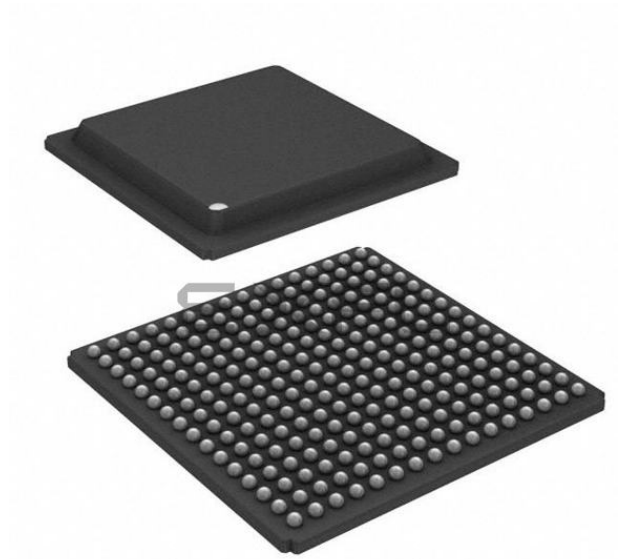
# Lattice Semiconductor Corporation - LCMXO640C-3FT256C Datasheet



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

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

## Applications of Embedded - FPGAs

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

| Details | |
|---|---|
| Product Status | Obsolete |
| Number of LABs/CLBs | 80 |
| Number of Logic Elements/Cells | 640 |
| Total RAM Bits | - |
| Number of I/O | 159 |
| Number of Gates | - |
| Voltage - Supply | 1.71V ~ 3.465V |
| Mounting Type | Surface Mount |
| Operating Temperature | 0°C ~ 85°C (TJ) |
| Package / Case | 256-LBGA |
| Supplier Device Package | 256-FTBGA (17x17) |
| Purchase URL | https://www.e-xfl.com/product-detail/lattice-semiconductor/lcmxo640c-3ft256c |

# MachXO Family Data Sheet Introduction

June 2013 Data Sheet DS1002

## Features

- **Non-volatile, Infinitely Reconfigurable**
  - Instant-on – powers up in microseconds
  - Single chip, no external configuration memory required
  - Excellent design security, no bit stream to intercept
  - Reconfigure SRAM based logic in milliseconds
  - SRAM and non-volatile memory programmable through JTAG port
  - Supports background programming of non-volatile memory
- **Sleep Mode**
  - Allows up to 100x static current reduction
- **TransFR™ Reconfiguration (TFR)**
  - In-field logic update while system operates
- **High I/O to Logic Density**
  - 256 to 2280 LUT4s
  - 73 to 271 I/Os with extensive package options
  - Density migration supported
  - Lead free/RoHS compliant packaging
- **Embedded and Distributed Memory**
  - Up to 27.6 Kbits sysMEM™ Embedded Block RAM
  - Up to 7.7 Kbits distributed RAM
  - Dedicated FIFO control logic
- **Flexible I/O Buffer**
  - Programmable sysIO™ buffer supports wide range of interfaces:
    - LVCMOS 3.3/2.5/1.8/1.5/1.2
    - LVTTL
    - PCI
    - LVDS, Bus-LVDS, LVPECL, RSDS
- **sysCLOCK™ PLLs**
  - Up to two analog PLLs per device
  - Clock multiply, divide, and phase shifting
- **System Level Support**
  - IEEE Standard 1149.1 Boundary Scan
  - Onboard oscillator
  - Devices operate with 3.3V, 2.5V, 1.8V or 1.2V power supply
  - IEEE 1532 compliant in-system programming

## Introduction

The MachXO is optimized to meet the requirements of applications traditionally addressed by CPLDs and low capacity FPGAs: glue logic, bus bridging, bus interfacing, power-up control, and control logic. These devices bring together the best features of CPLD and FPGA devices on a single chip.

***Table 1-1. MachXO Family Selection Guide***

| Device | LCMXO256 | LCMXO640 | LCMXO1200 | LCMXO2280 |
|---|---|---|---|---|
| LUTs | 256 | 640 | 1200 | 2280 |
| Dist. RAM (Kbits) | 2.0 | 6.1 | 6.4 | 7.7 |
| EBR SRAM (Kbits) | 0 | 0 | 9.2 | 27.6 |
| Number of EBR SRAM Blocks (9 Kbits) | 0 | 0 | 1 | 3 |
| $V_{CC}$ Voltage | 1.2/1.8/2.5/3.3V | 1.2/1.8/2.5/3.3V | 1.2/1.8/2.5/3.3V | 1.2/1.8/2.5/3.3V |
| Number of PLLs | 0 | 0 | 1 | 2 |
| Max. I/O | 78 | 159 | 211 | 271 |
| **Packages** | | | | |
| 100-pin TQFP (14x14 mm) | 78 | 74 | 73 | 73 |
| 144-pin TQFP (20x20 mm) | | 113 | 113 | 113 |
| 100-ball csBGA (8x8 mm) | 78 | 74 | | |
| 132-ball csBGA (8x8 mm) | | 101 | 101 | 101 |
| 256-ball caBGA (14x14 mm) | | 159 | 211 | 211 |
| 256-ball ftBGA (17x17 mm) | | 159 | 211 | 211 |
| 324-ball ftBGA (19x19 mm) | | | | 271 |

The devices use look-up tables (LUTs) and embedded block memories traditionally associated with FPGAs for flexible and efficient logic implementation. Through non-volatile technology, the devices provide the single-chip, high-security, instant-on capabilities traditionally associated with CPLDs. Finally, advanced process technology and careful design will provide the high pin-to-pin performance also associated with CPLDs.

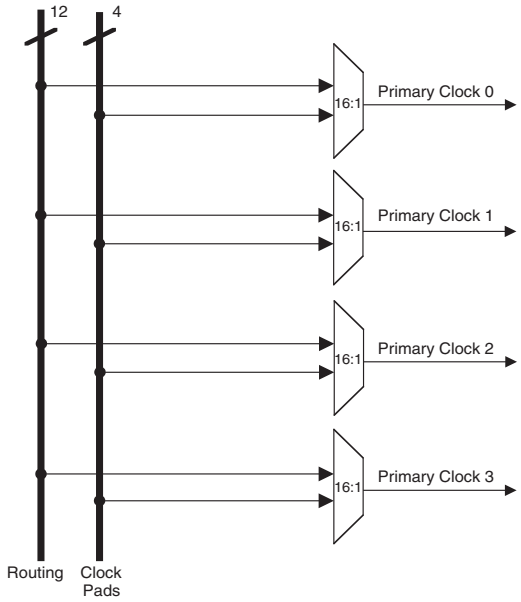
The ispLEVER® design tools from Lattice allow complex designs to be efficiently implemented using the MachXO family of devices. Popular logic synthesis tools provide synthesis library support for MachXO. The ispLEVER tools use the synthesis tool output along with the constraints from its floor planning tools to place and route the design in the MachXO device. The ispLEVER tool extracts the timing from the routing and back-annotates it into the design for timing verification.

The ispLEVER design tool takes the output of the synthesis tool and places and routes the design. Generally, the place and route tool is completely automatic, although an interactive routing editor is available to optimize the design.

## Clock/Control Distribution Network

The MachXO family of devices provides global signals that are available to all PFUs. These signals consist of four primary clocks and four secondary clocks. Primary clock signals are generated from four 16:1 muxes as shown in Figure 2-7 and Figure 2-8. The available clock sources for the MachXO256 and MachXO640 devices are four dual function clock pins and 12 internal routing signals. The available clock sources for the MachXO1200 and MachXO2280 devices are four dual function clock pins, up to nine internal routing signals and up to six PLL outputs.

***Figure 2-7. Primary Clocks for MachXO256 and MachXO640 Devices***



The EBR memory supports three forms of write behavior for single or dual port operation:

1. **Normal** – data on the output appears only during the read cycle. During a write cycle, the data (at the current address) does not appear on the output. This mode is supported for all data widths.

2. **Write Through** – a copy of the input data appears at the output of the same port. This mode is supported for all data widths.

3. **Read-Before-Write** – when new data is being written, the old contents of the address appears at the output. This mode is supported for x9, x18 and x36 data widths.

**FIFO Configuration**

The FIFO has a write port with Data-in, CEW, WE and CLKW signals. There is a separate read port with Data-out, RCE, RE and CLKR signals. The FIFO internally generates Almost Full, Full, Almost Empty and Empty Flags. The Full and Almost Full flags are registered with CLKW. The Empty and Almost Empty flags are registered with CLKR. The range of programming values for these flags are in Table 2-7.

***Table 2-7. Programmable FIFO Flag Ranges***

| Flag Name | Programming Range |
|---|---|
| Full (FF) | 1 to (up to $2^N$-1) |
| Almost Full (AF) | 1 to Full-1 |
| Almost Empty (AE) | 1 to Full-1 |
| Empty (EF) | 0 |

N = Address bit width

The FIFO state machine supports two types of reset signals: RSTA and RSTB. The RSTA signal is a global reset that clears the contents of the FIFO by resetting the read/write pointer and puts the FIFO flags in their initial reset state. The RSTB signal is used to reset the read pointer. The purpose of this reset is to retransmit the data that is in the FIFO. In these applications it is important to keep careful track of when a packet is written into or read from the FIFO.

**Memory Core Reset**

The memory array in the EBR utilizes latches at the A and B output ports. These latches can be reset asynchronously. RSTA and RSTB are local signals, which reset the output latches associated with Port A and Port B respectively. The Global Reset (GSRN) signal resets both ports. The output data latches and associated resets for both ports are as shown in Figure 2-13.

## Device Configuration

All MachXO devices contain a test access port that can be used for device configuration and programming.

The non-volatile memory in the MachXO can be configured in two different modes:

- In IEEE 1532 mode via the IEEE 1149.1 port. In this mode, the device is off-line and I/Os are controlled by BSCAN registers.
- In background mode via the IEEE 1149.1 port. This allows the device to remain operational in user mode while reprogramming takes place.

The SRAM configuration memory can be configured in three different ways:

- At power-up via the on-chip non-volatile memory.
- After a refresh command is issued via the IEEE 1149.1 port.
- In IEEE 1532 mode via the IEEE 1149.1 port.

Figure 2-22 provides a pictorial representation of the different programming modes available in the MachXO devices. On power-up, the SRAM is ready to be configured with IEEE 1149.1 serial TAP port using IEEE 1532 protocols.

**Leave Alone I/O**
When using IEEE 1532 mode for non-volatile memory programming, SRAM configuration, or issuing a refresh command, users may specify I/Os as high, low, tristated or held at current value. This provides excellent flexibility for implementing systems where reconfiguration or reprogramming occurs on-the-fly.

**TransFR (Transparent Field Reconfiguration)**
TransFR (TFR) is a unique Lattice technology that allows users to update their logic in the field without interrupting system operation using a single ispVM command. See TN1087, Minimizing System Interruption During Configuration Using TransFR Technology for details.

**Security**
The MachXO devices contain security bits that, when set, prevent the readback of the SRAM configuration and non-volatile memory spaces. Once set, the only way to clear the security bits is to erase the memory space.

For more information on device configuration, please see details of additional technical documentation at the end of this data sheet.

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

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

* NC for “E” devices.
** Primary clock inputs are single-ended.

## LCMXO256 and LCMXO640 Logic Signal Connections: 100 csBGA (Cont.)

| LCMXO256 | | | | | LCMXO640 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ball Number | Ball Function | Bank | Dual Function | Differen-tial | Ball Number | Ball Function | Bank | Dual Function | Differen-tial |
| 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 | | |

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

## LCMXO2280 Logic Signal Connections: 324 ftBGA (Cont.)

| LCMXO2280 | | | | |
|---|---|---|---|---|
| **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 | | |

## LCMXO2280 Logic Signal Connections: 324 ftBGA (Cont.)

| LCMXO2280 | | | | |
|---|---|---|---|---|
| **Ball Number** | **Ball Function** | **Bank** | **Dual Function** | **Differential** |
| E13 | PT16D | 1 | | C |
| C15 | PT16C | 1 | | T |
| F13 | PT16B | 1 | | C |
| D14 | PT16A | 1 | | T |
| A18 | PT15D | 1 | | C |
| B17 | PT15C | 1 | | T |
| A16 | PT15B | 1 | | C |
| A17 | PT15A | 1 | | T |
| VCC | VCC | - | | |
| D13 | PT14D | 1 | | C |
| F12 | PT14C | 1 | | T |
| C14 | PT14B | 1 | | C |
| E12 | PT14A | 1 | | T |
| C13 | PT13D | 1 | | C |
| B16 | PT13C | 1 | | T |
| B15 | PT13B | 1 | | C |
| A15 | PT13A | 1 | | T |
| VCCIO1 | VCCIO1 | 1 | | |
| GND | GNDIO1 | 1 | | |
| B14 | PT12F | 1 | | C |
| A14 | PT12E | 1 | | T |
| D12 | PT12D | 1 | | C |
| F11 | PT12C | 1 | | T |
| B13 | PT12B | 1 | | C |
| A13 | PT12A | 1 | | T |
| C12 | PT11D | 1 | | C |
| GND | GND | - | | |
| B12 | PT11C | 1 | | T |
| E11 | PT11B | 1 | | C |
| D11 | PT11A | 1 | | T |
| C11 | PT10F | 1 | | C |
| A12 | PT10E | 1 | | T |
| VCCIO1 | VCCIO1 | 1 | | |
| GND | GNDIO1 | 1 | | |
| F10 | PT10D | 1 | | C |
| D10 | PT10C | 1 | | T |
| B11 | PT10B | 1 | PCLK1_1*** | C |
| A11 | PT10A | 1 | | T |
| E10 | PT9D | 1 | | C |
| C10 | PT9C | 1 | | T |
| D9 | PT9B | 1 | PCLK1_0*** | C |
| E9 | PT9A | 1 | | T |
| B10 | PT8F | 0 | | C |

## LCMXO2280 Logic Signal Connections: 324 ftBGA (Cont.)

| LCMXO2280 | | | | |
|---|---|---|---|---|
| Ball Number | Ball Function | Bank | Dual Function | Differential |
| F16 | GND | - | | |
| H10 | GND | - | | |
| H11 | GND | - | | |
| H8 | GND | - | | |
| H9 | GND | - | | |
| J10 | GND | - | | |
| J11 | GND | - | | |
| J4 | GND | - | | |
| J8 | GND | - | | |
| J9 | GND | - | | |
| K10 | GND | - | | |
| K11 | GND | - | | |
| K17 | GND | - | | |
| K8 | GND | - | | |
| K9 | GND | - | | |
| L10 | GND | - | | |
| L11 | GND | - | | |
| L8 | GND | - | | |
| L9 | GND | - | | |
| N2 | GND | - | | |
| P14 | GND | - | | |
| P5 | GND | - | | |
| R7 | GND | - | | |
| F14 | VCC | - | | |
| G11 | VCC | - | | |
| G9 | VCC | - | | |
| H7 | VCC | - | | |
| L7 | VCC | - | | |
| M9 | VCC | - | | |
| H6 | VCCIO7 | 7 | | |
| J7 | VCCIO7 | 7 | | |
| M7 | VCCIO6 | 6 | | |
| K7 | VCCIO6 | 6 | | |
| M8 | VCCIO5 | 5 | | |
| R9 | VCCIO5 | 5 | | |
| M12 | VCCIO4 | 4 | | |
| M11 | VCCIO4 | 4 | | |
| L12 | VCCIO3 | 3 | | |
| K12 | VCCIO3 | 3 | | |
| J12 | VCCIO2 | 2 | | |
| H12 | VCCIO2 | 2 | | |
| G12 | VCCIO1 | 1 | | |
| G10 | VCCIO1 | 1 | | |

## LCMXO2280 Logic Signal Connections: 324 ftBGA (Cont.)

| LCMXO2280 | | | | |
|---|---|---|---|---|
| **Ball Number** | **Ball Function** | **Bank** | **Dual Function** | **Differential** |
| G8 | VCCIO0 | 0 | | |
| G7 | VCCIO0 | 0 | | |

* Supports true LVDS outputs.
** NC for “E” devices.
*** Primary clock inputs are single-ended.

## Thermal Management

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

### For Further Information

For further information regarding Thermal Management, refer to the following:

- Thermal Management document
- TN1090 - Power Estimation and Management for MachXO Devices
- Power Calculator tool included with the Lattice ispLEVER design tool, or as a standalone download from www.latticesemi.com/software

# MachXO Family Data Sheet Ordering Information

June 2013 Data Sheet DS1002

## Part Number Description

LCMXO XXXX X – X XXXXXX X XX

**Device Family**
MachXO PLD

**Logic Capacity**
256 LUTs = 256
640 LUTs = 640
1200 LUTs = 1200
2280 LUTs = 2280

**Supply Voltage**
C = 1.8V/2.5V/3.3V
E = 1.2V

Note: Parts dual marked as described.

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

**Package**
T100 = 100-pin TQFP
T144 = 144-pin TQFP
M100 = 100-ball csBGA
M132 = 132-ball csBGA
B256 = 256-ball caBGA
FT256 = 256-ball ftBGA
FT324 = 324-ball ftBGA

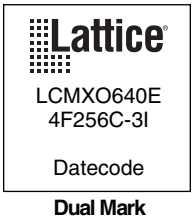
TN100 = 100-pin Lead-Free TQFP
TN144 = 144-pin Lead-Free TQFP
MN100 = 100-ball Lead-Free csBGA
MN132 = 132-ball Lead-Free csBGA
BN256 = 256-ball Lead-Free caBGA
FTN256 = 256-ball Lead-Free ftBGA
FTN324 = 324-ball Lead-Free ftBGA

**Grade**
C = Commercial
I = Industrial

ES = Engineering Sample
Blank = Production Device

## Ordering Information

Note: MachXO devices are dual marked except the slowest commercial speed grade device.þFor example the commercial speed grade LCMXO640E-4F256C is also marked with industrial grade -3I grade.þThe slowest commercial speed grade does not have industrial markings.þ The markings appears as follows:




**Dual Mark**

## 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 |

## Lead-Free Packaging

**Commercial**

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO256C-3TN100C | 256 | 1.8V/2.5V/3.3V | 78 | -3 | Lead-Free TQFP | 100 | COM |
| LCMXO256C-4TN100C | 256 | 1.8V/2.5V/3.3V | 78 | -4 | Lead-Free TQFP | 100 | COM |
| LCMXO256C-5TN100C | 256 | 1.8V/2.5V/3.3V | 78 | -5 | Lead-Free TQFP | 100 | COM |
| LCMXO256C-3MN100C | 256 | 1.8V/2.5V/3.3V | 78 | -3 | Lead-Free csBGA | 100 | COM |
| LCMXO256C-4MN100C | 256 | 1.8V/2.5V/3.3V | 78 | -4 | Lead-Free csBGA | 100 | COM |
| LCMXO256C-5MN100C | 256 | 1.8V/2.5V/3.3V | 78 | -5 | Lead-Free csBGA | 100 | COM |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO640C-3TN100C | 640 | 1.8V/2.5V/3.3V | 74 | -3 | Lead-Free TQFP | 100 | COM |
| LCMXO640C-4TN100C | 640 | 1.8V/2.5V/3.3V | 74 | -4 | Lead-Free TQFP | 100 | COM |
| LCMXO640C-5TN100C | 640 | 1.8V/2.5V/3.3V | 74 | -5 | Lead-Free TQFP | 100 | COM |
| LCMXO640C-3MN100C | 640 | 1.8V/2.5V/3.3V | 74 | -3 | Lead-Free csBGA | 100 | COM |
| LCMXO640C-4MN100C | 640 | 1.8V/2.5V/3.3V | 74 | -4 | Lead-Free csBGA | 100 | COM |
| LCMXO640C-5MN100C | 640 | 1.8V/2.5V/3.3V | 74 | -5 | Lead-Free csBGA | 100 | COM |
| LCMXO640C-3TN144C | 640 | 1.8V/2.5V/3.3V | 113 | -3 | Lead-Free TQFP | 144 | COM |
| LCMXO640C-4TN144C | 640 | 1.8V/2.5V/3.3V | 113 | -4 | Lead-Free TQFP | 144 | COM |
| LCMXO640C-5TN144C | 640 | 1.8V/2.5V/3.3V | 113 | -5 | Lead-Free TQFP | 144 | COM |
| LCMXO640C-3MN132C | 640 | 1.8V/2.5V/3.3V | 101 | -3 | Lead-Free csBGA | 132 | COM |
| LCMXO640C-4MN132C | 640 | 1.8V/2.5V/3.3V | 101 | -4 | Lead-Free csBGA | 132 | COM |
| LCMXO640C-5MN132C | 640 | 1.8V/2.5V/3.3V | 101 | -5 | Lead-Free csBGA | 132 | COM |
| LCMXO640C-3BN256C | 640 | 1.8V/2.5V/3.3V | 159 | -3 | Lead-Free caBGA | 256 | COM |
| LCMXO640C-4BN256C | 640 | 1.8V/2.5V/3.3V | 159 | -4 | Lead-Free caBGA | 256 | COM |
| LCMXO640C-5BN256C | 640 | 1.8V/2.5V/3.3V | 159 | -5 | Lead-Free caBGA | 256 | COM |
| LCMXO640C-3FTN256C | 640 | 1.8V/2.5V/3.3V | 159 | -3 | Lead-Free ftBGA | 256 | COM |
| LCMXO640C-4FTN256C | 640 | 1.8V/2.5V/3.3V | 159 | -4 | Lead-Free ftBGA | 256 | COM |
| LCMXO640C-5FTN256C | 640 | 1.8V/2.5V/3.3V | 159 | -5 | Lead-Free ftBGA | 256 | COM |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO1200C-3TN100C | 1200 | 1.8V/2.5V/3.3V | 73 | -3 | Lead-Free TQFP | 100 | COM |
| LCMXO1200C-4TN100C | 1200 | 1.8V/2.5V/3.3V | 73 | -4 | Lead-Free TQFP | 100 | COM |
| LCMXO1200C-5TN100C | 1200 | 1.8V/2.5V/3.3V | 73 | -5 | Lead-Free TQFP | 100 | COM |
| LCMXO1200C-3TN144C | 1200 | 1.8V/2.5V/3.3V | 113 | -3 | Lead-Free TQFP | 144 | COM |
| LCMXO1200C-4TN144C | 1200 | 1.8V/2.5V/3.3V | 113 | -4 | Lead-Free TQFP | 144 | COM |
| LCMXO1200C-5TN144C | 1200 | 1.8V/2.5V/3.3V | 113 | -5 | Lead-Free TQFP | 144 | COM |
| LCMXO1200C-3MN132C | 1200 | 1.8V/2.5V/3.3V | 101 | -3 | Lead-Free csBGA | 132 | COM |
| LCMXO1200C-4MN132C | 1200 | 1.8V/2.5V/3.3V | 101 | -4 | Lead-Free csBGA | 132 | COM |
| LCMXO1200C-5MN132C | 1200 | 1.8V/2.5V/3.3V | 101 | -5 | Lead-Free csBGA | 132 | COM |
| LCMXO1200C-3BN256C | 1200 | 1.8V/2.5V/3.3V | 211 | -3 | Lead-Free caBGA | 256 | COM |
| LCMXO1200C-4BN256C | 1200 | 1.8V/2.5V/3.3V | 211 | -4 | Lead-Free caBGA | 256 | COM |
| LCMXO1200C-5BN256C | 1200 | 1.8V/2.5V/3.3V | 211 | -5 | Lead-Free caBGA | 256 | COM |
| LCMXO1200C-3FTN256C | 1200 | 1.8V/2.5V/3.3V | 211 | -3 | Lead-Free ftBGA | 256 | COM |
| LCMXO1200C-4FTN256C | 1200 | 1.8V/2.5V/3.3V | 211 | -4 | Lead-Free ftBGA | 256 | COM |
| LCMXO1200C-5FTN256C | 1200 | 1.8V/2.5V/3.3V | 211 | -5 | Lead-Free ftBGA | 256 | COM |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO2280C-3TN100C | 2280 | 1.8V/2.5V/3.3V | 73 | -3 | Lead-Free TQFP | 100 | COM |
| LCMXO2280C-4TN100C | 2280 | 1.8V/2.5V/3.3V | 73 | -4 | Lead-Free TQFP | 100 | COM |
| LCMXO2280C-5TN100C | 2280 | 1.8V/2.5V/3.3V | 73 | -5 | Lead-Free TQFP | 100 | COM |
| LCMXO2280C-3TN144C | 2280 | 1.8V/2.5V/3.3V | 113 | -3 | Lead-Free TQFP | 144 | COM |
| LCMXO2280C-4TN144C | 2280 | 1.8V/2.5V/3.3V | 113 | -4 | Lead-Free TQFP | 144 | COM |
| LCMXO2280C-5TN144C | 2280 | 1.8V/2.5V/3.3V | 113 | -5 | Lead-Free TQFP | 144 | COM |
| LCMXO2280C-3MN132C | 2280 | 1.8V/2.5V/3.3V | 101 | -3 | Lead-Free csBGA | 132 | COM |
| LCMXO2280C-4MN132C | 2280 | 1.8V/2.5V/3.3V | 101 | -4 | Lead-Free csBGA | 132 | COM |
| LCMXO2280C-5MN132C | 2280 | 1.8V/2.5V/3.3V | 101 | -5 | Lead-Free csBGA | 132 | COM |
| LCMXO2280C-3BN256C | 2280 | 1.8V/2.5V/3.3V | 211 | -3 | Lead-Free caBGA | 256 | COM |
| LCMXO2280C-4BN256C | 2280 | 1.8V/2.5V/3.3V | 211 | -4 | Lead-Free caBGA | 256 | COM |
| LCMXO2280C-5BN256C | 2280 | 1.8V/2.5V/3.3V | 211 | -5 | Lead-Free caBGA | 256 | COM |
| LCMXO2280C-3FTN256C | 2280 | 1.8V/2.5V/3.3V | 211 | -3 | Lead-Free ftBGA | 256 | COM |
| LCMXO2280C-4FTN256C | 2280 | 1.8V/2.5V/3.3V | 211 | -4 | Lead-Free ftBGA | 256 | COM |
| LCMXO2280C-5FTN256C | 2280 | 1.8V/2.5V/3.3V | 211 | -5 | Lead-Free ftBGA | 256 | COM |
| LCMXO2280C-3FTN324C | 2280 | 1.8V/2.5V/3.3V | 271 | -3 | Lead-Free ftBGA | 324 | COM |
| LCMXO2280C-4FTN324C | 2280 | 1.8V/2.5V/3.3V | 271 | -4 | Lead-Free ftBGA | 324 | COM |
| LCMXO2280C-5FTN324C | 2280 | 1.8V/2.5V/3.3V | 271 | -5 | Lead-Free ftBGA | 324 | COM |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO256E-3TN100C | 256 | 1.2V | 78 | -3 | Lead-Free TQFP | 100 | COM |
| LCMXO256E-4TN100C | 256 | 1.2V | 78 | -4 | Lead-Free TQFP | 100 | COM |
| LCMXO256E-5TN100C | 256 | 1.2V | 78 | -5 | Lead-Free TQFP | 100 | COM |
| LCMXO256E-3MN100C | 256 | 1.2V | 78 | -3 | Lead-Free csBGA | 100 | COM |
| LCMXO256E-4MN100C | 256 | 1.2V | 78 | -4 | Lead-Free csBGA | 100 | COM |
| LCMXO256E-5MN100C | 256 | 1.2V | 78 | -5 | Lead-Free csBGA | 100 | COM |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO640E-3TN100C | 640 | 1.2V | 74 | -3 | Lead-Free TQFP | 100 | COM |
| LCMXO640E-4TN100C | 640 | 1.2V | 74 | -4 | Lead-Free TQFP | 100 | COM |
| LCMXO640E-5TN100C | 640 | 1.2V | 74 | -5 | Lead-Free TQFP | 100 | COM |
| LCMXO640E-3MN100C | 640 | 1.2V | 74 | -3 | Lead-Free csBGA | 100 | COM |
| LCMXO640E-4MN100C | 640 | 1.2V | 74 | -4 | Lead-Free csBGA | 100 | COM |
| LCMXO640E-5MN100C | 640 | 1.2V | 74 | -5 | Lead-Free csBGA | 100 | COM |
| LCMXO640E-3TN144C | 640 | 1.2V | 113 | -3 | Lead-Free TQFP | 144 | COM |
| LCMXO640E-4TN144C | 640 | 1.2V | 113 | -4 | Lead-Free TQFP | 144 | COM |
| LCMXO640E-5TN144C | 640 | 1.2V | 113 | -5 | Lead-Free TQFP | 144 | COM |
| LCMXO640E-3MN132C | 640 | 1.2V | 101 | -3 | Lead-Free csBGA | 132 | COM |
| LCMXO640E-4MN132C | 640 | 1.2V | 101 | -4 | Lead-Free csBGA | 132 | COM |
| LCMXO640E-5MN132C | 640 | 1.2V | 101 | -5 | Lead-Free csBGA | 132 | COM |
| LCMXO640E-3BN256C | 640 | 1.2V | 159 | -3 | Lead-Free caBGA | 256 | COM |
| LCMXO640E-4BN256C | 640 | 1.2V | 159 | -4 | Lead-Free caBGA | 256 | COM |
| LCMXO640E-5BN256C | 640 | 1.2V | 159 | -5 | Lead-Free caBGA | 256 | COM |
| LCMXO640E-3FTN256C | 640 | 1.2V | 159 | -3 | Lead-Free ftBGA | 256 | COM |
| LCMXO640E-4FTN256C | 640 | 1.2V | 159 | -4 | Lead-Free ftBGA | 256 | COM |
| LCMXO640E-5FTN256C | 640 | 1.2V | 159 | -5 | Lead-Free ftBGA | 256 | COM |

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

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

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO256E-3TN100I | 256 | 1.2V | 78 | -3 | Lead-Free TQFP | 100 | IND |
| LCMXO256E-4TN100I | 256 | 1.2V | 78 | -4 | Lead-Free TQFP | 100 | IND |
| LCMXO256E-3MN100I | 256 | 1.2V | 78 | -3 | Lead-Free csBGA | 100 | IND |
| LCMXO256E-4MN100I | 256 | 1.2V | 78 | -4 | Lead-Free csBGA | 100 | IND |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO640E-3TN100I | 640 | 1.2V | 74 | -3 | Lead-Free TQFP | 100 | IND |
| LCMXO640E-4TN100I | 640 | 1.2V | 74 | -4 | Lead-Free TQFP | 100 | IND |
| LCMXO640E-3MN100I | 640 | 1.2V | 74 | -3 | Lead-Free csBGA | 100 | IND |
| LCMXO640E-4MN100I | 640 | 1.2V | 74 | -4 | Lead-Free csBGA | 100 | IND |
| LCMXO640E-3TN144I | 640 | 1.2V | 113 | -3 | Lead-Free TQFP | 144 | IND |
| LCMXO640E-4TN144I | 640 | 1.2V | 113 | -4 | Lead-Free TQFP | 144 | IND |
| LCMXO640E-3MN132I | 640 | 1.2V | 101 | -3 | Lead-Free csBGA | 132 | IND |
| LCMXO640E-4MN132I | 640 | 1.2V | 101 | -4 | Lead-Free csBGA | 132 | IND |
| LCMXO640E-3BN256I | 640 | 1.2V | 159 | -3 | Lead-Free caBGA | 256 | IND |
| LCMXO640E-4BN256I | 640 | 1.2V | 159 | -4 | Lead-Free caBGA | 256 | IND |
| LCMXO640E-3FTN256I | 640 | 1.2V | 159 | -3 | Lead-Free ftBGA | 256 | IND |
| LCMXO640E-4FTN256I | 640 | 1.2V | 159 | -4 | Lead-Free ftBGA | 256 | IND |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO1200E-3TN100I | 1200 | 1.2V | 73 | -3 | Lead-Free TQFP | 100 | IND |
| LCMXO1200E-4TN100I | 1200 | 1.2V | 73 | -4 | Lead-Free TQFP | 100 | IND |
| LCMXO1200E-3TN144I | 1200 | 1.2V | 113 | -3 | Lead-Free TQFP | 144 | IND |
| LCMXO1200E-4TN144I | 1200 | 1.2V | 113 | -4 | Lead-Free TQFP | 144 | IND |
| LCMXO1200E-3MN132I | 1200 | 1.2V | 101 | -3 | Lead-Free csBGA | 132 | IND |
| LCMXO1200E-4MN132I | 1200 | 1.2V | 101 | -4 | Lead-Free csBGA | 132 | IND |
| LCMXO1200E-3BN256I | 1200 | 1.2V | 211 | -3 | Lead-Free caBGA | 256 | IND |
| LCMXO1200E-4BN256I | 1200 | 1.2V | 211 | -4 | Lead-Free caBGA | 256 | IND |
| LCMXO1200E-3FTN256I | 1200 | 1.2V | 211 | -3 | Lead-Free ftBGA | 256 | IND |
| LCMXO1200E-4FTN256I | 1200 | 1.2V | 211 | -4 | Lead-Free ftBGA | 256 | IND |

| Part Number | LUTs | Supply Voltage | I/Os | Grade | Package | Pins | Temp. |
|---|---|---|---|---|---|---|---|
| LCMXO2280E-3TN100I | 2280 | 1.2V | 73 | -3 | Lead-Free TQFP | 100 | IND |
| LCMXO2280E-4TN100I | 2280 | 1.2V | 73 | -4 | Lead-Free TQFP | 100 | IND |
| LCMXO2280E-3TN144I | 2280 | 1.2V | 113 | -3 | Lead-Free TQFP | 144 | IND |
| LCMXO2280E-4TN144I | 2280 | 1.2V | 113 | -4 | Lead-Free TQFP | 144 | IND |
| LCMXO2280E-3MN132I | 2280 | 1.2V | 101 | -3 | Lead-Free csBGA | 132 | IND |
| LCMXO2280E-4MN132I | 2280 | 1.2V | 101 | -4 | Lead-Free csBGA | 132 | IND |
| LCMXO2280E-3BN256I | 2280 | 1.2V | 211 | -3 | Lead-Free caBGA | 256 | IND |
| LCMXO2280E-4BN256I | 2280 | 1.2V | 211 | -4 | Lead-Free caBGA | 256 | IND |
| LCMXO2280E-3FTN256I | 2280 | 1.2V | 211 | -3 | Lead-Free ftBGA | 256 | IND |
| LCMXO2280E-4FTN256I | 2280 | 1.2V | 211 | -4 | Lead-Free ftBGA | 256 | IND |
| LCMXO2280E-3FTN324I | 2280 | 1.2V | 271 | -3 | Lead-Free ftBGA | 324 | IND |
| LCMXO2280E-4FTN324I | 2280 | 1.2V | 271 | -4 | Lead-Free ftBGA | 324 | IND |