Chapter 8

Programming the EPCS Device

This chapter describes how to program the serial configuration (EPCS) device with Serial Flash Loader (SFL) function via the JTAG interface. Users can program EPCS devices with a JTAG indirect configuration (.jic) file, which is converted from a user-specified SRAM object file (.sof) in Quartus. The .sof file is generated after the project compilation is successful. The steps of converting .sof to .jic in Quartus II are listed below.

8.1 Before Programming Begins

The FPGA should be set to AS x1 mode i.e. MSEL[4..0] = “10010” to use the Flash as a FPGA configuration device, as shown in Figure 8-1.

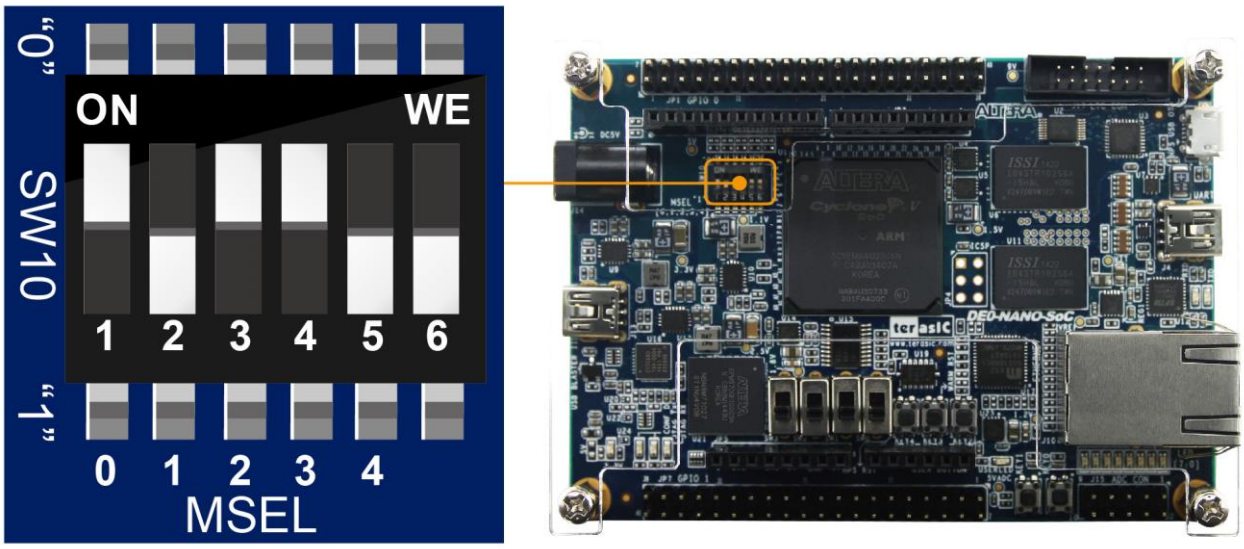

Figure 8-1 DIP switch (SW10) setting of Active Serial (AS) mode

8.2 Convert .SOF File to .JIC File

1. Choose **Convert Programming Files** from the File menu of Quartus II, as shown in Figure 8-2.

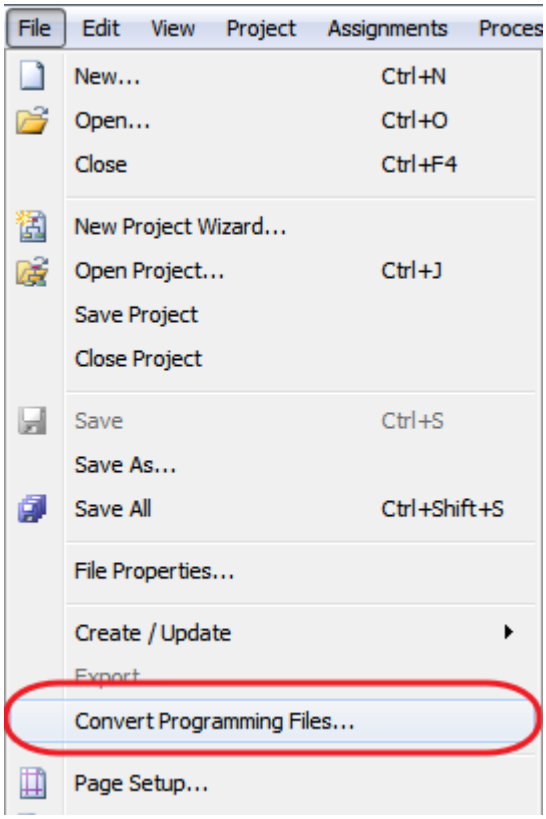

Figure 8-2 File menu of Quartus II

2. Select **JTAG Indirect Configuration File (.jic)** from the **Programming file type** field in the dialog of Convert Programming Files.

3. Choose **EPCS128** from the **Configuration device** field.

4. Choose **Active Serial** from the **Mode** filed.

5. Browse to the target directory from the **File name** field and specify the name of output file.

6. Click on the **SOF data** in the section of **Input files to convert**, as shown in Figure 8-3.

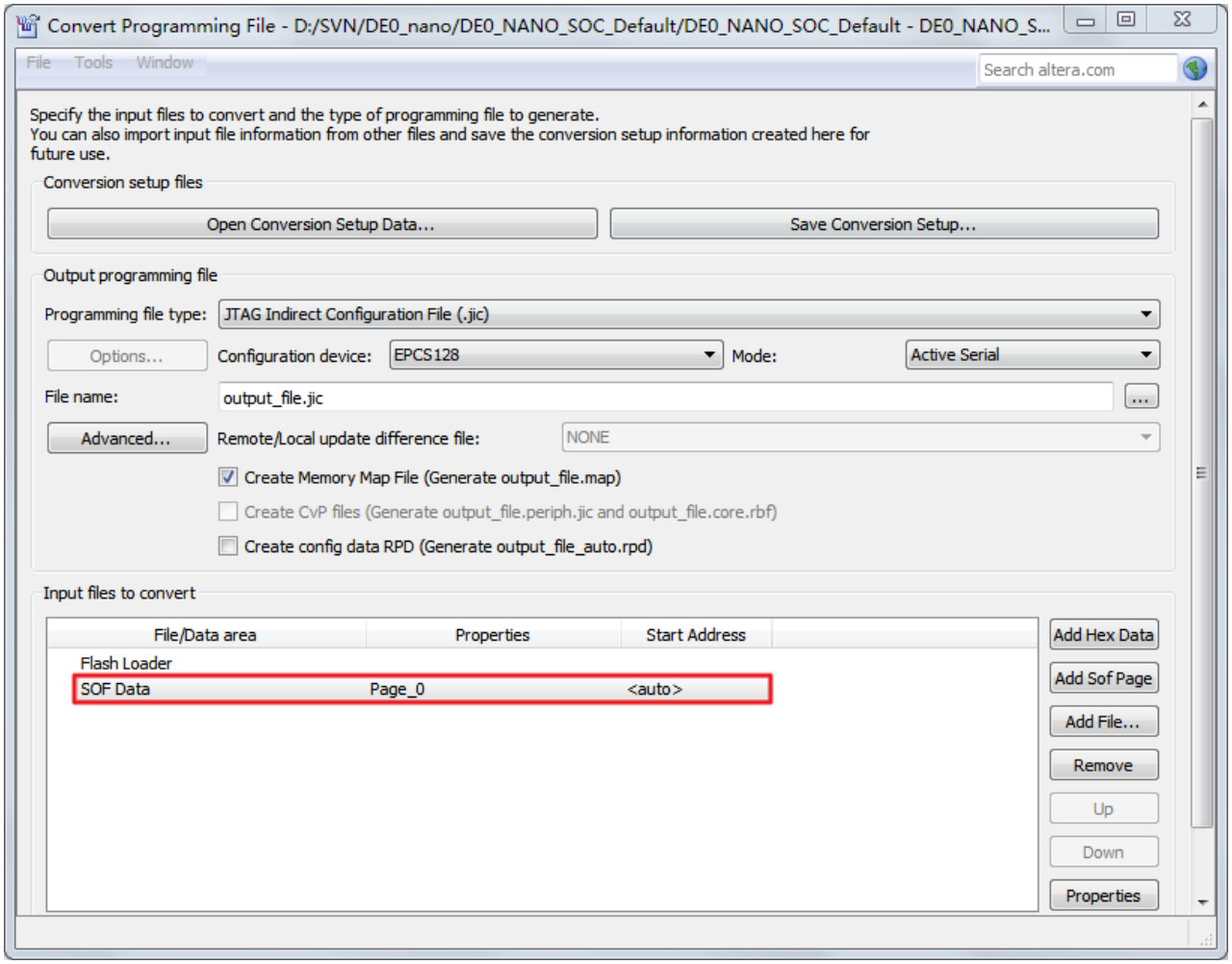

Figure 8-3 Dialog of "Convert Programming Files"

7. Click **Add File**.

8. Select the .sof to be converted to a .jic file from the Open File dialog.

9. Click **Open**.

10. Click on the **Flash Loader** and click **Add Device**, as shown in **Figure 8-4.**

11. Click **OK** and the **Select Devices** page will appear.

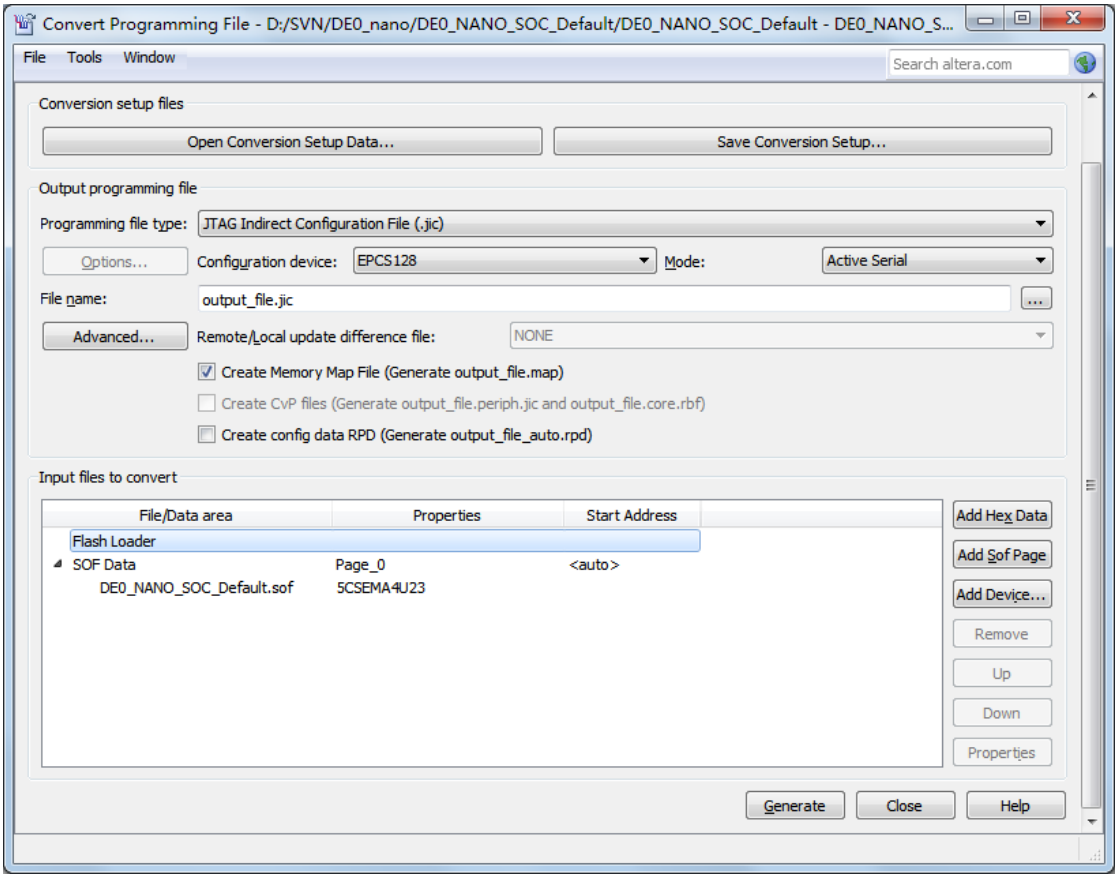

Figure 8-4 Click on the "Flash Loader"

12. Select the targeted FPGA to be programed into the EPCS, as shown in **Figure 8-5**.

13. Click **OK** and the **Convert Programming Files** page will appear, as shown in **Figure 8-6**.

14. Click **Generate**.

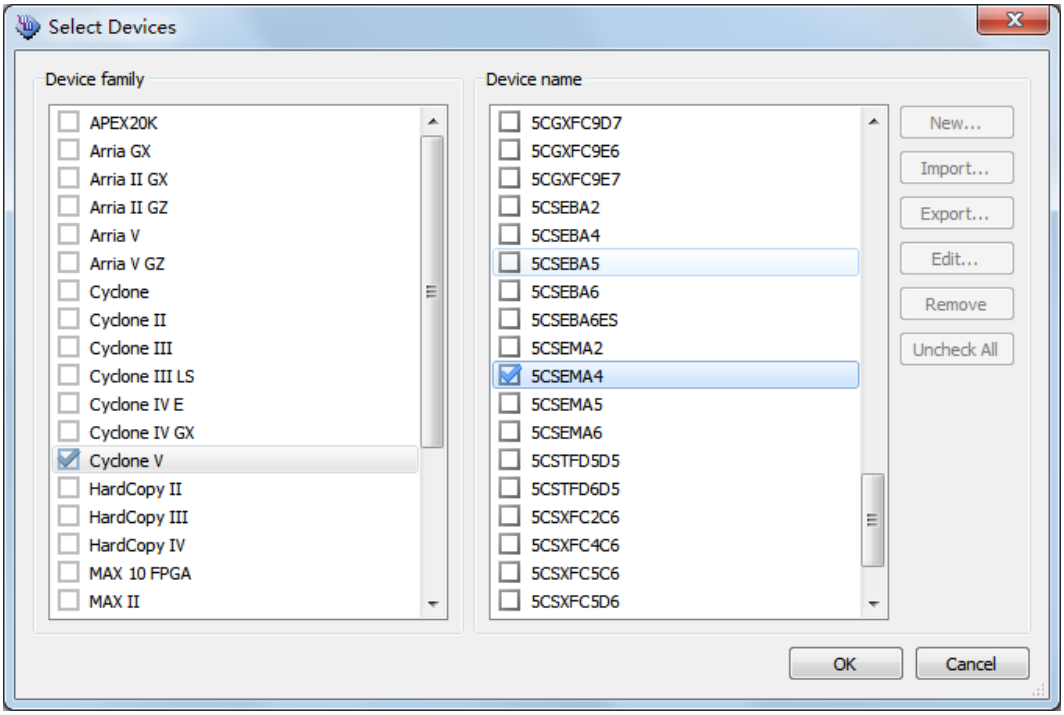

Figure 8-5 "Select Devices" page

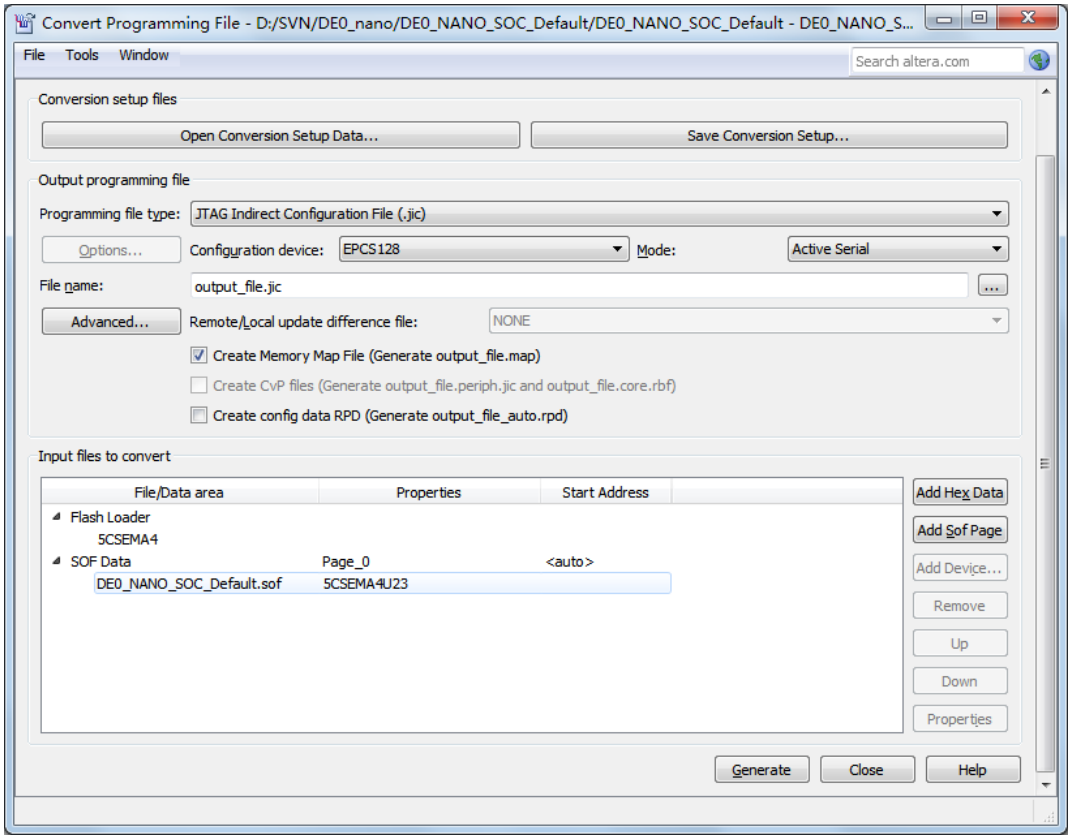

Figure 8-6 "Convert Programming Files" page after selecting the device

8.3 Write JIC File into the EPCS Device

When the conversion of SOF-to-JIC file is complete, please follow the steps below to program the EPCS device with the .jic file created in Quartus II Programmer.

1. Set MSEL[4..0] = “10010”

2. Choose **Programmer** from the Tools menu and the **Chain.cdf** window will appear.

3. Click **Auto Detect** and then select the correct device(5CSEMA4). Both FPGA device and HPS should be detected, as shown in **Figure 8-7.**

4. Double click the red rectangle region shown in **Figure 8-7** and the **Select New Programming File** page will appear. Select the .jic file to be programmed.

5. Program the EPCS device by clicking the corresponding **Program/Configure** box. A factory default SFL image will be loaded, as shown in **Figure 8-8**.

6. Click **Start** to program the EPCS device.

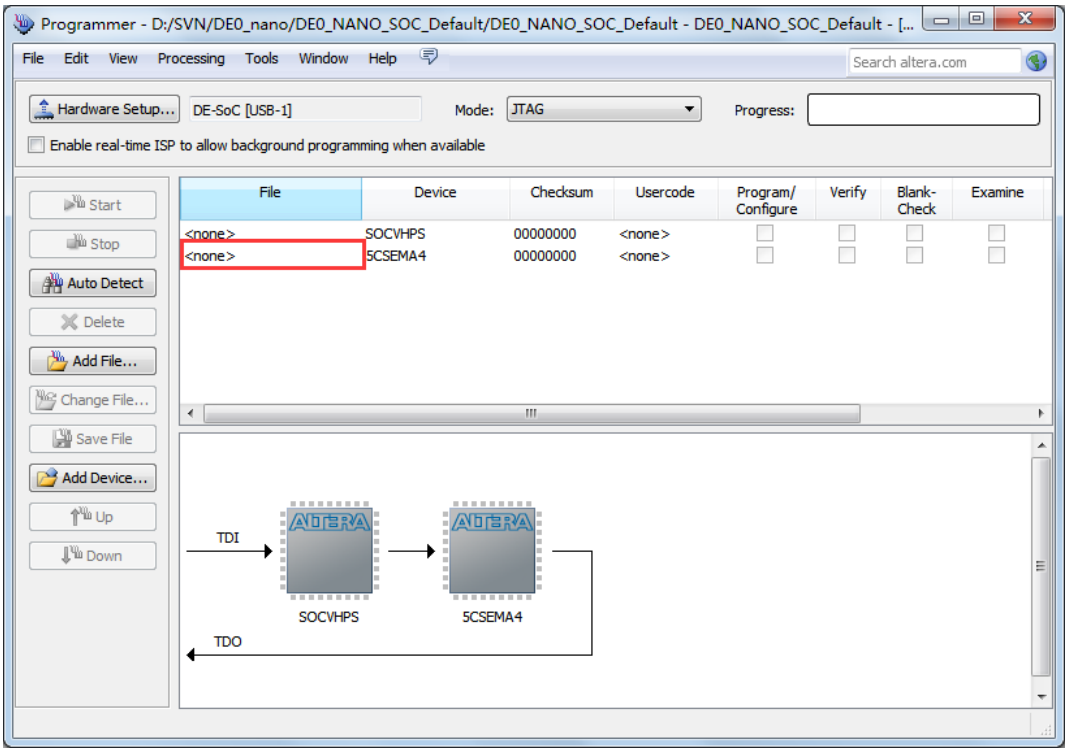

Figure 8-7 Two devices are detected in the Quartus II Programmer

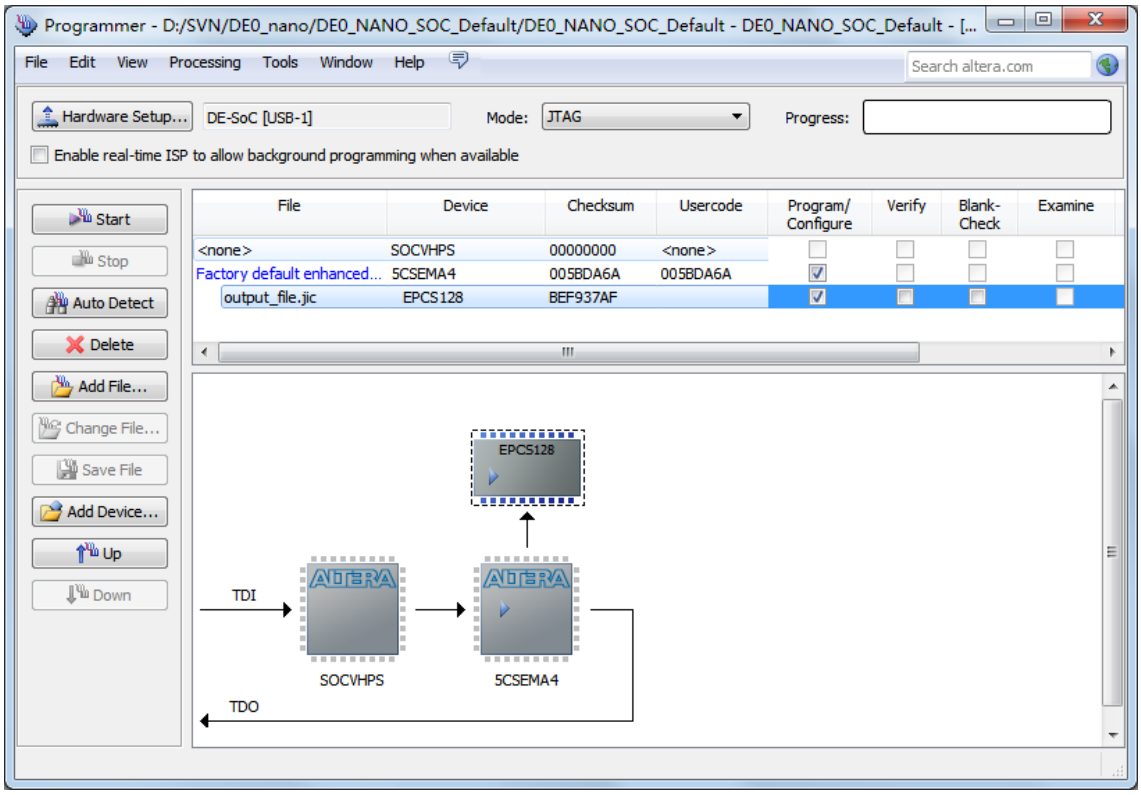

Figure 8-8 Quartus II programmer window with one .jic file

8.4 Erase the EPCS Device

The steps to erase the existing file in the EPCS device are:

1. Set MSEL[4..0] = “10010”

2. Choose **Programmer** from the **Tools** menu and the **Chain.cdf** window will appear.

3. Click **Auto Detect**, and then select correct device, both FPGA device and HPS will detected. (See **Figure 8-7**)

4. Double click the red rectangle region shown in **Figure 8-7**, and the **Select New Programming File** page will appear. Select the correct .jic file.

5. Erase the EPCS device by clicking the corresponding **Erase** box. A factory default SFL image will be loaded, as shown in **Figure 8-9**.

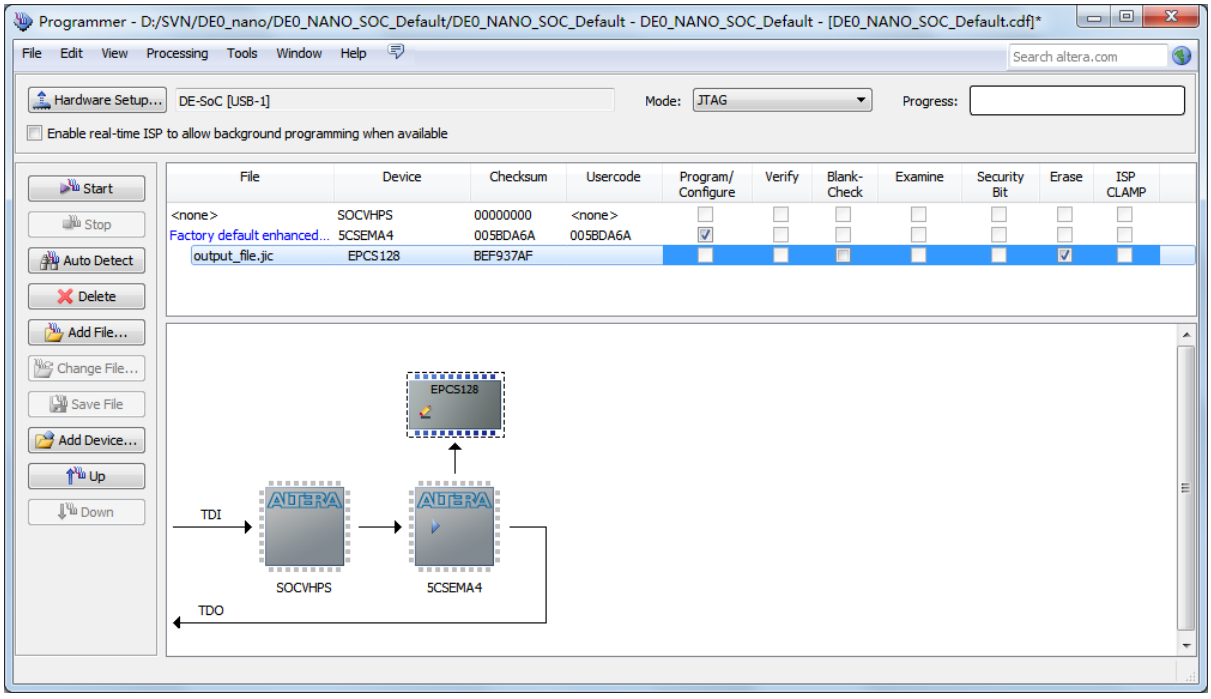

Figure 8-9 Erase the EPCS device in Quartus II Programmer

6. Click **Start** to erase the EPCS device.

8.5 EPCS Programming via nios-2-flash-programmer

Before programming the EPCS via nios-2-flash-programmer, users must add an EPCS patch file nios-flash-override.txt into the Nios II EDS folder. The patch file is available in the folder Demonstation\EPCS_Patch of DE0-Nano-SoC System CD. Please copy this file to the folder [QuartusInstalledFolder]\nios2eds\bin (e.g. C:\altera\14.1\nios2eds\bin)

If the patch file is not included into the Nios II EDS folder, an error will occur as shown in **Figure 8-10**.

```
Using cable "USB-Blaster [USB-0]", device 1, instance 0x00
Resetting and pausing target processor: OK
No EPCS layout data - looking for section [EPCS-010216]
Unable to use EPCS device
Leaving target processor paused
```

Figure 8-10 Error Message "No EPCS Layout Data".

8.6 Nios II Boot from EPCS Device in Quartus II v14.1

There is a known problem in Quartus II software that the Quartus Programmer must be used to program the EPCS device on DE0-Nano-SoC board.

Please refer to Altera's website here with details step by step.