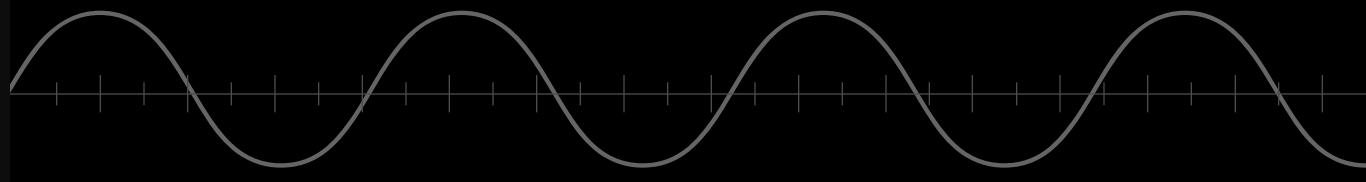
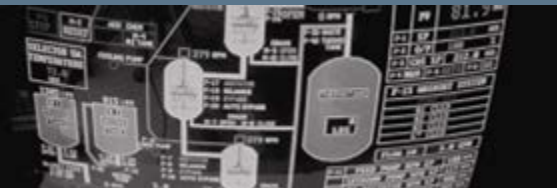


LTpowerPlanner III System-Level Power Tree Design Tool Quick Start Guide

Ver. 3.0.2
October 2016



Design Tool Development Team
Applications Engineering
Power Products, Linear Technology Corp.

LTpowerCAD@linear.com

Linear Technology Corporation Copyright.

Last Update: 10/2016



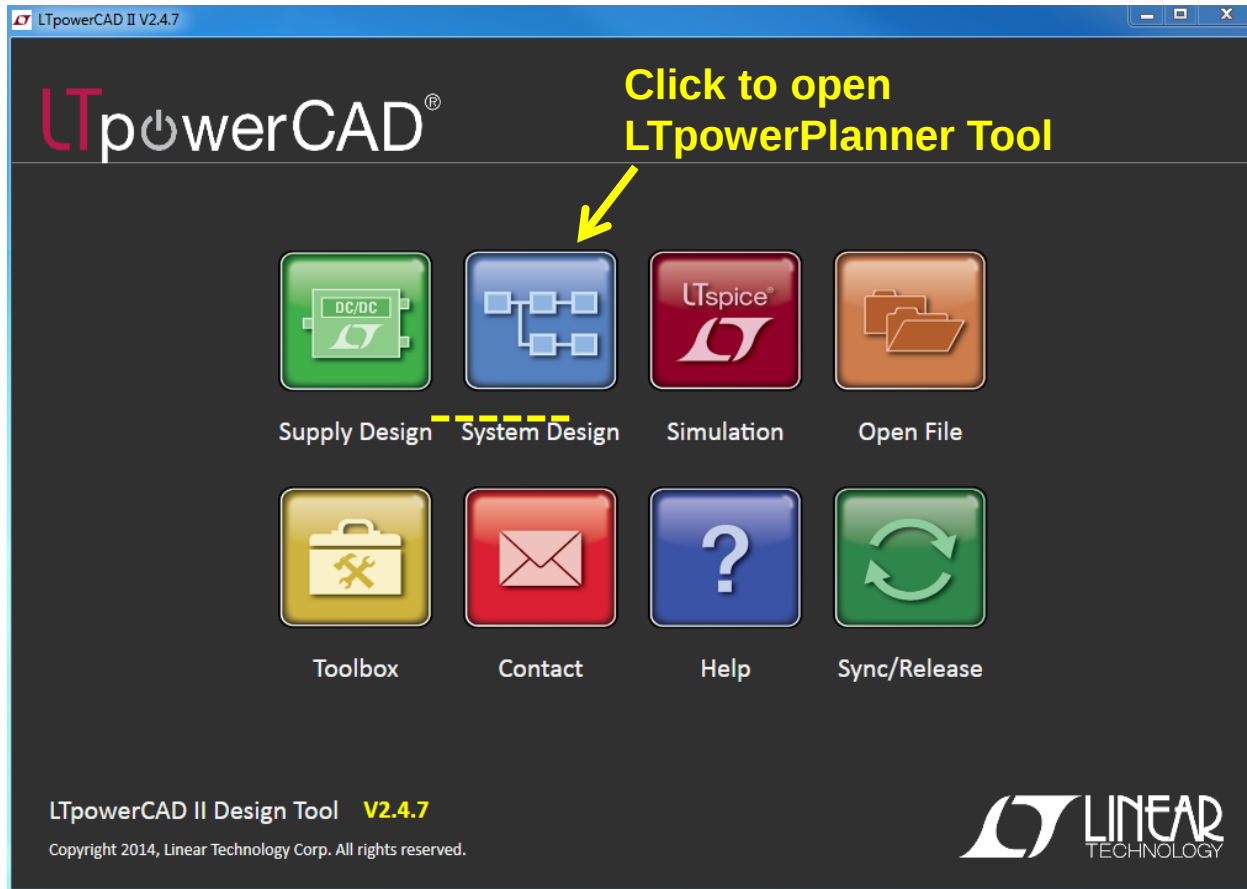
LTpowerPlanner™ Tool Introduction

A System-Level Power Architecture Planning Tool:

- ✓ Create a **“Power Tree”** diagram of your Power Management System
- ✓ Estimate **Total System Power, Efficiency and Solution Size**
- ✓ **Compare** different system architectures for optimum solution
- ✓ Display and Copy Block Diagram for **System Presentation**
- ✓ Save and Load System Design Files for **Project Organization**
- ✓ Interface with LTspice™ Simulation file
- ✓ Interface with LTpowerCAD™ Design Tool file
- ✓ Available inside LTpowerCAD, **free download** at www.linear.com/ltpowercad
- ✓ Offline program on PC with Windows 7, 8 or 10.

LTpowerPlanner Tool - Location

Located inside the **LTpowerCAD** program for “**system design**”:

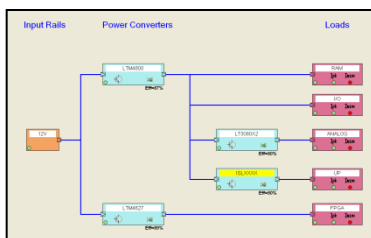


- Note: the previous LTpowerPlanner II program in the “Toolbox” is **NOT** recommended for new designs.

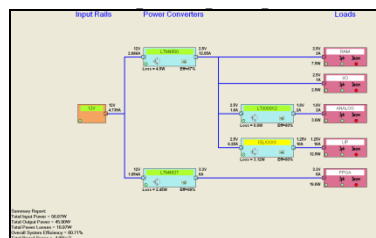
LTpowerPlanner Tool - Overview

Intuitive Power System Planning

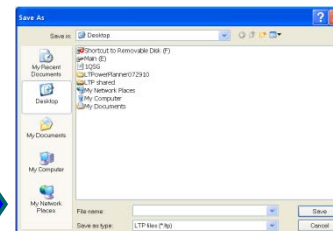
Create System “Power Tree”



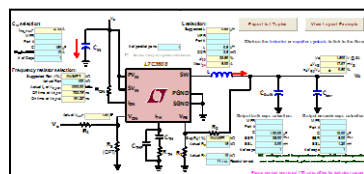
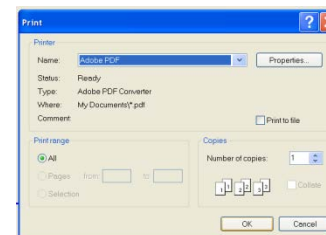
System Power



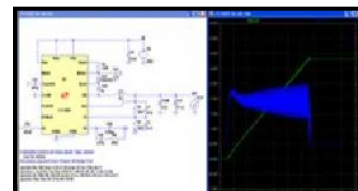
Save Design



Print

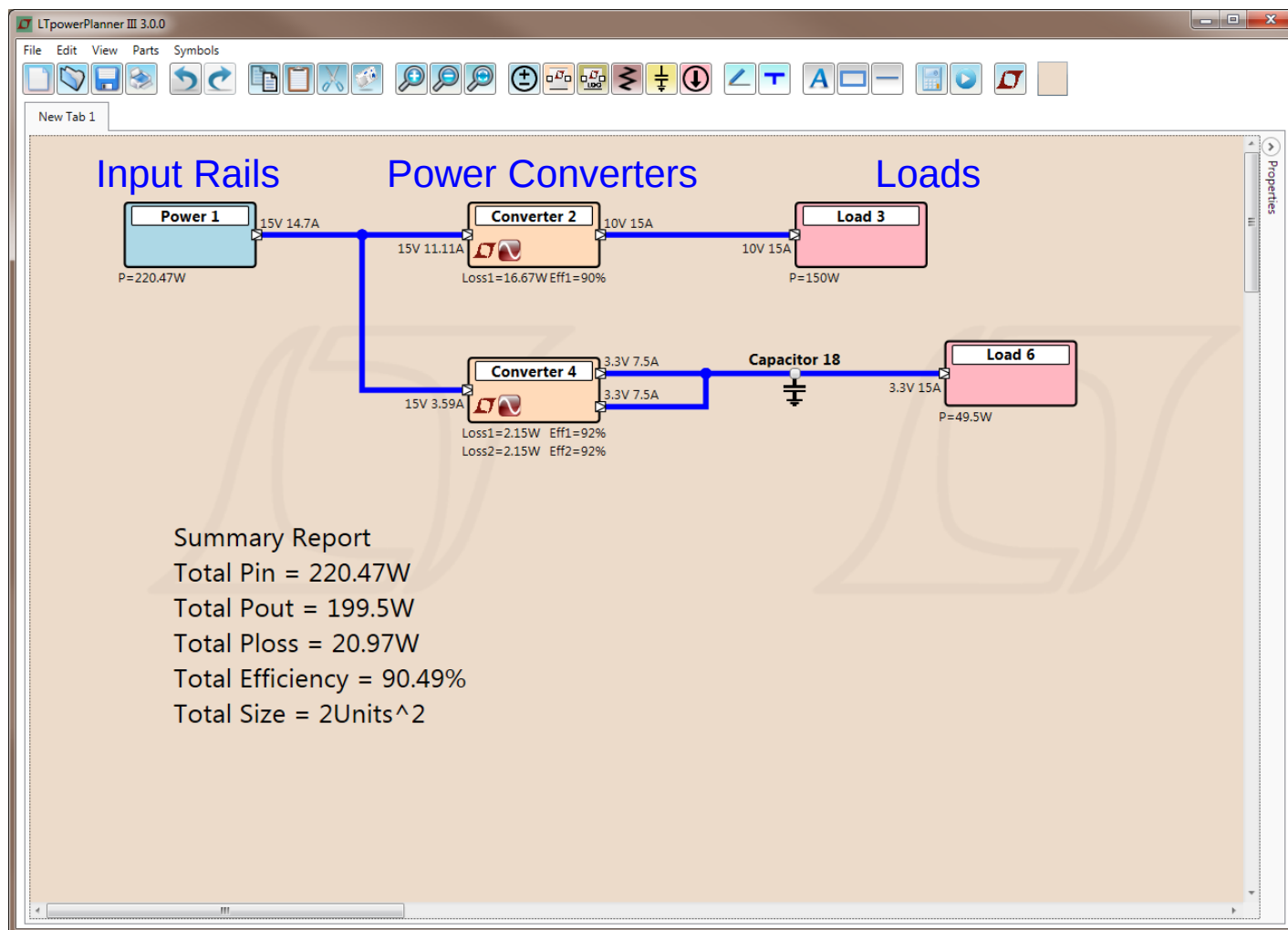


Interface With LTpowerCAD™ Design Tool



Interface With LTspice™ Simulation Tool

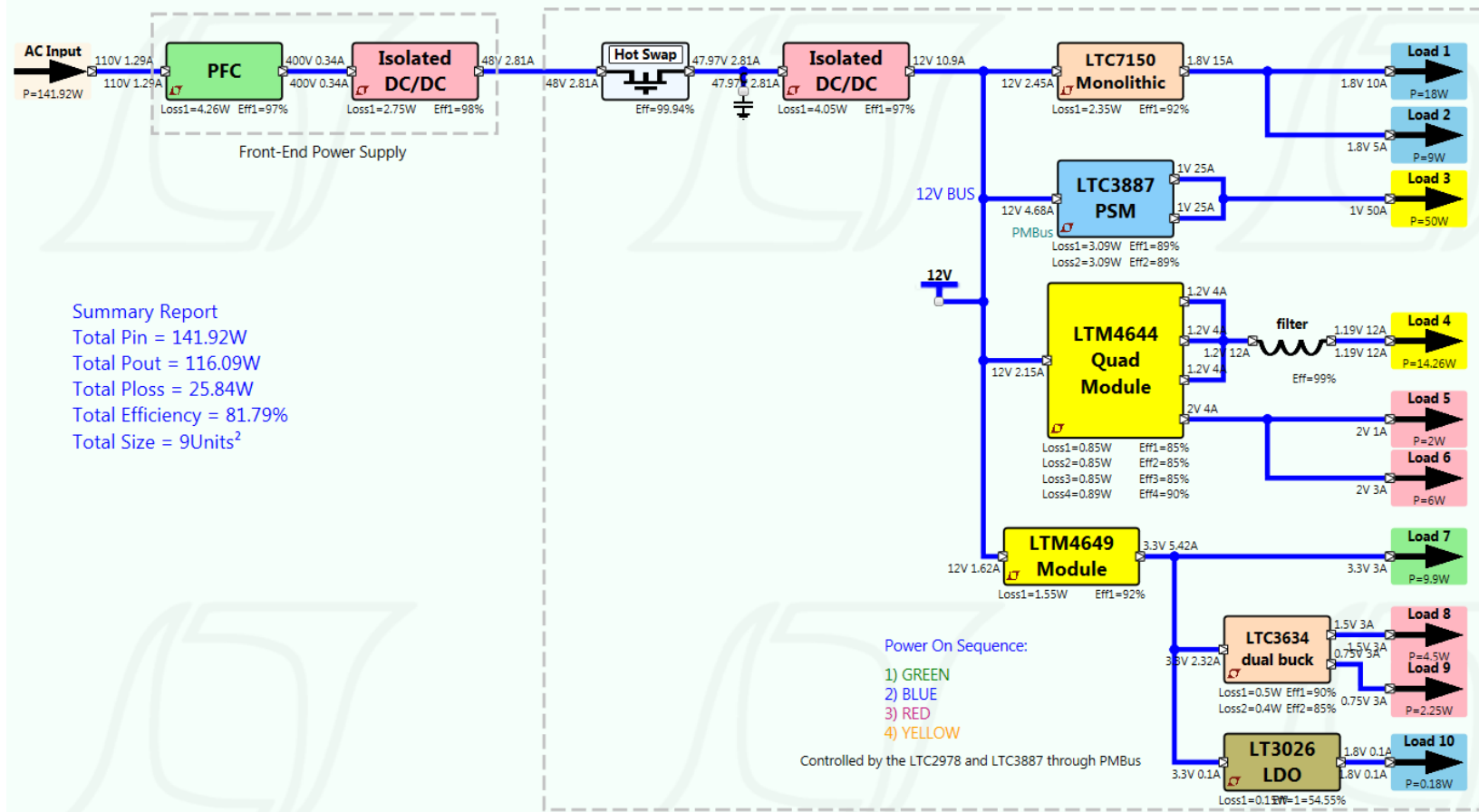
LTpowerPlanner™ - A Simple Design Example



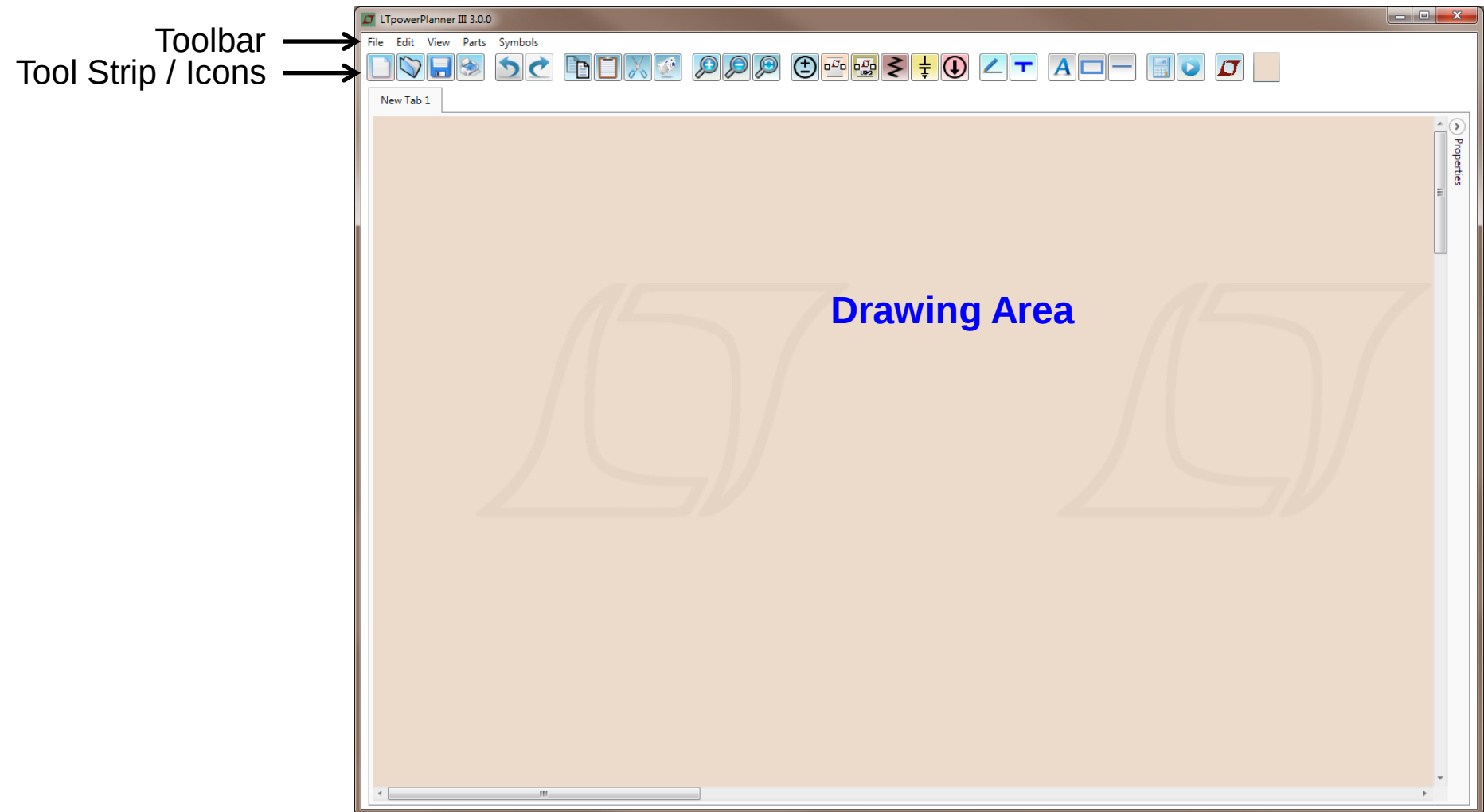
A More Complicated Power Tree Example

Communication Infrastructure Power Chain Example

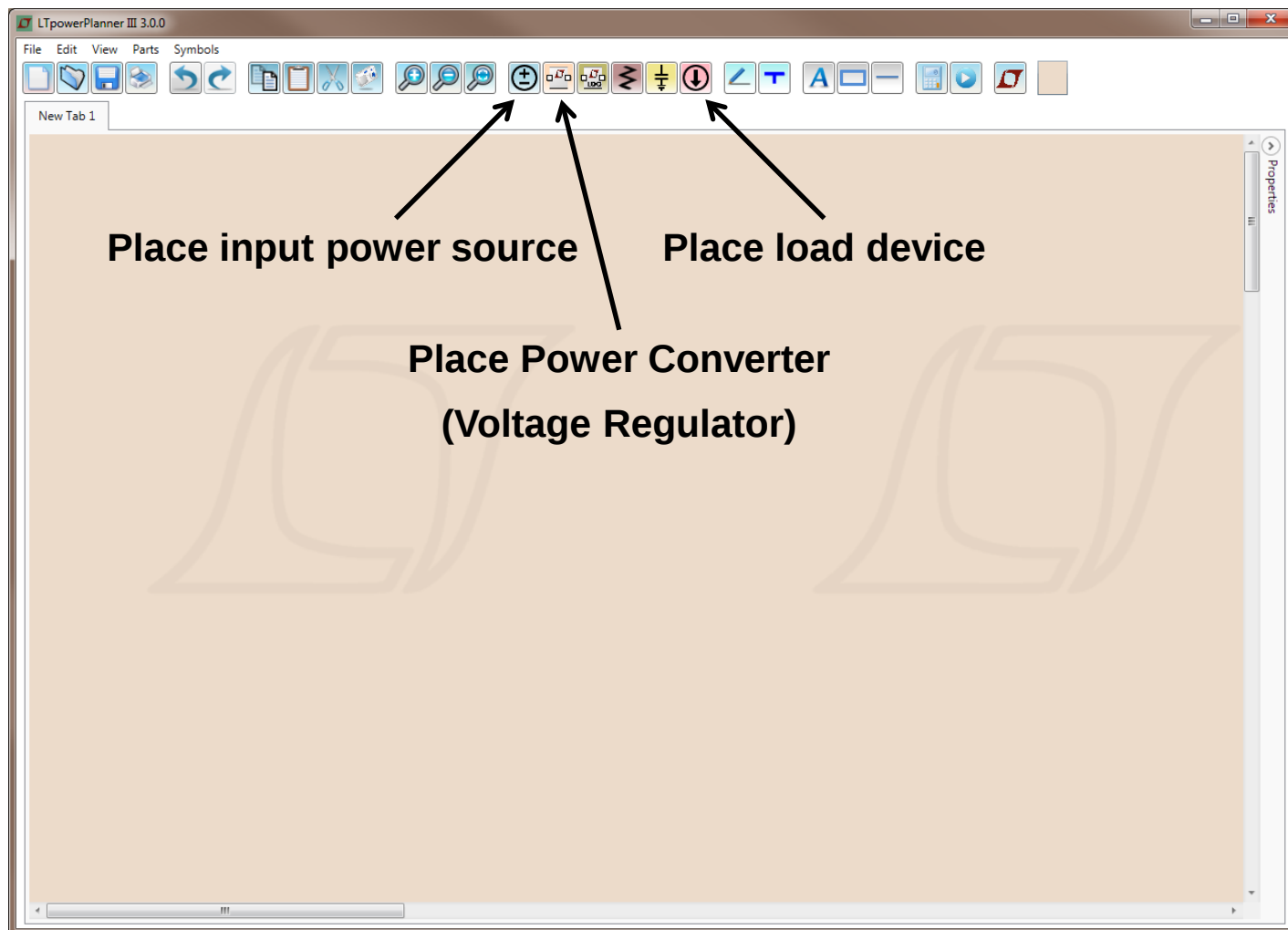
2015



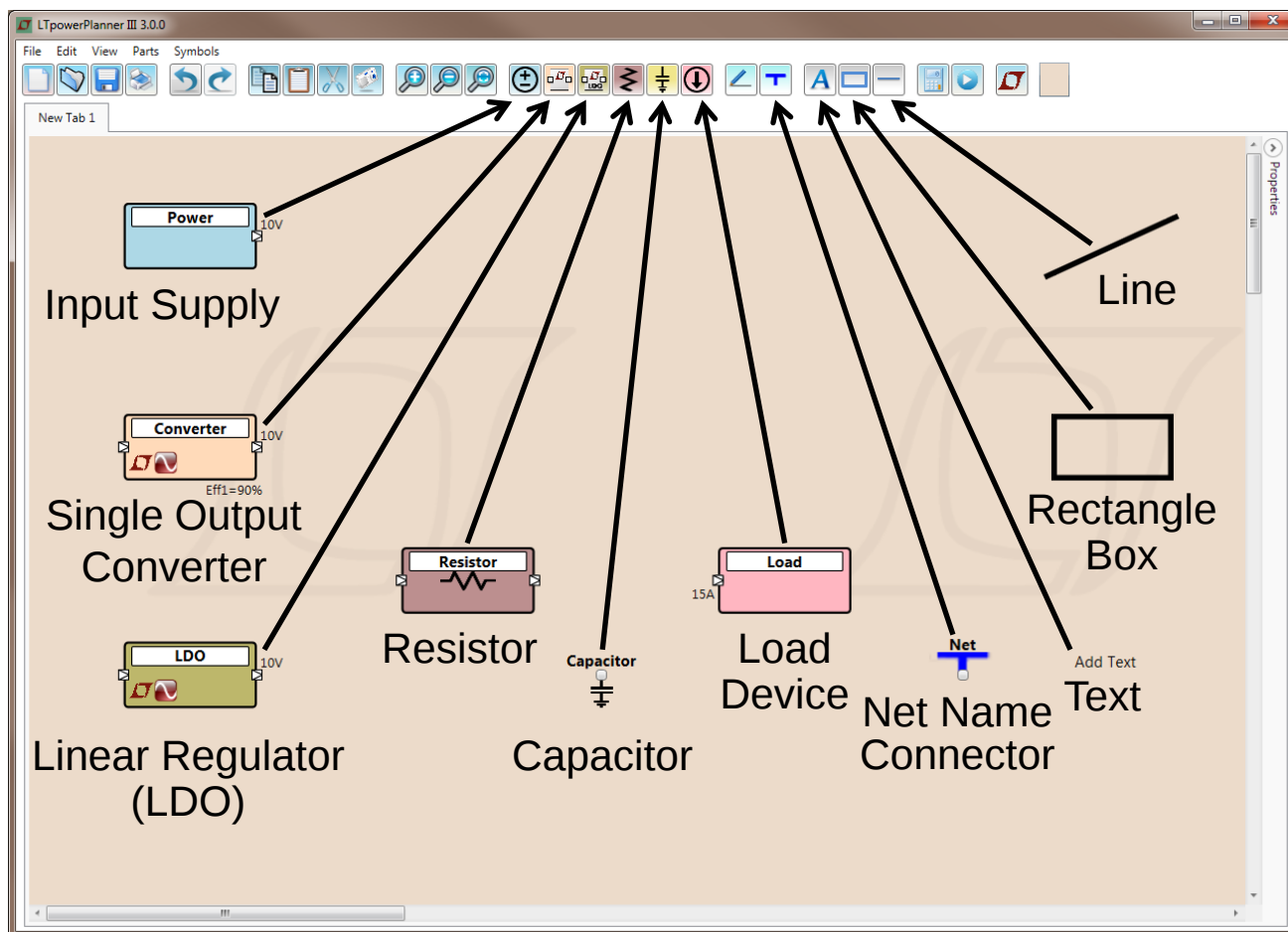
Main Screen



Components Toolbar



Components

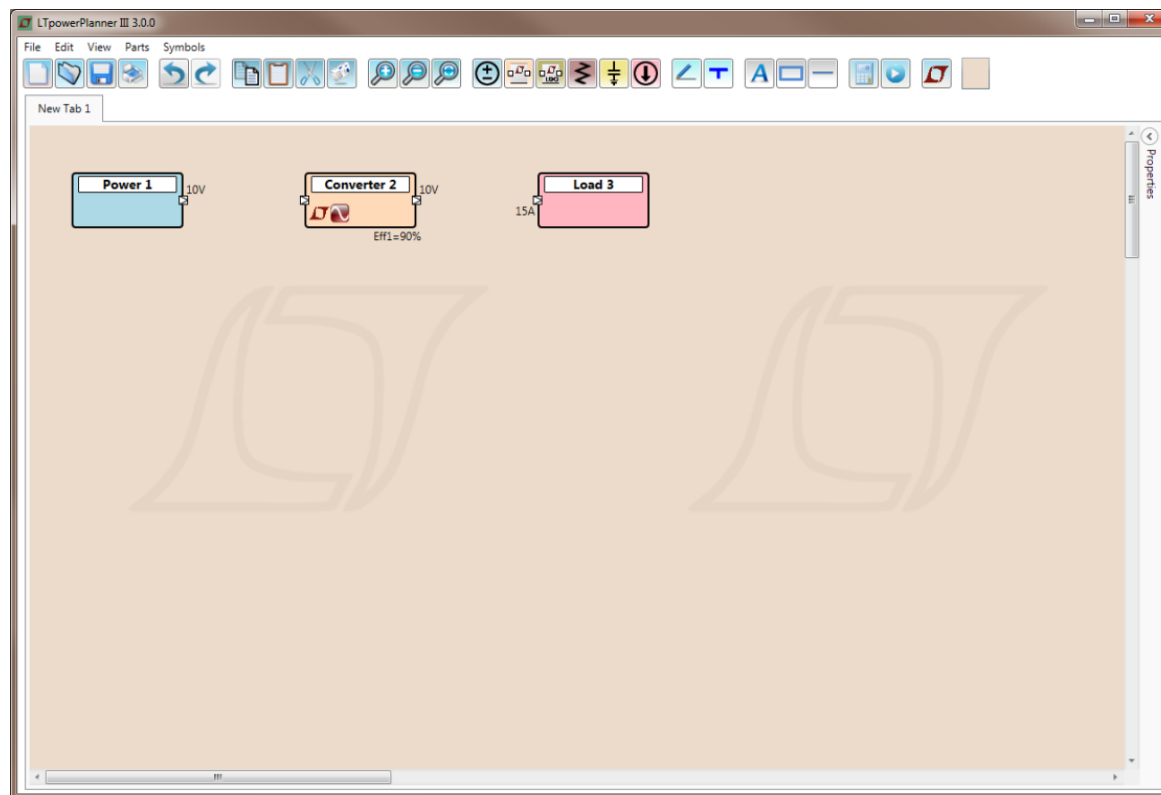


LTpowerPlanner™

Getting Started with an Example

A Simple Example – Step 1: Adding Parts

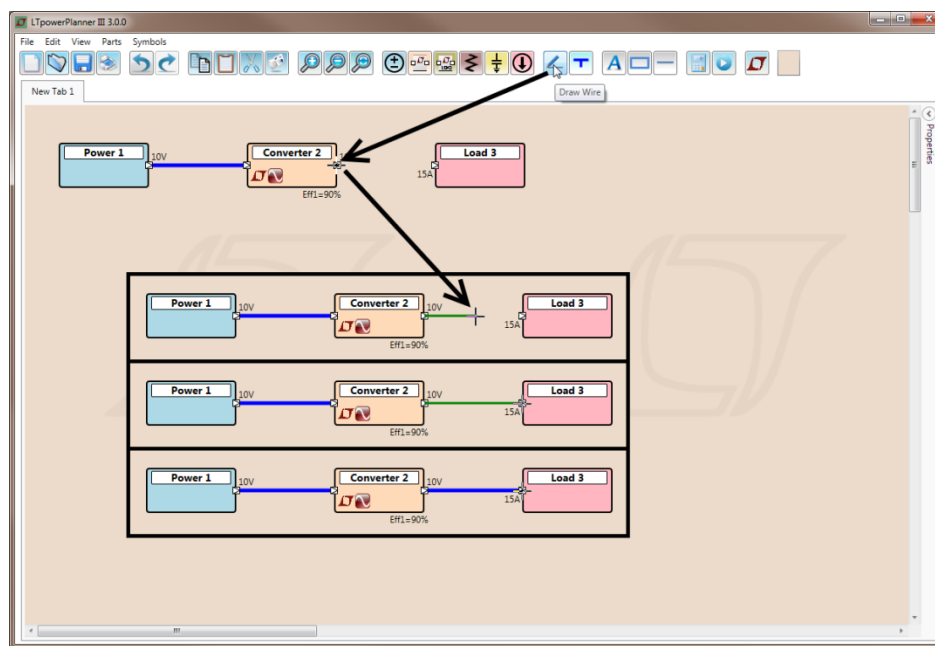
Click **Power, Converter or Load Icon** on the tool strip and drop the part onto the drawing area.



- By default, the input power source only has an output terminal. Converters have both input and output terminals. The load only has input terminals.
- **The input is always on the left side and the output is always on the right side.**

A Simple Example – Step 2: Making Connections

Add connections. Add a wire connecting Converter 2 to Load 3: **First click**  the **Icon**. While in “Draw Wire” mode, the cursor will become a cross-hair. **Click Converter2’s output terminal**. Then release the mouse. **Next click on Load3’s input terminal** to create the wire. Right-click the Drawing Area to cancel “Draw Wire” mode.

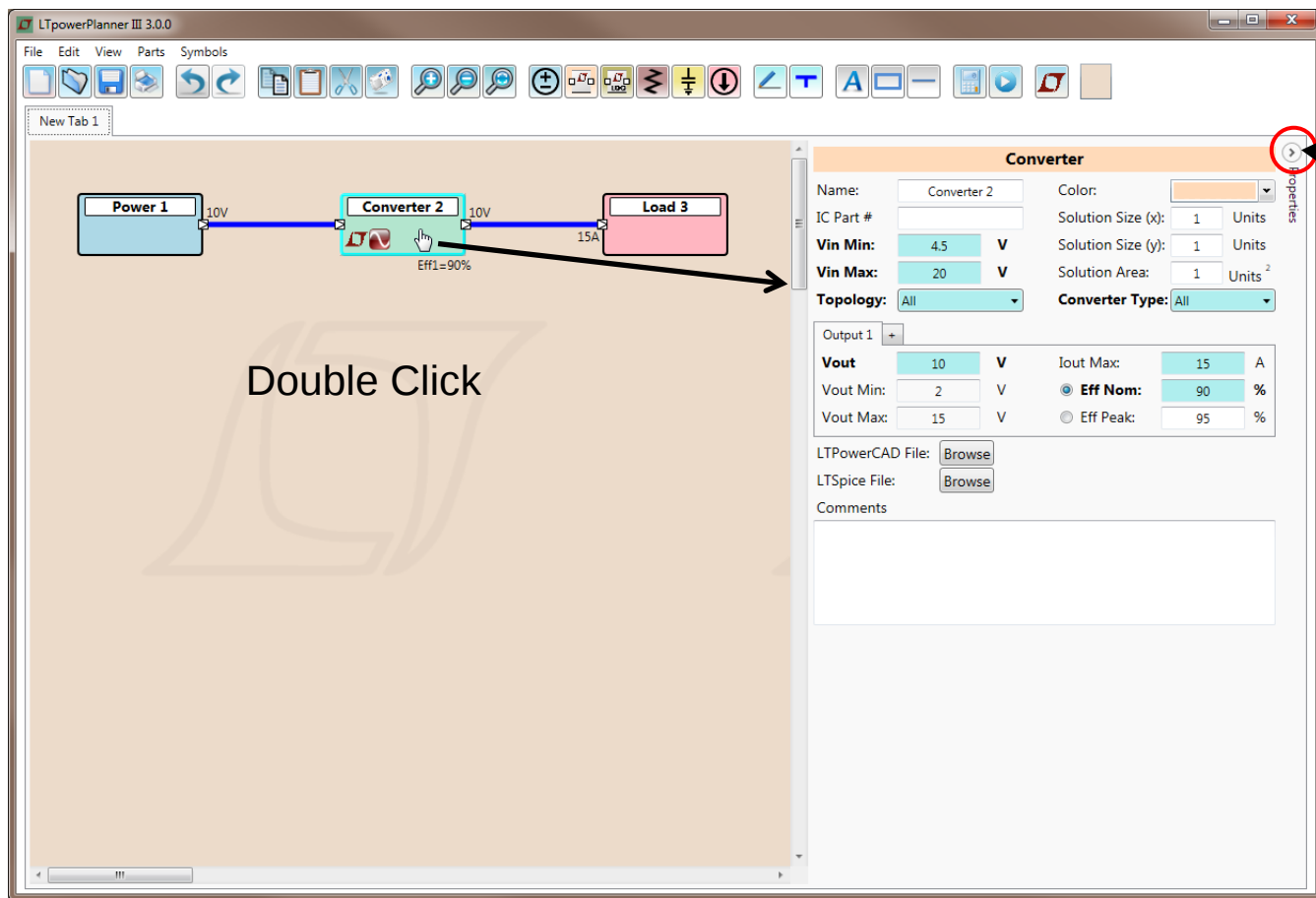


Tips:

1. Using an external mouse makes it easy to draw wires (instead of laptop PC touch pad/mouse)
2. The current program does **NOT** support “click-and-drag” to draw connection wire.
3. Routes requiring 90° turns must be placed by the user.

A Simple Example – Step 3: Editing Part Properties

Double click on part labeled “Converter 2” to open the “Properties Tab”. Update the text box entries appropriate to the desired values.



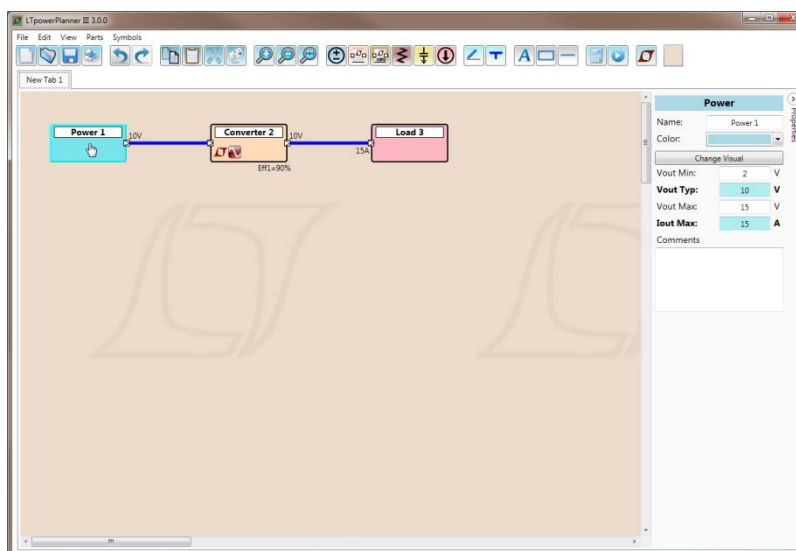
Pressing this arrow will keep the “Properties Tab” always open or always closed when a single part is selected. Shortcut is “Space”

Note: the values with blue cell background color are used for power calculation or interface with LTpowerCAD search.

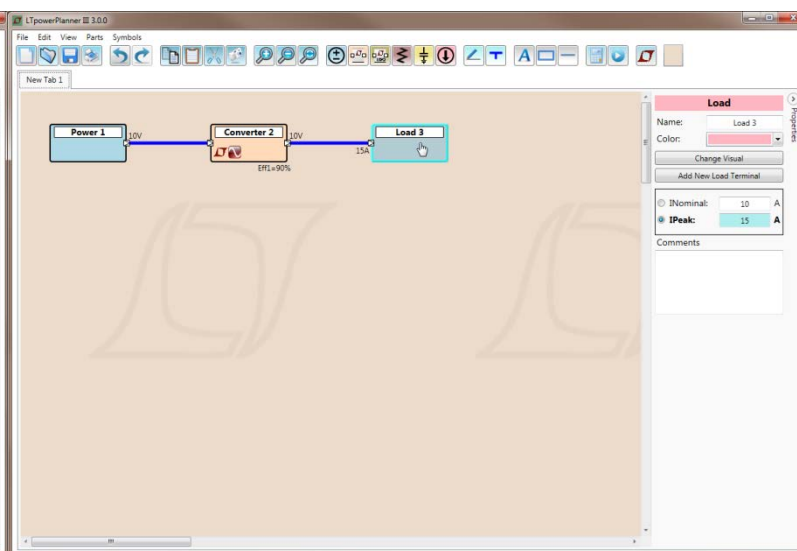
- Note the LTpowerPlanner is a generic program. User needs to type in / change converter parameters.

A Simple Example – Step 3: Part Properties (2)

Each component has a unique “Properties” box which allows the appropriate fields to be edited.



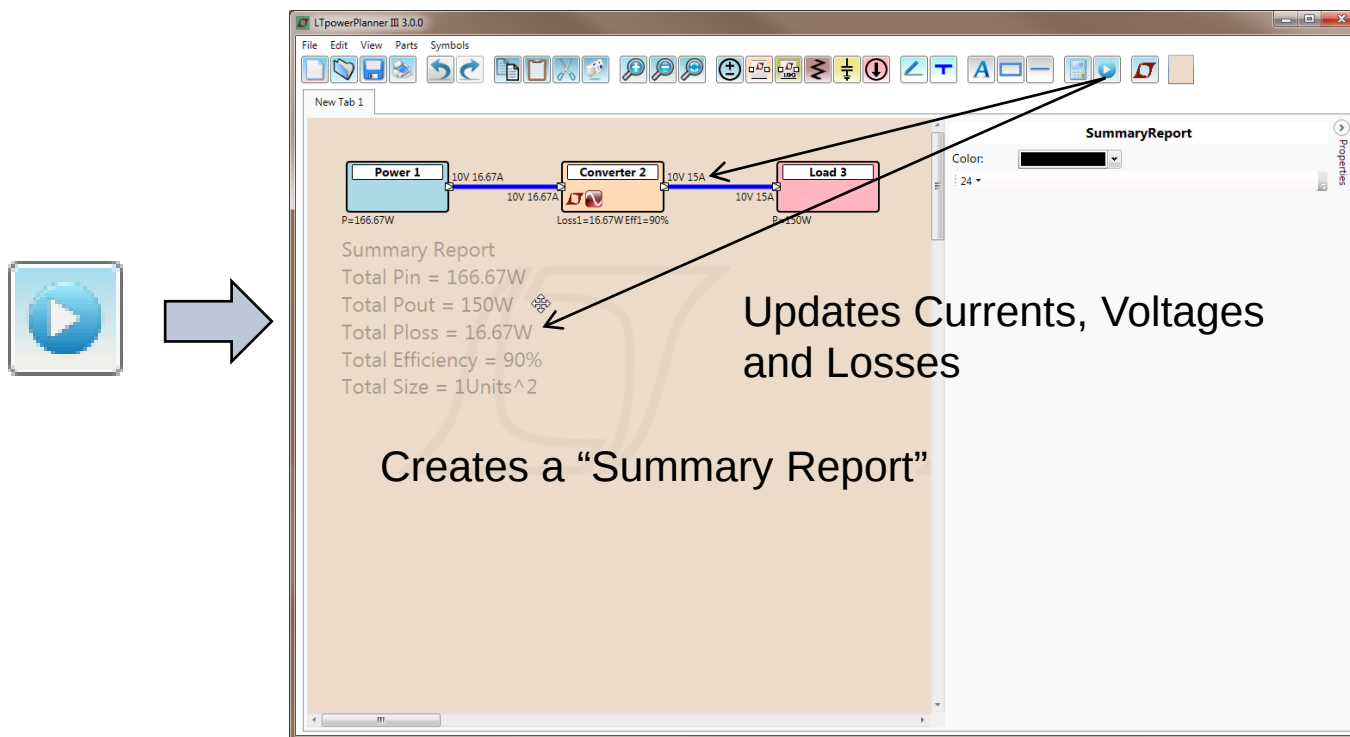
Power Source Properties



Load Device Properties

A Simple Example – Step 4: Calculating the System

Click the “**Calculate Power**” icon on the tool strip to calculate system efficiency, losses and total solution size.

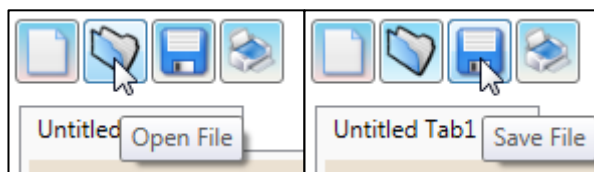


Note:

1. The user needs to **manually enter** the estimated efficiency and size of each converter to generate estimated total efficiency and board space.

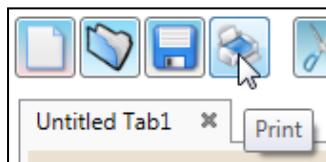
A Simple Example – Step 5: Save / Print

Save/Open. “Save” and “Open” apply to ALL TABS! Each tab is designed to be a part of one solution. This means “Save” saves all your tabs to one file which has multiple tabs. When you “Open” a file, all your tabs will be replaced by the new project.



- A design project is saved as an **.ltp3** file.

Print. Print will Zoom-to-Fit the current tab and open your printing options.

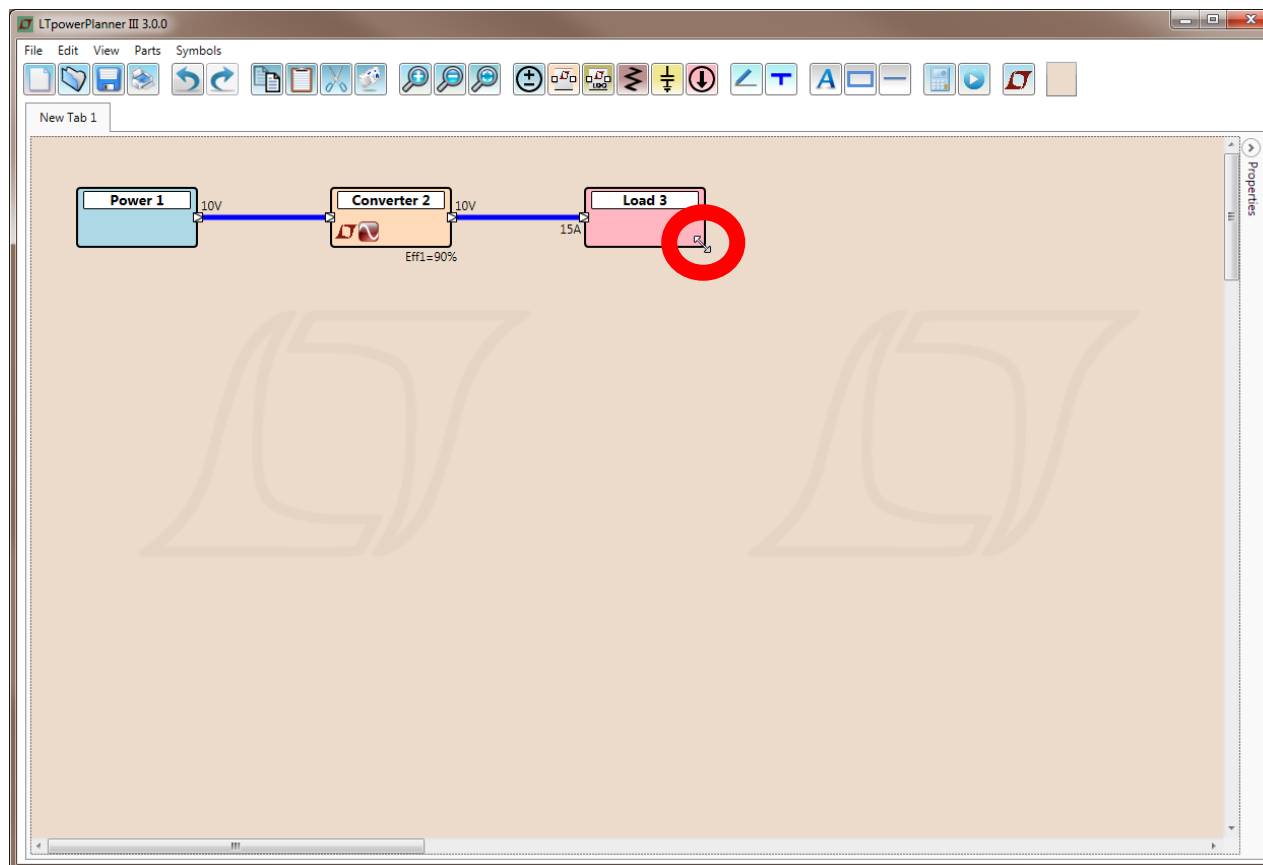


- Landscape printing is the default setting and can be changed in printing preferences.

Details on Adding / Changing Parts

Resize Components

Resize Component. Resize parts by dragging the corner of the part when the cursor changes to the resize icon. Symbols (rectangles, lines and text) can be resized from multiple corners.



Converter Display Visual Option

Click on the converter to open its properties window on right.
Click on “**Change Visual**” for different display options.

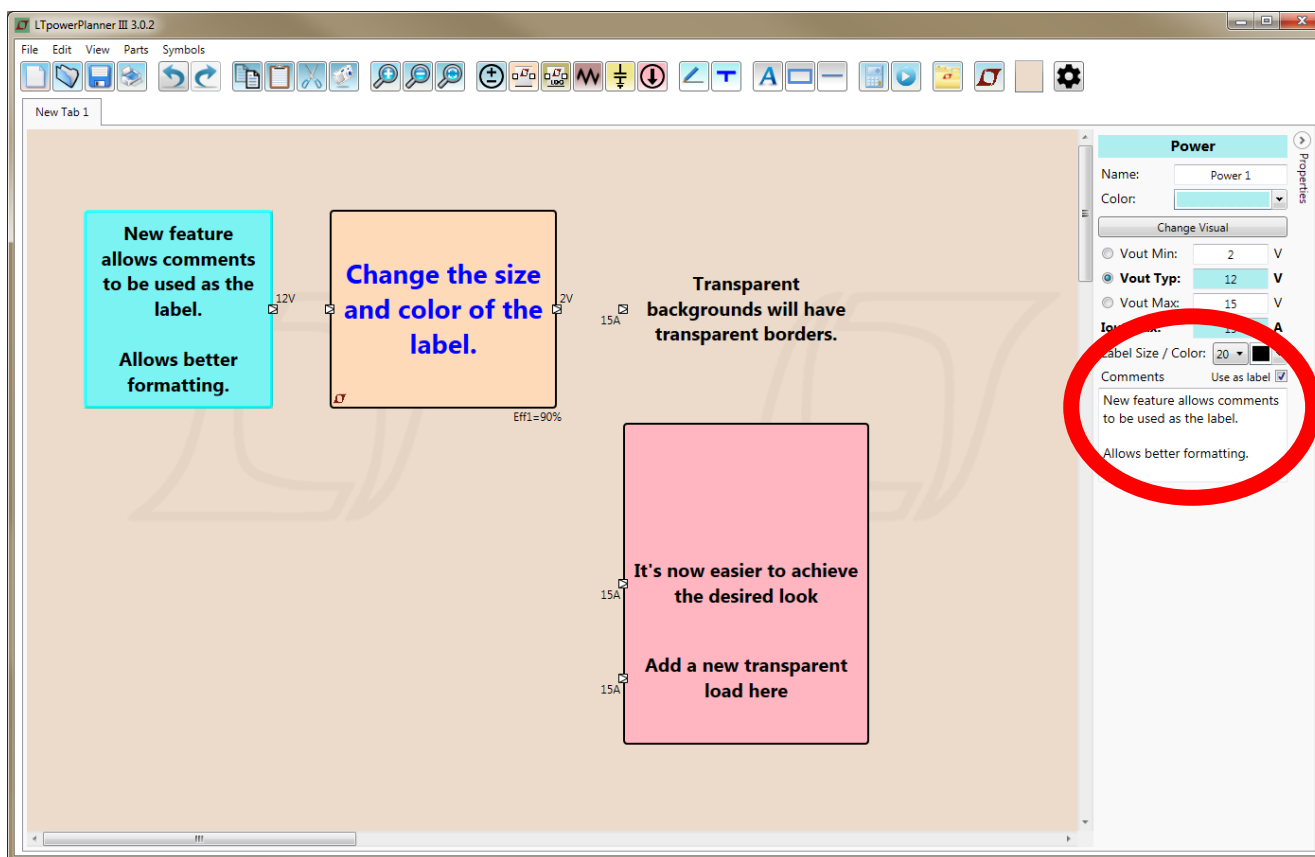
The screenshot displays two visual options for the LTM4600 Module in the LTpowerPlanner III software. Option 1 shows a green rectangular component with a cyan border, labeled "LTM4600 Module" and "Eff1=90%". Option 2 shows an orange rectangular component with a black border, labeled "LTM4600 Module" and "Eff1=90%". Both options are connected to a 2V source.

The properties window on the right, titled "Converter", contains the following settings:

- Name: LTM4600 Module
- Color: (Orange)
- IC Part #: (Empty)
- Solution Size (x): 1 Units
- Solution Size (y): 1 Units
- Solution Area: 1 Units²
- Vin Min: 4.5 V
- Vin Max: 20 V
- Topology: All
- Converter Type: All
- Output 1: +
- Vout: 2 V
- Vout Min: 0.6 V
- Vout Max: 15 V
- Eff Nom: 90 %
- Eff Peak: 95 %
- Iout Max: 15 A
- LTPowerCAD File: Browse
- LTSpice File: Browse
- Change Visual (Button)
- Label Color: (Black)
- Comments: (Empty text area)

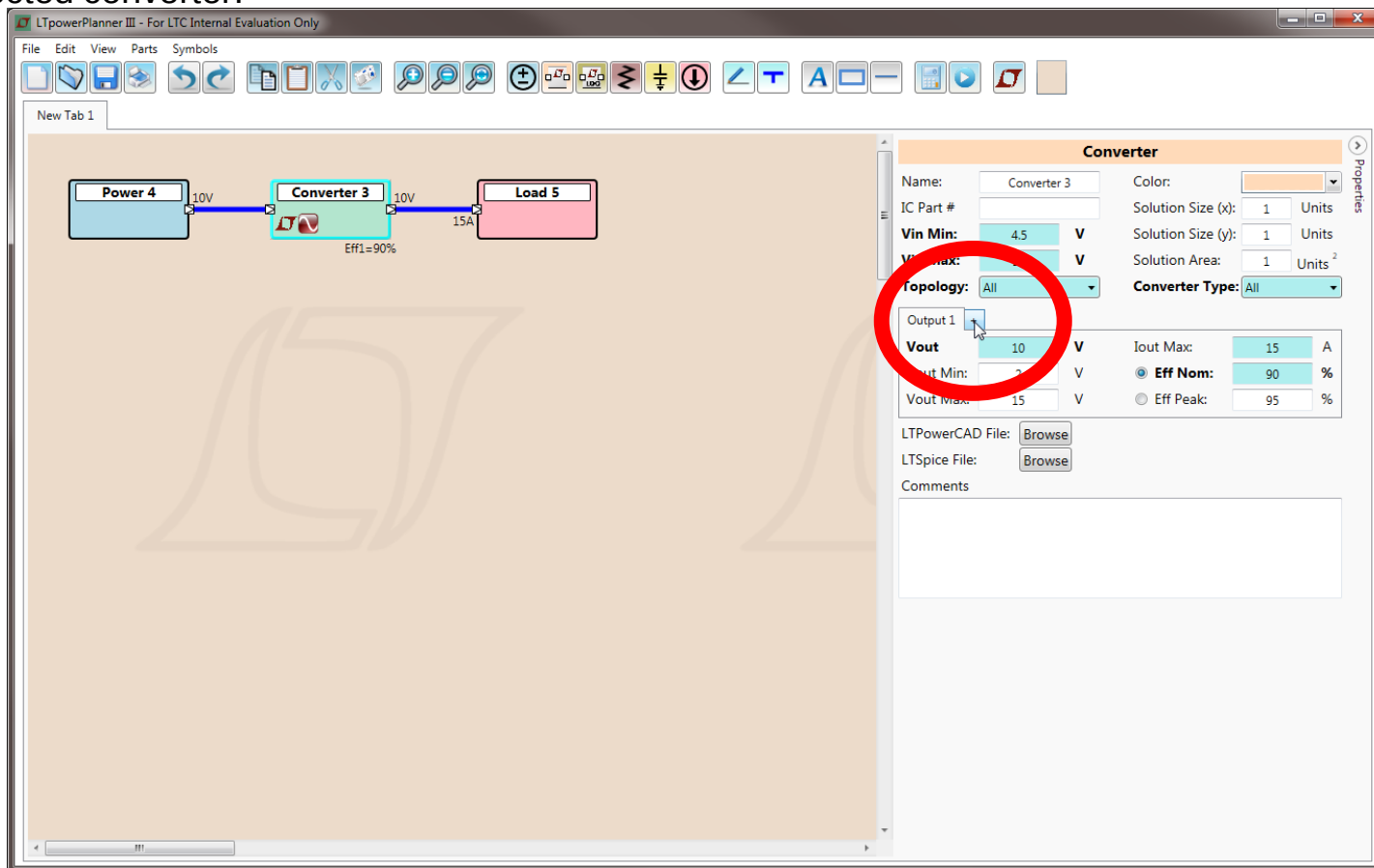
Component Label Options

Label Options. Change the font size and color of labels for some blocks by changing the visual. The comments text can be used as the label using the “Use as label” checkbox.



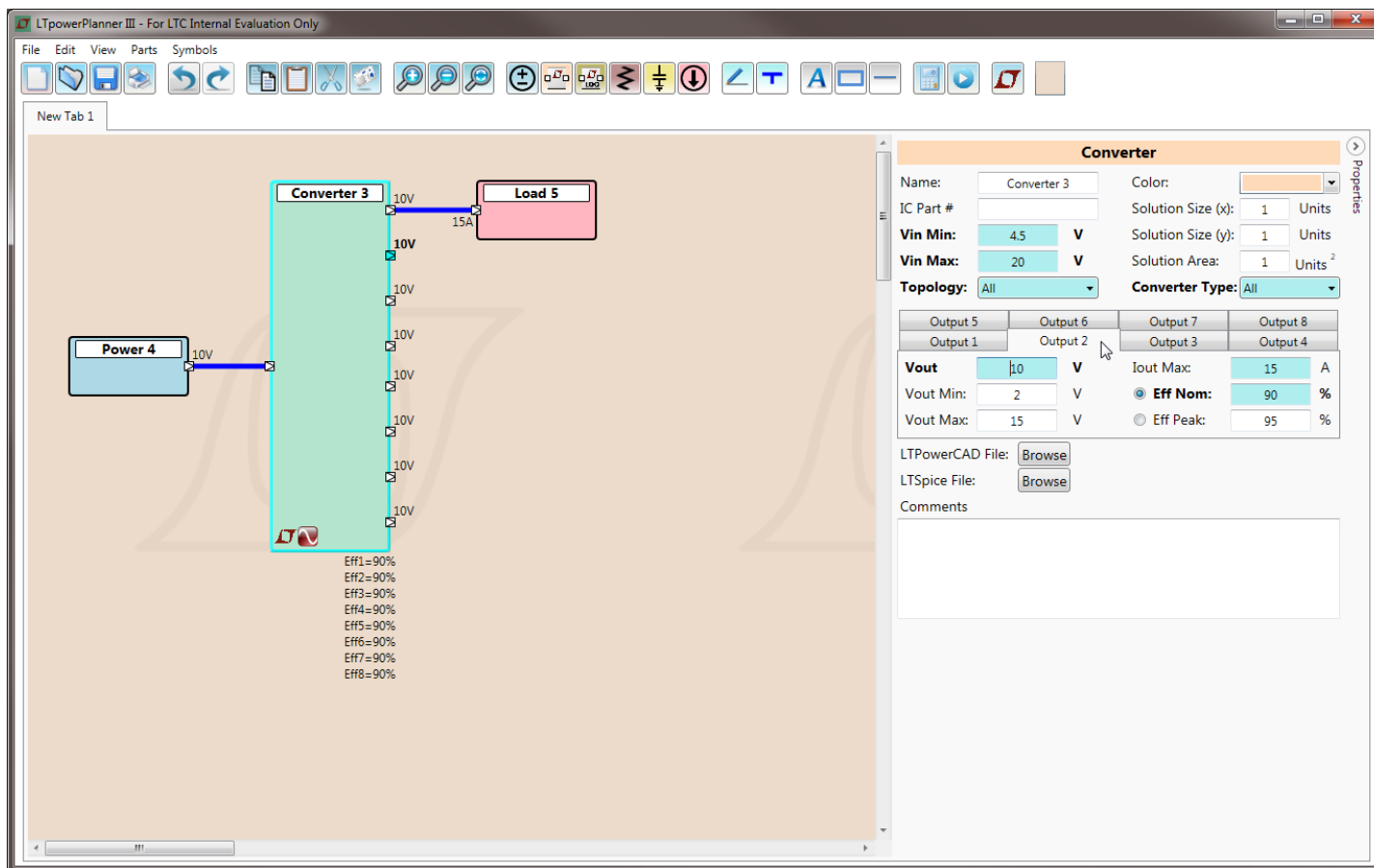
Adding Converter Output Terminals

Add Converter Output Terminals. Click the “+” button to add an output to the selected converter.



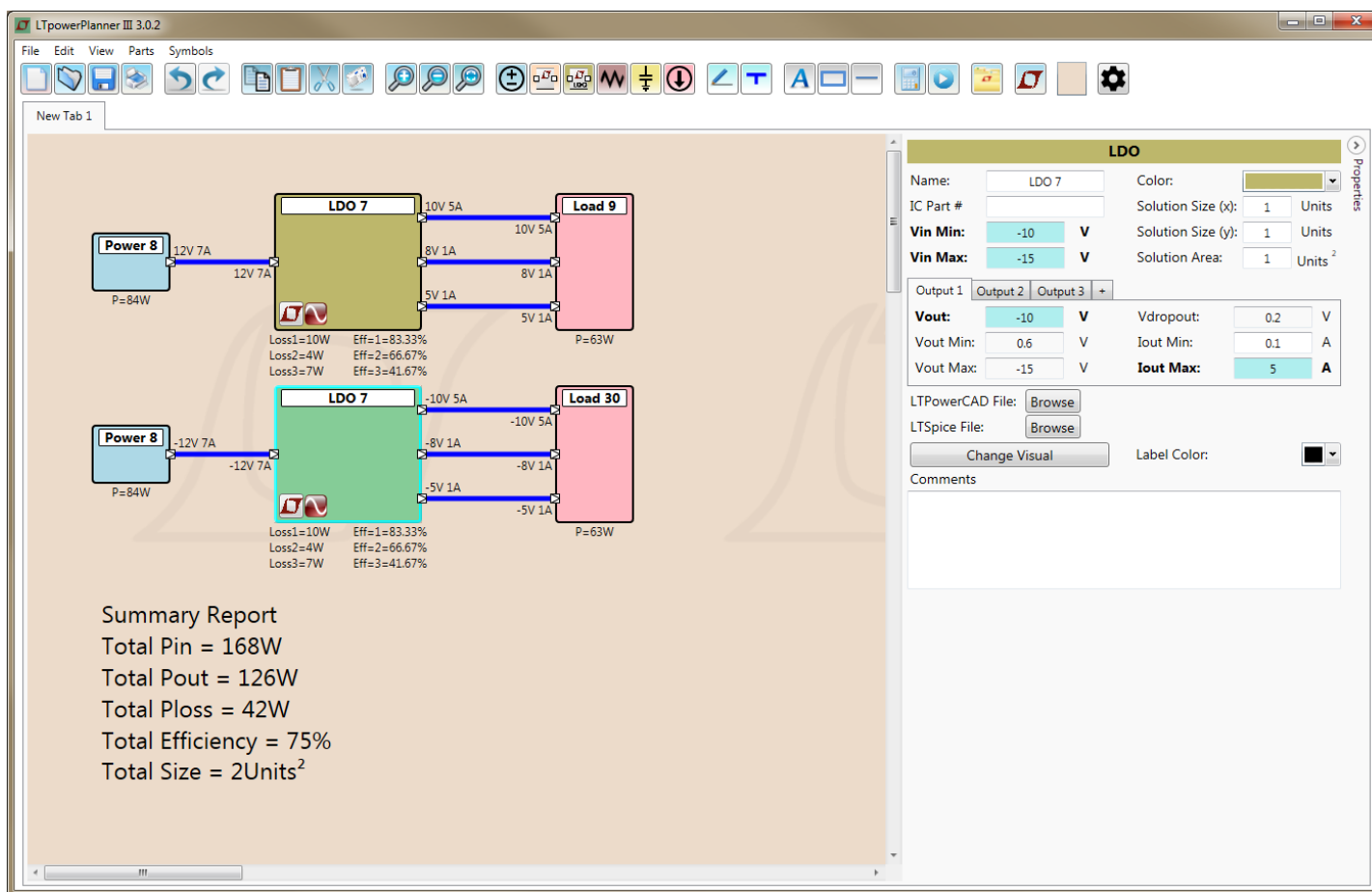
Adding Converter Output Terminals (2)

Add Output Terminals. Each converter can have up to **8** outputs with separate efficiencies and output voltages.



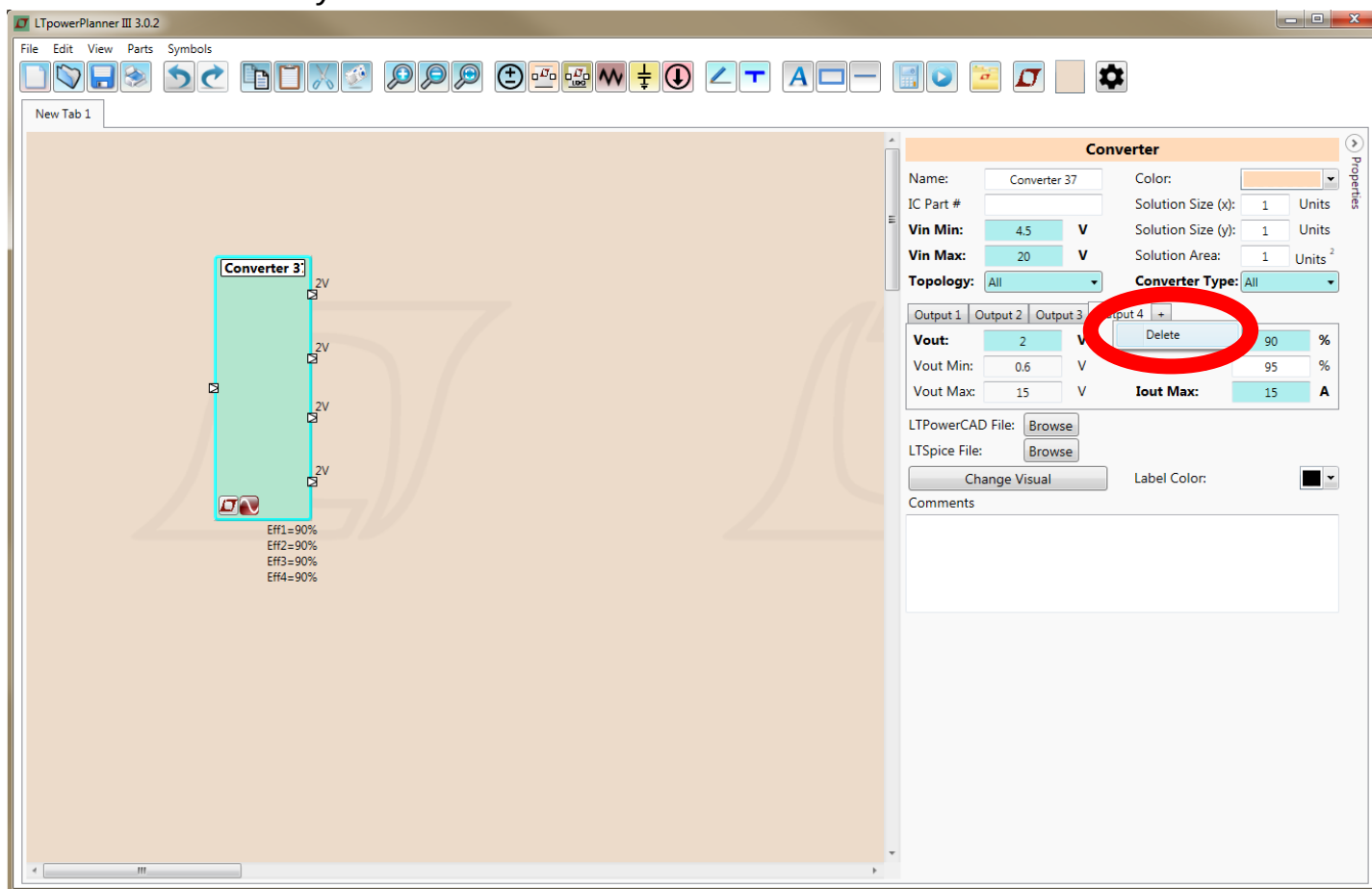
Negative Multiple Output LDO

Negative Multiple Output LDO. LDOs can have up to 8 outputs and negative outputs.



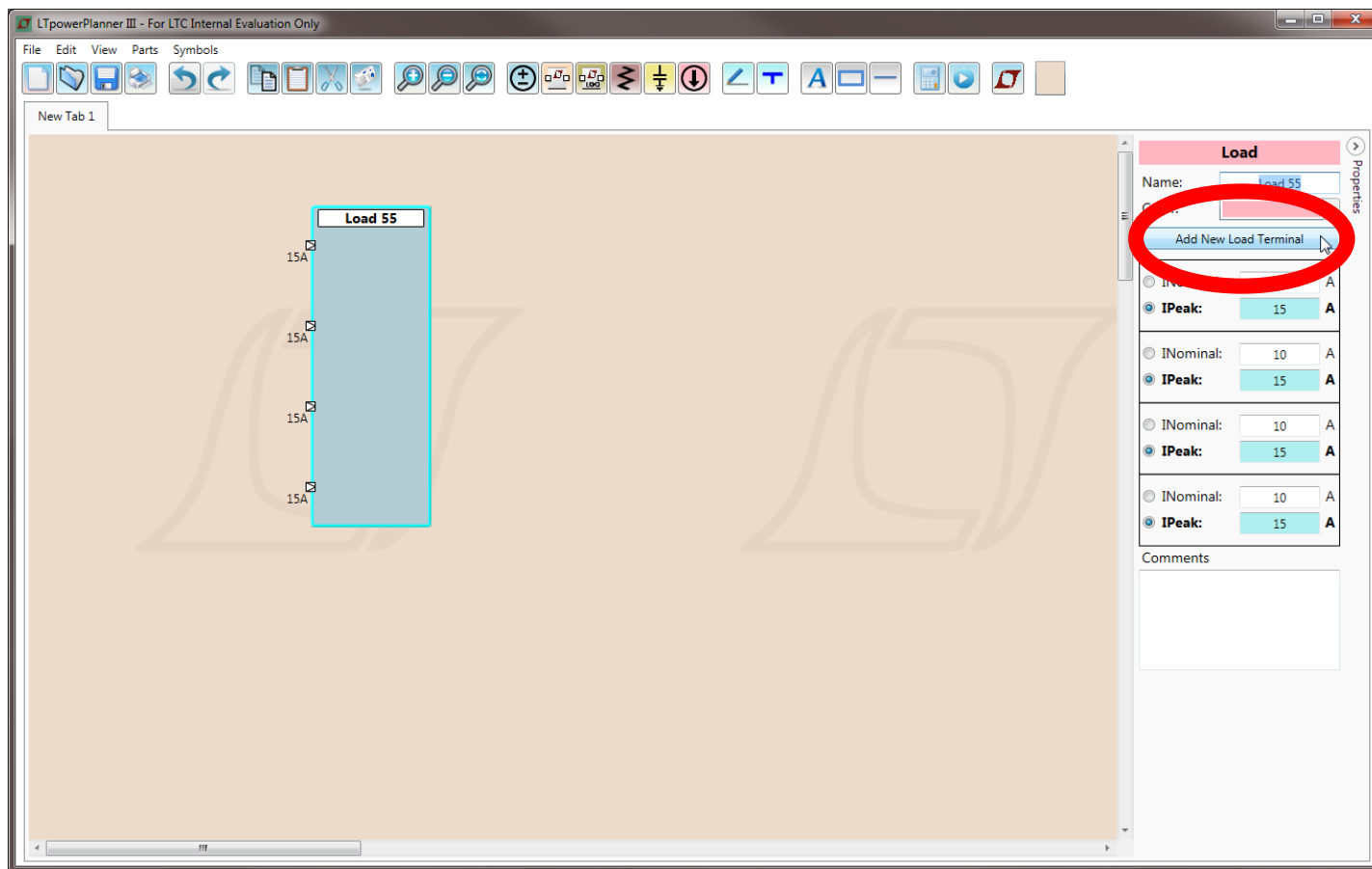
Deleting Unused Converter Output Terminals

Delete unused outputs. Right click the converter output to delete to access the option to delete the terminal. Only unconnected terminals can be deleted.



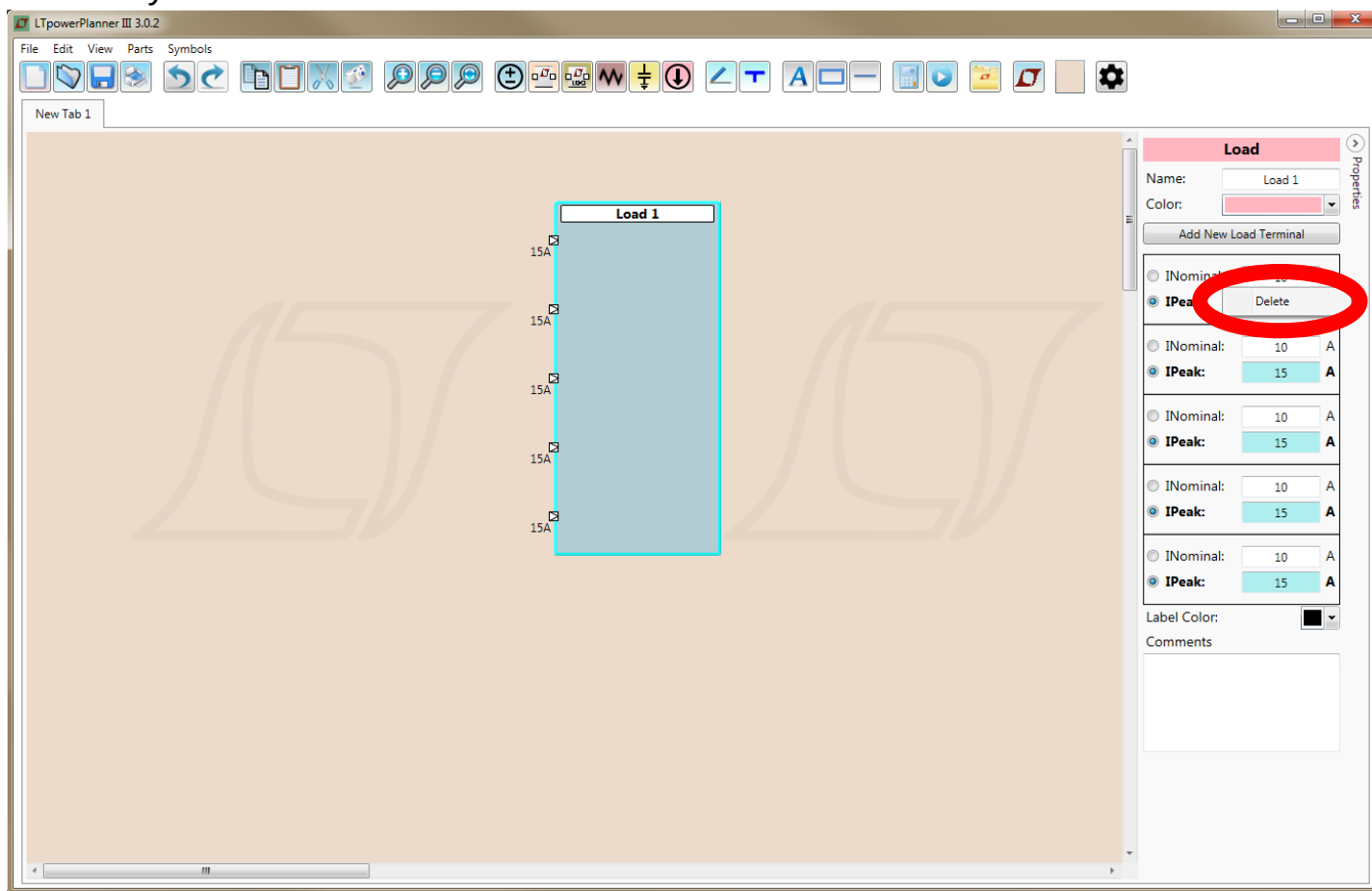
Adding Load Input Terminals

Add Load Input Terminals. Add an unlimited amount of Terminals to Load Parts by clicking the “Add New Load Terminal” button.



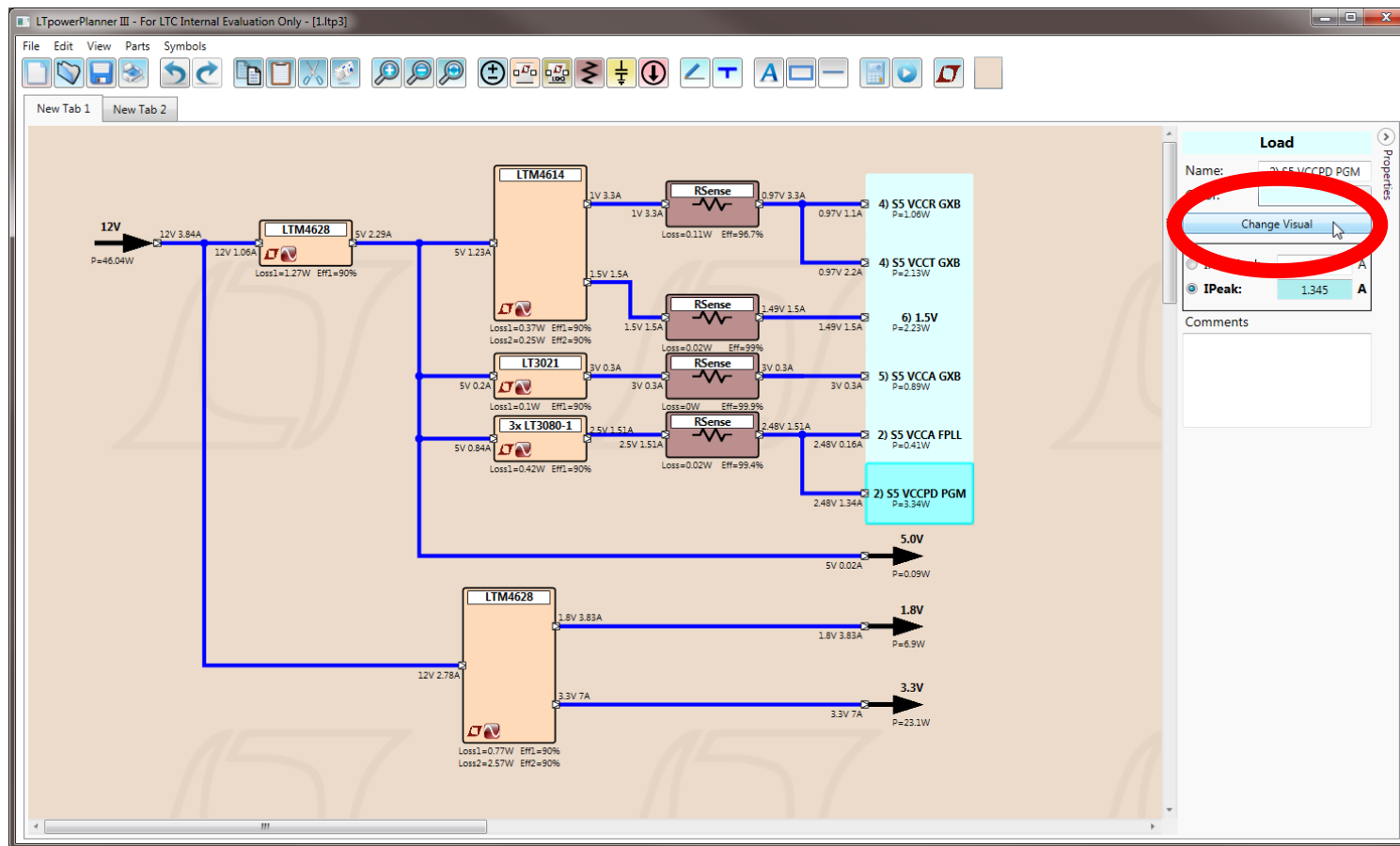
Deleting Unused Load Terminals

Delete unused inputs. Right click the load input to delete to access the option to delete the terminal. Only unconnected terminals can be deleted.



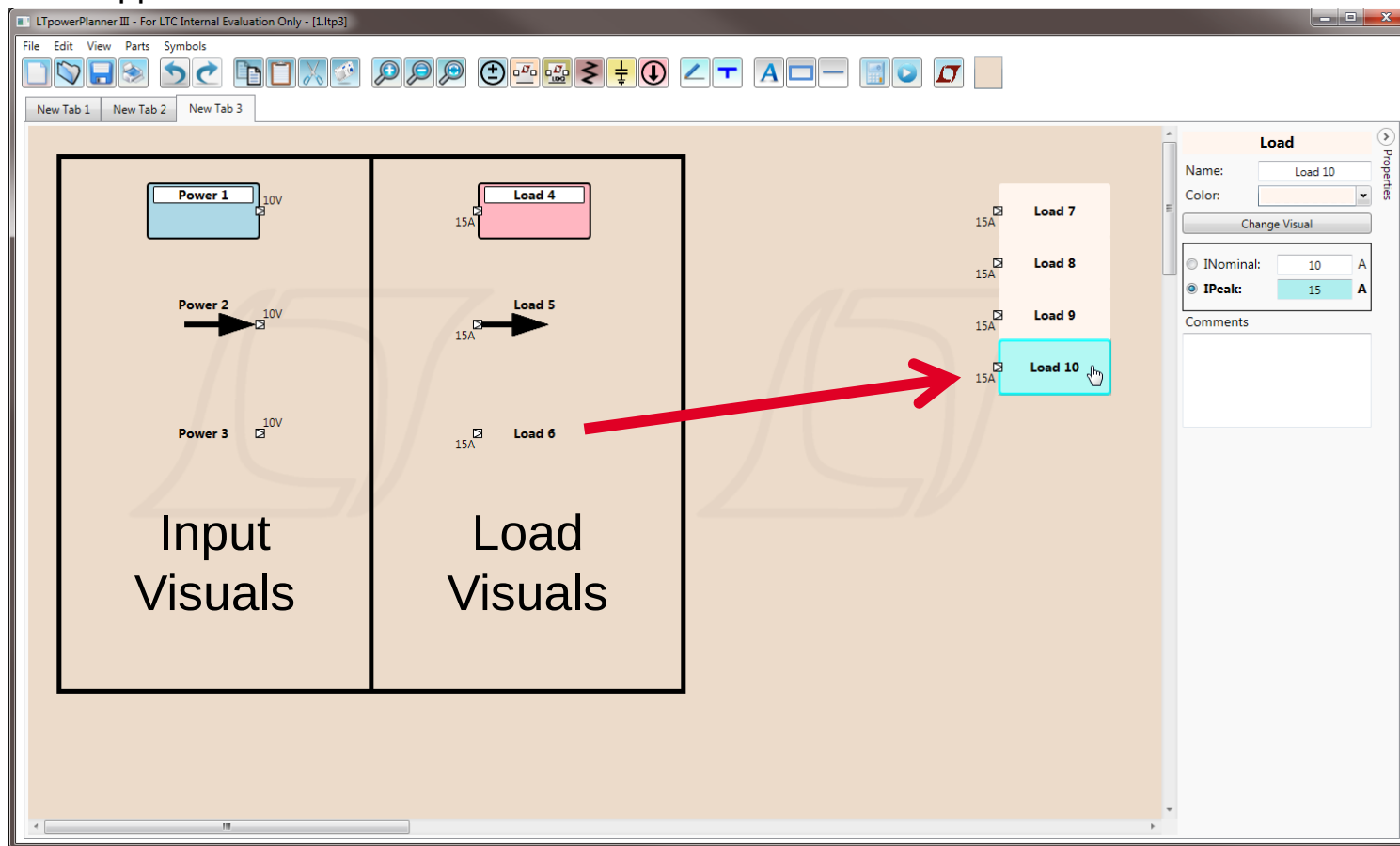
Change Load Visual (Symbol)

Change Load Visual (Symbol). Change the appearance of **Single** Load Parts and Input Parts by clicking the “Change Visual” button.



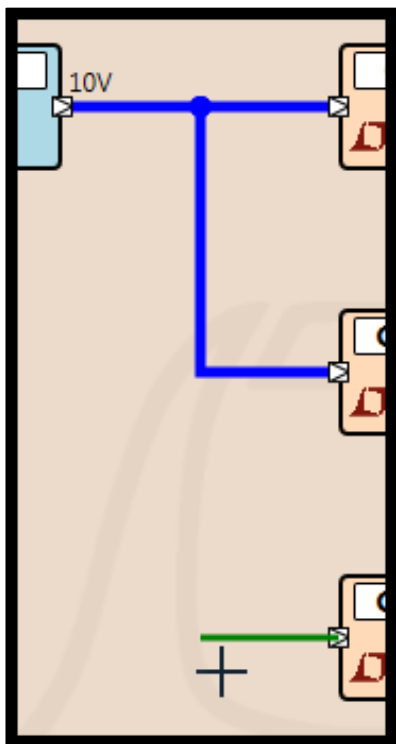
Changing Load Visual (2)

Change Load Visual. Experiment with different sizes and configurations to achieve the desired appearance.

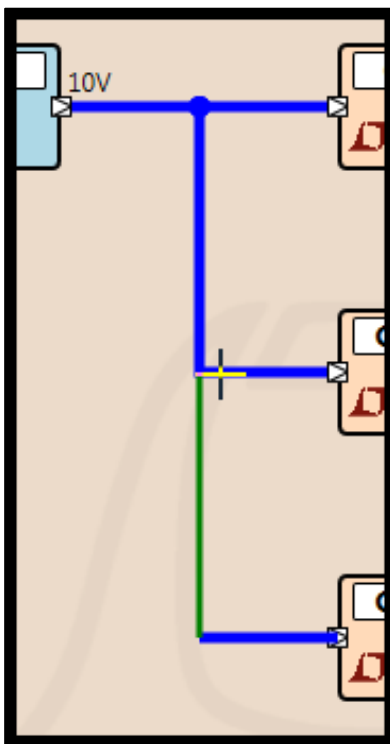


Details on Drawing Power Trees

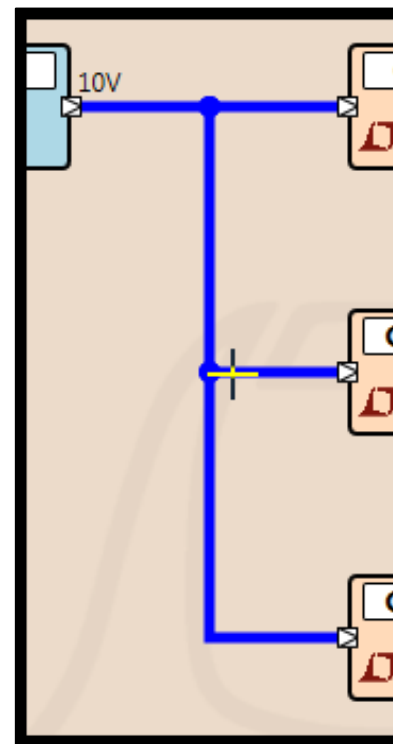
Wiring and Wire Snapping



Snap left of cursor location
to line up with the corner



Must click wire to make
connection, even though it
snaps to the correct place

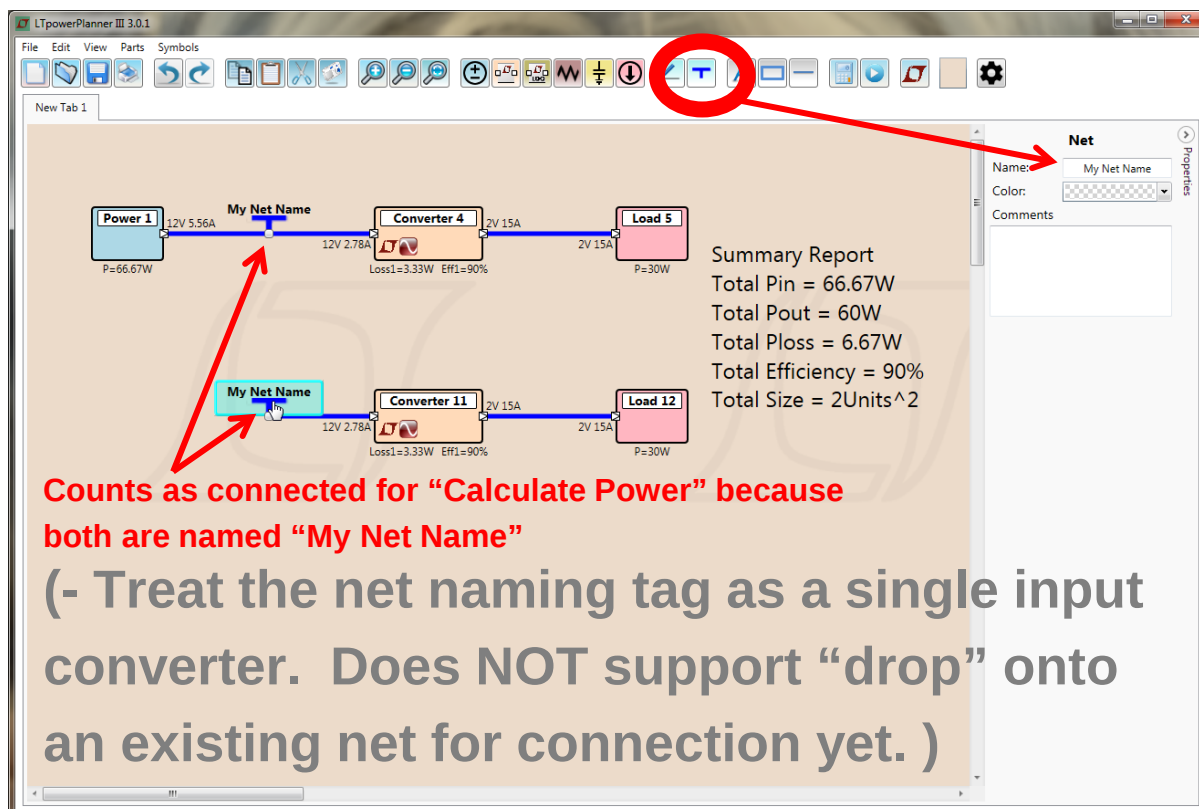


Easy clean connection

Drawing wires will snap to corners for easier and cleaner connections

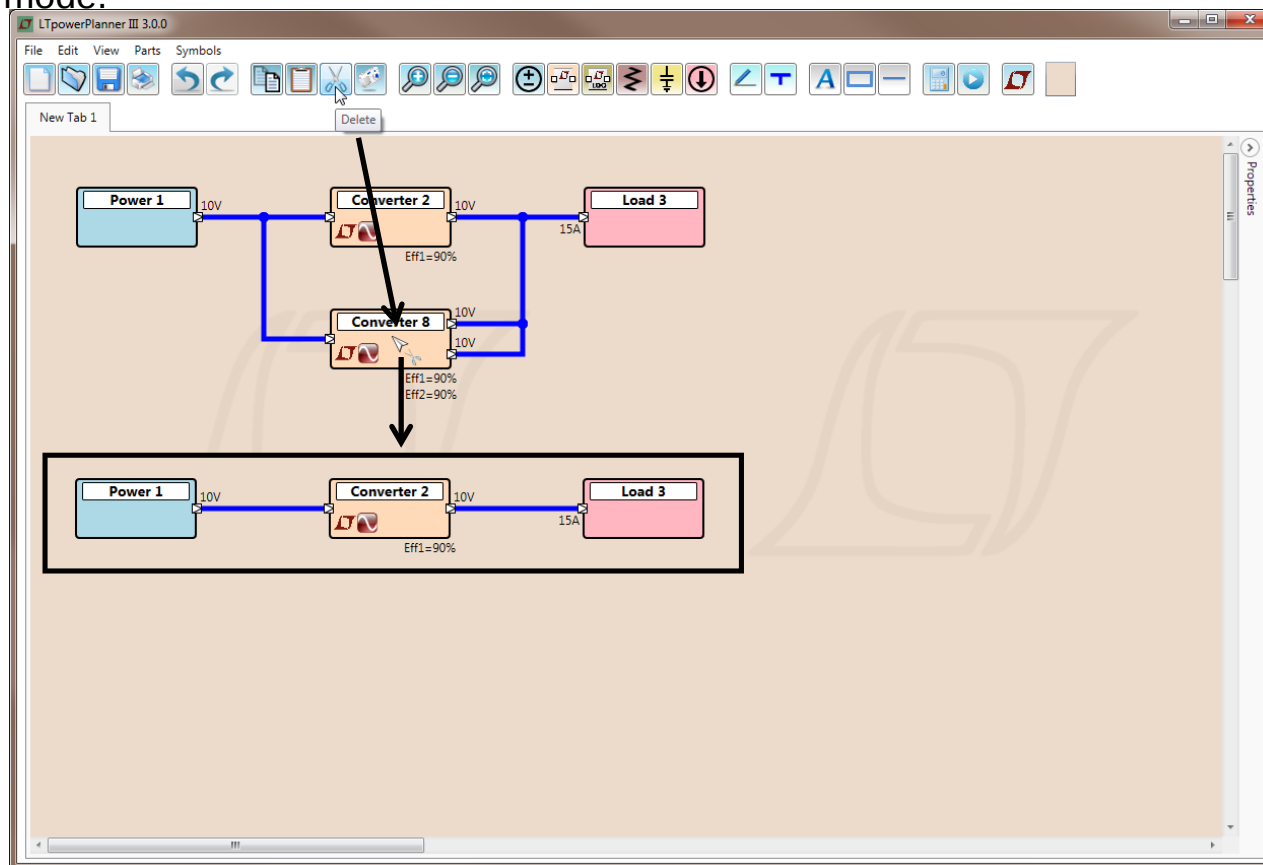
Using Net Naming Part for Connections

To connect separate wire nets, one option is to use “Net Name” part to each net. Then change the name of both parts to the **same name** in the properties window. The “Net Name” part cannot yet be connected by dropping onto existing wires. You have to manually connect wires to it to establish connections.



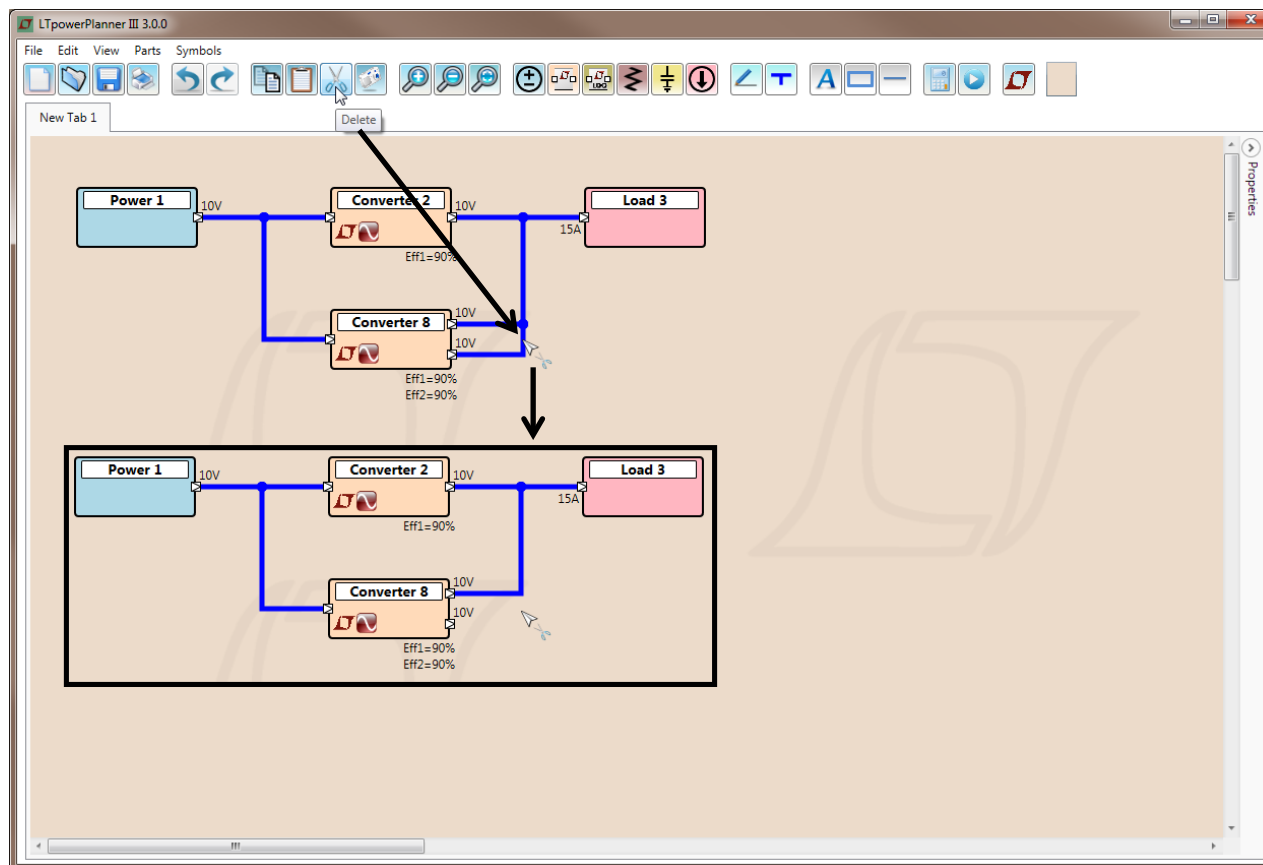
Delete A Component

Delete. Click the  icon to enter “Delete” Mode. **Deleting components** will automatically delete wires that are no longer relevant without the component. Right-click the Drawing Area to exit “Delete” mode.



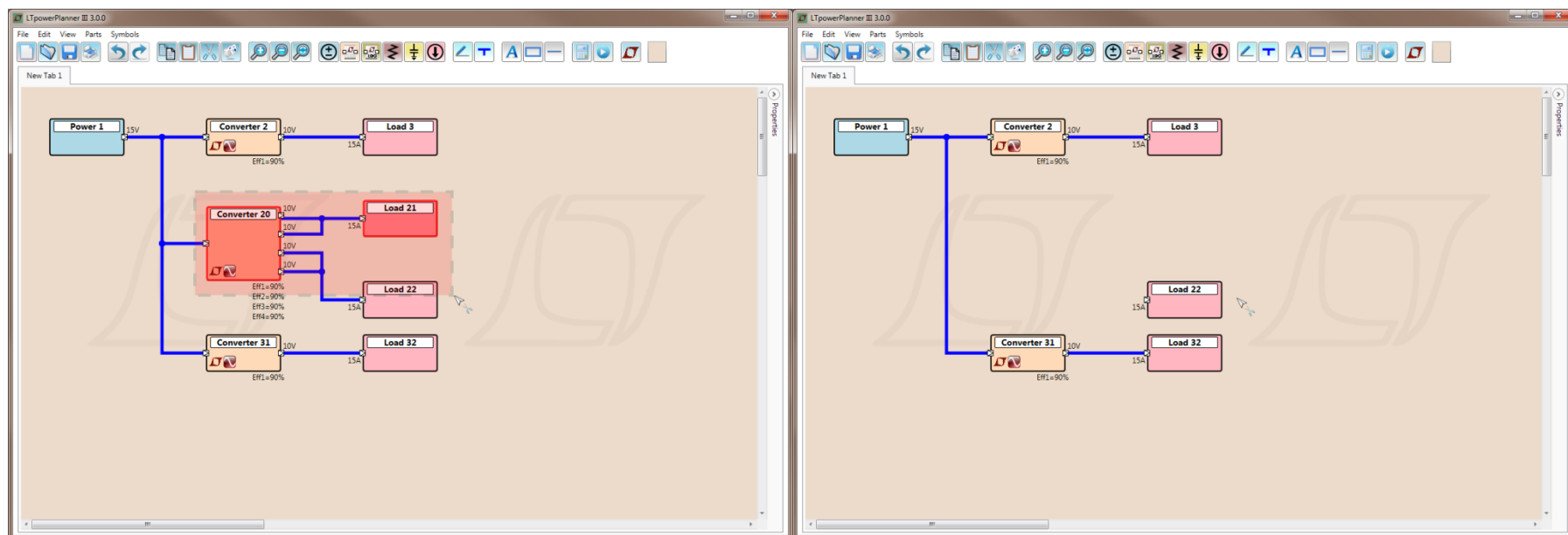
Delete a Wire

Delete. Deleting a wire will automatically delete joining wires that are no longer relevant. Right-click the Drawing Area to exit “Delete” mode.



Group Delete

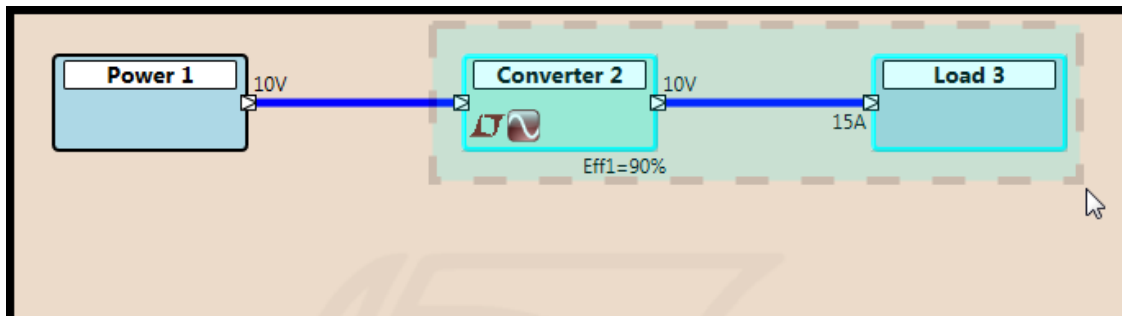
Drag (Group) Delete. Delete groups of parts by dragging the Delete tool



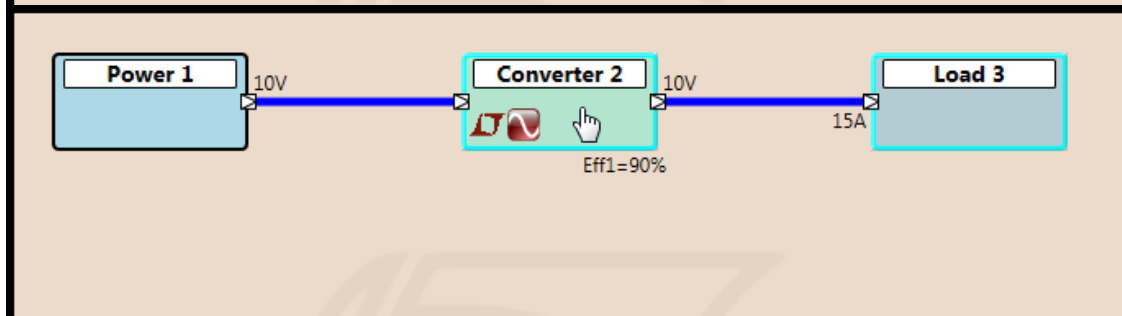
Move Components

Move. Click and drag a part to move it to a new location. Dragging will snap parts in line with other parts and wire lines.

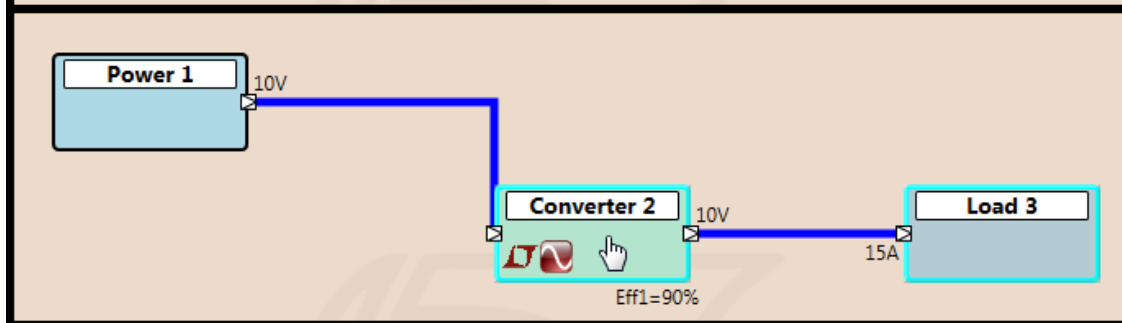
Step 1. Drag
(to select)



Step 2. Click & Hold
(to drag)

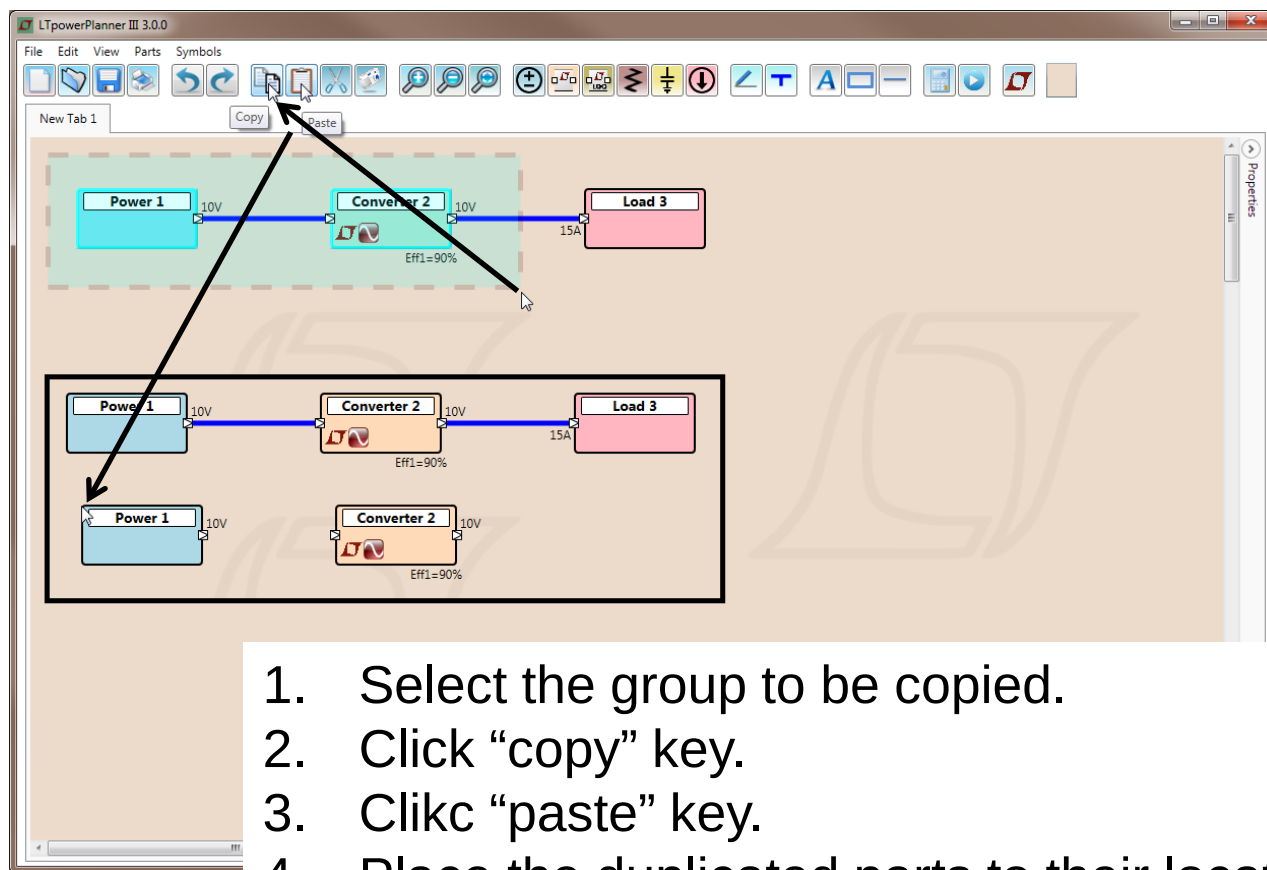


Step 3. Drag and Release
(to a new location)



(Group) Copy / Paste

Group Copy/Paste. Duplicates the selected components and their properties.

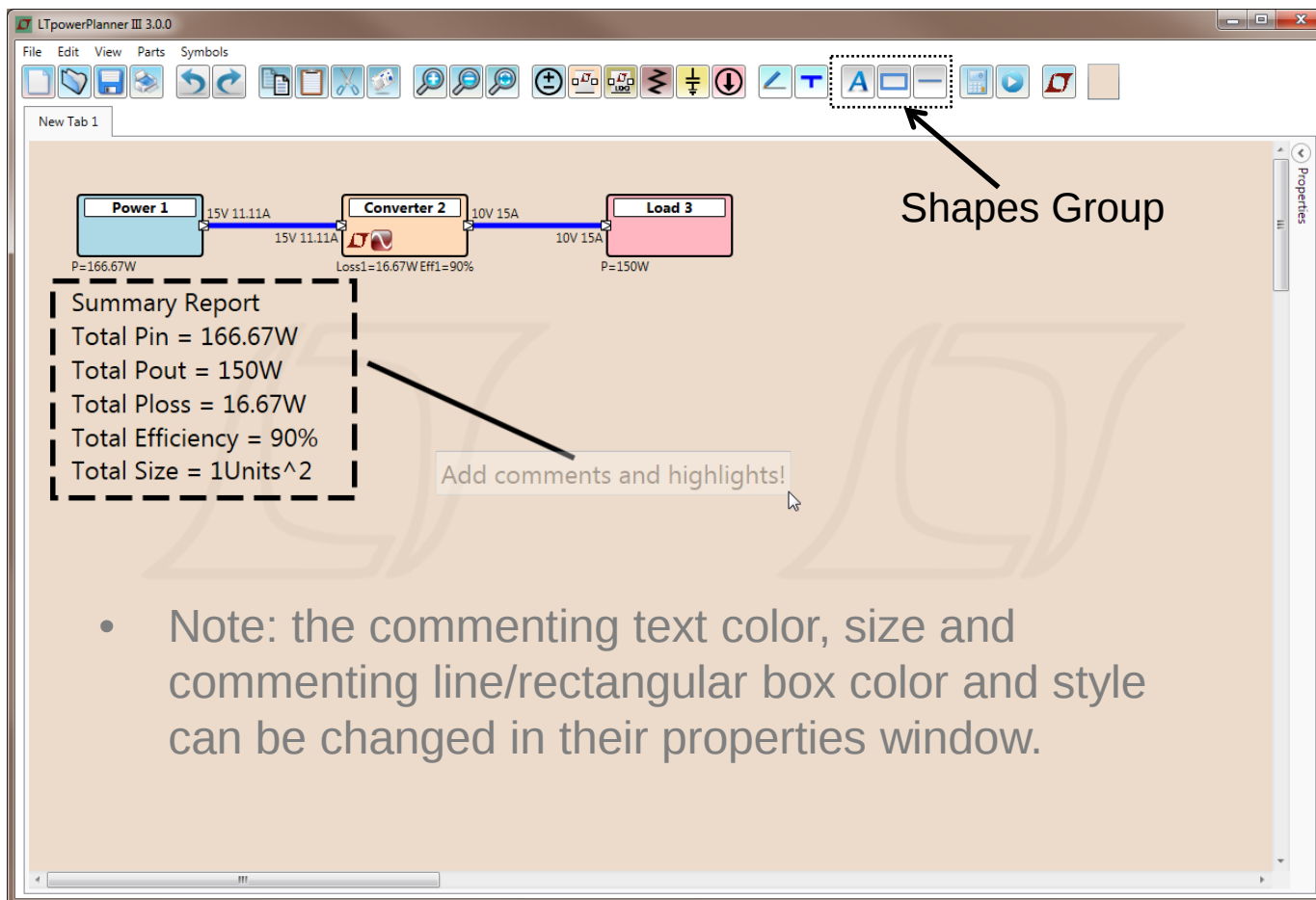


Notes:

1. copy/paste connection wires are not supported yet.
2. Copy/paste can be done in the same window or between different project windows.

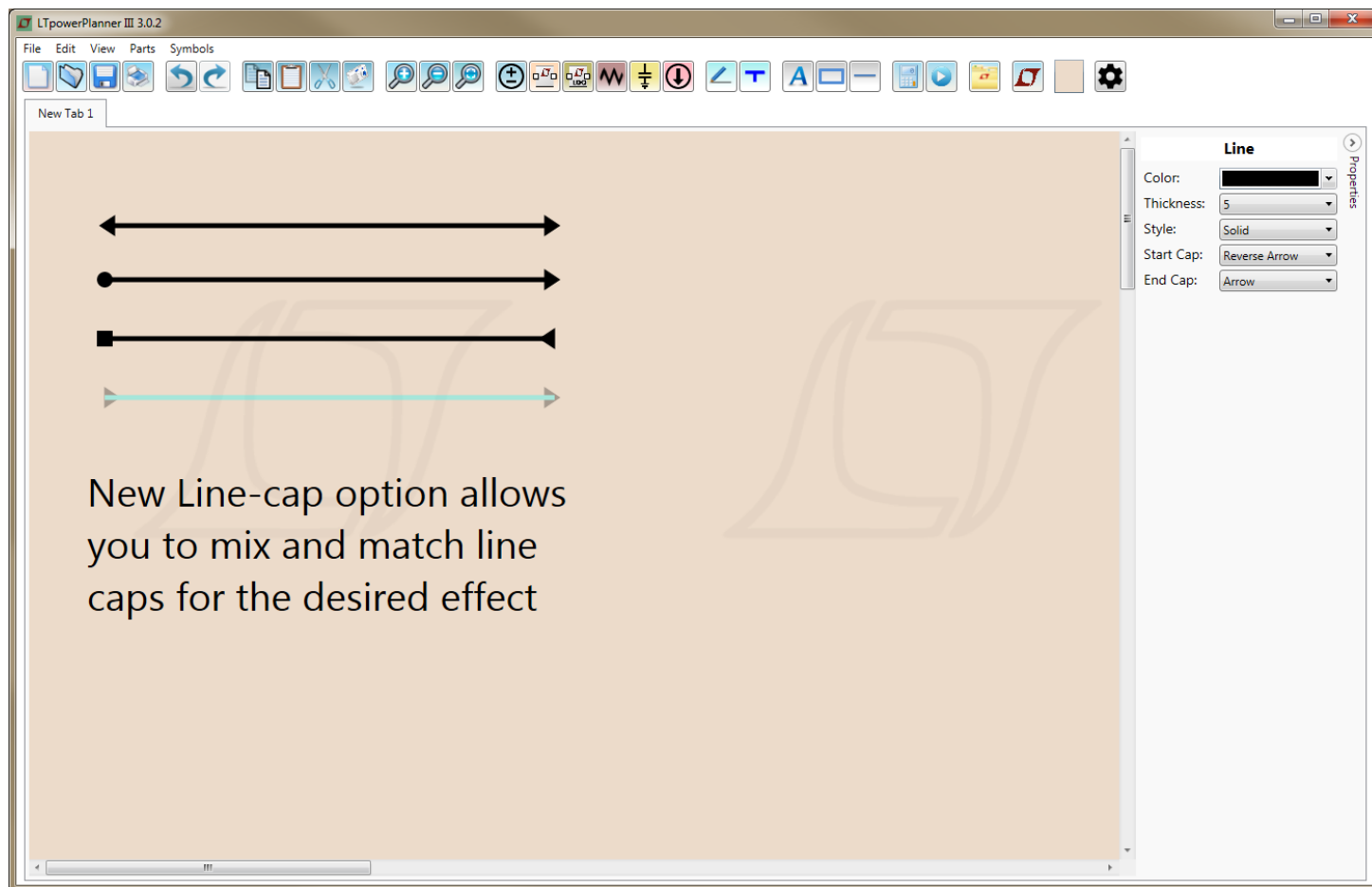
Add Commenting Text, Line and Box

Add text boxes and highlights. Icons from the Shapes group allow you to add commenting text and bring attention to specific areas.



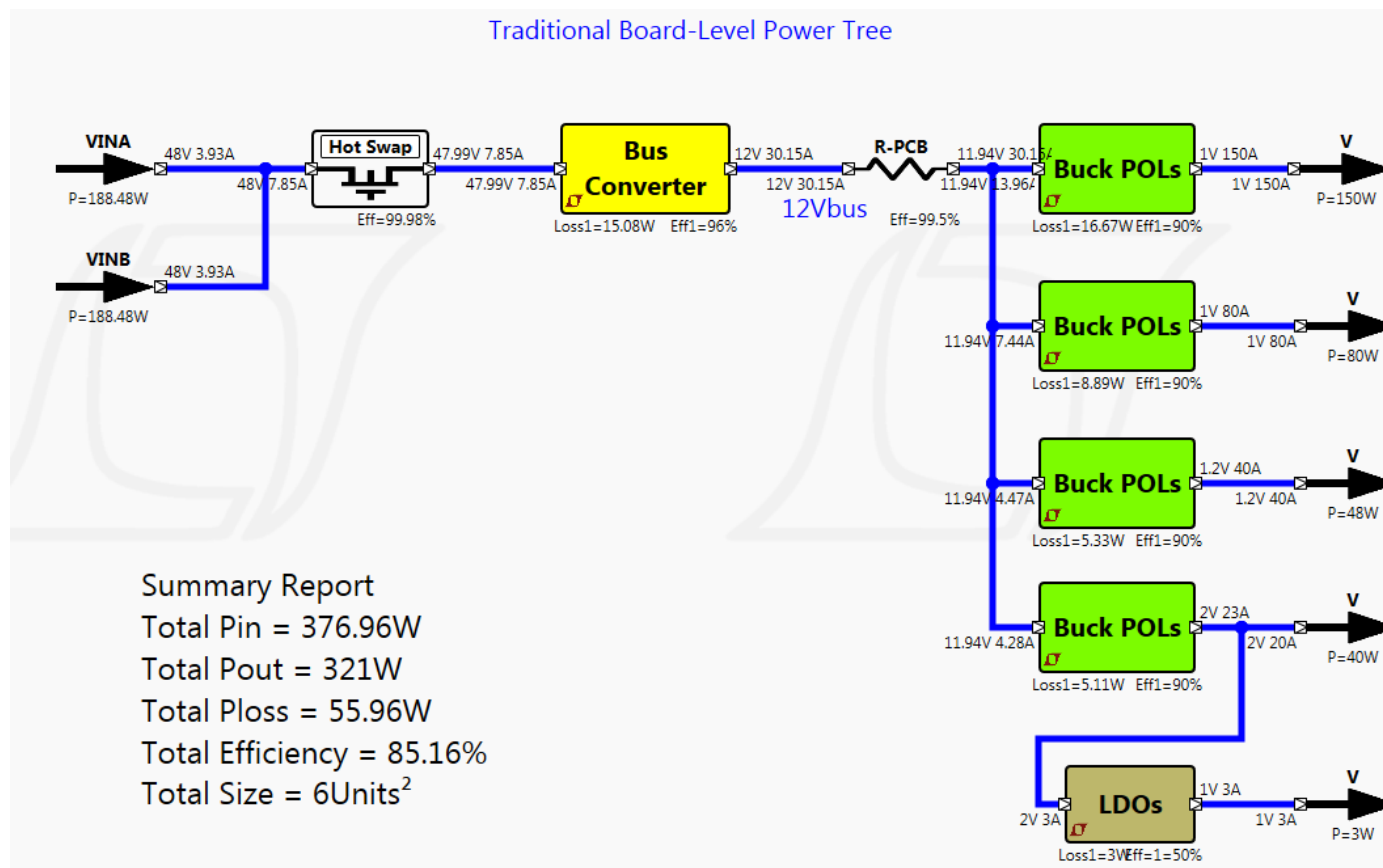
Commenting Line Options

Line Cap Options. Mix and match line cap options from the properties expander.



System Calculation Details

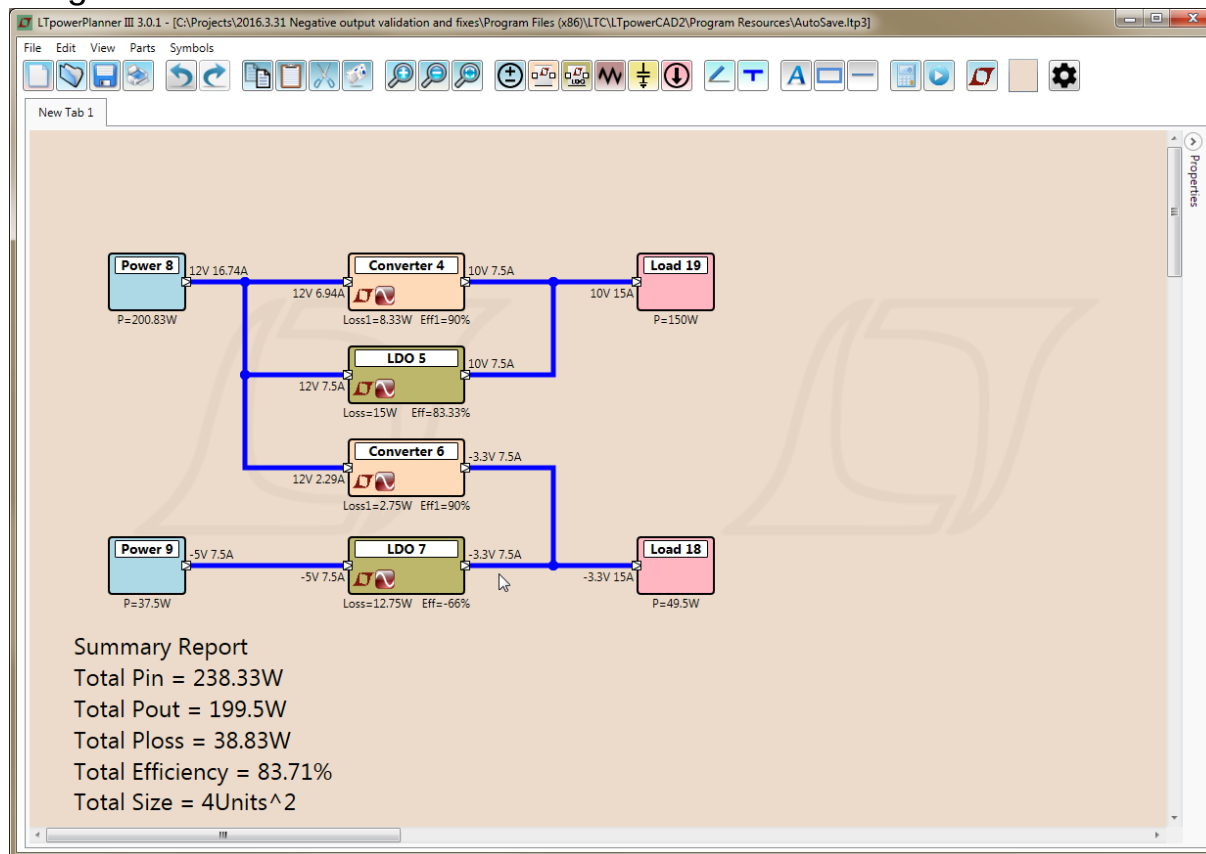
Calculating the Power Tree



- The program calculate the system power, efficiency and size, based on the parameters (entered by users) and operating of all the components.
- The results are shown in the on-screen “summary report”.

Negative Output Voltage

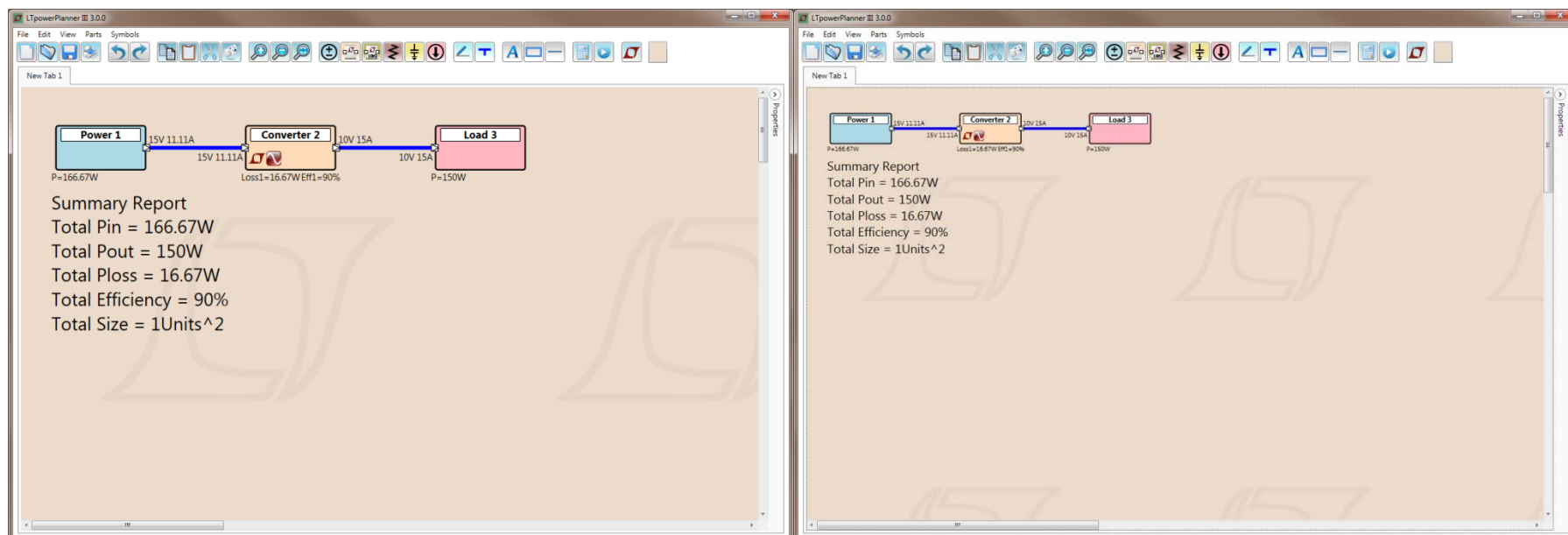
Negative Output Voltage. Power calculation and warnings support negative output voltage.



Details on Display Options

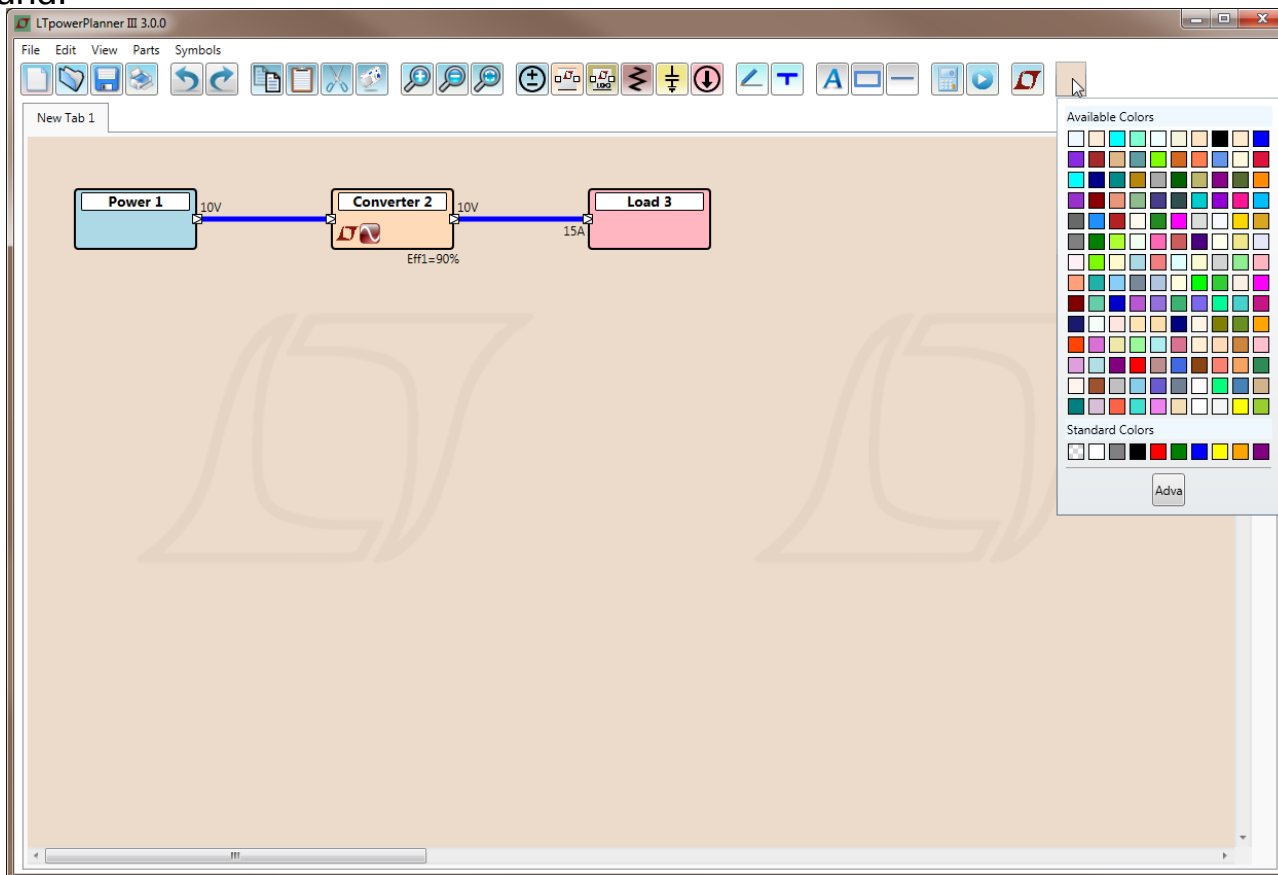
Zoom View

Zoom. Click the “Zoom In” icon on the tool strip menu. This will increment the zoom by one step. “Zoom Out” is opposite this function. “Zoom to Fit” automatically sizes the zoom.



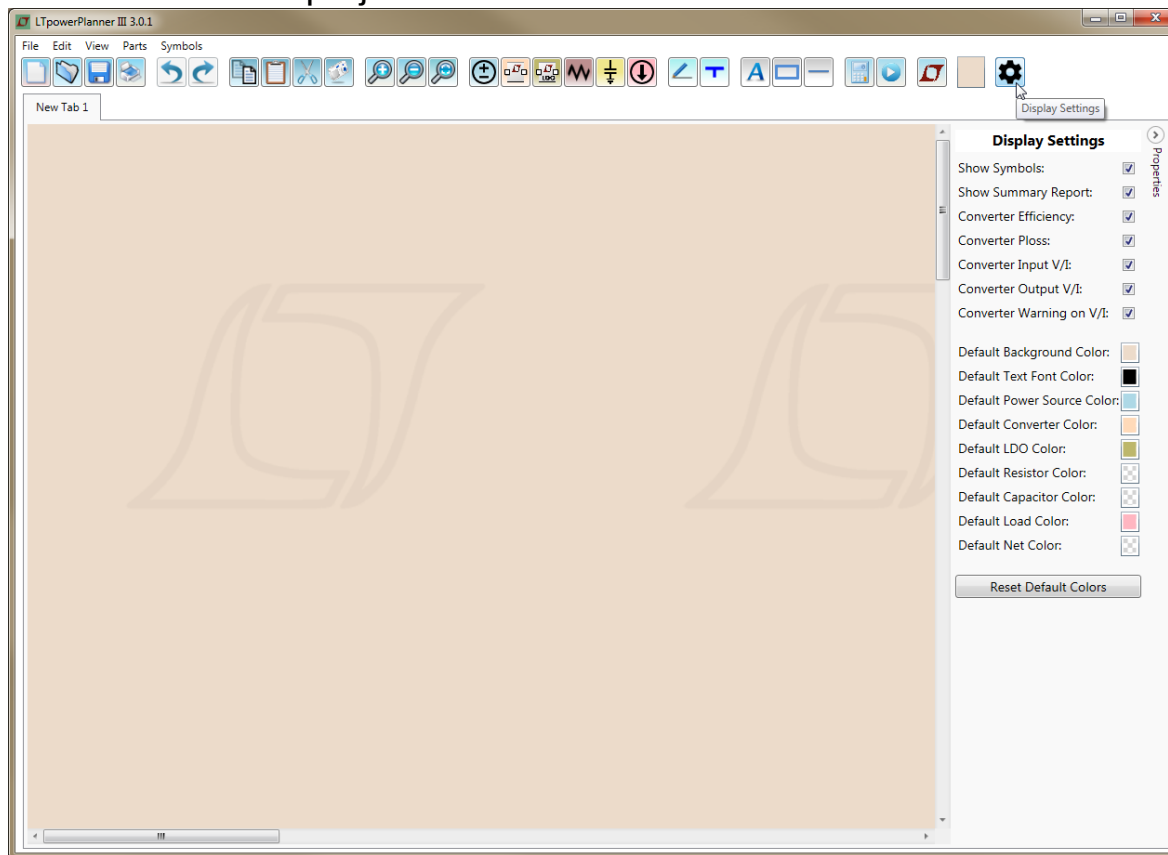
Changing Background Color

Change Background Color. Click the “Background Color” icon next to the “LTC Product Search” icon. This will bring up a Color box that will let you change the color of the drawing area background.



Display Setting.

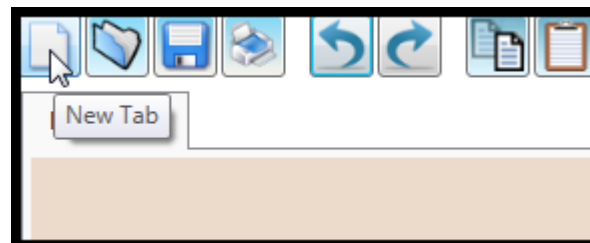
Display Settings. Display settings are available and saved for each tab. Default colors are saved across all projects and tabs.



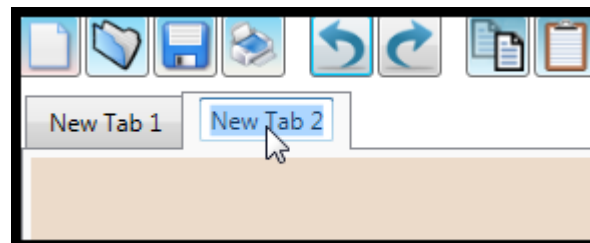
Advanced Features

Multiple-Tab Project

New Tab. Click the “Page” icon to create a new tab. Each tab is included under the same project. Save will save all tabs into one project file.



Rename Tab. Double click the Tab Name to rename the tab.



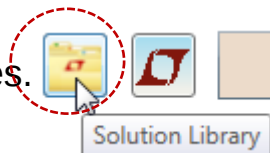
Delete Tab. Right click the Tab Name to bring up the delete option.



Note: there is no inter-connection between two tabs. Each tab is for an independent power tree.

Solution Library – Many Built-In Examples

Solution Library. Allows saving, sharing, and importing of templates.



Solutions Library

Built-In Solutions

Group	Solution Name	Description	Note	Input Rails	Output Rails	Power Part Number	Date	Designer
	Zynq Networking Platform - HTG-Z100	Two Power Tree Options Available		12V, 12V	1V/15A, 1V/15A, 1V/15A, 1V,	LTM4644, LTM4644, LTM4644, , LTM4644, , ,	10/15/2016	
	LTC Parts Library 1	Library for LTC parts and other components		12V, 12V	2V/10A, 2V/13A, 2V/13A, 2V,	LTM4600, LTM4620, LTM4676A, LTC3605A, L	10/15/2016	
NXP (Frecale)	i.MX7 96 Board	12Vin system using LTC3589-2 PMIC and LT8609		12V	5V/15A, 5V/15A, 1V/15A, 1.1	LT8609, LT8609, LTC3589-2	10/15/2016	
	Generic FPGA Power Tree	Example to show multi-input loads					10/15/2016	
	DC2204A PSM uModule Power Stick Board	Power Stick demo board using LTM4676A, 4675, 4				LTM4677, LTM4	10/15/2016	
	Datcom power architecture	Example with 12Vbus or 48V bus, two options					10/15/2016	
	Communication Power Tree 1	Example					10/15/2016	
	Communication Power Chain	Example-12Vbus		110V	400V/15A, 48V/15A, 12V/15/	LTC7150, LTC3887, LTM4644, LTM4649, LTC	10/15/2016	
FPGA Xilinx	Artix-7 on Digilent Inc Basys 3 platform	Evaluation platform using LTC3633 and LTC3621		5V	1V/15A, 3.3V/15A, 1.8V/15A	LTC3633, LTC3621	10/15/2016	
	Arria 10 SoC Development Kit	Two Power Tree Options Available		12V, 12V	0.9V/36A, 0.9V/15A, 3.3V/26	LTM4677, LTM4676A, LTM4648, LTM4624, L	10/15/2016	
FPGA Altera	Arria 10 GX FPGA Power Tree	Power parts recommended by Linear Tech		12V	0.95V/40A, 0.95V/40A, 0.95V	LTC3877 , LTC3874 , LTM4620, LT	10/15/2016	
	48V-14V Bidirectional Polyphase Buck Conv	4 x LTC3871 solution		48V	14V/30A, 14V/30A, 14V/30A,	LTC3871, LTC3871, LTC3871, LTC3871	10/15/2016	

User's Solutions

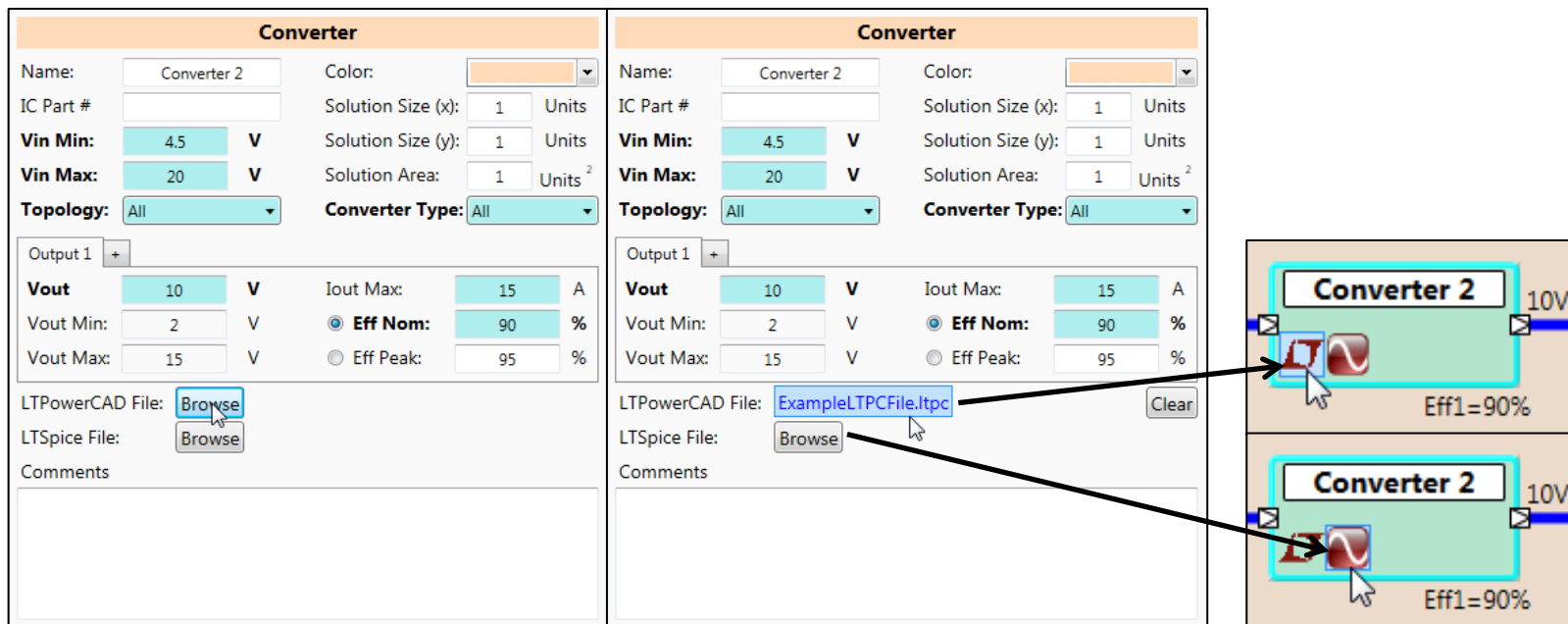
Group	Solution Name	Description	Note	Input Rails	Output Rails	Power Part Number	Date	Designer
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Add This Project As A New Solution

New Group : New Solution Name* : New Solution Description* : New Note : New Designer :

Functions – Link LTspice/LTpowerCAD Files

Link Files. Click “Browse” in a converter’s Property Window to link an existing **LTSpice** or **LTPowerCAD** design file (previously created by user in a PC folder) to a specific converter.



Open Linked Design / Simulation files. Click the LTpowerCAD or LTSpice button to open the linked files.

Functions – Open LTpowerCAD Parametric Search

Parametric Search. Clicking the LTpowerCAD button **without** a linked file will open LTpowerCAD's parametric search using parameters pulled from the LTpowerPlanner converter. Clicking LTspice without a linked file will open a new LTspice window.

Converter 2 10V
Eff1=90%

Converter

Name: Converter 2 Color: [Orange]

IC Part # [Empty]

Vin Min: 4.5 V

Vin Max: 20 V

Topology: All

Output 1 [Empty]

Vout 10 V

Vout Min: 2 V

Vout Max: 15 V

Iout Max: 15 A

Eff Nom: 90 %

Eff Peak: 95 %

LTPowerCAD File: [Browse]

LTSpice File: [Browse]

Comments [Empty]

LTpowerCAD Design Tool v2.4.3
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Converter Specification

Converter Topology: BuckBoost

Converter Type: All

Output Rail 1
Vout1 10 V
Iout1 15 A

Min. Input Voltage: 4.5 V

Nom. Input Voltage: 12.25 V

Max. Input Voltage: 20 V

Num. of Output Rails: One

Num. of Parallel Phases: 1

Find part #: (####) [Empty] Go

Optional Features

- ☐ Burst Mode
- ☐ Synchronous FET
- ☐ Isolated
- ☐ Run / Enable
- ☐ Sync. to External Clock
- ☐ Output Voltage Tracking
- ☐ Remote Voltage Sensing
- ☐ Margin Control
- ☐ Power Good Monitor
- ☐ Poly-phase / Load Share
- ☐ I2C/PMBus Interface

Search

Search Parts

All Parts

LTC Web Search

☐ Search Designer's Tools Only

☐ Always Keep Search Page Open

Reset Search Filters

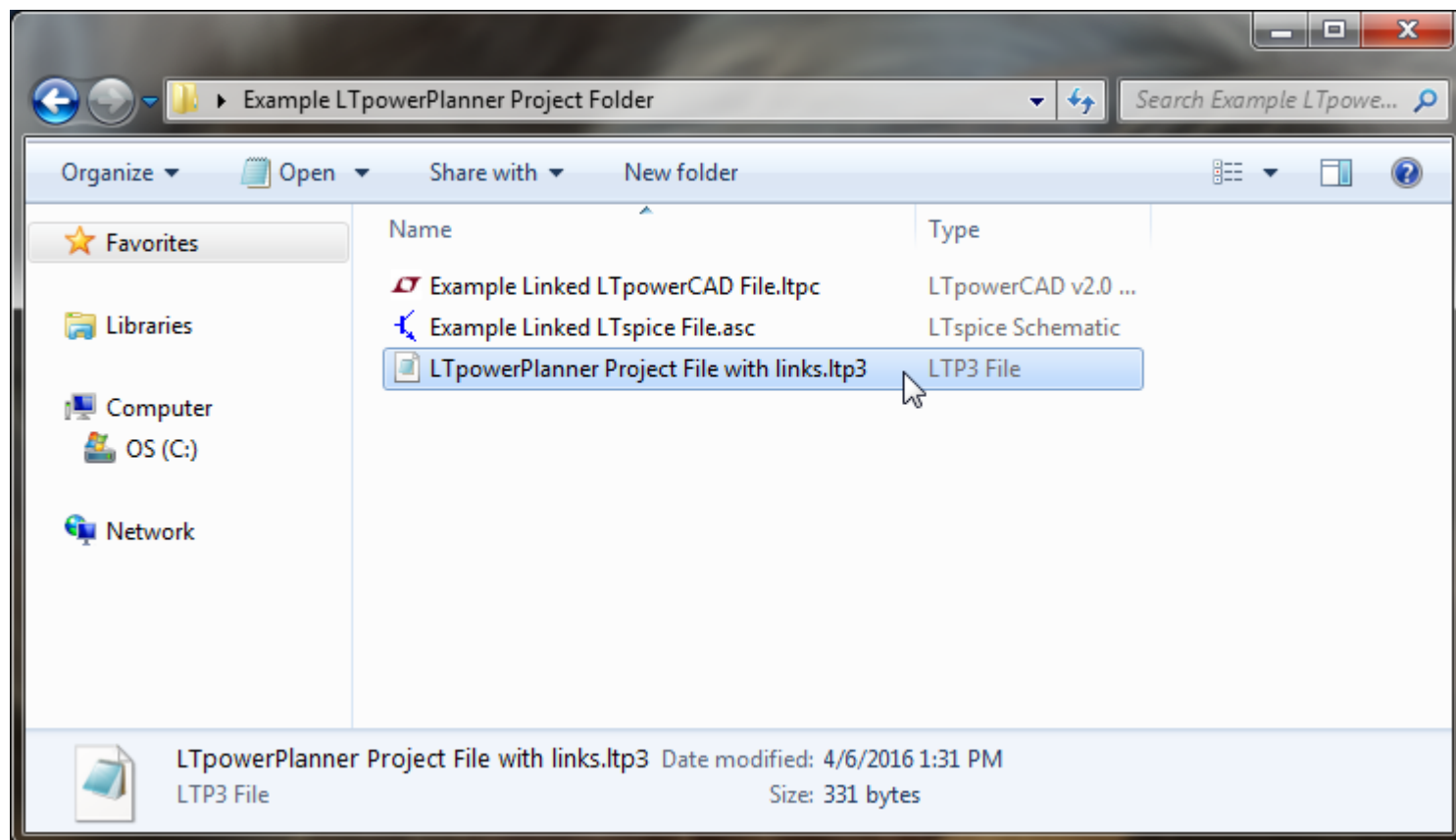
Search For Parts Search For Solutions

Design Tool	Website	Part #	Type	Description	Topology	IC Max Vin	IC Min Vin
[Icon]	LTC Web	LTC3780	Controller	High Efficiency, Synchronous, 4-Switch Buck-Boost Con	Buck-Boost	36	4
[Icon]	LTC Web	LTC3789	Controller	High Efficiency, Synchronous, 4-Switch Buck-Boost Con	Buck-Boost	38	4

LTpowerCAD currently supports design tools for a limited number of parts. For more part options click the LTC Web Search button.

Functions – Link LTspice/LTpowerCAD Files

Sending a Project with Linked Files. Copy the linked files into the same folder as the LTpowerPlanner project file. The links will continue to work without changing the linked file path (when sending projects to other users).



Advanced Functions – Keybindings & Shortcuts

- ◆ Ctrl + N = New Tab
- ◆ Ctrl + O = Open File
- ◆ Ctrl + S = Save File
- ◆ Ctrl + Shift + S = Save File As
- ◆ Ctrl + P = Print

- ◆ Delete = Delete Mode
- ◆ Ctrl + C = Copy/Paste Mode
- ◆ W = Wiring Mode
- ◆ B = Run Calculation

- ◆ I = Draw Line
- ◆ A = Draw Arrow
- ◆ E = Draw Rectangle
- ◆ T = Text

- ◆ Space = Open/Close Properties Tab
- ◆ P = Create Power
- ◆ S = Create Single Converter
- ◆ D = Create Dual Converter
- ◆ R = Create Resistor
- ◆ O = Create LDO Converter
- ◆ C = Create Capacitor
- ◆ L = Create Load

- ◆ - or Ctrl + Scroll Down = Zoom Out
- ◆ = or Ctrl + Scroll Up = Zoom In
- ◆ 0 = Zoom Fit
- ◆ Scroll = Vertical Scroll
- ◆ Shift + Scroll = Horizontal Scroll

Crash Recovery and AutoSave

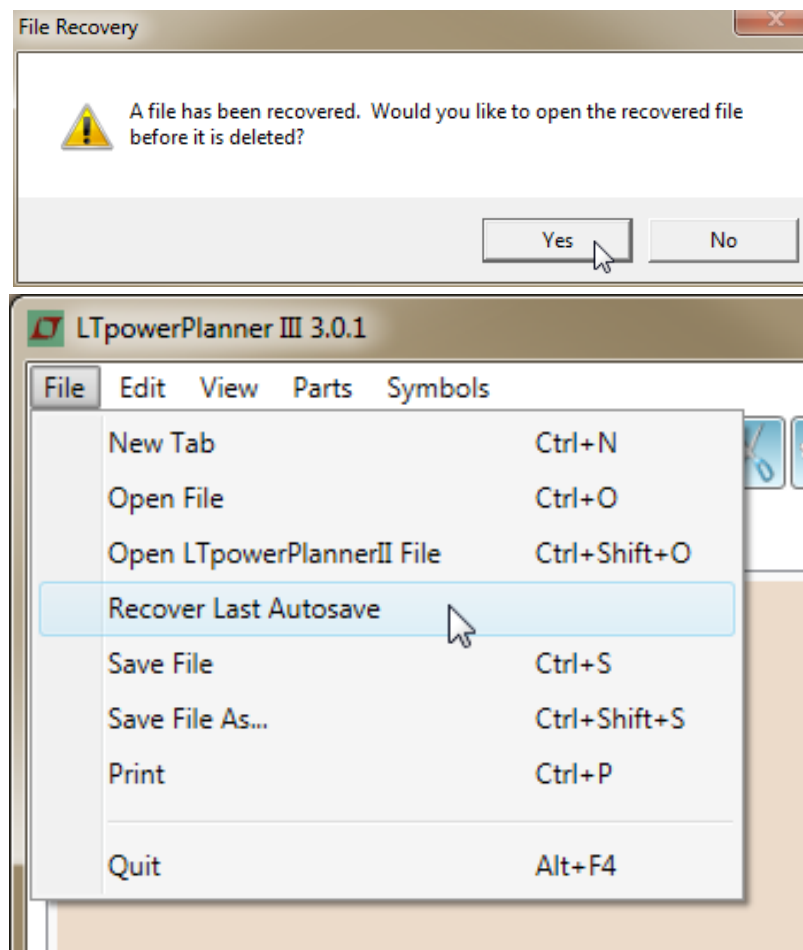
Crash Recovery.

If PowerPlannerIII closes unexpectedly, the next time it is opened, there will be a prompt asking to recover the autosave data.

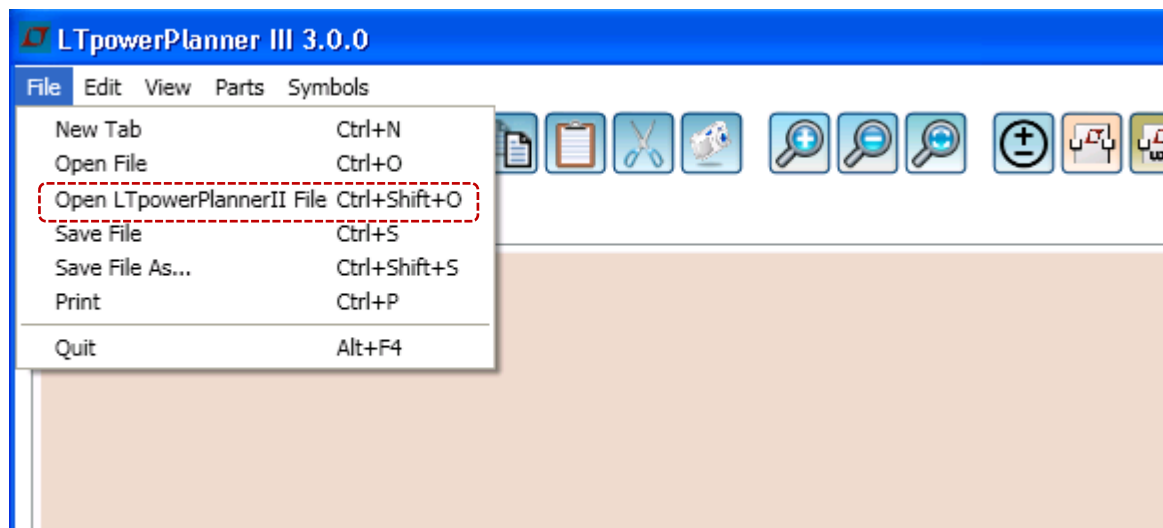
AutoSave. If PowerPlannerIII is closed by the user, the next time it is opened, the user can choose to “Recover Last Autosave” to open the autosave data.

*Crash recovery data is overwritten with any action or exit from PowerPlannerIII.

*“Recover Last Autosave” data is overwritten when exiting PowerPlannerIII.



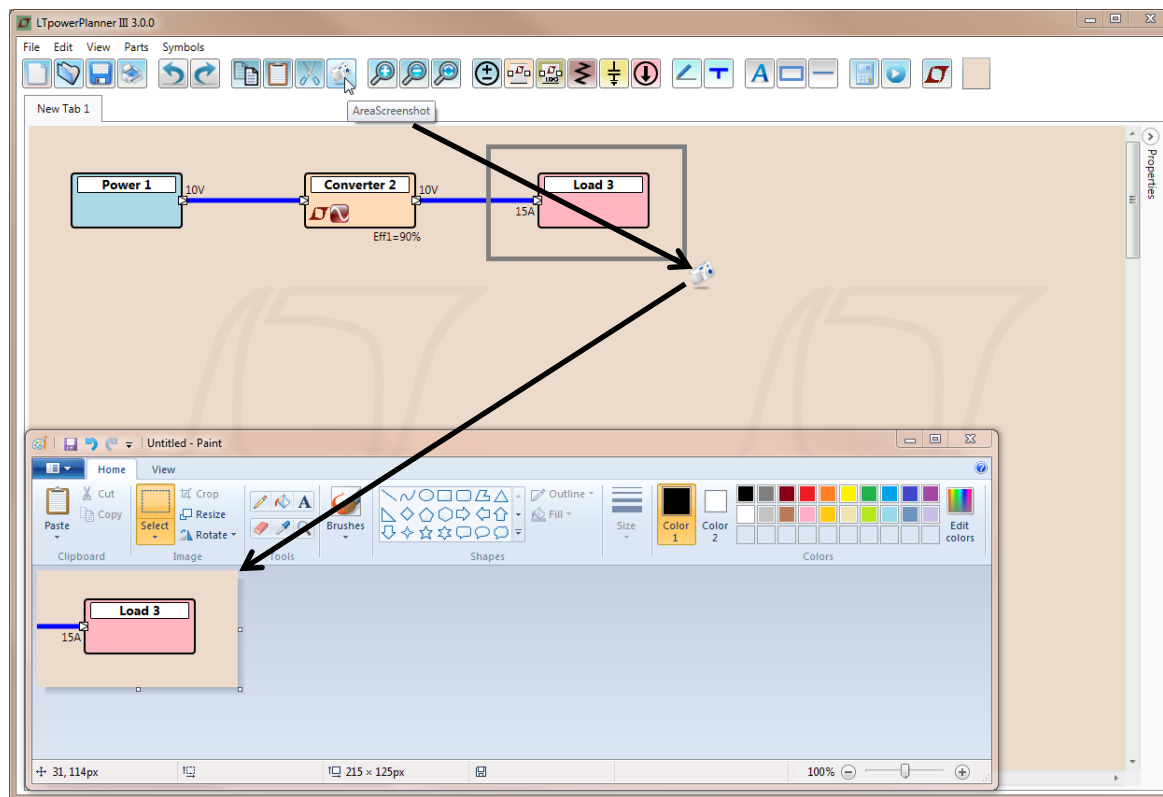
Backward Compatibility with LTpowerPlanner Rev.2.



- Due to the major program structure change, the LTpowerPlanner III can open the LTpowerPlanner II project files. Only the components are imported. The wiring connection is not imported.
- We will keep the backward compatibility for future LTpowerPlanner III and beyond program versions.

Design Example – Functions & Features(16)

Copy an area of the drawing to image. Click the “Camera” icon. Left click and drag the cursor until the area covers the image you want to copy. This highlighted area of the drawing has been copied to the clipboard which can now be pasted elsewhere as a picture/image.



Future Functions – In Development

In Development:

- **Group Copy/Paste with Wiring**
- **Move wiring nodes**
- **Share solutions including linked LTpowerCAD & Ltspice files**

Thank You

Now you have gone through the main features of the program and are ready to use LTpowerPlanner™ !

There are still more features to explore...

Questions? Suggestions?
Email to: LTpowerCAD@linear.com