Introduction

Lattice Semiconductor products can be configured or downloaded using a variety of hardware/software methods. The options include the ispDOWNLOAD® cable and a parallel port interface, the USB cable interface, embedded microprocessor solutions and complex tester hardware based systems as well as hardware based programming stations. This application note describes how to program the ispPAC products using ispVM System Software.

PAC-Designer's JTAG programming capabilities are intended for the development and debugging of prototypes. If more than a few ispPAC devices need to be programmed, increased throughput can be realized with Lattice's free ispVM System software. Figure 1 shows the ispVM user interface. This software utility also provides the ability to program multiple ispPAC devices in a chain, as depicted in Figure 2. ispVM's JTAG chain support enhances PAC-Designer's flexibility by allowing a greater variety of devices to be configured as a JTAG chain. V_{SUPPLY} is a user-provided power source that powers all of the ispPAC devices, as well as the buffer circuitry in the ispDOWNLOAD cable during programming. The ispVM System is available for Windows®, Solaris® and Linux platforms. Using ispVM System, ispPAC Devices, as well as other IEEE 1149.1-compliant devices, can be easily be programmed from JEDEC or SVF files generated by PAC-Designer® or other development software.

When ispPAC-POWR devices are used with other programmable devices, it is strongly recommended that the ispPAC-POWR devices be placed on a separate JTAG chain so that the ispPAC-POWR devices can be programmed first. This will allow for the ispPAC-POWR devices to properly sequence the power for the rest of the system components for programming.

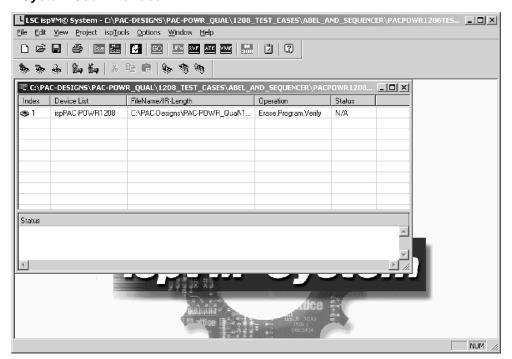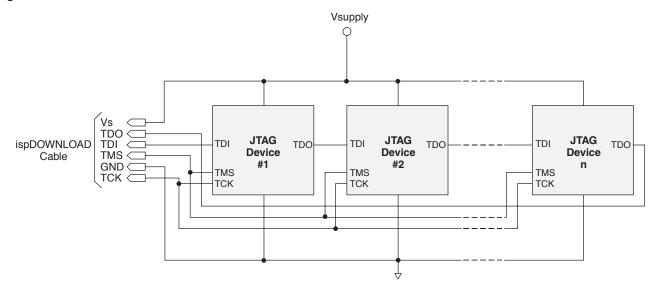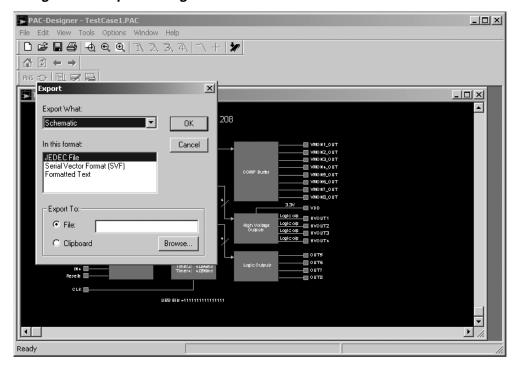*Figure 1. ispVM System User Interface*

Figure 2. JTAG Device Chain

Obtaining JEDEC or SVF Output From PAC-Designer

If you are using a device from the Power Manager family, you must first successfully compile either the LogiBuilder sequence or the ABEL source for your design to obtain valid JEDEC or SVF output from PAC-Designer. This precaution does not apply to other ispPAC devices. Make the Schematic window in PAC Designer active. From the toolbar, select File> Export... You will see the dialog box shown in Figure 3. When exporting a ispPAC-POWR design, the setting of the "Export What" pulldown can be ignored because it only affects formatted text output and has no effect on JEDEC or SVF output. With other PAC devices, "Schematic" must be selected in order to export the design.

Figure 3. PAC-Designer File Export Dialog

The brief descriptions below explain the key differences between JEDEC and SVF. Select the desired file format and enter the name of the output file in the text field of the "Export To" area of the dialog box. You may also click on the "Browse..." button to bring up the file manager.
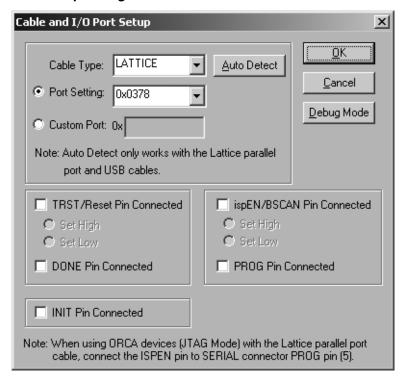
JEDEC (Joint Electron Device Engineering Council): This type of file contains the raw bit data that is to be written to the programmable device but does not contain information on register size, timing requirements, etc. In order to use JEDEC files, the programming system must be set up for the specific types of devices that you wish to program.

SVF (Serial Vector Format): This type of file contains more detailed instructions on how the device programming is to be performed. These files are designed to be platform-independent, and the programming system does not need to recognize specific models of programmable devices in order to successfully write data to them. SVF allows for the use of third-party programming systems with ispPAC devices.

ispVM Configuration

If this is the first time that ispVM is being used on your system, you should check the download cable and I/O port settings to be sure that they are correct. Start ispVM and select Options> Cable and I/O Port Setup... from the toolbar. You will see a dialog box like that shown in Figure 4. If you are using an ispDOWNLOAD parallel port cable, select LATTICE as the cable type and make sure that the port setting matches the address of your printer port, as set up in your computer's BIOS. If you are using a USB download cable, select USB for the cable type; you do not need to manually set any port parameters when using a USB download cable. Click the "OK" after verifying that all of the settings are correct.
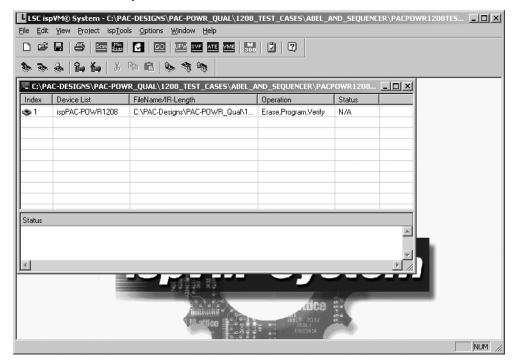
Figure 4. Cable and I/O Port Setup Dialog

Programming From JEDEC Files

In ispVM, the default mode of operation is to put together a JTAG chain, with configuration based on JEDEC files. When ispVM is started, a window containing a list of the devices in the JTAG chain will be displayed, as shown in Figure 5. If ispVM has not been used before, or if a new chain has been started, the list will be blank. If you need to begin a new JTAG chain configuration, select File> New from the toolbar.

Figure 5. ispVM JTAG Chain Setup Window

JTAG devices can be added to the list in two ways: ispVM can automatically insert them into the list based on the ID codes read from the devices in the chain or the devices can be added manually. The first method only requires connecting the chain of JTAG devices to the ispDOWNLOAD cable and clicking on the "SCAN" button on the tool-bar. In order to perform an automatic scan, however, all of the devices in the chain must support blind interrogation (blind interrogation is an industry-standard method of retrieving the ID code that is supported by all Lattice products that program through the JTAG interface).

Devices with ID codes not recognized by ispVM will be inserted into the JTAG chain as "JTAG-NOP," which stands for no operation. The default is that these devices will be placed into bypass mode and not be programmed by ispVM. If you want ispVM to program these parts, first, you must obtain an SVF file from the appropriate develop-ment software. You can then double-click on the desired device in the JTAG chain list; this will bring up the JTAG Device Information dialog shown in Figure 7. From there, the device can be changed from JTAG-NOP to JTAG-SVF and the appropriate SVF data file can be selected.

If automatic scanning is not feasible, devices can be added manually to the JTAG chain by pressing the <INSERT> key, selecting Edit>Add Device (Figure 6), or clicking on the Add Device icon on the toolbar. When a device is inserted into the chain, the dialog box shown in Figure 7 appears. The target device and the appropriate data file are selected from this dialog.

Figure 6. Adding a JTAG Device From the Edit Menu
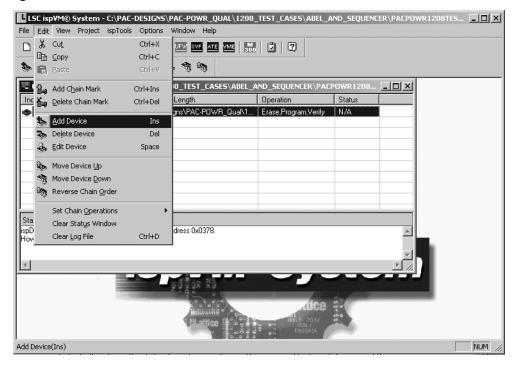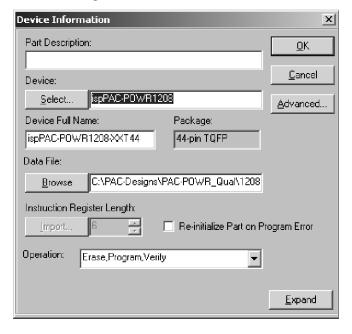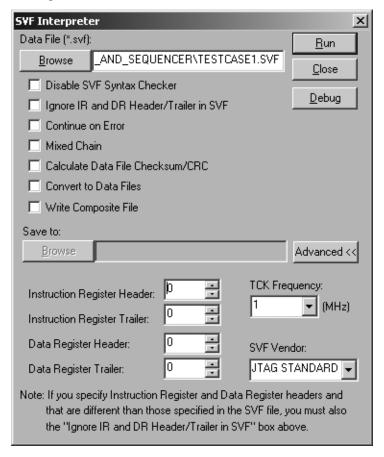

Figure 7. JTAG Device Information Dialog

Once the JTAG chain has been set up, save the design by selecting File> Save As... from the toolbar. ispVM System uses the file extension ".xcf" for JTAG chain configuration files. Programming is accomplished by clicking on the green "GO" button.

Once a JTAG chain has been set up as described above, it can be re-used simply by opening it in ispVM (by selecting File> Open) and clicking the green "GO" button. The JEDEC files can be updated, as long as their names and paths do not change, without having to make any changes to the chain setup in ispVM.

Programming From SVF Files

Select ispTools> SVF Interpreter from the toolbar to program from an SVF source file. A dialog box like that shown in Figure 8 will appear. Enter the path and name of the SVF file in the text entry field at the top of the dialog or click the "Browse" button to bring up the file manager. The file can be run directly from the SVF Interpreter window; click "Run" to download. The SVF Interpreter window can also be used to access the SVF debugger and to set advanced options.
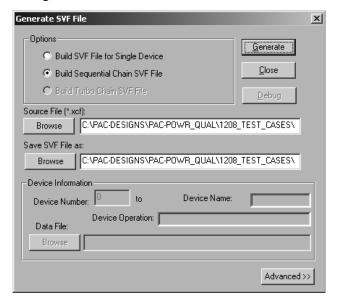
Figure 8. SVF Interpreter Dialog

Creating SVF files from JEDEC files in ispVM

With ispVM, it is possible to export a JTAG chain configuration and its associated JEDEC programming data as an SVF file. This capability is useful if you want to move the JTAG chain programming to a different system. To perform an SVF export of your JTAG chain, click on the blue SVF button. Note that a JTAG chain configuration file containing at least one device entry must be open in order for this button to be active. The dialog shown in Figure 9 will appear. Enter the appropriate .xcf JTAG chain configuration file into the Source File text entry field. Click on the "Generate" button to produce SVF output.

Figure 9. Generate SVF File Dialog

Summary

In this application note, the use of ispVM System to program ispPAC devices and JTAG chains containing ispPAC devices has been demonstrated. ispVM System augments the JTAG programming capabilities of PAC-Designer by improving throughput and incorporating support for chains of ispPAC-POWR products.

Related Literature

• ispVM System Software Data Sheet

• ispVM System Installation Notes for UNIX and Linux

• Lattice Application Note #AN6047, Powering Up and Programming the ispPAC-POWER1208

• Lattice Technical Note #TN1019, Using ispMACH™ 4000 Devices in Multiple JTAG Voltage Environments

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