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

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

## Applications of Embedded - FPGAs

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

### Details

|                                |                                                                                                                                                                         |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Product Status                 | Obsolete                                                                                                                                                                |
| Number of LABs/CLBs            | 150                                                                                                                                                                     |
| Number of Logic Elements/Cells | 1200                                                                                                                                                                    |
| Total RAM Bits                 | 9421                                                                                                                                                                    |
| Number of I/O                  | 73                                                                                                                                                                      |
| Number of Gates                | -                                                                                                                                                                       |
| Voltage - Supply               | 1.71V ~ 3.465V                                                                                                                                                          |
| Mounting Type                  | Surface Mount                                                                                                                                                           |
| Operating Temperature          | 0°C ~ 85°C (TJ)                                                                                                                                                         |
| Package / Case                 | 100-LQFP                                                                                                                                                                |
| Supplier Device Package        | 100-TQFP (14x14)                                                                                                                                                        |
| Purchase URL                   | <a href="https://www.e-xfl.com/product-detail/lattice-semiconductor/lcmxo1200c-5t100c">https://www.e-xfl.com/product-detail/lattice-semiconductor/lcmxo1200c-5t100c</a> |

## Architecture Overview

The MachXO family architecture contains an array of logic blocks surrounded by Programmable I/O (PIO). Some devices in this family have sysCLOCK PLLs and blocks of sysMEM™ Embedded Block RAM (EBRs). Figures 2-1, 2-2, and 2-3 show the block diagrams of the various family members.

The logic blocks are arranged in a two-dimensional grid with rows and columns. The EBR blocks are arranged in a column to the left of the logic array. The PIO cells are located at the periphery of the device, arranged into Banks. The PIOs utilize a flexible I/O buffer referred to as a sysIO interface that supports operation with a variety of interface standards. The blocks are connected with many vertical and horizontal routing channel resources. The place and route software tool automatically allocates these routing resources.

There are two kinds of logic blocks, the Programmable Functional Unit (PFU) and the Programmable Functional unit without RAM (PFF). The PFU contains the building blocks for logic, arithmetic, RAM, ROM, and register functions. The PFF block contains building blocks for logic, arithmetic, ROM, and register functions. Both the PFU and PFF blocks are optimized for flexibility, allowing complex designs to be implemented quickly and effectively. Logic blocks are arranged in a two-dimensional array. Only one type of block is used per row.

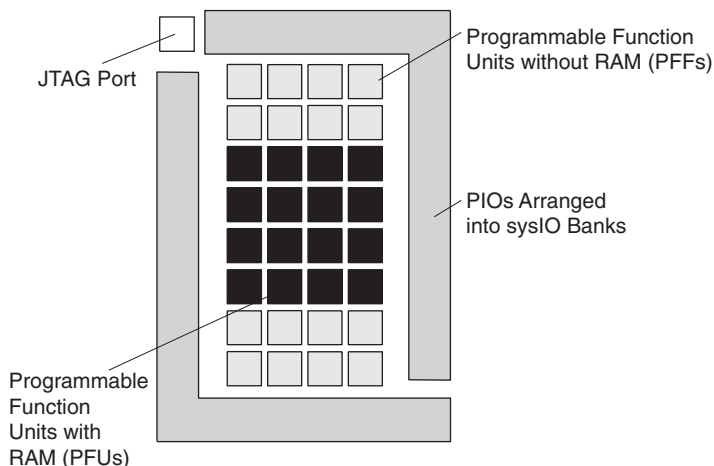
In the MachXO family, the number of sysIO Banks varies by device. There are different types of I/O Buffers on different Banks. See the details in later sections of this document. The sysMEM EBRs are large, dedicated fast memory blocks; these blocks are found only in the larger devices. These blocks can be configured as RAM, ROM or FIFO. FIFO support includes dedicated FIFO pointer and flag “hard” control logic to minimize LUT use.

The MachXO registers in PFU and sysI/O can be configured to be SET or RESET. After power up and device is configured, the device enters into user mode with these registers SET/RESET according to the configuration setting, allowing device entering to a known state for predictable system function.

The MachXO architecture provides up to two sysCLOCK™ Phase Locked Loop (PLL) blocks on larger devices. These blocks are located at either end of the memory blocks. The PLLs have multiply, divide, and phase shifting capabilities that are used to manage the frequency and phase relationships of the clocks.

Every device in the family has a JTAG Port that supports programming and configuration of the device as well as access to the user logic. The MachXO devices are available for operation from 3.3V, 2.5V, 1.8V, and 1.2V power supplies, providing easy integration into the overall system.

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

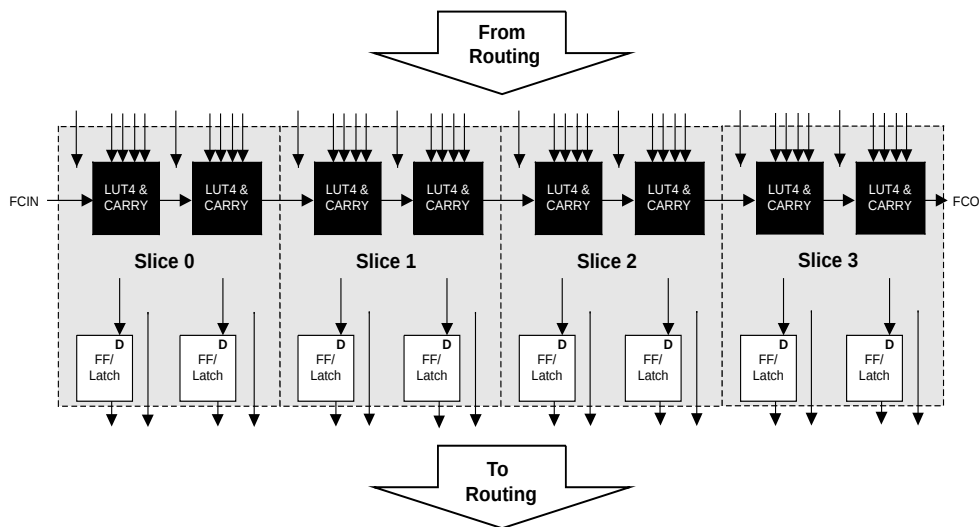


## PFU Blocks

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.

### Bus Size Matching

All of the multi-port memory modes support different widths on each of the ports. The RAM bits are mapped LSB word 0 to MSB word 0, LSB word 1 to MSB word 1 and so on. Although the word size and number of words for each port varies, this mapping scheme applies to each port.

### RAM Initialization and ROM Operation

If desired, the contents of the RAM can be pre-loaded during device configuration. By preloading the RAM block during the chip configuration cycle and disabling the write controls, the sysMEM block can also be utilized as a ROM.

### Memory Cascading

Larger and deeper blocks of RAMs can be created using EBR sysMEM Blocks. Typically, the Lattice design tools cascade memory transparently, based on specific design inputs.

### Single, Dual, Pseudo-Dual Port and FIFO Modes

Figure 2-12 shows the five basic memory configurations and their input/output names. In all the sysMEM RAM modes, the input data and address for the ports are registered at the input of the memory array. The output data of the memory is optionally registered at the memory array output.

**Figure 2-12. sysMEM Memory Primitives**

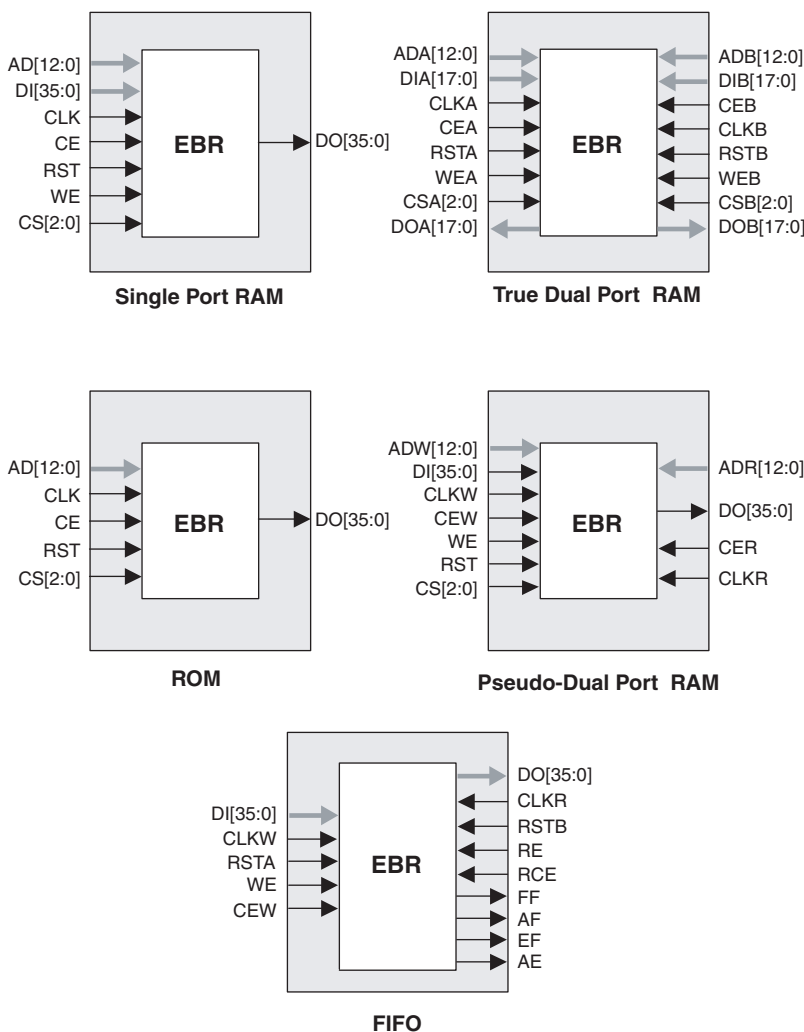


Figure 2-20. MachXO640 Banks

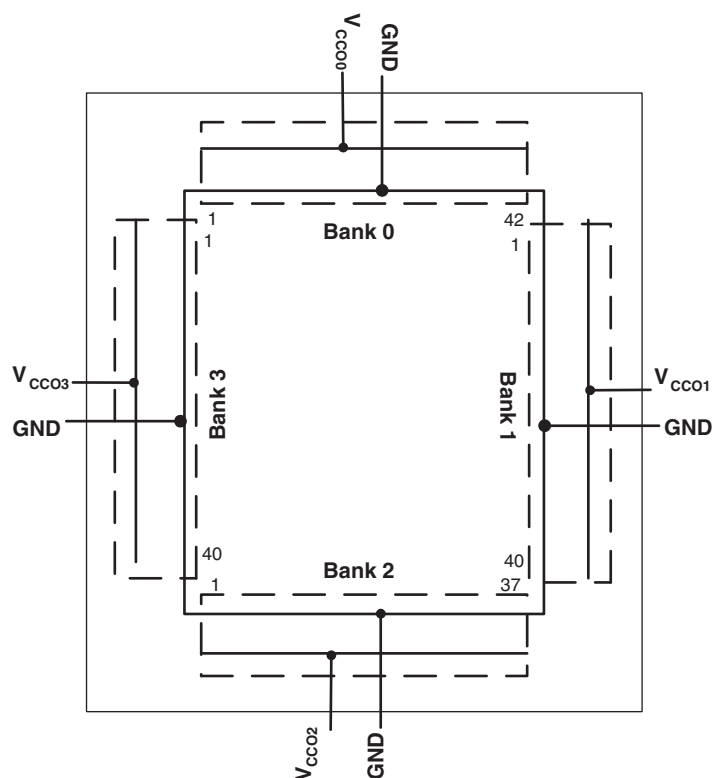
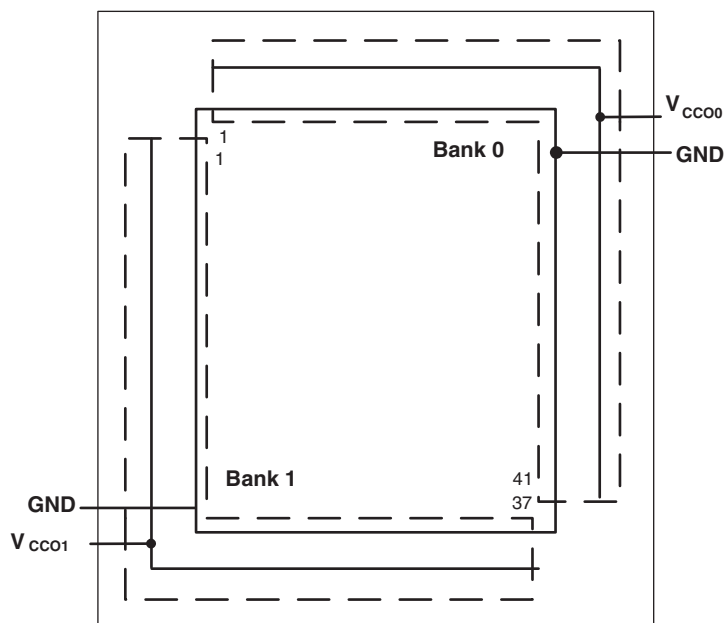


Figure 2-21. MachXO256 Banks



## 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

## 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 Internal Timing Parameters<sup>1</sup>

Over Recommended Operating Conditions

| Parameter                                   | Description                                                  | -5    |      | -4    |      | -3    |      | Units |
|---------------------------------------------|--------------------------------------------------------------|-------|------|-------|------|-------|------|-------|
|                                             |                                                              | Min.  | Max. | Min.  | Max. | Min.  | Max. |       |
| PFU/PFF Logic Mode Timing                   |                                                              |       |      |       |      |       |      |       |
| t <sub>LUT4_PFU</sub>                       | LUT4 delay (A to D inputs to F output)                       | —     | 0.28 | —     | 0.34 | —     | 0.39 | ns    |
| t <sub>LUT6_PFU</sub>                       | LUT6 delay (A to D inputs to OFX output)                     | —     | 0.44 | —     | 0.53 | —     | 0.62 | ns    |
| t <sub>LSR_PFU</sub>                        | Set/Reset to output of PFU                                   | —     | 0.90 | —     | 1.08 | —     | 1.26 | ns    |
| t <sub>SUM_PFU</sub>                        | Clock to Mux (M0,M1) input setup time                        | 0.10  | —    | 0.13  | —    | 0.15  | —    | ns    |
| t <sub>HM_PFU</sub>                         | Clock to Mux (M0,M1) input hold time                         | -0.05 | —    | -0.06 | —    | -0.07 | —    | ns    |
| t <sub>SUD_PFU</sub>                        | Clock to D input setup time                                  | 0.13  | —    | 0.16  | —    | 0.18  | —    | ns    |
| t <sub>HD_PFU</sub>                         | Clock to D input hold time                                   | -0.03 | —    | -0.03 | —    | -0.04 | —    | ns    |
| t <sub>CK2Q_PFU</sub>                       | Clock to Q delay, D-type register configuration              | —     | 0.40 | —     | 0.48 | —     | 0.56 | ns    |
| t <sub>LE2Q_PFU</sub>                       | Clock to Q delay latch configuration                         | —     | 0.53 | —     | 0.64 | —     | 0.74 | ns    |
| t <sub>LD2Q_PFU</sub>                       | D to Q throughput delay when latch is enabled                | —     | 0.55 | —     | 0.66 | —     | 0.77 | ns    |
| PFU Dual Port Memory Mode Timing            |                                                              |       |      |       |      |       |      |       |
| t <sub>CORAM_PFU</sub>                      | Clock to Output                                              | —     | 0.40 | —     | 0.48 | —     | 0.56 | ns    |
| t <sub>SUDATA_PFU</sub>                     | Data Setup Time                                              | -0.18 | —    | -0.22 | —    | -0.25 | —    | ns    |
| t <sub>HDATA_PFU</sub>                      | Data Hold Time                                               | 0.28  | —    | 0.34  | —    | 0.39  | —    | ns    |
| t <sub>SUADDR_PFU</sub>                     | Address Setup Time                                           | -0.46 | —    | -0.56 | —    | -0.65 | —    | ns    |
| t <sub>HADDR_PFU</sub>                      | Address Hold Time                                            | 0.71  | —    | 0.85  | —    | 0.99  | —    | ns    |
| t <sub>SUWREN_PFU</sub>                     | Write/Read Enable Setup Time                                 | -0.22 | —    | -0.26 | —    | -0.30 | —    | ns    |
| t <sub>HWREN_PFU</sub>                      | Write/Read Enable Hold Time                                  | 0.33  | —    | 0.40  | —    | 0.47  | —    | ns    |
| PIO Input/Output Buffer Timing              |                                                              |       |      |       |      |       |      |       |
| t <sub>IN_PIO</sub>                         | Input Buffer Delay                                           | —     | 0.75 | —     | 0.90 | —     | 1.06 | ns    |
| t <sub>OUT_PIO</sub>                        | Output Buffer Delay                                          | —     | 1.29 | —     | 1.54 | —     | 1.80 | ns    |
| EBR Timing (1200 and 2280 Devices Only)     |                                                              |       |      |       |      |       |      |       |
| t <sub>CO_EBR</sub>                         | Clock to output from Address or Data with no output register | —     | 2.24 | —     | 2.69 | —     | 3.14 | ns    |
| t <sub>COO_EBR</sub>                        | Clock to output from EBR output Register                     | —     | 0.54 | —     | 0.64 | —     | 0.75 | ns    |
| t <sub>SUDATA_EBR</sub>                     | Setup Data to EBR Memory                                     | -0.26 | —    | -0.31 | —    | -0.37 | —    | ns    |
| t <sub>HDATA_EBR</sub>                      | Hold Data to EBR Memory                                      | 0.41  | —    | 0.49  | —    | 0.57  | —    | ns    |
| t <sub>SUADDR_EBR</sub>                     | Setup Address to EBR Memory                                  | -0.26 | —    | -0.31 | —    | -0.37 | —    | ns    |
| t <sub>HADDR_EBR</sub>                      | Hold Address to EBR Memory                                   | 0.41  | —    | 0.49  | —    | 0.57  | —    | ns    |
| t <sub>SUWREN_EBR</sub>                     | Setup Write/Read Enable to EBR Memory                        | -0.17 | —    | -0.20 | —    | -0.23 | —    | ns    |
| t <sub>HWREN_EBR</sub>                      | Hold Write/Read Enable to EBR Memory                         | 0.26  | —    | 0.31  | —    | 0.36  | —    | ns    |
| t <sub>SUCE_EBR</sub>                       | Clock Enable Setup Time to EBR Output Register               | 0.19  | —    | 0.23  | —    | 0.27  | —    | ns    |
| t <sub>HCE_EBR</sub>                        | Clock Enable Hold Time to EBR Output Register                | -0.13 | —    | -0.16 | —    | -0.18 | —    | ns    |
| t <sub>RSTO_EBR</sub>                       | Reset To Output Delay Time from EBR Output Register          | —     | 1.03 | —     | 1.23 | —     | 1.44 | ns    |
| PLL Parameters (1200 and 2280 Devices Only) |                                                              |       |      |       |      |       |      |       |
| t <sub>RSTREC</sub>                         | Reset Recovery to Rising Clock                               | 1.00  | —    | 1.00  | —    | 1.00  | —    | ns    |
| t <sub>RSTSU</sub>                          | Reset Signal Setup Time                                      | 1.00  | —    | 1.00  | —    | 1.00  | —    | ns    |

1. Internal parameters are characterized but not tested on every device.

Rev. A 0.19

**LCMX01200 and LCMX02280 Logic Signal Connections: 100 TQFP (Cont.)**

| Pin Number | LCMX01200        |      |               |              | LCMX02280        |      |               |              |
|------------|------------------|------|---------------|--------------|------------------|------|---------------|--------------|
|            | Ball Function    | Bank | Dual Function | Differential | Ball Function    | Bank | Dual Function | Differential |
| 82         | PT9A             | 1    |               |              | PT12C            | 1    |               | T            |
| 83         | GND              | -    |               |              | GND              | -    |               |              |
| 84         | PT8B             | 1    |               | C            | PT11B            | 1    |               | C            |
| 85         | PT8A             | 1    |               | T            | PT11A            | 1    |               | T            |
| 86         | PT7D             | 1    | PCLK1_1****   |              | PT10B            | 1    | PCLK1_1****   |              |
| 87         | PT6F             | 0    | PCLK0_0****   |              | PT9B             | 1    | PCLK1_0****   |              |
| 88         | PT6D             | 0    |               | C            | PT8F             | 0    |               | C            |
| 89         | PT6C             | 0    |               | T            | PT8E             | 0    |               | T            |
| 90         | VCCAUX           | -    |               |              | VCCAUX           | -    |               |              |
| 91         | VCC              | -    |               |              | VCC              | -    |               |              |
| 92         | PT5B             | 0    |               |              | PT6D             | 0    |               |              |
| 93         | PT4B             | 0    |               |              | PT6F             | 0    |               |              |
| 94         | VCCIO0           | 0    |               |              | VCCIO0           | 0    |               |              |
| 95         | PT3D             | 0    |               | C            | PT4B             | 0    |               | C            |
| 96         | PT3C             | 0    |               | T            | PT4A             | 0    |               | T            |
| 97         | PT3B             | 0    |               |              | PT3B             | 0    |               |              |
| 98         | PT2B             | 0    |               | C            | PT2B             | 0    |               | C            |
| 99         | PT2A             | 0    |               | T            | PT2A             | 0    |               | T            |
| 100**      | GNDIO0<br>GNDIO7 | -    |               |              | GNDIO0<br>GNDIO7 | -    |               |              |

\*Supports true LVDS outputs.

\*\*Double bonded to the pin.

\*\*\*NC for "E" devices.

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

**LCMX0256 and LCMX0640 Logic Signal Connections: 100 csBGA (Cont.)**

| LCMX0256    |               |      |               |              | LCMX0640    |               |      |               |              |
|-------------|---------------|------|---------------|--------------|-------------|---------------|------|---------------|--------------|
| Ball Number | Ball Function | Bank | Dual Function | Differential | Ball Number | Ball Function | Bank | Dual Function | Differential |
| P13         | PB5A          | 1    |               |              | P13         | PB9C          | 2    |               | T            |
| M12*        | SLEEPN        | -    | SLEEPN        |              | M12*        | SLEEPN        | -    | SLEEPN        |              |
| P14         | PB5C          | 1    |               | T            | P14         | PB9D          | 2    |               | C            |
| N13         | PB5D          | 1    |               | C            | N13         | PB9F          | 2    |               |              |
| N14         | PR9B          | 0    |               | C            | N14         | PR11D         | 1    |               | C            |
| M14         | PR9A          | 0    |               | T            | M14         | PR11B         | 1    |               | C            |
| L13         | PR8B          | 0    |               | C            | L13         | PR11C         | 1    |               | T            |
| L14         | PR8A          | 0    |               | T            | L14         | PR11A         | 1    |               | T            |
| M13         | PR7D          | 0    |               | C            | M13         | PR10D         | 1    |               | C            |
| K14         | PR7C          | 0    |               | T            | K14         | PR10C         | 1    |               | T            |
| K13         | PR7B          | 0    |               | C            | K13         | PR10B         | 1    |               | C            |
| J14         | PR7A          | 0    |               | T            | J14         | PR10A         | 1    |               | T            |
| J13         | PR6B          | 0    |               | C            | J13         | PR9D          | 1    |               |              |
| H13         | PR6A          | 0    |               | T            | H13         | PR9B          | 1    |               |              |
| G14         | GNDIO0        | 0    |               |              | G14         | GNDIO1        | 1    |               |              |
| G13         | PR5D          | 0    |               | C            | G13         | PR7B          | 1    |               |              |
| F14         | PR5C          | 0    |               | T            | F14         | PR6C          | 1    |               |              |
| F13         | PR5B          | 0    |               | C            | F13         | PR6B          | 1    |               |              |
| E14         | PR5A          | 0    |               | T            | E14         | PR5D          | 1    |               |              |
| E13         | PR4B          | 0    |               | C            | E13         | PR5B          | 1    |               |              |
| D14         | PR4A          | 0    |               | T            | D14         | PR4D          | 1    |               |              |
| D13         | PR3D          | 0    |               | C            | D13         | PR4B          | 1    |               |              |
| C14         | PR3C          | 0    |               | T            | C14         | PR3D          | 1    |               |              |
| C13         | PR3B          | 0    |               | C            | C13         | PR3B          | 1    |               |              |
| B14         | PR3A          | 0    |               | T            | B14         | PR2D          | 1    |               |              |
| C12         | PR2B          | 0    |               | C            | C12         | PR2B          | 1    |               |              |
| B13         | GNDIO0        | 0    |               |              | B13         | GNDIO1        | 1    |               |              |
| A13         | PR2A          | 0    |               | T            | A13         | PT9F          | 0    |               | C            |
| A12         | PT5C          | 0    |               |              | A12         | PT9E          | 0    |               | T            |
| B11         | PT5B          | 0    |               | C            | B11         | PT9C          | 0    |               |              |
| A11         | PT5A          | 0    |               | T            | A11         | PT9A          | 0    |               |              |
| B12         | PT4F          | 0    |               | C            | B12         | VCCIO0        | 0    |               |              |
| A10         | PT4E          | 0    |               | T            | A10         | GNDIO0        | 0    |               |              |
| B10         | PT4D          | 0    |               | C            | B10         | PT7E          | 0    |               |              |
| A9          | PT4C          | 0    |               | T            | A9          | PT7A          | 0    |               |              |
| A8          | PT4B          | 0    | PCLK0_1**     | C            | A8          | PT6B          | 0    | PCLK0_1**     |              |
| B8          | PT4A          | 0    | PCLK0_0**     | T            | B8          | PT5B          | 0    | PCLK0_0**     | C            |
| A7          | PT3D          | 0    |               | C            | A7          | PT5A          | 0    |               | T            |
| B7          | VCCAUX        | -    |               |              | B7          | VCCAUX        | -    |               |              |
| A6          | PT3C          | 0    |               | T            | A6          | PT4F          | 0    |               |              |
| B6          | VCC           | -    |               |              | B6          | VCC           | -    |               |              |
| A5          | PT3B          | 0    |               | C            | A5          | PT3F          | 0    |               |              |

## LCMX0640, LCMX01200 and LCMX02280 Logic Signal Connections: 132 csBGA (Cont.)

| LCMX0640 |               |      |               |              | LCMX01200 |               |      |               |              | LCMX02280 |               |      |               |              |
|----------|---------------|------|---------------|--------------|-----------|---------------|------|---------------|--------------|-----------|---------------|------|---------------|--------------|
| Ball #   | Ball Function | Bank | Dual Function | Differential | Ball #    | Ball Function | Bank | Dual Function | Differential | Ball #    | Ball Function | Bank | Dual Function | Differential |
| M9       | PB7B          | 2    |               | C            | M9        | PB9B          | 4    |               | C            | M9        | PB12B         | 4    |               | C            |
| N10      | PB7E          | 2    |               | T            | N10       | PB9C          | 4    |               | T            | N10       | PB12C         | 4    |               | T            |
| P10      | PB7F          | 2    |               | C            | P10       | PB9D          | 4    |               | C            | P10       | PB12D         | 4    |               | C            |
| N11      | GNDIO2        | 2    |               |              | N11       | GNDIO4        | 4    |               |              | N11       | GNDIO4        | 4    |               |              |
| P11      | PB8C          | 2    |               | T            | P11       | PB10A         | 4    |               | T            | P11       | PB13C         | 4    |               | T            |
| M11      | PB8D          | 2    |               | C            | M11       | PB10B         | 4    |               | C            | M11       | PB13D         | 4    |               | C            |
| P12      | PB9C          | 2    |               | T            | P12       | PB10C         | 4    |               |              | P12       | PB15B         | 4    |               |              |
| P13      | PB9D          | 2    |               | C            | P13       | PB11C         | 4    |               | T            | P13       | PB16C         | 4    |               | T            |
| N12**    | SLEEPN        | -    | SLEEPN        |              | N12**     | SLEEPN        | -    | SLEEPN        |              | N12**     | SLEEPN        | -    | SLEEPN        |              |
| P14      | PB9F          | 2    |               |              | P14       | PB11D         | 4    |               | C            | P14       | PB16D         | 4    |               | C            |
| N14      | PR11D         | 1    |               | C            | N14       | PR16B         | 3    |               | C            | N14       | PR19B         | 3    |               | C            |
| M14      | PR11C         | 1    |               | T            | M14       | PR15B         | 3    |               | C*           | M14       | PR18B         | 3    |               | C*           |
| N13      | PR11B         | 1    |               | C            | N13       | PR16A         | 3    |               | T            | N13       | PR19A         | 3    |               | T            |
| M12      | PR11A         | 1    |               | T            | M12       | PR15A         | 3    |               | T*           | M12       | PR18A         | 3    |               | T*           |
| M13      | PR10B         | 1    |               | C            | M13       | PR14B         | 3    |               | C*           | M13       | PR17B         | 3    |               | C*           |
| L14      | PR10A         | 1    |               | T            | L14       | PR14A         | 3    |               | T*           | L14       | PR17A         | 3    |               | T*           |
| L13      | GNDIO1        | 1    |               |              | L13       | GNDIO3        | 3    |               |              | L13       | GNDIO3        | 3    |               |              |
| K14      | PR8D          | 1    |               | C            | K14       | PR12B         | 3    |               | C*           | K14       | PR15B         | 3    |               | C*           |
| K13      | PR8C          | 1    |               | T            | K13       | PR12A         | 3    |               | T*           | K13       | PR15A         | 3    |               | T*           |
| K12      | PR8B          | 1    |               | C            | K12       | PR11B         | 3    |               | C*           | K12       | PR14B         | 3    |               | C*           |
| J13      | PR8A          | 1    |               | T            | J13       | PR11A         | 3    |               | T*           | J13       | PR14A         | 3    |               | T*           |
| J12      | PR7C          | 1    |               |              | J12       | PR10B         | 3    |               | C*           | J12       | PR13B         | 3    |               | C*           |
| H14      | PR7B          | 1    |               | C            | H14       | PR10A         | 3    |               | T*           | H14       | PR13A         | 3    |               | T*           |
| H13      | PR7A          | 1    |               | T            | H13       | PR9B          | 3    |               | C*           | H13       | PR11B         | 3    |               | C*           |
| H12      | PR6D          | 1    |               | C            | H12       | PR9A          | 3    |               | T*           | H12       | PR11A         | 3    |               | T*           |
| G13      | PR6C          | 1    |               | T            | G13       | PR8B          | 2    |               | C*           | G13       | PR10B         | 2    |               | C*           |
| G14      | PR6B          | 1    |               |              | G14       | PR8A          | 2    |               | T*           | G14       | PR10A         | 2    |               | T*           |
| G12      | VCC           | -    |               |              | G12       | VCC           | -    |               |              | G12       | VCC           | -    |               |              |
| F14      | PR5D          | 1    |               | C            | F14       | PR6C          | 2    |               |              | F14       | PR8C          | 2    |               |              |
| F13      | PR5C          | 1    |               | T            | F13       | PR6B          | 2    |               | C*           | F13       | PR8B          | 2    |               | C*           |
| F12      | PR4D          | 1    |               | C            | F12       | PR6A          | 2    |               | T*           | F12       | PR8A          | 2    |               | T*           |
| E13      | PR4C          | 1    |               | T            | E13       | PR5B          | 2    |               | C*           | E13       | PR7B          | 2    |               | C*           |
| E14      | PR4B          | 1    |               |              | E14       | PR5A          | 2    |               | T*           | E14       | PR7A          | 2    |               | T*           |
| D13      | GNDIO1        | 1    |               |              | D13       | GNDIO2        | 2    |               |              | D13       | GNDIO2        | 2    |               |              |
| D14      | PR3D          | 1    |               | C            | D14       | PR4B          | 2    |               | C*           | D14       | PR5B          | 2    |               | C*           |
| D12      | PR3C          | 1    |               | T            | D12       | PR4A          | 2    |               | T*           | D12       | PR5A          | 2    |               | T*           |
| C14      | PR2D          | 1    |               | C            | C14       | PR3D          | 2    |               | C            | C14       | PR4D          | 2    |               | C            |
| B14      | PR2C          | 1    |               | T            | B14       | PR2B          | 2    |               | C            | B14       | PR3B          | 2    |               | C*           |
| C13      | PR2B          | 1    |               | C            | C13       | PR3C          | 2    |               | T            | C13       | PR4C          | 2    |               | T            |
| A14      | PR2A          | 1    |               | T            | A14       | PR2A          | 2    |               | T            | A14       | PR3A          | 2    |               | T*           |
| A13      | PT9F          | 0    |               | C            | A13       | PT11D         | 1    |               | C            | A13       | PT16D         | 1    |               | C            |
| A12      | PT9E          | 0    |               | T            | A12       | PT11B         | 1    |               | C            | A12       | PT16B         | 1    |               | C            |
| B13      | PT9D          | 0    |               | C            | B13       | PT11C         | 1    |               | T            | B13       | PT16C         | 1    |               | T            |
| B12      | PT9C          | 0    |               | T            | B12       | PT10F         | 1    |               |              | B12       | PT15D         | 1    |               |              |
| C12      | PT9B          | 0    |               | C            | C12       | PT11A         | 1    |               | T            | C12       | PT16A         | 1    |               | T            |
| A11      | PT9A          | 0    |               | T            | A11       | PT10D         | 1    |               | C            | A11       | PT14B         | 1    |               | C            |
| C11      | PT8C          | 0    |               |              | C11       | PT10C         | 1    |               | T            | C11       | PT14A         | 1    |               | T            |
| A10      | GNDIO0        | 0    |               |              | A10       | GNDIO1        | 1    |               |              | A10       | GNDIO1        | 1    |               |              |
| B10      | PT7F          | 0    |               | C            | B10       | PT9F          | 1    |               | C            | B10       | PT12F         | 1    |               | C            |
| C10      | PT7E          | 0    |               | T            | C10       | PT9E          | 1    |               | T            | C10       | PT12E         | 1    |               | T            |

## 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

| Pin Number | LCMXO640      |      |               |              | LCMXO1200     |      |                |              | LCMXO2280     |      |                |              |
|------------|---------------|------|---------------|--------------|---------------|------|----------------|--------------|---------------|------|----------------|--------------|
|            | Ball Function | Bank | Dual Function | Differential | Ball Function | Bank | Dual Function  | Differential | Ball Function | Bank | Dual Function  | Differential |
| 1          | PL2A          | 3    |               | T            | PL2A          | 7    |                | T            | PL2A          | 7    | LUM0_PLLT_FB_A | T            |
| 2          | PL2C          | 3    |               | T            | PL2B          | 7    |                | C            | PL2B          | 7    | LUM0_PLLC_FB_A | C            |
| 3          | PL2B          | 3    |               | C            | PL3A          | 7    |                | T*           | PL3A          | 7    |                | T*           |
| 4          | PL3A          | 3    |               | T            | PL3B          | 7    |                | C*           | PL3B          | 7    |                | C*           |
| 5          | PL2D          | 3    |               | C            | PL3C          | 7    |                | T            | PL3C          | 7    | LUM0_PLLT_IN_A | T            |
| 6          | PL3B          | 3    |               | C            | PL3D          | 7    |                | C            | PL3D          | 7    | LUM0_PLLC_IN_A | C            |
| 7          | PL3C          | 3    |               | T            | PL4A          | 7    |                | T*           | PL4A          | 7    |                | T*           |
| 8          | PL3D          | 3    |               | C            | PL4B          | 7    |                | C*           | PL4B          | 7    |                | C*           |
| 9          | PL4A          | 3    |               |              | PL4C          | 7    |                |              | PL4C          | 7    |                |              |
| 10         | VCCIO3        | 3    |               |              | VCCIO7        | 7    |                |              | VCCIO7        | 7    |                |              |
| 11         | GNDIO3        | 3    |               |              | GNDIO7        | 7    |                |              | GNDIO7        | 7    |                |              |
| 12         | PL4D          | 3    |               |              | PL5C          | 7    |                |              | PL6C          | 7    |                |              |
| 13         | PL5A          | 3    |               | T            | PL6A          | 7    |                | T*           | PL7A          | 7    |                | T*           |
| 14         | PL5B          | 3    | GSRN          | C            | PL6B          | 7    | GSRN           | C*           | PL7B          | 7    | GSRN           | C*           |
| 15         | PL5D          | 3    |               |              | PL6D          | 7    |                |              | PL7D          | 7    |                |              |
| 16         | GND           | -    |               |              | GND           | -    |                |              | GND           | -    |                |              |
| 17         | PL6C          | 3    |               | T            | PL7C          | 7    |                | T            | PL9C          | 7    |                | T            |
| 18         | PL6D          | 3    |               | C            | PL7D          | 7    |                | C            | PL9D          | 7    |                | C            |
| 19         | PL7A          | 3    |               | T            | PL10A         | 6    |                | T*           | PL13A         | 6    |                | T*           |
| 20         | PL7B          | 3    |               | C            | PL10B         | 6    |                | C*           | PL13B         | 6    |                | C*           |
| 21         | VCC           | -    |               |              | VCC           | -    |                |              | VCC           | -    |                |              |
| 22         | PL8A          | 3    |               | T            | PL11A         | 6    |                | T*           | PL13D         | 6    |                |              |
| 23         | PL8B          | 3    |               | C            | PL11B         | 6    |                | C*           | PL14D         | 6    |                | C            |
| 24         | PL8C          | 3    | TSALL         |              | PL11C         | 6    | TSALL          |              | PL14C         | 6    | TSALL          | T            |
| 25         | PL9C          | 3    |               | T            | PL12B         | 6    |                |              | PL15B         | 6    |                |              |
| 26         | VCCIO3        | 3    |               |              | VCCIO6        | 6    |                |              | VCCIO6        | 6    |                |              |
| 27         | GNDIO3        | 3    |               |              | GNDIO6        | 6    |                |              | GNDIO6        | 6    |                |              |
| 28         | PL9D          | 3    |               | C            | PL13D         | 6    |                |              | PL16D         | 6    |                |              |
| 29         | PL10A         | 3    |               | T            | PL14A         | 6    | LLM0_PLLT_FB_A | T*           | PL17A         | 6    | LLM0_PLLT_FB_A | T*           |
| 30         | PL10B         | 3    |               | C            | PL14B         | 6    | LLM0_PLLC_FB_A | C*           | PL17B         | 6    | LLM0_PLLC_FB_A | C*           |
| 31         | PL10C         | 3    |               | T            | PL14C         | 6    |                | T            | PL17C         | 6    |                | T            |
| 32         | PL11A         | 3    |               | T            | PL14D         | 6    |                | C            | PL17D         | 6    |                | C            |
| 33         | PL10D         | 3    |               | C            | PL15A         | 6    | LLM0_PLLT_IN_A | T*           | PL18A         | 6    | LLM0_PLLT_IN_A | T*           |
| 34         | PL11C         | 3    |               | T            | PL15B         | 6    | LLM0_PLLC_IN_A | C*           | PL18B         | 6    | LLM0_PLLC_IN_A | C*           |
| 35         | PL11B         | 3    |               | C            | PL16A         | 6    |                | T            | PL19A         | 6    |                | T            |
| 36         | PL11D         | 3    |               | C            | PL16B         | 6    |                | C            | PL19B         | 6    |                | C            |
| 37         | GNDIO2        | 2    |               |              | GNDIO5        | 5    |                |              | GNDIO5        | 5    |                |              |
| 38         | VCCIO2        | 2    |               |              | VCCIO5        | 5    |                |              | VCCIO5        | 5    |                |              |
| 39         | TMS           | 2    | TMS           |              | TMS           | 5    | TMS            |              | TMS           | 5    | TMS            |              |
| 40         | PB2C          | 2    |               |              | PB2C          | 5    |                | T            | PB2A          | 5    |                | T            |
| 41         | PB3A          | 2    |               | T            | PB2D          | 5    |                | C            | PB2B          | 5    |                | C            |
| 42         | TCK           | 2    | TCK           |              | TCK           | 5    | TCK            |              | TCK           | 5    | TCK            |              |
| 43         | PB3B          | 2    |               | C            | PB3A          | 5    |                | T            | PB3A          | 5    |                | T            |
| 44         | PB3C          | 2    |               | T            | PB3B          | 5    |                | C            | PB3B          | 5    |                | C            |
| 45         | PB3D          | 2    |               | C            | PB4A          | 5    |                | T            | PB4A          | 5    |                | T            |
| 46         | PB4A          | 2    |               | T            | PB4B          | 5    |                | C            | PB4B          | 5    |                | C            |
| 47         | TDO           | 2    | TDO           |              | TDO           | 5    | TDO            |              | TDO           | 5    | TDO            |              |
| 48         | PB4B          | 2    |               | C            | PB4D          | 5    |                |              | PB4D          | 5    |                |              |
| 49         | PB4C          | 2    |               | T            | PB5A          | 5    |                | T            | PB5A          | 5    |                | T            |
| 50         | PB4D          | 2    |               | C            | PB5B          | 5    |                | C            | PB5B          | 5    |                | 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 |
| E11         | NC            |      |               |              | E11         | PT10D         | 1    |               | C            | E11         | PT15B         | 1    |               | C            |
| E10         | NC            |      |               |              | E10         | PT10C         | 1    |               | T            | E10         | PT15A         | 1    |               | T            |
| D12         | PT9D          | 0    |               | C            | D12         | PT10B         | 1    |               | C            | D12         | PT14D         | 1    |               | C            |
| D11         | PT9C          | 0    |               | T            | D11         | PT10A         | 1    |               | T            | D11         | PT14C         | 1    |               | T            |
| A14         | PT7F          | 0    |               | C            | A14         | PT9F          | 1    |               | C            | A14         | PT14B         | 1    |               | C            |
| A13         | PT7E          | 0    |               | T            | A13         | PT9E          | 1    |               | T            | A13         | PT14A         | 1    |               | T            |
| C12         | PT8B          | 0    |               | C            | C12         | PT9D          | 1    |               | C            | C12         | PT13D         | 1    |               | C            |
| C11         | PT8A          | 0    |               | T            | C11         | PT9C          | 1    |               | T            | C11         | PT13C         | 1    |               | T            |
| -           | -             |      |               |              | VCCIO1      | VCCIO1        | 1    |               |              | VCCIO1      | VCCIO1        | 1    |               |              |
| -           | -             |      |               |              | GND         | GNDIO1        | 1    |               |              | GND         | GNDIO1        | 1    |               |              |
| B12         | PT7B          | 0    |               | C            | B12         | PT9B          | 1    |               | C            | B12         | PT12D         | 1    |               | C            |
| B11         | PT7A          | 0    |               | T            | B11         | PT9A          | 1    |               | T            | B11         | PT12C         | 1    |               | T            |
| A12         | PT7D          | 0    |               | C            | A12         | PT8F          | 1    |               | C            | A12         | PT12B         | 1    |               | C            |
| A11         | PT7C          | 0    |               | T            | A11         | PT8E          | 1    |               | T            | A11         | PT12A         | 1    |               | T            |
| GND         | GND           | -    |               |              | GND         | GND           | -    |               |              | GND         | GND           | -    |               |              |
| B10         | PT5D          | 0    |               | C            | B10         | PT8D          | 1    |               | C            | B10         | PT11B         | 1    |               | C            |
| B9          | PT5C          | 0    |               | T            | B9          | PT8C          | 1    |               | T            | B9          | PT11A         | 1    |               | T            |
| D10         | PT8D          | 0    |               | C            | D10         | PT8B          | 1    |               | C            | D10         | PT10F         | 1    |               | C            |
| D9          | PT8C          | 0    |               | T            | D9          | PT8A          | 1    |               | T            | D9          | PT10E         | 1    |               | T            |
| -           | -             |      |               |              | VCCIO1      | VCCIO1        | 1    |               |              | VCCIO1      | VCCIO1        | 1    |               |              |
| -           | -             |      |               |              | GND         | GNDIO1        | 1    |               |              | GND         | GNDIO1        | 1    |               |              |
| C10         | PT6D          | 0    |               | C            | C10         | PT7F          | 1    |               | C            | C10         | PT10D         | 1    |               | C            |
| C9          | PT6C          | 0    |               | T            | C9          | PT7E          | 1    |               | T            | C9          | PT10C         | 1    |               | T            |
| A9          | PT6B          | 0    | PCLK0_1***    | C            | A9          | PT7D          | 1    | PCLK1_1***    | C            | A9          | PT10B         | 1    | PCLK1_1***    | C            |
| A10         | PT6A          | 0    |               | T            | A10         | PT7C          | 1    |               | T            | A10         | PT10A         | 1    |               | T            |
| E9          | PT9B          | 0    |               | C            | E9          | PT7B          | 1    |               | C            | E9          | PT9D          | 1    |               | C            |
| E8          | PT9A          | 0    |               | T            | E8          | PT7A          | 1    |               | T            | E8          | PT9C          | 1    |               | T            |
| D7          | PT5B          | 0    | PCLK0_0***    | C            | D7          | PT6F          | 0    | PCLK1_0***    | C            | D7          | PT9B          | 1    | PCLK1_0***    | C            |
| D8          | PT5A          | 0    |               | T            | D8          | PT6E          | 0    |               | T            | D8          | PT9A          | 1    |               | T            |
| VCCIO0      | VCCIO0        | 0    |               |              | VCCIO0      | VCCIO0        | 0    |               |              | VCCIO0      | VCCIO0        | 0    |               |              |
| GND         | GNDIO0        | 0    |               |              | GND         | GNDIO0        | 0    |               |              | GND         | GNDIO0        | 0    |               |              |
| C8          | PT4F          | 0    |               | C            | C8          | PT6D          | 0    |               | C            | C8          | PT8D          | 0    |               | C            |
| B8          | PT4E          | 0    |               | T            | B8          | PT6C          | 0    |               | T            | B8          | PT8C          | 0    |               | T            |
| A8          | VCCAUX        | -    |               |              | A8          | VCCAUX        | -    |               |              | A8          | VCCAUX        | -    |               |              |
| A7          | PT4D          | 0    |               | C            | A7          | PT6B          | 0    |               | C            | A7          | PT7D          | 0    |               | C            |
| A6          | PT4C          | 0    |               | T            | A6          | PT6A          | 0    |               | T            | A6          | PT7C          | 0    |               | T            |
| VCC         | VCC           | -    |               |              | VCC         | VCC           | -    |               |              | VCC         | VCC           | -    |               |              |
| B7          | PT4B          | 0    |               | C            | B7          | PT5F          | 0    |               | C            | B7          | PT7B          | 0    |               | C            |
| B6          | PT4A          | 0    |               | T            | B6          | PT5E          | 0    |               | T            | B6          | PT7A          | 0    |               | T            |
| C6          | PT3C          | 0    |               | T            | C6          | PT5C          | 0    |               | T            | C6          | PT6A          | 0    |               | T            |
| C7          | PT3D          | 0    |               | C            | C7          | PT5D          | 0    |               | C            | C7          | PT6B          | 0    |               | C            |
| A5          | PT3E          | 0    |               | T            | A5          | PT5A          | 0    |               | T            | A5          | PT6C          | 0    |               | T            |
| A4          | PT3F          | 0    |               | C            | A4          | PT5B          | 0    |               | C            | A4          | PT6D          | 0    |               | C            |
| E7          | NC            |      |               |              | E7          | PT4C          | 0    |               | T            | E7          | PT6E          | 0    |               | T            |
| E6          | NC            |      |               |              | E6          | PT4D          | 0    |               | C            | E6          | PT6F          | 0    |               | C            |
| B5          | PT3B          | 0    |               | C            | B5          | PT3F          | 0    |               | C            | B5          | PT5D          | 0    |               | C            |
| B4          | PT3A          | 0    |               | T            | B4          | PT3E          | 0    |               | T            | B4          | PT5C          | 0    |               | T            |
| D5          | PT2D          | 0    |               | C            | D5          | PT3D          | 0    |               | C            | D5          | PT5B          | 0    |               | C            |
| D6          | PT2C          | 0    |               | T            | D6          | PT3C          | 0    |               | T            | D6          | PT5A          | 0    |               | T            |
| C4          | PT2E          | 0    |               | T            | C4          | PT4A          | 0    |               | T            | C4          | PT4A          | 0    |               | T            |
| C5          | PT2F          | 0    |               | C            | C5          | PT4B          | 0    |               | C            | C5          | PT4B          | 0    |               | C            |
| -           | -             | -    |               |              | -           | -             | -    |               |              | GND         | GND           | -    |               |              |
| D4          | NC            |      |               |              | D4          | PT2D          | 0    |               | C            | D4          | PT3D          | 0    |               | 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 |
| 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 |
| G2          | PL11A         | 6    |                | T*           |
| H2          | PL11B         | 6    |                | C*           |
| L3          | PL11C         | 6    |                | T            |
| L5          | PL11D         | 6    |                | C            |
| H1          | PL12A         | 6    |                | T*           |
| VCCIO6      | VCCIO6        | 6    |                |              |
| GND         | GNDIO6        | 6    |                |              |
| J2          | PL12B         | 6    |                | C*           |
| L4          | PL12C         | 6    |                | T            |
| L6          | PL12D         | 6    |                | C            |
| K2          | PL13A         | 6    |                | T*           |
| K1          | PL13B         | 6    |                | C*           |
| J1          | PL13C         | 6    |                | T            |
| VCC         | VCC           | -    |                |              |
| L2          | PL13D         | 6    |                | C            |
| M5          | PL14D         | 6    |                | C            |
| M3          | PL14C         | 6    | TSALL          | T            |
| L1          | PL14B         | 6    |                | C*           |
| M2          | PL14A         | 6    |                | T*           |
| M1          | PL15A         | 6    |                | T*           |
| N1          | PL15B         | 6    |                | C*           |
| M6          | PL15C         | 6    |                | T            |
| M4          | PL15D         | 6    |                | C            |
| VCCIO6      | VCCIO6        | 6    |                |              |
| GND         | GNDIO6        | 6    |                |              |
| P1          | PL16A         | 6    |                | T*           |
| P2          | PL16B         | 6    |                | C*           |
| N3          | PL16C         | 6    |                | T            |
| N4          | PL16D         | 6    |                | C            |
| GND         | GND           | -    |                |              |
| T1          | PL17A         | 6    | LLM0_PLLT_FB_A | T*           |
| R1          | PL17B         | 6    | LLM0_PLLC_FB_A | C*           |
| P3          | PL17C         | 6    |                | T            |
| N5          | PL17D         | 6    |                | C            |
| R3          | PL18A         | 6    | LLM0_PLLT_IN_A | T*           |
| R2          | PL18B         | 6    | LLM0_PLLC_IN_A | C*           |
| P4          | PL19A         | 6    |                | T            |
| N6          | PL19B         | 6    |                | C            |
| U1          | PL20A         | 6    |                | T            |
| VCCIO6      | VCCIO6        | 6    |                |              |
| GND         | GNDIO6        | 6    |                |              |
| GND         | GNDIO5        | 5    |                |              |
| VCCIO5      | VCCIO5        | 5    |                |              |

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

| LCMX02280   |               |      |               |              |
|-------------|---------------|------|---------------|--------------|
| Ball Number | Ball Function | Bank | Dual Function | Differential |
| T2          | PL20B         | 6    |               | C            |
| P6          | TMS           | 5    | TMS           |              |
| V1          | PB2A          | 5    |               | T            |
| U2          | PB2B          | 5    |               | C            |
| T3          | PB2C          | 5    |               | T            |
| N7          | TCK           | 5    | TCK           |              |
| R4          | PB2D          | 5    |               | C            |
| R5          | PB3A          | 5    |               | T            |
| T4          | PB3B          | 5    |               | C            |
| VCC         | VCC           | -    |               |              |
| R6          | PB3C          | 5    |               | T            |
| P7          | PB3D          | 5    |               | C            |
| U3          | PB4A          | 5    |               | T            |
| T5          | PB4B          | 5    |               | C            |
| V2          | PB4C          | 5    |               | T            |
| N8          | TDO           | 5    | TDO           |              |
| V3          | PB4D          | 5    |               | C            |
| T6          | PB5A          | 5    |               | T            |
| GND         | GNDIO5        | 5    |               |              |
| VCCIO5      | VCCIO5        | 5    |               |              |
| U4          | PB5B          | 5    |               | C            |
| P8          | PB5C          | 5    |               | T            |
| T7          | PB5D          | 5    |               | C            |
| V4          | TDI           | 5    | TDI           |              |
| R8          | PB6A          | 5    |               | T            |
| N9          | PB6B          | 5    |               | C            |
| U5          | PB6C          | 5    |               | T            |
| V5          | PB6D          | 5    |               | C            |
| U6          | PB7A          | 5    |               | T            |
| VCC         | VCC           | -    |               |              |
| V6          | PB7B          | 5    |               | C            |
| P9          | PB7C          | 5    |               | T            |
| T8          | PB7D          | 5    |               | C            |
| U7          | PB8A          | 5    |               | T            |
| V7          | PB8B          | 5    |               | C            |
| M10         | VCCAUX        | -    |               |              |
| U8          | PB8C          | 5    |               | T            |
| V8          | PB8D          | 5    |               | C            |
| VCCIO5      | VCCIO5        | 5    |               |              |
| GND         | GNDIO5        | 5    |               |              |
| T9          | PB8E          | 5    |               | T            |
| U9          | PB8F          | 5    |               | C            |
| V9          | PB9A          | 4    |               | T            |

**Conventional Packaging**
**Commercial**

| Part Number      | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO256C-3T100C | 256  | 1.8V/2.5V/3.3V | 78   | -3    | TQFP    | 100  | COM   |
| LCMXO256C-4T100C | 256  | 1.8V/2.5V/3.3V | 78   | -4    | TQFP    | 100  | COM   |
| LCMXO256C-5T100C | 256  | 1.8V/2.5V/3.3V | 78   | -5    | TQFP    | 100  | COM   |
| LCMXO256C-3M100C | 256  | 1.8V/2.5V/3.3V | 78   | -3    | csBGA   | 100  | COM   |
| LCMXO256C-4M100C | 256  | 1.8V/2.5V/3.3V | 78   | -4    | csBGA   | 100  | COM   |
| LCMXO256C-5M100C | 256  | 1.8V/2.5V/3.3V | 78   | -5    | csBGA   | 100  | COM   |

| Part Number       | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|-------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO640C-3T100C  | 640  | 1.8V/2.5V/3.3V | 74   | -3    | TQFP    | 100  | COM   |
| LCMXO640C-4T100C  | 640  | 1.8V/2.5V/3.3V | 74   | -4    | TQFP    | 100  | COM   |
| LCMXO640C-5T100C  | 640  | 1.8V/2.5V/3.3V | 74   | -5    | TQFP    | 100  | COM   |
| LCMXO640C-3M100C  | 640  | 1.8V/2.5V/3.3V | 74   | -3    | csBGA   | 100  | COM   |
| LCMXO640C-4M100C  | 640  | 1.8V/2.5V/3.3V | 74   | -4    | csBGA   | 100  | COM   |
| LCMXO640C-5M100C  | 640  | 1.8V/2.5V/3.3V | 74   | -5    | csBGA   | 100  | COM   |
| LCMXO640C-3T144C  | 640  | 1.8V/2.5V/3.3V | 113  | -3    | TQFP    | 144  | COM   |
| LCMXO640C-4T144C  | 640  | 1.8V/2.5V/3.3V | 113  | -4    | TQFP    | 144  | COM   |
| LCMXO640C-5T144C  | 640  | 1.8V/2.5V/3.3V | 113  | -5    | TQFP    | 144  | COM   |
| LCMXO640C-3M132C  | 640  | 1.8V/2.5V/3.3V | 101  | -3    | csBGA   | 132  | COM   |
| LCMXO640C-4M132C  | 640  | 1.8V/2.5V/3.3V | 101  | -4    | csBGA   | 132  | COM   |
| LCMXO640C-5M132C  | 640  | 1.8V/2.5V/3.3V | 101  | -5    | csBGA   | 132  | COM   |
| LCMXO640C-3B256C  | 640  | 1.8V/2.5V/3.3V | 159  | -3    | caBGA   | 256  | COM   |
| LCMXO640C-4B256C  | 640  | 1.8V/2.5V/3.3V | 159  | -4    | caBGA   | 256  | COM   |
| LCMXO640C-5B256C  | 640  | 1.8V/2.5V/3.3V | 159  | -5    | caBGA   | 256  | COM   |
| LCMXO640C-3FT256C | 640  | 1.8V/2.5V/3.3V | 159  | -3    | ftBGA   | 256  | COM   |
| LCMXO640C-4FT256C | 640  | 1.8V/2.5V/3.3V | 159  | -4    | ftBGA   | 256  | COM   |
| LCMXO640C-5FT256C | 640  | 1.8V/2.5V/3.3V | 159  | -5    | ftBGA   | 256  | COM   |

| Part Number        | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|--------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO1200C-3T100C  | 1200 | 1.8V/2.5V/3.3V | 73   | -3    | TQFP    | 100  | COM   |
| LCMXO1200C-4T100C  | 1200 | 1.8V/2.5V/3.3V | 73   | -4    | TQFP    | 100  | COM   |
| LCMXO1200C-5T100C  | 1200 | 1.8V/2.5V/3.3V | 73   | -5    | TQFP    | 100  | COM   |
| LCMXO1200C-3T144C  | 1200 | 1.8V/2.5V/3.3V | 113  | -3    | TQFP    | 144  | COM   |
| LCMXO1200C-4T144C  | 1200 | 1.8V/2.5V/3.3V | 113  | -4    | TQFP    | 144  | COM   |
| LCMXO1200C-5T144C  | 1200 | 1.8V/2.5V/3.3V | 113  | -5    | TQFP    | 144  | COM   |
| LCMXO1200C-3M132C  | 1200 | 1.8V/2.5V/3.3V | 101  | -3    | csBGA   | 132  | COM   |
| LCMXO1200C-4M132C  | 1200 | 1.8V/2.5V/3.3V | 101  | -4    | csBGA   | 132  | COM   |
| LCMXO1200C-5M132C  | 1200 | 1.8V/2.5V/3.3V | 101  | -5    | csBGA   | 132  | COM   |
| LCMXO1200C-3B256C  | 1200 | 1.8V/2.5V/3.3V | 211  | -3    | caBGA   | 256  | COM   |
| LCMXO1200C-4B256C  | 1200 | 1.8V/2.5V/3.3V | 211  | -4    | caBGA   | 256  | COM   |
| LCMXO1200C-5B256C  | 1200 | 1.8V/2.5V/3.3V | 211  | -5    | caBGA   | 256  | COM   |
| LCMXO1200C-3FT256C | 1200 | 1.8V/2.5V/3.3V | 211  | -3    | ftBGA   | 256  | COM   |
| LCMXO1200C-4FT256C | 1200 | 1.8V/2.5V/3.3V | 211  | -4    | ftBGA   | 256  | COM   |
| LCMXO1200C-5FT256C | 1200 | 1.8V/2.5V/3.3V | 211  | -5    | ftBGA   | 256  | COM   |

| Part Number        | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|--------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO2280C-3T100C  | 2280 | 1.8V/2.5V/3.3V | 73   | -3    | TQFP    | 100  | COM   |
| LCMXO2280C-4T100C  | 2280 | 1.8V/2.5V/3.3V | 73   | -4    | TQFP    | 100  | COM   |
| LCMXO2280C-5T100C  | 2280 | 1.8V/2.5V/3.3V | 73   | -5    | TQFP    | 100  | COM   |
| LCMXO2280C-3T144C  | 2280 | 1.8V/2.5V/3.3V | 113  | -3    | TQFP    | 144  | COM   |
| LCMXO2280C-4T144C  | 2280 | 1.8V/2.5V/3.3V | 113  | -4    | TQFP    | 144  | COM   |
| LCMXO2280C-5T144C  | 2280 | 1.8V/2.5V/3.3V | 113  | -5    | TQFP    | 144  | COM   |
| LCMXO2280C-3M132C  | 2280 | 1.8V/2.5V/3.3V | 101  | -3    | csBGA   | 132  | COM   |
| LCMXO2280C-4M132C  | 2280 | 1.8V/2.5V/3.3V | 101  | -4    | csBGA   | 132  | COM   |
| LCMXO2280C-5M132C  | 2280 | 1.8V/2.5V/3.3V | 101  | -5    | csBGA   | 132  | COM   |
| LCMXO2280C-3B256C  | 2280 | 1.8V/2.5V/3.3V | 211  | -3    | caBGA   | 256  | COM   |
| LCMXO2280C-4B256C  | 2280 | 1.8V/2.5V/3.3V | 211  | -4    | caBGA   | 256  | COM   |
| LCMXO2280C-5B256C  | 2280 | 1.8V/2.5V/3.3V | 211  | -5    | caBGA   | 256  | COM   |
| LCMXO2280C-3FT256C | 2280 | 1.8V/2.5V/3.3V | 211  | -3    | ftBGA   | 256  | COM   |
| LCMXO2280C-4FT256C | 2280 | 1.8V/2.5V/3.3V | 211  | -4    | ftBGA   | 256  | COM   |
| LCMXO2280C-5FT256C | 2280 | 1.8V/2.5V/3.3V | 211  | -5    | ftBGA   | 256  | COM   |
| LCMXO2280C-3FT324C | 2280 | 1.8V/2.5V/3.3V | 271  | -3    | ftBGA   | 324  | COM   |
| LCMXO2280C-4FT324C | 2280 | 1.8V/2.5V/3.3V | 271  | -4    | ftBGA   | 324  | COM   |
| LCMXO2280C-5FT324C | 2280 | 1.8V/2.5V/3.3V | 271  | -5    | ftBGA   | 324  | COM   |

| Part Number      | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO256E-3T100C | 256  | 1.2V           | 78   | -3    | TQFP    | 100  | COM   |
| LCMXO256E-4T100C | 256  | 1.2V           | 78   | -4    | TQFP    | 100  | COM   |
| LCMXO256E-5T100C | 256  | 1.2V           | 78   | -5    | TQFP    | 100  | COM   |
| LCMXO256E-3M100C | 256  | 1.2V           | 78   | -3    | csBGA   | 100  | COM   |
| LCMXO256E-4M100C | 256  | 1.2V           | 78   | -4    | csBGA   | 100  | COM   |
| LCMXO256E-5M100C | 256  | 1.2V           | 78   | -5    | csBGA   | 100  | COM   |

| Part Number       | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|-------------------|------|----------------|------|-------|---------|------|-------|
| LCMXO640E-3T100C  | 640  | 1.2V           | 74   | -3    | TQFP    | 100  | COM   |
| LCMXO640E-4T100C  | 640  | 1.2V           | 74   | -4    | TQFP    | 100  | COM   |
| LCMXO640E-5T100C  | 640  | 1.2V           | 74   | -5    | TQFP    | 100  | COM   |
| LCMXO640E-3M100C  | 640  | 1.2V           | 74   | -3    | csBGA   | 100  | COM   |
| LCMXO640E-4M100C  | 640  | 1.2V           | 74   | -4    | csBGA   | 100  | COM   |
| LCMXO640E-5M100C  | 640  | 1.2V           | 74   | -5    | csBGA   | 100  | COM   |
| LCMXO640E-3T144C  | 640  | 1.2V           | 113  | -3    | TQFP    | 144  | COM   |
| LCMXO640E-4T144C  | 640  | 1.2V           | 113  | -4    | TQFP    | 144  | COM   |
| LCMXO640E-5T144C  | 640  | 1.2V           | 113  | -5    | TQFP    | 144  | COM   |
| LCMXO640E-3M132C  | 640  | 1.2V           | 101  | -3    | csBGA   | 132  | COM   |
| LCMXO640E-4M132C  | 640  | 1.2V           | 101  | -4    | csBGA   | 132  | COM   |
| LCMXO640E-5M132C  | 640  | 1.2V           | 101  | -5    | csBGA   | 132  | COM   |
| LCMXO640E-3B256C  | 640  | 1.2V           | 159  | -3    | caBGA   | 256  | COM   |
| LCMXO640E-4B256C  | 640  | 1.2V           | 159  | -4    | caBGA   | 256  | COM   |
| LCMXO640E-5B256C  | 640  | 1.2V           | 159  | -5    | caBGA   | 256  | COM   |
| LCMXO640E-3FT256C | 640  | 1.2V           | 159  | -3    | ftBGA   | 256  | COM   |
| LCMXO640E-4FT256C | 640  | 1.2V           | 159  | -4    | ftBGA   | 256  | COM   |
| LCMXO640E-5FT256C | 640  | 1.2V           | 159  | -5    | ftBGA   | 256  | COM   |

**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   |

### Revision History

| Date          | Version | Section                          | Change Summary                                                                                                         |
|---------------|---------|----------------------------------|------------------------------------------------------------------------------------------------------------------------|
| February 2005 | 01.0    | —                                | Initial release.                                                                                                       |
| October 2005  | 01.1    | Introduction                     | Distributed RAM information in family table updated. Added footnote 1 - fpBGA packaging to the family selection guide. |
|               |         | Architecture                     | sysIO Buffer section updated.                                                                                          |
|               |         |                                  | Hot Socketing section updated.                                                                                         |
|               |         |                                  | Sleep Mode section updated.                                                                                            |
|               |         |                                  | SLEEP Pin Characteristics section updated.                                                                             |
|               |         |                                  | Oscillator section updated.                                                                                            |
|               |         |                                  | Security section updated.                                                                                              |
|               |         | DC and Switching Characteristics | Recommended Operating Conditions table updated.                                                                        |
|               |         |                                  | DC Electrical Characteristics table updated.                                                                           |
|               |         |                                  | Supply Current (Sleep Mode) table added with LCMXO256/640 data.                                                        |
|               |         |                                  | Supply Current (Standby) table updated with LCMXO256/640 data.                                                         |
|               |         |                                  | Initialization Supply Current table updated with LCMXO256/640 data.                                                    |
|               |         |                                  | Programming and Erase Flash Supply Current table updated with LCMXO256/640 data.                                       |
|               |         |                                  | Register-to-Register Performance table updated (rev. A 0.16).                                                          |
|               |         |                                  | External Switching Characteristics table updated (rev. A 0.16).                                                        |
|               |         |                                  | Internal Timing Parameter table updated (rev. A 0.16).                                                                 |
|               |         |                                  | Family Timing Adders updated (rev. A 0.16).                                                                            |
|               |         |                                  | sysCLOCK Timing updated (rev. A 0.16).                                                                                 |
|               |         |                                  | MachXO "C" Sleep Mode Timing updated (A 0.16).                                                                         |
|               |         |                                  | JTAG Port Timing Specification updated (rev. A 0.16).                                                                  |
|               |         | Pinout Information               | SLEEPIN description updated.                                                                                           |
|               |         |                                  | Pin Information Summary updated.                                                                                       |
|               |         |                                  | Power Supply and NC Connection table has been updated.                                                                 |
|               |         |                                  | Logic Signal Connection section has been updated to include all devices/packages.                                      |
|               |         | Ordering Information             | Part Number Description section has been updated.                                                                      |
|               |         |                                  | Ordering Part Number section has been updated (added LCMXO256C/LCMXO640C "4W").                                        |
|               |         | Supplemental Information         | MachXO Density Migration Technical Note (TN1097) added.                                                                |
| November 2005 | 01.2    | Pinout Information               | Added "Power Supply and NC Connections" summary information for LCMXO1200 and LCMXO2280 in 100 TQFP package.           |
| December 2005 | 01.3    | DC and Switching Characteristics | Supply Current (Standby) table updated with LCMXO1200/2280 data.                                                       |
|               |         | Ordering Information             | Ordering Part Number section updated (added LCMXO2280C "4W").                                                          |
| April 2006    | 02.0    | Introduction                     | Introduction paragraphs updated.                                                                                       |
|               |         | Architecture                     | Architecture Overview paragraphs updated.                                                                              |

| 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.                                                                                                                   |