Power Calculator Introductory Guide

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Type Conventions Used in This Document

Convention	Meaning or Use
Bold	Items in the user interface that you select or click. Text that you type into the user interface.
<Italic>	Variables in commands, code syntax, and path names.
Ctrl+L	Press the two keys at the same time.
`Courier`	Code examples. Messages, reports, and prompts from the software.
`...`	Omitted material in a line of code.
`.` `.` `.`	Omitted lines in code and report examples.
`[ ]`	Optional items in syntax descriptions. In bus specifications, the brackets are required.
`( )`	Grouped items in syntax descriptions.
`{ }`	Repeatable items in syntax descriptions.
`|`	A choice between items in syntax descriptions.

Contents

Power Calculator Introductory Guide

This guide describes the new features of the Power Calculator in 7.0 and later releases and explains how to import design files compiled in other releases into the Power Calculator. It also provides troubleshooting information.

New Features

Power Calculator version 7.0 and later releases is completely new and features greater granularity and more functionality than the previous version. It also offers a new graphical user interface.

Graphical User Interface

Power by block includes both dynamic and static (for used and unused resources) power for the block.

Static current and power per supply includes static leakage for both used and unused resources.

Individual tabs include only the dynamic current calculations. The static current for the resources is added to the current and power values in the Report tab and the Power Summary tab.

The cells in the tabs are color-coded as follows:

- White indicates that the cell is editable
- Gold indicates that the cell is read-only or contains output from the software.
- Cyan (turquoise) indicates that the cell contains data imported from an .ncd file, a package thermal file, or both. You can edit the contents of the cell.

Design-rule checking is based on device capture in the software.

The fields for logic blocks, clocks, DSP blocks, PLL/DLLs, and the summary report are similar to those in the previous version of the Power Calculator. The I/O tab features added modeling for external output terminations (static loads) and default values (resistive load) for Rth and Vth. Block RAMs are now separated into SP RAMs, DP RAMs, and DP True RAMs. Additionally, release 7.1 adds an I/O Termination tab, which shows the power used by the termination on the I/Os. This figure is actually a static number rather than the dynamic number shown in the other tabs.

Menus

The Edit menu contains a new option, Estimation Mode Settings, which is described in “Estimation Mode” on page 5.

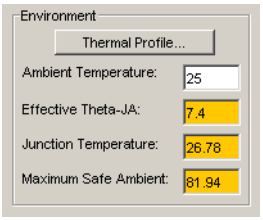
Instead of using the wizard, which has been removed, you can now enter the resource utilization directly in the tabs. You do not need to specify internal routing resource utilization.

Thermal Profiles

The Power Calculator in the 7.0 and later releases includes a selection of board, heat-sink, and airflow options. You can choose among the various combinations or override them with your own theta-JA effective thermal resistance value. All values are in degrees Celsius per watt (°C/W).

In the Power Summary tab in the Power Calculator window, you can change the default thermal environment by selecting the Thermal Profile button, shown in Figure 1.

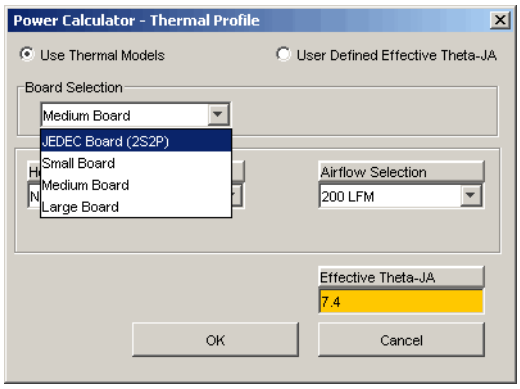
Figure 1: Thermal Profile Button



In the Thermal Profile dialog box, you see boxes for boards, heat sinks, and airflow.

In the Board Selection menu, shown in Figure 2, you can choose between JEDEC-defined Theta JA values, a small board, a medium board, or a large board.

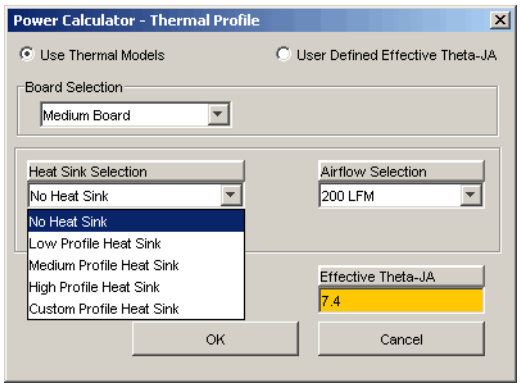
Figure 2: Board Selection Menu



Below the boards are the heat-sink selections, which are based on industry-standard copper-pin heat sinks. The heat-sink values include the thermal resistance of the thermal interface material, which is used to connect a heat sink to the top of a package. The thermal interface thermal value is 1.6°C-cm/W.

Low-, medium-, and tall-profile copper heat-sink thermal values are provided as guidelines for you. Many factors will cause the actual values to vary, including the actual airflow through the heat sink, the pressure on the heat sink, and thermal interface material.

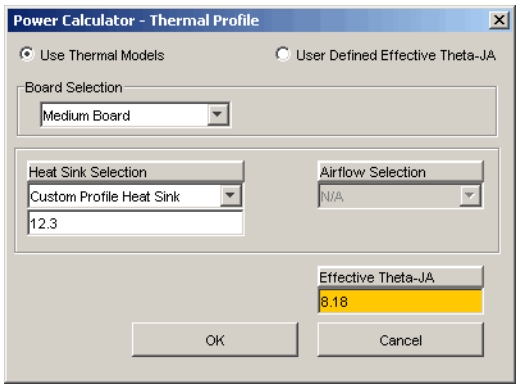
Figure 3: Heat Sink Selection Menu



If you want to use your own heat-sink thermal value or adjust for a different thermal interface material, choose **Custom Profile Heat Sink** in the Heat Sink Selection menu, type in your own value in the box below Heat Sink

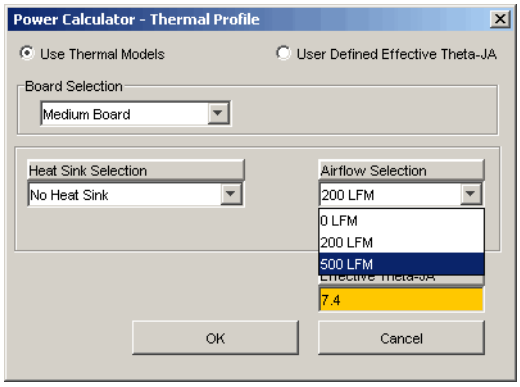
Selection, as shown in Figure 4, then choose **OK**. Theta JC for this package is added to your heat sink value and used in the calculations.

Figure 4: Specifying a Custom Heat Sink



You can also change the airflow to accommodate your new board selection. The JEDEC values in the Airflow Selection menu are Theta JA at 0 LFM, 200 LFM, and 500 LFM, as shown in Figure 5. They correspond to results measured from a 2S2P JEDEC board in JEDEC-defined test chambers. You can use the airflow values with both the board selection and the heat sinks. These change in value, depending on your current selection. There is no zero airflow for heat sinks.

Figure 5: Airflow Selection Menu



Estimation Mode

The new Power Calculator offers an intelligent estimation algorithm that calculates routing resource utilization based on the component (logic, EBR, I/O, DSP, PLL/DLL, and so forth) utilizations that you provide. Calculation is based on the statistical analysis of hundreds of designs. Using the block resources that you specify, the algorithm calculates internal routing lines (x0, x1, x2, x6, ISBs) and clock-tree utilization. You can select low, medium, or high routing utilization.

Importing Designs into Power Calculator 7.0 and Later

The database for some of the newer devices in ispLEVER has been updated to make the ispLEVER tools run faster and more efficiently. The placed and routed design (*.ncd) files for these devices must be updated to this new database.

Because of the enhancements to the Power Calculator's capabilities in the 7.0 and later releases, you cannot open Power Calculator Project (*.pep) files created in versions prior to 7.0 in the new Power Calculator.

Newer Design Families Placed and Routed in Previous Releases

You can import into the Power Calculator LatticeECP2, LatticeECP2M, LatticeXP2, LatticeSC, and LatticeSCM designs placed and routed in release 7.0 SP2. You can also import designs placed and routed in release 6.1 or earlier, but you must place and route them again to update the .ncd files to ispLEVER 7.1 design files.

To import the design files into the Power Calculator:

1. Load the design into the Project Navigator.
2. Double-click **Place & Route Design**.
3. Choose **Tools > Power Calculator**.
4. In the Power Calculator main window, choose **File > New** or click  to activate the Power Calculator - New Project dialog box.
5. In the **Project Name** box, type in a name for your Power Calculator project.
6. In the **Project Directory** box, enter the path and name of the directory where the Power Calculator project (*.pep) file will be stored. You can use the Browse button to browse to the correct directory. By default, the file is stored in the main project folder.
7. In the **NCD File** box, enter the path and name of the new .ncd file to use. You can use the Browse button to browse to the correct directory.
8. Click **Finish**.

Older Design Families Placed and Routed in Previous Releases

You can directly import LatticeECP/EC, LatticeXP, and MachXO designs placed and routed in release 6.1 or earlier. Because there has been no change to the database for these devices, the .ncd files are compatible between ispLEVER 7.0 and previous versions.

All Design Families Placed and Routed in ispLEVER 7.0 or Later

You can import new designs for all devices if you have placed and routed them with ispLEVER 7.0 or later software. The design files for these designs were created with the new database. To import these files, you invoke the Power Calculator and create a new Power Calculator project.

To import the design files into the Power Calculator:

1. Choose **Tools > Power Calculator**.
2. In the Power Calculator main window, choose **File > New** or click  to activate the Power Calculator - New Project dialog box.
3. In the **Project Name** box, type in a name for your Power Calculator project.
4. In the **Project Directory** box, enter the path and name of the directory where the Power Calculator project (*.pep) file will be stored. You can use the Browse button to browse to the correct directory. By default, the file is stored in the main project folder.
5. In the **NCD File** box, you can optionally enter the path and name of the correct .ncd file to use. You can use the Browse button to browse to the correct directory.

   If an .ncd file is available in the project directory, its path and name is automatically placed in the NCD File field.
6. Click **Finish**.

Troubleshooting

You may encounter the following issues in using the 7.0 or later version of the Power Calculator.

False Error Message Issued for LatticeSC Estimation Mode

When you add EBR blocks to LatticeSC designs and the Power Calculator is in estimation mode, the tool generates an error indicating that the number of available EBR blocks has been exceeded.

Current and Power are Different in Calculation and Estimation Modes

Current and power are different in calculation and estimation modes. Calculation mode uses data from the exact utilization in the .ncd file, including routing resources. Any change in the information extracted from the .ncd file puts the Power Calculator into estimation mode and starts the estimation mode routing resource calculation algorithm. However, the Power Calculator cannot return to calculation mode once it is in estimation mode. Even if you select the same device, the tool remains in estimation mode.

SERDES Power Supplies Are Not Listed for LatticeSC Devices

SERDES power supplies are not listed for LatticeSC devices. In this version of the Power Calculator, the coefficients are characterized to work with VCC. The power for the SERDES channel is added in the VCC section, and the number is correct.

LatticeSC and LatticeSCM Devices Have Too Many Suffixes in I/O Tab

The I/O types for the LatticeSC and LatticeSCM devices now indicate the internal terminations, if used. Each legal combination is now in the form *IOType-Termination Information-Drive Strength*.

SERDES Tab Options Are Different for LatticeSC and LatticeECP2M Devices

SERDES tab options are different for LatticeSC and LatticeECP2M devices, because of the way the SERDES blocks are characterized. The SERDES channel power in LatticeSC devices depends on the gearing ratio and the transmitter pre-emphasis and is independent of the SERDES modes. SERDES channel power in LatticeECP2M devices is characterized to be dependent on the mode in which SERDES is operating.