

INTRODUCTION TO THE POWERBENCH™ WHITEBOARD

The Vicor PowerBench™ WhiteBoard provides a workspace to architect and analyze the power efficiency of your design requirements.

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OVERVIEW OF THE WHITEBOARD

Vicor's PowerBench™ WhiteBoard is a web based design tool that allows users to architect and analyze power system designs which are built using Vicor's high density, high efficiency power components.

Users can set the operating condition for each component of the power design to match the intended application and perform efficiency as well as loss analysis of individual component as well as the full power system.

OVERVIEW OF THE WHITEBOARD – DESIGN EXAMPLE

Perform

Power Analysis

Analyze >

Schematic2
 Efficiency **94.56 %**
 Power Loss **33.05 W**

Alert Notification >

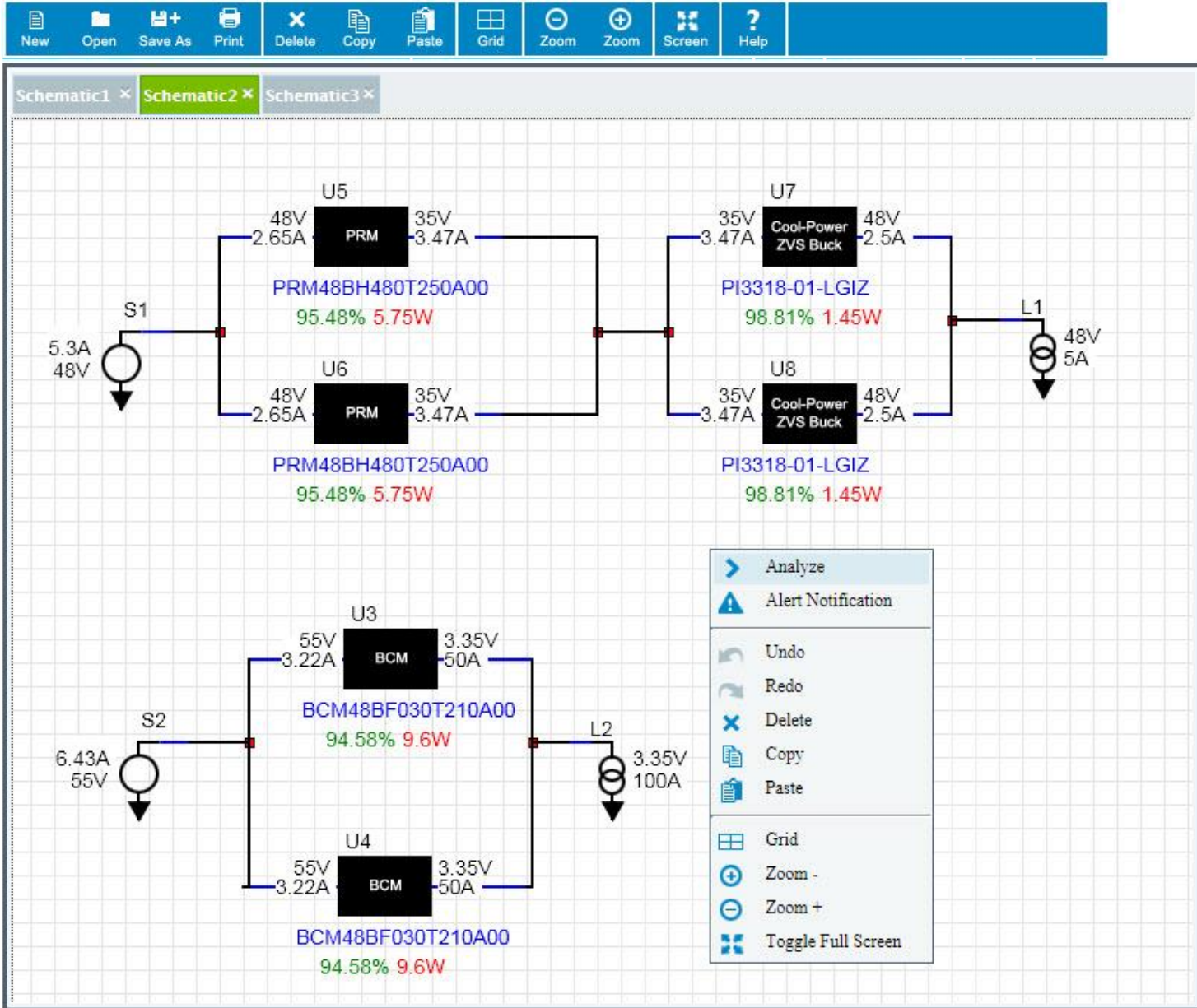
DC-DC

Isolated Non-Regulated

BCM IBC VTM

Non-Isolated Regulated

PRM Cool Power



Analyze

Alert Notification

Undo

Redo

Delete

Copy

Paste

Grid

Zoom -

Zoom +

Toggle Full Screen

QUICK START TUTORIAL

PowerBench™ WhiteBoard

The screenshot shows the PowerBench WhiteBoard interface. On the left is a sidebar with a 'Perform' section containing a 'Power Analysis' button and a 'Schematic1' section with 'Efficiency' and 'Power Loss' indicators. Below this is a 'Design Toolbox' with icons for wire, text, and various power components. The main area is a grid-based 'Schematic Canvas' with a 'Toolbar' at the top containing icons for file operations, grid, zoom, and screen. A 'Current Active Tab' is labeled 'Schematic1'.

Power Analysis
To determine the efficiency and loss of the design, click the Analyze button.

Design Toolbox
The Component Palette icons allow the placement of supplies, loads, distribution resistance etc. Also, using the Text tool, annotation can be added to a user schematic. The Wire icon changes the cursor to wire mode allowing users to draw their component to component connections.
The Product Palette contains icons representing various Vicor power component topologies where specific model numbers of each type can be chosen for addition to the power schematic.

Current Active Tab
The Schematic design on this tab is the one to be Analyzed.

Toolbar

Schematic Canvas
Components and items chosen from the Design Toolbox can be placed anywhere on the Schematic Canvas

The PowerBench WhiteBoard starts in “build mode”; this allows components and products to be selected from the palette and placed onto the canvas and allows for wiring and labeling of items on the Canvas.

To select a product from the Product Palette, click on a product type icon that you need.

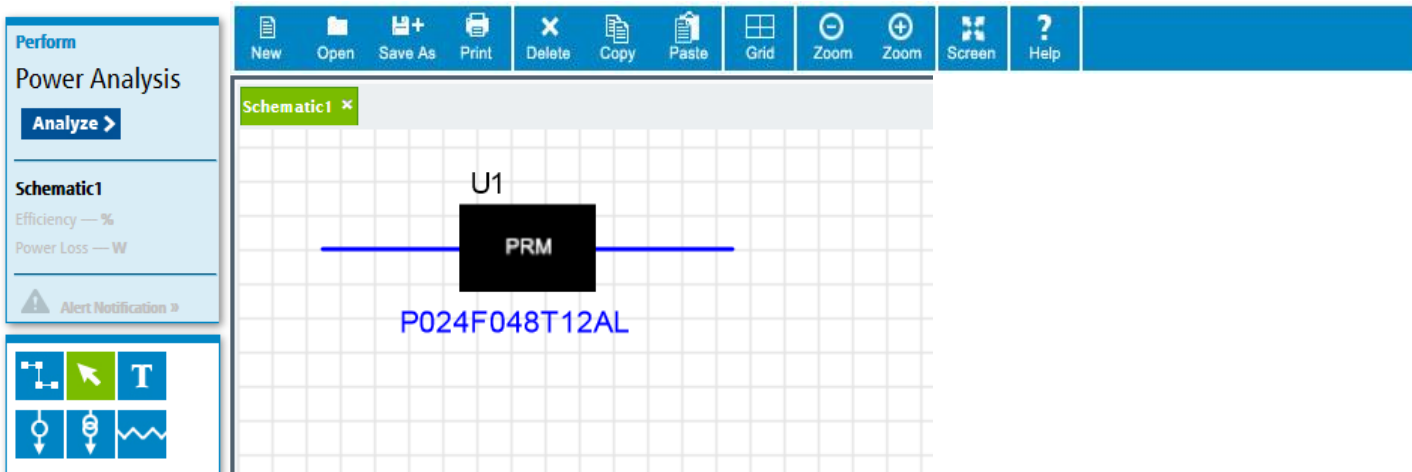


To add a specific product to the design, review the displayed product specifications for Vin, Vout and Power ratings for that product.

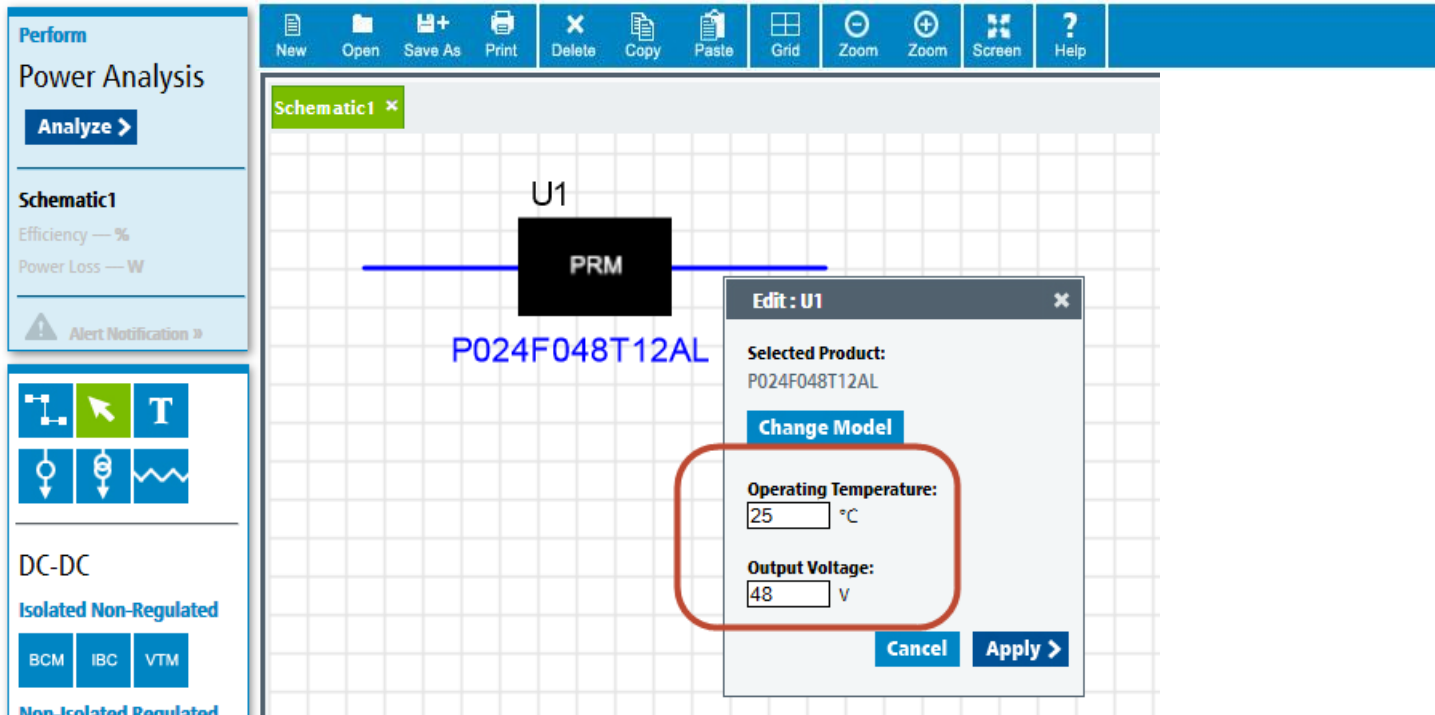
Choose your product based on the capabilities your design requires by clicking on the Part Number.

DC-DC Non-Isolated Regulated			
PRM			
Input	Output	Power	Part Number
24 V	48 V	120.0 W	P024F048T12AL »
28V	36V	120W	MP028F036M12AL »
36V	48V	120W	P036F048T12AL »
45V	48V	170W	P045F048T17AL »
15V	18V	300W	P015F018T30AL »

Once the part is selected move the mouse pointer and then click on the canvas to insert the item into the design on the WhiteBoard.

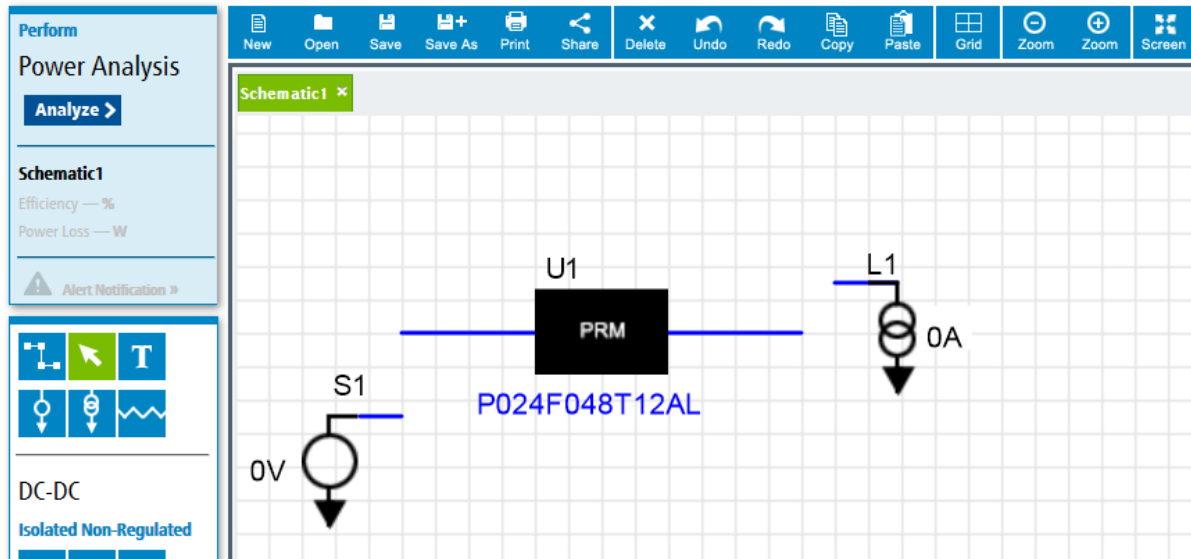


To edit the corresponding parameters of a product, i.e. operating temperature, right mouse click on the product and enter the required values.

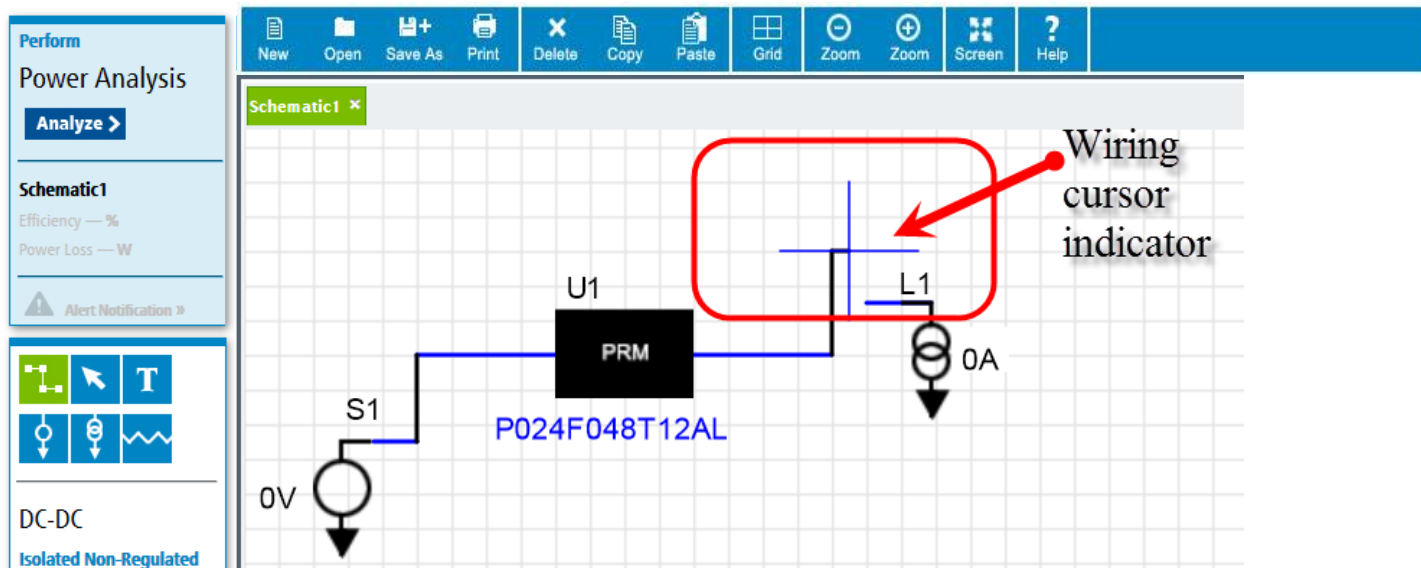


Select at least a supply and a load to wire to the selected product.



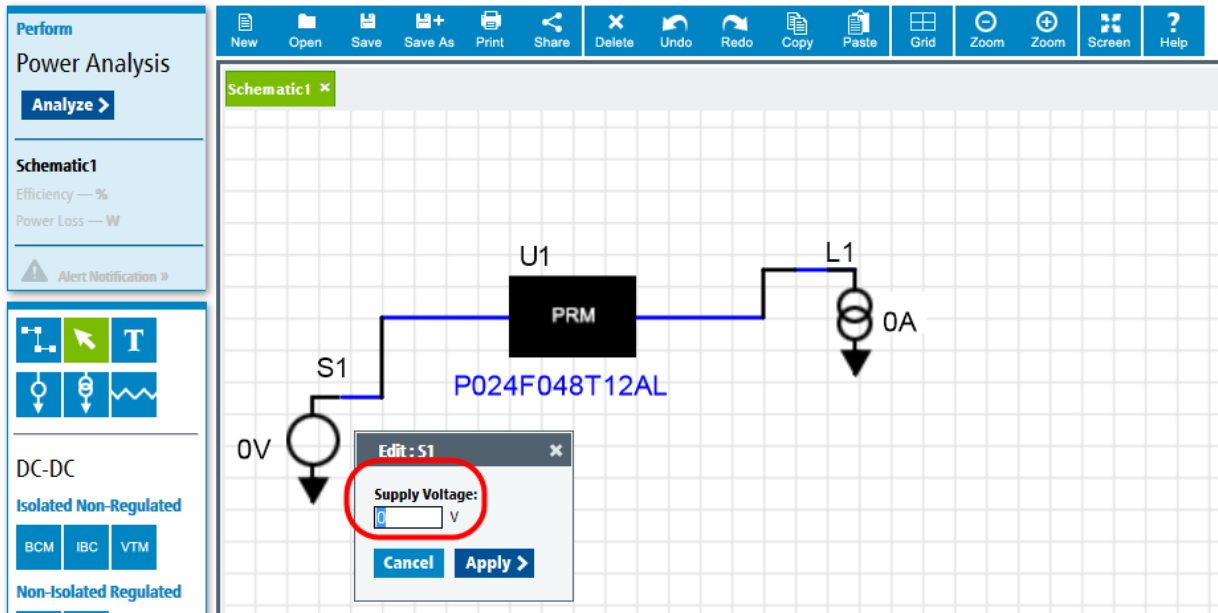


To connect the products together use the Wiring Icon to wire the items on the Canvas together.

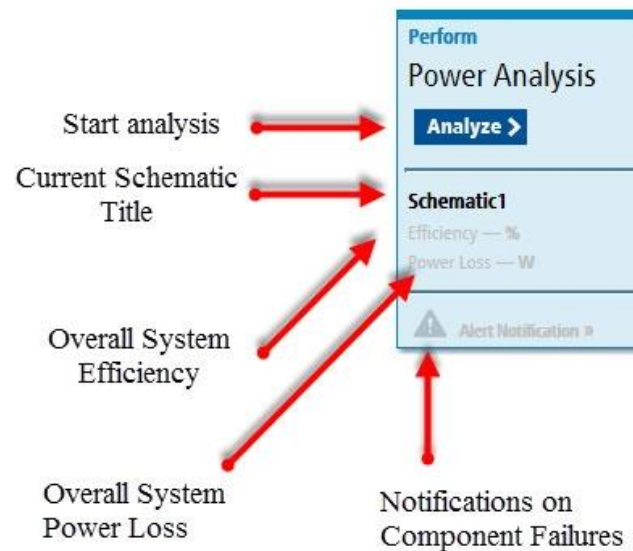


To specify values for the supply, load and resistance, right mouse click on the component and enter the needed value in the dialog box. Click change to accept the value, put it on the WhiteBoard and close the dialog.



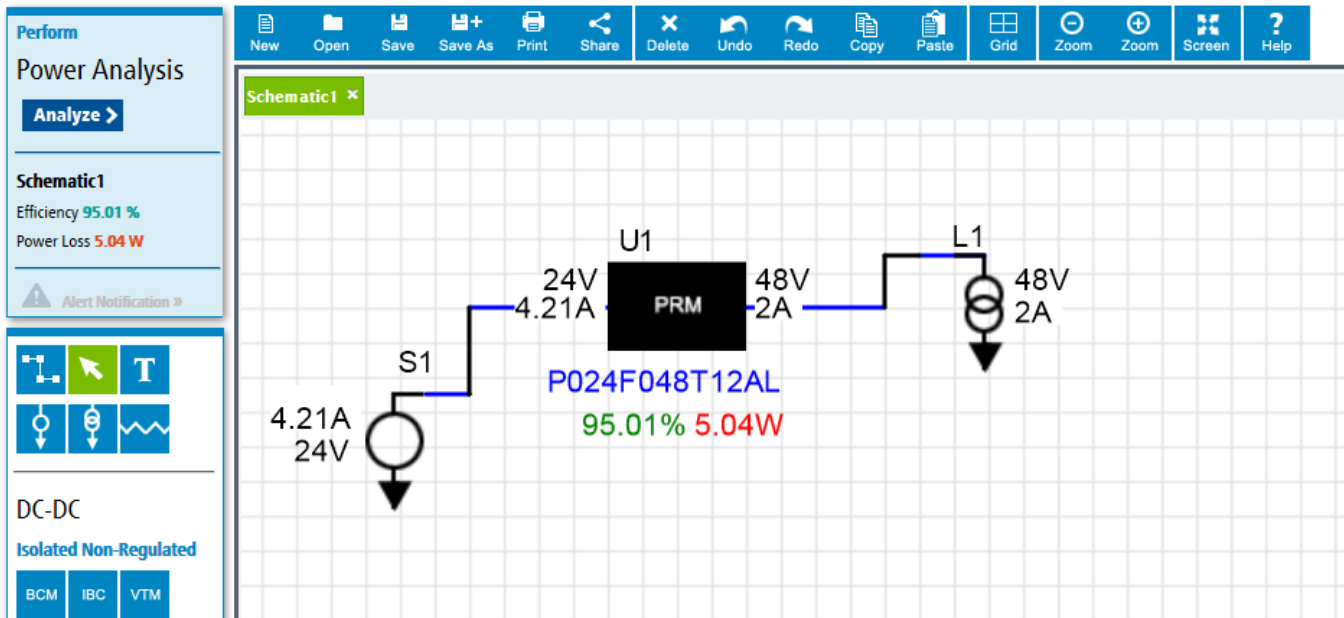


To perform analysis on the efficiency of the design, once supply, load and operating temperatures have been specified, click on the Analyze button and this information will be calculated and presented.





This is an example of the display and analysis data that is presented upon completion of the analysis calculations.









COMPONENT PALETTE

The Component Palette allows you to label, move and connect items on the schematic.

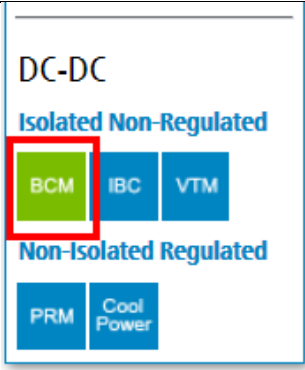
	Wire	Enables the 'wiring mode' to become active. Wiring activities available are: <ul style="list-style-type: none"> • Auto wiring: when the cursor is near to a contact point just clicking the mouse will connect • Wire edges can be moved using the pointer • Space bar can be used to realign auto wire bending
	Pointer	Enables the use of the mouse pointer cursor to pick and select items on the canvas to be moved and adjusted.

	Text	<p>Presents a dialog box to be able to specify font size and color and a free text entry box to type in text to be displayed on the canvas.</p> <p>Once text has been created, it can be moved using the mouse pointer to select the pointer, then clicking on the text on the canvas and doing a drag and drop placement to the new place on the canvas.</p>
	Supply	Enables the cursor to enter 'supply mode'. The cursor will place any number of supplies on the canvas until another component is selected from a palette to change the cursor mode.
	Load	Enables the cursor to enter 'load mode'. The cursor will place any number of loads on the canvas until another component is selected from a palette to change the cursor mode.
	Resistor	Enables the cursor to enter 'resistor mode'. The cursor will place any number of resistors on the canvas until another component is selected from a palette to change the cursor mode.

PRODUCT PALETTE

The Product Palette is where you will find specific Vicor product offerings to fit your needs.

To select a product from the Product Palette, click on the icon for the product type you need.



Select the Part Number of the product based on the capabilities required by the power design.



Perform
Power Analysis
Analyze >

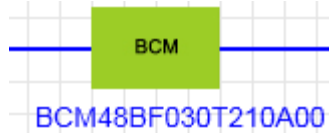
Schematic1
Efficiency 95.01 %
Power Loss 5.04 W
Alert Notification >

DC-DC
Isolated Non-Regulated
BCM IBC VTM
Non-Isolated Regulated
PRM Cool Power

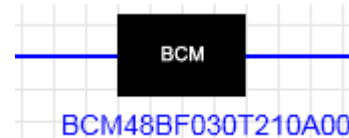
DC-DC Isolated Non-Regulated

Input	Output	Power	Part Number
48V	3V	210W	BCM48BF030T210A00 »
48V	4V	200W	BCM48BF040T200A00 »
352V	11V	300W	BCM352F110T300A00 »
48V	12V	120W	BCM48BH120T120A00 »
48V	12V	300W	BCM48BF120T300A00 »
352V	12.5V	300W	BCM352F125T300A00 »
352V	44V	325W	BCM352F440T330A00 »
380V	48V	1200W	BCM380P475T1K2A30 »
384V	48V	325W	BCM384F480T325A00 »

The cursor will appear as a block representing that product.

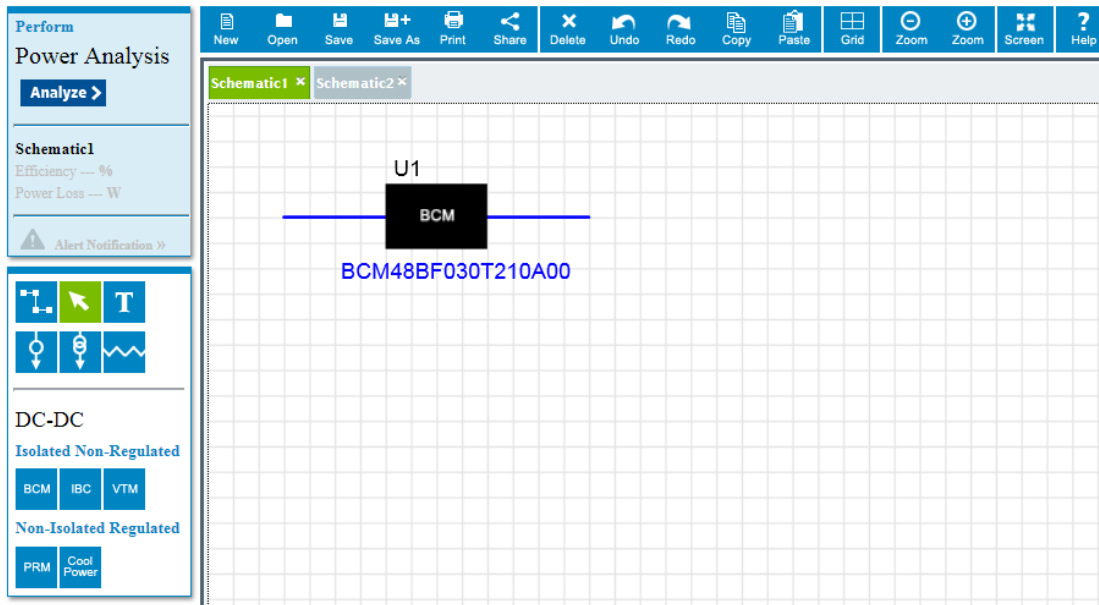


To place the product on the canvas click the left mouse button and the product image will change indicating it is placed on the canvas.



This is an example of what a product looks like when placed on the canvas.

New Open Save Save As Print Delete Copy Paste Grid Zoom Zoom Screen Help



HOW TO CHOOSE PRODUCTS

DC – DC Solutions

Isolated Non-Regulated	
BCM	BCM and IBC products have the highest efficiency and lowest losses among isolated unregulated DC/DC converters. BCM products have a higher power density, and have a flat molded top that makes it easier to conduct heat out of the parts, enabling higher output power levels.
IBC	IBC products are open frame, and follow industry standard quarter brick and eight brick formats. They should be specified where second sourcing compatibility is required. IBC converters also have a wider input voltage range than most BCM products.
VTM	VTM products are similar in topology and packaging to a BCM, but are optimized for use with a PRM, listed below, to form a regulated and isolated power supply. The VTM provides the isolation and voltage for a fixed turns ratio transformation of power. The PRM provides the regulation for the circuit. The VTM can be used without the PRM, however some external circuitry must be added.

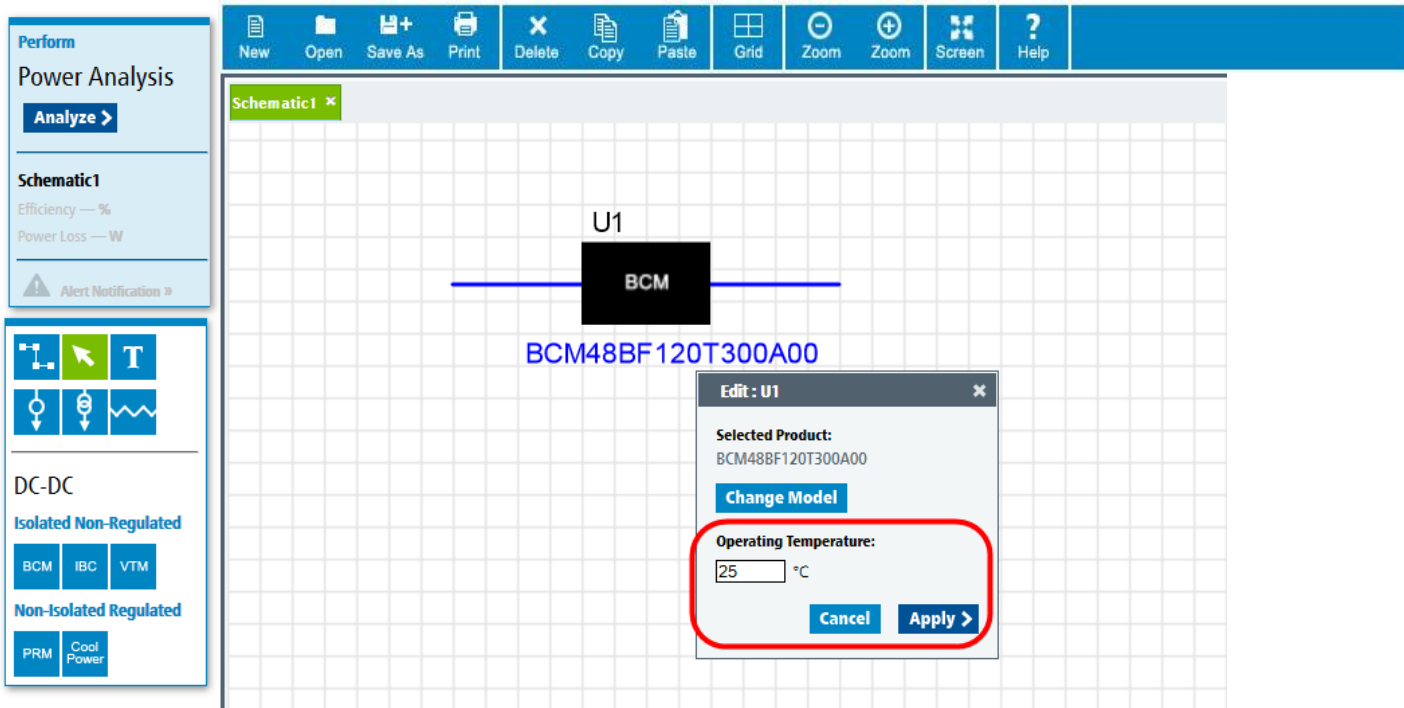
	The VTM has a much wider input range than BCM or IBC.
Non-Isolated Regulated	
PRM	PRM products can be used as a single stage buck/boost regulator, with local or remote sensing, or adaptive loop. Addition of a VTM following a PRM allows a voltage/current tradeoff similar to a transformer, allowing higher output power. The PRM is most efficient when the output voltage is close in value to the input voltage. Selection of the correct turns ratio in the VTM can be used to adjust the output voltage to optimize efficiency for lower voltage, higher current systems.
Cool Power	Cool Power products are smaller, and have lower power levels than other Vicor VI chip products. The Cool Power line offers high efficiency enabling a high power density solution. The Cool Power product is a natural selection in multiple output supplies for rail voltages requiring lower power levels than previously mentioned modules.

HOW TO SET VALUES FOR PRODUCTS

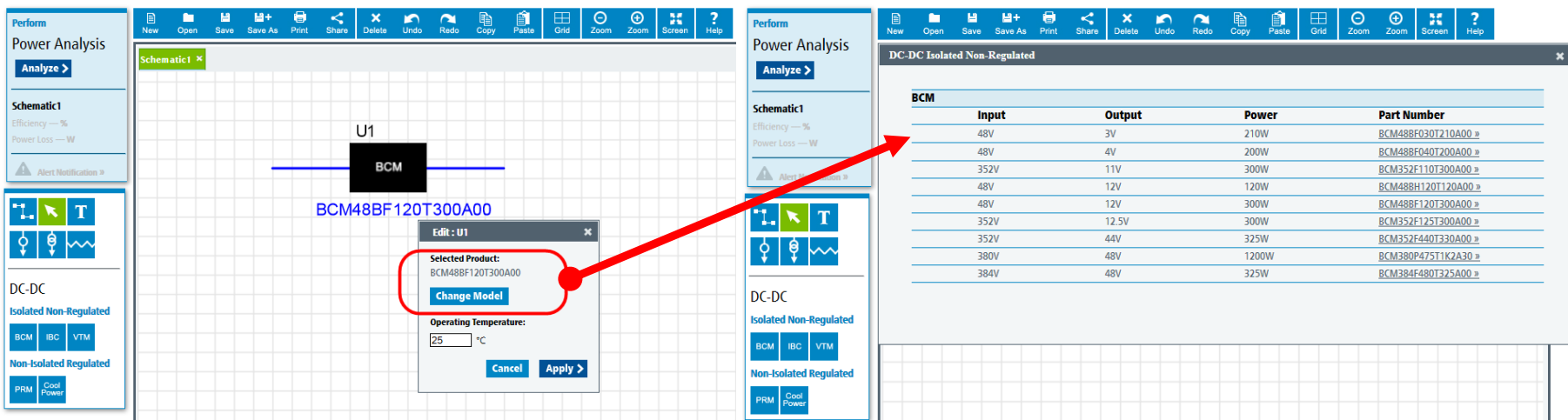
The operating temperature of a product can be set by using the right mouse context dialog.

To set the temperature of a product, right click on the product and enter the desired value to indicate the operating temperature of the product to be used during analysis.

Click the 'Apply' button to update the value.



The 'Change Model' button allows the ability to change the product to another model. It will present a table of the current product type to allow selection of a different product offering.

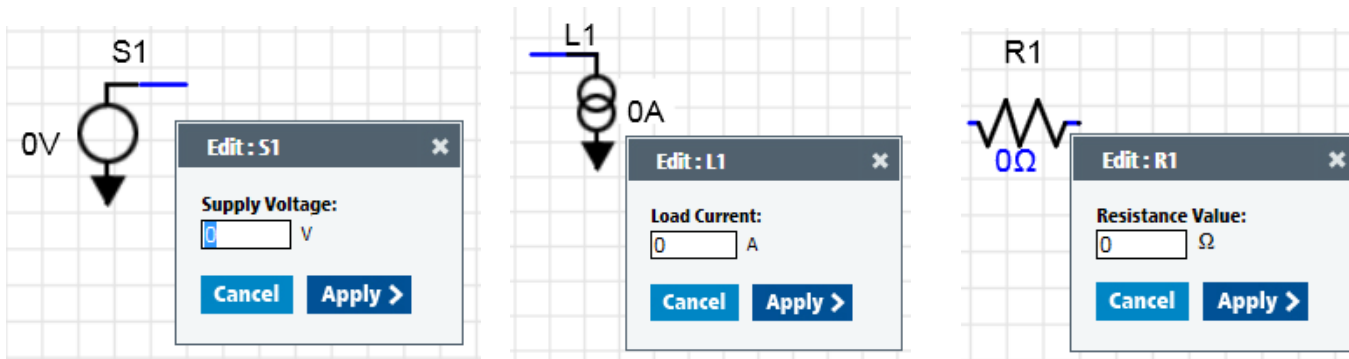


HOW TO SET VALUES FOR SUPPLY, LOAD AND RESISTANCE

When placing a Supply, Load or Resistor onto the Canvas, the value of each of these components needs to be set.

To do so, use the right mouse and click on a component when it is on the canvas. The respective value context dialog box will be displayed.

By entering in the required values for the design and clicking the Apply button, this information will be used in the Analysis of the efficiency of the design.



HOW TO ANALYZE THE DESIGN

When the product components in the design are wired up and operational supply load values set, you can analyze the power efficiency and loss of your architect concept.

Please note: the Analyze button will only act upon the currently active schematic tab. If the canvas has multiple tabs, only the currently active one will be analyzed and show values. The analysis box shows the name of the schematic that it has processed.

The image shows a software interface for power analysis. At the top is a blue menu bar with icons for New, Open, Save As, Print, Delete, Copy, Paste, Grid, Zoom (in and out), Screen, and Help. Below the menu bar is a tabbed interface with two tabs: 'Schematic1' and 'Schematic2'. The 'Schematic2' tab is active and highlighted with a red box. A red arrow points from this box to the text 'Active schematic name' in the main workspace. The main workspace contains a schematic diagram on a grid background. The diagram shows a 350V AC source labeled 'S1' connected to a black rectangular component labeled 'U1' with the text 'BCM' and 'BCM384F480T325A00' below it. This component is connected to another black rectangular component labeled 'U2' with the text 'VTM' and 'VTM48EF020T080A00' below it. Finally, the circuit is connected to a load labeled 'L1' with a 2A current source symbol. On the left side of the interface is a sidebar titled 'Power Analysis'. It contains an 'Analyze' button with a right-pointing arrow, which is highlighted with a red box. Below the 'Analyze' button are indicators for 'Efficiency — %' and 'Power Loss — W', and an 'Alert Notification' icon. At the bottom of the sidebar are icons for various components and a 'DC-DC' section with sub-sections for 'Isolated Non-Regulated' (containing BCM, IBC, VTM) and 'Non-Isolated Regulated' (containing PRM, Cool Power).

To begin the power analysis process, click the Analyze button.

The screenshot shows the PowerBench software interface. On the left, the 'Perform' tab is active, displaying 'Power Analysis' with an 'Analyze' button highlighted in red. Below this, 'Schematic2' is selected, showing 'Efficiency ---%' and 'Power Loss ---W'. The main workspace displays a schematic with a 360V source (S1), a BCM component (U1), a VTM component (U2), and a 2A load (L1). A red callout box is drawn around the BCM component, which is labeled 'BCM384F480T325A00'. Below the schematic, a text box states: 'Indicates that the power efficiency is being calculated using the products and component values on the schematic.'

The PowerBench WhiteBoard will show the values for your design like this:

The screenshot shows the same schematic diagram as above, but now with numerical values for efficiency and power loss. The 'Perform' tab shows 'Power Analysis' with 'Analyze' highlighted. 'Schematic2' is selected, showing 'Efficiency 25.97%' and 'Power Loss 10.66 W'. The schematic components are annotated with their operating parameters:

- Source S1: 360V, 0.04A
- BCM U1: 44.97V, 0.16A, BCM384F480T325A00, 49.97% efficiency, 7.2W power loss
- VTM U2: 44.97V, 0.16A, 1.87V, 2A, VTM48EF020T080A00, 51.98% efficiency, 3.46W power loss
- Load L1: 1.87V, 2A

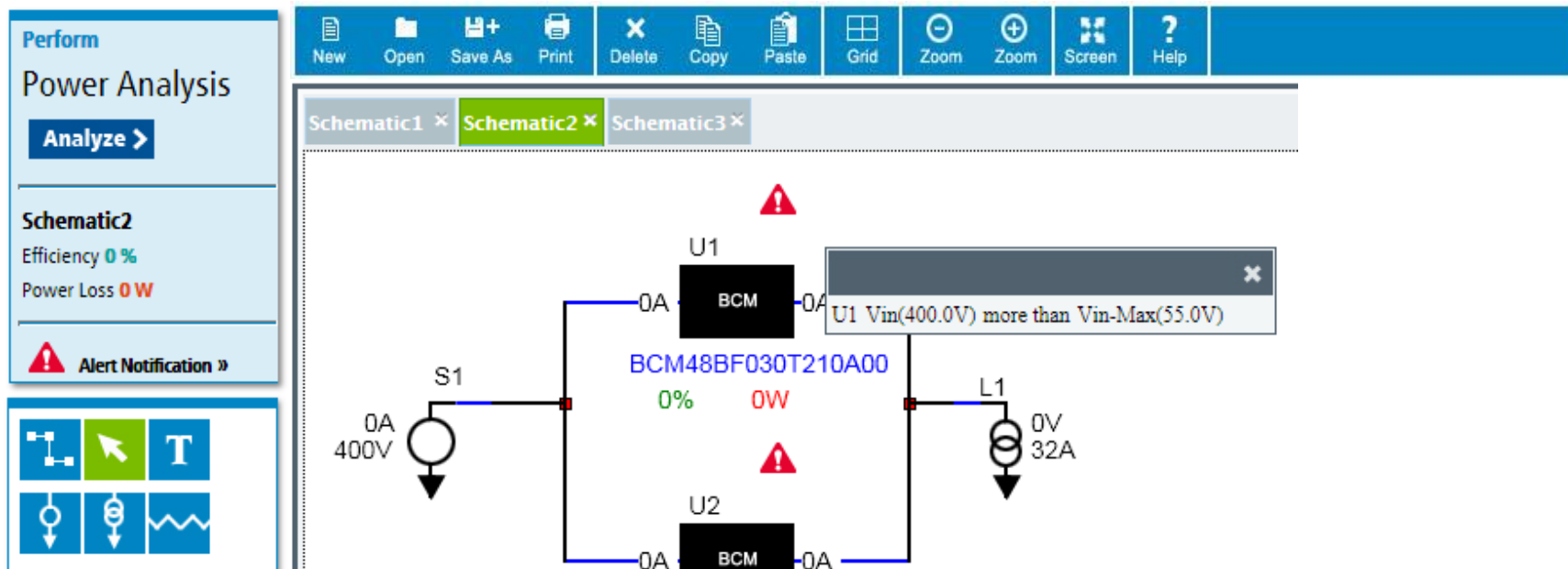
UNDERSTANDING ANALYSIS ERRORS

Certain conditions will cause Analysis errors to occur.

These are:

- V_{in} (Input Voltage) more than V_{in-Max} (maximum allowable input voltage)
- V_{in} (Input Voltage) less than V_{in-Min} (minimum allowable input voltage)
- I_{out} (Output Current) more than $I_{out-Max}$ (maximum allowable output current)

Analysis errors will appear like this:

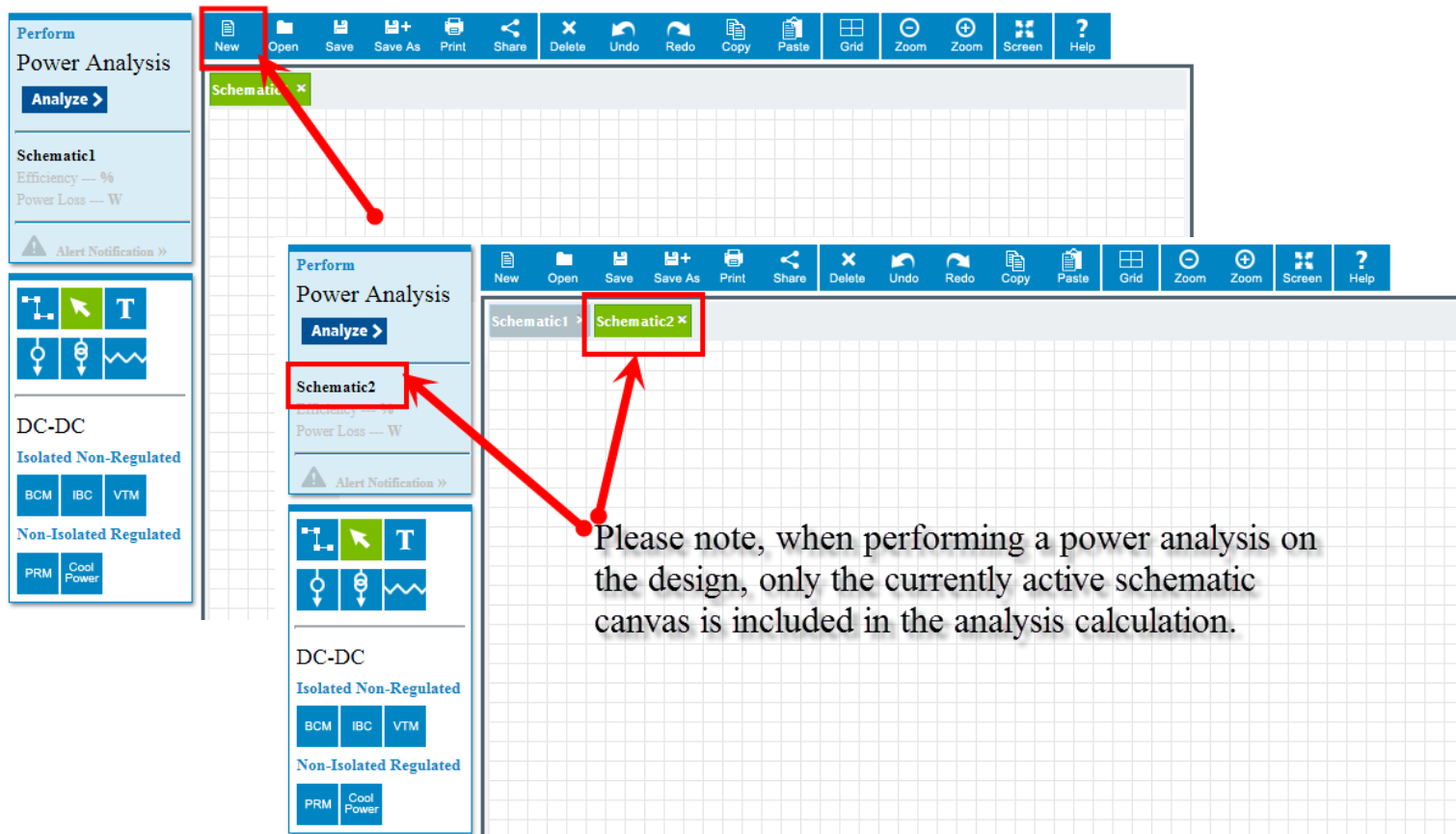


On the schematic canvas the error will initially show the Alert triangle. To see the error type associated with it, click on the Alert icon and the error condition will be displayed as shown in this example for incorrectly specifying the input voltage.

SCHEMATIC CANVAS

This is the area where you place your components and product design elements.

By using the 'New' command on the toolbar, multiple schematic tabs can be opened and editable.



Perform
Power Analysis
Analyze >

Schematic1
Efficiency — %
Power Loss — W
Alert Notification >>

DC-DC
Isolated Non-Regulated
BCM IBC VTM
Non-Isolated Regulated
PRM Cool Power

Perform
Power Analysis
Analyze >

Schematic1 Schematic2 *

Schematic2
Efficiency
Power Loss — W
Alert Notification >>

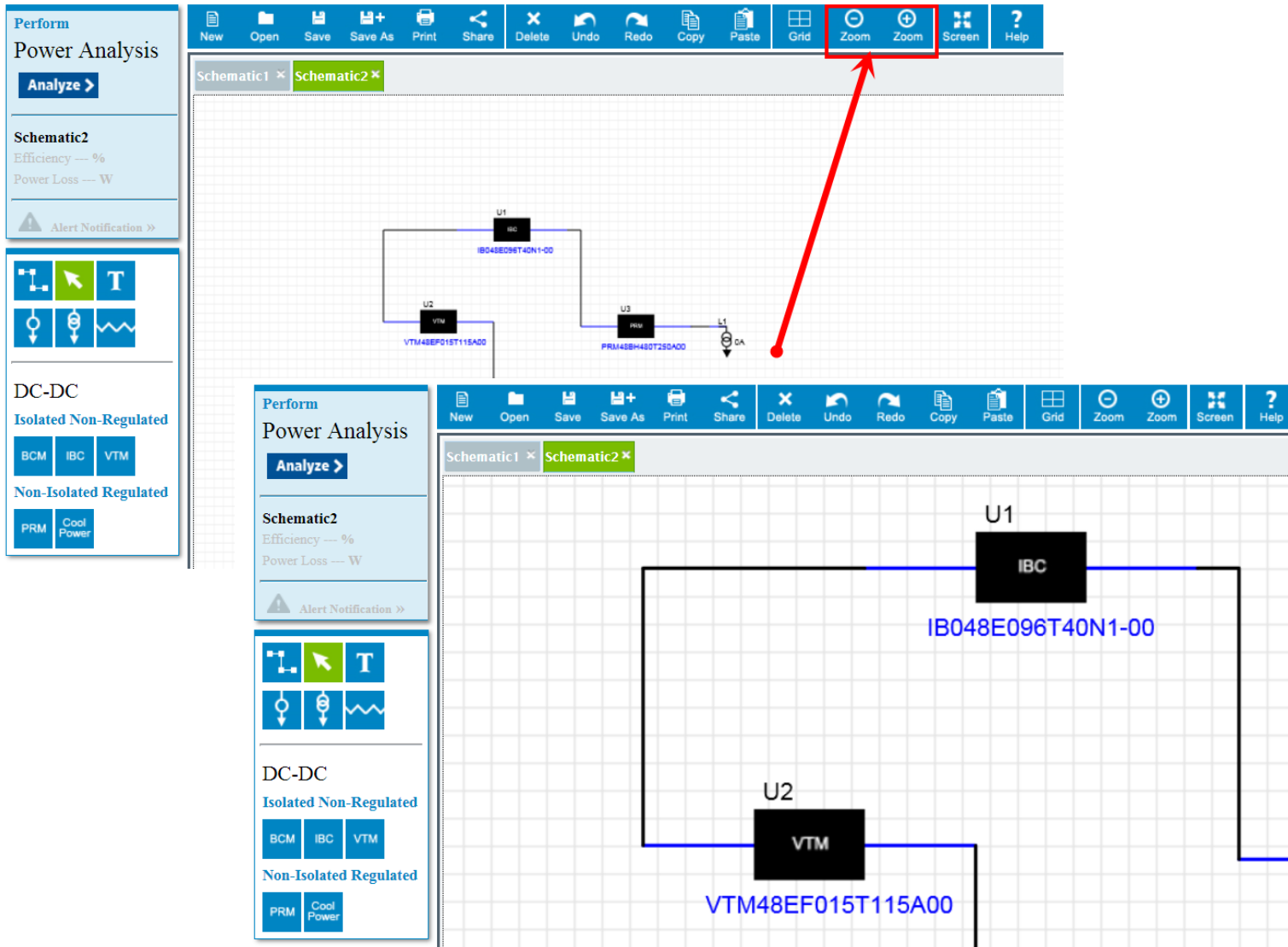
DC-DC
Isolated Non-Regulated
BCM IBC VTM
Non-Isolated Regulated
PRM Cool Power

New Open Save Save As Print Share Delete Undo Redo Copy Paste Grid Zoom Zoom Screen Help

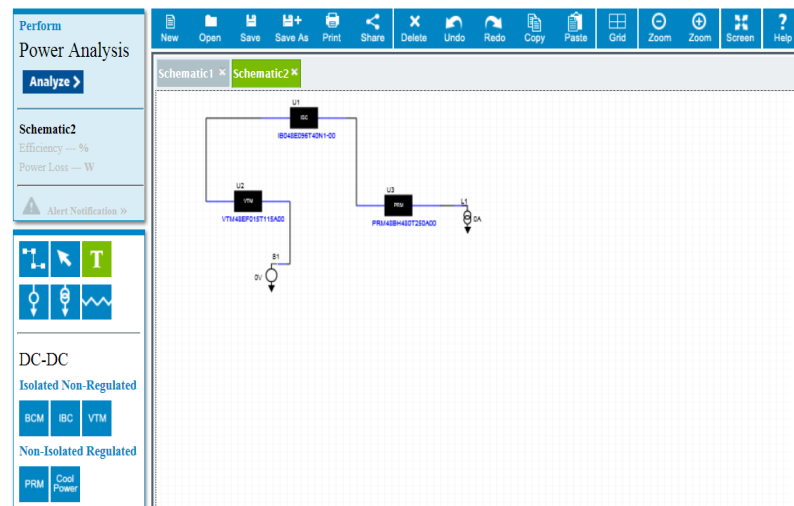
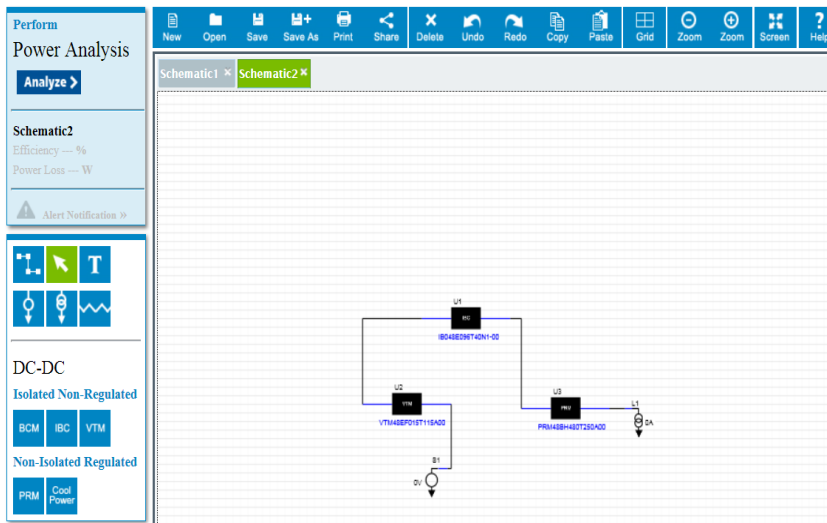
New Open Save Save As Print Share Delete Undo Redo Copy Paste Grid Zoom Zoom Screen Help

Please note, when performing a power analysis on the design, only the currently active schematic canvas is included in the analysis calculation.

When a very large design is being placed on the canvas, the Zoom toolbar buttons allow for easy resizing of the details.



Additionally, the canvas can be Panned by doing a Right mouse click and drag on the Canvas



TOOLBAR

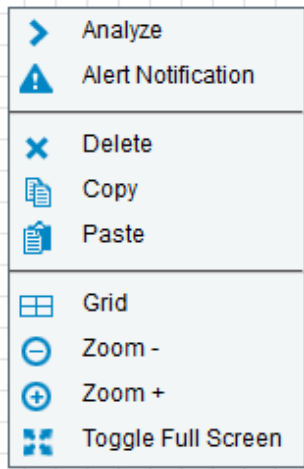
These are the basic functions to manage your files and layout of the WhiteBoard.



The Toolbar actions are as follows:

New	Creates an additional new tab on the Canvas.
Open	Allows a previously saved PowerBench WhiteBoard file to be loaded onto the Canvas.
Save As	Allows the currently active schematic to be saved to an alternate file name or shared.
Print	Prints the schematic on the currently active tab.
Delete	Deletes the currently selected component(s) from the design.
Copy	Copies the selected component(s) to the active clipboard.
Paste	Pastes the items on the active clipboard onto the Canvas.
Grid	Is a toggle action that displays or hides the grid on the Canvas.
Zoom -	Makes the Canvas visually shrink.
Zoom +	Makes the Canvas visually grow.
Screen	Makes the Canvas take the full screen area for display.
Help	Shows the PowerBench WhiteBoard help documentation.

CONTEXT MENU



In the Schematic Canvas area of the WhiteBoard, the right mouse button brings up the following context menu:

KEYBOARD SHORTCUTS

- **Delete** – to delete selected object/objects
- **Space Bar** - to bend wire in wire mode.
- **Esc** - to get out of the current action and return to just the pointer.

SYSTEM REQUIREMENTS

The PowerBench WhiteBoard uses HTML5 technology to manage the screen controls, canvas and drawing elements.

Browser compatibility version requirements:

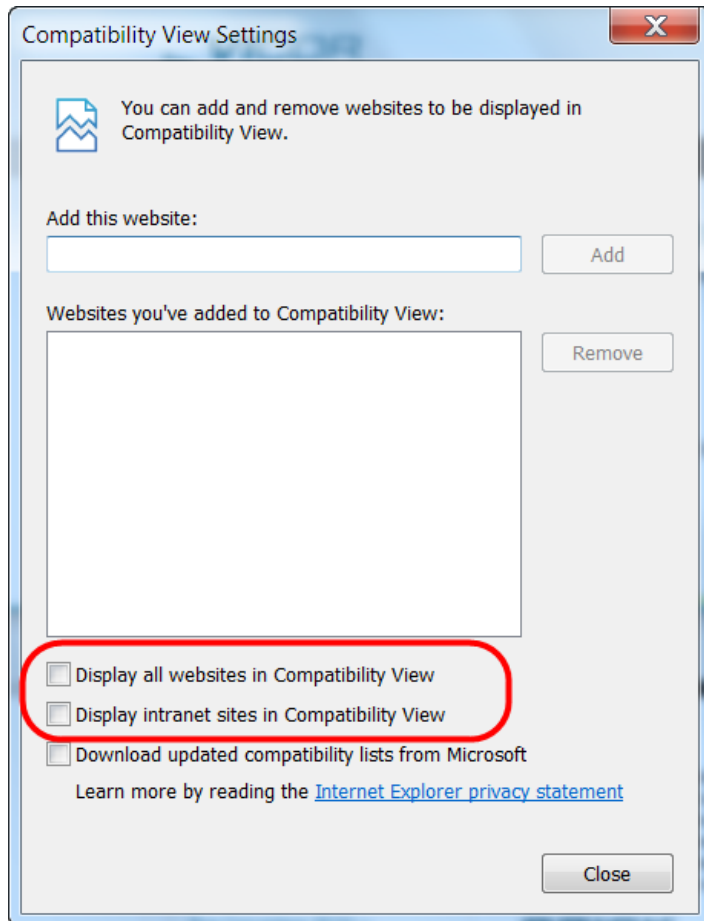
- Internet Explorer 9 and higher
- Firefox 10 and higher
- Chrome 10 and higher
- Safari 5.1 and higher

- Opera 11.50 and higher

Please be advised:

Problems may occur if the browser is in compatibility mode.

Please make sure that the browser is not using compatibility mode.



Please be advised:

Image degradation of icons and text is sometimes seen when the default Display environment is set to a larger size than normal.

It is recommended that the display be kept at the default. To enlarge the canvas, use the WhiteBoard Zoom features.

