# OHM-LCMXO2-4000HC Breakout Board

The OHM-LCMXO2-4000HC field programmable gate array (FPGA) breakout board is a compact, easy-to-use platform for evaluation and designing with MachXO2 ultra-low density FPGAs from Lattice Semiconductor, featuring the LCMXO2-4000HC-6QN84C device.

The board has all the components and circuitry required for the FPGA to function or to be configured to achieve various custom designs.

Features

- Power and Programming interface: USB 2.0 (USB Micro)
- LCMXO2-4000HC-6QN84C FPGA
- 10 RED LEDs
- Microchip RN4871 Bluetooth module with its own BLUE and RED LEDs for status
- 60-hole prototype area
- Three 2x20 expansion header landings for general I/O, JTAG and external power
- One 6-pin JTAG connector for programming the FPGA
- Pre-loaded demo allowing user to communicate with the board using a smartphone app via Bluetooth
- Standalone JEDEC file programming application
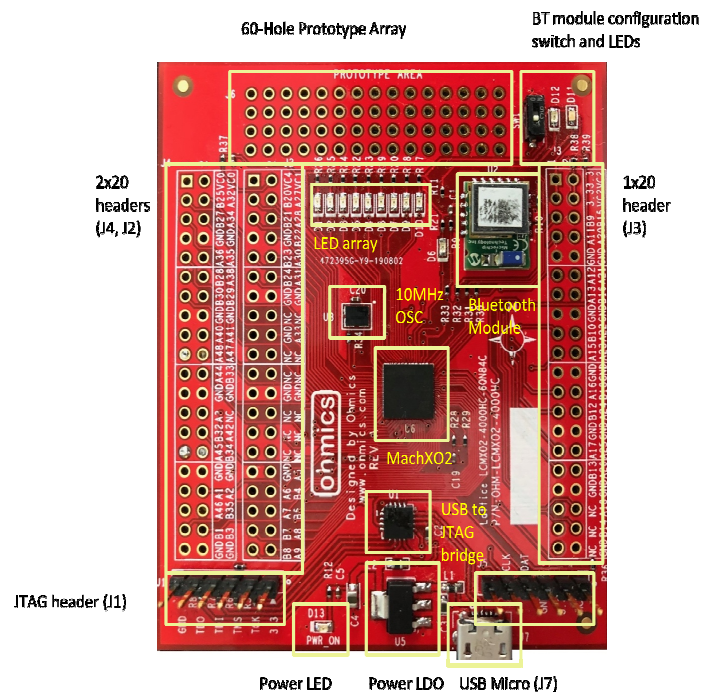
Warning

Static electricity can damage this board. When operating this board, use antistatic precautions such as operating on an antistatic mat and wearing an antistatic wrists band. Store the board in its antistatic bag when not used.

Software

- Lattice Diamond design software
- Ohmics FPGA Programmer for Windows programming via USB. (Also available for MAC users)
- iOS Microchip SmartData available on AppleStore or Android MLDP Terminal available on Microchip website. A simplified version of Android MLDP Terminal is available for download at ohmics.com

MachXO2 Device

This board features the Lattice MachX02 LCMXO2-4000HC-6QN84C Lattice DEVICE. A complete description of this device can be found on Lattice website

Demo Design

The board is provided with a pre-loaded demonstration design, which allows the user to turn on/off individual LEDs in the array sending simple commands over Bluetooth from a smartphone app.

To download the demo design, source code and the programming file, please visit ohmics.com.

Block Diagram
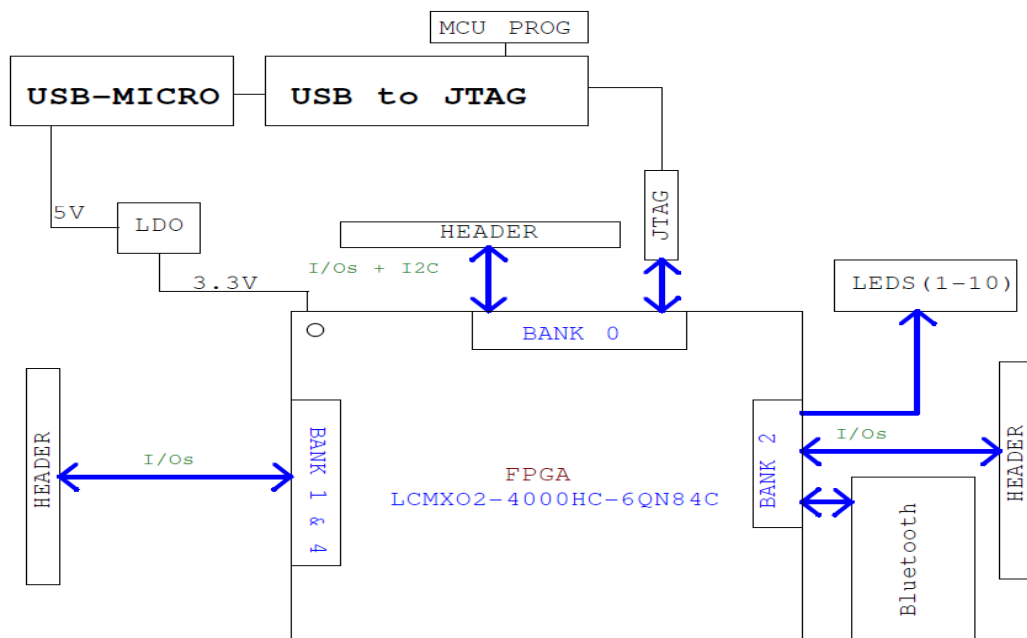
Connector Pinout

Table 1. Header (J2)

Header Pin Number	4000HC Function	MachXO2 Pin
1	VCCIO4	B6
2	VCCIO1	A29
3	PR10B	B20
4	PR10A	A27
5	PR9B	B21
6	PR9A	A28
7	GND	-
8	PR8A	B22
9	PR6B	B23
10	PR6A	A30
11	PR3B	B24
12	PR3A	A31
13	GND	-
14	GND	-
15	NC	-
16	NC	-
17	GND	-
18	PR2A	A33
19	NC	-
20	NC	-
21	NC	-
22	NC	-
23	GND	-
24	GND	-
25	NC	-
26	NC	-
27	NC	-
28	NC	-
29	NC	-
30	NC	-
31	GND	-
32	PL9A	A5
33	PL10B	A6
34	PL10A	B4
35	PL10D	A7
36	PL10C	B5
37	PL14A	B7
38	PL13A	A8
39	PL14B	B8
40	PL13B	A9

Table 2. Header (J3)

Header Pin Number	4000HC Function	MachXO2 Pin
1	3.3V	
2	VCCIO2	A14
3	3.3V	
4	VCCIO2	B7

5	PB3A	B9
6	PB20A	B15
7	PB3B	A11
8	PB20B	A20
9	GND	-
10	GND	-
11	PB4A	A12
12	PB21A	A21
13	PB4B	A13
14	PB21B	B16
15	GND	-
16	GND	-
17	PB7A	B10
18	PB23A	A22
19	PB7B	A15
20	PB23B	A23
21	GND	-
22	GND	-
23	PB9A	A16
24	PB24A	B18
25	PB9B	B12
26	PB24B	A24
27	GND	-
28	GND	-
29	PB13A	A17
30	PB30A	A25
31	PB13B	B13
32	PB30B	A26
33	GND	-
34	GND	-
35	NC	-
36	PB15A	A18
37	NC	-
38	PB15B	B14
39	NC	-
40	GND	-

Table 3. Header (J4)

Header Pin Number	4000HC Function	MachXO2 Pin
1	VCCIO0	A37
2	VCCIO0	A43,B36
3	PT25B	B25
4	PT25A	A32
5	PT28C	B27
6	PT28D	A34
7	GND	-
8	GND	-
9	PT26A	A36
10	PT26B	A35
11	PT24B	B28
12	PT24A	A38
13	PT23C	B30
14	PT23D	B29

15	GND	-
16	GND	-
17	PT21B	A40
18	PT21A	A41
19	PT13C	A48
20	PT13D	A47
21	PT18A	A44
22	PT18B	B33
23	GND	-
24	GND	-
25	PT9A	A3
26	NC	-
27	PT20C	B32
28	PT20D	A42
29	PT15C	A45
30	PT15D	B34
31	GND	-
32	GND	-
33	PT10B	A1
34	PT10A	A2
35	PT13B	A46
36	PT13A	B35
37	PT9B	B1
38	PT11B	B3
39	GND	-
40	GND	-

Table 4. JTAG Header (J1)

Header Pin Number	4000HC Function	MachXO2 Pin
1	3.3V	-
2	TMS	PT15D
3	TCK	PT15C
4	TDI	PT13D
5	TDO	PT13C
6	GND	-

Table 5. MCU JTAG Header (J5)

Header Pin Number	PIC16F1455-I/ML Function	MCU pin
1	MCLR	3
2	3.3V	16
3	GND	13
4	ICSPDAT	9
5	ICSPCLK	8
6	NC	-

Mechanical and environmental

Dimensions: 78 x 65 x 15mm. **Recommended operating temperature:** 0-85C

Programming the board example (Windows):

- Download OhmicsFPGA Programmer from ohmics.com and launch
- Connect the OHM-LCMXO2-4000HC board via USB. The board should be detected and the com port should be automatically displayed in the top left corner; select the programming file (*.jed)
- Press "Program FPGA" button. When programming is completed, an audible signal will be heard and the tool will report it as "Done".
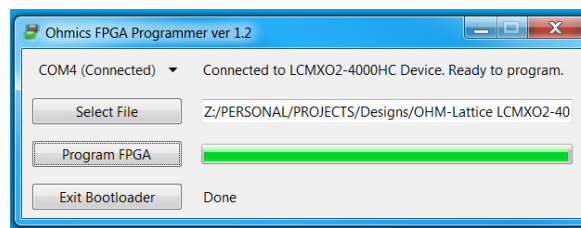
Smartphone interfacing example (iOS)

- Download Microchip SmartData app from AppStore and launch
- Power up the OHM-LCMXO2-4000HC board via USB
- In your app Bluetooth device scanning menu, tap the device labelled "ohmics_xxxx", to connect
- A serial terminal menu will open. Type "1", then hit "Send". First LED in the array will turn on. Similar commands for the rest of the other 9 LEDs.
- Sending "0" will turn off the LEDs. Sending ">" will initiate a shifting light type of motion
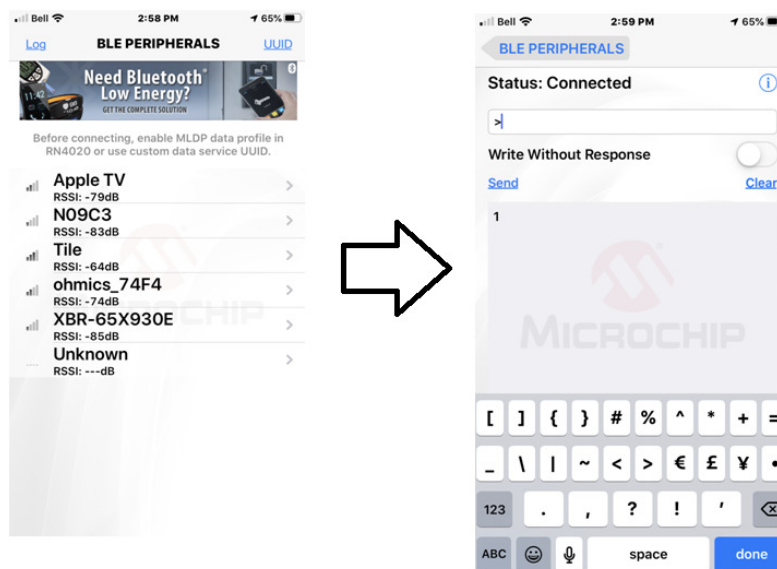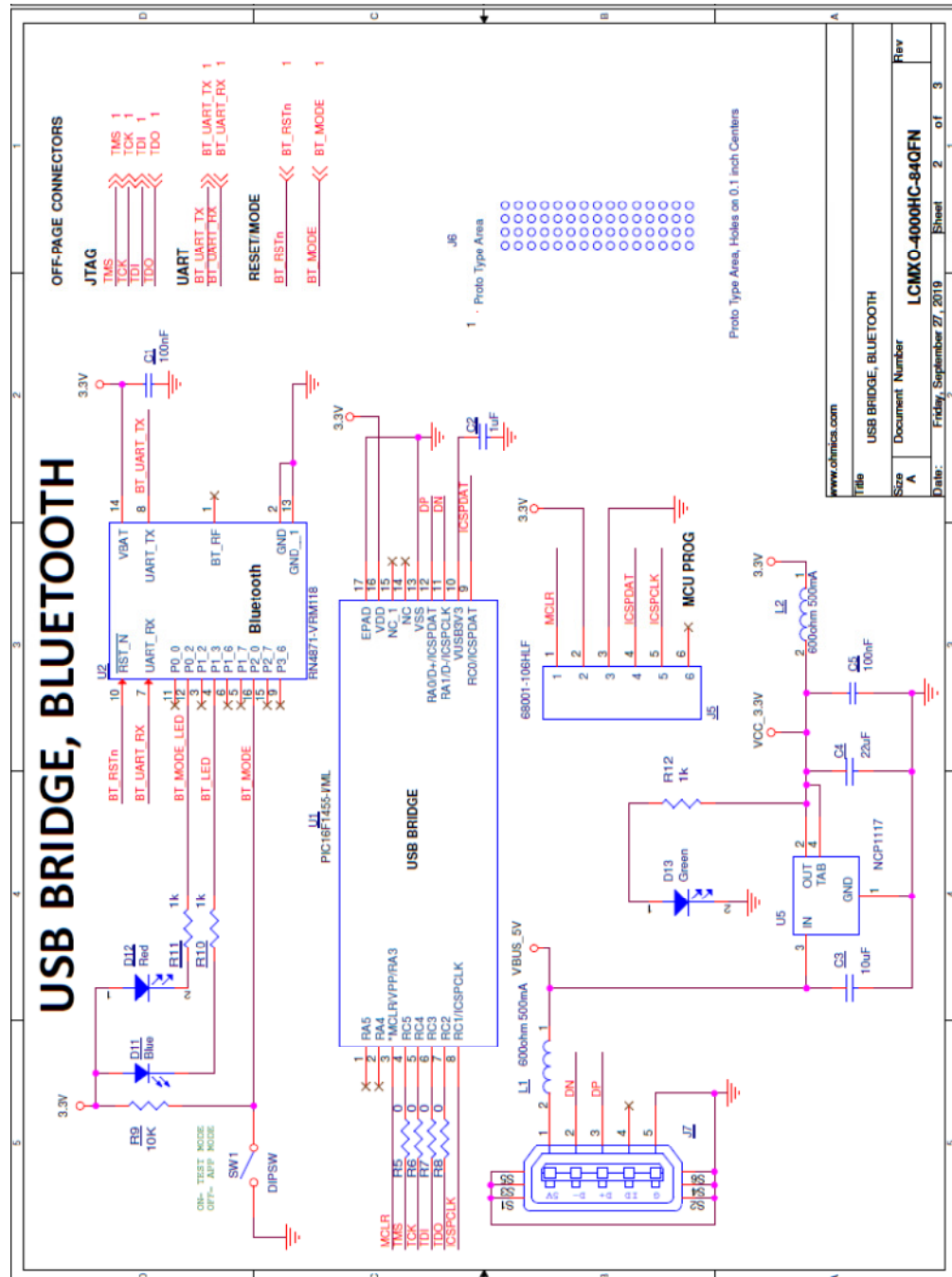
Appendix A . Schematics

Figure 1. Schematics

FPGA

OFF-PAGE CONNECTORS

JTAG
TMS_MOD
TDI_TMA
TDO_VAL

Bluetooth
BT_UART_TX
BT_UART_RX
BT_RSTn
BT_MODE

LATIOUT LEDs IN A SINGLE ROW

Place decoupling caps close to VCCIO pins

Place decoupling caps close to VCC pins

Place C15-C12 decoupling caps close to VCC pins

LCMXO2-4000HC-84QFN-REVB

FPGA

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