



# Intel® FPGA Power and Thermal Calculator Release Notes

Updated for Intel® Quartus® Prime Design Suite: **22.4**



**Online Version**



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# 1. Intel® FPGA Power and Thermal Calculator (PTC) Version 22.4 Release Notes

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The Intel® FPGA Power and Thermal Calculator (PTC) Version 22.4 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

## 1.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus® Prime Pro Edition software. Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on minimum system requirements.

## 1.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- The **Module** column, which was present on many pages in previous versions, is now the **Entity Name** column in version 22.4.
- The **Domain** column, which appeared on the **Clock** page in previous versions, is now the **Full Hierarchy Name** column in version 22.4.
- The **Module Manager** has been renamed as the **Hierarchy Manager**.
- The PTC can now import hierarchical information in `.qptc` files generated by the Intel Quartus Prime Power Analyzer. Refer to *Importing a .qptc File Generated in the Intel Quartus Prime Power Analyzer* in chapter 2 of the [Intel® FPGA Power and Thermal Calculator User Guide](#) for details.
- A new **IP Wizard** is now available for instantiating IP in your design. Refer to *Intel FPGA PTC - IP Wizard* in chapter 3 of the [Intel® FPGA Power and Thermal Calculator User Guide](#) for details.

## 1.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).



- In previous versions, when you opened the PTC embedded within the Intel Quartus Prime software, it opened with a default device. In version 22.4, the PTC inherits whatever device is current in the Intel Quartus Prime software project.
- In previous versions, the PTC would issue an error if the project specified an unsupported device. In version 22.4, under such circumstances, the PTC assumes a default device and displays a message to the user.
- In version 22.4, the **I/O IP** page is deprecated and replaced by the new **IP Wizard**.

## 1.4. Device Support Changes

Intel FPGA Power and Thermal Calculator (PTC) device support is the same as for the Intel Quartus Prime software.

Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on any changes in device support.

## 1.5. Known Issues and Workarounds

- None.

## 2. Intel FPGA Power and Thermal Calculator (PTC) Version 22.3 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 22.3 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 2.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software. Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on minimum system requirements.

### 2.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- Added the ability to section data input and results along hierarchical boundaries to view and improve power consumption per design hierarchy, as *Using Design Hierarchies in the Intel FPGA Power and Thermal Calculator* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).
- Added the ability to export, import, and reuse Intel FPGA PTC data for a particular design hierarchy, as *Exporting, Importing, Duplicating, Renaming, and Deleting Hierarchies in the Intel FPGA PTC* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).
- The new **Module Manager** GUI displays the hierarchy of the design as you enter it in the Intel FPGA PTC data entry pages, as *Intel FPGA PTC Module Manager* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).
- For **Recalculate mode**, the **Manual** setting now includes a warning message that appears in the message list, and a 'Recalculation Needed' status bar appears beside the **Recalculate mode** pulldown whenever the results become outdated. The message provides instructions on how to refresh the design's calculations, as *Intel FPGA PTC - Common Page Elements* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).
- A new **Voltage setting for unused GPIO banks** option on the **I/O** data entry page allows you to select a value to calculate voltage of unused GPIO banks, as *Intel FPGA PTC - I/O Page* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).

- A new **Treatment of unused transceiver dies setting** on the **Transceiver** data entry page allows you to specify how unused transceiver dies, or used transceiver dies with unused channels, should be treated, as *Intel FPGA PTC - Transceiver Page* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).
- Most data entry pages now include the **Full Hierarchy Name** field that allows you to optionally specify the hierarchical path relevant to the current entry.
- There is performance improvement when exporting data from the Intel Quartus Prime Power Analyzer into the Intel FPGA PTC.

## 2.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).

- When you enter a module name for a given hierarchy, the Intel FPGA PTC automatically updates the module name on all data entry pages that include that hierarchy, as *Entering Hierarchy Information Into the Intel FPGA PTC* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).
- When you define a hierarchy in the Intel FPGA PTC, the instance appears automatically in the **Module Manager**, as *Entering Hierarchy Information Into the Intel FPGA PTC* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).
- Importing an existing Intel FPGA PTC hierarchy prepends the imported file name to any imported instance path, as *Exporting, Importing, Duplicating, Renaming, and Deleting Hierarchies in the Intel FPGA PTC* describes in the [Intel® FPGA Power and Thermal Calculator User Guide](#).

## 2.4. Device Support Changes

Intel FPGA Power and Thermal Calculator (PTC) device support is the same as for the Intel Quartus Prime software.

Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on any changes in device support.

## 2.5. Known Issues and Workarounds

- On the **Transceiver** page, copy and paste does not function properly and does not copy the digital frequency, #refclk, and refclk frequency cell values correctly.



## 3. Intel FPGA Power and Thermal Calculator (PTC) Version 22.2 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 22.2 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 3.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software. Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on minimum system requirements.

### 3.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- Added the ability to import a .ptc or .qptc file and append it to the current file. Refer to the *Estimating Power Consumption While Creating the FPGA Design* topic in chapter 2 of the [Intel® FPGA Power and Thermal Calculator User Guide](#) for details.
- Added the ability to delete one or more rows from a table in the PTC. Refer to the *Deleting Rows from a Table* topic in chapter 3 of the [Intel® FPGA Power and Thermal Calculator User Guide](#) for details.

### 3.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).

- None.

### 3.4. Device Support Changes

Intel FPGA Power and Thermal Calculator (PTC) device support is the same as for the Intel Quartus Prime software.

Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on any changes in device support.



### 3.5. Known Issues and Workarounds

- None.

## 4. Intel FPGA Power and Thermal Calculator (PTC) Version 22.1 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 22.1 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 4.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software. Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on minimum system requirements.

#### Related Information

[Intel Quartus Prime Pro Edition: Software and Device Support Release Notes](#)

### 4.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- For Intel Agilex™ devices, the # of PMAs field on the *Transceiver* page is now editable.

#### Related Information

[Intel FPGA Power and Thermal Calculator User Guide](#)

### 4.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).

- For Intel Agilex devices, the **Power rail** summary now shows only those rails that actually have current flow; rails that are not in use are not shown. The **Power rail** summary on the **Report** page shows only the rails carrying current to the selected device; the **Power rail** summaries on each of the individual pages show only the rails supplying resources listed on that page. (For Intel Stratix® 10 devices, the **Power rail** summaries continue to show all available rails, whether actually in use or not.)

#### Related Information

[Intel FPGA Power and Thermal Calculator User Guide](#)

## 4.4. Device Support Changes

Intel FPGA Power and Thermal Calculator (PTC) device support is the same as for the Intel Quartus Prime software.

Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on any changes in device support.

### Related Information

[Intel Quartus Prime Pro Edition: Software and Device Support Release Notes](#)

## 4.5. Known Issues and Workarounds

- None.



## 5. Intel FPGA Power and Thermal Calculator (PTC) Version 21.4 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 21.4 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 5.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software. Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on minimum system requirements.

#### Related Information

[Intel Quartus Prime Pro Edition: Software and Device Support Release Notes](#)

### 5.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- A new *Crypto* page has been added to the Intel FPGA Power and Thermal Calculator for configuring the crypto blocks in Intel Agilex devices equipped with those blocks. Refer to the *Intel FPGA PTC - Crypto Page* topic in the *Intel FPGA Power and Thermal Calculator User Guide* for information on using this page.

#### Related Information

[Intel FPGA Power and Thermal Calculator User Guide](#)

### 5.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).

- The former *Apply recommended margin* parameter on the *Thermal* page has changed to *Apply additional margin*. This new parameter allows you to apply additional margin, as a percentage, to thermal analysis results. Refer to the *Intel FPGA PTC - Thermal Page* topic in the *Intel FPGA Power and Thermal Calculator User Guide* for details on this parameter.

#### Related Information

[Intel FPGA Power and Thermal Calculator User Guide](#)

## 5.4. Device Support Changes

Intel FPGA Power and Thermal Calculator (PTC) device support is the same as for the Intel Quartus Prime software.

Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on any changes in device support.

### Related Information

[Intel Quartus Prime Pro Edition: Software and Device Support Release Notes](#)

## 5.5. Known Issues and Workarounds

- None.



## 6. Intel FPGA Power and Thermal Calculator (PTC) Version 21.3 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 21.3 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 6.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software. Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on minimum system requirements.

#### Related Information

[Intel Quartus Prime Pro Edition: Software and Device Support Release Notes](#)

### 6.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- *Typical* power characteristics are now available for Intel Agilex devices. Refer to the description of the *Power characteristics* parameter in the *Intel FPGA PTC - Main Page* topic in the *Intel FPGA Power and Thermal Calculator User Guide*.

#### Related Information

[Intel FPGA Power and Thermal Calculator User Guide](#)

### 6.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).

- Power models for Intel Stratix 10 devices with high-bandwidth memory (HBM) have been updated to reflect more realistic use cases, rather than theoretical worst-case scenarios that would not occur in practice.
- Performance of the manual recalculation mode has been improved.
- Support for *Enpirion*\* power devices has been removed.

## 6.4. Device Support Changes

Intel FPGA Power and Thermal Calculator (PTC) device support is now the same as for the Intel Quartus Prime software.

Consult the *Intel Quartus Prime Pro Edition: Software and Device Support Release Notes* for information on any changes in device support.

### Related Information

[Intel Quartus Prime Pro Edition: Software and Device Support Release Notes](#)

## 6.5. Known Issues and Workarounds

- None.

## 7. Intel FPGA Power and Thermal Calculator (PTC) Version 21.2 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 21.2 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 7.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software.

### 7.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- None.

### 7.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).

- None.

### 7.4. Device Support Changes

The following are the device support changes in this version of the Intel FPGA Power and Thermal Calculator (PTC).

**Table 1. Device Support Changes**

Device	Change
Intel Stratix 10 1SG065 and 1SX065 devices	Power model status is now FINAL.
Intel Agilex devices	Intel FPGA Power and Thermal Calculator now supports Intel Agilex devices with F-tile and R-tile transceivers.

### 7.5. Known Issues and Workarounds

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- The Intel FPGA Power and Thermal Calculator for Intel Agilex devices with F-tile transceivers does not assign all regulator groups correctly when the **Power rail configuration field** on the **Report** page is set to **Agilex Device**. This results in errors on the **Report** and **Enpirion** pages.

To fix incorrect regulator group assignments, change **Power rail configuration field** in the **Report** page to **Custom** and manually specify regulator groupings appropriate for your board design.

- The Intel FPGA Power and Thermal Calculator for Intel Agilex devices may produce the following erroneous message when importing a design:

```
Input field "XCVR Die ID" had an invalid import value of "HSSI_0_1". The field was defaulted to a value of "HSSI_0_0" instead.
```

If HSSI\_0\_1 is not imported correctly despite being a valid setting, you must correct this manually by setting the fields' values to HSSI\_0\_1 where appropriate.

- If you import a design from the Intel Quartus Prime Power Analyzer into the Intel FPGA Power and Thermal Calculator for Intel Agilex devices, the *Protocol Mode* field on the *Transceiver* page does not receive the correct value, if any of the **F-tile x8, x4x4, or x4 PCIe** protocols are used.

In this circumstance, you must manually change the *Protocol Mode* field to its appropriate value.

## 8. Intel FPGA Power and Thermal Calculator (PTC) Version 21.1 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 21.1 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 8.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software.

### 8.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- The **Thermal Analysis** page for Intel Agilex devices has been revised to incorporate several improvements:
  - Removed the  $\pm 5^{\circ}\text{C}$  junction temperature ( $T_j$ ) variation.
  - Added temperature sensor diode (TSD) information to the Thermals Report, as absolute temperatures rather than as offsets.
  - The page now reports the following values, per die: Power (W), Temperature margin ( $\Delta^{\circ}\text{C}$ ), and Power margin ( $\Delta\text{W}$ ).
- Added **SmartVID Power Savings** to AGF012/014 devices. You can obtain the value of SmartVID Power Savings from the Intel Agilex device **Main** page. A summation of the dynamic power from adding up the Logic, RAM, DSP, Clock, IO, and Transceiver does not account for the savings. SmartVID savings have been subtracted from the Total Power value on the main page. For simplicity, the **Total Power includes both SmartVID Power Savings and Static Power Savings**.
- Added **Static Power Savings** to the **Main** page. To obtain the value of Static Power expected for your design, ensure that you subtract the Static Power Savings from the Static Power value on the **Main** page.
- If SmartVID or Static Power Savings report a value of 0, it does not indicate that there are no savings; a value of 0 indicates that production test limits have not yet been finalized for these savings.
- For Intel Agilex devices: The **Routing Factor** field on the **Logic** page and the **Utilization Factor** field on the **Clocks** page now both accept decimal values, for improved power modeling accuracy. The maximum value for both fields is now increased by one, to handle rare corner cases.

### 8.3. Changes to Software Behavior

The following general changes are implemented in this version of the Intel FPGA Power and Thermal Calculator (PTC).

- The PTC now supports standard operating system shortcut keys for snapping the PTC window to one half of a split screen.
- The **PTC Import Warnings** dialog box is now modeless, and includes a **Save** button for saving messages.
- This version adds the ability to export tables to comma-separated value (CSV) format. To do this, right-click in the desired cells and select **Export** from the context menu. The resulting CSV file includes the content and column headings for the selected cells.

### 8.4. Device Support Changes

The following are the device support changes in this version of the Intel FPGA Power and Thermal Calculator (PTC).

**Table 2. Device Support Changes**

Device	Change
Intel Stratix 10 NX devices	Power model status is now FINAL.
All Intel Stratix 10 devices	Power model now includes a bug fix for configurations with RAM depth greater than one M20K block.

### 8.5. Known Issues and Workarounds

The **I/O-IP** page does not populate or utilize the **Bank ID** columns on the **PLL** and **I/O** pages for external memory interface (EMIF) applications.

## 9. Intel FPGA Power and Thermal Calculator (PTC) Version 20.4 Release Notes

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The Intel FPGA Power and Thermal Calculator (PTC) Version 20.4 Release Notes provide up-to-date information about the Intel FPGA Power and Thermal Calculator.

### 9.1. Minimum System Requirements

There are no changes to the minimum system requirements for this release of the Intel FPGA Power and Thermal Calculator (PTC).

Minimum system requirements are the same as for the Intel Quartus Prime Pro Edition software.

#### Related Information

- [Intel Quartus Prime Pro Edition: Software and Device Support Release Notes](#)
- [Intel FPGA Power and Thermal Calculator User Guide](#)

### 9.2. New Features and Enhancements

The Intel FPGA Power and Thermal Calculator (PTC) includes the following new features and enhancements.

- The correct icon is now displayed in the title bar when the PTC is launched via *quartus\_ptc*.
- Changed wording on the **Thermal Page** from *Maximum junction temperature* to *Maximum junction temperature limit* to clarify that the value is a limit and not an actual junction temperature.

### 9.3. Changes to Software Behavior

There are no changes to the behavior in this version of the Intel FPGA Power and Thermal Calculator (PTC).

### 9.4. Device Support Changes

The following are the device support changes in this version of the Intel FPGA Power and Thermal Calculator (PTC).

**Table 3. Device Support Changes**

Device	Change
Intel Stratix 10 NX devices	Power model status is now FINAL.
All Intel Stratix 10 devices	Power model now includes a bug fix for configurations with RAM depth greater than one M20K block.

## 9.5. Known Issues and Workarounds

There are no known issues to report in this version of the Intel FPGA Power and Thermal Calculator (PTC).

## 10. Document Revision History for the Intel FPGA Power and Thermal Calculator Release Notes

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Document Version	Intel Quartus Prime Version	Changes
2022.12.19	22.4	Added chapter for version 22.4 release.
2022.09.26	22.3	Added chapter for version 22.3 release.
2022.06.20	22.2	Added chapter for version 22.2 release.
2022.03.28	22.1	Added chapter for version 22.1 release.
2021.12.13	21.4	Added chapter for version 21.4 release.
2021.10.04	21.3	Added chapter for version 21.3 release.
2021.06.21	21.2	<ul style="list-style-type: none"> <li>Added chapter for version 21.2 release.</li> <li>In the <i>New Features and Enhancements</i> section of the <i>21.1 Release Notes</i> chapter, modified the second bullet point and added a new third bullet point.</li> </ul>
2021.03.29	21.1	Added section for version 21.1 release.
2020.12.14	20.4	Initial release.