Smart Socket

Preliminary **User Guide**

UG114 Version 1.0

February 2016

Contents

Figures

1. Introduction

This document describes Smart Sockets, the next generation programming solution, from Lattice Semiconductor. Smart Sockets replace the legacy Lattice Model 300 and its associated Socket Adapters. Smart Sockets use the same JTAG-based Lattice Diamond® Programmer programming software that is used with Lattice Semiconductor's popular evaluation and customer boards. Standard ESD environment and procedures should be followed when working with loose devices and the Smart Socket.

2. Features

Each Smart Socket board is unique for a device family and package. Smart Socket boards have common features such as:

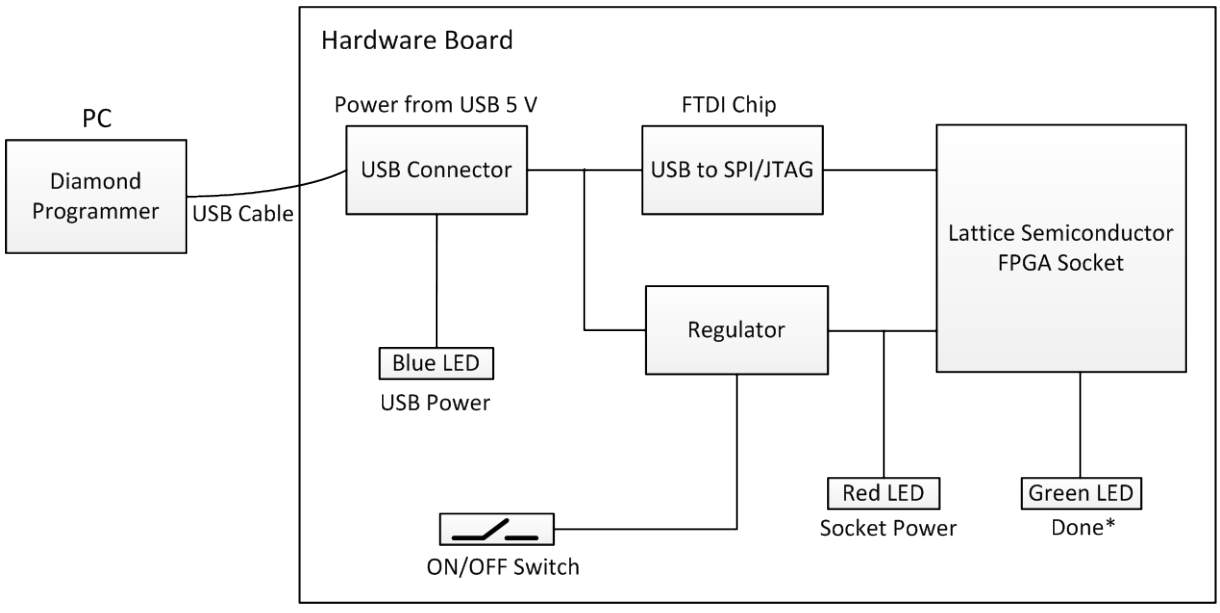
- Powered over simple USB cable
- Power switch to remove power from the socket
- Integrated FTDI USB interface to work directly with Lattice Programming tools
- Power indicator LEDs
- Convenient test points

3. Block Diagram

Figure 3.1 shows the high level blocks of a Smart Socket board. The four major blocks on the board are:

- USB connector
- USB-to-SPI/JTAG communication bridge
- Board power regulator
- Lattice Semiconductor Socket (Family specific)

A switch controls power to the socket. Three separate LEDs indicate USB power, Socket Power and Programming Done (Programming Done support varies by device family).



***Note**: Programming Done support depends on the device family.

Figure 3.1. Smart Socket Programming Board Block Diagram

4. Board Specifications

The outline dimension is the same for all Smart Socket boards. The dimensions of the socket vary based on target device family and package.

Board dimensions:

- Width: 4 inch
- Length: 6 inch
- Height: < 2 inch

Electrical Specification:

- +5 V @ 500 mA or less (provided by USB cable)

The complete list of sockets is available at: http://www.latticesemi.com/sockets

5. Software Requirements

Smart Sockets are supported by Lattice Diamond® Programmer. The latest version of the Lattice Diamond Programmer can be downloaded at:
http://www.latticesemi.com/en/Products/DesignSoftwareAndIP/FPGAandLDS/LatticeDiamond.aspx

The Smart Socket works with the Lattice Diamond Programmer using only a USB cable. Connect the cable from the Smart Socket to a PC, and use the cable search feature in Lattice Diamond Programmer to establish the programming link. The steps to program a device are described below.

5.1. Generic Programming

1. Launch the Lattice Diamond Programmer software. The Diamond Programmer starting page appears as shown in Figure 5.1.

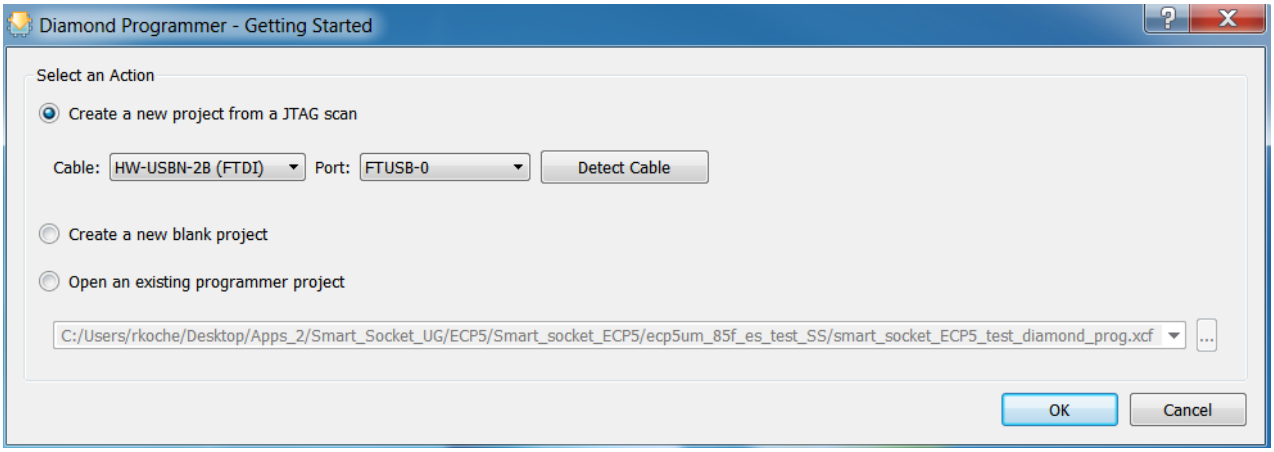


Figure 5.1. Getting Started

2. Click **OK.** The Diamond Programmer automatically starts scanning. The scanning page appears as shown in Figure 5.2.

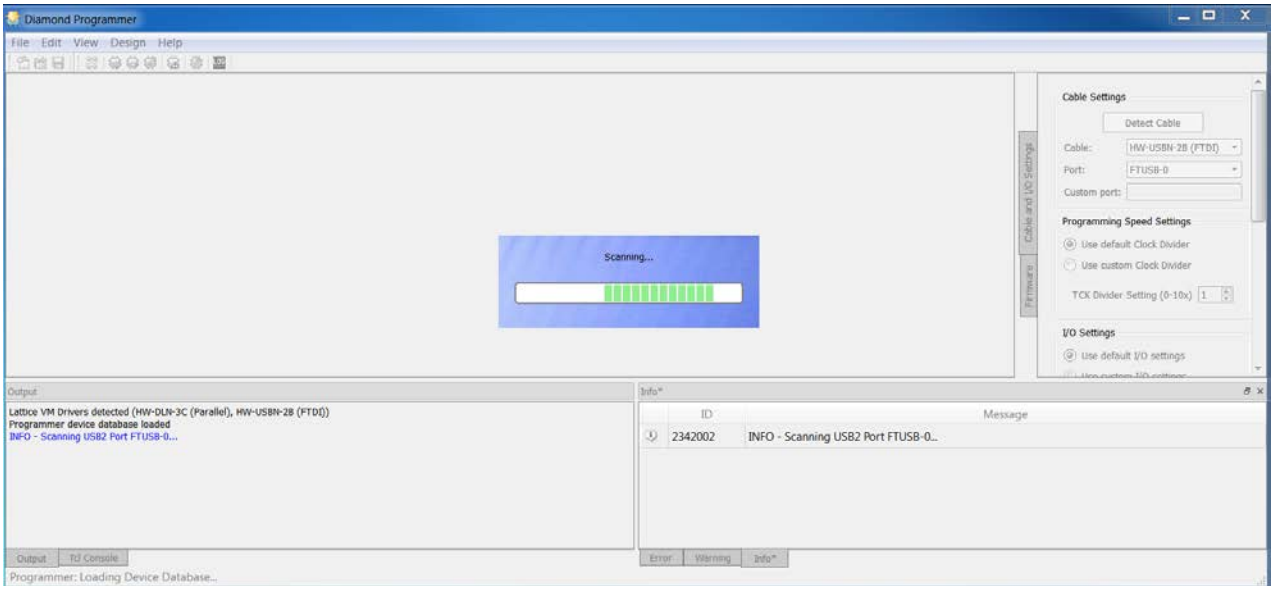


Figure 5.2. Scanning

When the device scanning is completed, the Diamond Programmer tool shows the device present in socket in the **Device** tab. If the Diamond Programmer is unable to identify the device in socket, the device family name will be highlighted with a yellow background in the **Device** tab as shown in Figure 5.3. Some device families may not support the scan operation. For details, see the Specific Software Requirements for Certain Device Families section on page 10.

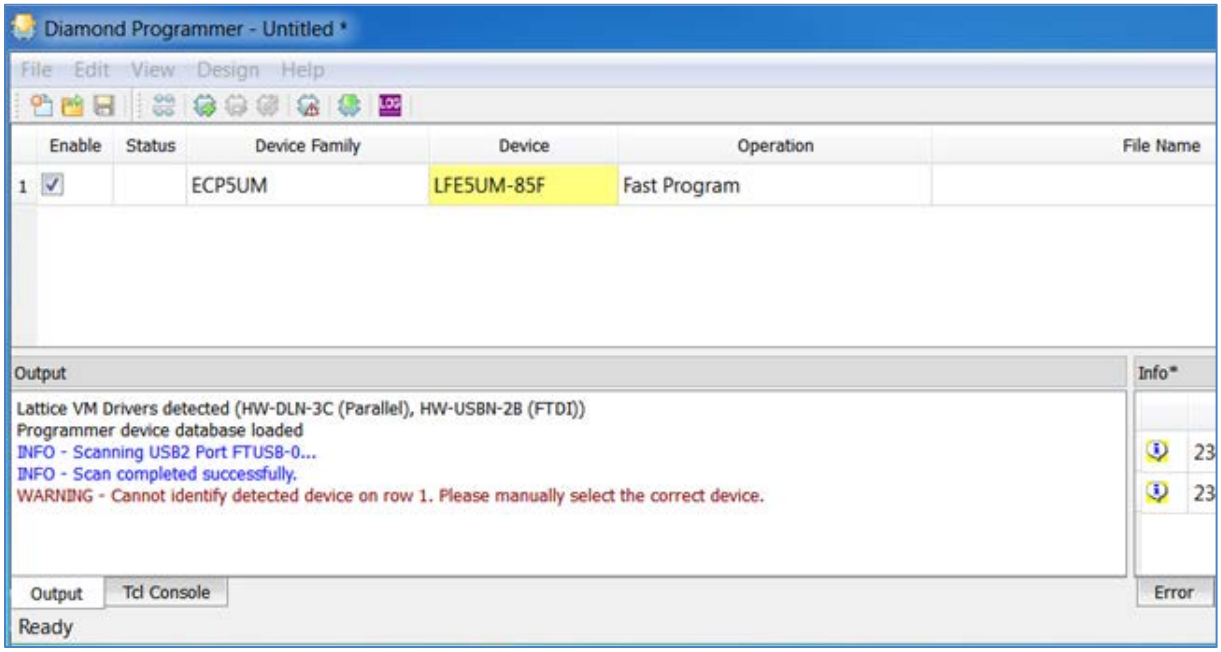


Figure 5.3. Unable to Identify Device

In such case, click in the yellow highlighted area and select the appropriate device by matching the device name on the package with the dropdown list in the **Device** tab. Select the correct device on the dropdown list, and the yellow background highlighting will disappear as shown in Figure 5.4.

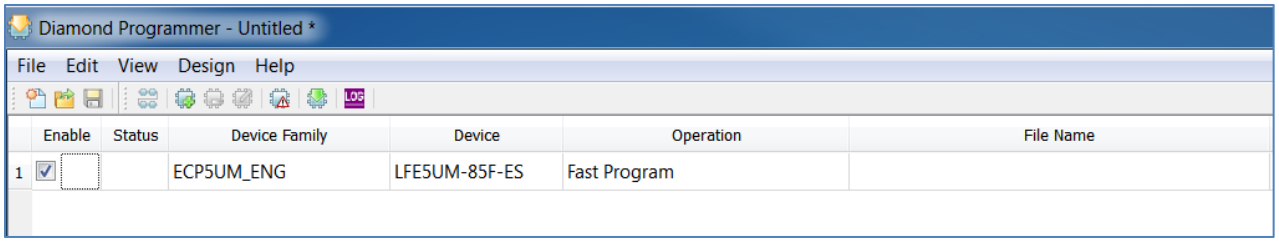


Figure 5.4. Identifying Correct Device

3. Next step is to verify that the desired **Operation** is specified, and update if necessary. To update the operation, select the device row so that it is highlighted in blue as shown in Figure 5.5. On the menu bar, click **Edit**, and on the dropdown menu click **Device Properties** as shown in Figure 5.5.

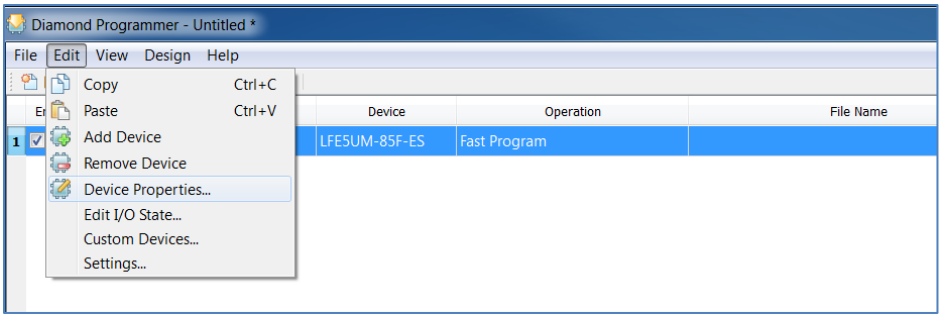


Figure 5.5. Access Device Properties through Edit

4. Select the appropriate programming file by clicking the ... button in the **Programming Options** section as shown in Figure 5.6.
5. Click **OK**.

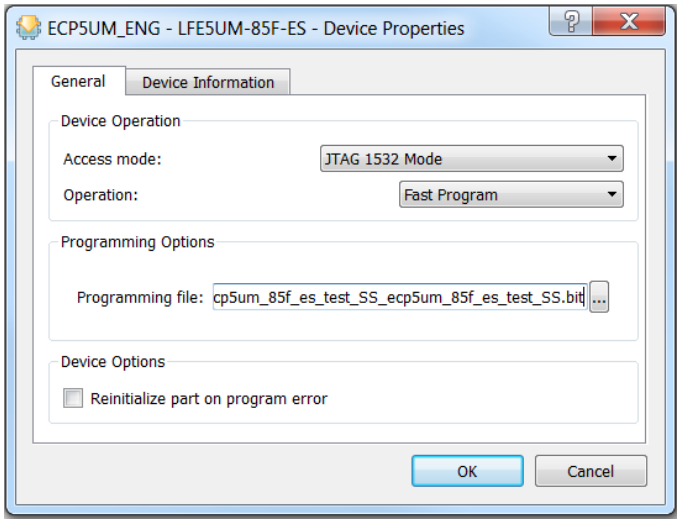


Figure 5.6. Programming Options

6. The selected file is shown in the **File Name** tab of Diamond Programmer, see Figure 5.7.

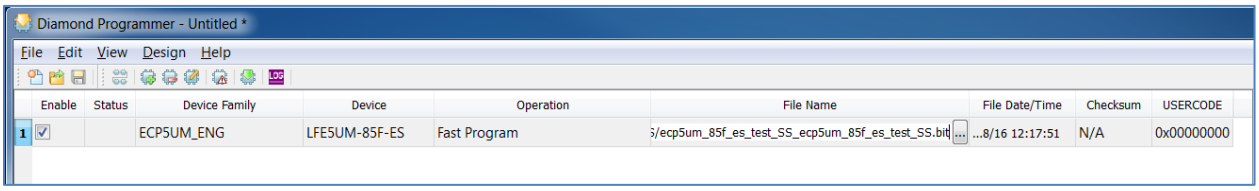


Figure 5.7. Bit File Selection

7. Programming the selected file in the device can be done in two ways:
   - Click the **Program** icon shown in Figure 5.8.

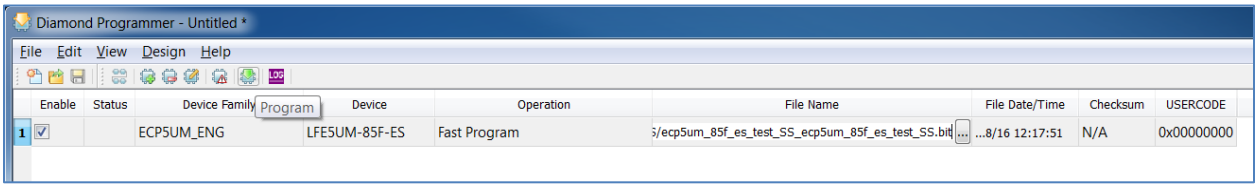


Figure 5.8. Program Icon

- On the menu bar, click **Design**, and on the dropdown menu, click **Program** as shown in Figure 5.9.

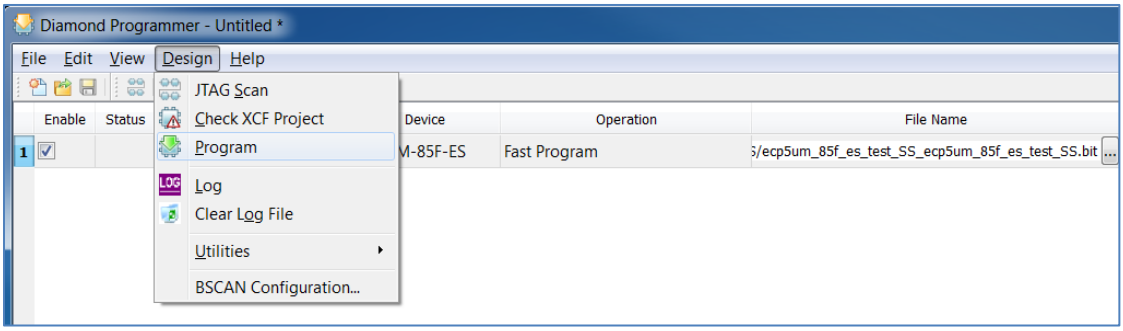


Figure 5.9. Design Menu

Figure 5.10 shows that the programming of device is in progress.

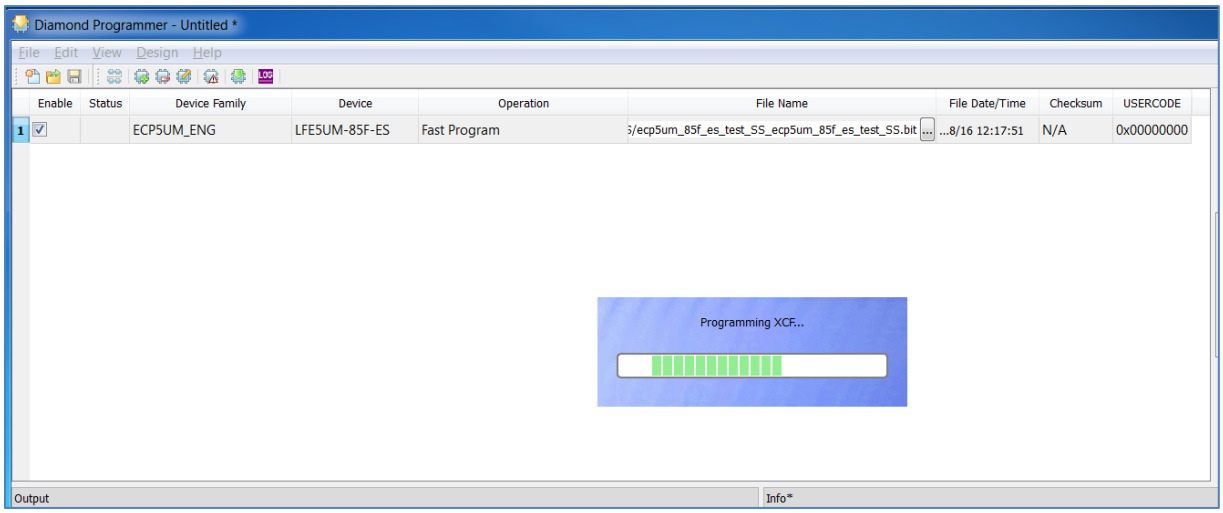


Figure 5.10. Programming in Progress

8. When the programming of the device is completed, the **Status** option changes to *PASS* and *Operation Successful* message appears in the **Output** console as shown in Figure 5.11. On the board, the green *Done* LED is lit when the device is successfully programmed (*Done* LED behavior is device dependent, see below for details).

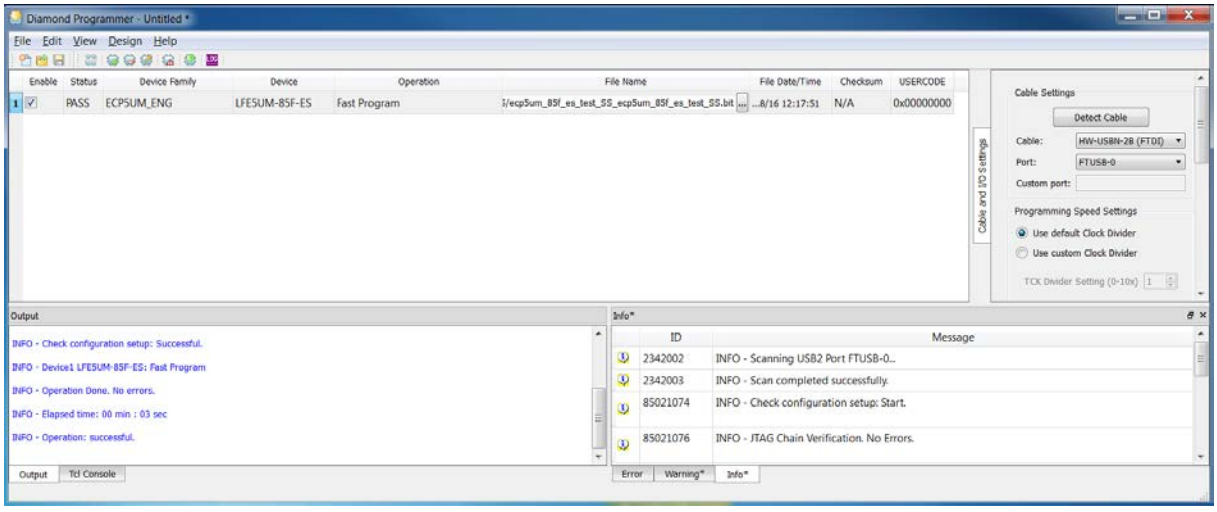


Figure 5.11. Successful Programming

5.2. Specific Software Requirements for Certain Device Families

5.2.1. MachXO3 Programming

The programming of Mach XO3 device family follows steps similar to the process described in Generic Programming section. *Done* is not a dedicated output in the MachXO3 family. *Done* LED indication is not supported.

5.2.2. ECP5 Family Programming

The programming of ECP5 device family follows steps similar to the process described in Generic Programming section. When the programming of these devices is completed successfully, the *Done* LED is lit.

5.2.3. L-ASC10 Programming

Specific steps to program the ASC devices:

1. Launch the Lattice Diamond Programmer software.

   The Diamond Programmer automatically starts scanning the device and detects XO2 device as shown in Figure 5.12.

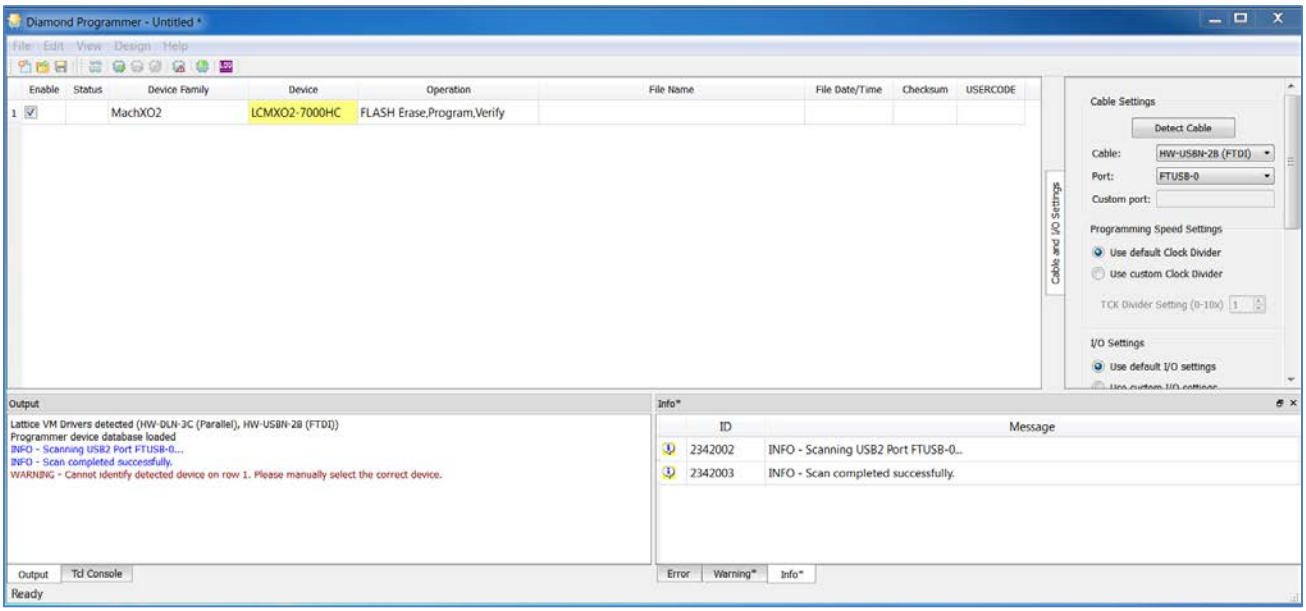


Figure 5.12. ASC Socket – Scanned Device XO2

2. Double click in the box below **Operation** tab, see Figure 5.13.

   The dialog box appears as shown in Figure 5.14.

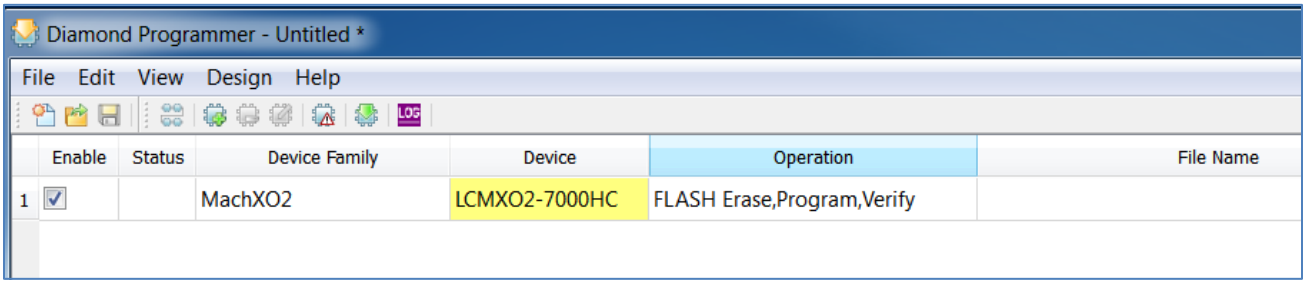


Figure 5.13. ASC Socket – Operation Tab

3. In **Access Mode** dropdown list, select *PTM programming.* When this access mode is selected the **Operation** tab changes to **PTM Bypass**.

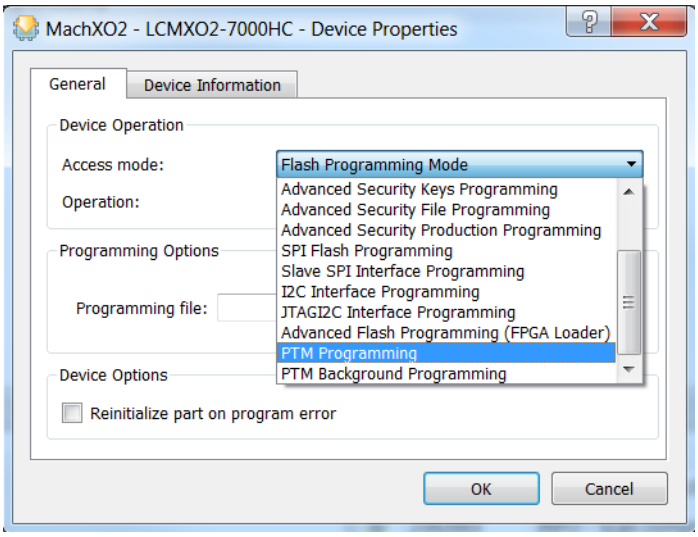


Figure 5.14. ASC Socket – Device Properties

4. Add an external ASC device, by clicking the + button as shown in Figure 5.15. The dialog box appears as shown in Figure 5.16 on the next page.

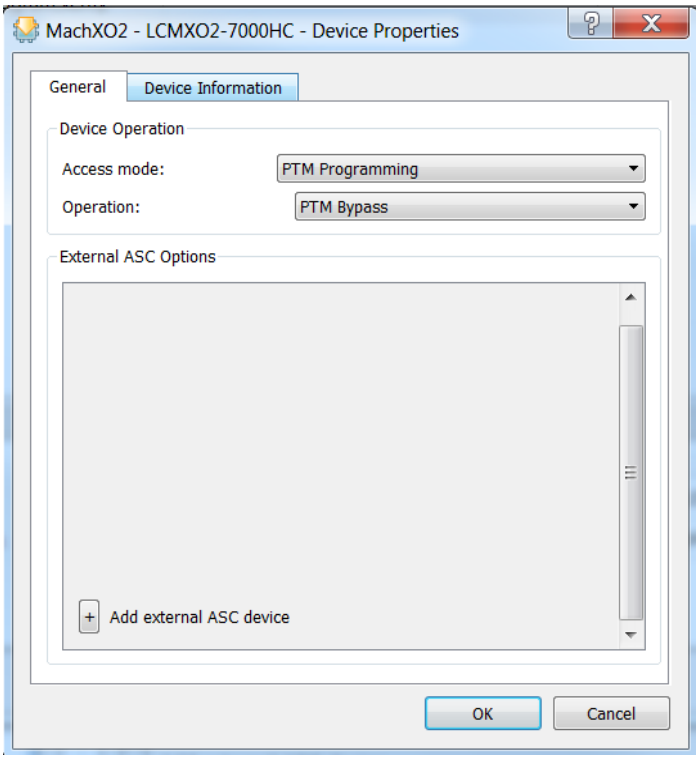


Figure 5.15. ASC Socket – Add External ASC Device

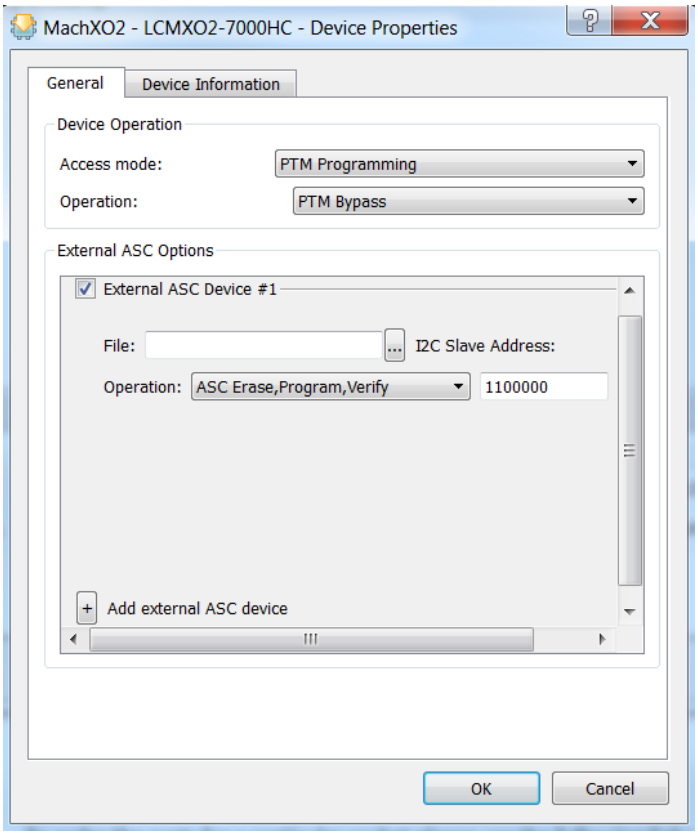


Figure 5.16. ASC Socket – ASC File Load Menu

5. Select the programming file by clicking the button. A dialog box appears where you can select the relevant *ASCx.hex file to program in the device.
6. From the **Operation** dropdown list, select *ASC Erase, Program, Verify*.

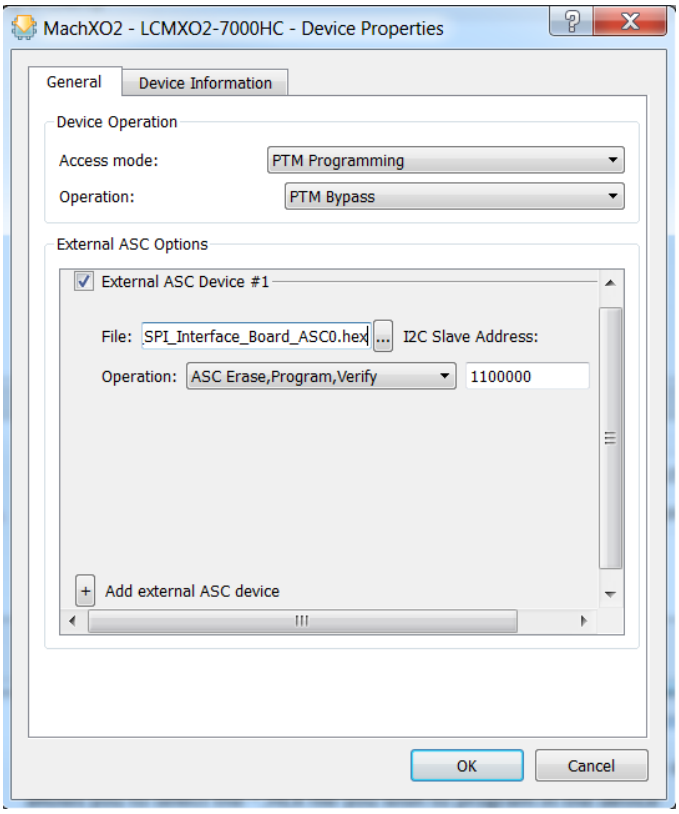


Figure 5.17. ASC Socket – Operation Menu

The warning shown in Figure 5.18 may appear if the selected external ASC device and the File targeting device do not match.

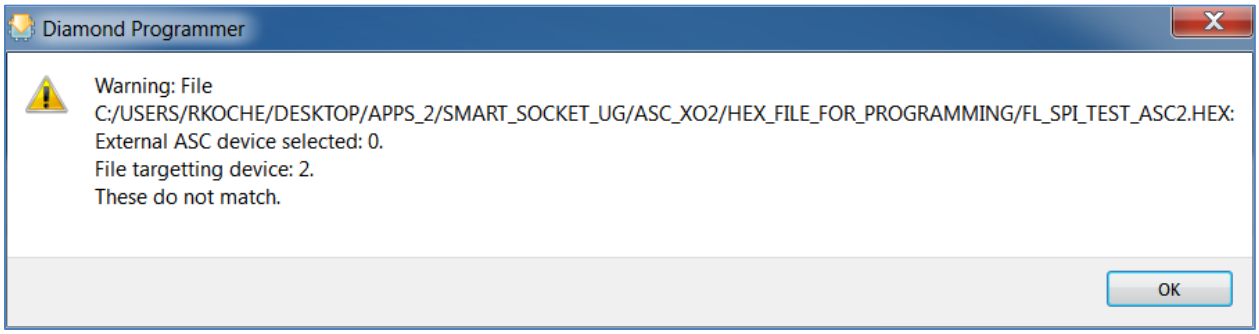


Figure 5.18. Warning

7. Click **OK**. The same warning appears in the output console window as shown Figure 5.19.

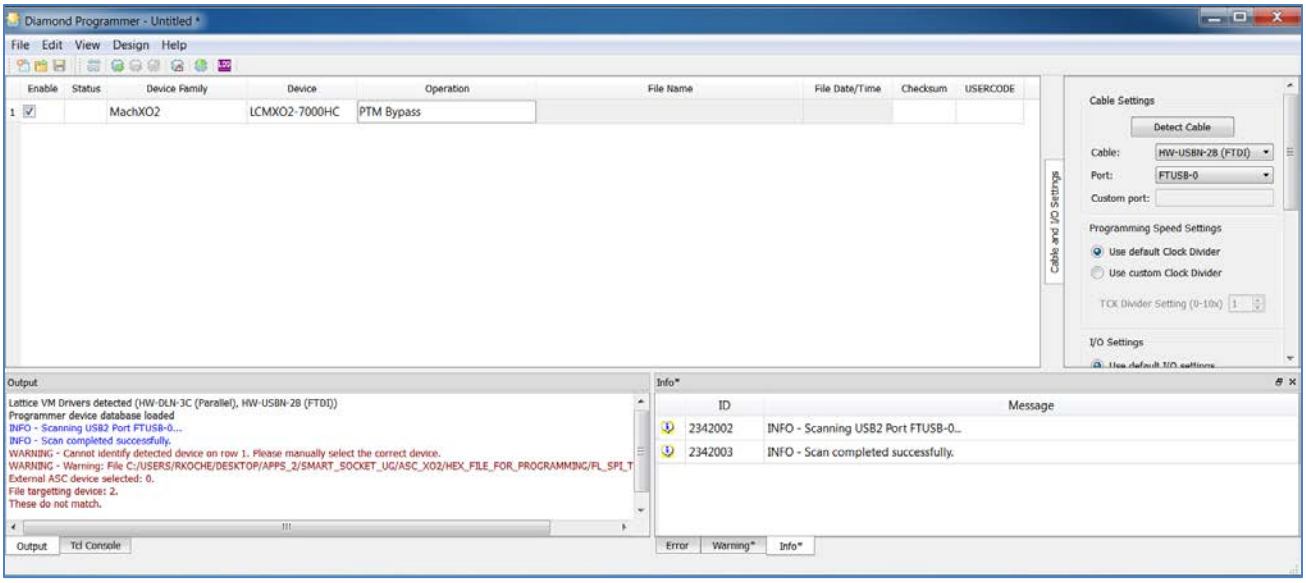


Figure 5.19. ASC Socket – Warning for XO2

In the **Operation** tab *PTM Bypass* and the **File Name** tab are greyed out (not allowing you to add a new file) as shown in Figure 5.20.

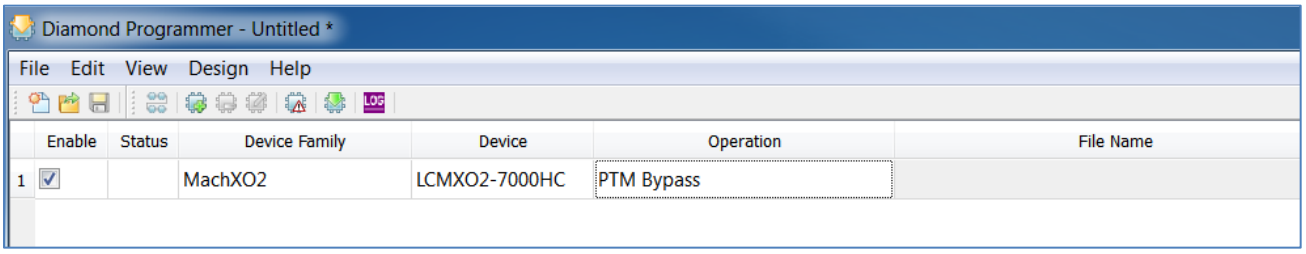


Figure 5.20. ASC Socket – Ready to Program Step

8. Program the ASC device through XO2 device on the Smart Socket board by clicking the **Program** icon  as shown in Figure 5.21.

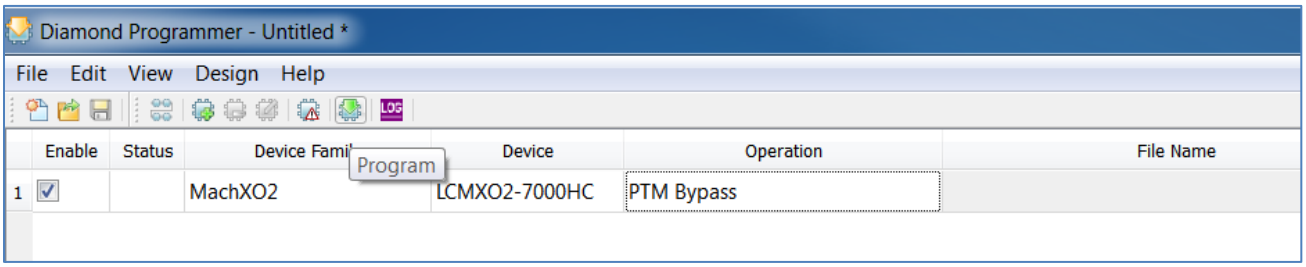


Figure 5.21. ASC Socket – Programming

9. When the programming of the device is completed, the **Status** option changes to *PASS* and *Operation Successful* message appears in the **Output** console as shown in Figure 5.22. During the programming activity the MXO2_SDA and MXO2_SCL LED light are blinking on the board showing communication between the XO2 and ASC device. *Done* is not a dedicated output in the MachXO2 family. *Done* LED indication is not supported.

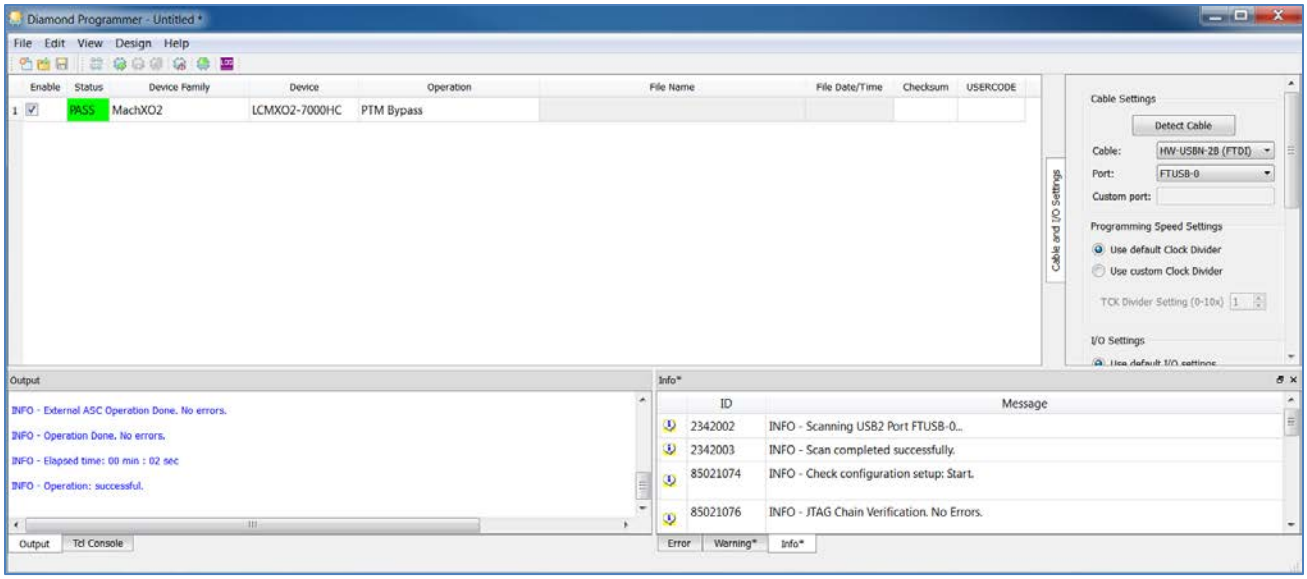


Figure 5.22. ASC Socket – Programming Completed

5.2.4. iCE Family Programming

1. Launch the Lattice Diamond Programmer software.

   The scanning of the device fails as the Scan operation is supported over JTAG interface only, and the iCE family of devices uses SPI interface for programming. See Figure 5.23.

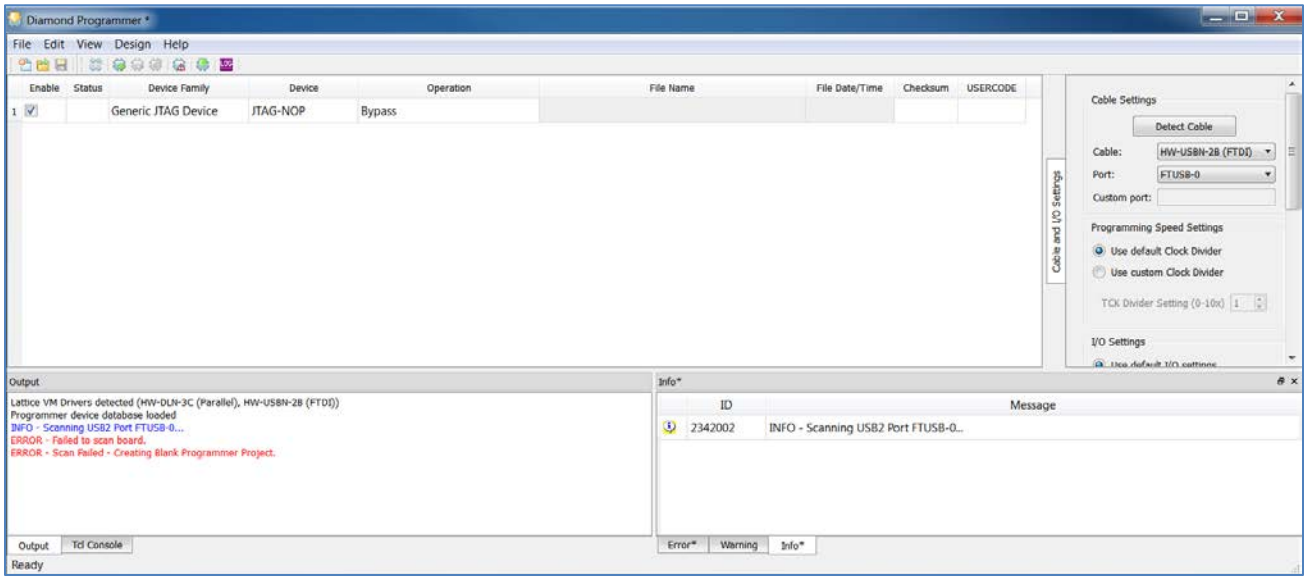


Figure 5.23. iCE Family – Scanning Failed

2. Manually select the device by choosing the following options as shown in Figure 5.24.

   Device Family: iCE5LP (select the appropriate device from the dropdown list)

   Device: iCE5LP1K (choose the size of the device based on the device present in the socket)

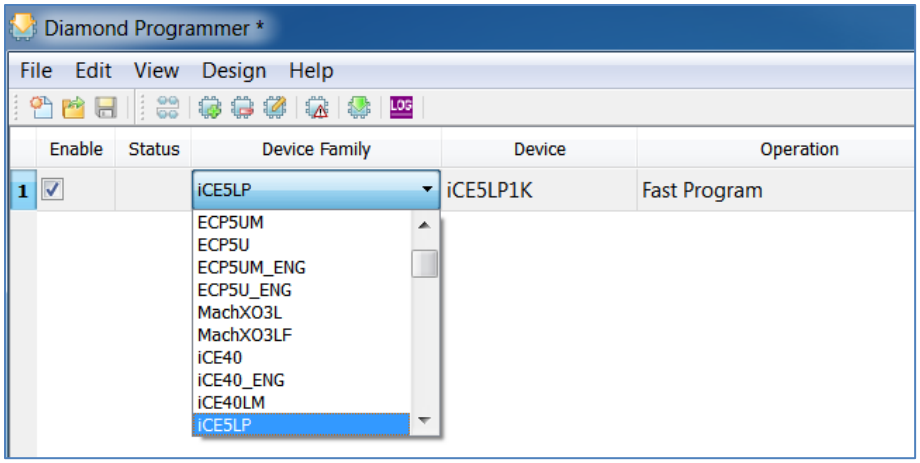


Figure 5.24. iCE Family – Device Family List

3. Select the programming file that you want to program in the iCE device by double clicking the button below the **File Name** tab as shown in Figure 5.25.

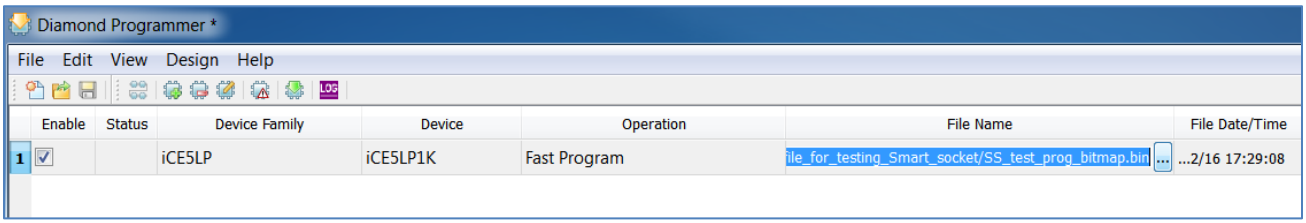


Figure 5.25. iCE Family – Select the Programming File

4. Click the **Program** icon to program the device as shown in Figure 5.26.

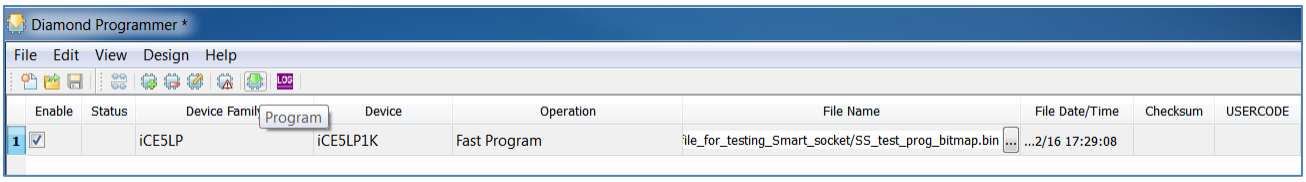


Figure 5.26. iCE Family – Program Icon

5. When the programming of the device is completed, the **Status** option changes to *PASS* and *Operation Successful* message appears in the **Output** console as shown in Figure 5.27.

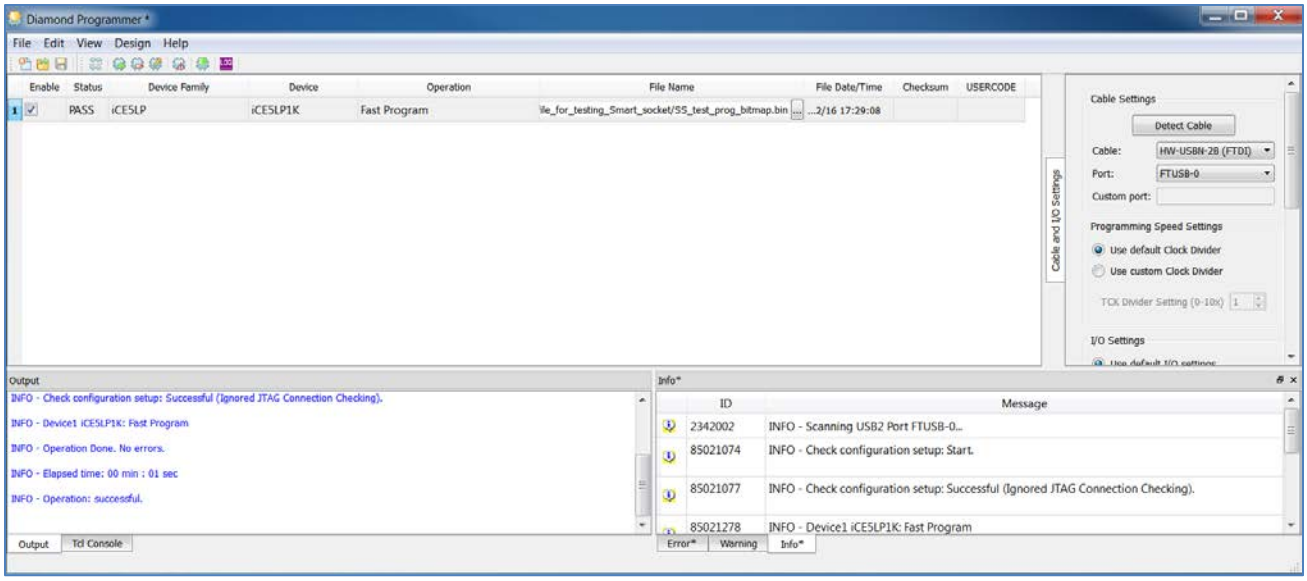


Figure 5.27. iCE Family – Programming Completed Successfully

6. Ordering Information

Ordering part numbers for a particular socket are available at http://www.latticesemi.com/sockets

Technical Support

For assistance, submit a technical support case at www.latticesemi.com/techsupport

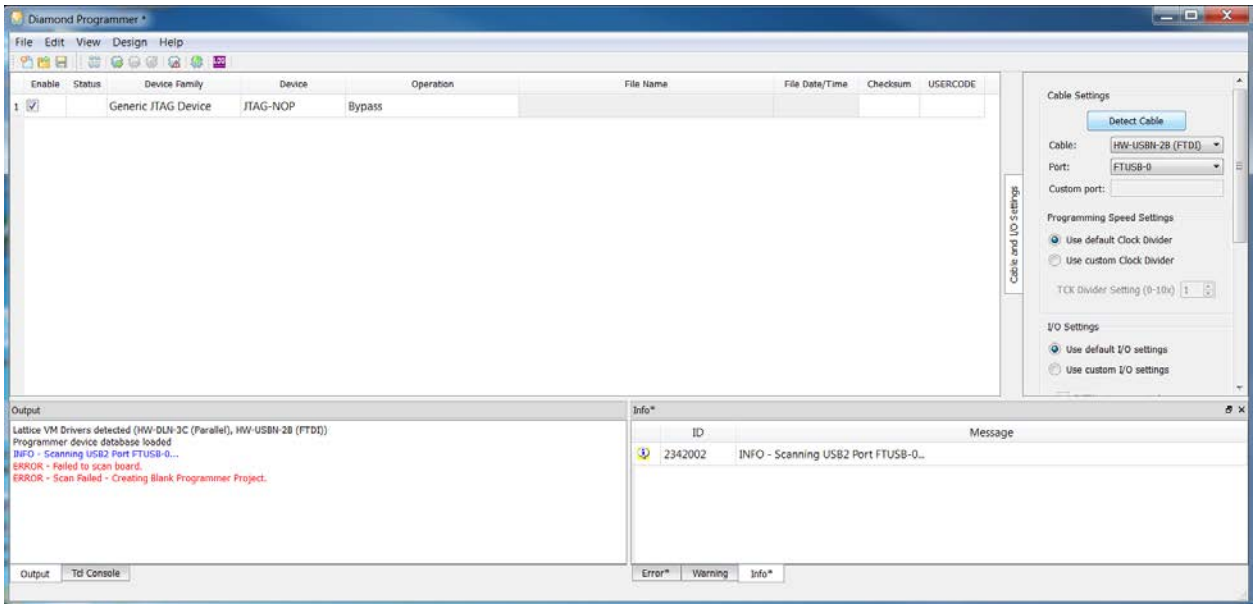
Revision History

Date	Version	Change Summary
February 2016	1.0	Initial release.

Appendix A: Debugging

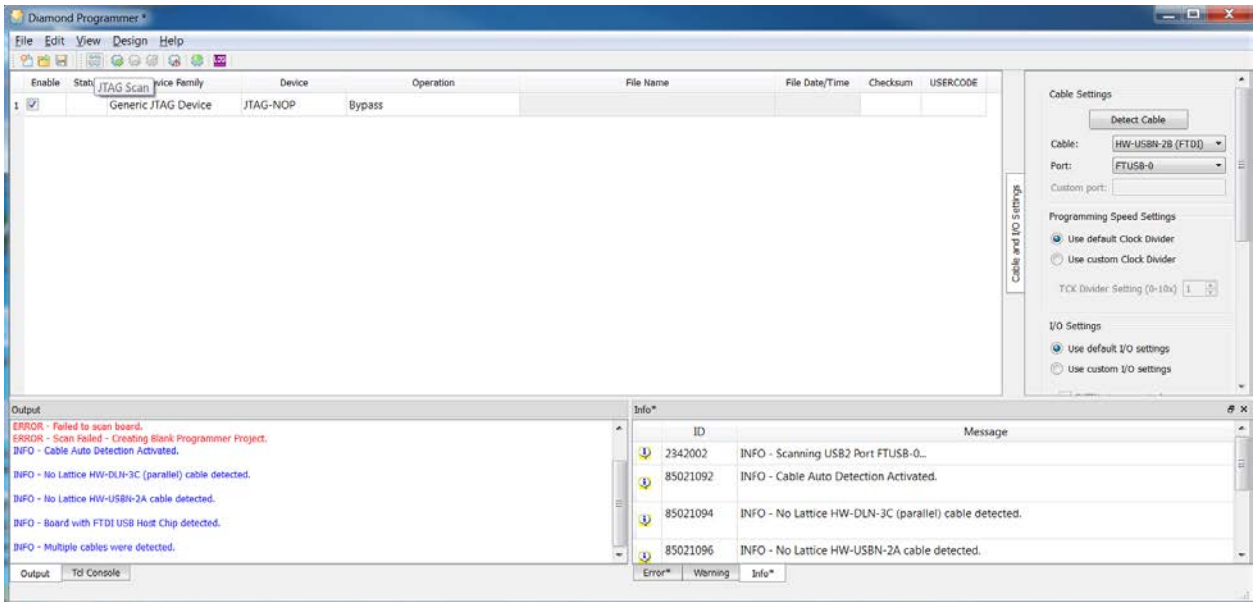
Check the following if the programming fails:

- USB power supply
- ON/OFF switch is turned ON to provide power to the socket
- Device scanning failed



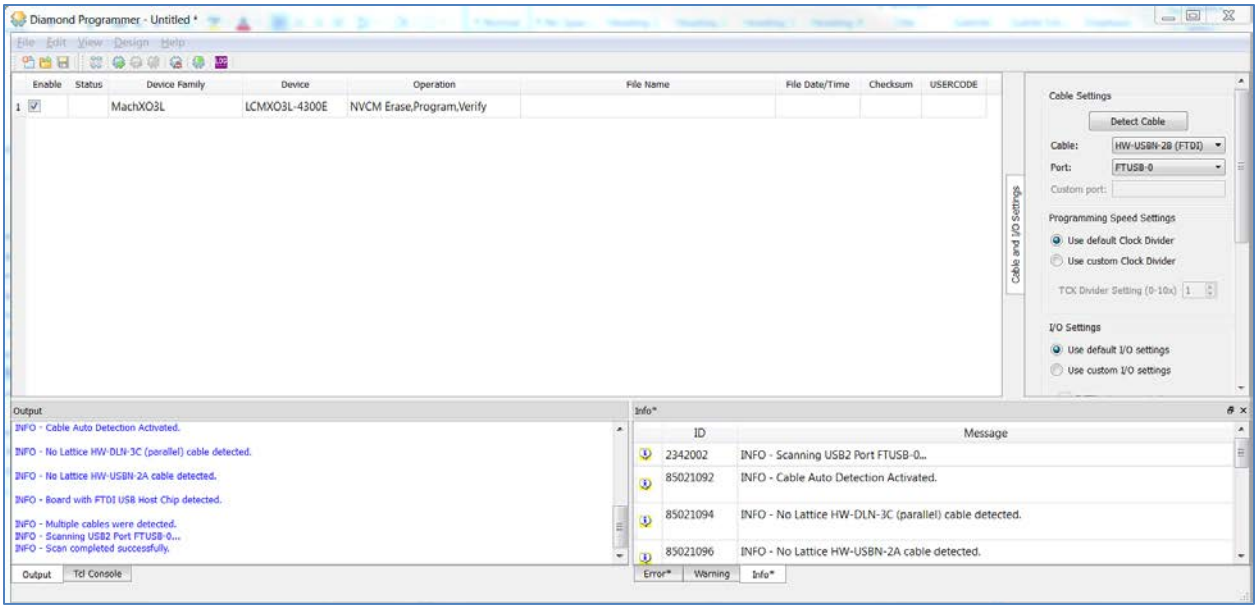
Failed to Scan Device

Click the **Detect Cable** button and the Diamond Programmer starts detecting all the cables attached to USB ports. In the **Cable** tab select the option which has the FTDI as shown in the figure below.



Detect Cable (FTDI)

Ensure that the ON/OFF switch is turned to the ON position. The Diamond Programmer starts scanning the device in the socket. When the scan is completed, the exact device present in the socket appears in the **Device** tab as shown in the figure on the next page.



Scanning Completed

5555 NE, Moore Court
Hillsboro, OR 97124, USA
T 503.268.8000
www.latticesemi.com