit/receive pairs. PIOs on the top of these larger devices also provide PCI support.

**Figure 2-15. Group of Four Programmable I/O Cells**



**Figure 2-16. Group of Six Programmable I/O Cells**



## PIO

The PIO blocks provide the interface between the sysIO buffers and the internal PFU array blocks. These blocks receive output data from the PFU array and a fast output data signal from adjacent PFUs. The output data and fast

Figure 2-20. MachXO640 Banks

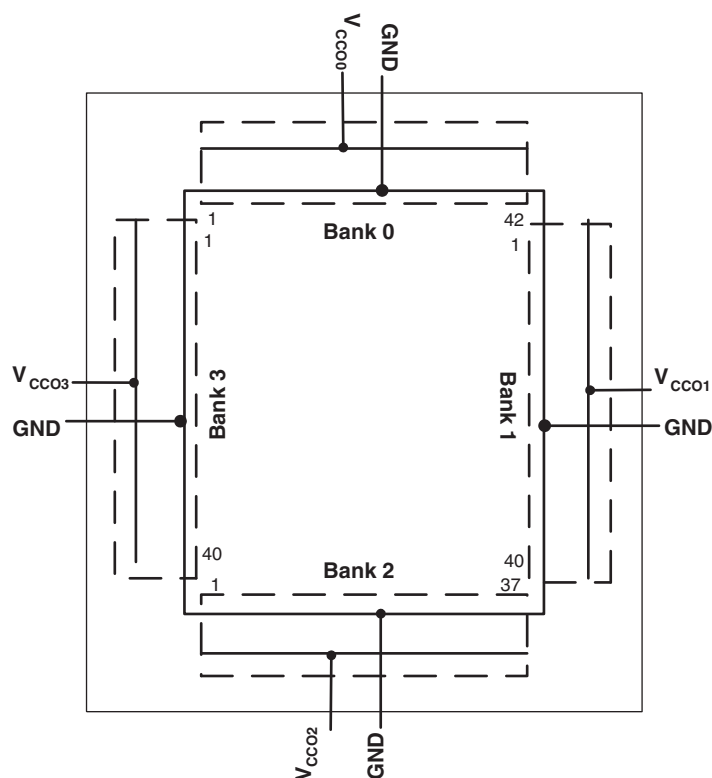
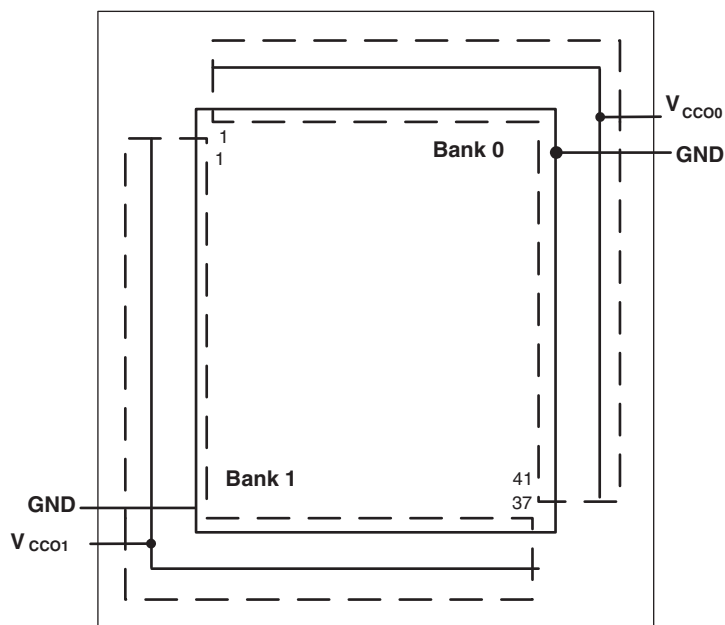


Figure 2-21. MachXO256 Banks



## Hot Socketing

The MachXO devices have been carefully designed to ensure predictable behavior during power-up and power-down. Leakage into I/O pins is controlled to within specified limits. This allows for easy integration with the rest of

### Absolute Maximum Ratings<sup>1, 2, 3</sup>

|                                                        | LCMXO E (1.2V) | LCMXO C (1.8V/2.5V/3.3V) |
|--------------------------------------------------------|----------------|--------------------------|
| Supply Voltage $V_{CC}$ . . . . .                      | -0.5 to 1.32V  | -0.5 to 3.75V            |
| Supply Voltage $V_{CCAUX}$ . . . . .                   | -0.5 to 3.75V  | -0.5 to 3.75V            |
| Output Supply Voltage $V_{CCIO}$ . . . . .             | -0.5 to 3.75V  | -0.5 to 3.75V            |
| I/O Tristate Voltage Applied <sup>4</sup> . . . . .    | -0.5 to 3.75V  | -0.5 to 3.75V            |
| Dedicated Input Voltage Applied <sup>4</sup> . . . . . | -0.5 to 3.75V  | -0.5 to 4.25V            |
| Storage Temperature (ambient) . . . . .                | -65 to 150°C   | -65 to 150°C             |
| Junction Temp. (Tj) . . . . .                          | +125°C         | +125°C                   |

1. Stress above those listed under the "Absolute Maximum Ratings" may cause permanent damage to the device. Functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.
2. Compliance with the Lattice *Thermal Management* document is required.
3. All voltages referenced to GND.
4. Overshoot and undershoot of -2V to ( $V_{IHMAX} + 2$ ) volts is permitted for a duration of <20ns.

### Recommended Operating Conditions<sup>1</sup>

| Symbol          | Parameter                                           | Min.  | Max.  | Units |
|-----------------|-----------------------------------------------------|-------|-------|-------|
| $V_{CC}$        | Core Supply Voltage for 1.2V Devices                | 1.14  | 1.26  | V     |
|                 | Core Supply Voltage for 1.8V/2.5V/3.3V Devices      | 1.71  | 3.465 | V     |
| $V_{CCAUX}^3$   | Auxiliary Supply Voltage                            | 3.135 | 3.465 | V     |
| $V_{CCIO}^2$    | I/O Driver Supply Voltage                           | 1.14  | 3.465 | V     |
| $t_{JCOM}$      | Junction Temperature Commercial Operation           | 0     | +85   | °C    |
| $t_{JIND}$      | Junction Temperature Industrial Operation           | -40   | 100   | °C    |
| $t_{JFLASHCOM}$ | Junction Temperature, Flash Programming, Commercial | 0     | +85   | °C    |
| $t_{JFLASHIND}$ | Junction Temperature, Flash Programming, Industrial | -40   | 100   | °C    |

1. Like power supplies must be tied together. For example, if  $V_{CCIO}$  and  $V_{CC}$  are both 2.5V, they must also be the same supply. 3.3V  $V_{CCIO}$  and 1.2V  $V_{CCIO}$  should be tied to  $V_{CCAUX}$  or 1.2V  $V_{CC}$  respectively.
2. See recommended voltages by I/O standard in subsequent table.
3.  $V_{CC}$  must reach minimum  $V_{CC}$  value before  $V_{CCAUX}$  reaches 2.5V.

### MachXO Programming/Erase Specifications

| Symbol          | Parameter                                    | Min. | Max.   | Units  |
|-----------------|----------------------------------------------|------|--------|--------|
| $N_{PROG}$      | Flash Programming Cycles per $t_{RETENTION}$ |      | 1,000  | Cycles |
|                 | Flash Functional Programming Cycles          |      | 10,000 | Cycles |
| $t_{RETENTION}$ | Data Retention at 125° Junction Temperature  | 10   |        | Years  |

### Supply Current (Sleep Mode)<sup>1, 2</sup>

| Symbol      | Parameter                      | Device                | Typ. <sup>3</sup> | Max. | Units   |
|-------------|--------------------------------|-----------------------|-------------------|------|---------|
| $I_{CC}$    | Core Power Supply              | LCMXO256C             | 12                | 25   | $\mu A$ |
|             |                                | LCMXO640C             | 12                | 25   | $\mu A$ |
|             |                                | LCMXO1200C            | 12                | 25   | $\mu A$ |
|             |                                | LCMXO2280C            | 12                | 25   | $\mu A$ |
| $I_{CCAUX}$ | Auxiliary Power Supply         | LCMXO256C             | 1                 | 15   | $\mu A$ |
|             |                                | LCMXO640C             | 1                 | 25   | $\mu A$ |
|             |                                | LCMXO1200C            | 1                 | 45   | $\mu A$ |
|             |                                | LCMXO2280C            | 1                 | 85   | $\mu A$ |
| $I_{CCIO}$  | Bank Power Supply <sup>4</sup> | All LCMXO 'C' Devices | 2                 | 30   | $\mu A$ |

1. Assumes all inputs are configured as LVCMOS and held at the VCCIO or GND.

2. Frequency = 0MHz.

3.  $T_A = 25^\circ C$ , power supplies at nominal voltage.

4. Per Bank.

### Supply Current (Standby)<sup>1, 2, 3, 4</sup>

#### Over Recommended Operating Conditions

| Symbol      | Parameter                                    | Device       | Typ. <sup>5</sup> | Units |
|-------------|----------------------------------------------|--------------|-------------------|-------|
| $I_{CC}$    | Core Power Supply                            | LCMXO256C    | 7                 | mA    |
|             |                                              | LCMXO640C    | 9                 | mA    |
|             |                                              | LCMXO1200C   | 14                | mA    |
|             |                                              | LCMXO2280C   | 20                | mA    |
|             |                                              | LCMXO256E    | 4                 | mA    |
|             |                                              | LCMXO640E    | 6                 | mA    |
|             |                                              | LCMXO1200E   | 10                | mA    |
|             |                                              | LCMXO2280E   | 12                | mA    |
| $I_{CCAUX}$ | Auxiliary Power Supply<br>$V_{CCAUX} = 3.3V$ | LCMXO256E/C  | 5                 | mA    |
|             |                                              | LCMXO640E/C  | 7                 | mA    |
|             |                                              | LCMXO1200E/C | 12                | mA    |
|             |                                              | LCMXO2280E/C | 13                | mA    |
| $I_{CCIO}$  | Bank Power Supply <sup>6</sup>               | All devices  | 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 VCCIO or GND.

3. Frequency = 0MHz.

4. User pattern = blank.

5.  $T_J = 25^\circ C$ , power supplies at nominal voltage.

6. Per Bank. VCCIO = 2.5V. Does not include pull-up/pull-down.



### MachXO External Switching Characteristics<sup>1</sup>

Over Recommended Operating Conditions

| Parameter                                                                | Description                             | Device    | -5   |      | -4   |      | -3   |      | Units |
|--------------------------------------------------------------------------|-----------------------------------------|-----------|------|------|------|------|------|------|-------|
|                                                                          |                                         |           | Min. | Max. | Min. | Max. | Min. | Max. |       |
| General I/O Pin Parameters (Using Global Clock without PLL) <sup>1</sup> |                                         |           |      |      |      |      |      |      |       |
| t <sub>PD</sub>                                                          | Best Case t <sub>PD</sub> Through 1 LUT | LCMXO256  | —    | 3.5  | —    | 4.2  | —    | 4.9  | ns    |
|                                                                          |                                         | LCMXO640  | —    | 3.5  | —    | 4.2  | —    | 4.9  | ns    |
|                                                                          |                                         | LCMXO1200 | —    | 3.6  | —    | 4.4  | —    | 5.1  | ns    |
|                                                                          |                                         | LCMXO2280 | —    | 3.6  | —    | 4.4  | —    | 5.1  | ns    |
| t <sub>CO</sub>                                                          | Best Case Clock to Output - From PFU    | LCMXO256  | —    | 4.0  | —    | 4.8  | —    | 5.6  | ns    |
|                                                                          |                                         | LCMXO640  | —    | 4.0  | —    | 4.8  | —    | 5.7  | ns    |
|                                                                          |                                         | LCMXO1200 | —    | 4.3  | —    | 5.2  | —    | 6.1  | ns    |
|                                                                          |                                         | LCMXO2280 | —    | 4.3  | —    | 5.2  | —    | 6.1  | ns    |
| t <sub>SU</sub>                                                          | Clock to Data Setup - To PFU            | LCMXO256  | 1.3  | —    | 1.6  | —    | 1.8  | —    | ns    |
|                                                                          |                                         | LCMXO640  | 1.1  | —    | 1.3  | —    | 1.5  | —    | ns    |
|                                                                          |                                         | LCMXO1200 | 1.1  | —    | 1.3  | —    | 1.6  | —    | ns    |
|                                                                          |                                         | LCMXO2280 | 1.1  | —    | 1.3  | —    | 1.5  | —    | ns    |
| t <sub>H</sub>                                                           | Clock to Data Hold - To PFU             | LCMXO256  | -0.3 | —    | -0.3 | —    | -0.3 | —    | ns    |
|                                                                          |                                         | LCMXO640  | -0.1 | —    | -0.1 | —    | -0.1 | —    | ns    |
|                                                                          |                                         | LCMXO1200 | 0.0  | —    | 0.0  | —    | 0.0  | —    | ns    |
|                                                                          |                                         | LCMXO2280 | -0.4 | —    | -0.4 | —    | -0.4 | —    | ns    |
| f <sub>MAX_IO</sub>                                                      | Clock Frequency of I/O and PFU Register | LCMXO256  | —    | 600  | —    | 550  | —    | 500  | MHz   |
|                                                                          |                                         | LCMXO640  | —    | 600  | —    | 550  | —    | 500  | MHz   |
|                                                                          |                                         | LCMXO1200 | —    | 600  | —    | 550  | —    | 500  | MHz   |
|                                                                          |                                         | LCMXO2280 | —    | 600  | —    | 550  | —    | 500  | MHz   |
| t <sub>SKEW_PRI</sub>                                                    | Global Clock Skew Across Device         | LCMXO256  | —    | 200  | —    | 220  | —    | 240  | ps    |
|                                                                          |                                         | LCMXO640  | —    | 200  | —    | 220  | —    | 240  | ps    |
|                                                                          |                                         | LCMXO1200 | —    | 220  | —    | 240  | —    | 260  | ps    |
|                                                                          |                                         | LCMXO2280 | —    | 220  | —    | 240  | —    | 260  | ps    |

1. General timing numbers based on LVCMOS2.5V, 12 mA.  
Rev. A 0.19

**Power Supply and NC (Cont.)**

| Signal           | 132 csBGA <sup>1</sup>                                 | 256 caBGA / 256 ftBGA <sup>1</sup>                                                                                                                                                                                                                                                                            | 324 ftBGA <sup>1</sup>                                                                                              |
|------------------|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| VCC              | H3, P6, G12, C7                                        | G7, G10, K7, K10                                                                                                                                                                                                                                                                                              | F14, G11, G9, H7, L7, M9                                                                                            |
| VCCIO0           | LCMXO640: B11, C5<br>LCMXO1200/2280: C5                | LCMXO640: F8, F7, F9, F10<br>LCMXO1200/2280: F8, F7                                                                                                                                                                                                                                                           | G8, G7                                                                                                              |
| VCCIO1           | LCMXO640: L12, E12<br>LCMXO1200/2280: B11              | LCMXO640: H11, G11, K11, J11<br>LCMXO1200/2280: F9, F10                                                                                                                                                                                                                                                       | G12, G10                                                                                                            |
| VCCIO2           | LCMXO640: N2, M10<br>LCMXO1200/2280: E12               | LCMXO640: L9, L10, L8, L7<br>LCMXO1200/2280: H11, G11                                                                                                                                                                                                                                                         | J12, H12                                                                                                            |
| VCCIO3           | LCMXO640: D2, K3<br>LCMXO1200/2280: L12                | LCMXO640: K6, J6, H6, G6<br>LCMXO1200/2280: K11, J11                                                                                                                                                                                                                                                          | L12, K12                                                                                                            |
| VCCIO4           | LCMXO640: None<br>LCMXO1200/2280: M10                  | LCMXO640: None<br>LCMXO1200/2280: L9, L10                                                                                                                                                                                                                                                                     | M12, M11                                                                                                            |
| VCCIO5           | LCMXO640: None<br>LCMXO1200/2280: N2                   | LCMXO640: None<br>LCMXO1200/2280: L8, L7                                                                                                                                                                                                                                                                      | M8, R9                                                                                                              |
| VCCIO6           | LCMXO640: None<br>LCMXO1200/2280: K3                   | LCMXO640: None<br>LCMXO1200/2280: K6, J6                                                                                                                                                                                                                                                                      | M7, K7                                                                                                              |
| VCCIO7           | LCMXO640: None<br>LCMXO1200/2280: D2                   | LCMXO640: None<br>LCMXO1200/2280: H6, G6                                                                                                                                                                                                                                                                      | H6, J7                                                                                                              |
| VCCAUX           | P7, A7                                                 | T9, A8                                                                                                                                                                                                                                                                                                        | M10, F9                                                                                                             |
| GND <sup>2</sup> | F1, P9, J14, C9, A10, B4, L13,<br>D13, P2, N11, E1, L2 | A1, A16, F11, G8, G9, H7, H8, H9,<br>H10, J7, J8, J9, J10, K8, K9, L6,<br>T1, T16                                                                                                                                                                                                                             | E14, F16, H10, H11, H8, H9, J10,<br>J11, J4, J8, J9, K10, K11, K17, K8,<br>K9, L10, L11, L8, L9, N2, P14, P5,<br>R7 |
| NC <sup>3</sup>  | —                                                      | LCMXO640: E4, E5, F5, F6, C3,<br>C2, G4, G5, H4, H5, K5, K4, M5,<br>M4, P2, P3, N5, N6, M7, M8, N10,<br>N11, R15, R16, P15, P16, M11,<br>L11, N12, N13, M13, M12, K12,<br>J12, F12, F13, E12, E13, D13,<br>D14, B15, A15, C14, B14, E11,<br>E10, E7, E6, D4, D3, B3, B2<br>LCMXO1200: None<br>LCMXO2280: None | —                                                                                                                   |

1. Pin orientation A1 starts from the upper left corner of the top side view with alphabetical order ascending vertically and numerical order ascending horizontally.
2. All grounds must be electrically connected at the board level. For fpBGA and ftBGA packages, the total number of GND balls is less than the actual number of GND logic connections from the die to the common package GND plane.
3. NC pins should not be connected to any active signals, VCC or GND.

**LCMXO256 and LCMXO640 Logic Signal Connections: 100 TQFP (Cont.)**

| Pin Number | LCMXO256      |      |               |              | LCMXO640      |      |               |              |
|------------|---------------|------|---------------|--------------|---------------|------|---------------|--------------|
|            | Ball Function | Bank | Dual Function | Differential | Ball Function | Bank | Dual Function | Differential |
| 85         | PT4B          | 0    | PCLK0_1**     | C            | PT6B          | 0    | PCLK0_1**     |              |
| 86         | PT4A          | 0    | PCLK0_0**     | T            | PT5B          | 0    | PCLK0_0**     | C            |
| 87         | PT3D          | 0    |               | C            | PT5A          | 0    |               | T            |
| 88         | VCCAUX        | -    |               |              | VCCAUX        | -    |               |              |
| 89         | PT3C          | 0    |               | T            | PT4F          | 0    |               |              |
| 90         | VCC           | -    |               |              | VCC           | -    |               |              |
| 91         | PT3B          | 0    |               | C            | PT3F          | 0    |               |              |
| 92         | VCCIO0        | 0    |               |              | VCCIO0        | 0    |               |              |
| 93         | GNDIO0        | 0    |               |              | GNDIO0        | 0    |               |              |
| 94         | PT3A          | 0    |               | T            | PT3B          | 0    |               | C            |
| 95         | PT2F          | 0    |               | C            | PT3A          | 0    |               | T            |
| 96         | PT2E          | 0    |               | T            | PT2F          | 0    |               | C            |
| 97         | PT2D          | 0    |               | C            | PT2E          | 0    |               | T            |
| 98         | PT2C          | 0    |               | T            | PT2B          | 0    |               | C            |
| 99         | PT2B          | 0    |               | C            | PT2C          | 0    |               |              |
| 100        | PT2A          | 0    |               | T            | PT2A          | 0    |               | T            |

\* NC for "E" devices.

\*\* Primary clock inputs are single-ended.

## LCMXO640, LCMXO1200 and LCMXO2280 Logic Signal Connections: 132 csBGA (Cont.)

| LCMXO640 |               |      |               |              | LCMXO1200 |               |      |               |              | LCMXO2280 |               |      |               |              |
|----------|---------------|------|---------------|--------------|-----------|---------------|------|---------------|--------------|-----------|---------------|------|---------------|--------------|
| Ball #   | Ball Function | Bank | Dual Function | Differential | Ball #    | Ball Function | Bank | Dual Function | Differential | Ball #    | Ball Function | Bank | Dual Function | Differential |
| B9       | PT7B          | 0    |               | C            | B9        | PT9B          | 1    |               | C            | B9        | PT12D         | 1    |               | C            |
| A9       | PT7A          | 0    |               | T            | A9        | PT9A          | 1    |               | T            | A9        | PT12C         | 1    |               | T            |
| A8       | PT6B          | 0    | PCLK0_1***    | C            | A8        | PT7D          | 1    | PCLK1_1***    |              | A8        | PT10B         | 1    | PCLK1_1***    |              |
| B8       | PT6A          | 0    |               | T            | B8        | PT7B          | 1    |               |              | B8        | PT9D          | 1    |               |              |
| C8       | PT5B          | 0    | PCLK0_0***    | C            | C8        | PT6F          | 0    | PCLK1_0***    |              | C8        | PT9B          | 1    | PCLK1_0***    |              |
| B7       | PT5A          | 0    |               | T            | B7        | PT6D          | 0    |               |              | B7        | PT8D          | 0    |               |              |
| A7       | VCCAUX        | -    |               |              | A7        | VCCAUX        | -    |               |              | A7        | VCCAUX        | -    |               |              |
| C7       | VCC           | -    |               |              | C7        | VCC           | -    |               |              | C7        | VCC           | -    |               |              |
| A6       | PT4D          | 0    |               | C            | A6        | PT5D          | 0    |               | C            | A6        | PT7B          | 0    |               | C            |
| B6       | PT4C          | 0    |               | T            | B6        | PT5C          | 0    |               | T            | B6        | PT7A          | 0    |               | T            |
| C6       | PT3F          | 0    |               | C            | C6        | PT5B          | 0    |               | C            | C6        | PT6D          | 0    |               |              |
| B5       | PT3E          | 0    |               | T            | B5        | PT5A          | 0    |               | T            | B5        | PT6E          | 0    |               | T            |
| A5       | PT3D          | 0    |               |              | A5        | PT4B          | 0    |               |              | A5        | PT6F          | 0    |               | C            |
| B4       | GNDIO0        | 0    |               |              | B4        | GNDIO0        | 0    |               |              | B4        | GNDIO0        | 0    |               |              |
| A4       | PT3B          | 0    |               |              | A4        | PT3D          | 0    |               | C            | A4        | PT4B          | 0    |               | C            |
| C4       | PT2F          | 0    |               |              | C4        | PT3C          | 0    |               | T            | C4        | PT4A          | 0    |               | T            |
| A3       | PT2D          | 0    |               | C            | A3        | PT3B          | 0    |               | C            | A3        | PT3B          | 0    |               | C            |
| A2       | PT2C          | 0    |               | T            | A2        | PT2B          | 0    |               | C            | A2        | PT2B          | 0    |               | C            |
| B3       | PT2B          | 0    |               | C            | B3        | PT3A          | 0    |               | T            | B3        | PT3A          | 0    |               | T            |
| A1       | PT2A          | 0    |               | T            | A1        | PT2A          | 0    |               | T            | A1        | PT2A          | 0    |               | T            |
| F1       | GND           | -    |               |              | F1        | GND           | -    |               |              | F1        | GND           | -    |               |              |
| P9       | GND           | -    |               |              | P9        | GND           | -    |               |              | P9        | GND           | -    |               |              |
| J14      | GND           | -    |               |              | J14       | GND           | -    |               |              | J14       | GND           | -    |               |              |
| C9       | GND           | -    |               |              | C9        | GND           | -    |               |              | C9        | GND           | -    |               |              |
| C5       | VCCIO0        | 0    |               |              | C5        | VCCIO0        | 0    |               |              | C5        | VCCIO0        | 0    |               |              |
| B11      | VCCIO0        | 0    |               |              | B11       | VCCIO1        | 1    |               |              | B11       | VCCIO1        | 1    |               |              |
| E12      | VCCIO1        | 1    |               |              | E12       | VCCIO2        | 2    |               |              | E12       | VCCIO2        | 2    |               |              |
| L12      | VCCIO1        | 1    |               |              | L12       | VCCIO3        | 3    |               |              | L12       | VCCIO3        | 3    |               |              |
| M10      | VCCIO2        | 2    |               |              | M10       | VCCIO4        | 4    |               |              | M10       | VCCIO4        | 4    |               |              |
| N2       | VCCIO2        | 2    |               |              | N2        | VCCIO5        | 5    |               |              | N2        | VCCIO5        | 5    |               |              |
| D2       | VCCIO3        | 3    |               |              | D2        | VCCIO7        | 7    |               |              | D2        | VCCIO7        | 7    |               |              |
| K3       | VCCIO3        | 3    |               |              | K3        | VCCIO6        | 6    |               |              | K3        | VCCIO6        | 6    |               |              |

\*Supports true LVDS outputs.

\*\*NC for "E" devices.

\*\*\*Primary clock inputs are single-ended.

## LCMXO640, LCMXO1200 and LCMXO2280 Logic Signal Connections: 144 TQFP (Cont.)

| Pin Number | LCMXO640      |      |               |              | LCMXO1200     |      |               |              | LCMXO2280     |      |               |              |
|------------|---------------|------|---------------|--------------|---------------|------|---------------|--------------|---------------|------|---------------|--------------|
|            | Ball Function | Bank | Dual Function | Differential | Ball Function | Bank | Dual Function | Differential | Ball Function | Bank | Dual Function | Differential |
| 51         | TDI           | 2    | TDI           |              | TDI           | 5    | TDI           |              | TDI           | 5    | TDI           |              |
| 52         | VCC           | -    |               |              | VCC           | -    |               |              | VCC           | -    |               |              |
| 53         | VCCAUX        | -    |               |              | VCCAUX        | -    |               |              | VCCAUX        | -    |               |              |
| 54         | PB5A          | 2    |               | T            | PB6F          | 5    |               |              | PB8F          | 5    |               |              |
| 55         | PB5B          | 2    | PCLKT2_1***   | C            | PB7B          | 4    | PCLK4_1***    |              | PB10F         | 4    | PCLK4_1***    |              |
| 56         | PB5D          | 2    |               |              | PB7C          | 4    |               | T            | PB10C         | 4    |               | T            |
| 57         | PB6A          | 2    |               | T            | PB7D          | 4    |               | C            | PB10D         | 4    |               | C            |
| 58         | PB6B          | 2    | PCLKT2_0***   | C            | PB7F          | 4    | PCLK4_0***    |              | PB10B         | 4    | PCLK4_0***    |              |
| 59         | GND           | -    |               |              | GND           | -    |               |              | GND           | -    |               |              |
| 60         | PB7C          | 2    |               |              | PB9A          | 4    |               | T            | PB12A         | 4    |               | T            |
| 61         | PB7E          | 2    |               |              | PB9B          | 4    |               | C            | PB12B         | 4    |               | C            |
| 62         | PB8A          | 2    |               |              | PB9E          | 4    |               |              | PB12E         | 4    |               |              |
| 63         | VCCIO2        | 2    |               |              | VCCIO4        | 4    |               |              | VCCIO4        | 4    |               |              |
| 64         | GNDIO2        | 2    |               |              | GNDIO4        | 4    |               |              | GNDIO4        | 4    |               |              |
| 65         | PB8C          | 2    |               | T            | PB10A         | 4    |               | T            | PB13A         | 4    |               | T            |
| 66         | PB8D          | 2    |               | C            | PB10B         | 4    |               | C            | PB13B         | 4    |               | C            |
| 67         | PB9A          | 2    |               | T            | PB10C         | 4    |               | T            | PB13C         | 4    |               | T            |
| 68         | PB9C          | 2    |               | T            | PB10D         | 4    |               | C            | PB13D         | 4    |               | C            |
| 69         | PB9B          | 2    |               | C            | PB10F         | 4    |               |              | PB14D         | 4    |               |              |
| 70**       | SLEEPN        | -    | SLEEPN        |              | SLEEPN        | -    | SLEEPN        |              | SLEEPN        | -    | SLEEPN        |              |
| 71         | PB9D          | 2    |               | C            | PB11C         | 4    |               | T            | PB16C         | 4    |               | T            |
| 72         | PB9F          | 2    |               |              | PB11D         | 4    |               | C            | PB16D         | 4    |               | C            |
| 73         | PR11D         | 1    |               | C            | PR16B         | 3    |               | C            | PR20B         | 3    |               | C            |
| 74         | PR11B         | 1    |               | C            | PR16A         | 3    |               | T            | PR20A         | 3    |               | T            |
| 75         | PR11C         | 1    |               | T            | PR15B         | 3    |               | C*           | PR19B         | 3    |               | C            |
| 76         | PR10D         | 1    |               | C            | PR15A         | 3    |               | T*           | PR19A         | 3    |               | T            |
| 77         | PR11A         | 1    |               | T            | PR14D         | 3    |               | C            | PR17D         | 3    |               | C            |
| 78         | PR10B         | 1    |               | C            | PR14C         | 3    |               | T            | PR17C         | 3    |               | T            |
| 79         | PR10C         | 1    |               | T            | PR14B         | 3    |               | C*           | PR17B         | 3    |               | C*           |
| 80         | PR10A         | 1    |               | T            | PR14A         | 3    |               | T*           | PR17A         | 3    |               | T*           |
| 81         | PR9D          | 1    |               |              | PR13D         | 3    |               |              | PR16D         | 3    |               |              |
| 82         | VCCIO1        | 1    |               |              | VCCIO3        | 3    |               |              | VCCIO3        | 3    |               |              |
| 83         | GNDIO1        | 1    |               |              | GNDIO3        | 3    |               |              | GNDIO3        | 3    |               |              |
| 84         | PR9A          | 1    |               |              | PR12B         | 3    |               | C*           | PR15B         | 3    |               | C*           |
| 85         | PR8C          | 1    |               |              | PR12A         | 3    |               | T*           | PR15A         | 3    |               | T*           |
| 86         | PR8A          | 1    |               |              | PR11B         | 3    |               | C*           | PR14B         | 3    |               | C*           |
| 87         | PR7D          | 1    |               |              | PR11A         | 3    |               | T*           | PR14A         | 3    |               | T*           |
| 88         | GND           | -    |               |              | GND           | -    |               |              | GND           | -    |               |              |
| 89         | PR7B          | 1    |               | C            | PR10B         | 3    |               | C*           | PR13B         | 3    |               | C*           |
| 90         | PR7A          | 1    |               | T            | PR10A         | 3    |               | T*           | PR13A         | 3    |               | T*           |
| 91         | PR6D          | 1    |               | C            | PR8B          | 2    |               | C*           | PR10B         | 2    |               | C*           |
| 92         | PR6C          | 1    |               | T            | PR8A          | 2    |               | T*           | PR10A         | 2    |               | T*           |
| 93         | VCC           | -    |               |              | VCC           | -    |               |              | VCC           | -    |               |              |
| 94         | PR5D          | 1    |               |              | PR6B          | 2    |               | C*           | PR8B          | 2    |               | C*           |
| 95         | PR5B          | 1    |               |              | PR6A          | 2    |               | T*           | PR8A          | 2    |               | T*           |
| 96         | PR4D          | 1    |               |              | PR5B          | 2    |               | C*           | PR7B          | 2    |               | C*           |
| 97         | PR4B          | 1    |               | C            | PR5A          | 2    |               | T*           | PR7A          | 2    |               | T*           |
| 98         | VCCIO1        | 1    |               |              | VCCIO2        | 2    |               |              | VCCIO2        | 2    |               |              |
| 99         | GNDIO1        | 1    |               |              | GNDIO2        | 2    |               |              | GNDIO2        | 2    |               |              |
| 100        | PR4A          | 1    |               | T            | PR4C          | 2    |               |              | PR5C          | 2    |               |              |

## LCMXO640, LCMXO1200 and LCMXO2280 Logic Signal Connections: 256 caBGA / 256 ftBGA (Cont.)

| LCMXO640    |               |      |               |              | LCMXO1200   |               |      |               |              | LCMXO2280   |               |      |               |              |
|-------------|---------------|------|---------------|--------------|-------------|---------------|------|---------------|--------------|-------------|---------------|------|---------------|--------------|
| Ball Number | Ball Function | Bank | Dual Function | Differential | Ball Number | Ball Function | Bank | Dual Function | Differential | Ball Number | Ball Function | Bank | Dual Function | Differential |
| -           | -             |      |               |              | VCCIO4      | VCCIO4        | 4    |               |              | VCCIO4      | VCCIO4        | 4    |               |              |
| -           | -             |      |               |              | GND         | GNDIO4        | 4    |               |              | GND         | GNDIO4        | 4    |               |              |
| M10         | PB6A          | 2    |               | T            | M10         | PB7E          | 4    |               | T            | M10         | PB10A         | 4    |               | T            |
| R9          | PB6C          | 2    |               | T            | R9          | PB8A          | 4    |               | T            | R9          | PB11C         | 4    |               | T            |
| R10         | PB6D          | 2    |               | C            | R10         | PB8B          | 4    |               | C            | R10         | PB11D         | 4    |               | C            |
| T10         | PB7C          | 2    |               | T            | T10         | PB8C          | 4    |               | T            | T10         | PB12A         | 4    |               | T            |
| T11         | PB7D          | 2    |               | C            | T11         | PB8D          | 4    |               | C            | T11         | PB12B         | 4    |               | C            |
| N10         | NC            |      |               |              | N10         | PB8E          | 4    |               | T            | N10         | PB12C         | 4    |               | T            |
| N11         | NC            |      |               |              | N11         | PB8F          | 4    |               | C            | N11         | PB12D         | 4    |               | C            |
| VCCIO2      | VCCIO2        | 2    |               |              | VCCIO4      | VCCIO4        | 4    |               |              | VCCIO4      | VCCIO4        | 4    |               |              |
| GND         | GNDIO2        | 2    |               |              | GND         | GNDIO4        | 4    |               |              | GND         | GNDIO4        | 4    |               |              |
| R11         | PB7E          | 2    |               | T            | R11         | PB9A          | 4    |               | T            | R11         | PB13A         | 4    |               | T            |
| R12         | PB7F          | 2    |               | C            | R12         | PB9B          | 4    |               | C            | R12         | PB13B         | 4    |               | C            |
| P11         | PB8A          | 2    |               | T            | P11         | PB9C          | 4    |               | T            | P11         | PB13C         | 4    |               | T            |
| P12         | PB8B          | 2    |               | C            | P12         | PB9D          | 4    |               | C            | P12         | PB13D         | 4    |               | C            |
| T13         | PB8C          | 2    |               | T            | T13         | PB9E          | 4    |               | T            | T13         | PB14A         | 4    |               | T            |
| T12         | PB8D          | 2    |               | C            | T12         | PB9F          | 4    |               | C            | T12         | PB14B         | 4    |               | C            |
| R13         | PB9A          | 2    |               | T            | R13         | PB10A         | 4    |               | T            | R13         | PB14C         | 4    |               | T            |
| R14         | PB9B          | 2    |               | C            | R14         | PB10B         | 4    |               | C            | R14         | PB14D         | 4    |               | C            |
| GND         | GND           | -    |               |              | GND         | GND           | -    |               |              | GND         | GND           | -    |               |              |
| T14         | PB9C          | 2    |               | T            | T14         | PB10C         | 4    |               | T            | T14         | PB15A         | 4    |               | T            |
| T15         | PB9D          | 2    |               | C            | T15         | PB10D         | 4    |               | C            | T15         | PB15B         | 4    |               | C            |
| P13**       | SLEEPN        | -    | SLEEPN        |              | P13**       | SLEEPN        | -    | SLEEPN        |              | P13**       | SLEEPN        | -    | SLEEPN        |              |
| P14         | PB9F          | 2    |               |              | P14         | PB10F         | 4    |               |              | P14         | PB15D         | 4    |               |              |
| R15         | NC            |      |               |              | R15         | PB11A         | 4    |               | T            | R15         | PB16A         | 4    |               | T            |
| R16         | NC            |      |               |              | R16         | PB11B         | 4    |               | C            | R16         | PB16B         | 4    |               | C            |
| P15         | NC            |      |               |              | P15         | PB11C         | 4    |               | T            | P15         | PB16C         | 4    |               | T            |
| P16         | NC            |      |               |              | P16         | PB11D         | 4    |               | C            | P16         | PB16D         | 4    |               | C            |
| VCCIO2      | VCCIO2        | 2    |               |              | VCCIO4      | VCCIO4        | 4    |               |              | VCCIO4      | VCCIO4        | 4    |               |              |
| GND         | GNDIO2        | 2    |               |              | GND         | GNDIO4        | 4    |               |              | GND         | GNDIO4        | 4    |               |              |
| GND         | GNDIO1        | 1    |               |              | GND         | GNDIO3        | 3    |               |              | GND         | GNDIO3        | 3    |               |              |
| VCCIO1      | VCCIO1        | 1    |               |              | VCCIO3      | VCCIO3        | 3    |               |              | VCCIO3      | VCCIO3        | 3    |               |              |
| M11         | NC            |      |               |              | M11         | PR16B         | 3    |               | C            | M11         | PR20B         | 3    |               | C            |
| L11         | NC            |      |               |              | L11         | PR16A         | 3    |               | T            | L11         | PR20A         | 3    |               | T            |
| N12         | NC            |      |               |              | N12         | PR15B         | 3    |               | C*           | N12         | PR18B         | 3    |               | C*           |
| N13         | NC            |      |               |              | N13         | PR15A         | 3    |               | T*           | N13         | PR18A         | 3    |               | T*           |
| M13         | NC            |      |               |              | M13         | PR14D         | 3    |               | C            | M13         | PR17D         | 3    |               | C            |
| M12         | NC            |      |               |              | M12         | PR14C         | 3    |               | T            | M12         | PR17C         | 3    |               | T            |
| N14         | PR11D         | 1    |               | C            | N14         | PR14B         | 3    |               | C*           | N14         | PR17B         | 3    |               | C*           |
| N15         | PR11C         | 1    |               | T            | N15         | PR14A         | 3    |               | T*           | N15         | PR17A         | 3    |               | T*           |
| L13         | PR11B         | 1    |               | C            | L13         | PR13D         | 3    |               | C            | L13         | PR16D         | 3    |               | C            |
| L12         | PR11A         | 1    |               | T            | L12         | PR13C         | 3    |               | T            | L12         | PR16C         | 3    |               | T            |
| M14         | PR10B         | 1    |               | C            | M14         | PR13B         | 3    |               | C*           | M14         | PR16B         | 3    |               | C*           |
| VCCIO1      | VCCIO1        | 1    |               |              | VCCIO3      | VCCIO3        | 3    |               |              | VCCIO3      | VCCIO3        | 3    |               |              |
| GND         | GNDIO1        | 1    |               |              | GND         | GNDIO3        | 3    |               |              | GND         | GNDIO3        | 3    |               |              |
| L14         | PR10A         | 1    |               | T            | L14         | PR13A         | 3    |               | T*           | L14         | PR16A         | 3    |               | T*           |
| N16         | PR10D         | 1    |               | C            | N16         | PR12D         | 3    |               | C            | N16         | PR15D         | 3    |               | C            |
| M16         | PR10C         | 1    |               | T            | M16         | PR12C         | 3    |               | T            | M16         | PR15C         | 3    |               | T            |
| M15         | PR9D          | 1    |               | C            | M15         | PR12B         | 3    |               | C*           | M15         | PR15B         | 3    |               | C*           |
| L15         | PR9C          | 1    |               | T            | L15         | PR12A         | 3    |               | T*           | L15         | PR15A         | 3    |               | T*           |
| L16         | PR9B          | 1    |               | C            | L16         | PR11D         | 3    |               | C            | L16         | PR14D         | 3    |               | C            |
| K16         | PR9A          | 1    |               | T            | K16         | PR11C         | 3    |               | T            | K16         | PR14C         | 3    |               | T            |
| K13         | PR8D          | 1    |               | C            | K13         | PR11B         | 3    |               | C*           | K13         | PR14B         | 3    |               | C*           |

## LCMXO640, LCMXO1200 and LCMXO2280 Logic Signal Connections: 256 caBGA / 256 ftBGA (Cont.)

| LCMXO640    |               |      |               |              | LCMXO1200   |               |      |               |              | LCMXO2280   |               |      |               |              |
|-------------|---------------|------|---------------|--------------|-------------|---------------|------|---------------|--------------|-------------|---------------|------|---------------|--------------|
| Ball Number | Ball Function | Bank | Dual Function | Differential | Ball Number | Ball Function | Bank | Dual Function | Differential | Ball Number | Ball Function | Bank | Dual Function | Differential |
| J13         | PR8C          | 1    |               | T            | J13         | PR11A         | 3    |               | T*           | J13         | PR14A         | 3    |               | T*           |
| GND         | GND           | -    |               |              | GND         | GND           | -    |               |              | GND         | GND           | -    |               |              |
| K14         | PR8B          | 1    |               | C            | K14         | PR10D         | 3    |               | C            | K14         | PR13D         | 3    |               | C            |
| J14         | PR8A          | 1    |               | T            | J14         | PR10C         | 3    |               | T            | J14         | PR13C         | 3    |               | T            |
| K15         | PR7D          | 1    |               | C            | K15         | PR10B         | 3    |               | C*           | K15         | PR13B         | 3    |               | C*           |
| J15         | PR7C          | 1    |               | T            | J15         | PR10A         | 3    |               | T*           | J15         | PR13A         | 3    |               | T*           |
| -           | -             |      |               |              | GND         | GNDIO3        | 3    |               |              | GND         | GNDIO3        | 3    |               |              |
| -           | -             |      |               |              | VCCIO3      | VCCIO3        | 3    |               |              | VCCIO3      | VCCIO3        | 3    |               |              |
| K12         | NC            |      |               |              | K12         | PR9D          | 3    |               | C            | K12         | PR11D         | 3    |               | C            |
| J12         | NC            |      |               |              | J12         | PR9C          | 3    |               | T            | J12         | PR11C         | 3    |               | T            |
| J16         | PR7B          | 1    |               | C            | J16         | PR9B          | 3    |               | C*           | J16         | PR11B         | 3    |               | C*           |
| H16         | PR7A          | 1    |               | T            | H16         | PR9A          | 3    |               | T*           | H16         | PR11A         | 3    |               | T*           |
| H15         | PR6B          | 1    |               | C            | H15         | PR8D          | 2    |               | C            | H15         | PR10D         | 2    |               | C            |
| G15         | PR6A          | 1    |               | T            | G15         | PR8C          | 2    |               | T            | G15         | PR10C         | 2    |               | T            |
| H14         | PR5D          | 1    |               | C            | H14         | PR8B          | 2    |               | C*           | H14         | PR10B         | 2    |               | C*           |
| G14         | PR5C          | 1    |               | T            | G14         | PR8A          | 2    |               | T*           | G14         | PR10A         | 2    |               | T*           |
| GND         | GNDIO1        | 1    |               |              | GND         | GNDIO2        | 2    |               |              | GND         | GNDIO2        | 2    |               |              |
| VCCIO1      | VCCIO1        | 1    |               |              | VCCIO2      | VCCIO2        | 2    |               |              | VCCIO2      | VCCIO2        | 2    |               |              |
| H13         | PR6D          | 1    |               | C            | H13         | PR7D          | 2    |               | C            | H13         | PR9D          | 2    |               | C            |
| H12         | PR6C          | 1    |               | T            | H12         | PR7C          | 2    |               | T            | H12         | PR9C          | 2    |               | T            |
| G13         | PR4D          | 1    |               | C            | G13         | PR7B          | 2    |               | C*           | G13         | PR9B          | 2    |               | C*           |
| G12         | PR4C          | 1    |               | T            | G12         | PR7A          | 2    |               | T*           | G12         | PR9A          | 2    |               | T*           |
| G16         | PR5B          | 1    |               | C            | G16         | PR6D          | 2    |               | C            | G16         | PR7D          | 2    |               | C            |
| F16         | PR5A          | 1    |               | T            | F16         | PR6C          | 2    |               | T            | F16         | PR7C          | 2    |               | T            |
| F15         | PR4B          | 1    |               | C            | F15         | PR6B          | 2    |               | C*           | F15         | PR7B          | 2    |               | C*           |
| E15         | PR4A          | 1    |               | T            | E15         | PR6A          | 2    |               | T*           | E15         | PR7A          | 2    |               | T*           |
| E16         | PR3B          | 1    |               | C            | E16         | PR5D          | 2    |               | C            | E16         | PR6D          | 2    |               | C            |
| D16         | PR3A          | 1    |               | T            | D16         | PR5C          | 2    |               | T            | D16         | PR6C          | 2    |               | T            |
| VCCIO1      | VCCIO1        | 1    |               |              | VCCIO2      | VCCIO2        | 2    |               |              | VCCIO2      | VCCIO2        | 2    |               |              |
| GND         | GNDIO1        | 1    |               |              | GND         | GNDIO2        | 2    |               |              | GND         | GNDIO2        | 2    |               |              |
| D15         | PR2D          | 1    |               | C            | D15         | PR5B          | 2    |               | C*           | D15         | PR6B          | 2    |               | C*           |
| C15         | PR2C          | 1    |               | T            | C15         | PR5A          | 2    |               | T*           | C15         | PR6A          | 2    |               | T*           |
| C16         | PR2B          | 1    |               | C            | C16         | PR4D          | 2    |               | C            | C16         | PR5D          | 2    |               | C            |
| B16         | PR2A          | 1    |               | T            | B16         | PR4C          | 2    |               | T            | B16         | PR5C          | 2    |               | T            |
| F14         | PR3D          | 1    |               | C            | F14         | PR4B          | 2    |               | C*           | F14         | PR5B          | 2    |               | C*           |
| E14         | PR3C          | 1    |               | T            | E14         | PR4A          | 2    |               | T*           | E14         | PR5A          | 2    |               | T*           |
| -           | -             | -    |               |              | -           | -             | -    |               |              | GND         | GND           | -    |               |              |
| F12         | NC            |      |               |              | F12         | PR3D          | 2    |               | C            | F12         | PR4D          | 2    |               | C            |
| F13         | NC            |      |               |              | F13         | PR3C          | 2    |               | T            | F13         | PR4C          | 2    |               | T            |
| E12         | NC            |      |               |              | E12         | PR3B          | 2    |               | C*           | E12         | PR4B          | 2    |               | C*           |
| E13         | NC            |      |               |              | E13         | PR3A          | 2    |               | T*           | E13         | PR4A          | 2    |               | T*           |
| D13         | NC            |      |               |              | D13         | PR2B          | 2    |               | C            | D13         | PR3B          | 2    |               | C*           |
| D14         | NC            |      |               |              | D14         | PR2A          | 2    |               | T            | D14         | PR3A          | 2    |               | T*           |
| VCCIO0      | VCCIO0        | 0    |               |              | VCCIO2      | VCCIO2        | 2    |               |              | VCCIO2      | VCCIO2        | 2    |               |              |
| GND         | GNDIO0        | 0    |               |              | GND         | GNDIO2        | 2    |               |              | GND         | GNDIO2        | 2    |               |              |
| GND         | GNDIO0        | 0    |               |              | GND         | GNDIO1        | 1    |               |              | GND         | GNDIO1        | 1    |               |              |
| VCCIO0      | VCCIO0        | 0    |               |              | VCCIO1      | VCCIO1        | 1    |               |              | VCCIO1      | VCCIO1        | 1    |               |              |
| B15         | NC            |      |               |              | B15         | PT11D         | 1    |               | C            | B15         | PT16D         | 1    |               | C            |
| A15         | NC            |      |               |              | A15         | PT11C         | 1    |               | T            | A15         | PT16C         | 1    |               | T            |
| C14         | NC            |      |               |              | C14         | PT11B         | 1    |               | C            | C14         | PT16B         | 1    |               | C            |
| B14         | NC            |      |               |              | B14         | PT11A         | 1    |               | T            | B14         | PT16A         | 1    |               | T            |
| C13         | PT9F          | 0    |               | C            | C13         | PT10F         | 1    |               | C            | C13         | PT15D         | 1    |               | C            |
| B13         | PT9E          | 0    |               | T            | B13         | PT10E         | 1    |               | T            | B13         | PT15C         | 1    |               | T            |

## LCMXO640, LCMXO1200 and LCMXO2280 Logic Signal Connections: 256 caBGA / 256 ftBGA (Cont.)

| LCMXO640    |               |      |               |              | LCMXO1200   |               |      |               |              | LCMXO2280   |               |      |               |              |
|-------------|---------------|------|---------------|--------------|-------------|---------------|------|---------------|--------------|-------------|---------------|------|---------------|--------------|
| Ball Number | Ball Function | Bank | Dual Function | Differential | Ball Number | Ball Function | Bank | Dual Function | Differential | Ball Number | Ball Function | Bank | Dual Function | Differential |
| D3          | NC            |      |               |              | D3          | PT2C          | 0    |               | T            | D3          | PT3C          | 0    |               | T            |
| A3          | PT2B          | 0    |               | C            | A3          | PT3B          | 0    |               | C            | A3          | PT3B          | 0    |               | C            |
| A2          | PT2A          | 0    |               | T            | A2          | PT3A          | 0    |               | T            | A2          | PT3A          | 0    |               | T            |
| B3          | NC            |      |               |              | B3          | PT2B          | 0    |               | C            | B3          | PT2D          | 0    |               | C            |
| B2          | NC            |      |               |              | B2          | PT2A          | 0    |               | T            | B2          | PT2C          | 0    |               | T            |
| VCCIO0      | VCCIO0        | 0    |               |              | VCCIO0      | VCCIO0        | 0    |               |              | VCCIO0      | VCCIO0        | 0    |               |              |
| GND         | GNDIO0        | 0    |               |              | GND         | GNDIO0        | 0    |               |              | GND         | GNDIO0        | 0    |               |              |
| A1          | GND           | -    |               |              | A1          | GND           | -    |               |              | A1          | GND           | -    |               |              |
| A16         | GND           | -    |               |              | A16         | GND           | -    |               |              | A16         | GND           | -    |               |              |
| F11         | GND           | -    |               |              | F11         | GND           | -    |               |              | F11         | GND           | -    |               |              |
| G8          | GND           | -    |               |              | G8          | GND           | -    |               |              | G8          | GND           | -    |               |              |
| G9          | GND           | -    |               |              | G9          | GND           | -    |               |              | G9          | GND           | -    |               |              |
| H7          | GND           | -    |               |              | H7          | GND           | -    |               |              | H7          | GND           | -    |               |              |
| H8          | GND           | -    |               |              | H8          | GND           | -    |               |              | H8          | GND           | -    |               |              |
| H9          | GND           | -    |               |              | H9          | GND           | -    |               |              | H9          | GND           | -    |               |              |
| H10         | GND           | -    |               |              | H10         | GND           | -    |               |              | H10         | GND           | -    |               |              |
| J7          | GND           | -    |               |              | J7          | GND           | -    |               |              | J7          | GND           | -    |               |              |
| J8          | GND           | -    |               |              | J8          | GND           | -    |               |              | J8          | GND           | -    |               |              |
| J9          | GND           | -    |               |              | J9          | GND           | -    |               |              | J9          | GND           | -    |               |              |
| J10         | GND           | -    |               |              | J10         | GND           | -    |               |              | J10         | GND           | -    |               |              |
| K8          | GND           | -    |               |              | K8          | GND           | -    |               |              | K8          | GND           | -    |               |              |
| K9          | GND           | -    |               |              | K9          | GND           | -    |               |              | K9          | GND           | -    |               |              |
| L6          | GND           | -    |               |              | L6          | GND           | -    |               |              | L6          | GND           | -    |               |              |
| T1          | GND           | -    |               |              | T1          | GND           | -    |               |              | T1          | GND           | -    |               |              |
| T16         | GND           | -    |               |              | T16         | GND           | -    |               |              | T16         | GND           | -    |               |              |
| G7          | VCC           | -    |               |              | G7          | VCC           | -    |               |              | G7          | VCC           | -    |               |              |
| G10         | VCC           | -    |               |              | G10         | VCC           | -    |               |              | G10         | VCC           | -    |               |              |
| K7          | VCC           | -    |               |              | K7          | VCC           | -    |               |              | K7          | VCC           | -    |               |              |
| K10         | VCC           | -    |               |              | K10         | VCC           | -    |               |              | K10         | VCC           | -    |               |              |
| H6          | VCCIO3        | 3    |               |              | H6          | VCCIO7        | 7    |               |              | H6          | VCCIO7        | 7    |               |              |
| G6          | VCCIO3        | 3    |               |              | G6          | VCCIO7        | 7    |               |              | G6          | VCCIO7        | 7    |               |              |
| K6          | VCCIO3        | 3    |               |              | K6          | VCCIO6        | 6    |               |              | K6          | VCCIO6        | 6    |               |              |
| J6          | VCCIO3        | 3    |               |              | J6          | VCCIO6        | 6    |               |              | J6          | VCCIO6        | 6    |               |              |
| L8          | VCCIO2        | 2    |               |              | L8          | VCCIO5        | 5    |               |              | L8          | VCCIO5        | 5    |               |              |
| L7          | VCCIO2        | 2    |               |              | L7          | VCCIO5        | 5    |               |              | L7          | VCCIO5        | 5    |               |              |
| L9          | VCCIO2        | 2    |               |              | L9          | VCCIO4        | 4    |               |              | L9          | VCCIO4        | 4    |               |              |
| L10         | VCCIO2        | 2    |               |              | L10         | VCCIO4        | 4    |               |              | L10         | VCCIO4        | 4    |               |              |
| K11         | VCCIO1        | 1    |               |              | K11         | VCCIO3        | 3    |               |              | K11         | VCCIO3        | 3    |               |              |
| J11         | VCCIO1        | 1    |               |              | J11         | VCCIO3        | 3    |               |              | J11         | VCCIO3        | 3    |               |              |
| H11         | VCCIO1        | 1    |               |              | H11         | VCCIO2        | 2    |               |              | H11         | VCCIO2        | 2    |               |              |
| G11         | VCCIO1        | 1    |               |              | G11         | VCCIO2        | 2    |               |              | G11         | VCCIO2        | 2    |               |              |
| F9          | VCCIO0        | 0    |               |              | F9          | VCCIO1        | 1    |               |              | F9          | VCCIO1        | 1    |               |              |
| F10         | VCCIO0        | 0    |               |              | F10         | VCCIO1        | 1    |               |              | F10         | VCCIO1        | 1    |               |              |
| F8          | VCCIO0        | 0    |               |              | F8          | VCCIO0        | 0    |               |              | F8          | VCCIO0        | 0    |               |              |
| F7          | VCCIO0        | 0    |               |              | F7          | VCCIO0        | 0    |               |              | F7          | VCCIO0        | 0    |               |              |

\* Supports true LVDS outputs.

\*\* NC for "E" devices.

\*\*\* Primary clock inputs are single-ended.



**LCMX02280 Logic Signal Connections: 324 ftBGA (Cont.)**

| LCMX02280   |               |      |               |              |
|-------------|---------------|------|---------------|--------------|
| Ball Number | Ball Function | Bank | Dual Function | Differential |
| V10         | PB9B          | 4    |               | C            |
| N10         | PB9C          | 4    |               | T            |
| R10         | PB9D          | 4    |               | C            |
| P10         | PB10F         | 4    | PCLK4_1***    | C            |
| T10         | PB10E         | 4    |               | T            |
| U10         | PB10D         | 4    |               | C            |
| V11         | PB10C         | 4    |               | T            |
| U11         | PB10B         | 4    | PCLK4_0***    | C            |
| VCCIO4      | VCCIO4        | 4    |               |              |
| GND         | GNDIO4        | 4    |               |              |
| T11         | PB10A         | 4    |               | T            |
| U12         | PB11A         | 4    |               | T            |
| R11         | PB11B         | 4    |               | C            |
| GND         | GND           | -    |               |              |
| T12         | PB11C         | 4    |               | T            |
| P11         | PB11D         | 4    |               | C            |
| V12         | PB12A         | 4    |               | T            |
| V13         | PB12B         | 4    |               | C            |
| R12         | PB12C         | 4    |               | T            |
| N11         | PB12D         | 4    |               | C            |
| U13         | PB12E         | 4    |               | T            |
| VCCIO4      | VCCIO4        | 4    |               |              |
| GND         | GNDIO4        | 4    |               |              |
| V14         | PB12F         | 4    |               | C            |
| T13         | PB13A         | 4    |               | T            |
| P12         | PB13B         | 4    |               | C            |
| R13         | PB13C         | 4    |               | T            |
| N12         | PB13D         | 4    |               | C            |
| V15         | PB14A         | 4    |               | T            |
| U14         | PB14B         | 4    |               | C            |
| V16         | PB14C         | 4    |               | T            |
| GND         | GND           | -    |               |              |
| T14         | PB14D         | 4    |               | C            |
| U15         | PB15A         | 4    |               | T            |
| V17         | PB15B         | 4    |               | C            |
| P13**       | SLEEPN        | -    | SLEEPN        |              |
| T15         | PB15D         | 4    |               |              |
| U16         | PB16A         | 4    |               | T            |
| V18         | PB16B         | 4    |               | C            |
| N13         | PB16C         | 4    |               | T            |
| R14         | PB16D         | 4    |               | C            |
| VCCIO4      | VCCIO4        | 4    |               |              |
| GND         | GNDIO4        | 4    |               |              |

**LCMX02280 Logic Signal Connections: 324 ftBGA (Cont.)**

| LCMX02280   |               |      |               |              |
|-------------|---------------|------|---------------|--------------|
| Ball Number | Ball Function | Bank | Dual Function | Differential |
| J13         | PR10C         | 2    |               | T            |
| M18         | PR10B         | 2    |               | C*           |
| L18         | PR10A         | 2    |               | T*           |
| GND         | GNDIO2        | 2    |               |              |
| VCCIO2      | VCCIO2        | 2    |               |              |
| H16         | PR9D          | 2    |               | C            |
| H14         | PR9C          | 2    |               | T            |
| K18         | PR9B          | 2    |               | C*           |
| J18         | PR9A          | 2    |               | T*           |
| J17         | PR8D          | 2    |               | C            |
| VCC         | VCC           | -    |               |              |
| H18         | PR8C          | 2    |               | T            |
| H17         | PR8B          | 2    |               | C*           |
| G17         | PR8A          | 2    |               | T*           |
| H13         | PR7D          | 2    |               | C            |
| H15         | PR7C          | 2    |               | T            |
| G18         | PR7B          | 2    |               | C*           |
| F18         | PR7A          | 2    |               | T*           |
| G14         | PR6D          | 2    |               | C            |
| G16         | PR6C          | 2    |               | T            |
| VCCIO2      | VCCIO2        | 2    |               |              |
| GND         | GNDIO2        | 2    |               |              |
| E18         | PR6B          | 2    |               | C*           |
| F17         | PR6A          | 2    |               | T*           |
| G13         | PR5D          | 2    |               | C            |
| G15         | PR5C          | 2    |               | T            |
| E17         | PR5B          | 2    |               | C*           |
| E16         | PR5A          | 2    |               | T*           |
| GND         | GND           | -    |               |              |
| F15         | PR4D          | 2    |               | C            |
| E15         | PR4C          | 2    |               | T            |
| D17         | PR4B          | 2    |               | C*           |
| D18         | PR4A          | 2    |               | T*           |
| B18         | PR3D          | 2    |               | C            |
| C18         | PR3C          | 2    |               | T            |
| C16         | PR3B          | 2    |               | C*           |
| D16         | PR3A          | 2    |               | T*           |
| C17         | PR2B          | 2    |               | C            |
| D15         | PR2A          | 2    |               | T            |
| VCCIO2      | VCCIO2        | 2    |               |              |
| GND         | GNDIO2        | 2    |               |              |
| GND         | GNDIO1        | 1    |               |              |
| VCCIO1      | VCCIO1        | 1    |               |              |

**Conventional Packaging**
**Industrial**

| Part Number      | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO256C-3T100I | 256  | 1.8V/2.5V/3.3V | 78   | -3    | TQFP    | 100  | IND   |
| LCMXO256C-4T100I | 256  | 1.8V/2.5V/3.3V | 78   | -4    | TQFP    | 100  | IND   |
| LCMXO256C-3M100I | 256  | 1.8V/2.5V/3.3V | 78   | -3    | csBGA   | 100  | IND   |
| LCMXO256C-4M100I | 256  | 1.8V/2.5V/3.3V | 78   | -4    | csBGA   | 100  | IND   |

| Part Number       | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|-------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO640C-3T100I  | 640  | 1.8V/2.5V/3.3V | 74   | -3    | TQFP    | 100  | IND   |
| LCMXO640C-4T100I  | 640  | 1.8V/2.5V/3.3V | 74   | -4    | TQFP    | 100  | IND   |
| LCMXO640C-3M100I  | 640  | 1.8V/2.5V/3.3V | 74   | -3    | csBGA   | 100  | IND   |
| LCMXO640C-4M100I  | 640  | 1.8V/2.5V/3.3V | 74   | -4    | csBGA   | 100  | IND   |
| LCMXO640C-3T144I  | 640  | 1.8V/2.5V/3.3V | 113  | -3    | TQFP    | 144  | IND   |
| LCMXO640C-4T144I  | 640  | 1.8V/2.5V/3.3V | 113  | -4    | TQFP    | 144  | IND   |
| LCMXO640C-3M132I  | 640  | 1.8V/2.5V/3.3V | 101  | -3    | csBGA   | 132  | IND   |
| LCMXO640C-4M132I  | 640  | 1.8V/2.5V/3.3V | 101  | -4    | csBGA   | 132  | IND   |
| LCMXO640C-3B256I  | 640  | 1.8V/2.5V/3.3V | 159  | -3    | caBGA   | 256  | IND   |
| LCMXO640C-4B256I  | 640  | 1.8V/2.5V/3.3V | 159  | -4    | caBGA   | 256  | IND   |
| LCMXO640C-3FT256I | 640  | 1.8V/2.5V/3.3V | 159  | -3    | ftBGA   | 256  | IND   |
| LCMXO640C-4FT256I | 640  | 1.8V/2.5V/3.3V | 159  | -4    | ftBGA   | 256  | IND   |

| Part Number        | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|--------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO1200C-3T100I  | 1200 | 1.8V/2.5V/3.3V | 73   | -3    | TQFP    | 100  | IND   |
| LCMXO1200C-4T100I  | 1200 | 1.8V/2.5V/3.3V | 73   | -4    | TQFP    | 100  | IND   |
| LCMXO1200C-3T144I  | 1200 | 1.8V/2.5V/3.3V | 113  | -3    | TQFP    | 144  | IND   |
| LCMXO1200C-4T144I  | 1200 | 1.8V/2.5V/3.3V | 113  | -4    | TQFP    | 144  | IND   |
| LCMXO1200C-3M132I  | 1200 | 1.8V/2.5V/3.3V | 101  | -3    | csBGA   | 132  | IND   |
| LCMXO1200C-4M132I  | 1200 | 1.8V/2.5V/3.3V | 101  | -4    | csBGA   | 132  | IND   |
| LCMXO1200C-3B256I  | 1200 | 1.8V/2.5V/3.3V | 211  | -3    | caBGA   | 256  | IND   |
| LCMXO1200C-4B256I  | 1200 | 1.8V/2.5V/3.3V | 211  | -4    | caBGA   | 256  | IND   |
| LCMXO1200C-3FT256I | 1200 | 1.8V/2.5V/3.3V | 211  | -3    | ftBGA   | 256  | IND   |
| LCMXO1200C-4FT256I | 1200 | 1.8V/2.5V/3.3V | 211  | -4    | ftBGA   | 256  | IND   |

| Part Number        | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|--------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO2280C-3T100I  | 2280 | 1.8V/2.5V/3.3V | 73   | -3    | TQFP    | 100  | IND   |
| LCMXO2280C-4T100I  | 2280 | 1.8V/2.5V/3.3V | 73   | -4    | TQFP    | 100  | IND   |
| LCMXO2280C-3T144I  | 2280 | 1.8V/2.5V/3.3V | 113  | -3    | TQFP    | 144  | IND   |
| LCMXO2280C-4T144I  | 2280 | 1.8V/2.5V/3.3V | 113  | -4    | TQFP    | 144  | IND   |
| LCMXO2280C-3M132I  | 2280 | 1.8V/2.5V/3.3V | 101  | -3    | csBGA   | 132  | IND   |
| LCMXO2280C-4M132I  | 2280 | 1.8V/2.5V/3.3V | 101  | -4    | csBGA   | 132  | IND   |
| LCMXO2280C-3B256I  | 2280 | 1.8V/2.5V/3.3V | 211  | -3    | caBGA   | 256  | IND   |
| LCMXO2280C-4B256I  | 2280 | 1.8V/2.5V/3.3V | 211  | -4    | caBGA   | 256  | IND   |
| LCMXO2280C-3FT256I | 2280 | 1.8V/2.5V/3.3V | 211  | -3    | ftBGA   | 256  | IND   |
| LCMXO2280C-4FT256I | 2280 | 1.8V/2.5V/3.3V | 211  | -4    | ftBGA   | 256  | IND   |
| LCMXO2280C-3FT324I | 2280 | 1.8V/2.5V/3.3V | 271  | -3    | ftBGA   | 324  | IND   |
| LCMXO2280C-4FT324I | 2280 | 1.8V/2.5V/3.3V | 271  | -4    | ftBGA   | 324  | IND   |

| Part Number         | LUTs | Supply Voltage | I/Os | Grade | Package         | Pins | Temp. |
|---------------------|------|----------------|------|-------|-----------------|------|-------|
| LCMXO1200E-3TN100C  | 1200 | 1.2V           | 73   | -3    | Lead-Free TQFP  | 100  | COM   |
| LCMXO1200E-4TN100C  | 1200 | 1.2V           | 73   | -4    | Lead-Free TQFP  | 100  | COM   |
| LCMXO1200E-5TN100C  | 1200 | 1.2V           | 73   | -5    | Lead-Free TQFP  | 100  | COM   |
| LCMXO1200E-3TN144C  | 1200 | 1.2V           | 113  | -3    | Lead-Free TQFP  | 144  | COM   |
| LCMXO1200E-4TN144C  | 1200 | 1.2V           | 113  | -4    | Lead-Free TQFP  | 144  | COM   |
| LCMXO1200E-5TN144C  | 1200 | 1.2V           | 113  | -5    | Lead-Free TQFP  | 144  | COM   |
| LCMXO1200E-3MN132C  | 1200 | 1.2V           | 101  | -3    | Lead-Free csBGA | 132  | COM   |
| LCMXO1200E-4MN132C  | 1200 | 1.2V           | 101  | -4    | Lead-Free csBGA | 132  | COM   |
| LCMXO1200E-5MN132C  | 1200 | 1.2V           | 101  | -5    | Lead-Free csBGA | 132  | COM   |
| LCMXO1200E-3BN256C  | 1200 | 1.2V           | 211  | -3    | Lead-Free caBGA | 256  | COM   |
| LCMXO1200E-4BN256C  | 1200 | 1.2V           | 211  | -4    | Lead-Free caBGA | 256  | COM   |
| LCMXO1200E-5BN256C  | 1200 | 1.2V           | 211  | -5    | Lead-Free caBGA | 256  | COM   |
| LCMXO1200E-3FTN256C | 1200 | 1.2V           | 211  | -3    | Lead-Free ftBGA | 256  | COM   |
| LCMXO1200E-4FTN256C | 1200 | 1.2V           | 211  | -4    | Lead-Free ftBGA | 256  | COM   |
| LCMXO1200E-5FTN256C | 1200 | 1.2V           | 211  | -5    | Lead-Free ftBGA | 256  | COM   |

| Part Number         | LUTs | Supply Voltage | I/Os | Grade | Package         | Pins | Temp. |
|---------------------|------|----------------|------|-------|-----------------|------|-------|
| LCMXO2280E-3TN100C  | 2280 | 1.2V           | 73   | -3    | Lead-Free TQFP  | 100  | COM   |
| LCMXO2280E-4TN100C  | 2280 | 1.2V           | 73   | -4    | Lead-Free TQFP  | 100  | COM   |
| LCMXO2280E-5TN100C  | 2280 | 1.2V           | 73   | -5    | Lead-Free TQFP  | 100  | COM   |
| LCMXO2280E-3TN144C  | 2280 | 1.2V           | 113  | -3    | Lead-Free TQFP  | 144  | COM   |
| LCMXO2280E-4TN144C  | 2280 | 1.2V           | 113  | -4    | Lead-Free TQFP  | 144  | COM   |
| LCMXO2280E-5TN144C  | 2280 | 1.2V           | 113  | -5    | Lead-Free TQFP  | 144  | COM   |
| LCMXO2280E-3MN132C  | 2280 | 1.2V           | 101  | -3    | Lead-Free csBGA | 132  | COM   |
| LCMXO2280E-4MN132C  | 2280 | 1.2V           | 101  | -4    | Lead-Free csBGA | 132  | COM   |
| LCMXO2280E-5MN132C  | 2280 | 1.2V           | 101  | -5    | Lead-Free csBGA | 132  | COM   |
| LCMXO2280E-3BN256C  | 2280 | 1.2V           | 211  | -3    | Lead-Free caBGA | 256  | COM   |
| LCMXO2280E-4BN256C  | 2280 | 1.2V           | 211  | -4    | Lead-Free caBGA | 256  | COM   |
| LCMXO2280E-5BN256C  | 2280 | 1.2V           | 211  | -5    | Lead-Free caBGA | 256  | COM   |
| LCMXO2280E-3FTN256C | 2280 | 1.2V           | 211  | -3    | Lead-Free ftBGA | 256  | COM   |
| LCMXO2280E-4FTN256C | 2280 | 1.2V           | 211  | -4    | Lead-Free ftBGA | 256  | COM   |
| LCMXO2280E-5FTN256C | 2280 | 1.2V           | 211  | -5    | Lead-Free ftBGA | 256  | COM   |
| LCMXO2280E-3FTN324C | 2280 | 1.2V           | 271  | -3    | Lead-Free ftBGA | 324  | COM   |
| LCMXO2280E-4FTN324C | 2280 | 1.2V           | 271  | -4    | Lead-Free ftBGA | 324  | COM   |
| LCMXO2280E-5FTN324C | 2280 | 1.2V           | 271  | -5    | Lead-Free ftBGA | 324  | COM   |

| Date          | Version | Section                          | Change Summary                                                                                                                                                         |
|---------------|---------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| November 2006 | 02.3    | DC and Switching Characteristics | Corrections to MachXO “C” Sleep Mode Timing table - value for $t_{WSLEEPN}$ (400ns) changed from max. to min. Value for $t_{WAWAKE}$ (100ns) changed from min. to max. |
|               |         |                                  | Added Flash Download Time table.                                                                                                                                       |
| December 2006 | 02.4    | Architecture                     | EBR Asynchronous Reset section added.                                                                                                                                  |
|               |         | Pinout Information               | Power Supply and NC table; Pin/Ball orientation footnotes added.                                                                                                       |
| February 2007 | 02.5    | Architecture                     | Updated EBR Asynchronous Reset section.                                                                                                                                |
| August 2007   | 02.6    | DC and Switching Characteristics | Updated sysIO Single-Ended DC Electrical Characteristics table.                                                                                                        |
| November 2007 | 02.7    | DC and Switching Characteristics | Added JTAG Port Timing Waveforms diagram.                                                                                                                              |
|               |         | Pinout Information               | Added Thermal Management text section.                                                                                                                                 |
|               |         | Supplemental Information         | Updated title list.                                                                                                                                                    |
| June 2009     | 02.8    | Introduction                     | Added 0.8-mm 256-pin caBGA package to MachXO Family Selection Guide table.                                                                                             |
|               |         | Pinout Information               | Added Logic Signal Connections table for 0.8-mm 256-pin caBGA package.                                                                                                 |
|               |         | Ordering Information             | Updated Part Number Description diagram and Ordering Part Number tables with 0.8-mm 256-pin caBGA package information.                                                 |
| July 2010     | 02.9    | DC and Switching Characteristics | Updated sysCLOCK PLL Timing table.                                                                                                                                     |
| June 2013     | 03.0    | All                              | Updated document with new corporate logo.                                                                                                                              |
|               |         | Architecture                     | Architecture Overview – Added information on the state of the register on power up and after configuration.                                                            |
|               |         | DC and Switching Characteristics | MachXO1200 and MachXO2280 Hot Socketing Specifications table – Removed footnote 4.                                                                                     |
|               |         |                                  | Added MachXO Programming/Erase Specifications table.                                                                                                                   |