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Welcome to SmartPower

Welcome to SmartPower, Actel’s state-of-the-art power analysis tool. SmartPower enables you to globally and in-depth visualize power consumption and potential power consumption problems within your design, so you can make adjustments – when possible – to reduce power.

SmartPower provides a detailed and accurate way to analyze designs for Actel FPGAs: from top-level summaries to deep down specific functions within the design, such as gates, nets, IOs, memories, clock domains, blocks, and power supply rails.

You can analyze the hierarchy of block instances and specific instances within a hierarchy, and each can be broken down in different ways to show the respective power consumption of the component pieces.

SmartPower also analyses power by functional modes, such as Active, Flash*Freeze, Shutdown, Sleep, or Static, depending on the specific FPGA family used. You can also create custom modes that may have been created in the design. Custom modes can also be used for testing "what if” potential operating modes.

SmartPower has a very unique feature that enables you to create test scenario profiles. A profile enables you to create sets of operational modes, so you can understand the average power consumed by this combination of functional modes. An example may be a combination of Active, Sleep, and Flash*Freeze modes – as would be used over time in an actual application.

SmartPower generates detailed hierarchical reports of the power consumption of a design for easy evaluation. This enables you to locate the power consumption source and take appropriate action to reduce the power if possible.

SmartPower supports use of files in the Value-Change Dump (VCD) format, as specified in the IEEE 1364 standard, generated by the simulation runs. Support for this format lets you generate switching activity information from ModelSim or other simulators, and then utilize the switching activity-over-time results to evaluate average and peak power consumption for your design.

SmartPower supports IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, Axcelerator, and RTAX-S families. If you are using any other family, the SmartPower button will not appear in your Designer window. For information on future support for other device families, visit the Actel website at http://www.actel.com.
Starting SmartPower

Note: When you launch SmartPower, you must first set your target clock and data frequencies before you evaluate your power consumption.

You cannot launch SmartPower if your design is not in a post-layout state in Designer. If you invoke SmartPower before compiling your netlist, Designer guides you through the compile and layout process.

There are three ways to invoke the SmartPower analysis tool:

- Choose SmartPower from the Tools menu.
- Click the SmartPower icon in the Designer toolbar.
- Click the SmartPower button in Designer design flow.
Figure 1 · SmartPower User Interface
SmartPower Interface

Summary Tab

The Summary tab is divided into five sections: Power Consumption, Breakdown, Annotation Coverage, Operating Conditions, and Battery Life.

Figure 2 · SmartPower Summary Tab
**Power Consumption**

Displays the total power consumption and the static and dynamic power of the design. (Accurate only after you have entered your target clock and data frequencies).

**Breakdown**

Displays a breakdown of power consumption in the design. You can specify whether to see the power breakdown by type of component, by voltage rail, or by clock domain from the drop-down list.

**Show**

Displays power usage as a chart or as a grid.

When you select **By Type** from the drop-down list, the Summary tab displays a breakdown of the design's power usage by the following types:

- Net
- Gate
- I/O
- Memory
- Core Static
- Banks Static
- Analog (for Fusion Designs)

Any static power used by instances of a component in a design will be included in the appropriate category. As a result, the sum of the power in breakdown by type will equal the total of the static and dynamic power consumption of the design. Percentages displayed are fractions of the total power. Global nets are included in the net power types. To obtain the power of a clock, select breakdown by clock domain.

When you select **By Rail** from the drop-down list, the Summary tab displays a breakdown of the power usage by the rail that the power is drawn from and a breakdown for the current usage. For each rail, the power, voltage, and current drawn are displayed.

When you select **By Clock Domain** from the drop-down list, the Summary tab displays a breakdown of the power usage by the clock domain that the power is drawn from. For each clock domain, the power and percentage of power drawn are displayed. Dynamic power is accounted for in breakdown by clock, but static power is not associated by any clock.

When you select **By Mode** — available only when a scenario is selected in the Modes and Scenarios toolbar — the Summary tab displays power consumption, duration and power duration weight by mode.

Whether you selected **By Type**, **By Rail**, **By Mode**, or **By Clock Domain**, you can customize which columns are displayed in the grid by right-clicking the column headers. To exclude a column, remove its checkmark from the right-click menu. Right-click a column header to set the column default size for the selected column or for all columns, sort the values in ascending or descending order, or customize columns.
To sort the contents of a column, double-click a column header.

To export the contents of the grid to a file, from the File menu, choose Export Grid or click its associated toolbar button.

To print the grid, from the File menu, choose Print Grid or click its associated toolbar button.

To copy the grid, from the Edit menu, choose Copy Grid or click its toolbar button.

To copy the chart, click the contents of the chart, and from the right-click menu, choose Copy Chart to Clipboard.

To export the chart, click the contents of the chart, and from the right-click menu, choose Export Chart to File.

To rotate the chart by 90 degrees, click the contents of the chart, and from the right-click menu, choose Rotate Chart Clockwise or Rotate Chart Counter-Clockwise.

**Annotation Coverage**

Displays the number and percentage of pins annotated by each source (VCD, manual annotation, SmartTime constraint, vectorless estimation, and fixed values) for all clocks, register outputs, combinational outputs, set/reset nets, primary inputs, enable pins, and other pins.

To hide/show the annotation coverage, click the Hide annotation coverage or Show annotation coverage link.

Use the Annotation Coverage Summary drop-down menu to view probability or frequency annotation statistics (frequency=0 shows statistics for pins that have a frequency of 0).

- **VCD**: displays the number/percentage of pins with frequencies/probabilities imported from a VCD file.
- **Manual annotation**: displays the percentage of pins with manually-annotated frequencies/probabilities.
- **SmartTime constraint**: displays the percentage of pins initialized with SmartTime.
- **Fixed values**: displays the percentage of pins with default frequency/probability.
- **Vectorless estimation**: displays the percentage of pins that have been annotated with vectorless estimation.

**Operating Conditions**

Displays the temperature and voltage operating conditions for the selected mode or scenario as specified in the Operating Conditions dialog box. When you select a scenario, the temperature and voltage operating conditions for each mode in the scenario are displayed.

To change the operating conditions, click the Change Operating Conditions link or from the Tools menu, choose Operating Conditions.

**Battery Life**

Enables you to set the battery capacity in mA/hr and reports the battery life.
Domains Tab

The **Domains** tab displays a list of existing domains with their corresponding clock and data frequencies and probabilities.

When you start SmartPower for the first time, it will automatically initialize frequencies from SmartTime with a default data toggle rate of 10%. However, if you update your timing constraints in SmartTime, you can use the **Initialize Frequencies and Probabilities** dialog box to update SmartPower with new frequencies from SmartTime. If you don't have timing constraints in SmartTime, you can manually initialize clock and data frequencies by directly editing the Domains tab grid, or you can use the Initialize Frequencies and Probabilities dialog box.

If you import a VCD file, the Domains tab will display average clock and data frequencies for each clock domain and input set. This average is calculated using VCD information.

**Note:** Note: If you change a clock or data frequency in the Domains tab, it will only impact nets using the default estimation source. Nets use the default estimation source when they have not been manually set to a specific frequency in the Frequencies tab, and when they have not been set by importing a VCD file. To see explicitly the list of nets using the default estimation source, refer to the **Frequencies** tab.

![Figure 3 · SmartPower Domains Tab](image)

**Figure 3 · SmartPower Domains Tab**

**Note:** Note: Data and clock frequencies are automatically set to zero when in non-active modes.

The Domains tab displays frequencies or probability data for clock domains and sets of pins. In this tab, you can add, edit, or remove domains or sets of pins, and change the clock and/or data frequency of a selected domain.

To hide or display the grid for set of pins, click the Hide/Show set of pins link.
You can edit frequency or probability data directly from the grid.

**To create a new clock domain or set of pins:**
1. Right-click the clock domain or set of pins and choose to add a new **create new clock domain** or **create new set of pins**.
2. Enter a name and click **OK**. The new clock domain or set of pins appears in the Domains tab.
3. Modify the frequency and probability data as needed.

Clock domain frequencies can be initialized by right-clicking the clock domain name and selecting **Initialize Frequencies and Probabilities**. If there is no frequency constraint set for this clock domain in SmartTime, the clock frequency of the domain will not be changed.

The status of a clock frequency or probability is displayed in the first column by an icon. Mouse over the icon to identify the status:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Alert]</td>
<td>This clock has not been initialized</td>
</tr>
<tr>
<td>![Alert]</td>
<td>No constraints available for this clock from SmartTime</td>
</tr>
<tr>
<td>![Check]</td>
<td>Average frequencies/probabilities imported from VCD</td>
</tr>
<tr>
<td>![Check]</td>
<td>Clock constraints imported from SmartTime</td>
</tr>
<tr>
<td>![Check]</td>
<td>This clock has been manually initialized</td>
</tr>
</tbody>
</table>

**Note:** Note: This feature is only available when in active operating mode or when in a mode based on the Active mode.

The status of a set of pins is displayed in the first column by an icon. Mouse over the icon to identify the status:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Alert]</td>
<td>This set has not been initialized</td>
</tr>
<tr>
<td>![Check]</td>
<td>Average frequencies/probabilities imported from VCD</td>
</tr>
<tr>
<td>![Check]</td>
<td>This set has been manually initialized</td>
</tr>
</tbody>
</table>

**Note:** Note: This feature is only available when in active operating mode or when in a mode based on the Active mode.
To remove one or multiple clock domains, select the clock domain(s), and click Remove Selected Domains(s).

**To edit a clock domain or a set of pins:**

1. Select the clock domain and from the right-click menu, choose *Edit Domain*. The Clock Domain or Set-of-Pins window appears.

![Clock Domain Window](image)

**Figure 4 · Clock Domain Window**

Any pins that do not belong to a domain are listed in the "Unclassified Pins" list box. You can select a pin from the 'Unclassified Pins' list box and add it to CLK/CLK1_reg:Q. You may also want select a pin from CLK/CLK1_reg:Q and remove it from the domain (this pin will appear in the Unclassified Pins list box).

**Clock Pins and Data Pins**: Select Clock Pins from the pull-down list to display all clock pins for the selected domain, or select Data Pins to display registers, asynchronous signals, primary input, and combinational signals for the selected domain.

Use the filter boxes to narrow your search for a specific pin. The boxes are text filters; * is a wildcard.

2. Click OK.

To delete a clock domain or a set-of-pins, select the clock domain or set-of-pins and from the right-click menu, choose Remove Domain.
Analysis Tab

The Analysis tab enables you to inspect detailed hierarchical reports of the power consumption. The Analysis tab consists of two windows: the Hierarchy of Instances window and the Analysis window.

Hierarchy of Instances Window

SmartPower displays the hierarchy of instances in a list in the Hierarchy of Instances window. Sub-blocks of a block are shown in the tree when you click the plus sign (+) next to the block. Only hierarchical blocks are displayed in this list (no gates or nets).

When you select a block of the hierarchical tree, SmartPower displays its name and power consumption in the Analysis window.

Analysis Window

The Analysis window is divided into two sections: Power Consumption and Breakdown.

Power Consumption

Displays the name of the currently selected block from the hierarchy of instances window, as well as the static and dynamic power consumption of the selected block.
### Show
Displays power usage as a chart (not available when breakdown by instance is selected) or as a grid.

### Breakdown
Displays a breakdown of power usage of the currently selected block. Use the drop-down list to select whether to display the power breakdown by type of component, instance, or clock domain.

When you select **By Type** from the drop-down list, the Analysis tab displays a breakdown of the selected block's power usage by the following types:
- Net
- Gate
- I/O
- Memory
- Core Static
- Banks Static
- Analog

Any static power used by instances of a component in a design will be included in the appropriate category. As a result, the sum of the power in breakdown by type will equal the total of the static and dynamic power consumption of the design. Percentages displayed are fractions of the total power. Global nets are included in the net power types. To obtain the power of a clock, select breakdown by clock domain.

When you select **By Clock Domain** from the drop-down list, the Analysis tab displays a breakdown of the power usage by the clock domain that the power is drawn from. For each clock domain, the power and percentage of power drawn are displayed. Dynamic power is accounted for in breakdown by clock, but static power is not associated by any clock.

Whether you selected **By Type**, **By Instance** or **By Clock Domain**, you can customize which columns are displayed in the grid by right-clicking the column headers. To exclude a column, remove its checkmark from the right-click menu. Right-click a column header to set the column default size for the selected column or for all columns, sort the values in ascending or descending order, or customize columns.

To sort the contents of a column, double-click a column header.

To export the contents of the grid to a file, from the *File* menu, choose *Export Grid* or click its associated toolbar button.

To print the grid, from the *File* menu, choose *Print Grid* or click its associated toolbar button.

To copy the grid, from the *Edit* menu, choose *Copy Grid* or click its toolbar button.

To copy the chart, click the contents of the chart, and from the right-click menu, choose *Copy Chart to Clipboard*.

To export the chart, click the contents of the chart, and from the right-click menu, choose *Export Chart to File*.

To rotate the chart by 90 degrees, click the contents of the chart, and from the right-click menu, choose *Rotate Chart Clockwise* or *Rotate Chart Counter-Clockwise*. 
To view an instance properties, right-click any instance and select **Instance Properties**. This brings the **Instance Properties** window, which displays the instance name, type and power and other properties specific to each type of instance, see image below.

![Instance Properties Window](image)

The **Instance Properties** allows you to access a list of pins of a gate and to check their domain and frequency.

**See Also**
- Analyze results
- Advanced Analysis of I/Os

**Frequencies Tab**

Use the **Frequencies** tab to attach switching frequency attributes to the interconnects of the design. The **Frequencies** tab is divided into **Switching Frequencies**, **Average Frequencies**, and **Annotation Statistics**.

![Frequencies Tab](image)
Switching Frequencies

Displays the pins and lists the net, domain, frequency, and frequency source for each pin.

The Driver box enables you to filter the list of pins based on the criteria entered. Enter text in the filter box, and click Set to apply this text as a filter. Use the * character to display all pins or as a wildcard.

Use the Domain drop-down list to select a different domain (All, CLIN, Default, or Input to Output).

Use the Source drop-down list to select a different source (All, Default, Manual Annotation, or VCD Import).

You can change the frequency by entering a new value in the Frequency column or by selecting multiple pins and pressing the Set frequencies for selected pins button and entering a new frequency. Use Reset frequencies for selected pins to revert to the default frequency.

To select all the pins, click Select All.

Average Frequencies

Displays the average frequency of all pins displayed in the grid.

Average Frequencies are useful when you import a VCD file or SAIF file. Since these files enable you to specify the frequency of each pin individually, it is often useful to know the average clock pin or data pin frequency for a particular clock domain.
If you did not specify a frequency annotation for any clock pin in this clock domain, the average value is equal to the default clock frequency of the clock domain. If you set one or several clock pins, SmartPower takes these specific annotations into account to compute an average value.

If you did not specify a frequency annotation for any data pin in this clock domain, the average value is equal to the default data frequency of the clock domain. If you set one or several data pins, SmartPower takes these specific annotations into account to compute an average value.

**Annotation Statistics**

- **VCD import**: displays the percentage of pins with frequencies imported from the *.vcd file.
- **Manual annotation**: displays the percentage of pins with manually-annotated frequencies.
- **Fixed values**: displays the percentage of pins with default frequency.

**Probabilities Tab**

You can use the **Probabilities** tab to control the probabilities for all pins.

- **Bidirectional and Tristate I/Os**: Controls the output probability of each tristate and bidirectional I/O. The probability is the percent of time that the I/O is used as an output. You can change the default value and set a specific value for each bidirectional or tristate I/O.

- **Memories**: Controls the read cycle probability or the write cycle probability of a memory block. The probability is the percent of time that a memory block will be used either in a read cycle or a write cycle. You can change the default value as well as set a specific value for each enable pin of each memory block available in the design.

  If an enable pin is active low, assign it a probability of 0% to completely enable the I/O or the memory block, or 100% to disable it completely.

  In designs with a cascaded memory, all memory enable pins are shown in the Probabilities tab. To simulate real-world power consumption, selectively enable only some memory enable pins, as specified in the memory cascading structure. For purely vertical cascading, enable the pins belonging to one RAM block. For purely horizontal cascading, enable all pins belonging to all RAM blocks of the cascaded memory. You can find which RAM block corresponds to which pin by cross-probing with the MVN NetlistViewer.

  Power consumption values predicted by SmartPower may be overestimated for Axcelerator and RTAX-S/SL devices. Axcelerator and RTAX-S/SL devices have automatic depth cascading, which is not accounted for in the current version of SmartPower. A more accurate value for memory power consumption may be achieved by dividing the probability by the level of depth cascading. To simulate a 2048x9 RAM and a cascading level of 2048/512 = 4 with a probability of 40%, enter 40/4 = 10%. Similarly, to simulate a 1024x9 RAM with a 100% probability, enter a probability of 50%.

  **Note**: SmartPower does not support custom probabilities for asynchronous RAMs and FIFOs for ProASIC**$^{\text{PLUS}}$** devices.

The Probabilities tab displays the drivers, nets, types, polarity, rates, and source for each pin.
The **Driver** box enables you to filter the list of drivers based on the criteria entered. Enter text in the filter box, and click **Set** to apply this text as a filter. Use the * character as a wildcard.

Use the **Type** drop-down list to filter the pin list by different type (All, All enable, CLKIN, Default, or Input to Output).

Use the **Polarity** drop-down list to filter the pin list by polarity (Low, High, or All).

Use the **Source** drop-down list to filter the pin list by source (All, Default Estimation, Manual Annotation, Saif Import, or VCD Import).

You can change the rate by entering a new value in the **Rate** column or by selecting multiple pins, pressing the **Set Probabilities for selected pins** button, and entering a new frequency in the Set Default Probabilities dialog box.

![SmartPower Probabilities Tab](image)

**Figure 9 · SmartPower Probabilities Tab**

Use **Reset Probabilities for selected pins** to revert to the default polarity.

![Set Probability for Pins Dialog Box](image)

**Figure 10 · Set Probability for Pins Dialog Box**
You can change the default probability from the Domains tab.

To select all the drivers, click **Select All**.

You can set or reset the probabilities, set a default probability, copy, export, or print the grid by selecting one or multiple pins and choosing an option from the right-click menu.

**See Also**

Specify probabilities

---

### Preferences Toolbar

The SmartPower Preferences toolbar gives you quick access to commonly used settings. Mouse over the toolbar button to view a description of the command. Use the drop-down list to select your settings.

![SmartPower Preferences Toolbar](image)

**Figure 11 · SmartPower Preferences Toolbar**

**Operating Conditions**: Enables you to set the operating conditions - Best, Typical, or Worst.

The actual voltage and temperature of a given operating condition is defined by the operating condition range selected for the current design (COM, IND, MIL, Auto, TGrade1, TGrade2, and Custom). For SmartPower, unlike SmartTime, the worst voltage is the upper bound of the range. That is, higher (worst-case) power comes from higher voltage, whereas higher voltage results in best-case speed.

**Note**: Note: Worst-case and best-case calculations are available only for certain families and devices.

**Frequency**: Sets unit preferences for frequency – Hz, KHz, MHz.

**Power Units**: Sets unit preferences for power – W, mW, or uW.

**See Also**

SmartPower toolbar / menu commands

---

### Modes and Scenarios Toolbar

The Modes and Scenarios toolbar displays all pre-defined modes, custom modes, pre-defined scenarios, and custom scenarios. The Modes and Scenarios toolbar is shown by default, but can be closed or undocked. To view the toolbar, from the **View** menu, choose **Modes and Scenarios toolbar**.

From this toolbar, you can:

- Select a **pre-defined mode** by clicking the mode name
- **Select** a custom mode by clicking the mode name
• Select a custom mode for power-driven layout by right-clicking the active-based mode and selecting **Use for PDPR**

• Re-import a VCD file from an Active mode or a custom mode by right-clicking the VCD file and selecting **Re-import VCD File**

• Remove a VCD file from an Active mode or a custom mode by right-clicking the VCD file and selecting **Remove VCD File from <mode name> Mode**; or from the **Simulation** menu, choose **Remove VCD File > <file name>**

• Generate a Cycle-Accurate Power report by right-clicking the VCD file and selecting **Cycle-Accurate Power Report**

• Generate an Activity and Hazards Power report by right-clicking the VCD file and selecting **Activity and Hazards Power Report**

• View the Cycle-Accurate Power analysis by right-clicking the VCD file and selecting **Cycle-Accurate Power Analysis**

• **Create** a new custom mode by clicking **Custom modes** and selecting **New Custom Mode**; or by clicking the **New Custom Mode** hyperlink

• **Edit** and **delete** a custom mode by right-clicking the mode name and selecting **Edit custom mode** or **Delete custom mode**

• **Copy** a custom or a pre-defined mode by right-clicking the mode name and selecting **Create a copy of this mode**

• **Select** a scenario by clicking the scenario name

• **Create** a new custom scenario by clicking **Scenarios** and selecting **New custom scenario**

• **Edit** and **delete** a custom scenario by right-clicking the scenario name and selecting **Edit custom scenario** or **Delete custom scenario**

• **Copy** a scenario by right-clicking the scenario name and selecting **Create a copy of this scenario**

**Note:** Note: When a scenario is selected, only the Summary tab is available.
SmartPower Standard Toolbar and Menu Commands

The SmartPower standard toolbar contains commands for performing common SmartPower operations on your designs. Roll the mouse pointer over the toolbar button to view a description of the button. Click the button to access the command.

Table 3 · SmartPower Toolbar

<table>
<thead>
<tr>
<th>Toolbar Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Commit" /></td>
<td>Commit</td>
</tr>
<tr>
<td><img src="image" alt="Settings Summary" /></td>
<td>Settings Summary</td>
</tr>
<tr>
<td><img src="image" alt="Operating Conditions" /></td>
<td>Operating Conditions</td>
</tr>
<tr>
<td><img src="image" alt="Options" /></td>
<td>Options</td>
</tr>
<tr>
<td><img src="image" alt="Export Path Grid" /></td>
<td>Export Path Grid</td>
</tr>
<tr>
<td><img src="image" alt="Copy Path Grid" /></td>
<td>Copy Path Grid</td>
</tr>
<tr>
<td><img src="image" alt="Print Grid" /></td>
<td>Print Grid</td>
</tr>
<tr>
<td><img src="image" alt="Generate Power Report" /></td>
<td>Generate Power Report</td>
</tr>
</tbody>
</table>
The PC and UNIX workstation versions of SmartPower have the same menus. However, some dialog boxes may look slightly different on the two platforms due to the different window environments. The functionality is the same on both platforms, though the locations of the fields and buttons on the dialog boxes may vary. The names of some fields may also vary between the PC and workstation versions.

**SmartPower Standard Toolbar and Menu Commands**

<table>
<thead>
<tr>
<th>Toolbar Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Initialize Frequencies and Probabilities" /></td>
<td>Initialize Frequencies and Probabilities</td>
</tr>
<tr>
<td><img src="image2" alt="Refreshes Vectorless Estimation" /></td>
<td>Refreshes Vectorless Estimation</td>
</tr>
</tbody>
</table>

**File Menu**

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commit</td>
<td>Commits power information to Designer. You must commit your changes if you wish to save your settings in SmartPower. If you commit your changes, the information is stored in the .adb file, and your settings are restored the next time you open your design in SmartPower</td>
</tr>
<tr>
<td>Export Grid</td>
<td>Exports the selected area of the Report window to a text (.txt) file</td>
</tr>
<tr>
<td>Print Grid</td>
<td>Prints the selected area of the Report window</td>
</tr>
<tr>
<td>Settings</td>
<td>Displays a summary of the power settings for the current design</td>
</tr>
<tr>
<td>Close</td>
<td>Closes SmartPower</td>
</tr>
</tbody>
</table>

**Edit Menu**

<table>
<thead>
<tr>
<th>Menu</th>
<th>Sub-Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domains</td>
<td>New Clock Domain</td>
<td>Adds a clock domain</td>
</tr>
<tr>
<td></td>
<td>New Set of Pins</td>
<td>Adds a set of pins</td>
</tr>
<tr>
<td></td>
<td>Delete Domain</td>
<td>Deletes a clock domain</td>
</tr>
<tr>
<td></td>
<td>Edit Domain</td>
<td>Edits a clock domain</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Menu</th>
<th>Sub-Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modes and Scenarios</td>
<td>Use for Analysis &gt; mode or scenario name</td>
<td>Sets the selected mode or scenario to be used for analysis</td>
</tr>
<tr>
<td></td>
<td>Use for PDPR &gt; mode or scenario name</td>
<td>Sets the selected mode or scenario to be used for Power-Driven Layout</td>
</tr>
<tr>
<td></td>
<td>Custom Modes &gt; New Custom Mode</td>
<td>Creates a new custom mode</td>
</tr>
<tr>
<td></td>
<td>Custom Modes &gt; Edit Custom Mode</td>
<td>Edits a custom mode</td>
</tr>
<tr>
<td></td>
<td>Custom Modes &gt; Delete Custom Mode</td>
<td>Deletes a custom mode</td>
</tr>
<tr>
<td></td>
<td>Custom Scenarios &gt; New Scenario</td>
<td>Creates a new custom scenario</td>
</tr>
<tr>
<td></td>
<td>Custom Scenarios &gt; Edit Scenario</td>
<td>Edits a custom scenario</td>
</tr>
<tr>
<td></td>
<td>Custom Scenarios &gt; Delete Scenario</td>
<td>Deletes a custom scenario</td>
</tr>
<tr>
<td>Copy Grid</td>
<td>—</td>
<td>Copies the selected cells of the dynamic grid onto the clipboard</td>
</tr>
</tbody>
</table>

**View Menu**

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Toolbar</td>
<td>Displays or hides the SmartPower Standard toolbar</td>
</tr>
<tr>
<td>Preferences Toolbar</td>
<td>Displays or hides the SmartPower Preferences toolbar</td>
</tr>
<tr>
<td>Modes and Scenarios Toolbar</td>
<td>Displays or hides the Modes and Scenarios toolbar</td>
</tr>
<tr>
<td>Unprocessed Simulation Files Toolbar</td>
<td>Displays or hides the Unprocessed Simulation Files toolbar</td>
</tr>
</tbody>
</table>
### SmartPower Standard Toolbar and Menu Commands

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customize Columns</td>
<td>Selects and orders the columns displayed in the user interface</td>
</tr>
<tr>
<td>Reset Window Layout</td>
<td>Resets the window layout to the default layout</td>
</tr>
</tbody>
</table>

### Tools Menu

<table>
<thead>
<tr>
<th>Menu</th>
<th>Sub-Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initialize Frequencies and Probabilities</td>
<td>—</td>
<td>Imports clock constraints from SmartTime and enables the user to input frequencies and probabilities for the design</td>
</tr>
<tr>
<td>Operating Conditions</td>
<td>—</td>
<td>Enables the user to customize the operating conditions used in SmartPower</td>
</tr>
<tr>
<td>Options</td>
<td>—</td>
<td>Invokes the Options dialog box, where you can set analysis and display preferences</td>
</tr>
<tr>
<td>Reports</td>
<td>Power Report</td>
<td>Generates a power report</td>
</tr>
<tr>
<td></td>
<td>Scenario Power Report</td>
<td>Generates a scenario power report</td>
</tr>
<tr>
<td></td>
<td>Cycle Accurate Power Report</td>
<td>Generates a cycle accurate power report</td>
</tr>
<tr>
<td></td>
<td>Activity and Hazards Power Report</td>
<td>Generates an activity and hazards power report</td>
</tr>
<tr>
<td>Cycle Accurate Power Analysis</td>
<td>—</td>
<td>Generates a cycle-accurate power analysis</td>
</tr>
</tbody>
</table>

### Simulation Menu

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
</tr>
</thead>
</table>
### SmartPower Interface

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Import VCD File</td>
<td>Invokes the <a href="#">Import VCD Options dialog box</a></td>
</tr>
<tr>
<td>Remove VCD file</td>
<td>Removes the selected CVD file from the design</td>
</tr>
<tr>
<td>Audit files</td>
<td>Audits simulation files within the project</td>
</tr>
</tbody>
</table>

#### Help Menu

<table>
<thead>
<tr>
<th>Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help on current tab</td>
<td>Displays the help content for the current tab</td>
</tr>
<tr>
<td>Help Topics</td>
<td>Opens the help files for SmartPower</td>
</tr>
<tr>
<td>Data Change History</td>
<td>Displays the <a href="#">data change history report</a></td>
</tr>
</tbody>
</table>

**See Also**

[SmartPower preferences toolbar](#)

**Power - Settings Summary**

The **Power - Settings Summary** dialog box displays a summary of the power settings for the current design.

To open the **Power - Settings Summary** dialog box, from the **File** menu, choose **Settings Summary** or click the icon in the SmartPower toolbar.
Initializing Frequencies and Probabilities

The Power - Settings Summary dialog box displays the following information:

- **Design**: Displays the name of the design.
- **Family**: Displays the device family used in the design.
- **Die**: Displays the die.
- **Package**: Displays the package.
- **Temperature Range**: Displays the temperature range.
- **Voltage Range**: Displays the core supply voltage.
- **Operating Condition**: Displays the operating conditions that SmartPower uses to calculate static and dynamic power contributions.
- **Operating Mode**: Displays the operating mode that SmartPower uses to calculate static and dynamic power contributions.

**Note**: The status bar also shows the ambient temperature, VCCA and speed grade.

**Initializing Frequencies and Probabilities**

The Initialize Frequencies and Probabilities dialog box enables you to initialize the frequencies and probabilities for your design.

To open the Initialize Frequencies and Probabilities dialog box, from the Tools menu, choose Initialize Frequencies and Probabilities, or click the icon in the SmartPower toolbar.
Note: This feature is only available in the Active operating mode or modes derived from the Active mode.

The dialog box is organized in the following panels: General, Clocks, Register Outputs, Set/Reset Nets, Primary Inputs, Combinational Outputs, Enables Sets of Pins, and Other Sets of Pins.

General

**Figure 14** · Initialize Frequencies and Probabilities Dialog Box – General

**Initialize mode** – Select an active-based mode to initialize the frequencies and probabilities for.

For pins that have not been annotated, SmartPower can estimate their frequency and probability using vectorless analysis or fixed values:

- **Use vectorless analysis** – SmartPower initializes frequencies and probabilities with vectorless analysis.
- **Use fixed values** – SmartPower initializes frequencies and probabilities (%) of all registers with a default toggle rate (available only when using toggle rates), frequency, and probability.

Based on the selected mode, a warning appears with information on the annotated pins. If the selected mode contains any annotations, you can remove annotations by selecting one or both options below:

- **Remove simulation file (VCD) if any** – Select this option to remove the simulation file for the selected mode.
- **Remove any manual annotations** – Select this option to remove all manual pin annotations for the selected mode.
Clocks

Figure 16 · Frequencies and Probabilities Dialog Box – Clocks

Initialize clock frequencies and duty cycles – Select this option to initialize clock frequencies and duty cycles, with:

with clock constraint if available in SmartTime: When only this box is checked, SmartPower initializes all clock domains in SmartPower with clock constraints from SmartTime. If there is no frequency constraint set for this clock domain in SmartTime, the clock frequency of the domain will not be updated.

default frequency (MHz) and duty cycle (%): When only this box is checked, SmartPower initializes all clock domains in SmartPower with the specified default frequency and duty cycle.

Note: When both boxes (with clock constraint if available in SmartTime and with default frequency and duty cycle) are checked, SmartPower initializes all clock domains with clock constraints from SmartTime. If there is no frequency constraint set for a clock domain in SmartTime, it is initialized with the specified default frequency and duty cycle.
Register Outputs

Initialize frequencies and probabilities – Select this option to initialize frequencies and probabilities for register outputs in your design.

With vectorless analysis – SmartPower initializes frequencies and probabilities using vectorless analysis.

With fixed values: SmartPower initializes frequencies and probabilities (%) of all register outputs with a default toggle rate (available only when using toggle rates) or frequency (when not using toggle rates), and a default probability.
Set/Reset Nets

SmartPower - Initialize Frequencies and Probabilities

Figure 18: Frequencies and Probabilities Dialog Box – Asynchronous

Initialize frequencies and probabilities – Select this option to initialize frequencies and probabilities for set/reset nets in your design.

With default toggle rate (%): SmartPower initializes frequencies and probabilities of all set/reset nets with the specified default toggle rate. This option is available only when using toggle rates.

With default frequency (MHz): SmartPower initializes all set/reset nets in SmartPower with the specified default frequency. This option is available only when not using toggle rates.

With default probability (%): SmartPower initializes probabilities of all set/reset nets with the specified default probability.
Primary Inputs

Figure 19 · Frequencies and Probabilities Dialog Box – Primary Inputs

Initialize frequencies and probabilities – Select this option to initialize frequencies and probabilities for the primary inputs in your design.

With default toggle rate (%): SmartPower initializes frequencies and probabilities of all primary inputs with the specified default toggle rate. This option is available only when using toggle rates.

With default frequency (MHz): SmartPower initializes all primary inputs in SmartPower with the specified default frequency. This option is available only when not using toggle rates.

With default probability (%): SmartPower initializes probabilities of all primary inputs with the specified default probability.
Combinational Outputs

**Figure 20 · Frequencies and Probabilities Dialog Box – Combinational**

**Initialize frequencies and probabilities** – Select this option to initialize frequencies and probabilities for the combinational outputs in your design.

**With vectorless analysis** – SmartPower initializes frequencies and probabilities with vectorless analysis.

**With fixed values**: SmartPower initializes frequencies and probabilities (%) of all combinational outputs with a default toggle rate (available only when using toggle rates) or frequency (when not using toggle rates), and a default probability.
Enables

**SmartPower - Initialize Frequencies and Probabilities**

- **General**
- **Clocks**
  - Register outputs
  - Set/Reset nets
  - Primary inputs
  - Combinational outputs
- **Set of pins**
  - Enables
  - Others

**Figure 21 · Frequencies and Probabilities Dialog Box – Enables**

- **Initialize frequencies and probabilities** – Select this option to initialize frequencies and probabilities for the enable sets of pins in your design.

- **With vectorless analysis** – SmartPower initializes frequencies and probabilities with vectorless analysis.

- **With fixed values**: SmartPower initializes frequencies and probabilities of all enables sets of pins with the specified default probability and frequency.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Frequency MHz</th>
<th>Probability %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1    IOEnableSet</td>
<td>0.00</td>
<td>12.50</td>
</tr>
<tr>
<td>2    MemoriesEnableSet</td>
<td>0.00</td>
<td>12.50</td>
</tr>
</tbody>
</table>
Others

Figure 22 · Frequencies and Probabilities Dialog Box – Others

- **Initialize frequencies and probabilities** – Select this option to initialize frequencies and probabilities for the other sets of pins in your design with default values.

- **With vectorless analysis** – SmartPower initializes frequencies and probabilities with vectorless analysis as specified in the primary inputs frequency and probability.

- **With fixed values** – SmartPower initializes frequencies and probabilities (%) of all other sets of pins with a default frequency and probability.

**See Also**

- Domains Tab
- Vectorless Analysis

**Power Options**

Enables you to set options that affect the graphical and textual reports.

To open the SmartPower **Power Options** dialog box:

- From the **File** menu choose **Options**
- Select the **Options** panel in the **Power Report** dialog box.
- Click the icon in the SmartPower toolbar.
There are two sections: **Units** and **Use Toggle Rates**.

- **Units**: Sets unit preferences for power (W, mW, μW) and frequency (Hz, KHz, MHz).
- **Use Toggle Rates**: When toggle rates are active (**Use Toggle Rates** box is checked), the data frequency of all the clock domains is defined as a function of the clock frequency. This updates the data frequency automatically when you update the clock frequency. Toggle rates enable you to specify the data frequency as a percentage of clock frequency, but you can no longer specify the data frequency as a number, only as a percentage of the clock frequency. To specify data frequencies, clear the **Use Toggle Rates** option in the **Preferences** window.

You can set the data frequency percentage when you **create a new clock domain** with toggle rates active. In addition, when toggle rates are active you can set the data frequency percentage in the **Domain** and **Frequencies** tabs.

**Operating Conditions**

The SmartPower Operating Conditions dialog box enables you to customize the operating conditions used in SmartPower for voltage and temperature.

**Note**: Note: Changes will apply only to SmartPower and will not change the operating conditions set in Designer.
The General panel enables you to select the operating condition you want to apply to SmartPower: Best, Typical, or Worst.

You can customize temperature settings in the Temperature Settings panel, and the voltage settings in the Voltage Settings panels — each VCC voltage used in the design appears under Voltage settings.
Select one of three options to specify the temperature or voltage settings:

- **Design operating range (default):** sets the temperature or voltage operating range as specified in the Device Selection Wizard in Designer.

- **Custom operating range:** sets the temperature (junction or ambient) or voltage operating range for the current design in SmartPower only. You can enter temperature values in degrees Celsius and voltage values in volts for Best, Typical, and Worst.

- **Mode by mode operating range:** sets the temperature (junction or ambient) or voltage for each mode in SmartPower only. You can use the grid to enter temperature values in degrees Celsius and voltage values in volts for each mode, or select multiple modes in the grid, and click the **Set values for selected modes** button to enter the same values for all selected modes.
The junction temperature and static power are computed iteratively until they converge.

The formulas are:

$$T_J = T_A + \theta_{JA} \cdot (P_{dynamic} + P_{static})$$

$$P_{static} = f(T_J) = P_0 + P_1 \cdot T_J$$

If the computed junction temperature is outside the operating condition range (smaller than the best case value or greater than the worst case value), a violation warning will be reported.

Both $T_J$ and $P_{static}$ will be re-computed when any of the following parameters are changed:

- Ambient temperature
- Cooling style
- Custom thermal resistance,

or any parameters/options that affect the static or dynamic power values:

- Junction Temperature Display Mode
- Operating Condition (Affect dynamic power)
- Operating Mode (Affect dynamic power)
- Any of the clock domain frequencies (Affect dynamic power)
If you specified the Ambient temperature in the Temperature Settings panel, you can select the thermal characteristic for \( \Theta_{JA} \).

![SmartPower Operating Conditions Dialog Box - Thermal Resistance Settings](image)

The thermal resistance is predefined for Still Air, 300 ft/min and Case Cooling. To enter a custom thermal resistance, select **Custom** from the **Cooling** field, and change the value.

SmartPower also reports the thermal resistance, \( \Theta_{JA} \).

**See Also**

- SmartPower toolbar / menu commands
- SmartPower preferences toolbar

### Custom Operating Modes

SmartPower enables you to use pre-defined and custom operating modes. A pre-defined operating mode is an inherent mode of a family of devices that comes with a number of hard availability constraints on the FPGA resources. Custom operating modes are user-defined modes based on one of the pre-defined modes available for the family, where parameters such as clock, data, and toggle rate frequencies have been customized. A custom mode can also be linked to a VCD.

Custom modes can be used:

- To define additional modes where the chip is in the active pre-defined mode, but where the clock frequencies or the toggle rates are scaled up or down.
- To import multiple VCD files that capture individual steps that take place in different modes.
• To define a sequence of modes with a duration for each mode and get an estimate of the overall power consumption, from which extrapolate the battery life for the application. The Scenario Power report enables you to define a sequence of modes and estimate the weighted average of the power consumption of the chip over the whole sequence.

• To define additional modes where the chip is in a pre-defined mode, but the junction/ambient temperature or the rails’ voltage modes are different.

**To set the current mode:**
From the Edit menu in SmartPower, choose Modes and Scenarios > Use for Analysis > mode name; or select the mode in the Modes and Scenarios toolbar.

**To create a new custom mode:**
1. From the Edit menu in SmartPower, choose Modes and Scenarios > Custom Modes > New Custom Mode; or click Custom Modes in the Modes and Scenarios toolbar, and select New custom mode. This brings up the New Custom Mode dialog box.

![Figure 29 · New Custom Mode Dialog Box](image)

2. Enter the mode name, select the base mode, and enter comments that describe the mode. The base mode can be either a user-defined custom mode or the active mode. The new mode will inherit all clock and data frequencies and annotations of its base mode.

3. Click OK. The newly created operating mode is set as default in the Modes and Scenarios toolbar.

**To edit a custom mode:**
1. From the Edit menu in SmartPower, choose Modes and Scenarios > Custom Modes > Edit Custom Mode; or right-click the mode in the Modes and Scenarios toolbar, and select Edit custom mode. This brings up the Edit Custom Mode dialog box.
2. Edit the mode name and comments.
3. Click **OK**.

**Note:** Note: You can only use the Edit Mode dialog box to edit the name and comment of the current mode. To edit the mode properties such as clock and data frequencies, use the SmartPower tabs.

**To copy a custom mode:**
1. Right-click the mode in the Modes and Scenarios toolbar, and select **Create a copy of this mode**. This brings up the New Custom Mode dialog box.

**To delete a custom mode:**
1. From the **Edit** menu in SmartPower, choose **Modes and Scenarios > Custom Modes > Delete Custom Mode**; or right-click the mode in the Modes and Scenarios toolbar, and select **Delete Mode**. This brings up the Delete Custom Mode dialog box.
Scenarios

A scenario is a sequence of previously defined operating modes with a specific duration for each mode. When you create a new design, SmartPower will automatically create some pre-defined scenarios that can be used as is, or copied to create a new scenario based on the pre-defined one.

Note: Pre-defined scenarios cannot be deleted or edited.

**To set the current scenario for analysis:**
From the Edit menu in SmartPower, choose Modes and Scenarios > Use for Analysis > <scenario name>; or select the scenario in the Modes and Scenarios toolbar.

Note: When a scenario is selected, only the Summary tab is available.

**To create a new custom scenario**
1. From the Edit menu in SmartPower, choose Modes and Scenarios > Custom Scenarios > New Custom Scenario; or click Scenarios in the Modes and Scenarios toolbar, and select New custom scenario. This brings up the New Custom Scenario dialog box.
2. Enter the scenario name, enter a duration (total duration for the sequence must equal to 100%) and select previously defined operating modes for this sequence.
3. Click OK. The newly created scenario is set as default in the Modes and Scenarios toolbar.

**To edit a custom scenario:**
1. From the Edit menu in SmartPower, choose Modes and Scenarios > Custom Scenarios > Edit Custom Scenario; or right-click the scenario in the Modes and Scenarios toolbar, and select Edit custom scenario. This brings up the Edit Custom Scenario dialog box.

Note: You can only delete custom operating modes. Pre-defined modes cannot be deleted.
2. Edit the information.
3. Click **OK**.

**To copy a scenario:**

1. Right-click the scenario in the Modes and Scenarios toolbar, and select **Create a copy of this scenario**. This brings up the New Custom Scenario dialog box.
2. Edit the information.

3. Click OK.

**To delete a custom scenario:**

1. From the Edit menu in SmartPower, choose Modes and Scenarios > Custom Scenarios > Delete Custom Scenario; or right-click the scenario in the Modes and Scenarios toolbar, and select Delete Scenario. This brings up the Delete Custom Scenario dialog box.

2. Select the scenario from the pull down and click OK.

**Power Reports**

The power report enables you to quickly determine if any power consumption problems exist in your design.
To generate a power report:


2. Select the options you want to include in the report, and then click OK. The power report appears in a separate window.

You can also generate the power report from within SmartPower. From the Tools menu, choose Reports > Power Report, or click the Report button to open the Report dialog box. By default, the report includes global design information and a power summary. Specify which results you want to display by selecting the categories and their options.

The power report dialog box is organized in the following panels: General, Operating Conditions, Options, Breakdown by Instance, Frequency Summary, and Probability Summary.

General

The general panel enables you to select what to include in the report, the report format, and the mode that you want to generate the report for.

Include in the Report

Select the option(s) that you want to include in the Power Report:

- **Power summary** – This section reports the static, dynamic and total power consumption of the design.
- **Breakdown by rail** – This section shows the power consumption of each rail.
- **Breakdown by type** – This section enables reporting on the power consumption according to: gates, nets, clocks, core static, IOs and memories.
**Breakdown by clock domain** – This section enables reporting on the power consumption of each clock domain.

**Thermal summary** – This section includes a thermal report. The ambient temperature can be defined by the operating conditions or defined by the ambient temperature.

When the first option is selected, the following characteristics are reported:

- Operating conditions
- Temperature range
- Junction temperature

When the second option is selected, the following characteristics are reported:

- Ambient temperature
- Cooling style
- Package
- Thermal resistance Theta-JA
- Junction temperature
- Temperature range
- Junction temperature range limits specification

**Battery Life** – This section reports the battery life.

**Clock Domain Summary** – This section reports the clock and data frequencies for each clock domain.

**Operating Condition Summary** – This section reports the operating conditions.

**Annotation Coverage** – This section reports the number and percentage of pins annotated by each source (VCD, manual annotation, SmartTime constraint, vectorless estimation, and fixed values) for all clocks, register outputs, combinational outputs, set/reset nets, primary inputs, enable pins, and other pins

**Report Format**

Select **Text** or **CSV** (Comma Separated Value) as the desired export format.

**Mode**

Select a mode to generate the report for.

**Operating Conditions**

The Operating Conditions panel enables you to select the operating conditions for the current report.
Options

The Options panel enables you to select power and frequency units and to use toggle rates.
**Units**

- **Frequency**: Sets unit preferences for frequency - Hz, KHz, MHz.
- **Power Units**: Sets unit preferences for power - W, mW, or uW.

**Use Toggle Rates**

When toggle rates are active (Use Toggle Rates box is checked), the data frequency of all the clock domains is defined as a function of the clock frequency. This updates the data frequency automatically when you update the clock frequency. Toggle rates enable you to specify the data frequency as a percentage of clock frequency, but you can no longer specify the data frequency as a number, only as a percentage of the clock frequency. To set the data frequency again, clear the Use Toggle Rates option.

**Breakdown by Instance**

From this panel you can include the breakdown by instance in the report and set specific options.

![SmartPower Power Report Dialog Box - Breakdown By Instance Panel](image)

**Figure 39 · SmartPower Power Report Dialog Box - Breakdown By Instance Panel**

- **Include breakdown by instance** – This section shows the power consumption of each element that has been instantiated in the design: gates, nets, memories, and IOs.

The breakdown by instance can be filtered by:

- **Limit the number of reported instances to**: will limit the number of instances reported to the specified number.
- **Report only instances with power greater than**: any instance with power consumption below the selected value will not be reported.

This section can be sorted by selecting the preferred method:
- Sort by: Name (alphabetical) or Power Values
- Sort Order: Ascending or Descending

Note: Note: The filter reduces the number of lines in the report, one per instance.

**Frequency Summary**

From this panel you can include the frequency summary in the report and set specific options.

![Figure 40 - SmartPower Power Report Dialog Box - Frequency Summary Panel](image)

**Include frequency summary** – This section shows the frequency summary and reports the pin, net, domain, frequency, and frequency source for each pin.

The frequency summary can be filtered by:

- **Limit the number of reported pins to**: will limit the number of pins reported to the specified number.
- **Report only pins with frequencies greater than**: any pin with a frequency below the selected value will not be reported.

This section can be sorted by selecting the preferred method:

- **Sort by**: Pin Name, Net Name, Domain, Frequency, or Source
- **Sort Order**: Ascending or Descending

**Probability Summary**

From this panel you can include the probability summary in the report and set specific options.
Include probability summary – This section shows the probability summary and reports the driver, net, rate, source, and type for each pin.

This section can be sorted by selecting the preferred method:

- **Sort by:** Pin Name, Net Name, Rate, Source, or Type
- **Sort Order:** Ascending or Descending
In addition to the information selected on the **Power Reports** dialog box, the report contains global design information.

**Global design information**: This section shows the target family, the package and the die. It also shows information about the operating conditions, speed grade, and power mode. This option is set by default.
The scenario power report enables you to select a previously defined scenario and calculate the average power consumption and the battery life for this scenario.

**To generate a scenario power report:**

*Note:* In order to generate a scenario power report, your design must contain one or more scenarios.

2. Select the options you want to include in the report, and then click OK. The scenario power report appears in a separate window.

You can also generate the scenario power report from within SmartPower. From the Tools menu, choose Reports > Scenario Power Report, or click the Scenario Power Report button to open the Power Scenarios dialog box. By default, the report includes global design information and power sequencer summary. Specify which results you want to display by checking the boxes to be included in the report.

The power report dialog box is organized in the following panels: General, Operating Conditions, Options, and Battery Life.

**General**

The general panel enables you to select what to include in the report, the report format, and the scenario you want to generate the report for.
**Include in the Report**

**Breakdown by Rail** – This section shows the power consumption of each rail.

**Breakdown by Type** – This section enables reporting on the power consumption according to: gates, nets, clocks, core static, IOs, and memories.

**Breakdown by Mode** – This section enables reporting on the power consumption by mode.

**Operating Condition Summary** – This section reports the operating conditions.

**Report Format**

Select **Text** or **CSV** (Comma Separated Value) as the desired export format.

**Scenario**

Select a previously defined scenario to generate the report from.

**Operating Conditions**

The Operating Conditions panel enables you to select the operating conditions case for the current design.
Options

The Options panel enables you to select power and frequency units and to use toggle rates.
**Units**

**Frequency:** Sets unit preferences for frequency – Hz, KHz, MHz.

**Power Units:** Sets unit preferences for power – W, mW, or μW.

**Use Toggle Rates**

When toggle rates are active (Use Toggle Rates box is checked), the data frequency of all the clock domains is defined as a function of the clock frequency. This updates the data frequency automatically when you update the clock frequency. Toggle rates enable you to specify the data frequency as a percentage of clock frequency, but you can no longer specify the data frequency as a number, only as a percentage of the clock frequency. To set the data frequency again, clear the Use Toggle Rates option.

**Battery Life**

The Battery Life panel enables reporting of the battery capacity and the battery life. Enter a battery capacity in MA/Hrs.

![Figure 46 · SmartPower Scenario Power Report Dialog Box – Battery Life Panel](image)

The SmartPower scenario power report returns the average power consumption and battery life for this sequence.
Figure 47 · SmartPower Scenario Power Report

In addition to the information selected on the **Scenario Power Reports** dialog box, the report contains global design information, a mode summary and the sequence average power.
Global design information: This section shows the target family, the package and the die. It also shows information about the operating conditions, speed grade and power mode. This option is set by default.

Power Summary: This section reports the power consumption of the sequence by mode. This option is set by default.

Sequence Average Power: This section reports the average power consumption of the sequence. This option is set by default.

See Also
Report (Sequencer)

Cycle-Accurate Power Reports

Traditional power analysis based on a VCD simulation file reports an average power for the entire simulation time. Based on a VCD simulation file, the cycle-accurate power analysis will report one power value per clock period (or half-period) instead of an average power for the whole simulation. This feature allows to easily identify the worst cycle in terms of power performance; and helps to understand and further minimize power consumption by facilitating the analysis of data-dependent power variations, as well as dynamic power variations due to clock-gating, or even clock frequency variations.

To generate a cycle-accurate power report:

2. Select the options you want to include in the report, and then click OK. The cycle accurate power report appears in a separate window.

You can also generate the cycle accurate power report from within SmartPower. From the Tools menu, choose Reports > Cycle Accurate Power Report to open the cycle accurate power report dialog box; or select a vcd file from the Modes and Scenarios toolbar, and from the right-click menu, select Tools > Power Cycle Accurate.

The cycle-accurate power report dialog box is organized in the following panels: General, Sampling Period, Partial Parsing, Top-Level Name, Glitch Filtering, and History Size Reduction.
General

**Cycle Accurate Power Report**

- **Select a Category:**
  - General
  - Sampling period
  - VCD parsing options
    - Partial parsing
    - Top level name
    - Glitch filtering
  - History size reduction
  - Report format
  - Use operating conditions from

**Figure 48 · SmartPower Cycle Accurate Power Report Dialog Box – General**

- **VCD file** - Select the VCD file you want to import.
- **Report format** – Select **Text** or **CSV** (Comma Separated Value) as the desired export format.
- **Use operating conditions from** – Select the mode from which the operating conditions will be used.
Sampling Period

**Automatic detection from clock** – This option automatically detects the sampling period from the fastest clock. You can also select any other clock in your design. You can specify whether the average value is computed per period or half-period.

**Specify** – Select this option to specify the period and offset used to calculate the sampling period.

Figure 49 · SmartPower Cycle Accurate Power Report Dialog Box – Sampling Period

![SmartPower Cycle Accurate Power Report Dialog Box](image-url)
Partial Parsing

**Figure 50 · SmartPower Cycle Accurate Power Report Dialog Box – Partial Parsing**

**Partially parse VCD file** – Specify the Start and End times to partially parse the VCD file. This option can be used for large VCD files.

Top-Level Name

**Figure 51 · SmartPower Cycle Accurate Power Report Dialog Box – Top-Level Name**

- Automatic detection
- Specify:
This option enables you to select how the top-level name is specified. Select **Automatic Detection** to let the VCD reader automatically detect the top-level name of the design, or select **Specify** to manually specify the top-level name.

**Glitch Filtering**

![Glitch Filtering Panel](image)

This panel enables you to filter out pulses of short durations by selecting **Automatic Glitch Filtering** or by entering a value in the **Specify Filtering Threshold** field. The default glitch filtering option is **Automatic Glitch Filtering**.
History Size Reduction

This panel enables you to limit the history size by keeping only local extrema or setting a power threshold.

The results are displayed in the cycle accurate power report below.
Activity and Hazards Reports

Traditional Power Analysis based on a VCD simulation file reports an average power value that will account for all nets switching in the design. This switching includes functional transitions and spurious transitions. Due to the delay of each gate, paths arriving at one internal gate may have different propagation delays. Therefore, a gate may exhibit
multiple spurious transitions before settling to the correct logic level. The Activity and Hazards Power Report allows to quickly identify gates and nets of the design that consume power because of spurious transitions. This is helpful to understand and further minimize power consumption. The activity and hazards report reads a VCD file and reports transitions and hazards for each clock cycle of the VCD file.

**To generate an activity and hazards power report:**

1. From the Designer **Tools** menu, choose **Reports > Power > Power Activity and Hazards**. The Activity and Hazards Power Report dialog box appears.
2. Select the options you want to include in the report, and then click **OK**. The activity and hazards report appears in a separate window.

You can also generate the activity and hazards report from within SmartPower. From the **Tools** menu, choose **Reports > Activity and Hazards Report**; or select a vcd file from the Modes and Scenarios toolbar, and from the right-click menu, select **Tools > Power Activity and Hazards**.

The activity and hazards report dialog box is organized in the following panels: General, Partial Parsing, Top-Level Name, Glitch Filtering, and Clock Domains.

### General

**Select a Category:**

- **General**
  - VCD parsing options
    - Partial parsing
  - Top level name
  - Glitch filtering
  - Clock domains

**General**

- **VCD file:** D:\work\code\design_vcd\EMotor.vcd
- **Report format:** Text
- **Use operating conditions from:** Active
- **Report type:** Report by Net - summary

- For each net, report activity and power; sort by total power; sort order descending; limit the number of reported nets to 40.

**Figure 55 · SmartPower Activity and Hazards Report Dialog Box – General**

- **VCD file** – Select the VCD file you want to import.
- **Report format** – Select **Text** or **CSV** (Comma Separated Value) as the desired export format.
- **Use operating conditions from** – Select the mode from which the operating conditions will be used.
- **Report type** – Select the report type:
- Report by net – summary: summary report by net
- Report by net – detailed: detailed report by cycle
- Report by cycle – summary: summary report by net
- Report by cycle – detailed: detailed report by cycle

The selected report type reports activity and power for each net sorted by power in descending order and limits the number of reported nets to 20 by default. To change these options, click each option and from the pop-up menu, select the desired option:

- Report: Select the query report type: activity, power, or activity and power.
- Sort by: Select the query sort by functional power, functional transitions, spurious power, spurious transitions, or total power.
- Sort order: Select the query sort order: ascending or descending.
- Limit the number of reported nets: Enter the query filter limit.

**Partial Parsing**

![SmartPower Activity and Hazards Power Report Dialog Box – Partial Parsing](image)

Partially parse VCD file – Specify the Start and End times to partially parse the VCD file. This option can be used for large VCD files.
Top-Level Name

This option enables you to select how the top-level name is specified. Select **Automatic Detection** to let the VCD reader automatically detect the top-level name of the design, or select **Specify** to manually specify the top-level name.
Glitch Filtering

This option enables you to filter out pulses of short durations by selecting **Automatic Glitch Filtering** or by entering a value in the **Specify Filtering Threshold** field. The default glitch filtering option is **Automatic Glitch Filtering**.

Clock Domains

This option allows you to specify clock domains. You can set the clock domain's active clock and active edge.
The clock domain can be automatically constructed or it can be specified by the user.

**Automatic construction** – This option automatically constructs the clock domain. SmartPower automatically analyzes your design to assess if a clock is active and what is the active edge.

**Specify** – Select this option to specify the period and first edge.

Use the clock domain table to set the active edge (rising, falling or both) and to set a clock as transparent.

The results are displayed in the activity and hazards power report below.

![SmartPower Activity and Hazards Report](image)

**Figure 60 · SmartPower Activity and Hazards Report**
Cycle-Accurate Power Analysis

The Cycle-Accurate Power Analysis reports cycle-accurate power data in a graphical form. In the analysis window, you can specify ranges and compute averages for each range, define a list of watched blocks, obtain power usage of a single block or cycle, or obtain power usage of multiple blocks over several cycles.

To generate a cycle-accurate power analysis:

1. From the SmartPower Tools menu, choose cycle-accurate Power Analysis; or select a vcd file from the Modes and Scenarios toolbar, and from the right-click menu, select Tools > cycle-accurate Power Analysis. The cycle-accurate Power Analysis dialog box appears.
2. Select the options you want to include in the report, and then click OK. The cycle-accurate power report appears in a separate window.

The cycle-accurate power analysis dialog box is organized in the following panels: General, Sampling Period, Partial Parsing, Top-Level Name, and Glitch Filtering.

General

Figure 61 · SmartPower cycle-accurate Power Analysis Dialog Box – General

VCD file – Select the VCD file you want to import.

Use operating conditions from – Select the mode from which the operating conditions will be used.
**Sampling Period**

**Cycle Accurate Power Analysis**

**Select a Category:**
- General
- Sampling period
  - VCD parsing options
    - Partial parsing
    - Top level name
    - Glitch filtering

**Sampling period**

- **Automatic detection from clock:**
  - ck

- **Compute an average value per clock period**

- **Compute an average value per half clock period**

- **Specify:**
  - **Period:** 10000.00 ps
  - **Offset:** 0.00 ps

**Figure 62 · SmartPower cycle-accurate Power Analysis Dialog Box – Sampling Period**

**Automatic detection from clock** – This option automatically detects the sampling period from the fastest clock. You can also select any other clock in your design. You can specify whether the average value is computed per period or half-period.

**Specify** – Select this option to specify the period and offset used to calculate the sampling period.
Partial Parsing

**Figure 63 · SmartPower cycle-accurate Power Analysis Dialog Box – Partial Parsing**

**Partially parse VCD file** – Specify the Start and End times to partially parse the VCD file. This option can be used for large VCD files.

Top-Level Name

**Figure 64 · SmartPower cycle-accurate Power Analysis Dialog Box – Top-Level Name**
This option enables you to select how the top-level name is specified. Select **Automatic Detection** to let the VCD reader automatically detect the top-level name of the design, or select **Specify** to manually specify the top-level name.

**Glitch Filtering**

This option enables you to filter out pulses of short durations by selecting **Automatic Glitch Filtering** or by entering a value in the **Specify Filtering Threshold** field. The default glitch filtering option is **Automatic Glitch Filtering**.

Figure 65 - SmartPower cycle-accurate Power Analysis Advanced Options Dialog Box – Glitch Filtering
**Cycle-Accurate Power Analysis Window**

Mouse over a cycle to obtain the cycle number, the start and end times, and the power usage for the selected cycle.

Use the **Select** button to select a cycle in the analysis, the grid displays the block name and power usage for the watched blocks.

Use the **Add Marker** button to create cycle ranges – intervals between markers and/or the simulation ends.
To select a range, mouse over the average power usage horizontal line. This will display the average power usage for the range.

To move to the beginning or end of a range, right-click the average power usage of the range and select **Go to Beginning of Range** or **Go to End of Range**.

To move the marker to another cycle, click and drag the marker to another cycle; or from the right-click menu, select **Move marker**, and enter a time value.

To delete the marker, right-click the marker, and select **Delete marker**.

To move to the previous or next markers, right-click the marker, and select **Go to previous marker** or **Go to previous marker**.

Use the **Zoom In** button to zoom in the analysis view.

Use the **Zoom In Horizontal** button to zoom in the analysis view.

Use the **Zoom Out** button to zoom out the analysis view.

Use the **Zoom to Full View** button to zoom into full view.

To view the most power-consuming blocks for a cycle, right-click the cycle, and select **Show Most Consuming Blocks for this Cycle**. This opens the Biggest Power Contributors for Cycle window.
To view the analysis for a specific time, enter a time value in the Go to time box, select the time unit, and press the Go button.

To view the analysis for a specific block, select the block from the Analysis Block pull-down.

To export the cycle-accurate power analysis chart, right-click the chart, and select Export Chart to File.

You can modify the blocks you want to watch during analysis, by pressing the Add/Remove Watched Blocks button.

If the operating conditions in SmartPower have been modified, a warning appears to indicate that the settings have been changed. Click the hyperlink to regenerate the Cycle-Accurate analysis view.

Click the View Settings Summary button to display the cycle-accurate settings.
Figure 68 · Cycle-Accurate Settings Summary

Click the **Add/Remove Watched Blocks** button to display a list of watched blocks. You can add or remove watched blocks by checking or unchecking the **Watch** checkbox for that particular block(s) or by selecting blocks in the grid and using the **Check** or **Uncheck Selected Blocks** buttons. You can use the filter options to hide or display the list of blocks based on the criteria entered.
Importing a VCD File

The Value Change Dump (VCD) file is a simulation file. The format of this file is specified in the IEEE 1364 standard.

You can configure the Project Manager to automatically generate VCD files using ModelSim.

You can also generate a VCD file with a ModelSim simulator using the following commands:

```
vcd file example.vcd
vcd add -r /testbench/<top>_0/*
run 1 us
vcd flush
```

This example creates a VCD file example.vcd, adds all signals recursively, runs the simulation for one micro second, and quits. You must quit ModelSim in order to get an accurate result from SmartPower.

If you have not yet completed the layout of the design, the design software guides you through place-and-route so that you can import the VCD file. In order to successfully annotate your VCD values to the design, Designer must complete place-and-route even if you generated your VCD file using timing simulation (pre-layout).
Note: SmartPower has been validated with VCD files generated by ModelSim. However, you may use any Verilog/VHDL simulator that offers a VCD dump feature.

Refer to the user manual of your simulation tool for more information on how to generate a VCD file.

**To import a VCD file:**

1. From the Simulation menu, select Import VCD File. This opens the Import VCD Options dialog box.

   ![Import VCD Options](image)

   **Figure 70 · Import VCD File Dialog Box**

2. Select the VCD file you want to import and select a mode to import it in, or click New Mode and enter a mode name.

3. Select the options you want to specify:

   **Partial Parsing** — Specify the Start and End Times to partially parse the VCD file. This option can be used for large VCD files.
**SmartPower Interface**

**Figure 71 · Import VCD File Dialog Box — Partial Parsing**

*Top-Level Name* — This option enables you to select how the top-level name is specified. The **Top Level Name** is the instance name of your design instantiated in the simulation testbench.

Select **Automatic Detection** to let the VCD reader automatically detect the top-level name of the design, or select **Specify** to manually specify the top-level name.

**Figure 72 · Import VCD File Dialog Box — Top-Level Name**
**Glitch Filtering** — This option enables you to filter out pulses of short durations by selecting **Automatic Glitch Filtering** or by entering a value in the **Specify Filtering Threshold** field. The default option is **Automatic Glitch Filtering**.

![Import VCD File Dialog Box — Glitch Filtering](image)

**Remaining Signals** — Some signals may not be annotated by the VCD reader. This generally happens with VCD files created from a behavioral or a post-synthesis simulation. For those signals, you can either complete the annotation with the **vectorless analysis** or with the average values computed from the VCD file.

![Import VCD File Dialog Box — Remaining Signals](image)
4. Click **OK**.

5. When the vcd file is successfully imported, the file appears in the Modes and Scenarios toolbar, under the imported mode. The following messages appear in the Designer Log window:

   **Info:**
   VCD:34 glitch(es) filtered with 1000 ps threshold
   The message above reports the number of glitches that have been filtered by the VCD reader.

   **Info:**
   VCD: Annotation Statistics
   Percentage of Annotated Pins:100.00 %
   Percentage of Unannotated Pins:0.00 %
   Percentage of Annotated Pins with Zero Frequency: 25.99 %

   If the percentage of annotated pins is less than 50.00%, a warning message will be generated.

   If the percentage of annotated pins is low, you may want to verify that signals at all levels of hierarchy were added recursively (for example using `vcd add -r` in ModelSim).

   If you simulate a pre-synthesis netlist or a post-synthesis RTL netlist, it is possible to get a low percentage of annotated pins. This happens because not all logic elements are in the pre-synthesis netlist and the post-synthesis RTL netlist. For accurate power estimation, it is best to run post-layout simulation with a back-annotated netlist.

   If you want to see exactly which pins are not annotated, open the SmartPower **Frequencies tab**. If your file was imported successfully, you will see a list of pins with annotated individual frequencies displayed with **VCD Import** as a source. The unannotated pins are displayed with **Default Estimation** as source. If your design has enable pins, open the SmartPower **Probabilities tab**.

   After finishing the import VCD process, you can now create a **custom mode** based on the active mode. This custom mode will inherit all the clock and toggle frequencies of the active mode that have just been set through the VCD import. This final step is optional. It gives you the flexibility to modify the active mode frequencies while saving the VCD scenario in SmartPower. Refer to **Custom operating modes** for more details.

   **Note:** Note: If you generated the VCD file from Project Manager and if you are using Designer from Libero IDE, the list of generated VCD files appear in the unprocessed VCD file list. To import the VCD file, right-click and select Import VCD File.
Importing a SAIF File in Designer

Use the following instructions to import a SAIF file.

To import a SAIF file:

1. From the File menu in Designer, select Import Auxiliary Files. Click Add to browse to your SAIF file and select it. When you have selected a SAIF file, click OK to continue.
   
   If you have not yet completed the layout of the design, the design software guides you through place-and-route so that you can import the SAIF file. In order to successfully annotate your SAIF values to the design, Designer must complete place-and-route even if you generated your SAIF file using timing simulation (post-layout). You may wish to import multiple SAIF files. If these files conflict (attempt to set a different frequency for the same net of your design, for example), the latest imported value takes precedence.

2. Specify your SAIF import options. Use the SAIF Import Options window to specify the instance name of your design in the simulation testbench (the instance name is the instance name of your design instantiated in the simulation testbench). You must include the hierarchy with the instance name. The example below shows how to identify the instance name of your design in the SAIF file. For example, the instance name of the design in the following SAIF file is “TEST_BENCH/UUT”.

   ```
   (SAIFILE
   (SAIFVERSION "1.1")
   (DESIGN 2ff)
   (DATE "Fri May 10 14:48:46 2002")
   
   (TIMESCALE 1ns)
   (DURATION 50000)
   (INSTANCE TEST_BENCH/UUT (PORT (OUT_PORT (TC 26) (IG 0) (T1 25994)
   (T0 22000) (TX 2006)))
   (INSTANCE TEST_BENCH/UUT/\outpad/U0/U1\ (PORT (Y (TC 26) (IG 0)
   ```
Click **OK** to continue.

3. Check the **Log** window for notification that you successfully imported the SAIF file ("The Import command succeeded...”). Even if the Import command succeeds, Actel recommends that you use SmartPower to verify which pins have been affected after you import the file.

4. Verify results of the imported file in the **Frequencies** tab screen in SmartPower. To view the results of your imported SAIF file, launch SmartPower and navigate to the **Frequencies** tab screen to view pins with annotated switching activities. If your file was imported successfully, you will see a list of pins with annotated switching frequencies and specific individual frequencies.

It may be that some pins of your design are not annotated by a SAIF import command. This sometimes happens if you simulate a pre-synthesis netlist. It is normal; not all logic elements are in the pre-synthesis netlist. Thus it is better to do a post-layout simulation with a back-annotated netlist for the most accurate power estimation.

### Removing a VCD File

The Value Change Dump (VCD) file is a simulation file. The format of this file is specified in the IEEE 1364 standard.

**To remove a VCD file:**

- Select the VCD file from Active mode or a custom mode, right-click the VCD file, and select **Remove VCD File from <mode name> Mode**; or
- From the **Simulation** menu, choose **Remove VCD File > <file name>**

**Note:** Note: Any annotation will be removed when you remove the VCD file.

### See Also

- [Importing a VCD File](#)
- [Modes and Scenarios Toolbar](#)

### Auditing Files

SmartPower checks the time stamps of the VCD file and reports any missing or out-of-date files.
Audit is performed automatically when SmartPower is launched. You can trigger file audit at any time from the Simulation menu, by choosing Audit Files. An icon displaying the file status appears in the Modes and Scenarios toolbar next to the VCD file. Mouse over the icon to obtain more information.

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Indicates that the VCD file has been modified</td>
</tr>
<tr>
<td><img src="image" alt="Icon" /></td>
<td>Indicates that the VCD file is missing</td>
</tr>
</tbody>
</table>

To re-import the VCD file, right-click the VCD file and select Re-import VCD File, this will open the Import VCD Options dialog box.
Calculating Power

Steps to Calculate Power

Use the steps below to calculate the power consumption of your design. The list of screens and steps appear in the order in which you should view them to analyze your power accurately.

1. **Summary tab** – View global power at the design level and view its impact on junction temperature.
2. **Domains tab** – Define clock domains and specify a clock frequency and a data frequency for each clock domain.
3. **Analysis tab** – View detailed hierarchical analysis of your power consumption. This step is optional. But if your power consumption exceeds your budget, this step will help you to understand where there is room for improvement.
4. **Frequencies tab** – Specify individual pin frequencies, this step is optional, but gives you pin-by-pin control of the frequency.
5. **Probabilities tab** – Specify probabilities, this step is optional. You can use the default probabilities or set your own.

Extracting Power Consumption of a Specific Clock Domain

To calculate the power consumption of a single clock domain (clock tree and data path) in a design:

1. Set SmartPower in toggle-rate mode. This is the default setting. To confirm that SmartPower is in toggle-rate mode, choose Preferences from File menu. Select the Use Toggle Rates check box
2. In the **Domains** tab, set all the **Clock Frequencies** to zero except for the clock domain for which you are calculating the power consumption.

The total power consumption of this clock domain is displayed in the **Summary** tab. This includes the contribution of the clock buffer, clock tree, and all clock input of the registers of this specific clock domain.

**Note:** Note: In case you need to determine the power of the clock tree only, set the toggle rate of data on that clock domain to zero. The total power displayed is the power of that clock tree.

Advanced Analysis of I/Os

SmartPower provides an easy way of estimating the power consumption related to I/Os. You can then analyze power consumption in detail.

**To display I/O power consumption:**

1. In the **Summary** tab, select By Type from the Breakdown drop-down list. The grid displays the total power consumption of all I/Os in the design, as well as all other components. If you use different I/O standards, and
different Vcci power rails, you can also display the power consumption for each rail by selecting By Rail from the Breakdown drop-down list. Breakdown By Rail shows the power consumption and current for each Vcci rail in the design.

2. In the Analysis tab, select the highest hierarchy level in the Hierarchy tree in the left pane. Select By Instance from the Breakdown drop-down list.

3. In the Analysis tab, unselect all categories under Instances Contributions except I/Os, and then click Apply. The table then displays a list of all I/Os in the design, along with the power contribution of each individual I/O. The columns display important I/O attributes: external port name, load, standard, drive-strength, slew, and macro.

4. In the Probabilities tab, you can control the output probability of each tri-state and bidirectional I/O. The probability is the percentage of time that the I/O is used as an output. The default value can be changed and a specific value can also be set for each bidirectional or tri-state I/O.

See Also
Analyze results
Analysis tab

Define Clock Domains and Set of Pins
When you run SmartPower, it researches your existing clock domains and partitions your design automatically. You may wish to review the list of clock domains in the Domains tab to ensure that all the clocks of your design are included in the list. Add or remove clocks as necessary.

To add a new clock domain:
1. Click the Domains tab, and click the Add Domain button. Select Clock Domain from the drop-down list. This opens the Create Clock Domain dialog box.

![Create Clock Domain Dialog Box – Toggle Rates Disabled](image)

2. To create a new clock, select a Potential Clock Pin, specify a clock and data frequency, and click Create. The new clock domain appears in the Domains window. If you select an existing clock pin from the drop-down list, the lists of clock pins and data pins of this new clock domain are computed automatically based on the netlist topology.
Note: Select Use Toggle Rates in the SmartPower Preferences to define your data frequency as a percentage of your clock frequency. If your data frequency is 20% of your clock frequency, type "20" in the Data Frequency text box.

You may wish to create an empty clock domain and fill the lists of clock-pins and data pins manually. If so, do not select a clock pin, just type a new name for your clock domain.

Beyond the verification of the list of clock domains, you may also wish to verify that the lists of clock pins and data pins computed for each clock domain are correct.

To verify the lists of clock pins and data pins of a clock domain:

1. Click the Domains tab and select a specific Domain in the list.
2. Display the list of clock pins or data pins of this Domain. A drop-down list in the Domains tab enables you to select clock pins or data pins. SmartPower displays the list of pins corresponding to your selection below the drop-down list. You can add or remove clock pins and data pins as necessary.
3. Remove a pin from a clock domain. Highlight the selected pin and click the Remove button. The pin is removed from the clock domain and is made available in the list of pins that you can add in another clock domain.
4. Highlight the selected pin in the list of pins that are not yet in a domain and click the Add button to add a pin in a clock domain. This pin is added to the clock domain. It is a clock pin or a data pin, depending on the specification of the drop-down list when you click the Add button.

Note: You cannot add a pin that exists in another domain until you free it from its existing domain. The pin is unavailable until you remove it from that domain.

After you have verified that all the clocks of your designs are correctly identified and constructed, you must specify the correct clock and data frequency for each clock domain.

To add a new set of pins:

1. Open the Create Clock Domain dialog box. Click the Domains tab, and click the Add Domain button. Select Set of Pins from the drop-down list.
Specify Clock and Data Frequencies in SmartPower

To specify a clock and data frequency:
1. Click the Domains tab
2. Select the Clock/Data frequency cell and type in a new value

SmartPower defaults to 0 MHz for the clock frequency. Import your clock frequency from SmartTime by using the Initialize Frequencies dialog box in SmartPower or input your target for each clock frequency in the Domains tab. You must also specify a data frequency (5% of your clock frequency is a typical guideline for your data frequency – this corresponds to a toggle rate of 10%).

Not all the pins/gates/nets of your design are associated with a specific clock. For example, the frequency of a design input port is not always correlated to a clock frequency. By extension, all pins that are upstream of the first level of sequential elements are not associated with any clock. SmartPower creates an InputSet by default that it uses to group all the pins that are controlled by design inputs (instead of sequential elements). You may wish to view and verify the InputSet to further evaluate your design.

Viewing and Verifying the InputSet in SmartPower

To verify the InputSet:
1. Click the Domains tab and select the domain named InputSet in the list.
2. Verify the list of pins of this domain. All the input ports of your design (except the clocks) belong in the InputSet. Also, all the pins that are between these input ports and the first level of sequential elements belong in the InputSet. You can add or remove pins as necessary.
3. Specify an average input frequency. SmartPower uses the same frequency for all pins of the InputSet. The default InputSet frequency is 1 MHz. Type in a new value to change it.

You may wish to split the InputSet into several sets in order to specify different frequencies. A classic example is to create a ResetSet, a reset tree with a very low frequency.
To split the InputSet into several sets:

1. Create a new set of pins: In the Domains tab, click the New button, and select Set of Pins from the drop-down menu. In the Create Set Of Pins dialog box, type a name and a frequency for the new set and click Create. The new set of pins appears in the Domains window. You can only create an empty set of pins, but it is possible to add pins to this domain later.

2. Remove a group of pins from the InputSet. Click the Domains tab and select the domain named InputSet in the list. Select the pins that you want to remove and click the Remove button.

3. Add this group of pins to the new set of pins. Click the Domains tab and select the newly created set of pins in the list. Highlight the pins in the list of pins that are not yet in a domain, and click the Add button. Repeat these three steps as necessary to create multiple input sets.

Specifying Individual Pin Frequencies

The Frequencies tab enables you to specify an average clock and data frequency for each clock domain, and also an average frequency for each set of pins. This gives you an initial estimate of the power consumption of your design. However, if this estimate is not accurate enough, you may refine it with a pin-by-pin annotation of the frequency.

To specify a frequency annotation for an individual pin:

1. Locate the pin in the Frequencies tab. You may need to select different clock domains from the drop-down list on the Frequencies tab. You can use filters to facilitate this search.

2. Select the pin(s) in the grid and click the Set frequencies for selected pins button, enter a new frequency value, and click OK. This specifies a new frequency for the selected pin(s).

Note: Note: This annotation procedure enables you to set the frequency of an individual pin, but this does not mean that the pin is removed from its clock domain. A frequency annotation just overrides the domain level frequency.

You may wish to change or remove a frequency annotation of an individual pin. This may be useful when you import a VCD (value change-dump) file or a SAIF (Switching Activity Interchange Format) file.

To change the frequency annotation of an individual pin:

1. Locate the pin in the Frequencies tab. You may need to select different clock domains from the drop-down list on the Frequencies tab. You can use filters to facilitate the search.

2. Select the pin(s) in the grid and click the Set frequency for selected pins button, enter a new frequency value, and click OK. This specifies a new frequency for the selected pin(s).

To remove the frequency annotation of an individual pin:

1. Locate the pin in the Frequencies tab. You may need to select different clock domains from the drop-down menu on the Frequencies tab. You can use filters to facilitate the search.

2. Select the pin(s) in the grid and click the Reset frequencies for selected pins button. This removes the specified frequency from the selected pins.
Specifying Individual Pin Probabilities

The Probabilities tab enables you to specify the default output probability value for memory blocks, and tristate and bidirectional I/Os. In addition, you can increase the accuracy of the power estimation by annotating the probability of specific pins.

To specify or change the probability for one or multiple pins:

1. Locate the pin(s) in the Probabilities tab. You can use filters to facilitate this search.
2. Select the pin(s) and press the Set probabilities for selected pins button.
3. Enter a new probability value and press OK.

To reset the probability for one or multiple pins:

1. Locate the pin(s) in the Probabilities tab. You can use filters to facilitate this search.
2. Select the pin(s) and press the Reset Probabilities for selected pins button. This will reset the probability value.

Vectorless Estimation

The Vectorless estimation method is an accurate method of annotating individual pins with frequencies and probabilities. It uses primary inputs, clock frequencies, and nets annotated with other methods as a starting point, and uses a Monte Carlo simulation to annotate all nets in the design with frequencies and probabilities.

Vectorless estimation is available and enabled by default for IGLOO, ProASIC3, SmartFusion and Fusion families of devices.

Vectorless estimation can be enabled from the Initialize Frequencies and Probabilities dialog box or from the VCD Import dialog box.

Changes to probabilities or frequencies in the Probabilities, Frequencies, or Domains tabs result in an out-of-date vectorless estimation. To update vectorless estimation, press the refresh vectorless button.

Viewing Results (Design Level)

Click the Summary tab to view global power consumption at the design level. The Summary tab shows your design's estimated power consumption and temperature information.

The power estimation reported in the Summary tab is the total static and dynamic power consumption of your design. For a more detailed view of this power consumption, click the Analysis tab.

To estimate the junction temperature:

1. Verify your package. You cannot change your package directly in SmartPower, because it may render your place-and-route information (and thus it may severely impact the total power consumption). If you wish to choose another package, you have to do it in Designer > Tools > Device Selection.
2. Click the **Summary** tab, and select a **Cooling** style in the list. Thermal resistance changes automatically when you update the cooling style.

3. Specify an ambient temperature. Enter an **ambient temperature** (default value is 25°C), and click the **Set** button.

---

**Note:** The junction temperature value changes according to the package, cooling style, and ambient temperature values you choose.

---

## Analyzing Results

The **Analysis** tab displays the estimated power consumption of individual blocks, gates, nets, I/Os, and memory and enables you to make a hierarchical analysis of your power consumption. The **Analysis** tab may also help you to improve your power consumption by identifying the components that consume a significant amount of power.

**To identify the components consuming the most power:**

1. Use the **Analysis** tab to expand the design hierarchy. The **Analysis** tab enables you to expand your design hierarchy and view a complete list of the blocks in your design. In the hierarchy window, click the + next to your design to view the items in the hierarchy. Click the + next to a sub-block to view its sub-elements.

![Figure 80 · Analysis Tab Dialog Box](image)

2. Click to select a block. By default, SmartPower selects the design-level block, but you can always select another block in the hierarchical tree. The **Report** window displays the list of sub-elements of the selected block.
Initially, this list includes all sub-elements. The grid in the Analysis window displays a breakdown of the power of the selected block by type. This breakdown provides you a good overview of which areas of your design you should optimize for power.

3. To find the components that use a significant amount of power, choose By Instance from the Breakdown drop-down list.

4. Sort and filter the sub-elements to find the component that is using the most power. The Analysis window displays the list of sub-elements of the selected block. By default, this list includes all sub-elements. The grid contains columns for name, type, power, driver, fanout, macro, I/O standard, output load, output drive, slew, port, domain and frequency. You may limit the list of sub-elements to a list of sub-blocks, nets, gates, I/Os, memories, or any combination of these five classes of sub-elements. You can sort the list according to any column by double-clicking the column header.

**See Also**
- Advanced Analysis of I/Os
- Analysis tab

**Cross-Probing in SmartPower**

SmartPower supports cross probing with the other Designer tools. You must calculate your design's power consumption before you can cross probe effectively. See the Calculating Power section for more information.

**To cross probe with the SmartPower tool:**

1. View the detailed results of your power analysis in the Analysis tab of the SmartPower tool.
2. Select By Instance from the Breakdown drop-down list.
3. Open MultiView Navigator in Designer.
4. Select your component.
5. Click a sub-component in the grid to highlight the corresponding component in the ChipPlanner or PinEditor tool.
Figure 81 - Cross-Probing with SmartPower: SmartPower Analysis View
SmartPower Calculation Equations

SmartPower calculates the static power and the dynamic power of your design, for given operating conditions and operating modes:

**Static Power**: This value is a summation of the static power consumed by each element of the design. SmartPower provides a static power consumption of the array. This value is die-dependent. This value is also a function of the operating mode. For some families, SmartPower also considers a static power contribution per I/O bank. For specific I/O technologies like voltage referenced I/Os or differential I/Os, SmartPower also considers a static power contribution per I/O.

**Dynamic Power**: This value is a summation of the dynamic power consumed by each element of the design (nets, modules, I/Os, RAMs, FIFOs, PLLs, etc.).
Operating Conditions: SmartPower calculates power consumption in Worst, Typical, or Best operating conditions. SmartPower uses the following as general guidelines:

- It applies a voltage derating to dynamic power contributions. Higher voltage typically leads to higher power consumption.
- It applies a temperature derating to static power contributions. Higher temperature typically leads to higher power consumption.
- It applies no radiation derating.

Operating Modes: SmartPower calculates power consumption in Active, Static, Flash*Freeze, Sleep, and Shutdown operating modes, when applicable for your design.

Sample Equations:

The examples below are for general evaluation purposes only. They are not a precise representation of the actual calculations, since each calculation takes into account family-specific information.

- For a net, \[ P = C \cdot V^2 \cdot F \]
  where C is the total capacitive loading of the net (extracted from the routing topology), V is the net’s voltage swing, and F is the average switching frequency.

Note: For the ProASICPLUS family, SmartPower extracts the capacitive loading of a net from a Wire Load model.

- For a module, the power is computed using a characterized library (by family and die-size) describing a specific power model for each type of module. For example, the power model of a flip-flop is given by \[ P = P_{CK} \cdot F_{CK} + P_{DOUT} \cdot F_{DOUT} + P_{Din} \cdot F_{Din} \]
  where \( F_{CK} \) is the average clock-input frequency for this flip-flop, \( F_{DOUT} \) is its average data-output frequency, and \( P_{CK}, P_{DOUT}, P_{Din} \) are three constants estimated by electrical simulation and silicon characterization for this flip-flop module, and \( F_{Din} \) is its average data-input frequency.

- For an I/O, the formula used for computing the power consumption depends on the I/O technology and the family. For example, for a TTL output, the dynamic power is given by \[ P = P_{INT} \cdot F + C \cdot V^2 \cdot F \]
  where C is the output load (derived from what you have set in the I/O Attribute Editor GUI, typically 35 pF for TTL), V is the output’s voltage swing (3.3 V for TTL), and \( P_{INT} \) represents an internal power contribution dissipated in the pad, and F is the average switching frequency of the I/O.

- For a complex block, like a RAM, a FIFO, or a PLL, SmartPower uses a high-level power model that integrates design parameters.
SmartPower automatically computes all the constant parameters of these equations. However, the frequencies depend on the target frequencies of your design. Since it is impractical to enter each frequency manually, SmartPower has several flows that help you to estimate the frequencies and calculate the power consumption.
SmartPower Tcl Commands

SmartPower supports the following Tcl scripting commands:

- report (Activity and Hazards Power Report)
- report (Cycle Accurate Power Report)
- Report (Data History)
- report (Power)
- Report (Power Scenario)
- smartpower_add_new_custom_mode
- smartpower_add_new_scenario
- smartpower_add_pin_in_domain
- smartpower_change_clock_statistics
- smartpower_change_setofpin_statistics
- smartpower_commit
- smartpower_create_domain
- smartpower_edit_custom_mode
- smartpower_edit_scenario
- smartpower_initialize_clock_with_constraints
- smartpower_init do
- smartpower_init_set_clocks_options
- smartpower_init_set_combinational_options
- smartpower_init_set Enables_options
- smartpower_init_set Othersets_options
- smartpower_init_set primaryinputs_options
- smartpower_init_set Registers_options
- smartpower_init_set_setofpinnreset Options
- smartpower_init_setofpins_values
- smartpower_remove_all_annotations
- smartpower_remove_custom_mode
- smartpower_remove_domain
- smartpower Remove_file
The activity and hazards report reads a VCD file and reports transitions and hazards for each clock cycle of the VCD file.

```
report -type power_activity_map \ [-vcd_file {path}] \ [-style {value}] \ [-partial_parse {value}] \ [-start_time {value}] \ [-end_time {value}] \ [-auto_detect_top_level_name {value}] \ [-top_level_name {name}] 
```
[-report_type {value}] \ 
[-report_query {value}] \ 
[-sortby {value }] \ 
[-sortorder {value }] \ 
[-max_net {value}] \ 
[-max_cycle {value}] \ 
[-clock_settings {value}] \ 
[-glitch_filtering {value}] \ 
[-glitch_threshold {value}] \ 
[-auto_construct_clock_domain {value}] \ 
[-clock_period {value}] \ 
[-clock_offset {value}] \ 
[-opmode {value}] \ 
{filename}

**Arguments**

- **type -power_activity_map**
  Specifies the type of report to generate is an activity and hazards power report.
  
- **-vcd_file {path}**
  Specifies the path to the *.vcd file that you want to import.
  
- **-style {value}**
  Specifies the format in which the report will be exported. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>The report will be exported as Text file</td>
</tr>
<tr>
<td>CSV</td>
<td>The report will be exported as CSV file</td>
</tr>
</tbody>
</table>

- **-partial_parse {value}**
  Specifies whether to partially parse the *.vcd file. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Partially parses the *.vcd file</td>
</tr>
<tr>
<td>false</td>
<td>Does not partially parse the *.vcd file</td>
</tr>
</tbody>
</table>

- **-start_time {value}**
  This option is available only if -partially_parse is set to true. Specifies the start time (in ns) to partially parse the *.vcd file.

- **-end_time {value}**
  This option is available only if -partially_parse is set to true. Specifies the end time (in ns) to partially parse the *.vcd file.

- **-auto_detect_top_level_name {value}**
Specifies whether to automatically detect the top-level name. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Automatically detects the top-level name</td>
</tr>
<tr>
<td>false</td>
<td>Does not automatically detect the top-level name</td>
</tr>
</tbody>
</table>

```-top_level_name {name}```

Specifies the top-level name.

```-report_type {value}```

Specifies the report query type. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>activity</td>
<td>Includes activity information for each net</td>
</tr>
<tr>
<td>power</td>
<td>Includes power information for each net</td>
</tr>
<tr>
<td>activity and power</td>
<td>Includes activity and power information for each net</td>
</tr>
</tbody>
</table>

```-report_query {value}```

Specifies the report type. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report by Net - summary</td>
<td>Provides a summary report for each net</td>
</tr>
<tr>
<td>Report by Net - detailed</td>
<td>Provides a detailed report for each net</td>
</tr>
<tr>
<td>Report by Cycle - summary</td>
<td>Provides a summary report for each cycle</td>
</tr>
<tr>
<td>Report by cycle - detailed</td>
<td>Provides a detailed report for each cycle</td>
</tr>
</tbody>
</table>

```-sortby {value}```

Specifies how to sort the values in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>total power</td>
<td>Sorts based on the power values</td>
</tr>
<tr>
<td>spurious power</td>
<td>Sorts based on the spurious power</td>
</tr>
<tr>
<td>functional power</td>
<td>Sorts based on the functional power</td>
</tr>
</tbody>
</table>
SmartPower Tcl Commands

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>spurious transitions</td>
<td>Sorts based on the spurious transitions</td>
</tr>
<tr>
<td>functional transitions</td>
<td>Sorts based on the functional transitions</td>
</tr>
</tbody>
</table>

- `sortorder {value}`
  Specifies the sort order of the values in the report. This could be descending or ascending.

- `max_net {value}`
  Specifies the maximum number of nets to report. In a net summary or net details report, this argument limits the total number of entries. In a cycle details report, this argument limits the number of nets reported for each cycle.

- `max_cycle {value}`
  Specifies the maximum number of cycles to report. In a cycle summary or cycle details report, this argument limits the total number of entries. In a net details report, this argument limits the number of cycles reported for each net.

- `clock_settings {value}`
  Specifies the settings for the clock. The format is "< clock name >:< active edge { value } >". The following table shows the acceptable values for the active edge:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>rising</td>
<td>Sets the clock to a rising active edge</td>
</tr>
<tr>
<td>falling</td>
<td>Sets the clock to a falling active edge</td>
</tr>
<tr>
<td>both</td>
<td>Sets the clock to both rising and falling active edge</td>
</tr>
<tr>
<td>not_active</td>
<td>Does not use the signal as a clock</td>
</tr>
</tbody>
</table>

- `glitch_filtering {value}`
  Specifies whether to use glitch filtering. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Glitch filtering is on</td>
</tr>
<tr>
<td>auto</td>
<td>Enables automatic glitch filtering. This option will ignore any value specified in -glitch_threshold</td>
</tr>
<tr>
<td>false</td>
<td>Glitch filtering is off</td>
</tr>
</tbody>
</table>

- `glitch_threshold {value}`
  This option is only available when -glitch_filtering is set to true. Specifies the glitch filtering value in ps.

- `auto_construct_clock_domain {value}`
Specifies whether to automatically construct the clock domain. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Automatically constructs the clock domain</td>
</tr>
<tr>
<td>false</td>
<td>Does not automatically construct the clock domain</td>
</tr>
</tbody>
</table>

-\(\text{clock\_period\ }\{\text{value}\}\)

Use this option to specify a virtual clock period (in ps). This should be used if -\(\text{auto\_construct\_clock\_domain}\) is set to false.

-\(\text{clock\_offset\ }\{\text{value}\}\)

Use this option to specify the time of the first active edge of the virtual clock (in ps). This should be used if -\(\text{auto\_construct\_clock\_domain}\) is set to false.

-\(\text{opmode\ }\{\text{value}\}\)

Use this option to specify the mode from which the operating conditions are extracted to generate the report.

\(\{\text{filename}\}\)

Specifies the name of the report.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\(^\text{PLUS}\), ProASIC, and Axcelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

This example generates an activity and hazards power report named \(\text{report\_power\_activity\_map.txt}\).

```
report -type "power_activity_map" -vcd_file "D:/FPU/mul.vcd" -style "Text" -partial_parse "TRUE" -start_time "0.05" -end_time "1.00" -auto_detect_top_level_name "TRUE" -report_query "Report by Net - Summary" -clock_settings "UUT/un3_out_3:Y:not_active" -clock_settings "clk:rising" -glitch_filtering "FALSE" -glitch_threshold "100" -auto_construct_virtual_clock "TRUE" -virtual_clock_period "10000.00" -virtual_clock_first_edge "0.00" -opmode "Active"\
(D:/FPU/report_power_activity_map.txt)
```

**Report (Cycle Accurate Power Report)**

Creates a cycle accurate power report, which reports a power waveform with one power value per clock period or half-period instead of an average power for the whole simulation.
report -type power_peak_analyzer \
[-vcd_file {path}] \
[-style {value}] \
[-partial_parse {value}] \
[-start_time {value}] \
[-end_time {value}] \
[-auto_detect_top_level_name {value}] \
[-top_level_name {name}] \
[-glitch_filtering {value}] \
[-glitch_threshold {value}] \
[-auto_detect_sampling_period {value}] \
[-sampling_clock { }] \
[-sampling_rate_per_period {value}] \
[-sampling_offset {value}] \
[-sampling_period {value}] \
[-use_only_local_extrema {value}] \
[-use_power_threshold {value}] \
[-power_threshold {value}] \
[-opmode {value}] \
{filename}

Arguments

-type power_peak_analyzer
Specifies the type of report to generate is a cycle accurate power report.

-vcd_file {path}
Specifies the path to the *.vcd file that you want to import.

-style {value}
Specifies the format in which the report will be exported. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>The report will be exported as Text file</td>
</tr>
<tr>
<td>CSV</td>
<td>The report will be exported as CSV file</td>
</tr>
</tbody>
</table>

-partial_parse {value}
Specifies whether to partially parse the *.vcd file. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Partially parses the *.vcd file</td>
</tr>
<tr>
<td>false</td>
<td>Does not partially parse the *.vcd file</td>
</tr>
</tbody>
</table>

-start_time {value}
This option is available only if -partial_parse is set to true. Specifies the start time (in ns) to partially parse the *.vcd file.
-end_time \{value\}
This option is available only if -partially_parse is set to true. Specifies the end time (in ns) to partially parse the *.vcd file.

-auto_detect_top_level_name \{value\}
Specifies whether to automatically detect the top-level name. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Automatically detects the top-level name</td>
</tr>
<tr>
<td>false</td>
<td>Does not automatically detect the top-level name</td>
</tr>
</tbody>
</table>

-top_level_name \{name\}
Specifies the top-level name.

-glitch_filtering \{value\}
Specifies whether to use glitch filtering. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Glitch filtering is on</td>
</tr>
<tr>
<td>auto</td>
<td>Enables automatic glitch filtering. This option will ignore any</td>
</tr>
<tr>
<td></td>
<td>value specified in -glitch_threshold</td>
</tr>
<tr>
<td>false</td>
<td>Glitch filtering is off</td>
</tr>
</tbody>
</table>

-glitch_threshold \{value\}
This option is only available when -glitch_filtering is set to true. Specifies the glitch filtering value (in ps).

-power_summary \{value\}
Specifies whether to include the power summary, which shows the static and dynamic values in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the power summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the power summary in the report</td>
</tr>
</tbody>
</table>

-auto_detect_sampling_period \{value\}
Specifies whether to automatically detect the sampling period. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Automatically detects the sampling period</td>
</tr>
</tbody>
</table>
**SmartPower Tcl Commands**

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>false</td>
<td>Does not automatically detect the sampling period</td>
</tr>
</tbody>
</table>

```-
sampling_clock {}
```

Specifies the sampling clock.

```-
sampling_rate_per_period {value}
```

Specifies whether to set the sampling rate per period. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Specifies the sampling rate per period</td>
</tr>
<tr>
<td>false</td>
<td>Specifies the sampling rate per half period</td>
</tr>
</tbody>
</table>

```-
sampling_offset {value}
```

Specifies the offset used to calculate the sampling offset (in ps).

```-
sampling_period {value}
```

Specifies the offset used to calculate the sampling period (in ps).

```-
use_only_local_extrema {value}
```

Specifies whether to limit the history size by keeping only local extrema. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Limits the history size by keeping only local extrema</td>
</tr>
<tr>
<td>false</td>
<td>Does not limit the history size by keeping only local extrema</td>
</tr>
</tbody>
</table>

```-
use_power_threshold {value}
```

Specifies whether to limit the history size by setting a power threshold. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Limits the history size by setting a power threshold</td>
</tr>
<tr>
<td>false</td>
<td>Does not limit the history size by setting a power threshold</td>
</tr>
</tbody>
</table>

```-
power_threshold {value}
```

Sets the power threshold value.

```-
opmode {value}
```

Use this option to specify the mode from which the operating conditions are extracted to generate the report.

*(filename)*
Specifies the name of the report.

**Supported Families**
IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\^PLUS, ProASIC, and Axcelerator

**Notes**
- None

**Exceptions**
- None

**Examples**
This example generates a cycle accurate power report named report_power_cycle_based.txt.
```
report -type "power_cycle_based" -vcd_file "D:/FPU/mul.vcd" -style "Text" -partial_parse "TRUE" -start_time "0.05" -end_time "1.00" -auto_detect_top_level_name "TRUE" -glitch_filtering "FALSE" -glitch_threshold "100" -auto_detect_sampling_period "TRUE" -sampling_clock "clk" -sampling_rate_per_period "TRUE" -sampling_offset "0.00" -sampling_period "10000.00" -use_only_local_extrema "TRUE" -use_power_threshold "TRUE" -power_threshold "0.00" -opmode "Active" \ {D:/FPU/report_power_cycle_based.txt}
```

**report (Data Change History)**
Creates a Data Change History report, which lists new features and enhancements, bug fixes and known issues for the current release that may impact the power consumption of the design.
```
report -type power_history \ {report.txt}
```

**Arguments**
- **-type power_history**
  Specifies the type of report to generate is a data change history report.
- **{report.txt}**
  Specifies the name of the report. You must use .txt as the filename extension.

**Supported Families**
IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\^PLUS, ProASIC, and Axcelerator

**Notes**
- None

**Exceptions**
- None
**Examples**

This example generates a data change history report named `report.txt`.

```bash
report -type "power_history" \ 
(report.txt)
```

**report (Power)**

Creates a Power report, which enables you to determine if you have any power consumption problems in your design. It includes information about the global device and SmartPower preferences selection, and hierarchical detail (including gates, blocks, and nets), with a block-by-block, gate-by-gate, and net-by-net power summary SmartPower results.

```bash
report -type power \ 
[-powerunit {value}] \ 
[-frequnit {value}] \ 
[-opcond {value}] \ 
[-opmode {value}] \ 
[-toggle {value}] \ 
[-power_summary {value}] \ 
[-rail_breakdown {value}] \ 
[-type_breakdown {value}] \ 
[-clock_breakdown {value}] \ 
[-thermal_summary {value}] \ 
[-battery_life {value}] \ 
[-opcond_summary {value}] \ 
[-clock_summary {value}] \ 
[-style {value}] \ 
[-sortorder {value}] \ 
[-sortby {value}] \ 
[-instance_breakdown {value}] \ 
[-power_threshold {value}] \ 
[-min_power {number}] \ 
[-max_instance {integer >= 0}] \ 
[-activity_sortorder {value}] \ 
[-activity_sortby {value}] \ 
[-activity_summary {value}] \ 
[-frequency_threshold {value}] \ 
[-filter_pin {value}] \ 
[-enablerates_sortorder {value}] \ 
[-enablerates_sortby {value}] \ 
[-enablerates_summary {value}] \ 
[-with_annotation_coverage {value}] \ 
{filename}
```

**Arguments**

- `-type power`
Specifies the type of report to generate is a Power report.

-`powerunit {value}`

Specifies the unit in which power is set. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>The power unit is set to watts</td>
</tr>
<tr>
<td>mW</td>
<td>The power unit is set to milliwatts</td>
</tr>
<tr>
<td>uW</td>
<td>The power unit is set to microwatts</td>
</tr>
</tbody>
</table>

-`frequnit {value}`

Specifies the unit in which frequency is set. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hz</td>
<td>The frequency unit is set to hertz</td>
</tr>
<tr>
<td>kHz</td>
<td>The frequency unit is set to kilohertz</td>
</tr>
<tr>
<td>MHz</td>
<td>The frequency unit is set to megahertz</td>
</tr>
</tbody>
</table>

-`opcond {value}`

Specifies the operating condition. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>worst</td>
<td>The operating condition is set to worst case</td>
</tr>
<tr>
<td>typical</td>
<td>The operating condition is set to typical case</td>
</tr>
<tr>
<td>best</td>
<td>The operating condition is set to best case</td>
</tr>
</tbody>
</table>

-`opmode {value}`

Specifies the operating mode. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>active</td>
<td>The operating mode is set to active</td>
</tr>
<tr>
<td>static</td>
<td>The operating mode is set to static</td>
</tr>
<tr>
<td>sleep</td>
<td>The operating mode is set to sleep</td>
</tr>
</tbody>
</table>
### SmartPower Tcl Commands

#### Flash*Freeze

The operating mode is set to Flash*Freeze

#### shutdown

The operating mode is set to shutdown

---

#### -toggle {value}

Specifies the toggle. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>The toggle is set to true</td>
</tr>
<tr>
<td>false</td>
<td>The toggle is set to false</td>
</tr>
</tbody>
</table>

---

#### -power_summary {value}

Specifies whether to include the power summary, which shows the static and dynamic values in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the power summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the power summary in the report</td>
</tr>
</tbody>
</table>

---

#### -rail_breakdown {value}

Specifies whether to include the breakdown by rail summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the breakdown by rail summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the breakdown by rail summary in the report</td>
</tr>
</tbody>
</table>

---

#### -type_breakdown {value}

Specifies whether to include the breakdown by type summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the breakdown by type summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the breakdown by type summary in the report</td>
</tr>
</tbody>
</table>
-clock_breakdown \{value\}
Specifies whether to include the breakdown by clock domain in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the breakdown by clock domain summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the breakdown by clock domain summary in the report</td>
</tr>
</tbody>
</table>

-thermal_summary \{value\}
Specifies whether to include the thermal summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the thermal summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the thermal summary in the report</td>
</tr>
</tbody>
</table>

-battery_life \{value\}
Specifies whether to include the battery life summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the battery life summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the battery life summary in the report</td>
</tr>
</tbody>
</table>

-opcond_summary \{value\}
Specifies whether to include the operating conditions summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the operating conditions summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the operating conditions summary in the report</td>
</tr>
</tbody>
</table>

-clock_summary \{value\}
Specifies whether to include the clock domains summary in the report. The following table shows the acceptable values for this argument:
### SmartPower Tcl Commands

- **-style {value}**
  Specifies the format in which the report will be exported. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>The report will be exported as Text file</td>
</tr>
<tr>
<td>CSV</td>
<td>The report will be exported as CSV file</td>
</tr>
</tbody>
</table>

- **-sortby {value}**
  Specifies how to sort the values in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>power values</td>
<td>Sorts based on the power values</td>
</tr>
<tr>
<td>alphabetical</td>
<td>Sorts in an alphabetical order</td>
</tr>
</tbody>
</table>

- **-sortorder {value}**
  Specifies the sort order of the values in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ascending</td>
<td>Sorts the values in ascending order</td>
</tr>
<tr>
<td>descending</td>
<td>Sorts the values in descending order</td>
</tr>
</tbody>
</table>

- **-instance_breakdown {value}**
  Specifies whether to include the breakdown by instance in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the breakdown by instance in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the breakdown by instance in the report</td>
</tr>
</tbody>
</table>

- **-power_threshold {value}**
This specifies whether to include only the instances that consume power above a certain minimum value. When this command is set to true, the \texttt{-min\_power} argument must also be used to specify that only the instances that consume power above this minimum power value are the ones that are included in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the power threshold in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the power threshold in the report</td>
</tr>
</tbody>
</table>

\texttt{-filter\_instance \{value\}}

This specifies whether to have a limit on the number of instances to include in the Power report. When this command is set to true, the \texttt{-max\_instance} argument must also be used to specify the maximum number of instances to be included into the Power report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Indicates that you want to have a limit on the number of instances to include in the Power report</td>
</tr>
<tr>
<td>false</td>
<td>Indicates that you do not want to have a limit on the number of instances to include in the Power report</td>
</tr>
</tbody>
</table>

\texttt{-min\_power \{number\}}

Specifies which block to expand based on the minimum power value of a block.

\texttt{-max\_instance \{integer \ge 0\}}

Sets the maximum number of instances to a specified integer greater than or equal to 0 (zero). This will limit the maximum number of instances to be included in the Power report.

\texttt{-activity\_sortorder \{value\}}

Specifies the sort order for the activity summary. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ascending</td>
<td>Sorts the values in ascending order</td>
</tr>
<tr>
<td>descending</td>
<td>Sorts the values in descending order</td>
</tr>
</tbody>
</table>

\texttt{-activity\_sortby \{value\}}

Specifies how to sort the values for the activity summary. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pin name</td>
<td>Sorts based on the pin name</td>
</tr>
</tbody>
</table>
### SmartPower Tcl Commands

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>net name</td>
<td>Sorts based on the net name</td>
</tr>
<tr>
<td>domain</td>
<td>Sorts based on the clock domain</td>
</tr>
<tr>
<td>frequency</td>
<td>Sorts based on the clock frequency</td>
</tr>
<tr>
<td>source</td>
<td>Sorts based on the clock frequency source</td>
</tr>
</tbody>
</table>

- **activity_summary** \{value\}

  Specifies whether to include the activity summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the activity summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the activity summary in the report</td>
</tr>
</tbody>
</table>

- **frequency_threshold** \{value\}

  Specifies whether to add a frequency threshold. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Adds a frequency threshold</td>
</tr>
<tr>
<td>false</td>
<td>Does not add a frequency threshold</td>
</tr>
</tbody>
</table>

- **filter_pin** \{value\}

  Specifies whether to filter by maximum number of pins. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Filters by maximum number of pins</td>
</tr>
<tr>
<td>false</td>
<td>Does not filter by maximum number of pins</td>
</tr>
</tbody>
</table>

- **min_frequency** \{value\}

  Sets the minimum frequency to \{decimal value [unit { Hz | KHz | MHz}]\}.

- **max_pin** \{value\}

  Sets the maximum number of pins.

- **enablerates_sortorder** \{value\}
Specifies the sort order for the probabilities summary. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ascending</td>
<td>Sorts the values in ascending order</td>
</tr>
<tr>
<td>descending</td>
<td>Sorts the values in descending order</td>
</tr>
</tbody>
</table>

-`-enablerates_sortby (value)`

Specifies how to sort the values for the probabilities summary. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>pin name</td>
<td>Sorts based on the pin name</td>
</tr>
<tr>
<td>net name</td>
<td>Sorts based on the net name</td>
</tr>
<tr>
<td>domain</td>
<td>Sorts based on the clock domain</td>
</tr>
<tr>
<td>frequency</td>
<td>Sorts based on the clock frequency</td>
</tr>
<tr>
<td>source</td>
<td>Sorts based on the clock frequency source</td>
</tr>
</tbody>
</table>

-`-enablerates_summary (value)`

Specifies whether to include the probabilities summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the activity summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the activity summary in the report</td>
</tr>
</tbody>
</table>

-`-with_annotation_coverage (value)`

Specifies whether to include the annotation coverage summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the annotation coverage summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the annotation coverage summary in the report</td>
</tr>
</tbody>
</table>

{filename}
Specifies the name of the report.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- The following arguments have been removed. Running the script will trigger a warning message: Warning: Invalid argument: -argname "argvalue" Ignored. Ignore the warning.
  - annotated_pins {value}
  - stat_pow {value}
  - dyn_pow {value}
- Flash*Freeze, Sleep, and Shutdown are available only for certain families and devices.
- Worst and Best are available only for certain families and devices.

**Exceptions**

- None

**Examples**

This example generates a Power report named report.rpt.

```tcl
report -type "power" 
 "Power Values" 
 "Descending" 
 "TRUE" 
 "FALSE" 
 "FALSE" 
 "Typical" 
 -min_power "2 mW" 
 "ACTIVE" 
 "TRUE" 
 "TRUE" 
 "TRUE" 
 "TRUE" 
 "5" 
 "TRUE" 
 (e:\SmartPower\report.rpt)
```

**report (Power Scenario)**

Creates a scenario power report for a previously defined scenario. It includes information about the global device and SmartPower preferences selection, and the average power consumption and the expected battery life for this sequence.
report -type power_scenario \ 
[-powerunit {value}] \ 
[-frequnit {value}] \ 
[-opcond {value}] \ 
[-toggle {value}] \ 
[-scenario {value}] \ 
[-style {value}] \ 
[-battery_life {value}] \ 
[-battery_capacity {value}] \ 
[-rail_breakdown {value}] \ 
[-type_breakdown {value}] \ 
[-mode_breakdown {value}] \ 
[-opcond_summary {value}] \ 
{filename}

**Arguments**

- **-type power_scenario**
  Specifies the type of report to generate is a scenario power report.
- **-powerunit {value}**
  Specifies the unit in which power is set. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>The power unit is set to watts</td>
</tr>
<tr>
<td>mW</td>
<td>The power unit is set to milliwatts</td>
</tr>
<tr>
<td>uW</td>
<td>The power unit is set to microwatts</td>
</tr>
</tbody>
</table>

- **-frequnit {value}**
  Specifies the unit in which frequency is set. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hz</td>
<td>The frequency unit is set to hertz</td>
</tr>
<tr>
<td>kHz</td>
<td>The frequency unit is set to kilohertz</td>
</tr>
<tr>
<td>MHz</td>
<td>The frequency unit is set to megahertz</td>
</tr>
</tbody>
</table>

- **-toggle {value}**
  Specifies the toggle. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>The toggle is set to true</td>
</tr>
</tbody>
</table>
-scenario {value}
  Specifies a scenario that the report is generated from.
-style {value}
  Specifies the format in which the report will be exported. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
<td>The report will be exported as Text file</td>
</tr>
<tr>
<td>CSV</td>
<td>The report will be exported as CSV file</td>
</tr>
</tbody>
</table>

-battery_life {value}
  Specifies whether to include the battery life summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the battery life summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the battery life summary in the report</td>
</tr>
</tbody>
</table>

-battery_capacity {value}
  Specifies the battery capacity in A*H.
-rail_breakdown {value}
  Specifies whether to include the breakdown by rail summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the breakdown by rail summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the breakdown by rail summary in the report. This is the default value.</td>
</tr>
</tbody>
</table>

-type_breakdown {value}
  Specifies whether to include the breakdown by type summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### report (Power Scenario)

**Value** | **Description**
---|---
true | Includes the breakdown by type summary in the report
false | Does not include the breakdown by type summary in the report. This is the default value.

```bash
-mode_breakdown {value}
```

Specifies whether to include a breakdown by mode in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the breakdown by mode in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the breakdown by mode in the report. This is the default value.</td>
</tr>
</tbody>
</table>

```bash
-opcond_summary {value}
```

Specifies whether to include the operating conditions summary in the report. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Includes the operating conditions summary in the report</td>
</tr>
<tr>
<td>false</td>
<td>Does not include the operating conditions summary in the report</td>
</tr>
</tbody>
</table>

```bash
{filename.rpt}
```

Specifies the name of the report.

### Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC PLUS, ProASIC, and Axcelerator

### Notes

- Flash*Freeze, Sleep, and Shutdown are available only for certain families and devices.
- Worst and Best are available only for certain families and devices.

### Exceptions

- None
Examples

This example generates a scenario power report named report.txt for my_scenario

```bash
report -type power_scenario -scenario my_scenario -rail_breakdown true -type_breakdown true -mode_breakdown true -style text -battery_capacity 10 report.txt
```

See Also

Scenario Power Report

smartpower_add_new_custom_mode

Creates a new custom mode.

```bash
smartpower_add_new_custom_mode -name {mode_name} -base_mode {base_mode} -description {mode_description}
```

Arguments

- `name {mode_name}`
  
  Specifies the name of the new custom mode.

- `base_mode {base_mode}`
  
  Specifies the name of the base mode used to create the new custom mode.

- `description {mode_description}`
  
  Specifies the description of the new custom mode.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- None

Exceptions

- None

Examples

This example creates a new custom mode "Cust_1" based on the Active mode:

```bash
smartpower_add_new_custom_mode -name {Cust_1} -base_mode {Active} -description {frequency 10 MHz}
```

See Also

smartpower_remove_custom_mode
smartpower_add_new_scenario

Creates a new scenario.

smartpower_add_new_scenario -name \{value\} -description \{value\} -mode \{value\}

Arguments

- `name \{value\}`
  Specifies the name of the new scenario.
- `description \{value\}`
  Specifies the description of the new scenario.
- `mode \{<operating_mode>:<duration>|\}`
  Specifies the mode(s) and duration(s) for the specified scenario.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- None

Exceptions

- None

Examples

This example creates a new scenario called myscenario:

```
smartpower_add_new_scenario -name myscenario -description mynewscenario -mode active:30 + shutdown:30 + active:40
```

smartpower_add_pin_in_domain

Adds a pin into a clock or set domain.

smartpower_add_pin_in_domain -pin_name \{pin_name\} -pin_type \{value\} -domain_name \{domain_name\} -domain_type \{value\}

Arguments

- `pin_name \{pin_name\}`
  Specifies the name of the pin to add to the domain.
- `pin_type \{value\}`
  Specifies the type of the pin to add. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock</td>
<td>The pin to add is a clock pin</td>
</tr>
</tbody>
</table>
SmartPower Tcl Commands

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>data</td>
<td>The pin to add is a data pin</td>
</tr>
</tbody>
</table>

- `domain_name {domain_name}`
  Specifies the name of the domain in which to add the specified pin.
- `domain_type {value}`
  Specifies the type of domain in which to add the specified pin. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock</td>
<td>The domain is a clock domain</td>
</tr>
<tr>
<td>set</td>
<td>The domain is a set domain</td>
</tr>
</tbody>
</table>

**Supported Families**
IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator

**Notes**
- The `domain_name` must be a name of an existing domain.
- The `pin_name` must be a name of a pin that exists in the design.

**Exceptions**
- None

**Examples**
The following example adds a clock pin to an existing Clock domain:
```tcl```
smartpower_add_pin_in_domain -pin_name { XCMP3/U0/U1:Y } -pin_type {clock} -domain_name {clk1} -domain_type {clock}
```tcl```
The following example adds a data pin to an existing Set domain:
```tcl```
smartpower_add_pin_in_domain -pin_name { XCMP3/U0/U1:Y } -pin_type {data} -domain_name {myset} -domain_type {set}
```tcl```

**See Also**
smartpower_remove_pin_of_domain

**smartpower_change_clock_statistics**
Changes the default frequencies and probabilities for a specific domain.
smartpower_change_clock_statistics -domain_name {value} -clocks_freq {value} -clocks_proba {value} -registers_freq {value} -registers_proba {value} -set_reset_freq {value} -set_reset_proba {value} -primaryinputs_freq {value} -primaryinputs_proba {value} -combinational_freq {value} -combinational_proba {value}

**Arguments**

- **domain_name {value}**
  Specifies the domain name in which to initialize frequencies and probabilities.

- **clocks_freq {value}**
  Specifies the user input frequency in Hz, KHz, or MHz for all clocks.

- **clocks_proba {value}**
  Specifies the user input probability in % for all clocks.

- **registers_freq {value}**
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and
toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a
frequency.

- **registers_proba {value}**
  Specifies the user input probability in % for all registers.

- **set_reset_freq {value}**
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and
toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a
frequency.

- **set_reset_proba {value}**
  Specifies the user input probability in % for all set/reset nets.

- **primaryinputs_freq {value}**
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and
toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a
frequency.

- **primaryinputs_proba {value}**
  Specifies the user input probability in % for all primary inputs.

- **combinational_freq {value}**
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and
toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a
frequency.

- **combinational_proba {value}**
  Specifies the user input probability in % for all combinational combinational output.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.
Exceptions

- None

Examples

The following example initializes all clocks with:

```
smartpower_change_clock_statistics -domain_name {my_domain} -clocks_freq {10 MHz} -
clocks_proba {20} -registers_freq {10 MHz} -registers_proba {20} -set_reset_freq {10
MHz} -set_reset_proba {20} -primaryinputs_freq {10 MHz} -primaryinputs_proba {20} -
combinational_freq {10 MHz} -combinational_proba {20}
```

**smartpower_change_setofpin_statistics**

Changes the default frequencies and probabilities for a specific set.

```
smartpower_change_setofpin_statistics -domain_name {value} -data_freq {value} -
data_proba {value}
```

Arguments

- **-domain_name {value}**
  Specifies the domain name in which to initialize data frequencies and probabilities.
- **-data_freq {value}**
  Specifies the user input data frequency in Hz, KHz, or MHz for all sets of pins.
- **-data_proba {value}**
  Specifies the user input data probability in % for all sets of pins.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.

Exceptions

- None

Examples

The following example initializes all clocks with:

```
smartpower_change_setofpin_statistics -domain_name {my_domain} -data_freq {10 MHz} -
data_proba {20}
```

**smartpower_commit**

Saves the changes to the design (.adb) file.
smartpower_commit

**Arguments**
- None

**Supported Families**
IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator

**Notes**
- None

**Exceptions**
- None

**Examples**
smartpower_commit

**See Also**
smartpower_restore

smartpower_create_domain
Creates a new clock or set domain.

smartpower_create_domain -domain_type \{value\} -domain_name \{domain_name\}

**Arguments**
- -domain_type \{value\}
  Specifies the type of domain to create. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock</td>
<td>The domain is a clock domain</td>
</tr>
<tr>
<td>set</td>
<td>The domain is a set domain</td>
</tr>
</tbody>
</table>

- -domain_name \{domain_name\}
  Specifies the name of the new domain.

**Supported Families**
IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator
Notes

- The domain name cannot be the name of an existing domain.
- The domain type must be either clock or set.

Exceptions

- None

Examples

The following example creates a new clock domain named "clk2":
smartpower_create_domain -domain_type {clock} -domain_name {clk2}
The following example creates a new set domain named "myset":
smartpower_create_domain -domain_type {set} -domain_name {myset}

See Also

smartpower_remove_domain

smartpower_edit_custom_mode

Edits a custom mode.

smartpower_edit_custom_mode -name {old_mode_name} new_name {new_mode_name} -description {mode_description}

Arguments

- name {old_mode_name}
  Specifies the name of the custom mode you want to edit.
- new_name {new_mode_name}
  Specifies the new name of the custom mode.
- description {mode_description}
  Specifies the description of the new custom mode.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Accelerator

Notes

- None

Exceptions

- None
smartpower_edit_scenario

Edits a scenario.

smartpower_edit_scenario -name {value} -description {value} -mode {value} -new_name {value}

Arguments

- name {value}
  Specifies the name of the scenario.
- description {value}
  Specifies the description of the scenario.
- mode {<operating mode>:<duration>}
  Specifies the mode(s) and duration(s) for the specified scenario.
- new_name {value}
  Specifies the new name for the scenario

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

• None

Exceptions

• None

Examples

This example edits the name of myscenario to finalscenario:

smartpower_edit_scenario -name myscenario -new_name finalscenario

smartpower_initialize_clock_with_constraints

Initializes the clock frequency and the data frequency of a single clock domain with a specified clock name and the initialization options.
smartpower_initialize_clock_with_constraints -clock_name {value}

Arguments
-clock_name {value}
Specifies the name of the clock that will be initialized.

Supported Families
IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes
- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.
- This command is associated with the right-click menu Synchronize Domain with SmartTime on a single clock domain in the Domains tab.

Exceptions
- None

Examples
The following example initializes "my_clock" with clock constraints from SmartTime:
smartpower_initialize_clock_with_constraints -clock_name {my_clock}

smartpower_init_do
Initializes the frequencies and probabilities for clocks, registers, set/reset nets, primary inputs, combinational outputs, enables and other sets of pins, and selects a mode for initialization.

smartpower_init_do -with {value} -opmode {value} -clocks {value} -registers {value} -set_reset {value} -primaryinputs {value} -combinational {value} -enables {value} -othersets {value}

Arguments
-with {value}
This sets the option of initializing frequencies and probabilities with vectorless analysis or with fixed values. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>vectorless</td>
<td>Initializes frequencies and probabilities with vectorless analysis</td>
</tr>
<tr>
<td>fixed</td>
<td>Initializes frequencies and probabilities with fixed values</td>
</tr>
</tbody>
</table>

-opmode {value}
Specifies the mode in which to initialize frequencies and probabilities. The mode needs to be based on an Active mode.

-**clocks** (**value**)

This sets the option of initializing frequencies and probabilities for all clocks. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Initializes frequencies and probabilities for all clocks</td>
</tr>
<tr>
<td>false</td>
<td>Does not initialize frequencies and probabilities for all clocks</td>
</tr>
</tbody>
</table>

-**registers** (**value**)

This sets the option of initializing frequencies and probabilities for all registers. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Initializes frequencies and probabilities for all registers</td>
</tr>
<tr>
<td>false</td>
<td>Does not initialize frequencies and probabilities for all registers</td>
</tr>
</tbody>
</table>

-**set_reset** (**value**)

This sets the option of initializing frequencies and probabilities for all set/reset nets. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Initializes frequencies and probabilities for all set/reset nets</td>
</tr>
<tr>
<td>false</td>
<td>Does not initialize frequencies and probabilities for all set/reset nets</td>
</tr>
</tbody>
</table>

-**primaryinputs** (**value**)

This sets the option of initializing frequencies and probabilities for all primary inputs. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Initializes frequencies and probabilities for all primary inputs</td>
</tr>
<tr>
<td>false</td>
<td>Does not initialize frequencies and probabilities for all primary inputs</td>
</tr>
</tbody>
</table>

-**combinational** (**value**)

This sets the option of initializing frequencies and probabilities for all combinational outputs. The following table shows the acceptable values for this argument:
### Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Note: Vectorless estimation is not supported for ProASIC, ProasicPLUS, and Axcelerator devices.

### Notes

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.

### Exceptions

- None

### Examples

The following example initializes all clocks with:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Initializes frequencies and probabilities for all enable sets of pins</td>
</tr>
<tr>
<td>false</td>
<td>Does not initialize frequencies and probabilities for all enable sets of pins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Initializes frequencies and probabilities for all other sets of pins</td>
</tr>
<tr>
<td>false</td>
<td>Does not initialize frequencies and probabilities for all other sets of pins</td>
</tr>
</tbody>
</table>
smartpower_init_set_clocks_options

Initializes the clock frequency options of all clock domains.

\[ \text{smartpower_init_set_clocks_options -with_clock_constraints \{value\} -with_default_values \{value\} -freq \{value\} -duty_cycle \{value\}} \]

**Arguments**

- `with_clock_constraints \{value\}`
  This sets the option of initializing the clock frequencies with frequency constraints from SmartTime. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Sets initialize clock frequencies with clock constraints ON</td>
</tr>
<tr>
<td>false</td>
<td>Sets initialize clock frequencies with clock constraints OFF</td>
</tr>
</tbody>
</table>

- `with_default_values \{value\}`
  This sets the option of initializing the clock frequencies with a user input default value. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Sets initialize clock frequencies with default values ON</td>
</tr>
<tr>
<td>false</td>
<td>Sets initialize clock frequencies with default values OFF</td>
</tr>
</tbody>
</table>

- `freq \{value\}`
  Specifies the user input frequency in Hz, KHz, or MHz.

- `duty_cycle \{value\}`
  Specifies the user input duty cycles in %.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.
Exceptions

- None

Examples

The following example initializes all clocks after executing `smartpower_init_do` with `clobber {true}`:

```
smartpower_init_set_clocks_options -with_clock_constraints {true} -with_default_values {true} -freq {10 MHz} -duty_cycle {20}
```

**smartpower_init_set_combinational_options**

Initializes the frequency and probability of all combinational outputs.

```
smartpower_init_set_combinational_options  -freq {value} -proba {value}
```

Arguments

- `freq {value}`
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a frequency.

- `proba {value}`
  Specifies the user input probability in %.

Supported Families

- IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.

Exceptions

- None

Examples

The following example initializes all combinational signals after executing `smartpower_init_do` with `clobber {true}`:

```
smartpower_init_set_combinational_options -freq {10 MHz} -proba {20}
```

**smartpower_init_set_enables_options**

Initializes the clock frequency of all enable clocks with the initialization options.

```
smartpower_init_set_enables_options  -freq {value} -proba {value}
```
Arguments

- **-freq** *(value)*
  Specifies the user input frequency (in Hz, KHz, or MHz).
- **-proba** *(value)*
  Specifies the user input probability in %.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.

Exceptions

- None

Examples

The following example initializes all clocks after executing `smartpower_init_do` with `-enables {true}`:

```
smartpower_init_set_enables_options -freq {10 MHz} -proba {20}
```

```
smartpower_init_set_othersets_options
```

Initializes the frequency and probability of all other sets.

```
smartpower_init_set_othersets_options [-freq "decimal value [unit {Hz | KHz | MHz}]"
[-proba "decimal value"]
[-with "vectorless | default"]
[-input_freq "decimal value [unit {Hz | KHz | MHz}]" ]
[-input_proba "decimal value"]
```

Arguments

- **-freq** *("decimal value [unit {Hz | KHz | MHz}]"
  Specifies the default frequency and units.
- **-proba** *("decimal value")
  Specifies the default probability.
- **-with** *("vectorless | default")
  Specifies vectorless or default analysis.
- **-input_freq** *("decimal value [unit {Hz | KHz | MHz}]"
  Specifies the input frequency and units.
- **-input_proba** *("decimal value")
  Specifies the input probability.
**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- This command is associated with the functionality of Initialize Frequencies and Probabilities dialog box.

**Exceptions**

- None

**Examples**

The following example initializes all other sets after executing `smartpower_init_do` with `-othersets {true}:

```
smartpower_init_set_othersets_options -freq {10 MHz} -proba {20} [-with default]
```

**smartpower_init_set_primaryinputs_options**

Initializes the frequency and probability of all primary inputs.

```
smartpower_init_set_primaryinputs_options -freq {value} -proba {value}
```

**Arguments**

- **-freq {value}**
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a frequency.

- **-proba {value}**
  Specifies the user input probability in %.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.

**Exceptions**

- None

**Examples**

The following example initializes all primary inputs after executing `smartpower_init_do` with `-primaryinputs {true}:

```
smartpower_init_set_primaryinputs_options -freq {10 MHz} -proba {20}
```
smartpower_init_set_registers_options

Initializes the frequency and probability of all register outputs.

smartpower_init_set_registers_options -freq {value} -proba {value}

**Arguments**

- **-freq {value}**
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a frequency.
- **-proba {value}**
  Specifies the user input probability in %.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator

**Notes**

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.

**Exceptions**

- None

**Examples**

The following example initializes all register outputs after executing smartpower_init_do with -registers {true}:

```
smartpower_init_set_registers_options -freq {10 MHz} -proba {20}
```

smartpower_init_set_set_reset_options

Initializes the frequency and probability of all set and reset nets.

smartpower_init_set_set_reset_options -freq {value} -proba {value}

**Arguments**

- **-freq {value}**
  Specifies the user input frequency (in Hz, KHz, or MHz) or the toggle rate (in %). If the unit is not provided and toggle rate is active, the value is handled as a toggle rate; if toggle rate is not active, the value is handled as a frequency.
- **-proba {value}**
  Specifies the user input probability in %.
**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator

**Notes**

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.

**Exceptions**

- None

**Examples**

The following example initializes all set/reset nets after executing `smartpower_init_do` with `-set_reset {true}):

```
smartpower_init_set_set_reset_options -freq 10 MHz -proba 20
```

**smartpower_init_setofpins_values**

Initializes the frequency and probability of all sets of pins.

```
smartpower_init_setofpins_values -domain_name {name} -freq {value} -proba {value}
```

**Arguments**

- `-domain_name {name}`
  - Specifies the set of pins that will be initialized. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IOsEnableSet</td>
<td>Specifies that the IOsEnableSet set of pins will be initialized</td>
</tr>
<tr>
<td>MemoriesEnableSet</td>
<td>Specifies that the MemoriesEnableSet set of pins will be initialized</td>
</tr>
</tbody>
</table>

- `-freq {value}`
  - Specifies the user input frequency in Hz, MHz, or KHz.

- `-proba {value}`
  - Specifies the user input probability in %.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator

**Notes**

- This command is associated with the functionality of Initialize frequencies and probabilities dialog box.
Exceptions

- None

Examples

The following example initializes all primary inputs after executing `smartpower_init_do` with `-othersets {true}:

```plaintext
smartpower_init_setofpins_values -domain_name {IOsEnableSet} -freq {10 MHz} -proba {20}
```

`smartpower_remove_all_annotations`

Removes all initialization annotations for the specified mode.

```plaintext
smartpower_remove_all_annotations -opmode {value}
```

Arguments

- `opmode {value}`
  
  Removes all initialization annotations for the specified mode.

Supported Families

- IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- This command is associated with the functionality of `Initialize frequencies and probabilities` dialog box.

Exceptions

- None

Examples

The following example initializes all clocks with:

```plaintext
smartpower_remove_all_annotations -opmode {my_mode}
```

`smartpower_remove_custom_mode`

Removes a custom mode.

```plaintext
smartpower_remove_custom_mode -name {deleted_mode_name}
```

Arguments

- `name {deleted_mode_name}`
  
  Specifies the name of the custom mode you want to delete.
**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

This example deletes custom mode "Cust_1":

```
smartpower_delete_custom_mode -name {Cust_1}
```

**See Also**

- `sp_add_custom_mode`
- `sp_edit_custom_mode`

### smartpower_remove_domain

Removes an existing clock or set domain.

```
smartpower_remove_domain -domain_type {value} -domain_name {domain_name}
```

**Arguments**

- `domain_type {value}`
  
  This specifies the type of domain to remove. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock</td>
<td>The domain is a clock domain</td>
</tr>
<tr>
<td>set</td>
<td>The domain is a set domain</td>
</tr>
</tbody>
</table>

- `domain_name {domain_name}`
  
  This specifies the name of the domain to remove

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

The domain name must be the name of an existing domain.

The domain type must be either clock or set.
Exceptions

None

Examples

The following example removes the clock domain named "clk2":
smartpower_remove_domain -domain_type {clock} -domain_name {clk2}
The following example removes the set domain named "myset":
smartpower_remove_domain -domain_type {set} -domain_name {myset}

See Also

smartpower_create_domain

smartpower_remove_file

Removes a VCD file from the specified mode.

Arguments

-file {value}
Specifies the file to be removed.
-format VCD
Specifies that the type to be removed is a VCD file.
-opmode {value}
Specifies the operating mode. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>active</td>
<td>The operating mode is set to active</td>
</tr>
<tr>
<td>static</td>
<td>The operating mode is set to static</td>
</tr>
<tr>
<td>sleep</td>
<td>The operating mode is set to sleep</td>
</tr>
<tr>
<td>FlashFreeze</td>
<td>The operating mode is set to FlashFreeze</td>
</tr>
<tr>
<td>shutdown</td>
<td>The operating mode is set to shutdown</td>
</tr>
</tbody>
</table>

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator
Notes

- None

Exceptions

- None

Examples

This example removes the file test.vcd from the active mode.

smartpower_remove_file -file test -format -vcd opmode -active

smartpower_remove_pin_probability

Removes the probability value associated with a specific pin. This pin will have a default probability based on the domain set it belongs to.

smartpower_remove_pin_probability -pin_name {pin_name}

Arguments

- pin_name {pin_name}
  Specifies the name of the pin with the probability to remove. This pin must be the direct driver of an enable pin.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- None

Exceptions

- None

Examples

The following example removes the probability of the pin driving the enable pin of a bidirectional I/O:

Smartpower_remove_pin_probability -pin_name mybibuf/U0/U1:EOUT

See Also

smartpower_set_pin_probability

smartpower_remove_pin_frequency

Removes the frequency associated with a specific pin. This pin will have a default frequency based on its domain.

smartpower_remove_pin_frequency -pin_name {pin_name}
Arguments

- `pin_name` `{pin_name}`
  Specifies the name of the pin for which the frequency will be removed.

Supported Families

- IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator

Notes

- The `pin_name` must be the name of a pin that already exists in the design and already belongs to a domain.

Exceptions

- None

Examples

The following example removes the frequency from the pin named "count8\_clock":

```
smartpower_remove_pin_frequency -pin_name {count8\_clock}
```

See Also

- `smartpower_set_pin_frequency`

smartpower_remove_pin_of_domain

Removes a clock pin or a data pin from a clock or set domain, respectively.

```
smartpower_remove_pin_of_domain -pin_name `{pin_name}` -pin_type `{value}` -domain_name `{domain_name}` -domain_type `{value}`
```

Arguments

- `pin_name` `{pin_name}`
  Specifies the name of the pin to remove from the domain.

- `pin_type` `{value}`
  Specifies the type of the pin to remove. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock</td>
<td>The pin to remove is a clock pin</td>
</tr>
<tr>
<td>data</td>
<td>The pin to remove is a data pin</td>
</tr>
</tbody>
</table>

- `domain_name` `{domain_name}`
  Specifies the name of the domain from which to remove the pin.

- `domain_type` `{value}`
Specifies the type of domain from which the pin is being removed. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock</td>
<td>The domain is a clock domain</td>
</tr>
<tr>
<td>set</td>
<td>The domain is a set domain</td>
</tr>
</tbody>
</table>

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- The domain name must be the name of an existing domain.
- The pin name must be the name of an existing pin.

**Exceptions**

- None

**Examples**

The following example removes the clock pin named "XCMP3/UO/U1:Y" from the clock domain named "clockh":

```
smartpower_remove_pin_of_domain -pin_name {XCMP3/U0/U1:Y} -pin_type {clock} -domain_name {clockh} -domain_type {clock}
```

The following example removes the data pin named "count2_en" from the set domain named "InputSet":

```
smartpower_remove_pin_of_domain -pin_name {count2_en} -pin_type {data} -domain_name {InputSet} -domain_type {set}
```

**See Also**

smartpower_add_pin_in_domain

**smartpower_remove_scenario**

Removes a scenario from the current design.

```
smartpower_remove_scenario -name {value}
```

**Arguments**

- `name {value}`
  - Specifies the name of the scenario.
**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC PLUS, ProASIC, and Axcelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

This example removes a scenario from the current design:

```sh
csmartpower_remove_scenario -name myscenario
```

**smartpower_remove_vcd**

Removes an existing VCD file from a mode or entire design.

```sh
csmartpower_remove_vcd -from {value} -mode {value} -file
```

**Arguments**

- `-from {value}`
  
  This specifies the if the VCD is removed for a specific mode or for the entire project. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mode</td>
<td>The VCD file is removed for a mode</td>
</tr>
<tr>
<td>project</td>
<td>The VCD file is removed from the project</td>
</tr>
</tbody>
</table>

- `-mode {value}`
  
  This specifies the name of the mode for which the VCD will be removed

- `-filename`
  
  This specifies the name of the VCD file to be removed

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC PLUS, ProASIC, and Axcelerator

**Notes**

None
**Exceptions**

None

**Examples**

The following example removes the VCD file named `my_vcd.vcd` from the active mode:

```tcl
smartpower_remove_vcd -from {mode} -mode {active} -my_vcd.vcd
```

**See Also**

`smartpower_create_domain`

---

**smartpower_restore**

Restores all power information previously committed in SmartPower.

```tcl
smartpower_restore
```

**Arguments**

- None

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Accelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

```tcl
smartpower_restore
```

**See Also**

`smartpower_commit`

---

**smartpower_set_battery_capacity**

Sets the battery capacity.

```tcl
smartpower_set_battery_capacity {value}
```

**Arguments**

- `value`
  
  Sets the battery capacity to a value in mA/h.
**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

The following example sets the battery capacity to 40 A/h:

```
smartpower_set_battery_capacity {40}
```

**smartpower_set_cooling**

Sets the cooling style to one of the predefined types, or a custom value.

```
smartpower_set_cooling -style {value} -teta {value}
```

**Arguments**

- **-style {value}**
  
  Specifies the cooling style to custom value or to one of the predefined types with a default thermal resistance value.
  
  The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>300_lfm</td>
<td>Predefined cooling style</td>
</tr>
<tr>
<td>case_cooling</td>
<td>Predefined cooling style</td>
</tr>
<tr>
<td>still_air</td>
<td>Predefined cooling style</td>
</tr>
<tr>
<td>custom</td>
<td>Cooling style defined by user input</td>
</tr>
</tbody>
</table>

- **-teta {value}**
  
  Specifies the thermal resistance in °C/W. This argument is only available when style is set to Custom.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator
Notes

- To compute the junction temperature, set the following three commands: `smartpower_set_thermalmode`, `smartpower_set_tambient` and `smartpower_set_cooling`. The junction temperature will be updated when an output command is executed, such as `report(Power)`.

Exceptions

- None

Examples

The following example sets the cooling style to still air:

```tcl
smartpower_set_cooling -style {still_air}
```

`smartpower_set_mode_for_analysis`

Sets the mode for cycle-accurate power analysis.

```tcl
smartpower_set_mode_for_analysis -mode {value}
```

Arguments

- `-mode {value}`
  
  Specifies the mode for cycle-accurate power analysis.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- None

Exceptions

- None

Examples

The following example sets the mode for analysis to active:

```tcl
smartpower_set_mode_for_analysis -mode {active}
```

`smartpower_set_operating_condition`

Sets the operating conditions used in SmartPower to one of the pre-defined types.

```tcl
smartpower_set_operating_condition -opcond {value}
```
Arguments

-opcond {value}

Specifies the value of the operating condition. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>best</td>
<td>Sets the operating conditions to best</td>
</tr>
<tr>
<td>typical</td>
<td>Sets the operating conditions to typical</td>
</tr>
<tr>
<td>worst</td>
<td>Sets the operating conditions to worst</td>
</tr>
</tbody>
</table>

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

• None

Exceptions

• None

Examples

This example sets the operating conditions to best:

```
smartpower_set_operating_condition -opcond {best}
```

**smartpower_set_pin_frequency**

Sets the frequency of a pin in megahertz (MHz). If you do not use this command, each pin will have default frequency based on its domain.

```
smartpower_set_pin_frequency -pin_name {pin_name} -pin_freq {value}
```

Arguments

-pin_name {pin_name}

Specifies the name of the pin for which the frequency will be set.

-pin_freq {value}

Specifies the value of the frequency in MHz, which can be any positive decimal number.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator
SmartPower Tcl Commands

Notes

- The `pin_name` must be the name of a pin that already exists in the design and already belongs to a domain.
- When specifying the unit, a space must be between the frequency value and the unit.

Exceptions

- None

Examples

This example sets the frequency of the pin named "count8_clock" to 100 MHz:

```
smartpower_set_pin_frequency -pin_name {count8_clock} -pin_freq {100}
```

See Also

`smartpower_remove_pin_frequency`

smartpower_set_pin_probability

Enables you to set the probability value of a pin driving an enable pin. For I/Os, if you do not use this command, the probability of the IOEnableSet is used. For memories, if you do not use this command, the probability of the MemoriesEnableSet is used.

```
smartpower_set_pin_probability -pin_name {pin_name} -pin_enable_rate {value}
```

Arguments

- `pin_name` `{pin_name}`
  Specifies the name of a pin for which the probability will be set. This pin must be the direct driver of an enable pin.
- `pin_proba` `{value}`
  Specifies the value of the pin probability as a percentage, which can be any positive decimal between 0 and 100, inclusive.

Supported Families

- IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- None

Exceptions

- None

Examples

The following example sets the probability of the pin driving the enable pin of a bidirectional I/O

```
smartpower_set_pin_probability -pin_name mybibuf/U0/U1:EOUT
```

See Also

`smartpower_remove_pin_probability`
smartpower_set_preferences

Sets the following preferences: power unit, frequency unit, operating mode, operating conditions, and toggle. These preferences can also be set from the preferences dialog box.

smartpower_set_preferences -powerunit {value} -frequnit {value} -opmode {value} -opcond {value} -toggle {value}

Arguments

-powerunit {value}
Specifies the unit in which power is set. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>The power unit is set to watts</td>
</tr>
<tr>
<td>mW</td>
<td>The power unit is set to milliwatts</td>
</tr>
<tr>
<td>uW</td>
<td>The power unit is set to microwatts</td>
</tr>
</tbody>
</table>

-frequnit {value}
Specifies the unit in which frequency is set. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hz</td>
<td>The frequency unit is set to hertz</td>
</tr>
<tr>
<td>kHz</td>
<td>The frequency unit is set to kilohertz</td>
</tr>
<tr>
<td>MHz</td>
<td>The frequency unit is set to megahertz</td>
</tr>
</tbody>
</table>

-opmode {value}
Specifies the operating mode. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>active</td>
<td>The operating mode is set to active</td>
</tr>
<tr>
<td>static</td>
<td>The operating mode is set to static</td>
</tr>
<tr>
<td>sleep</td>
<td>The operating mode is set to sleep</td>
</tr>
</tbody>
</table>
### SmartPower Tcl Commands

#### Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC\textsuperscript{PLUS}, ProASIC, and Axcelerator

#### Notes

- The following arguments have been removed. Running the script will trigger a warning message: Warning: Invalid argument: -argname "argvalue" Ignored. Ignore the warning.
- -maxblocks {integer > 0}
- -maxpins [{integer > 0}
- -sortorder {ascending, descending}
- -sortby {powervalues, alphabetical}
- Flash*Freeze, Sleep, and Shutdown are available only for certain families and devices.
- Worst and Best operating conditions are available only for certain families and devices.
Exceptions

- None

Examples

This example sets the frequency of the power unit to "watts", the frequency unit to "Hz", the operating mode to "active", the operating condition to "typical", and the toggle to "true":

```
smartpower_set_setpreferences -powerunit {w} -frequnit {hz} -opmode {active} -opcond {typical} -toggle {true}
```

See Also

SmartPower Preferences

---

smartpower_set_scenario_for_analysis

Sets the scenario for cycle-accurate power analysis.

```
smartpower_set_scenario_for_analysis -scenario {value}
```

Arguments

- `scenario {value}`

  Specifies the mode for cycle-accurate power analysis.

Supported Families

- IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- None

Exceptions

- None

Examples

The following example sets the scenario for analysis to my_scenario:

```
smartpower_set_scenario_for_analysis -scenario {my_scenario}
```

---

smartpower_set_temperature_opcond

Sets the temperature in the operating conditions to one of the pre-defined types.

```
smartpower_set_temperature_opcond -use {value}
```
Arguments

-`use {value}`

Specifies the temperature in the operating conditions. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oprange</td>
<td>Sets the temperature in the operating conditions as specified in the Device Selection Wizard in Designer</td>
</tr>
<tr>
<td>design</td>
<td>Sets the temperature in the operating conditions as specified in the SmartPower design-wide operating range. Applies to SmartPower only.</td>
</tr>
<tr>
<td>mode</td>
<td>Sets the temperature in the operating conditions as specified in the SmartPower mode-specific operating range. Applies to SmartPower only.</td>
</tr>
</tbody>
</table>

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

- None

Exceptions

- None

Examples

This example sets the temperature in the operating conditions as specified in the custom mode-settings:

```tcl```
smartpower_set_temperature_opcond -use {mode}
```

smartpower_set_thermalmode

Sets the mode of computing junction temperature.

```tcl```
smartpower_set_thermalmode -mode {value}
```

Arguments

-`mode {value}`

Specifies the mode in which the junction temperature is computed. The following table shows the acceptable values for this argument:
smartpower_set_voltage_opcond

Value Description
ambient The junction temperature will be iteratively computed with total static power
opcond The junction temperature will be given as one of the operating condition range values specified in the device selection

Supported Families
IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes
- To compute the junction temperature, set the following three commands: smartpower_set_thermalmode, smartpower_set_tambient and smartpower_set_cooling. The junction temperature will be updated when an output command is executed, such as report(Power).

Exceptions
- None

Examples
The following example sets the computing of the junction temperature to ambient mode:

smartpower_set_thermalmode -mode {ambient}

smartpower_set_voltage_opcond
Sets the voltage in the operating conditions.

smartpower_set_voltage_opcond -voltage{value} -use{value}

Arguments
-voltage{value}
Specifies the voltage supply in the operating conditions. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCCA</td>
<td>Sets the voltage operating conditions for VCCA</td>
</tr>
<tr>
<td>VCCI 3.3</td>
<td>Sets the voltage operating conditions for VCCI 3.3</td>
</tr>
<tr>
<td>VCCI 2.5</td>
<td>Sets the voltage operating conditions for VCCI 2.5</td>
</tr>
</tbody>
</table>
### SmartPower Tcl Commands

**-use{value}**

Specifies the voltage in the operating conditions for each voltage supply. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>oprange</td>
<td>Sets the voltage in the operating conditions as specified in the Device Selection Wizard in Designer</td>
</tr>
<tr>
<td>design</td>
<td>Sets the voltage in the operating conditions as specified in the SmartPower design-wide operating range. Applies to SmartPower only.</td>
</tr>
<tr>
<td>mode</td>
<td>Sets the voltage in the operating conditions as specified in the SmartPower mode-specific operating range. Applies to SmartPower only.</td>
</tr>
</tbody>
</table>

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

This example sets the VCCA as specified in the SmartPower mode-specific settings:

```
smartpower_set_voltage_opcond -voltage{vcca} -use{mode}
```
smartpower_temperature_opcond_set_design_wide

Sets the temperature for SmartPower design-wide operating conditions.

```
smartpower_temperature_opcond_set_design_wide -best{value} -typical{value} -worst{value} -thermal_mode{value}
```

**Arguments**

- **-best{value}**
  Specifies the best temperature (in degrees Celsius) used for design-wide operating conditions.
- **-typical{value}**
  Specifies the typical temperature (in degrees Celsius) used for design-wide operating conditions.
- **-worst{value}**
  Specifies the worst temperature (in degrees Celsius) used for design-wide operating conditions.
- **-thermal_mode{value}**
  Specifies the mode in which the junction temperature is computed. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ambient</td>
<td>The junction temperature will be iteratively computed with total static power</td>
</tr>
<tr>
<td>opcond</td>
<td>The junction temperature will be given as one of the operating condition range values specified in the device selection</td>
</tr>
</tbody>
</table>

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC^{PLUS}, ProASIC, and Accelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

This example sets the temperature for design-wide operating conditions to Best 20, Typical 30, and Worst 60:

```
smartpower_temperature_opcond_set_design_wide -best{20} -typical{30} -worst{60}
```

smartpower_temperature_opcond_set_mode_specific

Sets the temperature for SmartPower mode-specific operating conditions.
smartpower_temperature_opcond_set_mode_specific -mode{value} -best{value} -typical{value} -worst{value} -thermal_mode{value}

**Arguments**

- **-mode{value}**
  Selects the mode to which apply the operating condition settings. You can select a pre-defined mode or any custom mode in your design.

- **-best{value}**
  Specifies the best temperature (in degrees Celsius) for the selected mode.

- **-typical{value}**
  Specifies the typical temperature (in degrees Celsius) for the selected mode.

- **-worst{value}**
  Specifies the worst temperature (in degrees Celsius) for the selected mode.

- **-thermal_mode{value}**
  Specifies the mode in which the junction temperature is computed. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ambient</td>
<td>The junction temperature will be iteratively computed with total static power</td>
</tr>
<tr>
<td>opcond</td>
<td>The junction temperature will be given as one of the operating condition range values specified in the device selection</td>
</tr>
</tbody>
</table>

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASIC<sup>PLUS</sup>, ProASIC, and Accelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

This example sets the temperature for mode-specific operating conditions for mode1:

```
smartpower_temperature_opcond_set_mode_specific -mode{model} -best{20} -typical{30} -worst{60}
```
smartpower_voltage_opcond_set_design_wide

Sets the voltage settings for SmartPower design-wide operating conditions.

```
smartpower_voltage_opcond_set_design_wide -voltage{value} -best{value} -typical{value} -worst{value}
```

**Arguments**

- `-voltage{value}`
  Specifies the voltage supply in the operating conditions. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCCA</td>
<td>Sets the voltage operating conditions for VCCA</td>
</tr>
<tr>
<td>VCCI 3.3</td>
<td>Sets the voltage operating conditions for VCCI 3.3</td>
</tr>
<tr>
<td>VCCI 2.5</td>
<td>Sets the voltage operating conditions for VCCI 2.5</td>
</tr>
<tr>
<td>VCCI 1.8</td>
<td>Sets the voltage operating conditions for VCCI 1.8</td>
</tr>
<tr>
<td>VCCI 1.5</td>
<td>Sets the voltage operating conditions for VCCI 1.5</td>
</tr>
<tr>
<td>VCC33A</td>
<td>Sets the voltage operating conditions for VCC33A</td>
</tr>
<tr>
<td>VCCDA</td>
<td>Sets the voltage operating conditions for VCCDA</td>
</tr>
</tbody>
</table>

- `-best{value}`
  Specifies the best voltage used for design-wide operating conditions.

- `-typical{value}`
  Specifies the typical voltage used for design-wide operating conditions.

- `-worst{value}`
  Specifies the worst voltage used for design-wide operating conditions.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

**Notes**

- None

**Exceptions**

- None
Examples

This example sets VCCA for design-wide to best 20, typical 30 and worst 40:

```
smartpower_voltage_opcond_set_design_wide -voltage(VCCA) -best{20} -typical{30} -worst{40}
```

smartpower_voltage_opcond_set_mode_specific

Sets the voltage settings for SmartPower mode-specific use operating conditions.

```
smartpower_voltage_opcond_set_mode_specific -opmode{value} -voltage{value} -best{value} -typical{value} -worst{value}
```

Arguments

- `-opmode{value}`
  Selects the mode to which apply the operating condition settings. You can select a pre-defined mode or any custom mode in your design.
- `-voltage{value}`
  Specifies the voltage in the operating conditions. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCCA</td>
<td>Sets the voltage operating conditions for VCCA</td>
</tr>
<tr>
<td>VCCI 3.3</td>
<td>Sets the voltage operating conditions for VCCI 3.3</td>
</tr>
<tr>
<td>VCCI 2.5</td>
<td>Sets the voltage operating conditions for VCCI 2.5</td>
</tr>
<tr>
<td>VCCI 1.8</td>
<td>Sets the voltage operating conditions for VCCI 1.8</td>
</tr>
<tr>
<td>VCCI 1.5</td>
<td>Sets the voltage operating conditions for VCCI 1.5</td>
</tr>
<tr>
<td>VCC33A</td>
<td>Sets the voltage operating conditions for VCC33A</td>
</tr>
<tr>
<td>VCCDA</td>
<td>Sets the voltage operating conditions for VCCDA</td>
</tr>
</tbody>
</table>

- `-best{value}`
  Specifies the best voltage used for mode-specific operating conditions.
- `-typical{value}`
  Specifies the typical voltage used for mode-specific operating conditions.
- `-worst{value}`
  Specifies the worst voltage used for mode-specific operating conditions.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Accelerator
Notes

• None

Exceptions

• None

Examples

This example sets the voltage for the static mode and sets best to 20, typical to 30 and worst to 40:

```tcl
smartpower_voltage_opcond_set_mode_specific -opmode {active} -voltage {VCCA} -best {20} -typical {30} -worst {40}
```

SmartPower Obsolete TCL Commands

**smartpower_initialize_allclocks**

This command was obsoleted in SmartPower v8.5. Update your script to use:

- `smartpower_init_set_clocks_options` to initialize the clock frequency options of all clock domains.
- `smartpower_init_set_registers_options` to initialize the frequency and probability of all register outputs.
- `smartpower_init_set_reset_options` to initialize the frequency and probability of all set/reset nets.
- `smartpower_init_set_primaryinputs_options` to initialize the frequency and probability of all primary inputs.
- `smartpower_init_set_combinational_options` to initialize the frequency and probability of all combinational outputs.
- `smartpower_init_do` to initialize the frequencies and probabilities for clocks, register outputs, set/reset nets, primary inputs, combinational outputs, enables and other sets of pins, and selects a mode for initialization.

**Note:** The information below is obsolete and should only be used as reference. Update your scripts to use the TCL commands above.

Initializes the clock frequency and the data frequency of all clock domains with the initialization options.

```tcl
smartpower_initialize_allclocks -with_clock_constraints {value} -with_clock_freq {value} -clock_freq {value} -with_data_freq {value} -data_freq {value}
```

**Arguments**

- `with_clock_constraints {value}`

  This sets the option of initializing the clock frequencies of all clock domains with frequency constraints from SmartTime. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Sets initialize clock frequencies with clock constraints ON</td>
</tr>
<tr>
<td>false</td>
<td>Sets initialize clock frequencies with clock constraints OFF</td>
</tr>
</tbody>
</table>
-with_clock_freq {value}
This sets the option of initializing the clock frequencies with a user input frequency. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Sets initialize clock frequencies with fixed frequency ON</td>
</tr>
<tr>
<td>false</td>
<td>Sets initialize clock frequencies with fixed frequency OFF</td>
</tr>
</tbody>
</table>

-clock_freq {value}
Specifies the user input clock frequency in MHz.

-with_data_freq {value}
Sets the option of initializing the data frequencies of all clock domains with a user input toggle rate or a user input frequency. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>true</td>
<td>Sets initialize data frequencies with fixed frequency ON</td>
</tr>
<tr>
<td>false</td>
<td>Sets initialize data frequencies with fixed frequency OFF</td>
</tr>
</tbody>
</table>

-data_freq {value}
Specifies the user input toggle rate or data frequency. If the value is a percentage number such as 20.0 %, it will be interpreted as a toggle rate. If the value is a decimal number in MHz such as 100.0 MHz, it will be interpreted as a fixed frequency value.

**Supported Families**
IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Acelerator

**Notes**
- This command is associated with the functionality of Initialize with SmartTime dialog box.

**Exceptions**
- None

**Examples**
The following example initializes all clocks with clock constraints from SmartTime:
smartpower.Initialize_allclocks -with_clock_constraints {true}
smartpower_remove_pin_enable_rate

This command was obsoleted in SmartPower v8.5. Update your script to use

smartpower_remove_pin_probability to remove the pin probability.

Note: The information below is obsolete and should only be used as reference when executing previously-created scripts. Update your scripts to use smartpower_remove_pin_probability.

Removes the probability value associated with a specific pin. This pin will have a default probability based on the domain set it belongs to.

smartpower_remove_pin_enable_rate -pin_name {pin_name}

Arguments

-pin_name {pin_name}

Specifies the name of the pin with the probability to remove. This pin must be the direct driver of an enable pin.

Supported Families

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Axcelerator

Notes

• None

Exceptions

• None

Examples

The following example removes the probability of the pin driving the enable pin of a bidirectional I/O:

Smartpower_remove_pin_enable_rate -pin_name mybibuf/U0/U1:EOUT

smartpower_set_default_enable_rate

This command was obsoleted in SmartPower v8.5. Update your script to use

smartpower_change_setofpin_statistics to set the frequency and probability of the specified domain.

Note: The information below is obsolete and should only be used as reference when executing previously-created scripts. Update your scripts to use smartpower_change_setofpin_statistics.

Sets the enable-rate of one of the enable set domains: IOEnableSet or MemoriesEnableSet.

smartpower_set_default_enable_rate -domain_name {name} pin_enable_rate {value}

Arguments

-domain_name {name}

Specifies the name of the domain value of which you want to apply the enable_rate value. The domain_name can be IOsEnableSet or MemoriesEnableSet.
-pin_enable_rate {value}
Specifies the value of the pin enable rate as a percentage, which can be any positive decimal between 0 and 100, inclusive.

**Supported Families**
IGLOO, Fusion, ProASIC3, ProASICPLUS, ProASIC, and Axcelerator

**Notes**
- None

**Exceptions**
- None

**Examples**
The following example sets the enable rate for all the pins belonging to the domain set IOsEnableSet:
smartpower_set_default_enable_rate -domain_name IOsEnableSet -pin_enable_rate 52.2

**smartpower_set_domain_frequency**
This command was obsoleted in SmartPower v8.5. Update your script to use:
smartpower_change_setofpin_statistics to change the frequencies and probabilities for all sets of pins in a specific domain
smartpower_change_clock_statistics to change the frequencies and probabilities for all clocks in a specific domain

*Note:* The information below is obsolete and should only be used as reference when executing previously-created scripts. Update your scripts to use the TCL commands above.

Sets the frequency of a domain in megahertz (MHz).

```
smartpower_set_domain_frequency -domain_type {value} -domain_name {domain_name} -clock_freq {value} -data_freq {value} -pin_freq {value}
```

**Arguments**
- **-domain_type {value}**
  Specifies the type of domain to set. The following table shows the acceptable values for this argument:

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>clock</td>
<td>The domain is a clock domain</td>
</tr>
<tr>
<td>set</td>
<td>The domain is a set domain</td>
</tr>
</tbody>
</table>

- **-domain_name {domain_name}**
  Specifies the name of the domain for which the frequency will be set.
-clock_freq {value}
Specifies the clock frequency in megahertz (MHz), which can be any positive decimal number. This argument is available only for a clock domain.
-data_freq {value}
Specifies the data frequency in megahertz (MHz), which can be any positive decimal number. This argument is available only for a clock domain.
-pin_freq {value}
Specifies the value of the pin frequency in megahertz (MHz), which can be any positive decimal number. This argument is available only for a set domain.

Supported Families
IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Accelerator

Notes
- The domain type must be either clock or set.
- The domain name must be the name of an existing domain.
- The clock frequency must be a positive decimal number. Specifying the unit as part of the frequency value is optional. You must enter a space between the frequency value and the unit. You set the clock frequency only for clock domains.
- The data frequency must be a positive decimal number. Specifying the unit as part of the data frequency value is optional. You must enter a space between the data frequency value and the unit.

Exceptions
- None

Examples
The following example sets the clock and data frequency of a clock domain:
```
smartpower_set_domain_frequency -domain_type {clock} -domain_name {clk1} -clock_freq {32} or {30 MHz} -data_freq {3} or {3 MHz}
```
The following example sets the data frequency of a set domain:
```
smartpower_set_domain_frequency -domain_type {set} -domain_name {set1} -data_freq {10}
```

smartpower_set_pin_enable_rate
This command was obsoleted in SmartPower v8.5. Update your script to use `smartpower_set_pin_probability` to set the pin probability.

Note: The information below is obsolete and should only be used as reference when executing previously-created scripts. Update your scripts to use `smartpower_set_pin_probability`.
Enables you to set the probability value of a pin driving an enable pin. For I/Os, if you do not use this command, the probability of the IOEnableSet is used. For memories, if you do not use this command, the probability of the MemoriesEnableSet is used.

```
smartpower_set_pin_enable_rate -pin_name {pin_name} -pin_enable_rate {value}
```

**Arguments**

- **-pin_name {pin_name}**
  Specifies the name of a pin for which the probability will be set. This pin must be the direct driver of an enable pin.

- **-pin_enable_rate {value}**
  Specifies the value of the pin probability as a percentage, which can be any positive decimal between 0 and 100, inclusive.

**Supported Families**

IGLOO, ProASIC3, SmartFusion, Fusion, ProASICPLUS, ProASIC, and Accelerator

**Notes**

- None

**Exceptions**

- None

**Examples**

The following example sets the probability of the pin driving the enable pin of a bidirectional I/O

```
smartpower_set_pin_enable_rate -pin_name mybibuf/U0/U1:EOUT \ 
-pin_enable_rate 50.4
```

**Data Change History - SmartPower**

The data change history report lists power data updates up to the current release that may impact the power consumption of the design.

To generate a data change history report, from the Help menu, choose Data Change History. This opens a data change history report in text format.
Product Support

Actel backs its products with various support services including Customer Service, a Customer Technical Support Center, a web site, an FTP site, electronic mail, and worldwide sales offices. This appendix contains information about contacting Actel and using these support services.

Customer Service

Contact Customer Service for non-technical product support, such as product pricing, product upgrades, update information, order status, and authorization.

From Northeast and North Central U.S.A., call 650.318.4480
From Southeast and Southwest U.S.A., call 650.318.4480
From South Central U.S.A., call 650.318.4434
From Northwest U.S.A., call 650.318.4434
From Canada, call 650.318.4480
From Europe, call 650.318.4252 or +44 (0) 1276 401 500
From Japan, call 650.318.4743
From the rest of the world, call 650.318.4743
Fax, from anywhere in the world 650.318.8044

Actel Customer Technical Support Center

Actel staffs its Customer Technical Support Center with highly skilled engineers who can help answer your hardware, software, and design questions. The Customer Technical Support Center spends a great deal of time creating application notes and answers to FAQs. So, before you contact us, please visit our online resources. It is very likely we have already answered your questions.

Actel Technical Support

Visit the Actel Customer Support website (http://www.actel.com/support/search/default.aspx) for more information and support. Many answers available on the searchable web resource include diagrams, illustrations, and links to other resources on the Actel web site.

Website

You can browse a variety of technical and non-technical information on Actel’s home page, at http://www.actel.com/.

Contacting the Customer Technical Support Center

Highly skilled engineers staff the Technical Support Center from 7:00 A.M. to 6:00 P.M., Pacific Time, Monday through Friday. Several ways of contacting the Center follow:

Email

You can communicate your technical questions to our email address and receive answers back by email, fax, or phone. Also, if you have design problems, you can email your design files to receive assistance. We constantly monitor the email account throughout the day. When sending your request to us, please be sure to include your full name, company name, and your contact information for efficient processing of your request.
The technical support email address is tech@actel.com.

**Phone**

Our Technical Support Center answers all calls. The center retrieves information, such as your name, company name, phone number and your question, and then issues a case number. The Center then forwards the information to a queue where the first available application engineer receives the data and returns your call. The phone hours are from 7:00 A.M. to 6:00 P.M., Pacific Time, Monday through Friday. The Technical Support numbers are:

**650.318.4460**  
**800.262.1060**  

Customers needing assistance outside the US time zones can either contact technical support via email (tech@actel.com) or contact a local sales office. Sales office listings can be found at www.actel.com/company/contact/default.aspx.
Actel is the leader in low-power and mixed-signal FPGAs and offers the most comprehensive portfolio of system and power management solutions. Power Matters. Learn more at http://www.actel.com.