



Parallel to DSI Demo for iCE40 Ultra™ Wearable Development Platform User Guide

UG99 Version 1.0, September 2015

Demo Setup

Hardware Requirements

- iCE40 Ultra™ Wearable Development Platform
- Android smart phone with Android 4.3 or higher
- Windows PC or Linux machine for downloading the bit stream
- USB cable for programming the device

Software Requirements

- Lattice Diamond® Programmer software 3.3 or higher
- MachXO2™ device bitstream file *p2dsi.jed*
- Image file *image.hex*
- iCE40 Ultra device bitstream file *p2dsi_ice.hex*
- iCE40 Ultra device bitstream download support files *p2dsi_ice.bat* and *FlashProgrammer.exe*

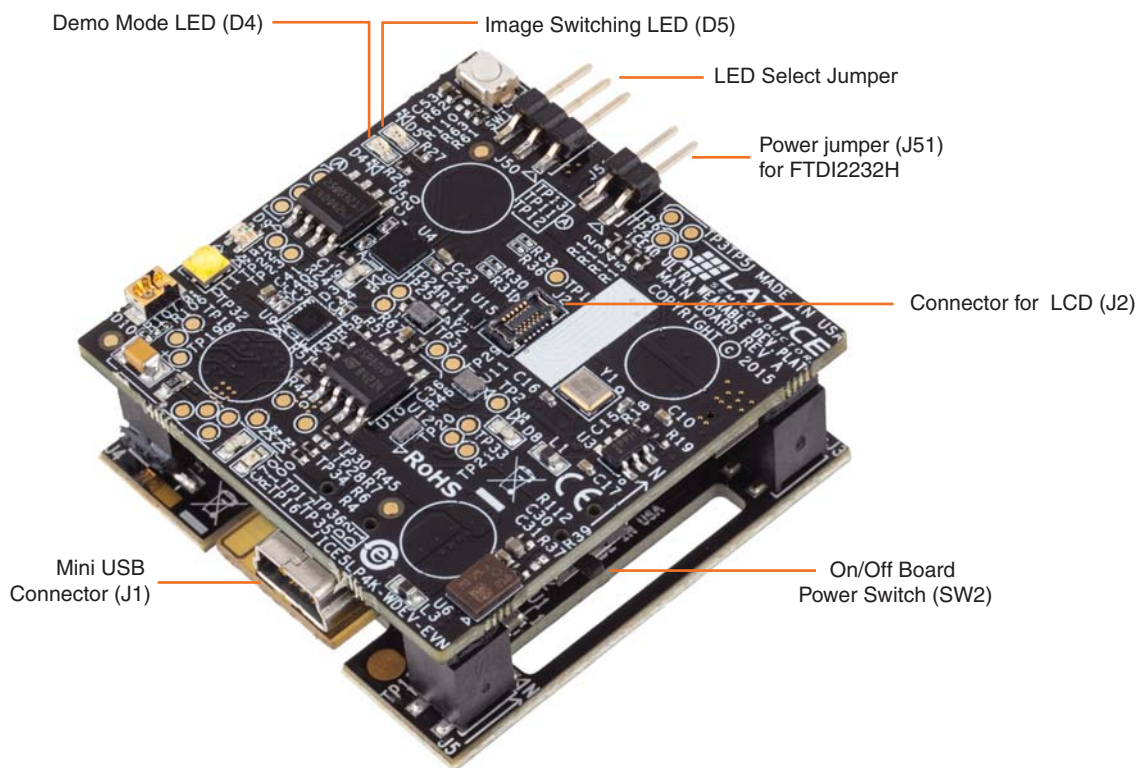
Figure 1. Demo Setup



Board Demo Resources

Connect the USB2JTAG Power Jumper (J51) for FTDI device. For more information about the board, see EB100, [iCE40 Ultra Wearable Development Platform User Guide](#).

Figure 2. Demo Resources



Demo Mode LED

The demo mode LED indicates if the design is in external switching mode or in self-running mode. The LED is on when in external switching mode and off when in self running mode.

- **External switching mode** – Switching of images is controlled by the iCE5LP device on the board. Only the image selected by the iCE5LP device is displayed on the LCD. In this mode, the iCE5LP device changes the selected device every 0.5 seconds.
- **Self-running mode** – Two images stored in the flash are displayed one after the other in intervals of about 3 seconds.

Power Jumper (J51) for FTDI 2232H

The J51 jumper provides power for the FTDI 2232h, which is used to write the image data to the SPI flash memory and program the MachXO2/iCE40 device configuration memory.

The jumper can be pulled off after the programming operation to save power consumption on the board.

Mini USB Connector (J1) for Programming and Battery Charging

The mini USB connector is used for:

- Connecting the development platform with the PC
- Programming the flash memory devices
- Configuring the memory of MachXO2 and iCE40 devices
- Powering the development platform
- Charging the battery

Preparing the Hardware for the Demo

To prepare the hardware for the demo:

1. Make sure that the power switch SW2 is off.
2. Connect the LCD module if it is not available on the board. Please refer Figure 2 to ensure that the LCD module is connected correctly.
3. Connect the power jumper (J51) for the FTDI2232H device.
4. Connect the platform to the PC with a USB mini cable.
5. Power on the board through SW2.

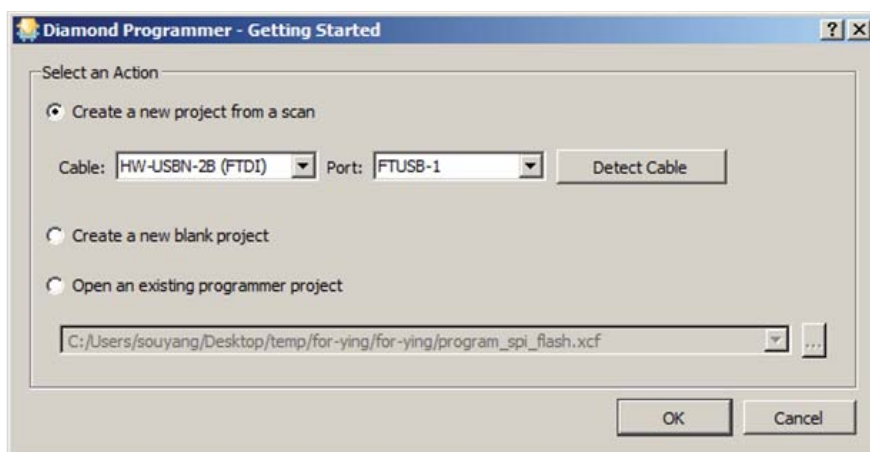
Programming the Image to Flash Memory

A sample HEX file converted from two images is provided in the package for programming the flash memory. Make sure that the USB cable is connected between the PC and the development platform.

To program the image to flash memory:

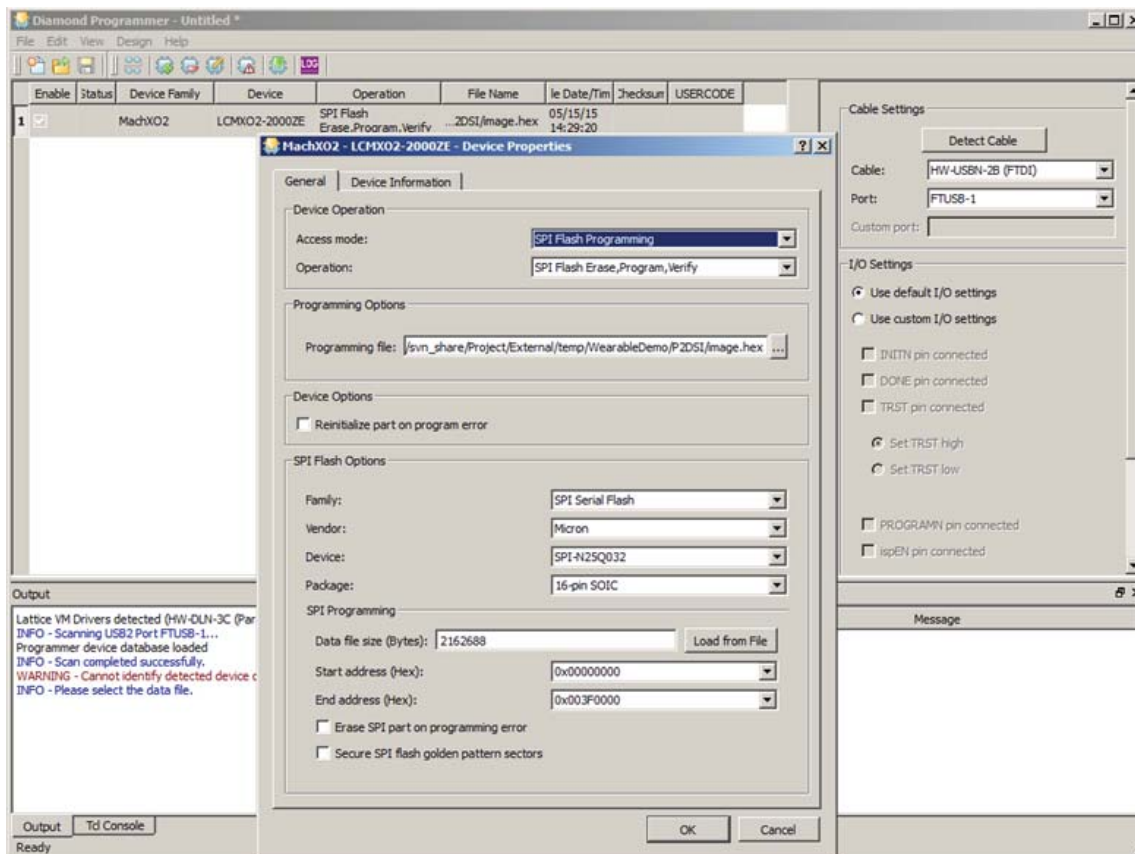
1. Start Diamond Programmer.
2. In the Getting Started dialog box, select the following options as shown in Figure 3.
 - **Create a new blank project**
 - Cable: **HW-USBN-2B (FTDI)**
 - Port: **FTUSB-1**

Figure 3. Start Diamond Programmer



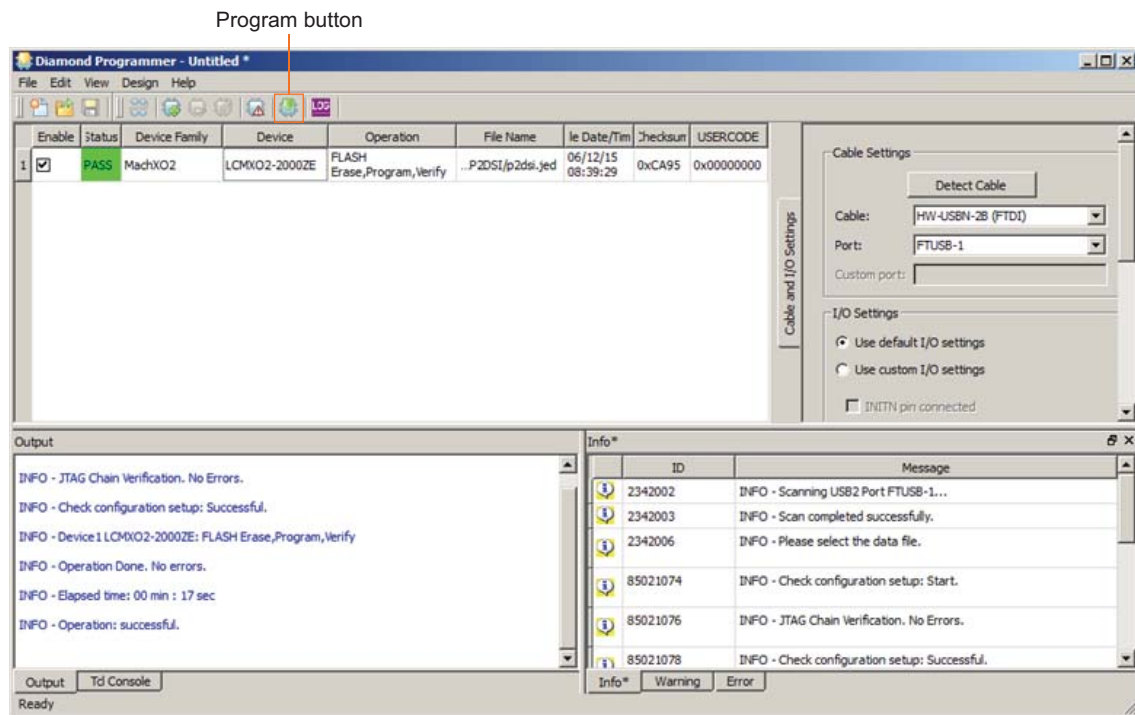
3. Click **Detect Cable**.
4. Click **OK**. This opens the main interface of Diamond Programmer.

Figure 4. Setting Programmer Options



5. Select the following options as shown in Figure 4.
 - Access mode: **SPI Flash Programming**
 - Operation: **SPI Flash Erase, Program, Verify**
 - Programming file: **.../WearableDemo/P2DSI/image.hex**
 - Family: **SPI Serial Flash**
 - Vendor: **Micron**
 - Device: **SPI-N25Q32**
 - Package: **8-pin VDFPN8**
 - Start address: **0x00000000**
 - End address: **0x003F0000**
6. Click **OK** to close the dialog box.
7. Click the **Program** button in the main window of Diamond Programmer as shown in Figure 5.

Figure 5. Program the SPI Flash Memory



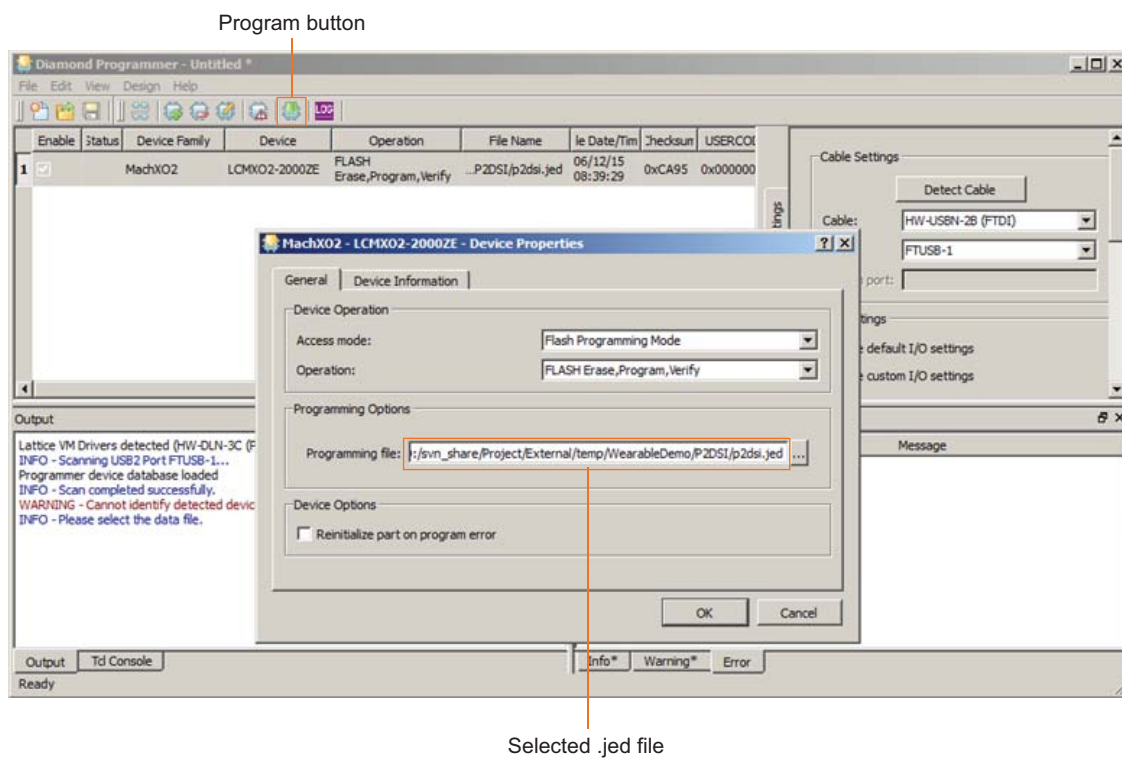
After the data is successfully written to the flash memory, the program status indicates Pass.

Programming the MachXO2 FPGA Device

To program the MachXO2 device:

1. A JED file of the design is provided in the .../WearableDemo/P2DSI folder. It is used to program the internal flash memory of the MachXO2 device.
2. Double-click the Operation type to open the Device Properties dialog box as shown in Figure 6.
3. Select the following options:
 - Access mode: **Flash Programming Mode**
 - Operation: **Flash Erase, Program, Verify**
 - Programming file: .../WearableDemo/P2DSI/p2dsi.jed.

Figure 6. Program the MachXO2 FPGA Device



4. Click **OK** to close the dialog box.
5. Click the **Program** button in the main window.

The MachXO2 device is programmed.

Demo Procedure

After the data file and design file are programmed to the board, the demo is started automatically.

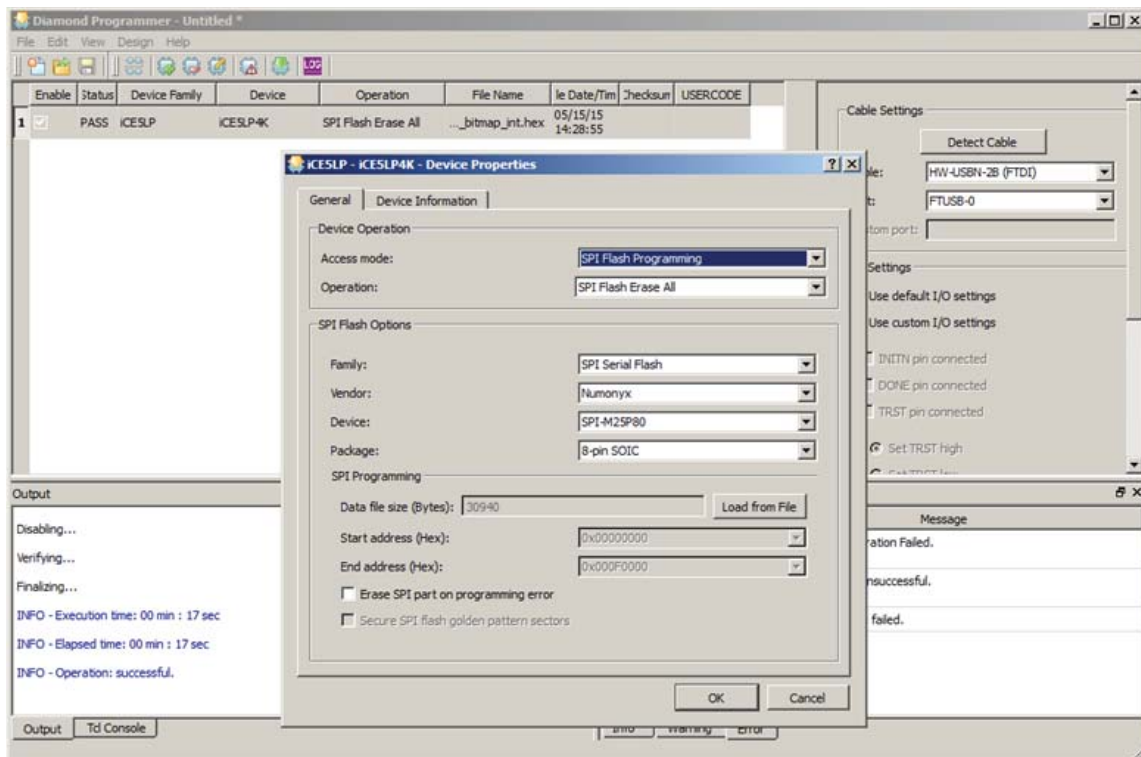
Self-running Mode

- By default, if the iCE5LP device is not programmed or erased, the demo is in Self-running mode after reconfiguration or power on. Make sure the demo mode LED (D4) is not lighted.
- The two images stored in the flash memory are displayed one after the other on the LCD.
- The Image Switching LED (D5) is toggled each time, then the picture is switched.
- Erase the flash for the iCE5LP device configuration as shown in Figure 7.
Repower the board if the picture does not change.

To erase the flash for the iCE5LP device:

1. Select the following options:
 - Device: **iCE5LP4K**
 - Port: **FTUSB-0**.
2. Click the **Device Properties** button to open the Device Properties dialog box.
3. Select the following options:
 - Access Mode: **SPI Flash Programming**
 - Operation: **SPI Flash Erase All** for operation
 Configure the SPI Flash Options and other settings as shown in Figure 7.
4. Click **OK** to close Device Properties window.
5. Click the **Program** button to perform Erase operation.

Figure 7. Erase iCE5 Configuration Flash



External Switching Mode

- Connect the board and PC using the USB download cable.
- Double-click **.../WearableDemo/P2DSI/p2dsi_ice.bat**. The flash writer tool is started to program the SPI memory with **.../WearableDemo/P2DSI/p2dsi_ice.hex**.
- When the SPI memory is programmed and verified successfully, the flash writer tool displays confirming message.
- The demo mode LED (D4) is turned on. This indicates that external switching mode is enabled. In this mode, the iCE5LP device changes the selected images every 0.5 seconds.

Technical Support Assistance

Submit a technical support case through www.latticesemi.com/techsupport.

Revision History

Date	Version	Change Summary
September 2015	1.0	Initial release.