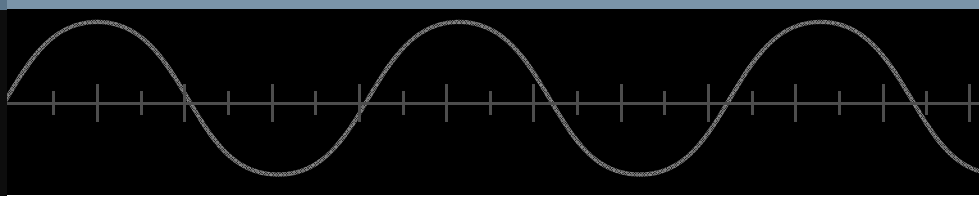
THE DATASHEET OF

LTM4677IY#PBF

LTpowerCAD™ II

Introduction & Quick Start

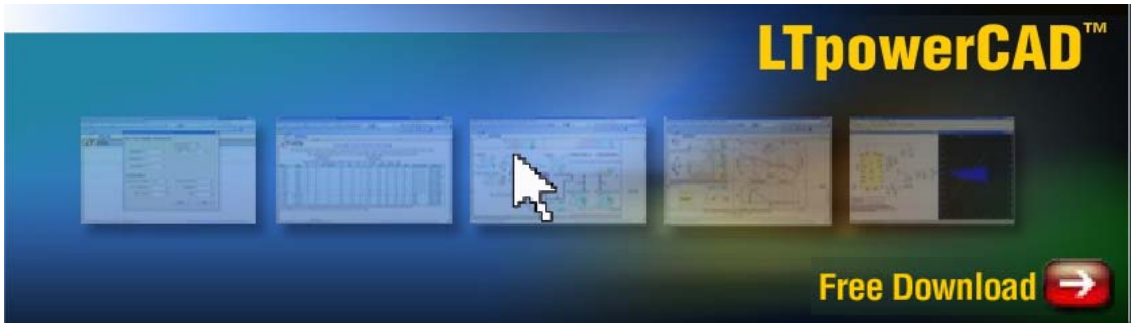
Rev



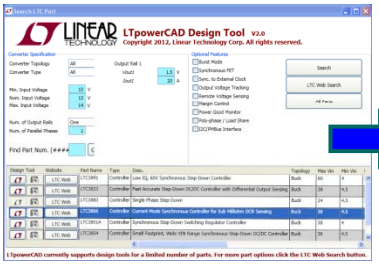
Design Tool Development Team
Power Products, Linear Technology Corp.
LTpowerCAD@Linear.com

What is LTpowerCAD Design Tool

A Complete, Step-by-Step Power Supply Design Tool:

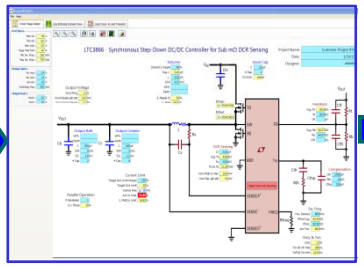


Step-by-Step Power Supply Design:



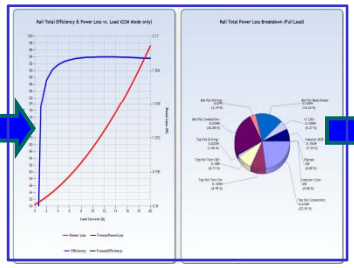
Enter specs,

search solution.

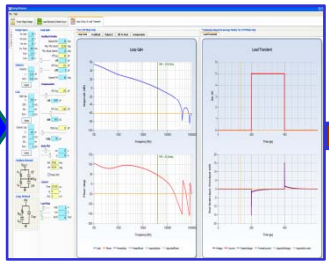


Power Supply

Schematic.



Efficiency &
Power Loss



Loop Stability

& Transient

LTpowerCAD

How is LTpowerCAD Different from LTspice:

LTspice: A powerful circuit **simulation tool** with integrated mod
Linear Technology products.

LTpowerCAD Design Tool :

- A power supply **design tool** instead of simulation tool.
- **Searches for a solution** / LTC part for given power supp
- Guides users to **select power stage components**.
- Provides detailed **power efficiency / loss** analysis.
- Provide quick **loop bode plot** stability and load transient
- Only supports **selected power products** (mostly buck &
- Design file can be exported into LTspice simulation circu

How to get your free LTpowerCAD II

- Go to **http://www.linear.com/LTpowerCAD**
- Download & install **LTpowerCAD II** on your Windows PC
- See later pages for installation instruction.

LTpowerCAD II 2.0 Supported Parts

Buck Converters :

Buck

	Green Cell Background - Excel tool available
	Red Cell Background - LTpowerCAD Non-Excel Tool available
Bold	Bold - Polyphase single output compatible

Upd

Controller

3-output	2-output	1 output
	LTC3838	LTC3829
	LTC3838-1	LTC3833
	LTC3838-2	LTC3839
	LTC3850	LTC3851A
	LTC3855	LTC3854
	LTC3857	LTC3856
	LTC3857-1	LTC3866
	LTC3858	LTC3883
	LTC3858-1	LTC3883
	LTC3858-2	
	LTC3869	LTC3864
	LTC3869-2	LTC3891
	LTC3880	
	LTC3890	
	LTC3890-1	

Monolithic

3-output	2-output	1-output	
	LTC3615	LTC3600	LT3976
	LTC3615(CH1)	LTC3601	LT3990
	LTC3615(CH2)	LTC3602	LT3991
	LTC3633	LTC3603	LTC3403
	LTC3633A	LTC3604	LTC3404
	LTC3633A-1	LTC3605	LTC3405
	LTC3633A-2	LTC3605A	LTC3405A
	LTC3633A-3	LTC3415	LTC3405A-1.375
	LTC3407(CH1)	LTC3418	LTC3405A-1.5
	LTC3407(CH2)	LTC3608	LTC3405A-1.8
	LTC3407-2(CH1)	LTC3609	LTC3406/3406B
	LTC3407-2(CH2)	LTC3610	LTC3406-1.2
	LTC3407-	LTC3611	LTC3406-1.5
	LTC3407-	LTC3612	LTC3406-1.8
	LTC3407-4(CH1)	LTC3614	LTC3406A
	LTC3407-4(CH2)	LTC3616	LTC3406AB
	LTC3417(CH1)	LTC3613	LTC3406AB-2
	LTC3417(CH2)	LTC3646	LTC3406B-1.2
	LTC3417A(CH1)	LTC3646-1	LTC3406B-2
	LTC3417A(CH2)		LTC3409
	LTC3417A-		LTC3409A
	LTC3417A-		LTC3410
	LTC3419(CH1)		LTC3410-1.2
	LTC3419(CH2)		LTC3410-1.65
	LTC3547(CH1)		LTC3410-1.875
	LTC3547(CH2)		LTC3410B
			LTC3411
			LTC3411A
			LTC3412
			LTC3412A
			LTC3413
			LTC3414
			LTC3416
			LTC3549
			LTC3561
			LTC3568

µModule Regulato

3-output	2-ou
	LTM
	LTM4
	LTM
	LTM
	LTM
	LTM
	LTM

Note:

This list was generated on 07/25/2013. **New parts** could be added to the library after that. Click "**Sync-Release**" to update LTpowerCAD library & functions.

LTpowerCAD II 2.0 Supported Parts

Boost Converters :

Boost

Updated:

Polyphase (Bold)

	Green Cell Background - Excel tool available
	Red Cell Background - LTpowerCAD Non-Excel Tool available
Bold	Bold - Polyphase single output compatible

Controller			Monolithic			µModule Regulator®	
3-output	2-output	1-output	3-output	2-output	1-output	3-output	2-output
	LTC3788	LTC3787 LTC3862 LTC3786					

Buck-Boost Converters :

Buck-Boost

Updated:

Polyphase (Bold)

	Green Cell Background - Excel tool available
	Red Cell Background - LTpowerCAD Non-Excel Tool available
Bold	Bold - Polyphase single output compatible

Controller			Monolithic			µModule Regulator®	
3-output	2-output	1-output	3-output	2-output	1-output	3-output	2-output

Note:

This list was generated on 06/06/2013. **New parts** could be added to the library after that. Click "**Sync-Release**" to update LTpowerCAD library & functions.

I. Installation

LTpowerCAD II

Software Installation

Minimum Requirements

The following system and software is required for LTpowerCAD

- ✓ **PC with Microsoft Windows** XP SP2 or later OS
- ✓ **Microsoft Office Excel** 2000, 2003, 2007, 2010 or 2013
- ✓ **Microsoft .NET Framework** 3.5 SP1, 4.0 or Higher

  http://www.microsoft.com/net/download

- ✓ **Microsoft SQL Server** Compact 3.5 Service Pack 2

  http://www.microsoft.com/en-us/download/details.aspx?id=5783

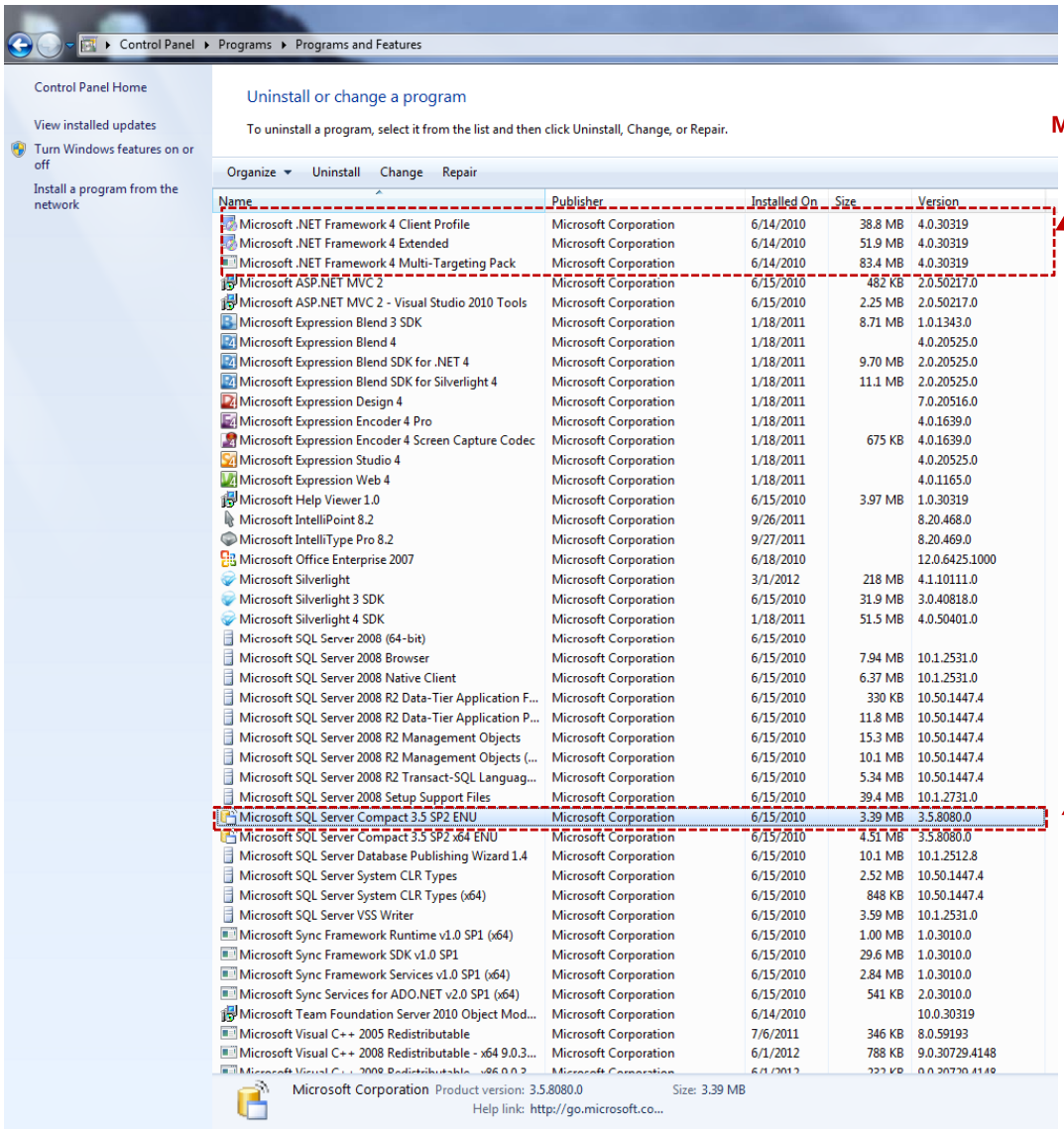
  * Note : The LTpowerCAD installer is made to **automatically download and install these the Microsoft .NET and SQL Server** to your system if your system does not already have these installed. However, if for some reason they are not installed automatically, you need to install them manually from Microsoft download sites.

**Note:
•Windows Vista or Windows 7, Windows 8 based PC has .NET Framework integrated.
•Some Windows XP based PC may need additional installation of the .NET Framework, wh
freely downloaded at www.microsoft.com.

•Many new computers may already have SQL Server Compact 3.5SP2 installed (check to r

Minimum Requirements (cont'd)

Optional: check if .NET and SQL Server are installed:



Installing LTpowerCAD II v2.0™

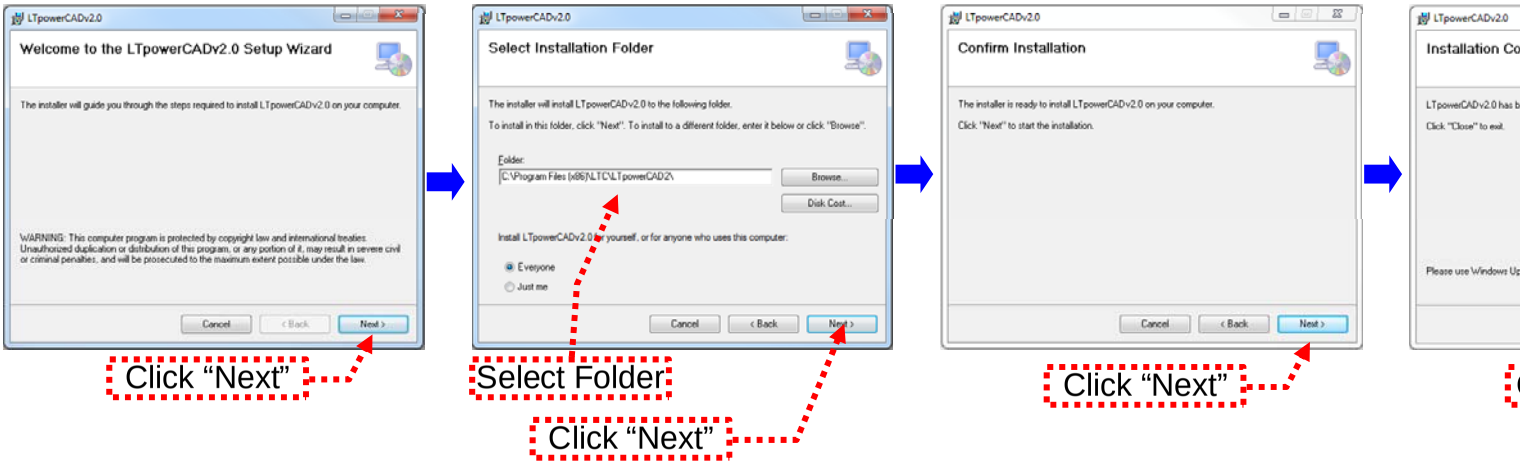
1. Double Click “**Setup.exe**” to Start LTpowerCAD II v2.0™ Design Tool Setup Wizard

   Note : Do not install by double clicking the “MS.msi” file as this will prevent the installer from checking to inst
   missing Microsoft requirements.

2. Click “**Next**”

3. Select Installation Folder and Click “**Next**”

4. Click “**Next**” to Confirm Installation and then “**Close**” to complete the Installation

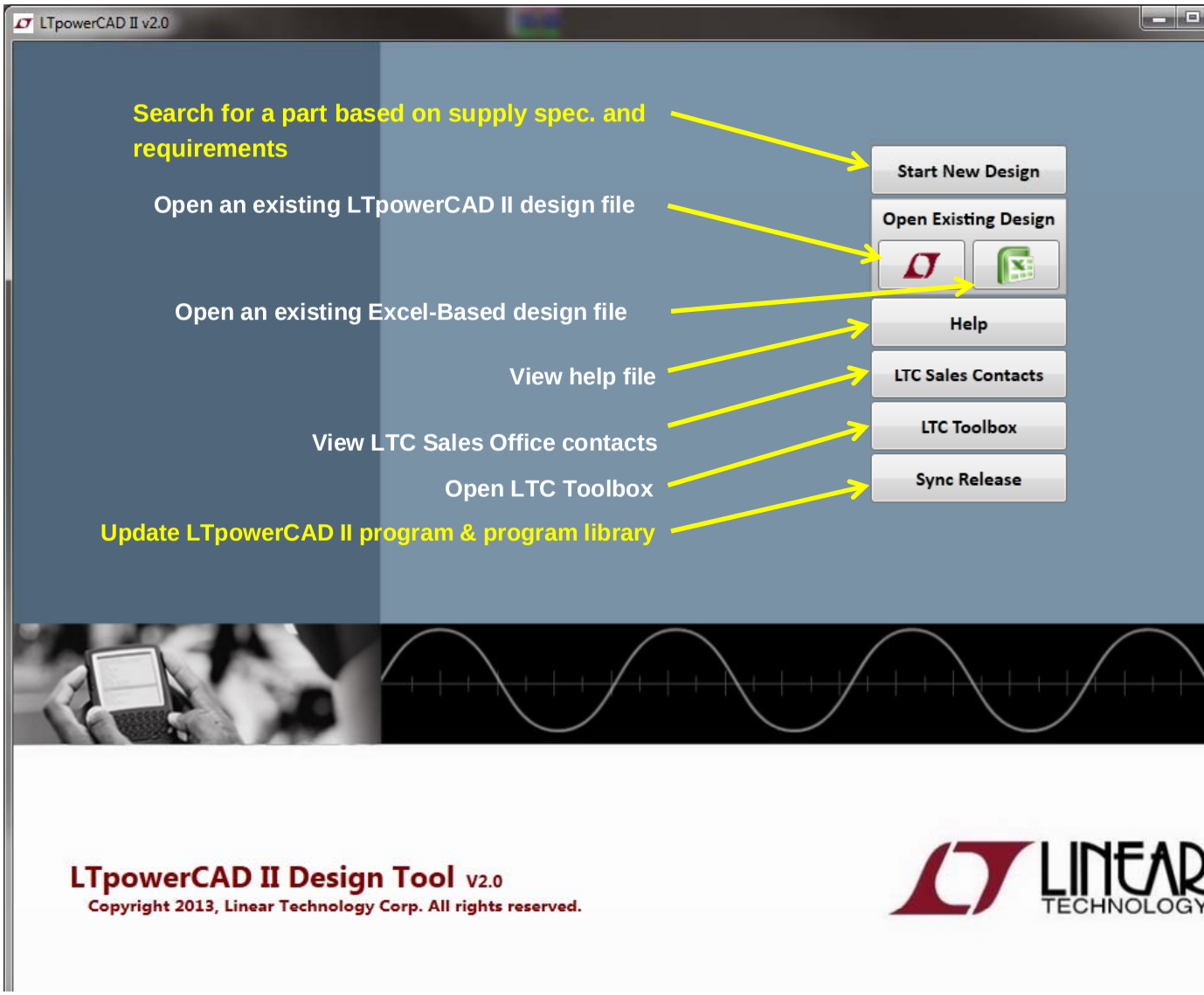


5. Check the contents of the installation folder (see next slide)

Note : The installation will place shortcuts to the LTpowerCAD II v2.0

Getting Start with LTpowerCAD II

Main Page



Search Page

Step 1. Enter power supply spec. and required functions.

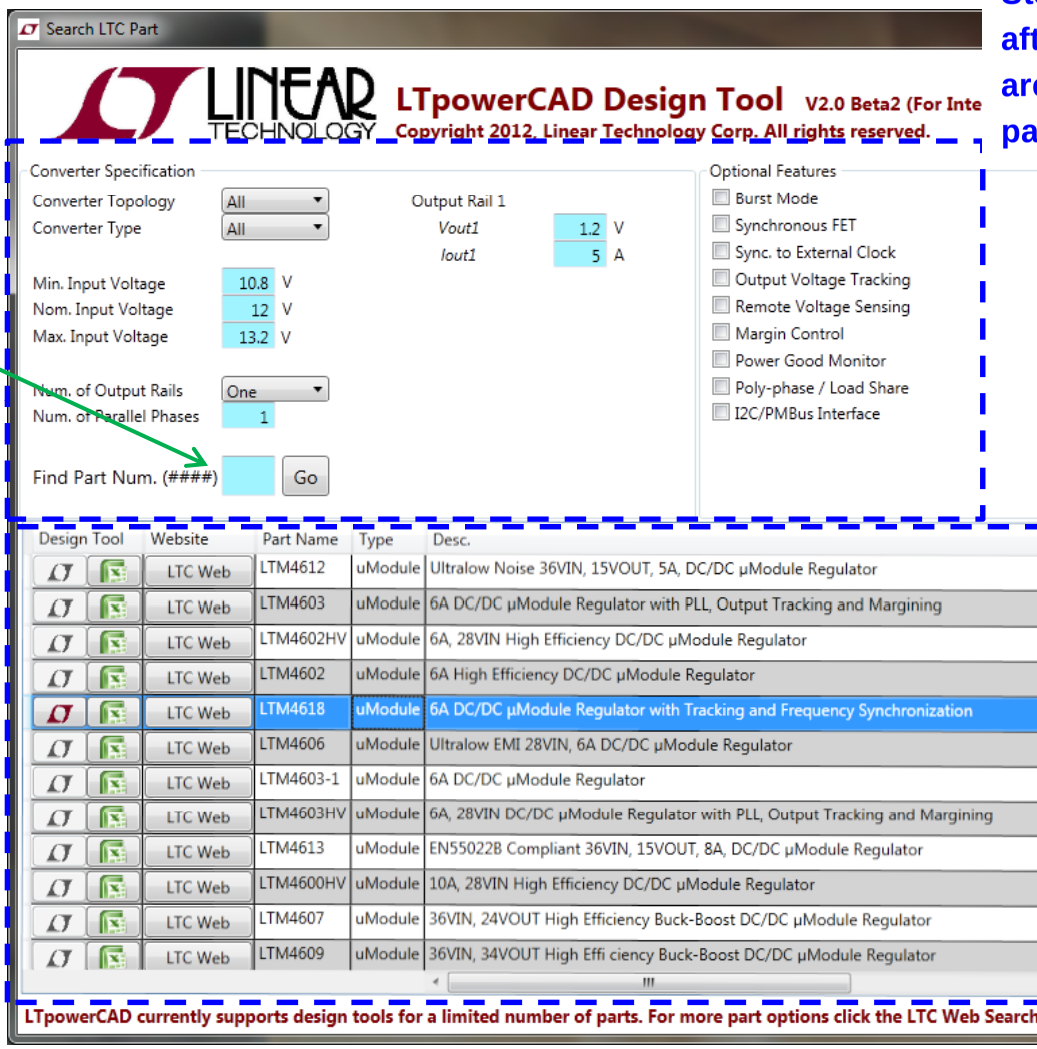
If you know the LT part# to use, you can enter the 4-digit part# and click “go” instead of search.

Step 3. Select a Part from Search Results Table:

Click LTC icon for LTpowerCAD II tool

Click Excel icon for Excel-Based tool

Note: if the icon is in grey color, it means the design tool is not available.



Available Design Tool Formats

Two possible design tool formats:

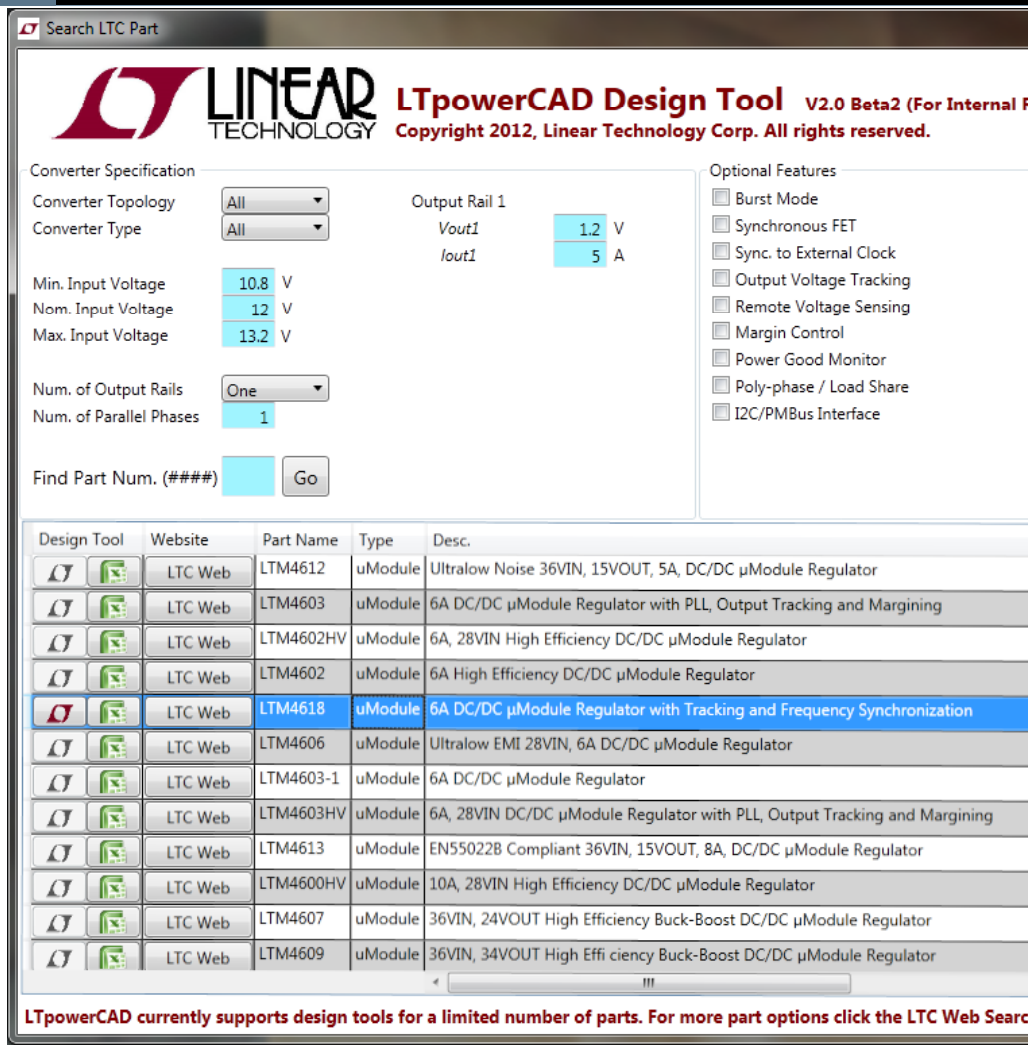
1. Non-Excel LTpowerCAD Design Tool:

If available, an active LTC button is shown: 

2. Excel-Based Design Tool:

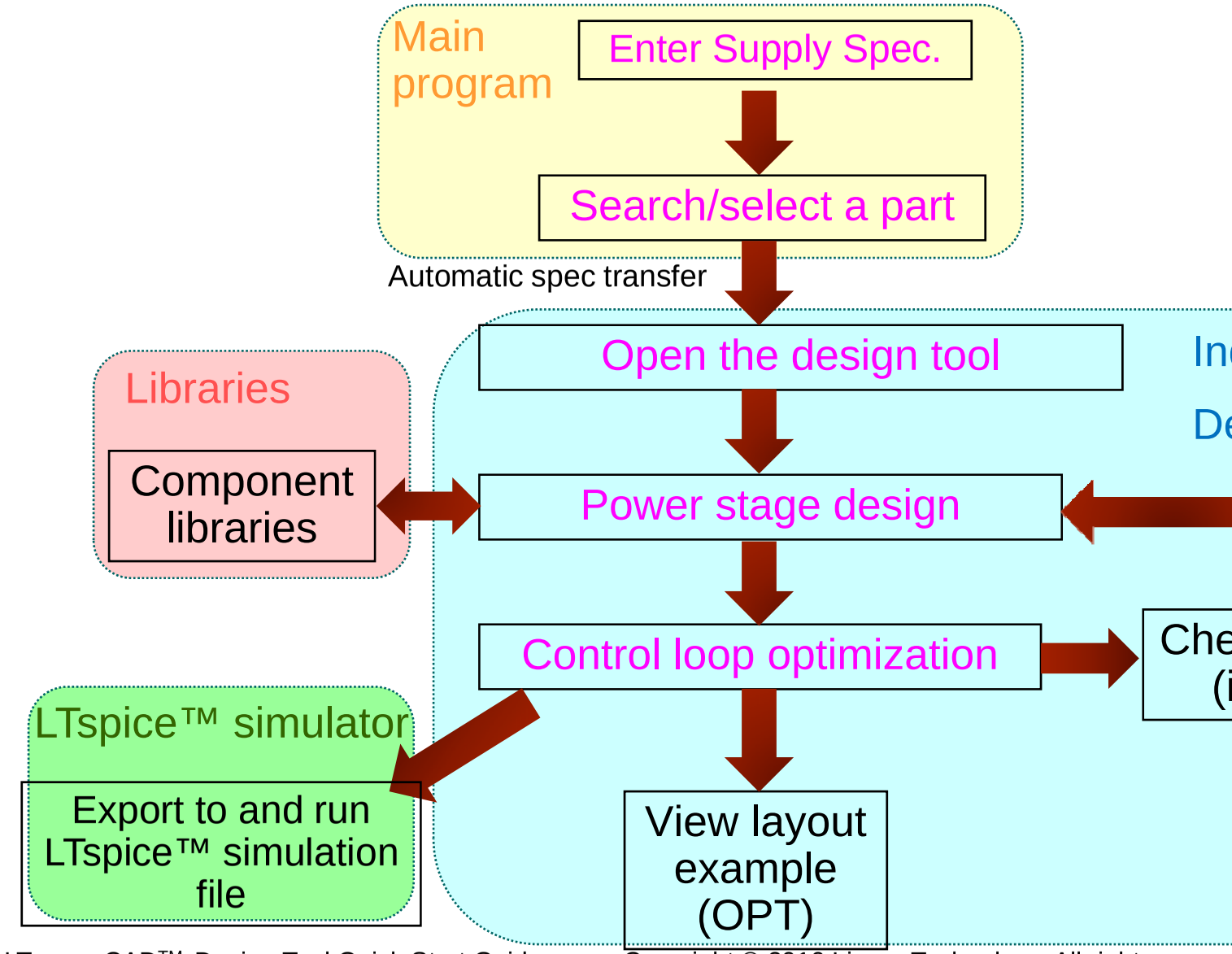
If available, an active Excel button is shown: 

Note: if the icon is in grey color, it means the design tool is not available yet.



Step-By-Step Supply Design Proc

using the LTpowerCAD™ Design



Example of a non-Excel **LTpowerCAD** d

Tool

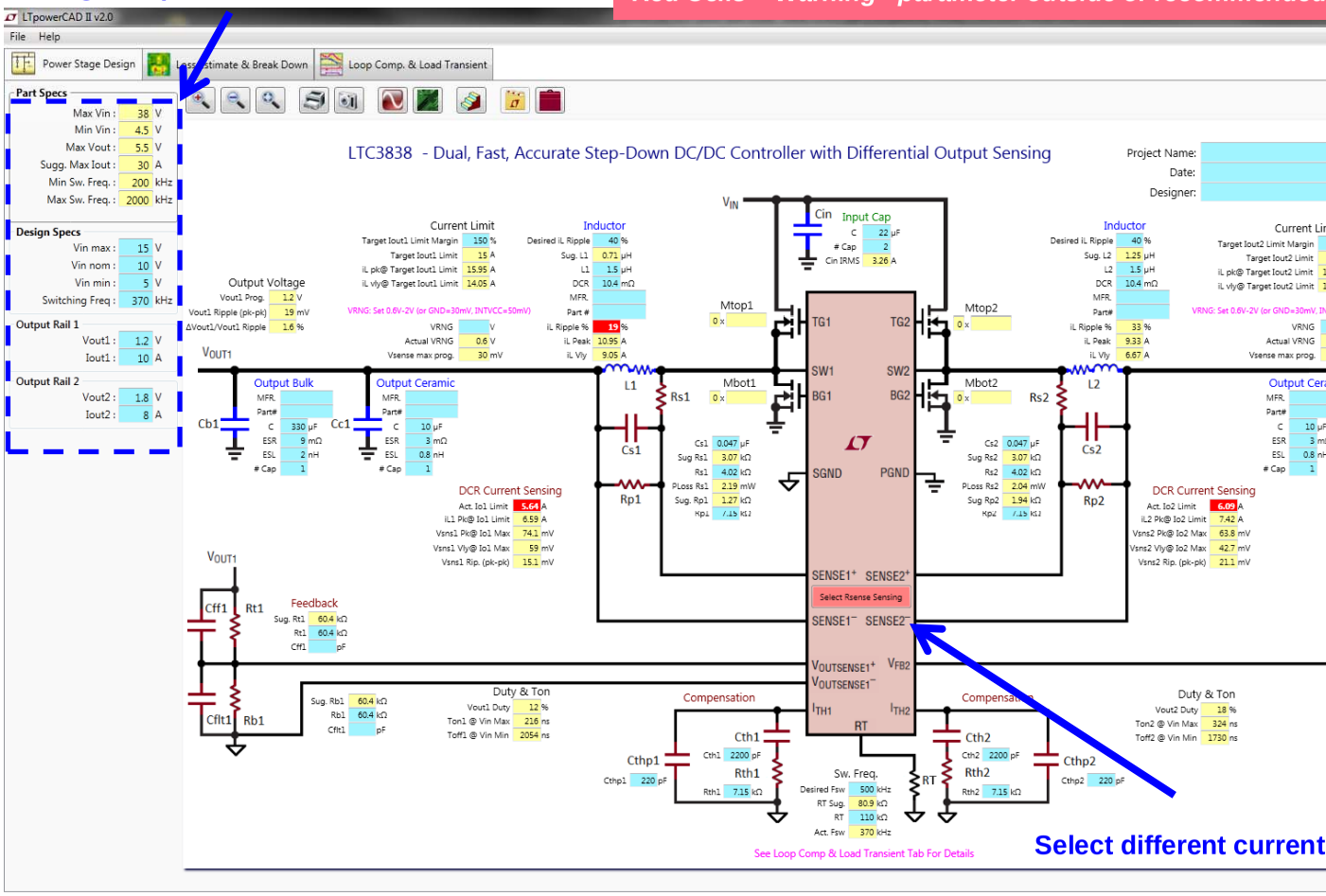
Design Step 1 – Power Stage De

Yellow Cells = Suggested values or calculated parameters

Blue Cells = User's chosen values

Red Cells = Warning - parameter outside of recommended

Design Requirements & Part Limits

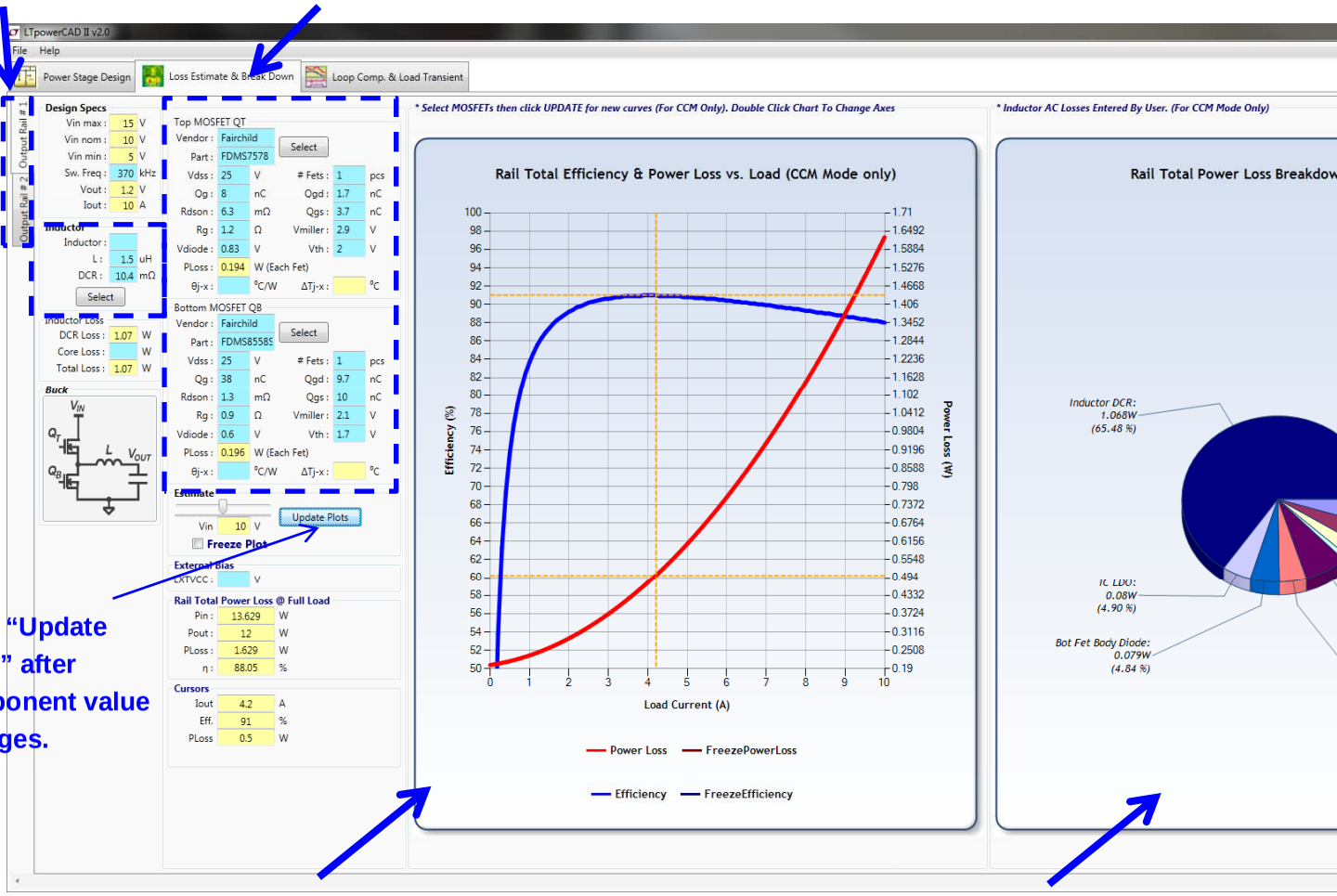


- User can only change blue-cell values and check calculated circuit parameters in yellow
- Red cells are for warnings. User needs to decide if following/correcting the warning or

Design Step 2– Select L and FET, Optimize Eff % & Po

View data for each rail

Enter power stage component details & Test Conditions (enter manually or select

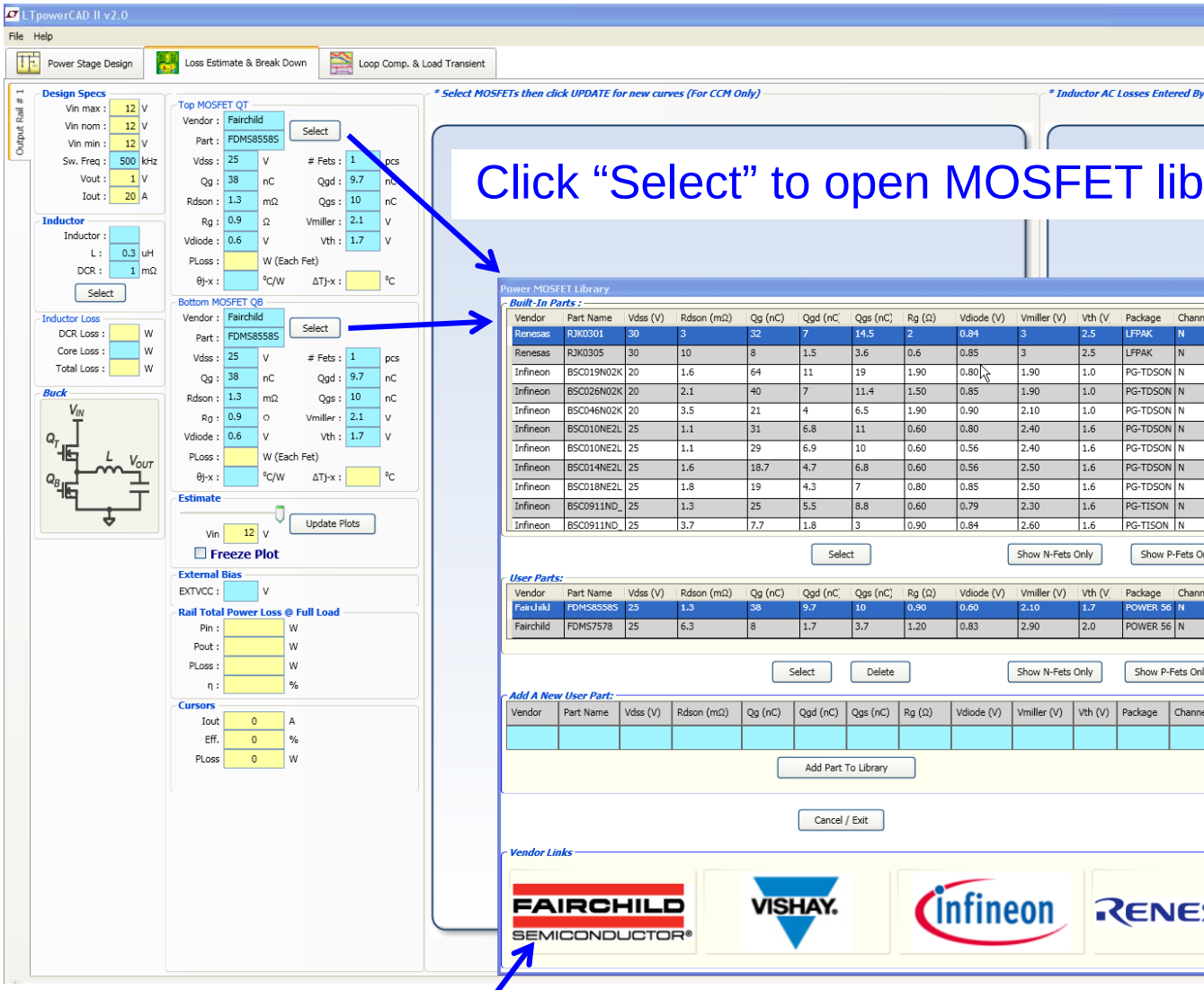


Click "Update Plots" after component value changes.

Estimated Efficiency & Power Loss Curves with Data Point Cursors. Double-click to set axes Preferences

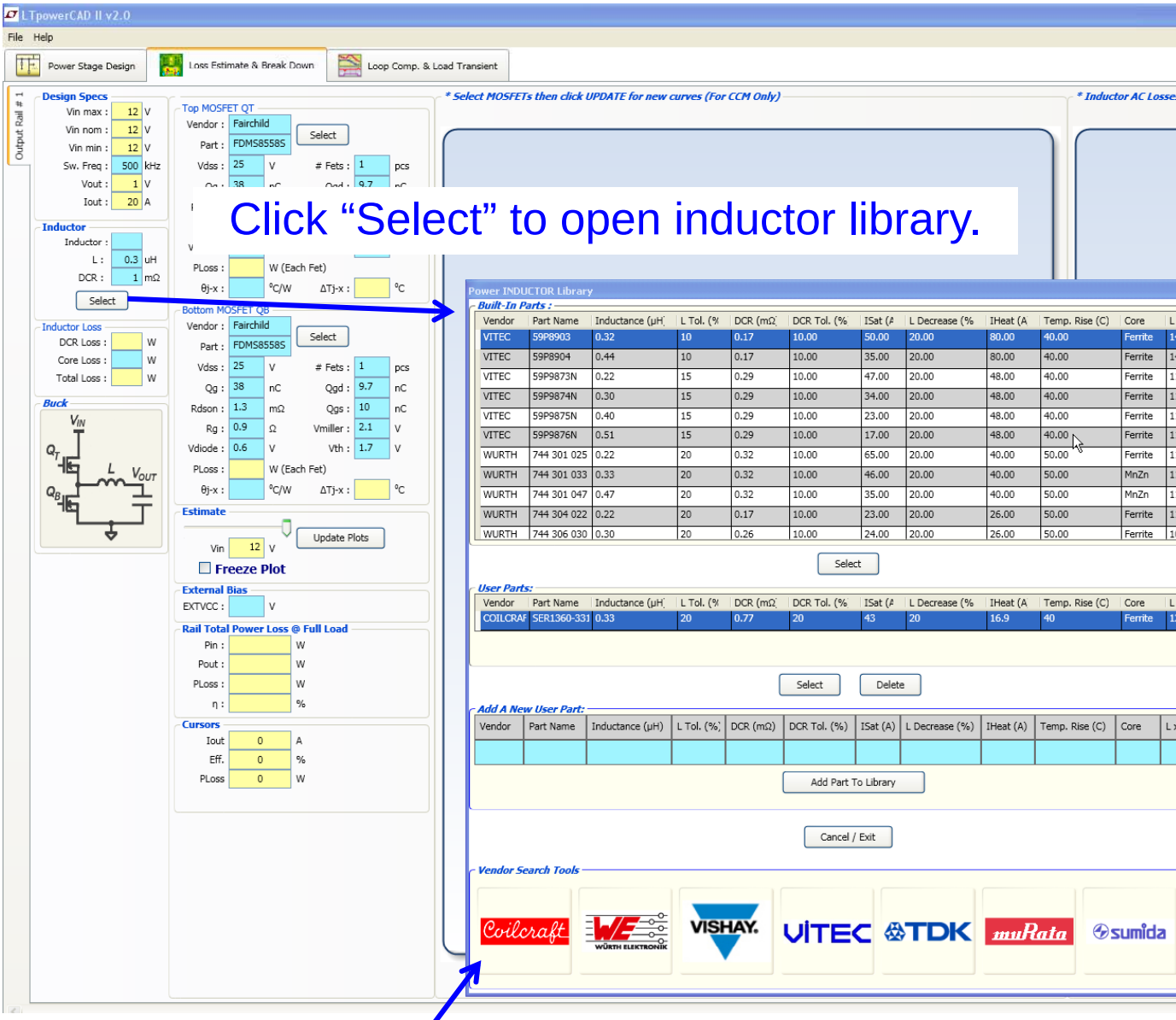
Estimated Power Loss Breakdown

Power Component Library - FET



Popular vendor weblinks

Power Component Library - Inductor



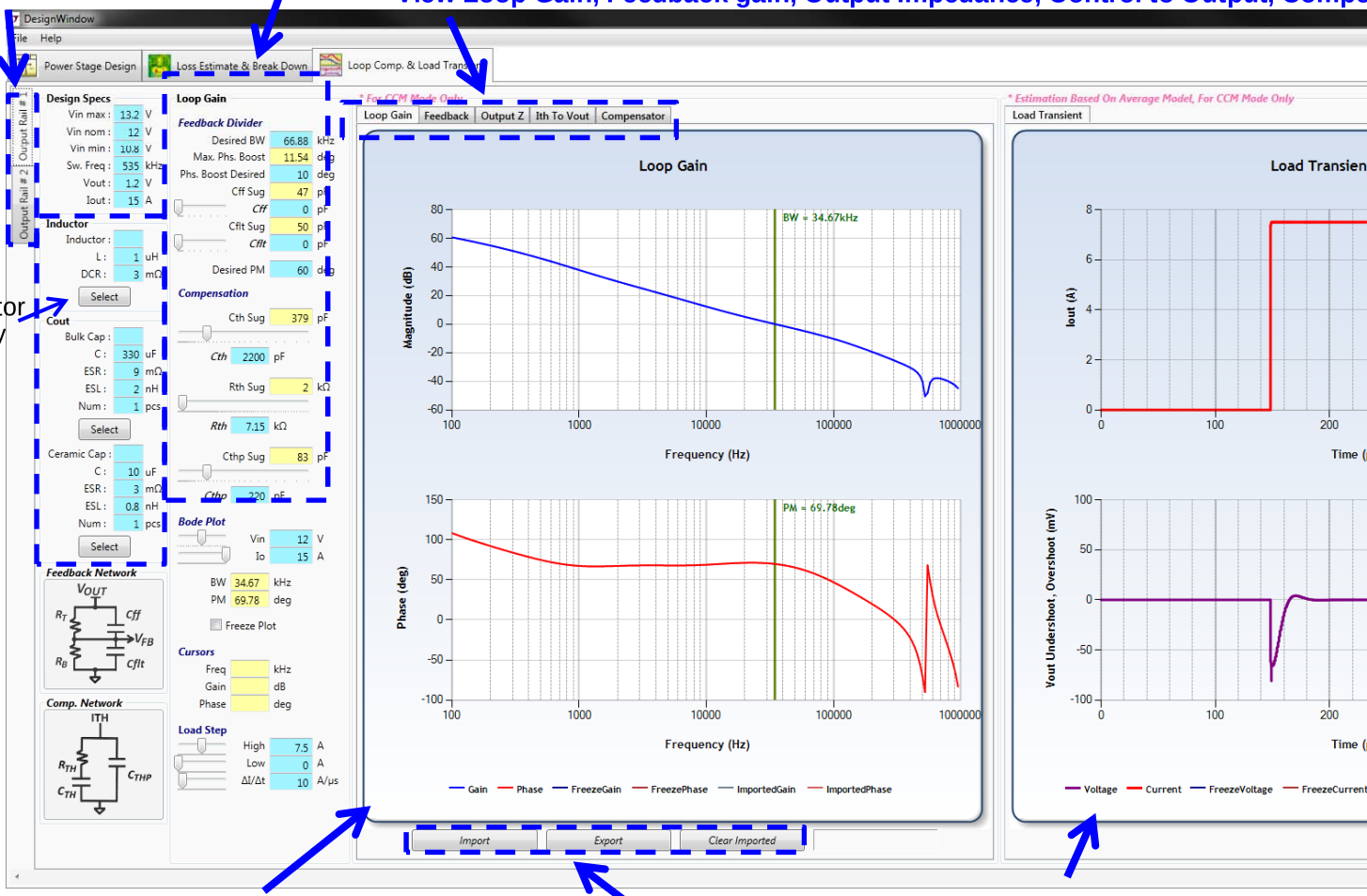
Popular vendor weblink / web-search site.

Design Step 3 – Optimize Loop Comp & Load Tr

Enter component details (enter manually or select from built-in library)

View data for each rail

View Loop Gain, Feedback gain, Output Impedance, Control to Output, Compe



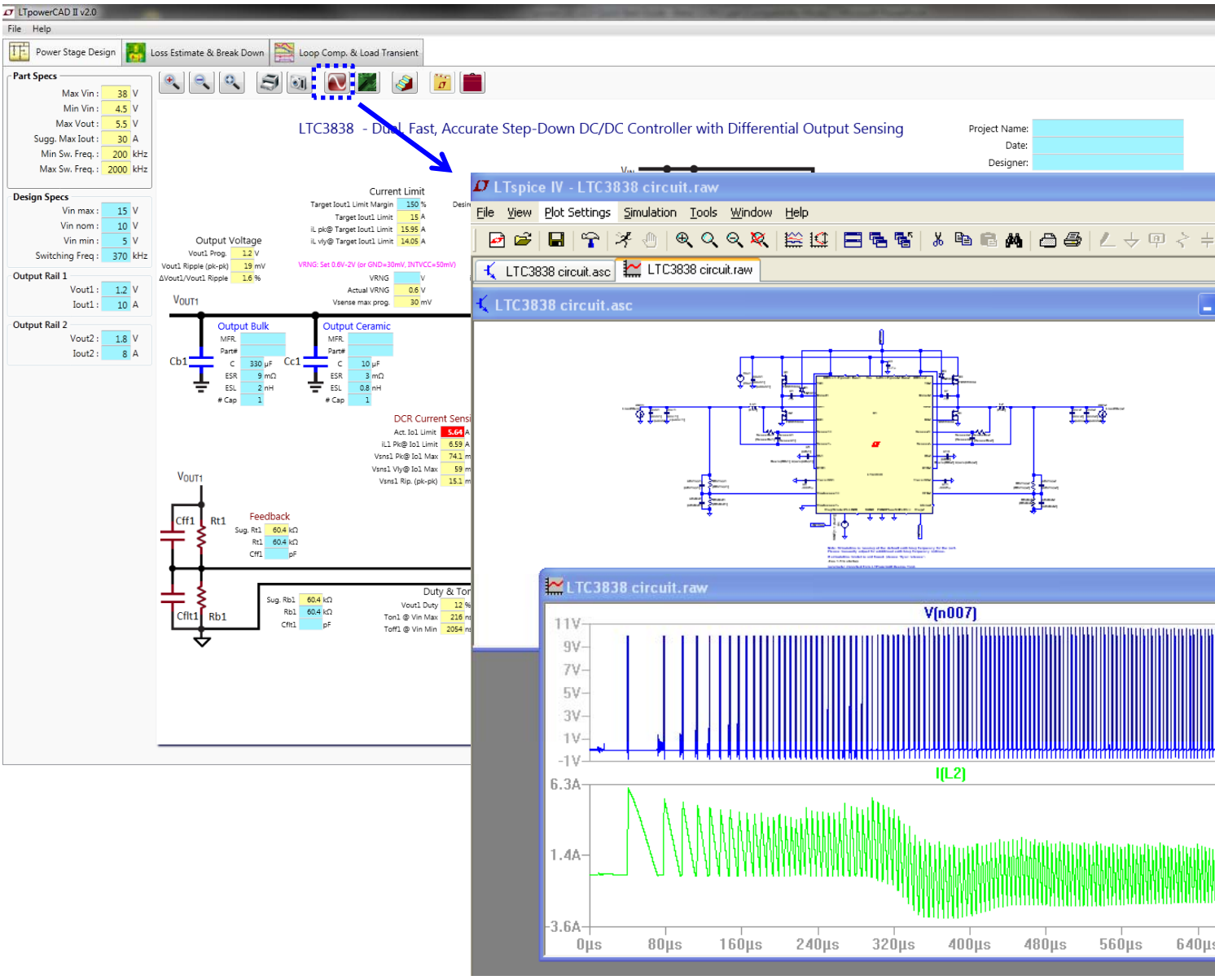
Capacitor library

Loop Gain, Feedback, Output Impedance, Ith to Vout, and Compensator plots

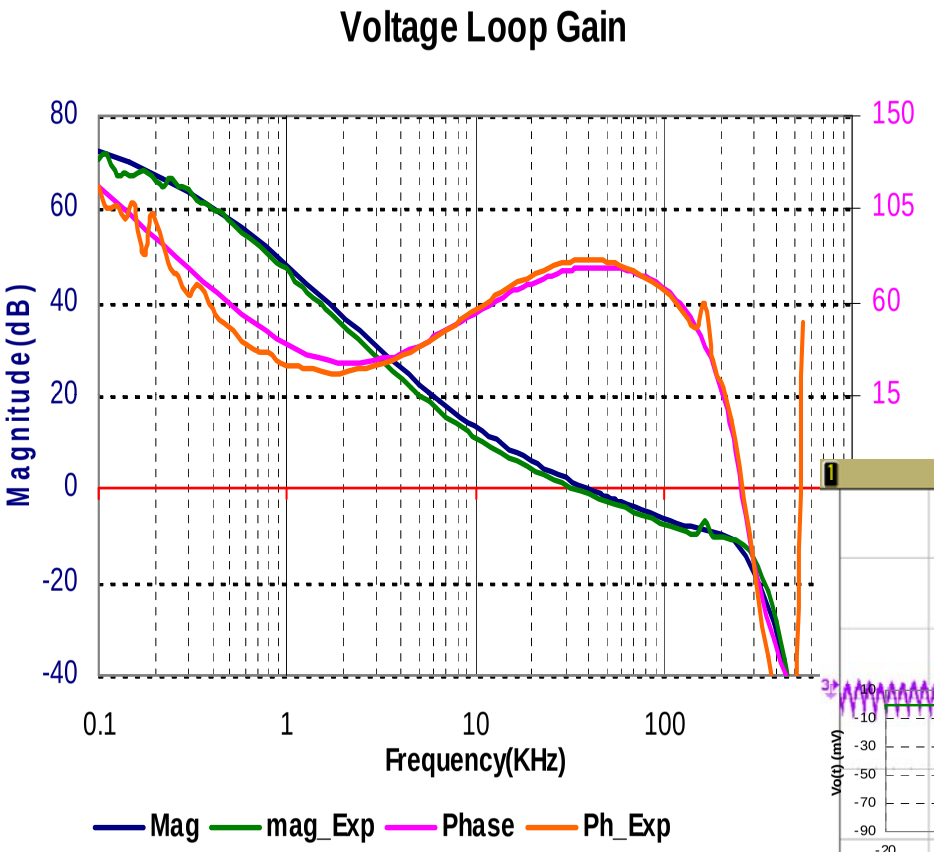
Import plot data from data file (ie Ridley AP300) or Export data to data file or Excel.

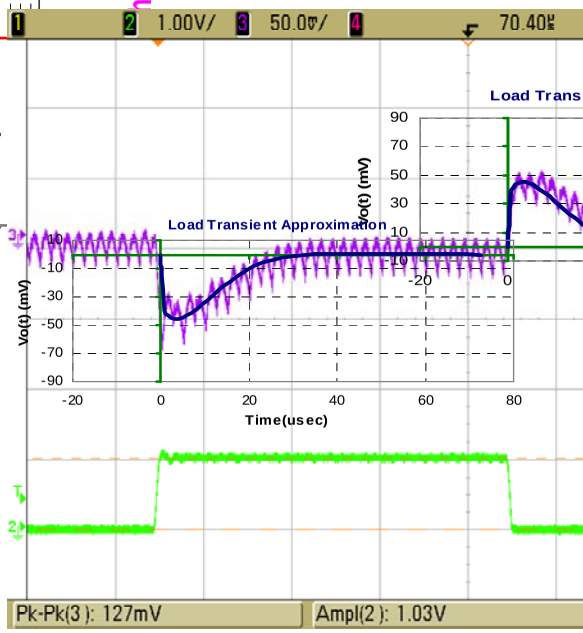
Load Transient Estimation

(Optional) Design Step 4 – Export to LTspice for Simul



Bench Verified Loop and Load Transient





• In the design tool, t
model of every part h
on LTC standard der

• It remains the user'
verify his calculated
prototype.

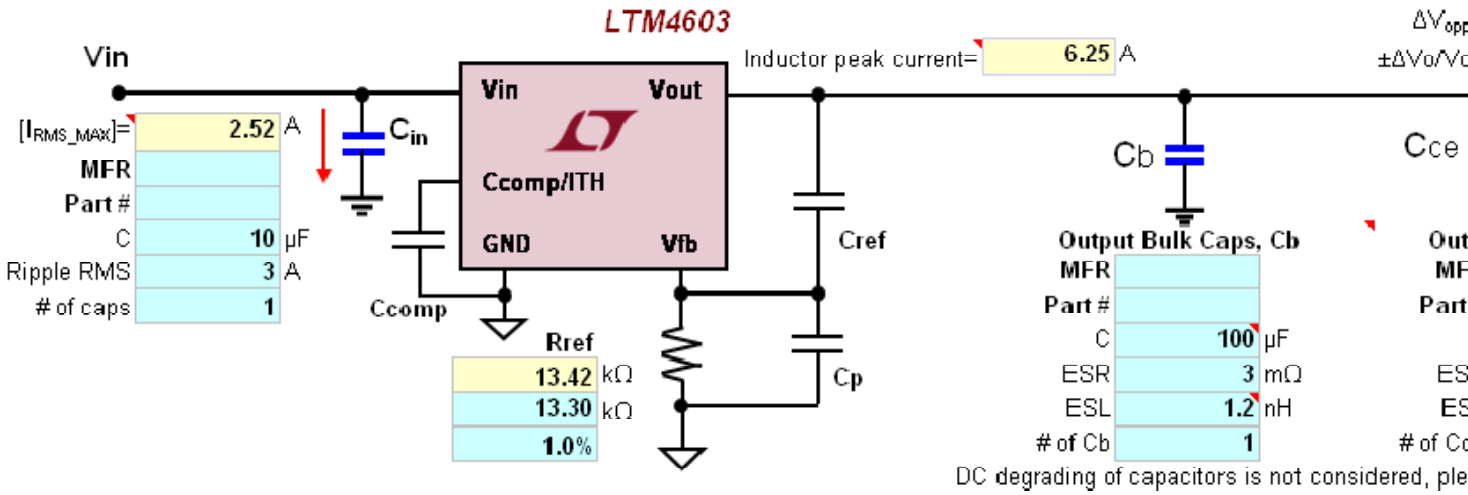
Example of a Excel-Based design To

Step 1: Power Components Se

In the design spreadsheet, power components design is guide
with schematic interface:

Values in yellow cells are calcula
/ recommended by design tool

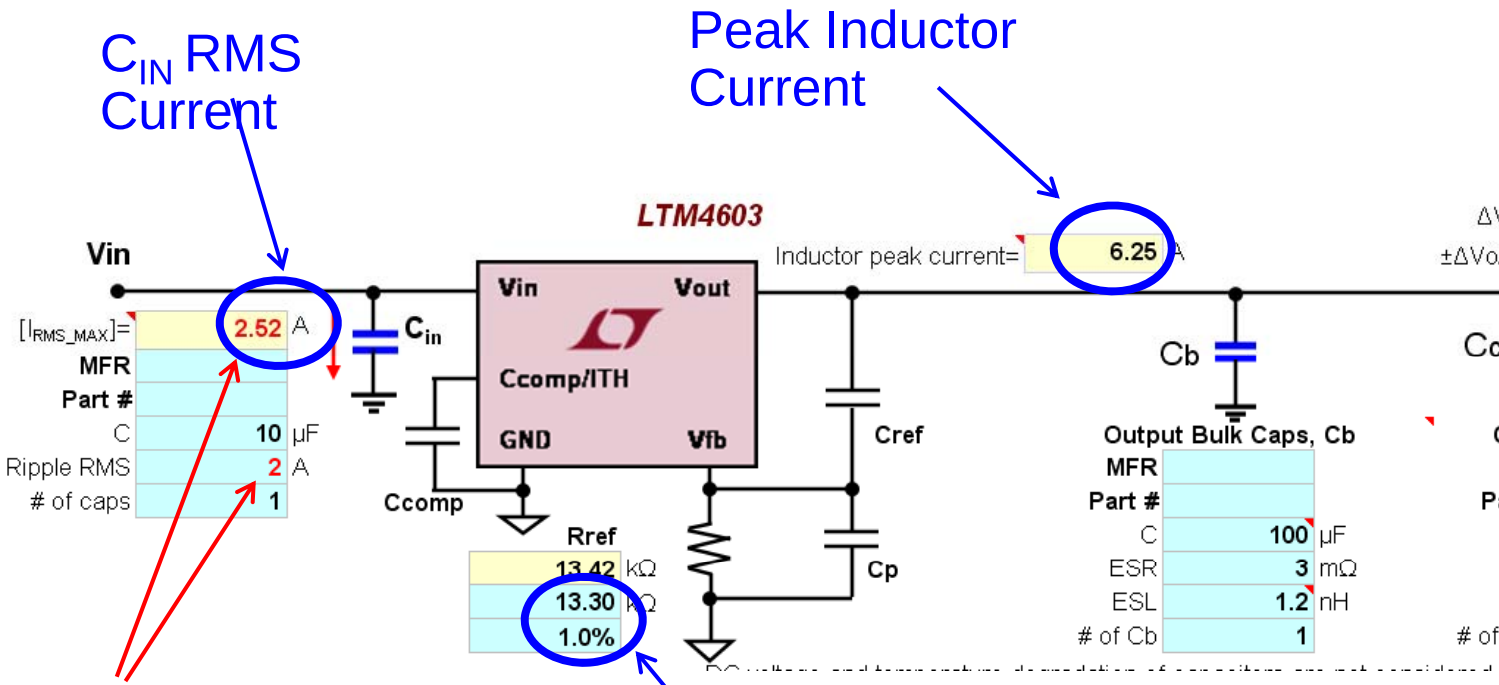
Note: Click on a capacitor s



Values in blue

/ entere

Power Stage Performances



RED fonts give "warnings" of undesirable design values

Standard Vo setting resistor values

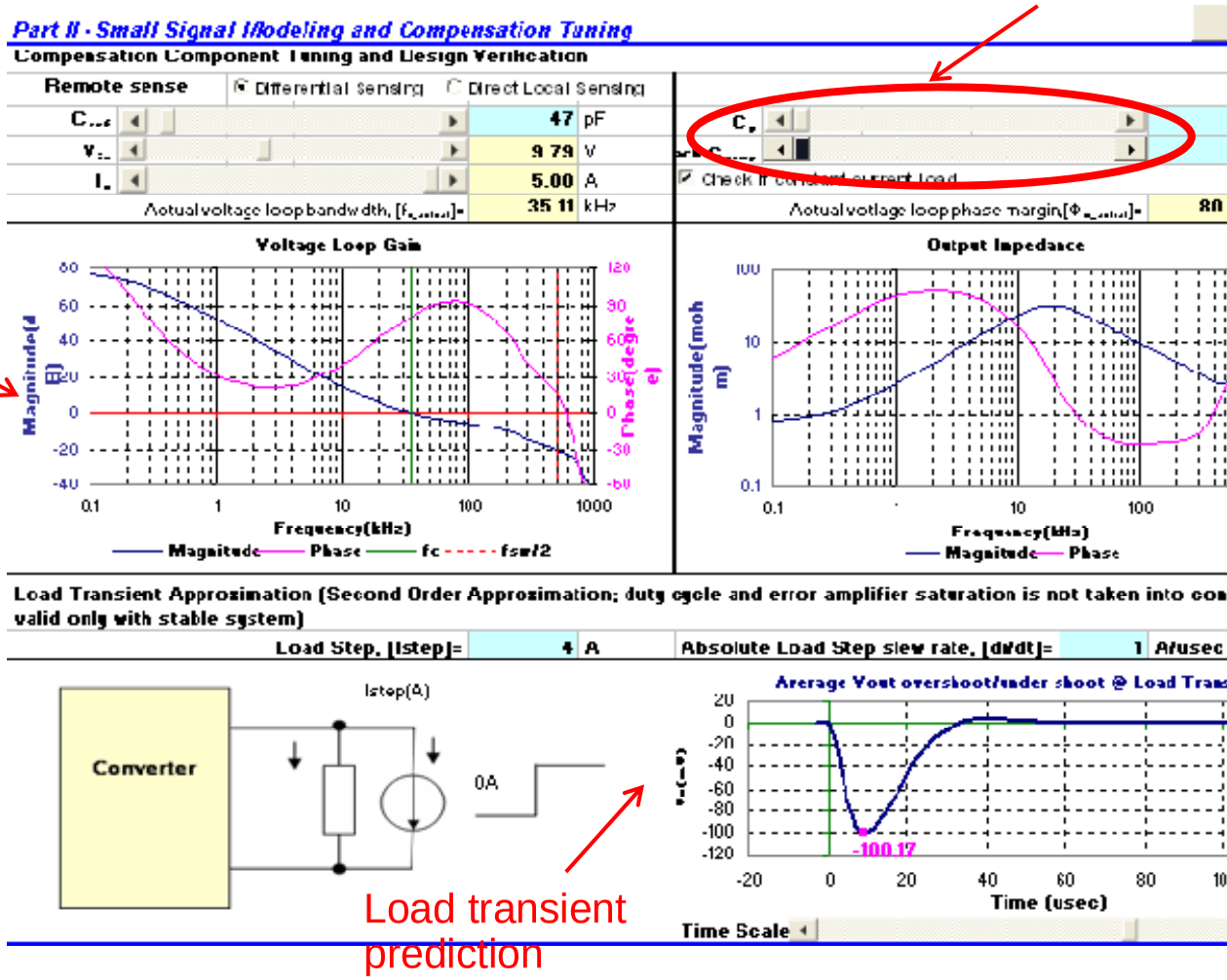
Real Vo and ripp

Step 2: Control Loop Optimizatio

In the design spreadsheet, control loop design can be fine tu

Sliding bar for compensation

Loop gain prediction

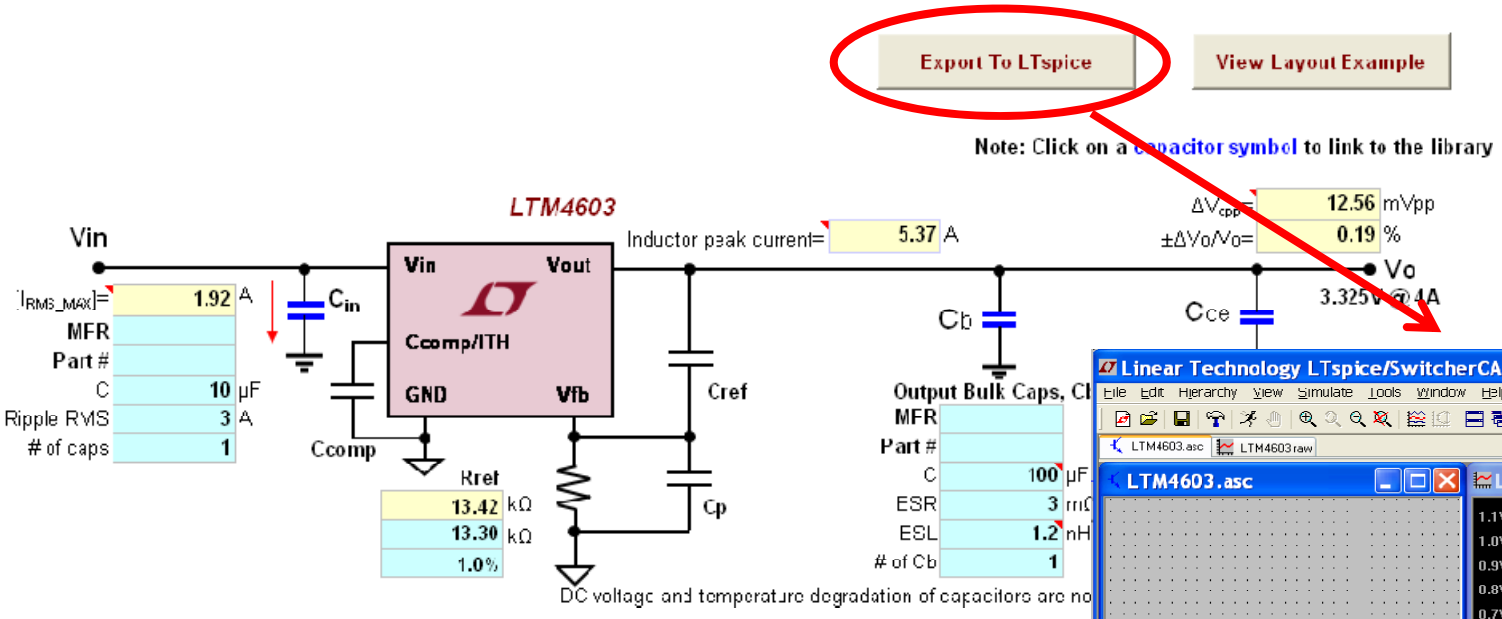


Load transient prediction

Additional Feature (1):

Export to & Run LTspice™ Simula

In the design spreadsheet, click the “Export To LTspice” butto



If the LTspice™ simulator is installed,
it will be automatically opened:

Link to down load free LTSpice™ simulator:
http://www.linear.com/designtools/software/ltspice.jsp

Additional Feature (2):

Summary of design: BOM, size, cost and s

In the design spreadsheet, click the “Summary” sheet:

Summary of Design

Bill of Material of Power Components

Unit (•) inch ( ) mm

Componnent	Part #	# of parts	Value	Package	L	W	H	Unit Price	Total Price
Cin (bulk)	0	1	100 µF	1210	0.098	0.126	N/A		$0.00
Cin (ceramic)			uF	1206	0.063	0.126	N/A		$0.00
Cout (bulk)	2R5TPE220MC	0	220 µF	0805	0.049	0.079	N/A		$0.00
Cout (ceramic)	0.00	1	72 µF	1210	0.098	0.126	N/A		$0.00
MicroModule	LTM4603	1		LGA (15 X 15 X2.8)	0.591	0.591	0.110		$0.00

Power Component Summary: Foot print clearance factor= 1.5

Total footprint are W/O output Bulk Capacitors	0.560	inch^2
Total footprint	0.560	inch^2
Total BOM cost W/O input and output Bulk Capacitors	$0.00	
Total BOM cost	$0.00	

Design Analysis

Parameters	Condition	Minimum	Typical	Maximum	Units
Input Votlage		7.000	12.000	14.000	V
Output Votlage		0.984	0.999	1.014	V
Inductor peak-to-peak Ripple			0.909	0.921	A
Frequency			1004.016		KHz
Crossover freq.	Vin=8.09V		119.891		kHz
Phase Margin	Vin=8.09V		39.159		Deg.

It remains the customer's responsibility to verify proper and reliable operation in the actual application.

Any feedback comments on the program or issues encountered are we

Please forward your comments to the addresses below.

LTpowerCAD@Linear.com

LTpowerCAD II v2.0™

Installation

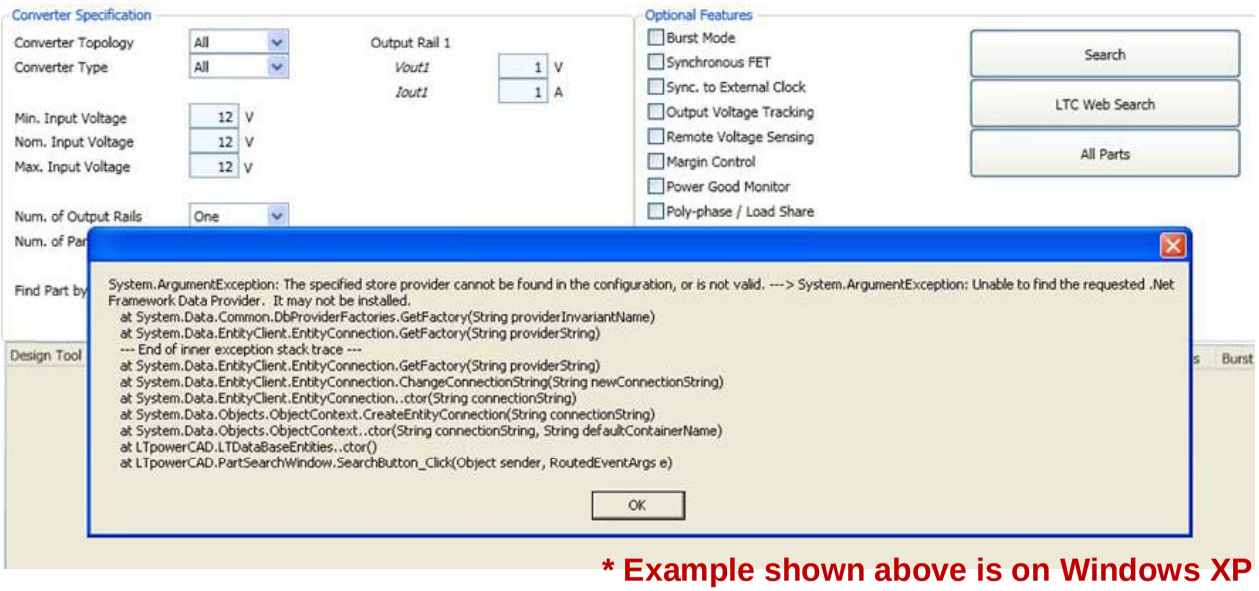
Troubleshooting

Appendix : Installation Troubleshooting

I. Microsoft SQL Server Compact 3.5 SP2 ENU requirement :

1) **Possible issue:** Microsoft SQL Server Compact 3.5 SP2 is requirement missing

LTpowerCAD II v2.0 requires Microsoft SQL Server Compact 3.5 SP2 to access the internal parts d this is not installed, the program may have issues accessing information for parts included in the pro example screenshot is shown below where this type of error has occurred. *If this is confirmed to be your system, make sure it was installed correctly which may require a repair of the installation or ne installation of this requirement.*



*** Example shown above is on Windows XP**

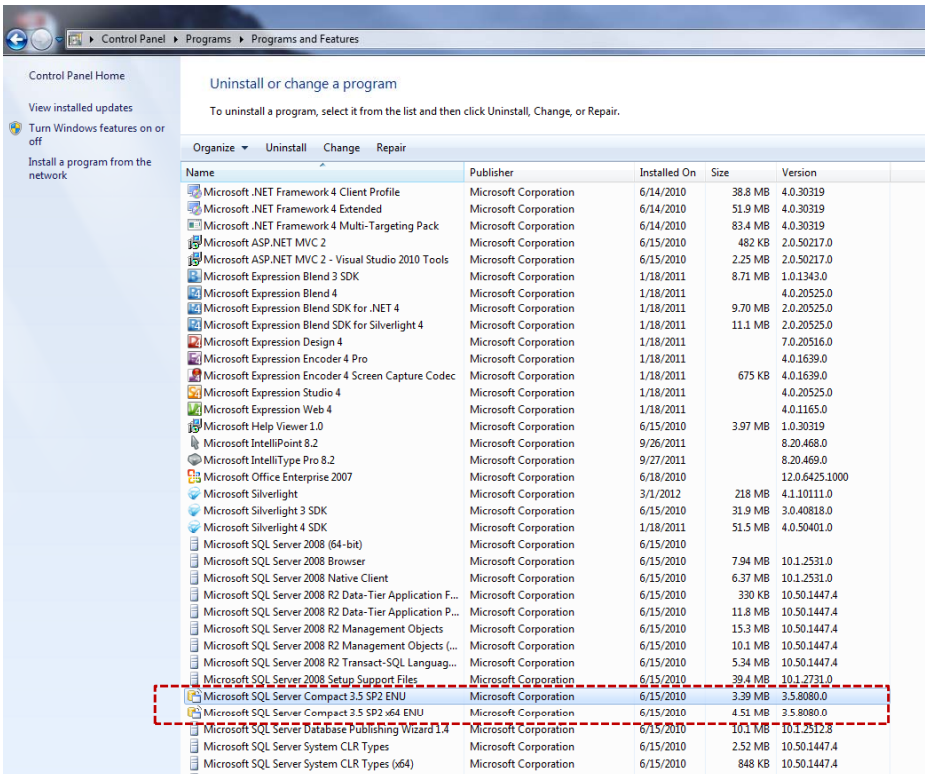
Important : Make sure you installed using “setup.exe” file (not the MS.msi file

Appendix : Installation Troubleshooting

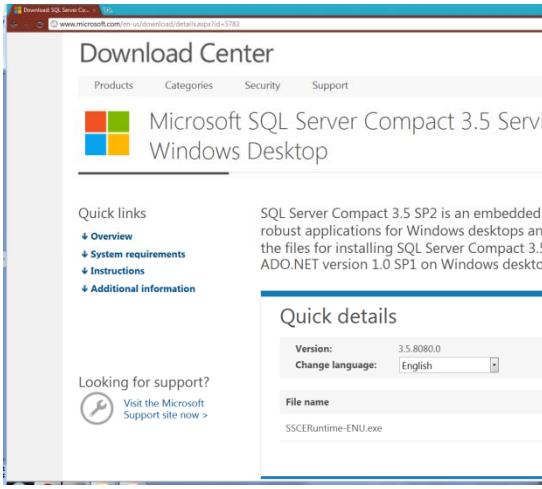
Possible issue solution:

Check the programs you have currently installed on your system to see if Microsoft SQL Server Comp
requirement is missing or not. The LTpowerCAD II v2.0 installer automatically checks if you have this r
will download and install it automatically. This can also be freely downloaded at Microsoft at http://www
us/download/details.aspx?id=5783 *If this is confirmed to be installed on your system, make sure it was
which may require a repair of the installation or new installation of this requirement.*

Step 1) Check the list of programs you have currently installed on your system by going to Start Menu → Control Panel → Uninstall a program



Step 2) If this is not installed, this can be downloa
http://www.microsoft.com/en-us/download/details.as
and install this package, then try to
un-install / re-install LTpowerCAD II v2.0.



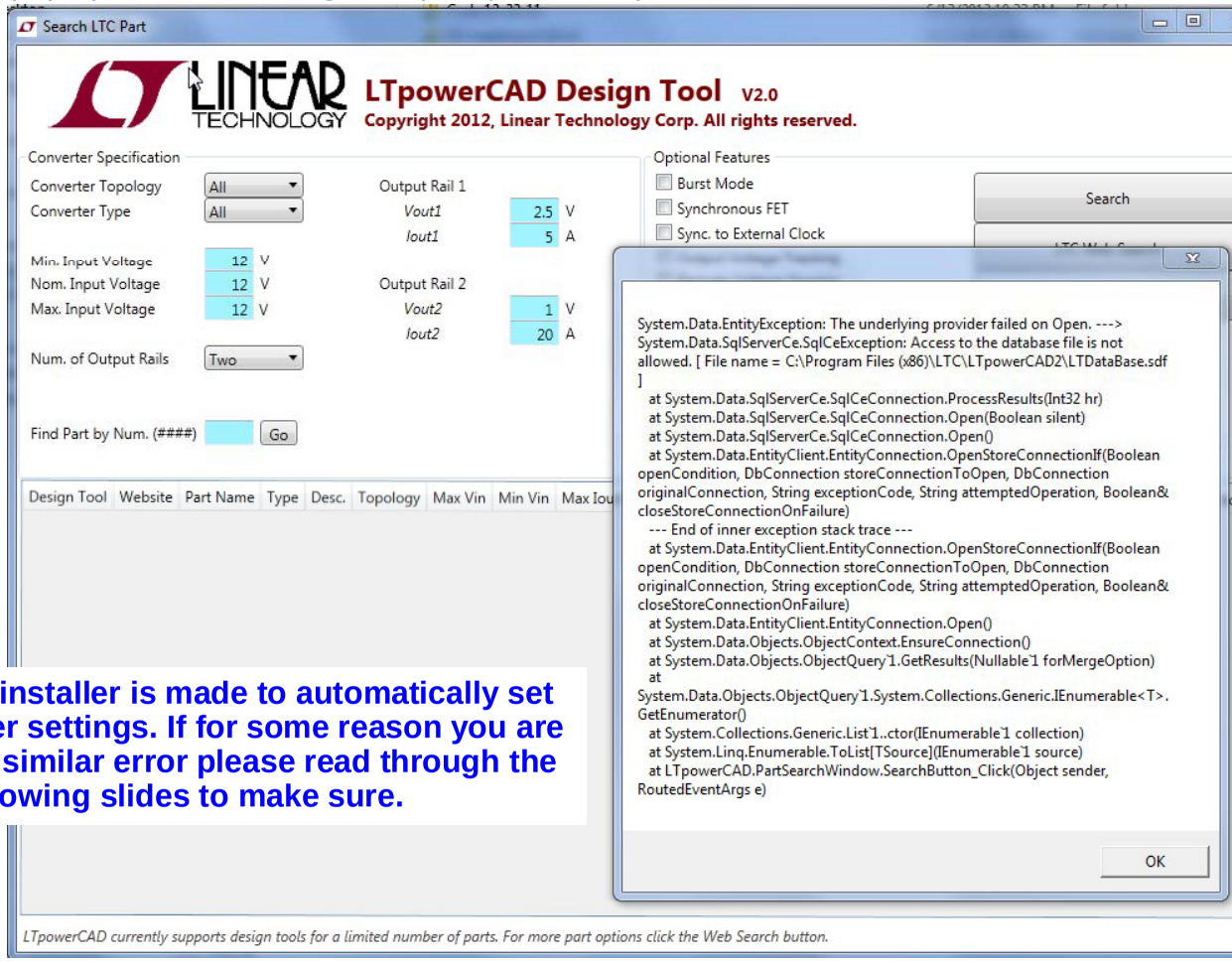
**** Note : The installer is made
download and install these sof
to your system if your system
have these insta**

Important : Make sure you installed using "setup.exe" file (not the MS.msi file

II. Microsoft Security Settings :

2) Possible issue: Microsoft Security Settings

Security default settings may prevent access of LTpowerCAD II v2.0 from its database causing an e
message to pop up when searching for a part (see below).



**** Note : The installer is made to automatically set up these folder settings. If for some reason you are still getting a similar error please read through the following slides to make sure.**

Important : Make sure you installed using “setup.exe” file (not the MS.msi file

Appendix : Installation Troubleshooting

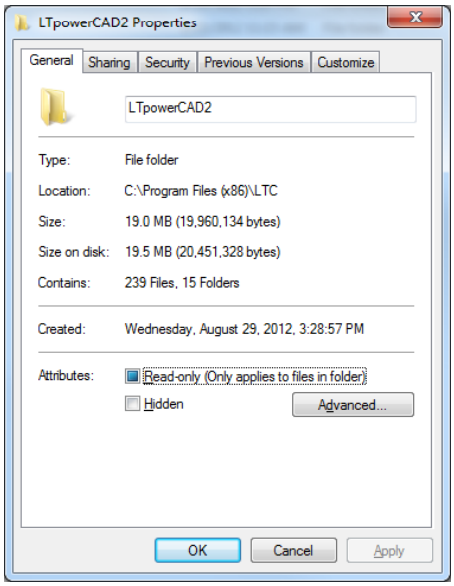
Possible issue solution:

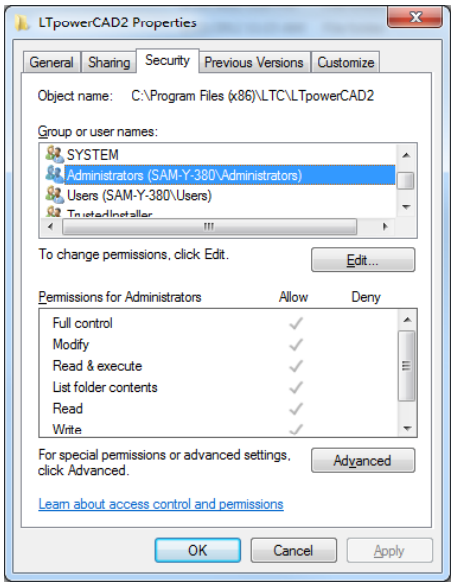
Run the program with an Administrator account , or try to modify your system's Users account secur
for now (see below).

Step 1) Go to the LTC folder location: (ie C:\Program Files (x86)\LTC)

Step 2) Right click on the LTpowerCAD 2 program folder → ***Properties***

Step 3) Click on the ***Security*** tab. Click on your **Administr**
that the permissions should show Allow for all options (excep
permissions). The **SYSTEM** account should also have the sa



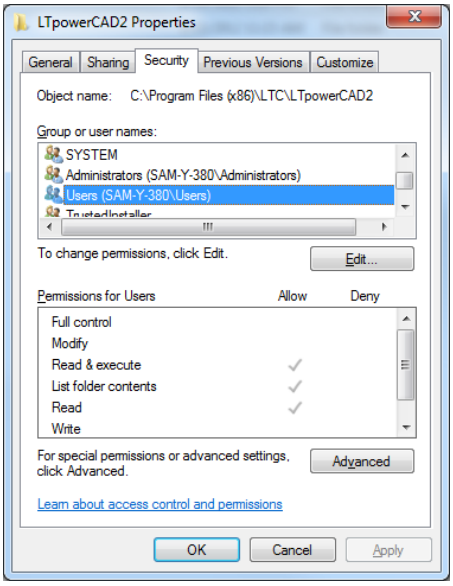


Important : Make sure you installed using "setup.exe" file (not the MS.msi file

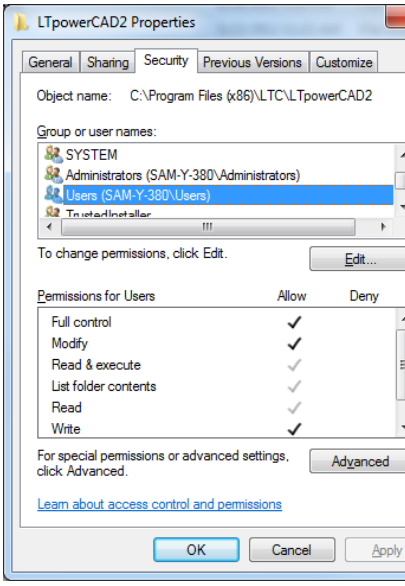
Appendix : Installation Troubleshooting

Possible issue solution (cont'd):

Step 4) Click on your **Users** account to see the user settings. Your user account may not have the permissions set (like shown below) that are needed. You can change these in the next step.



Step5) Click on the **Edit** button and click on your check boxes on the **Allow** column for ***Full control,*** settings should now be the same as you saw for the



Important : Make sure you installed using "setup.exe" file (not the MS.msi file

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