



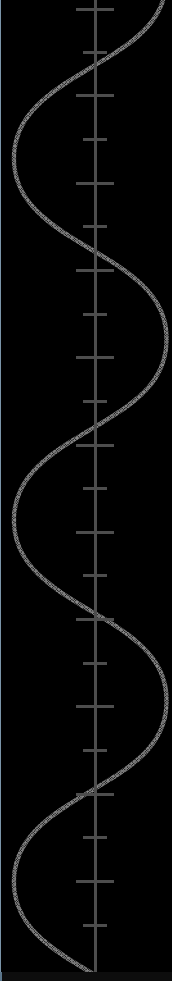
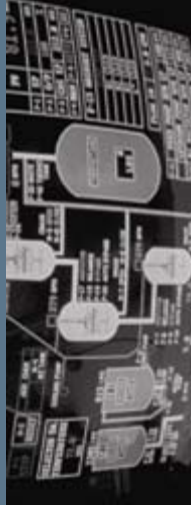
**THE DATASHEET OF
LTC3780IG#TRPBF**



LTPowerCAD™ II

Introduction & Quick Start

Rev



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



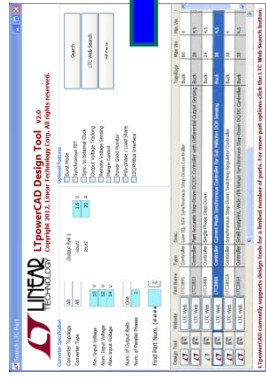
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What is LTpowerCAD Design Tool

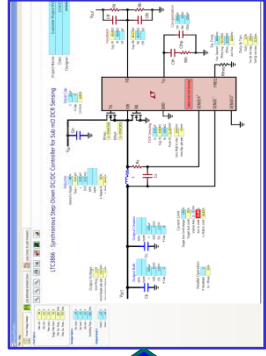
A Complete, Step-by-Step Power Supply Design Tool:



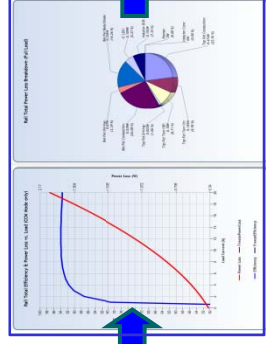
Step-by-Step Power Supply Design:



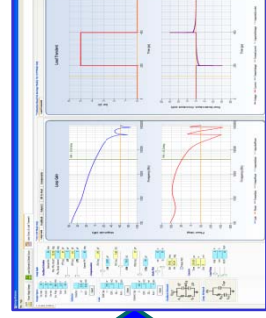
Enter specs,
search solution.



Power Supply
Schematic.



Efficiency &
Power Loss



Loop Stability
& Transient

LTpowerCAD

How is LTpowerCAD Different from LTspice:

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

LTpowerCAD Design Tool :

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

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.

Buck

Buck Converters :

| 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 | |

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

Controller

Monolithic

| 3-output | 2-output | 3-output | 2-output | 1-output |
|----------|----------------|----------|----------------|----------------|
| | LTC3615 | | LTC3615 | LTC3600 |
| | LTC3615(CH1) | | LTC3615(CH1) | LTC3601 |
| | LTC3615(CH2) | | LTC3615(CH2) | LTC3602 |
| | LTC3633 | | LTC3633 | LTC3603 |
| | LTC3633A | | LTC3633A | LTC3604 |
| | LTC3633A-1 | | LTC3633A-1 | LTC3605 |
| | LTC3633A-2 | | LTC3633A-2 | LTC3605A |
| | LTC3633A-3 | | LTC3633A-3 | LTC3415 |
| | LTC3407(CH1) | | LTC3407(CH1) | LTC3405A-1.375 |
| | LTC3407(CH2) | | LTC3407(CH2) | LTC3405A-1.5 |
| | LTC3407-2(CH1) | | LTC3407-2(CH1) | LTC3405A-1.8 |
| | LTC3407-2(CH2) | | LTC3407-2(CH2) | LTC3406/3406B |
| | LTC3407- | | LTC3407- | LTC3405-1.2 |
| | LTC3407- | | LTC3407- | LTC3405-1.5 |
| | LTC3407-4(CH1) | | LTC3407-4(CH1) | LTC3405-1.8 |
| | LTC3407-4(CH2) | | LTC3407-4(CH2) | LTC3406A |
| | LTC3417(CH1) | | LTC3417(CH1) | LTC3406AB |
| | LTC3417(CH2) | | LTC3417(CH2) | LTC3406AB-2 |
| | LTC3417A(CH1) | | LTC3417A(CH1) | LTC3406B-1.2 |
| | LTC3417A(CH2) | | LTC3417A(CH2) | LTC3406B-2 |
| | LTC3417A- | | LTC3417A- | LTC3409 |
| | LTC3417A- | | LTC3417A- | LTC3409A |
| | LTC3419(CH1) | | LTC3419(CH1) | LTC3410 |
| | LTC3419(CH2) | | LTC3419(CH2) | LTC3410-1.2 |
| | LTC3547(CH1) | | LTC3547(CH1) | LTC3410-1.65 |
| | LTC3547(CH2) | | LTC3547(CH2) | LTC3410-1.875 |
| | | | | LTC3410B |
| | | | | LTC3411 |
| | | | | LTC3411A |
| | | | | LTC3412 |
| | | | | LTC3412A |
| | | | | LTC3413 |
| | | | | LTC3414 |
| | | | | LTC3416 |
| | | | | LTC3549 |
| | | | | LTC3561 |
| | | | | LTC3568 |

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.

Boost Converters :

Boost
Polyphase (Bold)

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

Updated:

Controller

| | | |
|----------|----------|-------------------------------|
| 3-output | 2-output | 1-output |
| | LTC3788 | LTC3787 LTC3862 LTC3786 |

Monolithic

| | | |
|----------|----------|----------|
| 3-output | 2-output | 1-output |
| | | |

µModule Regulator®

| | |
|----------|----------|
| 3-output | 2-output |
| | |

Buck-Boost
Polyphase (Bold)

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

Updated:

Controller

| | | |
|----------|----------|----------|
| 3-output | 2-output | 1-output |
| | | |

Monolithic

| | | |
|----------|----------|----------|
| 3-output | 2-output | 1-output |
| | | |

µModule Regulator®

| | |
|----------|----------|
| 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, which is freely downloaded at www.microsoft.com.
- Many new computers may already have SQL Server Compact 3.5SP2 installed (check to see if it is installed)

Minimum Requirements (cont'd)

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

Control Panel Home

View installed updates
Turn Windows features on or off

Install a program from the network

Control Panel > Programs > Programs and Features

Uninstall or change a program

To uninstall a program, select it from the list and then click Uninstall, Change, or Repair.

| Name | Publisher | Installed On | Size | Version |
|--|-----------------------|--------------|----------------|----------------|
| Microsoft .NET Framework 4 Client Profile | Microsoft Corporation | 6/14/2010 | 38.8 MB | 4.0.30319 |
| Microsoft .NET Framework 4 Extended | Microsoft Corporation | 6/14/2010 | 51.9 MB | 4.0.30319 |
| Microsoft .NET Framework 4 Multi-Targeting Pack | Microsoft Corporation | 6/14/2010 | 83.4 MB | 4.0.30319 |
| Microsoft ASP.NET MVC 2 | Microsoft Corporation | 6/15/2010 | 482 KB | 2.0.50717.0 |
| Microsoft ASP.NET MVC 2 - Visual Studio 2010 Tools | Microsoft Corporation | 6/15/2010 | 2.25 MB | 2.0.50717.0 |
| Microsoft Expression Blend 3 SDK | Microsoft Corporation | 1/18/2011 | 8.71 MB | 1.0.1343.0 |
| Microsoft Expression Blend 4 | Microsoft Corporation | 1/18/2011 | 4.0.20525.0 | 4.0.20525.0 |
| Microsoft Expression Blend SDK for .NET 4 | Microsoft Corporation | 1/18/2011 | 9.70 MB | 2.0.20525.0 |
| Microsoft Expression Blend SDK for Silverlight 4 | Microsoft Corporation | 1/18/2011 | 11.1 MB | 2.0.20525.0 |
| Microsoft Expression Design 4 | Microsoft Corporation | 1/18/2011 | 7.0.20516.0 | 7.0.20516.0 |
| Microsoft Expression Encoder 4 Pro | Microsoft Corporation | 1/18/2011 | 4.0.1639.0 | 4.0.1639.0 |
| Microsoft Expression Encoder 4 Screen Capture Codec | Microsoft Corporation | 1/18/2011 | 675 KB | 4.0.20525.0 |
| Microsoft Expression Studio 4 | Microsoft Corporation | 1/18/2011 | 4.0.20525.0 | 4.0.20525.0 |
| Microsoft Expression Web 4 | Microsoft Corporation | 1/18/2011 | 4.0.1165.0 | 4.0.1165.0 |
| Microsoft Help Viewer 1.0 | Microsoft Corporation | 6/15/2010 | 1.0.30319 | 1.0.30319 |
| Microsoft IntelliPoint 8.2 | Microsoft Corporation | 9/26/2011 | 8.20.468.0 | 8.20.468.0 |
| Microsoft IntelliType Pro 8.2 | Microsoft Corporation | 9/27/2011 | 8.20.469.0 | 8.20.469.0 |
| Microsoft Office Enterprise 2007 | Microsoft Corporation | 6/18/2010 | 12.0.6425.1000 | 12.0.6425.1000 |
| Microsoft Silverlight | Microsoft Corporation | 3/1/2012 | 218 MB | 4.1.10111.0 |
| Microsoft Silverlight 3 SDK | Microsoft Corporation | 6/15/2010 | 31.9 MB | 3.0.40818.0 |
| Microsoft Silverlight 4 SDK | Microsoft Corporation | 6/15/2010 | 51.5 MB | 4.0.50401.0 |
| Microsoft SQL Server 2008 (64-bit) | Microsoft Corporation | 1/18/2011 | 7.94 MB | 10.1.2531.0 |
| Microsoft SQL Server 2008 Browser | Microsoft Corporation | 6/15/2010 | 6.37 MB | 10.1.2531.0 |
| Microsoft SQL Server 2008 Native Client | Microsoft Corporation | 6/15/2010 | 330 KB | 10.50.1447.4 |
| Microsoft SQL Server 2008 R2 Data-Tier Application F... | Microsoft Corporation | 6/15/2010 | 11.8 MB | 10.50.1447.4 |
| Microsoft SQL Server 2008 R2 Data-Tier Application P... | Microsoft Corporation | 6/15/2010 | 15.3 MB | 10.50.1447.4 |
| Microsoft SQL Server 2008 R2 Management Objects | Microsoft Corporation | 6/15/2010 | 10.1 MB | 10.50.1447.4 |
| Microsoft SQL Server 2008 R2 Management Objects (...) | Microsoft Corporation | 6/15/2010 | 5.34 MB | 10.50.1447.4 |
| Microsoft SQL Server 2008 R2 Transact-SQL Language... | Microsoft Corporation | 6/15/2010 | 39.4 MB | 10.1.2731.0 |
| Microsoft SQL Server 2008 Setup Support Files | Microsoft Corporation | 6/15/2010 | 3.94 MB | 10.1.2731.0 |
| Microsoft SQL Server Compact 3.5 SP2 ENU | Microsoft Corporation | 6/15/2010 | 1.51 MB | 3.5.8080.0 |
| Microsoft SQL Server Compact 3.5 SP2, 64-bit ENU | Microsoft Corporation | 6/15/2010 | 10.1 MB | 10.1.2512.8 |
| Microsoft SQL Server Database Publishing Wizard 1.4 | Microsoft Corporation | 6/15/2010 | 2.52 MB | 10.50.1447.4 |
| Microsoft SQL Server System CLR Types | Microsoft Corporation | 6/15/2010 | 848 KB | 10.50.1447.4 |
| Microsoft SQL Server System CLR Types (x64) | Microsoft Corporation | 6/15/2010 | 3.59 MB | 10.1.2531.0 |
| Microsoft SQL Server VSS Writer | Microsoft Corporation | 6/15/2010 | 1.00 MB | 1.0.3010.0 |
| Microsoft Sync Framework Runtime v1.0 SP1 (x64) | Microsoft Corporation | 6/15/2010 | 29.6 MB | 1.0.3010.0 |
| Microsoft Sync Framework SDK v1.0 SP1 | Microsoft Corporation | 6/15/2010 | 2.84 MB | 1.0.3010.0 |
| Microsoft Sync Framework Services v1.0 SP1 (x64) | Microsoft Corporation | 6/15/2010 | 2.84 MB | 1.0.3010.0 |
| Microsoft Sync Services for ADO.NET v2.0 SP1 (x64) | Microsoft Corporation | 6/15/2010 | 541 KB | 2.0.3010.0 |
| Microsoft Team Foundation Server 2010 Object Mod... | Microsoft Corporation | 6/14/2010 | 346 KB | 8.0.59193 |
| Microsoft Visual C++ 2005 Redistributable | Microsoft Corporation | 7/6/2011 | 788 KB | 9.0.30729.4148 |
| Microsoft Visual C++ 2008 Redistributable - x64 9.0.3... | Microsoft Corporation | 6/1/2012 | 223 KB | 9.0.30729.4148 |
| Microsoft Visual C++ 2008 Redistributable - x64 9.0.2... | Microsoft Corporation | 6/1/2012 | 223 KB | 9.0.30729.4148 |

Microsoft Corporation Product version: 3.5.8080.0 Size: 3.39 MB

Help link: <http://go.microsoft.com...>

Installing LTPowerCAD II v2.0™

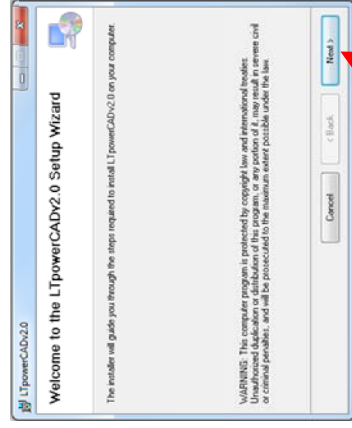
1. Double Click **“Setup.exe”** to Start LTPowerCAD II v2.0™ Design Tool Setup Wizard

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

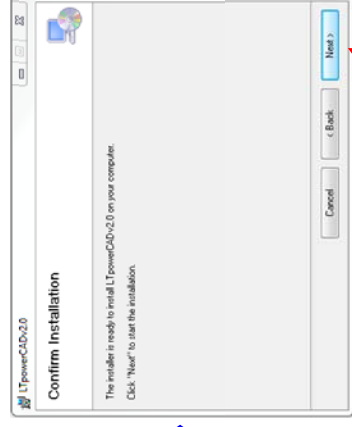


Click **“Next”**

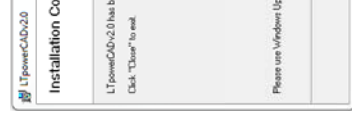


Select Folder

Click **“Next”**

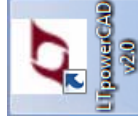


Click **“Next”**



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

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



II. User Interface

Getting Start with LTpowerCAD II

Main Page

The screenshot shows the main page of the LTpowerCAD II v2.0 software. The interface is dark-themed with a top navigation bar. Below the navigation bar, there are several buttons: 'Start New Design', 'Open Existing Design', 'Help', 'LTC Sales Contacts', 'LTC Toolbox', and 'Sync Release'. Yellow arrows point from descriptive text on the left to each of these buttons. The text includes instructions on how to search for parts, open existing designs, view help files, and update the program library. The Linear Technology logo is visible in the bottom right corner of the screenshot.

LTpowerCAD II v2.0

Search for a part based on supply spec. and requirements

Open an existing LTpowerCAD II design file

Open an existing Excel-Based design file

View help file

View LTC Sales Office contacts

Open LTC Toolbox

Update LTpowerCAD II program & program library

Start New Design

Open Existing Design

Help

LTC Sales Contacts

LTC Toolbox

Sync Release

LTpowerCAD II Design Tool v2.0
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LINEAR
TECHNOLOGY

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.

LINEAR TECHNOLOGY **LTPowerCAD Design Tool v2.0 Beta2 (For Internal Use Only)** Copyright 2012, Linear Technology Corp. All rights reserved.

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

Output Rail 1
Vout1: 1.2 V
Iout1: 5 A

Converter Specification
Converter Topology: All
Converter Type: All
Min. Input Voltage: 10.8 V
Nom. Input Voltage: 12 V
Max. Input Voltage: 13.2 V
Num. of Output Rails: One
Num. of Parallel Phases: 1

Find Part Num. (####)

| Design Tool | Website | Part Name | Type | Desc. |
|-------------|---------|-----------|---------|---|
| | LTC Web | LTM4612 | uModule | Ultralow Noise 36VIN, 15VOUT, 5A, DC/DC uModule Regulator |
| | LTC Web | LTM4603 | uModule | 6A DC/DC uModule Regulator with PLL, Output Tracking and Margining |
| | LTC Web | LTM4602HV | uModule | 6A, 28VIN High Efficiency DC/DC uModule Regulator |
| | LTC Web | LTM4602 | uModule | 6A High Efficiency DC/DC uModule Regulator |
| | LTC Web | LTM4618 | uModule | 6A DC/DC uModule Regulator with Tracking and Frequency Synchronization |
| | LTC Web | LTM4606 | uModule | Ultralow EMI 28VIN, 6A DC/DC uModule Regulator |
| | LTC Web | LTM4603-1 | uModule | 6A DC/DC uModule Regulator |
| | LTC Web | LTM4603HV | uModule | 6A, 28VIN DC/DC uModule Regulator with PLL, Output Tracking and Margining |
| | LTC Web | LTM4613 | uModule | EN55022B Compliant 36VIN, 15VOUT, 8A, DC/DC uModule Regulator |
| | LTC Web | LTM4600HV | uModule | 10A, 28VIN High Efficiency DC/DC uModule Regulator |
| | LTC Web | LTM4607 | uModule | 36VIN, 24VOUT High Efficiency Buck-Boost DC/DC uModule Regulator |
| | LTC Web | LTM4609 | uModule | 36VIN, 34VOUT High Efficiency Buck-Boost DC/DC uModule Regulator |

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

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.

Search LTC Part



LTpowerCAD Design Tool V2.0 Beta2 (For Internal F
Copyright 2012, Linear Technology Corp. All rights reserved.

Converter Specification

Converter Topology

Converter Type

Min. Input Voltage

Nom. Input Voltage

Max. Input Voltage

Num. of Output Rails

Num. of Parallel Phases

Find Part Num. (####)

Go

Output Rail 1

Vout1

Iout1

1.2 V

5 A

Optional Features

Burst Mode

Synchronous FET

Sync. to External Clock

Output Voltage Tracking

Remote Voltage Sensing

Margin Control

Power Good Monitor

Poly-phase / Load Share

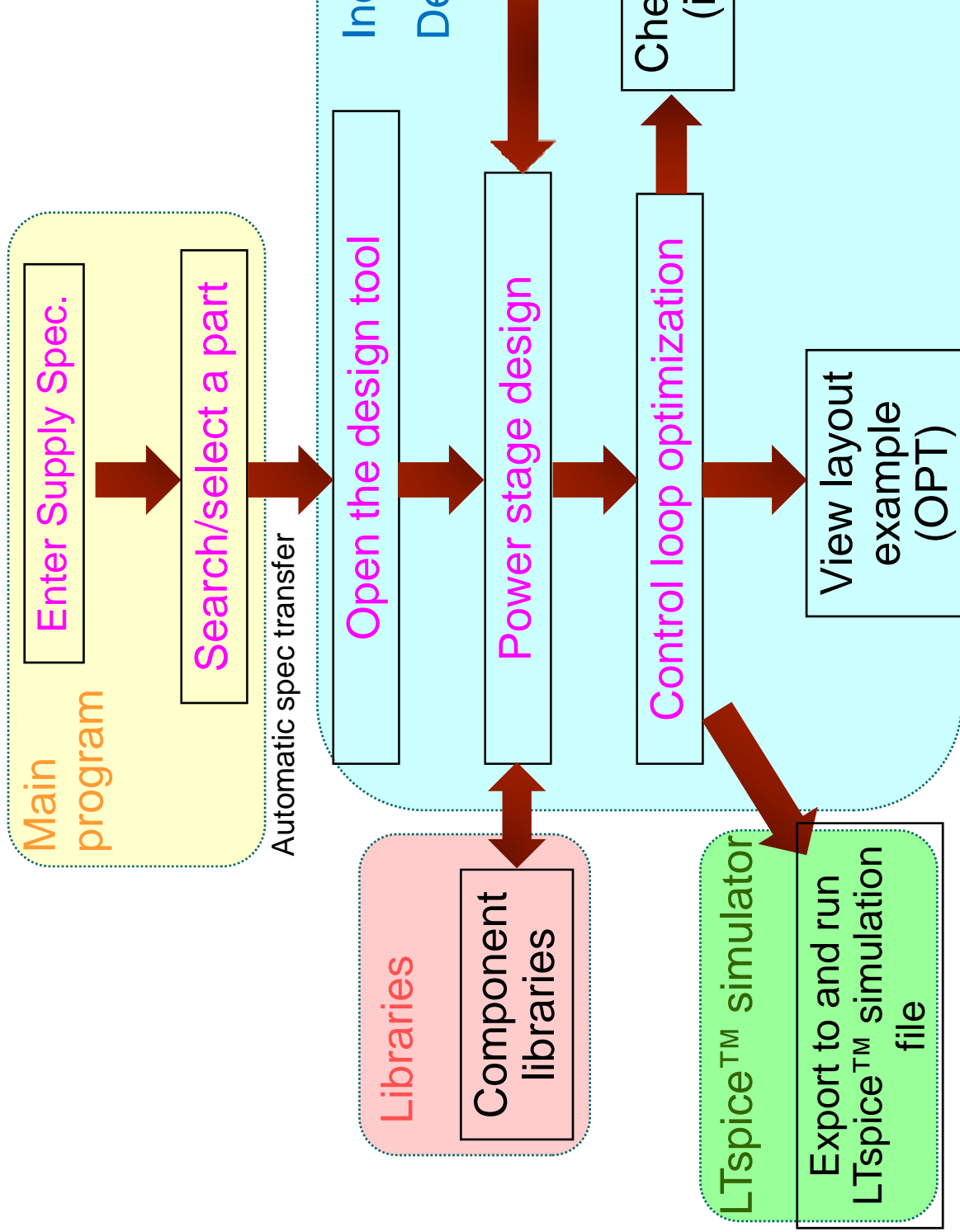
I2C/PMBus Interface

| Design Tool | Website | Part Name | Type | Desc. |
|-------------|---------|-----------|---------|---|
| | LTC Web | LTM4612 | uModule | Ultralow Noise 36VIN, 15VOUT, 5A, DC/DC uModule Regulator |
| | LTC Web | LTM4603 | uModule | 6A DC/DC uModule Regulator with PLL, Output Tracking and Margining |
| | LTC Web | LTM4602HV | uModule | 6A, 28VIN High Efficiency DC/DC uModule Regulator |
| | LTC Web | LTM4602 | uModule | 6A High Efficiency DC/DC uModule Regulator |
| | LTC Web | LTM4618 | uModule | 6A DC/DC uModule Regulator with Tracking and Frequency Synchronization |
| | LTC Web | LTM4606 | uModule | Ultralow EMI 28VIN, 6A DC/DC uModule Regulator |
| | LTC Web | LTM4603-1 | uModule | 6A DC/DC uModule Regulator |
| | LTC Web | LTM4603HV | uModule | 6A, 28VIN DC/DC uModule Regulator with PLL, Output Tracking and Margining |
| | LTC Web | LTM4613 | uModule | EN55022B Compliant 36VIN, 15VOUT, 8A, DC/DC uModule Regulator |
| | LTC Web | LTM4600HV | uModule | 10A, 28VIN High Efficiency DC/DC uModule Regulator |
| | LTC Web | LTM4607 | uModule | 36VIN, 24VOUT High Efficiency Buck-Boost DC/DC uModule Regulator |
| | LTC Web | LTM4609 | uModule | 36VIN, 34VOUT High Efficiency Buck-Boost DC/DC uModule Regulator |

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

Step-By-Step Supply Design Process

using the LTpowerCAD™ Design Process





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

Design Step 1 – Power Stage Design

Yellow Cells = Suggested values or calculated parameters

Blue Cells = User's chosen values

Design Requirements & Part Limits

LTC3838 - Dual, Fast, Accurate Step-Down DC/DC Controller with Differential Output Sensing

Project Name: _____ Date: _____ Designer: _____

Part Specs

| | |
|------------------|----------|
| Max Vin: | 38 V |
| Min Vin: | 4.5 V |
| Max Vout: | 5.5 V |
| Sugg. Max. Iout: | 30 A |
| Min Sw. Freq.: | 200 kHz |
| Max Sw. Freq.: | 2000 kHz |

Design Specs

| | |
|------------------|---------|
| Vin max: | 15 V |
| Vin nom: | 10 V |
| Vin min: | 5 V |
| Switching Freq.: | 370 kHz |

Output Rail 1

| | |
|--------|-------|
| Vout1: | 1.2 V |
| Iout1: | 10 A |

Output Rail 2

| | |
|--------|-------|
| Vout2: | 1.8 V |
| Iout2: | 8 A |

Current Limit

| | |
|---|---------|
| Target I _L Ripple %: | 40% |
| Target I _L Limit: | 15 A |
| I _L @ Target I _L Limit: | 15.95 A |
| I _L @ Target I _L Limit: | 14.05 A |

DCR Current Sensing

| | |
|---|---------|
| Actual V _{IRNG} : | 0.5 V |
| V _{IRNG} max. Prop.: | 30 mV |
| Actual I _{IRNG} : | 32.9 A |
| I _L @ I _{IRNG} Limit: | 32.9 A |
| I _L @ I _{IRNG} Limit: | 31.5 A |
| V _{IRNG1} @ I _{IRNG} Max: | 74.1 mV |
| V _{IRNG1} @ I _{IRNG} Max: | 59 mV |
| V _{IRNG1} R _{IP} (pk-pk): | 15.1 mV |

DCR Current Sensing

| | |
|---|---------|
| Actual V _{IRNG} : | 0.5 V |
| V _{IRNG} max. Prop.: | 30 mV |
| Actual I _{IRNG} : | 32.9 A |
| I _L @ I _{IRNG} Limit: | 32.9 A |
| I _L @ I _{IRNG} Limit: | 31.5 A |
| V _{IRNG2} @ I _{IRNG} Max: | 63.8 mV |
| V _{IRNG2} @ I _{IRNG} Max: | 42.7 mV |
| V _{IRNG2} R _{IP} (pk-pk): | 11.1 mV |

Inductor

| | |
|----------------------------------|---------|
| Desired I _L Ripple %: | 40% |
| Sugg. L ₁ : | 0.71 µH |
| L ₁ : | 1.5 µH |
| DCR: | 10.4 mΩ |

Inductor

| | |
|----------------------------------|---------|
| Desired I _L Ripple %: | 40% |
| Sugg. L ₂ : | 1.25 µH |
| L ₂ : | 1.5 µH |
| DCR: | 10.4 mΩ |

Output Ceramic

| | |
|---------|-------|
| MFR: | |
| Part #: | |
| C: | 10 µF |
| ESR: | 3 mΩ |
| ESL: | 2 nH |
| # Cap: | 1 |

Output Bulk

| | |
|---------|--------|
| MFR: | |
| Part #: | |
| C: | 330 µF |
| ESR: | 9 mΩ |
| ESL: | 2 nH |
| # Cap: | 1 |

Feedback

| | |
|---------|---------|
| MFR: | |
| Part #: | |
| C: | 604 kΩ |
| ESR: | 60.4 kΩ |
| ESL: | 0.8 mH |
| # Cap: | 1 |

Compensation

| | |
|--------------------|---------|
| MFR: | |
| Part #: | |
| C _{CH1} : | 2200 pF |
| R _{CH1} : | 315 kΩ |
| R _{CH2} : | 315 kΩ |
| C _{CH2} : | 2200 pF |

Compensation

| | |
|--------------------|---------|
| MFR: | |
| Part #: | |
| C _{CH1} : | 2200 pF |
| R _{CH1} : | 315 kΩ |
| R _{CH2} : | 315 kΩ |
| C _{CH2} : | 2200 pF |

Duty & Ton

| | |
|-----------------|---------|
| Vout1 Duty: | 12% |
| Ton1 @ Vin Max: | 216 ns |
| Ton1 @ Vin Min: | 2054 ns |

Duty & Ton

| | |
|-----------------|---------|
| Vout2 Duty: | 18% |
| Ton2 @ Vin Max: | 324 ns |
| Ton2 @ Vin Min: | 1720 ns |

Select different current

- 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

The screenshot displays the LTpowerCAD II v2.0 software interface. At the top, the 'Design Specs' section shows: Vin max: 15 V, Vin nom: 10 V, Vin min: 5 V, Sw. Freq: 370 kHz, Iout: 10 A, Vout: 1.2 V. Below this, the 'Inductor' section is highlighted with a dashed blue box, showing L: 1.5 uH, DCR: 10.4 mΩ. The 'MOSFET' section is also highlighted, showing Top MOSFET QT (FDM5758) and Bottom MOSFET QB (FDM5558) with various parameters like Vds, Qg, Qrs, Rg, and Vth. A circuit diagram of a power stage is shown at the bottom left. On the right, a 'Rail Total Power Loss @ Full Load' summary table is visible, showing Pin: 13.629 W, Pout: 1.2 W, Ploss: 1.629 W, and η: 88.05%. The main plot area shows 'Rail Total Efficiency & Power Loss vs. Load (CCM Mode only)' with Efficiency (%) on the y-axis and Load Current (A) on the x-axis. A red curve represents Power Loss and a blue curve represents Efficiency. A 'Freeze Plots' button is located below the plot. To the right of the plot is a 'Rail Total Power Loss Breakdown' pie chart with labels for Inductor DCR (1.068W, 65.48%), I.C. LDO (0.08W, 4.90%), and Bot. Fet. Body Diode (0.079W, 4.84%).

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

LTpowerCAD II v2.0

File Help Power Stage Design Loss Estimate & Break Down Loop Comp. & Load Transient

Design Specs
 Vin max: 12 V
 Vin nom: 12 V
 Vin min: 12 V
 Sw. Freq: 500 kHz
 Vout: 1 V
 Iout: 20 A

Inductor
 L: 0.3 μH
 DCR: 1 mΩ

Inductor Loss
 DCR Loss: W
 Core Loss: W
 Total Loss: W

Back

Top MOSFET QT
 Vendor: Fairchild
 Part: FDM5585S
 Vds: 25 V
 Qg: 38 nC
 Rds(on): 1.3 mΩ
 Rg: 0.9 Ω
 Vds: 0.6 V
 Ploss: W (Each Fet)
 Bypass: °C/W
 ΔTj-x: °C

Bottom MOSFET QB
 Vendor: Fairchild
 Part: FDM5585S
 Vds: 25 V
 Qg: 38 nC
 Rds(on): 1.3 mΩ
 Rg: 0.9 Ω
 Vds: 0.6 V
 Ploss: W (Each Fet)
 Bypass: °C/W
 ΔTj-x: °C

Estimate
 Win: 12 V
 Freeze Plot
 External Bias
 EXTVC: V
 Rail Total Power Loss @ Full Load
 Pin: W
 Pout: W
 Ploss: W
 n: %
 Cursors
 Iout: 0 A
 Eff: 0 %
 Ploss: 0 W

Update Plots

Power MOSFET Library

Filter In Parts: *

| Vendor | Part Name | Vds (V) | Rds(on) (mΩ) | Qg (nC) | Qgd (nC) | Qgs (nC) | Rg (Ω) | Vdiode (V) | Vmiller (V) | Vth (V) | Package | Chan |
|----------|--------------|---------|--------------|---------|----------|----------|--------|------------|-------------|---------|----------|------|
| Renesas | RJMG301 | 30 | 3 | 14.5 | 2 | 14.5 | 2 | 0.84 | 3 | 2.5 | LFP4K | N |
| Renesas | RJMG305 | 30 | 10 | 8 | 3 | 3.6 | 0.6 | 0.85 | 3 | 2.5 | LFP4K | N |
| Infineon | BSC019N02K | 20 | 1.6 | 64 | 11 | 19 | 1.90 | 0.80 | 1.90 | 1.0 | PG-TDSON | N |
| Infineon | BSC028N02K | 20 | 2.1 | 40 | 7 | 11.4 | 1.50 | 0.85 | 1.90 | 1.0 | PG-TDSON | N |
| Infineon | BSC046N02K | 20 | 3.5 | 21 | 4 | 6.5 | 1.90 | 0.90 | 2.10 | 1.0 | PG-TDSON | N |
| Infineon | BSC010N02L | 25 | 1.1 | 31 | 6.8 | 11 | 0.60 | 0.80 | 2.40 | 1.6 | PG-TDSON | N |
| Infineon | BSC010N02L | 25 | 1.1 | 29 | 6.9 | 10 | 0.60 | 0.56 | 2.40 | 1.6 | PG-TDSON | N |
| Infineon | BSC014N02L | 25 | 1.6 | 18.7 | 4.7 | 6.8 | 0.60 | 0.56 | 2.50 | 1.6 | PG-TDSON | N |
| Infineon | BSC018N02L | 25 | 1.8 | 19 | 4.3 | 7 | 0.80 | 0.85 | 2.50 | 1.6 | PG-TDSON | N |
| Infineon | BSC0911N0... | 25 | 1.3 | 25 | 5.5 | 8.8 | 0.60 | 0.79 | 2.30 | 1.6 | PG-TDSON | N |
| Infineon | BSC0911N0... | 25 | 3.7 | 7.7 | 1.8 | 3 | 0.90 | 0.84 | 2.60 | 1.6 | PG-TDSON | N |

User Parts:

| Vendor | Part Name | Vds (V) | Rds(on) (mΩ) | Qg (nC) | Qgd (nC) | Qgs (nC) | Rg (Ω) | Vdiode (V) | Vmiller (V) | Vth (V) | Package | Chan |
|-----------|-----------|---------|--------------|---------|----------|----------|--------|------------|-------------|---------|---------|------|
| Fairchild | FDM5585S | 25 | 1.3 | 38 | 9.7 | 10 | 0.90 | 0.60 | 2.10 | 1.7 | POWER56 | N |
| Fairchild | FDM57278 | 25 | 6.3 | 8 | 1.7 | 3.7 | 1.20 | 0.83 | 2.90 | 2.0 | POWER56 | N |

Add A New User Part:

| Vendor | Part Name | Vds (V) | Rds(on) (mΩ) | Qg (nC) | Qgd (nC) | Qgs (nC) | Rg (Ω) | Vdiode (V) | Vmiller (V) | Vth (V) | Package | Chan |
|--------|-----------|---------|--------------|---------|----------|----------|--------|------------|-------------|---------|---------|------|
| | | | | | | | | | | | | |

Vendor Links

FAIRCHILD SEMICONDUCTOR
 VISHAY
 infineon
 RENE

Cancel / Exit

Click "Select" to open MOSFET lib

Popular vendor weblinks

Power Component Library - Inductor

LTpowerCAD II v2.0

File Help

Power Stage Design

Loop Comp. & Load Transient

Design Specs

Output Ball # 1

Top MOSFET Q1

Vendor: Fairchild
Part: FDM5558S
Vds: 25 V
Fets: 1 pcs

Bottom MOSFET Q2

Vendor: Fairchild
Part: FDM5558S
Vds: 25 V
Fets: 1 pcs

Inductor

L: 0.3 uH
DCR: 1 mΩ

Inductor Loss

DCR Loss: W
Core Loss: W
Total Loss: W

Back

Worst Case

V_{IN} V_{OUT}

Estimate

V_{in}: 12 V
Freeze Plot

External Bias

EXTVCC: V

Rail Total Power Loss @ Full Load

Pin: W
Pout: W
Ploss: W
η: %

Cursors

Iout: 0 A
Eff: 0 %
Ploss: 0 W

Power INDUCTOR Library

Build-In Parts:

| Vendor | Part Name | Inductance (uH) | L Tol. (%) | DCR (mΩ) | DCR Tol. (%) | ISat (A) | L Decrease (%) | IHeat (A) | Temp. Rise (C) | Core |
|--------|-------------|-----------------|------------|----------|--------------|----------|----------------|-----------|----------------|---------|
| VITEC | 59P8903 | 0.32 | 10 | 0.17 | 10.00 | 50.00 | 20.00 | 80.00 | 40.00 | Ferrite |
| VITEC | 59P8904 | 0.44 | 10 | 0.17 | 10.00 | 35.00 | 20.00 | 80.00 | 40.00 | Ferrite |
| VITEC | 59P9873N | 0.22 | 15 | 0.29 | 10.00 | 47.00 | 20.00 | 48.00 | 40.00 | Ferrite |
| VITEC | 59P9874N | 0.30 | 15 | 0.29 | 10.00 | 34.00 | 20.00 | 48.00 | 40.00 | Ferrite |
| VITEC | 59P9875N | 0.40 | 15 | 0.29 | 10.00 | 23.00 | 20.00 | 48.00 | 40.00 | Ferrite |
| VITEC | 59P9876N | 0.51 | 15 | 0.29 | 10.00 | 17.00 | 20.00 | 48.00 | 40.00 | Ferrite |
| WURTH | 744 301 025 | 0.22 | 20 | 0.32 | 10.00 | 65.00 | 20.00 | 40.00 | 50.00 | MnZn |
| WURTH | 744 301 033 | 0.33 | 20 | 0.32 | 10.00 | 46.00 | 20.00 | 40.00 | 50.00 | MnZn |
| WURTH | 744 301 047 | 0.47 | 20 | 0.32 | 10.00 | 35.00 | 20.00 | 40.00 | 50.00 | MnZn |
| WURTH | 744 304 022 | 0.22 | 20 | 0.17 | 10.00 | 23.00 | 20.00 | 26.00 | 50.00 | Ferrite |
| WURTH | 744 306 030 | 0.30 | 20 | 0.26 | 10.00 | 24.00 | 20.00 | 26.00 | 50.00 | Ferrite |

User Parts:

| Vendor | Part Name | Inductance (uH) | L Tol. (%) | DCR (mΩ) | DCR Tol. (%) | ISat (A) | L Decrease (%) | IHeat (A) | Temp. Rise (C) | Core |
|----------|-------------|-----------------|------------|----------|--------------|----------|----------------|-----------|----------------|---------|
| COLCRAFT | SERLE90-333 | 0.33 | 20 | 0.77 | 20 | 43 | 20 | 16.9 | 40 | Ferrite |

Add A New User Part:

| Vendor | Part Name | Inductance (uH) | L Tol. (%) | DCR (mΩ) | DCR Tol. (%) | ISat (A) | L Decrease (%) | IHeat (A) | Temp. Rise (C) | Core |
|--------|-----------|-----------------|------------|----------|--------------|----------|----------------|-----------|----------------|------|
| | | | | | | | | | | |

Vendor Search Tools

Coilcraft
VISHAY
VITEC
TDK
MURATA
sumida

Click "Select" to open inductor library.

Popular vendor weblink / web-search site.

Design Step 3 – Optimize Loop Comp & Load Trans

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

View data for each rail

The screenshot displays the LTpowerCAD II v2.0 software interface. At the top, the 'Design Specs' section lists parameters: Vin max: 13.2 V, Vin nom: 12 V, Vin min: 10.8 V, Sw. Freq: 335 kHz, Vout: 1.2 V, Iout: 15 A. Below this, the 'Loop Gain' section shows a 'Feedback Divider' with a 'Desired BW' of 66.88 kHz and a 'Max. Phs. Boost' of 11.54 dB. The 'Compensation' section includes a 'Bulk Cap' of 330 uF, a 'Ceramic Cap' of 10 uF, and a 'Cmp Sng' of 83 pF. The 'Bode Plot' section shows a 'BW' of 34.67 kHz and a 'PM' of 69.78 deg. The bottom right features a 'Comp. Network' schematic diagram with components R_T , C_{FF} , R_B , C_{THP} , and R_{THP} .

Two blue dashed boxes highlight the 'Loop Gain' and 'Phase' plots. A blue arrow points to the 'Loop Gain' plot, which shows a magnitude of approximately 60 dB at 100 kHz. Another blue arrow points to the 'Phase' plot, which shows a phase margin of approximately 70 degrees at 100 kHz. A third blue arrow points to the 'Export' button in the bottom right corner of the plots area.

At the bottom of the interface, there are two more plots: 'Load Transient' showing 'Iout (A)' and 'Vout Undershoot, Overshoot (mV)' over time, and a 'FreezeCurrent' plot. A blue arrow points to the 'FreezeCurrent' plot.

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 Simulation

LTpowerCAD II v2.0

File Help

Power Stage Design Loop Comp. & Load Transient

Loss Estimate & Break Down

Part Specs

| | |
|-----------------|----------|
| Max Vin: | 38 V |
| Min Vin: | 4.5 V |
| Max Vout: | 5.5 V |
| Sugg. Max Iout: | 30 A |
| Min Sw. Freq.: | 200 kHz |
| Max Sw. Freq.: | 2000 kHz |

Design Specs

| | |
|------------------|---------|
| Vin max: | 15 V |
| Vin nom: | 10 V |
| Vin min: | 5 V |
| Switching Freq.: | 370 kHz |

Output Rail 1

| | |
|--------|-------|
| Vout1: | 1.2 V |
| Iout1: | 10 A |

Output Rail 2

| | |
|--------|-------|
| Vout2: | 1.8 V |
| Iout2: | 8 A |

Current Limit

| | |
|---------------------------------------|---------|
| Target Iout1 Limit (pp) | 15.85 A |
| I _{pk} @ Target Iout1 Limit | 15.85 A |
| I _{avg} @ Target Iout1 Limit | 14.05 A |

Output Voltage

| | |
|---------------------|--------|
| Vout1 Peak | 1.2 V |
| Vout1 Ripple (pp) | 1.6 mV |
| ΔVout1/Vout1 Ripple | 1.6 % |

Output Bulk

| | |
|-------|------|
| ESR | 9 mΩ |
| ESL | 2 nH |
| # Csp | 1 |

Output Ceramic

| | |
|-------|------|
| ESR | 3 mΩ |
| ESL | 3 nH |
| # Csp | 1 |

DCR Current Sens

| | |
|--|---------|
| Act. I _{o1} Limit | 8.59 A |
| LL Pk@I _{o1} Limit | 6.59 A |
| Vinst1_Pk@I _{o1} Max | 74.1 mV |
| Vinst1_V _{avg} @I _{o1} Max | 59 mV |
| Vinst1_Rip. (pp-pk) | 15.1 mV |

Duty & Ton

| | |
|----------------|--------|
| Vout2 Duty | 11 % |
| Ton1 @ Vin Max | 215 ns |
| Ton1 @ Vin Min | 255 ns |

Project Name: _____
Date: _____
Designer: _____

LTC3838 - Dual Fast, Accurate Step-Down DC/DC Controller with Differential Output Sensing

LTspice IV - LTC3838 circuit.raw

File View Plot Settings Simulation Tools Window Help

LTC3838 circuit.asc LTC3838 circuit.raw

LTC3838 circuit.asc LTC3838 circuit.raw

Vin

V(p007)

I(L2)

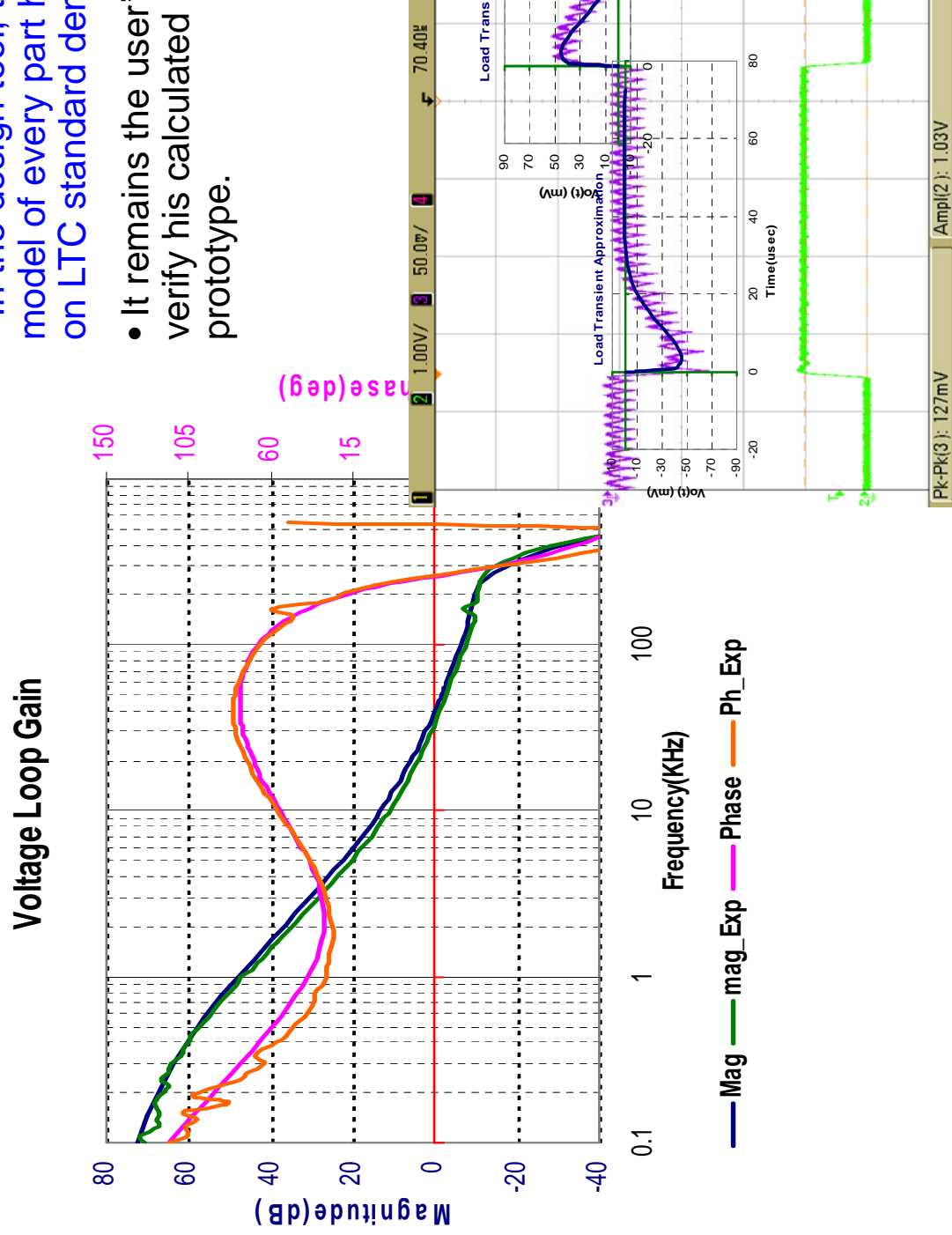
11V 9V 7V 5V 3V 1V -1V

6.3A 1.4A -3.6A 0ps

0ps 80μs 160μs 240μs 320μs 400μs 480μs 560μs 640μs

Bench Verified Loop and Load Transient

- In the design tool, the model of every part is on LTC standard der
- It remains the user verify his calculated prototype.



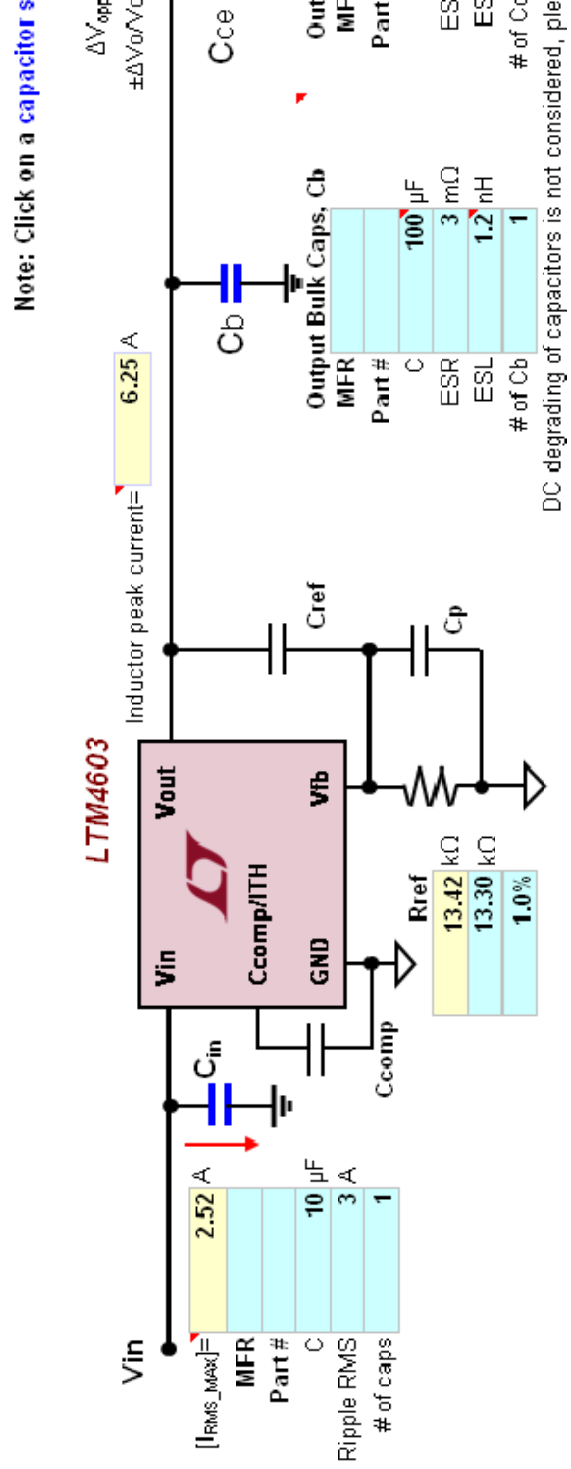


Example of a **Excel-Based** design Tool

Step 1: Power Components Selection

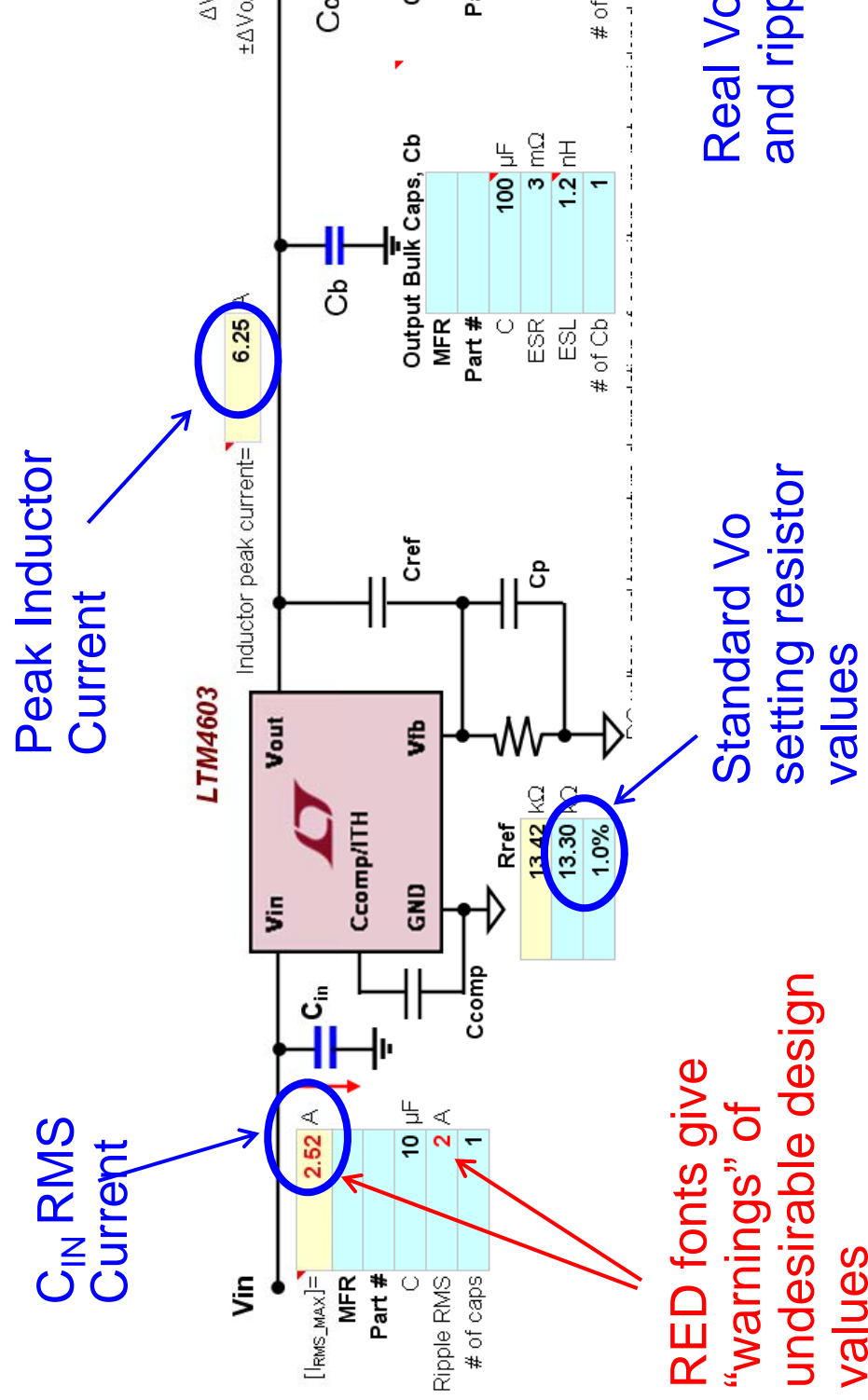
In the design spreadsheet, power components design is guided with schematic interface:

Values in yellow cells are calculated / recommended by design tool



Values in blue / entered

Power Stage Performances



Step 2: Control Loop Optimization

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

Sliding bar for compensation

Part II - Small Signal Modeling and Compensation Tuning
 Compensation Component Tuning and Design Verification

| | | |
|---|--|--|
| Remote sense | <input checked="" type="checkbox"/> Differential Sensing | <input type="checkbox"/> Direct Local Sensing |
| C _{comp} | 47 pF | |
| V _{ref} | 9.79 V | |
| I _{load} | 5.00 A | |
| Actual voltage loop bandwidth, [k _{v,actual}] | 35.11 kHz | Actual voltage loop phase margin, [φ _{v,actual}]= 80 |

Voltage Loop Gain
 Magnitude (dB) vs Frequency (kHz). Legend: Magitude (blue solid), Phase (magenta solid), f_c (green dashed), f_{sw/2} (red dashed). A red arrow points to the phase curve.

Output Impedance
 Magnitude (mohm) vs Frequency (kHz). Legend: Magitude (blue solid), Phase (magenta solid). A red oval highlights the phase margin area.

Load Transient Approximation (Second Order Approximation; duty cycle and error amplifier saturation is not taken into account valid only with stable system)
 Load Step, [Istep]= 4 A, Absolute Load Step slew rate, [dI/dt]= 1 A/μsec

Load transient prediction
 A schematic shows a converter connected to a load. A red arrow points to a 0A load transient step. Below it, a graph shows the average Vout overshoot/undershoot @ Load Transient, with a value of -100.17 mV. A red arrow points to this value.

Additional Feature (2):

Summary of design: BOM, size, cost and

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

Summary of Design

Bill of Material of Power Components

| Component | Part # | # of parts | Value | Unit | ⌀ inch | C mm | | | Unit Price | Total Price |
|----------------|-------------|------------|-------------|--------------------|---------|-------|-------|-------|------------|-------------|
| | | | | | | L | W | H | | |
| Cin (bulk) | 0 | 1 | 100 μ F | 1210 | Package | 0.098 | 0.126 | N/A | | \$0.00 |
| Cin (ceramic) | | | μ F | 1206 | | 0.063 | 0.126 | N/A | | \$0.00 |
| Cout (bulk) | 2R5TPE220MC | 0 | 220 μ F | 0805 | | 0.049 | 0.079 | N/A | | \$0.00 |
| Cout (ceramic) | 0.00 | 1 | 72 μ F | 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 Voltage | | 7.000 | 12.000 | 14.000 | V |
| Output Voltage | | 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 welcome.

Please forward your comments to the addresses below.

LTpowerCAD@Linear.com

LTpowerCAD II v2.0™

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 database. If this is not installed, the program may have issues accessing information for parts included in the product catalog. An 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 reinstallation of this requirement.*



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

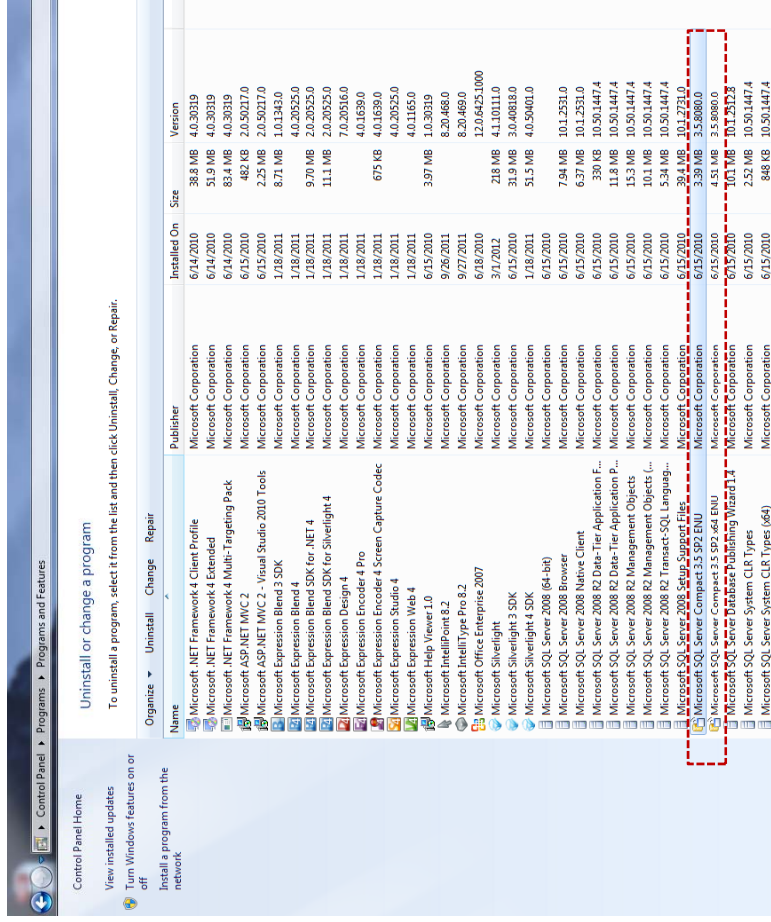
Important : Make sure you installed using “setup.exe” file (not the MS.msi file)

Appendix : Installation Troubleshooting

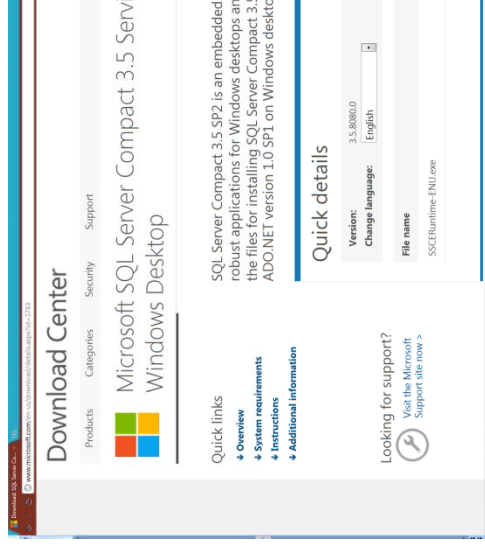
Possible issue solution:

Check the programs you have currently installed on your system to see if Microsoft SQL Server Compact requirement is missing or not. The LTPowerCAD II v2.0 installer automatically checks if you have this requirement will download and install it automatically. This can also be freely downloaded at Microsoft at <http://www.microsoft.com/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 → Programs and Features → Uninstall a program



Step 2) If this is not installed, this can be downloaded at <http://www.microsoft.com/en-us/download/details.aspx?id=5783> and install this package, then try to un-install / re-install LTPowerCAD II v2.0.



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

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

Appendix : Installation Troubleshooting

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 error message to pop up when searching for a part (see below).

The screenshot displays the LTpowerCAD II v2.0 software interface. The main window shows the 'Converter Specification' section with the following settings:

- Converter Topology: All
- Converter Type: All
- Output Rail 1: Vout1 (2.5 V, 5 A)
- Output Rail 2: Vout2 (1 V, 20 A)
- Min. Input Voltage: 12 V
- Nom. Input Voltage: 12 V
- Max. Input Voltage: 12 V
- Num. of Output Rails: Two
- Find Part by Num. (###): [] [Go]

The 'Optional Features' section includes:

- Burst Mode:
- Synchronous FET:
- Sync. to External Clock:

An error dialog box is open, displaying the following message:

```
System.Data.EntityException: The underlying provider failed on Open. --->
System.Data.SqlClient.SqlCeException: Access to the database file is not
allowed. [ File name = C:\Program Files (x86)\LTC\LTpowerCAD2\LTDatBase.sdf
]
at System.Data.SqlClient.SqlCeConnection.ProcessResults(Int32 hr)
at System.Data.SqlClient.SqlCeConnection.Open(Boolean silent)
at System.Data.SqlClient.SqlCeConnection.Open()
at System.Data.EntityClient.EntityConnection.OpenStoreConnectionIf(Boolean
openCondition, DbConnection storeConnectionToOpen, DbConnection
originalConnection, String exceptionCode, String attemptedOperation, Boolean&
closeStoreConnectionOnFailure)
--- End of inner exception stack trace ---
at System.Data.EntityClient.EntityConnection.OpenStoreConnectionIf(Boolean
openCondition, DbConnection storeConnectionToOpen, DbConnection
originalConnection, String exceptionCode, String attemptedOperation, Boolean&
closeStoreConnectionOnFailure)
at System.Data.EntityClient.EntityConnection.Open()
at System.Data.Objects.ObjectContext.EnsureConnection()
at System.Data.Objects.ObjectQuery`1.GetResults(Nullable`1 forMergeOption)
at
System.Data.Objects.ObjectQuery`1.System.Collections.Generic.ICollection`1.
GetEnumerator()
at System.Collections.Generic.List`1..ctor(IEnumerable`1 collection)
at System.Linq.Enumerable.ToList[TSource](IEnumerable`1 source)
at LTpowerCAD.PartSearchWindow.SearchButton_Click(Object sender,
RoutedEventArgs e)
OK
```

**** 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.**

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

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

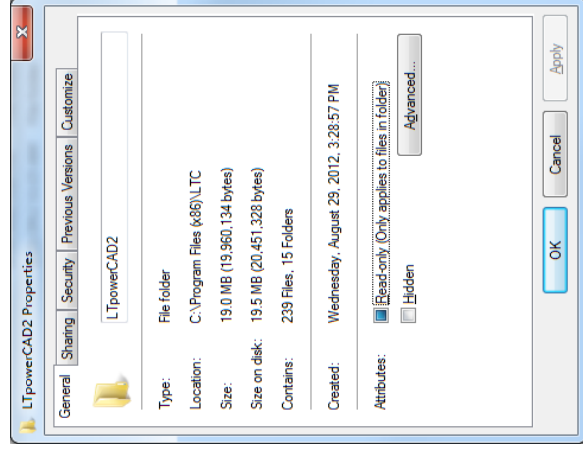
Appendix : Installation Troubleshooting

Possible issue solution:

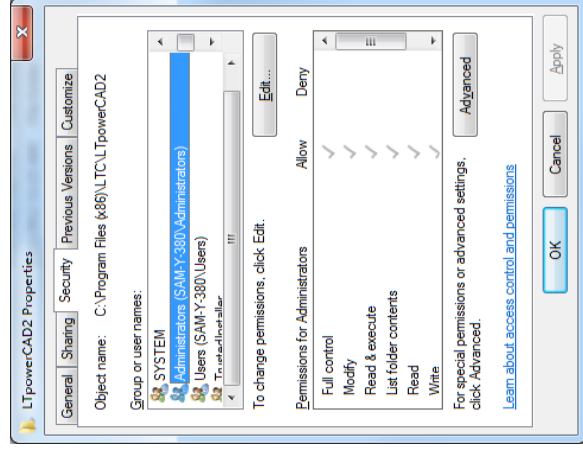
Run the program with an Administrator account , or try to modify your system's Users account security for now (see below).

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 **Administrators** that the permissions should show Allow for all options (except permissions). The **SYSTEM** account should also have the same

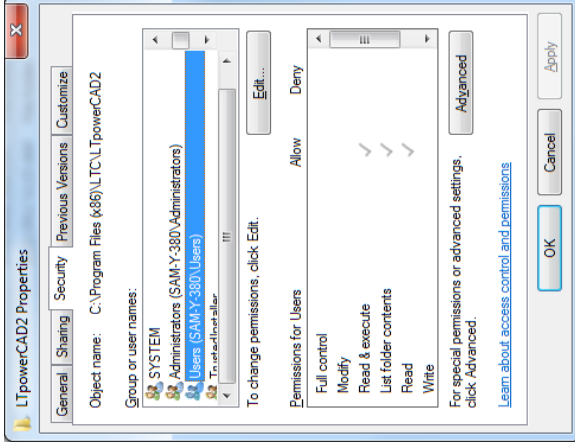


Important : Make sure you installed using “setup.exe” file (not the MS.msi file)

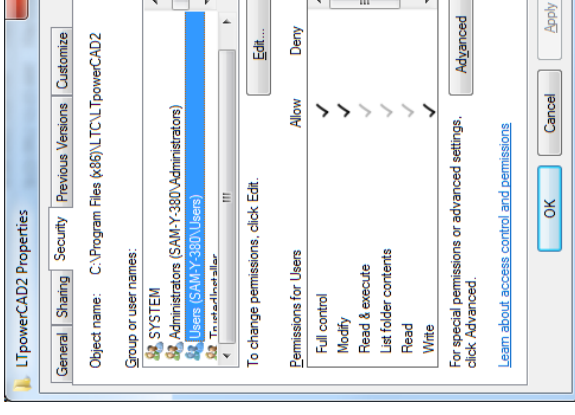
Appendix : Installation Troubleshooting

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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